WPI Teaching Practicum

Interactive Qualifying Project

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Teaching Practicum Paper

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Purpose of IQP Report

1. It serves as a historical document with regard to the student's practicum
2. It demonstrates the student's understanding of the how the actual course(s) they are involved in relate to and supports the Curriculum Frameworks
3. It demonstrates the student's ability to develop classroom materials consistent with the Frameworks
4. It provides the student the opportunity to assess his or her classes so as to determine the degree to which the Frameworks standards are being met
5. It provides the student with opportunity to provide evidence of effective classroom management, promoting equity and meeting professional responsibilities.
6. It requires the students to reflect upon the connections between their experiences in both the secondary education they are providing and the college education they are simultaneously experiencing.

North High School

Worcester Public Schools

North High School, or Worcester North, is one of the seven Worcester Public High Schools. Most commonly known to the students of North High School are their rivals: Burncoat High School, Doherty Memorial High School, and South High Community School. Claremont Academy, University Park Campus School, and Worcester Technical High School are the other three schools that complete the Worcester district's population (School Fusion).

The School

North High School has been home to several Worcester County students since 1980. Best known for its extracurricular activities, North High holds just over eleven hundred students. The school is viewed as very run-down and in need of some improvement. That, along with its twentieth century dynamics, is why a new building is in progress and is said to be finished within the next year or two. Statistics have shown that Worcester North struggled with attendance as the 2007-2008 school year progressed (School Fusion).

Demographics

There is very little continuity at Worcester High School. The majority of kids are Hispanic or White/Caucasian, followed by African American and Asian or Pacific Islander. Although diversity is common at Worcester North, wealth is not. Just over seventy five percent of the students are eligible for free or reduced lunch. Eligibility for free and reduced lunch is based on family size and household income. Teachers of North High also encounter students who have difficulty speaking English. With around fourteen percent of the school's students having limited proficiency in English, North High School is forced to employ faculty members that can translate for students and their parents. Furthermore, more than twenty two percent of students require special education (Worcester Public Schools, 2010).

Curriculum

There are several levels of courses in mathematics offered at North High School. The school offers three levels of Algebra I, Geometry, and Algebra II as well as two levels of Advanced Topology/Trigonometry and Topics in Algebra/Geometry. Furthermore, the students at Worcester North have the opportunity to be challenged in Advanced Placement (AP) Courses such AP Calculus and AP Statistics. Worcester North gives students a chance to take courses such as Pre-Calculus, College Level Statistics, and Numeracy. Due to the high level of undereducated kids, North High is forced to add a course called MCAS Math 1, as well. This class prepares students who have struggled with the MCAS in the past to be better prepared for the test in the near future (Massachusetts Department of Elementary and Secondary Education, 2008).

Overall, the intermediate level math courses are the most popular, by far. Thus, they do seem to be lacking in the college-preparatory and honors level course attendance (School Fusion).

MCAS

The most recent MCAS results found for North High School are from the year of 2008. Below, Table 1 shows the results for grade ten students who tested in the spring of 2008 at North High School (School Fusion). Table 2 displays the same results for the entire state of Massachusetts in the spring of 2008 (Worcester Public Schools, 2010).

Table 1

Mathematical Subject	Average Score
Number Sense and Operations	53.3%
Patterns, Relations, and Algebra	52.7%
Geometry	47.8%
Measurement	49%
Data Analysis, Statistics, and Probability	57.2%
Item Analysis (Multiple Choice)	56.2 %
Item Analysis (Open Response)	48.7%

Table 2

Threshold Scores for Performance Levels	
Maximum Score	100%
Advanced (Above Proficient): minimum score needed	75%
Proficient: minimum score needed	53.3%
Needs Improvement: minimum score needed	30%

The data above strongly suggests that the students at North High School are below average. An average student at Worcester North is just below or right at the Proficient Performance Level. This is why the curriculum is much lower and there are less Advanced Placement course offered at North High School. With that said, one must consider the fact that these are the average results, which implies that there are a fair number of students above the average, as well.

Course Descriptions

General Overview

The structure of courses at North High School changed this past year (Appendix Q). Up until the 2010-2011 school-year, North used block scheduling. In block scheduling, courses are a semester long and meet for over two hours. 2010 was the first year that North High changed to year-long courses that meet for approximately an hour every day. This change allows for very little in-class discussion or hands-on activities because of the short amount of time. It is a big adjustment for students and teachers. The impact of this change is mentioned below when discussing each course.

The Massachusetts State Frameworks describe the expectations for every teacher to follow in three steps (Appendix F). I used these steps as a guideline when designing my courses (Appendix A: A,1). First, teachers are expected to familiarize the students with the general concepts. This step requires an ability to perform the basic idea using an example. Secondly, students are expected to be able to explain their reasoning on how they arrived at their solution. This requires understanding beyond memorization and calculation. Lastly, teachers must be assured that their students can make abstract or basic connections with other topics in order to solve more complicated problems. This three-step concept is a perfect preparation for the MCAS Test. A significant portion of the MCAS Test asks students to answer open response questions which may require mastery in several concepts in order to answer a single problem. (Appendix A: E,1)

North High School offers a very standard sequence of math courses. For most courses, there is a higher level option, which is classified as “Honors”, and an average level option, which is classified as “College”. This sequence consists of Algebra I, Geometry, Advanced Algebra, Pre-Calculus, and AP Calculus and/or AP Statistics. The school also offers optional math courses that focus more specifically on subjects such as Statistics, MCAS Math, Numeracy, and Trigonometry. The focus of this paper is College Algebra I along with College and Honors Advanced Algebra.

Algebra I

The majority of freshmen students take Algebra I when they first enter high school. Previous knowledge for this course is not outlined by the Worcester Public Schools (Appendix B). There are no courses that regularly precede Algebra I due to its basic concepts. On the contrary, students are expected to be knowledgeable in addition and subtraction of whole numbers. Additionally, students should know the number line but even this basic concept is discussed at first (Appendix A: A,4).

Several students begin in the honors level course but find that the difficulty is much greater in high school than in middle school. For this reason, many students move from the honors level to the college level Algebra I course. Algebra I is the foundation for all mathematical courses that will follow in a student's high school and college careers. Teachers should be able to rely on the knowledge students learn in Algebra I when teaching any higher level math courses. "Major emphasis includes solving, graphing and interpreting linear and quadratic functions. Connections between Algebra, Geometry and Data will be explored. Students will investigate real world problems and apply number theory and rules of operations to the solution. Parallels and differences between linear and non-linear functions will be addressed." (Appendix B)

Essentially, Algebra I is designed as a yearlong course in which students are expected to master ten fundamental concepts: Properties of Real Numbers, Solving Linear Equations, Graphing Linear Equations, Writing Linear Equations, Solving and Graphing Linear Inequalities, Systems of Linear Equations and Inequalities, Exponents and Exponential Functions, Quadratic Equations and Functions, Polynomials and Factoring, and Rational Expressions and Equations. These concepts mirror their respective Academic Standards according to the City of Worcester and the State of Massachusetts (Appendix C).

Advanced Algebra

After successfully completing Algebra I and Geometry, students enter Advanced Algebra. Several other schools refer to this course as Algebra II. “This course is a bridge from Algebra I into advanced topics in mathematics. This is the prerequisite to Pre-calculus and Advanced Placement Statistics.” (Appendix D) Students have an opportunity to take either College or Honors Advanced Algebra. The placement of students depends on prior performance in Algebra I and Geometry, teacher recommendations, and parent recommendations. In order to be considered for this course, students are expected to be able to perform those concepts presented in Algebra I and Geometry.

There are twelve concepts that students must grasp in order to be properly prepared for higher level mathematics. These topics are outline in the City of Worcester and State of Massachusetts Academic Standards. They include Linear Representations, Numbers and Functions, Systems of Linear Equations and Inequalities, Matrices, Quadratic functions, Exponential and Logarithmic Functions, Polynomial Functions, Rational & Radical Functions, Conic Sections, Counting Principals, Series and Patterns, and Trigonometric Functions (Appendix E).

Students placed in College Advanced Algebra experience a comfortably paced course that focuses on thoroughly understanding the topics that are covered. A bulk of the coursework takes place in class where students have an opportunity to ask questions. Those students who take college level courses are often less likely to study independently or may need more explanation than other students.

Honors Advanced Algebra is for students who have proven to be hard workers in Algebra I and Geometry. This course thoroughly analyzes each topic in order to give students a better understanding of the ideas discussed. Students are expected to be independent with their studies and ask the more difficult questions. Parents may request to have their child placed in an honors course but it is primarily the teachers that decide.

Proceeding Mathematics Courses

Pre-Calculus, AP Statistics, and AP Calculus are courses that follow after a student completes the basic courses discussed above. Pre-Calculus is designed to introduce students to concepts that will be used constantly in higher level math courses. Of course, Algebra I, Geometry, Advanced Algebra sequence is essential for success in this course. Seniors may take this as their final high school math course. Some students may enroll in Pre-Calculus their junior year in order to prepare themselves for AP Statistics or AP Calculus. In either case, it will prepare them for a faster-paced curriculum with a more demanding work load. Furthermore, Advanced Placement (AP) courses, such as AP Calculus and AP Statistics, are a great way to show a university or college that a student can perform at a higher level of education.

Course Materials

Period 1: Advanced Algebra, College

College Advanced Algebra was a difficult course to teach due to the low level of effort and preparedness from the students each day. For this reason, consistency was the most important part of every class. Preparation consisted of having the entire week planned well in advance with daily agendas written on the board (Appendix G). Every daily agenda had objectives (Appendix A: B,1.i) and goals for the day (Appendix A: A,5). Agendas also consisted of a briefing of the lesson plan for the day; random math question on board; questions on homework; daily lesson; and the night's homework (Appendix H).

Random math questions were given out a few times a week in order to get the class settled and thinking about different topics. Sometimes the question was related to the subject they were currently studying in class. This way, I could see the students' progress on the current topic. Other times, a random math question would get the students thinking about other applications of math (Appendix A: B,1.iii). Many times it would be a simple application problem but students rarely use applications because everything is out of a textbook. This is very good practice for students because it they are all interested in questions outside of the textbook (Appendix A: A,3).

The second part of the agenda each day was open for questions. These questions primarily pertain to recent homework problems which were assigned previously. Students were encouraged to ask questions and realize that no question was a stupid question (Appendix A: B,2.v). For this class, they rarely preferred to write the solutions on the board. Thus, I would write the answers on the board half the time and the other half would consist of students volunteering to present the answer. In both either case, the answer was written on the board with details on how the solution was found. This allowed students to show their knowledge, critique each other's knowledge, and have the correct answers in their notes for future studying.

The majority of class time was dedicated to the daily lesson (Appendix H). One section was covered over a span of one to two days, depending on the need for explanation. The lesson plan was consistent with the recommendations of the textbook. Mirroring the given lesson is beneficial because it gives students consistency if they study the textbook at a later time or are frequently absent. It is still possible to break out into an activity when classes are becoming monotonous and students need a real life application to keep them interested. A lecturing of the lesson on the board was a common way of teaching students and worked very well. Since students were given grades on their notebooks, they were motivated to take notes. There were many examples given along with the lecture. Concrete examples allow students to have a template to follow when completing their homework. Other times, activities such as group work or graphing calculator workshops worked great to break the lecture trend (Appendix A: A,7). Students were expected to participate in group activities and follow along during lectures.

Whether there was lecturing or group work, homework was assigned every night. Students were expected to put forth a solid effort into completing the homework (Appendix A: D,1). Thus, homework was checked off each day as either a yes or no (Appendix A: B,3.i). If students had difficulty with a specific problem, they were expected to show everything they knew, at the very least. It consisted of ten to twenty problems from the book that covered every topic discussed in class. Along with basic examples, a couple application problems were always included. These application problems were normally word problems that made students think for themselves and no longer follow a template. Multiple choice problems were also included in order for students to be more prepared for any type of problem, especially in preparation for the MCAS. More abstract homework was given on occasion such as the graphing assignment. This assignment was given following a graphing calculator activity earlier that week (Appendix H). This was an opportunity for students to answer open-ended questions. Thus, there answer was correct as long as they could defend their reasoning. Open-ended questions are great when trying to get students to illustrate the concepts that they have learned.

Period 3 and 6: Advanced Algebra, Honors

These Advanced Algebra courses were held to higher standards due to their honors level classification. The only significant difference between the third and sixth period classes was numbers of students. The sixth period Advanced Algebra course had thirty students in comparison to the third period's fifteen students (Appendix Q). It was important to challenge these students are prepared them for more advanced and independent courses such as Pre-Calculus and AP Calculus. Furthermore, the pace of the course had to be faster in order to ensure that students covered the course in its entirety. For this reason, students were expected to study on their own and stay after school for questions that could not be answered in class. In addition, students were expected to have the basic concepts on Algebra I and Geometry mastered. By assuming the mastery of previous math courses, these honors level courses had the opportunity to do one lesson per day, on average. Students were then assigned daily homework which was to be completed and checked daily.

Preparation for these courses was more sporadic than College Advanced Algebra. Lesson plans were prepared by the week (Appendix I, J). At times, students would have more questions on a specific subject that may push the week's lessons forward by a day. Other times the lessons were pushed forward in order to accommodate for a student's request for an activity or group work. Overall, consistency was not the focus of this course. Although the agenda was posted on the board daily (Appendix A: C,4), there was always a possibility for changes. Honors level students know how they, as individuals, learn. For this reason, the course was their course to create and critique. More interactions with students made them more excited to come to class each day.

A typical day in Honors Advanced Algebra started with a fun warm up problem that got the students settled. Many times it would be similar to the previous night's homework. While walking around, I was able to see whether students needed more time on this topic or were ready to move on to the next section. Other times, warm ups would be fun math problems that were not directly related to

Algebra at all. The idea was to get the students settled and thinking about math without wasting class time (Appendix A: C,4).

After a few minutes working on a warm up, class continued with questions on the warm up and/or previous homework. Oftentimes, I allowed students to write their answers on the board and explain their process. Students were forced to teach other students, which is the best way to prove mastery. Furthermore, the students that do not understand are more likely to listen to their peers. In the interest of time, I would sometimes answer the questions on the board myself.

The majority of class time was dedicated to learning something new. Students preferred teacher-lead lectures along with frequent questioning. Examples were the key part of this class. Although explanation of where concepts came from was important, these students needed to see examples and then try problems themselves. An exercise or two would be assigned in class so that students could make a couple mistakes and be corrected on them before they try the homework. Overall, these honors students learned through trial and error. For this reason, homework was a very important for students to complete if they wanted to be successful.

Homework was checked daily for effort. Homework was checked off as complete if students tried every problem and could explain why they did not complete any unfinished problems. Eventually, several students were frustrated that their homework did not receive an actual grade. I began collecting homework and determining the percentage correct/attempted (Appendix Q). Some students worked harder to complete their homework after they knew it was being assessed more thoroughly.

Period 4: Algebra I, College

College Algebra I had two groups of students: first year students and repeating students (Appendix P). The first year students in this course were either ineligible for Honors Algebra I or did not wish to be challenged. All other students were repeating the courses due to failing on a previous attempt. For these reasons, patience was important when designing the daily lesson plans and overall goals of the course. The structure was monotonous in order to get the students in a daily routine (Appendix K, L). Class time started with a warm up, followed by completion of a note taking, and finished with assigned practice sheets. Each student had a binder provided by the school which kept these course materials together. Since lectures were nearly impossible with this group, work was done independently. Preparation for this class was very important. Warm ups and practice sheets needed to be photocopied daily and extra copies were needed for students who lost assignments.

As students entered the classroom each day, they were required to take the printed out warm up and copy it into their notebook. After completing the work in their notebook, students turned in the printed version of the warm up with their name and answer on it. Five minutes after the start of class, students received a completion grade for warm up if they followed these steps. Following the warm up, students were expected to spend time on the section assigned that day. Students were given two days to complete a section. Completion of a section meant that the student completed his/her note taking guide and practice sheet for that section.

The note taking guide was done in class. This was a “fill in the blank” book that mirrored the lesson given in the textbook. There were notes, examples, and exercises for each lesson. Sometimes answers to the note taking guide were projected up front to make sure that each student had it correct for studying purposes (Appendix A: B,2.vi). When several students struggled on the same section, I would explain concepts on the board. Overall, one-on-one questions were the best way to address a student’s issue in understanding concepts.

Practice sheets were to be completed as homework (Appendix O). The first page was basic questions which mirrored examples given in the book and note taking guide. The second page had word problems that challenged students to understand simple applications. All questions on the second page ask students to explain their answer by showing their work. This made it obvious whether students mastered the material or just followed an example. By having the section split up over two days, students had time to attempt problems and then ask questions on the areas that caused them to struggle.

The Students

Period 1: Advanced Algebra, College

College Advanced Algebra was the first class of the day for eighteen students (Appendix Q). These eighteen students varied in their ability and effort. There was a solid group of students that put forth enough effort to keep up with the course material; a group of trouble makers that were smart enough to know the material but did not apply themselves; and stragglers that tried to sleep and/or refused to pay attention every class.

The solid group of students was located in the center of the room and was always quiet during lectures. They asked questions when confused and took notes otherwise. It was not hard to keep these students on track. Homework was a separate issue, which was a struggle. Even the best students did not do homework on a regular basis. Originally, homework was just a part of their notebook grade and was not checked separately. This frustrated students because they felt that they were given nothing for their effort. Explanation of how homework is practice for tests helped but grading their homework separately became a worthwhile solution (Appendix A: A,2). Similarly, studying was not a norm in mathematics at North High School. Students did not know how to study math. The idea of doing extra homework problems without receiving credit was absurd. The lack of homework and studying made test grades quite low. Aiding in the lazy mentality was the group of troublemakers.

There were three or four students that felt high school was unnecessary and grades were a joke. They had the philosophy that it was “cool” to get the lowest grade on a test and you were a “nerd” if you did well. This made other students embarrassed when they did well. I countered this issue by writing notes on good test grades that mentioned there good performance. Two of the troublemakers came late for class almost every day. This meant they missed about ten minutes of class time and disturbed the class after they had finally settled down. Another member of this classification was eighteen years old and had failed the course the year prior. I sent him to the office several times for disturbing the classroom. Eventually, this was counterproductive so I made him sit in the front of the classroom where his attention was focused towards me. I eventually found out that this student's parents were not supportive of him. He had a job that took up all of his time after school and he rarely had any down time to do his homework. I talked to him and took this into consideration when assessing him for the term.

The rest of the students in my period one class cannot be categorized. One student claimed he had a learning disability and used it as an excuse during lectures and tests. During lectures, he would start by taking notes and eventually fall asleep. Waking him was easy but keeping his attention towards classwork was not. During tests, he would stare off into space for five to ten minutes before writing anything. When he ran out of time, he claimed now enough time was allowed for the test. I tried to give him extra time after class to finish tests or quizzes but his grade did not change. Another student struggled with English making lectures useless to her. I solved this by meeting with her during my lunch break almost every day. We went over the lesson and worked on a couple homework problems. She still struggled but she always tried her hardest and asked a lot of questions. I tried to answer her questions individually during class because to other students, the answers to her questions were obvious.

Overall, there was a pattern of learning styles. In order for these students to understand and try, they needed applications. The best application was money. Anything associated with money made perfect sense to these students (Appendix A: B,1.iv). Furthermore, group work was the solution to getting all different types of students to work together. I learned this philosophy of group work from my ID 3100 class at Worcester Polytechnic Institute (Appendix A: E,3). The course was taught by the principal of the Massachusetts Academy of Math and Science. Some of my colleagues used the group work and found it successful (Appendix A: E,4). This caused me to use it in the following manner once or twice a week. I created groups of three or four that integrated students who rarely interacted with each other. I gave them a few problems to work on as a group. If someone had a question, I asked someone else in the group what the question was. This forced every student to problem solve on their own without my help. When we returned to the lecture style class, every student knew a little more than they did before the group activity (Appendix A: A,2). Class time was my primary focus because homework problems were rarely completed by students. All of the practice had to be done in class.

Period 3: Advanced Algebra, Honors

My Honors Advanced Algebra course that took place during period three was a very close group of sixteen students (Appendix Q). They all knew each other and most of them were involved in extracurricular activities. Those who were not involved elsewhere were even more interested in doing well in the course. Both sets of students combined to make class time a very effective learning environment. Whether I assigned group work, individual work, or board work they always put forth a considerable amount of effort. Sadly, with a lack of effort on homework and studying, their grades did not meet the expectations of an honors level course. Yet the potential was never lost with this crew.

Classroom management was very easy in this class. During lectures, students took notes and frequently asked questions when concepts did not make sense. Eventually, several students realized that notes were helpful but they knew they would not understand the material until they practiced. Since students rarely did homework, I did many examples in class. Instead of doing five of the same basic example, I made sure to cover each possible case that students may see in their homework and quizzes/tests. By using class time in this manner, students would ask their questions in class and have a template to follow when working on homework problems. If a homework problem did not look familiar, they would rarely try it. Instead, they chose to come into class the next day stating that the homework made little sense and was nothing like I taught the day before. This is why the questions section of my daily lesson was so crucial. This process was also helpful because I allowed students to use their notebooks on quizzes and tests. So even if they didn’t do their homework, their class notes were enough to help them through the more difficult problems.

When I felt it was necessary, I split the class into groups of three or four. This philosophy was similar to that of my College Algebra II course. For this honors course, I used groups to get students to ask each other the more difficult questions. I wanted students to discover on their own instead of relying on me. Oftentimes, group work frustrated these students but the discoveries they made on their own have a lasting impression. Furthermore, students tend to benefit from teaching other students what they have learned, which is why I had students do examples on the board. Explanation is very important in both of these situations. In order to explain a problem, a student must have the concept mastered. In order for students to understand a problem in this course, thorough explanation was essential.

Overall, applications were still a big part of maintaining the student interest. Any time that I was able to relate the daily lesson to something I experienced in college, students were all ears. This may cause some class time to be wasted but the connections between a story and math are rarely forgotten. This also allowed me to teach the students more than mathematics. There were many times that I went into a more complicated explanation of mathematical applications to make students realize that math does not stop in high school (Appendix A: E,2). This proved my knowledge of their algebra course and more advanced college courses (Appendix A: B,2.iii). I also emphasized the importance of responsibility and keeping an open mind. I frequently used the stereotype people had of fraternities and informed them that I am in a fraternity. I went on to mention the responsibility that comes with fraternity life and how it applies to everything we face in life. It was always interesting to hear the goals they had after high school. (Appendix A: D,4)

Period 4: Algebra I, College

The groups of learning styles in my College Algebra I class were scattered between twenty three different students (Appendix P). It was their first year in high school for most of these students. Thus, they did not take the course very seriously. This mentality is caused by the lack of high expectations in

Worcester elementary schools. I gained this information from encounters with several high school teachers at North High School (Appendix A: A,6). Those students that were not first year high school students had taken Algebra I before and did not meet the previous teacher's requirements. With these classifications of students in mind, students were very intolerant of structure, making the course difficult and a challenge to teach.

Several teaching styles were explored over the duration of this course (Appendix A: B,2.ii). To accommodate for the few quiet students that listened and ask questions, I did a brief lecture on each section. Those who listened were able to complete the note taking guide using what I had taught them, along with their textbook. Yet, the majority of the students did other things during lectures. Some attempted to use their iPods and cellphones, which I took away when noticed. Others tried to complete their World History or English homework from the night before. There were even students who disturbed the class by throwing thing s or running around the room. Each situation was addressed as needed. Students were sometimes given warnings and eventually sent to the office if they refused to cooperate. After some time, it was apparent that lectures were not the best way to teach these students.

A second effort focused on students doing individual classwork. Here, students read the textbook in the beginning of class and took notes in their note taking guides. When the note taking guide was complete, they were to work on their practice sheet and complete it for homework. More students enjoyed this because they felt that it gave them some freedom. Also, their work was checked daily. This way the students had no reason to think their effort would go unnoticed. Some students still struggled because they were uncomfortable asking questions during this more quiet time.

The best solution was a combination of both philosophies (Appendix A: D,3). I moved the students that listened to lectures to the front of the classroom so that they could clearly listen and follow along to my explanations. The students who wanted to work individually were given the privilege to do so if they worked quietly in the back of the room. Although some students were still off task, this philosophy made for the highest percentage of involvement. Those who still refused were spoken to after class. I discovered that their lack of effort was caused by a fear of embarrassment. They either didn't want to be seen as smart or didn't want to ask a stupid question. Thus, meeting with them after class when no students were around was helpful. I was able to discover where they were struggling and address the issues one-on-one. As long as these students did well on the assessments, I knew they were trying. The combination of these different teaching styles was necessary in order to encourage achievement of every student in my classroom (Appendix A: D,2).

Period 6: Advanced Algebra, Honors

Around thirty students made up my Honors Advanced Algebra course which took place sixth period (Appendix Q). By the time class began, every seat in the classroom was taken. Managing the students was far easier than any other classroom. Starting the first day of class, discipline was vital. Once students realized the expectations in my classroom were to listen, take notes, ask questions, and put forth one hundred percent of their effort, everything else followed (Appendix A: D,1). Although these same expectations were explained to my period three class, I had time to realize what did and did not work by the time period six began. This was an advantage for me and my students, which made for a classroom full of learning and fun (Appendix A: C,1).

Due to their discipline, these students were able to learn through practice and note taking. Following a lecture, the class was much more independent than other classes. They would either do the work on their own or help each other when dealing with questions. Questions directed towards me were usually related to more complicated applications or more in depth uses of the daily lesson. On the whole, these students were more than willing to think for themselves. This allowed me to use the group work when lectures became repetitive. It was just another way of managing the class and keeping students interested. Also, it forced students who normally worked independently to learn how to collaborate with others. There was only one student who was uncomfortable around others because she lacked confidence. Luckily, she was more than willing to meet after school each day. We would meet briefly after the end of the school day to go over any quick questions she had which allowed her to realize her guess on the solution was correct. This helped her boost her confidence in her answers.

There were a couple cases of behavioral issues. A few students would chat in the back corner of the classroom and refuse to pay attention. I made it clear to these students that their behavior was unacceptable (Appendix A: C,3). Speaking to them did not work and sending them to the office did not help them learn. Eventually, I changed the seating around so that they were not sitting by their friends during class. Since they had no one to talk to, they tended to listen to me more. There was another student who had family issues which got in the way of her studies. When her Mom found noticed her daughter's grades slipping, she had her staying after school constantly. After a couple weeks, she had trouble keeping up again. She tried to learn a quarter's worth of material in a limited amount of time to get caught up. She got burnt out real fast, especially when her grades were not what she had hoped. Both of our extra efforts help her complete the first semester with a passing grade (Appendix A: D,3). The second semester meant a new set of grades, allowing her to start fresh.

Classes Overall

Aside from the class-by-class struggles, there were also things that every teacher at North High School had to address: absent and transfer students. These are situations that no teacher can avoid. The difference between teachers is how they deal with these types of dilemmas. Since I am a college student, my limited time at Worcester North caused me to have a limited number of options of how to solve these situations. I was unable to stay after school for very long and the connection I had with students was not tight. With this in mind, it was still my classroom to manage.

Students were absent from class quite often (Appendix P, Q). Whether the cause was skipping school, skipping class, suspension, or sickness it did not matter. Absence meant that the student missed a new lesson. I resolved this issue by offering to meet the student during one of my preparation periods, lunch breaks, or after school. During this time, I would briefly go over the lesson and let them know that they still needed to hand in the assigned work the following day. Some students took advantage of my offerings and those who did not were expected to learn the material on their own. As long as I mentioned my available times to meet, students understood there was nothing else I could do. Luckily, other math teachers were able to help them when it was more convenient.

Transfer students were also a common situation that caused confusion (Appendix P). Two of the transfer students I received arrived on the day of a test. I had the students take the test to see their level of understanding the material. If the test went well, it would be their first grade. If the students struggled, I planned to meet with them and discuss the areas that they didn’t understand. The only other transfer students I encountered were very intelligent and ahead of the class. These students quickly caught on and did not need any extra help.

Assessment/MCAS Preparation

College and Honors Advanced Algebra

All College and Honors Advanced Algebra courses had the same grading policy. As noted in the syllabus given to every student and signed by every parent/guardian (Appendix A: E,5), students' grades were based on classroom participation (10%), presentations (15%), homework/notebook (25%), tests/quizzes (40%), and final test/assessment (10%) (Appendix A: B,3.iii). This grading policy is the recommended format for all Worcester Public Schools (Appendix Q). It benefits students by giving them a variety of ways to receive credit for their work (Appendix A: B,4.i). Furthermore, the logic of the system is explained below. Within these given assignments, and also in addition, students were consistently challenged with problems that prepared them for questions they may see in the MCAS.

Classroom participation is meant to be an easy contribution to each student's final grade. Students who frequently miss class have a possibility of not receiving the full ten points for their quarter grade. Any student who could explain the cause of their absence and successfully make-up their work would still be eligible for a full ten points. Students that disturb the classroom by talking out of turn or often coming in late would lose points in this category. Likewise, students that fell asleep during class lost the majority of their class participation credit.

Presentations are another form of classroom participation that has more of a focus. During class, students are frequently asks to answer homework questions on the board to benefit their peers. This is a great way for students to prove their knowledge that they have attained in the course. Presentations after group work also counted towards a student's presentation grade. Overall, students had several chances over the months to present at some point. As long as a student attempted the presentation and had proven some knowledge of the material, the majority of the fifteen points were granted.

Although it was not the highest percentage of the grading policy, homework and note taking had the biggest impact on a student's grade. Students were expected to take notes every day during class lectures. Furthermore, homework was to be done in the same notebook every night. Normally, homework was problems out of the textbook referring to the appropriate chapter. Other times, an open response question (Appendix A: B,2.iv) may be asked in order to prepare students for MCAS problems. The book also prepared students for the MCAS by giving multiple choice exercises, which I frequently assigned for that reason. When a test or quiz was assigned, students were allowed to use their notebooks. As long as the student took accurate notes and completed his/her homework assignment, including asking questions when unsure, his/her notebook was practically an answer sheet. Thus, the reason for this grade was to encourage students to pay attention during class, along with practicing all course material as much as possible.

Finally, test and quizzes were assigned as the textbook recommended (Appendix M, N). Normally, these test and quizzes were copied directly from the textbook unless I felt another form of testing was more beneficial. For example, I assigned a take home test that was open-ended which tested the students' ability to create, record, and analyze a small set of data. Students were expected to defend their answers in order to receive full credit. Open-ended problems are, once again, a great way for students to prepare themselves for the MCAS. The standard quiz covered two or three sections and were no more than ten questions. Tests covered entire chapters by taking a few questions from each section. This philosophy was important to follow in order for students to show that they remember to key parts of each lesson.

To encourage mastering of the material covered and meet Worcester School Committee requirements, a final test was to be given at the end of the year (Appendix Q). During this test, students are expected to exemplify understanding of all material covered in Advanced Algebra. This final is longer for those in the honors level course and shorter for the college level course, depending on the amount of material covered.

College Algebra I

As mentioned earlier, College Algebra I was a very structured course that left little independence for students. It was designed to show students how to succeed through note taking, practice, and, most important, organization. For these reasons the grading policy was broking down into five categories: binder (15%), warm-up (10%), note taking guide (15%), practice sheets (20%), and quizzes/tests (40%) (Appendix A: B,3.iii). The percentage changed at times, depending on the outcome of a student's grade. Different students were strong in different areas and thus grading was done accordingly (Appendix A: B,4.i). This break down of grading was provided to students during the middle and end of each grading quarter. Students were told to grade themselves and then meet with me individually to discuss my dis/agreements (Appendix A: B,3.ii).

At the beginning of the course, every student was provided with a one inch binder along with warm-up, classwork, and homework indexes. Students were expected to bring their binder to class every day and keep their indexes up to date. Index entries consisted of writing the date and the lesson or activity that was done on that day. All work done in class and for homework was expected to be three-hole punched and in its respective organized location in the binder. This binder was allowed to be used as a resource during tests and quizzes periodically. At the end and middle of each quarter, students presented there binder to me in order to receive this percentage of their grade. This binder also provided a great, continuous portfolio for students that wished to present their achievements to school personnel or parents/guardians (Appendix A: B,4.ii).

As described earlier, warm-ups were assigned at the beginning of class each day. This was a math problem from the eighth or tenth grade MCAS. These problems were a great way to get the students settled down as well as becoming familiar with problems they will see on the MCAS. In order to receive full credit for a warm-up, a student was required to copy the printed warm-up question and answer it in their binder. After completing the problem, they wrote down the answer on the warm-up sheet and handed it in to me. A correct answer was not required for students to receive credit when handing in the problem. After five minutes passed, I explained the answer to the warm-up on the board and students were expected to correct their answer in their binder, if necessary. During binder checks, I made sure every warm-up was recorded in their warm-up section in order to receive the full ten points.

A Note Taking Guide was also provided to every student at the beginning of the course. This Note Taking Guide was provided by the authors of the Algebra I textbook. It was a fill in the blank book that provided students with a format for their notes. This was good for students that did not have experience with taking notes. The next time these students take a math course, they will have an idea of what a good page of notes looks like. Note Taking Guides were checked with binders.

The second-highest percentage of every student's grade was determined by their overall performance on Practice Sheets (Appendix O). These Practice Sheets were assigned as homework for every lesson. Students normally had two days to complete the practice sheet. The first page was full of several basic exercises while the second page had four to six word problems that applied the section's concepts to real life problems (Appendix A: B,2.i). These Practice Sheets were used because of recommendations by the textbook and the benefit towards the MCAS. Open-ended applications are also a great way for students to show mastery concepts. Practice Sheets were passed-in, graded, and returned every other day.

Quizzes and Tests had the most significant impact on the students' final grade (Appendix O). Quizzes for each section allowed students to realize the areas where they were struggling. At the end of each chapter, these quizzes made for great study material. In order to prove mastery of the chapter, students were required to take a test which covered the key concepts. These tests were also provided with the textbook. Once again, to encourage mastering of the material covered over the entire course and meet Worcester School Committee requirements, a final test was to be given at the end of the year. Since the course was very slow-paced, there were only a few tests and about six quizzes.

Conclusion

The four months spent at North High School as an Observer and Teacher opened my eyes and made me grow as a person. The teachers were very accepting and helpful. I sensed the frustration in the feelings of a few teachers due to the low expectations of the school. Yet every teacher was there to change lives. Reflecting over the entire experience allows me to identify the areas of success and failure. This will make my future teaching experiences even better for my students and me.

My success was in connecting with the students. Since I am only a few years older than many of them, it was easy to relate our experiences. My young energy also allowed me to keep up with the students' energy levels. Furthermore, I had very little piety for the students that complained about the amount of work they were given. I was in a similar situation three years ago and now I am in an even busier lifestyle. These qualities allowed me to hold these students to much higher expectations than they were accustomed. Sometimes they did not realize the amount of work they were doing because I made class fun. As long as students tried, I was able to ease up and not yell. On the rare occasion that I did yell, students took me seriously.

Of course, there were several more struggles than successes. Luckily, this experience has allowed me to make mistakes and learn form them while I still have a safety net: my teaching mentor, Mr. Turner. Mr. Turner observed me throughout my classes and pointed out my flaws. My flaws were anything from standing in front of my writing at the whiteboard to wasting time in the beginning of the course by not having a warm-up problem. As I fixed these flaws, classroom management became much easier. Many of these solutions have become habits and will be remembered when I teach in the future.

Overall, Worcester North is a high need school that survives because of the patience that is so apparent in character of every teacher. Patience is a virtue at North High because students are not held to high expectations. Expectations of students are said every day during morning announcements but not every teacher and administrator obeys. Inconsistency is noticed by the students which allow them to take full advantage. The most important thing to do is to keep the expectations in the classroom obvious. As long as these expectations are clear and consistent every day, students will learn to be disciplined and success will follow. (Appendix A: E,6)

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Appendixes

Standards for All Teachers

A. Plans Curriculum and Instruction.

1. Draws on content standards of the relevant curriculum frameworks to plan sequential units of study, individual lessons, and learning activities that make learning cumulative and advance students' level of content knowledge.
2. Draws on results of formal and informal assessments as well as knowledge of human development to identify teaching strategies and learning activities appropriate to the specific discipline, age, level of English language proficiency, and range of cognitive levels being taught.
3. Identifies appropriate reading materials, other resources, and writing activities for promoting further learning by the full range of students within the classroom.
4. Identifies prerequisite skills, concepts, and vocabulary needed for the learning activities.
5. Plans lessons with clear objectives and relevant measurable outcomes.
6. Draws on resources from colleagues, families, and the community to enhance learning.
7. Incorporates appropriate technology and media in lesson planning.
8. Uses information in Individualized Education Programs (IEPs) to plan strategies for integrating students with disabilities into general education classrooms.

B. Delivers Effective Instruction.

1. Communicates high standards and expectations when beginning the lesson:
    - i. Makes learning objectives clear to students.
    - ii. Communicates clearly in writing and speaking.
    - iii. Uses engaging ways to begin a new unit of study or lesson.
    - iv. Builds on students' prior knowledge and experience.
2. Communicates high standards and expectations when carrying out the lesson:
    - i. Uses a balanced approach to teaching skills and concepts of elementary reading and writing.
    - ii. Employs a variety of content-based and content-oriented teaching techniques from more teacher-directed strategies such as direct instruction, practice, and Socratic dialogue, to less teacher-directed approaches such as discussion, problem solving, cooperative learning, and research projects (among others).
    - iii. Demonstrates an adequate knowledge of and approach to the academic content of lessons.
    - iv. Employs a variety of reading and writing strategies for addressing learning objectives.
    - v. Uses questioning to stimulate thinking and encourages all students to respond.
    - vi. Uses instructional technology appropriately.
    - vii. Employs appropriate sheltered English or subject matter strategies for English learners
3. Communicates high standards and expectations when extending and completing the lesson:
    - i. Assigns homework or practice that furthers student learning and checks it.
    - ii. Provides regular and frequent feedback to students on their progress.
    - iii. Provides many and varied opportunities for students to achieve competence.
4. Communicates high standards and expectations when evaluating student learning:
    - i. Accurately measures student achievement of, and progress toward, the learning objectives with a variety of formal and informal assessments, and uses results to plan further instruction.
    - ii. Translates evaluations of student work into records that accurately convey the level of student achievement to students, parents or guardians, and school personnel.

C. Manages Classroom Climate and Operation.

1. Creates an environment that is conducive to learning.
2. Creates a physical environment appropriate to a range of learning activities.
3. Maintains appropriate standards of behavior, mutual respect, and safety.
4. Manages classroom routines and procedures without loss of significant instructional time.

D. Promotes Equity.

1. Encourages all students to believe that effort is a key to achievement.
2. Works to promote achievement by all students without exception.
3. Assesses the significance of student differences in home experiences, background knowledge, learning skills, learning pace, and proficiency in the English language for learning the curriculum at hand and uses professional judgment to determine if instructional adjustments are necessary.
4. Helps all students to understand American civic culture, its underlying ideals, founding political principles and political institutions, and to see themselves as members of a local, state, national, and international civic community.

E. Meets Professional Responsibilities.

1. Understands his or her legal and moral responsibilities.
2. Conveys knowledge of and enthusiasm for his/her academic discipline to students.
3. Maintains interest in current theory, research, and developments in the academic discipline and exercises judgment in accepting implications or findings as valid for application in classroom practice.
4. Collaborates with colleagues to improve instruction, assessment, and student achievement.
5. Works actively to involve parents in their child's academic activities and performance, and communicates clearly with them.
6. Reflects critically upon his or her teaching experience, identifies areas for further professional development as part of a professional development plan that is linked to grade level, school, and district goals, and is receptive to suggestions for growth.
7. Understands legal and ethical issues as they apply to responsible and acceptable use of the Internet and other resources.

Worcester Public Schools

Course Syllabus– Part I

Course Title: **Algebra I**

Course Description:

Students will focus on the Grade 9 Massachusetts Mathematics Curriculum Framework and the Worcester Public Schools 9th grade Mathematics Curriculum. Major emphasis includes solving, graphing and interpreting linear and quadratic functions. Connections between Algebra, Geometry and Data will be explored. Students will investigate real world problems and apply number theory and rules of operations to the solution. Parallels and differences between linear and non-linear functions will be addressed.

Course Objectives:

Students will:

- Gather, plot and interpret data
- Generalize, apply, and predict information from patterns, tables, and graphs
- Evaluate and solve multi-step equations
- Evaluate formulas to express relationships given in written, tabular, and graphic form
- Find measures of Central Tendency, and represent data including scatter plots and stem plots
- Demonstrate an ability to manipulate numbers, use order of operations, and integers
- Solve and work with linear functions, linear equations, slope, intercepts, and quadratics

Essential Questions:

1. How does "unit rate" translate into linear functions?
2. What are the similarities and differences between linear and non-linear functions?
3. How does slope appear in real world situations?

Texts:

McDougal Littell, Algebra I, Concepts and Skills, 2004.

District-Wide Reading Skills Across the Curriculum:

- **Preview** (survey) – note major elements such as organization, vocabulary, summary, and graphics.
- **Ask Questions -** question the text, the author and self.
- **Activate Prior Knowledge** (schema) – use what is already known to enhance understanding of what is new in the text.
- **Make Connections -** link text to self, text to world and text to text.
- **Visualize -** use sensory images to create a mental picture of the scene, story, situation, or process and involve oneself in it.
- **Draw Inferences -** go beyond the literal information in the text including predicting, figurative meaning and thematic understanding.
- **Distinguish Key Ideas -** recognize main idea and key concepts.
- **Use Fix-Up Strategies -** monitor own understanding by pausing to think, re-read, consider what makes sense, restate in own words.

Contextual Vocabulary:

linear
quadratic
measures of central tendency

- mean
- median
- mode
- range

Recommended Grading Policy (indicate percent for each factor):

- Classroom participation -
- Projects/papers -
- Homework -
- Final test/assessment* - 10%
- Other _________________

*The Worcester School Committee requires that the final test/assessment be 10% of a student's grade

Prerequisite Courses:

none

Note to Teachers: In addition to handing out the above syllabus to students, you should also hand out to them your expectations in the following areas:

- ✓ Homework policy
- ✓ Make-up policy
- ✓ Attendance requirements
- ✓ Any other expectations

Worcester Public Schools

Course Syllabus – Part II, Academic Content for the First Semester
Algebra I

Content/Topics –	Skills	Required Papers/Projects, Readings, and Final Assessment/Test	Academic Standards (Worcester Benchmarks and State Frameworks)
Properties of Real Numbers	**Solve using operations of real numbers and the order of operations Use the distributive property Combine like terms Solve absolute value problems**		**AI.N.1 Identify and use the properties of operations on real numbers.**
Solving Linear Equations	**Solve one-step and multi-step equations Evaluate equations with variables on both sides Solve problems using ratios, rates, and percents**		**AI.P.2 Use properties of the real number system to judge the validity of equations and inequalities.**
Graphing Linear Equations	**Describe the coordinate plane Graph lines including horizontal and vertical lines Find intercepts and slope Identify direct variation Utilize the slope-intercept form**		**AI.P.5 Demonstrate an understanding of the relationship between various representations of a line.**

Writing Linear Equations	**Use the slope-intercept and point-slope forms of a line Find linear equations given two points Use the standard form of a line Identify perpendicular lines**		**AI.P.6 Find linear equations that represent lines either perpendicular or parallel to a given line and through a point.**
Solving and Graphing Linear Inequalities	**Solve one-step and multi-step inequalities Find compound inequalities Solve absolute value inequalities Analyze linear inequalities in two variables**		**AI.P.10 Solve equations and inequalities including those involving absolute value of linear expressions.**

Worcester Public Schools

Course Syllabus – Part II, Academic Content for the Second Semester
Algebra I

Content/Topics –	Skills	Required Papers/Projects, Readings, and Final Assessment/Test	Academic Standards (Worcester Benchmarks and State Frameworks)
Systems of Linear Equations and Inequalities	Graph linear systems Solve systems by substitution and combinations Use systems of linear equations and inequalities to solve problems		AI.P.12 Solve everyday problems that can be modeled using systems of linear equations or inequalities.
Exponents and Exponential Functions	Use properties of exponents Graph exponential functions Use scientific notation Use exponential growth and decay in the solution of problems		AI.P.11 Solve everyday problems that can be modeled using exponential functions.
Quadratic Equations and Functions	Solve square roots Simplify radicals Graph quadratics Solve quadratics Use the quadratic formula Find the discriminant Graph quadratic inequalities		AI.P.9 Find solutions to quadratic equations (with real roots) by factoring, completing the square, or using the quadratic formula.

Polynomials and Factoring	**Solve operations with polynomials** **Solve quadratics in factored form** **Factor quadratics** **Factor cubics**		**AI.P.7 Add, subtract, and multiply polynomials. Divide polynomials by monomials.**
Rational Expressions and Equations	**Use proportions, direct and inverse variation to solve problems** **Simplify rational expressions** **Use operations with rational expressions** **Solve rational equations**		**AI.P.8 Demonstrate facility in symbolic manipulation of polynomial and rational expressions.**

Worcester Public Schools
High School Curriculum

Course Syllabus– Part I

Course Title: Advanced Algebra

Course Description:

The course will focus on the Algebra II Massachusetts Mathematics Curriculum Framework and the Worcester Public Schools 11th Grade Mathematics Curriculum. This course is a bridge from Algebra I into advanced topics in mathematics. This is the prerequisite to Pre-calculus and Advanced Placement Statistics.

Course Objectives:

Students will:

- Solve problems using systems of linear equations
- Use matrices to solve problems
- Solve quadratic functions with complex roots
- Utilize the inverse relationship between exponential and logarithmic functions
- Use polynomial functions in the solution of problems
- Solve trigonometric functions

Essential Questions:

1. How are non-linear situations represented in mathematics?
2. Where do trigonometric functions and solutions occur in our world?

Texts:

Holt, Rinehart, and Winston; Advanced Algebra; 2003.

District-Wide Reading Skills Across the Curriculum:

- **Preview** (survey) – note major elements such as organization, vocabulary, summary and graphics.
- **Ask Questions -** question the text, the author and self.
- **Activate Prior Knowledge** (schema) – use what is already known to enhance understanding of what is new in the text.
- **Make Connections -** link text to self, text to world and text to text.
- **Visualize -** use sensory images to create a mental picture of the scene, story, situation, or process and involve oneself in it.
- **Draw Inferences -** go beyond the literal information in the text including predicting, figurative meaning and thematic understanding.
- **Distinguish Key Ideas -** recognize main idea and key concepts.
- **Use Fix-Up Strategies -** monitor own understanding by pausing to think, re-read, consider what makes sense, restate in own words.

Contextual Vocabulary:

polynomial
exponential
logarithmic
matrix
trigonometric
combinatorics

Recommended Grading Policy (indicate percent for each factor):

- Classroom participation -
- Projects/papers -
- Homework -
- Final test/assessment* - 10%
- Other _________________

*The Worcester School Committee requires that the final test/assessment be 10% of a student's grade

Prerequisite Courses:

Algebra I and Geometry

Note to Teachers: In addition to handing out the above syllabus to students, you should also hand out to them your expectations in the following areas:

- ✓ Homework policy
- ✓ Make-up policy
- ✓ Attendance requirements
- ✓ Any other expectations

Worcester Public Schools
High School Curriculum

Course Syllabus – Part II, Academic Content for the First Semester
Advanced Algebra II

Content/Topics –	Skills	Required Papers/Projects, Readings, and Final Assessment/Test	Academic Standards (Worcester Benchmarks and State Frameworks)
Linear Representations	**Find slope and intercepts** **Solve linear equations in two variables**		**AII.P.8 Solve a variety of equations and inequalities using algebraic, graphical, and numerical methods.**
Numbers and Functions	**Use operations with numbers** **Use operations with functions** **Identify properties of exponents**		**AII.N.2 Simplify numerical expressions with powers and roots. Including fractional and negative exponents.**
Systems of Linear Equations and Inequalities	**Solve systems of equations** **Find solutions to linear inequalities in two variables** **Solve systems of linear inequalities**		
Matrices	**Use matrices to represent data** **Solve using matrix multiplication** **Find the inverse of a matrix**		**AII.P.9 Use matrices to solve systems of linear equations.**

Quadratic functions	**Solve quadratic equations** **Factor quadratic equations** **Use the completing the square method** **Solve using the quadratic formula** **Use complex numbers in the solution to quadratic equations**		**AII.P.7 Find solutions to quadratic equations and apply to the solutions of problems.**
Exponential and Logarithmic Functions	**Solve problems involving exponential growth and decay** **Graph and solve exponential functions** **Graph and solve logarithmic functions** **Use and apply the properties of logarithms** **Solve problems using base *e***		**AII.P.4 Demonstrate an understanding of the exponential and logarithmic functions.**

Worcester Public Schools
High School Curriculum

Course Syllabus – Part II, Academic Content for the Second Semester
Advanced Algebra II

Content/Topics –	Skills	Required Papers/Projects, Readings, and Final Assessment/Test	Academic Standards (Worcester Benchmarks and State Frameworks)
Polynomial Functions	Graph polynomial functions Find products and factors of polynomials Solve polynomial equations Find the zeros of polynomial functions		AII.P.8 Solve a variety of equations and inequalities including polynomial, exponential, and logarithmic functions.
Rational & Radical Functions	Identify inverse, joint and combined variation Graph rational functions Multiply and divide rational expressions Add and subtract rational expressions Solve rational equations and inequalities Identify radical expressions and functions Simplify radical expressions		AII.P.5 Perform operations on functions, including composition.
Conic Sections	Find parabolas, circles, ellipses, and hyperbolas		AII.G.3 Relate geometric and algebraic representations of lines, simple curves, and conic sections.

Counting Principals	**Use Permutations and combinations** **Identify independent events** **Solve situations involving dependant events and conditional probability**		**AII.D.2 Use combinatorics to solve problems, in particular, to compute probabilities of compound events.**
Series and Patterns	**Solve using arithmetic and geometric sequences** **Solve using arithmetic and geometric series** **Use Pascal's triangle in the solution to problems** **Use the binomial theorem**		**AII.P.2 Identify arithmetic and geometric sequences and finite arithmetic and geometric series.**
Trigonometric Functions	**Solve trigonometric functions** **Find radian measure and arc length** **Graph trigonometric functions** **Find inverses of trigonometric functions** **Use the Laws of Sines and Cosines**		**AII.G.1 Define the sine, cosine, and tangent of an acute angle.** **AII.G.2 Derive and apply basic trigonometric identities and the laws of sines and cosines.**

MASSACHUSETTS CURRICULUM FRAMEWORK
FOR
MATHEMATICS

Grades Pre-Kindergarten to 12

Incorporating the Common Core State Standards for Mathematics

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Pre-publication edition

COPY EDITING IN PROGRESS

January 2011

Massachusetts Department of
ELEMENTARY & SECONDARY
EDUCATION

This document was prepared by the
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The Common Core State Standards for Mathematics was adopted by the Massachusetts Board of Elementary and Secondary Education on July 21, 2010. The Massachusetts pre-kindergarten standards in this framework were adopted by the Massachusetts Board of Early Education and Care on December 14, 2010. The Massachusetts additional standards and features were adopted by the Massachusetts Board of Elementary and Secondary Education on December 21, 2010.

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Mitchell D. Chester, Ed.D., *Commissioner*

December 2010

Dear Colleagues,

I am pleased to present to you the *Massachusetts Curriculum Framework for Mathematics, Grades Pre-Kindergarten to 12* adopted by the Board of Elementary and Secondary Education in December 2010. This framework merges the Common Core State Standards for Mathematics with Massachusetts standards and other features. These pre-kindergarten to grade 12 standards are based on research and effective practice and will enable teachers and administrators to strengthen curriculum, instruction, and assessment.

In partnership with the Department of Early Education and Care (EEC), we added pre-kindergarten standards that were collaboratively developed by early childhood educators from the Department of Elementary and Secondary Education (ESE), EEC mathematics staff, and early childhood specialists across the state. The pre-kindergarten standards were approved by the Board of Early Education and Care in December 2010. These pre-kindergarten standards lay a strong necessary foundation for the kindergarten standards.

I am proud of the work that has been accomplished. The comments and suggestions received during the revision process of the 2000 Mathematics Framework as well as comments on the Common Core State Standards as they were being developed have strengthened this framework. I want to thank everyone who worked with us to create challenging learning standards for Massachusetts students.

We will continue to work with schools and districts to implement the 2011 Massachusetts Curriculum Framework for Mathematics over the next several years, and we encourage your comments as you use it. All of the frameworks are subject to continuous review and improvement, for the benefit of the students of the Commonwealth.

Thank you again for your ongoing support and for your commitment to achieving the goals of improved student achievement for all students.

Sincerely,

Mitchell D. Chester, Ed.D.
Commissioner of Education

Acknowledgements for the Massachusetts Curriculum Framework for Mathematics

The 2011 *Massachusetts Curriculum Framework for Mathematics* is the result of the contributions of many educators across the state. The Department of Elementary and Secondary Education wishes to thank all of the Massachusetts groups that contributed to the development of these mathematics standards and all of the individual teachers, administrators, mathematicians, mathematics education faculty, and parents who took the time to provide thoughtful comments during the public comment periods.

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Introduction

Background

The Massachusetts Curriculum Framework for Mathematics builds on the Common Core State Standards for Mathematics. The standards in this framework are the culmination of an extended, broad-based effort to fulfill the charge issued by the states to create the next generation of pre-kindergarten–12 standards in order to help ensure that all students are college and career ready in mathematics no later than the end of high school.

In 2008 the Massachusetts Department of Elementary and Secondary Education convened a team of educators to revise the existing Mathematics Curriculum Framework and, when the Council of Chief State School Officers (CCSSO) and the National Governors Association Center for Best Practice (NGA) began a multi-state standards development initiative in 2009, the two efforts merged. The standards in this document draw on the most important international models as well as research and input from numerous sources, including state departments of education, scholars, assessment developers, professional organizations, educators from pre-kindergarten through college, and parents, students, and other members of the public. In their design and content, refined through successive drafts and numerous rounds of feedback, the Standards represent a synthesis of the best elements of standards-related work to date and an important advance over that previous work.

As specified by CCSSO and NGA, the Standards are (1) research and evidence based, (2) aligned with college and work expectations, (3) rigorous, and (4) internationally benchmarked. A particular standard was included in the document only when the best available evidence indicated that its mastery was essential for college and career readiness in a twenty-first-century, globally competitive society. The standards are intended to be a living work: as new and better evidence emerges, the standards will be revised accordingly.

Unique Massachusetts Standards and Features

Staff at the Massachusetts Department of Education worked closely with the Common Core writing team to ensure that the resulting standards were comprehensive and organized in ways to make them useful for teachers. In contrast to earlier Massachusetts Mathematics standards, these standards are written for individual grades. To the Common Core K–12 standards we have added a select number of standards pre-kindergarten–high school for further clarity and coherence. The Massachusetts additions are coded with "MA" at the beginning of the standard.

Highlights of the 2011 Massachusetts Curriculum Framework for Mathematics

- Grade-level content standards, pre-kindergarten to grade 8. Each grade level includes an introduction and articulates a small number of critical mathematical areas that should be the focus for this grade.
- New to the 2011 Mathematics Framework are the Standards for Mathematical Practice that describe mathematically proficient students and should be a part of the instructional program along with the content standards.
- The pre-kindergarten through grade 8 mathematics standards present a coherent progression and a strong foundation that will prepare students for the 2011 Algebra I course. The new grade 8 mathematics standards are rigorous and include some standards that were covered in the 2000 Algebra I course. With this stronger middle school progression, students will need to progress through the grades 6-8 standards in order to be prepared for the 2011 Algebra I course.
- The High School Standards are presented by conceptual categories and in response to many educators' requests to provide models for how these standards can be configured into high school courses, this framework also presents the high school standards by courses in two pathways: the

traditional pathway courses (Algebra I, Geometry, Algebra II) and the integrated pathway courses (Mathematics I, II, and II). In addition, two advanced courses (Precalculus and Advanced Quantitative Reasoning), developed by Massachusetts educators, are included.
- Other features included in this document are revised Guiding Principles that show a strong connection to the Mathematical Practices in the framework and an updated glossary of mathematics terms that now includes graphics and tables of key mathematical rules, properties and number sets.
- Also included as Appendices are the following sections from the June 2010 Common Core State Standards document: Applications of Common Core State Standards for English Language Learners and Applications of Common Core State Standards for Students with Disabilities.

Toward Greater Focus and Coherence

For over a decade, research studies of mathematics education in high-performing countries have pointed to the conclusion that the mathematics curriculum in the United States must become substantially more focused and coherent in order to improve mathematics achievement in this country. To deliver on the promise of common standards, the standards must address the problem of a curriculum that is “a mile wide and an inch deep.” These Standards are a substantial answer to that challenge and aim for clarity and specificity.

William Schmidt and Richard Houang (2002) have said that content standards and curricula are coherent if they are:

articulated over time as a sequence of topics and performances that are logical and reflect, where appropriate, the sequential or hierarchical nature of the disciplinary content from which the subject matter derives. That is, what and how students are taught should reflect not only the topics that fall within a certain academic discipline, **but also the key ideas** that determine how knowledge is organized and generated within that discipline. This implies that to be coherent, a set of content standards must evolve from particulars (e.g., the meaning and operations of whole numbers, including simple math facts and routine computational procedures associated with whole numbers and fractions) to deeper structures inherent in the discipline. These deeper structures then serve as a means for connecting the particulars (such as an understanding of the rational number system and its properties). (emphasis added)

The development of these Standards began with research-based learning progressions detailing what is known today about how students’ mathematical knowledge, skill, and understanding develop over time. The standards in this framework begin on page 15 with the eight Standards for Mathematical Practice.

Guiding Principles for Mathematics Programs

The following principles are philosophical statements that underlie the mathematics content and practice standards and resources in this curriculum framework. They should guide the construction and evaluation of mathematics programs in the schools and the broader community.

Guiding Principle 1: Learning

Mathematical ideas should be explored in ways that stimulate curiosity, create enjoyment of mathematics, and develop depth of understanding.

Students need to understand mathematics deeply and use it effectively. The standards of mathematical practice describe ways in which students increasingly engage with the subject matter as they grow in mathematical maturity and expertise through the elementary, middle, and high school years.

To achieve mathematical understanding, students should have a balance of mathematical procedures and conceptual understanding. Students should be actively engaged in doing meaningful mathematics, discussing mathematical ideas, and applying mathematics in interesting, thought-provoking situations. Student understanding is further developed through ongoing reflection about cognitively demanding and worthwhile tasks.

Tasks should be designed to challenge students in multiple ways. Short- and long-term investigations that connect procedures and skills with conceptual understanding are integral components of an effective mathematics program. Activities should build upon curiosity and prior knowledge, and enable students to solve progressively deeper, broader, and more sophisticated problems. Mathematical tasks reflecting sound and significant mathematics should generate active classroom talk, promote the development of conjectures, and lead to an understanding of the necessity for mathematical reasoning.

Guiding Principle 2: Teaching

An effective mathematics program is based on a carefully designed set of content standards that are clear and specific, focused, and articulated over time as a coherent sequence.

The sequence of topics and performances should be based on what is known about how students' mathematical knowledge, skill, and understanding develop over time. What and how students are taught should reflect not only the topics within mathematics but also the key ideas that determine how knowledge is organized and generated within mathematics. Students should be asked to apply their learning and to show their mathematical thinking and understanding by engaging in the first Mathematical Practice, *Making sense of problems and persevere in solving them*. This requires teachers who have a deep knowledge of mathematics as a discipline.

Mathematical problem solving is the hallmark of an effective mathematics program. Skill in mathematical problem solving requires practice with a variety of mathematical problems as well as a firm grasp of mathematical techniques and their underlying principles. Armed with this deeper knowledge, the student can then use mathematics in a flexible way to attack various problems and devise different ways of solving any particular problem. Mathematical problem solving calls for reflective thinking, persistence, learning from the ideas of others, and going back over one's own work with a critical eye. Students should construct viable arguments and critique the reasoning of others, they analyze situations and justify their conclusions and are able to communicate them to others and respond to the arguments of others. *(See Mathematical Practice 3, Construct viable arguments and critique reasoning of others.)* Students at all grades can listen or read the arguments of others and decide whether they make sense, and ask questions to clarify or improve the arguments.

Mathematical problem solving provides students with experiences to develop other mathematical practices. Success in solving mathematical problems helps to create an abiding interest in mathematics. Students learn to model with mathematics, they learn to apply the mathematics that they know to solve problems arising in everyday life, society, or the workplace. *(See Mathematical Practice 4, Model with mathematics.)*

For a mathematics program to be effective, it must also be taught by knowledgeable teachers. According to Liping Ma, “The real mathematical thinking going on in a classroom, in fact, depends heavily on the teacher's understanding of mathematics.”[1] A landmark study in 1996 found that students with initially comparable academic achievement levels had vastly different academic outcomes when teachers’ knowledge of the subject matter differed.[2] The message from the research is clear: having knowledgeable teachers really does matter; teacher expertise in a subject drives student achievement. “Improving teachers’ content subject matter knowledge and improving students’ mathematics education are thus interwoven and interdependent processes that must occur simultaneously.”[3]

Guiding Principle 3: Technology

Technology is an essential tool that should be used strategically in mathematics education.

Technology enhances the mathematics curriculum in many ways. Tools such as measuring instruments, manipulatives (such as base ten blocks and fraction pieces), scientific and graphing calculators, and computers with appropriate software, if properly used, contribute to a rich learning environment for developing and applying mathematical concepts. However, appropriate use of calculators is essential; calculators should not be used as a replacement for basic understanding and skills. Elementary students should learn how to perform the basic arithmetic operations independent of the use of a calculator.[4] Although the use of a graphing calculator can help middle and secondary students to visualize properties of functions and their graphs, graphing calculators should be used to enhance their understanding and skills rather than replace them.

Teachers and students should consider the available tools when presenting or solving a problem. Student should be familiar with tools appropriate for their grade level to be able to make sound decisions about which of these tools would be helpful. *(See Mathematical Practice 5, Use appropriate tools strategically.)*

Technology enables students to communicate ideas within the classroom or to search for information in external databases such as the Internet, an important supplement to a school’s internal library resources. Technology can be especially helpful in assisting students with special needs in regular and special classrooms, at home, and in the community.

Technology changes what mathematics is to be learned and when and how it is learned. For example, currently available technology provides a dynamic approach to such mathematical concepts as functions, rates of change, geometry, and averages that was not possible in the past. Some mathematics becomes more important because technology requires it, some becomes less important because technology replaces it, and some becomes possible because technology allows it.

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[1] Ma, Lipping, *Knowing and Teaching Elementary Mathematics*, Mahwah, New Jersey: Lawrence Erlbaum Associates, 1999.

[2] Milken, Lowell, *A Matter of Quality: A Strategy for Answering the High Caliber of America’s Teachers*, Santa Monica, California: Milken Family Foundation, 1999.

[3] Ma, p. 147.

[4] National Center for Education Statistics, *Pursuing Excellence: A Study of U.S. Fourth-Grade Mathematics and Science Achievement in International Context*. Accessed June 2000.

Guiding Principle 4: Equity

All students should have a high quality mathematics program that prepares them for college and a career.

All Massachusetts students should have high quality mathematics programs that meet the goals and expectations of these standards and address students' individual interests and talents. The standards provide clear signposts along the way to the goal of college and career readiness for all students. The standards provide for a broad range of students, from those requiring tutorial support to those with talent in mathematics. To promote achievement of these standards, teachers should encourage classroom talk, reflection, use of multiple problem solving strategies, and a positive disposition toward mathematics. They should have high expectations for all students. At every level of the education system, teachers should act on the belief that every child should learn challenging mathematics. Teachers and guidance personnel should advise students and parents about why it is important to take advanced courses in mathematics and how this will prepare students for success in college and the workplace.

All students should have the benefit of quality instructional materials, good libraries, and adequate technology. All students must have the opportunity to learn and meet the same high standards. In order to meet the needs of the greatest range of students, mathematics programs should provide the necessary intervention and support for those students who are below- or above grade-level expectations. Practice and enrichment should extend beyond the classroom. Tutorial sessions, mathematics clubs, competitions, and apprenticeships are examples of mathematics activities that promote learning.

Because mathematics is the cornerstone of many disciplines, a comprehensive curriculum should include applications to everyday life and modeling activities that demonstrate the connections among disciplines. Schools should also provide opportunities for communicating with experts in applied fields to enhance students' knowledge of these connections.

An important part of preparing students for college and careers is to ensure that they have the necessary mathematics and problem-solving skills to make sound financial decisions that they face in the world every day, including setting up a bank account; understanding student loans; credit and debit; selecting the best buy when shopping; choosing the most cost effective cell phone plan based on monthly usage; and so on.

Guiding Principle 5: Literacy Across the Content Areas

An effective mathematics program builds upon and develops students' literacy skills and knowledge.

Reading, writing, and communication skills are necessary elements of learning and engaging in mathematics, as well as in other content areas. Supporting the development of students' literacy skills will allow them to deepen their understanding of mathematics concepts and help them determine the meaning of symbols, key terms, and mathematics phrases as well as develop reasoning skills that apply across the disciplines. In reading, teachers should consistently support students' ability to gain and deepen understanding of concepts from written material by acquiring comprehension skills and strategies, as well as specialized vocabulary and symbols. Mathematics classrooms should make use of a variety of text materials and formats, including textbooks, math journals, contextual math problems, and data presented in a variety of media.

In writing, teachers should consistently support students' ability to reason and deepen understanding of concepts and the ability to express them in a focused, precise, and convincing manner. Mathematics classrooms should incorporate a variety of written assignments ranging from math journals to formal written proofs.

In speaking and listening, teachers should provide students with opportunities for mathematical discourse, to use precise language to convey ideas, to communicate a solution, and support an argument.

Guiding Principle 6: Assessment

Assessment of student learning in mathematics should take many forms to inform instruction and learning.

A comprehensive assessment program is an integral component of an instructional program. It provides students with frequent feedback on their performance, teachers with diagnostic tools for gauging students' depth of understanding of mathematical concepts and skills, parents with information about their children's performance in the context of program goals, and administrators with a means for measuring student achievement.

Assessments take a variety of forms, require varying amounts of time, and address different aspects of student learning. Having students "think aloud" or talk through their solutions to problems permits identification of gaps in knowledge and errors in reasoning. By observing students as they work, teachers can gain insight into students' abilities to apply appropriate mathematical concepts and skills, make conjectures, and draw conclusions. Homework, mathematics journals, portfolios, oral performances, and group projects offer additional means for capturing students' thinking, knowledge of mathematics, facility with the language of mathematics, and ability to communicate what they know to others. Tests and quizzes assess knowledge of mathematical facts, operations, concepts, and skills and their efficient application to problem solving. They can also pinpoint areas in need of more practice or teaching. Taken together, the results of these different forms of assessment provide rich profiles of students' achievements in mathematics and serve as the basis for identifying curricula and instructional approaches to best develop their talents.

Assessment should also be a major component of the learning process. As students help identify goals for lessons or investigations, they gain greater awareness of what they need to learn and how they will demonstrate that learning. Engaging students in this kind of goal-setting can help them reflect on their own work, understand the standards to which they are held accountable, and take ownership of their learning.

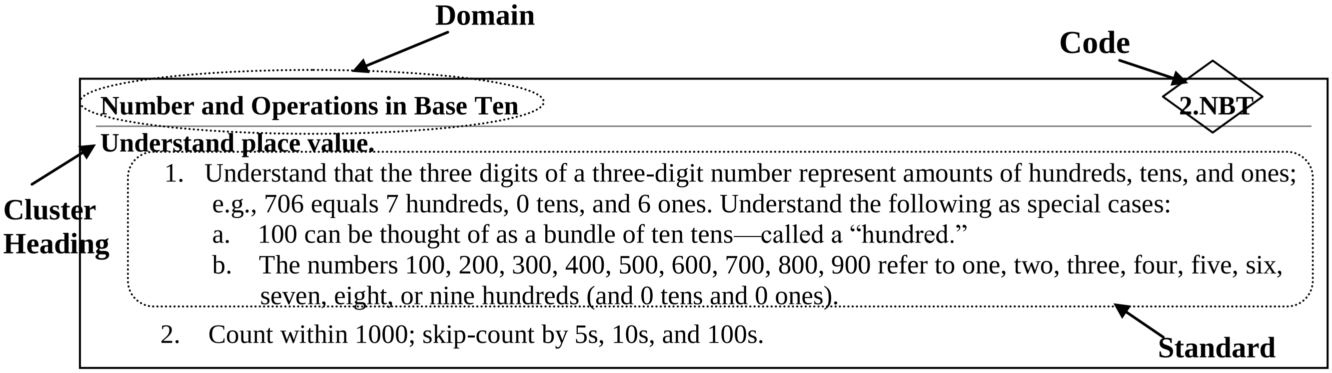
Format and Organization of the Grade Level Standards (PreK–8)

How to read the grade level standards

Standards define what students should understand and be able to do.

Clusters are groups of related standards. Note that standards from different clusters may sometimes be closely related, because mathematics is a connected subject.

Domains are larger groups of related standards. Standards from different domains may sometimes be closely related.



Number and Operations in Base Ten **2.NBT**

Understand place value.

1. Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones; e.g., 706 equals 7 hundreds, 0 tens, and 6 ones. Understand the following as special cases:
   a. 100 can be thought of as a bundle of ten tens—called a “hundred.”
   b. The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones).
2. Count within 1000; skip-count by 5s, 10s, and 100s.

Each standard has a unique identifier that consists of the grade level, (PK, K, 1, 2, 3, 4, 5, 6, 7, or 8), the domain code (see above) and the standard number. For example, the standard highlighted above would be identified as 2.NBT.1, identifying it as a grade 2 standard in the Number and Operations in Base Ten domain, and is the first standard in that domain. Standards unique to Massachusetts are included in grades Pre-kindergarten, 1, 2, 4, 5, 6, and 7. The standards unique to Massachusetts are included in the appropriate domain and cluster and are coded with “MA” to indicate that they are additions. For example, a Massachusetts addition in grade 1 “*MA.9. Write and solve number sentences from problem situations that express relationships involving addition and subtraction within 20”* is identified as MA.1.OA.9, and is included in the grade 1 content standards in the *Operations and Algebraic Thinking* domain and in the *Work with Addition and Subtraction Equations* cluster.

These Standards do not dictate curriculum or teaching methods. For example, just because topic A appears before topic B in the standards for a given grade, it does not necessarily mean that topic A must be taught before topic B. A teacher might prefer to teach topic B before topic A, or might choose to highlight connections by teaching topic A and topic B at the same time. Or, a teacher might prefer to teach a topic of his or her own choosing that leads, as a byproduct, to students reaching the standards for topics A and B.

What students can learn at any particular grade level depends upon what they have learned before. Ideally then, each standard in this document might have been phrased in the form, “Students who already know … should next come to learn ….” But at present this approach is unrealistic—not least because existing education research cannot specify all such learning pathways. Of necessity therefore, grade placements for specific topics have been made on the basis of state and international comparisons and the collective experience and collective professional judgment of educators, researchers and mathematicians. One promise of common state standards is that over time they will allow research on learning progressions to inform and improve the design of standards to a much greater extent than is possible today. Learning opportunities will continue to vary across schools and school systems, and educators should make every effort to meet the needs of individual students based on their current understanding.

These Standards are not intended to be new names for old ways of doing business. They are a call to take the next step. It is time for states to work together to build on lessons learned from two decades of standards based reforms. It is time to recognize that standards are not just promises to our children, but promises we intend to keep.

Standards for Mathematical Practice

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council's report Adding It Up: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy).

1 Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

2 Reason abstractly and quantitatively.

Mathematically proficient students make sense of the quantities and their relationships in problem situations. Students bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

3 Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

4 Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

5 Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

6 Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

7 Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 – 3(x – y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

8 Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y – 2)/(x – 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x – 1)(x + 1)$, $(x – 1)(x^2 + x + 1)$, and $(x – 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Connecting the Standards for Mathematical Practice to the Standards for Mathematical Content

The Standards for Mathematical Practice describe ways in which developing student practitioners of the discipline of mathematics increasingly ought to engage with the subject matter as they grow in mathematical maturity and expertise throughout the elementary, middle and high school years. Designers of curricula, assessments, and professional development should all attend to the need to connect the mathematical practices to mathematical content in mathematics instruction.

The Standards for Mathematical Content are a balanced combination of procedure and understanding. Expectations that begin with the word “understand” are often especially good opportunities to connect the practices to the content. Students who lack understanding of a topic may rely on procedures too heavily. Without a flexible base from which to work, they may be less likely to consider analogous problems, represent problems coherently, justify conclusions, apply the mathematics to practical situations, use technology mindfully to work with the mathematics, explain the mathematics accurately to other students, step back for an overview, or deviate from a known procedure to find a shortcut. In short, a lack of understanding effectively prevents a student from engaging in the mathematical practices.

In this respect, those content standards which set an expectation of understanding are potential “points of intersection” between the Standards for Mathematical Content and the Standards for Mathematical Practice. These points of intersection are intended to be weighted toward central and generative concepts in the school mathematics curriculum that most merit the time, resources, innovative energies, and focus necessary to qualitatively improve the curriculum, instruction, assessment, professional development, and student achievement in mathematics.

Pre-Kindergarten

The preschool/pre-kindergarten population includes children between at least 2 years, 9 months until they are kindergarten eligible. A majority attend programs in diverse settings—community-based early care and education centers, family child care, Head Start, and public preschools. Some children do not attend any formal program. These standards apply to children who are at the end of that age group, meaning older four- and younger five-year olds.

In this age group, foundations of mathematical understanding are formed out of children's experiences with real objects and materials. The standards can be promoted through play and exploration activities, and embedded in almost all daily activities. They should not be limited to "math time." These mathematics standards correspond with the learning activities in the *Massachusetts Guidelines for Preschool Learning Experiences* (2003). The standards should be considered guideposts to facilitate young children's underlying mathematical understanding.

In preschool or pre-kindergarten, activity time should focus on two critical areas: (1) developing an understanding of whole numbers to 10, including concepts of one-to-one correspondence, counting, cardinality (the number of items in a set), and comparison; (2) recognizing two-dimensional shapes, describing spatial relationships, and sorting and classifying objects by one or more attributes. Relatively more learning time should be devoted to developing children's sense of number as quantity than to other mathematics topics.

(1) These young children begin counting and quantifying numbers up to 10. Children begin with oral counting and recognition of numerals and word names for numbers. Experience with counting naturally leads to quantification. Children count objects and learn that the sizes, shapes, positions, or purposes of objects do not affect the total number of objects in the group. One-to-one correspondence with its matching of elements between the sets, provides the foundation for the comparison of groups and the development of comparative language such as, *more than, less than,* and *equal to*.

(2) Young children explore shapes and the relationships among them. They identify the attributes of different shapes including the length, area, weight by using vocabulary such as: *long, short, tall, heavy, light, big, small, wide, narrow*. They compare objects using comparative language such as: *longer/shorter, same length, heavier/lighter*. They explore and create 2- and 3-dimensional shapes by using various manipulative and play materials such as: popsicle sticks, blocks, pipe cleaners, and pattern blocks. They sort, categorize, and classify objects and identify basic 2-dimensional shapes using the appropriate language.

The Standards for Mathematical Practice complement the content standards at each grade level so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise.

Mathematics Standards for High School

The high school standards specify the mathematics that all students should study in order to be college and career ready. Additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics is indicated by (+), as in this example:

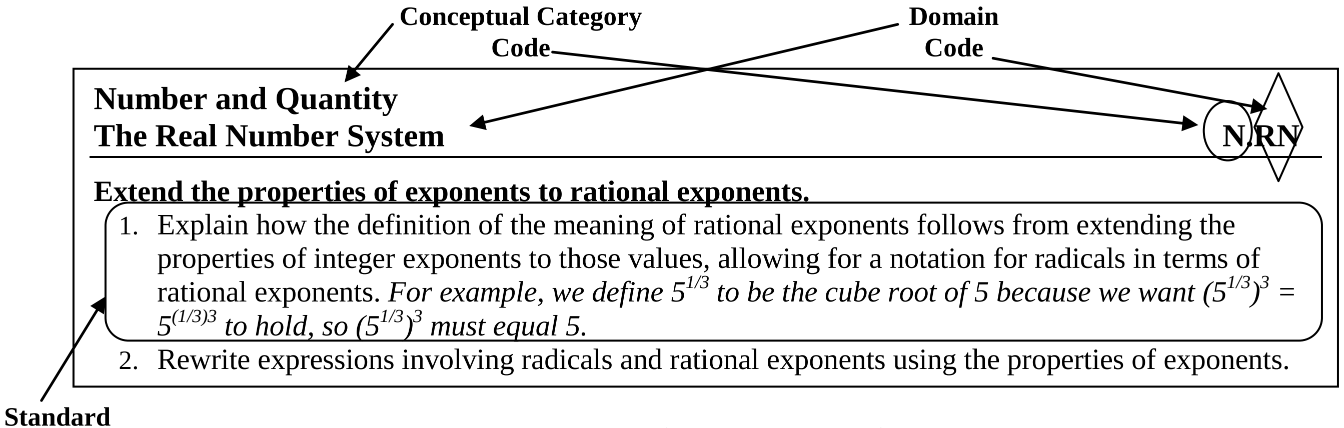
> N.CN.4. (+) Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary numbers).

All standards without a (+) symbol should be in the common mathematics curriculum for all college and career ready students. Standards with a (+) symbol may also appear in courses intended for all students.

The high school standards are listed in conceptual categories:

- Number and Quantity (N)
- Algebra (A)
- Functions (F)
- Modeling (M)
- Geometry (G)
- Statistics and Probability (S).

Conceptual categories portray a coherent view of high school mathematics; a student's work with functions, for example, crosses a number of traditional course boundaries, potentially up through and including calculus.



Number and Quantity
The Real Number System **N.RN**

Extend the properties of exponents to rational exponents.

1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. *For example, we define* $5^{1/3}$ *to be the cube root of 5 because we want* $(5^{1/3})^3 = 5^{(1/3)3}$ *to hold, so* $(5^{1/3})^3$ *must equal 5.*
2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.

Each high school standard has a unique identifier that consists of the conceptual category code (N, A, F, M, G, S), the domain code, and the standard number. For example, the standard highlighted above would be identified as N.RN.1, identifying it as a Number and Quantity (conceptual category) standard in The Real Number System domain, and is the first standard in that domain. The standards unique to Massachusetts are included in the conceptual categories Number and Quantity, Algebra, Functions and Geometry, are included in the appropriate domain and cluster and are coded with "MA" to indicate that they are additions. For example, Massachusetts addition "*MA.4c. Demonstrate an understanding of the equivalence of factoring, completing the square, or using the quadratic formula to solve quadratic equations"* is identified as MA.A.REI.4c. because it is included in the Algebra (A) conceptual category in the Reasoning with Equations and Inequalities (REI) domain.

Modeling is best interpreted not as a collection of isolated topics but in relation to other standards. Making mathematical models is a Standard for Mathematical Practice, and specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol sometimes appears on the heading for a group of standards; in that case, it should be understood to apply to all standards in that group.

Conceptual Category: Number and Quantity

Numbers and Number Systems. During the years from kindergarten to eighth grade, students must repeatedly extend their conception of number. At first, "number" means "counting number": 1, 2, 3…. Soon after that, 0 is used to represent "none" and the whole numbers are formed by the counting numbers together with zero. The next extension is fractions. At first, fractions are barely numbers and tied strongly to pictorial representations. Yet by the time students understand division of fractions, they have a strong concept of fractions as numbers and have connected them, via their decimal representations, with the base-ten system used to represent the whole numbers. During middle school, fractions are augmented by negative fractions to form the rational numbers. In Grade 8, students extend this system once more, augmenting the rational numbers with the irrational numbers to form the real numbers. In high school, students will be exposed to yet another extension of number, when the real numbers are augmented by the imaginary numbers to form the complex numbers. (See Illustration 1 in Glossary.)

With each extension of number, the meanings of addition, subtraction, multiplication, and division are extended. In each new number system—integers, rational numbers, real numbers, and complex numbers—the four operations stay the same in two important ways: They have the commutative, associative, and distributive properties and their new meanings are consistent with their previous meanings.

Extending the properties of whole-number exponents leads to new and productive notation. For example, properties of whole-number exponents suggest that $(5^{1/3})^3$ should be $5^{(1/3)\cdot 3} = 5^1 = 5$ and that $5^{1/3}$ should be the cube root of 5.

Calculators, spreadsheets, and computer algebra systems can provide ways for students to become better acquainted with these new number systems and their notation. They can be used to generate data for numerical experiments, to help understand the workings of matrix, vector, and complex number algebra, and to experiment with non-integer exponents.

Quantities. In real-world problems, the answers are usually not numbers but quantities: numbers with units, which involves measurement. In their work in measurement up through Grade 8, students primarily measure commonly used attributes such as length, area, and volume. In high school, students encounter a wider variety of units in modeling, e.g., acceleration, currency conversions, derived quantities such as person-hours and heating degree days, social science rates such as per-capita income, and rates in everyday life such as points scored per game or batting averages. They also encounter novel situations in which they themselves must conceive the attributes of interest. For example, to find a good measure of overall highway safety, they might propose measures such as fatalities per year, fatalities per year per driver, or fatalities per vehicle-mile traveled. Such a conceptual process is sometimes called quantification. Quantification is important for science, as when surface area suddenly "stands out" as an important variable in evaporation. Quantification is also important for companies, which must conceptualize relevant attributes and create or choose suitable measures for them.

Number and Quantity Overview

The Real Number System

- Extend the properties of exponents to rational exponents.
- Use properties of rational and irrational numbers.

Quantities

- Reason quantitatively and use units to solve problems.

The Complex Number System

- Perform arithmetic operations with complex numbers.
- Represent complex numbers and their operations on the complex plane.
- Use complex numbers in polynomial identities and equations.

Vector and Matrix Quantities

- Represent and model with vector quantities.
- Perform operations on vectors.
- Perform operations on matrices and use matrices in applications.

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Number and Quantity
The Real Number System N.RN

Extend the properties of exponents to rational exponents.

1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. *For example, we define* $5^{1/3}$ *to be the cube root of 5 because we want* $(5^{1/3})^3 = 5^{(1/3)3}$ *to hold, so* $(5^{1/3})^3$ *must equal 5.*
2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.

Use properties of rational and irrational numbers.

3. Explain why the sum or product of two rational numbers are rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.

Quantities★ N.Q

Reason quantitatively and use units to solve problems.★

1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★
2. Define appropriate quantities for the purpose of descriptive modeling. ★
3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★
   MA.3a. Describe the effects of approximate error in measurement and rounding on measurements and on computed values from measurements. Identify significant figures in recorded measures and computed values based on the context given and the precision of the tools used to measure. ★

The Complex Number System N.CN

Perform arithmetic operations with complex numbers.

1. Know there is a complex number i such that $i^2 = -1$, and every complex number has the form $a + bi$ with a and b real.
2. Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.
3. (+) Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers.

Represent complex numbers and their operations on the complex plane.

4. (+) Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary numbers), and explain why the rectangular and polar forms of a given complex number represent the same number.
5. (+) Represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation. *For example,* $\left(-1+\sqrt{3}i\right)^3 = 8$ *because* $\left(-1+\sqrt{3}i\right)$ *has modulus 2 and argument 120°.*
6. (+) Calculate the distance between numbers in the complex plane as the modulus of the difference, and the midpoint of a segment as the average of the numbers at its endpoints.

Use complex numbers in polynomial identities and equations.

7. Solve quadratic equations with real coefficients that have complex solutions.
8. (+) Extend polynomial identities to the complex numbers. *For example, rewrite* $x^2 + 4$ *as* $(x + 2i)(x - 2i)$.

★ Specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

9. (+) Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.

Vector and Matrix Quantities N.VM

Represent and model with vector quantities.

1. (+) Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., ***v***, |***v***|, ||***v***||, ***v***).
2. (+) Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.
3. (+) Solve problems involving velocity and other quantities that can be represented by vectors.

Perform operations on vectors.

4. (+) Add and subtract vectors.
    a. Add vectors end-to-end, component-wise, and by the parallelogram rule. Understand that the magnitude of a sum of two vectors is typically not the sum of the magnitudes.
    b. Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum.
    c. Understand vector subtraction ***v*** – ***w*** as ***v*** + (–***w***), where –***w*** is the additive inverse of ***w***, with the same magnitude as ***w*** and pointing in the opposite direction. Represent vector subtraction graphically by connecting the tips in the appropriate order, and perform vector subtraction component-wise.
5. (+) Multiply a vector by a scalar.
    a. Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise, e.g., as $c(v_x, v_y) = (cv_x, cv_y)$.
    b. Compute the magnitude of a scalar multiple *c**v*** using $||c\mathbf{v}|| = |c|\mathbf{v}$. Compute the direction of *c**v*** knowing that when $|c|\mathbf{v} \neq 0$, the direction of *c**v*** is either along ***v*** (for $c > 0$) or against ***v*** (for $c < 0$).

Perform operations on matrices and use matrices in applications.

6. (+) Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.
7. (+) Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled.
8. (+) Add, subtract, and multiply matrices of appropriate dimensions.
9. (+) Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.
10. (+) Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.
11. (+) Multiply a vector (regarded as a matrix with one column) by a matrix of suitable dimensions to produce another vector. Work with matrices as transformations of vectors.
12. (+) Work with 2 × 2 matrices as transformations of the plane, and interpret the absolute value of the determinant in terms of area.

Conceptual Category: Algebra

Expressions. An expression is a record of a computation with numbers, symbols that represent numbers, arithmetic operations, exponentiation, and, at more advanced levels, the operation of evaluating a function. Conventions about the use of parentheses and the order of operations assure that each expression is unambiguous. Creating an expression that describes a computation involving a general quantity requires the ability to express the computation in general terms, abstracting from specific instances.

Reading an expression with comprehension involves analysis of its underlying structure. This may suggest a different but equivalent way of writing the expression that exhibits some different aspect of its meaning. For example, $p + 0.05p$ can be interpreted as the addition of a 5% tax to a price p. Rewriting $p + 0.05p$ as $1.05p$ shows that adding a tax is the same as multiplying the price by a constant factor.

Algebraic manipulations are governed by the properties of operations and exponents, and the conventions of algebraic notation. At times, an expression is the result of applying operations to simpler expressions. For example, $p + 0.05p$ is the sum of the simpler expressions p and $0.05p$. Viewing an expression as the result of operation on simpler expressions can sometimes clarify its underlying structure.

A spreadsheet or a computer algebra system (CAS) can be used to experiment with algebraic expressions, perform complicated algebraic manipulations, and understand how algebraic manipulations behave.

Equations and inequalities. An equation is a statement of equality between two expressions, often viewed as a question asking for which values of the variables the expressions on either side are in fact equal. These values are the solutions to the equation. An identity, in contrast, is true for all values of the variables; identities are often developed by rewriting an expression in an equivalent form.

The solutions of an equation in one variable form a set of numbers; the solutions of an equation in two variables form a set of ordered pairs of numbers, which can be plotted in the coordinate plane. Two or more equations and/or inequalities form a system. A solution for such a system must satisfy every equation and inequality in the system.

An equation can often be solved by successively deducing from it one or more simpler equations. For example, one can add the same constant to both sides without changing the solutions, but squaring both sides might lead to extraneous solutions. Strategic competence in solving includes looking ahead for productive manipulations and anticipating the nature and number of solutions.

Some equations have no solutions in a given number system, but have a solution in a larger system. For example, the solution of $x + 1 = 0$ is an integer, not a whole number; the solution of $2x + 1 = 0$ is a rational number, not an integer; the solutions of $x^2 – 2 = 0$ are real numbers, not rational numbers; and the solutions of $x^2 + 2 = 0$ are complex numbers, not real numbers.

The same solution techniques used to solve equations can be used to rearrange formulas. For example, the formula for the area of a trapezoid, $A = ((b_1+b_2)/2)h$, can be solved for h using the same deductive process.

Inequalities can be solved by reasoning about the properties of inequality. Many, but not all, of the properties of equality continue to hold for inequalities and can be useful in solving them.

Connections to Functions and Modeling. Expressions can define functions, and equivalent expressions define the same function. Asking when two functions have the same value for the same input leads to an equation; graphing the two functions allows for finding approximate solutions of the equation. Converting a verbal description to an equation, inequality, or system of these is an essential skill in modeling.

Algebra Overview

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Seeing Structure in Expressions

- Interpret the structure of expressions.
- Write expressions in equivalent forms to solve problems.

Arithmetic with Polynomials and Rational Expressions

- Perform arithmetic operations on polynomials.
- Understand the relationship between zeros and factors of polynomials.
- Use polynomial identities to solve problems.
- Rewrite rational expressions.

Creating Equations

- Create equations that describe numbers or relationships.

Reasoning with Equations and Inequalities

- Understand solving equations as a process of reasoning and explain the reasoning.
- Solve equations and inequalities in one variable.
- Solve systems of equations.
- Represent and solve equations and inequalities graphically.

Algebra

Seeing Structure in Expressions A.SSE

Interpret the structure of expressions.

1. Interpret expressions that represent a quantity in terms of its context.★
   a. Interpret parts of an expression, such as terms, factors, and coefficients.
   b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret* $P(1+r)^n$ *as the product of P and a factor not depending on P.*
2. Use the structure of an expression to identify ways to rewrite it. *For example, see* $x^4 - y^4$ *as* $(x^2)^2 - (y^2)^2$, *thus recognizing it as a difference of squares that can be factored as* $(x^2 - y^2)(x^2 + y^2)$.

Write expressions in equivalent forms to solve problems.

3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
   a. Factor a quadratic expression to reveal the zeros of the function it defines.
   b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
   c. Use the properties of exponents to transform expressions for exponential functions. *For example the expression* 1.15^t *can be rewritten as* $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ *to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*
4. Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. *For example, calculate mortgage payments.*

Arithmetic with Polynomials and Rational Expressions A.APR

Perform arithmetic operations on polynomials.

1. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
   MA.1a. Divide polynomials.

Understand the relationship between zeros and factors of polynomials.

2. Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $x - a$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$.
3. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.

Use polynomial identities to solve problems.

4. Prove polynomial identities and use them to describe numerical relationships. *For example, the polynomial identity* $(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$ *can be used to generate Pythagorean triples.*
5. (+) Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.[5]

Rewrite rational expressions.

6. Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system.
7. (+) Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.

★ Specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

[5] The Binomial Theorem can be proved by mathematical induction or by a combinatorial argument.

Creating Equations★ A.CED

Create equations that describe numbers or relationships. ★

1. Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.* ★
2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. ★
3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.* ★
4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law $V = IR$ to highlight resistance R.* ★.

Reasoning with Equations and Inequalities A.REI

Understand solving equations as a process of reasoning and explain the reasoning.

1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

Solve equations and inequalities in one variable.

3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
   MA.3.a. Solve linear equations and inequalities in one variable involving absolute value.
4. Solve quadratic equations in one variable.
   a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x – p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.
   b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.
   MA.4c. Demonstrate an understanding of the equivalence of factoring, completing the square, or using the quadratic formula to solve quadratic equations.

Solve systems of equations.

5. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.
6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
7. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. *For example, find the points of intersection between the line $y = –3x$ and the circle $x^2 + y^2 = 3$.*
8. (+) Represent a system of linear equations as a single matrix equation in a vector variable.
9. (+) Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 × 3 or greater).

★ Specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

Represent and solve equations and inequalities graphically.

10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).
11. Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.[★]
12. Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

[★] Specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

Conceptual Category: Functions

Functions describe situations where one quantity determines another. For example, the return on $10,000 invested at an annualized percentage rate of 4.25% is a function of the length of time the money is invested. Because we continually make theories about dependencies between quantities in nature and society, functions are important tools in the construction of mathematical models.

In school mathematics, functions usually have numerical inputs and outputs and are often defined by an algebraic expression. For example, the time in hours it takes for a car to drive 100 miles is a function of the car's speed in miles per hour, v; the rule $T(v) = 100/v$ expresses this relationship algebraically and defines a function whose name is T.

The set of inputs to a function is called its domain. We often infer the domain to be all inputs for which the expression defining a function has a value, or for which the function makes sense in a given context.

A function can be described in various ways, such as by a graph (e.g., the trace of a seismograph); by a verbal rule, as in, "I'll give you a state, you give me the capital city;" by an algebraic expression like $f(x) = a + bx$; or by a recursive rule. The graph of a function is often a useful way of visualizing the relationship of the function models, and manipulating a mathematical expression for a function can throw light on the function's properties.

Functions presented as expressions can model many important phenomena. Two important families of functions characterized by laws of growth are linear functions, which grow at a constant rate, and exponential functions, which grow at a constant percent rate. Linear functions with a constant term of zero describe proportional relationships.

A graphing utility or a computer algebra system can be used to experiment with properties of these functions and their graphs and to build computational models of functions, including recursively defined functions.

Connections to Expressions, Equations, Modeling, and Coordinates. Determining an output value for a particular input involves evaluating an expression; finding inputs that yield a given output involves solving an equation. Questions about when two functions have the same value for the same input lead to equations, whose solutions can be visualized from the intersection of their graphs. Because functions describe relationships between quantities, they are frequently used in modeling. Sometimes functions are defined by a recursive process, which can be displayed effectively using a spreadsheet or other technology.

Functions Overview

Interpreting Functions

- Understand the concept of a function and use function notation.
- Interpret functions that arise in applications in terms of the context.
- Analyze functions using different representations.

Building Functions

- Build a function that models a relationship between two quantities.
- Build new functions from existing functions.

Linear, Quadratic, and Exponential Models

- Construct and compare linear, quadratic, and exponential models and solve problems.
- Interpret expressions for functions in terms of the situation they model.

Trigonometric Functions

- Extend the domain of trigonometric functions using the unit circle.
- Model periodic phenomena with trigonometric functions.
- Prove and apply trigonometric identities.

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Interpreting Functions F.IF

Understand the concept of a function and use function notation.

1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$.
2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by* $f(0) = f(1) = 1$, $f(n+1) = f(n) + f(n-1)$ *for* $n \geq 1$.

Interpret functions that arise in applications in terms of the context.[★]

4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* ★
5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.* ★
6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. ★

Analyze functions using different representations.

7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★
    - a. Graph linear and quadratic functions and show intercepts, maxima, and minima. ★
    - b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. ★
    - c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. ★
    - d. (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. ★
    - e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. ★
8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
    - a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
    - b. Use the properties of exponents to interpret expressions for exponential functions. *For example, identify percent rate of change in functions such as* $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{12t}$, $y = (1.2)^{t/10}$, *and classify them as representing exponential growth or decay.*

    MA.8c. Translate between different representations of functions and relations: graphs, equations, point sets, and tables.
9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*

[★] Specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

MA.10. Given algebraic, numeric and/or graphical representations of functions, recognize the function as polynomial, rational, logarithmic, exponential, or trigonometric.

Building Functions F.BF

Build a function that models a relationship between two quantities.

1. Write a function that describes a relationship between two quantities. ⋆
   a. Determine an explicit expression, a recursive process, or steps for calculation from a context. ⋆
   b. Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.* ⋆
   c. (+) Compose functions. *For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time.* ⋆
2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms. ⋆

Build new functions from existing functions.

3. Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k\,f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.*
4. Find inverse functions.
   a. Solve an equation of the form $f(x) = c$ for a simple function f that has an inverse and write an expression for the inverse. *For example,* $f(x) =2\,x^3$ *or* $f(x) = (x+1)/(x-1)$ *for* $x \neq 1$.
   b. (+) Verify by composition that one function is the inverse of another.
   c. (+) Read values of an inverse function from a graph or a table, given that the function has an inverse.
   d. (+) Produce an invertible function from a non-invertible function by restricting the domain.
5. (+) Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.

Linear, Quadratic, and Exponential Models⋆ F.LE

Construct and compare linear, quadratic, and exponential models and solve problems. ⋆

1. Distinguish between situations that can be modeled with linear functions and with exponential functions. ⋆
   a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. ⋆
   b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. ⋆
   c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. ⋆
2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). ⋆
3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. ⋆
4. For exponential models, express as a logarithm the solution to $a\,b^{ct} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. ⋆

⋆ Specific modeling standards appear throughout the high school standards indicated by a star symbol (⋆). The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

Interpret expressions for functions in terms of the situation they model.[★]

5. Interpret the parameters in a linear or exponential function in terms of a context. ★

Trigonometric Functions F.TF

Extend the domain of trigonometric functions using the unit circle.

1. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
2. Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.
3. (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for π /3, π/4 and π/6, and use the unit circle to express the values of sine, cosine, and tangent for π-*x*, π+*x*, and 2π-*x* in terms of their values for *x*, where *x* is any real number.
4. (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.

Model periodic phenomena with trigonometric functions.

5. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.★
6. (+) Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.
7. (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context. ★

Prove and apply trigonometric identities.

8. Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it find sin(θ), cos(θ), or tan(θ) given sin(θ), cos(θ), or tan(θ) and the quadrant.
9. (+) Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.

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Conceptual Category: Modeling

Modeling links classroom mathematics and statistics to everyday life, work, and decision-making. Modeling is the process of choosing and using appropriate mathematics and statistics to analyze empirical situations, to understand them better, and to improve decisions. Quantities and their relationships in physical, economic, public policy, social, and everyday situations can be modeled using mathematical and statistical methods. When making mathematical models, technology is valuable for varying assumptions, exploring consequences, and comparing predictions with data.

A model can be very simple, such as writing total cost as a product of unit price and number bought, or using a geometric shape to describe a physical object like a coin. Even such simple models involve making choices. It is up to us whether to model a coin as a three-dimensional cylinder, or whether a two-dimensional disk works well enough for our purposes. Other situations—modeling a delivery route, a production schedule, or a comparison of loan amortizations—need more elaborate models that use other tools from the mathematical sciences. Real-world situations are not organized and labeled for analysis; formulating tractable models, representing such models, and analyzing them is appropriately a creative process. Like every such process, this depends on acquired expertise as well as creativity.

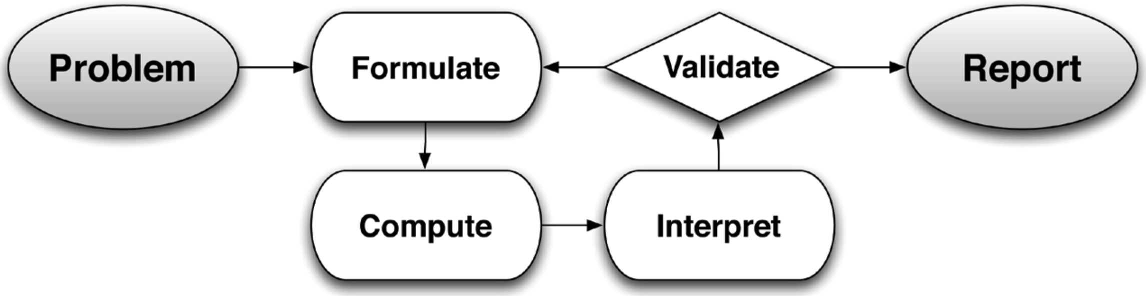
Some examples of such situations might include:

- Estimating how much water and food is needed for emergency relief in a devastated city of 3 million people, and how it might be distributed.
- Planning a table tennis tournament for 7 players at a club with 4 tables, where each player plays against each other player.
- Designing the layout of the stalls in a school fair so as to raise as much money as possible.
- Analyzing stopping distance for a car.
- Modeling savings account balance, bacterial colony growth, or investment growth.
- Engaging in critical path analysis, e.g., applied to turnaround of an aircraft at an airport.
- Analyzing risk in situations such as extreme sports, pandemics, and terrorism.
- Relating population statistics to individual predictions.

In situations like these, the models devised depend on a number of factors: How precise an answer do we want or need? What aspects of the situation do we most need to understand, control, or optimize? What resources of time and tools do we have? The range of models that we can create and analyze is also constrained by the limitations of our mathematical, statistical, and technical skills, and our ability to recognize significant variables and relationships among them. Diagrams of various kinds, spreadsheets and other technology, and algebra are powerful tools for understanding and solving problems drawn from different types of real-world situations.

One of the insights provided by mathematical modeling is that essentially the same mathematical or statistical structure can sometimes model seemingly different situations. Models can also shed light on the mathematical structures themselves, for example, as when a model of bacterial growth makes more vivid the explosive growth of the exponential function.

The basic modeling cycle is summarized in the diagram. It involves (1) identifying variables in the situation and selecting those that represent essential features, (2) formulating a model by creating and selecting geometric, graphical, tabular, algebraic, or statistical representations that describe relationships between the variables, (3) analyzing and performing operations on these relationships to draw conclusions, (4) interpreting the results of the mathematics in terms of the original situation, (5) validating the conclusions by comparing them with the situation, and then either improving the model or, if it is acceptable, (6) reporting on the conclusions and the reasoning behind them. Choices, assumptions, and approximations are present throughout this cycle.



In descriptive modeling, a model simply describes the phenomena or summarizes them in a compact form. Graphs of observations are a familiar descriptive model—for example, graphs of global temperature and atmospheric CO_2 over time.

Analytic modeling seeks to explain data on the basis of deeper theoretical ideas, albeit with parameters that are empirically based; for example, exponential growth of bacterial colonies (until cut-off mechanisms such as pollution or starvation intervene) follows from a constant reproduction rate. Functions are an important tool for analyzing such problems.

Graphing utilities, spreadsheets, computer algebra systems, and dynamic geometry software are powerful tools that can be used to model purely mathematical phenomena (e.g., the behavior of polynomials) as well as physical phenomena.

Modeling Standards *Modeling is best interpreted not as a collection of isolated topics but rather in relation to other standards. Making mathematical models is a Standard for Mathematical Practice, and specific modeling standards appear throughout the high school standards indicated by a star symbol (★).*

Conceptual Category: Geometry

An understanding of the attributes and relationships of geometric objects can be applied in diverse contexts—interpreting a schematic drawing, estimating the amount of wood needed to frame a sloping roof, rendering computer graphics, or designing a sewing pattern for the most efficient use of material.

Although there are many types of geometry, school mathematics is devoted primarily to plane Euclidean geometry, studied both synthetically (without coordinates) and analytically (with coordinates). Euclidean geometry is characterized most importantly by the Parallel Postulate that through a point not on a given line there is exactly one parallel line. (Spherical geometry, in contrast, has no parallel lines.)

During high school, students begin to formalize their geometry experiences from elementary and middle school, using more precise definitions and developing careful proofs. Later in college some students develop Euclidean and other geometries carefully from a small set of axioms.

The concepts of congruence, similarity, and symmetry can be understood from the perspective of geometric transformation. Fundamental are the rigid motions: translations, rotations, reflections, and combinations of these, all of which are here assumed to preserve distance and angles (and therefore shapes generally). Reflections and rotations each explain a particular type of symmetry, and the symmetries of an object offer insight into its attributes—as when the reflective symmetry of an isosceles triangle assures that its base angles are congruent.

In the approach taken here, two geometric figures are defined to be congruent if there is a sequence of rigid motions that carries one onto the other. This is the principle of superposition. For triangles, congruence means the equality of all corresponding pairs of sides and all corresponding pairs of angles. During the middle grades, through experiences drawing triangles from given conditions, students notice ways to specify enough measures in a triangle to ensure that all triangles drawn with those measures are congruent. Once these triangle congruence criteria (ASA, SAS, and SSS) are established using rigid motions, they can be used to prove theorems about triangles, quadrilaterals, and other geometric figures.

Similarity transformations (rigid motions followed by dilations) define similarity in the same way that rigid motions define congruence, thereby formalizing the similarity ideas of “same shape” and “scale factor” developed in the middle grades. These transformations lead to the criterion for triangle similarity that two pairs of corresponding angles are congruent.

The definitions of sine, cosine, and tangent for acute angles are founded on right triangles and similarity, and, with the Pythagorean Theorem, are fundamental in many real-world and theoretical situations. The Pythagorean Theorem is generalized to non-right triangles by the Law of Cosines. Together, the Laws of Sines and Cosines embody the triangle congruence criteria for the cases where three pieces of information suffice to completely solve a triangle. Furthermore, these laws yield two possible solutions in the ambiguous case, illustrating that Side-Side-Angle is not a congruence criterion.

Analytic geometry connects algebra and geometry, resulting in powerful methods of analysis and problem solving. Just as the number line associates numbers with locations in one dimension, a pair of perpendicular axes associates pairs of numbers with locations in two dimensions. This correspondence between numerical coordinates and geometric points allows methods from algebra to be applied to geometry and vice versa. The solution set of an equation becomes a geometric curve, making visualization a tool for doing and understanding algebra. Geometric shapes can be described by equations, making algebraic manipulation into a tool for geometric understanding, modeling, and proof. Geometric transformations of the graphs of equations correspond to algebraic changes in their equations.

Dynamic geometry environments provide students with experimental and modeling tools that allow them to investigate geometric phenomena in much the same way as computer algebra systems allow them to experiment with algebraic phenomena.

Connections to Equations. The correspondence between numerical coordinates and geometric points allows methods from algebra to be applied to geometry and vice versa. The solution set of an equation becomes a geometric curve, making visualization a tool for doing and understanding algebra. Geometric shapes can be described by equations, making algebraic manipulation into a tool for geometric understanding, modeling, and proof.

Geometry Overview

Congruence

- Experiment with transformations in the plane.
- Understand congruence in terms of rigid motions.
- Prove geometric theorems.
- Make geometric constructions.

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Similarity, Right Triangles, and Trigonometry

- Understand similarity in terms of similarity transformations.
- Prove theorems involving similarity.
- Define trigonometric ratios and solve problems involving right triangles.
- Apply trigonometry to general triangles.

Circles

- Understand and apply theorems about circles.
- Find arc lengths and areas of sectors of circles.

Expressing Geometric Properties with Equations

- Translate between the geometric description and the equation for a conic section.
- Use coordinates to prove simple geometric theorems algebraically.

Geometric Measurement and Dimension

- Explain volume formulas and use them to solve problems.
- Visualize relationships between two-dimensional and three-dimensional objects.

Modeling with Geometry

- Apply geometric concepts in modeling situations.

Geometry

Congruence G.CO

Experiment with transformations in the plane.

1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
2. Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).
3. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
4. Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
5. Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.

Understand congruence in terms of rigid motions.

6. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.
7. Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
8. Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.

Prove geometric theorems.

9. Prove theorems about lines and angles. *Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.*
10. Prove theorems about triangles. *Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.*
11. Prove theorems about parallelograms. *Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.*
    MA.11a. Prove theorems about polygons. *Theorems include: measures of interior and exterior angles, properties of inscribed polygons.*

Make geometric constructions.

12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). *Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.*
13. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

Similarity, Right Triangles, and Trigonometry G.SRT

Understand similarity in terms of similarity transformations.

1. Verify experimentally the properties of dilations given by a center and a scale factor:

    a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.
    b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
2. Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.
3. Use the properties of similarity transformations to establish the Angle-Angle (AA) criterion for two triangles to be similar.

Prove theorems involving similarity.

4. Prove theorems about triangles. *Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.*
5. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

Define trigonometric ratios and solve problems involving right triangles.

6. Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.
7. Explain and use the relationship between the sine and cosine of complementary angles.
8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.*

Apply trigonometry to general triangles.

9. (+) Derive the formula $A = ½ ab \sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.
10. (+) Prove the Laws of Sines and Cosines and use them to solve problems.
11. (+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).

Circles G.C

Understand and apply theorems about circles.

1. Prove that all circles are similar.
2. Identify and describe relationships among inscribed angles, radii, and chords. *Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.*
3. Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.
    MA.3a. Derive the formula for the relationship between the number of sides and sums of the interior and sums of the exterior angles of polygons and apply to the solutions of mathematical and contextual problems.
4. (+) Construct a tangent line from a point outside a given circle to the circle.

Find arc lengths and areas of sectors of circles.

5. Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.

Expressing Geometric Properties with Equations G.GPE

Translate between the geometric description and the equation for a conic section.

1. Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.
2. Derive the equation of a parabola given a focus and directrix.
3. (+) Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant.

MA.3a (+) Use equations and graphs of conic sections to model real-world problems.

Use coordinates to prove simple geometric theorems algebraically.

4. Use coordinates to prove simple geometric theorems algebraically. *For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1,* $\sqrt{3}$*) lies on the circle centered at the origin and containing the point (0, 2).*
5. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).
6. Find the point on a directed line segment between two given points that partitions the segment in a given ratio.
7. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.★

Geometric Measurement and Dimension G.GMD

Explain volume formulas and use them to solve problems.

1. Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. *Use dissection arguments, Cavalieri's principle, and informal limit arguments.*
2. (+) Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.
3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. ★

Visualize relationships between two-dimensional and three-dimensional objects.

4. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.

Modeling with Geometry★ G.MG

Apply geometric concepts in modeling situations. ★

1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). ★
2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). ★
3. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). ★

MA.4. Use dimensional analysis for unit conversions to confirm that expressions and equations make sense. ★

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Conceptual Category: Statistics and Probability★

Decisions or predictions are often based on data—numbers in context. These decisions or predictions would be easy if the data always sent a clear message, but the message is often obscured by variability. Statistics provides tools for describing variability in data and for making informed decisions that take it into account.

Data are gathered, displayed, summarized, examined, and interpreted to discover patterns and deviations from patterns. Quantitative data can be described in terms of key characteristics: measures of shape, center, and spread. The shape of a data distribution might be described as symmetric, skewed, flat, or bell shaped, and it might be summarized by a statistic measuring center (such as mean or median) and a statistic measuring spread (such as standard deviation or interquartile range). Different distributions can be compared numerically using these statistics or compared visually using plots. Knowledge of center and spread are not enough to describe a distribution. Which statistics to compare, which plots to use, and what the results of a comparison might mean, depend on the question to be investigated and the real-world actions to be taken.

Randomization has two important uses in drawing statistical conclusions. First, collecting data from a random sample of a population makes it possible to draw valid conclusions about the whole population, taking variability into account. Second, randomly assigning individuals to different treatments allows a fair comparison of the effectiveness of those treatments. A statistically significant outcome is one that is unlikely to be due to chance alone, and this can be evaluated only under the condition of randomness. The conditions under which data are collected are important in drawing conclusions from the data; in critically reviewing uses of statistics in public media and other reports, it is important to consider the study design, how the data were gathered, and the analyses employed as well as the data summaries and the conclusions drawn.

Random processes can be described mathematically by using a probability model: a list or description of the possible outcomes (the sample space), each of which is assigned a probability. In situations such as flipping a coin, rolling a number cube, or drawing a card, it might be reasonable to assume various outcomes are equally likely. In a probability model, sample points represent outcomes and combine to make up events; probabilities of events can be computed by applying the Addition and Multiplication Rules. Interpreting these probabilities relies on an understanding of independence and conditional probability, which can be approached through the analysis of two-way tables.

Technology plays an important role in statistics and probability by making it possible to generate plots, regression functions, and correlation coefficients, and to simulate many possible outcomes in a short amount of time.

Connections to Functions and Modeling. Functions may be used to describe data; if the data suggest a linear relationship, the relationship can be modeled with a regression line, and its strength and direction can be expressed through a correlation coefficient.

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Statistics and Probability Overview

Interpreting Categorical and Quantitative Data

- Summarize, represent, and interpret data on a single count or measurement variable.
- Summarize, represent, and interpret data on two categorical and quantitative variables.
- Interpret linear models.

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Making Inferences and Justifying Conclusions

- Understand and evaluate random processes underlying statistical experiments.
- Make inferences and justify conclusions from sample surveys, experiments and observational studies.

Conditional Probability and the Rules of Probability

- Understand independence and conditional probability and use them to interpret data.
- Use the rules of probability to compute probabilities of compound events in a uniform probability model.

Using Probability to Make Decisions

- Calculate expected values and use them to solve problems.
- Use probability to evaluate outcomes of decisions.

Statistics and Probability★
Interpreting Categorical and Quantitative Data[★] S.ID

Summarize, represent, and interpret data on a single count or measurement variable. ★

1. Represent data with plots on the real number line (dot plots, histograms, and box plots). ★
2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★
3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★
4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★

Summarize, represent, and interpret data on two categorical and quantitative variables. ★

5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★
6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★
   a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.* ★
   b. Informally assess the fit of a function by plotting and analyzing residuals. ★
   c. Fit a linear function for a scatter plot that suggests a linear association. ★

Interpret linear models. ★

7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. ★
8. Compute (using technology) and interpret the correlation coefficient of a linear fit. ★
9. Distinguish between correlation and causation. ★

Making Inferences and Justifying Conclusions★ S.IC

Understand and evaluate random processes underlying statistical experiments. ★

1. Understand statistics as a process for making inferences to be made about population parameters based on a random sample from that population. ★
2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. *For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?* ★

Make inferences and justify conclusions from sample surveys, experiments, and observational studies.★

3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. ★
4. Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling. ★
5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. ★
6. Evaluate reports based on data. ★

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Conditional Probability and the Rules of Probability[★] S.CP

Understand independence and conditional probability and use them to interpret data. ★

1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not"). ★
2. Understand that two events *A* and *B* are independent if the probability of *A* and *B* occurring together is the product of their probabilities, and use this characterization to determine if they are independent. ★
3. Understand the conditional probability of *A* given *B* as $P(A \text{ and } B)/P(B)$, and interpret independence of *A* and *B* as saying that the conditional probability of *A* given *B* is the same as the probability of *A*, and the conditional probability of *B* given *A* is the same as the probability of *B*. ★
4. Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. *For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.* ★
5. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.* ★

Use the rules of probability to compute probabilities of compound events in a uniform probability model. ★

6. Find the conditional probability of *A* given *B* as the fraction of *B*'s outcomes that also belong to *A*, and interpret the answer in terms of the model. ★
7. Apply the Addition Rule, $P(A \text{ or } B) = P(A) + P(B) – P(A \text{ and } B)$, and interpret the answer in terms of the model. ★
8. (+) Apply the general Multiplication Rule in a uniform probability model, $P(A \text{ and } B) = P(A)P(B|A) = P(B)P(A|B)$, and interpret the answer in terms of the model. ★
9. (+) Use permutations and combinations to compute probabilities of compound events and solve problems. ★

Using Probability to Make Decisions★ S.MD

Calculate expected values and use them to solve problems. ★

1. (+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions. ★
2. (+) Calculate the expected value of a random variable; interpret it as the mean of the probability distribution. ★
3. (+) Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value. *For example, find the theoretical probability distribution for the number of correct answers obtained by guessing on all five questions of a multiple-choice test where each question has four choices, and find the expected grade under various grading schemes.* ★
4. (+) Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. *For example, find a current data distribution on the number of TV sets per household in the United States, and calculate the expected*

[★] Specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

number of sets per household. How many TV sets would you expect to find in 100 randomly selected households? ⋆

Use probability to evaluate outcomes of decisions. ⋆

5. (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. ⋆
    a. Find the expected payoff for a game of chance. *For example, find the expected winnings from a state lottery ticket or a game at a fast-food restaurant.* ⋆
    b. Evaluate and compare strategies on the basis of expected values. *For example, compare a high-deductible versus a low-deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.* ⋆
6. (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator). ⋆
7. (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling [out] a hockey goalie at the end of a game). ⋆

High School Model Pathways and Courses

Transition from Grade 8 to Algebra I or Mathematics I

The pre-kindergarten to grade 8 standards present a coherent progression of concepts and skills that will prepare students for Algebra I or Mathematics I. Students will need to master the grades 6-8 standards in order to be prepared for the model Algebra I or Mathematics I course presented in this document. Some students may master the 2011 grade 8 standards earlier than grade 8 which would enable these students to take the model high school Algebra I or Mathematics I course in grade 8.

The 2011 grade 8 standards are rigorous and students are expected to learn about linear relationships and equations, to begin the study of functions and compare rational and irrational numbers. In addition, the statistics presented in the grade 8 standards are more sophisticated and include connecting linear relations with the representation of bivariate data. The model Algebra I and Mathematics I courses progress from these concepts and skills and focus on quadratic and exponential functions. Thus, the 2011 model Algebra I course is a more advanced course than the Algebra I course identified in our 2000 framework. Likewise, the Mathematics I course is also designed to follow the more rigorous 2011 grade 8 standards.

Development of High School Model Pathways and Courses[6]

The 2011 grades 9–12 high school mathematics standards presented by conceptual categories provide guidance on what students are expected to learn in order to be prepared for college and careers. These standards do not indicate the sequence of high school courses. In Massachusetts we received requests for additional guidance about how these 9–12 standards might be configured into model high school courses and represent a smooth transition from the grades prek-8 standards.

Achieve (in partnership with the Common Core writing team) convened a group of experts, including state mathematics experts, teachers, mathematics faculty from two and four year institutions, mathematics teacher educators, and workforce representatives to develop Model Course Pathways in Mathematics based on the Common Core State Standards that would reflect a logical progression from the pre-K–8 standards. The Pathways, Traditional (Algebra I, Geometry, and Algebra II) and Integrated (Mathematics I, Mathematics II, and Mathematics III), are presented in the June 2010 Common Core State Standards for Mathematics *Appendix A: Designing High School Mathematics Courses Based on the Common Core State Standards for Mathematics.*

The Department of Elementary and Secondary Education convened high school teachers, higher education faculty, and business leaders to review the two model pathways and related courses, and create additional model courses for students to enter after completing either pathway. The resulting Pathways and courses were presented to the Board of Elementary and Secondary Education as the model courses to be included in the 2011 Massachusetts Mathematics Curriculum Framework.

The Pathways

All of the high school content standards (originally presented by conceptual categories) that specify the mathematics all students should study for college and career readiness[7] are included in appropriate locations within the three courses of both Pathways. Students completing the three courses that comprise the Traditional Pathway or the three courses that comprise the Integrated Pathway are prepared for additional courses in higher level math comprised of the (+) standards. There are two such advanced model courses defined in this document: Precalculus and Advanced Quantitative Reasoning.

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[6] Adapted from the *Common Core State Standards for Mathematics* and *Appendix A: Designing High School Courses based on the Common Core State Standards for Mathematics*

[7] In select cases (+) standards are included in Pathway model courses to maintain mathematical coherence.

The Traditional Pathway reflects the approach typically seen in the U.S. consisting of two algebra courses and a geometry course, with some data, probability and statistics included in each course. The Integrated Pathway reflects the approach typically seen internationally consisting of a sequence of three courses, each of which includes number, algebra, geometry, probability and statistics.

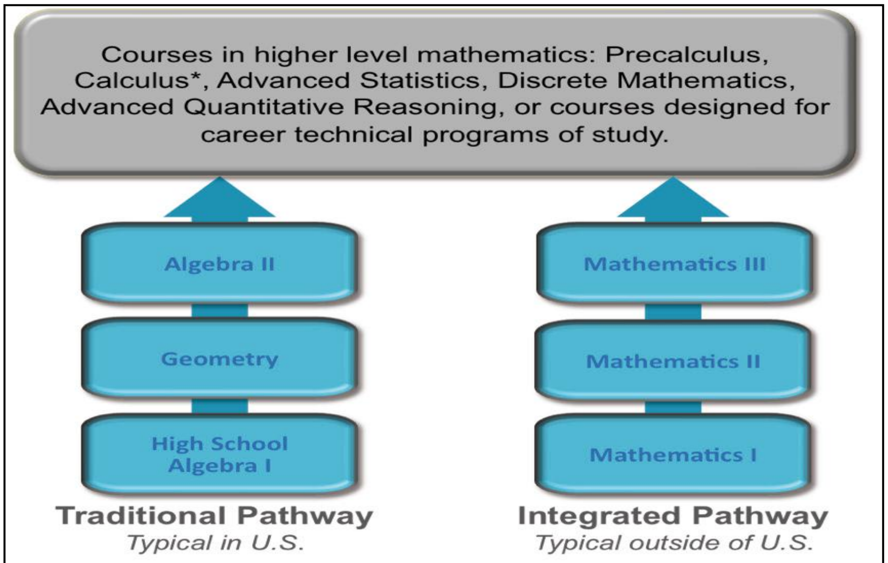
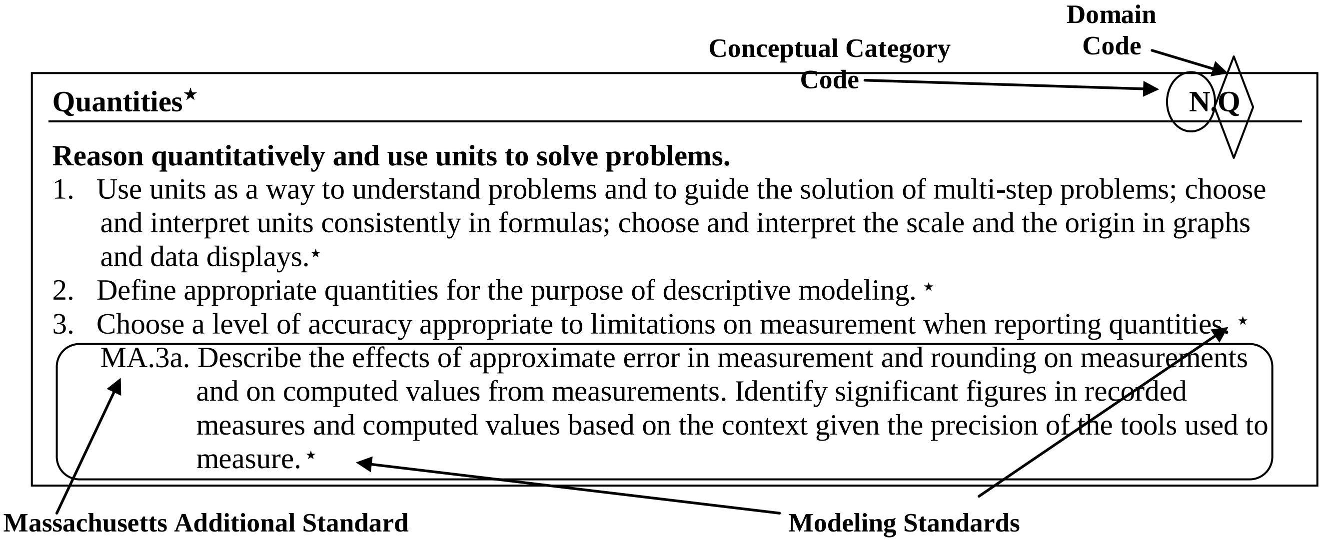


Illustration from *Appendix A: Designing High School Mathematics Courses Based on the Common Core State Standards.*

Each model course delineates the mathematics standards to be covered in a course; they are not prescriptions for curriculum or pedagogy. Additional work will be needed to create coherent instructional programs that help students achieve these standards. While the Pathways and model courses organize the Standards for Mathematical Content into model pathways to college and career readiness, the content standards must also be connected to the Standards for Mathematical Practice to ensure that the skills needed for later success are developed.

How to Read the Model High School Courses



Quantities★

Reason quantitatively and use units to solve problems.

1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.★
2. Define appropriate quantities for the purpose of descriptive modeling. ★
3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★

MA.3a. Describe the effects of approximate error in measurement and rounding on measurements and on computed values from measurements. Identify significant figures in recorded measures and computed values based on the context given the precision of the tools used to measure. ★

The unique identifier for the standards containing the conceptual category code, the domain code, and standard number will continue to be used to code standards as they appear in the model courses. The specific modeling standards will be identified with the star symbol (★)

The format of the model courses follows that of the pre-K – 8 grade-level standards. Each course begins with an introduction that describes the critical areas, and an overview that identifies the conceptual categories, domains, and cluster headings of the standards in the course. The introduction, domain and cluster headings help to illustrate the relationships between the standards, and are integral parts of the course.

Footnotes

It is important to note that some standards are repeated in two or more courses within a Pathway. Footnotes have been included in the courses in order to clarify what aspect(s) of a standard is appropriate for each course. The footnotes are an important part of the standards for each course. For example, “N.RN.1 Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents” is included in the Algebra I and Algebra II courses. The footnote in Algebra I, “Introduce rational exponents for square and cube roots in Algebra I and expand to include other rational exponents in Algebra II” indicates that rational exponents should be limited to square and cube roots. The footnote in Algebra II, “Expand understanding of rational exponents to all uses” indicates that other applications of rational exponents should be included in Algebra II.

Importance of Modeling in High School

Modeling (indicated by a ★ in the standards) is defined as both a *conceptual category* for high school mathematics and a *mathematical practice* and is an important avenue for motivating students to study mathematics, for building their understanding of mathematics, and for preparing them for future success. Development of the pathways into instructional programs will require careful attention to modeling and the mathematical practices. Assessments based on these pathways should reflect both the content and standards for mathematical practice.

Traditional Pathway
Model Course: High School Algebra I[8]

The fundamental purpose of Algebra I is to formalize and extend the mathematics that students learned in the middle grades. The course contains standards from the High School Conceptual Categories, each of which were written to encompass the scope of content and skills to be addressed throughout grades 9–12 not in any single course. Therefore, the full standard is presented in each model course, with clarifying footnotes as needed to limit the scope of the standard and indicate what is appropriate for study in a particular course. For example, the scope of Algebra I is limited to linear, quadratic, and exponential expressions and functions as well as some work with absolute value, step, and functions that are piecewise-defined; therefore, although a standard may include references to logarithms or trigonometry, those functions are not be included in the work of Algebra I students, rather they will be addressed in Algebra II. Reminders of this limitation are included as footnotes where appropriate in the Algebra I standards.

Algebra I has four critical areas that deepen and extend understanding of linear and exponential relationships by contrasting them with each other and by applying linear models to data that exhibit a linear trend. Students engage in methods for analyzing, solving and using quadratic functions. The Standards for Mathematical Practice apply throughout the course and, together with the content standards, prescribe that students experience mathematics as a coherent, useful, and logical subject that makes use of their ability to make sense of problem situations.

(1) By the end of eighth grade, students have learned to solve linear equations in one variable and have applied graphical and algebraic methods to analyze and solve systems of linear equations in two variables. In this course students analyze and explain the process of solving an equation and justify the process used in solving a system of equations. Students develop fluency writing, interpreting, and translating between various forms of linear equations and inequalities, and using them to solve problems. They master the solution of linear equations and apply related solution techniques and the laws of exponents to the creation and solution of simple exponential equations.

(2) In earlier grades, students define, evaluate, and compare functions, and use them to model relationships between quantities. Students will learn function notation and develop the concepts of domain and range. They focus on linear, quadratic, and exponential functions, including sequences, and also explore absolute value, step, and piecewise-defined functions; they interpret functions given graphically, numerically, symbolically, and verbally, translate between representations, and understand the limitations of various representations. Students build on and extend their understanding of integer exponents to consider exponential functions. They compare and contrast linear and exponential functions, distinguishing between additive and multiplicative change. Students explore systems of equations and inequalities, and they find and interpret their solutions. They interpret arithmetic sequences as linear functions and geometric sequences as exponential functions.

(3) Students extend the laws of exponents to rational exponents involving square and cube roots and apply this new understanding of number; they strengthen their ability to see structure in and create quadratic and exponential expressions. They create and solve equations, inequalities, and systems of equations involving quadratic expressions. Students become facile with algebraic manipulation, including rearranging and collecting terms, factoring, identifying and canceling

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[8] Adapted from the *Common Core State Standards for Mathematics* and *Appendix A: Designing High School Courses based on the Common Core State Standards for Mathematics*

common factors in rational expressions. Students consider quadratic functions, comparing the key characteristics of quadratic functions to those of linear and exponential functions. They select from among these functions to model phenomena. Students learn to anticipate the graph of a quadratic function by interpreting various forms of quadratic expressions. In particular, they identify the real solutions of a quadratic equation as the zeros of a related quadratic function. Students expand their experience with functions to include more specialized functions—absolute value, step, and those that are piecewise-defined.

(4) Building upon prior students' prior experiences with data, students explore a more formal means of assessing how a model fits data. Students use regression techniques to describe approximately linear relationships between quantities. They use graphical representations and knowledge of the context to make judgments about the appropriateness of linear models. With linear models, they look at residuals to analyze the goodness of fit.

Algebra I Model Course Overview

Number and Quantity

The Real Number System

- Extend the properties of exponents to rational exponents.
- Use properties of rational and irrational numbers.

Quantity

- Reason quantitatively and use units to solve problems.

Algebra

Seeing Structure in Expressions

- Interpret the structure of expressions.
- Write expressions in equivalent forms to solve problems.

Arithmetic with Polynomials and Rational Expressions

- Perform arithmetic operations on polynomials.

Creating Equations

- Create equations that describe numbers or relationships.

Reasoning with Equations and Inequalities

- Understand solving equations as a process of reasoning and explain the reasoning.
- Solve equations and inequalities in one variable
- Solve systems of equations.
- Represent and solve equations and inequalities graphically.

Functions

Interpreting Functions

- Understand the concept of a function and use function notation.
- Interpret functions that arise in applications in terms of a context.
- Analyze functions using different representations.

Building Functions

- Build a function that models a relationship between two quantities.
- Build new functions from existing functions.

Linear, Quadratic, and Exponential Models

- Construct and compare linear, quadratic and exponential models and solve problems.
- Interpret expressions for functions in terms of the situation they model.

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Statistics and Probability

Interpreting Categorical and Quantitative Data

- Summarize, represent, and interpret data on a single count or measurement variable.
- Summarize, represent, and interpret data on two categorical and quantitative variables.
- Interpret linear models.

Number and Quantity

The Real Number System N.RN

Extend the properties of exponents to rational exponents.[9]

1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. *For example, we define* $5^{1/3}$ *to be the cube root of 5 because we want* $(5^{1/3})^3 = 5^{(1/3) \times 3}$ *to hold, so* $(5^{1/3})^3$ *must equal 5.*
2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.

Use properties of rational and irrational numbers.

3. Explain why the sum or product of rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.

Quantities★ N.Q

Reason quantitatively and use units to solve problems.

1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.★
2. Define appropriate quantities for the purpose of descriptive modeling. ★
3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★
   MA.3a. Describe the effects of approximate error in measurement and rounding on measurements and on computed values from measurements. Identify significant figures in recorded measures and computed values based on the context given the precision of the tools used to measure. ★

Algebra

Seeing Structure in Expressions A.SSE

Interpret the structure of expressions.[10]

1. Interpret expressions that represent a quantity in terms of its context. ★
   a. Interpret parts of an expression, such as terms, factors, and coefficients. ★
   b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret* $P(1+r)^n$ *as the product of P and a factor not depending on P.*★
2. Use the structure of an expression to identify ways to rewrite it. *For example, see* $x^4 – y^4$ *as* $(x^2)^2 – (y^2)^2$, *thus recognizing it as a difference of squares that can be factored as* $(x^2 – y^2)(x^2 + y^2)$.

Write expressions in equivalent forms to solve problems.

3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
   a. Factor a quadratic expression to reveal the zeros of the function it defines.
   b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
   c. Use the properties of exponents to transform expressions for exponential functions. *For example the expression* 1.15^t *can be rewritten as* $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ *to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*

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[9] Introduce rational exponents involving square and cube roots in Algebra I and continue with other rational exponents in Algebra II.

★ Specific modeling standards appear through out the high school standards indicated by a star symbol (★). The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

[10] Algebra I is limited to linear, quadratic, and exponential expressions.

Arithmetic with Polynomials and Rational Functions A.APR

Perform arithmetic operations on polynomials.[11]

1. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

Creating Equations[12]★ A.CED

Create equations that describe numbers or relationships. ★

1. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. ★
2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. ★
3. Represent constraints by equations or inequalities[13], and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.* ★
4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law $V = IR$ to highlight resistance R.* ★

Reasoning with Equations and Inequalities A.REI

Understand solving equations as a process of reasoning and explain the reasoning.

1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

Solve equations and inequalities in one variable.

3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
    - MA.3a. Solve linear equations and inequalities in one variable involving absolute value.
4. Solve quadratic equations in one variable.
    - a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x – p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.
    - b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions[14] and write them as $a \pm bi$ for real numbers a and b.
    - MA.4c. Demonstrate an understanding of the equivalence of factoring, completing the square, or using the quadratic formula to solve quadratic equations.

Solve systems of equations.

5. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.
6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

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[11] For Algebra I, focus on adding and multiplying polynomial expressions, factor or expand polynomial expressions to identify and collect like terms, apply the distributive property.

[12] Create linear, quadratic, and exponential (with integer domain) equations in Algebra I.

★ Specific modeling standards appear throughout the high school standards indicated by a star (★) symbol. The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

[13] Equations and inequalities in this standard should be limited to linear.

[14] It is sufficient in Algebra I to recognize when roots are not real; writing complex roots are included in Algebra II .

7. Solve a simple system consisting of a linear equation and a quadratic[15] equation in two variables algebraically and graphically. *For example, find the points of intersection between the line* $y = –3x$ *and the circle* $x^2 + y^2 = 3$.

Represent and solve equations and inequalities[16] graphically.

10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).
11. Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. ★
12. Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

Functions

Interpreting Functions F.IF

Understand the concept of a function and use function notation.

1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$.
2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. F*or example, the Fibonacci sequence is defined recursively by* $f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1)$ *for* $n \geq 1$.

Interpret functions[17] that arise in applications in terms of the context.

4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* ★
5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.* ★
6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. ★

Analyze functions[18] using different representations.

7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★

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[15] Algebra I does not include the study of conic equations; include quadratic equations typically included in Algebra I.

[16] In Algebra I, functions are limited to linear, absolute value, and exponential functions for this standard.

★ Specific modeling standards appear throughout the high school standards indicated by a star (★) symbol. The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

[17] Limit to interpreting linear, quadratic, and exponential functions.

[18] In Algebra I, only linear, exponential, quadratic, absolute value, step, and piecewise functions are included in this cluster.

    a. Graph linear and quadratic functions and show intercepts, maxima, and minima. ★
    b. Graph square root, cube root[19], and piecewise-defined functions, including step functions and absolute value functions. ★
    e. Graph exponential and logarithmic[20] functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. ★[21]

8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
    a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
    b. Use the properties of exponents to interpret expressions for exponential functions. *For example, identify percent rate of change in functions such as* $y = 1.02^t$, $y = (0.97)^t$, $y = (1.01)^{12t}$, $y = (1.2)^{t/10}$, *and classify them as representing exponential growth and decay.*

    MA.8c. Translate between different representations of functions and relations: graphs, equations point sets, and tabular.

9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*

MA.10. Given algebraic, numeric, and/or graphical representations of functions, recognize the function as polynomial, rational, logarithmic, exponential, or trigonometric.

Building Functions [22] F.BF

Build a function that models a relationship between two quantities.

1. Write a function that describes a relationship between two quantities. ★
    a. Determine an explicit expression, a recursive process, or steps for calculation from a context.
    b. Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.*★
2. Write arithmetic and geometric sequences both recursively and with an explicit formula[23], use them to model situations, and translate between the two forms.★

Build new functions from existing functions.

3. Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.*
4. Find inverse functions.
    a. Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. *For example,* $f(x) = 2x^3$ *or* $f(x) = (x+1)/(x-1)$ *for* $x \neq 1$.

★ Specific modeling standards appear throughout the high school standards indicated by a star (★) symbol. The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

[19] Graphing square root and cube root functions is included in Algebra II.

[20] In Algebra I it is sufficient to graph exponential functions showing intercepts.

[21] Showing end behavior of exponential functions and graphing logarithmic and trigonometric functions is not part of Algebra I.

[22] Functions are limited to linear, quadratic , and exponential in Algebra I.

[23] In Algebra I identify linear and exponential sequences that are defined recursively, continue the study of sequences in Algebra II.

Linear, Quadratic, and Exponential Models★ F.LE

Construct and compare linear, quadratic, and exponential models and solve problems. ★

1. Distinguish between situations that can be modeled with linear functions and with exponential functions.★
   a. Prove that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals. ★
   b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. ★
   c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. ★
2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). ★
3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. ★

Interpret expressions for functions in terms of the situation they model.★

5. Interpret the parameters in a linear or exponential[24] function in terms of a context. ★

Statistics and Probability★ S.ID

Interpreting Categorical and Quantitative Data★

Summarize, represent, and interpret data on a single count or measurement variable. ★

1. Represent data with plots on the real number line (dot plots, histograms, and box plots). ★
2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★
3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★
4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★

Summarize, represent, and interpret data on two categorical and quantitative variables. [25] ★

5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★
6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.★
   a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. *Emphasize linear, quadratic, and exponential models.* ★
   b. Informally assess the fit of a function by plotting and analyzing residuals. ★
   c. Fit a linear function for a scatter plot that suggests a linear association.★

Interpret linear models.

7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. ★
8. Compute (using technology) and interpret the correlation coefficient of a linear fit. ★
9. Interpret linear models. Distinguish between correlation and causation. ★

★ Specific modeling standards appear throughout the high school standards indicated by a star (★) symbol. The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

[24] Limit exponential function to the form $f(x) = b^x + k$).

[25] Linear focus; discuss as a general principle in Algebra I.

Traditional Pathway
Model Course: Geometry[26]

The fundamental purpose of the Geometry course is to formalize and extend students' geometric experiences from the middle grades. Students explore more complex geometric situations and deepen their explanations of geometric relationships, presenting and hearing formal mathematical arguments. Important differences exist between this Geometry course and the historical approach taken in Geometry classes. For example, transformations are emphasized in this course. Close attention should be paid to the introductory content for the Geometry conceptual category found on page 84. The Standards for Mathematical Practice apply throughout this course and, together with the content standards, prescribe that students experience mathematics as a coherent, useful, and logical subject that makes use of their ability to make sense of problem situations. The critical areas are as follows:

(1) Students have prior experience with drawing triangles based on given measurements, performing rigid motions including translations, reflections, and rotations, and have used these to develop notions about what it means for two objects to be congruent. In this course, students establish triangle congruence criteria, based on analyses of rigid motions and formal constructions. They use triangle congruence as a familiar foundation for the development of formal proof. Students prove theorems—using a variety of formats including deductive and inductive reasoning and proof by contradiction—and solve problems about triangles, quadrilaterals, and other polygons. They apply reasoning to complete geometric constructions and explain why they work.

(2) Students apply their earlier experience with dilations and proportional reasoning to build a formal understanding of similarity. They identify criteria for similarity of triangles, use similarity to solve problems, and apply similarity in right triangles to understand right triangle trigonometry, with particular attention to special right triangles and the Pythagorean theorem. Students develop the Laws of Sines and Cosines in order to find missing measures of general (not necessarily right) triangles, building on students' work with quadratic equations done in the first course. They are able to distinguish whether three given measures (angles or sides) define 0, 1, 2, or infinitely many triangles.

(3) Students' experience with three-dimensional objects is extended to include informal explanations of circumference, area, and volume formulas. Additionally, students apply their knowledge of two-dimensional shapes to consider the shapes of cross-sections and the result of rotating a two-dimensional object about a line.

(4) Building on their work with the Pythagorean theorem in 8th grade to find distances, students use the rectangular coordinate system to verify geometric relationships, including properties of special triangles and quadrilaterals and slopes of parallel and perpendicular lines, which relates back to work done in the first course. Students continue their study of quadratics by connecting the geometric and algebraic definitions of the parabola.

(5) Students prove basic theorems about circles, with particular attention to perpendicularity and inscribed angles, in order to see symmetry in circles and as an application of triangle congruence criteria. They study relationships among segments on chords, secants, and tangents as an application of similarity. In the Cartesian coordinate system, students use the distance formula to write the equation of a circle when given the radius and the coordinates of its center. Given an equation of a circle, they draw the graph in the coordinate plane, and apply techniques for

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[26] Adapted from *Appendix A: Designing High School Mathematics Course Based on the Common Core State Standards,* http://www.corestandards.org/the-standards

solving quadratic equations, which relates back to work done in the first course, to determine intersections between lines and circles or parabolas and between two circles.

(6) Building on probability concepts that began in the middle grades, students use the languages of set theory to expand their ability to compute and interpret theoretical and experimental probabilities for compound events, attending to mutually exclusive events, independent events, and conditional probability. Students should make use of geometric probability models wherever possible. They use probability to make informed decisions.

Geometry Overview

Number and Quantity

Quantity

- Reason quantitatively and use units to solve problems.

Geometry

Congruence

- Experiment with transformations in the plane.
- Understand congruence in terms of rigid motions
- Prove geometric theorems.
- Make geometric constructions.

Similarity, Right Triangles, and Trigonometry

- Understand similarity in terms of similarity in terms of similarity transformations.
- Prove theorems involving similarity.
- Define trigonometry ratios and solve problems involving right triangles.
- Apply trigonometry to general triangles.

Circles

- Understand and apply theorems about circles.
- Find arc lengths and area of sectors of circles.

Expressing Geometric Properties with Equations

- Translate between the geometric description and the equations for a conic section.
- Use coordinates to prove simple geometric theorems algebraically.

Geometric Measurement and Dimension

- Explain volume formulas and use them to solve problems.
- Visualize the relationship between two-dimensional and three-dimensional objects.

Modeling with Geometry

- Apply geometric concepts in modeling situations.

Statistics and Probability

Conditional Probability and the Rules of Probability

- Understand independence and conditional probability and use them to interpret data.
- Use the rules of probability to compute probabilities of compound events in a uniform probability model.

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Number and Quantity
Quantity N.Q

Reason quantitatively and use units to solve problems.[★]

2. Define appropriate quantities for the purpose of descriptive modeling. ★
3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
   - MA.3a. Describe the effects of approximate error in measurement and rounding on measurements and on computed values from measures. Identify significant figures in recorded measures and computed values based on the context given and the precision of the tools used to measure. ★

Geometry
Congruence G.CO

Experiment with transformations in the plane.

1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
2. Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).
3. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
4. Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
5. Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.

Understand congruence in terms of rigid motions.

6. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.
7. Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
8. Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.

Prove geometric theorems. [27]

9. Prove theorems about lines and angles. *Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.*
10. Prove theorems about triangles. *Theorems include: measures of interior angles of a triangle sum to 180 degrees; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.*
11. Prove theorems about parallelograms. *Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.*

[★] Specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

[27] Proving the converse of theorems should be included when appropriate.

MA.11a. Prove theorems about polygons. *Theorems include: measures of interior and exterior angles, properties of inscribed polygons.*

Make geometric constructions.

12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). *Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.*
13. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

Similarity, Right Triangles, and Trigonometry G.SRT

Understand similarity in terms of similarity transformations.

1. Verify experimentally the properties of dilations given by a center and a scale factor:
    a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.
    b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
2. Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.
3. Use the properties of similarity transformations to establish the Angle-Angle criterion (AA) for two triangles to be similar.

Prove theorems involving similarity.

4. Prove theorems about triangles. *Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.*
5. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

Define trigonometric ratios and solve problems involving right triangles.

6. Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.
7. Explain and use the relationship between the sine and cosine of complementary angles.
8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

Apply trigonometry to general triangles.

9. (+) Derive the formula $A = (1/2)ab \sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.
10. (+) Prove the Laws of Sines and Cosines and use them to solve problems.
11. (+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).

Circles G.C

Understand and apply theorems about circles.

1. Prove that all circles are similar.
2. Identify and describe relationships among inscribed angles, radii, and chords. *Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.*
3. Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.

    MA.3a. Derive the formula for the relationship between the number of sides and sums of the interior and sums of the exterior angles of polygons and apply to the solutions of mathematical and contextual problems.

4. (+) Construct a tangent line from a point outside a given circle to the circle.

Find arc lengths and areas of sectors of circles.

5. Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.

Expressing Geometric Properties with Equations G.GPE

Translate between the geometric description and the equation for a conic section.

1. Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.
2. Derive the equation of a parabola given a focus and a directrix.

Use coordinates to prove simple geometric theorems algebraically.

4. Use coordinates to prove simple geometric theorems algebraically. *For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1,* $\sqrt{3}$*) lies on the circle centered at the origin and containing the point (0, 2).*
5. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).
6. Find the point on a directed line segment between two given points that partitions the segment in a given ratio.
7. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.[★]

Geometric Measurement and Dimension G.GMD

Explain volume formulas and use them to solve problems.

1. Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. *Use dissection arguments, Cavalieri's principle, and informal limit arguments.*
2. (+) Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.
3. Use volume formulas[28] for cylinders, pyramids, cones, and spheres to solve problems.★

Visualize relationships between two-dimensional and three-dimensional objects.

4. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.

Modeling with Geometry G.MG

Apply geometric concepts in modeling situations.

1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).★
2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).★
3. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).★

MA.4. Use dimensional analysis for unit conversion to confirm that expressions and equations make sense.

[★] Specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

[28] Note: MA 2011 grade 8 requires that students know volume formulas for cylinders, cones and spheres.

Statistics and Probability ★
Conditional Probability and the Rules of Probability★ S.CP

Understand independence and conditional probability and use them to interpret data.[29] ★

1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not"). ★
2. Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent. ★
3. Understand the conditional probability of A given B as $P(A \text{ and } B)/P(B)$, and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B. ★
4. Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. *For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.* ★
5. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.* ★

Use the rules of probability to compute probabilities of compound events in a uniform probability model.[30] ★

6. Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model. ★
7. Apply the Addition Rule, $P(A \text{ or } B) = P(A) + P(B) – P(A \text{ and } B)$, and interpret the answer in terms of the model. ★
8. (+) Apply the general Multiplication Rule in a uniform probability model, $P(A \text{ and } B) = P(A)P(B|A) = P(B)P(A|B)$, and interpret the answer in terms of the model. ★
9. (+) Use permutations and combinations to compute probabilities of compound events and solve problems. ★

★ Specific modeling standards appear through out the high school standards indicated by a star symbol (★). The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

[29] Link to data from simulations or experiments.

[30] Introductory only

Traditional Pathway
Model Course: Algebra II[31]

Building on their work with linear, quadratic, and exponential functions, students extend their repertoire of functions to include logarithmic, polynomial, rational, and radical functions. The course contains standards from the High School Conceptual Categories, each of which were written to encompass the scope of content and skills to be addressed throughout grades 9–12 not in any single course. Therefore, the full standard is presented in each model course, with clarifying footnotes as needed to limit the scope of the standard and indicate what is appropriate for study in a particular course. Standards that were limited in Algebra I, no longer have those restrictions in Algebra II. Students work closely with the expressions that define the functions, are facile with algebraic manipulations of expressions, and continue to expand and hone their abilities to model situations and to solve equations, including solving quadratic equations over the set of complex numbers and solving exponential equations using the properties of logarithms. The Standards for Mathematical Practice apply throughout this course and, together with the content standards, prescribe that students experience mathematics as a coherent, useful, and logical subject that makes use of their ability to make sense of problem situations. The critical areas for this course are as follows:

(1) A central theme is that the arithmetic of rational expressions is governed by the same rules as the arithmetic of rational numbers. Students explore the structural similarities between the system of polynomials and the system of integers. They draw on analogies between polynomial arithmetic and base-ten computation, focusing on properties of operations, particularly the distributive property. Connections are made between multiplication of polynomials with multiplication of multi-digit integers, and division of polynomials with long division of integers. Students identify zeros of polynomials, including complex zeros of quadratic polynomials, and make connections between zeros of polynomials and solutions of polynomial equations. The Fundamental Theorem of Algebra is examined.

(2) Building on their previous work with functions, and on their work with trigonometric ratios and circles in Geometry, students now use the coordinate plane to extend trigonometry to model periodic phenomena.

(3) Students synthesize and generalize what they have learned about a variety of function families. They extend their work with exponential functions to include solving exponential equations with logarithms. They explore the effects of transformations on graphs of diverse functions, including functions arising in an application, in order to abstract the general principle that transformations on a graph always have the same effect regardless of the type of the underlying function. They identify appropriate types of functions to model a situation, they adjust parameters to improve the model, and they compare models by analyzing appropriateness of fit and making judgments about the domain over which a model is a good fit. The description of modeling as "*the process of choosing and using mathematics and statistics to analyze empirical situations, to understand them better, and to make decisions*" is at the heart of this unit. The narrative discussion and diagram of the modeling cycle should be considered when knowledge of functions, statistics, and geometry is applied in a modeling context.

(4) Students see how the visual displays and summary statistics they learned in earlier grades relate to different types of data and to probability distributions. They identify different ways of collecting data— including sample surveys, experiments, and simulations—and the role that randomness and careful design play in the conclusions that can be drawn.

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[31] Adapted from *Appendix A: Designing High School Mathematics Course Based on the Common Core State Standards,* http://www.corestandards.org/the-standards

Algebra II Overview

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Number and Quantity

The Real Number System

- Extend the properties of exponents to rational exponents.

Complex Number System

- Perform arithmetic operations with complex numbers
- Use complex numbers in polynomial identities and equations.

Vector and Matrix Quantities

- Represent and model with vector quantities
- Perform operations on matrices and use matrices in applications.

Algebra

Seeing Structure in Expressions

- Interpret the structure of expressions.
- Write expressions in equivalent forms to solve problems.

Arithmetic with Polynomials and Rational Expressions

- Perform arithmetic operations on polynomials
- Understand the relationship between zeros and factors of polynomials.
- Use polynomial identities to solve problems
- Rewrite rational expressions.

Creating Equations

- Create equations that describe numbers or equations.

Reasoning with Equations and Inequalities

- Understand solving equations as a process of reasoning and explain the reasoning.
- Represent and solve equations and inequalities graphically.

Functions

Interpreting Functions

- Interpret functions that arise in applications in terms of a context.
- Analyze functions using different representations.

Building Functions

- Build a function that models a relationship between two quantities.
- Build new functions from existing functions.

Linear, Quadratic, and Exponential Models

- Construct and compare linear, quadratic, and exponential models and solve problems.

Functions (continued)

Trigonometric Functions

- Extend the domain of trigonometric functions using the unit circle.
- Model periodic phenomena with trigonometric functions.
- Prove and apply trigonometric identities.

Statistics and Probability

Interpreting Categorical and Quantitative Data

- Summarize, represent and interpret data on a single count of measurement variable.

Making Inferences and Justifying Conclusions

- Understand and evaluate random processes underlying statistical experiments.
- Make inferences and justify conclusions from sample surveys, experiments and observational studies.

Number and Quantity

The Real Number System N.RN

Extend the properties of exponents to rational exponents.[32]

1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. *For example, we define* $5^{1/3}$ *to be the cube root of 5 because we want* $(5^{1/3})^3 = 5^{(1/3) \times 3}$ *to hold, so* $(5^{1/3})^3$ *must equal 5.*
2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.

The Complex Number System N.CN

Perform arithmetic operations with complex numbers.

1. Know there is a complex number i such that $i^2 = -1$, and every complex number has the form $a + bi$ with a and b real.
2. Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.

Use complex numbers in polynomial identities and equations.

7. Solve quadratic equations with real coefficients that have complex solutions.
8. (+) Extend polynomial identities to the complex numbers. *For example, rewrite* $x^2 + 4$ *as* $(x + 2i)(x - 2i)$*.*
9. (+) Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.

Vector Quantities and Matrices N.VM

Represent and model with vector quantities.

1. (+) Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., v, $|v|$, $||v||$, v).
3. (+) Solve problems involving velocity and other quantities that can be represented by vectors.

Perform operations on matrices and use matrices in applications.

6. (+) Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.
8. (+) Add, subtract, and multiply matrices of appropriate dimensions.
12. (+) Work with 2 x 2 matrices as transformations of the plane, and interpret the absolute value of the determinant in terms of area.

Algebra

Seeing Structure in Expressions A.SSE

Interpret the structure of expressions.

1. Interpret expressions that represent a quantity in terms of its context.[★]
2. Use the structure of an expression to identify ways to rewrite it. *For example, see* $x^4 - y^4$ *as* $(x^2)^2 - (y^2)^2$*, thus recognizing it as a difference of squares that can be factored as* $(x^2 - y^2)(x^2 + y^2)$*.*

Write expressions in equivalent forms to solve problems.

4. Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. *For example, calculate mortgage payments.* ★

Arithmetic with Polynomials and Rational Expressions A.APR

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[32] Introduce rational exponents in simple situations; master in Algebra II

[★] Specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

Perform arithmetic operations on polynomials.

1. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
   MA.1a. Divide polynomials.

Understand the relationship between zeros and factors of polynomials.

2. Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $x – a$ is $p(a)$, so $p(a) = 0$ if and only if $(x – a)$ is a factor of $p(x)$.
3. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.

Use polynomial identities to solve problems.

4. Prove polynomial identities and use them to describe numerical relationships. *For example, the polynomial identity* $(x^2 + y^2)^2 = (x^2 – y^2)^2 + (2xy)^2$ *can be used to generate Pythagorean triples.*
5. (+) Know and apply that the Binomial Theorem gives the expansion of $(x + y)^n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.[33]

Rewrite rational expressions.

6. Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system.
7. (+) Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.

Creating Equations★ A.CED

Create equations that describe numbers or relationships. ★

1. Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions*. ★
2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. ★
3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.* ★
4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law* $V = IR$ *to highlight resistance* R. ★

Reasoning with equations and inequalities A.REI

Understand solving equations as a process of reasoning and explain the reasoning.

2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

Represent and solve equations and inequalities graphically.

11. Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.★

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[33] The Binomial Theorem can be proved by mathematical induction or by a combinatorial argument.

★ Specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

Functions
Interpreting Functions F.IF

Interpret functions that arise in applications in terms of the context.[★]

4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* ★
5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.* ★
6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. ★

Analyze functions using different representations.

7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★
    - b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. ★
    - c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. ★
    - e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. ★
8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
    - MA.8c. Translate between different representations of functions and relations: graphs, equations, point sets, and tables.
9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*

Building Functions F.BF

Build a function that models a relationship between two quantities.

1. Write a function that describes a relationship between two quantities.★
    - b. Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.*

Build new functions from existing functions.

3. Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
4. Find inverse functions.
    - a. Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. *For example,* $f(x) = 2(x^3)$ *or* $f(x) = (x+1)/(x-1)$ *for* $x \neq 1$.

Linear, Quadratic, and Exponential Models[★] F.LE

[★] Specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

Construct and compare linear, quadratic, and exponential models and solve problems. ★

4. For exponential models, express as a logarithm the solution to ab^(ct) = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. ★

Trigonometric Functions F.TF

Extend the domain of trigonometric functions using the unit circle.

1. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
2. Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.

Model periodic phenomena with trigonometric functions.

5. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline. ★

Prove and apply trigonometric identities.

8. Prove the Pythagorean identity (sin A)^2 + (cos A)^2 = 1 and use it to find sin A, cos A, or tan A, given sin A, cos A, or tan A, and the quadrant of the angle.

Statistics and Probability★

Interpreting Categorical and Quantitative Data★ S.ID

Summarize, represent, and interpret data on a single count or measurement variable. ★

4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★

Making Inferences and Justifying Conclusions S.IC

Understand and evaluate random processes underlying statistical experiments.

1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population. ★
2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. *For example, a model says a spinning coin falls heads up with probability 0. 5. Would a result of 5 tails in a row cause you to question the model? ★*

Make inferences and justify conclusions from sample surveys, experiments and observational studies.

3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. ★
4. Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling. ★
5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. ★
6. Evaluate reports based on data. ★

★ Specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

Integrated Pathway
Model Course: Mathematics I[34]

The fundamental purpose of Mathematics I is to formalize and extend the mathematics that students learned in the middle grades. The course contains standards from the High School Conceptual Categories, each of which were written to encompass the scope of content and skills to be addressed throughout grades 9–12 not in any single course. Therefore, the full standard is presented in each model course, with clarifying footnotes as needed to limit the scope of the standard and indicate what is appropriate for study in a particular course. For example, the scope of Mathematics I is limited to linear and exponential expressions and functions as well as some work with absolute value, step, and functions that are piecewise-defined; therefore, although a standard may include references to quadratic, logarithmic or trigonometric functions, those functions should not be included in the work of Mathematics I students, rather they will be addressed in Mathematics II or III. The critical areas deepen and extend understanding of linear relationships, in part by contrasting them with exponential phenomena, and in part by applying linear models to data that exhibit a linear trend. Mathematics 1 uses properties and theorems involving congruent figures to deepen and extend understanding of geometric knowledge from prior grades. The course ties together the algebraic and geometric ideas studied. The Standards for Mathematical Practice apply throughout each course and, together with the content standards, prescribe that students experience mathematics as a coherent, useful, and logical subject that makes use of their ability to make sense of problem situations.

(1) By the end of eighth grade students have had a variety of experiences working with expressions and creating equations. Students become facile with algebraic manipulation in much the same way that they are facile with numerical manipulation. Algebraic facility includes rearranging and collecting terms, factoring, identifying and canceling common factors in rational expressions and applying properties of exponents. Students continue this work by using quantities to model and analyze situations, to interpret expressions, and by creating equations to describe situations.

(2) In earlier grades, students define, evaluate, and compare functions, and use them to model relationships between quantities. Students will learn function notation and develop the concepts of domain and range. They move beyond viewing functions as processes that take inputs and yield outputs and start viewing functions as objects in their own right. They explore many examples of functions, including sequences; they interpret functions given graphically, numerically, symbolically, and verbally, translate between representations, and understand the limitations of various representations. They work with functions given by graphs and tables, keeping in mind that, depending upon the context, these representations are likely to be approximate and incomplete. Their work includes functions that can be described or approximated by formulas as well as those that cannot. When functions describe relationships between quantities arising from a context, students reason with the units in which those quantities are measured. Students build on and informally extend their understanding of integer exponents to consider exponential functions. They compare and contrast linear and exponential functions, distinguishing between additive and multiplicative change. They interpret arithmetic sequences as linear functions and geometric sequences as exponential functions.

(3) By the end of eighth grade, students have learned to solve linear equations in one variable and have applied graphical and algebraic methods to analyze and solve systems of linear equations in two variables. Building on these earlier experiences, students analyze and explain the process of

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[34] Adapted from *Appendix A: Designing High School Mathematics Course Based on the Common Core State Standards,* http://www.corestandards.org/the-standards

solving an equation and to justify the process used in solving a system of equations. Students develop fluency writing, interpreting, and translating between various forms of linear equations and inequalities, and using them to solve problems. They master the solution of linear equations and apply related solution techniques and the laws of exponents to the creation and solution of simple exponential equations. Students explore systems of equations and inequalities, and they find and interpret their solutions. All of this work is grounded on understanding quantities and on relationships between them.

(4) Students' prior experiences with data Is the basis for with the more formal means of assessing how a model fits data. Students use regression techniques to describe approximately linear relationships between quantities. They use graphical representations and knowledge of the context to make judgments about the appropriateness of linear models. With linear models, they look at residuals to analyze the goodness of fit.

(5) In previous grades, students were asked to draw triangles based on given measurements. They also have prior experience with rigid motions: translations, reflections, and rotations and have used these to develop notions about what it means for two objects to be congruent. Students establish triangle congruence criteria, based on analyses of rigid motions and formal constructions. They solve problems about triangles, quadrilaterals, and other polygons. They apply reasoning to complete geometric constructions and explain why they work.

(6) Building on their work with the Pythagorean Theorem in 8th grade to find distances, students use a rectangular coordinate system to verify geometric relationships, including properties of special triangles and quadrilaterals and slopes of parallel and perpendicular lines.

Mathematics I Overview

Number and Quantity

Quantities

- Reason quantitatively and use units to solve problems.

Algebra

Seeing Structure in Expressions

- Interpret the structure of expressions.

Creating Equations

- Create equations that describe numbers of relationships.

Reasoning with Equations and Inequalities

- Understand solving equations as a process of reasoning and explain the reasoning.
- Solve equations and inequalities in one variable.
- Solve systems of equations.
- Represent and solve equations and inequalities graphically.

Functions

Interpreting Functions

- Understand the concept of a function and use function notation.
- Interpret functions that arise in applications in terms of a context.
- Analyze functions using different representations.

Building Functions

- Build a function that models a relationship between two quantities.
- Build a new function from existing functions.

Linear, Quadratic, and Exponential Models

- Construct and compare linear, quadratic, and exponential models and solve problems.
- Interpret expressions for functions in terms of the situation they model.

Geometry

Congruence

- Experiment with transformations in the plane.
- Understand congruence in terms of rigid motions.
- Make geometric constructions.

Expressing Geometric Properties with Equations

- Use coordinates to prove simple geometric theorems algebraically.

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Statistics and Probability

Interpreting Categorical and Quantitative Data

- Summarize, represent, and interpret data on a single count or measurement variable.
- Summarize, represent, and interpret data on two categorical and quantitative variables.

Number and Quantities
Quantities [35] N.Q

Reason quantitatively and use units to solve problems.

1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.★
2. Reason quantitatively and use units to solve problems. Define appropriate quantities for the purpose of descriptive modeling.★
3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
   MA.3a. Describe the effects of approximate error in measurement and rounding on measurements and on computed values from measures.

Algebra
Seeing Structure in Expressions[36] A.SSE

Interpret the structure of expressions.

1. Interpret expressions that represent a quantity in terms of its context.★
   a. Interpret parts of an expression, such as terms, factors, and coefficients. ★
   b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret P(1+r)^n as the product of P and a factor not depending on P.* ★

Creating Equations★[37] A.CED

Create equations that describe numbers or relationship. ★

1. Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*★
2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.★
3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.*[38]★
4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law V = IR to highlight resistance R.*★

Reasoning with Equations and Inequalities A.REI

Understand solving equations as a process of reasoning and explain the reasoning.

1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. [39]

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[35] Foundation for work with expressions, equations, and functions

[★] Specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

[36] Limit Mathematics I to linear expressions and exponential expressions with integer exponents.

[37] Limit Mathematics I to linear and exponential equations with integer exponents.

[38] Limit to linear equations and inequalities.

[39] Master for linear equations and inequalities, learn as general principle to be expanded in Mathematics II and III

Solve equations and inequalities in one variable.[40]

3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
   MA.3a. Solve linear equations and inequalities in one variable involving absolute value.

Solve systems of equations.[41]

5. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.

Represent and solve equations and inequalities graphically.[42]

10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).
11. Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.★
12. Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

Functions
Interpreting Functions F.IF

Understand the concept of a function and use function notation.[43]

1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x).
2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥ 1 (n is greater than or equal to 1).*

Interpret functions that arise in applications in terms of the context.[44]

4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*★
5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*★
6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.★

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[40] Limit Mathematics I to linear inequalities and exponential of a form $2^x=1/16$.

[41] Limit Mathematics I to systems of linear equations.

[42] Limit Mathematics I to linear and exponential equations; learn as general principle to be expanded in Mathematics II and III.

★ Specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

[43] Focus on linear and exponential functions with integer domains and on arithmetic and geometric sequences.

[44] Focus on linear and exponential functions with integer domains.

Analyze functions using different representations.[45]

7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.★
   a. Graph linear and quadratic functions and show intercepts, maxima, and minima.★
   e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.★
9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*

MA.10. Given algebraic, numeric, and/or graphical representations of functions, recognize functions as polynomial, rational, logarithmic, exponential, or trigonometric.

Building Functions F.BF

Build a function that models a relationship between two quantities.[46]

1. Write a function that describes a relationship between two quantities.★
   a. Determine an explicit expression, a recursive process, or steps for calculation from a context.
   b. Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.*
2. Build a function that models a relationship between two quantities. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.★

Build new functions from existing functions.[47]

3. Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.*

Linear, Quadratic, and Exponential Models F.LE

Construct and compare linear, quadratic, and exponential models and solve problems.[48]

1. Distinguish between situations that can be modeled with linear functions and with exponential functions.
   a. Prove that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals.★
   b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.★
   c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.★
2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).★
3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.★

Interpret expressions for functions in terms of the situation they model.[49]

5. Interpret the parameters in a linear or exponential function in terms of a context.★

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[45] Limit Mathematics I to linear and exponential functions with integer domains.

[46] Limit Mathematics I to linear and exponential functions with integer domains.

[47] Limit Mathematics I to linear and exponential functions; focus on vertical translations for exponential functions.

[48] Limit Mathematics I to linear and exponential models.

[49] Limit Mathematics I to linear and exponential functions of the form $f(x) = b^x + k$.

Geometry
Congruence G.CO

Experiment with transformations in the plane.

1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
2. Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).
3. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
4. Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
5. Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.

Understand congruence in terms of rigid motions.[50]

6. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.
7. Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
8. Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.

Make geometric constructions.[51]

12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). *Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.*
13. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

Expressing Geometric Properties with Equations G.GPE

Use coordinates to prove simple geometric theorems algebraically. [52]

4. Use coordinates to prove simple geometric theorems algebraically. F*or example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point* $(1,\sqrt{3})$ *lies on the circle centered at the origin and containing the point (0,2).*
5. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).
7. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

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[50] Build on rigid motions as a familiar starting point for development of geometric proof.

[51] Formalize proof, and focus on explanation of process.

[52] Include the distance formula and relate to the Pythagorean Theorem.

Statistics and Probability[★]

Interpreting Categorical and Quantitative Data★ S.ID

Summarize, represent, and interpret data on a single count or measurement variable.

1. Represent data with plots on the real number line (dot plots, histograms, and box plots).★
2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.★
3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).★

Summarize, represent, and interpret data on two categorical and quantitative variables.[53]

5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.★
6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.★
   a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.★
   b. Informally assess the fit of a function by plotting and analyzing residuals.★
   c. Fit a linear function for a scatter plot that suggests a linear association.★

Interpret linear models.

7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.★
8. Compute (using technology) and interpret the correlation coefficient of a linear fit.★
9. Distinguish between correlation and causation.★

[★] Specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

[53] Focus on linear applications; learn as general principle to be expanded in Mathematics II and III.

Integrated Pathway
Model Course: Mathematics II[54]

The focus of Mathematics II is on quadratic expressions, equations, and functions; comparing their characteristics and behavior to those of linear and exponential relationships from Mathematics I as organized into 5 critical areas. The course contains standards from the High School Conceptual Categories, each of which were written to encompass the scope of content and skills to be addressed throughout grades 9–12 not in any single course. Therefore, the full standard is presented in each model course, with clarifying footnotes as needed to limit the scope of the standard and indicate what is appropriate for study in a particular course. For example, the scope of Mathematics II is limited to quadratic expressions and functions as well as some work with absolute value, step, and functions that are piecewise-defined; therefore, although a standard may include references to logarithms or trigonometry, those functions should not be included in the work of Mathematics II students, rather they will be addressed in Mathematics III.

(1) Students extend the laws of exponents to rational exponents and explore distinctions between rational and irrational numbers by considering their decimal representations. Students learn that when quadratic equations do not have real solutions the number system must be extended so that solutions exist, analogous to the way in which extending the whole numbers to the negative numbers allows $x+1 = 0$ to have a solution. Students explore relationships between number systems: whole numbers, integers, rational numbers, real numbers, and complex numbers. The guiding principle is that equations with no solutions in one number system may have solutions in a larger number system.

(2) Students consider quadratic functions, comparing the key characteristics of quadratic functions to those of linear and exponential functions. They select from among these functions to model phenomena. Students learn to anticipate the graph of a quadratic function by interpreting various forms of quadratic expressions. In particular, they identify the real solutions of a quadratic equation as the zeros of a related quadratic function. When quadratic equations do not have real solutions, students learn that that the graph of the related quadratic function does not cross the horizontal axis. They expand their experience with functions to include more specialized functions—absolute value, step, and those that are piecewise-defined.

(3) Students begin by focusing on the structure of expressions, rewriting expressions to clarify and reveal aspects of the relationship they represent. They create and solve equations, inequalities, and systems of equations involving exponential and quadratic expressions.

(4) Building on probability concepts that began in the middle grades, students use the languages of set theory to expand their ability to compute and interpret theoretical and experimental probabilities for compound events, attending to mutually exclusive events, independent events, and conditional probability. Students should make use of geometric probability models wherever possible. They use probability to make informed decisions.

(5) Students apply their earlier experience with dilations and proportional reasoning to build a formal understanding of similarity. They identify criteria for similarity of triangles, use similarity to solve problems, and apply similarity in right triangles to understand right triangle trigonometry, with particular attention to special right triangles and the Pythagorean Theorem. Students develop facility with geometric proof. They use what they know about congruence and similarity to prove theorems involving lines, angles, triangles, and other polygons. They explore a variety of formats for writing proofs.

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[54] Adapted from *Appendix A: Designing High School Mathematics Course Based on the Common Core State Standards,* http://www.corestandards.org/the-standards

Mathematics II Overview

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Number and Quantity

The Real Number System

- Extend the properties of exponents to rational exponents.
- Use properties of rational and irrational numbers.

The Complex Number Systems

- Perform operations on matrices and use matrices in applications.
- Use complex numbers in polynomial identities and equations.

Algebra

Seeing Structure in Expressions

- Interpret the structure of expressions.
- Write expressions in equivalent forms to solve problems.

Arithmetic with Polynomials and Rational Expressions

- Perform arithmetic operations on polynomials.

Creating Equations

- Create equations that describe numbers of relationships.

Reasoning with Equations and Inequalities

- Solve equations and inequalities in one variable.
- Solve systems of equations.

Functions

Interpreting Functions

- Interpret functions that arise in applications in terms of a context.
- Analyze functions using different representations.

Building functions

- Build a function that models a relationship between two quantities.
- Build new functions from existing functions.

Linear, Quadratic, and Exponential Models

- Construct and compare linear, quadratic and exponential models and solve problems.

Trigonometric Functions

- Prove and apply trigonometric identities.

Geometry

Congruence

- Prove geometric theorems.

Similarity, Right Triangles, and Trigonometry

- Understand similarity in terms of similarity transformations.
- Prove theorems involving similarity.
- Define trigonometric ratios and solve problems involving right triangles.

Geometry (continued)

Circles

- Understand and apply theorems about circles.
- Find arc lengths and areas of sectors of circles.

Expressing Geometric Properties with Equations

- Translate between the geometric description and the equation for a conic section.
- Use coordinates to prove simple geometric theorems algebraically.

Geometric Measurement and Dimension

- Explain volume formulas and use them to solve problems.

Statistics and Probability

Conditional Probability and the Rules of Probability

- Understand independence and conditional probability and use them to interpret data.
- Use the rules of probability to compute probabilities of compound events in a uniform probability model.

Using Probability to Make Decisions

- Use probability to evaluate outcomes or decisions.

Number and Quantity

The Real Number System N.RN

Extend the properties of exponents to rational exponents.

1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. *For example, we define* $5^{1/3}$ *to be the cube root of 5 because we want* $(5^{1/3})^3 = 5^{(1/3)3}$ *to hold, so* $(5^{1/3})^3$ *must equal 5.*
2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.

Use properties of rational and irrational numbers.

3. Explain why the sum or product of rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.

The Complex Number System N.CN

Perform arithmetic operations with complex numbers.[55]

1. Know there is a complex number i such that $i^2 = -1$, and every complex number has the form a + bi with a and b real.
2. Use the relation $i^2 = –1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.

Use complex numbers in polynomial identities and equations.[56]

7. Solve quadratic equations with real coefficients that have complex solutions.
8. (+) Extend polynomial identities to the complex numbers. *For example, rewrite* $x^2 + 4$ *as* $(x + 2i)(x – 2i)$.
9. (+) Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.

Algebra

Seeing Structure in Expressions★ A.SSE

Interpret the structure of expressions.[57]

1. Interpret expressions that represent a quantity in terms of its context.★
   a. Interpret parts of an expression, such as terms, factors, and coefficients.★
   b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret P(1+r)^n as the product of P and a factor not depending on P.*★
2. Use the structure of an expression to identify ways to rewrite it. *For example, see* $x^4 – y^4$ *as* $(x^2)^2 – (y^2)^2$, *thus recognizing it as a difference of squares that can be factored as* $(x^2 – y^2)(x^2 + y^2)$.

Write expressions in equivalent forms to solve problems.[58]

3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.★
   a. Factor a quadratic expression to reveal the zeros of the function it defines.★
   b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.★
   c. Use the properties of exponents to transform expressions for exponential functions. *For example the expression* 1.15^t *can be rewritten as* $[1.15^{(1/12)}]^{(12t)} \approx 1.012^{(12t)}$ *to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*★

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[55] Limit Mathematics II to i^2 as highest power of i.

[56] Limit Mathematics II to quadratic equations with real coefficients.

★ Specific modeling standards appear through out the high school standards indicated by a star symbol (★). The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

[57] Expand to include quadratics and exponential expressions.

[58] Expand to include quadratic and exponential expressions.

Arithmetic with Polynomials and Rational Expressions A.APR

Perform arithmetic operations on polynomials.[59]

1. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

Creating Equations★ A.CED

Create equations that describe numbers or relationship. ★

1. Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions*.★
2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.★
4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law $V = IR$ to highlight resistance R.*★ [60]

Reasoning with Equations and Inequalities A.REI

Solve equations and inequalities in one variable.[61]

4. Solve quadratic equations in one variable.
   a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x – p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.
   b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.
   MA.4c. Demonstrate an understanding of the equivalence of factoring, completing the square, or using the quadratic formula to solve quadratic equations.

Solve systems of equations.[62]

7. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. *For example, find the points of intersection between the line $y = –3x$ and the circle $x^2 + y^2 = 3$.*

Functions

Interpreting Functions F.IF

Interpret functions that arise in applications in terms of the context.[63]

4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*★

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[59] Focus on adding and multiplying polynomial expressions; factor expressions to identify and collect like terms, and apply the distributive property.

★ Specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

[60] Include formulas involving quadratic terms.

[61] Limit to quadratic equations with real coefficients.

[62] Expand to include linear/quadratic systems.

[63] Expand to include quadratic functions.

5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.* ★
6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. ★

Analyze functions using different representations.[64]

7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.[★] ★
   a. Graph linear and quadratic functions and show intercepts, maxima, and minima. ★
   b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. ★
8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
   a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
   b. Use the properties of exponents to interpret expressions for exponential functions. *For example, identify percent rate of change in functions such as* $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{(12t)}$, $y = (1.2)^{(t/10)}$*, and classify them as representing exponential growth and decay.*

   MA.8c. Translate between different representations of functions and relations: graphs, equations, point sets, and tables.
10. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*

   MA.10a. Given algebraic, numeric, and/or graphical representations of functions, recognize functions as polynomial, rational, logarithmic, exponential or trigonometric.

Building Functions F.BF

Build a function that models a relationship between two quantities.[65]

1. Write a function that describes a relationship between two quantities. ★
   a. Determine an explicit expression, a recursive process, or steps for calculation from a context.
   b. Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.*
   c. (+) Compose functions. *For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time.*

Build new functions from existing functions.[66]

3. Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k\,f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.*
4. Find inverse functions.
   a. Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. *For example,* $f(x) =2(x^3)$ *or* $f(x) = (x+1)/(x-1)$ *for* $x \neq 1$ *(x not equal to 1).*

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[64] Limit Mathematics I to linear, exponential, quadratic, piecewise-defined, and absolute value functions.

[★] Specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

[65] Expand to include quadratic and exponential functions.

[66] Expand to include quadratic and absolute value functions.

Linear, Quadratic, and Exponential Models★ F.LE

Construct and compare linear, quadratic, and exponential models and solve problems.

3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.★

Trigonometric Functions F.TF

Prove and apply trigonometric identities.

8. Prove the Pythagorean identity $(\sin A)^2 + (\cos A)^2 = 1$ and use it to find sin A, cos A, or tan A, given sin A, cos A, or tan A, and the quadrant of the angle.

Geometry
Congruence G.CO

Prove geometric theorems.[67]

9. Prove theorems about lines and angles. *Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.*
10. Prove theorems about triangles. *Theorems include: measures of interior angles of a triangle sum to 180 degrees; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.*
11. Prove theorems about parallelograms. *Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.*
    MA.11a. Prove theorems about polygons. Theo*rems include: measures of interior and exterior angels, properties of inscribed polygons.*

Similarity, Right Triangles, and Trigonometry G.SRT

Understand similarity in terms of similarity transformations.

1. Verify experimentally the properties of dilations given by a center and a scale factor:
    a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.
    b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
2. Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.
3. Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.

Prove theorems involving similarity.[68]

4. Prove theorems about triangles. *Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.*

★ Specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

[67] Focus on validity underlying reasoning and use a variety of ways of writing proofs

[68] Focus on validity underlying reasoning and use a variety of ways of writing proofs

5. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

Define trigonometric ratios and solve problems involving right triangles.

6. Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.
7. Explain and use the relationship between the sine and cosine of complementary angles.
8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

Circles G.C

Understand and apply theorems about circles.

1. Prove that all circles are similar.
2. Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.
3. Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.
   MA.3a. Derive the formula for the relationship between the number of sides and the sums of the interior and the sums of the exterior angles of polygons and apply to the solutions of mathematical and contextual problems.
4. (+) Construct a tangent line from a point outside a given circle to the circle.

Find arc lengths and areas of sectors of circles.

5. Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.[69]

Expressing Geometric Properties with Equations G.GPE

Translate between the geometric description and the equation for a conic section.

1. Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.
2. Derive the equation of a parabola given a focus and directrix.

Use coordinates to prove simple geometric theorems algebraically.

4. Use coordinates to prove simple geometric theorems algebraically. *For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point* $(1, \sqrt{3})$ *lies on the circle centered at the origin and containing the point (0, 2).*[70]
6. Find the point on a directed line segment between two given points that partitions the segment in a given ratio.

Geometric Measurement with Dimension G.GMD

Explain volume formulas and use them to solve problems.

1. Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and informal limit arguments.
3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.★

Statistics and Probability★

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[69] Limit Mathematics II use of radian to unit of measure

[70] Include simple circle theorems

Conditional Probability and the Rules of Probability★ S.CP

Understand independence and conditional probability and use them to interpret data.[71] ★

1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”).★
2. Understand that two events *A* and *B* are independent if the probability of *A* and *B* occurring together is the product of their probabilities, and use this characterization to determine if they are independent.★
3. Understand the conditional probability of *A* given *B* as *P*(*A* and *B*)/*P*(*B*), and interpret independence of *A* and B as saying that the conditional probability of *A* given *B* is the same as the probability of *A*, and the conditional probability of *B* given *A* is the same as the probability of *B*.★
4. Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. *For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.* ★
5. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.* ★

Use the rules of probability to compute probabilities of compound events in a uniform probability model. ★

6. Find the conditional probability of *A* given *B* as the fraction of *B*’s outcomes that also belong to *A*, and interpret the answer in terms of the model.★
7. Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model.★
8. (+) Apply the general Multiplication Rule in a uniform probability model,
   P(A and B) = [P(A)]x[P(B|A)] =[P(B)]x[P(A|B)], and interpret the answer in terms of the model.★
9. (+) Use permutations and combinations to compute probabilities of compound events and solve problems.★

Using Probability to Make Decisions ★ S.MD

Use probability to evaluate outcomes of decisions.★[72]

6. (+) Use probabilities to make fair decision (e.g., drawing by lots, using a random number generator).
7. (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling [out] a hockey goalie at the end of a game).

★ Specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

[71] Link to data from simulations and/or experiments.

[72] Introductory only; apply counting rules.

Integrated Pathway
Model Course: Mathematics III[73]

It is in Mathematics III that students pull together and apply the accumulation of learning that they have from their previous courses, with content grouped into four critical areas. The course contains standards from the High School Conceptual Categories, each of which were written to encompass the scope of content and skills to be addressed throughout grades 9–12 not in any single course. Therefore, the full standard is presented in each model course, with clarifying footnotes as needed to limit the scope of the standard and indicate what is appropriate for study in a particular course. Standards that were limited in Mathematics I and Mathematics II, no longer have those restrictions in Mathematics III. Students apply methods from probability and statistics to draw inferences and conclusions from data. Students expand their repertoire of functions to include polynomial, rational, and radical functions[74]. They expand their study of right triangle trigonometry to include general triangles. And, finally, students bring together all of their experience with functions and geometry to create models and solve contextual problems. The Standards for Mathematical Practice apply throughout each course and, together with the content standards, prescribe that students experience mathematics as a coherent, useful, and logical subject that makes use of their ability to make sense of problem situations.

(1) Students see how the visual displays and summary statistics they learned in earlier grades relate to different types of data and to probability distributions. They identify different ways of collecting data— including sample surveys, experiments, and simulations—and the role that randomness and careful design play in the conclusions that can be drawn.

(2) The structural similarities between the system of polynomials and the system of integers are developed. Students draw on analogies between polynomial arithmetic and base-ten computation, focusing on properties of operations, particularly the distributive property. Students connect multiplication of polynomials with multiplication of multi-digit integers, and division of polynomials with long division of integers. Students identify zeros of polynomials and make connections between zeros of polynomials and solutions of polynomial equations. Rational numbers extend the arithmetic of integers by allowing division by all numbers except 0. Similarly, rational expressions extend the arithmetic of polynomials by allowing division by all polynomials except the zero polynomial. A central theme is that the arithmetic of rational expressions is governed by the same rules as the arithmetic of rational numbers. This critical area also includes and exploration of the Fundamental Theorem of Algebra

(3) Students develop the Laws of Sines and Cosines in order to find missing measures of general (not necessarily right) triangles. They are able to distinguish whether three given measures (angles or sides) define 0, 1, 2, or infinitely many triangles. This discussion of general triangles open up the idea of trigonometry applied beyond the right triangle—that is, at least to obtuse angles. Students build on this idea to develop the notion of radian measure for angles and extend the domain of the trigonometric functions to all real numbers. They apply this knowledge to model simple periodic phenomena.

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[73] Adapted from *Appendix A: Designing High School Mathematics Course Based on the Common Core State Standards*, http://www.corestandards.org/the-standards

[74] In this course, rational functions are limited to those whose numerators are of degree at most 1 and denominators are of degree at most 2; radical functions are limited to square roots or cube roots of at most quadratic polynomials.

(4) Students synthesize and generalize what they have learned about a variety of function families. They extend their work with exponential functions to include solving exponential equations with logarithms. They explore the effects of transformations on graphs of diverse functions, including functions arising in an application, in order to abstract the general principle that transformations on a graph always have the same effect regardless of the type of the underlying functions. They identify appropriate types of functions to model a situation, they adjust parameters to improve the model, and they compare models by analyzing appropriateness of fit and making judgments about the domain over which a model is a good fit. The description of modeling as "the process of choosing and using mathematics and statistics to analyze empirical situations, to understand them better, and to make decisions" is at the heart of this unit. The narrative discussion and diagram of the modeling cycle should be considered when knowledge of functions, statistics, and geometry is applied in a modeling context.

Overview Mathematics III

Number and Quantity

The Complex Number System

- Use complex numbers in polynomial identities and equations.

Algebra

Seeing Structure in Expressions

- Interpret the structure or expressions.
- Write expressions in equivalent forms to solve problems.

Arithmetic with Polynomials and Rational Expressions

- Perform arithmetic operations on polynomials.
- Understand the relationship between zeros and factors of polynomials.
- Use polynomial identities to solve problems

- Rewrite rational expressions.

Creating Equations

- Create equations that describe numbers of relationships.

Reasoning with Equations and Inequalities

- Understand solving equations as a process of reasoning and explain the reasoning.
- Represent and solve equations and inequalities graphically.

Functions

Interpreting Functions

- Interpret functions that arise in applications in terms of a context.
- Analyze functions using different representations.

Building Functions

- Build a function that models a relationship between two quantities.
- Build new functions from existing functions.

Linear, Quadratic, and Exponential Models

- Construct and compare linear, quadratic, and exponential models and solve problems.

Trigonometric Functions

- Extend the domain of trigonometric functions using the unit circle.
- Model periodic phenomena with trigonometric functions.

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Geometry

Similarity, Right Triangles, and Trigonometry

- Apply trigonometry to right triangles.

Geometric Measurement and Dimension

- Visualize the relationship between two- and three-dimensional objects.

Modeling with Geometry

- Apply Geometric concepts in modeling situations.

Statistics and Probability

Interpreting Categorical and Quantitative Data

- Summarize, represent, and interpret data on a single or measurement variable.

Making Inferences and Justifying Conclusions

- Understand and evaluate random processes underlying statistical experiments.
- Make inferences and justify conclusions from sample surveys experiments and observational studies.

Using Probability to Make Decisions

- Use probabilities to evaluate outcomes of decisions.

Number and Quantity
The Complex Number System N.CN

Use complex numbers in polynomial identities and equations.[75]

8. (+) Extend polynomial identities to the complex numbers. *For example, rewrite* $x^2 + 4$ *as* $(x + 2i)(x - 2i)$.
9. (+) Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.[76]

Algebra
Seeing Structure in Expressions★[77] A.SSE

Interpret the structure of expressions.

1. Interpret expressions that represent a quantity in terms of its context.★
   a. Interpret parts of an expression, such as terms, factors, and coefficients.★
   b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret* $P(1+r)^n$ *as the product of P and a factor not depending on P.*★
2. Use the structure of an expression to identify ways to rewrite it. *For example, see* $x^4 - y^4$ *as* $(x^2)^2 - (y^2)^2$, *thus recognizing it as a difference of squares that can be factored as* $(x^2 - y^2)(x^2 + y^2)$.

Write expressions in equivalent forms to solve problems.

4. Derive the formula for the sum of a finite geometric series (when the common ration is not 1), and use the formula to solve problems. *For example, calculate mortgage payments.*

Arithmetic with Polynomials and Rational Expressions A.APR

Perform arithmetic operations on polynomials.

1. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
   MA.1.a. Divide polynomials.

Understand the relationship between zeros and factors of polynomials.

2. Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $x - a$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$.
3. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.

Use polynomial identities to solve problems.

4. Prove polynomial identities and use them to describe numerical relationships. *For example, the polynomial identity* $(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$ *can be used to generate Pythagorean triples.*
5. (+) Know and apply that the Binomial Theorem gives the expansion of $(x + y)^n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle. (The Binomial Theorem can be proved by mathematical induction or by a combinatorial argument.)

Rewrite rational expressions.[78]

6. Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system.

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[75] Limit Mathematics III to polynomials with real coefficients.

[76] Expand to include higher degree polynomials.

★ Specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

[77] Expand to polynomial and rational expressions.

[78] Focus on linear and quadratic denominators.

7. (+) Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.

Creating Equations[★] A.CED

Create equations that describe numbers or relationship.[79] ★

1. Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*★
2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.★
3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.*★
4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law $V = IR$ to highlight resistance R.*★

Reasoning with Equations and Inequalities A.REI

Understand solving equations as a process of reasoning and explain the reasoning.

2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

Represent and solve equations and inequalities graphically.

11. Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.★

Functions

Interpreting Functions F.IF

Interpret functions that arise in applications in terms of the context.[80]

4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.★
5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function $h(n)$ gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*★
6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.★

[★] Specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

[79] Expand to include simple root functions.

[80] Emphasize the selection of appropriate function model; expand to include rational functions, square and cube functions.

Analyze functions using different representations.[81]

7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.★
    - b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.★
    - c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.★
    - e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.★
8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
    - a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
    - b. Use the properties of exponents to interpret expressions for exponential functions. *For example, identify percent rate of change in functions such as* $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{(12t)}$, $y = (1.2)^{(t/10)}$, *and classify them as representing exponential growth and decay.*
    - MA.8c. Translate between different representations of functions and relations: graphs, equations, point sets, and tables.
9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*

Building Functions F.BF

Build a function that models a relationship between two quantities.

1. Write a function that describes a relationship between two quantities. ★
    - b. Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.*

Build new functions from existing functions.[82]

3. Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k\,f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
4. Find inverse functions.
    - a. Solve an equation of the form $f(x) = c$ for a simple function f that has an inverse and write an expression for the inverse. *For example,* $f(x) =2(x^3)$ *or* $f(x) = (x+1)/(x-1)$ *for* $x \neq 1$ *(x not equal to 1).*

Linear, Quadratic, and Exponential Models F.LE

Construct and compare linear, quadratic, and exponential models and solve problems.[83]

4. For exponential models, express as a logarithm the solution to $ab^{(ct)} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.★

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[81] Expand to include rational and radical functions; focus on using key features to guide selection of appropriate type of function model.

★ Specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

[82] Expand to include simple radical, rational and exponential functions; emphasize common effect of each transformation across function types.

[83] Only include logarithms as solutions of exponential functions.

Trigonometric Functions F.TF

Extend the domain of trigonometric functions using the unit circle.

1. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
2. Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.

Model periodic phenomena with trigonometric functions.

5. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.★

Geometry
Similarity, Right Triangles, and Trigonometry G.SRT

Apply trigonometry to general triangles.

9. (+) Derive the formula A = (1/2)*ab* sin(C) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.
10. (+) Prove the Laws of Sines and Cosines and use them to solve problems.
11. (+) Apply trigonometry to general triangles. Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).

Geometric Measurement and Dimension G.GMD

Visualize relationships between two-dimensional and three-dimensional objects.

4. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.

Modeling with Geometry★ G.MG

Apply geometric concepts in modeling situations.

1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).★
2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).★
3. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).★

MA.4. Use dimensional analysis for unit conversion to confirm that expressions and equations make sense.★

Statistics and Probability
Interpreting Categorical and Quantitative Data S.ID

Summarize, represent, and interpret data on a single count or measurement variable.

4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.★

★ Specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol appearing on the cluster heading should be understood to indicate that all standards in that cluster are modeling standards.

Making Inferences and Justifying Conclusions S.IC

Understand and evaluate random processes underlying statistical experiments.

1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.★
2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. *For example, a model says a spinning coin falls heads up with probability 0. 5. Would a result of 5 tails in a row cause you to question the model.*★

Make inferences and justify conclusions from sample surveys, experiments, and observational studies.

3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.★
4. Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.★
5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.★
6. Evaluate reports based on data.★

Using Probability to Make Decisions S.MD

Use probability to evaluate outcomes of decisions.

6. (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).★
7. (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling [out] a hockey goalie at the end of a game).★

Advanced Model Course: Precalculus

Precalculus combines the trigonometric, geometric, and algebraic techniques needed to prepare students for the study of calculus and strengthens their conceptual understanding of problems and mathematical reasoning in solving problems. Facility with these topics is especially important for students intending to study calculus, physics and other sciences, and engineering in college. As with the other courses, the Standards for Mathematical Practice apply throughout this course, and together with the content standards, prescribe that students experience mathematics as a coherent, useful, and logical subject that makes use of their ability to make sense of problem situations.

(1) Students continue their work with complex numbers. They perform arithmetic operations with complex numbers and represent them and the operations on the complex plane. The student will investigate and identify the characteristics of the graphs of polar equations, using graphing utilities. This will include classification of polar equations, the effects of changes in the parameters in polar equations, conversion of complex numbers from rectangular form to polar form and vice versa, and the intersection of the graphs of polar equations.

(2) Students expand their understanding of functions to include logarithmic and trigonometric functions. The student will investigate and identify the characteristics of exponential and logarithmic functions in order to graph these functions and solve equations and practical problems. This will include the role of e, natural and common logarithms, laws of exponents and logarithms, and the solution of logarithmic and exponential equations. They model periodic phenomena with trigonometric functions and prove trigonometric identities. Other trigonometric topics include reviewing unit circle trigonometry, proving trigonometric identities, solving trigonometric equations and graphing trigonometric functions.

(3) Students will investigate and identify the characteristics of polynomial and rational functions and use these to sketch the graphs of the functions. They will determine zeros, upper and lower bounds, y-intercepts, symmetry, asymptotes, intervals for which the function is increasing or decreasing, and maximum or minimum points. Students translate between the geometric description and equation of conic sections. They deepen their understanding of the Fundamental Theorem of Algebra.

(4) Students will perform operations with vectors in the coordinate plane and solve practical problems using vectors. This will include the following topics: operations of addition, subtraction, scalar multiplication, and inner (dot) product; norm of a vector; unit vector; graphing; properties; simple proofs; complex numbers (as vectors); and perpendicular components.

Precalculus Overview

Number and Quantity

The Complex Number System

- Perform arithmetic operations with complex numbers.
- Represent complex numbers and their operations on the complex plane.
- Use complex numbers in polynomial identities and equations.

Vector and Matrix Quantities

- Represent and model with vector quantities.
- Perform operations on vectors.
- Perform operations on matrices and use matrices in applications.

Algebra

Arithmetic with Polynomials and Rational Expressions

- Use polynomial identities to solve problems
- Rewrite rational expressions.

Reasoning with Equations and Inequalities

- Solve systems of equations.

Functions

Interpreting Functions

- Analyze functions using different representations.

Building Functions

- Build a function that models a relationship between two quantities.
- Build a new function from existing functions.

Trigonometric Functions

- Extend the domain of trigonometric functions using the unit circle.
- Model periodic phenomena with trigonometric functions.
- Prove and apply trigonometric identities.

Geometry

Similarity, Right Triangles, and Trigonometry

- Apply trigonometry to general triangles.

Circles

- Understand and apply theorems about circles.

Expressing Geometric Properties with Equations

- Translate between the geometric description and the equations for a conic section.

Geometric Measurement and Dimension

- Explain volume formulas and use them to solve problems.
- Visualize relationships between two- and three-dimensional objects.

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Number and Quantity
The Complex Number System N.CN

Perform arithmetic operations with complex numbers.

3. (+) Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers.

Represent complex numbers and their operations on the complex plane.

4. (+) Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary numbers), and explain why the rectangular and polar forms of a given complex numbers represent the same number.
5. (+) Represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation. F*or example,* $(1-\sqrt{3i})^3 = 8$*has modulus 2 and argument* 120^o*.*
6. (+) Calculate the distance between numbers in the complex plane as the modulus of the difference, and the midpoint of a segment as the average of the numbers at its endpoints.

Use complex numbers in polynomial identities and equations.

8. (+) Extend polynomial identities to the complex numbers. *For example, rewrite* $x^2 + 4$ *as* $(x + 2i)(x – 2i)$*.*
9. (+) Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.

Vector Quantities and Matrices N.VM

Represent and model with vector quantities.

1. (+) Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., **v**, |**v**|, ||**v**||, v).
2. (+) Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.
3. (+) Solve problems involving velocity and the other quantities that can be represented by vectors.

Perform operations on vectors.

4. (+) Add and subtract vectors.
   a. (+) Add vectors end-to-end, component-wise, and by the parallelogram rule. Understand that the magnitude of a sum of two vectors is typically no the sum of the magnitudes.
   b. (+) Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum.
   c. (+) Understand vector subtraction **v** – **w** as **v** + (–**w**), where (–**w**) is the additive inverse of **w**, with the same magnitude as **w** and pointing in the opposite direction. Represent vector subtraction graphically by connecting the tips in the appropriate order, and perform vector subtraction component-wise.
5. (+) Multiply a vector by a scalar.
   a. (+) Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar vectors and possibly reversing their direction; perform scalar multiplication component-wise, e.g., as $c(v_x,v_y) = (cv_x, cv_y)$.
   b. (+) Compute the magnitude of a scalar multiple c**v** using ||c**v**|| = |c|**v**. Compute the direction of cv knowing that when |c|**v** $\neq$ 0, the direction of cv is either along v (for c > 0) or against **v** (for c < 0).

Perform operations on matrices and use matrices in applications.

6. (+) Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.
7. (+) Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled.
8. (+) Add, subtract, and multiply matrices of appropriate dimensions.

9. (+) Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.
10. (+) Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.
11. (+) Multiply a vector (regarded as a matrix with one column) by a matrix of suitable dimensions to produce another vector. Work with matrices as transformations of vectors.
12. (+) Work with 2 x 2 matrices as transformations of the plane, and interpret the absolute value of the determinate in terms of area.

Algebra

Arithmetic with polynomials and rational expressions A.APR

Use polynomial identities to solve problems.

5. (+) Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined, for example, by Pascal's Triangle.[84]

Rewrite rational expressions.

6. Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system.
7. (+) Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.

Reasoning with Equations and Inequalities A.REI

Solve systems of equations.

8. (+) Represent a system of linear equations as a single matrix equation in a vector variable.
9. (+) Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 × 3 or greater).

Functions

Interpreting Functions F.IF

Analyze functions using different representations.

7. (+) Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ⋆
    d. (+) Graph rational functions, identifying zeros when suitable factorizations are available, and showing end behavior.

Building Functions F.BF

Build a function that models a relationship between two quantities.

1. Write a function that describes a relationship between two quantities.⋆
    c. (+) Compose functions. F*or example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as the function of time.*

Build new functions from existing functions.

4. Find inverse functions.

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[84] The Binomial Theorem can be proved by mathematical induction or by a combinatorial argument.

   - b. (+) Verify by composition that one function is the inverse of another.
   - c. (+) Read values of an inverse function from a graph or a table, given that the function has an inverse.
   - d. (+) Produce an invertible function from a non-invertible function by restricting the domain.
5. (+) Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.

Trigonometric Functions F.TF

Extend the domain of trigonometric functions using the unit circle.

3. (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for $\pi/3$, $\pi/4$ and $\pi/6$, and use the unit circle to express the values of sine, cosines, and tangent for x, $\pi+x$, and $2\pi-x$ in terms of their values for x, where x is any real number.
4. (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.

Model periodic phenomena with trigonometric functions.

6. (+) Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.
7. (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.★

Prove and apply trigonometric identities.

9. (+) Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.

Geometry
Similarity, right triangles, and trigonometry G.SRT

Apply trigonometry to general triangles.

9. (+) Derive the formula $A = ½\, ab \sin(C)$ for the area of a triangle by drawing an auxiliary line form a vertex perpendicular to the opposite side.
10. (+) prove the Laws of Sines and Cosines and use them to solve problems.
11. (+) Understand and apply the Laws of Sines and Cosines to find unknown measurements in right and non-right triangles, e.g., surveying problems, resultant forces.

Circles G.C

Understand and apply theorems about circles.

4. (+) Construct a tangent line from a point outside a given circle to the circle.

Expressing Geometric Properties with Equations G.GPE

Translate between the geometric description and the equation for a conic section.

3. (+) Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum of difference of distances from the foci is constant.
   MA.3a. (+) Use equations and graphs of conic sections to model real-world problems.

Geometric Measurement and Dimension G.GMD

Explain volume formulas and use them to solve problems.

2. (+) Give an informal argument using Cavalieri's Principle for the formulas for the volume of a sphere and other solid figures.

Visualize relationships between two-dimensional and three-dimensional objects.

4. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.

Advanced Model Course: Advanced Quantitative Reasoning

Because the standards for this course are (+) standards, students taking Advanced Quantitative Reasoning will have completed the three courses Algebra I, Geometry and Algebra II in the Traditional Pathway, or the three courses Mathematics I, II, and II in the Integrated Pathway. This course is designed as a mathematics course alternative to Precalculus. Students not preparing for Calculus are encouraged to continue their study of mathematical ideas in the context of real-world problems and decision making through the analysis of information, modeling change and mathematical relationships. As with the other courses, the Standards for Mathematical Practice apply throughout this course, and together with the content standards, prescribe that students experience mathematics as a coherent, useful, and logical subject that makes use of their ability to make sense of problem situations.

(1) Students will learn to become critical consumers of the quantitative data that surround them every day, knowledgeable decision makers who use logical reasoning, and mathematical thinkers who can use their quantitative skills to solve problems related to a wide range of situations. They will link classroom mathematics and statistics to everyday life, work, and decision-making, using mathematical modeling. They will choose and use appropriate mathematics and statistics to analyze empirical situations, to understand them better, and to improve decisions.

(2) Through the investigation of mathematical models from real life situations, students will strengthen conceptual understandings in mathematics and further develop connections between algebra and geometry. Students will use geometry to model real-world problems and solutions. They will use the language and symbols of mathematics in representations and communication.

(3) Students will explore linear algebra concepts of matrices and vectors. They use vectors to model physical relationships to define, model, and solve real-world problems. Students draw, name, label, and describe vectors and perform operations with vectors and relate these components to vector magnitude and direction. They will use matrices in relationship to vectors and to solve problems.

Advanced Quantitative Reasoning Overview

Number and Quantity

Vector and Matrix Quantities

- Represent and model with vector quantities.
- Perform operations on matrices and use matrices in applications.

Algebra

Arithmetic with Polynomials and Expressions

- Use polynomials to solve problems.
- Solve systems of equations.

Functions

Trigonometric Functions

- Extend the domain of trigonometric functions using the unit circle.
- Model periodic phenomena with trigonometric functions.

Geometry

Similarity, Right Triangles, and Trigonometry

- Apply trigonometry to general triangles.

Geometric Measurement and Dimension

- Explain volume formulas and use them to solve problems.

Statistics and Probability

Interpreting Categorical and Quantitative Data

- Summarize, represent, and interpret data on two categorical and quantitative variables.
- Interpret linear models.

Making Inferences and Justifying Conclusions

- Make inferences and justify conclusions from sample surveys, experiments, and observational studies.

Conditional Probability and the Rules of Probability

- Use the rules of probability to compute probabilities of compound events in a uniform probability model.
- Calculate expected values and use them to solve problems.

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Number and Quantity
Vectors and Matrix Quantities N.VM

Represent and model with vector quantities.

1. (+) Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., **v**, |**v**|, ||**v**||, v).
2. (+) Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.
3. (+) Solve problems involving velocity and the other quantities that can be represented by vectors.

Perform operations on matrices and use matrices in applications.

6. (+) Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.
7. (+) Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled.
8. (+) Add, subtract, and multiply matrices of appropriate dimensions.
9. (+) Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.
10. (+) Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.
11. (+) Multiply a vector (regarded as a matrix with one column) by a matrix of suitable dimensions to produce another vector. Work with matrices as transformations of vectors.
12. (+) Work with 2 x 2 matrices as transformations of the plane, and interpret the absolute value of the determinate in terms of area.

Algebra
Arithmetic with polynomials and rational expressions A.APR

Use polynomial identities to solve problems.

5. (+) Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined, for example, by Pascal's Triangle.[85]

Reasoning with Equations and Inequalities A.REI

Solve systems of equations.

8. (+) Represent a system of linear equations as a single matrix equation in a vector variable.
9. (+) Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 × 3 or greater).

Functions
Trigonometric Functions F.TF

Extend the domain of trigonometric functions using the unit circle

3. (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for $\pi/3$, $\pi/4$ and $\pi/6$, and use the unit circle to express the values of sine, cosines, and tangent for x, $\pi+x$, and $2\pi-x$ in terms of their values for x, where x is any real number.
4. (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.

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[85] The Binomial Theorem can be proved by mathematical induction or by a combinatorial argument.

Model periodic phenomena with trigonometric functions.

5. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline. ★
7. (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.★

Prove[86] and apply trigonometric identities.

9. (+) Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.

Geometry

Similarity, right triangles, and trigonometry G.SRT

Apply trigonometry to general triangles.

11. (+) Understand and apply the Laws of Sines and Cosines to find unknown measurements in right and non-right triangles, e.g., surveying problems, resultant forces.

Circles G.C

Understand and apply theorems about circles.

4. (+) Construct a tangent line from a point outside a given circle to the circle.

Expressing Geometric Properties with Equations G.GPE

Translate between the geometric description and the equation for a conic section.

3. (+) Derive the equations of ellipses and hyperbolas given the foci and directrices.
   MA.3a. Use equations and graphs of conic sections to model real-world problems. ★

Geometric Measurement and Dimension G.GMD

Explain volume formulas and use them to solve problems.

2. (+) Give an informal argument using Cavalieri's Principle for the formulas for the volume of a sphere and other solid figures.

Visualize relationships between two-dimensional and three-dimensional objects.

4. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.

Modeling with Geometry G.MG

Apply geometric concepts in modeling situations.

3. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).★

MA.4. Use dimensional analysis for unit conversion to confirm that expressions and equations make sense.★

Statistics and Probability

Interpreting Categorical and Quantitative Data S.ID

Interpret linear models.

9. Distinguish between correlation and causation.

---

[86] In Advanced Quantitative Reasoning, should accept informal proof and focus on the underlying reasoning and use the theorems to solve problems.

Making Inferences and Justifying Conclusions S.IC

Make inferences and justify conclusions from sample surveys, experiments, and observational studies.

4. Use data from a sample survey to estimate a population mean or proportion; develop margin of error through the use of simulation models for random sampling.
5. Use data from a randomized experiment to compare two treatments; sue simulations to decide if differences between parameters are significant.
6. Evaluate reports based on data.

Conditional Probability and the Rules of Probability S.CP

Use the rules of probability to compute probabilities of compound events in a uniform probability model.

8. (+) Apply the general Multiplication Rule in a uniform probability model, $P(A \text{ and } B) = P(A)\,P(B|A) = P(B)\,P(A|B)$, and interpret the answer in terms of the model.
9. (+) Use permutations and combinations to compute probabilities of compound events and solve problems.

Using Probability to Make Decisions S.MD

Calculate expected values and use them to solve problems.

1. (+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.★
2. (+) Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.★
3. (+) Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value. *For example, find the theoretical probability distribution for the number of correct answers obtained by guessing on all five questions of a multiple-choice test where each question has four choices, and find the expected grade under various grading schemes.*★
4. (+) Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. *For example, find a current data distribution on the number of TV sets per household in the United States, and calculate the expected number of sets per household. How many TV sets would you expect to find in 100 randomly selected households?*★

Use probability to evaluate outcomes of decisions.

5. (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.★
   a. (+) Find the expected payoff for a game of chance. *For example, find the expected winnings from a state lottery ticket or a game at a fast-food restaurant.*★
   b. (+) Evaluate and compare strategies on the basis of expected values. *For example, compare a high-deductible versus a low-deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.*★
6. (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).★
7. (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling [out] a hockey goalie at the end of a game).★

North High School MATH Weekly Lesson Plan-Teachers Name

Topic: Algebra II, Col. Week Of: 12/13-17 Period: [✓ 1] 2 3 4 5 6 7

Weekly Objectives

. Finish Chapter 4

2. Assess Chapter 4

3.

Instructional Strategies

Students will demonstrate understanding through....

CEEI	Cornell Notes
T4's	Letters
Other______________	

Assessments and Rubrics

WPS students write effectively

Summative Assessments

4-pt. WPS rubric 4=96 3=84 2=72 1=60

4-pt. MCAS O/R rubric 4=96 3=84 2=72 1=60

[✓ Tests]

Quizzes

Projects

Presentations

Group Work

[✓ Class work]

[✓ Homework]

Other________________________

Formative assessments

Verbal Questioning

Conferencing

[✓ Journals]

[✓ Class Discussion/Participation]

Exit Slips

Other________________________

Accommodations/Differentiation:

Outline of Monday's Class

Long Period

4.8 ?'s

4.9 Discussion

HW: 4.9 ex.

Outline of Tuesday's Class

4.9 Questions

Begin 4.10

HW: 4.10 G.P.
4.10 ex.

Outline of Wednesday's Class

4.10 Questions

Finish 4.10

Same 4.10 HW

Chapter review HW

Outline of Thursday's Class

Review Chapter 4

HW: Study!!

Outline of Friday's Class

Chapter 4 Test

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

[✓ 10.N.1]	[✓ 10.N.3]	[✓ 12.N.1]	AI.N.1	AI.N.3	[✓ AII.N.1]
[✓ 10.N.2]	[✓ 10.N.4]	[✓ 12.N.2]	AI.N.2	AI.N.4	[✓ AII.N.2]
PC.N.1					

Patterns Relations and Algebra

[✓ 10.P.1]	[✓ 10.P5]	12.P.1	[✓ 12.P.5]	[✓ 12.P.9]	12.P.13
[✓ 10.P.2]	[✓ 10.P.6]	12.P.2	[✓ 12.P.6]	[✓ 12.P.10]	
[✓ 10.P.3]	[✓ 10.P.7]	12.P.3	[✓ 12.P.7]	[✓ 12.P.11]	
[✓ 10.P.4]	[✓ 10.P.8]	12.P.4	[✓ 12.P.8]	12.P.12	
AI.P.1	[✓ AI.P.3]	[✓ AI.P.5]	[✓ AI.P.7]	[✓ AI.P.9]	[✓ AI.P.11]
AI.P.2	[✓ AI.P.4]	[✓ AI.P.6]	[✓ AI.P.8]	[✓ AI.P.10]	[✓ AI.P.12]
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

[✓ 10.G.1]	10.G.8	12.G.4	G.G.6	[✓ G.G.13]	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
[✓ 10.G.7]	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability

Measurement

[✓ 10.D.1]	12.D.2	12.D.6	AI.D.3	PC.D.2	[✓ 10.M.1]	12.M.1	G.M.3	PC.M.2
[✓ 10.D.2]	12.D.3	12.D.7	AII.D.1	PC.D.3	[✓ 10.M.2]	[✓ 12.M.2]	G.M.4	
[✓ 10.D.3]	12.D.4	[✓ AI.D.1]	AII.D.2	PC.D.4	[✓ 10.M.3]	[✓ G.M.1]	G.M.5	
12.D.1	12.D.5	[✓ AI.D.2]	PC.D.1	PC.D.5	[✓ 10.M.4]	G.M.2	PC.M.1	

Bloom's Taxonomy/ Costa's Levels of Questions

Knowledge- Recalling Information

Identify Define Examine Name Describe Tell Label

Comprehension- Understanding meaning

Summarize Interpret Estimate Differentiate

Analysis- Seeing Parts and Relationships

Analyze Explain Classify Connect Compare

Synthesis- Using Parts of New information to Create a Whole

Prepare Create Formulate Rewrite Compose Generalize

Evaluation- Judging Based on Criteria

Assess Test Support Decide Explain Conclude Compare

North High School MATH Weekly Lesson Plan-Teachers Name

Topic: Algebra II, Col. Week Of: 12/6-10 Period: [✓ 1] 2 3 4 5 6 7

Weekly Objectives

1. Assess 4.5, 4.6
2. Review 4.1-4.4
3. Introduce more ways to solve quadratic functions

Instructional Strategies

Students will demonstrate understanding through....

CEEI Cornell Notes

T4's Letters

Other________________

Assessments and Rubrics

WPS students write effectively

Summative Assessments

4-pt. WPS rubric 4=96 3=84 2=72 1=60

4-pt. MCAS O/R rubric 4=96 3=84 2=72 1=60

Tests

[✓ Quizzes]

Projects

Presentations

Group Work

[✓ Class work]

[✓ Homework]

Other____________________________

Formative assessments

Verbal Questioning

Conferencing

Journals

[✓ Class Discussion/Participation]

Exit Slips

Other_____________________________

Accommodations/Differentiation:

Outline of Monday's Class

4.7 Lecture

HW: 4.7 Exercises

Outline of Tuesday's Class

4.5, 4.6, 4.1-4.3 (brief) Quiz

More 4.7 Discussion

HW: 4.7 Ex.
4.8 G.P. (Quad formula)

Outline of Wednesday's Class

4.8 Discussion

HW: 4.8 Ex.

Awful!

Outline of Thursday's Class

Go over Quiz

Go over 4.7 ?'s

HW: 4.8 G.P.

Outline of Friday's Class

4.8 Discussion

HW: 4.8 Ex.
1 G.P. from 4.9

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

[✓ 10.N.1]	[✓ 10.N.3]	[✓ 12.N.1]	AI.N.1	AI.N.3	[✓ AII.N.1]
[✓ 10.N.2]	[✓ 10.N.4]	[✓ 12.N.2]	AI.N.2	AI.N.4	[✓ AII.N.2]
PC.N.1					

Patterns Relations and Algebra

[✓ 10.P.1]	[✓ 10.P5]	12.P.1	[✓ 12.P.5]	[✓ 12.P.9]	12.P.13
[✓ 10.P.2]	[✓ 10.P.6]	12.P.2	[✓ 12.P.6]	[✓ 12.P.10]	
[✓ 10.P.3]	[✓ 10.P.7]	12.P.3	[✓ 12.P.7]	[✓ 12.P.11]	
[✓ 10.P.4]	[✓ 10.P.8]	12.P.4	[✓ 12.P.8]	12.P.12	
AI.P.1	[✓ AI.P.3]	[✓ AI.P.5]	[✓ AI.P.7]	[✓ AI.P.9]	[✓ AI.P.11]
AI.P.2	[✓ AI.P.4]	[✓ AI.P.6]	[✓ AI.P.8]	[✓ AI.P.10]	[✓ AI.P.12]
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

[✓ 10.G.1]	10.G.8	12.G.4	G.G.6	[✓ G.G.13]	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
[✓ 10.G.7]	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability

Measurement

[✓ 10.D.1]	12.D.2	12.D.6	AI.D.3	PC.D.2	[✓ 10.M.1]	12.M.1	G.M.3	PC.M.2
[✓ 10.D.2]	12.D.3	12.D.7	AII.D.1	PC.D.3	10.M.2	[✓ 12.M.2]	G.M.4	
[✓ 10.D.3]	12.D.4	[✓ AI.D.1]	AII.D.2	PC.D.4	[✓ 10.M.3]	[✓ G.M.1]	G.M.5	
12.D.1	12.D.5	[✓ AI.D.2]	PC.D.1	PC.D.5	[✓ 10.M.4]	G.M.2	PC.M.1	

Bloom's Taxonomy/ Costa's Levels of Questions

Knowledge- Recalling Information

Identify Define Examine Name Describe Tell Label

[✓ Comprehension]- Understanding meaning

Summarize Interpret Estimate Differentiate

Analysis- Seeing Parts and Relationships

Analyze Explain Classify Connect Compare

Synthesis- Using Parts of New information to Create a Whole

Prepare Create Formulate Rewrite Compose Generalize

[✓ Evaluation]- Judging Based on Criteria

Assess Test Support Decide Explain Conclude Compare

North High School MATH Weekly Lesson Plan-Teachers Name
Topic: Algebra II, Col. Week Of: 11/29-12/3 Period: [✓ 1] 2 3 4 5 6 7

Weekly Objectives

Assess 4.1-4.4
2. Rules of roots
3. Complex Numbers

Instructional Strategies

Students will demonstrate understanding through….

CEEI	Cornell Notes
T4's	Letters
Other______________	

Assessments and Rubrics

WPS students write effectively

Summative Assessments

4-pt. WPS rubric 4=96 3=84 2=72 1=60
4-pt. MCAS O/R rubric 4=96 3=84 2=72 1=60
Tests
[✓ Quizzes]
Projects
Presentations
Group Work
[✓ Class work]
[✓ Homework]
Other_________________________

Formative assessments

Verbal Questioning
Conferencing
[✓ Journals]
[✓ Class Discussion/Participation]
Exit Slips
Other_________________________

Accommodations/Differentiation:

L. p. 3

Outline of Monday's Class 11/29

Review 4.1-4.4

HW: Study 4.1-4.4.

L. p. 4

Outline of Tuesday's Class 11/30

Quiz 4.1-4.4

HW: 4.5 G.P.

L. p. 6

Outline of Wednesday's Class 12/1

4.5 Lecture

HW: 4.5 exercises
What is $\sqrt{-1} = ?$

L. p. 7

Outline of Thursday's Class 12/2

Begin 4.6

HW: First half 4.6 ?'s

L. p. 1

Outline of Friday's Class 12/3

Finish 4.6

HW: Remaining 4.6 ?'s

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

[✓ 10.N.1]	[✓ 10.N.3]	[✓ 12.N.1]	AI.N.1	AI.N.3	[✓ AII.N.1]
[✓ 10.N.2]	[✓ 10.N.4]	[✓ 12.N.2]	AI.N.2	AI.N.4	[✓ AII.N.2]
PC.N.1					

Patterns Relations and Algebra

[✓ 10.P.1]	[✓ 10.P5]	12.P.1	[✓ 12.P.5]	[✓ 12.P.9]	12.P.13
[✓ 10.P.2]	[✓ 10.P.6]	12.P.2	[✓ 12.P.6]	[✓ 12.P.10]	
[✓ 10.P.3]	[✓ 10.P.7]	12.P.3	[✓ 12.P.7]	[✓ 12.P.11]	
[✓ 10.P.4]	[✓ 10.P.8]	12.P.4	[✓ 12.P.8]	12.P.12	
AI.P.1	[✓ AI.P.3]	[✓ AI.P.5]	[✓ AI.P.7]	[✓ AI.P.9]	[✓ AI.P.11]
AI.P.2	[✓ AI.P.4]	[✓ AI.P.6]	[✓ AI.P.8]	[✓ AI.P.10]	[✓ AI.P.12]
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

[✓ 10.G.1]	[✓ 10.G.8]	12.G.4	G.G.6	[✓ G.G.13]	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
[✓ 10.G.7]	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability

Measurement

[✓ 10.D.1]	12.D.2	12.D.6	AI.D.3	PC.D.2	[✓ 10.M.1]	12.M.1	G.M.3	PC.M.2	
[✓ 10.D.2]	12.D.3	12.D.7	AII.D.1	PC.D.3	[✓ 10.M.2]	[✓ 12.M.2]	G.M.4		
[✓ 10.D.3]	12.D.4	[✓ AI.D.1]	AII.D.2	PC.D.4	[✓ 10.M.3]	[✓ G.M.1]	G.M.5		
12.D.1	12.D.5	[✓ AI.D.2]	PC.D.1	PC.D.5	[✓ 10.M.4]	G.M.2	PC.M.1		

Bloom's Taxonomy/ Costa's Levels of Questions

Knowledge- Recalling Information

Identify Define Examine Name Describe Tell Label

Comprehension- Understanding meaning

Summarize Interpret Estimate Differentiate

[✓ **Analysis**]- Seeing Parts and Relationships

Analyze Explain Classify Connect Compare

[✓ **Synthesis**]- Using Parts of New information to Create a Whole

Prepare Create Formulate Rewrite Compose Generalize

Evaluation- Judging Based on Criteria

Assess Test Support Decide Explain Conclude Compare

North High School MATH Weekly Lesson Plan-Teachers Name

Topic: Algebra II Week Of: 11/15-19, 11/22-23 Period: [✓ 1] 2 [✓ 3] 4 5 [✓ 6] 7

Weekly Objectives

. Review Chapters 1, 2, 4 in class

2. Review basic algebra topics as HW

3.

Instructional Strategies

Students will demonstrate understanding through….

CEEI Cornell Notes
T4's Letters
Other________________

Assessments and Rubrics

WPS students write effectively

Summative Assessments

4-pt. WPS rubric 4=96 3=84 2=72 1=60
4-pt. MCAS O/R rubric 4=96 3=84 2=72 1=60
sts
uizzes
rojects
Presentations
[✓ Group Work]
[✓ Class work]
[✓ Homework]
Other____________________________

Formative assessments

Verbal Questioning
Conferencing
[✓ Journals]
[✓ Class Discussion/Participation]
Exit Slips
Other____________________________

Accommodations/Differentiation:

Outline of Monday's Class

Review covered chapters

HW: Algebra review

Outline of Tuesday's Class

〃

Outline of Wednesday's Class

〃

Outline of Thursday's Class

〃

Outline of Friday's Class

〃

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

[✓ 10.N.1]	[✓ 10.N.3]	[✓ 12.N.1]	AI.N.1	AI.N.3	[✓ AII.N.1]
[✓ 10.N.2]	[✓ 10.N.4]	[✓ 12.N.2]	AI.N.2	AI.N.4	[✓ AII.N.2]
PC.N.1					

Patterns Relations and Algebra

[✓ 10.P.1]	[✓ 10.P5]	12.P.1	[✓ 12.P.5]	12.P.9	12.P.13
[✓ 10.P.2]	[✓ 10.P.6]	12.P.2	[✓ 12.P.6]	[✓ 12.P.10]	
[✓ 10.P.3]	[✓ 10.P.7]	12.P.3	[✓ 12.P.7]	[✓ 12.P.11]	
[✓ 10.P.4]	[✓ 10.P.8]	12.P.4	[✓ 12.P.8]	12.P.12	
AI.P.1	[✓ AI.P.3]	[✓ AI.P.5]	[✓ AI.P.7]	[✓ AI.P.9]	[✓ AI.P.11]
AI.P.2	[✓ AI.P.4]	[✓ AI.P.6]	[✓ AI.P.8]	[✓ AI.P.10]	[✓ AI.P.12]
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

[✓ 10.G.1]	[✓ 10.G.8]	12.G.4	G.G.6	[✓ G.G.13]	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
[✓ 10.G.5]	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	[✓ G.G.11]	G.G.18	
[✓ 10.G.7]	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability

[✓ 10.D.1]	12.D.2	12.D.6	AI.D.3	PC.D.2
[✓ 10.D.2]	12.D.3	12.D.7	AII.D.1	PC.D.3
[✓ 10.D.3]	12.D.4	[✓ AI.D.1]	AII.D.2	PC.D.4
12.D.1	12.D.5	[✓ AI.D.2]	PC.D.1	PC.D.5

Measurement

[✓ 10.M.1]	12.M.1	G.M.3	PC.M.2
[✓ 10.M.2]	[✓ 12.M.2]	G.M.4	
[✓ 10.M.3]	[✓ G.M.1]	G.M.5	
[✓ 10.M.4]	G.M.2	PC.M.1	

Bloom's Taxonomy/ Costa's Levels of Questions

[✓ Knowledge]- Recalling Information

Identify Define Examine Name Describe Tell Label

[✓ Comprehension]- Understanding meaning

Summarize Interpret Estimate Differentiate

Analysis- Seeing Parts and Relationships

Analyze Explain Classify Connect Compare

Synthesis- Using Parts of New information to Create a Whole

Prepare Create Formulate Rewrite Compose Generalize

Evaluation- Judging Based on Criteria

Assess Test Support Decide Explain Conclude Compare

North High School MATH Weekly Lesson Plan-Teachers Name
Topic: Algebra II, Col. Week Of: 11/8 - 11/12 Period: [✓ 1 2] 3 4 5 6 7

Weekly Objectives

1. Complete 4.1-4.4
2. Assess 4.1-4.4
3.

Instructional Strategies

Students will demonstrate understanding through….

CEEI	Cornell Notes
T4's	Letters
Other______________	

Assessments and Rubrics

WPS students write effectively

Summative Assessments

4-pt. WPS rubric 4=96 3=84 2=72 1=60
4-pt. MCAS O/R rubric 4=96 3=84 2=72 1=60
Tests
[✓ Quizzes]
Projects
Presentations
Group Work
[✓ Class work]
[✓ Homework]
Other_________________________

Formative assessments

[✓ Verbal Questioning]
Conferencing
[✓ Journals]
[✓ Class Discussion/Participation]
Exit Slips
Other_________________________

Accommodations/Differentiation:

Outline of Monday's Class (L p. 4)

4.2 Lecture

HW: 4.2 exercises

Outline of Tuesday's Class (L. p. 6)

FOIL
4.3 Lecture

HW: 4.3 Exercises
4.4 G.P.

Outline of Wednesday's Class (L. p. 7)

4.4 Lecture

HW: 4.4 Exercises
Study 4.4-4.1

Outline of Thursday's Class

Outline of Friday's Class (Long Period)

25 minutes of questions
Quiz 4.1-4.4

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

[✓ 10.N.1]	10.N.3	12.N.1	AI.N.1	AI.N.3	AII.N.1
[✓ 10.N.2]	10.N.4	12.N.2	AI.N.2	AI.N.4	AII.N.2
PC.N.1					

Patterns Relations and Algebra

[✓ 10.P.1]	[✓ 10.P5]	12.P.1	12.P.5	12.P.9	12.P.13
[✓ 10.P.2]	10.P.6	12.P.2	[✓ 12.P.6]	12.P.10	
[✓ 10.P.3]	[✓ 10.P.7]	12.P.3	12.P.7	12.P.11	
[✓ 10.P.4]	10.P.8	12.P.4	12.P.8	12.P.12	
AI.P.1	AI.P.3	AI.P.5	AI.P.7	AI.P.9	AI.P.11
AI.P.2	AI.P.4	AI.P.6	AI.P.8	AI.P.10	AI.P.12
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

10.G.1	10.G.8	12.G.4	G.G.6	G.G.13	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
10.G.7	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability

Measurement

10.D.1	12.D.2	12.D.6	AI.D.3	PC.D.2	10.M.1	12.M.1	G.M.3	PC.M.2
10.D.2	12.D.3	12.D.7	AII.D.1	PC.D.3	10.M.2	12.M.2	G.M.4	
10.D.3	12.D.4	AI.D.1	AII.D.2	PC.D.4	10.M.3	G.M.1	G.M.5	
12.D.1	12.D.5	AI.D.2	PC.D.1	PC.D.5	10.M.4	G.M.2	PC.M.1	

Bloom's Taxonomy/ Costa's Levels of Questions

Knowledge- Recalling Information

Identify Define Examine Name Describe Tell Label

Comprehension- Understanding meaning

Summarize Interpret Estimate Differentiate

Analysis- Seeing Parts and Relationships

Analyze Explain Classify Connect Compare

Synthesis- Using Parts of New information to Create a Whole

Prepare Create Formulate Rewrite Compose Generalize

Evaluation- Judging Based on Criteria

Assess Test Support Decide Explain Conclude Compare

North High School MATH Weekly Lesson Plan-Teachers Name

Topic:
Week Of:
Period: [✓ 1] 2 3 4 5 6 7

Weekly Objectives

1. Assess Chapter 2 thus far
2. Introduce Quadratic Functions
3.

Instructional Strategies

Students will demonstrate understanding through….

CEEI
Cornell Notes
T4's
Letters
Other______________

Assessments and Rubrics

WPS students write effectively

Summative Assessments

4-pt. WPS rubric 4=96 3=84 2=72 1=60
4-pt. MCAS O/R rubric 4=96 3=84 2=72 1=60
[✓ Tests]
Quizzes
Projects
Presentations
Group Work
[✓ Class work]
[✓ Homework]
Other__________________________

Formative assessments

[✓ Verbal Questioning]
Conferencing
[✓ Journals]
[✓ Class Discussion/Participation]
Exit Slips
Other___________________________

Accommodations/Differentiation:

Outline of Monday's Class

Answer 2.8 Questions

HW: Study Ch. 2
Ch. 2 Review

Outline of Tuesday's Class

Ch. 2 ?'s
Ch. 2 Review ?'s
HW: Study Ch. 2

Outline of Wednesday's Class (Long Period)

- Chapter 2 Test (45 min.)
- Start 4.1 (15 min.)
- HW: G.P
  Few ex.

Outline of Thursday's Class

- Continue 4.1
- Start 4.2
- HW: 4.1 Ex.
  4.2 G.P.

Outline of Friday's Class

- End 4.1
- Do 4.2
- HW: 4.2 G.P.
  4.2 Ex.

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

[✓ 10.N.1]	[✓ 10.N.3]	12.N.1	AI.N.1	AI.N.3	AII.N.1
[✓ 10.N.2]	[✓ 10.N.4]	12.N.2	AI.N.2	AI.N.4	AII.N.2
PC.N.1					

Patterns Relations and Algebra

[✓ 10.P.1]	[✓ 10.P5]	12.P.1	12.P.5	12.P.9	12.P.13
[✓ 10.P.2]	[✓ 10.P.6]	12.P.2	12.P.6	12.P.10	
[✓ 10.P.3]	[✓ 10.P.7]	12.P.3	12.P.7	12.P.11	
[✓ 10.P.4]	[✓ 10.P.8]	12.P.4	12.P.8	12.P.12	
AI.P.1	AI.P.3	AI.P.5	AI.P.7	AI.P.9	AI.P.11
AI.P.2	AI.P.4	AI.P.6	AI.P.8	AI.P.10	AI.P.12
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

10.G.1	10.G.8	12.G.4	G.G.6	G.G.13	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
10.G.7	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability					Measurement			
10.D.1	12.D.2	12.D.6	AI.D.3	PC.D.2	10.M.1	12.M.1	G.M.3	PC.M.2
10.D.2	12.D.3	12.D.7	AII.D.1	PC.D.3	10.M.2	12.M.2	G.M.4	
10.D.3	12.D.4	AI.D.1	AII.D.2	PC.D.4	10.M.3	G.M.1	G.M.5	
12.D.1	12.D.5	AI.D.2	PC.D.1	PC.D.5	10.M.4	G.M.2	PC.M.1	

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Prepare Create Formulate Rewrite Compose Generalize

[✓ Evaluation]- Judging Based on Criteria

Assess Test Support Decide Explain Conclude Compare

North High School MATH Weekly Lesson Plan-Teachers Name
Topic: Algebra II, College Week Of: 10/25 - 10/29 Period: [✓ 1] 2 3 4 5 6 7

Weekly Objectives

Discuss 2.4-2.6
2. Understand 2.1-2.3 mistakes (go over quiz)
3. Quiz on 2.4-2.6 ?

Instructional Strategies

Students will demonstrate understanding through….

CEEI	Cornell Notes
T4's	Letters
Other______________	

Assessments and Rubrics

WPS students write effectively

Summative Assessments
4-pt. WPS rubric 4=96 3=84 2=72 1=60
4-pt. MCAS O/R rubric 4=96 3=84 2=72 1=60
Tests
[✓ Quizzes]
Projects
Presentations
Group Work
[✓ Class work]
[✓ Homework]
Other________________________

Formative assessments
[✓ Verbal Questioning]
Conferencing
[✓ Journals]
[✓ Class Discussion/Participation]
Exit Slips
Other________________________

Accommodations/Differentiation:

Outline of Monday's Class

- Answer 2.4 ?'s
- Lecture 2.5
  (direct variation)
- HW: 2.5 G.P.
  2.5 Ex.

Outline of Tuesday's Class Long Period

- 2.5 ?'s
- Start scatter plots (2.6)
  ↳ Plenty of time → Lots of examples
- HW: 2.6 G.P.
  (ex. for 2.6, if ready)

☆ Go over quizes? ☆

Outline of Wednesday's Class

- 2.6 ?'s
- Finish yesterday's presentations
- Start HW → Take-home quiz
- HW: Give each student data + do scatter plot stuff

Outline of Thursday's Class

- Turn in Scatter Plots
- 2.7 Lecture: Absolute Value Functions
  ↳ G.P. in class
- HW: 2.7 G.P. (finish)
  2.7 exercises

Outline of Friday's Class

- 2.7 Questions
- Hand back scatter plots stuff
  → Go over trouble areas
- 2.8 Lecture
- HW: 2.8 G.P.
  2.8 Exercises

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

[✓ 10.N.1]	10.N.3	12.N.1	AI.N.1	AI.N.3	AII.N.1
[✓ 10.N.2]	[✓ 10.N.4]	12.N.2	AI.N.2	AI.N.4	AII.N.2
PC.N.1					

Patterns Relations and Algebra

[✓ 10.P.1]	[✓ 10.P5]	12.P.1	12.P.5	12.P.9	12.P.13
[✓ 10.P.2]	[✓ 10.P.6]	12.P.2	12.P.6	12.P.10	
10.P.3	[✓ 10.P.7]	12.P.3	12.P.7	12.P.11	
10.P.4	[✓ 10.P.8]	12.P.4	12.P.8	12.P.12	
AI.P.1	AI.P.3	AI.P.5	AI.P.7	AI.P.9	AI.P.11
AI.P.2	AI.P.4	AI.P.6	AI.P.8	AI.P.10	AI.P.12
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

10.G.1	10.G.8	12.G.4	G.G.6	G.G.13	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
10.G.7	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability

Measurement

10.D.1	12.D.2	12.D.6	AI.D.3	PC.D.2	10.M.1	12.M.1	G.M.3	PC.M.2
10.D.2	12.D.3	12.D.7	AII.D.1	PC.D.3	10.M.2	12.M.2	G.M.4	
10.D.3	12.D.4	AI.D.1	AII.D.2	PC.D.4	10.M.3	G.M.1	G.M.5	
12.D.1	12.D.5	AI.D.2	PC.D.1	PC.D.5	10.M.4	G.M.2	PC.M.1	

Bloom's Taxonomy/ Costa's Levels of Questions

[✓ **Knowledge**]**- Recalling Information**

Identify Define Examine Name Describe Tell Label

Comprehension- Understanding meaning

Summarize Interpret Estimate Differentiate

Analysis- Seeing Parts and Relationships

Analyze Explain Classify Connect Compare

Synthesis- Using Parts of New information to Create a Whole

Prepare Create Formulate Rewrite Compose Generalize

Evaluation- Judging Based on Criteria

[✓ Assess] Test Support Decide Explain Conclude Compare

North High School MATH Weekly Lesson Plan-Teachers Name
Topic: Algebra I Week Of: 10/18-10/22 Period: [✓ 1] 2 3 4 5 6 7

Weekly Objectives

1. Introduce 2.1-2.4
2. Return + understand Chapter 1 Test
3. Assess the week's discussions

Instructional Strategies

Students will demonstrate understanding through….

CEEI Cornell Notes
T4's Letters
Other_______________

Assessments and Rubrics

WPS students write effectively

Summative Assessments

4-pt. WPS rubric 4=96 3=84 2=72 1=60
4-pt. MCAS O/R rubric 4=96 3=84 2=72 1=60
Tests
[✓ Quizzes]
Projects
[✓ Presentations] → Maybe
[✓ Group Work]
[✓ Class work]
[✓ Homework]
Other___________________________

Formative assessments

[✓ Verbal Questioning]
[✓ Conferencing] → After school
[✓ Journals]
[✓ Class Discussion/Participation]
Exit Slips
Other___________________________

Accommodations/Differentiation:

- Time after school

Outline of Monday's Class

Long Period

- Any more test questions
- Complete 2.1 : Lecture
  General ?'s
- General 2.1 Ext. Overview
- Start 2.2 : Lecture
- HW: 2.1 Ext. exercises
  2.2 exercises

Return extra credit

Outline of Tuesday's Class

- Questions on: 2.1 Ext. ex,
- 2.2 ex,
- Return old tests
- Go over questions on test
- HW: 2.3 - Study G.P.

Outline of Wednesday's Class

- Second page of test
- #14 and more
- Still need # lines

- Questions - 2.3 G.P.
- 2.3 - Lecture
  ↳ Examples
- HW: 2.3 Ex.

Outline of Thursday's Class

~~Long Period~~

- Finish 2.3 lecture
- 2.3 - Questions
- 2.1-2.3 Questions
  ↓
  Quiz tomorrow!
  (unless want it today)
- HW: Study + 2.4 G.P.

Quiz 2.1-2.3
~~End Thursday~~
or
Start Friday

Outline of Friday's Class

- 2.1-2.3 Quiz
- Last 10/15 min.
  → 2.4 ?'s
- HW: 2.4 Ex.
  2.4 G.P. (finish)

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

[✓ 10.N.1]	10.N.3	12.N.1	AI.N.1	AI.N.3	AII.N.1
[✓ 10.N.2]	10.N.4	12.N.2	AI.N.2	AI.N.4	AII.N.2
PC.N.1					

Patterns Relations and Algebra

[✓ 10.P.1]	10.P5	12.P.1	12.P.5	12.P.9	12.P.13
[✓ 10.P.2]	[✓ 10.P.6]	12.P.2	12.P.6	12.P.10	
10.P.3	[✓ 10.P.7]	12.P.3	12.P.7	12.P.11	
10.P.4	[✓ 10.P.8]	12.P.4	12.P.8	12.P.12	
AI.P.1	AI.P.3	AI.P.5	AI.P.7	AI.P.9	AI.P.11
AI.P.2	AI.P.4	AI.P.6	AI.P.8	AI.P.10	AI.P.12
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

10.G.1	10.G.8	12.G.4	G.G.6	G.G.13	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
10.G.7	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability

10.D.1	12.D.2	12.D.6	AI.D.3	PC.D.2
10.D.2	12.D.3	12.D.7	AII.D.1	PC.D.3
10.D.3	12.D.4	AI.D.1	AII.D.2	PC.D.4
12.D.1	12.D.5	AI.D.2	PC.D.1	PC.D.5

Measurement

10.M.1	12.M.1	G.M.3	PC.M.2
10.M.2	12.M.2	G.M.4	
10.M.3	G.M.1	G.M.5	
10.M.4	G.M.2	PC.M.1	

Bloom's Taxonomy/ Costa's Levels of Questions

[✓ Knowledge]- Recalling Information

Identify Define Examine Name Describe Tell Label

[✓ Comprehension]- Understanding meaning

Summarize Interpret Estimate Differentiate

Analysis- Seeing Parts and Relationships

Analyze Explain Classify Connect Compare

Synthesis- Using Parts of New information to Create a Whole

Prepare Create Formulate Rewrite Compose Generalize

[✓ Evaluation]- Judging Based on Criteria

Assess Test Support Decide Explain Conclude Compare

Friday December 17th, 2010

Algebra II, Col (p. 1)

- Student Prep. Before Class
  - Studied for exam
- Goals
  - Assess Chapter 4
- Class Time
  - Hand out Chapter 4 Test
  - Give entire period to complete
- Homework
  - Pages 330-332
    G.P. #1-4 (all)
  - Page 328
    #1-12 (all)

Thursday, December 16th, 2010

Algebra II, Col. (p.1)

- Student Prep. Before Class
  - Page 323 (Chapter Review) #2-28 Cevens
- Goals
  - Review Chapter 4
  - Prepare for Chapter 4 Exam
- Class Time
  - Go over all Chapter ?'s and make sure to cover one from each section.
- Homework
  - STUDY!!!

Wednesday, December 15th, 2010
AND
Tuesday, December 14th, 2010
Algebra II, Col. (p. 1)

- Student Prep. Before Class
  - Pages 304-6 # 4-16 (ev.), 60-66 (evens), 70
- Goals
  - Fully understand how to graph and solve quadratic inequalities
  - Write Quadratic Functions + Models
- Class Time
  - Homework Questions (4.9)
  - 4.10 Discussion
    Write the function when given one of the following:
    → Vertex, point
    → X-intercepts, point
    → 3 points
- Homework
  - Pages 312-313 (4.9)
    #4-14 (evens) → Vertex
    #18-24 (evens) → X-intercepts
    #28-38 (evens) → 3 Points
    #47 → Good problem (application)
  - Page 323 (Chapter Review)
    #2-28 (evens)

Monday, December 13th, 2010 ☆Clay Period☆

Algebra II Col. (p. 1)

- Student Prep. Before Class
  - Pages 296-7 #2-54 (evens) → **Turn-in**
  - Page 301 G.P. #1
- Goals
  - Graph and Solve Quadratic Inequalities
- Class Time
  - Homework Questions (4.8)
  - 4.9 Discussion
    - Steps: ① Graph $y=ax^2+bx+c$
      (Use dotted for $<, >$)
      (Use solid for $\leq, \geq$)
      ② Test a point
      ③ Shade the true area
    - Do it using a number line
    - Ignore other methods
      (comment for HW)
- Homework
  - Pages 304-6: #4-16 (evens)
    #60-66 (evens)
    #70

Friday, December 10, 2010

Algebra II, College (p.1)

- Student Prep. Before Class
  Pages 292-5 #1-10 (4.8 G.P.)
  Page 296 #2-38 (ev.) (4.8 ex.)
- Goals
  Understand how to interpret and use the quadratic formula and the discriminant.
- Class Time
  Discuss 4.8 Briefly
  - Quadratic Formula
    - List a=, b=, c=
    - Plug it in
  - Discriminant
    - Key Concept Box (p. 294)

Use questions as examples

- Homework
  Pages 296-7 #2-54 (evens)
  ↳ Turn in on Monday
  (already did 2-38 ev.)

Separate from?

OR NOT.

Page 301: G.P. #1

Thursday December 9, 2010

- Student Prep. Before Class
  Page 296 : # 2-38 (evens)
  ↳ Probably didn't do it because we didn't do the lesson.
- Goals
  Review Quiz 2
  Review completing the square
- Class Time
  Hand out Quiz 2
  Go over problem areas ⇒ All of them
  Go over any homework questions
- Homework
  Fix Quiz 2
  Do Pages 292-5 # 1-10 (4.8 G.P.)

★

Wednesday December 8, 2010

L. p. 4

- Student Prep. Before Class
  - Pages 288-9: #34-56 (evens)
  - Page 292: Quadratic Formula
- Goals
  - Use the Quadratic Formula and the Discriminant
- Class Time
  - Homework Questions

    ★ Finish 4.7 ?'s ★ /lecture

    ★ Hand out a printout ★
      - w/ Derivation of quadratic formula
      - + Interesting complex number application (online)
  - Discuss 4.8
    - $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
    - Discriminant: Key Concept Box (p. 294)
- Homework
  - Page 296: #2-38 (evens)

Tuesday December 7, 2010 (L. p. 3)

Algebra II, College (p. 1)

- Student Prep. Befor Class
  - Pages 288-9 #4-32 (evens)
- Goals
  - Assess 4.5, 4.6, and a couple from 4.1-4.4
- Class Time
  - Last second questions before quiz
  - Quiz! (4.5, 4.6, little 4.1-4.4)
- Homework
  - Pages 288-9 #34-56 (evens)
  - Page 292: Quadratic Formula

Monday December 6, 2010 L.p. 2

Algebra II, College (p.1)

- Student Prep. Before Class
  Page 279-280 # 34-64 (ev.)
  ☆Collect This☆
- Goals
  Complete the square
- Class Time
  4.6 Questions
  Discuss 4.7 Page 284
  - Complete the Square
    → When a=1
    → When a≠1
  - Write a quadratic function in vertex form
  - Find the max value of a quadratic function.
- Homework
  Pages 288-9: # 4-32 (evens)

☆Quiz tomorrow☆

Thrs. Fri

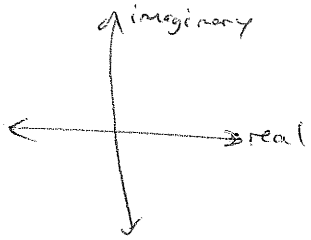
L. p. 7+1

Thursday
Friday December 2nd-3rd, 2010
Algebra II, College (p. 1)

- Student Prep Before Class
  - Pages 269-270 # 2-34 (ev.) → ~~§~~ 4.5
  - What is $i / \sqrt{-1}$?
- Goals
  - Complete square root basic understanding
  - Introduce/Master Complex numbers
- Class Time
  - Homework Questions
  - Define $i = \sqrt{-1}$
    $i^2 = -1$
  - Define complex numbers: $\underset{\text{real}}{a} + \underset{\text{imaginary}}{bi}$ ← Standard form

    ☆ Ignore Key Concept Box on page 276!!!

    → Treat i like any other variable
      - Add, subtract, multiply, divide
  - $i = \sqrt{-1}$, so i cannot be in denominator
  - Plot complex numbers:



  - $z = a + bi$

    Distance = absolute value = $|z| = \sqrt{a^2+b^2}$
    ↳ Triangle

    ☆ Key Concept Box on p. 279
- Homework

  Pages 279-280
  - #4-10 (ev.) - Solve ±
  - #12-20 (ev.) - Add/Subtract complex #'s
  - #22-32 (ev.) - Mult./Div. complex #'s

  ~~§~~ 4.6 Collect this
  - #34-40 (ev.) - Plot complex #'s
  - #42-50 (ev.) - Distance $|z| = \sqrt{a^2+b^2}$
  - #52-64 (ev.) - Good stuff

Wednesday - ~~A~~ December 1st, 2010 L. p. 6

Algebra II College (p. 1)

- Student Prep. Before Class
  - 4.5 G.P. # 1-20 (pp. 266-9)
- Goals
  - Solve Quadratic Equations by finding square roots
- Class Time
  - 4.5 Lecture
    - Properties of square roots
      - $\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$
      - $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$
    - Factor Trees

    } Simplify $\sqrt{\ }$

    - Rationalizing the denominator

Denominator	Multiply by
$\sqrt{b}$	$\sqrt{b}$
$a+\sqrt{b}$	$a-\sqrt{b}$
$a-\sqrt{b}$	$a+\sqrt{b}$

- Taking I$\sqrt{\ }$

- Homework
  - Pages 269-270 # 2-34 (evens)
  - Answer: What is i ?
    What is $\sqrt{-1}$?
    > One or the other... duh!

Tuesday - November 30th, 2010

L. p. 4

Algebra II College (p. 1)

- Student Prep. Before Class
  Studied 4.1-4.4
- Goals
  Assess 4.1-4.4. Knowledge
- Class Time
  Hand out 4.1-4.4 Quiz
  Entire class time to complete
- Homework
  4.5 G.P. #1-20 (pp. 266-269)
  ↳ Previous HW

L. p. 3

Monday - November 29th, 2010

Algebra II, College (p. 1)

- Student Prep. Before Class
  - Page 243: 62-74 (ev.)
  - Page 251: 58-64 (ev.)
  - Page 258: 74-90 (ev.)
  - Page 265: 70-80 (ev.)
  - Correct 4.1-4.4 Quiz
- Goals
  - Review 4.1-4.4
  - Prepare for 4.1-4.4 Assessment
- Class Time
  - Homework questions
  - Go over rest of 4.1-4.4 Quiz
  - Collect homeworks
  - Give back old homeworks/papers
- Homework
  - STUDY 4.1-4.4 ... A LOT!

11/15 - 11/19 , 11/22-23

Algebra II (Honors + College)

- Class Time

  Review sections 1.1 - 1.7
  2.1 - 2.8
  4.1 - 4.9 / 4.10
  ↑ Col. ↑ Hon.

  → 3-4 Sections per day

- Homework

  Monday : Page 975 # 2-34 (evens)
  976 # 2-30 (evens)
  977 # 2-30 (evens)
  Tuesday : Page 979 # 2-68 (evens)
  Wednesday : Page 980 # 2-28 (evens)
  981 # 2-28 (evens)
  Thursday : Page 984 # 2-18 (evens)
  985 # 2-26 (evens)
  Friday : Page 986 # 2-26 (evens)
  987 # 2-44 (evens)
  Monday : Page 1001 # 2-22 (evens)
  1005 # 2-8 (evens)
  991 # 2-8 (evens)

☆ Homework will be corrected and graded daily ☆

Algebra II, Col.

Monday

Finish Chapter 2 Review

Tuesday

Go over Quiz 4.1-4.4
(Return to them)

Break

★ Page 243: # 62-74 (evens) 6
~~Page 251: # 58-70 (evens)~~
★ Page 251: # 58-64 (evens) 4
★ Page 258: # 74-90 (evens) 8
★ Page 265: # 70-80 (evens) 5
★ Correct Quiz 4.1-4.4

23 problems

After Break

Monday Turn in HW for grading
Review 4.1-4.4

Tuesday Quiz on 4.1-4.4
↳ Will replace old quiz grade
(Make up a new quiz??)

Friday 11/12/2010

Algebra II, Col. (p.1)

Long Period

- Student Prep. Before Class
  4.4 #7-22 G.P. pp. 260-2
  #32-38 (ev.) p. 263
- Goals
  Understand and Assess 4.1-4.4
  - Graphing, FOILing, and factoring quadratic functions
- Class Time
  - 30-20 minutes for 4.1-4.4 Questions
  - Hand out 4.1-4.4 Quiz
- Homework
  4.5 #1-20 G.P. (pp. 266-9)

Wednesday 11/10/2010

Algebra II, Col. (p.1)

- Student Prep. Before Class
  - 4.3 #2-30 (ev.), #44-50 (ev.) (pp. 255-6)
  - 4.4 #1-6 G.P. (p. 260)
- Goals
  - Understand how to factor $ax^2+bx+c=0$ when $a \neq 1$
- Class Time
  - Questions
  - In general: $ax^2+bx+c = (kx+m)(lx+n)$
    $= klx^2+(kn+lm)x+mn$
  - PRACTICE!
  - → Check by factoring
  - Always look to take out a factor, first
  - Solve: Same thing, have to divide
  - (Zeros)
- Homework
  - 4.4 ~~#7-22 (G.P.) pp. 260-2~~
    #32-40 (ev.) p. 263
  - Quiz 4.1-4.4 on Friday

Tuesday 11/9/2010

Algebra II, Col. (p.1)

- Student Prep. Before Class
  4.2 # 2-20 (ev.), 34-40 (ev.) (p. 249)
  4.3 G.P. (over the weekend)
- Goals
  Understand how to FOIL and factor
- Class Time
  In general: $x^2 + bx + c = (x+m)(x+n)$ *FOIL*
  $= x^2 + (m+n)x + mn$
  Patterms: $a^2 - b^2 = (a+b)(a-b)$
  ↳ Difference of two squares
  $a^2 \pm 2ab + b^2 = (a \pm b)^2$
  ↳ Perfect square trinomial
  Zeros: Set = 0
  (Solve) When can this be true?
- Homework
  4.3 # 2-30 (ev.) } pp. 255-6
  # 44-50 (ev.) }
  4.4 # 1-6 G.P. (p. 260)

*Check answers by FOILing

Monday 11/8/2010

Algebra II, Col. (p. 1)

- Student Prep. Before Class
  4.1 # 55, 56, 80 (pp. 242-3)
  4.2 and 4.3 G.P.
- Goals
  Understand how to graph quadratic functions in standard, intercept, and vertex form.
- Class Time
  Brief homework questions
  Compare forms
  Standard: $y = ax^2 + bx + c$
  Y-int. → $(0, c)$
  Vertex → $\left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right)\right)$
  Random x-value → y-value
  Reflect over $x = -b/2a$
  Vertex: $y = a(x-h)^2 + k$
  Vertex → (h, k)
  Random x-value → y-value
  Intercept: $y = a(x-p)(x-q)$
  $(p, 0)$, $(q, 0)$ ← X-int.
  Vertex → $\left(\frac{p+q}{2}, f\left(\frac{p+q}{2}\right)\right)$
  Reflect over $x = (p+q)/2$
  Similarity
  ⟷ $a > 0$ vs. $a < 0$

- Homework
  4.2 # 2-20 (ev.) } on pp. 249
  # 34-40 (ev.) }

Friday 11/5/2010

Algebra II Col. (p. 1)

- Student Prep. Before Class
  - 4.1: Ex. #8-18 (ev.), 34-40 (ev.) (pp. 240-241)
  - 4.2: G.P. #1-8 (pp. 245-247)
- Goals
  - Understand how to graph quadratic functions in any form (standard, intercept, vertex)
- Class Time
  - Homework Questions ✓
  - Compare forms
    - ✓ Standard: (0, c) → a, positive

      Random x-value

      ↳ y-value

      Vertex: $\left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right)\right)$

Brief

- Vertex: (h, k)

  Random x-value

  ↳ y-value

- Intercept: (p, 0) (q, 0)

  Vertex: $\left(\frac{p+q}{2}, f\left(\frac{p+q}{2}\right)\right)$

→ Don't forget axis of symmetry

↳ Reflect across this

- ~~Homework~~
  - FOIL
- Homework
  - ~~G.P. #9-16 (p. 248)~~
  - ~~Ex. #2-20 (ev.), 24, 28 24-30 (ev.)~~
  - 4.1: Do pp. 242-3 #55, 56, 80
  - Study 4.2, 4.3 ↳ Do G.P.

Thursday 11/4/2010

Algebra II Col. (p. 1)

- Student Prep. Before Class
  - G.P. # 1-8 (pp. 236-9)
  - Ex. # 1-6 (p. 240)
- Goals
  - Grasp full understanding of how to graph a quadratic function
- Class Time
  - Homework questions
  - Max/Min. Values
  - Review steps to graphing quadratic function in standard form
  - Examples (homework)
  - Introduce Vertex and Intercept Forms, if time (4.2)
- Homework
  - 4.1: Ex. # 8-18 (ev.), 34-40 (ev.) (pp. 240-241)
  - 4.2: G.P. # 1-8 (pp. 245-247)

Wednesday 11/3/2010

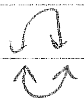
Algebra II, College (p. 1)

- Student Prep. Before Class
  - Studied Chapter 2
- Goal
  - ~~Preparatio~~ Assess Chapter 2 Knowledge
- Class Time
  - Hand out test
  - ~~Have entire period to complete~~
  - Have ~~45~~ 20 minutes to complete (at least)
  - Introduce Quadratic Functions

$y = x^2$

$y = ax^2 \rightarrow |a| > 1 \Rightarrow$ narrow $\quad a < 0$

$\quad\quad\quad\quad |a| < 1 \Rightarrow$ wider $\quad a > 0$



☆ Steps☆

$y = ax^2 + c \rightarrow c$ is y-intercept $(0, c)$

$y = ax^2 + bx + c \rightarrow$ Vertex: $\left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right)\right)$

Axis of Symmetry: $x = \frac{-b}{2a}$

- Homework
  - G.P. #1-8 (pp. 236-239)
  - Ex. #1-6 (p. 240)

Tuesday 11/2/2010

Algebra II, College (p. 1)

- Student Prep. Before Class
  - Pages 141-144 #2-34 (ev.), #23
- Goals
  - Fully understand Chapter 2
- Class Time
  - Take and answer all Chapter 2 Questions
- Homework
  - Study Chapter 2 for tomorrow's exam

☆ Started Test ☆
(last 20 minutes of class)

Monday 11/1/2010

Algebra II, College (p. 1)

- Student Prep. Before Class
  - Exercises 14, 18, 24, 30
  - G.P. 1-14 (pp. 132-5)
- Goals
  - Understand 2.7 (Graphing linear equalities)
- Class Time
  - Answer 2.7 Questions
- Homework
  - Pages 141-144 #2-34 (ev.), #23

Friday, 10/29/2010

Algebra II, College (p.1)

- Student Prep. Before Class
  - G.P. #1-7 (Pages 123-126)
  - Ex. # 4, 14, 16, 18, 22, 26, 30, 32
- Class Time
  - Pass back Scatter Pots
  - Half credit to pass in late (better than a zero)
  - Trouble areas:

    Correlation Coefficient (Number!)

    Don't give fractional decimals / decimal fractions as an answer

    $m = \frac{y_2 - y_1}{x_2 - x_1}$ (x_1, y_1), (x_2, y_2) Don't mismatch!
  - 2.7 Questions
  - 2.8 Lecture: Graph Linear inequalities w/ 2 Variables

    ① Graph line as usual → Dotted / Solid

    ② Test a point

    ③ Shade necessary area
- Homework
  - Exercises 14, 18, 24, 30
  - G.P. #1-14 (pp. 132-135)

Thursday, 10/28/2010

Algebra II, College (p. 1)

- Student Prep. Before Class
  - Take home quiz: Scatter Plots
- Class Time
  - Turn in take home quizes
  - 2.7 Lecture: Absolute Value Functions

Transformations

- $f(x) = |x| \rightarrow$ ① $f(x) = x$ ② $f(x) = -x$ } Positive direction only
- $f(x) = y = a|x-h| + k$

Vertex: (h, k) → y direction, → x direction } Translation

- Transformation: Changes a graph's size, shape, position, orientation
- a: Slope $a>0 \rightarrow \vee$ $a<0 \rightarrow \wedge$ $a=0\ldots? \Rightarrow y=k$, ↔

↳ ~~≥1~~ $>1 \Rightarrow$ ↔ → Wide (Shrink) vertically

Fraction $\Rightarrow$ ⇑ → Skinny (Stretch) vertically

- Transformation of any graph : $y = a \cdot f(x-h) + k$

(p. 126) Steps: ① Stretch/Shrink vertically
② Reflect (if $a<0$)
③ Translate (moves vertical/horizontal)

- Homework
  - G.P. #1-7 (Pages 123-126) (2.7)
  - Exercises # 4, 14, 16, 18, 22, 26, 30, 32
  - Chapter 2 Test, Wednesday

Wednesday 10/27/2010

Algebra II College (p.1)

- Student Prep. Before Class
  - G.P. #1-4 (pp. 113-117)
  - Ex. #1-10,18 (pp. 117-118)
- Goals
  - Get a full understanding of scatter plots through groupwork and take-home quiz
- Class Time
  - Finish yesterday's presentations on scatter plots
  - Any questions on scatter plots
  - Start HW (take home quiz)
- Homework
  - Assign each student a set of data which they will: • create a scatter plot
    - draw the best-fitting line
    - write an equation of that line
    - estimate the value at a given point.

→ This will be a take home quiz, which covers the last 3 sections, actually.

- Quiz grade!

Scatter Plot Examples

Resource Book (Chapter 2)

~~2 • P. 67 #4~~

~~2 • P. 67 #6~~

1/2 • P. 68 #10-12 (all one set of data)

~~2 • P. 69 #7~~

~~2 • P. 69 #5~~

~~2 • P. 70 #6~~

~~1 • P. 70 #8-10 (all one set of data)~~

~~1 • P. 71 #3~~

~~1 • P. 71 #4~~

~~1 • P. 71 #6+7 (all one set)~~

2 • P. 72 #8+9 (all one set)

2 • P. 72 #10-12 (all one set)

19/20

Need 16

Print for HW

X	3.5	4.25	4.75	5.25	6
Y	3.25	5.5	7	8.25	9.5

x = 10

Tuesday 10/26/2010

☆ Long ☆
Period

Algebra II, College (p. 1)

- Student Prep. Before Class
  - G.P. # 1-6 (pp. 107-109) (2.5)
  - Ex. # 1, 4-22 (ev.), 32, 34
- Goals
  - Fully understand direct variation
  - Understand Quiz 1 mistakes
  - Introduce scatter plots
- Class Time
  - Questions for 2.5 HW (direct variation)
  - Hand back graded Quiz 1
    → Go over trouble areas
  - Introduce 2.6 - Scatter plots
    - Graph of a set of data pairs → Reading a table...
    - Positive vs. Negative Correlation OR No Correlation
      → Examples
    - Correlation Coefficient
      Ranges from $r=-1 \xleftarrow{-0.5} r=0 \xrightarrow{0.5} r=1$
      → Examples
    - Best-Fitting Line
      → Examples
      ↳ Draw what looks good
      Find points, find equation using 2 points
    - Answers <u>WILL</u> vary.

Groupwork
- 3 per group
- Make line

- Homework
  - G.P. # 1-4 (pp. 113-117)
  - Ex. # 1-10 (pp. 117-118) # 18

Monday 10/25/2010

Algebra II, College (p. 1)

- Student Prep. Before Class
  - Finished G.P. #1-10, pages 98-101 (2.4)
  - Pages 101-102: #1, 2-6 (ev.), 12, 16, 20, 24, 28-32 (ev.), 40
- Goals
  - Fully understand how to write linear equations (2.5)
  - Write and graph direct variation equations
- Class Time
  - Questions on 2.4
  - Direct Variation: (2.5)
    - $b = 0 \Rightarrow$ Always!
    - $y = \underbrace{m}x$ / $y = \underbrace{a}x$ → Constant of variation (Slope)
    - Don't think about it differently!!
    - Given: One point (x, y)
      "Direct Variation" / "Vary directly"

      $\underset{\uparrow}{y} = m\underset{\uparrow}{x}$

      Do: p. 109 #22, 24

      → Find m, write equation
    - Do NOT OVERTHINK THIS!
- Homework
  - G.P. #1-6 (pp. 107-109)
  - Ex. #1, [illegible] 4-22 (evens), 32, 34

Friday, 10/22/2010

Algebra II, College (p. 1)

- Student Prep Before class
  - Studied + Completed HW's : 2.1-2.3
  - Pages 98-101, G.P. #1-10 (2.4)
- Goals
  - Assess understanding of 2.1-2.3
  - Begin understanding how to find the equation of a given line.
- Class Time
  - First 25 minutes:

    Quiz (2.1-2.3)
  - Last 10-15 minutes:

    2.4 Lecture:
    - Given $m, b \Rightarrow y = mx + b$
    - Given $m, (x_1, y_1) \Rightarrow y - y_1 = m(x - x_1)$
    - Given $(x_1, y_1), (x_2, y_2) \Rightarrow m = \frac{y_2 - y_1}{x_2 - x_1}$

      THEN: $y - y_1 = m(x - x_1)$
- Homework
  - Finish G.P. on pages 98-101, #1-10
  - Pages 101-10

    # 1, 2-6 (evens), 12, 16, 20, 24, 28-32 (evens), 40

Thursday, 10/21/2010

Algebra II, College (p. 1)

- Student Prep Before Class
  - Page 93: #2-12 (evens), 22-30 (evens), 36, 44, 50
- Goals
  - Understand how to graph linear equations in slope-intercept form.
  - Acquire a full understanding of 2.1-2.3
- Class Time
  - Continue on yesterday's lecture which discussed $y=mx+b$ and all of its parts (see Wednesday's lesson plan)
  - Answer any questions on 2.3 homework
  - Answer any questions on 2.1-2.3
- Homework
  - Finish all HW's from 2.1-2.3
  - Study for quiz (tomorrow!)
  - G.P. #1-10 (p. 98-101) (2.4)

$$M = \frac{3+2}{2-0} = \frac{5}{2}$$

$$y+2 = \frac{5}{2}(x-0)$$

$$y+2 = \frac{5}{2}x$$

$$y = \frac{5}{2}x - 2$$

Wednesday, 10/20/2010

Algebra II, College (p. 1)

- Student Prep. Before Class
  - Page 86: # 26-36 (evens)
  - Pages 89-92: G.P. # 1-14
- Goals
  - Further understanding of Ch. 1
  - Complete understanding of slope/rate of change
  - Introduce how to graph linear equations in slope-intercept or standard form.
- Class Time
  - Finish Ch. 1 Test Questions
    - → # 14
    - → Number lines (bounded w/ decimals, fractions)
  - Questions on P. 86 HW
  - Section 2.3 Lecture:
    - Parent Function - For linear: $f(x) (= y) = x$

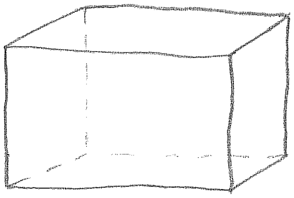
      $y = 1x + 0$
    - y-intercept: b : when $x = 0$
    - slope: m
    - Slope-intercept form: $y = mx + b$
    - Graph: y-intercept → PLOT

      slope → $\frac{\text{rise}}{\text{run}}$ from y-intercept
    - Standard Form: $Ax + By = C$

      ↳ Graph: $y = 0$ → x-int. } Connect ✓

      $x = 0$ → y-int. }
    - Vertical / Horizontal Lines ⇒ slope
- Homework
  - Page 93: # 2-12 (evens), 22-30 (evens), 36, 44, 50

⑭



$\ell = 4w$

$h = \frac{1}{2}\ell$

$V = 1000$

$V = \ell w h$

$1000 = \ell \cdot \frac{1}{4}\ell \cdot \frac{1}{2}\ell$

$1000 = \frac{1}{8}\ell^3$

$\ell^3 = 8000$

$\ell = 20$

$\ell = \ell$

$w = \frac{1}{4}\ell$

$h = \frac{1}{2}\ell$

$w = \frac{1}{4}\ell$

$w = \frac{1}{4}(20)$

$w = 5$

$h = \frac{1}{2}\ell$

$h = \frac{1}{2}(20)$

$h = 10$

⑮

Hours	1	2	3	4	5	6	7	8
Rain	0.15	0.3	0.45	0.60	0.75	0.90	1.05	1.20

⑯ $v_0 = 10$ m/h

paddle @ 15 m/h

$t = 1$ hour

(15-10) m/h for 1 hour = 5 miles

$d = vt$

$d = (15-10)(1)$ ⇒ there

$(5)(1) = 5$

$5 = (10)(?)$ ⇒ Back

$? = 0.5$ hours

Book says 30 min.

㉑ CD: 800 Mb

8 Mb/song

$\text{Mb} = \frac{\text{Mb}}{\text{song}} \cdot \text{song}$

$800 = 8s$

Tuesday, 10/19/2010

Algebra II, College (p.1)

- Student Prep. Before Class
  - Page 81: 2, 4, 6
  - Page 86: 2-12 (evens), 18-~~12~~ 24 (evens)
- Goals
  - Full understanding of slope/rate of change
  - Completely understand old test (ch. 1) (the retake)
- Class Time
  - Questions on 2.1 HW (last night)
  - Go over retake test
    - Hand out tests

      extra credit
    - All questions thoroughly ⇒ Bounded # lines (decimals, fractions)

      → Do on board (by students)?
- Homework
  - Page 86: #26-36 (evens)
  - Pages 89-92: G.P. #1-14

Long Period

8:28

Monday, 10/18/2010

Algebra II, College (p. 1)

- Student Prep Before Class
  - 2.1: Exercises 24-38 (evens), 44, 46 (pp. 77-78)
- Goals
  - Full understanding of linear functions
  - Graph and Classify discrete/continuous fctns.
  - Introduce slope/rate of change
- Class Time
  - Go over any more test 1 questions that Mr. Turner would like you to do
  - Answer 2.1 HW questions
  - Make sure 2.1 is absolutely clear
  - 2.1 Extension (Lecture): (Pages 80-81)

    Discete Functions: Seperate points

    Continuous Functions: Unbroken line

    Ex.: 1, 3, 5
  - 2.2 (Lecture): (Pages 82-85)

    Slope: $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{rise}}{\text{run}}$

    Parallel: Slope is same

    Perpendicular: Slope is negative (recipri?cal)

    Rate of Change: How much a quantity changes, on average, relative to the change in another quantity.
- Homework:
  - Page 81: #2, 4, 6
  - Page 86: #2-12 (evens), 18-24 (evens)

North High School MATH Weekly Lesson Plan-Teachers Name

Topic: Algebra II, Hon. Week Of: 12/20/10 Period: 1 2 [✓ 3] 4 5 [✓ 6] 7

Weekly Objectives

Wrap-up 5.7-5.9

2. Review Chapter 5

3. Assess Chapter 5

Instructional Strategies

Students will demonstrate understanding through….

CEEI Cornell Notes

T4's Letters

Other_______________

Assessments and Rubrics

WPS students write effectively

Summative Assessments

4-pt. WPS rubric 4=96 3=84 2=72 1=60

4-pt. MCAS O/R rubric 4=96 3=84 2=72 1=60

[✓ Tests]

[✓ Quizzes]

Projects

Presentations

[✓ Group Work]

[✓ Class work]

[✓ Homework]

Other___________________________

Formative assessments

Verbal Questioning

Conferencing

[✓ Journals]

[✓ Class Discussion/Participation]

Exit Slips

Other___________________________

Accommodations/Differentiation:

Outline of Monday's Class (L.p.7)

Discuss 5.9 (D1)

Outline of Tuesday's Class (L.p.1)

Discuss 5.9 (D2)

HW: 5.7-5.9 Quiz (Q3)

Outline of Wednesday's Class (L.p.2)

Go over 5.7-5.9 Quiz AND review Chapter 5

HW: Chapter 5 Review
Give them answers

Outline of Thursday's Class (L.p.3)

Chapter 5 [illegible]
TEST

~~Study Chapter 5 for HW~~

Outline of Friday's Class

~~☆ Chapter 5 Test~~

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

10.N.1	10.N.3	12.N.1	AI.N.1	AI.N.3	AII.N.1
10.N.2	10.N.4	12.N.2	AI.N.2	AI.N.4	AII.N.2
PC.N.1					

Patterns Relations and Algebra

10.P.1	10.P5	12.P.1	12.P.5	12.P.9	12.P.13
10.P.2	10.P.6	12.P.2	12.P.6	12.P.10	
10.P.3	10.P.7	12.P.3	12.P.7	12.P.11	
10.P.4	10.P.8	12.P.4	12.P.8	12.P.12	
AI.P.1	AI.P.3	AI.P.5	AI.P.7	AI.P.9	AI.P.11
AI.P.2	AI.P.4	AI.P.6	AI.P.8	AI.P.10	AI.P.12
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

10.G.1	10.G.8	12.G.4	G.G.6	G.G.13	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
10.G.7	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability

10.D.1	12.D.2	12.D.6	AI.D.3	PC.D.2
10.D.2	12.D.3	12.D.7	AII.D.1	PC.D.3
10.D.3	12.D.4	AI.D.1	AII.D.2	PC.D.4
12.D.1	12.D.5	AI.D.2	PC.D.1	PC.D.5

Measurement

10.M.1	12.M.1	G.M.3	PC.M.2
10.M.2	12.M.2	G.M.4	
10.M.3	G.M.1	G.M.5	
10.M.4	G.M.2	PC.M.1	

Bloom's Taxonomy/ Costa's Levels of Questions

Knowledge- Recalling Information

Identify Define Examine Name Describe Tell Label

Comprehension- Understanding meaning

Summarize Interpret Estimate Differentiate

Analysis- Seeing Parts and Relationships

Analyze Explain Classify Connect Compare

Synthesis- Using Parts of New information to Create a Whole

Prepare Create Formulate Rewrite Compose Generalize

Evaluation- Judging Based on Criteria

Assess Test Support Decide Explain Conclude Compare

North High School MATH Weekly Lesson Plan-Teachers Name

Topic: Algebra II, Hon. Week Of: 12/12/10 Period: 1 2 [✓ 3] 4 5 [✓ 6] 7

Weekly Objectives

1. Assess 5.4-5.6 Knowledge
2. 5.7 - 5.8
3.

Instructional Strategies

Students will demonstrate understanding through….

CEEI	Cornell Notes
T4's	Letters
Other_______________	

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WPS students write effectively

Summative Assessments

4-pt. WPS rubric 4=96 3=84 2=72 1=60

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Tests
[✓ Quizzes]
Projects
Presentations
[✓ Group Work]
[✓ Class work]
[✓ Homework]
Other___________________________

Formative assessments

Verbal Questioning
Conferencing
[✓ Journals]
[✓ Class Discussion/Participation]
Exit Slips
Other___________________________

Accommodations/Differentiation:

Outline of Monday's Class (L. p. 1)

5.6 Discussion (D2)

Outline of Tuesday's Class (L. p. 2)

5.4-5.6 Quiz (Q2)

HW: 5.7 G.P.

Outline of Wednesday's Class (L. p. 3)

Discuss 5.7 (D 1)

Outline of Thursday's Class (L. p. 4)

Discuss 5.7 (D 2)

Outline of Friday's Class (L. p. 6)

Discuss 5.8

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

[✓ 10.N.1]	[✓ 10.N.3]	[✓ 12.N.1]	AI.N.1	AI.N.3	[✓ AII.N.1]
[✓ 10.N.2]	[✓ 10.N.4]	[✓ 12.N.2]	AI.N.2	AI.N.4	[✓ AII.N.2]
PC.N.1					

Patterns Relations and Algebra

[✓ 10.P.1]	[✓ 10.P5]	12.P.1	[✓ 12.P.5]	[✓ 12.P.9]	12.P.13
[✓ 10.P.2]	[✓ 10.P.6]	12.P.2	[✓ 12.P.6]	[✓ 12.P.10]	
[✓ 10.P.3]	[✓ 10.P.7]	[✓ 12.P.3]	[✓ 12.P.7]	[✓ 12.P.11]	
[✓ 10.P.4]	[✓ 10.P.8]	12.P.4	[✓ 12.P.8]	12.P.12	
AI.P.1	[✓ AI.P.3]	[✓ AI.P.5]	[✓ AI.P.7]	[✓ AI.P.9]	[✓ AI.P.11]
AI.P.2	[✓ AI.P.4]	[✓ AI.P.6]	[✓ AI.P.8]	[✓ AI.P.10]	[✓ AI.P.12]
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

[✓ 10.G.1]	[✓ 10.G.8]	12.G.4	G.G.6	[✓ G.G.13]	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
[✓ 10.G.7]	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability Measurement

[✓ 10.D.1]	12.D.2	12.D.6	AI.D.3	PC.D.2	[✓ 10.M.1]	12.M.1	G.M.3	PC.M.2
[✓ 10.D.2]	12.D.3	12.D.7	AII.D.1	PC.D.3	[✓ 10.M.2]	[✓ 12.M.2]	G.M.4	
[✓ 10.D.3]	12.D.4	[✓ AI.D.1]	AII.D.2	PC.D.4	[✓ 10.M.3]	[✓ G.M.1]	G.M.5	
12.D.1	12.D.5	[✓ AI.D.2]	PC.D.1	PC.D.5	[✓ 10.M.4]	G.M.2	PC.M.1	

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North High School MATH Weekly Lesson Plan-Teachers Name
Topic: Algebra II, Hon. Week Of: 12/6-10 Period: 1 2 [✓ 3] 4 5 [✓ 6] 7

Weekly Objectives

Assess 5.1-5.3
2. Introduce Rational Zero theorem
3.

Instructional Strategies

Students will demonstrate understanding through....

CEEI
T4's
Other________

Cornell Notes
Letters

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WPS students write effectively

Summative Assessments

4-pt. WPS rubric 4=96 3=84 2=72 1=60
4-pt. MCAS O/R rubric 4=96 3=84 2=72 1=60
Tests
[✓ Quizzes]
Projects
Presentations
Group Work
[✓ Class work]
[✓ Homework]
Other________

Formative assessments

Verbal Questioning
Conferencing
[✓ Journals]
[✓ Class Discussion/Participation]
Exit Slips
Other________

Accommodations/Differentiation:

Outline of Monday's Class

Discuss 5.4

HW: Study 5.1-5.3
5.4 Ex.

Outline of Tuesday's Class

5.1-5.3 Quiz

Finish 5.4 discussion
HW: 5.4 Ex.
Look @ 5.5

Outline of Wednesday's Class

5.5 Discussion (D1)

HW: 5.5 ex.
5.5 G.P.

Outline of Thursday's Class

5.5 Discussion (D2)

HW: 5.5 ex.
Define Rational Zero theorem

Outline of Friday's Class

5.6 Discussion (D1)

HW: 5.6 Ex.

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

[✓ 10.N.1]	[✓ 10.N.3]	[✓ 12.N.1]	AI.N.1	AI.N.3	[✓ AII.N.1]
[✓ 10.N.2]	[✓ 10.N.4]	[✓ 12.N.2]	AI.N.2	AI.N.4	[✓ AII.N.2]
PC.N.1					

Patterns Relations and Algebra

[✓ 10.P.1]	[✓ 10.P5]	12.P.1	[✓ 12.P.5]	[✓ 12.P.9]	12.P.13
[✓ 10.P.2]	[✓ 10.P.6]	12.P.2	[✓ 12.P.6]	[✓ 12.P.10]	
[✓ 10.P.3]	[✓ 10.P.7]	12.P.3	[✓ 12.P.7]	[✓ 12.P.11]	
[✓ 10.P.4]	[✓ 10.P.8]	12.P.4	[✓ 12.P.8]	12.P.12	
AI.P.1	[✓ AI.P.3]	[✓ AI.P.5]	[✓ AI.P.7]	[✓ AI.P.9]	[✓ AI.P.11]
AI.P.2	[✓ AI.P.4]	[✓ AI.P.6]	[✓ AI.P.8]	[✓ AI.P.10]	[✓ AI.P.12]
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

[✓ 10.G.1]	[✓ 10.G.8]	12.G.4	G.G.6	[✓ G.G.13]	AII.G.2
[✓ 10.G.2]	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
[✓ 10.G.7]	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability

Measurement

[✓ 10.D.1]	12.D.2	12.D.6	AI.D.3	PC.D.2	[✓ 10.M.1]	12.M.1	G.M.3	PC.M.2
[✓ 10.D.2]	12.D.3	12.D.7	AII.D.1	PC.D.3	[✓ 10.M.2]	[✓ 12.M.2]	G.M.4	
[✓ 10.D.3]	12.D.4	[✓ AI.D.1]	AII.D.2	PC.D.4	[✓ 10.M.3]	[✓ G.M.1]	G.M.5	
12.D.1	12.D.5	[✓ AI.D.2]	PC.D.1	PC.D.5	[✓ 10.M.4]	G.M.2	PC.M.1	

Bloom's Taxonomy/ Costa's Levels of Questions

[✓ **Knowledge**]- Recalling Information

Identify Define Examine Name Describe Tell Label

Comprehension- Understanding meaning

Summarize Interpret Estimate Differentiate

Analysis- Seeing Parts and Relationships

Analyze Explain Classify Connect Compare

Synthesis- Using Parts of New information to Create a Whole

Prepare Create Formulate Rewrite Compose Generalize

[✓ **Evaluation**]- Judging Based on Criteria

Assess Test Support Decide Explain Conclude Compare

North High School MATH Weekly Lesson Plan-Teachers Name
Topic: Algebra II, Hon. Week Of: 11/29 -12/3 Period: 1 2 [✓ 3] 4 5 [✓ 6] 7

Weekly Objectives

. Assess Chapter 4
2. Polynomial Functions!
3. 5.1-5.3

Instructional Strategies

Students will demonstrate understanding through....

CEEI	Cornell Notes
T4's	Letters
Other_______________	

Assessments and Rubrics

WPS students write effectively

Summative Assessments

4-pt. WPS rubric 4=96 3=84 2=72 1=60
4-pt. MCAS O/R rubric 4=96 3=84 2=72 1=60
[✓ Tests]
uizzes
rojects
Presentations
Group Work
[✓ Class work]
[✓ Homework]
Other__________________________

Formative assessments

Verbal Questioning
Conferencing
[✓ Journals]
[✓ Class Discussion/Participation]
Exit Slips
Other___________________________

Accommodations/Differentiation:

L.p.3 **Outline of Monday's Class** 11/29

Review Chapter 4

HW: STUDY CHAPTER 4!

L.p.4 **Outline of Tuesday's Class** 11/30

Chapter 4 Test

HW: 5.1 Ex.
5.2 G.P.

L.p.6 **Outline of Wednesday's Class** 12/1

Start 5.2 Lecture

HW: First half 5.2 ?'s

L.p.7 **Outline of Thursday's Class** 12/2

Finish 5.2 Lecture

HW: Second half 5.2 ?'s
5.3 G.P.

L.p.1 **Outline of Friday's Class** 12/3

5.3 Lecture

HW: 5.3 Exercises

☆ 5.1-5.3 Quiz next week ☆

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

[✓ 10.N.1]	[✓ 10.N.3]	[✓ 12.N.1]	AI.N.1	AI.N.3	[✓ AII.N.1]
[✓ 10.N.2]	[✓ 10.N.4]	[✓ 12.N.2]	AI.N.2	AI.N.4	[✓ AII.N.2]
PC.N.1					

Patterns Relations and Algebra

[✓ 10.P.1]	[✓ 10.P5]	12.P.1	[✓ 12.P.5]	[✓ 12.P.9]	12.P.13
[✓ 10.P.2]	[✓ 10.P.6]	12.P.2	[✓ 12.P.6]	[✓ 12.P.10]	
[✓ 10.P.3]	[✓ 10.P.7]	12.P.3	[✓ 12.P.7]	[✓ 12.P.11]	
[✓ 10.P.4]	[✓ 10.P.8]	12.P.4	[✓ 12.P.8]	12.P.12	
AI.P.1	[✓ AI.P.3]	[✓ AI.P.5]	[✓ AI.P.7]	[✓ AI.P.9]	[✓ AI.P.11]
AI.P.2	[✓ AI.P.4]	[✓ AI.P.6]	[✓ AI.P.8]	[✓ AI.P.10]	[✓ AI.P.12]
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

[✓ 10.G.1]	[✓ 10.G.8]	12.G.4	G.G.6	[✓ G.G.13]	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
[✓ 10.G.7]	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability

Measurement

[✓ 10.D.1]	12.D.2	12.D.6	AI.D.3	PC.D.2	[✓ 10.M.1]	12.M.1	G.M.3	PC.M.2
[✓ 10.D.2]	12.D.3	12.D.7	AII.D.1	PC.D.3	[✓ 10.M.2]	[✓ 12.M.2]	G.M.4	
[✓ 10.D.3]	12.D.4	[✓ AI.D.1]	AII.D.2	PC.D.4	[✓ 10.M.3]	[✓ G.M.1]	G.M.5	
12.D.1	12.D.5	[✓ AI.D.2]	PC.D.1	PC.D.5	[✓ 10.M.4]	G.M.2	PC.M.1	

Bloom's Taxonomy/ Costa's Levels of Questions

Knowledge- Recalling Information

Identify Define Examine Name Describe Tell Label

Comprehension- Understanding meaning

[✓ Summarize] Interpret Estimate Differentiate

Analysis- Seeing Parts and Relationships

Analyze Explain Classify Connect Compare

[✓ Synthesis]- Using Parts of New information to Create a Whole

Prepare Create Formulate Rewrite Compose Generalize

Evaluation- Judging Based on Criteria

Assess Test Support Decide Explain Conclude Compare

North High School MATH Weekly Lesson Plan-Teachers Name
Topic: Algebra II Week Of: 11/15-19; 11/22-23 Period: [✓ 1] 2 [✓ 3] 4 5 [✓ 6] 7

Weekly Objectives

Review Chapters 1,2,4 in class
2. Review basic algebra topics as HW
3.

Instructional Strategies

Students will demonstrate understanding through….

CEEI Cornell Notes
T4's Letters
Other______________

Assessments and Rubrics

WPS students write effectively

Summative Assessments

4-pt. WPS rubric 4=96 3=84 2=72 1=60
4-pt. MCAS O/R rubric 4=96 3=84 2=72 1=60
Tests
uizzes
rojects
Presentations
[✓ Group Work]
[✓ Class work]
[✓ Homework]
Other_________________________

Formative assessments

Verbal Questioning
Conferencing
[✓ Journals]
[✓ Class Discussion/Participation]
Exit Slips
Other_________________________

Accommodations/Differentiation:

Outline of Monday's Class

Review covered chapters

HW: Algebra review

Outline of Tuesday's Class

"

Outline of Wednesday's Class

"

Outline of Thursday's Class

"

Outline of Friday's Class

"

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

[✓ 10.N.1]	[✓ 10.N.3]	[✓ 12.N.1]	AI.N.1	AI.N.3	[✓ AII.N.1]
[✓ 10.N.2]	[✓ 10.N.4]	[✓ 12.N.2]	AI.N.2	AI.N.4	[✓ AII.N.2]
PC.N.1					

Patterns Relations and Algebra

[✓ 10.P.1]	[✓ 10.P5]	12.P.1	[✓ 12.P.5]	12.P.9	12.P.13
[✓ 10.P.2]	[✓ 10.P.6]	12.P.2	[✓ 12.P.6]	[✓ 12.P.10]	
[✓ 10.P.3]	[✓ 10.P.7]	12.P.3	[✓ 12.P.7]	[✓ 12.P.11]	
[✓ 10.P.4]	[✓ 10.P.8]	12.P.4	[✓ 12.P.8]	12.P.12	
AI.P.1	[✓ AI.P.3]	[✓ AI.P.5]	[✓ AI.P.7]	[✓ AI.P.9]	[✓ AI.P.11]
AI.P.2	[✓ AI.P.4]	[✓ AI.P.6]	[✓ AI.P.8]	[✓ AI.P.10]	[✓ AI.P.12]
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

[✓ 10.G.1]	[✓ 10.G.8]	12.G.4	G.G.6	[✓ G.G.13]	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
[✓ 10.G.5]	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	[✓ G.G.11]	G.G.18	
[✓ 10.G.7]	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability

Measurement

[✓ 10.D.1]	12.D.2	12.D.6	AI.D.3	PC.D.2	[✓ 10.M.1]	12.M.1	G.M.3	PC.M.2
[✓ 10.D.2]	12.D.3	12.D.7	AII.D.1	PC.D.3	[✓ 10.M.2]	[✓ 12.M.2]	G.M.4	
[✓ 10.D.3]	12.D.4	[✓ AI.D.1]	AII.D.2	PC.D.4	[✓ 10.M.3]	[✓ G.M.1]	G.M.5	
12.D.1	12.D.5	[✓ AI.D.2]	PC.D.1	PC.D.5	[✓ 10.M.4]	G.M.2	PC.M.1	

Bloom's Taxonomy/ Costa's Levels of Questions

[✓ Knowledge]- Recalling Information

Identify Define Examine Name Describe Tell Label

[✓ Comprehension]- Understanding meaning

Summarize Interpret Estimate Differentiate

Analysis- Seeing Parts and Relationships

Analyze Explain Classify Connect Compare

Synthesis- Using Parts of New information to Create a Whole

Prepare Create Formulate Rewrite Compose Generalize

Evaluation- Judging Based on Criteria

Assess Test Support Decide Explain Conclude Compare

North High School MATH Weekly Lesson Plan-Teachers Name

Topic: Algebra II, Hon. Week Of: 11/8 Period: 1 2 [✓ 3] 4 5 [✓ 6] 7

Weekly Objectives

Complete Chapter 4

2. Assess 4.7-4.10
3. Re-Assess 4.1-4.6

Instructional Strategies

Students will demonstrate understanding through….

CEEI Cornell Notes
T4's Letters
Other______________

Assessments and Rubrics

WPS students write effectively

Summative Assessments

4-pt. WPS rubric 4=96 3=84 2=72 1=60
4-pt. MCAS O/R rubric 4=96 3=84 2=72 1=60
[✓ Tests]
[✓ Quizzes]
Projects
Presentations
Group Work
[✓ Class work]
[✓ Homework]
Other__________________________

Formative assessments

Verbal Questioning
Conferencing
[✓ Journals]
[✓ Class Discussion/Participation]
Exit Slips
Other__________________________

Accommodations/Differentiation:

Outline of Monday's Class

L. p. 4

4.9 Questions
Lecture 4.10

HW: G.P. #1-7 pp. 310-311 } 4.10
Ex. #2-20 (ev.) } pp. 312-3
32-36 (ev.)

Outline of Tuesday's Class

L. P. 6

Finish 4.10 Lecture
Answer HW questions

HW: Review with answers

Outline of Wednesday's Class

L. p. 7

Test
Chapter 4 Test A
↓
#21-27

Brief Questions
30 minutes for 4.7-4.10 Assessment
Mention exponent rules
HW: Fix 4.1-4.6 Test
-5.1 G.P.
{ 1/2 credit to fix
{ Full credit for answer if blank

Outline of Thursday's Class

Outline of Friday's Class

L. p. 1

Collect 4.1-4.6 Test
Start 5.1
↳ Exponents

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

[✓ 10.N.1]	10.N.3	[✓ 12.N.1]	AI.N.1	AI.N.3	AII.N.1
[✓ 10.N.2]	[✓ 10.N.4]	[✓ 12.N.2]	AI.N.2	AI.N.4	AII.N.2
PC.N.1					

Patterns Relations and Algebra

[✓ 10.P.1]	[✓ 10.P5]	12.P.1	12.P.5	12.P.9	12.P.13
[✓ 10.P.2]	[✓ 10.P.6]	12.P.2	12.P.6	12.P.10	
[✓ 10.P.3]	[✓ 10.P.7]	12.P.3	12.P.7	12.P.11	
[✓ 10.P.4]	[✓ 10.P.8]	12.P.4	12.P.8	12.P.12	
AI.P.1	AI.P.3	AI.P.5	AI.P.7	AI.P.9	AI.P.11
AI.P.2	AI.P.4	AI.P.6	AI.P.8	AI.P.10	AI.P.12
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

10.G.1	10.G.8	12.G.4	G.G.6	G.G.13	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
10.G.7	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability

Measurement

10.D.1	12.D.2	12.D.6	AI.D.3	PC.D.2	10.M.1	12.M.1	G.M.3	PC.M.2
10.D.2	12.D.3	12.D.7	AII.D.1	PC.D.3	10.M.2	12.M.2	G.M.4	
10.D.3	12.D.4	AI.D.1	AII.D.2	PC.D.4	10.M.3	G.M.1	G.M.5	
12.D.1	12.D.5	AI.D.2	PC.D.1	PC.D.5	10.M.4	G.M.2	PC.M.1	

Bloom's Taxonomy/ Costa's Levels of Questions

Knowledge- Recalling Information

Identify Define Examine Name Describe Tell Label

Comprehension- Understanding meaning

Summarize Interpret Estimate Differentiate

Analysis- Seeing Parts and Relationships

Analyze Explain Classify Connect Compare

Synthesis- Using Parts of New information to Create a Whole

Prepare Create Formulate Rewrite Compose Generalize

Evaluation- Judging Based on Criteria

Assess Test Support Decide Explain Conclude Compare

North High School MATH Weekly Lesson Plan-Teachers Name

Topic: Week Of: Period: 1 2 3 4 5 [✓ 6] 7

Weekly Objectives

1. Assess 4.1-4.6

2.

3.

Instructional Strategies

Students will demonstrate understanding through….

CEEI Cornell Notes
T4's Letters
Other______________

Assessments and Rubrics

WPS students write effectively

Summative Assessments

4-pt. WPS rubric 4=96 3=84 2=72 1=60
4-pt. MCAS O/R rubric 4=96 3=84 2=72 1=60
[✓ Tests]
Quizzes
Projects
Presentations
Group Work
[✓ Class work]
[✓ Homework]
Other_________________________

Formative assessments

Verbal Questioning
Conferencing
[✓ Journals]
Class Discussion/Participation
Exit Slips
Other_________________________

Accommodations/Differentiation:

Outline of Monday's Class Long Period

Review 4.1-4.6
Take any/all questions

Outline of Tuesday's Class

4.1-4.6 exam

HW: 4.7 ex.

Outline of Wednesday's Class

Introduce 4.8
↳ Complete the square

HW: 4.7 ex.
4.8 G.P.

Outline of Thursday's Class

Derive quad formula
Start 4.8
(discriminant)
HW: 4.8 ex.
4.9 G.P.

Outline of Friday's Class

Finish 4.8
Start 4.9
↳ Quad inequalities
HW: 4.9 ex. + G.P.

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

[✓ 10.N.1]	[✓ 10.N.3]	[✓ 12.N.1]	AI.N.1	AI.N.3	AII.N.1
[✓ 10.N.2]	[✓ 10.N.4]	[✓ 12.N.2]	AI.N.2	AI.N.4	AII.N.2
PC.N.1					

Patterns Relations and Algebra

[✓ 10.P.1]	[✓ 10.P5]	12.P.1	12.P.5	12.P.9	12.P.13
[✓ 10.P.2]	[✓ 10.P.6]	12.P.2	12.P.6	12.P.10	
[✓ 10.P.3]	[✓ 10.P.7]	12.P.3	12.P.7	12.P.11	
[✓ 10.P.4]	[✓ 10.P.8]	12.P.4	12.P.8	12.P.12	
AI.P.1	AI.P.3	AI.P.5	AI.P.7	AI.P.9	AI.P.11
AI.P.2	AI.P.4	AI.P.6	AI.P.8	AI.P.10	AI.P.12
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

10.G.1	10.G.8	12.G.4	G.G.6	G.G.13	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
10.G.7	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability					Measurement			
10.D.1	12.D.2	12.D.6	AI.D.3	PC.D.2	10.M.1	12.M.1	G.M.3	PC.M.2
10.D.2	12.D.3	12.D.7	AII.D.1	PC.D.3	10.M.2	12.M.2	G.M.4	
10.D.3	12.D.4	AI.D.1	AII.D.2	PC.D.4	10.M.3	G.M.1	G.M.5	
12.D.1	12.D.5	AI.D.2	PC.D.1	PC.D.5	10.M.4	G.M.2	PC.M.1	

Bloom's Taxonomy/ Costa's Levels of Questions

[✓ **Knowledge**]- **Recalling Information**

Identify Define Examine Name Describe Tell Label

[✓ **Comprehension**]- **Understanding meaning**

Summarize Interpret Estimate Differentiate

Analysis- **Seeing Parts and Relationships**

Analyze Explain Classify Connect Compare

[✓ **Synthesis**]- **Using Parts of New information to Create a Whole**

Prepare Create Formulate Rewrite Compose Generalize

Evaluation- **Judging Based on Criteria**

Assess Test Support Decide Explain Conclude Compare

North High School MATH Weekly Lesson Plan-Teachers Name

Topic: Week Of: Period: 1 2 [✓ 3] 4 5 6 7

Weekly Objectives

1. Assess 4.1-4.6
2. Start 4.7-4.9
3. Understand quarter grades

Instructional Strategies

Students will demonstrate understanding through….

CEEI Cornell Notes
T4's Letters
Other______________

Assessments and Rubrics

WPS students write effectively

Summative Assessments

4-pt. WPS rubric 4=96 3=84 2=72 1=60
4-pt. MCAS O/R rubric 4=96 3=84 2=72 1=60
[✓ Tests]
Quizzes
Projects
Presentations
Group Work
[✓ Class work]
[✓ Homework]
Other_________________________

Formative assessments

Verbal Questioning
[✓ Conferencing]
[✓ Journals]
[✓ Class Discussion/Participation]
Exit Slips
Other_________________________

Accommodations/Differentiation:

Outline of Monday's Class

Review 4.1-4.6
Take any/all questions

HW: Study

Outline of Tuesday's Class

4.1-4.6 exam

HW: 4.7 exercises

Outline of Wednesday's Class

Introduce 4.8
→ Complete the Square

HW: 4.7 ex.
4.8 G.P.

Outline of Thursday's Class

- Derive quad formula
- Start 4.8
(discriminant)
- HW: 4.8 ex.
4.9 G.P.

Outline of Friday's Class

Long Period

- Finish 4.8
- Start 4.9
↳ Quad inequalities
- HW: 4.9 G.P.
4.9 Ex.

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

[✓ 10.N.1]	10.N.3	[✓ 12.N.1]	AI.N.1	AI.N.3	AII.N.1
[✓ 10.N.2]	[✓ 10.N.4]	[✓ 12.N.2]	AI.N.2	AI.N.4	AII.N.2
PC.N.1					

Patterns Relations and Algebra

[✓ 10.P.1]	[✓ 10.P5]	12.P.1	12.P.5	12.P.9	12.P.13
[✓ 10.P.2]	[✓ 10.P.6]	12.P.2	12.P.6	12.P.10	
[✓ 10.P.3]	[✓ 10.P.7]	12.P.3	12.P.7	12.P.11	
[✓ 10.P.4]	[✓ 10.P.8]	12.P.4	12.P.8	12.P.12	
AI.P.1	AI.P.3	AI.P.5	AI.P.7	AI.P.9	AI.P.11
AI.P.2	AI.P.4	AI.P.6	AI.P.8	AI.P.10	AI.P.12
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

10.G.1	10.G.8	12.G.4	G.G.6	G.G.13	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
10.G.7	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability Measurement

10.D.1	12.D.2	12.D.6	AI.D.3	PC.D.2	10.M.1	12.M.1	G.M.3	PC.M.2
10.D.2	12.D.3	12.D.7	AII.D.1	PC.D.3	10.M.2	12.M.2	G.M.4	
10.D.3	12.D.4	AI.D.1	AII.D.2	PC.D.4	10.M.3	G.M.1	G.M.5	
12.D.1	12.D.5	AI.D.2	PC.D.1	PC.D.5	10.M.4	G.M.2	PC.M.1	

Bloom's Taxonomy/ Costa's Levels of Questions

[✓ Knowledge]- Recalling Information

Identify Define Examine Name Describe Tell Label

[✓ Comprehension]- Understanding meaning

Summarize Interpret Estimate Differentiate

Analysis- Seeing Parts and Relationships

Analyze Explain Classify Connect Compare

[✓ Synthesis]- Using Parts of New information to Create a Whole

Prepare Create Formulate Rewrite Compose Generalize

Evaluation- Judging Based on Criteria

Assess Test Support Decide Explain Conclude Compare

North High School MATH Weekly Lesson Plan-Teachers Name

Topic: Algebra II, Hon. Week Of: 10/25 - 10/29 Period: 1 2 3 4 5 [✓ 6/7]

Weekly Objectives

Go over 4.1-4.4 (Quiz)

2. Introduce 4.5-4.7
3. Derive Quadratic Formula

Instructional Strategies

Students will demonstrate understanding through….

CEEI	Cornell Notes
T4's	Letters
Other_______________	

Assessments and Rubrics

WPS students write effectively

Summative Assessments

4-pt. WPS rubric 4=96 3=84 2=72 1=60
4-pt. MCAS O/R rubric 4=96 3=84 2=72 1=60
Tests
[✓ Quizzes]
rojects
Presentations
[✓ Group Work]
[✓ Class work]
[✓ Homework]
Other___________________________

Formative assessments

[✓ Verbal Questioning]
Conferencing
Journals
Class Discussion/Participation
Exit Slips
Other____________________________

Accommodations/Differentiation:

Outline of Monday's Class

- 4.4 ?'s
- 4.5 Lecture
- HW: 4.5 G.P.

Outline of Tuesday's Class

- Go over quizzes
- 4.5 ?'s
- HW: 4.5 ex.
  4.6 ~~ex.~~ Read

Outline of Wednesday's Class

- 4.5 ?'s
- 4.6 - Lecture
- HW: 4.6 G.P.

Outline of Thursday's Class

- Finish 4.6 Lecture
- 4.6 ?'s
- HW: 4.6 exercises
  4.7 G.P.

Outline of Friday's Class

- 4.7 Lecture
- 4.6/4.7 ?'s
- HW: 4.7 exercises

Monday = Long Period

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

[✓ 10.N.1]	[✓ 10.N.3]	[✓ 12.N.1]	AI.N.1	AI.N.3	AII.N.1
[✓ 10.N.2]	[✓ 10.N.4]	[✓ 12.N.2]	AI.N.2	AI.N.4	AII.N.2
PC.N.1					

Patterns Relations and Algebra

[✓ 10.P.1]	[✓ 10.P5]	12.P.1	[✓ 12.P.5]	12.P.9	12.P.13
[✓ 10.P.2]	[✓ 10.P.6]	12.P.2	[✓ 12.P.6]	12.P.10	
[✓ 10.P.3]	[✓ 10.P.7]	12.P.3	[✓ 12.P.7]	12.P.11	
[✓ 10.P.4]	[✓ 10.P.8]	12.P.4	[✓ 12.P.8]	12.P.12	
AI.P.1	AI.P.3	AI.P.5	AI.P.7	AI.P.9	AI.P.11
AI.P.2	AI.P.4	AI.P.6	AI.P.8	AI.P.10	AI.P.12
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

10.G.1	10.G.8	12.G.4	G.G.6	G.G.13	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
10.G.7	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability

Measurement

10.D.1	12.D.2	12.D.6	AI.D.3	PC.D.2	10.M.1	12.M.1	G.M.3	PC.M.2
10.D.2	12.D.3	12.D.7	AII.D.1	PC.D.3	10.M.2	12.M.2	G.M.4	
10.D.3	12.D.4	AI.D.1	AII.D.2	PC.D.4	10.M.3	G.M.1	G.M.5	
12.D.1	12.D.5	AI.D.2	PC.D.1	PC.D.5	10.M.4	G.M.2	PC.M.1	

Bloom's Taxonomy/ Costa's Levels of Questions

Knowledge- Recalling Information

Identify Define Examine Name Describe Tell Label

[✓ Comprehension]- Understanding meaning

Summarize Interpret Estimate Differentiate

Analysis- Seeing Parts and Relationships

Analyze Explain Classify Connect Compare

[✓ Synthesis]- Using Parts of New information to Create a Whole

Prepare Create Formulate Rewrite Compose Generalize

Evaluation- Judging Based on Criteria

Assess Test Support Decide Explain Conclude Compare

North High School MATH Weekly Lesson Plan-Teachers Name

Topic: Algebra II, Hon. Week Of: 10/25-10/29 Period: 1 2 [✓ 3] 4 5 6 7

Weekly Objectives

1. Go over 4.1-4.4 (Quiz)
2. Introduce 4.5-4.7
3. Derive Quadratic Formula

Instructional Strategies

Students will demonstrate understanding through….

CEEI	Cornell Notes
T4's	Letters

Other______________

Assessments and Rubrics

WPS students write effectively

Summative Assessments

4-pt. WPS rubric 4=96 3=84 2=72 1=60
4-pt. MCAS O/R rubric 4=96 3=84 2=72 1=60
Tests
[✓ Quizzes]
Projects
Presentations
[✓ Group Work]
[✓ Class work]
[✓ Homework]
Other______________________

Formative assessments

Verbal Questioning
Conferencing
[✓ Journals]
[✓ Class Discussion/Participation]
Exit Slips
Other________________________

Accommodations/Differentiation:

Outline of Monday's Class

- 4.4 ?'s
- 4.5 Lecture
- HW: 4.5 G.P.

Outline of Tuesday's Class

- Go over quizzes
- 4.5 ?'s
- HW: 4.5 ex.
  4.6 read

Outline of Wednesday's Class

- 4.5 ?'s
- 4.6 Lecture
- HW: 4.6 G.P.

Outline of Thursday's Class

Long Period

- Finish 4.6 Lecture
- 4.6 ?'s
- 4.7 Lecture
- HW: 4.6 ex.
  4.7 G.P.

Outline of Friday's Class

- Finish 4.7
- 4.6/4.7 ?'s

[Derive quadratic formula]

- HW: 4.7 exercises

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

[✓ 10.N.1]	[✓ 10.N.3]	[✓ 12.N.1]	AI.N.1	AI.N.3	AII.N.1
[✓ 10.N.2]	[✓ 10.N.4]	[✓ 12.N.2]	AI.N.2	AI.N.4	AII.N.2
PC.N.1					

Patterns Relations and Algebra

[✓ 10.P.1]	[✓ 10.P5]	12.P.1	[✓ 12.P.5]	12.P.9	12.P.13
[✓ 10.P.2]	[✓ 10.P.6]	12.P.2	[✓ 12.P.6]	12.P.10	
[✓ 10.P.3]	[✓ 10.P.7]	12.P.3	[✓ 12.P.7]	12.P.11	
[✓ 10.P.4]	[✓ 10.P.8]	12.P.4	[✓ 12.P.8]	12.P.12	
AI.P.1	AI.P.3	AI.P.5	AI.P.7	AI.P.9	AI.P.11
AI.P.2	AI.P.4	AI.P.6	AI.P.8	AI.P.10	AI.P.12
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

10.G.1	10.G.8	12.G.4	G.G.6	G.G.13	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
10.G.7	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability — Measurement

10.D.1	12.D.2	12.D.6	AI.D.3	PC.D.2	10.M.1	12.M.1	G.M.3	PC.M.2
10.D.2	12.D.3	12.D.7	AII.D.1	PC.D.3	10.M.2	12.M.2	G.M.4	
10.D.3	12.D.4	AI.D.1	AII.D.2	PC.D.4	10.M.3	G.M.1	G.M.5	
12.D.1	12.D.5	AI.D.2	PC.D.1	PC.D.5	10.M.4	G.M.2	PC.M.1	

Bloom's Taxonomy/ Costa's Levels of Questions

Knowledge- Recalling Information

Identify Define Examine Name Describe Tell Label

[✓ Comprehension]- Understanding meaning

Summarize Interpret Estimate Differentiate

Analysis- Seeing Parts and Relationships

Analyze Explain Classify Connect Compare

[✓ Synthesis]- Using Parts of New information to Create a Whole

Prepare Create Formulate Rewrite Compose Generalize

Evaluation- Judging Based on Criteria

Assess Test Support Decide Explain Conclude Compare

North High School MATH Weekly Lesson Plan-Teachers Name
Topic: Algebra II, Honors Week Of: 10/18-10/22 Period: 1 2 3 4 5 [✓ 6] 7

Weekly Objectives

Introduce 4.1–4.4
2. Understand Ch. 2 Assessment Results
3. Assess 4.1-4.3/4.4

Instructional Strategies

Students will demonstrate understanding through….

CEEI	Cornell Notes
T4's	Letters
Other______________	

Assessments and Rubrics

WPS students write effectively

Summative Assessments
4-pt. WPS rubric 4=96 3=84 2=72 1=60
4-pt. MCAS O/R rubric 4=96 3=84 2=72 1=60
[✓ Tests]
[✓ Quizzes]
Projects
[✓ Presentations] } Maybe Friday
[✓ Group Work] }
[✓ Class work]
[✓ Homework]
Other________________________

Formative assessments
[✓ Verbal Questioning]
[✓ Conferencing] → After school
Journals
[✓ Class Discussion/Participation]
Exit Slips
Other________________________

Accommodations/Differentiation:

Outline of Monday's Class

- Go over Ch. 2 Test
  → Trouble areas…?
- Questions on 4.1
- HW: 4.2: G.P
  4 ex.

Outline of Tuesday's Class

Go over extra credit option

- Do: 4.1 #(24), 28
- Any more specific 4.1 ?'s
- 4.2 Lecture
  while answering their questions
- HW: 4.2 → More ex.
  4.3 → G.P.

Outline of Wednesday's Class

- 4.2 Questions
- 4.3 Lecture
  → Examples
  → Answer G.P problems
- HW: 4.3 Ex.
  Bring all 4.1-4.3 ?'s
  4.4 → Start looking (bonus on quiz)

Outline of Thursday's Class

- Answer 4.3 ?'s
- Any 4.1-4.3 ?'s ?
- 4.4 Intro
- HW: Study for quiz tomorrow
  Look at 4.4 G.P.

Outline of Friday's Class

Long Period

4.1-4.4 Quiz with 4.4 as bonus

- 4.1-4.3 Quiz
- 4.4 Explanation
  → Group work?
- HW: 4.4 G.P. + Ex.

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

[✓ 10.N.1]	[✓ 10.N.3]	12.N.1	AI.N.1	AI.N.3	AII.N.1
[✓ 10.N.2]	10.N.4	12.N.2	AI.N.2	AI.N.4	AII.N.2
PC.N.1					

Patterns Relations and Algebra

[✓ 10.P.1]	[✓ 10.P5]	12.P.1	12.P.5	12.P.9	12.P.13
[✓ 10.P.2]	[✓ 10.P.6]	12.P.2	[✓ 12.P.6]	12.P.10	
[✓ 10.P.3]	[✓ 10.P.7]	12.P.3	12.P.7	12.P.11	
[✓ 10.P.4]	[✓ 10.P.8]	12.P.4	12.P.8	12.P.12	
AI.P.1	AI.P.3	AI.P.5	AI.P.7	AI.P.9	AI.P.11
AI.P.2	AI.P.4	AI.P.6	AI.P.8	AI.P.10	AI.P.12
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

10.G.1	10.G.8	12.G.4	G.G.6	G.G.13	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
10.G.7	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability

10.D.1	12.D.2	12.D.6	AI.D.3	PC.D.2
10.D.2	12.D.3	12.D.7	AII.D.1	PC.D.3
10.D.3	12.D.4	AI.D.1	AII.D.2	PC.D.4
12.D.1	12.D.5	AI.D.2	PC.D.1	PC.D.5

Measurement

10.M.1	12.M.1	G.M.3	PC.M.2
10.M.2	12.M.2	G.M.4	
10.M.3	G.M.1	G.M.5	
10.M.4	G.M.2	PC.M.1	

Bloom's Taxonomy/ Costa's Levels of Questions

[✓ Knowledge]- Recalling Information

Identify Define Examine Name Describe Tell Label

Comprehension- Understanding meaning

Summarize Interpret Estimate Differentiate

[✓ Analysis]- Seeing Parts and Relationships

Analyze Explain Classify Connect Compare

Synthesis- Using Parts of New information to Create a Whole

Prepare Create Formulate Rewrite Compose Generalize

Evaluation- Judging Based on Criteria

Assess Test Support Decide Explain Conclude Compare

North High School MATH Weekly Lesson Plan-Teachers Name

Topic: Algebra II Week Of: 10/18 - 10/22 Period: 1 2 [✓ 3] 4 5 6 7

Weekly Objectives

1. Introduce 4.1 - 4.4
2. Understand problems on chapter 2 test
3. Assess 4.1 - 4.3/4.4

Instructional Strategies

Students will demonstrate understanding through….

CEEI	Cornell Notes
T4's	Letters
Other______________	

Assessments and Rubrics

WPS students write effectively

Summative Assessments

4-pt. WPS rubric 4=96 3=84 2=72 1=60
4-pt. MCAS O/R rubric 4=96 3=84 2=72 1=60
Tests
[✓ Quizzes]
Projects
Presentations → Maybe on Wednesday
Group Work
[✓ Class work]
[✓ Homework]
Other__________________________

Formative assessments

[✓ Verbal Questioning]
Conferencing
[✓ Journals]
[✓ Class Discussion/Participation]
Exit Slips
Other__________________________

Accommodations/Differentiation:

Outline of Monday's Class

- Go over chapter 2 Tests
  - → Trouble areas..?
- Questions on 4.1 ?.
  - → Need to be perfect
- 4.2 → Lecture
- HW: 4.2 G.P., Ex.

Outline of Tuesday's Class

- Questions on 4.2
  - → Long explanation
- HW: More 4.2 practice

Mention extra credit option

Outline of Wednesday's Class

Long Period

★ Open Response Question ★

- Collect 4.2 practice
- Lecture 4.3
- HW: 4.3 G.P.
  - 4.3 exercises

→ Students do On board?

Outline of Thursday's Class

- Answer questions on 4.3
- Any 4.1-4.3 ?'s
- If time, start 4.4
  - (not too different)
- HW: Study + 4.4 G.P.

Outline of Friday's Class

4.1-4.4 Quiz with 4.4 as bonus

- Quiz on 4.1-4.3
- Last 10/15 min.
  - → 4.4 Questions
  - → 4.4 Explanation
- HW: 4.4 G.P. + Ex

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

[✓ 10.N.1]	[✓ 10.N.3]	12.N.1	AI.N.1	AI.N.3	AII.N.1
[✓ 10.N.2]	10.N.4	12.N.2	AI.N.2	AI.N.4	AII.N.2
PC.N.1					

Patterns Relations and Algebra

[✓ 10.P.1]	[✓ 10.P5]	12.P.1	[✓ 12.P.5]	12.P.9	12.P.13
[✓ 10.P.2]	[✓ 10.P.6]	12.P.2	[✓ 12.P.6]	12.P.10	
[✓ 10.P.3]	[✓ 10.P.7]	12.P.3	12.P.7	12.P.11	
[✓ 10.P.4]	[✓ 10.P.8]	12.P.4	12.P.8	12.P.12	
AI.P.1	AI.P.3	AI.P.5	AI.P.7	AI.P.9	AI.P.11
AI.P.2	AI.P.4	AI.P.6	AI.P.8	AI.P.10	AI.P.12
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

10.G.1	10.G.8	12.G.4	G.G.6	G.G.13	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
10.G.7	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability					Measurement			
10.D.1	12.D.2	12.D.6	AI.D.3	PC.D.2	10.M.1	12.M.1	G.M.3	PC.M.2
10.D.2	12.D.3	12.D.7	AII.D.1	PC.D.3	10.M.2	12.M.2	G.M.4	
10.D.3	12.D.4	AI.D.1	AII.D.2	PC.D.4	10.M.3	G.M.1	G.M.5	
12.D.1	12.D.5	AI.D.2	PC.D.1	PC.D.5	10.M.4	G.M.2	PC.M.1	

Bloom's Taxonomy/ Costa's Levels of Questions

[✓ Knowledge]- Recalling Information

Identify Define Examine Name Describe Tell Label

Comprehension- Understanding meaning

[✓ Summarize] Interpret Estimate Differentiate

[✓ Analysis]- Seeing Parts and Relationships

Analyze Explain Classify Connect Compare

Synthesis- Using Parts of New information to Create a Whole

Prepare Create Formulate Rewrite Compose Generalize

Evaluation- Judging Based on Criteria

Assess Test Support Decide Explain Conclude Compare

North High School MATH Weekly Lesson Plan-Teachers Name
Topic: Advanced Algebra Week Of: 10/11/2010 Period: 1 2 [✓ 3] 4 5 6 7

Weekly Objectives

1. Assessment of Chapter 2
2. Graph Quadratics
3. Understand forms of Quadratic Equations

Instructional Strategies

Students will demonstrate understanding through….

CEEI	Cornell Notes
T4's	Letters
Other______________	

Assessments and Rubrics

WPS students write effectively

Summative Assessments

4-pt. WPS rubric 4=96 3=84 2=72 1=60
4-pt. MCAS O/R rubric 4=96 3=84 2=72 1=60
[✓ Tests]
Quizzes
Projects
Presentations
Group Work
[✓ Class work]
[✓ Homework]
Other_______________________

Formative assessments

Verbal Questioning
Conferencing
Journals
[✓ Class Discussion/Participation]
Exit Slips
[✓ Other Note taking]

Accommodations/Differentiation:

Outline of Monday's Class

COLUMBUS DAY

Outline of Tuesday's Class

- Piecewise Functions
- Answer Ch. 2 Questions
- Review/Prepare for Chapter 2 Test

Outline of Wednesday's Class

- Chapter 2 Test
- HW: 4.1 G.P.
- 4.1 Intro, if time

Outline of Thursday's Class

- 4.1 Lecture
- HW: 4.1 exercises

Outline of Friday's Class

- Go over chapter 2 test
- Lecture on 4.2
- HW: 4.2 G.P
Ex.

Monday

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

[✓ 10.N.1]	10.N.3	12.N.1	AI.N.1	AI.N.3	AII.N.1
[✓ 10.N.2]	10.N.4	12.N.2	AI.N.2	AI.N.4	AII.N.2
PC.N.1					

Patterns Relations and Algebra

10.P.1	[✓ 10.P5]	12.P.1	12.P.5	12.P.9	12.P.13
[✓ 10.P.2]	10.P.6	12.P.2	12.P.6	12.P.10	
[✓ 10.P.3]	[✓ 10.P.7]	12.P.3	12.P.7	12.P.11	
[✓ 10.P.4]	10.P.8	12.P.4	12.P.8	12.P.12	
AI.P.1	AI.P.3	AI.P.5	AI.P.7	AI.P.9	AI.P.11
AI.P.2	AI.P.4	AI.P.6	AI.P.8	AI.P.10	AI.P.12
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

10.G.1	10.G.8	12.G.4	G.G.6	G.G.13	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
10.G.7	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability					Measurement			
10.D.1	12.D.2	12.D.6	AI.D.3	PC.D.2	10.M.1	12.M.1	G.M.3	PC.M.2
10.D.2	12.D.3	12.D.7	AII.D.1	PC.D.3	10.M.2	12.M.2	G.M.4	
10.D.3	12.D.4	AI.D.1	AII.D.2	PC.D.4	10.M.3	G.M.1	G.M.5	
12.D.1	12.D.5	AI.D.2	PC.D.1	PC.D.5	10.M.4	G.M.2	PC.M.1	

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Identify Define Examine Name Describe Tell Label

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North High School MATH Weekly Lesson Plan-Teachers Name

Topic: Advanced Algebra Week Of: 10/11/2010 Period: 1 2 3 4 5 [✓ 6] 7

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[✓ Tests]

Quizzes

Projects

Presentations

Group Work

[✓ Class work]

[✓ Homework]

Other______________

Formative assessments

Verbal Questioning

Conferencing

Journals

[✓ Class Discussion/Participation]

Exit Slips

[✓ Other Note taking]

Accommodations/Differentiation:

Outline of Monday's Class

COLUMBUS DAY

Outline of Tuesday's Class

~~Piecewise Fun~~

- Answer Ch. 2 Questions
- Review / Prepare for Ch. 2 Test

Outline of Wednesday's Class

- Chapter 2 Test
- HW: 4.1 G.P.
- 4.1 Intro. if time

Outline of Thursday's Class

- 4.1 Lecture
- HW: 4.1 ex.

Outline of Friday's Class

- Go over ch. 2 ~~test~~
- Lecture on 4.2
- HW: 4.2 G.P. Ex.

Monday

Standards Addressed This Week:
Please circle the standards addressed this week

Number Sense and Operations

[✓ 10.N.1]	10.N.3	12.N.1	AI.N.1	AI.N.3	AII.N.1
[✓ 10.N.2]	10.N.4	12.N.2	AI.N.2	AI.N.4	AII.N.2
PC.N.1					

Patterns Relations and Algebra

10.P.1	[✓ 10.P5]	12.P.1	12.P.5	12.P.9	12.P.13
[✓ 10.P.2]	10.P.6	12.P.2	12.P.6	12.P.10	
[✓ 10.P.3]	[✓ 10.P.7]	12.P.3	12.P.7	12.P.11	
[✓ 10.P.4]	10.P.8	12.P.4	12.P.8	12.P.12	
AI.P.1	AI.P.3	AI.P.5	AI.P.7	AI.P.9	AI.P.11
AI.P.2	AI.P.4	AI.P.6	AI.P.8	AI.P.10	AI.P.12
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

10.G.1	10.G.8	12.G.4	G.G.6	G.G.13	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
10.G.7	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability / Measurement

Data Analysis, Statistics, and Probability					Measurement			
10.D.1	12.D.2	12.D.6	AI.D.3	PC.D.2	10.M.1	12.M.1	G.M.3	PC.M.2
10.D.2	12.D.3	12.D.7	AII.D.1	PC.D.3	10.M.2	12.M.2	G.M.4	
10.D.3	12.D.4	AI.D.1	AII.D.2	PC.D.4	10.M.3	G.M.1	G.M.5	
12.D.1	12.D.5	AI.D.2	PC.D.1	PC.D.5	10.M.4	G.M.2	PC.M.1	

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Analyze Explain Classify Connect Compare

[✓ **Synthesis**]- **Using Parts of New information to Create a Whole**

Prepare Create Formulate Rewrite Compose Generalize

[✓ **Evaluation**]- **Judging Based on Criteria**

Assess Test Support Decide Explain Conclude Compare

Friday - 12/17/2010

Algebra II Honors (p. 3+6)

- Student Prep Before Class
  - Pages 383-5 # 2-55 (evens, all, random)
- Goals
  - Analyze Graphs of Polynomial Functions
- Class Time
  - 5.7 Questions
  - 5.8 Discussion (p. 387-)
    - Use x-intercepts to graph a polynomial function
      - *Example 1
    - Local Max. } (p. 388) → Key Concept Box
    - Local Min. }
      - ☆ No graphing calculator stuff ☆
      - ↳ Stop @ Example 2
- Homework
  - Page 390: # 2-20 (evens)
  - Pages 393-4: G.P. #1-3

Wednesday + Thursday - 12/15-16/2010
Algebra II Honors (p. 3 + 6)

- Student Prep. Before Class
  Pages 379-383 # 1-10 (5.6 G.P.)
- Goals
  Apply the Fundamental Theorem of Algebra
- Class Time
  5.7 Discussion
  Theorem : f(x) w/ degree n (n>0) has at least one solution in the set of complex #'s
  Corollary : There are n solutions to a polynomial with degree n.
  ✓
  What does this mean? → Double/Triple/.. Roots

  Behavior Near Zeros (Mid page 380)
  Double Root
  Triple Root etc..
  Complex Conjugates Theorem
  If a+bi is a zero then a-bi is a zero.
  Irrational Conjugates theorem
  Given $\sqrt{b}$ is irrational + b = rational
  If $a+\sqrt{b}$ is a zero then $a-\sqrt{b}$ is a zero.
  Descartes' Rule of Signs
  P. 381 (bottom)
- Homework
  Pages 383-5 # 2-8 (evens) → # sol'ns
  #10-18 (evens) → find all zeros
  #20-32 (evens)
  #34-40 (evens) → Descartes's Rule
  #53-55 (all) → Picture

Tuesday - 12/14/2010
Algebra II, Honors (p. 3+6)

- Student Prep. Before Class
  Pages 374-5 #2-18 (ev.) → ~~Thu~~(Friday)
  #20-32 (ev.) → (Monday)
- Goals
  Asess 5.4-5.6 Knowledge
- Class Time
  Go over any last second questions
  Hand out 5.4-5.6 Quiz
- Home Work
  Pages 379-383 #1-10 (5.7 G.P.)

Friday + Monday - December 10 + 13, 2010 — Fri. L.p. 7 / Mon. L.p. 1

Algebra II, Honors (p. 3 + 6)

- Student Prep. Before Class
  - Pages 366-367 #22-36 (evens)
  - Define: Rational ~~Root~~ Zero Theorem
- Goals
  - Find Rational Zeros
- Class Time
  - -5.5 Questions
  - -5.6 Discussion (p. 370)

Day 1
- → Rational Zero Theorem
  - ↳ Described on top of 370 (very well!)

$$\frac{p}{q} = \frac{\text{factor of constant term}}{\text{factor of leading coefficient}}$$

- • List possible rational zeros
- • Find zeros when leading coefficient is 1
  - ① List possible rational zeros
  - ② Test using synthetic division (Ex. 2, p. 371)
  - ③ Factor trinomial

Day 2
- • Find zeros when leading coefficient is not 1
  - Page 372: Ex. 3

- Homework
  - Pages 374-375 #2-18 (evens) → Day 1
  - #20-32 (evens) → Day 2

Wednesday + Thursday - December 8+9, 2010 Wed. (L. p. 4)
Algebra II Honors (p. 3+6) Thurs. (L. p. 6)

- Student Prep. Before Class
  - Page 357 #30-52 (evens)
  - Look @ 5.5
- Goals
  - Apply the Remainder and Factor Theorems
- Class Time
  - 5.4 Questions
  - 5.5 Discussion (p. 362)

Day 1

→ Polynomial long division

→ Use polynomial long division with a linear divisor

→ Remainder theorem

◎ If a polynomial $f(x)$ is divided by $x-k$, then the remainder is $r = f(k)$

★ For this reason, sometimes synthetic substitution is sometimes called synthetic division

→ Use synthetic division (p. 363 Ex. 3)

Day 2

→ Factor Theorem

A polynomial $f(x)$ has a factor $x-k$ iff $f(k)=0$

◦ Factor a polynomial (Ex 4)

◦ Example 5

- Homework
  - Day 1: 2-20 (evens) → p. 366
    G.P. 3-9 → pp. 364-5
  - Day 2: 22-36 (evens) → pp. 366-7
    Define: Rational ~~Root~~ Zero Theorem

Tuesday - December 7, 2010 L. p. 3

Algebra II, Honors (p. 3 +6)

- Student Prep. Before Class
  - Pages 356-7 # 2-28 (evens)
- Goals
  - Assess 5.1-5.3 Knowledge
- Class Time
  - Hand out 5.1-5.3 Quiz
  - Finish any 5.4 stuff
- Homework
  - Page~~s~~ ~~357~~ 357 # 30-52 (evens)
  - Look @ 5.5

Monday - December 6, 2010 (L. P. 2)

Algebra II, Honors (p. 3+6)

- Student Prep. Before Class
  - Pages 349-350 #4-46 (evens)
- Goals
  - Factor and Solve Polynomials
- Class Time
  - 5.3 Questions (5.1-5.3 Quiz tomorrow)
  - Start 5.4 Discussion (P. 353)
    - Review previous factoring knowledge
    - PATTERNS (p. 354 - 'Key Concept')
      - Sum of two cubes
      - Difference of two cubes
    - Factor by grouping
    - Factor polynomials in quad. form
- Homework
  - Study for 5.1-5.3 Quiz
    - ↳ TOMORROW!
  - Pages 356-357
    - #2-28 (evens)

Friday - December 3, 2010

L. P. 1

Algebra II, Honors (p. 3 + 6)

- Student Prep. Before Class
  - Completed 5.2 understanding
  - 5.3 G.P. (#1-6 on pp. 346-8)
- Goals
  - Add, Subtract, Multiply Polynomials
- Class Time
  - 5.3 Lecture (p. 346)
    - → Vertically vs. Horizontally
      - Add
      - Subtract
      - Multiply

      } Polynomials
    - → Multiply 3 polynomials
      - P. 347: Key Concept Box
        - → Shortcuts/Patterns
- Homework

Pages 349-350:
#4-14 - Sum/Diff. Poly.
#16-24 - Product w/ 2 polys.
#28-36 - Product w/ 3 polys.
#38-46 - Poly product patterns
#48, 50 - Good geometry applications

☆ 5.1-5.3 Quiz next week ☆

☆ Ask about field trip!

Thursday + Wednesday

Thursday – December 2, 2010 — Thurs → L. p. 7

Wednesday – ~~November~~ December 1, 2010 — Wed → L. p. 6

Algebra II Honors (p. 3+6)

- Student Prep. Before Class
  - Ex. 2-36 (ev.) p. 333
  - G.P. 1-12 pp. 337-341
- Goals
  - Review 5.1
  - Begin 5.2: Polynomial Functions (ID + Graph)
- Class Time
  - Homework Questions
    - → Any necessary 5.1 review
  - 5.2 Lecture (p. 337)
    - → Polynomial Function
      - Leading coefficient
      - Degree
      - Constant Term
      - Standard Form
        - ↳ Rules
    - → Direct Substitution
    - → Synthetic Substitution
    - → End Behavior of Polynomial Functions
      - → Key Concept Box (p. 339)
        - → What does $x \to$ as $f(x) \to \pm\infty$
    - → Graph Polynomial Functions
      - → Graph w/ $x = -3 \ldots 0 \ldots 3$
- Homework

Pages 341-3: #4-8 (ev.) – ID, degree, type, leading coeff....
#10-14 (ev.) – Direct Substitution
5.2 #16-22 (ev.) – Synthetic Substitution
#24-36 (ev.) – End Behavior
#38-50 (ev.) – Graph polynomial fcns.

Pages 346-8: #1-6 (G.P.)
5.3

Tuesday - November 30th, 2010

L. p. 4

Algebra II, Honors (p. 3 + 6)

- Student Prep Before Class
  - Studied Chapter 4
- Goals
  - Assess Chapter 4 knowledge
- Class Time
  - Hand out Chapter 4 Test
  - Class time only
- Homework
  - Ex. 2-36 (ev.) p. 333
  - G.P. 1-12 pp. 337-341

} Previous HW

Monday - November 29th, 2010

L. p. 3

Algebra II, Honors (p. 3+6)

- Student Prep. Before Class
  - Page 323 #1-32, "Chapter Test"
- Goals
  - Fully prepare for Chapter 4 Test
- Class Time
  - Collect HW for grading
  - Go over 4.7-4.10 Quiz
    - → Return graded papers
  - Answer any final questions
- Homework
  - STUDY your butt off!!

11/15 - 11/19 , 11/22-23

Algebra II (Honors + College)

- Class Time
  Review sections 1.1-1.7
  2.1-2.8
  4.1-4.9/4.10
  ↑ Col. ↑ Hon.
  → 3-4 Sections per day
- Homework
  Monday: Page 975 # 2-34 (evens)
  976 # 2-30 (evens)
  977 # 2-30 (evens)
  Tuesday: Page 979 # 2-68 (evens)
  Wednesday: Page 980 # 2-28 (evens)
  981 # 2-28 (evens)
  Thursday: Page 984 # 2-18 (evens)
  985 # 2-26 (evens)
  Friday: Page 986 # 2-26 (evens)
  987 # 2-44 (evens)
  Monday: Page 1001 # 2-22 (evens)
  1005 # 2-8 (evens)
  991 # 2-8 (evens)

☆ Homework will be corrected and graded daily ☆

Algebra II Honors

- Before Break
  - → Continue review: Brief Chapter 2
    - ↳ $y=mx+b$
  - Review 4.1-4.6 Test
  - 4.7-4.10 if time allows
- Over Break
  - → Homework: Chapter 4 Test: Page 323 → Chapter 4 Test (1-32)
    - ↳ Graded when we get back
- After Break
  - → Monday: Turn in Chapter 4 Test HW
    - Go over Chapter 4 Questions
    - Complete Review
  - → Tuesday: Chapter 4 Exam in class
  - → Wednesday: Chapter 5!

Algebra II , Honors

- Finish reviewing Chapter 1
- Skip Chapter 2 ?
- Review Chapter 4 (before break)
  → during &
- Review Chapter 4 (after break)
- Chapter 4 Test after break

Break HW
Page 323 : Chapter Test (1-32)

Grading

● 6 homeworks form back of book	15%
→ — more ?	
● Vacation Assignment	
→ — any ch 4 : no; 40% enough	
● 4.1 - 4.6 Retests (that were taken home)	10%
→	
● 4.7 - 4.10 Test (that was done in class)	10%
→	
∘ ch 4 test	20%
ch 5 test(s)	20%
notebook	25%

Friday 11/12/2010

Algebra II Honors (p. 3+6)

- Student Prep. Before Class
  - Fixed 4.1-4.6 Test
  - 5.1 G.P.

P. 321 # 41
P. 322 # 48

- Goals
  - Understand rules of exponents
- Class Time
  - Collect 4.1-4.6 Tests, revised
  - 5.1 Lecture

$$x^m \cdot x^n = x^{m+n}$$

$$(x^m)^n = x^{m \cdot n}$$

$$(xy)^m = x^m y^m$$

$$x^{-m} = \frac{1}{x^m}$$

$$x^0 = 1$$

$$\frac{x^m}{x^n} = x^{m-n}$$

$$\left(\frac{x}{y}\right)^m = \frac{x^m}{y^m}$$

- Homework
  - Ex. 2-36 (ev.) → p. 333 (5.1)
  - G.P. 1-12 → pp. 337-341 (5.2)

Wednesday 11/10/2010

Algebra II Honors (p. 3+6)

- Student Prep - Before Class
  - Review sheet (4.7-4.10)
    - → given with answers
- Goals
  - Assess knowledge on 4.7-4.10
- Class Time
  - 10/15 minutes → Questions
  - 30 minutes → 4.7-4.10 Assessment
  - 2 minutes → General exponential rules

$$\left.\begin{array}{r} \frac{x^p}{x^q} = x^{p-q} \\ x^p \cdot x^q = x^{p+q} \end{array}\right\} \underline{\text{Must have same base}}$$

$$(x^p)^q = x^{p \cdot q}$$

$$x^{-p} = \frac{1}{x^p}$$

- Homework
  - Take 4.1-4.6 Test
    - → Fix wrong answers for +1/2 credit
    - → Give correct answers for lack of answers and get full credit
  - ↳ Due Friday
  - 5.1 G.P. 1-8 (pp. 330-333)

$$\begin{array}{r} {}^{1}36 \\ 3 \\ \hline 108 \end{array} \qquad \begin{array}{r} {}^{2}18 \\ 3 \\ \hline 54 \end{array} \qquad \begin{array}{r} 12 \\ 9 \\ \hline 1080 \end{array}$$

$R=(90-3x)(12+x)$

$R=1080+90x-36x-3x^2$

$R=-3x^2+54x+1080$

$= \cancel{-3(x^2-18x-36)}$

$=$

$=-3(x^2-18x)+1080$

$=-3(x^2-18x+81)+1080-(81)(-3)$

$=-3(x^2-18x+81)+1080+243$

$=-3(x^2-18x+81)+\cancel{351}\ 1323$

$=-3(x-9)^2+\cancel{351}\ 1323$

$$\boxed{(9, 1323)}$$

$$\begin{array}{r} 81 \\ 3 \\ \hline 243 \end{array} \qquad \begin{array}{r} 1080 \\ 243 \\ \hline 1323 \end{array}$$

$R=(90-3(9))(12+9)$

$R=(90-27)(21)$

$R=(63)(21)$

$$\begin{array}{r} 63 \\ 21 \\ \hline 63 \\ 126 \\ \hline 1323 \end{array}$$

$$\begin{array}{r} {}^{2}18 \\ 3 \\ \hline 54 \end{array} \qquad \begin{array}{r} 81 \\ \times 3 \\ \hline 243 \end{array} \qquad \begin{array}{r} 351 \\ -243 \end{array}$$

$-3(x-9)(x-9)+351$

$-3(x^2-18x+81)+351$

$-3x^2+54x-243+351$

$-3x^2+54x+108$

Tuesday 11/9/2010

Algebra II Honors (p. 3+6)

- Student Prep- Before Class
  - 4.10 G.P. 1-7 → (pp. 310-311)
    Ex. 2-20 (ev.), 32-36 (ev.) → (pp. 312-313)
- Goals
  - Finish understanding how to find the equation of a graphical representation of a quadratic.
  - Prepare for 4.7-4.10 Quiz/Test
- Class Time
  - Finish 4.10
    → See yesterday's lesson plan
  - Start general review
  - Handout practice/review sheet with answers
- Homework
  - Review sheet with answers.
    ↳ Pages 321-322
    #35-48

$-2 = a+b+c$

$0 = a-b+c$

$-15 = 4a+2b+c$

Monday 11/8/2010

Algebra II, Honors (p. 3+6)

- Student Prep. Before Class
  - G.P. #1-7 (p300-303) -4.9
  - Ex. #8,16,20,26,34,36,46,50 (p. 304?) -4.9
- Goals
  - Understand how to graph quadratic inequalities
  - Understand how to find the quadratic equation of a given parabola
- Class Time
  - 4.9 Questions
  - Start 4.10 Lecture

    3 possibilities: ① Given vertex and point
    → Example 1
    ② Given x-intercepts and point
    → Example 2
    ③ Given 3 points
    → Example 3
- Homework
  - 4.10 G.P. #1-7 pp. 310-311
    Ex. #2-20 ev. } pp. 312-313
    #32-36 ev.

*Mention chapter 5 before leaving them for the weekend
↳ basic rules of exponents

Friday 11/5/2010

Algebra II, Honors (p. 3+6)

- Student Prep. Before Class
  - 2-44 (ev.), 32-48 (ev.) → p. 296
  - Start 4.9 G.P.
- Goals
  - Understand how to use the quadratic formula
  - Graph and solve quadratic inequalities
- Class Time
  - Go over any 4.8 that was not covered yesterday ☆Discriminant☆
  - Questions on 4.8 homework
  - 4.9 Lecture
    - ① → Same thing except test a point and see where it is true.
      → Shade correct area (examples 1,2,3,5)
    - ② → Using a table (example 4)
    - ③ → Graphing w/ graphing calc (example 6)
    - ④ → Using zeroes and a number line
- Homework
  - G.P. # 1-7 (pp. 300-303)
  - Ex. # 8, 16, 20, 26, 34, 36, 46, 50

Thursday 11/4/2010

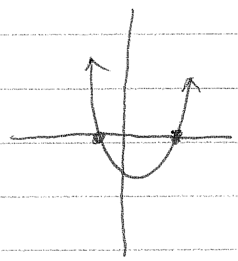
Algebra II, Honors (p. 3+6)

- Student Prep. Before Class
  - 24-38 (ev.), 50 (pp. 288-289) → (4.7)
  - G.P. #1-10 (pp. 292-295) → (4.8)
- Goals
  - Understand how to complete the square
  - Understand how to use the quadratic formula and why it works
- Class Time
  - Quadratic formula! $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

    Works for everything, even if it factors

    Always!
  - Memorize it!
  - Discriminant: $\sqrt{b^2-4ac}$ Key Concept (p. 294)

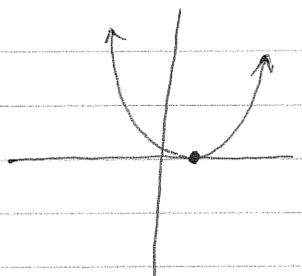
$b^2-4ac > 0$



2 real roots

2 x-int.

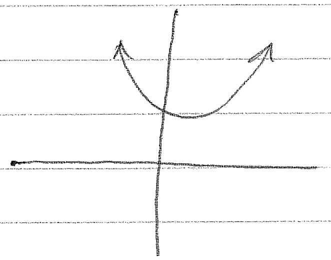
$b^2-4ac = 0$



1 real root

1 x-int.

$b^2-4ac < 0$



2 imaginary roots

0 x-int.

- Homework
  - → 4-22 (ev.), 32-48 (ev.) (p. 296)
  - → Look @ 4.9 (Start G.P.

→ $ax^2+bx+c=0$

→ In order to complete the square, a must $=0$

→ $a\left(x^2+\frac{b}{a}x\right)+c=0$

→ $\underbrace{x^2+\frac{b}{a}x}_{\text{Complete the square}} = \frac{-c}{a}$

→ $x^2+\frac{b}{a}x+\left(\frac{1}{2}\cdot\frac{b}{a}\right)^2 = \frac{-c}{a}+\left(\frac{1}{2}\cdot\frac{b}{a}\right)^2$

→ $\left[x^2+\frac{b}{a}x+\frac{b^2}{4a^2} = \frac{-c}{a}+\frac{b^2}{4a^2}\right]\cdot 4a^2$

→ $4a^2x^2+4abx+b^2=-4ac+b^2$

→ $(2ax+b)^2=b^2-4ac$

→ $2ax+b=\pm\sqrt{b^2-4ac}$

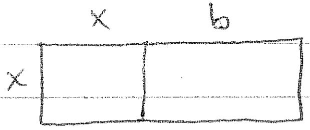
→ $2ax=-b\pm\sqrt{b^2-4ac}$

→ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

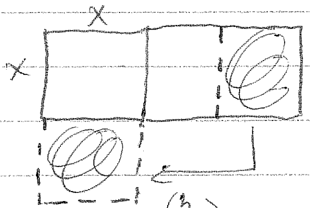
Wednesday 11/3/2010

Algebra II, Honors (p. 3 + 6)

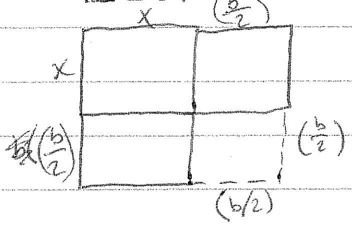
- Student Prep. Before Class
  - 4.7: P. 288-289 # 4-22 (ev.), 42-48 (ev.), 54
  - Looked at 4.8
- Goals
  - Understand the process of "completing the square"
  - Derive the quadratic function
- Class Time
  - Complete the Square:



$\Rightarrow$ Area: $(x+b)x = x^2 + bx$



$\Rightarrow$ Area: $x \cdot x + x\left(\frac{b}{2}\right) + x\left(\frac{b}{2}\right) = x^2 + bx$



$\Rightarrow$ Area: $x \cdot x + \left(\frac{b}{2}\right)x + \left(\frac{b}{2}\right)x + \left(\frac{b}{2}\right)^2$

OR

$\left(x + \frac{b}{2}\right)\left(x + \frac{b}{2}\right)$

$\Rightarrow \left(x + \frac{b}{2}\right)^2$

SO, we had to add $\left(\frac{b}{2}\right)$ to both sides of the equality, not just one side.

  - Do homework examples w/ picture
  - Derive Quadratic Function:
    ☆ (Seperate sheet) ☆
- Homework
  - 24-38 (ev.), 50 (pp. 288-289) $\Rightarrow$ (4.7)
  - G.P. #1-10 (pp. 292-295) $\Rightarrow$ (4.8)

Tuesday 11/2/2010

Algebra II, Honors (p. 3+6)

- Student Prep. Before Class
  - Studied and prepared 4.1-4.6
- Goals
  - Assess 4.1-4.6
- Class Time
  - Give students entire period to do 4.1-4.6 exam
- Homework
  - 4.7 Homework (from Friday)
    P. 288-9: #4-22 (ev.), 42-48 (ev.), 54
  - Look at 4.8

Monday 11/1/2010

Algebra II, Honors (p. 3+6)

- Student Prep. Before Class
  - Pages 288-9: #4-22(ev.), 42-48 (ev.), 54
- Class Time
  - Take any questions from 4.1-4.6
    - ↳ Do on board
- Goals
  - To be completely prepared for 4.1-4.6 exam tomorrow
- Homework
  - STUDY 4.1-4.6 !!

Friday, 10/29/2010

Algebra II, Honors (p. 3+6)

- Student Prep. Before Class
  - Pages 279-280: #4,10,12,20,22,32,38-44 (ev.)
  - Pages 284-287: #2-16 (ev.)
- Goals
  - Finish understanding complex numbers
  - Introduce solving quadratics by completing the square. (4.7)
- Class Time
  - Brief 4.6 Questions (5-10 minutes)
  - 4.7 Lecture
    - Key Concept Box (p. 284)

$$x^2+bx+\left(\frac{b}{2}\right)^2=\left(x+\frac{b}{2}\right)\left(x+\frac{b}{2}\right)=\left(x+\frac{b}{2}\right)^2$$

G.P. 1-3 → How it works

G.P. 4-6 → How to get there

- Write Quadratic Function in Vertex Form

$$\left.\begin{array}{l}\text{Example 6}\\ \text{Example 7}\\ \text{G.P. 13-15}\end{array}\right\}$$

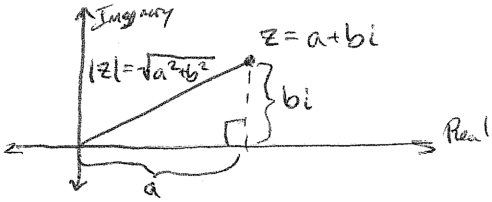
- Homework
  - 4-22 (evens), 42-48 (evens), 54 (Pages 288-289)

Period 3: Long Period

Thursday, 10/28/2010

Algebra II, Honors (p. 3+6)

- Student Prep. Before Class
  - Pages 275-279: #1-18 (G.P.)
- Goals
  - Full understanding of the imaginary unit and complex numbers, in general
- Class Time
  - 4.6 Lecture
    → *See yesterday's lesson plan*
  - Group presenting if there's time
    (Period 3: Use this to go over HW)
  - Absolute Value of a Complex Number
    Notation: $|z|$, for $z = a+bi$
    $|z| = \sqrt{a^2+b^2}$ → Distance between z and origin



⇒ Pythagorean Theorem

- Homework
  - Test on 4.1-4.7 on Tuesday
  - Pages 279-280: #4, 10, 12, 20, 22, 32, 38-44 (evens)
  - Pages 284-287: #2-16 (evens)

Wednesday 10/27/2010

Algebra II, Honors (p. 3+6)

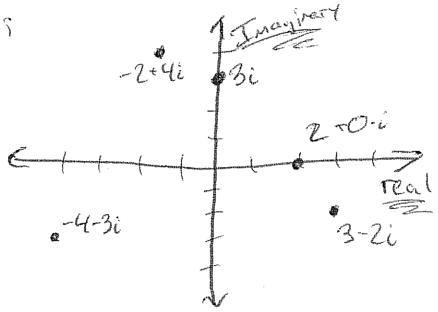
- Student Prep. Before Class
  - 4.5 Ex. #2-30 (evens) → Tuesday
  - 4.5 G.P. 1-20 (P. 266-269) → Monday
- Goals
  - Completely understand evaluating square roots
  - Introduce imaginary numbers
- Class Time
  - Go over 4.5 questions
  - Introduce 4.6: Imaginary Numbers -
    - → $\sqrt{-1} = i$ → Imaginary Unit
    - → $(\sqrt{-1})^2 = (i)^2 = i^2 = -1$

      $= -1$

      Why? $(\sqrt{a})^2 = a$
    - → Like any variable:

      $ai + bi = i(a+b)$
    - → Complex number: $\underset{\text{real}}{\underset{\uparrow}{a}} + \underset{\text{imaginary}}{\underset{\uparrow}{b}}i$
    - → Imaginary number: $b \neq 0$ for $a+bi$
    - → Complex Conjugate: $a+bi$ and $a-bi$

      Why? No i in denominator
    - → Complex Plane:



    - → Absolute Value of a Complex Number (tomorrow)
- Homework
  - Pages 275-279: #1-18 (G.P.)

Tuesday, 10/26/2010

Algebra II, Honors (p. 3+6)

- Student Prep. Before Class
  - Pages 266-269, G.P. #1-20 (4.5)
- Goals
  - Solve equations using square roots
  - Understand parabolic equations + how to graph

    (Quiz 4.1-4.3 (+4.4))
- Class Time
  - Hand back 4.1-4.3 (+4.4) Quizes
  - Go over problem areas, thoroughly!
  - Last 10 minutes:

    Go over any 4.5 Questions
- Homework
  - 4.5 Ex.: #2-30 (evens)
  - Read 4.6 (pp. 275-279)

Monday, 10/25/2010

Algebra II, Honors (p. 3+6)

- Student Prep. Before Class
  - Finish G.P. 1-22 p. 259-262 (4.4)
  - P. 263: 1, 2-10 (ev.), 20, 24, 32 (4.4 ex.)
- Class Goals
  - Understand how to factor $ax^2+bx+c=0$
  - Introduce how to solve using square roots
- Class Time
  - Questions on 4.4?
  - 4.5: Roots
    - Square root, radical, radicand
    - Product / Quotient Properties ($a>0$, $b>0$) p. 266
    - Simplifying roots (factor trees)
    - When solving, $\boxed{\pm}\sqrt{\ }$
    - Rationalizing denominator (p. 267, top)
      - → $\frac{1}{\sqrt{a}} = \sqrt{a}/a$
      - → Using conjugates
- Home work
  - Pages 266-268, G.P. #1-20

Friday 10/22/2010

Algebra II, Honors (p. 6) + (p. 3)

- Student Prep. Before Class
  - Studied 4.1-4.3 (+4.4)
  - G.P. on pages 259-262 #1-22 (Looked at)
- Goals
  - Assess understanding of how to graph quadratic functions and how to factor $x^2+bx+c=0$. (4.1-4.3)
  - Clarify Section 4.4 - Factoring $ax^2+bx+c=0$
- Class Time
  - First 25/30 minutes
    - → QUIZ! (4.1-4.3)(+4.4)
  - Last 10/15 minutes
    - → Section 4.4: (p. 259-262)

$$ax^2+bx+c = (kx+m)(lx+n)$$
$$= klx^2+(kn+lm)x+mn$$

↳ Use G.P. as examples on board

★ Before you do anything, look for a common factor

- Homework
  - Finish G.P. #1-22 on pages 259-262
  - Pages 263
    #1, 2-10 (evens), 20, 24, 32

★ Good examples for class ★

① $2x^2-14x-36$
$2(x-9)(x+2)$

② $4x^2-9x+2$
$(4x-1)(x-2)$

③ $2w^2+w+3$
(cannot be factored)

④ $3s^2-24$
$3(s^2-8)$

⑤ $9x^2+15x-36$
$3(3x-4)(x+3)$

⑥ $36n^2-9$
$(6n-3)(6n+3)$

3 3 OR

$9(4n^2-1) = 9(2n-1)(2n+1)$

Thursday 10/21/2010

Algebra II, Honors (p. 3) + (p. 6)

- Student Prep Before Class
  - Pages 252-5: G.P. #1-12 (4.3)
  - Pages 255-6: #4, 6, 12, 16, 22, 26 (4.3)
- Goals
  - ~~Asses~~ Identify any troubled areas for graphing a quadratic function.
  - Fully understand how to factor $x^2+bx+c=0$
  - Brief introduction on how to factor $ax^2+bx+c=0$
- Class Time
  - Return graphing quadratic functions homework
    → Go over any trouble areas
  - Answer any questions on factoring $x^2+bx+c=0$
  - Fully prepare for 4.1-4.3 (+4.4) Quiz, which will be tomorrow.
    ↳ Vertex Form
  - Last 5 minutes:
    → Introduce Section 4.4 → Factoring $ax^2+bx+c=0$
- Homework
  - Study 4.1-4.3! (+4.4 for extra credit)
  - Pages 259-262: (Study and) look at G.P. #1-22

Wednesday 10/20/2010

Algebra II, Honors (p.6)

- Student Prep Before Class
  - Page 249 # 6, 14, 18, 22, 26, 40 (4.2)
  - Pages 252-5 # 1-12 (4.3, G.P.)
- Goals
  - Understand how to graph quadratic functions and manipulate them in several ways.
- Class Time
  - Questions on 4.1
  - Questions on ~~4.1~~ 4.2
  - If Time...
    - 4.3 Lecture (p. 252) - G.P. HW on this
      - Factoring: $x^2+bx+c = (x+m)(x+n)$
        $= x^2+(m+n)x+mn$
        "What adds to b and multiplies to c?"
      - Zeros: For $y=a(x-p)(x-q)$
        p and q are the "zeros" → x-int.
      - Roots: Solutions to a quadratic equation
- Homework:

~~Optional~~ 4.1: Finish all old problems

4.2: Finish all old problems

4.3: Pages 255-6: # 4, 6, 12, 16, 22, 26

$\left.\begin{matrix}4.1\\4.2\end{matrix}\right\}$ Specific ?'s tomorrow

$\left.\begin{matrix}4.1\\4.2\\4.3\end{matrix}\right\}$ Quiz Friday (4.1-4.3)

Wednesday 10/20/2010

Algebra II, Honors (p.3)

PASS IN HOMEWORK

- Student Prep Before Class
  - Page 249 : # 6, 14, 16
- Goals + Class Time
  - REALLY NEED TO UNDERSTAND HOW TO GRAPH QUADRATIC FUNCTIONS! ⇒ Group Work?
  - Assess using open response question! Question + Answer written on sheet! p. 241 #53
  - Introduce Section 4.3 (P. 252):
    - Factoring : $x^2+bx+c = (x+m)(x+n)$

      $= x^2+(m+n)x+mn$

      Ask yourself: "What adds to b and multiplies to c?"
    - Zeros: For $y=a(x-p)(x-q)$, p and q are the "zeros" → x-ints.
    - Monomial, Binomial, Trinomial, Polynomial
    - Roots: Solutions to a quadratic equation
- Homework
  - Pages 252-255: G.P. #1-12 (4.3)
  - Pages 255-256: #4, 6, 12, 16, 22, 26 (4.3)

} Quiz Friday (4.1-4.3)

☆ ~~Better explanation of extra credit~~ ☆

Show work, explain in words

Tuesday 10/19/2010

Algebra II, Honors (p. 6)

- Student Prep Before Class
  - Section 4.1: P. 240-1 #1-6, 8-32 (evens)
  - Section 4.2: P. 246-8 #1-16 (G.P.)
    P. 249 #4, 10, 20, 28

- Goals
  - Full understanding of how to graph quadratic functions in standard form
  - Understand how to graph quadratic functions in vertex and intercept forms.
- Class Time
  - Do #24, 28 from p. 240-241
  - ~~Answer any Section 4.1 specific questions~~ → Tomorrow
  - Lecture 4.2
    - Vertex Form: $y = a(x-h)^2 + k$
      - Evaluated: $y = ax^2 + bx + c$
      - h units horizontal; k units vertical
      - Vertex: (h, k) ; $a > 0$ vs. $a < 0$
      - Axis of symmetry: $x = h$
    - Use G.P. questions to show examples
    - Intercept Form: $y = a(x-p)(x-q)$
      - Evaluated: $y = ax^2 + bx + c$
      - Intercepts: $(p, 0)$; $(q, 0)$
      - Axis of Symmetry: $\frac{(p+q)}{2}$ ← x-coord. of vertex

- Homework
  - Section 4.2: P. ~~240-1~~ 249 #6, 14, 18, 22, 26, 40
  - Section 4.3: P. 252-255 #1-12 (G.P.)

Class Ends: 12:55

Quiz Friday?

Tuesday, 10/19/2010

Algebra II, Honors (p. 3)

- Student Prep Before Class
  - P. 246-248 : G.P. #1-16
  - P. 249 : #4, 10, 20, 28
- Goals
  - Understand how to graph quadratics in vertex and intercept forms
- Class Time
  - Answer 4.2 questions
    → Need to understand fully!!
    (Have trouble)
- Homework
  - Page 249 : # 6, 14, 16 => Will be collected

CLASS ENDS

P.3 → ~~9:37~~ 10:00
P.6 → ~~12:32~~ 12:55

Monday, 10/18/2010

~~Friday, 10/15/2010~~

Algebra II, Honors (p. 3+6)

☆Extra Credit☆ Due Friday
Pages 141 - 144
One exercise from each section (2.1-2.8) } ⑧ Problems
Show ALL work

- Student Prep. Before Class
  - Section 4.1 Exercises:
    Pages 240-241, # 1-6, 8-32 (evens)
- Goals
  - Full understanding of how to graph quadratic functions in standard form.
  - Introduction and brief understanding of how to graph quadratic functions in vertex form and intercept form.
  - Understand that they are all the same (standard, vertex, and intercept forms)
- Class Time
  - Return Chapter 2 Tests
    → Briefly go over trouble areas
  - Answer a few questions on 4.1 homework
    → they need to understand this
  - Lecture 4.2
    - Vertex Form: $y = a(x-h)^2 + k$
      - Evaluated: $y = ax^2 + bx + c$
      - h units horizontal; k units vertical
      - Vertex: (h, k) $a < 0$ vs. $a > 0$
        → Sound familiar?! (Abs. Value fctns)
      - Axis of symmetry: $x = h$
    - Example (G.P.)
    - Intercept Form: $y = a(x-p)(x-q)$
      - Evaluated: $y = ax^2 + bx + c$
      - Intercepts: $(p, 0)$ and $(q, 0)$
      - Axis of symmetry: $(p+q)/2$

FOIL

$a < 0$ vs. $a > 0$ } Same

- Homework
  - Finish G.P. #1-~~8~~16 (pp. 246-248)
  - Exercises 4, 10, 20, 28 on page 249

CLASS ENDS

P.3 → ~~9:37~~ 9:37

~~LONG~~ P.6 → ~~12:35~~ 12:32

Friday, 10/15/2010

~~Thursday, 10/14/2010~~

Algebra II, Honors (periods 3+6)

- Student Prep. Before Class
  - Section 4.1 G.P. (Pages 236-239, #1-8)
- Goals
  - Know how to interpret and graph the quadratic function in standard form ($y = ax^2 + bx + c$)
- Class Time
  - Lecture 4.1
    - Quadratic function
      - Standard form $y = ax^2 + bx + c$ ($a \neq 0$, why?)
      - $y = x^2$ ☆ Parabola ☆
    - Vertex: Lowest/Highest point of a parabola
    - Axis of Symmetry: Divides into mirror image
    - Graphing: 2 Options (Give them a choice)
      - ① Transformations from $y = x^2$
      - ② x, y Table
      - ↳ $a < 0$ ∩ ; $a > 0$ ∪
        - ↳ Sound familiar?! (Abs. Value functions)
    - → Mention Key Concept Box on p. 237
      - Axis of symmetry: $x = \frac{-b}{2a}$
      - Vertex: $\left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right)$
    - Max/Min Values
- Homework
  - Pages 240-24
    - Ex. 1-6, ~~9-31~~ 8-32 (evens)
      - → I know graphs are annoying
      - → Get some graph paper and spend time on this
        - → Really important!!

CLASS ENDS
P.3 → 9:37
P.6 → 12:55

Thursday, 10/14/2010

~~Wednesday, 10/13/2010~~

Algebra II, Honors (periods 3+6)

- Student Prep. Before Class
  - Studied Chapter 2
  - Prepared notebook for proper use
- Goals
  - Prove understanding of Chapter 2 through assessment test.
- Class Time
  - Chapter 2 Test
  - If time permits: 4.1 Lecture introduction
- Homework
  - Section 4.1 Guided Practice #1-8 (pp. 236-239)

CLASS ENDS
LONG P. 3 → 10:00
P. 6 → 12:55

Wednesday, 10/13/2010
+
Tuesday, 10/12/2010

Algebra II, Honors (periods 3+6)

- Student Prep. Before Class
  - All Chapter 2 homework completed
  - Page 145: Chapter Test (1-27)
  - Prepared questions for complete understanding of chapter.
- Goals
  - Period 3: Brief understanding of step functions and Piecewise Functions
  - Periods 3+6: Completely prepared for Test on Chapter 2 Test
- Class Time
  - Period 3:
    - First 20 minutes on 2.7 Extension (131 ish)
      - Piecewise Functions: At least 2 equations w/ boundaries
        Keep endpoints in mind (open/closed)
      - Step Function: Example in book
        Endpoints are most important
  - Periods 3+6:
    - Questions on previous sections
    - Questions on 1-27
    - Make sure to cover:
      - Identify D/R
      - Tell whether function is linear
      - Given 2 points, find slope
      - Graph equation
      - Word problem w/ equation
      - $y=mx+b$ ($m=?$; $b=?$)
      - Scatter plot
      - Graph absolute value function
      - Graph inequality

Period 6: 26+27

- Homework
  - Study!!
  - Take advantage of "open notebook"

P. 3 ends @ 10:00
P. 6 ends @ 12:55

Thursday, 10/7/2010

ALGEBRA II, COLLEGE + HONORS

- Student prep. before class
  - A previous knowledge of scatter plots and regression lines.
  - Little graphing calculator knowledge
- Materials needed
  - Enough graphing calculators for at least one per 2 people
  - Step-by-step thing on how to graph scatter plots and regression lines.
    - → Enough for one per graphing calculator.
- Goals
  - Learn/Understand how to plot a scatter plot and create a regression line which best fits the data, using a graphing calculator.
  - Light understanding of how to use a graphing calculator (hopefully more than before).
- Class Time → More examples: Page 118 #19, 20
  - Handout step-by-step sheet
  - Handout graphing calculators, as necessary
  - Go over handout steps aloud with them.
  - Walk around as necessary and let them go ahead if they would like
  - Go over any homework questions if there is extra time and they want to.
- Homework
  - Finish all section HW
  - Page 145: Chapter Test (1-27)
    - ⇒ For YOUR benefit
  - Bring all questions on Tuesday (Review)
    - ⇒ Test Wednesday

Step 0. Setup

Set floating point mode, if you haven't already. [MODE] [▼] [ENTER]

Go to the home screen [2nd MODE *makes* QUIT] [CLEAR]

Turn on diagnostics with the [DiagnosticOn] command. [2nd 0 *makes* CATALOG] [x⁻¹]
Don't press the [ALPHA] key, because the CATALOG command has already put the calculator in alpha mode.

Scroll down to DiagnosticOn and press [ENTER] twice.

Step 1. Make the Scatter Plot

Turn off other plots. [Y=]
Cursor to each highlighted = sign or Plot number and press [ENTER] to deactivate.

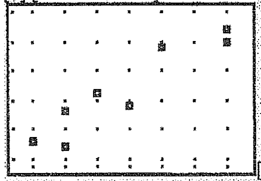
Enter the numbers in two statistics lists. [STAT] [1] selects the list-edit screen.

Cursor onto the label L1 at top of first column, then [CLEAR] [ENTER] erases the list. Enter the x values.

Cursor onto the label L2 at top of second column, then [CLEAR] [ENTER] erases the list. Enter the y values.

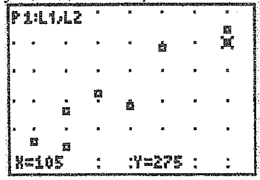
Set up the scatter plot. [2nd Y= *makes* STAT PLOT] [1] [ENTER] turns Plot 1 on.
[▼] [ENTER] selects scatter plot.
[▼] [2nd 1 *makes* L1] ties list 1 to the x axis.
[▼] [2nd 2 *makes* L2] ties list 2 to the y axis.

Plot the points.



[ZOOM] [9] automatically adjusts the window frame to fit the data, but does not adjust the grid spacing.

Check your data entry by tracing the points. [TRACE] shows you the first (x,y) pair, and then [▶] shows you the others. They're shown in the order you entered them, not necessarily from left to right.

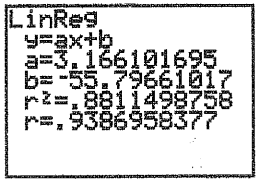


Step 2. Perform the Regression

Set up to calculate statistics. [STAT] [▶] [4] pastes LinReg(ax+b) to the home screen.
[2nd 1 *makes* L1] [,] [2nd 2 *makes* L2] defines L1 as x values and L2 as y values.

Set up to store regression equation. [,] [VARS] [▶] [1] [1] pastes Y1 into the LinReg command.

Make it so! [ENTER] shows correlation and regression statistics *and* pastes the regression equation into Y1.



```
LinReg
 y=ax+b
 a=3.166101695
 b=-55.79661017
 r²=.8811498758
 r=.9386958377
```

Write down a (slope), b (y intercept), r (correlation coefficient).

Correlation Coefficient, r

Look first at r, the coefficient of linear correlation. We usually round it to two decimal places unless it's very close to ±1. As discussed in class, a positive correlation means that y tends to increase as x increases, and a negative correlation means that y tends to decrease as x increases.

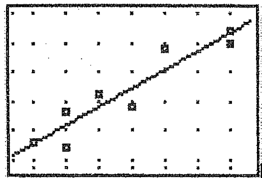
Regression Line, $\hat{y} = ax+b$

Write the equation of the line using $\hat{y}$, not y, to indicate that this is a prediction. b is the y intercept, and a is the slope. Your book rounds both of them to four decimal places, so you would write the equation of the line as

$\hat{y} = 3.1661x - 55.7966$

Step 3. Display the Regression Line

Show line with original data points.



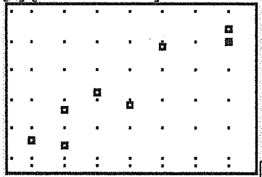
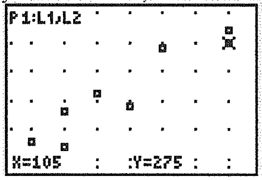
[GRAPH]

X (L_1)	Y (L_2)
100	257
102	264
103	274
101	266
105	277
100	263
99	258
105	275

Step 0. Setup

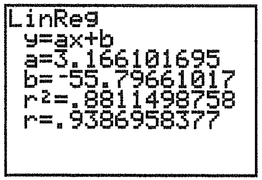
Set floating point mode, if you haven't already.	[MODE] [▼] [ENTER]
Go to the home screen	[2nd MODE *makes* QUIT] [CLEAR]
Turn on diagnostics with the [DiagnosticOn] command.	[2nd 0 *makes* CATALOG] [x^{-1}] Don't press the [ALPHA] key, because the CATALOG command has already put the calculator in alpha mode. Scroll down to DiagnosticOn and press [ENTER] twice.

Step 1. Make the Scatter Plot

Turn off other plots.	[Y=] Cursor to each highlighted = sign or Plot number and press [ENTER] to deactivate.
Enter the numbers in two statistics lists.	[STAT] [1] selects the list-edit screen. Cursor onto the label L1 at top of first column, then [CLEAR] [ENTER] erases the list. Enter the x values. Cursor onto the label L2 at top of second column, then [CLEAR] [ENTER] erases the list. Enter the y values.
Set up the scatter plot.	[2nd Y= *makes* STAT PLOT] [1] [ENTER] turns Plot 1 on. [▼] [ENTER] selects scatter plot. [▼] [2nd 1 *makes* L1] ties list 1 to the x axis. [▼] [2nd 2 *makes* L2] ties list 2 to the y axis.
Plot the points.	 [ZOOM] [9] automatically adjusts the window frame to fit the data, but does not adjust the grid spacing.
Check your data entry by tracing the points.	[TRACE] shows you the first (x,y) pair, and then [▶] shows you the others. They're shown in the order you entered them, not necessarily from left to right. 

Step 2. Perform the Regression

Set up to calculate statistics.	[STAT] [▶] [4] pastes LinReg(ax+b) to the home screen. [2nd 1 *makes* L1] [,] [2nd 2 *makes* L2] defines L1 as x values and L2 as y values.
Set up to store regression equation.	[,] [VARS] [▶] [1] [1] pastes Y1 into the LinReg command.
Make it so!	[ENTER] shows correlation and regression statistics *and* pastes the regression equation into Y1.



```
LinReg
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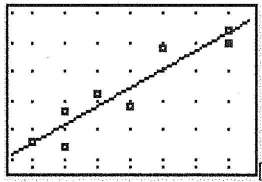
Regression Line, ŷ = ax+b

Write the equation of the line using ŷ, not y, to indicate that this is a prediction. b is the y intercept, and a is the slope. Your book rounds both of them to four decimal places, so you would write the equation of the line as

ŷ = 3.1661x − 55.7966

Step 3. Display the Regression Line

Show line with original data points.



[GRAPH]

X (L_1)	Y (L_2)
100	257
102	264
103	274
101	266
105	277
100	263
99	258
105	275

P. 3 ends @ 10:00
P. 6 ends @ 12:55

Wednesday, 10/6/2010

Algebra II, Honors (p. 3+6)

- Student prep. before class
  - Period 3: Pages 127-128
    Ex. 1-8, 14-26 (evens), 32
    Looked over 2.8
  - Period 6: Pages 127-128
    Ex. 24-32 (evens)
    Page 131
    Ex. 1-7
    Looked over 2.8
- Goals
  - Graph linear inequalities in two variables
  - Prior to this, complete understanding of 2.7.
- Class Time
  - Go over any questions from previous HW
  - Period 3: #14 answer
    - Explanation of "why?" for inequalities
  - Lecture 2.8: (p. 132-)
    - Determining whether or not a given ordered pair is a solution of a linear inequality. (G.P. 1-4)
    - Graphing a linear equality (G.P. 5-10)
      - Solve for y
      - Graph as you would
        NOTE: Dotted line for <, >
        Solid line for ≤, ≥
      - Try a point, shade true area
    - Application to Absolute Value inequalities (G.P. 11-14)

Period 6: Seating chart

- Homework
  - Pages 135-137
    Ex. 1, 2-14 (evens), 18-24, 28, 32, 36, 44
  - Bring graphing calculators tomorrow
  - Chapter 2 Test on Wednesday (10/13)

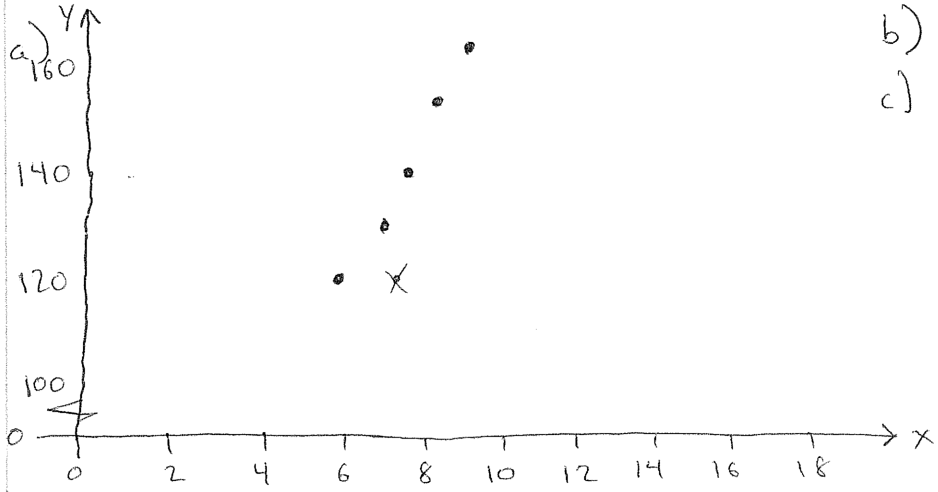
Period 3 - Extra Questions

Page 118 #14

X	5.6	6.2	.7	7.3	8.4
Y	120	130	141	156	167

a) Draw scatter plot
b) Approximate best-fitting line
c) (20, ??)

a)



b) $y = 17.4x + 22.8$
c) (20, 371)

~~Ineq~~

Absolute Value Functions: WHY?

$y = a|x-h|+k$ ~~$y = a$~~

$y = |x|$

$y = x$ → Graph

$y = -x$ → Graph

$y = 2|x-5|+3$

$y = 2(x-5)+3$
$y = 2x-10+3$
$y = 2x-7$
→ Graph

$y = 2 \cdot -(x-5)+3$
$y = 2(-x+5)+3$
$y = -2x+10+3$
$y = -2x+13$
→ Graph

→ But why only half the line?
- Cuz: $\oplus|\ |$ means only positive direction
  $\ominus|\ |$ means only negative direction

a-values

Tuesday, 10/5/2010

Algebra II, HONORS (p. 6)

- Student prep. before class
  - Section 2.7: G.P. 1-7
    1, 2-12 (evens), 16, 18
- Goals
  - Graph and Write absolute value functions (2.7)
  - Understand transformations of abs. value fctns. (2.7)
  - General understanding of Piecewise, Step Functions
- Class Time
  - Go over any questions off of 2.7 HW
  - Lecture 2.7:
    - Refer to p. 3 lesson plan if needed
    - r-value (told them wrong yesterday)
    - Transformations:
      - → $y = a \cdot f(x-h) + k$ can be obtained from the graph of any $y=f(x)$. (p. 126)
    - Piecewise Function
      - At least equations w/ boundaries
      - Keep endpoints in mind (open/closed)
    - Step Function
      - Example of a piecewise function
- Homework
  - ~~$f(x) = x^2 - 2x + 5$; $f(2)$~~
  - ~~$f(x) = x + 12$; $f(5)$~~
  - Page 127: 24-32 (evens)
    Page 131: 1-7
  - Look over 2.8

Ends @ 12:32

Tuesday, 10/5/2010

Algebra II, Honors (P.3)

★ Do your ★
homework!

- Student prep before class
  - Section 2.6: exercises 2-26 (evens)
- Goals
  - Full understanding of 2.6
  - 2.7: Graph and Write Absolute Value Functions
- Class Time
  - Go over a few questions on 2-26 (evens)
    - They should get this (gave them an extra night)
  - Lecture on 2.7:
    - Graph absolute value functions:

      $y = |x-h| + k$; $y = a|x|$; $y = a|x-h| + k$
    - $a > 0$ → Opens up

      $a < 0$ → Opens down
    - r-value: $-1, -.5, 0, .5, 1$
    - Vertex: (h, k)
    - a is the slope
    - Transformations:

      $y = a \cdot f(x-h) + k$ can be obtained from the graph of any $y = f(x)$. (p. 126)
- Homework
  - Pages 127-128:

    Exercises 1-8, 14-26 (evens), 32

    ~~Also, $f(x) = x^2\ 2x + 5$; $f(2)$~~

    ~~$f(x) = x + 12$; $f(-5)$~~
  - Look over 2.8
- Notes
  - Class ends @ 9:37
  - Test next Wednesday (if today goes as planned) - Chapter 2

Next Class

Notes

- #14 answer
- Why? explain

Monday, 10/4/2010

ALGEBRA II, HONORS (p. 3+6)

- Student prep. before class
  - Period 3: Section 2.6 - G.P., Study 2-26 (evens)
  - Period 6: Section 2.6 - G.P., Study 1-18 (all)
- Goals
  - Understanding of previous quiz
  - Full understanding of Section 2.6:
    - Fit lines to data in scatter plots
- Class Time
  - Hand out previous quiz
  - Go over the quiz
    - Questions that many students got wrong
    - Any questions they have
  - Last 10/15 minutes of class
    - Answer any questions off of Section 2.6
    - Go over a couple examples if they don't have questions. (Anything from previous HW)
- Homework
  - G.P. Problems from section 2.7 (pp. 123-126 #1-7)
  - Get an understanding of 2.7 (read it).
  - Bring graphing calculator on Tuesday (tomorrow).

☆ Class over @ 9:37 ☆ P.3
☆ Class over @ 12:55 ☆ P.6

North High School MATH Weekly Lesson Plan-Teachers Name
Topic: Algebra I, Col. Week Of: 12/13/10 Period [✓ 1] 2 3 4 5 6 7

Weekly Objectives

Introduce graphs!!

2.

3.

Instructional Strategies

Students will demonstrate understanding through….

CEEI	Cornell Notes
T4's	Letters
Other______________	

Assessments and Rubrics

WPS students write effectively

Summative Assessments

4-pt. WPS rubric 4=96 3=84 2=72 1=60
4-pt. MCAS O/R rubric 4=96 3=84 2=72 1=60
Tests
Quizzes
Projects
Presentations
Group Work
Class work
Homework
Other________________________

Formative assessments

Verbal Questioning
Conferencing
Journals
Class Discussion/Participation
Exit Slips
Other________________________

Accommodations/Differentiation:

Outline of Monday's Class

4.1 NTG

Outline of Tuesday's Class

4.1 Practice

Outline of Wednesday's Class

4.2 NTG

Outline of Thursday's Class

4.2 Practice

Outline of Friday's Class

4.3 NTG

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

[✓ 10.N.1]	[✓ 10.N.3]	12.N.1	[✓ AI.N.1]	[✓ AI.N.3]	AII.N.1
[✓ 10.N.2]	[✓ 10.N.4]	12.N.2	[✓ AI.N.2]	[✓ AI.N.4]	AII.N.2
PC.N.1					

Patterns Relations and Algebra

[✓ 10.P.1]	10.P5	12.P.1	12.P.5	12.P.9	12.P.13
[✓ 10.P.2]	10.P.6	12.P.2	12.P.6	12.P.10	
[✓ 10.P.3]	[✓ 10.P.7]	12.P.3	12.P.7	12.P.11	
[✓ 10.P.4]	10.P.8	12.P.4	12.P.8	12.P.12	
[✓ AI.P.1]	[✓ AI.P.3]	[✓ AI.P.5]	AI.P.7	AI.P.9	AI.P.11
AI.P.2	[✓ AI.P.4]	[✓ AI.P.6]	AI.P.8	AI.P.10	AI.P.12
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

10.G.1	10.G.8	12.G.4	G.G.6	G.G.13	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
10.G.7	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability

10.D.1	12.D.2	12.D.6	AI.D.3	PC.D.2
10.D.2	12.D.3	12.D.7	AII.D.1	PC.D.3
10.D.3	12.D.4	AI.D.1	AII.D.2	PC.D.4
12.D.1	12.D.5	AI.D.2	PC.D.1	PC.D.5

Measurement

10.M.1	12.M.1	G.M.3	PC.M.2
10.M.2	12.M.2	G.M.4	
10.M.3	G.M.1	G.M.5	
10.M.4	G.M.2	PC.M.1	

Bloom's Taxonomy/ Costa's Levels of Questions

Knowledge- Recalling Information

Identify Define Examine Name Describe Tell Label

Comprehension- Understanding meaning

Summarize Interpret Estimate Differentiate

Analysis- Seeing Parts and Relationships

Analyze Explain Classify Connect Compare

Synthesis- Using Parts of New information to Create a Whole

Prepare Create Formulate Rewrite Compose Generalize

Evaluation- Judging Based on Criteria

Assess Test Support Decide Explain Conclude Compare

North High School MATH Weekly Lesson Plan-Teachers Name

Topic: Algebra I, Col. Week Of: 12/6-10 Period: 1 2 3 [✓ 4] 5 6 7

Weekly Objectives

Assess Chapter 3

2. Introduce Chapter 4

3.

Instructional Strategies

Students will demonstrate understanding through....

CEEI
T4's
Other________________

Cornell Notes
Letters

Assessments and Rubrics

WPS students write effectively

Summative Assessments

4-pt. WPS rubric 4=96 3=84 2=72 1=60
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[✓ Quizzes]
Projects
Presentations
[✓ Group Work]
[✓ Class work]
[✓ Homework]
Other____________________________

Formative assessments

[✓ Verbal Questioning]
Conferencing
[✓ Journals]
[✓ Class Discussion/Participation]
Exit Slips
Other____________________________

Accommodations/Differentiation:

Outline of Monday's Class

~~S~~ 3.7 NTG

HW: 3.7 Practice

Outline of Tuesday's Class

~~Chapter 3 Review~~
3.8 NTG
HW: 3.8 Practice
~~HW: Review sheet~~

Outline of Wednesday's Class Long period

~~Chapter 3 Test~~
Chapter 3 Review

Outline of Thursday's Class

~~4.1 NTG~~
Chapter 3 Test
~~HW: 4.1 Practice~~

Outline of Friday's Class

Activity because
Fridays are
impossible

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

[✓ 10.N.1]	[✓ 10.N.3]	12.N.1	[✓ AI.N.1]	[✓ AI.N.3]	AII.N.1
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[✓ 10.P.2]	10.P.6	12.P.2	12.P.6	12.P.10	
[✓ 10.P.3]	10.P.7	12.P.3	12.P.7	12.P.11	
[✓ 10.P.4]	10.P.8	12.P.4	12.P.8	12.P.12	
AI.P.1	AI.P.3	AI.P.5	AI.P.7	AI.P.9	AI.P.11
AI.P.2	AI.P.4	AI.P.6	AI.P.8	AI.P.10	AI.P.12
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

10.G.1	10.G.8	12.G.4	G.G.6	G.G.13	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
10.G.7	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability

Measurement

10.D.1	12.D.2	12.D.6	AI.D.3	PC.D.2	10.M.1	12.M.1	G.M.3	PC.M.2
10.D.2	12.D.3	12.D.7	AII.D.1	PC.D.3	10.M.2	12.M.2	G.M.4	
10.D.3	12.D.4	AI.D.1	AII.D.2	PC.D.4	10.M.3	G.M.1	G.M.5	
12.D.1	12.D.5	AI.D.2	PC.D.1	PC.D.5	10.M.4	G.M.2	PC.M.1	

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North High School MATH Weekly Lesson Plan-Teachers Name
Topic: Algebra I - Col. Week Of: 11/29 - 12/3 Period: 1 2 3 [✓ 4 5] 6 7

Weekly Objectives

3.3
2. 3.4
3. Assess 3.1-3.4

Instructional Strategies

Students will demonstrate understanding through….

CEEI Cornell Notes
T4's Letters
Other_______________

Assessments and Rubrics

WPS students write effectively

Summative Assessments
4-pt. WPS rubric 4=96 3=84 2=72 1=60
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Tests
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Presentations
[✓ Group Work]
[✓ Class work]
[✓ Homework]
Other_______________________

Formative assessments
[✓ Verbal Questioning]
Conferencing
[✓ Journals]
[✓ Class Discussion/Participation]
Exit Slips
Other_______________________

Accommodations/Differentiation:

L.p.3 **Outline of Monday's Class** 11/29

3.3 NTG in class

HW: 3.3 Practice

L.p.4 **Outline of Tuesday's Class** 11/30

3.3 Practice in class
3.3 ?'s

HW: 3.3 Practice

L.p.6 **Outline of Wednesday's Class** 12/1

3.4 NTG in class

HW: 3.4 Practice

L.p.7 **Outline of Thursday's Class** 12/2

3.4 Practice in class
3.4 ?'s

HW: 3.4 Practice

L.p.1 **Outline of Friday's Class** 12/3

~~3.1-3.4 Quiz~~

3.5 + 3.6 NTG

HW: 3.5 + 3.6 Practice

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

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[✓ 10.N.2]	[✓ 10.N.4]	[✓ 12.N.2]	[✓ AI.N.2]	[✓ AI.N.4]	AII.N.2
PC.N.1					

Patterns Relations and Algebra

10.P.1	10.P5	12.P.1	12.P.5	12.P.9	12.P.13
[✓ 10.P.2]	10.P.6	12.P.2	12.P.6	12.P.10	
[✓ 10.P.3]	10.P.7	12.P.3	12.P.7	12.P.11	
[✓ 10.P.4]	10.P.8	12.P.4	12.P.8	12.P.12	
AI.P.1	AI.P.3	AI.P.5	AI.P.7	AI.P.9	AI.P.11
AI.P.2	AI.P.4	AI.P.6	AI.P.8	AI.P.10	AI.P.12
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

10.G.1	10.G.8	12.G.4	G.G.6	G.G.13	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
10.G.7	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability

10.D.1	12.D.2	12.D.6	AI.D.3	PC.D.2
10.D.2	12.D.3	12.D.7	AII.D.1	PC.D.3
10.D.3	12.D.4	AI.D.1	AII.D.2	PC.D.4
12.D.1	12.D.5	AI.D.2	PC.D.1	PC.D.5

Measurement

10.M.1	12.M.1	G.M.3	PC.M.2
10.M.2	12.M.2	G.M.4	
10.M.3	G.M.1	G.M.5	
10.M.4	G.M.2	PC.M.1	

Bloom's Taxonomy/ Costa's Levels of Questions

[✓ Knowledge]- Recalling Information

Identify Define Examine Name Describe Tell Label

Comprehension- Understanding meaning

Summarize Interpret Estimate Differentiate

Analysis- Seeing Parts and Relationships

Analyze Explain Classify Connect Compare

Synthesis- Using Parts of New information to Create a Whole

Prepare Create Formulate Rewrite Compose Generalize

[✓ Evaluation]- Judging Based on Criteria

Assess Test Support Decide Explain Conclude Compare

North High School MATH Weekly Lesson Plan-Teachers Name
Topic: Algebra I, Col. Week Of: 11/15/2010-11/19 Period: 1 2 3 [✓ 4] 5 6 7

Weekly Objectives

. Assess Chapter 2

2. Begin Chapter 3

3. Identify trouble areas in Chapter 2 (go over test)

Instructional Strategies

Students will demonstrate understanding through….

CEEI Cornell Notes
T4's Letters
Other______________

Assessments and Rubrics

WPS students write effectively

Summative Assessments

4-pt. WPS rubric 4=96 3=84 2=72 1=60
4-pt. MCAS O/R rubric 4=96 3=84 2=72 1=60
[✓ Tests]
uizzes
rojects
Presentations
[✓ Group Work]
[✓ Class work]
[✓ Homework]
Other_________________________

Formative assessments

Verbal Questioning
Conferencing
[✓ Journals]
[✓ Class Discussion/Participation]
Exit Slips
Other__________________________

Accommodations/Differentiation:

Outline of Monday's Class L. p. 2

Collect 2.7 Practice

Chapter 2 Review
Copy p. 120
HW: Study
* Check NTGs tomorrow

Outline of Tuesday's Class L. p. 3

Collect any Practice sheets (2.6, 2.7)

Chapter 2 Test
Check NTG's during test

Outline of Wednesday's Class L. p. 4

3.1 NTG (on projector)
HW: 3.1 Practice

Outline of Thursday's Class L. p. 6

3.1 NTG - Finish
3.1 Practice (on board)

HW: Finish 3.1 Practice

Outline of Friday's Class L. p. 7

Check 3.1 Practice
3.2 NTG (on projector)
HW: 3.2 Practice

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

[✓ 10.N.1]	[✓ 10.N.3]	12.N.1	[✓ AI.N.1]	[✓ AI.N.3]	AII.N.1
[✓ 10.N.2]	[✓ 10.N.4]	12.N.2	[✓ AI.N.2]	[✓ AI.N.4]	AII.N.2
PC.N.1					

Patterns Relations and Algebra

[✓ 10.P.1]	10.P5	12.P.1	12.P.5	12.P.9	12.P.13
[✓ 10.P.2]	10.P.6	12.P.2	12.P.6	12.P.10	
[✓ 10.P.3]	10.P.7	12.P.3	12.P.7	12.P.11	
10.P.4	10.P.8	12.P.4	12.P.8	12.P.12	
AI.P.1	AI.P.3	AI.P.5	AI.P.7	AI.P.9	AI.P.11
AI.P.2	AI.P.4	AI.P.6	AI.P.8	AI.P.10	AI.P.12
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

10.G.1	10.G.8	12.G.4	G.G.6	G.G.13	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
10.G.7	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability

Measurement

[✓ 10.D.1]	12.D.2	12.D.6	AI.D.3	PC.D.2	10.M.1	12.M.1	G.M.3	PC.M.2
10.D.2	12.D.3	12.D.7	AII.D.1	PC.D.3	10.M.2	12.M.2	G.M.4	
10.D.3	12.D.4	AI.D.1	AII.D.2	PC.D.4	10.M.3	G.M.1	G.M.5	
12.D.1	12.D.5	AI.D.2	PC.D.1	PC.D.5	10.M.4	G.M.2	PC.M.1	

Bloom's Taxonomy/ Costa's Levels of Questions

Knowledge- Recalling Information

Identify Define Examine Name Describe Tell Label

[✓ **Comprehension**]- Understanding meaning

[✓ Summarize] Interpret Estimate Differentiate

Analysis- Seeing Parts and Relationships

Analyze Explain Classify Connect Compare

Synthesis- Using Parts of New information to Create a Whole

Prepare Create Formulate Rewrite Compose Generalize

[✓ **Evaluation**]- Judging Based on Criteria

[✓ Assess] Test Support Decide Explain Conclude Compare

North High School MATH Weekly Lesson Plan-Teachers Name
Topic: 11/8/2010 Week Of: Algebra I, Col. Period: 1 2 3 [✓ 4] 5 6 7

Weekly Objectives

Know what Q2 is all about

2. Complete 2.6+2.7

3.

Instructional Strategies

Students will demonstrate understanding through….

CEEI Cornell Notes
T4's Letters
Other_______________

Assessments and Rubrics

WPS students write effectively

Summative Assessments

4-pt. WPS rubric 4=96 3=84 2=72 1=60
4-pt. MCAS O/R rubric 4=96 3=84 2=72 1=60
Tests
uizzes
rojects
Presentations
Group Work
[✓ Class work]
[✓ Homework]
Other__________________________

Formative assessments

Verbal Questioning
Conferencing
[✓ Journals]
[✓ Class Discussion/Participation]
Exit Slips
Other____________________________

Accommodations/Differentiation:

Outline of Monday's Class L. p. 4

2.6 NTG

HW: 2.6 Practice

Outline of Tuesday's Class L. p. 6

2.6 Practice

HW: Finish 2.6 Practice

Outline of Wednesday's Class L. p. 7

2.7 NTG

HW: 2.7 Practice

Outline of Thursday's Class

Outline of Friday's Class L. p. 1

2.7 Practice

HW: Finish 2.7 Practice

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

[✓ 10.N.1]	10.N.3	12.N.1	AI.N.1	AI.N.3	AII.N.1
[✓ 10.N.2]	[✓ 10.N.4]	12.N.2	AI.N.2	AI.N.4	AII.N.2
PC.N.1					

Patterns Relations and Algebra

[✓ 10.P.1]	10.P5	12.P.1	12.P.5	12.P.9	12.P.13
[✓ 10.P.2]	[✓ 10.P.6]	12.P.2	12.P.6	12.P.10	
[✓ 10.P.3]	10.P.7	12.P.3	12.P.7	12.P.11	
10.P.4	10.P.8	12.P.4	12.P.8	12.P.12	
AI.P.1	AI.P.3	AI.P.5	AI.P.7	AI.P.9	AI.P.11
AI.P.2	AI.P.4	AI.P.6	AI.P.8	AI.P.10	AI.P.12
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

10.G.1	10.G.8	12.G.4	G.G.6	G.G.13	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
10.G.7	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability					Measurement			
10.D.1	12.D.2	12.D.6	AI.D.3	PC.D.2	10.M.1	12.M.1	G.M.3	PC.M.2
10.D.2	12.D.3	12.D.7	AII.D.1	PC.D.3	10.M.2	12.M.2	G.M.4	
10.D.3	12.D.4	AI.D.1	AII.D.2	PC.D.4	10.M.3	G.M.1	G.M.5	
12.D.1	12.D.5	AI.D.2	PC.D.1	PC.D.5	10.M.4	G.M.2	PC.M.1	

Bloom's Taxonomy/ Costa's Levels of Questions

[✓ Knowledge]- Recalling Information

[✓ Identify] Define Examine Name Describe Tell Label

[✓ Comprehension]- Understanding meaning

[✓ Summarize] Interpret Estimate Differentiate

[✓ Analysis]- Seeing Parts and Relationships

[✓ Analyze] Explain Classify Connect Compare

Synthesis- Using Parts of New information to Create a Whole

Prepare Create Formulate Rewrite Compose Generalize

Evaluation- Judging Based on Criteria

Assess Test Support Decide Explain Conclude Compare

North High School MATH Weekly Lesson Plan-Teachers Name

Topic: Algebra I, Col. Week Of: 11/1/2010-11/5/2010 Period: 1 2 3 [✓ 4] 5 6 7

Weekly Objectives

1. Finish 2.1-2.5
2. Go over Q1 grades
3. Understand how to do better next quarter

Instructional Strategies

Students will demonstrate understanding through….

CEEI Cornell Notes
T4's Letters
Other_______________

Assessments and Rubrics

WPS students write effectively

Summative Assessments

4-pt. WPS rubric 4=96 3=84 2=72 1=60
4-pt. MCAS O/R rubric 4=96 3=84 2=72 1=60
Tests
Quizzes
Projects
Presentations
[✓ Group Work]
[✓ Class work]
[✓ Homework]
Other_________________________

Formative assessments

Verbal Questioning
Conferencing
[✓ Journals]
[✓ Class Discussion/Participation]
Exit Slips
Other_________________________

Accommodations/Differentiation:

Outline of Monday's Class

Return 2.1-2.3 Quiz
Go over quarter grading
↳ Begin grading
2.4 NTG + Practice

Outline of Tuesday's Class

MCAS
2.4 Practice → Did a few
2.5 NTG
HW: 2.4 Practice (finish)

Outline of Wednesday's Class

MCAS
2.5 NTG
HW: 2.5 Practice

Outline of Thursday's Class

MCAS
2.5 NTG
HW: 2.5 Practice

Outline of Friday's Class

Extra Credit wkst.
Grading notebooks

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

[✓ 10.N.1]	10.N.3	12.N.1	AI.N.1	AI.N.3	AII.N.1
[✓ 10.N.2]	[✓ 10.N.4]	12.N.2	AI.N.2	AI.N.4	AII.N.2
PC.N.1					

Patterns Relations and Algebra

[✓ 10.P.1]	10.P5	12.P.1	12.P.5	12.P.9	12.P.13
[✓ 10.P.2]	[✓ 10.P.6]	12.P.2	12.P.6	12.P.10	
[✓ 10.P.3]	10.P.7	12.P.3	12.P.7	12.P.11	
10.P.4	10.P.8	12.P.4	12.P.8	12.P.12	
AI.P.1	AI.P.3	AI.P.5	AI.P.7	AI.P.9	AI.P.11
AI.P.2	AI.P.4	AI.P.6	AI.P.8	AI.P.10	AI.P.12
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

10.G.1	10.G.8	12.G.4	G.G.6	G.G.13	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
10.G.7	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability

10.D.1	12.D.2	12.D.6	AI.D.3	PC.D.2
10.D.2	12.D.3	12.D.7	AII.D.1	PC.D.3
10.D.3	12.D.4	AI.D.1	AII.D.2	PC.D.4
12.D.1	12.D.5	AI.D.2	PC.D.1	PC.D.5

Measurement

10.M.1	12.M.1	G.M.3	PC.M.2
10.M.2	12.M.2	G.M.4	
10.M.3	G.M.1	G.M.5	
10.M.4	G.M.2	PC.M.1	

Bloom's Taxonomy/ Costa's Levels of Questions

Knowledge- Recalling Information

Identify Define Examine Name Describe Tell Label

Comprehension- Understanding meaning

Summarize Interpret Estimate Differentiate

Analysis- Seeing Parts and Relationships

Analyze Explain Classify Connect Compare

Synthesis- Using Parts of New information to Create a Whole

Prepare Create Formulate Rewrite Compose Generalize

Evaluation- Judging Based on Criteria

Assess Test Support Decide Explain Conclude Compare

North High School MATH Weekly Lesson Plan-Teachers Name
Topic: Algebra I, Col. Week Of: 10/25-10/29 Period: 1 2 3 [✓ 4] 5 6 7

Weekly Objectives

Complete Sections 2.1-2.3
2. Go over old Ch. 1 Test
3. Hand back old graded tests/quizzes

Instructional Strategies

Students will demonstrate understanding through….

CEEI Cornell Notes
T4's Letters
Other______________

Assessments and Rubrics

WPS students write effectively

Summative Assessments
4-pt. WPS rubric 4=96 3=84 2=72 1=60
4-pt. MCAS O/R rubric 4=96 3=84 2=72 1=60
Tests
[✓ Quizzes]
rojects
Presentations
Group Work
[✓ Class work]
[✓ Homework]
Other________________________

Formative assessments
[✓ Verbal Questioning]
Conferencing
Journals
[✓ Class Discussion/Participation]
Exit Slips
Other_________________________

Accommodations/Differentiation:

Outline of Monday's Class

- W-U: MCAS Problem
- C-W: 2.1 NTG
  2.1 Practice
- H-W: 2.1 Practice

Outline of Tuesday's Class

- W-U: MCAS Problem
- C-W: 2.2 NTG
- H-W: 2.2 Practice

Outline of Wednesday's Class

- W-U: MCAS Problem
- C-W: 2.2 NTG
  2.2 Practice
- H-W: 2.2 Practice

Outline of Thursday's Class

- W-U: MCAS Problem
- C-W: 2.3 NTG
- H-W: 2.3 Practice

Outline of Friday's Class Long Period

- W-U: MCAS Problem
- C-W: 2.1-2.3 Quiz
  2.4 NTG
- H-W: 2.4 Practice

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

[✓ 10.N.1]	10.N.3	12.N.1	AI.N.1	AI.N.3	AII.N.1
[✓ 10.N.2]	[✓ 10.N.4]	12.N.2	AI.N.2	AI.N.4	AII.N.2
PC.N.1					

Patterns Relations and Algebra

10.P.1	[✓ 10.P5]	12.P.1	12.P.5	12.P.9	12.P.13
10.P.2	[✓ 10.P.6]	12.P.2	12.P.6	12.P.10	
10.P.3	10.P.7	12.P.3	12.P.7	12.P.11	
10.P.4	10.P.8	12.P.4	12.P.8	12.P.12	
AI.P.1	AI.P.3	AI.P.5	AI.P.7	AI.P.9	AI.P.11
AI.P.2	AI.P.4	AI.P.6	AI.P.8	AI.P.10	AI.P.12
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

10.G.1	10.G.8	12.G.4	G.G.6	G.G.13	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
10.G.7	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability					Measurement			
10.D.1	12.D.2	12.D.6	AI.D.3	PC.D.2	10.M.1	12.M.1	G.M.3	PC.M.2
10.D.2	12.D.3	12.D.7	AII.D.1	PC.D.3	10.M.2	12.M.2	G.M.4	
10.D.3	12.D.4	AI.D.1	AII.D.2	PC.D.4	10.M.3	G.M.1	G.M.5	
12.D.1	12.D.5	AI.D.2	PC.D.1	PC.D.5	10.M.4	G.M.2	PC.M.1	

Bloom's Taxonomy/ Costa's Levels of Questions

[✓ Knowledge]- Recalling Information

Identify Define Examine Name Describe Tell Label

Comprehension- Understanding meaning

Summarize Interpret Estimate Differentiate

[✓ Analysis]- Seeing Parts and Relationships

Analyze Explain Classify Connect Compare

Synthesis- Using Parts of New information to Create a Whole

Prepare Create Formulate Rewrite Compose Generalize

Evaluation- Judging Based on Criteria

Assess Test Support Decide Explain Conclude Compare

North High School MATH Weekly Lesson Plan-Teachers Name
Topic: Algebra I, Col. Week Of: ~~10/19~~ 10/18-10/22 Period: 1 2 3 [✓ 4] 5 6 7

Weekly Objectives

Assessment of Chapter 1
2. Introduce 2.1
3. Introduce 2.2

Instructional Strategies

Students will demonstrate understanding through….

CEEI Cornell Notes
T4's Letters
Other______________

Assessments and Rubrics

WPS students write effectively

Summative Assessments

4-pt. WPS rubric 4=96 3=84 2=72 1=60
4-pt. MCAS O/R rubric 4=96 3=84 2=72 1=60
[✓ Tests]
Quizzes
Projects
Presentations
Group Work
[✓ Class work]
[✓ Homework]
Other________________________

Formative assessments

[✓ Verbal Questioning]
Conferencing
[✓ Journals]
Class Discussion/Participation
Exit Slips
Other_________________________

Accommodations/Differentiation:

Outline of Monday's Class

Catch-up on binders
Review sheet (ch. 1)
(in class)
↳ Handout answers at end of class
HW: Study

Outline of Tuesday's Class

Chapter 1 Test

- Collect NTG + Practice sheets

Outline of Wednesday's Class

Finish Chapter 1 Test

Outline of Thursday's Class Long Period

- Go over binders with them individually
- Start 2.1
  → NTG
  → Practice
- HW: 2.1 Practice

Outline of Friday's Class

- 2.1 NTG: Finish in class
- 2.1 Practice: In class
- HW: Finish 2.1 Practice

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

[✓ 10.N.1]	10.N.3	12.N.1	AI.N.1	AI.N.3	AII.N.1
[✓ 10.N.2]	10.N.4	12.N.2	AI.N.2	AI.N.4	AII.N.2
PC.N.1					

Patterns Relations and Algebra

[✓ 10.P.1]	[✓ 10.P5]	12.P.1	12.P.5	12.P.9	12.P.13
[✓ 10.P.2]	[✓ 10.P.6]	12.P.2	12.P.6	12.P.10	
[✓ 10.P.3]	[✓ 10.P.7]	12.P.3	12.P.7	12.P.11	
[✓ 10.P.4]	[✓ 10.P.8]	12.P.4	12.P.8	12.P.12	
AI.P.1	AI.P.3	AI.P.5	AI.P.7	AI.P.9	AI.P.11
AI.P.2	AI.P.4	AI.P.6	AI.P.8	AI.P.10	AI.P.12
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

10.G.1	10.G.8	12.G.4	G.G.6	G.G.13	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
10.G.7	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability

10.D.1	12.D.2	12.D.6	AI.D.3	PC.D.2
10.D.2	12.D.3	12.D.7	AII.D.1	PC.D.3
10.D.3	12.D.4	AI.D.1	AII.D.2	PC.D.4
12.D.1	12.D.5	AI.D.2	PC.D.1	PC.D.5

Measurement

10.M.1	12.M.1	G.M.3	PC.M.2
10.M.2	12.M.2	G.M.4	
10.M.3	G.M.1	G.M.5	
10.M.4	G.M.2	PC.M.1	

Bloom's Taxonomy/ Costa's Levels of Questions

[✓ **Knowledge**]- **Recalling Information**

Identify Define Examine Name Describe Tell Label

Comprehension- **Understanding meaning**

Summarize Interpret Estimate Differentiate

Analysis- **Seeing Parts and Relationships**

Analyze Explain Classify Connect Compare

Synthesis- **Using Parts of New information to Create a Whole**

Prepare Create Formulate Rewrite Compose Generalize

Evaluation- **Judging Based on Criteria**

[✓ Assess] Test Support Decide Explain Conclude Compare

North High School MATH Weekly Lesson Plan-Teachers Name
Topic: Algebra I, Col. Week Of: 10/12 - 10/15 Period: 1 2 3 [✓ 4] 5 6 7

Weekly Objectives

1. Assess knowledge of Sections 1.4/1.5 (Quiz)
2. Finish 1.6
3. Start + Finish 1.7 ~~and review chapter 1~~

Instructional Strategies

Students will demonstrate understanding through….

CEEI	Cornell Notes
T4's	Letters
Other______________	

Assessments and Rubrics

WPS students write effectively

Summative Assessments

4-pt. WPS rubric 4=96 3=84 2=72 1=60
4-pt. MCAS O/R rubric 4=96 3=84 2=72 1=60
Tests
[✓ Quizzes]
Projects
Presentations
Group Work
[✓ Class work]
[✓ Homework]
Other________________________

Formative assessments

[✓ Verbal Questioning]
Conferencing
Journals
[✓ Class Discussion/Participation]
Exit Slips
[✓ Other NTG, Notebook]

Accommodations/Differentiation:

Outline of Monday's Class

COLUMBUS DAY

Outline of Tuesday's Class

MCAS #8
1.4/1.5 Quiz
HW: 1.6 NTG
1.6 Practice

Outline of Wednesday's Class

~~MCAS #9~~
Review quiz answers/struggles
~~Go over 1.6 Wkst (Practice)~~
~~Explain 1.7~~
~~HW: 1.7 Wkst (Practice)~~

Outline of Thursday's Class

MCAS ~~#10~~ #9
1.7 NTG
HW: 1.7 NTG
1.7 Practice

Outline of Friday's Class

Review chapter 1 material
(MCAS #10)
NTG, Page 22
Chapter review sheet?
HW: Finish Chapter review sheet

Monday

Standards Addressed This Week:

Please circle the standards addressed this week

Number Sense and Operations

10.N.1	10.N.3	12.N.1	AI.N.1	AI.N.3	AII.N.1
[✓ 10.N.2]	10.N.4	12.N.2	AI.N.2	AI.N.4	AII.N.2
PC.N.1					

Patterns Relations and Algebra

[✓ 10.P.1]	10.P5	12.P.1	12.P.5	12.P.9	12.P.13
[✓ 10.P.2]	[✓ 10.P.6]	12.P.2	12.P.6	12.P.10	
10.P.3	[✓ 10.P.7]	12.P.3	12.P.7	12.P.11	
10.P.4	[✓ 10.P.8]	12.P.4	12.P.8	12.P.12	
AI.P.1	AI.P.3	AI.P.5	AI.P.7	AI.P.9	AI.P.11
AI.P.2	AI.P.4	AI.P.6	AI.P.8	AI.P.10	AI.P.12
AII.P.1	AII.P.3	AII.P.5	AII.P.7	AII.P.9	AII.P.11
AII.P.2	AII.P.4	AII.P.6	AII.P.8	AII.P.10	AII.P.12
AII.P.13	PC.P.1	PC.P.2	PC.P.3	PC.P.4	PC.P.5
PC.P.6	PC.P.7	PC.P.8	PC.P.9		

Geometry

10.G.1	10.G.8	12.G.4	G.G.6	G.G.13	AII.G.2
10.G.2	10.G.9	12.G.5	G.G.7	G.G.14	AII.G.3
10.G.3	10.G.10	G.G.1	G.G.8	G.G.15	PC.G.1
10.G.4	10.G.11	G.G.2	G.G.9	G.G.16	PC.G.2
10.G.5	12.G.1	G.G.3	G.G.10	G.G.17	PC.G.3
10.G.6	12.G.2	G.G.4	G.G.11	G.G.18	
10.G.7	12.G.3	G.G.5	G.G.12	AII.G.1	

Data Analysis, Statistics, and Probability

Measurement

10.D.1	12.D.2	12.D.6	AI.D.3	PC.D.2	10.M.1	12.M.1	G.M.3	PC.M.2
10.D.2	12.D.3	12.D.7	AII.D.1	PC.D.3	10.M.2	12.M.2	G.M.4	
10.D.3	12.D.4	AI.D.1	AII.D.2	PC.D.4	10.M.3	G.M.1	G.M.5	
12.D.1	12.D.5	AI.D.2	PC.D.1	PC.D.5	10.M.4	G.M.2	PC.M.1	

Bloom's Taxonomy/ Costa's Levels of Questions

[✓ **Knowledge**]- **Recalling Information**

Identify Define Examine Name Describe Tell Label

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Summarize Interpret Estimate Differentiate

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Analyze Explain Classify Connect Compare

Synthesis- **Using Parts of New information to Create a Whole**

Prepare Create Formulate Rewrite Compose Generalize

Evaluation- **Judging Based on Criteria**

Assess Test Support Decide Explain Conclude Compare

Friday - 12/17/2010
Algebra I, Col. (p. 4)

- Student Prep. Before Class
  - 4.2 Practice
- Goals
  - Master graphing using standard form
- Class Time
  - 4.3 NTG
    - → As a class
    - → Answer questions
- Homework
  - Finish 4.3 NTG (if needed)
  - Start 4.3 Practice

Thursday - 12/16/2010

Algebra I, Col. (p. 4)

- Student Prep. Before Class
  4.2 NTG
- Goals
  Master the idea of solving for y
  Understand the use of standard form
- Class Time - Warm-up : Graph
  Do 4.2 Practice as a class
    Go over one from each section
    Answer any questions
- Homework
  Finish 4.2 Practice

Wednesday - 12/15/2010

Algebra I Col. (p.4)

- Student Prep. Before Class
  - 4.1 Practice
- Goals
  - Solve for y
  - Introduce Standard Form
- Class Time - Warm-up: Graph
  - 4.2 NTG
    - Start and complete in class
    - Answer any questions
- Homework
  - Finish 4.2 NTG (if not in class)

Tuesday - 12/14/2010
Algebra I Col. (p. 4)

- Student Prep. Before Class
  - Did 4.1 NTG
- Class Time - Warm-up: Graph
  - Go over any 4.1 NTG Questions
  - Do 4.1 Practice as a class
    - Do one of each example on board
    - Answer questions
- Homework
  - Finish 4.1 Practice

Monday - 12/13/2010
Algebra I, Col. (p. 4)

- Student Prep. Before Class
  - Activity after Chapter 3 Test
- Class Time
  - Warm-Up: Book on desk
  - Classwork: 4.1 NTG
    Done orally as a class
- Homework
  - None

Friday 12/10/2010

Algebra I Col. (p. 4)

- Student Prep. Before Class
  - Took Chapter 3 Test last period
- Goals
  - Introduce Chapter 4
- Class Time
  - 4.1 NTG done as a class
- Homework
  - 4.1 Practice

Thursday 12/9/2010

Algebra I, Col. (p.4)

- Student Prep. Before Class
  - Studied Chapter 3
- Goals
  - Assess Chapter 3 Knowledge
- Class Time
  - Allow entire class time for Chapter 3 Test
- Homework
  - Nothing

Wednesday 12/8/2010

Algebra I, Col. (p. 4)

- Student Prep. Before Class
  - 3.8 Practice
- Goals
  - Review Chapter 3
- Class Time
  - Review Chapter 3 out of book
  - Hand out answers to whatever problems were not done in class
- Homework
  - STUDY!!!

Tuesday 12/7/2010
Algebra II Col. (p.4)

- Student Prep. Before Class
  - 3.7 Practice
- Goals
  - Complete 3.8
- Class Time
  - Display 3.8 NTG and explain while copying
  - Go over 3.8 Practice to prepare for HW
- Homework
  - 3.8 Practice

Monday - 12/6/2010

Algebra I, College (p. 4)

- Student Prep. Before Class
  - 3.5 and 3.6 Practice
- Goals
  - Understand percents
- Class Time
  - Display 3.7 NTG
  - Go over 3.7 NTG as they copy
- Homework
  - 3.7 Practice

4 p. 1

Friday - 12/3/2010

Algebra I, College (p. 4)

- Student Prep. Before Class
  - Finished 3.4
- ~~Goals~~
  - ~~Assess 3.1-3.4 Knowledge~~
- ~~Class Time~~
  - ~~Hand out 3.1-3.4 Quiz~~
  - ~~All class time to complete~~
  - ~~Activity to keep occupied (+10 on quiz)~~
- ~~Homework~~
  - ~~Nothing~~
- Goals
  - Catch-up!
- Class Time
  - Do 3.5 and 3.6 NTG
  - Use projector and explain
- Homework
  - 3.5 and 3.6 Practice

Wednesday + Thursday } 12/1-2/2010

Wed → (L. p. 6)
Thur → (L. p. 7)

Algebra I, College (p. 4)

- Student Prep. Before Class
  - Finished 3.3
- Goals
  - Solve Equations with variables on both sides
- Class Time
  - Put 3.4 NTG on projector
    - ↳ Explain as you go along
  - Assign 3.4 Practice
  - Do some of 3.4 Practice sheet in class
  - Answer any 3.4 Questions
- Homework
  - Complete 3.4 Practice and bring in to get checked off

~~★ 3.1-3.4 Quiz ★~~
~~Tomorrow (Friday)~~

Tuesday - 11/30/2010 → (L. p. 4)
+
Monday - 11/29/2010 → (L. p. 3)

Algebra I, College (p. 4)

- Student Prep Before Class
  - Finished 3.2
- Goals
  - Solve Multi-Step Equations (3.3)
- Class Time
  - Put 3.3 NTG on projector
    - ↳ Explain as you go along
  - Assign 3.3 Practice Sheet
  - Do some of 3.3 Practic Sheet in class
  - Answer any 3.3 Questions
- Homework
  - Complete 3.3 Practice and bring in to get checked off

Monday - 11/22/2010 L. p. 1

Algebra I, College (p. 4)

- Student Prep. Before Class
  - 3.2 NTG + Practice
- Goals
  - Solve 2-Step Equations
- Class Time
  - Go over 3.2 NTG
  - Review 3.2 Practice
    - → Do some examples
- Homework
  - Complete 3.2 NTG + Practice

11/19/2010

Algebra I, College (p. 4)

- Student Prep. Before Class
  - Finished 3.1 NTG in class
  - Finished 3.1 Practice for HW
- Goals
  - 3.2 Understanding
- Class Time
  - Warm-up
  - Project 3.2 NTG on board
    - ↳ Go over while copying
- Homework
  - Start 3.2 Practice

11/18/2010

Algebra I, College (p. 4)

- Student Prep. Before Class
  - Did 3.1 NTG in class yesterday
  - Started 3.1 Practice
- Goals
  - 3.1 Mastering
- Class Time
  - Warm-up
  - Talk about 3.1 Practice
    - ↳ Explain some on board
      Take questions
  - 3.1 NTG should be done
- Homework
  - 3.1 Practice → Finish!
    ↳ Due tomorrow

☆Long Period☆

11/17/2010

Algebra I, College (p. 4)

- Student Prep. Before Class
  - Chapter 2 Test last class
- Goals
  - 3.1 Understanding
- Class Time
  - Warm-up
  - Go over tests (if corrected, graded, recorded)
  - Project 3.1 NTG on board
    - ↳ Go over while copying
- Homework
  - Start 3.1 Practice

11/16/2010

Algebra I, College (p.4)

- Student Prep. Before Class
  - Studied Chapter 2
- Goals
  - Assess chapter 2
- Class Time
  - Pass out exam
  - Collect 2.6/2.7 Practice Sheets for credit
  - Check NTG's during exam (2.6, 2.7)
- Homework
  - Nothing

11/15/2010

Algebra I, College (p. 4)

- Student Prep. Before Class
  - Finished 2.7 Practice
- Goals
  - To review Chapter 2 and prepare for exam
- Class Time
  - Collect 2.7 Practice
  - Copy p. 120 for use on exam
- Homework
  - Study Chapter 2
  - Finish copying Chapter 2 summary (p. 120)

Friday 11/12/2010

Algebra I, Col. (p. 4)

- Student Prep. Before Class
  - 2.7 Practice → Some effort
  - 2.7 NTG done
- Goals
  - 2.6 :
- Class Time
  - Do Warm-Up
  - Check 2.7 NTG
  - Make sure they tried 2.7 Practice
  - Go over 2.7 Practice sheets with class
- Homework
  - Finish 2.7 Practice

Wednesday 11/10/2010

Algebra I, Col. (p. 4)

- Student Prep. Before Class
  - Finish 2.6 Practice
- Goals
  - 2.7:
- Class Time (Warm-up)
  - Collect + Check 2.6 Practice
  - Put 2.7 NTG on projector
  - Go over 2.7 NTG with them, following projector
- Homework
  - Put some effort into 2.7 ~~A~~ Practice

Tuesday 11/9/2010

Algebra I, Col. (p. 4)

- Student Prep. Before Class
  - Started 2.6 NTG, Practice
- Goals
  - Fully understand the use of multiplicative inverse
- Class Time
  - Do warm-up (MCAS)
  - Check 2.6 and 2.5 NTG
  - Make sure they tried 2.6 Practice
  - Hand out Index sheets
  - Go over questions on 2.6 Practice
- Homework
  - Finish 2.6 Practice

Monday 11/8/2010

Algebra I, Col. (p. 4)

- Student Prep. Before Class
  - Thurs. - Finished 2.5
  - Fri. - Extra credit work
- Goals
  - Understand the use of the multiplicative inverse
- Class Time
  - 2.6 NTG done in class
  - Projector show answers and I explain
- Homework
  - 2.6 Practice
    - ↳ Start it and show tomorrow that you tried.

Friday 11/5/2010

Algebra I, Col.

- Student Prep. Before Class
  - 2.5 Practice
- Goals
  - Finish first quarter
- Class Time
  - Pass out extra credit
  - Go over binder/quarter grades
- Homework
  - Have a good weekend

Wednesday 11/3/2010

Algebra I, Col. (p.4)

- Student Prep. Before Class
  - 2.4 Practice finished
- Class Time
  - Divide positive, negative numbers
  - 2.5 NTG
- Homework
  - 2.5 Practice

Thursday 11/4/2010

Algebra I, Col. (p.4)

- Student Prep. Before Class
  - 2.5 Practice
- Goals
  - Divide positive, negative numbers
- Class Time,
  - 2.5 NTG + Practice
- Homework
  - Finish 2.5 Practice

Tuesday 11/2/2010

Algebra I, College (p. 4)

- Student Prep. Before Class
  - 2.4 Practice
- Goals
  - Divide positive and negative numbers
- Class Time
  - Warm-Up: MCAS
  - Classwork: 2.5 NTG, 2.4 Practice on board
  - Continue grading notebooks
- Homework
  - 2.4 Practice to finish

Monday 11/1/2010

Algebra I, College (p.4)

- Student Prep. Before Class
  - 2.4 Practice
- Goals
  - Multiply positive and negative numbers
- Class Time
  - Warm-Up: MCAS #18
  - Classwork: 2.4 NTG
  - Start grading notebooks/homeworks
- Homework
  - 2.4 Practice

☆ Long Period ☆

Friday, 10/29/2010

Algebra I, College (p. 4)

- Student Prep. Before Class
  - Began 2.3 NTG yesterday
  - Started 2.3 Practice for HW last night
- Goals
  - Fully answer all 2.3 questions
- Class Time
  - Warm-up: MCAS #15
  - Classwork: Finish 2.3 NTG
    Go over 2.3 Practice as a ~~g~~ class
    Review all of 2.1-2.3
    Start discussing binder grades
- Homework:
  Finish 2.3 Practice
  Have binders ready to be graded

☆ Go around and grade:
Warm-up
Binder organization } for quarter grade ☆

Wednesday, 10/27/2010

Algebra I, College (p. 4)

- Student Prep. Before Class
  - Finished all 2.1 (NTG + Practice)
- Goals
  - Introduce 2.2 (Negative numbers...)
- Class Time
  - Warm-Up: MCAS #13
  - Classwork: 2.2 NTG; 2.2 Practice (go over examples)
- Homework:

  2.2 Practice Wkst.

Thursday, 10/28/2010

- Algebra I College (p. 4)

Before Class - Did ~~half~~ all of 2.2 Practice Wkst.

- Goals
  - Complete understanding of 2.2 (Negative numbers...)
- Class Time
  - Warm-Up: MCAS #14
  - Classwork: 2.3 NTG ~~← Finish~~

    2.3 Practice Wkst. ~~→ Go over as a class~~
- Homework
  - 2.3 Practice Wkst

Tuesday, 10/26/2010

Algebra I, College (p. 4)

- Student Prep. Before Class
  - Finish 2.1 Practice
- Goals
  - Fully understand 2R Concepts
- Class Time
  - ~~Answer a~~
  - Warm-Up: MCAS Problem #12
  - Classwork: ~~Answer~~ ~~2.1~~ 2.2 Practice Questions
    Do some ~~2.1~~ 2.2 Practice Problems on board
- Homework
  - Finish ~~2.1~~ 2.2 Practice (stuff you had trouble with)

Monday, 10/25/2010

Algebra I, Col. (p.4)

- Student Prep. Before Class
  - Most of 2.1 NTG
  - Some 2.1 Practice
- Goals
  - Understand concepts in Section 2.1
- Class Time
  - MCAS → Warm-up
  - Classwork: Finish 2.1 NTG
    Answer questions on 2.1 Practice
    Do examples from 2.1 Practice on board
    Have students finish 2.1 Practice
- Homework
  - Finish 2.1 Practice Sheet.

Friday 10/22/2010

Algebra I, College (p. 4)

- Student Prep. Before Class
  - 2.1 Practice (partially done for HW)
- Goals
  - Finish understanding 2.1
    - → Address any issues
  - Finish grading binders
- Class Time
  - Warm-up: MCAS Problem
  - During Class
    - → Finish going through binders w/ students
  - Classwork: 2.1 NTG
    2.1 Practice
  - Hand out graded tests at end of period
    (OR wait until Monday)
- Homework
  - 2.1 Practice
  - If got tests back, fix any problems (w/ details) for extra credit.

Thursday 10/21/2010

Algebra I, College (p. 4)

- Student Prep Before Class
  - No homework because they had a test yesterday
- Goals
  - Let each student know how their grade is looking so far and how to do well
  - Begin looking at Chapter 2 (2.1)
- Class Time
  - Warm-up: MCAS Problem
  - During Class
    - → Go through binder w/ each student (just under 5 min./student)
    - → End up w/ rubric + grade complete for chapter 2
  - Classwork: 2.1 NTG
    2.1 Practice
- Homework
  - 2.1 Practice

Wednesday 10/20/2010
AND
Tuesday, 10/19/2010

Algebra I, College (p.4)

- Student Prep. Befor Class
  - Studied Chapter 1, as a whole
  - Chapter 1 review sheet.
- Goals
  - Assess understanding of Chapter 1 material
- Class Time
  - Hand out Ch. 1 Test (have whole period)
    - → Students may use their notebook
    - → Parts of test may replace quiz grades
    - → Take your time, check your answers
- Homework
  - Night off
  - ☆ Pass in NTG and Practice Sheets 1.1-1.7

☆ Get a stupid activity to keep them ☆
busy after they are done with the test

Monday, 10/18/2010

Algebra I, College (p. 4)

- Student Prep Before Class
  - Completion of Chapter 1 material
- Goals
  - Identify all troubled issues in chapter 1
  - Fully review chapte 1
  - Full preparation for exam on chapter 1
- Class Time
  - Warm-up: MCAS #
  - Classwork: Chapter 1 review sheet
    - → Hand out review sheet answers at end of class
- Homework
  - Study chapter 1 material for <u>TEST</u> <u>TOMORROW!</u>

CLASS ENDS
10:23

Friday, 10/15/2010
+
Thursday, 10/14/2010

Algebra I, College (p. 4)

- Student Prep Before Class
  - General understanding of ~~1.6~~ 1.7
  - ~~Began / Completed 1.7 Practice~~
- Goals
  - Complete understanding of how to represent functions as graphs.
- Class Time
  - Warm-up: MCAS #10 - #11
  - Class~~n~~work: 1.7 NTG / Practice
    Done independently, answering questions when asked
- Homework
  - Must have 1.7 NTG complete
  - Finish 1.7 Practice

CLASS ENDS
10:46

Wednesday, 10/13/2010

Algebra I, College (p. 4)

- Student Prep Before Class
  - Finished NTG + Practice off 1.6
  - Took test on 1.4/1.5 yesterday => BAD!
- Goals
  - Better understand 1.4/1.5 Quiz material
  - ~~Complete 1.6 Practice as a class~~
    - ~~→ Understand completely~~
- Class Time
  - ~~Warm-up: MCAS # 9~~
  - Classwork:
    - Go over quiz, as a class
    - Explain possible retake? *
    - ~~Go over 1.6 practice, as a class~~
    - ~~If time permits, begin explanation of Section 1.7: Representing functions in a graph.~~
- Homework
  - ~~1.7 Practice Sheet~~

→ All students were given 25 minutes to fix any errors and get credit for what they did

~~★ Class will be missing ★ several students due to MCAS Testing~~

CLASS ENDS
10:46

Tuesday, 10/12/2010

Algebra I, College (p. 4)

- Student Prep. Before Class
  - 1.6 Practice
  - 1.6 NTG
- Goals
  - Represent functions as rules and as tables
  - * - Assess knowledge of 1.5, 1.4
- Class Time
  - Warm-Up: MCAS #8
  - Classwork: Quiz on 1.4/1.5
  - Homework: Finish 1.6 NTG + Practice
    - ↳ Start when done with Quiz
- Homework
  - Finish 1.6 Practice

Chapter 4 Test

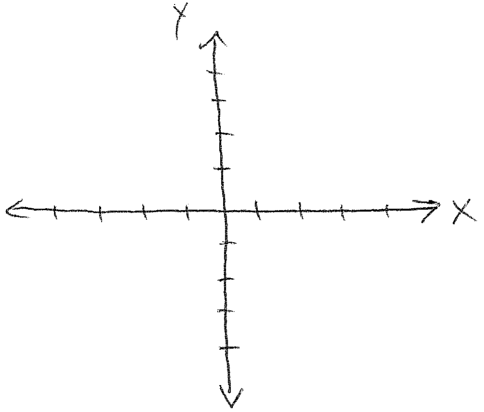
(period 1, Algebra II, College)

Name: ____________

Date: ____________

Graph the function. Label the vertex and axis of symmetry

1. $y=x^2-2x+1$

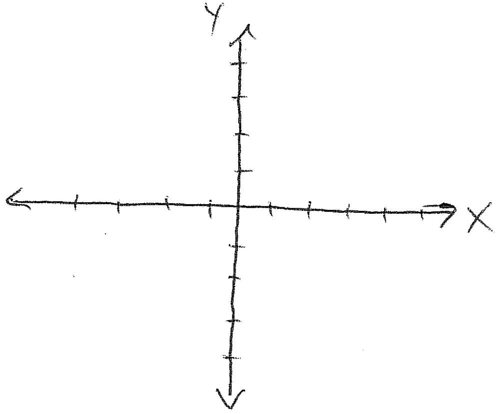


Tell whether the function has a minumum value or a maximumum value. Then find the value

2. $y=x^2-5x+6$

Graph the function. Label the vertex and the axis of symmetry. Also label the x-intercepts.

3. $y=-(x+2)(x-2)$



Write the Quadratic function in standard form.

4. $y=5(x-2)^2-5$

Factor the expression.

5. x^2-49

6. Solve $c^2+5c=14$.

7. A rectangular picture frame measures 8cm×4cm. You want to triple the frame's area by adding the same distance x to the length and the width. Write and solve an equation to find the value of x. What are the new dimensions of the picture freame.

1. See left

2. ____________

____

3. See left

4. ____________

5. ____________

6. ____________

7. ____________

____

8. Factor $10x^2+19x+6$.

9. Simplify $\sqrt{75}$.

10. Solve $3a^2=24$

Write the expression as a complex number in standard form.

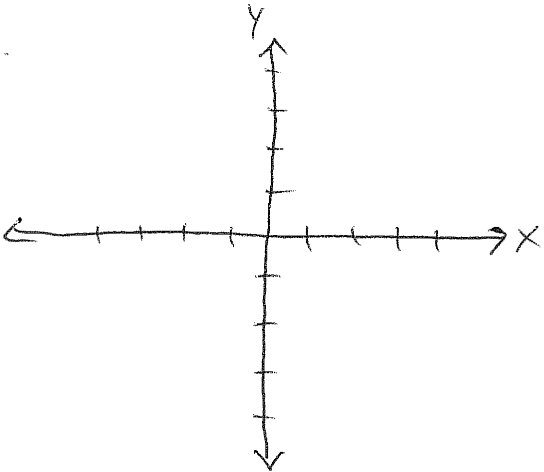
11. $(-1+i)-(-2-i)$

12. $\frac{13i}{1-2i}$

13. Find the discriminant of $r^2-4r+4=0$ and give the number and type of solutions to the equation.

14. Graph the system.

$y \le (x-1)^2$



15. Write a quadratic function whose graph has a vertex at (2,3) and lies on the point (0,-1)

8. ________

9. ________

10. ________

11. ________

12. ________

13. ________

____

____

14. See left

15. ________

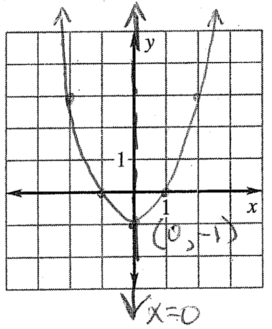
Name ________________________ Date ______________

CHAPTER 4 Chapter Test A

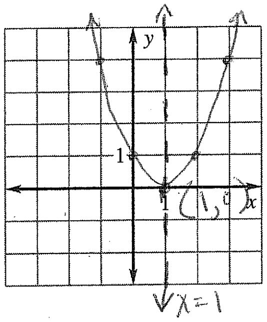
For use after Chapter 4

Graph the function. Label the vertex and the axis of symmetry.

1. $y = x^2 - 1$



2. $y = x^2 - 2x + 1$



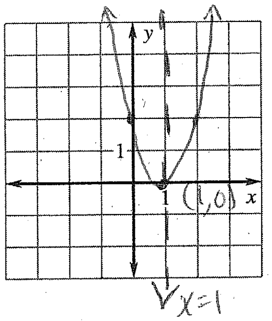
Tell whether the function has a *minimum value* or a *maximum value*. Then find that value.

3. $y = -x^2 + 1$

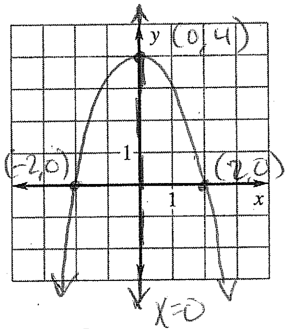
4. $y = x^2 - 5x + 6$

Graph the function. Label the vertex and the axis of symmetry. For Exercise 6, also label the *x*-intercepts.

5. $y = 2(x - 1)^2$



6. $y = -(x + 2)(x - 2)$



Write the quadratic function in standard form.

7. $y = 2(x + 3)(x - 1)$

8. $y = 5(x - 2)^2 - 5$

Factor the expression.

9. $x^2 - 49$

10. $q^2 - 11q + 24$

11. Solve $c^2 + 5c = 14$.

12. A rectangular picture frame measures 8 cm by 4 cm. You want to triple the frame's area by adding the same distance *x* to the length and the width. Write and solve an equation to find the value of *x*. What are the new dimensions of the picture frame?

Answers

1. See left.

2. See left.

3. Max
1

4. Min
$\frac{-1}{4}$

5. See left.

6. See left.

7. $2x^2+4x-6$

8. $5x^2-20x+15$

9. $(x+7)(x-7)$

10. $(q-3)(q-8)$

11. $-7, 2$

12. 4
12 cm x 8 cm

Name ______________________ Date ______________

CHAPTER 4

Chapter Test A *continued*

For use after Chapter 4

13. Factor $10x^2 + 19x + 6$.

14. Solve $4x^2 - 6x - 18 = 0$.

Simplify the expression.

15. $\sqrt{75}$

16. $\sqrt{3} \cdot 2\sqrt{3}$

Solve the equation.

17. $3a^2 = 24$

18. $x^2 + 9 = 0$

Write the expression as a complex number in standard form.

19. $(-1 + i) - (-2 - i)$

20. $\dfrac{13i}{1 - 2i}$

21. A campground rents campsites for $12 per night. At this rate, all 90 campsites are usually rented. For each $1 increase in the price per night, about 3 less sites are rented. The campground's nightly revenue can be modeled by $R = (90 - 3x)(12 + x)$. Use the vertex form to find how the campground can maximize nightly revenue.

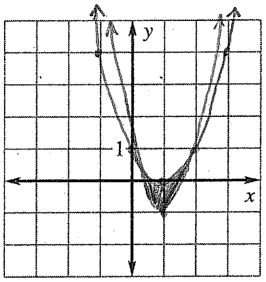
22. Solve $b^2 + 2b + 4 = 0$.

23. Find the discriminant of $r^2 - 4r + 4 = 0$ and give the number and type of solutions to the equation.

24. Graph the system.

$y \le (x - 1)^2$

$y \ge 2(x - 1)^2 - 1$



25. Solve $r^2 > 3r + 10$.

Write a quadratic function whose graph has the given characteristics.

26. vertex: (2, 3); points on graph: (0, −1)

27. x-intercepts: −3, 1; points on graph: (2, 2.5)

Answers

13. $(2x+3)(5x+2)$

14. $-\frac{3}{2}, 3$

15. $5\sqrt{3}$

16. 6

17. $\pm 2\sqrt{2}$

18. $\pm 3i$

19. $1+2i$

20. $-\frac{26}{5} + \frac{13}{5}i$

21. $9 price

increase maximizes

revinue @ $1323/night

22. $-1 \pm \sqrt{3}\, i$

23. 0

One real sol'n

24. See left.

25. $r<-2$ or $r>5$

26. $y = -(x-2)^2+3$

27. $y = \frac{1}{2}(x+3)(x-1)$

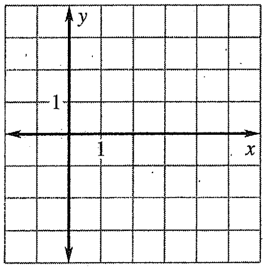
Name ______________________________ Date ______________

CHAPTER 4 Quiz 1

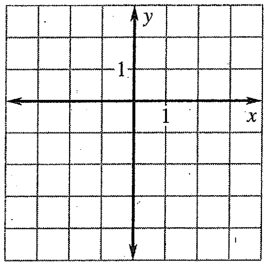
For use after Lessons 4.1–4.4

Graph the function. Label the vertex and axis of symmetry.

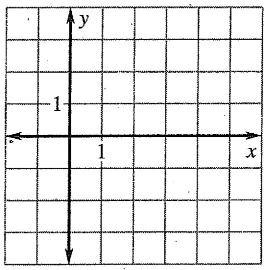
1. $y = x^2 - 6x + 7$



2. $y = 2(x - 1)^2 - 4$



3. $y = -2(x - 4)(x - 2)$



Write the quadratic function in standard form.

4. $y = -2(x - 9)(x + 7)$

5. $y = -4(x + 6)(x - 8)$

6. $y = 3(x - 4)^2 - 8$

Solve the equation.

7. $x^2 + 13x + 36 = 0$

8. $z^2 - 9z + 14 = 0$

9. $3a^2 + 5a - 28 = 0$

10. You have a picture that is 5 inches by 7 inches. You want to make a frame for the picture that is of uniform width. Together, the picture and the frame have an area of 99 inches. What should be the width of the frame?

Answers

1. See left.

2. See left.

3. See left.

4. ______________

5. ______________

6. ______________

7. ______________

8. ______________

9. ______________

10. ______________

Name ______________________ Date ____________

CHAPTER 2 Chapter Test A

For use after Chapter 2

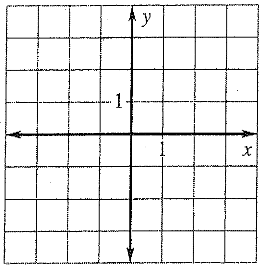
In Exercises 1–3, use the following relation.

(0, 0), (3, 2), (3, −2), (1, 1)

1. Identify the domain and range of the relation.

2. Represent the relation using a graph.

3. Use the vertical line test on the graph you drew in Exercise 2. Tell whether the relation is a function.

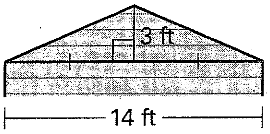


Find the slope of the line passing through the given points. Then tell whether the line *rises, falls, is horizontal,* or *is vertical.*

4. (1, 0), (0, 2)

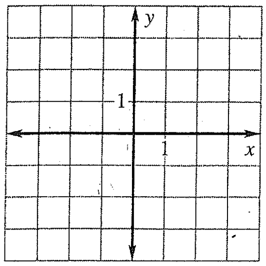
5. (2, 3), (−1, −3)

6. The shed roof has the dimensions shown. What is the slope of the roof?

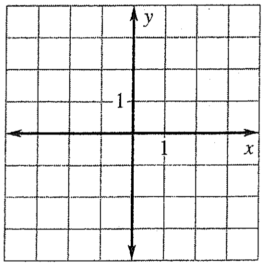


Graph the equation. Label any intercepts.

7. $y = 2x - 1$



8. $\frac{1}{3}x - y = 1$



9. A popular mobile phone plan charges a flat rate per month, plus a *per minute* fee for each minute the phone is used. The function $C = 0.25m + 15$ gives the total monthly cost C in dollars after using m minutes on the plan. What is the flat rate per month? What is the *per minute* fee?

In Exercises 10 and 11, write the equation of the line using the information provided.

10. The line passes through (0, 2) and (1, 1).

11. The line passes through (−1, 1) and has slope $m = -1$.

Answers

1. ____________

____

2. See left.

3. ____________

4. ____________

____

5. ____________

____

6. ____________

7. See left.

8. See left.

9. ____________

____

10. ____________

11. ____________

Name ______________________ Date ______________

CHAPTER 2

Chapter Test A *continued*

For use after Chapter 2

12. A barber has already cut 4 people's hair today. Every 10 minutes another person comes to the barber to get a haircut. Write an equation that models the total number H of haircuts m minutes from now.

Tell whether the equation represents direct variation. If it does, give the constant of variation.

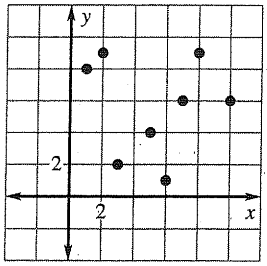
13. $y = -\frac{3}{4}x$

14. $-2x + y = 0$

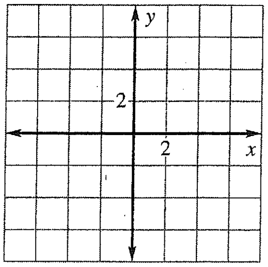
15. The table shows the distance in miles and the gas used in gallons of a new test car. Tell whether distance and gas used show direct variation. If so, write an equation that relates the quantities.

Distance	63.1	37.5	112.2	48.8
Gas used	1.97	1.18	3.55	1.51

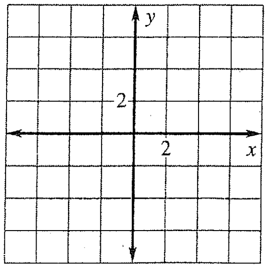
16. Tell whether the correlation coefficient for the data is closest to -1, -0.5, 0, 0.5, or 1.



17. Graph $y = |x - 3|$.



18. Graph the inequality $-2y > -6$ in a coordinate plane.



Answers

12. ______________

13. ______________

____

14. ______________

____

15. ______________

____

16. ______________

17. See left.

18. See left.

Name ______________________________ Date ____________

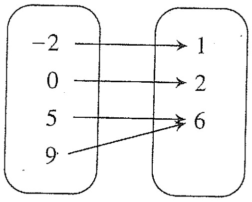
CHAPTER 2

Quiz 1

For use after Lessons 2.1–2.3

Tell whether the relation is a function.

1. Input Output



2. (8, 5), (−6, 4), (3, −2), (−6, 7)

Tell whether the function is linear. Then evaluate the function for the given value of *x*.

3. $f(x) = 5x - 10; f(-5)$

4. $f(x) = x^2 - 5x + 4; f(2)$

Find the slope of the line passing through the given points. Then tell whether the line *rises, falls, is horizontal,* or is *vertical.*

5. (3, −2), (−4, −2)

6. (9, 6), (−7, −4)

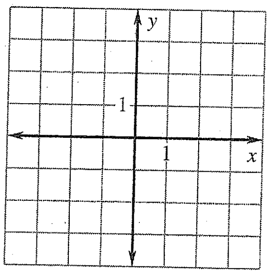
7. Tell whether the lines are *parallel*, *perpendicular*, or *neither*.

Line 1: through (4, −2) and (5, −7)

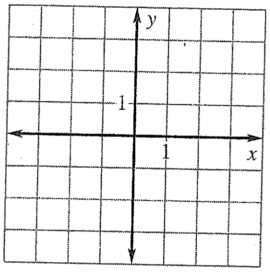
Line 2: through (2, 3) and (1, 8)

Graph the equation.

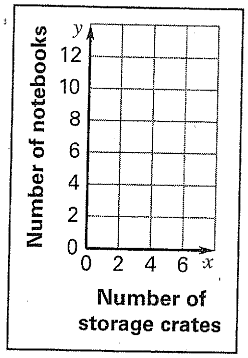
8. $y = 2x - 1$



9. $y = -3$



10. You spent \$36 buying \$9 storage crates and \$3 notebooks. This situation can be modeled by the equation $9x + 3y = 36$. Find the x- and y-intercepts. Graph the equation.



Answers

1. ____________________

____

____

____

2. ____________________

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____

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3. ____________________

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4. ____________________

____

5. ____________________

____

6. ____________________

____

7. ____________________

8. See left.

9. See left.

10. ____________________

____

See left.

Name ______________________ Date ______________

CHAPTER 5

Quiz 2

For use after Lessons 5.4–5.6

Factor the polynomial completely.

1. $3x^3 - 81$ **2.** $3x^3 + 6x^2 + x + 2$

3. $4x^7 - 64x^3$ **4.** $5x^2 - 20x - 25$

Divide using polynomial long division or synthetic division.

5. $(x^4 + 10x^3 + 8x^2 - 59x + 40) \div (x^2 + 3x - 5)$

6. $(2x^3 - 25x^2 + 83x - 88) \div (x - 8)$

Find all real zeros of the function.

7. $f(x) = x^3 - 3x^2 - x + 3$

8. $f(x) = x^3 - 6x^2 + 4x - 24$

9. $f(x) = x^4 - 2x^3 - 8x^2 + 8x + 16$

10. You have 432 cubic inches of concrete to make a rectangular prism for a small bench. You want the width and the height to be 6 inches less than the length. What should be the dimensions of the bench?

Answers

1. $3(x-3)(x^2+3x+9)$
2. $(3x^2+1)(x+2)$
3. $4x^3(x^2+4)(x-2)(x+2)$
4. $5(x-5)(x+1)$
5. x^2+7x-8
6. $2x^2-9x+11$
7. $-1, 1, 3$
8. 6
9. $-2, 2, 1+\sqrt{5}$, $1-\sqrt{5}$
10. 6 in. x 6 in. x 12 in.

$\bar{x} = 2.7$

$\sigma x = 2.1$

Min. = 0

Max. = 7

Out of 10

0 - 41%

1 - 48%

2 - 54%

3 - 61%

4 - 67%

5 - 74%

6 - 80%

7 - 87%

Chapter 5: Quiz 2 (Lessons 5.4-5.6)

① $3x^3-81$

$3(x^3-27)$

$3(x^3-3^3)$ ★ Difference of 2 cubes

$\boxed{3(x-3)(x^2+3x+9)}$

② $3x^3+6x^2+x+2$

$(3x^3+6x^2)+(x+2)$ ★ Factor by grouping

$3x^2(x+2)+1(x+2)$

$\boxed{(3x^2+1)(x+2)}$

③ $4x^7-64x^3$

$4x^3(x^4-16)$

$4x^3((x^2)^2-4^2)$ ★ Difference of 2 squares

$4x^3(x^2+4)(x^2-4)$

$4x^3(x^2+4)(x^2-2^2) \longrightarrow$ Difference of 2 squares

$\boxed{4x^3(x^2+4)(x+2)(x-2)}$

④ $5x^2-20x-25$

$5(x^2-4x-5)$

$\boxed{5(x-5)(x+1)}$

⑤

$$\boxed{x^2+7x-8}$$

$$x^2+3x-5\,\overline{)\,x^4+10x^3+8x^2-59x+40}$$

$$-(x^4+3x^3-5x^2)$$

$$7x^3+13x^2-59x+40$$

$$7x^3+21x^2-35x$$

$$-8x^2-24x+40$$

$$-8x^2-24x+40$$

$$0$$

⑥
$$\boxed{2x^2-9x+11}$$
$$x-8\,\overline{)\,2x^3-25x^2+83x-88}$$
$$\underline{2x^3-16x^2}$$
$$-9x^2+83x-88$$
$$\underline{-9x^2+72x}$$
$$11x-88$$
$$\underline{11x-88}$$
$$0$$

⑦ $f(x)=x^3-3x^2-x+3$

$x^3-3x^2-x+3=0$ ☆ Factor by grouping

$(x^3-3x^2)+(-x+3)=0$

$x^2(x-3)-1(x-3)=0$

$(x^2-1)(x-3)=0$ → ☆ Difference of 2 squares

$(x+1)(x-1)(x-3)=0$

$$\begin{array}{lll} x+1=0 & x-1=0 & x-3=0 \\ -1\quad -1 & +1\quad +1 & +3\quad +3 \\ x=-1 & x=1 & x=3 \end{array}$$

$$\boxed{\text{The real zeros are } x=-1,1,3}$$

⑧ $f(x)=x^3-6x^2+4x-24$

$x^3-6x^2+4x-24=0$ ☆ Factor by grouping

$(x^3-6x^2)+(4x-24)=0$

$x^2(x-6)+4(x-6)=0$

$(x^2+4)(x-6)=0$

$$\begin{array}{ll} x^2+4=0 & x-6=0 \\ -4\quad -4 & +6\quad +6 \\ x^2=-4 & x=6 \\ x=\pm\sqrt{-4} & \\ x=\pm 2i & \end{array}$$

$x=\pm 2i$ ← Imaginary zeros

$$\boxed{\text{The real zero is } x=6}$$

⑨ $f(x)=x^4-2x^3-8x^2+8x+16$

$p=\pm1,\pm2,\pm4,\pm8,\pm16$
$q=\pm1$

$\frac{p}{q}=\pm1,\pm2,\pm4,\pm8,\pm16$ → Possible zeros

$$\begin{array}{r|rrrrr} \boxed{-2} & 1 & -2 & -8 & 8 & 16 \\ & \downarrow & -2 & 8 & 0 & -16 \\ \hline & 1 & -4 & 0 & 8 & 0 \end{array}\ ✓$$

x^3-4x^2+8

$$\begin{array}{r|rrrr} 2 & 1 & -4 & 0 & 8 \\ & \downarrow & 2 & -4 & -8 \\ \hline & 1 & -2 & -4 & 0 \end{array}\ ✓$$

x^2-2x-4

(page 2)

⑨ Continued . . .

Zeros thus far: $x = -2, 2$

So we have: $\underset{\checkmark}{(x+2)}\underset{\checkmark}{(x-2)}\underset{\times}{(x^2-2x-4)}=0$

↙

$x^2 - 2x - 4 = 0$

★ Quadratic Formula $\longrightarrow \begin{cases} a = 1 \\ b = -2 \\ c = -4 \end{cases}$

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$

$$x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-4)}}{2(1)}$$

$$x = \frac{2 \pm \sqrt{4+16}}{2} = \frac{2 \pm \sqrt{20}}{2} = \frac{2 \pm 2\sqrt{5}}{2} = 1 \pm \sqrt{5} = x$$

The real zeros are $x = -2, 2, 1-\sqrt{5}, 1+\sqrt{5}$

⑩ 432 cubic inches for rectangular prism

Width and Height are 6 inches less than length

Width = w = $l - 6$ $\qquad V = lwh$

Height = h = $l - 6$ $\qquad V = 432$ in.³

Length = l = x

$$432 = x(x-6)(x-6)$$

$$432 = x(x^2 - 6x - 6x + 36)$$

$$432 = x(x^2 - 12x + 36)$$

$$432 = x^3 - 12x^2 + 36x$$

$$x^3 - 12x^2 + 36x - 432 = 0$$

$(x^3 - 36x) + (-12x^2 - 432) = 0$ ★ Factor by grouping

$$x(x^2-36) - 12(x^2-36) = 0$$

$$(x-12)(x^2-36) = 0$$

⑩ Continued . . .

$(x-12)(x^2-36)=0$

$x-12=0$
$+12 \quad +12$
$x=12$

$x^2-36=0$
$+36 \quad +36$
$x^2=36$
$x=\pm 6$

☆ You can't have a negative length, so we deny $l=-6$ and use $x=6$ and $x=12$

Width = 6
Length = 12
Height = 6

Name: ______________________

Date: ______________________

Chapter 4 Test

1. Write a quadratic function in standard form whose graph has the vertex $(2, 1)$.

2. Write $y = -(x-2)^2 + 3$ in standard form

Graph the function. Label the vertex and axis of symmetry for 3 and 4.

3. $y = 2x^2 + x - 3$ 4. $y = -3(x+1)(x-2)$

5. Tell whether $y = -2x(x+3) - 5$ has a minimum value or a maximum value. Then find that value.

Factor the expression and find the zeros.

6. $2x^2 - 12x - 110 = 0$

7. $-x^2 - 4x - 2 = 1$

8. $\frac{1}{3}x^2 - \frac{1}{3}x - \frac{1}{4} = 0$

Simplify.

9. $\dfrac{\sqrt{5}}{6 - \sqrt{7}}$ 10. $\dfrac{\sqrt{100} \cdot \sqrt{25}}{\sqrt{2}}$

Solve.

11. $9x^2 + 12 = 48$

12. Write $\dfrac{2i^2 - 3i(i-2)}{2i}$ as a complex number in standard form.

13. Solve $x^2 + 2x + 5 = 0$

14. Find the discriminant of $x^2 - 4x + 1 = 0$ and give the number and type of solutions to the equation.

1. ______________________

2. ______________________

3. See left

4. See left

5. __________ __________

6. ______________________

7. ______________________

8. ______________________

9. ______________________

10. ______________________

11. ______________________

12. ______________________

13. ______________________

14. ______________________

Name ANSWER SHEET Date

CHAPTER 4

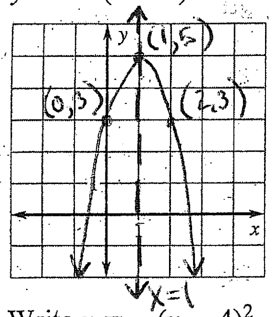
Chapter Test C

For use after Chapter 4

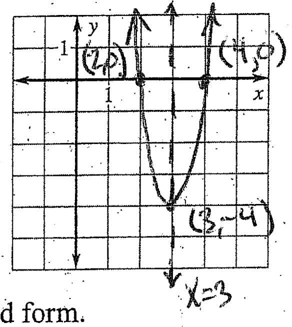
1. Write three different quadratic functions in standard form whose graphs have a vertex of (-3, 2).

Graph the function. Label the vertex and the axis of symmetry. For Exercise 5, also label the *x*-intercepts.

4. $y = -2(x - 1)^2 + 5$



5. $y = 4(x - 2)(x - 4)$



6. Write $y = -(x - 4)^2 - 16$ in standard form.

7. Tell whether $y = -3x(x - 3)$ has a *minimum value* or a *maximum value*. Then find that value.

Factor the expression. (8 and 9)

8. $w^2 + 10w + 16$

9. $9v^2 - 13v + 4$

10. Simplify $\frac{\sqrt{2}}{4+\sqrt{5}}$

11. Solve $t^2 = 6t + 55$.

12. Simplify $\sqrt{3} \cdot \sqrt{363}$.

Find the zeros of the function [redacted]

13. $y = -3x^2 - 12x - 9$

14. $g(x) = \frac{1}{3}x^2 - \frac{1}{3}x - \frac{1}{4}$

Solve the equation.

15. $4x^2 - 14 = 11$

16. $12^2 - w^2 = -25$

17. Write $\frac{4i(1 + i) + 4}{2i}$ as a complex number in standard form.

Answers

1.

4. See left.

5. See left.

6. $y = -x^2 + 8x - 32$

7. Max ; $27/4$

8. $(w+8)(w+2)$

9. $(9v-4)(v-1)$

10. $\frac{4\sqrt{2}-\sqrt{10}}{11}$

11. $t = -5, 11$

12. 33

13. $x = -3, -1$

14. $x = \frac{-1}{2}, \frac{3}{2}$

15. $\pm 5/2$

16. ± 13

17. 2

$4(-2-2)(-2-4)$

$4(-4)(-6)$

$\frac{3}{12} + \frac{8}{12} = \frac{11}{12} + \frac{6}{12} = \frac{17}{12}$

$4 + \frac{8}{6} + \frac{3}{6} = 4\frac{11}{6} = 5\frac{5}{6}$

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CHAPTER 4

Chapter Test C

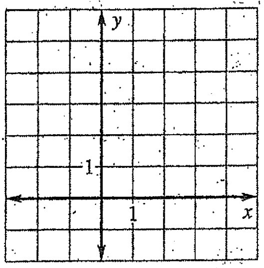
For use after Chapter 4

TAKE HOME (RETAKE)

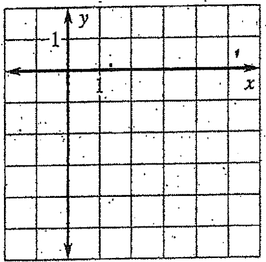
1. Write three different quadratic functions in standard form whose graphs have a vertex of (-3, 2).

Graph the function. Label the vertex and the axis of symmetry. For Exercise 5, also label the *x*-intercepts.

4. $y = -2(x - 1)^2 + 5$



5. $y = 4(x - 2)(x - 4)$



6. Write $y = -(x - 4)^2 - 16$ in standard form.

7. Tell whether $y = -3x(x - 3)$ has a *minimum value* or a *maximum value*. Then find that value.

Factor the expression. (8 and 9)

8. $w^2 + 10w + 16$

9. $9v^2 - 13v + 4$

10. Simplify $\frac{\sqrt{2}}{4+\sqrt{5}}$

11. Solve $t^2 = 6t + 55$.

12. Simplify $\sqrt{3} \cdot \sqrt{363}$.

Find the zeros of the function [redacted].

13. $y = -3x^2 - 12x - 9$

14. $g(x) = \frac{1}{3}x^2 - \frac{1}{3}x - \frac{1}{4}$

Solve the equation.

15. $4x^2 - 14 = 11$

16. $12^2 - w^2 = -25$

17. Write $\frac{4i(1 + i) + 4}{2i}$ as a complex number in standard form.

Answers

1. ____________

____

____

4. See left.

5. See left.

6. ____________

7. ____________

8. ____________

9. ____________

10. ____________

11. ____________

12. ____________

13. ____________

14. ____________

15. ____________

16. ____________

17. ____________

Quiz 4.7-4.10

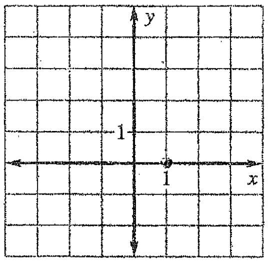
21. A campground rents campsites for \$12 per night. At this rate, all 90 campsites are usually rented. For each \$1 increase in the price per night, about 3 less sites are rented. The campground's nightly revenue can be modeled by $R = (90 - 3x)(12 + x)$. Use the vertex form to find how the campground can maximize nightly revenue.

22. Solve $b^2 + 2b + 4 = 0$.

23. Find the discriminant of $r^2 - 4r + 4 = 0$ and give the number and type of solutions to the equation.

24. Graph the system.

$y \leq (x - 1)^2$
$y \geq 2(x - 1)^2 - 1$



25. Solve $r^2 > 3r + 10$.

Write a quadratic function whose graph has the given characteristics.

26. vertex: (2, 3); points on graph: (0, −1)

27. x-intercepts: −3, 1; points on graph: (2, 2.5)

19. ______________

20. ______________

21. ______________

____

____

22. ______________

23. ______________

____

____

24. See left.

25. ______________

26. ______________

27. ______________

Name MY COPY Date

D: All or nothing
R: All or nothing

CHAPTER 2

Chapter Test B

For use after Chapter 2

Identify the domain and range of the relation.

1. (0, 2), (1, 0), (3, −2), (−1, 1) **2.** (−1, −3), (2, 3), (1, 2), (−1, 2)

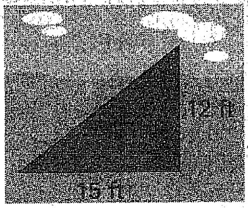
Tell whether the function is linear. Then evaluate the function for the given value of *x*.

3. $f(x) = 2x + \frac{3}{2}; f(1)$ **4.** $f(x) = 2x^2 + x; f(3)$

Find the slope of the line passing through the given points. Then tell whether the line *rises, falls, is horizontal,* or *is vertical.*

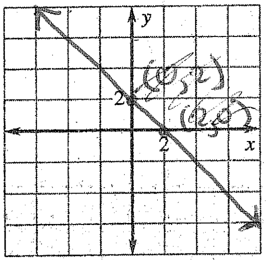
5. (2, 4), (0, 4) **6.** (−1, −3), (1, −2)

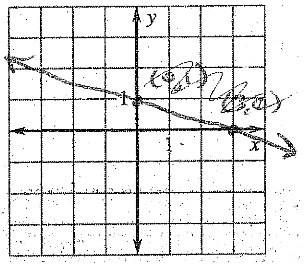
7. You are measuring a bike ramp which is 15 feet wide at its base and 12 feet tall at its tallest point. What is the slope of the bike ramp?



Graph the equation. Label any intercepts.

8. $y = -x + 2$ **9.** $-\frac{1}{3}x - y = -1$





10. A company makes 2 models of snowboards, standard and deluxe. The standard model *s* costs \$30 to make, while the deluxe model *d* costs \$40. They have \$1000 available with which to make snowboards. The number of snowboards that can be made is given by $30s + 40d = 1000$. Give 2 possible combinations where all of the \$1000 is used.

11. For first time customers, a bank will open an account with \$25 included. This bank also charges a monthly \$2.95 service fee on the account. Write an equation that shows the balance *B* after *m* months, assuming no other activity is made on the account. Find the balance in the account after 8 months.

Should know that balance decreases

360

Answers

1. D: -1, 0, 1, 3 ①
R: -2, 0, 1, 2 ②

2. D: -1, 1, 2 ②
R: -3, 2, 3

3. Linear ③
3.5 ④

4. Not Linear ⑤
21 ⑥

5. 0 ⑦
Horizontal

6. 1/2 ⑧
Rises

7. 4/5 ⑨

8. See left. ⑩

9. See left. ⑪

⑫ 10. (20, 10) (32, 1)
(0, 25) (24, 7) (12, 16)
(10, 15) (8, 19) (16, 13)

⑬ 11. B = -2.95m + 25
\$1.40

480
520
13
×4
52
24
72
28
16
+4
64

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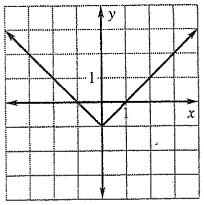
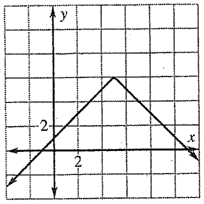
Quiz 3

1.



The graphs have the same shape. The graph of $y = |x| - 1$ is the graph of $y = |x|$ translated down 1 unit.

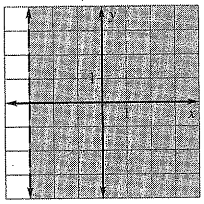
2.



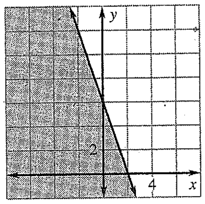
The graphs have the same shape. The graph of $y = -|x - 5| + 6$ is the graph of $y = |x|$ reflected in the x-axis and then translated 6 units up and 5 units right.

3. $y = \frac{4}{3}|x|$ **4.** $y = \frac{3}{2}|x + 2| - 3$ **5.** yes

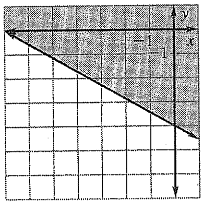
6. yes **7.**



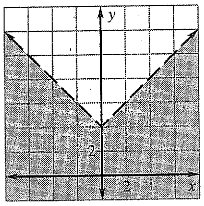
8.



9.



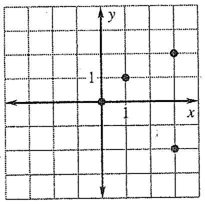
10.



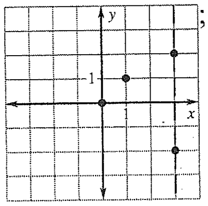
Chapter Test A

1. domain: 0, 1, 3; range: −2, 0, 1, 2

2.



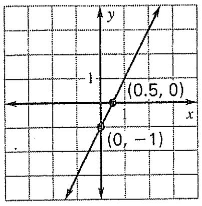
3.



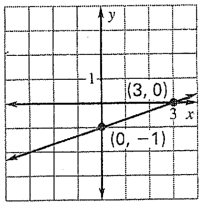
; not a function **4.** −2; falls

5. 2;. rises **6.** $\frac{3}{7}$

7.



8.

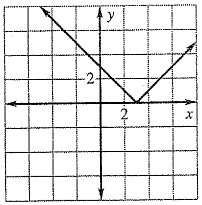


9. \$15/month; \$.25/min **10.** $y = -x + 2$

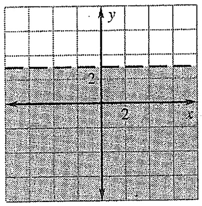
11. $y = -x$ **12.** $H = \frac{1}{10}m + 4$ **13.** yes; $-\frac{3}{4}$

14. yes; 2 **15.** yes; $y = 32x$ **16.** 0

17.



18.



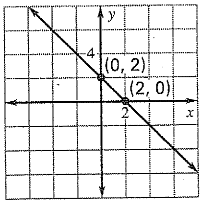
Chapter Test B

1. domain: −1, 0, 1, 3; range: −2, 0, 1, 2

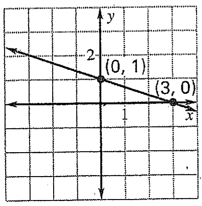
2. domain: −1, 1, 2; range: −3, 2, 3 **3.** linear; 3.5 **4.** not linear; 21 **5.** 0; is horizontal

6. $\frac{1}{2}$; rises

7. $\frac{4}{5}$ **8.**



9.

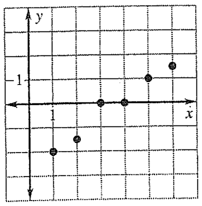


10. *Sample answer:* $s = 20, d = 10; s = 0, d = 25$ **11.** $B = -2.95m + 25$; \$1.40

12. $y = -\frac{1}{3}x + 2$ **13.** $y = -2x; -\frac{3}{2}$

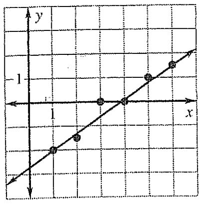
14. $y = -1.5x; -2$

15.



16. 0.9

17.



18. about 3

Name ______________________ Date ______________

CHAPTER 2

Chapter Test B

For use after Chapter 2

Identify the domain and range of the relation.

1. (0, 2), (1, 0), (3, −2), (−1, 1)

2. (−1, −3), (2, 3), (1, 2), (−1, 2)

Tell whether the function is linear. Then evaluate the function for the given value of *x*.

3. $f(x) = 2x + \frac{3}{2}; f(1)$

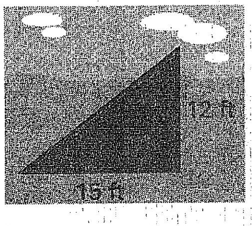
4. $f(x) = 2x^2 + x; f(3)$

Find the slope of the line passing through the given points. Then tell whether the line *rises, falls, is horizontal,* or *is vertical.*

5. (2, 4), (0, 4)

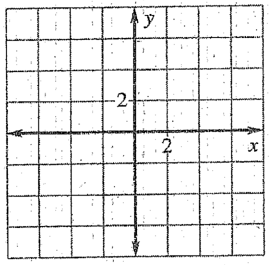
6. (−1, −3), (1, −2)

7. You are measuring a bike ramp which is 15 feet wide at its base and 12 feet tall at its tallest point. What is the slope of the bike ramp?

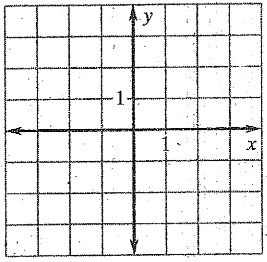


Graph the equation. Label any intercepts.

8. $y = -x + 2$



9. $-\frac{1}{3}x - y = -1$



10. A company makes 2 models of snowboards, standard and deluxe. The standard model s costs \$30 to make, while the deluxe model d costs \$40. They have \$1000 available with which to make snowboards. The number of snowboards that can be made is given by $30s + 40d = 1000$. Give 2 possible combinations where all of the \$1000 is used.

11. For first time customers, a bank will open an account with \$25 included. This bank also charges a monthly \$2.95 service fee on the account. Write an equation that shows the balance B after m months, assuming no other activity is made on the account. Find the balance in the account after 8 months.

Answers

1. ______________

____

2. ______________

____

3. ______________

____

4. ______________

____

5. ______________

____

6. ______________

____

7. ______________

8. See left.

9. See left.

10. ______________

____

____

11. ______________

____

Name ______________________________ Date ______________

CHAPTER 2

Chapter Test B *continued*

For use after Chapter 2

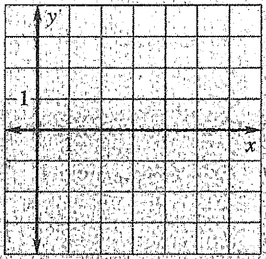
12. Write the equation of the line with slope $m = -\frac{1}{3}$ and y-intercept $b = 2$.

The variables x and y vary directly. Write an equation that relates x and y. Then find x when $y = 3$.

13. $x = 2, y = -4$ **14.** $x = 2, y = -3$

In Exercises 15–18, use the following table.

x	1	2	3
y	−2	−1.5	0
x	4	5	6
y	0	1	1.5



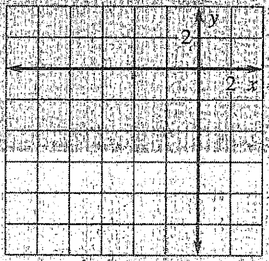
15. Draw a scatter plot of the data.

16. Estimate the correlation coefficient.

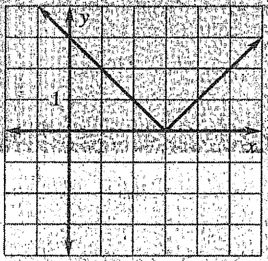
17. On the scatter plot, approximate the best fitting line.

18. Estimate y when $x = 8$.

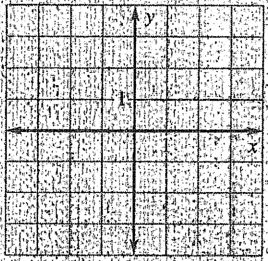
19. Graph $f(x) = -|x + 3| - 2$.



20. Write an equation of the graph.



21. Graph the inequality $x + 2y > 3$.



Answers

12. ______________

13. ______________

____

14. ______________

____

15. See left.

16. ______________

17. See left.

18. ______________

19. See left.

20. ______________

21. See left.

Name ______________________________ Date ________________

CHAPTER 1

Quiz 2

For use after Lessons 1.4–1.5

Write an equation or an inequality.

1. The sum of twice a number d and 3 is 12.
2. Six less than four times a number j is 18.
3. The product of 8 and a number q is at least 32.
4. The difference of 10 and a number w is no more than 8.

In Exercises 5–8, check whether the given number is a solution of the equation or inequality.

5. $z - 4 = 9$; 12
6. $2x - 9 \geq 11$; 10
7. $k - 8.2 < 10$; 18
8. $4d + 1 < 13$; 3
9. What is the interest on $950 invested for 4 years in an account that earns simple interest at a rate of 3% per year?
10. A car travels 210 miles in 3.5 hours. What is the average speed of the car?

Answers

1. ________________
2. ________________
3. ________________
4. ________________
5. ________________
6. ________________
7. ________________
8. ________________
9. ________________
10. ________________

Name ______________________________ Date ______________

LESSON 1.6

Practice

For use with pages 35–41

Complete the sentence.

1. The input variable is called the __________ variable.

2. The output variable is called the __________ variable.

Tell whether the pairing is a function.

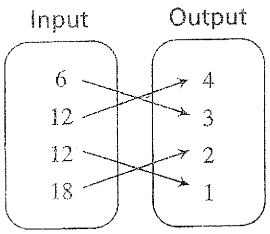
3.

Input	Output
1	15
3	20
5	15
7	20

4.

Input	Output
5	5
6	5
7	5
8	5

5.



Make a table for the function. Identify the range of the function.

6. $y = 4x - 2$

Domain: 1, 2, 3, 4

7. $y = 0.1x + 3$

Domain: 10, 20, 30, 40

8. $y = \frac{1}{2}x + 2$

Domain: 6, 7, 8, 9

Name ______________________________ Date ______________

LESSON 1.6

Practice *continued*

For use with pages 35–41

Write a rule for the function.

9.

Input, x	1	2	3	4
Output, y	5	10	15	20

10.

Input, x	10	11	12	13
Output, y	3	4	5	6

11. **Shoe Sizes** The table shows men's shoe sizes in the United States and Australia. Write a rule for the Australian size as a function of the United States' size.

U.S. size	5	6	7	8	9	10
Australian size	3	4	5	6	7	8

12. **Balloon Bunches** You are making balloon bunches to attach to tables for a charity event. You plan on using 8 balloons in each bunch. Write a rule for the total number of balloons used as a function of the number of bunches created. Identify the independent and dependent variables. How many balloons will you use if you make 10 bunches?

13. **Baking** A baker has baked 10 loaves of bread so far today and plans on baking 3 loaves more each hour for the rest of his shift. Write a rule for the total number of loaves baked as a function of the number of hours left in the baker's shift. Identify the independent and dependent variables. How many loaves will the baker make if he has 4 hours left in his shift?

Name ______________________ Date ______________

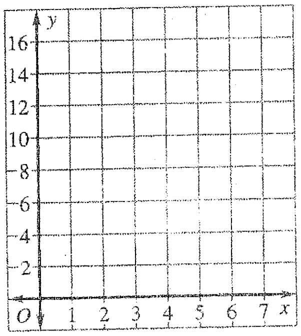
LESSON 1.7

Practice

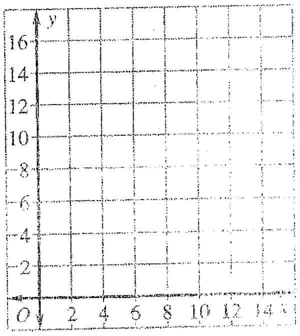
For use with pages 42–48

Graph the ordered pairs.

1. (3, 4), (4, 7), (5, 10), (6, 13), (7, 16)



2. (2, 5), (6, 7), (4, 6), (12, 10), (10, 9)



Complete the input-output table for the function.

3. $y = 3x + 2$

x	0	1	2	3
y				

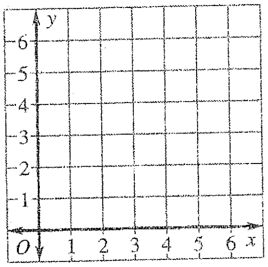
4. $y = 4x - 1$

x	1	2	3	4
y				

Graph the function.

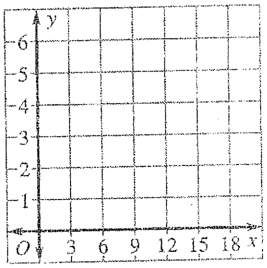
5. $y = 6 - x$

Domain: 6, 5, 4, 3, 2



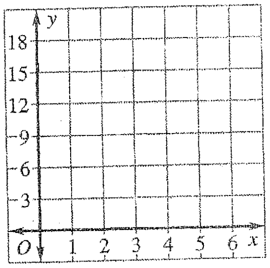
6. $y = \frac{1}{3}x$

Domain: 6, 9, 12, 15, 18



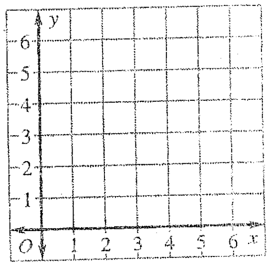
7. $y = 4x - 3$

Domain: 1, 2, 3, 4, 5



8. $y = 1.2x$

Domain: 1, 2, 3, 4, 5



Name ______________________________ Date ______________

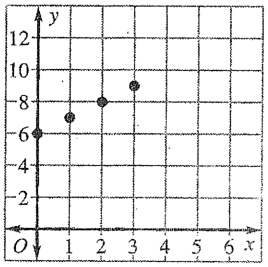
LESSON
1.7

Practice *continued*

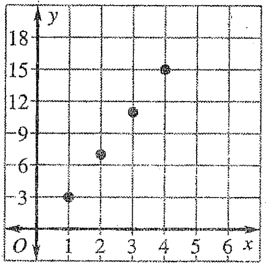
For use with pages 42–48

Write a rule for the function represented by the graph. Identify the domain and range of the function.

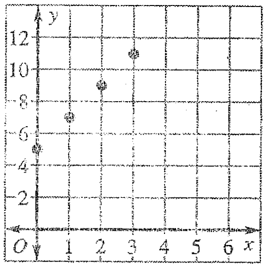
9.



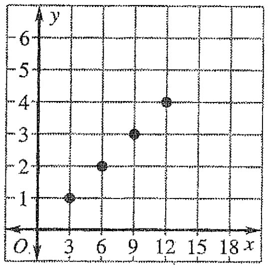
10.



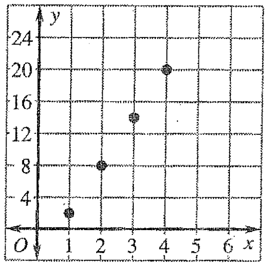
11.



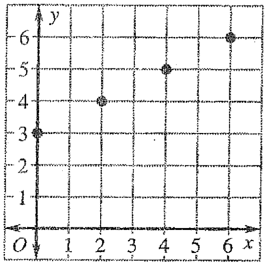
12.



13.



14.



Attendance/Warm-Up

DATE:	**13-Dec**	**14-Dec**	**15-Dec**	**16-Dec**	**17-Dec**	**20-Dec**	**21-Dec**	**22-Dec**	**23-Dec**
NAME	*Y/N/A*	*Y/N/A*	*Y/N/A*	*Y/N/A*	*Y/N/A*	*Y/N/A*	*Y/N/A*	*Y/N/A*	*Y/N/A*
Arrington, Chris	Y		Y	N					
Colon, Deborah	Y		Y	N					
Cortes, Jonathon	A		A	A	A				
Flores, Nazarai	Y		N	Y					
Fimpong, Edward	Y		A	Y					
Fuster, Israel	N		Y	Y					
Harlachel, Meghan	Y		N	N					
Hughes, Anthony	N		N	A					
Jackson, Khalil	Y		Y	Y					
Jawad, Mohamed	Y		N	N					
Maclellan, Meghan	A		N	A					
Matthews, Sara Jean	Y		A	Y					
Martinezt, Rossanna	N		N	A	A				
Melendez, Oneliz	A		A	N	A				
Mont, Michael	A		A	A	A				
Ngendahorori, Tereza	Y		Y	Y					
Ortiz, Kathleen	Y		A	N					
Sanchez, Jose	Y		A	N					
Santos, Richard	Y		Y	N					
Skerrett, Anfernee	Y		Y	N	A				
Soto, Nenoshka	Y		N	N					
Rasch Garcia, Wesley	Y			N	A				
Hernandez Llanos, Giancarlos	Y		Y	Y					

Attendance/Warm-Up

Chapter 2 Test

Open Response Day

DATE:	1-Nov	2-Nov	3-Nov	4-Nov	5-Nov	8-Nov	9-Nov	10-Nov	11-Nov	12-Nov	15-Nov	16-Nov	17-Nov	18-Nov	19-Nov
NAME	Y/N/A	Y/N/A	Y/N/A	Y/N/A	Y/N/A	Y/N/A	Y/N/A	Y/N/A	Y/N/A	Y/N/A	Y/N/A	Y/N/A	Y/N/A	Y/N/A	Y/N/A
Arrington, Chris								Y		N	A	N	Y		N
Colon, Deborah								Y		Y	Y	Y	Y		A
Cortes, Jonathon Curty, back of room								N		N	A *	A	Y	A	A
Flores, Nazarai								Y		Y	Y	Y	Y	A	Y
Fimpong, Edward								N		Y	Y	Y	N		N
Fuster, Israel								N		Y	Y	N	Y		Y
Harlachel, Meghan								N		N	A	Y	Y	A	Y
Hughes, Anthony								Y		N	N	N	Y		Y
Jackson, Khalil								Y		Y	Y	Y	Y		Y
Jawad, Mohamed								N		N	Y	A	N		Y
Maclellan, Meghan								A		N	A	A	A	A*	A
Matthews, Sara Jean								N		N	N	N	Y	A	Y
Martinezt, Rossanna								N		Y	N	Y	Y		N
Melendez, Oneliz								N		A	A	A	A	A	A
Mont, Michael back in [illegible] / not dumb								Y		Y	Y	N	Y		A
Ngendahorori, Tereza								Y		Y	Y	Y	Y		Y
Ortiz, Kathleen								Y		Y	Y	N	Y		Y
Sanchez, Jose						A	A	A		A	A	A	A		N
Santos, Richard								Y		N	N	N	Y		N
Skerrett, Anfernee								A		N	N	N	Y		N
Soto, Nenôshka								Y		Y	Y	N	Y		Y
Gonzalez Joseph															Y

New Student

Attendance/Warm-Up

Assembly (D)

3.5 NTG

3.6 NTG

3.7 NTG

0/14
Progress Rep

DATE:	22-Nov	23-Nov	~~24-Nov~~	~~25-Nov~~	~~26-Nov~~	29-Nov	30-Nov	1-Dec	2-Dec	3-Dec	6-Dec	7-Dec	8-Dec	9-Dec	10-Dec	
NAME	Y/N/A	Y/N/A	~~Y/N/A~~	~~Y/N/A~~	~~Y/N/A~~	Y/N/A	Y/N/A	Y/N/A	Y/N/A	Y/N/A	Y/N/A	Y/N/A	Y/N/A	Y/N/A	Y/N/A	
Arrington, Chris	N	N				N	N	Office	N	N	N			N	Y	14
Colon, Deborah	Y	Y				Y	D	Y	Y	N	Y			Y	Y	79
Cortes, Jonathon	N	N				Y	Y	A	Y	Y	Y	A	A	A	Y	43
Flores, Nazarai	Y	Y				N	D	Y	Y	Y	N			A		79
Fimpong, Edward	Y	Y				Y	N	Y	Y	Y	Y			Y		71
Fuster, Israel	Y	Y				N	D	N	N	N	Y			N		50
Harlachel, Meghan	Y	N				N	D	N	N	N	N	A		Y		29
Hughes, Anthony	Y	Y				A	D	N	N	N	N			N		36
Jackson, Khalil	Y	Y				Y	D	Y	Y	Y	Y			A		93
Jawad, Mohamed	Y	Y				Y	N	Y	Y	Y	Y			Y		64
Maclellan, Meghan	A	A				A	A	A	A	A	A	A		Y		0
Matthews, Sara Jean	Y	Y				Y	D	Y	Y	A	N	A		Y		50
Martinezt, Rossanna	A	A				N	D	Y	N	Y	N			Y		36
Melendez, Oneliz	A	A				A	A	A	A	A	N	A	A	A		0
Mont, Michael	Y	A				N	N	Y	N	A	A	A	A	A		43
Ngendahorori, Tereza	Y	Y				Y	Y	Y	Y	Y	Y			Y		100
Ortiz, Kathleen	Y	Y				Y	Y	A	Y	Y	Y			Y		86
Sanchez, Jose	Y	N				Y	Y	Y	Y	Y	Y			Y		50
Santos, Richard	Y	N				N	Y	Y	N	N	N			Y		36
Skerrett, Anfernee	A	N				N	D	N	A	A	A			Y		7
Soto, Nenoshka	Y	N				Y	N	N	Y	N	N			Y		57
~~Gonzalez, Joseph~~	~~Y~~	~~Y~~				~~A~~	Y	Y	Y	Y	Y		A	A		86
Rasch Garcia, Wesley																
Hernandez Llanos, Giancarlos																

Practice/Note Taking Guide

Section:	3.5		3.6		3.7		Chapter 3 Test		Progress Report		P.204 #1-11		4.1	
NAME	*NTG*	*Pract.*	*NTG*	*Pract.*	*NTG*	*Pract.*	~~*NTG*~~	~~*Pract.*~~	*NTG*/135	*Pract.*	~~*NTG*~~	~~*Pract.*~~	*NTG*	*Pract.*
Arrington, Chris	0	0	0	0	0	0	0		10	7		+	~~10~~	10
Colon, Deborah	10	15	0	15	10	15	13%		80	78	✓			
Cortes, Jonathon	10	0	10	A	10	A			75	0		✓		
Flores, Nazarai	10	0	5	0	0	0	33%		85	15		✓		
Fimpong, Edward	10	0	10	0	10	0	0		95	41	✓	+		
Fuster, Israel	0	0	0	0	0	0	0		50	11			~~10~~	10
Harlachel, Meghan	0	0	0	0	0	0	0		10	0		✓		
Hughes, Anthony	0	0	0	0	0	0	0		10	0				
Jackson, Khalil	10	0	10	0	10	15	60%		100	56			10	15
Jawad, Mohamed	10	0	10	0	10	0	23%		70	7			~~10~~	10
Maclellan, Meghan	A	A	A	A	A	A	—							
Matthews, Sara Jean	10	0	0	0	A	A	27%		90	19		A		
Martinezt, Rossanna	0	0	0	0	0	0	0		20	0		✓		
Melendez, Oneliz	0	0	0	0	0	0			10	0		A		
Mont, Michael	0	0	A	A	A	A			10	0		A		
Ngendahorori, Tereza	10	15	10	10	10	10	85%		100	81	✓	+	~~15~~ 10	15
Ortiz, Kathleen	10	0	10	0	10	0	0%		95	19	✓		10	
Sanchez, Jose	10	15	10	15	10	15	Take-home		90	95	✓		~~15~~ 10	15
Santos, Richard	0	0	0	0	0	0	0		15	15			~~10~~	10
Skerrett, Anfernee	A	A	A	A	A	A	0							
Soto, Nenoshka	10	0	5	0	10	0	0		95	0	✓			
Rasch Garcia Wesley											✓	A		

15

Hernandez Llanes, Giancarlos

Extra 10
Credit (x2)

NTG: 0-10
Pract.: 0-15

Practice/Note Taking Guide

11/16

Section:	2.6		2.7		Chapter 2 Test		3.1		3.2		3.3		3.4	
NAME	*NTG*	*Pract.*	*NTG*	*Pract.*	~~*NTG*~~	~~*Pract.*~~	*NTG*	*Pract.*	*NTG*	*Pract.*	*NTG*	*Pract.*	*NTG*	*Pract.*
Arrington, Chris	0	0	0	0	0		0	10	0	0	0	0	0	0
Colon, Deborah	10	15	10	15	55		10	0	0	0	10	15	10	15
Cortes, Jonathon	0	0	0	0			5	0	10	0	10	0	10	0
Flores, Nazarai	10	10	10	10	24		10	0	10	0	10	0	10	0
Fimpong, Edward	10	10	10	10	5		10	10	10	15	10	10	5	0
Fuster, Israel	10	0	10	0	0		10	15	0	0	0	0	10	0
Harlachel, Meghan	0	0	0	0	17		0	0	0	0	0	0	0	0
Hughes, Anthony	0	0	0	0	0		0	15	0	0	0	0	0	0
Jackson, Khalil	10	15	10	15	44		10	15	10	15	10	0	10	0
Jawad, Mohamed	0	0	0	0			10	0	0	0	10	10	10	0
Maclellan, Meghan	0	0	0	0			A	A	A	A	A	A	A	A
Matthews, Sara Jean	10	10	10	0	0		10	0	10	15	10	0	10	0
Martinezt, Rossanna	5	0	5	0	15		0	0	0	0	0	0	0	0
Melendez, Oneliz	0	0	0	0			0	0	0	0	0	0	0	0
Mont, Michael	0	0	0	0	0		0	0	0	0	0	0	0	0
Ngendahorori, Tereza	10	10	10	10	25		10	15	10	15	10	10	10	15
Ortiz, Kathleen	10	10	5	0	0		10	0	10	15	10	0	10	0
Sanchez, Jose							0	10	0	15	0	15	10	15
Santos, Richard	5	10	0	0	0		0	10	0	0	0	0	0	0
Skerrett, Anfernee	0	0	0	0	0		0	10	0	0	0	0	0	0
Soto, Nenôshka	10	0	10	0	0		10	0	10	0	10	0	10	0
~~Gonzalez, Joseph~~														

Resch Garcia, Wesley

A

THE BLANK COLUMNS AT THE RIGHT MAY BE USED TO RECORD ASSIGNMENTS ▶

▼ STUDENT ID. NO. AND/OR NAME ▼		Warm-ups																						
ARRINGTON, CHISTOPHER	1														94				/					37
ON, DEBORAH	2	////									/				63	/						/		49
	3																							
CORTES, JONATHEL	4	/	A?					/						/	/	64			/			/		45
~~DEJESUS, KIMBERLY~~	5				/	/		/	/	/					33		/		/				/	○
	6																							
~~DEMELLS, COURTNEY~~	7														74	/						/	/	○
NAZARAH, FLORES	8	////	A												53									61
	9																							
FRIMPONG, EDWARD	10	////				/		/							/			/						16
FUSTER, ISRAEL	11	/							/						44							1H		46
	12																							
HARLACHEL, MEGHAN	13											/			74									64
HUGHES, ANTHONY (Special)	14	#810-92												/	0				/					82
	15																							
JACKSON, KHALIL	16	/////													104									76
DAD, MOHAMED	17	/////									/			/	/	30								31
	18																							
~~LABRECK, ANDREW~~	19	WITH DRAWN																						
MACLELLAN, MEGHAN	20	# 401			/	/						/	/		0		/	/	/	/	/		/	
MATTHEWS, SARA JEAN (Moss?)	21	// #3777																				9/30	START	
MARTINEZ, ROSSANNA	22	//	A?							/					74	/	1H			/				61
MELENDEZ, ONELIZ	23													/	33	/	/	/		/			/	○
	24																							
MONT, MICHAEL	25	///												START 9/23								/	/	57
NGENDAHORORI, TEREZA	26	////													73									40
	27																							
ORTIZ, KATHLEEN	28	//// ~~#364~~													42					/				24
SANCHEZ L., JOSE	29														65								/	42
	30																							
SANTOS, RICHARD	31														84									64
KEERETT, ANFERNEE	32														72									64
	33																							
SOTO, NENOSHKI	34	/////													93									82
WILLIAM, ELLABA	35				/				/	/	/	/	/	/	104	/	/	/	/	/	/		/	○

												Test (Chapter 1)																	
4	5 O	6 cT	7	8	C O L	12	13	14	15	18	19	20	21	22	25	26	27	28	29	1	2	3	4	5	Daily Average	Test	Grade	1st Quarter	2nd Quarter
					U	10						6	60	✓				A	50							50		2	
					M	10	/					24	67	✓					90							56		4	
					B																								
/					U S	0			/	/		0	57	✓		A	A		A	A	A			A		33		12	
/	/	/	B			/	/	/	/																				
					D																								
/	/	/	O		A	/	✓	0	/																				
					Y	O						48	78	✗					50	A						48		1	
						O						0	57	✓					0					A	10	15		5	
						10	/					23	67	✓					70							47		2	
						40						37	83	✓					70	A				A		66		3	
						50						0	57	✓			A		0		A				3	38		4	
						50			X			67	[illegible]	86					70					A	77	77		1	
						30						11	[illegible]	62					0						31	31		3	
/		/	INH			20	/					0	57	✓					40							23		14	
						40						12	62	✓					0	A						51		1	
						10	/	/				6	60						50							51		5	
						0.5		/	/	A	A	0	A	A	A	A	A		A			A		A	7	7		19	
						50						0	57	A					50							53		3	
						35						32	71	✓					50							54		0	
						0				/		0	57	✓		~~A~~			10							27		3	
						0	/					0		✓					A							21		3	
						50						0	57	✓					10							53		0	
						50						27	69	A					10							53		1	
						40						50	79	✓					30		A					65		1	
~~/~~	~~/~~	~~/~~	~~O~~			~~O~~	~~/~~	~~/~~	~~/~~	~~/~~		~~0~~		~~A~~	~~A~~	~~A~~													

16.5
21
37.5

37.5 + 20 = 57.5 + 20 = 77.5

10.5 + 6 = 16.5 hrs.

↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓

250 + 250 + 150 = 650 min./60 = 10 hrs.

10 hrs/week
15 weeks

First Week of teaching: October 4th

900 min/60 min = 15 hrs

15 hrs/week

BELL SCHEDULE

A	B	C	D	E	F
Period 1 **7:20-8:28**	Period 1 7:20-8:05	Period 1 7:20-8:05	Period 1 7:20-8:05	Period 1 7:20-8:05	Period 1 7:20-8:05
Period 2 8:32-9:14	**Period 2** **8:09-9:14**	Period 2 8:09-8:51	Period 2 8:09-8:51	Period 2 8:09-8:51	Period 2 8:09-8:51
Period 3 9:18-10:00	Period 3 9:18-10:00	**Period 3** **8:55-10:00**	Period 3 8:55-9:37	Period 3 8:55-9:37	Period 3 8:55-9:37
Period 4 10:04-10:46	Period 4 10:04-10:46	Period 4 10:04-10:46	**Period 4** **9:41-10:46**	Period 4 9:41-10:23	Period 4 9:41-10:23
Period 5A 10:51-11:11 1st Lunch 11:16-12:09 Class	Period 5A 10:51-11:11 1st Lunch 11:16-12:09 Class	Period 5A 10:51-11:11 1st Lunch 11:16-12:09 Class	Period 5A 10:51-11:11 1st Lunch 11:16-12:09 Class	Period 5A 10:28-10:48 1st Lunch 10:53-11:46 Class	Period 5A 10:28-10:48 1st Lunch 10:53-11:46 Class
Period 5B 10:50-11:15 Class 11:20-11:40 2nd Lunch 11:45-12:09 Class	Period 5B 10:50-11:15 Class 11:20-11:40 2nd Lunch 11:45-12:09 Class	Period 5B 10:50-11:15 Class 11:20-11:40 2nd Lunch 11:45-12:09 Class	Period 5B 10:50-11:15 Class 11:20-11:40 2nd Lunch 11:45-12:09 Class	Period 5B 10:27-10:52 Class 10:57-11:17 2nd Lunch 11:22-11:46 Class	Period 5B 10:27-10:52 Class 10:57-11:17 2nd Lunch 11:22-11:46 Class
Period 5C 10:50-11:43 Class 11:48-12:09 3RD Lunch	Period 5C 10:50-11:43 Class 11:48-12:09 3RD Lunch	Period 5C 10:50-11:43 Class 11:48-12:09 3RD Lunch	Period 5C 10:50-11:43 Class 11:48-12:09 3RD Lunch	Period 5C 10:27-11:20 Class 11:25-11:46 3RD Lunch	Period 5C 10:27-11:20 Class 11:25-11:46 3RD Lunch
Period 6 12:13-12:55	Period 6 12:13-12:55	Period 6 12:13-12:55	Period 6 12:13-12:55	**Period 6** **11:50-12:55**	Period 6 11:50-12:32
Period 7 12:59-1:43	Period 7 12:59-1:43	Period 7 12:59-1:43	Period 7 12:59-1:43	Period 7 12:59-1:43	**Period 7** **12:36-1:43**

*Lunch will be assigned based upon the scheduled location of the period 5 class

KEY:
HSA/RED STB/GREEN
SSJ/BLUE
GRAY SHADING/INCLUSION

REVISED August 26, 2010

NORTH HIGH SCHOOL – 2010-2011

RM. #	PERIOD 1	PERIOD 2	PERIOD 3	PERIOD 4	PERIOD 5	PERIOD 6	PERIOD 7
A-20	FUNDAMENTALS OF HEALTH J. THIBODEAU	BIOTECHNOLOGY SABOURIN	BIOLOGY 1 COLLEGE SABOURIN	BIOLOGY 1 COLLEGE SABOURIN	*STUDY* *LEDNAR*	BIOLOGY 1 HONORS SABOURIN	BIOLOGY 2 HONORS SABOURIN
A-21	DRUGS & SOCIETY M. BURKE		*STUDY* *M. BURKE*	PATHO-PHYSIOLOGY M. BURKE	DRUGS & SOCIETY M. BURKE	HUMAN PHYSIOLOGY M. BURKE	DRUGS & SOCIETY M. BURKE
A-22	ENGLISH 4 HONORS BLONDIN	ENGLISH 4 HONORS BLONDIN	AVID 3 BLONDIN	HUMAN PHYSIOLOGY J. THIBODEAU	HUMAN PHYSIOLOGY J. THIBODEAU	ENGLISH 3 COLLEGE BLONDIN	ACADEMIC LIT RES. BLONDIN
A-23	NOVANET LUPERCHIO						
A-24	FUNDAMENTALS OF HEALTH J. THIBODEAU	PIANO M. THIBODEAU	PIANO M. THIBODEAU	CHORUS 1-3 HON & COLL M. THIBODEAU		CHORUS 1-3 HON & COLL M. THIBODEAU	CHORUS 1-3 HON & COLL M. THIBODEAU
A-25			ENGLISH 1 RESOURCE MATEYCHUK	ENGLISH 1 RESOURCE MATEYCHUK	ENGLISH 2 RESOURCE MATEYCHUK	ENGLISH 2 RESOURCE MATEYCHUK	
B-1	CHEMISTRY DUPRE	PHYSICS DUPRE	CHEMISTRY DUPRE	BIOLOGY DUPRE	*STUDY* *PEDONE*	BIOLOGY DUPRE	
B-2	LIFE SKILLS MCCORKINDALE / MULLIN						
B-3	ENGLISH 4 RESOURCE LALOS	ENGLISH 3 RESOURCE LALOS	W. HISTORY 2 MURPHY	US HISTORY 1 RESOURCE MURPHY	ENGLISH 4 RESOURCE LALOS	ENLGLISH 3 RESOURCE LALOS	ENGLISH 1 RESOURCE LALOS
B-4	INTRO TO BUSINESS COONAN		INTRO TO BUSINESS COONAN	EXPLORING BUS. INFO SYSTEMS COONAN	BUS. INFO. SYS. MARKETING COONAN	EXPLORING BUS. INFO SYSTEMS COONAN	
B-5	OFFICE						
B-6	ALTERNATIVE YANOVICH						
B-7	AP ENGLISH LITERATURE PEDONE	AVID 2 PEDONE	ENGLISH 3 HONORS PEDONE	ENGLISH 3 COLLEGE PEDONE	ALGEBRA 1 RESOURCE JOYCE	ALGEBRA 1 RESOURCE JOYCE	US HISTORY 2 RESOURCE MURPHY
B-8	ACADEMIC LIT. LODI	ACADEMIC LIT. LODI	MCAS ELA LODI	ACADEMIC LIT. LODI	TOPICS IN ALG/GEO RES. CORNACCHIOLI	US HISTORY 1 RESOURCE MURPHY	ACADEMIC LIT. LODI
B-9	BIOTECHNOLOGY TORRES	BIOTECHNOLOGY TORRES	ALGEBRA 1 RESOURCE JOYCE	BIOLOGY 1 COLLEGE HADDAD	BIOLOGY 2 COLLEGE HADDAD	BIOLOGY 1 HONORS HADDAD	BIOLOGY 1 COLLEGE HADDAD
B-10	GEOMETRY HONORS KOLACZYK	GEOMETRY RESOURCE CORNACCHIOLI	TOPICS IN ALG/GEO RES. CORNACCHIOLI	GEOMETRY COLLEGE KOLACZYK	GEOMETRY HONORS KOLACZYK	GEOMETRY HONORS KOLACZYK	GEOMETRY COLLEGE KOLACZYK
B-11	US HISTORY 1 COLLEGE LYNCH	ALGEBRA 1 RESOURCE JOYCE	US HISTORY 1 COLLEGE LYNCH	ADV. ALGEBRA CORNACCHIOLI	US HISTORY 1 HONORS LYNCH	US HISTORY 1 COLLEGE LYNCH	US HISTORY 1 HONORS LYNCH
B-12	ADV. ALGEBRA CORNACCHIOLI	US HISTORY 2 COLLEGE N. BURKE	ALGEBRA 1 RESOURCE JOYCE	US HISTORY 2 COLLEGE N. BURKE	US HISTORY 2 HONORS N. BURKE	US HISTORY 2 HONORS N. BURKE	
B-13	GEOMETRY COLLEGE CATULLO	*STUDY* *HARVEY*	GEOMETRY COLLEGE CATULLO	MCAS MATH CATULLO	GEOMETRY HONORS CATULLO	MCAS MATH CATULLO	

Grey shading – Inclusion
Yellow shading -- Repeaters

REVISED August 26, 2010

. #	PERIOD 1	PERIOD 2	PERIOD 3	PERIOD 4	PERIOD 5	PERIOD 6	PERIOD 7
B-14	ENGLISH 3 HONORS HARVEY	AVID 1 CAPLAN	MCAS MATH SNOW	ALGEBRA 1 COLLEGE CAPLAN	ALGEBRA 1 HONORS CAPLAN	ALGEBRA 1 COLLEGE CAPLAN	ALGEBRA 1 COLLEGE CAPLAN
B-15	ADV. ALGEBRA COLLEGE KIAGO	ADV. ALGEBRA HONORS KIAGO	W. HISTORY' 2 HONORS LAPOMARDO	W. HISTORY 2 COLLEGE LAPOMARDO	W. HISTORY 2 COLLEGE LAPOMARDO	W. HISTORY 2 COLLEGE LAPOMARDO -- R	CRIMINAL JUSTICE LAPOMARDO
B-16	ALTERNATIVE KRIKORIAN						
B-17	AVID 1 BOYLE	AP US HISTORY BOYLE	INTERNSHIP CLASS		W. HISTORY 2 COLLEGE BOYLE	W. HISTORY 2 COLLEGE BOYLE	W. HISTORY 2 HONORS BOYLE
B-18	ENGLISH 4 HONORS BLAKE	ENGLISH 2 COLLEGE BLAKE	*STUDY* *KIAGO*	MCAS ELA .5 BLAKE	ENGLISH 2 HONORS BLAKE	ENGLISH 1 COLLEGE HARVEY	ENGLISH 1 COLLEGE HARVEY
B-19	ENGLISH 4 COLLEGE SAVAGE	ENGLISH 4 COLLEGE SAVAGE	*STUDY* *KOLACZYK*	ENGLISH 3 HONORS SAVAGE	*STUDY* *LODI*	*STUDY* *SAVAGE*	ENGLISH 4 COLLEGE SAVAGE
B-20	*STUDY* *CHANDLEY*	CHEMISTRY HONORS HSA CHANDLEY	CHEMISTRY HONORS CHANDLEY	CHEMISTRY HONORS CHANDLEY	MCAS MATH SNOW	AP CHEMISTRY CHANDLEY	
B-21	BIOLOGY 2 COLLEGE HOWARTH	*STUDY* *HOWARTH*	BIOLOGY 2 COLLEGE HOWARTH	VERTEBRATE ANAT. HONORS HOWARTH	ADV. ALGEBRA COLLEGE KIAGO	AP ENVIRONMENTAL SCIENCE HOWARTH	
B-22	APPLIED PHYSICS INT. ENGINEERING BLESSINGTON	APPLIED PHYSICS INT. ENGINEERING BLESSINGTON	APPLIED PHYSICS INT. ENGINEERING BLESSINGTON	AP ENVIRONMENTAL SCIENCE RAABIS		AP BIOLOGY RAABIS	
B-23	NUMERACY AWUMI	ADV. TOPICS ALG.-TRIG. AWUMI	PHYSICS COLLEGE - I MARZILLI	PHYSICS HONORS MARZILLI	PHYSICS HONORS MARZILLI	AP PHYSICS MARZILLI	
B-24	*STUDY* *HOLMES*	APPLIED PHYSICS INT. ENGINEERING HOLMES	CHEMISTRY 1 COLLEGE HOLMES	ADV. ALGEBRA COLLEGE KIAGO	APPLIED PHYSICS INT. ENGINEERING HOLMES	APPLIED PHYSICS INT. ENGINEERING HOLMES	APPLIED PHYSICS INT. ENGINEERING HOLMES
B-25	MCAS MATH TURNER	AP CALCULUS TURNER	~~*STUDY*~~ ~~*J. THIBODEAU*~~ Algebra 2 Turner	ENGLISH 1 HONORS HARVEY	ENGLISH 1 COLLEGE HARVEY	ADV. ALGEBRA HONORS TURNER	PRE-CALCULUS HONORS TURNER
B-26	STUDENT SUPPORT ROOM						
B-27	AP ENGLISH LANGUAGE C. MORSE	AVID 2 C. MORSE	NUMERACY AWUMI	ENGLISH 1 HONORS C. MORSE	ENGLISH 1 COLLEGE C. MORSE	ENGLISH 1 COLLEGE C. MORSE	ADV. TOPICS ALG. –TRIG. AWUMI
B-28	GEOMETRY RESOURCE JOYCE	AP STATISTICS OWENS	ADV. TOPICS ALG-GEOM. OWENS	*STUDY* *AWUMI*	GEOMETRY AWUMI - I	ADV. TOPICS ALG-GEOM OWENS	STATISTICS COLLEGE OWENS
B-28A			JOBS FOR BAY STATE GRADUATES -- TBD				
B-30	AVID 4 COTE	ENGLISH 1 HONORS COTE	ENGLISH 1 COLLEGE COTE	ENGLISH 1 COLLEGE COTE	ENGLISH 1 COLLEGE COTE – R	MCAS MATH SNOW	*STUDY* *C. MORSE*
B-31	AVID 1 MCFADDEN	ALGEBRA 1 COLLEGE MCFADDEN	ALGEBRA 1 COLLEGE MCFADDEN	ALGEBRA 1 COLLEGE MCFADDEN	ALGEBRA 1 HONORS MCFADDEN	FUNDAMENTALS OF HEALTH J. THIBODEAU	FUNDAMENTALS OF HEALTH J. THIBODEAU
B-32	AVID 1 HIPPERT	BIOLOGY 1 COLLEGE HIPPERT	BIOLOGY 1 COLLEGE HIPPERT	BIOLOGY 1 HONORS HIPPERT	BIOLOGY 1 COLLEGE HIPPERT	CHEMISTRY 1 COLLEGE – I BLESSINGTON	CHEMISTRY 1 COLLEGE – I BLESSINGTON
B-33	HEALTH 2 TSOUVALOS	INTRO TO GOVT & JUSTICE LATINO		EARLY CHILDHOOD1 LATINO	INTRO TO GOVT & JUSTICE LATINO	EARLY CHILDHOOD 2 LATNO	INTRO TO GOVT & JUSTICE LATINO
B-34	HEALTH 1 LEDNAR	HEALTH 2 LEDNAR	HEALTH 1 LEDNAR	HEALTH 2 TSOUVALOS	HEALTH 1 TSOUVALOS	HEALTH 2 LEDNAR	EARLY CHIILDHOOD 1 LEDNAR

[illegible]
3/4·5
15/4
4 hrs
4·5
=20

Team Teach w/ Turner
Teach in other classrooms w/ Turner
observing some days

Grey shading – Inclusion
Yellow shading -- Repeaters

REVISED August 26, 2010

	PERIOD 1	PERIOD 2	PERIOD 3	PERIOD 4	PERIOD 5	PERIOD 6	PERIOD 7
B-35	AP ENGLISH LANGUAGE SWEETMAN	ENGLISH 2 COLLEGE SWEETMAN	ENGLISH 2 HONORS SWEETMAN	ENGLISH 3 COLLEGE SWEETMAN	ENGLISH 3 COLLEGE SWEETMAN	FRENCH 3 HON & COLL BOWERS	FRENCH 1 HON & COLL BOWERS
B-36	FRENCH 2 HON & COLL BOWERS	FRENCH 1 HON & COLL BOWERS	AP SPANISH HUAMAN	MCAS MATH SNOW	SPANISH 3 HON. & COLL. HUAMAN	SPANISH 3 HON & COLL HUAMAN	SPANISH 4 & NATIVE 2 HUAMAN
B-37	US HISTORY 2 COLLEGE NIEVES	US HISTORY 2 HONORS NIEVES	SPANISH 2 HON & COLL CASTILLA	*STUDY* *TURNER*	US HISTORY 2 HONORS NIEVES	US HISTORY 2 COLLEGE NIEVES	SPANISH NATIVE SPEAKERS 1 CASTILLA
B-38	SPANISH 1 COLLEGE GALICIA	SPANISH 1 HONORS GALICIA	SPANISH 1 COLLEGE GALICIA		SPANISH 2 COLLEGE CASTILLA	SPANISH 2 HON & COLL GALICIA	SPANISH 1 HONORS GALICIA
B-39	GEOMETRY COLLEGE GOLDSTEIN	HEALTH 1 TSOUVALOS	ALGEBRA 1 COLLEGE GOLDSTEIN	ALGEBRA 1 COLLEGE GOLDSTEIN	ALGEBRA 1 HONORS GOLDSTEIN	ALGEBRA 1 COLLEGE GOLDSTEIN	HEALTH 1 TSOUVALOS
B-40	US HISTORY 1 HONORS HALPER	US HISTORY 1 COLLEGE HALPER	PSYCHOLOGY COLLEGE HALPER	US HISTORY 1 HONORS HALPER	FRENCH 2 HON & COLL BOWERS	SPANISH 2 COLLEGE CASTILLA	US HISTORY 1 COLLEGE HALPER
B-41	ENGLISH 2 COLLEGE MOORE	SPANISH 1 COLLEGE CASTILLA	ENGLISH 2 COLLEGE MOORE	ENGLISH 2 HONORS MOORE	ENGLISH 2 COLLEGE MOORE	ENGLISH 2 COLLEGE MOORE	ADV. ALGEBRA COLLEGE KIAGO
B-42	ADV. ALGEBRA HONORS CHOW	PRE-CALCULUS HONORS CHOW	AP ECONOMICS CHOW		MCAS MATH .5 CHOW		MCAS MATH .5 CHOW
B-43	US HISTORY 1 RESOURCE MURPHY	W. HISTORY 2 COLLEGE BELANGER	W. HISTORY 2 HONORS BELANGER	W. HISTORY 2 COLLEGE BELANGER	W. HISTORY 2 COLLEGE BELANGER	*STUDY* *CORNACCHIOLI*	*STUDY* *NIEVES*
B-44	EXPLORING TECH & COMM LUCEY	INTRO TO TECH & COMM LUCEY	INTRO TO TECH & COMM LUCEY	INTRO TO TECH & COMM LUCEY	INTERNSHIP CLASS		INTRO TO TECH & COMM LUCEY
C-01	INTRO TO GOVT & JUSTICE VAUGHN	CRIMINAL JUSTICE VAUGHN	PSYCHOLOGY HONORS VAUGHN	CRIMINAL JUSTICE VAUGHN	*STUDY* *HALPER*	PSYCHOLOGY HONORS VAUGHN	
C-02	ELL1 POIRIER						ELL 3 POIRIER
	ELL2 STEARN		ELL3 STEARN			ELL 2 STEARN	
C-03	**FAST FORWORD LAB**						
C-04	ART 1 HON & COLL HARTHAN	*STUDY* *HARTHAN*	ART 2 & 3 COLL ART 3 HONORS HARTHAN		ART 1 HON & COLL HARTHAN	ART 2 COLL ART 5 HARTHAN	ART 1 HON & COLL HARTHAN
C-05	ROTC 1 FRYDEL		ROTC 1 FRYDEL	ROTC 2 FRYDEL		ROTC 2 FRYDEL	ROTC 1 FRYDEL
C-06	ALTERNATIVE ROBBINS						
C-07			ROTC 2 GODIN		ROTC 2 GODIN	ROTC 3 & 4 GODIN	ROTC 3 & 4 GODIN
AUD.			HSA, SSJ, STB INTERNSHIPS DRAKE		THEATRE SAVAGE		
CAF.	*STUDY* *RAABIS*	*STUDY* *J. MOORE*	*STUDY* *LALOS*				
LIB.			MCAS ELA HIGGINS	MCAS ELA HIGGINS	MCAS ELA HIGGINS	MCAS ELA HIGGINS POPE	
YM	PE 2 – ROSS PE 1 –PAGEAU						

Amber

OUTSIDE DUTY – GODIN

PM HALL -- FRYDEL

Grey shading – Inclusion
Yellow shading -- Repeaters

Dear Parent or Guardian,

As your child's math teacher, I want to introduce myself and emphasize that each student can excel in, and certainly pass, their Advanced Algebra class if they simply take notes, do their homework daily, study for tests and quizzes, and come for extra help when needed.

Your son or daughter will roughly 60 minutes of math homework **every** day, including weekends and vacations. Your cooperation in regularly checking that work is completed is appreciated. Extra help is available from me after school, so please ask your child to schedule such time. I am generally available for extra help after school at least Tuesdays and Fridays. If you need to speak with me, please either (1) send a note with your child, (2) send email to larryturner@townisp.com or (3) leave a message at (508) 799-3370.

Please review the attached course syllabus and classroom management plan with your child and complete and return the form below.

Thank you.

Larry Turner

EXPECTATIONS: BE ON TIME! BE PREPARED! BE POSITIVE! BE CREATIVE! TRY YOUR BEST!

(Please Detach & Return)

Student Name (*please print*)**:** ______________________________

Student Signature: ______________________________ **Date:** ______________

Student Address: ______________________________

Student Email Address: ______________________________

	first	**second**
Parent/Guardian Signature:		
Parent/Guardian Name:		
Relationship:		
Email Address:		
Work Phone:		
Home Phone:		

Comments & Questions:

Worcester Public Schools
High School Curriculum Mapping Initiative
Course Syllabus Template – Part I

Advanced Algebra **Mr. Turner**

Course Description:

The course will focus on the Algebra II Massachusetts Mathematics Curriculum Framework and the Worcester Public Schools 11th Grade Mathematics Curriculum. This course is a bridge from Algebra I into advanced topics in mathematics. This is the prerequisite to Pre-calculus and Advanced Placement Statistics.

Course Objectives:

Students will:
- Solve problems using systems of linear equations
- Use matrices to solve problems
- Solve quadratic functions with complex roots
- Utilize the inverse relationship between exponential and logarithmic functions
- Use polynomial functions in the solution of problems
- Solve trigonometric functions

Essential Questions:

How are non-linear situations represented in mathematics?
Where do trigonometric functions and solutions occur in our world?

Prerequisite Courses:

Algebra I and Geometry

Texts & Learning Materials:

Textbook: Focus on Advanced Algebra: An Integrated Approach, supplemented extensively by worksheets and other resources.

Resources Needed: A scientific calculator is essential for homework. A TI-83 Plus Graphics Calculator would be ideal (~$90-130), but a less expensive calculator (e.g., TI-30) with exponents, square roots and trigonometric functions will suffice (~$15-20).

District-Wide Reading Skills Across the Curriculum:

- **Preview** (survey) – note major elements such as organization, vocabulary, summary and graphics.
- **Ask Questions -** question the text, the author and self.
- **Activate Prior Knowledge** (schema) – use what is already known to enhance understanding of what is new in the text.
- **Make Connections -** link text to self, text to world and text to text.
- **Visualize -** use sensory images to create a mental picture of the scene, story, situation, or process and involve oneself in it.
- **Draw Inferences -** go beyond the literal information in the text including predicting, figurative meaning and thematic understanding.
- **Distinguish Key Ideas -** recognize main idea and key concepts.
- **Use Fix-Up Strategies -** monitor own understanding by pausing to think, re-read, consider what makes sense, restate in own words.

Contextual Vocabulary:

Polynomial
Exponential
Logarithmic
Matrix
Trigonometric
Combinatorics

Recommended Grading Policy (indicate percent for each factor):

- Classroom Participation, Individual & Team – 10%
- Projects/Papers/Presentations – 15%
- Homework & Notebook – 25%
- Tests & Quizzes – 40%
- Final Test/Assessment* – 10%

*The Worcester School Committee requires that the final test/assessment be 10% of a student's grade.

Extra help is available from me after school, so please ask your child to schedule such time. I am generally available for extra help after school at least Tuesdays and Fridays.

To set up a phone or face-to-face conference, please send a note with your child, leave a message for me at 799-3370 or send email to larryturner@townisp.com

CLASSROOM MANAGEMENT PLAN

Advanced Algebra – Mr. Turner

School Wide Non-negotiable Policies

- Respect yourself, each other and this place
- Be on time and ready to work
- Bring all necessary materials for class

Student Success

- The most important ingredient in your success as a student is you. Your success as a student depends on your attendance and effort in this class every day.

Classroom Expectations

- Be in assigned seat with materials ready when bell rings and remain in seat till final bell has rung
- Bring needed materials to class each day, including book, notebook, homework, pencils, tools
- Raise your hand to speak – No interrupting others
- All outerwear, hats and book bags must be stored in your lockers during the school day.
- NO food or gum in classroom & NO beverages other than bottled water
- NO swearing in class

Homework & Project Work:

- **Homework**, critical to success, will average ~60 minutes every night, including weekends.
- Homework will include both daily practice and special problems and projects taking longer.
- Notebooks for notes, classwork & homework will be collected periodically at random and graded, so… a *separate math notebook is highly recommended.*
- All students will present work to the class frequently, as a critical part of both learning and assessment.
- Maintaining a portfolio of best work is another critical part of both learning and assessment.
- **Missed Work** is the student's responsibility to make up. Except for excused absences, all late work will lose 10 points per day. Work missed by a student due to illness or other excused absence must be made up within one school week after returning. Failure to do so = F.

Attendance Policy:

- Students are expected to be in class every day, prepared and ready to work. Credit for class in regards to absence will follow City-Wide Policy.

Tardy Policy:

- Students are expected to be in their seat by the bell. Being out in the hall, or standing around the room is not acceptable. Every tardy will result in detention.

To set up a phone or face-to-face conference, please send a note with your child, leave a message for me at 799-3370 or send email to larryturner@townisp.com

EXPECTATIONS: Be On Time! Be Prepared! Be Positive! Be Creative! Try Your Best!

Worcester Public Schools
High School Curriculum Mapping Initiative
Advanced Algebra Course Syllabus Template – Part II
Academic Content

Content/Topics –	Skills	Academic Standards (Worcester Benchmarks and State Frameworks)
Linear Representations	Find slope and intercepts Solve linear equations in two variables	AII.P.8 Solve a variety of equations and inequalities using algebraic, graphical, and numerical methods.
Numbers and Functions	Use operations with numbers Use operations with functions Identify properties of exponents	AII.N.2 Simplify numerical expressions with powers and roots. Including fractional and negative exponents.
Systems of Linear Equations and Inequalities	Solve systems of equations Find solutions to linear inequalities in two variables Solve systems of linear inequalities	
Matrices	Use matrices to represent data Solve using matrix multiplication Find the inverse of a matrix	AII.P.9 Use matrices to solve systems of linear equations.
Quadratic functions	Solve quadratic equations Factor quadratic equations Use the completing the square method Solve using the quadratic formula Use complex numbers in the solution to quadratic equations	AII.P.7 Find solutions to quadratic equations and apply to the solutions of problems.
Exponential and Logarithmic Functions	Solve problems involving exponential growth and decay Graph and solve exponential functions Graph and solve logarithmic functions Use and apply the properties of logarithms Solve problems using base *e*	AII.P.4 Demonstrate an understanding of the exponential and logarithmic functions.
Polynomial Functions	Graph polynomial functions Find products and factors of polynomials Solve polynomial equations Find the zeros of polynomial functions	AII.P.8 Solve a variety of equations and inequalities including polynomial, exponential, and logarithmic functions.

Worcester Public Schools
High School Curriculum Mapping Initiative
Advanced Algebra Course Syllabus Template – Part II
Academic Content

Content/Topics –	Skills	Academic Standards (Worcester Benchmarks and State Frameworks)
Rational & Radical Functions	Identify inverse, joint and combined variation Graph rational functions Multiply and divide rational expressions Add and subtract rational expressions Solve rational equations and inequalities Identify radical expressions and functions Simplify radical expressions	AII.P.5 Perform operations on functions, including composition.
Conic Sections	Find parabolas, circles, ellipses, and hyperbolas	AII.G.3 Relate geometric and algebraic representations of lines, simple curves, and conic sections.
Counting Principals	Use Permutations and combinations Identify independent events Solve situations involving dependant events and conditional probability	AII.D.2 Use combinatorics to solve problems, in particular, to compute probabilities of compound events.
Series and Patterns	Solve using arithmetic and geometric sequences Solve using arithmetic and geometric series Use Pascal's triangle in the solution to problems Use the binomial theorem	AII.P.2 Identify arithmetic and geometric sequences and finite arithmetic and geometric series.
Trigonometric Functions	Solve trigonometric functions Find radian measure and arc length Graph trigonometric functions Find inverses of trigonometric functions Use the Laws of Sines and Cosines	AII.G.1 Define the sine, cosine, and tangent of an acute angle. AII.G.2 Derive and apply basic trigonometric identities and the laws of sines and cosines.

Algebra II, College (period 1)

	Homework 1	Homework 2	Homework 3	Homework 4	Homework 5	Homework 6	Thanksgiving Homework	4.1-4.4 Quiz	4.1-4.4 Re-Quiz	Random HW	Quiz 2 (4.1-4.4, 4.5, 4.6)
Vanessa Beliveau								32	43	90	0
Juan Cruz-Velazquez								0			too late
David Edward								0	43 (0)		0
Danielle Douglas	91	77				32		76	78	70	80
Mrielys Figueroa	39							37	51	90	0
Brandon Hemenway								37	55		41
Shahd Jiad SJ	87	58	50	23	57	58		39	61	70	51
Heather Johnson	83	80						42	43		9
Ryan Kruzewski	87	80	94		57	85		52	61	100	9
Jeffrey Labbe								47	60	70	23
Christian Laboy	73	83	97	100				0	43 (0)	90	0
Jeremy McGinty								0	46	80	45
Anthony Perrone								76	75		72
Ashley Rodriguez	65	67	40	54	66	50	60	58	55	100	—
Thomas Rogers				41	57	20		39	73	100	80
Nycel Santiago		68	97	90				0	43 (0)		0
Idalisvette Malave										70	"0"
Cortes, Anckly											

didn't come forth when when prev abs called it

12/15 - New student

nca

Date: 10/15/2010 10:39 am

WPS Sage Report

Page: 30 of 62

Name: rptAttdAtdRecording
Master Status = A

Attendance Recording List

School = 23 (NORTH HIGH)

Module: Attendance

Week Starting = 10/18/10
2 Week(s), Show Day Dates

33 **Mr.Turner** B-25

Home Room = ALL

4.1-4.4

10/18	10/19	10/20	10/21	10/22	10/25	10/26	10/27	10/28	10/29
Mon	Tue	Wed	Thu	Fri	Mon	Tue	Wed	Thu	Fri

STUDENT Stu ID	Last Name	First Name	M	Gr.	Home Room								Quiz 4.1-4.4	HW 1	HW 2	HW 3	HW 4	HW 5
101886	BELIVEAU	VANESSA	M	11	B-25	54	50	71	73	68	65	but really 62	32					
105555	CRUZ-VELAZQUEZ	JUAN	L	11	B-25	52	50	60	42	50	58							
9086	DAVID	EDWARD		12	B-25	"52"	50	54	55	54	53	no notebook	0					
147103	DOUGLASS	DANIELLE	A	10	B-25	87	90	89	88	82	80	really 77	76	91	77			
☆ 128898	FIGUEROA	MARIELYS		11	B-25	62	80	81	73	74	74		37	39		47	32	
102100	HEMENWAY	BRANDON	M	10	B-25	"52"	50	54	78	63	71	no ntbk	37					
140022	JIAD SS	SHAHD		11	B-25	85	90	80	73	80	78		39	87	58	50	23	57
102208	JOHNSON	HEATHER	A	10	B-25	67	50	54	59	59	60	I forgot it can't find	42	83	80			
100238	KRUZEWSKI	RYAN	A	11	B-25	69	90	76	67	73	76		52	87	80	94		57
23827	LABBE	JEFFREY	J	11	B-25	54	80	65	82	68	65	really 64	47					
122755	LABOY	CHRISTIAN	M	11	B-25	54	90	54	42	49	51	no notebook	~	73	83	97	100	
10876	MCGINTY	JEREMY	S	11	B-25	69	80	54	86	71	70		0					
100104	PERRONE	ANTHONY	P	12	B-25	79	50	65	82	74	73		76					
~~126129~~	~~PORTILLO~~	~~MARLON~~	~~A~~	~~11~~	~~B-25~~													
104219	RODRIGUEZ	☆ ASHLEY +6 on interim	E	11	B-25	59	90	100	82	83	80	really 75	58	65	67	40	54	3.
101848	ROGERS	THOMAS	W	11	B-25	82	70	71	78	74	78		39				41	57
100623	SANTIAGO	NYCEL	A	10	B-25	59	85	63	0	39	50	refused to finish			68	97	90	day

Homeroom: B-25 17 Student(s) printed

Please write name of a

Chapter 2 Test A (10)

Sutter Ad "Quiz" (5)

ntbk

TEST

Sw grd (8)

EQRM 1

A 0
B 2
C 7
D 2
F 5

Name: rptAtdAtdRecording
Master Status = A

Attendance Recording List

School = 23 (NORTH HIGH)

Module: Attendance

Week Starting = 11/15/10
2 Week(s), Show Day Dates

Home Room = ALL

33 Mr.Turner B-25

STUDENT						11/15	11/16	11/17	11/18	11/19	11/22	11/23	11/24	11/25	11/26
Stu ID	Last Name	First Name	M	Gr	Home Room	Mon	Tue	Wed	Thu	Fri	Mon	Tue	Wed	Thu	Fri
101886	BELIVEAU	VANESSA	M	11	B-25										
105555	CRUZ-VELAZQUEZ	JUAN	L	11	B-25	A	A								
9086	DAVID	EDWARD	*	12	B-25										
147103	DOUGLASS	DANIELLE	A	10	B-25										
102100	HEMENWAY	BRANDON	M	10	B-25		A								
140022	JIAD	SHAHD		11	B-25										
102208	JOHNSON	HEATHER	A	10	B-25										
100238	KRUZEWSKI	RYAN	A	11	B-25										
23827	LABBE	JEFFREY	J	11	B-25										
122755	LABOY	CHRISTIAN	M	11	B-25										
10876	MCGINTY	JEREMY	S	11	B-25										
100104	PERRONE	ANTHONY	P	12	B-25			A							
104219	RODRIGUEZ	ASHLEY	E	11	B-25										
101848	ROGERS	THOMAS	W	11	B-25										
100623	SANTIAGO	NYCEL	A	10	B-25	A									

Homeroom: B-25 15 Student(s) printed

Please write name of any student in homeroom NOT on this list

→ Marielys Figueroa

Algebra II, Honors (period 6)

	Homework 1	Homework 2	Homework 3	Homework 4	Homework 5	Homework 6	Thanksgiving Homework	4.1-4.6 Retake	4.7-4.10 Quiz	Chapter 4 Test	Random HW	Quiz 5.1-5.3	Quiz 5.4-6
Annette Agyei	90	70	80	80	67	78			61	50	100	34	66
Vladevir Anjos	80	95	90	95	70	66	16		61	47	100	39	41 (0)
Gilbert Appiah	75	95	95	75	64	29	44	49	46	62		42	67
Xenia Artiga	95	80	85	95		58			75	64	90	54	72
Aundreya Boisvert	85	20	95	90					46	47			41 (0)
Katerina Briggs	80	90	65	100	70	63	16		51	61	100	56	56
Gwendolyn Bryan	90	95	90	95	81	42	44		51	66	90	64	61
Francis Cartagena	95	45	95							58		62	61
Sharley Danh	95	95	95	90	75	87	57	75	56	52	90	62	61
Amanda Debrusk	75	85		36	49	53	19		61	51	100	48	50
Mercy Frimpong	95		50	100	70	84	50		61	71		68	66
Jasmine Garcia	60	75	70	75				85	41	67	100	45	46
Aesha Gonzalez	100	100	100	100	95	82	71	81	71	78	90	79	87
Daniel Gutkey	85	100	95	90		92			51	50		35	51
Miho Inashima	100	95	100	100	78	84	16	88	61	79	100	76	58
Rochely Mata	85	85	90	90					56	61		56	58
Anna Nguyen	85	80	85	70	0	34	35	78	61	55	100	65	
Cao Nguyen	75		85	87		39			46	52	90	55	61
Prince Oduro	95	90	90	85	61	67	47		56	58		51	80
Cadija Pinson	70	95	70	95	67	58	28	66	75	63	90	66	58
Carlos Quinanilla	90	90	100	95	78	79	84	83	90	84	100	78	72
Guilherm Rangel	95	90	95	100	70		46	61		73	100	66	58
Shannon Roy	85	90	95	70		63			56	56		48	41 (0)
Samantha Santora	70	95	40	90	60		76			56	100		51
Joshua Spangenberg			45										
Diamond Tarwoe	75	70		65	37				56	53	100	28	41 (0)
Adebuea Van Cliff	70	95	90	90	46	100		57	61	84		78	72
Yesenia Valentin	95	80	100	100	70	84	0	70	46	55	100	39	46

Algebra II, Honors (period 3)

	Homework 1	Homework 2	Homework 3	Homework 4	Homework 5	Homework 6	Thanksgiving Homework	4.1-4.6 Retake	4.7-4.10 Quiz	Chapter 4 Test	Quiz 5.1-5.3	Quiz 5.4-6
Henry Acquah	87	95	80		87	74		75	90	74	81	80
Paula Alves		65	87						41	47	48	48
Marc Banzuela	89	92	80		75			65	51	70	59	71
Darralie Barthilemy	100	98	90	96	87	100	69	78	90	73	79	80
Marcela Chavez	93	58	11	68					51	47	39	45
Nicholas DiMauro	91	95							41	62	62	53
Ama Duodu	47		32	56	93	95		47	41	50	34	41(0)
Branon Hemenway												
Ashley Hernandez	59	86	90		57	62	0		51	60	42	50
Jayro Machado	87							60	61	52	56	54
Bright Oppong	85	94	80	92	84	100	38	70	51	50	64	76
David Pingitore	95	98	97		84	100		85	75	82	85	87
Andrew Rudy	73	80	58	95	77	64				50		41(0)
Sergio Soltau	79	82	90	72	70	48	16	52	56	58	69	48
Peter Vangel	88			100	49	56			71	61	79	61
Autumn Wells	87	74	65	36	17	20		52	56	47	44	41(0)

H Alg II
Period 6

Hon. Alg II
Period 6

	2.1-2.3 Quiz 15 points		Extra Credit	Chapter 2 Test	HW 1 11/16	HW 2	4.1-4.6 retake	HW 3	
Valdevir Anjos	70			73	80	95		90	95
Gilbert Appiah	70			56	75	95	49	95	75
Xenia Artiga	abs	Taking it on 10/3	4/8	91	95	80		85	95
Aundreya Boisvert			2/8	70	85	20		95	90
Katerina Briggs	69			86	80	90		65	100
Francis Cartagena	abs	10/3 ?		67	95	45		95	
Sharley Danh	70			75	95	95	75	95	90
Amanda Debrusk	72			60	75	85			
Mercy Frimpong	80			90	95			50	100
Jasmine Garcia	70			74	60	75	85	~~70~~	75
Aesha Gonzalez	56			73	100	100	78	100	100
Miho Inashima	100			93	100	95	88	100	100
Rochely Mata		10/3 ?	5/8	70	85	85		90	90
Anna Nguyen	70			59	85	80	78	85	70
Cao Nguyen	70				75			85	
Carlos Quinanilla	100		6/8	101	90	90	83	100	95
Guilherme Rangel	82			70	95	90	61	95	
Shannon Roy	78			57	85	90		95	70
Samantha Santora	62			53	70	95		40	90
Joshua Spangenberg	67							45	
Diamond Tarwoe	70			54	75	70			65
Yesenia Valentin	66		6/8	71	95	80	70	100	100
Annette Agyei	82			67	90	70		80	80
Gwendolyn Bryan	88		5/8	74	90	95		90	95
Daniel Gutkey	81			53	85	100		95	90
~~Matthew Kupfer~~		~~10/3 ?~~							
Cadija Pinson	71		2/8	80	70	95	66	70	95
Prince Oduro	65			54	95	90		90	85
Adebuea Van Cliff	62			69	70	95	57	90	90
TA: Oscar Zelayandio	88								

1/2 ↑

HW4 ↑

	Extra Credit	Chapter 2 Test	HW 1 11/16	HW 2	HW3		4.1-4.6 Retake
Ama	2/8	49	47		32	47	56
Marc		51	89	92	80	65	
Jayro		51	87			60	
Autumn		73	87	74	65	52	36
Nicholas		76	91	95			
Paula		49	0	65	87		
Peter		64	88				100
Andrew		61	73	80	58		
Ashley	2/8	67	59	86	90		
Sergio	2/8	62	79	82	90	52	72
Henry		84	87	95	80	75	
Branon							
Marcela		51	93	55	11		68
David		80	95	98	97	85	
Bright		61	85	94	80	70	92
Darralie		92	100	98	90	78	96

HW 4

1/2 ↑

Hs II H.

SEATING PLAN

TEACHER Turner

ROOM # B25

PERIOD Per 3

		Larry Turner 035		Paula absent on			
				Brandon H absent on test day (9/15)			
						Abs 9/23 Brandon Ashley	
		Ana Duddy 064	MARC BANZUELA 058	Nicholas DiMauro 056	Andrew Rudy 077	Henry Acquah 071	David Pingitore 068
			Jayro Machado 168	Paula Alves 034	Ashley Hernandes 082	Brandon Hemenway	Bright Oppong 036
			Autumn Wells BOOK NO. 150	Peter Vangel 31	Sergio Soltau 033	Marcela Chavez 110	Darralie Barthelemy 090

windows

TEACHER'S DESK

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Russell Varney

Week Of: 12/13 - 12/17

	Activity	Subject Area	Hours	Signature
Monday 12/13	Teaching	Algebra II, Col.	1 hr. 5 min.	
	Teaching	Algebra II Hon.	45 min.	
	Teaching	Algebra I Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
Tuesday 12/14	Teaching	Algebra II, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra I, Col.	45 min.	
Wednesday 12/15	Teaching	Algebra II, Col.	45 min.	
	Teaching	Algebra II, Hon.	1 hr. 5 min.	
	Teaching	Algebra I Col.	45 min.	
	Teaching	Algebra II Hon.	45 min.	
Thursday 12/16	Teaching	Algebra II, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra I, Col.	1 hr. 5 min.	
	Teaching	Algebra II Hon.	45 min.	
Friday 12/17	Teaching	Algebra II, Col.	45 min.	
	Teaching	Algebra II Hon.	45 min.	
	Teaching	Algebra I Col.	45 min.	
	Teaching	Algebra II Hon.	1 hr. 5 min.	
Totals		Direct Hours	15 hr. 35 min.	
		Observation Hours		

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Russell Varney

Week Of: 12/6 - 12/10

	Activity	Subject Area	Hours	Signature
	Teaching (extra help)	Algebra I+II	30 min.	
Monday 12/6	Teaching	Algebra II, Col.	45 min.	
	Teaching	AP Calc	1 hr. 5 min.	
	Teaching	Algebra II Hon. x 2	1 hr. 30 min.	
	Teaching	Algebra I, Col.	45 min.	
	Teaching	Precalc	45 min.	
Tuesday 12/7	Teaching	Algebra II, Col.	45 min.	
	Teaching	Algebra II, Hon.	1 hr. 5 min.	
	Teaching	Algebra I, Col.	45 min.	
	Teaching	Algebra II, Hon.	15 min.	
Wednesday 12/8	Teaching	Algebra II, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra I, Col.	1 hr. 5 min.	
	Teaching	Algebra II, Hon.	45 min.	
Thursday 12/9	Teaching	Algebra II, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra I, Col.	45 min.	
	Teaching	Algebra II, Hon.	1 hr. 5 min.	
Friday 12/10	Teaching	Algebra II Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra I, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
Totals		Direct Hours	17 hr. 50 min.	
		Observation Hours		

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Russell Varney

Week Of: 11/29-12/3

	Activity	Subject Area	Hours	Signature
Monday 11/29	Teaching	Algebra II, Col.	45 min.	
	Teaching	Algebra II, Hon.	1 hr. 5 min.	
	Teaching	Algebra I, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
Tuesday 11/30	Teaching	Algebra II, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra I, Col.	1 hr. 5 min.	
	Teaching	Algebra II, Hon.	15 min.	
Wednesday 12/1	Teaching	Algebra II, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra I, Col.	45 min.	
	Teaching	Algebra II, Hon.	1 hr. 5 min.	
	Teaching (extra help)	Algebra II	20 min.	
Thursday 12/2	Teaching	Algebra II, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra I, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
Friday 12/3	Teaching	Algebra II, Col.	1 hr. 5 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra I, Col.	45 min.	
	Teaching	Algebra II, Hon.	15 min.	
Totals		Direct Hours	15 hr. 15 min.	
		Observation Hours		

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Russell Varney

Week Of: 11/22 - 11/23

	Activity	Subject Area	Hours	Signature
Monday 11/22	Teaching	Algebra II, Col.	1 hr. 5 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra I, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
Tuesday 11/23	Teaching	Algebra II, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra I, Col.	45 min	
Wednesday				
Thursday				
Friday				
Totals		Direct Hours	5 hr. 35 min.	
		Observation Hours		

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Russell Varney

Week Of: 11/15 - 11/19

	Activity	Subject Area	Hours	Signature
Monday 11/15	Algebra II, Col. ↔	Teaching	45 min.	
	Algebra II Hon. ↔	Teaching	45 min.	
	Algebra I, Col. ↔	Teaching	45 min.	
	Algebra II, Hon. ↔	Teaching	45 min.	
Tuesday 11/16	Teaching	Algebra II, Col.	45 min.	
	Teaching	Algebra II, Hon.	1 hr. 5 min.	
	Teaching	Algebra I, Col.	45 min.	
	Teaching	Algebra II, Hon.	20 min.	
Wednesday 11/17	Teaching	Algebra II, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra I, Col.	1 hr. 5 min.	
	Teaching	Algebra II, Hon.	45 min.	
Thursday 11/18	Teaching	Algebra II, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra I, Col.	45 min.	
	Teaching	Algebra II, Hon.	1 hr. 5 min.	
Friday 11/19	Teaching	Algebra II Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra I Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
Totals		Direct Hours	15 hr. 35 min.	
		Observation Hours		

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Russell Varney

Week Of: 11/8 - 11/12

	Activity	Subject Area	Hours	Signature
Monday 11/8	Teaching	Algebra II, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra I, Col./Hon.	2 hr. ~~5 min.~~	
	Teaching	Algebra II Hon.	45 min.	
	Teaching (extra help)	Algebra II	25 min.	
Tuesday 11/9	Teaching	Algebra II, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra I, Col.	~~1 hr.~~ 45 min.	
	Teaching	Algebra II, Hon.	40 min.	
Wednesday 11/10	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra I, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching (extra help)	Algebra II	25 min.	
Thursday 11/11				
Friday 11/12	Teaching	Algebra II, Col.	1 hr. 5 min.	
	Teaching	Algebra II Hon.	45 min.	
	Teaching	Algebra I, Col.	45 min.	
	Teaching	Algebra II, Hon.	25 min.	
Totals		Direct Hours	13 hr. 15 min.	
		Observation Hours		

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Russell Varney

Week Of: 11/1 - 11/5

	Activity	Subject Area	Hours	Signature
Monday	Teaching	Algebra II, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra I, Col.	45 min.	
	Teaching	Algebra II, Hon.	1 hr. 5 min.	
	Teaching (extra help)	Algebra II	30 min.	
Tuesday	Teaching	Algebra II, Col.	45 min.	
	Teaching	Algebra II Hon.	45 min.	
	Teaching	Algebra I, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
Wednesday	Teaching	Algebra II Col.	1 hr. 5 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra I Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching (extra help)	Algebra II	30 min.	
Thursday	Teaching	Algebra II Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra I Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
Friday	Teaching	Algebra II, Hon.	1 hr. 5 min.	
	Teaching	Algebra I, Col.	45 min.	
	Teaching	Algebra II, Hon.	20 min.	
Totals		Direct Hours	18 hr. 10 min.	
		Observation Hours		

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Russell Varney

Week Of: 10/25 - 10/29

	Activity	Subject Area	Hours	Signature
Monday	Teaching	Algebra II, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra II Col.	45 min.	
	Teaching	Algebra II Hon.	45 min.	
	Teaching (extra help)	Algebra II	30 min.	
Tuesday	Teaching	Algebra II, Col.	1 hr. 5 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra I, Col.	45 min.	
	Teaching	Algebra II, Hon.	15 min.	
Wednesday	Teaching	Algebra II, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra II, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching (extra help)	Algebra II	30 min.	
Thursday	Teaching	Algebra II x3	2 hr. 35 min.	
	Teaching	Algebra I, Col.	45 min.	
	Teaching	AP Calc	45 min.	
	Teaching	Precalculus	45 min.	
Friday	Teaching	Algebra II x3	1 hr. 50 min.	
	Teaching	AP Calc	45 min	
	Teaching	Algebra I, Col.	1 hr. 5 min.	
Totals		Direct Hours	21 hr. 20 min.	
		Observation Hours		

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Russell Varney

Week Of: 10/18 - 10/22

	Activity	Subject Area	Hours	Signature
Monday 10/18	Teaching	Algebra II, Col.	1 hr. 5 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra I, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching (extra help)	Algebra II	10 min.	
Tuesday 10/19	Teaching	Algebra II, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra I, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching (extra help)	Algebra II	15 min.	
Wednesday 10/20	Teaching	Algebra II x3 (p.1,3,6)	2 hr. 35 min.	
	Teaching	AP Calc	45 min.	
	Teaching	Algebra I, Col.	45 min.	
	Teaching	Pre-Calc	45 min.	
	Teaching (extra help)	Algebra II	10 min.	
Thursday 10/21	Teaching	Algebra II, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra I, Col.	1 hr. 5 ~~45~~ min.	
	Teaching	Algebra II,	45 min.	
Friday 10/22	Teaching	Algebra II, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra II, ~~H~~ Col.	45 min.	
	Teaching	Algebra II, Hon.	1 hr. 5 min.	
Totals		Direct Hours	18 hr. 25 min.	
		Observation Hours		

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Russell Varney

Week Of: 10/12 - 10/15

	Activity	Subject Area	Hours	Signature
Monday				
Tuesday 10/12	Observation	Algebra II, Col.	45 min.	
	Teaching	Algebra II, Hon.	1 hr. 5 min.	
	Teaching	Algebra I, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
Wednesday 10/13	Observation	Algebra II, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra I, Col.	1 hr. 5 min.	
	Teaching	Algebra II, Hon.	20 min.	
Thursday 10/14	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra I, Col.	45 min.	
	Teaching	Algebra II, Hon.	1 hr. 5 min.	
Friday 10/15	Observation	Algebra II, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
	Teaching	Algebra I, Col.	45 min.	
	Teaching	Algebra II, Hon.	45 min.	
Totals		Direct Hours	9 hr. 35 min.	
		Observation Hours	2 hr. 15 min.	

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Russell Varney

Week Of: 10/4 - 10/7

	Activity	Subject Area	Hours	Signature
Monday 10/4	~~Te Observation~~ Teaching	Algebra II p.1	45 min.	
	Teaching	Algebra II p.3	45 min.	
	Observation	Algebra I	45 min.	
	Teaching	Algebra II p.6	1 hr. 5 min.	
Tuesday 10/5	Observation	Algebra II p.1	45 min.	
	Teaching	Algebra II p.3	45 min.	
	Observation	Algebra I	45 min.	
	Teaching	Algebra II p.6	45 min.	
Wednesday 10/6	Teaching	Algebra II p.1	35 min.	
	Teaching	Algebra II p.3	45 min.	
	Observation	Algebra I p.4	45 min.	
	Teaching	Algebra II p.6	20 min.	
Thursday 10/7	Observation	Algebra II p.1	45 min.	
	Teaching	Algebra II p.3	45 min.	
	Observation	Algebra I p.4	45 min.	
	Teaching	Algebra II p.6	45 min.	
Friday				
Totals		Direct Hours	7 hr. 15 min.	
		Observation Hours	4 hr. 30 min.	

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Russell Varney

Week Of: 9/27 - 10/1

	Activity	Subject Area	Hours	Signature
Monday 9/27	Observation	Algebra II	45 min.	
	Observation	AP Calc	45 min.	
	Observation	Algebra II	45 min.	
	Observation	Algebra I x 2	1 hr. 45 min.	
	Observation	Algebra II	45 min.	
Tuesday 9/28	Observation	Algebra II	1 hr. 10 min.	
	Observation	AP Calc	45 min.	
	Observation	Algebra II	45 min.	
	Observation	Algebra I (p.4)	45 min.	
	Observation	Algebra II	45 min.	
Wednesday 9/29	Observation	Algebra II	45 min.	
	Observation	AP Calc	1 hr. 5 min.	
	Observation	Algebra II	45 min.	
	Observation	Algebra I x 2	1 hr. 45 min.	
	Observation	Algebra II	15 min.	
Thursday 9/30	Observation	Algebra II	45 min.	
	Observation	AP Calc	45 min.	
	Observation	Algebra II	1 hr. 5 min.	
	Observation	Algebra I x 2	1 hr. 45 min.	
	Observation	Algebra II	45 min.	
Friday 10/1	Observation	Algebra II	45 min.	
	Observation	AP Calc	45 min.	
	Observation	Algebra II	45 min.	
	Observation	Algebra I x 2	2 hr.	
	Observation	Algebra II	45 min.	
Totals		Direct Hours	—	
		Observation Hours	23 hrs. 35 min.	

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Russell Varney

Week Of: 9/20 - 9/24

	Activity	Subject Area	Hours	Signature
Monday 9/20	Observation	Algebra II	1 hr. 10 min.	
	Observation	AP Calc	45 min.	
	Observation	Algebra II	45 min.	
	Observation	Algebra I × 2	1 hr. 45 min.	
	Observation	Algebra II	45 min.	
Tuesday 9/21	Observation	Algebra II	45 min.	
	Observation	AP Calc	1 hr. 10 min.	
	Observation	Algebra II	45 min.	
	Observation	Algebra I × 2	1 hr. 45 min.	
	Observation	Algebra II	45 min.	
Wednesday 9/22	Observation	Algebra II	45 min.	
	Observation	AP Calc	45 min.	
	Observation	Algebra II	1 hr. 10 min	
	Observation	Algebra I × 2	1 hr. 45 min.	
	Observation	Algebra II	20 min.	
Thursday 9/23	Observation	Algebra II	45 min.	
	Observation	AP Calc	45 min.	
	Observation	Algebra II	45 min.	
	Observation	Algebra I × 2	2 hr.	
	Observation	Algebra II	45 min.	
Friday 9/24	Observation	Algebra II	45 min.	
	Observation	AP Calc	45 min.	
	Observation	Algebra II	45 min.	
	Observation	Algebra I × 2	1 hr. 45 min.	
	Observation	Algebra II	1 hr. 10 min.	
Totals		Direct Hours	—	
		Observation Hours	25 hr. 45 min.	

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Russell Varney

Week Of: 9/13 - 9/17

	Activity	Subject Area	Hours	Signature
Monday 9/13	Observation (sub)	Geometry	45 min.	
	Observation (sub)	Algebra I	45 min.	
	Observation (sub)	Algebra I	45 min.	
	Observation (sub)	Algebra I	1 hr.	
	Observation (sub)	Algebra I	45 min.	
Tuesday 9/14				
Wednesday 9/15	Observation	Geometry	45 min.	
	Observation	AP Calculus	45 min.	
	Observation	Algebra II	45 min.	
	Observation	Algebra I	1 hr.	
	Observation	Algebra I	1 hr.	
Thursday 9/16	Observation	Algebra II	45 min.	
	Observation	AP Calculus	45 min.	
	Observation	Algebra II	45 min.	
	Observation	Algebra I (x2)	1 hr. 45 min.	
	Observation	Algebra II	1 hr.	
Friday 9/17	Observation	Algebra II	45 min.	
	Observation	Algebra I	45 min.	
	Observation	Algebra I	1 hr.	
	Observation	Algebra II	45 min.	
Totals		Direct Hours	—	
		Observation Hours	16 hr. 30 min.	

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Russell Varney

Week Of: 9/7 - 9/10

	Activity	Subject Area	Hours	Signature
Monday				
Tuesday 9/7	Observe	AP Calc (T)	45 min.	
	Observe	Algebra II (T)	45 min.	
	Observe	Algebra I (G)	50 min	
	Observe	Algebra II (T)	20 min	
Wednesday 9/8	Observe (Sub)	Geometry	45 min.	
	Observe (Sub)	Algebra I	45 min.	
	Observe (Sub)	Algebra I	45 min.	
	Observe (Sub)	Algebra I	1 hour	
Thursday 9/9	Observe (Sub)	Geometry	45 min.	
	Observe (Sub)	Algebra I	45 min.	
	Observe (Sub)	Algebra I	45 min.	
	Observe (Sub)	Algebra I	1 hr.	
	Observe (Sub)	Algebra I	45 min.	
Friday 9/10	Observe (Sub)	Geometry	1 hr. 10 min.	
	Observe (Sub)	Algebra I	45 min.	
	Observe (Sub)	Algebra I	45 min.	
	Observe (Sub)	Algebra I	1 hr.	
	Observe (Sub)	Algebra I	45 min.	
Totals		Direct Hours	—	
		Observation Hours	14 hr. 20 min.	

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Russell Varney

Week Of: 9/1 - 9/3

	Activity	Subject Area	Hours	Signature
Monday				
Tuesday				
Wednesday 9/1	Observe	Algebra II (T)	1 hr. 10 min.	
	Observe	Agebra II (T)	20 min.	
Thursday 9/2	Observe	Algebra II (T)	45 min.	
	Observe	Algebra I (G)	40 min.	
	Observe	Algebra I (G)	55 min.	
	Observe	Algebra II (T)	20 min.	
Friday 9/3	Observe	Algebra II (T)	45 min	
	Observe	Algebra I (G)	45 min	
	Observe	Algebra I (G)	40 min	
	Observe	Algebra II (T)	20 min.	
Totals		Direct Hours	—	
		Observation Hours	6 hr. 40 min.	