

**Student Teaching Practicum at  
Doherty Memorial High School**

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## **Abstract**

Over C and D term of 2017, I participated in the student teacher practicum offered at Worcester Polytechnic Institute. I served as student teacher at Doherty High School in Worcester, MA. The student teacher practicum served as my Interactive Qualifying Project at Worcester Polytechnic Institute. In this paper, I will discuss all the components relevant to the student teacher practicum. The first component discussed will be about new reforms in state laws concerning public education in Massachusetts. All relevant background to Doherty Memorial High will be discussed to create a picture of what the school's environment looks like. The major focus of the paper will be the six essential elements of CAP, candidate assessment of performance. All teacher candidates must effectively demonstrate and score proficiency on the following elements in order to become a licensed teacher in Massachusetts: well-structured lessons, adjustment to practice, meeting diverse needs, high expectations, safe learning environment, and reflective practice. In this paper I will go into more details about the strategies and methods I used to achieve each of these essential elements in my classroom. Lastly, I provide analysis on each of my classes and reflect on my time at Doherty High School. All sources I use within this paper are cited on my Works Cited page. All student work and material I have can be found at the end of the paper in the Appendix.

## **Acknowledgements**

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# Chapter 1: Background

## Massachusetts Education Reform Act of 1993

There are a lot of aspects that shape and affect education and the responsibilities of a teacher. One such aspect is the Massachusetts Education Reform Act of 1993. This act was designed to improve Massachusetts public education system after they saw a steady decline in our test scores. The Massachusetts Education Reform Act of 1993, or MERA, wanted to establish some basics for schools statewide to better the public education. It created new high standards for each student, a statewide test which would be used to tell whether the new standards were met or not, and a system to hold schools and districts accountable for said standards (Chester). Along with new standards, MERA established a new budget to help schools financially. It made sure all basic financial needs were met based on demographics and enrollment numbers of the school. The council assigned to look over the financial needs is called Chapter 70. MERA's impact was far reaching and affected more than just finances, standards, and state assessments of public schools. Other areas impacted included, "educator licensure, professional development, educator evaluation, vocational education, charter schools, school budgeting and accounting, district hiring authority, and technology utilization" (Chester).

The biggest change which affected my time as student teacher were the changes to the education standards, or what the students needed to know and what they would be tested on. MERA set up a new system of standards called Common Core State Standards, or CCSS. Every student would be evaluated on if they met the CCSS based on their performance on the state standard exam called Massachusetts Comprehensive Assessment System, or MCAS for short. In

order to graduate, each student had to meet these MCAS standards for Math, English Language Arts, and Science. This meant that the standards which educators used to guide their lessons and teaching for decades had changed. Educators had to restructure their lesson plans and teaching to make sure the students now met the CCSS. Generally students finish taking the MCAS by 10th grade, but all math teachers have to be conscious of these new standards for a few reasons. One, these new standards meant content had to be restructured. The CCSS had different thoughts on what should be emphasized in mathematics and so it was the teachers' jobs to have their class reflect these new standards. Two, teachers who taught 11th and 12th grade mathematics had students entering their classroom with slightly different backgrounds than they had before. These teachers had to redefine what they considered prior knowledge and what they considered new content. Educators could choose to restructure their classes to account for the gaps or spend time filling in the gaps. My classes consisted of 11th and 12th graders, so I chose to carefully fill in the gaps where I saw fit. I used formula sheets from the MCAS for basic equations because my students were already intimately familiar with them.

### **Trends in International Mathematics and Science Study (TIMMS)**

The second standard that has been newly imposed on public schools is called TIMMS or trends in international mathematics and science study. The United States is among 57 other countries participating in this program (TIMSS 2015). These are science, mathematics, and numeracy assessments which test a country's performance with international standards. The newest program is TIMMS Advanced 2015 which is, "the only international assessment that provides essential information about students' achievement in advanced mathematics and

physics” (TIMSS 2015). TIMSS 2015 is given to fourth and eighth graders to evaluate their performance on an international scale in the subjects of mathematics, numeracy, and science.

The importance of TIMSS in regards to the student teacher practicum is the results of Massachusetts in comparison to the international standards. As seen in Figure 1, Massachusetts scores very high in comparison to other countries and other states in the US (TIMSS 2011). In fact, only 4 countries beat our scores and one country was on par with ours. Based off of these TIMSS reports, you can see Massachusetts holds our students in mathematics to a high standard. As an educator we need to continue to hold them to the same high standard. These TIMSS scores demonstrate that the new changes from MERA had positive effects within the public education system of Massachusetts.

**Average mathematics scores of 8th-grade students in Massachusetts public schools compared with other participating education systems: 2011**

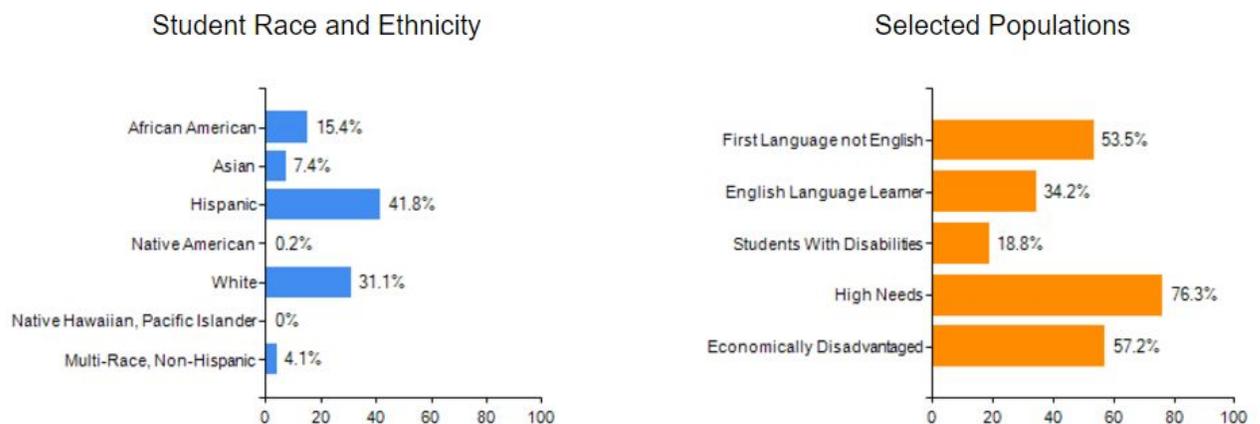
Grade 8	
<b>Education systems higher than Massachusetts</b>	
Korea, Rep. of	<i>Chinese Taipei-CHN</i>
Singapore	<i>Hong Kong-CHN</i>
<b>Education systems not measurably different from Massachusetts</b>	
Japan	
<b>Education systems lower from Massachusetts</b>	
<i>Minnesota-USA</i>	Norway
Russian Federation	Armenia
<i>North Carolina-USA</i>	<i>Alabama-USA</i>
<i>Quebec-CAN</i>	Romania
<i>Indiana-USA</i>	United Arab Emirates
<i>Colorado-USA</i>	Turkey
<i>Connecticut-USA</i>	Lebanon
Israel	<i>Abu Dhabi-UAE</i>
Finland	Malaysia
<i>Florida-USA</i>	Georgia
<i>Ontario-CAN</i>	Thailand
United States	Macedonia, Rep. of
<i>England-GBR</i>	Tunisia
<i>Alberta-CAN</i>	Chile
Hungary	Iran, Islamic Rep. of
Australia	Qatar
Slovenia	Bahrain
Lithuania	Jordan
Italy	<i>Palestinian Nat'l Auth.</i>
<i>California-USA</i>	Saudi Arabia
New Zealand	Indonesia
Kazakhstan	Syrian Arab Republic
Sweden	Morocco
Ukraine	Oman
<i>Dubai-UAE</i>	Ghana

NOTE: Italics indicate participants identified and counted in this report as an education system and not as a separate country.  
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2011.

**Figure 1:** 2011 Average Mathematics Scores of 8th Grade Massachusetts Students Compared Internationally

## Worcester Public School District Profile

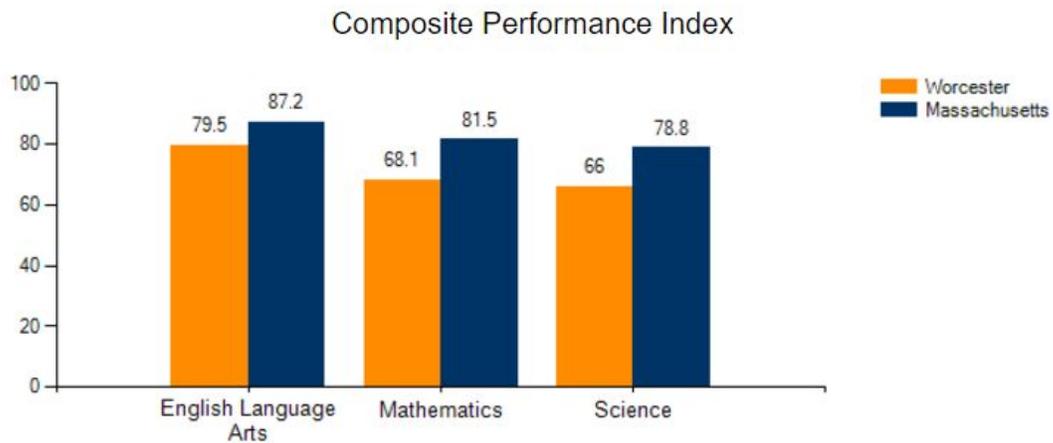
The background of the district I was teaching in had a big impact on my teaching methods and strategies. Doherty Memorial High School is part of the Worcester Public School District. The Worcester Public School District has an enrollment of 25,479 students spread out over 45 schools (Worcester Public School). The school district is highly diverse. For example, the percentage of Hispanic students is 41.8% which is high compared to state percentage of 19.4% (Massachusetts Enrollment). The most notable minority populations are Hispanic, African American, and Asian. Within the district, there is high population of students whose first language is not English and students from economically disadvantaged households as seen in Figure 2 (Worcester Public School).



**Figure 2:** Worcester Public School District Population Demographics

Worcester Public Schools District is Level 4 on the School and District Accountability scale (Worcester Public School). This scale ranges from Level 1 to Level 5; Level 1 classifies districts that proficiently meet their goals and Level 5 classifies districts with the lowest

performing schools. Typically the lower the level a school is assigned, the more emphasis it has on the state’s part to give assistance and additional support. The Worcester Public School District is in need of higher assistance compared to others. The Composite Performance Index compares districts on a state level in terms of students’ performance in the subjects of Mathematics, English Language Arts, and Science. The Worcester Public School District performs slightly below state average in these subjects as seen in Figure 3 (Worcester Public School).



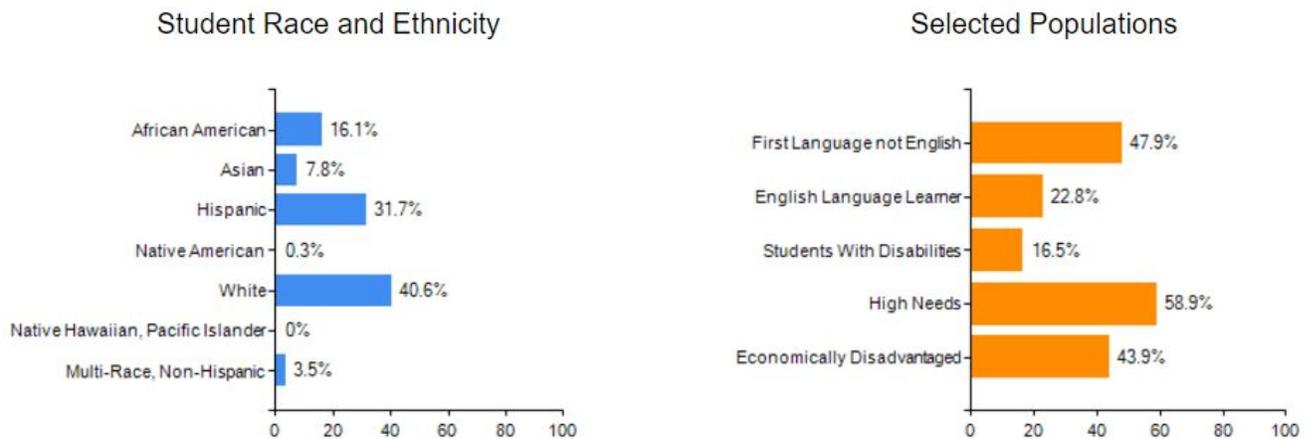
	English Language Arts (CPI)	Mathematics (CPI)	Science (CPI)
<b>Worcester</b>	79.5	68.1	66.0
<b>Massachusetts</b>	87.2	81.5	78.8

**Figure 3:** Worcester Public School District Results of Composite Performance Index

### Doherty Memorial High School Profile

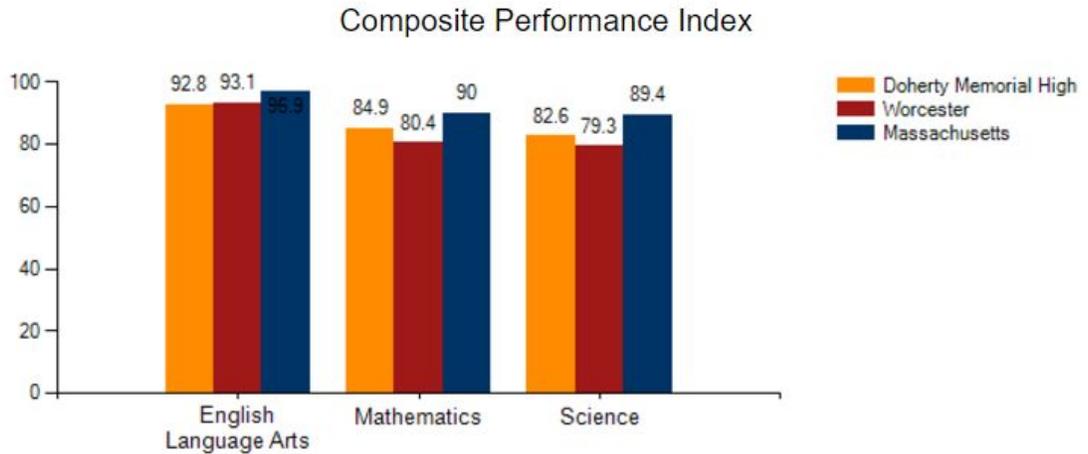
Doherty Memorial High School is a public high school within the Worcester Public School District. It has an enrollment of 1,555 students serving grades 9 through 12 (Doherty Memorial). Those 1,555 students are quite diverse, the major minorities being Hispanic and

African American. The biggest differences are within the populations, as seen in Figure 4. Doherty has a high population of economically disadvantaged households, a total of 43.9% which is higher than the state's average of 30.2% (2016-17 Selected). Doherty has created programs such as free meals for students to combat this struggle. There is also a high number of English Language Learners. Doherty has a total of 22.8% of English Language Learners while Massachusetts total is only 9.5%, over 3 times the state total. English Language Learners, or ELL students, require different methods of teaching and therefore creates a unique challenge for Doherty teachers.



**Figure 4:** Doherty Memorial High School Demographics

Doherty Memorial High School ranks at a Level 3 on the Composite Performance Index, as seen below in Figure 5 (Doherty Memorial). This means that the school is among the lowest 20% performing schools (Doherty Memorial). In terms of mathematics and science, Doherty performs lower than the state average. However, Doherty performs higher than the Worcester District scores despite all the obstacles the school faces.



	English Language Arts (CPI)	Mathematics (CPI)	Science (CPI)
Doherty Memorial High	92.8	84.9	82.6
Worcester	93.1	80.4	79.3
Massachusetts	96.9	90.0	89.4

**Figure 5:** Doherty Memorial High School Composite Performance Index

Despite all these difficulties, students at Doherty Memorial High School are doing well. A total of 78.8% of Doherty graduates attend an institute of higher education. In class of 2016, “55% of students went on to attend four year colleges, 31% went on to two year colleges, 2% attended post-secondary /trade schools and 12% entered the military” (2015 Massachusetts). These numbers support the notion that Doherty adequately prepares their students for bright futures.

## Chapter 2: Well Structured Lessons

Well-structured lessons are one of six essential elements that an educator must reach proficient on. At a proficient basis, well-structured lessons are defined as when the teacher, “develops well-structured lessons with challenging, measurable objectives and appropriate

student engagement strategies, pacing, sequence, activities, materials, resources, technologies, and grouping” (Guidelines for Candidates). They are the content focused portion of being an educator. It’s how you plan on presenting new material to the class, what your objectives are for your students, and how you will present material. This is a critical part of being a strong educator because this is the basic foundation of all classrooms. Within a given class period, you should have a reasonable objective for your students. Your job as a teacher is to work with them to help every student reach this goal. Well thought out lesson plans and preparation is the best way to ensure that your teaching helps every student reach the objectives.

As part of my student teacher practicum, it was my duty to prepare a lesson plan each day for every class and then teach the material. I based the format of my lesson plans on the structure we were given in ID3100 and Seminar. Once I had the unit and section I wanted to teach, I would format a lesson plan around it. There were three stages that I had to properly fill out to create a successful lesson plan.

The first stage was called “Desired Results”. This section had to do with what standards I was meeting based off of the lesson. Here I would add Objectives for the day and essential questions. Typical questions would be to finish phrases like, “Students will be able to…” and “Students will understand…” My objective would follow the form of “students will be able to…”, or SWBAT for short. Each day the objective would be written on the board and I would communicate the objective with my students so they knew what was expected of them. Typically in this section I would have two objectives. One objective would be for the day, something I expected them to have a grasp of as they left my classroom. These are shorter and often have to do with the assigned homework. The second objective for me was a unit objective, so my

students kept in mind a broader picture of what we're doing. I would often allude to how what we were doing during the day would help them further along in class. I found this made students more amicable and willing to stick with you during the more tedious but necessary lessons.

The second stage is "Assessment Evidence". This is a short rundown of how I will know if my lesson plan was a success. Anything collected from the students or check-ins I plan on doing with my students were listed in this section, including do-nows, homework, and performance tasks. A typical day involved a do-now at the beginning of the day. They were designed to either give me a quick check-in to see how yesterday's lesson was understood or to allude to the lesson they were going to learn that day. No matter what, the do-nows were great at putting the students in a math mindset and giving me time to check homework and take attendance. Generally, performance tasks included the guided and check-in questions I would ask my students. On Fridays it would be a form of formal assessment, such as quizzes or exams.

The third stage is "Learning Plan". This is the most useful section for an educator on a day to day basis. In this section you spell out what your do-now is, learning activities students will work on during class, and your closing or summary. Accommodations, types of teaching delivery, intelligences addressed, and your plan for grouping also belonged here. This was useful to make sure I was using variety in my teaching. The last two sections were the homework assignment for the day and a list of all materials I needed to have before the bell rang. Checking these sections were a great way to prepare for my classes. I could write necessary objectives and homework on the board, make sure supplies were out and copies were made, and have an idea of how I was going to tweak my lesson plans for all types of learners.

My lesson plans were very methodical, examples of which can be seen in Appendix C. I made the formal lesson plans which would be approved by my advisors and also kept a notebook to have during class. My notebook was the most important teaching tool I had. It had written out the do-now problems, outlined necessary content we had to go over that day, any homework answers I needed to give my kids, that night's homework assignment, and any comments I needed to hit on. I would highlight sections that didn't go as well as planned that day. I would revisit the highlighted sections and have specific reflection geared towards what went wrong and how I could improve. Anything highlighted in my notebook was repeated or explained again the next day in class.

I taught two different levels during my time at Doherty; I had one section of Pre-Calculus Honors students and three sections of Pre-Calculus College students. The biggest difference that occurs between these two levels was pacing. Each class on their own was expected to cover the same units, with two big distinctions. One, an honors level class was expected to move at a faster pace. A section that takes a day for an honors level class should take about two to three days in a college level class. You can still challenge each class, within reason. However, the honors level class was expected to pick it up quicker and move faster. Two, an honors class could go in depth into a unit, whereas a college level class may not go as deep simply because of time or complications.

Along with two different levels, I found that even within one level there was varying paces. As I got to know each of my classes, I was able to guess how long it would take each class to understand the material. One of my college level classes really struggled to understand, so I would prepare a few problems but go in depth for strategies for each one. Another college level

class of mine was quick to understand, so I prepared more practice for them along with some more challenging problems. I also had to account for long block, which at Doherty was a class that was about twice as long as normal and it rotated each day on a 6 day schedule. I utilized this time for in-class projects, group work, and games because we had the time to do them well and successfully.

The biggest way I made strides in well-structured lessons is variety. When I started off, I was a bit timid when it came to branching out and trying new things. With the support of my teacher and my students' trust, I gained confidence and tried new ways of learning. When starting a new lesson I would stick to notes and incorporate real world examples. My biggest challenge was teaching seniors after they have received college acceptance letters. I tried to meet this with a lot of real world applications and examples using their interests. I began to use technology in class in order to vary the way I presented material. I created a few jeopardy games that often acted as review before big assessments. Every time I did this, I found that I had high participation and interest. It was a wonderful way to gauge where each class was in terms of understanding. I also used the student whiteboards heavily to have review competitions. This gave my students variety in class, a chance to work with their peers, and the opportunity to get immediate feedback from me.

I changed how I gave homework too. One type of homework assignment was textbook questions. It was expected that students tried all the problems and would record their work in a notebook which I would check the next day. The other way was an online assignment using a website called Assisments. For students who did not have access to a computer I would print the assignments out for them. I gave all my students two days to complete the assignment which I

found was enough time for them to plan on staying after school if needed. Assistments is a wonderful program which allows you to upload homework questions. The students get immediate feedback about if their answer is correct or not. As a teacher, there is a way to see each class's responses on a spreadsheet. I could tell which problems students struggled with the most and which problems they had the most success with. There is even an option for adding hints into it for students who struggled with the homework. Hints were designed around the most common questions that would arise on that particular question. I used these results to help me plan for the next day's lesson.

The most important thing to remember is that your lesson plan is a fluid object. A successful teacher uses the lesson plans to prepare for the day and to make sure you have a plan. However, each lesson plan is fluid and should be adapted to as you give the lesson based on each class's individual needs.

## **Chapter 3: Adjustment to Practice**

Adjustment to practice is the teaching part of education. Lesson plans are an outline of what your plan is for the day, but factors you encounter day to day and even class to class will end up changing how much you accomplish. This adjustment to practice is the component that adapts the lesson plan to unforeseen hardships or problems so the lesson is still successful. A proficient level for an educator is defined as when he/she, "Organizes and analyzes results from a variety of assessments to determine progress toward intended outcomes and uses these findings to adjust practice and identify and/or implement appropriate differentiated interventions and enhancements for students" (Guidelines for Candidates). Meeting a proficient level of adjustment

to practice is vital in becoming a successful educator. Students have different learning styles, so there is such high importance on using a variety of measurements to assess and promote student learning. Only assessing and teaching in one way is bad for your class as a whole and not an effective teaching method. It only benefits the students who learn with that one specific learning style. There are students who can learn and reach the same level of understanding, but they need a different approach or multiple approaches for the same concept. Without that approach they aren't learning and will actually become discouraged in the classroom. A teacher's biggest strength is their ability to listen to their classes' needs and adapting them into practices and strategies. An effective teacher should be able to appropriately apply the following strategies to adjust their teaching to best suit the needs of their students: using design concepts, giving written notes, giving oral explanations, showing a variety of examples, and answering the same question by using multiple explanations.

Proficiency means success on a weekly basis, not just once in a while. I really wanted to start off with understanding and implementing practices that will help me make adjustments to meet each class's needs, so I made feedback a routine in my classroom. I used do nows as an informal assessment on how the prior day's lesson went. I would put a problem on the board that related to yesterday's content that students would be expected to do as soon as they entered the classroom. I graded these quickly, 100% for students who got it right and 70% for students who got it wrong but tried. This grading system encouraged students to at least try the problems. I could quickly glance at them within a minute or two and know how my class did with yesterday's lesson. From there I would make the adjustment decisions necessary to keep my class on track. For the problems that a majority of my class got right, I would go ahead and start

my lesson for the day. For the problems that were a pretty even split of correct and incorrect, I would go over the do now step by step. For the problems that a majority of my students got incorrect, I would go over the do now step by step and also go over a few more similar problems until they reached understanding. Every day I made sure I generated or found extra problems for each class that I would have at my disposal, that way I didn't waste precious time trying to figure out more examples for the students in order to reach understanding. I could also use the do-nows to help guide learning. I had one day where the lesson was to find the missing angle using Law of Cosine. For the do now I had them solve for the missing angle using Law of Sine, something that we have already learned. This helped lead into my new lesson and to check to make sure my class knew and remembered how to use Law of Sine before we moved on.

I also made it part of my routine that on Fridays they had formal assessments, either quizzes or exams. On Wednesdays I would use exit slips that the students had to fill out in order to leave class. I would list all of the material they had to know for Friday on the board and then I would ask them two questions. One, what do you feel most comfortable with? Two, what would you like to see more examples of? I would collect each class's responses and tailor a review session for Thursday based off of what each class needed.

I dealt with more difficult concepts and struggling classes by adjusting my board use. I used color coordinated notes on the board where each variable was defined on the board and assigned a specific color. Throughout the lesson I would use the appropriate colors to link known information in the examples to the corresponding variables. This helped my struggling students visualize how a new formula or concept is applied to examples. I would also check in with my students periodically throughout the lesson. I used thumbs up, thumbs down system to see when

we could move on or when we needed to slow down. After explaining a concept, I would ask my students if it made sense. The system was thumbs up if they understood, sideways if kind of but a few more examples, down if it made no sense. A few times I did this and was able to catch when my students were falling behind before it was too late. At that point, I would explain the concept in a few different ways and use different comparisons or examples until my class reached understanding. After thumbs up or thumbs down, I opened the floor to questions. Students could see that they weren't the only ones struggles, so I found students were more open to asking questions.

One of the best ways to make adjustments to lessons is to get immediate feedback. One way I did this is by integrating technology into the classroom. There are so many benefits of using technology: higher student engagement, and quicker feedback and responses. One thing Mrs. Razzaq and I tried during the beginning of the year that had very good responses from her students was plickers. Plickers is an app that allows the teacher to get immediate feedback from their students without the students' use of technology. Students have a paper card and are given a multiple choice question. Depending on what their answer was, they would hold the paper up in the orientation corresponding to the letter (example: A is the paper facing up, B is sideways, etcetera). We could then use the app on our phone to scan the students' response. We found the app very responsive and you could stand at the front of the class to scan them, rather than going desk to desk. The students' names would light up green if they got the correct answer and red if they got the question wrong. We could project the names up on the board so the students could tell whose name got scanned, but not what their answer was. The students really enjoyed the quick feedback and liked how they could see their names light up on the board. It was also a

better way to do practice questions because the app immediately lights up their name red if it's wrong and green if it's right. It gives you a running total of who answered what immediately after they answer. I was able to get a quick idea of how many people got it right or wrong and what the most common wrong answer was. Then I could determine if I needed to go over the question again or not. There were minor technical issues all revolving around the learning curve of using a new technology. Once I figured out how to use it, I was able to immediately see what content my students were all set on and what content we needed more review on.

Another way to give my students immediate feedback and adjust my teaching was by having my students use white boards for practice problems. My classroom had a set of whiteboards, so I would pair students up to work on problems. I would steadily increase the amount of challenge with each problem. I had immense success with this technique. I could give immediate feedback to students because I could see the students' answer. It also gave me time to walk around and talk to students individually. It was an easy way to tell where the class was. If a question met a lot of unsure stares and wrong answers, I would pause class and go over the problem on the front board. I would follow it up with a similar question to make sure my explanation fixed the problem. The immediate feedback using these techniques helped me adapt my lesson in the classroom to best fit my students' needs.

## **Chapter 4: Meeting Diverse Needs**

Meeting diverse needs for an educator on a proficient standard is defined as, "Uses appropriate practices, including tiered instruction and scaffolds, to accommodate differences in learning styles, needs, interests, and levels of readiness, including those of students with

disabilities and English learners” (Guidelines for Candidates). The basic principle of meeting diverse needs is this: you structure lessons and use different techniques with an end goal of reaching all types of students, eventually reaching all learning styles or disabilities or ELL. An effective teacher reaches all her students in the classroom, not just a few of them, which is why meeting diverse needs is so important for educators. As a teacher we have to know the content and being able to articulate the same basic principle multiple ways. A class of students is never full of only one type of student. Each class has multiple types of learners: some are visual learners and need more diagrams, some are oral learners and need more instruction, some need more practice and hands on projects, and some are better with exams. A teacher must accommodate every learning style into her lessons to make sure she’s teaching every student. This is one of the categories as a teacher that you are continuously working on. The teachers I talked to, who were all seasoned teachers, said they’re constantly looking for new ideas and ways to integrate different learning styles in the classroom. I talked to one teacher who is always trying new projects with her students. She was constantly on the quest to find the right one that could accommodate all her students and help teach the content in multiple ways. I discovered a few ways of meeting diverse needs in the classroom by talking to other teachers and my mentor, trying new things, and research.

My first step towards meeting diverse needs was tiered instruction and scaffolding. This helps all types of students and is easier to do without intimate knowledge of each class’s specific learning styles and paces. I did this by starting each lesson off small. I started off with one bit of information, explained, and then work my way up. Bit by bit the new information came together until we had learned a whole concept. I found breaking the information up in chunks helped

students stay with me and not get overwhelmed. During my practicum, I found the biggest downfall of a class was when they got discouraged. Even if they didn't understand, the hope and encouragement from me as teacher was enough to get them to move forward and stick with me. All they had to do was stay with me and eventually as a class through scaffolding we'd reach understanding. The biggest success with avoiding overwhelming my students was to break the information up in pieces and give a new piece after they reached understanding of the first part. I also varied my examples in class by increasing them with difficulty and using different types of problems. I would start off simpler when they first learn the concept and then increased difficulty as the lesson progressed to demonstrate mastery.

At Doherty, there are a high number of ELL students, English language learners. We had students that are learning English along with learning Pre-Calculus. There were a few students of mine that understood the math really well, but sometimes struggled in my class because of language barriers. In order to meet diverse needs, I attempted to breach the language gap in a number of ways. One way I did this was color coordinate my notes on the board. Depending on the lesson, I would assign each variable a different color. On the left of the board we would write each variable and define them. Then as we worked on examples I would use the same color coding in the examples to help students identify where everything is, despite the new format of a question or word problem. With word problems I always made sure to draw diagrams. The first couple of diagrams I would draw for them, but after they began to show understanding I would test them by drawing a part of the diagram and then having them help me fill out the rest. Teaching them how to draw the diagrams and understand how to use them definitely helped the ELL students on exams.

Going over problems step by step and repetition were definitely the biggest factors in helping ELL students and struggling students. I made sure each example followed a similar format. It helped organize information for students, repetition of this format made it stick in their heads so they were able to use it on their own, and it gave students something to refer to if they got stuck on a problem. The first thing I'd do is start off by writing all the knowns we had and identify what our unknown was that we're solving for. Next, we would draw a diagram for the situation, if applicable. After, we would write down the formulas or the concepts we needed to solve it. Lastly, we solved the problem step by step. Step by step solutions helped because it gave great reference material, students following my example would also do it step by step which made it easier for them to find their mistakes, and it gave them the option to work on it on their own and tune in when they got stuck.

Varying your presentation of material is a great way to reach every student. I made a conscious effort to not just give them lecture 4 days a week and then assess the 5th day. I varied how I presented material. I used lecture, bookwork and worksheets, group work, games like jeopardy and matching games to name a few. Every lesson I had I gave oral explanations, I would write summaries of the explanations on the board, and I made sure to use diagrams whenever possible. I wanted them to have multiple ways available to reach each objective.

Meeting diverse needs also involves multiple forms of assessments. One way I did this was give students a project each quarter as a test grade. For the last quarter that I was there, I gave them a project called "Sally's Plot". This gave the students who understood the material, but don't test well the chance to prove they understood and do well. It also gave the more creative students an outlet to do some art. The project was to find the area of the usable land in

her plot and the cost of the entire plot of land. The plot of land was in the shape of a triangle with a trapezoid shaped river running through the middle of it. It corresponded to my trigonometry unit and they had learned multiple techniques before this that could be used to solve for the project. I had a clear rubric that went along with the project. It listed and explained each component, along with the total amount of points they could earn with it. I handed out the rubric and explained it to each class, pausing after each point to allow for questions. I wanted to emphasize a few different things with this project, so I added them to the rubric with points connected to each as incentive to follow them. One was for students to really try the project on their own. I wanted them to try the project without me holding their hands at each step. The project was created to make them think, but I knew each student was capable of accomplishing this goal on their own with a little effort. I rewarded students a total of 10 points for working on the project individually and not requiring hand holding. I also wanted to emphasize creativity and I wanted to reward students who were stronger in arts and humanities. Due to this, a total of 10 points were rewarded for what I called the “Wow Factor” which I explained and gave examples for. This meant students projects were above and beyond what I was expecting. The final project wasn’t just neat, organized, and colorful, it had to show care, effort, and creativity. The final projects definitely amazed me in all my classes, but especially my college level classes. Examples of the projects can be found in Appendix B.

With my honors class I handed out the rubric, explained the rubric and project, and then they started with the project. I floated around the classroom to answer any questions they had. If it was a common question, I’d pause the class and go over it on the board. With my college level class, I added more structure. At this point I had intimate knowledge of my classes, so I actually

made a list of anticipated common misconceptions and went over all of these on the board as a class before they started the project. I found this really helpful because students responded well to it and actually immediately began work instead of just staring at the paper and then calling me over for help.

## **Chapter 5: Safe Learning Environment**

Creating a safe learning environment for your students is, in my opinion, one of the most vital components of becoming an educator. Nothing gets accomplished if your classroom isn't a safe environment for your students. Students need to feel comfortable and be able to show respect so they can ask questions to aid in their learning. They need to be responsible in order to use materials for projects. The classroom needs to have a routine so students know what to expect from you and what's expected from them. By definition, a proficient safe learning environment is when the teacher, "Uses rituals, routines, and appropriate responses that create and maintain a safe physical and intellectual environment where students take academic risks and most behaviors that interfere with learning are prevented" (Guidelines for Candidates). Creating and maintaining a safe environment helps lessen the amount of behavior problems you will have and will enrich your student's education.

When you start teaching a class, the first thing you should do is lay out expectations and establish a classroom routine. I came into a classroom in January and by then my mentor teacher Mrs. Razzaq had already laid out what she expected out of her students and the routine of the class. I was lucky in that her routine is similar to how I wish to conduct a classroom. When I started, I introduced myself to each class and reiterated my expectations and classroom routines.

I made it clear to my students what I wanted from them and what they could expect from me on a daily basis. My routine started as soon as they walked into the classroom. It was my expectation that they got to their seats, pulled out last night's homework for me to check off, and then start the Do-Now which could be found on the board. Once they finished the Do-Now they would pass it to the right and I would go up the row and collect it. We would go over Do-Now and homework, depending on what they needed help on. From here I would announce their homework for the night which would be written on the board and then give them an itinerary of what the rest of our day would look like. The agenda for the day put a lot of students at ease and I found it made them more willing to stick with me through the more mundane parts of the lesson because they knew in a few minutes it would be more interesting. If at any point in class they had to leave, either for the bathroom or nurse or guidance, they were expected to raise their hand and ask. I wrote each person a pass and they had to sign out in a class notebook. Only one person was allowed out of the classroom at a time, unless of course it was an emergency. I also maintained the idea that assessments would be on Fridays and Thursdays they could expect some form of review. It lessened the amount of questions on when the next exam was and they were less likely to complain because they knew of it in advance.

However, sometimes routines are broken. The major thing I had to learn to do is accommodate for when my routine got disrupted. The smallest disruption, if not handled properly, can halt a class for the entire day. Disruptions could be as small as a missing student, all the way up to a school wide problem. As a teacher you want to make sure outside situations affect the classroom as minimally as possible. Day one of observation I witnessed firsthand how teachers have to balance school problems and a classroom. After coming back from winter break,

many teachers discovered they could no longer get into Engrade and there was slight panic because of it. Engrade is a school platform teachers use for grades and attendance. I watched my mentor teacher field questions about Engrade, while still effectively teaching. She did not let her students see her crack or become stressed. She maintained a calm composure and because of it the class ran very smoothly and the students behaved. My biggest disruptions came after April Vacation until I finished teaching in May. This time of the year is an extreme headache for teachers, especially those with juniors and seniors like I had. There is SAT testing, MCAS testing, constant field trips, NHS ceremony practices, and graduation and college events. In order to accommodate for varying amounts of missing students, I had to structure lessons differently. Within these weeks I did a lot more group work and projects. The benefits for this were twofold. One, I was able to group students who were out together. I was able to give groups of students who had been here the previous day more practice and varying levels of question, so they didn't become bored with repetition. The students who were absent I grouped together. It enabled me to give a quick review of what we did yesterday to everyone at once, so I didn't waste time constantly repeating myself. It also allowed me to individualize problems for students so it was at the correct level for them and I could keep a close eye on students who needed more help. Two, it was an efficient way of getting everyone on task again without part of the class becoming bored or disruptive.

My biggest goal that I started as soon as I walked into the classroom and worked on every week until I finished was creating an environment that encouraged questions. I wanted a classroom where every single student felt comfortable asking a question, whether it was a clarification question or I need help or how does this relate or where did this come from. If I left

my students with anything, I wanted to leave them with the idea that mistakes are part of learning and it does not make you weak to ask questions. From the beginning I started to show my students that questions were encouraged and I would never judge a student for a question they asked. I tried to praise students who asked questions and never left a question unanswered. I made sure to follow up every question with an answer and explanation. I would thank students for pointing out my errors on the board in order to not only keep myself honest but also prove to my students everyone makes mistakes and it's ok. As my practicum progressed, students began to get more comfortable with me and my class. Students felt comfortable volunteering answers and participating in class. I very rarely had the issue as a teacher where no one is willing to respond.

One day that made it evident to me that I was succeeding in creating a safe learning environment for my students was one of my college level classes when we started the trigonometry unit. We were going over the unit circle and learning about the first quadrant. This class was having a particularly hard time understanding where numbers were coming from and how they related to one another. They struggled wrapping their heads around how sin and cos related to x and y values on the unit circle and therefore didn't understand the coordinate points. In class they began to get really frustrated with themselves. A few students were so comfortable that they raised their hands and told me they were completely lost and needed help because they still didn't get it. When students became frustrated, my practice was to put my marker down when I saw this and tell me students to take a few deep breaths which I also did with them. My students immediately responded and calmed down. When they were done they knew to expect me to explain it again, but in a different way this time. I said something along the lines of, "okay

we're going to start this from the beginning, everyone ready? Take out a new piece of paper." I decided to start off with a graph and a point, what's the coordinate point? They responded with the x value and the y value. Then I moved to the special right triangle 45-45-90 and asked for the side values for this. They immediately rattled them off. I explained how the unit circle is just a special graph which puts these special right triangles that we already know into the unit circle. I showed them how to putting it in the unit circle meant we had to shrink the hypotenuse to 1 and then re-find the sides. Wait these side values are the same as our sin and cos! By placing these triangles in the unit circle our cosine becomes our x value or how long the triangle runs along the x-axis. Our sine values become our y value or how long the triangle runs along the y-axis. . My entire class had a sigh of relief and aha moments. That explanation made sense to them and then they started doing really well in this unit, which I'm really proud of. If I didn't establish early on that they could ask me questions or that it was perfectly justified to raise their hand and simply say "I don't understand", my class never would have stopped me. I would have kept going and lost my class for the rest of the unit. The trigonometry unit is big and it's very important to understand the basics because everything builds.

I succeeded in creating an inquisitive and safe learning environment. As evident in my students' responses to the survey in Appendix A, they felt comfortable asking questions and knew that I wouldn't judge and I would answer their questions. If I left my students with anything, I wanted to leave them with the idea that mistakes are part of learning and it does not make you weak to ask questions. Sometimes the biggest thing to do is to admit you need help. In fact, I handed out an anonymous survey at the end of my practicum for each of my students. Question number 1 had them strongly agree, agree, disagree, or strongly disagree to the

following statement: My teacher demonstrates that mistakes are a part of learning. 100% of my students who completed the survey either agreed or strongly agreed that I demonstrated that mistakes are a part of learning. One student actually said, “I like the way she explains things over in a class when I don’t understand without making me feel unintelligent but more eager to participate and ask questions”. It’s a response like this that I tried extremely hard to foster in my classroom and I believe I succeeded over my time with my students.

## **Chapter 6: High Expectations**

High expectations are creating objectives that are reasonable for your students to reach, objectives which are not extremely difficult and not too easy. As part of high expectations, a teacher must make sure they build lesson plans and examples to help students achieve these objectives. Not only does it involve objectives and the teacher’s role in helping students reach them, it involves the expectation the teacher has for participation in their class. On a proficient standard, high expectations is defined by Massachusetts Department of Elementary and Secondary Education as, “Effectively models and reinforces ways that students can master challenging material through effective effort, rather than having to depend on innate ability” (Guidelines for Candidates). In summary, it’s a plan on how to help every student reach the objective in your class.

An effective teacher is able to place high expectations and help every student to achieve them. Using different methods and strategies, the goal is to prove to every student with some hard work and effort they can surpass their natural talents. Promoting this way of thinking in the

classroom encourages all students to try and put in effort with the idea that they can succeed if they do.

One thing I wanted my students to do was by the end of the section be able to apply the knowledge they have to solve a variety of problems. I helped them accomplish this expectation through scaffolding practices and showing them a range of problems in class. Scaffolding is when a teacher models a task and then gives appropriate advice and coaching to help each student accomplish said task. Each section I had I would model different types of problems on the board with a basic step by step approach. After I modeled a few of them, I would put a few more on the board for my students to try in their notebooks. As they worked on the problems I would wander the classroom and check in with students. I answered questions and gave advice as needed.

One thing I wanted to do as a teacher was help students achieve the high expectations, but if they needed a reminder I wanted to make sure I didn't isolate or discourage the student. I had a situation where one student was dead asleep in class. I knew this student and knew he could do well if he was paying attention, so I put examples on the board for the rest of the class to practice. I took this opportunity as students were busy at their desks to go over to the student who was asleep and wake him up. I checked in on him and recommended he start the work. He was really respectful, especially because I gave him the respect to not embarrass him in front of his peers, and he started his work and remained focused for the remainder of class. I used this tactic a few times with students. I would put problems on the board and then go talk to the student individually about misbehavior. Each time this made a big impact and the student put up minimal fuss and started their work.

One of my biggest challenges was the fact that about half of each class I taught consisted of seniors. These seniors were receiving college acceptance letters or had already made plans for after high school, so naturally they became unfocused and a bit more unwilling to participate. I noticed this soon after February Vacation, so I reminded them that they were still under the same high expectations that the juniors were under. However, an effective educator doesn't just tell their students to do something and expect them to do it without guidance or help. As a result, I sat down and came up with some strategies to combat this. First, I decided to try my hand at cold calling more. I had used this technique before for classroom management, but wanted to try to it to help participation. Cold calling is when the teacher calls on a student randomly to answer questions or participate in class. At this point I had more knowledge of my students on an individual level, so I made sure I called students who I knew could answer the question even if they needed some guidance. I did this because I wanted to encourage participation, not scare my students and consequently ruin the safe learning environment we had created together. The prospect of being randomly called on help my more easily motivated seniors get back on track. For the students who needed more persuasion, I made sure to call on them in class until we came to an understanding that I wanted them to participate because it would help them in the long run.

My second tactic to overcome senioritis was to link every new unit and topic to a real world example and to a point of interest of my students'. I started to sprinkle cool facts into my lecture and relate the topics to professions that use it in the real world. For my trigonometry unit I made a PowerPoint Presentation on real world trigonometry applications, as seen starting on page 85 in Appendix D. It had lists of professions that use trigonometry ranging from engineers to game designers to welders to music editors. I tried to incorporate professions I knew my

students were interested in to grab the students' attention. In the presentation I also put example problems that corresponded to real world applications, such as rough estimations by pilots and how to improve your foul shot in basketball. Using my students' interests in examples made my students excited and much more engaged. I developed a project called Sally's Plot which was a real world application of the trigonometry rules we had been learning in class, examples of which can be seen in Appendix B. I didn't want them to just take my word for it that what they're learning in math class is useful, I wanted to prove it. I had the high expectation that the seniors would continue to participate in my class for the remaining weeks they were in high school, but I took it upon myself to make the class interesting and help them stay focused.

While maintaining fairness and implementing high expectations on my classes as a whole, I also had to remember that each student's success looked different. As a teacher, I wanted to motivate my students and let them know when they did well. I had to remind myself that success looked different for each and every student. One student's success could be a passing grade while another student's success could be an A. It was fair to want every student to reach their potential, but I also had to make sure I wasn't putting unfair expectations on them. As I got to know my students, I developed a deeper understanding of each of them academically. I could tell when a student put in maximum effort and succeeded and I made it a point to tell them.

## **Chapter 7: Reflective Practice**

Reflective practice is the only way for an educator to improve and grow. As defined by Massachusetts Department of Elementary and Secondary Education, a proficient reflective practice is when a teacher, "Regularly reflects on the effectiveness of lessons, units, and

interactions with students, both individually and with colleagues, and uses insights gained to improve practice and student learning” (Guidelines for Candidates). At the end of the day, a good teacher looks back on their classes and reflects: What went well? What needs to be improved upon? How should we move forward? This skill is helpful in moving past an unsuccessful lesson or difficult day without impeding the students’ learning. Constant reflection means improvement and growth on the teacher’s part. Reflection helps teachers tailor their teaching to best fit the students and situation they have. It also helps them figure out what strategies they need for classroom management. A major way teachers can foster our own professional growth and development is to always have a listening ear and be open to criticism. Whether it’s from our students or other teachers, each person’s advice and opinions can help give us insight on improving our lessons or teaching styles. If a whole class is confused, as a teacher we need to step back and think about how we can improve to help them. Do we need more examples? Better explanations? Just more time? Feedback is critical in improving on ourselves.

I met daily with my mentor teacher Mrs. Razzaq. We would meet at the beginning of the day, we’d have lunch together, and then talk at the end of the day. The time spent with my mentor teacher was extremely helpful. I made sure to utilize this time to run any new ideas by her to see if she had input. A question that I often asked her was “What could I do better?” If a lesson plan went bad I would explain how it went bad and my ideas for improving it to see what a veteran teacher could see that I may have missed. With our daily meetings I was given the advice and opportunity to work on my teacher persona, the person I am in front of a classroom. I wanted to keep my calm demeanor but somehow also have control of the classroom. Mrs. Razzaq suggested working on projecting my voice and gave some tips on maintaining authority

that fit into my personality. We both realized we were opposites, but we made sure to always be in contact with one another and hear each other out. Any advice she gave me I would immediately try to implement in my classroom. Some things worked for me and others did not, but that was part of the learning process. I had to try different techniques to learn what worked for me.

I know that as a student teacher, I had minimal experience and so much to learn. I wanted to use every source available to learn and improve while at Doherty Memorial High School. For me that meant using other adults and my mentor teacher, for advice. I wanted to hear about their experiences or opinions about teaching. Department heads and older teachers were an invaluable wealth of knowledge. They've had the chance to experiment with lots of different teaching approaches and know what works and doesn't. The math teacher lounge always had another teacher present. I would ask the other teachers questions and made sure I listened and was respectful. The other teachers had more years under their belts and had a lot of insight, advice, and ideas. I tried to think about everything they told me while creating new strategies and projects for my class. It was also really helpful when trying to figure out what prior knowledge my students had or what my students needed to know for their next class. There were a few times I asked teachers who had already taught my students if they went over subject X or Y. Depending on the answer I would either do review or start off my lesson with a short introduction to the topic. I also had the chance once a week to meet with my supervising practitioner during seminar. There we would go over highlights and challenges of the week. We'd talk about teaching strategies for lessons and classroom management.

Adults were really helpful in a big scope kind of way, but my students helped me grow most within the classroom. I made sure I really listened to my students feedback and implement strategies to help with problems for the next day. I would assess my students progress through formal and informal assessments and then reflect on how the lesson went. If one student was doing poorly, maybe the student needed individual help with a different approach. If it was multiple students doing poorly, then I became responsible for bettering the lesson and coming up with a different approach. I used students' homework performances to figure out what they needed more practice with, what I needed to create better explanations for, and which ones we could move on from. During class I could determine pace by reading my students. If it looked like the class was picking it up quickly and they were blasting through examples (and getting the right answers) then it was probably time to move on or challenge them. If the class was struggling with the lesson and seemed to be confused, it was a good idea to take a deep breath and explain things from a different approach. One thing I tried were exit slips. An exit slip was done by each student in the last few remaining minutes of class and passed in before they left. I often did these on Wednesdays. I would create a master list of concepts on the board that they needed to know for Friday's exam or quiz. I would then ask them to write down anything they felt comfortable with in terms of material and anything they wanted to see more examples on. That night I would read the responses and create review games and problems for Thursday that was tailored to each class's specific needs.

Reflection helped me a lot with classroom management. The thing I tried to remember and act upon is the idea that a student is acting a specific way for a reason. Maybe the student who talks too much is just bored because the material comes too easy for him? Maybe the

student who can't sit still really just needs an opportunity to move a little every class to help him refocus? I would write down any student's behavior during class in my notebook which I wanted to revisit to see what I could do on my end to help fix the problem. I had one student who was being extremely sassy. It became a disruption and honestly didn't sit with me well. It was rude and I was not a fan of that behavior. I had to use a lot of patience and talking to him in order to get it to stop. I wrote it down in my notebook and that night revisited the issue. I quickly realized looking at his work that he was quickly recalling the material I gave him, so a good portion of his outbursts might had to do with boredom. I decided to give him jobs in the classroom to keep him busy and have him help his peers if he finished early. I also tried to encourage him to do harder problems. Through reflection I learned how a student acting out can generally be helped if not remedied from my end.

One thing that helped with reflection was my notebook. I used my notebook to help me focus my reflection at the end of each day, focusing on anything that went wrong and how I can improve. I kept a notebook with notes for lesson plans, comments I had about successes and failures I saw within each class, and any new ideas that popped into my head as I taught. I made sure to take notes right after class while it was fresh in my mind. I would highlight sections of my notes that didn't go as well as planned that day and make sure I revisit them when I got home. Using these notes, I would construct better explanations and examples for the next day to alleviate any confusion my students had. I would also use it to reflect on my teaching and try and figure out what I need to improve on: Was my pacing too quick? Did I need more examples? Should I present the material in a different order? I made sure to write down any ideas for my improvement and then used them to better improve my teaching and future lessons.

## Chapter 8: My WPI Education

My career at Worcester Polytechnic Institute really helped me prepare for my role as student teacher at Doherty High School. One class that helped me prepare before the practicum was ID3100: Teaching Methods in Math and Science. It was taught by Doherty Math Department head Mrs. Renah Razzaq and Doherty Science Department head Mr. John Staley. Here we learned the basics of teaching and got to hear some real experience from two veteran teachers. I learned how to format and create lesson plans which was a crucial part of being a student teacher. We designed lesson plans and submitted them for feedback. The feedback and practice went a long way in helping me prepare to create effective and realistic lesson plans. Also, we were all given a chance to practice teaching our lesson plan for twenty minutes in front of our peers. Teaching candidates were asked to participate as real high school students to practice classroom management. Each teaching candidate would be given a different behavior which we had to act out as the teacher taught the lesson. We had a safe environment to practice classroom strategies and we got the chance to get immediate feedback from everyone. Mrs. Razzaq and Mr. Staley shared their experiences as high school teachers. It gave all of us a realistic picture of what our time as student teacher would look like. It was here that I learned, “A teacher on her feet is worth two in the seat.” Through these stories, I was able to mentally prepare myself for my time as student teacher at Doherty High School. The mental preparation helped minimize the initial shock new teachers get and I was able to hit the ground running with my classes because of it.

As a Mechanical Engineer, a lot of my classes required a good basis in pre-calculus, the math class I taught at Doherty High School. A huge aspect of physics is trigonometry, one of the biggest lessons I tackled with my students while student teacher. WPI classes such as Calculus III, Calculus IV, and my Physics Mechanics class had a heavy hand in preparing me for student teacher. It acted as good review of concepts that I learned in high school. I remembered how to use logarithms and exponential functions, and trigonometry. Mechanical Engineering problems are also enriched with real world applications. I would often find myself going back to things I was learning in my own classes, tweaking and simplifying them to fit my classes, and then presenting them in class as real world applications of the math we were learning. I think the biggest contribution was the set of organization and problem solving skills that I had developed so far at WPI. I definitely increased organization skills to accommodate for WPI's fast paced curriculum. Freshman year I learned to keep a running list of questions to review at the end of the day, a practice that helped me become better at reflection in terms of my classes. I also learned quickly that color coordinated notes are a lifesaver. I frequently used this technique in my own classes at WPI to help with really long formulas. I would color coordinate variables and in the side of my notebook define each one. I successfully used this technique as student teacher to help reach my ELL students and any struggling students. WPI also emphasizes problem solving, especially with peers. This mentality was already thoroughly ingrained in me, so it was second nature for me to talk to other math teachers and my mentor teacher when I wanted to run an idea by someone or seek advice on how to handle a specific situation.

## Chapter 9: My Classes

### Period 2: Honors Pre-Calculus

My Period 2 Honors Pre-Calculus class was the last class I took over as student teacher. Period 2 was an honors level course that consisted of 28 juniors and seniors. This class was my only honors level class that I taught. Honors level classes have different expectations than the college level classes. Period 2 worked at a faster pace and had the expectation that they could handle learning the same concepts in less time. Units that would take a few weeks in my college level classes could only take as little as a few days in my honors level class. I quickly had to learn how fast they went through material and fix my pacing. When I first started I was under the assumption that it would take them longer than it actually did to finish a lesson. In the first week of teaching Period 2 I often ran out of new material and had to create more practice problems. Eventually I learned their pacing and matched it while constructing lesson plans. I also found my honors students would pick the concepts up quickly and then get bored, so I needed more challenging problems. I made sure to always have extra problems on hand for when they finished and tried to challenge them to go beyond the scope of the basic examples and use problem solving skills to apply their knowledge to a wider range of examples.

Behaviorally speaking, this class was one of my more challenging classes to teach. There were two students that were very chatty and would often interrupt the lesson. A lot of the other students got really frustrated and distracted by this. It created a lot of friction within this class. I developed some classroom management strategies to compensate for this. Group work was with

partners whom I picked to make sure major frictions were avoided and I tried to prevent fighting. I made an effort in this class to use the space and wander around the classroom as I taught. Close proximity kept students quiet and on task.

Along with students, this class had a different location than my other classes. Rather than class occurring in Mrs. Razzaq's classroom, period 2 had class in Ms. Richard's classroom. Ms. Richard's classroom was bigger than mine and had more distractions: bigger windows, the phone was connected to neighboring classroom so it rang more often, and we had classes on both sides of us. Due to the sheer size difference of this classroom, I had to work really hard at projecting my voice. I also had to make sure that I was especially prepared for this class. All of my class materials were in Mrs. Razzaq's room, so I had to gather and bring any materials with me for the class. Generally this involved my classroom set of graphing calculators.

Period 2 Honors Pre-Calculus taught me a lot about teaching. My students were always ready for the next challenge and needed very little motivation to work hard and attack a problem. I had the privilege of seeing the final outcomes for two of their projects and I was amazed every time. The attention to detail, care, and creativity this class put forth went above and beyond my expectations.

### **Period 3: College Pre-Calculus**

My Period 3 College Pre-Calculus class was the third class I took over from Mrs. Razzaq. Period 3 was my biggest class I had and it consisted of 31 juniors and seniors. Almost every single desk was filled in my classroom. As a college level class, they are expected to learn similar material as my honors level class but at a slightly slower pace. My students ranged in

languages in this class, so I took great care in trying to meet the diverse needs. I always used color coordinated notes and I supplemented my writing on the board with oral explanations and lots of step by step examples. As for content, honestly this class was always a surprise. There were times the lesson just clicked and they breezed through it, while other times it was a struggle to reach understanding. Since this class was a bit unexpected, I prepared for both scenarios. I always made sure to have spare problems handy and practice different explanations for the same topic.

The group of students in this class were definitely the most chatty and distractible bunch I taught. They would frequently get sidetracked and I had to catch myself before I got distracted too. I worked on reigning them back in and continuing lecture. This class had a big group of seniors who were really curious about college and the scholarship process. On the days I could afford a few second tangents, so long blocks or days where they understood the material quickly, I did answer their questions. This definitely helped me build a strong rapport with them. I think it also helped with their patience level for me. They knew I was there for them and wanted to see them succeed in my class and in life. If lesson wasn't going well, they weren't as quick to frustration as some of my other classes. They quickly learned if they stuck with me, we would work it out together. There was one instance where on a Friday they really struggled with understanding the unit circle. However, Monday they came in prepared and ready to learn. I noticed a lot of them using the left palm trick in order to solve the trig problems they had learned the past week. This made me really happy because they were doing their work. They were actually eager to learn and continue last week's lesson despite it being a Monday.

Honestly I was the most nervous to take over this class. There were a lot of students and they all had very big and loud personalities, while I am more of a quiet and calm demeanor. I was nervous about how they would respond to me, but I have to say this was my most rewarding class I taught. They did try to test where my boundaries and rules were, but once they were established this class went really well. Once we got to know each other, we were able to joke around in class without disrupting the lesson. All the students in this class got along really well and I was honored that they accepted me so quickly. Period 3 taught me the most about how to gain a classroom's attention and how to be the authority figure, while still being you. I didn't have to change my personality with them, just some of my strategies.

#### **Period 4: College Pre-Calculus**

My Period 4 College Pre-Calculus class was the second class I took over from Mrs. Razzaq. Period 4 had 27 juniors and seniors. As a college level class, they are expected to learn similar material as my honors level class but at a slightly slower pace. This class had a few loud personalities which could take over the classroom. There were a group of students that playfully teased one another, but sometimes things got out of hand. I reminded students to be respectful in this class and when that didn't work I often moved seats for the day. I would separate students who were fighting to different corners of the room. The distance helped them calm down and get back to being focused. Most of my students in this class did really care to learn and had decent behavior. When asked, they would do their work or pay attention to class. However, I did have one student who presented a particular challenge. They were very smart and quickly picked up the material they were given. However, because of this they were very disruptive in class. If they

finished early, they would start chatting. This student made comments like that's too easy or how do you not get, which I found extremely rude and unacceptable. They offended their fellow peers with comments like this and a few students around him got frustrated and discouraged. I caught this early on and worked with this student. Immediately I made sure they and the entire class knew comments like that would absolutely not be tolerated. To amend any damage these comments caused his peers, I shared how I really struggled with the unit too the first time I learn it. I emphasized in my class that you cannot learn without making mistakes, so no one should be ashamed. After some reflection I realized this student needed more challenge and he was too bored. I began to use him as a helper to pass out paper because he often finished his work first. They were one of the students I encouraged to try more challenging problems. These tactics really worked and towards the end of my practicum he behaved better and had only funny sassy remarks that were not directed at his peers.

A big difference with my Period 4 class was I took particular care in grading their Do-Nows. Unlike my other classes, I found this class to be shy about not understanding material. We had a few loud personalities that had the tendency to pick up material quickly, so I felt some students got drowned out. I made sure to have routine concept check-ins. I found if I asked them if they understood what we just went over, the loud people would say yes and drown the others out. Instead, I used thumbs up, thumbs down approach. This ensured every student had a chance to be heard. I would ask if the explanation or concept we just went over made sense. Each student would put a thumb up if it did, thumb down if it didn't, or thumb sideways if they weren't sure and wanted more examples. I could glance across the room and see what everyone

was feeling and make a judgement based off of that. I found this to be the most helpful because I could take everyone's opinion into account.

I also found this class to get frustrated quickly if they didn't understand the material. When they hit frustration, it became difficult to grab their attention again and continue class. I found a few strategies to compensate for this. One, I used scaffolding a lot. I would lay out examples and we would work our way through them. They did well when things were very clear and step by step. Two, if they became frustrated I told them to put their pencils down and take a deep breath. I'd put my marker down and do this with them. After, I would say "ready, let's try looking at it like this" and I would give them a different explanation. I had the most success with this. The technique recognized the students were frustrated and showed that I cared. It also showed them that I wasn't giving up on them and I knew they could do it. Once they calmed down I had their undivided attention for the rest of class. Period 4 was very motivated. Once calm, they worked hard and often had the biggest success stories out of my classes.

I wanted every one of my students to succeed and I knew that in my Period 4 College Pre-Calculus class we such a vast range of learners. I needed to be conscious of how I taught them. I needed to challenge my stronger students, while moving more step by step with my other students. Every student was able to succeed and attain the same level of understanding, they just needed different approaches. I had some very strong students who quickly picked up material and needed more challenge. I encouraged them to go the extra mile: try a more challenging problem, help a peer, or ask a deeper question. I also had some visual learners, so I made sure to use diagrams and more hands on review like white board games. For my students who needed step by step approach, I made sure every lesson had at least one step by step example at the

beginning of class. When students were working on problems at their desks I took special care to swing by theirs and check in on them. Often times I found they needed that little extra one-on-one time and they were all set.

## **Period 6: College Pre-Calculus**

My Period 6 College Pre-Calculus class was the first class I took over which consisted of 21 juniors and seniors. As a college level class, they are expected to learn similar material as my honors level class but at a slightly slower pace. I worked on accommodating their pace in my lesson plans. Since this was my first class I taught, it really was a learning experience with them. I definitely learned and improved on my estimation on how long a section would take to teach. Period 6 picked material up the quickest out of all my college level classes. I made sure I always had more challenging material or more interesting real life problems available for them. I prepared a lot of practice games and group work with them in mind, giving them something to do that wasn't just busy work. I found this class actually learned best in groups because they were able to help one another so much. The students were great at communication and the learning styles were very similar in this class.

Period 6 College Pre-Calculus class was an extreme pleasure to teach. It was that one class as a teacher I looked forward to teaching every single day. The first thing I noticed was the great chemistry this class had. The students were all wonderful and everyone worked really well together. It was clear that the students really liked one another and were able to laugh together. The only issue this caused was chattiness. These students in particular loved to have side conversations since everyone in this class was friends. I really had to develop some strategies so

I didn't get talked over while teaching. I tried to use cold call more. I randomly called on students for answers during lesson. It kept students on their toes and therefore paying better attention in class. I also tried to be stricter about ending side conversations. I wouldn't just tell the class to be quiet; I had to single people out who were talking. The classroom environment was very safe so I could do this without harming the student. Specifically calling out the chatty student or students generally met with giggles from the class, their peers would quiet them, and they'd move on. The students would refocus and stop talking which is why I knew this tactic was safe enough to do, they never got angry or upset.

I did encounter another difficulty with Period 6. After April Vacation, this class exhibited the most amount of apathy and senioritis out of all my classes. It was clear the seniors were done and ready to leave. Due to the close knit nature of this class, the juniors also exhibited the same tendencies as their fellow seniors. I had to be much stricter about the phone policy in this class. In general students weren't allowed to use their phones. First time I saw it was a warning, next time I took it for the period. This class I had to really enforce this. I also took it upon myself to make the class more interesting and captivate their attention. I created more games, like jeopardy, and a project for them to do instead of traditional classwork. To make content more relevant to their current status, I related material from class to real world examples. I used the students' interests (sports, favored professions, and money) to develop problems and examples. The more interesting examples made the students much more engaged and helped lessen the amount of apathy I encountered in class.

One memorable challenge I encountered was with a student in this class. I had both behavior challenges from this student and teaching challenges with my own techniques because

of this student. The student was extremely outgoing and genuinely wanted to learn. They would often be the first hand in the air and because of excitement they would shout out answers to my questions. The only problem I had with this was they would often shout over fellow classmates. I also as an educator encountered the problem of picking them because they were the first hand I saw. It meant this student could sometimes dominated the discussion. This was unfair to their classmates and unhelpful from a teacher perspective because I couldn't gauge how the class was doing off of one student. On their behavior, I had to remind them to wait and not shout. I would call on them once or twice, but also call on other students. I tried to use their enthusiasm to get other students just as excited. On my end, it really tested my ability to use wait time properly and to not pick the student with the loudest voice. My wait time improved because of this, but there's still a lot of room for improvement. I had to learn how to feel more comfortable waiting those thirty seconds, because someone else would raise their hand.

Overall this class was very energetic and ready to learn despite it being the end of the day. They were my first class and because of this I definitely built a good rapport with them early on. I made mistakes and learned a lot

## **Parent Communication**

One parent interaction I had was with a parent of a student who was going through a difficult life situation. There was a major health issue of a family member which affected their attendance in my class and their focus. The parent was very to the fact and wanted to let the appropriate teachers and administrative people aware so their child would not encounter extreme difficulties at school. This student was pretty quiet and generally did their work, without the

mention from a parent I don't think anyone would've known something so big was happening. It was really important because sure enough they began to miss homework assignments and be distracted in class. As a teacher, I acted accordingly and worked with the student. The parent interaction made me realize how important it could be to involve parents into the classroom.

## **Feedback**

Near the end of my practicum, my students were presented with a 'CAP Student Feedback Survey', the results which you can see in Appendix A. This anonymous survey asked them to rate and comment on my performance as an educator. Every single one of my students, 100%, said that I demonstrate mistakes are part of learning. Above everything else this is the proudest accomplishment I made in my time with them. When I started teaching my goal was to show students that mistakes were part of learning and it's perfectly okay to ask questions. Questions don't make you a weak student and I won't judge you because of them. As students we must build skills and the right mentality to break through these difficult barriers. If we put enough effort and dedication into class, everyone can learn. I adopted a practice of answering every question and explaining things in multiple ways. I wanted to stick with my students until they understood. I believe over the course of this practicum I was able to show my students this and the survey supports this. A lot of students commented that I gave explanations in multiple ways and made sure everyone understood. Quite a few students said they didn't feel bad or weren't afraid to ask questions. One student even said, "Ms. Marissa Ford honestly helped me understand that to understand a teacher you really can't fool around. If you set your mind to a goal you can achieve it."

I found a lot of my students commented that I was shy and kind. Some students felt it made them more comfortable and less frustrated in class. They liked my enthusiasm and energy in the classroom and found my patience to be very comforting to them when they were stuck. A few students believed these traits actually hampered my ability to handle distracting and misbehaving students. A few commented that I could increase my strictness in the classroom to prevent students from talking. I do believe that I need to work more on my level of strictness in the classroom. I gave too much lead way and patience to students when I should've used stricter tactics to lessen the time spent dealing with the problem. This is something I need to work on in the future as an educator. I often find myself questioning if the situation demands a strict or gentle hand, but sometimes strict is the only way to fix unruly behavior before it affects other students.

Talking to students I learned a lot about my performance too. They really enjoyed the review games, especially the jeopardy. As a teacher I want to make sure I continue to do more of those as they had great success in terms of complete engagement and learning. I found a lot of my students believed I was very shy at the beginning, but they were also nervous about having a student teacher. Once we both opened up, they liked how comfortable they felt asking content questions or life after high school questions. I really got to know my students and it paid off.

## **Chapter 10: Conclusion**

During my time at Doherty Memorial High, I had the privilege of growing as both an educator and an individual. I saw the biggest growth in my confidence over my 16 weeks there. When I started out in the classroom I was shy and quiet which is my personality. As the weeks

progressed, I became more comfortable in the classroom. I didn't change my personality, I just improved my confidence. I developed my teacher personality which could still be quiet and patient, but could earn the authority and respect of a class through a more confident side. I became more comfortable in front of the classroom, I projected my voice more, and my posture improved to a more confident side of me. The build in confidence is something I can definitely take away from my experience at Doherty Memorial High.

At Doherty I was also granted the chance to see the inner workings of the teaching profession. The culture surrounding the teaching profession is mentality to help everyone; not one teacher there was just for themselves. I found teachers by nature wanted to help and share their knowledge. That personality type extends outside the classroom to other adults. I was frequently offered new resources from other math teachers which they found useful. They asked if I wanted them to show me how to use these resources. Another Pre-Calculus teacher often showed me games and activities her class was doing. The collaboration was phenomenal and it paid off. Teachers constantly learned from each other and shared experiences about projects or classroom management. They worked together and pooled their knowledge and insight into improving the activities. It really helped the students. Students were given multiple resources to help them understand and learn. Alone, it's harder for one teacher to amass such an extensive and encompassing list of resources. Together it became much easier to gather lots of different resources. Since there are so many different learning styles within the teachers too, the lists became more diverse and friendly to all students. Teachers were able to learn from other teachers' experiences and the students got the benefit of teachers not repeating the same mistakes. Collaboration between teachers of different grades helped find knowledge gaps within

a specific group of students which the current teacher could then remedy. I found working with other teachers definitely improved my teaching and softened my learning curve so my students weren't as affected by it. I learned a lot from other teachers. There are so many different ways to teach and different teaching personalities. The one commonality I saw in every successful teacher was an ability to adapt. Every successful teacher could take advice, reflect on their class, and then adapt either their teaching strategies or lesson plans to best help their students.

When I step into my own classroom, I want to focus on improving my ability to meet diverse needs. I definitely learned important lessons while at Doherty. I learned how to meet diverse needs in lecture by color coding my notes, drawing diagrams, giving multiple oral explanations, and written notes on the board for every lesson. I did work on varying my assessments like Sally's Plot Project and Jeopardy Review, but when I step into my own classroom I want to try and create one for every unit possible. I feel like multiple forms of assessment are really beneficial to the students. It ensures all types of students and learners get a chance to shine and show me what they know.

The Teaching Practicum gave me invaluable teaching experience. It was an honor to work with my teacher mentor Mrs. Razzaq. I learned so much about teaching and myself under her care and guidance. It was a pleasure to teach and get to know all my Pre-Calculus students at Doherty Memorial High. I could not have asked for a better experience and I will carry all the lessons I learned with me for the rest of my life.

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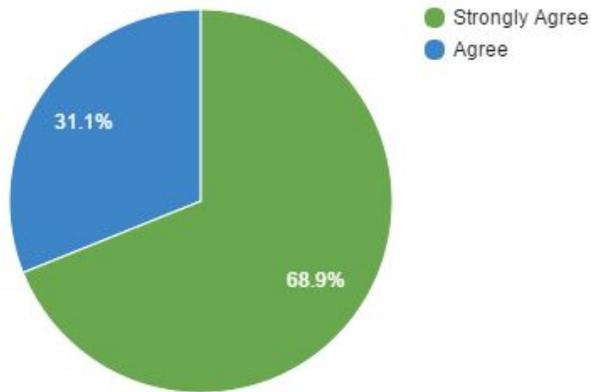
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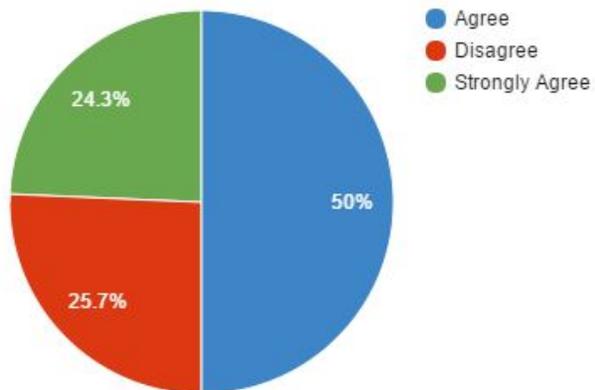
# Appendices

## Appendix A: Responses to CAP Student Feedback Survey

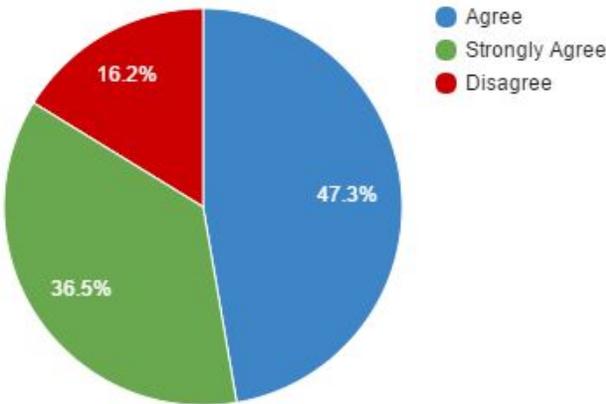
**Question 1: My teacher demonstrates that mistakes are a part of learning.**



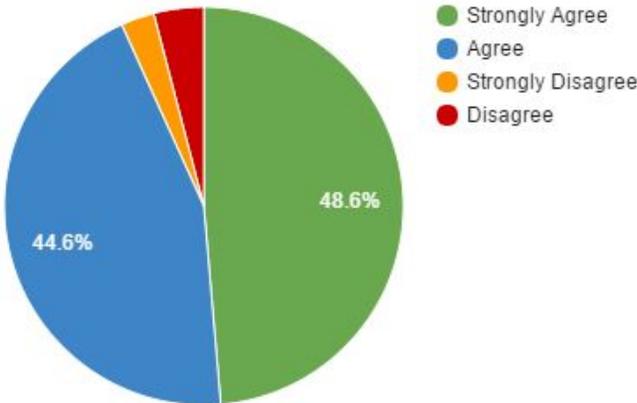
**Question 2: My teacher asks us to summarize what we have learned in a lesson.**



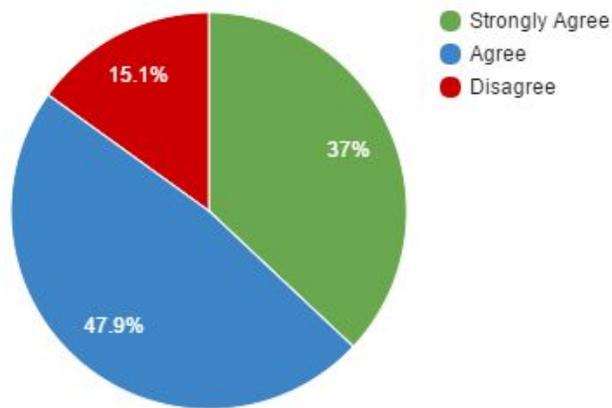
**Question 3: Students push each other to do better work in this class.**



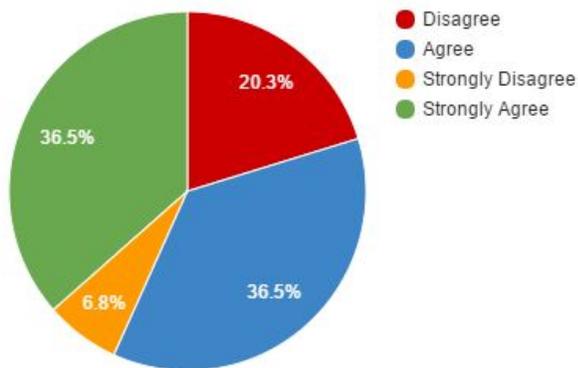
**Question 4: The work in this class is challenging but not too difficult for me.**



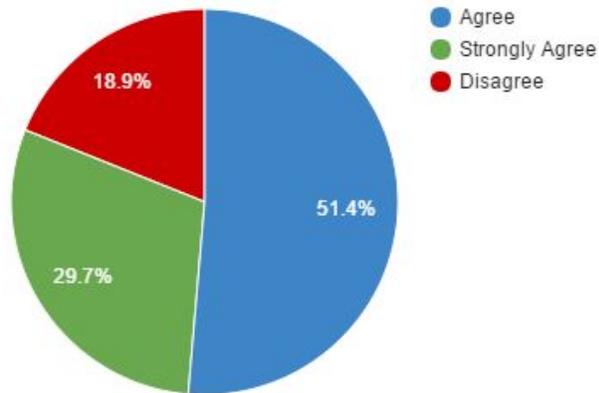
**Question 5: In my class, my teacher uses students' interests to plan class activities.**



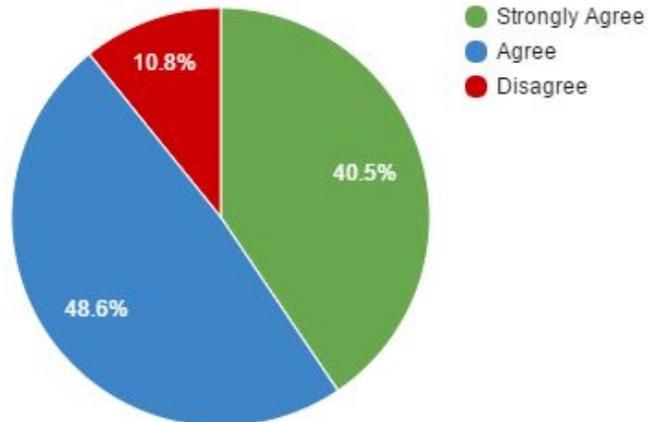
**Question 6: The level of my work in this class goes beyond what I thought I was able to do.**



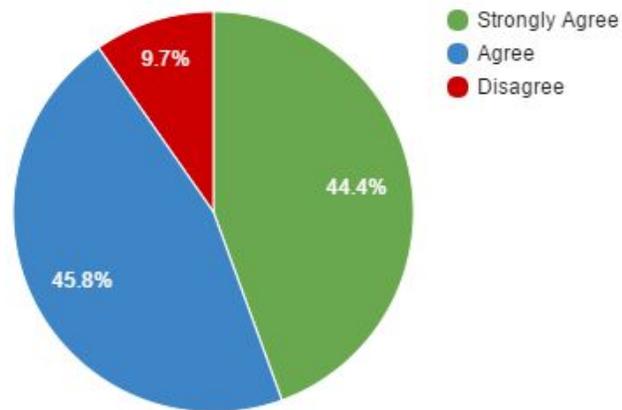
**Question 7: To help me understand, my teacher uses my interests to explain difficult ideas to me.**



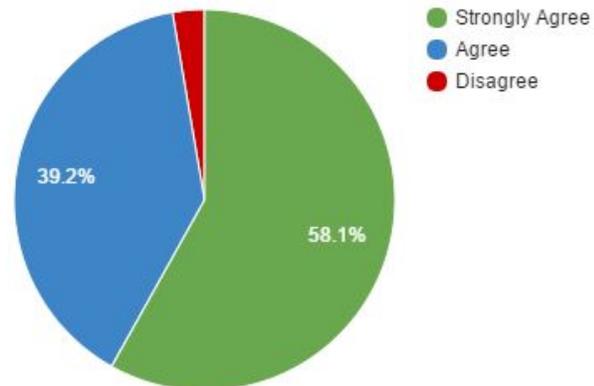
**Question 8: In this class, I learn how to use technology well (eg Internet tools) to support my learning.**



**Question 9: Our class stays on task and does not waste time.**



**Question 10: I can show my learning in many ways (eg writing, graphs, pictures) in this class.**



OPTIONAL: If you have any additional feedback for your teacher, please share it here.

Made sure every student had help if they did not understand and never left anyone behind if they didn't get the work. She would explain in detail everything we were going to do and was so much fun to have her teach us.

OPTIONAL: If you have any additional feedback for your teacher, please share it here.

You performed very well instructing us, however at times disruptions were made by other students in the class.

You took care of this, getting them to stop but I would recommend a slight increase in how strict you are (this was a rather minor problem) so as to end it more quickly.

Aside from that: keep doing what you're doing.

Ms. Marissa Ford honestly helped me understand that to understand a teacher you really can't fool around. If you set your mind to a goal you can achieve it.

CAP Student Feedback Survey  
Grades 6-12: Mini-Form



OPTIONAL: If you have any additional feedback for your teacher, please share it here.

I wasn't afraid to ask questions and I felt very comfortable with how Ms. Ford taught us. If I had the chance, I would like it if she was my full-time teacher.

## CAP Student Feedback Survey

Grades 6-12: Mini-Form

OPTIONAL: If you have any additional feedback for your teacher, please share it here.

Ms. Ford was AMAZING!!! She was very thorough with her lessons and always made sure everyone understood what was going on before she moved on. She would find multiple ways to explain it if you didn't understand. Absolutely love her!!!

OPTIONAL: If you have any additional feedback for your teacher, please share it here.

I like the way she explains things over in a class when I don't understand without making me feel unintelligent but more eager to participate and ask questions.

OPTIONAL: If you have any additional feedback for your teacher, please share it here.

At first she was a little shy, but she really came out and taught our class well. She explained the ideas and concepts well. She also showed us how we can use it in our potential professions. She was a great teacher.

OPTIONAL: If you have any additional feedback for your teacher, please share it here.

. Student teacher needed to direct the class better, and use her authority better.

- Marissa Ford did demonstrate a willingness to learn, and took input from students.

OPTIONAL: If you have any additional feedback for your teacher, please share it here.

she is very kind and sweet.  
I really appreciated how she took time to explain everything.

OPTIONAL: If you have any additional feedback for your teacher, please share it here.

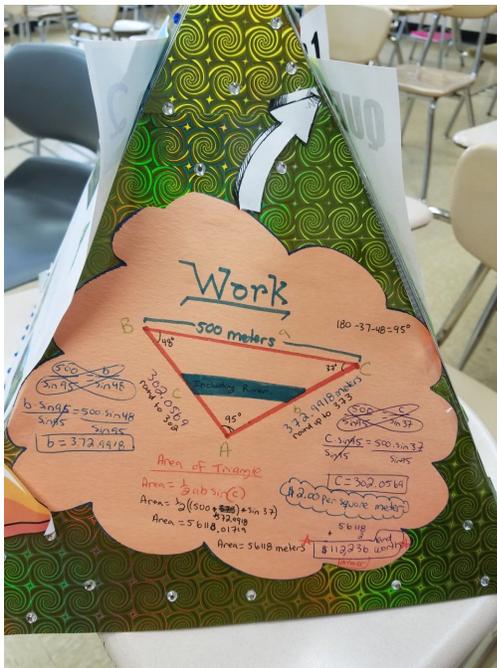
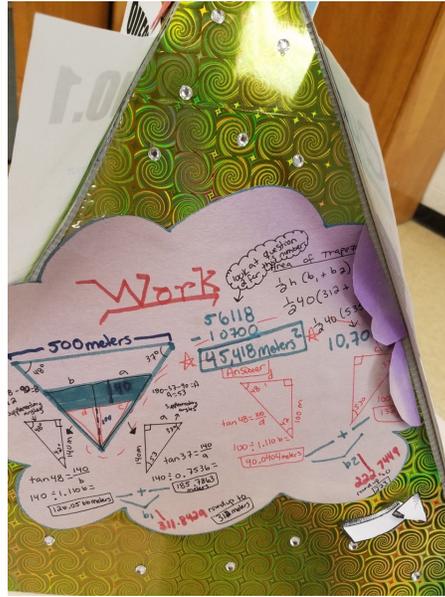
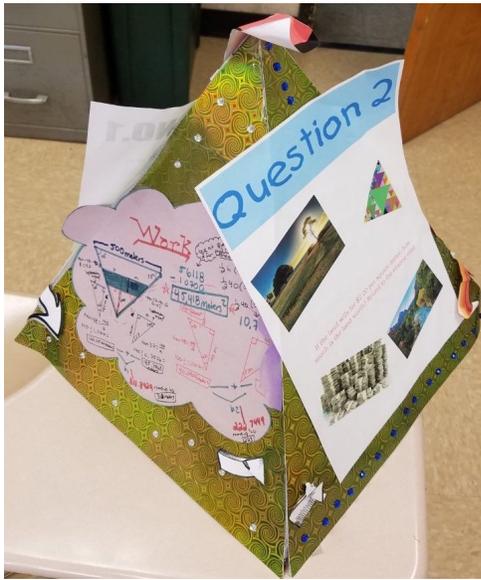
- My teacher is funny and she makes the atmosphere in the class comfortable. I feel inspired when I go to this class.

## Appendix B: Sally's Plot Project (Trigonometry Unit)

### Student 1

Grade: 99

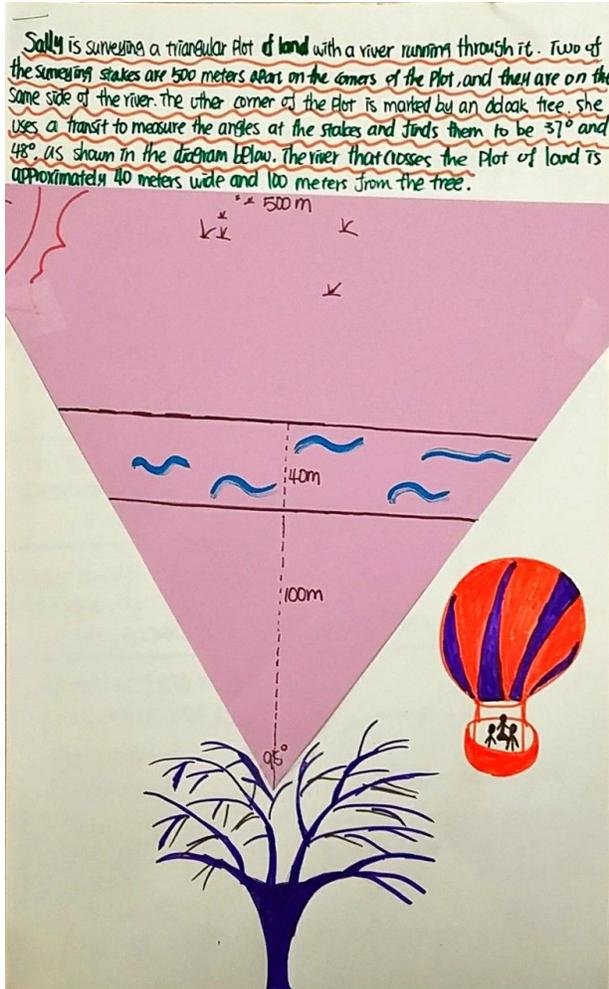
Comments: So creative, I loved it! All measurements are correct for sides and angles. Answers are correct, but be careful of rounding errors (-1).



## Student B

Grade: 99

Comments: All measurements are correct, sides and angles needed. Work is neat and colorful. Drawing and interactive project is really cool.



What is the usable area of the plot? Round your answer to the nearest meter.

Law of Sines:  $\frac{500}{\sin(95)} = \frac{x}{\sin(48)}$   
 $x \sin(95) = 500 \sin(48)$   
 $x \cdot 0.9961946981 = \frac{500 \times 0.7431448255}{0.9961946981}$   
 $x = 372.9917589$

SAS - side-angle-side

$\sin(37) \times 500 \times 372.9917589 \times \frac{1}{2}$   
 $= 224.472044 \times 500 \times \frac{1}{2}$   
 $= 112236 \div 2$   
 $= 56118.011$

$\tan(37) = \frac{140}{a}$ $0.753554050 = \frac{140}{a}$ $a = 185.7862751$	$\tan(48) = \frac{140}{b}$ $1.110612415 = \frac{140}{b}$ $b = 126.0561662$
$\tan(37) = \frac{100}{c}$ $0.753554050 = \frac{100}{c}$ $c = 132.7044822$	$\tan(48) = \frac{100}{d}$ $1.110612415 = \frac{100}{d}$ $d = 90.04040442$

$(a+b+c+d) \times 40 \times \frac{1}{2}$   
 $= 534.5871279 \times 40 \times \frac{1}{2}$   
 $= 21883.50912 \times \frac{1}{2}$   
 $= 10691.75456$

2. If the land sells for \$200 per square meter, how much is the land worth? Round to the nearest cent.

$56118.011 - 10691.75456$   
 $= 45426$

$0.753554050 = \frac{100}{c}$   
 $c = 132.7044822$

$d = 90.04040442$

$(a+b+c+d) \times 40 \times \frac{1}{2}$   
 $= 534.5871279 \times 40 \times \frac{1}{2}$   
 $= 21883.50912 \times \frac{1}{2}$   
 $= 10691.75456$

$56118.11 \times 2 = 112236.02$

$56118.011 - 10691.75456$   
 $= 45426$

<- Tab Opened in bottom left

## Student C

Grade: 95

Comments: Calculation process is right along with sides. Area and cost have rounding errors be careful. Neat and colorful, I love the story, very creative!

Once upon a time Sally was surveying a triangular plot of land with a river running through it. Two of the surveying stakes are 500 meters apart on the corners of the plot, and they are on the same side of the river. The other corner of the plot is marked by a beautiful old oak tree. She uses a transit to measure the angles at the stakes and finds them to be  $37^\circ$  and  $48^\circ$ , the river that crosses the plot of land is approximately 40 meters wide and 100 meters from the tree.

Sally wants to build a beautiful castle on the plot, but first she needs to know what is the usable area of the plot? How much gold she will be taking out of the royal treasure. If the land sells for \$200 per square meter, how much is the land worth? Join Sally as she embarks on her biggest adventure yet.

$$\frac{100}{\sin 48} = \frac{500}{\sin 75} \Rightarrow \frac{500 \sin 48}{\sin 75} = \frac{50 \sin 75}{\sin 48}$$

$$= 372.9$$

$$\frac{372.9}{\sin 48} = \frac{6}{\sin 37} \Rightarrow \frac{372.9 \sin 37}{\sin 48} = \frac{6 \sin 48}{\sin 37}$$

$$= 301.9$$

$$A\Delta = \frac{1}{2} ab \sin C$$

$$= \frac{1}{2} (372.9)(301.9) \sin(45)$$

$$= 56,075.1$$

$\frac{opp}{adj} = \tan$   
 $\frac{140}{adj} = \tan 48$   
 $adj = \frac{140}{\tan 48} = 126.06$

$\frac{opp}{adj} = \tan$   
 $\frac{140}{adj} = \tan 37$   
 $adj = \frac{140}{\tan 37} = 185.79$

total = 311.85

$\frac{opp}{adj} = \tan$   
 $\frac{100}{adj} = \tan 48$   
 $adj = \frac{100}{\tan 48} = 90.04$

$\frac{opp}{adj} = \tan$   
 $\frac{100}{adj} = \tan 37$   
 $adj = \frac{100}{\tan 37} = 132.70$

total = 222.74

$A\Delta = \frac{1}{2} h(b_1 + b_2)$   
 $= \frac{1}{2} (40)(311.85 + 222.74)$   
 $= 10,691.8$

$A\Delta$  without the river = 45,383.3  
 $56,075.1$   
 $- 10,691.8$   
 $45,383.3$

## Student D

Grade: 91

Comments: Very neat, organized, and colorful. Few rounding errors (-2), be careful. All measurements are correct (sides, angles) and correct formulas used.

### Let's Help Sally Sell Some Land!

This is Sally's land that is 500 meters long.

This is the river that cuts between Sally's river that is 40 meters wide.

This is the other piece of Sally's land that is 100 meters wide.

From the other two angles we find the angle to be 95°.

1. I have to find out what area of land I can use.  
 This includes only the land, not the river. So, let's find the area of the entire triangular piece of land.  
 - using the law of sines, we can find the measurement of side **a** and **b**.

To find side **a**

$$\frac{500}{\sin(95)} = \frac{a}{\sin(48)}$$

$$\sin(95) \cdot a = \sin(48) \cdot 500$$

$$a = \frac{371.5724127}{\sin(95)}$$

$$\boxed{a = 372.9 \text{ m}}$$

To find side **b**

$$\frac{500}{\sin(95)} = \frac{b}{\sin(37)}$$

$$\sin(95) \cdot b = \sin(37) \cdot 500$$

$$b = \frac{300.9075116}{\sin(95)}$$

$$\boxed{b = 302 \text{ m}}$$

Now I can use SAS, to find the area of the entire triangle.

$$A = \frac{b \cdot a \cdot \sin(95)}{2} = \frac{302 \cdot 372.9 \cdot \sin(95)}{2}$$

$$A = 156,075.1 \text{ miles}^2$$

Now let's find the area of the river and subtract it from the total area to get our usable land

We can find sides **a** and **b** using the measurements given in the river and bottom piece of land.

$$\tan(48) = \frac{140}{a} \quad a = \frac{140}{\tan(48)}$$

$$\tan(37) = \frac{140}{b} \quad b = \frac{140}{\tan(37)}$$

$$a = 126.06 \text{ m}$$

$$b = 185.79 \text{ m}$$

Now we can use the bottom piece of land to solve for sides **c** and **d** to get the second base.

$$\tan(48) = \frac{100}{c} \quad \tan(37) = \frac{100}{d}$$

$$c = \frac{100}{\tan(48)} \quad d = \frac{100}{\tan(37)}$$

$$\boxed{c = 90.04} \quad \boxed{d = 132.7}$$

$c + d =$  measurement of base 2

Let's solve for the area of the river!

$$\text{Area} = \frac{1}{2} h (b_1 + b_2)$$

$$= \frac{1}{2} (40) (126.06 + 185.79 + 90.04 + 132.7)$$

$$\boxed{= 10,691.8 \text{ miles}^2}$$

Finally our usable land is given to us as:

$$56,075.1 \text{ miles}^2 - 10,691.8 \text{ miles}^2 = 45,383.3 \text{ miles}^2 \text{ of usable land!}$$

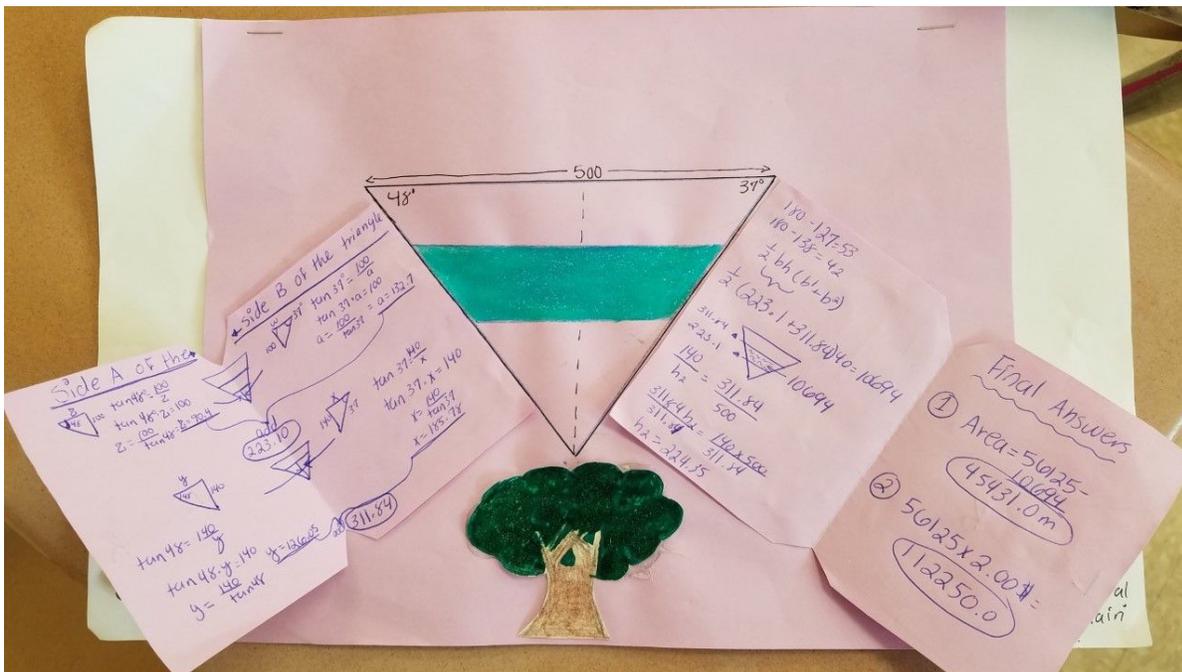
2. For this part, to find the lands worth if Sally sells it for 2.00 dollars per square meter, multiply the entire area by 2.00.

$$\text{Area} = 56,075.1 \text{ m}^2 \quad 56,075.1 \times 2.00 = \boxed{112,150.11}$$

**Student E**

Grade: 90

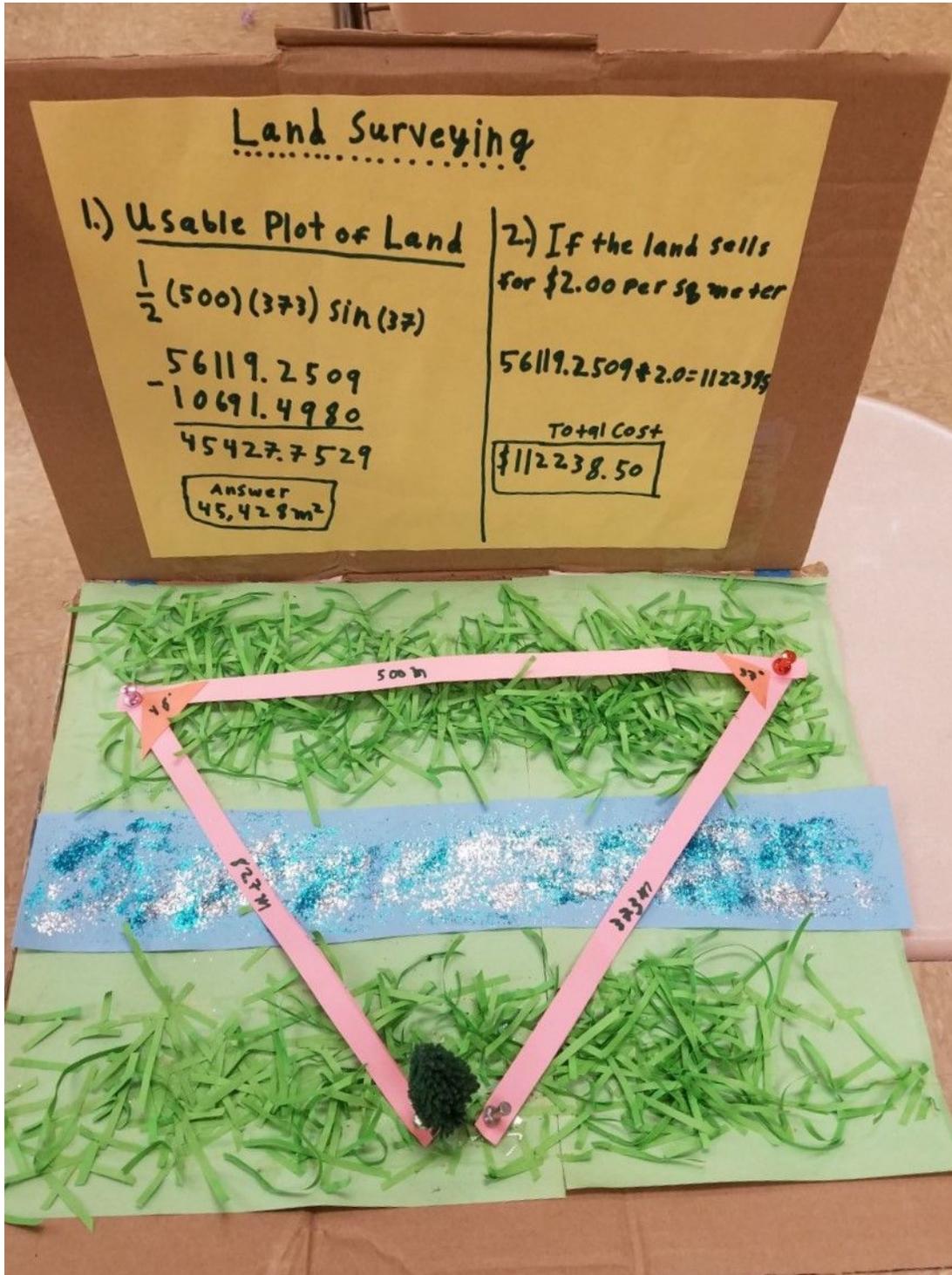
Comments: Process is correct and answers are close. Careful of rounding errors (-3). Wow factor obtained, cute and creative! Work is neat and organized.



**Student F**

Grade: 99

Comments: Project is amazingly creative! Work is correct, formulas are right, and all necessary measurements are found. Careful of rounding errors (-1).



Student G

**My Land**

500m  
48° 37°  
River 140  
100  
95°

① SAS = 56,116.46  
302.05 15 372.9

1) River's Area  
 $A = \frac{1}{2}h(b_1 + b_2) = \frac{1}{2} \cdot 100(500 + 140) = 31,830$   
 $A = \frac{1}{2} \cdot 100(311.83 + 227.17) = 26,975$

2)  $\tan 37 = \frac{140}{a}$      $\tan 48 = \frac{140}{b}$   
 $\frac{1}{140} \tan 37 = \frac{1}{a}$      $\frac{1}{140} \tan 48 = \frac{1}{b}$   
 $185.78 = a$      $126.05 = b$   
 $311.83 = b_1$

3)  $\tan 37 = \frac{100}{c}$      $\tan 48 = \frac{100}{d}$   
 $\frac{1}{100} \tan 37 = \frac{1}{c}$      $\frac{1}{100} \tan 48 = \frac{1}{d}$   
 $32.7 = c$      $126.05 = d = 222.74 = b_2$

The usable area is  
 $56,116.46$   
 $- 10,691.4$   
 $45,424.66 \text{ sq m}$

② The land cost \$12,232.91  
 ex:  $56,116.46 \text{ sq}$   
 $\times 2$

## Appendix C: Lesson Plans

### Lesson Plan 1: Expanding and Condensing Logs

#### Lesson Plan Title: Expanding and Condensing Logs

Teacher's Name: Ms. Ford

Subject/Course: Pre\_Calculus

Unit: Logarithms and Exponents

Grade Level: 11&12

#### Overview of and Motivation for Lesson:

The purpose of this lesson is to review the past two weeks so the students are comfortable for the exam on Friday.

Stage 1-Desired Results	
<b>Standard(s):</b> <ul style="list-style-type: none"> <li>Curriculum, Planning, and Assessment Standard</li> <li>Teaching All Students Standard</li> <li>Professional Culture Standard</li> </ul>	
<b>Understanding(s):</b> <i>Students will understand that...</i> <ul style="list-style-type: none"> <li>Properties of logs and basic algebra can be used to expand or condense logs</li> </ul>	<b>Essential Question(s):</b> How do we use properties of logs to expand or condense logarithmic functions?
<b>Content Objectives:</b> <b>Knowledge:</b> <i>Students will know...</i> <ul style="list-style-type: none"> <li>Properties of logs</li> </ul> <b>Skills/Performance:</b> <i>Students will be able to...</i> <ul style="list-style-type: none"> <li>Identify 3 properties of logs</li> <li>Expand logs</li> <li>Condense logs</li> </ul>	<b>Language Objectives:</b> ELD Level <i>Students will be able to... in English</i> <ul style="list-style-type: none"> <li></li> </ul> ELD Level <i>Students will be able to... in English</i> <ul style="list-style-type: none"> <li></li> </ul>
<b>Key Vocabulary</b>	
Stage 2-Assessment Evidence	
<b>Performance Task(s) or Key Evidence</b> <ul style="list-style-type: none"> <li>Do-Now</li> </ul>	<b>Other Evidence:</b> <ul style="list-style-type: none"> <li>Practice Problems</li> </ul>

<b>Key Criteria to measure Performance Task (s) or Key Evidence</b> <ul style="list-style-type: none"> <li>• Can use properties of logs</li> <li>• Can expand or condense given logs</li> </ul>	
<b>Stage 3- Learning Plan</b>	
<b>Learning Activities:</b> Do Now/Bell Ringer/Opener: 1 expanding and 1 condensing from hw  Learning Activity 1: Review, Practice Problems  Learning Activity 2:   Closing <b>Final questions</b>  <b>Multiple Intelligences Addressed:</b> <input type="checkbox"/> Linguistic <input checked="" type="checkbox"/> Logical-Mathematical <input type="checkbox"/> Musical <input type="checkbox"/> Bodily-kinesthetic <input type="checkbox"/> Spatial <input type="checkbox"/> Interpersonal <input type="checkbox"/> Intrapersonal <input type="checkbox"/> Naturalistic  <b>Student Grouping</b> <input checked="" type="checkbox"/> Whole Class <input type="checkbox"/> Small Group <input type="checkbox"/> Pairs <input checked="" type="checkbox"/> Individual  <b>Instructional Delivery Methods</b> <input checked="" type="checkbox"/> Teacher Modeling/Demonstration <input checked="" type="checkbox"/> Lecture <input type="checkbox"/> Discussion <input checked="" type="checkbox"/> Cooperative Learning <input type="checkbox"/> Centers <input checked="" type="checkbox"/> Problem Solving <input type="checkbox"/> Independent Projects	



<b>Accommodations</b> None	<b>Modifications</b> None
<b>Homework/Extension Activities:</b> Assisments due Friday	
<b>Materials and Equipment Needed:</b> <ul style="list-style-type: none"> <li>• Calculators</li> <li>• Worksheet Copies</li> </ul>	

Adapted from Grant Wiggins and Jay McTighe-*Understanding by Design*

Lesson Plan 2: Expanding and Condensing Logs

**Lesson Plan Title: Review on Logs**

**Teacher's Name:** Ms. Ford    **Subject/Course:** Pre\_Calculus  
**Unit:** Logarithms and Exponents    **Grade Level:** 11&12

**Overview of and Motivation for Lesson:**  
**Review for the Exam on February 15<sup>th</sup>.**



Stage 1-Desired Results	
<p><b>Standard(s):</b></p> <ul style="list-style-type: none"> <li>• Curriculum, Planning and Assessment Standard</li> <li>• Teaching All Students Standard</li> <li>• Professional Culture Standard</li> </ul>	
<p><b>Understanding(s):</b>  <i>Students will understand that ...</i></p> <ul style="list-style-type: none"> <li>• Logs can be rewritten in exponential form to make solving them easier.</li> <li>• Properties of logs and basic algebra can be used to expand or condense logs</li> </ul>	<p><b>Essential Question(s):</b>                      How do logs relate to exponential form?                      How do we use calculators to solve more complicated log problems?                      How do we use properties of logs to expand or condense logarithmic functions?</p>
<p><b>Content Objectives:</b>  <b>Knowledge:</b> <i>Students will know...</i></p> <ul style="list-style-type: none"> <li>• Relationship between logs and exponential functions</li> <li>• Properties of logs</li> </ul> <p><b>Skills/Performance:</b> <i>Students will be able to ...</i></p> <ul style="list-style-type: none"> <li>• Rewrite logs to exponential form and exponential to log form</li> <li>• Evaluate logs without a calculator</li> <li>• Evaluate logs with a calculator</li> <li>• Solve for logs and natural logs</li> <li>• Identify 3 properties of logs</li> <li>• Expand and condense logs</li> </ul>	<p><b>Language Objectives:</b></p> <p>ELD Level . . .      <i>Students will be able to . . . in English</i></p> <p>ELD Level . . .      <i>Students will be able to . . . in English</i></p>
<p><b>Key Vocabulary</b></p>	
Stage 2-Assessment Evidence	
<p><b>Performance Task(s) or Key Evidence</b></p> <ul style="list-style-type: none"> <li>• Jeopardy Logarithm and Exponential Review</li> </ul>	<p><b>Other Evidence:</b>                      Do Now</p>
<p><b>Key Criteria to measure Performance Task (s) or Key Evidence</b></p>	

Stage 3- Learning Plan																						
<p><b>Learning Activities:</b>            Do Now/Bell Ringer/Opener: 1 Expanding and 1 Condensing Question</p> <p>Learning Activity 1:            Jeopardy</p> <p>Learning Activity 2:</p> <p>Closing  <b>Final Questions</b>  <b>What to expect on Exam tomorrow</b></p> <p><b>Multiple Intelligences Addressed:</b></p> <table style="width: 100%; border: none;"> <tr> <td><input checked="" type="checkbox"/> Linguistic</td> <td><input checked="" type="checkbox"/> Logical-Mathematical</td> <td><input type="checkbox"/> Musical</td> <td><input type="checkbox"/> Bodily-kinesthetic</td> </tr> <tr> <td><input type="checkbox"/> Spatial</td> <td><input checked="" type="checkbox"/> Interpersonal</td> <td><input type="checkbox"/> Intrapersonal</td> <td><input type="checkbox"/> Naturalistic</td> </tr> </table> <p><b>Student Grouping</b></p> <table style="width: 100%; border: none;"> <tr> <td><input checked="" type="checkbox"/> Whole Class</td> <td><input checked="" type="checkbox"/> Small Group</td> <td><input type="checkbox"/> Pairs</td> <td><input type="checkbox"/> Individual</td> </tr> </table> <p><b>Instructional Delivery Methods</b></p> <table style="width: 100%; border: none;"> <tr> <td><input type="checkbox"/> Teacher Modeling/Demonstration</td> <td><input type="checkbox"/> Lecture</td> <td><input checked="" type="checkbox"/> Discussion</td> </tr> <tr> <td><input checked="" type="checkbox"/> Cooperative Learning</td> <td><input type="checkbox"/> Centers</td> <td><input checked="" type="checkbox"/> Problem Solving</td> </tr> <tr> <td><input type="checkbox"/> Independent Projects</td> <td></td> <td></td> </tr> </table>		<input checked="" type="checkbox"/> Linguistic	<input checked="" type="checkbox"/> Logical-Mathematical	<input type="checkbox"/> Musical	<input type="checkbox"/> Bodily-kinesthetic	<input type="checkbox"/> Spatial	<input checked="" type="checkbox"/> Interpersonal	<input type="checkbox"/> Intrapersonal	<input type="checkbox"/> Naturalistic	<input checked="" type="checkbox"/> Whole Class	<input checked="" type="checkbox"/> Small Group	<input type="checkbox"/> Pairs	<input type="checkbox"/> Individual	<input type="checkbox"/> Teacher Modeling/Demonstration	<input type="checkbox"/> Lecture	<input checked="" type="checkbox"/> Discussion	<input checked="" type="checkbox"/> Cooperative Learning	<input type="checkbox"/> Centers	<input checked="" type="checkbox"/> Problem Solving	<input type="checkbox"/> Independent Projects		
<input checked="" type="checkbox"/> Linguistic	<input checked="" type="checkbox"/> Logical-Mathematical	<input type="checkbox"/> Musical	<input type="checkbox"/> Bodily-kinesthetic																			
<input type="checkbox"/> Spatial	<input checked="" type="checkbox"/> Interpersonal	<input type="checkbox"/> Intrapersonal	<input type="checkbox"/> Naturalistic																			
<input checked="" type="checkbox"/> Whole Class	<input checked="" type="checkbox"/> Small Group	<input type="checkbox"/> Pairs	<input type="checkbox"/> Individual																			
<input type="checkbox"/> Teacher Modeling/Demonstration	<input type="checkbox"/> Lecture	<input checked="" type="checkbox"/> Discussion																				
<input checked="" type="checkbox"/> Cooperative Learning	<input type="checkbox"/> Centers	<input checked="" type="checkbox"/> Problem Solving																				
<input type="checkbox"/> Independent Projects																						
<p><b>Accommodations</b>            none</p>	<p><b>Modifications</b>            none</p>																					
<p><b>Homework/Extension Activities:</b>            Study for exam</p>																						
<p><b>Materials and Equipment Needed:</b></p> <ul style="list-style-type: none"> <li>• Copy of <u>Powerpoint</u> Jeopardy Review</li> <li>• Projector</li> <li>• White Board and Markers</li> </ul>																						

Adapted from Grant Wiggins and Jay McTighe-*Understanding by Design*

Lesson Plan 3: Unit Circle Families

**Lesson Plan Title: Unit Circle Families**

**Teacher's Name:** Ms. Ford    **Subject/Course:** Pre-Calculus Honors

**Unit:** Trigonometry                      **Grade Level:** 11&12

**Overview of and Motivation for Lesson:**

A continued introduction to Trigonometry and the sin, cos, and tan of the families of the basic angles  $(\frac{\pi}{6}, \frac{\pi}{4}, \frac{\pi}{3}, 0)$ .



Stage 1-Desired Results	
<b>Standard(s):</b> <ul style="list-style-type: none"> <li>Curriculum, Planning and Assessment Standard</li> <li>Teaching All Students Standard</li> <li>Professional Culture Standard</li> </ul>	
<b>Understanding(s):</b> <i>Students will understand that ...</i> <ul style="list-style-type: none"> <li>There is a connection between angles within the same family (they share the same values but differ in signs)</li> </ul>	<b>Essential Question(s):</b> How do we use the angle families to solve for trigonometry questions in the unit circle?
<b>Content Objectives:</b> <b>Knowledge:</b> <i>Students will know...</i> <ul style="list-style-type: none"> <li>Sin, Cos, and Tan</li> </ul> <b>Skills/Performance:</b> <i>Students will be able to ...</i> <ul style="list-style-type: none"> <li>Find sin, cos, and tang of angles in all quadrants of the unit circle</li> </ul>	<b>Language Objectives:</b> ELD Level: ... <i>Students will be able to ... in English</i> ... ELD Level: ... <i>Students will be able to ... in English</i>
<b>Key Vocabulary</b>	
Stage 2-Assessment Evidence	
<b>Performance Task(s) or Key Evidence</b> <ul style="list-style-type: none"> <li>Homework</li> <li>Filling out the remainder of the unit circle using the first family as a basis</li> </ul>	<b>Other Evidence:</b> <ul style="list-style-type: none"> <li>In class participation</li> </ul>
<b>Key Criteria to measure Performance Task (s) or Key Evidence</b>	
Stage 3- Learning Plan	
<b>Learning Activities:</b>	

Do Now/Bell Ringer/Opener: Find  $\sin\left(\frac{\pi}{3}\right)$ ,  $\cos\left(\frac{\pi}{6}\right)$ , and  $\tan\left(\frac{\pi}{6}\right)$ .

Learning Activity 1:  
Lecture

Learning Activity 2:

Closing  
summary

**Multiple Intelligences Addressed:**

<input type="checkbox"/> Linguistic	<input checked="" type="checkbox"/> Logical-Mathematical	<input type="checkbox"/> Musical	<input type="checkbox"/> Bodily-kinesthetic
<input checked="" type="checkbox"/> Spatial	<input type="checkbox"/> Interpersonal	<input type="checkbox"/> Intrapersonal	<input type="checkbox"/> Naturalistic

**Student Grouping**

<input checked="" type="checkbox"/> Whole Class	<input type="checkbox"/> Small Group	<input type="checkbox"/> Pairs	<input checked="" type="checkbox"/> Individual
---	--------------------------------------	--------------------------------	--

**Instructional Delivery Methods**

<input checked="" type="checkbox"/> Teacher Modeling/Demonstration	<input checked="" type="checkbox"/> Lecture	<input type="checkbox"/> Discussion
<input checked="" type="checkbox"/> Cooperative Learning	<input type="checkbox"/> Centers	<input type="checkbox"/> Problem Solving
<input type="checkbox"/> Independent Projects		

<b>Accommodations</b>	<b>Modifications</b>

**Homework/Extension Activities:**  
Page 270 #23-38

**Materials and Equipment Needed:**

- White Board Markers
- Colored pencils (for students notes 3 each)

Adapted from Grant Wiggins and Jay ~~McTighe~~ *Understanding by Design*

# Notes P2 March 1

Hw p270 #23-38

Do Now → Find  $\sin \frac{\pi}{3} = \frac{\sqrt{3}}{2}$ ,  $\cos \frac{\pi}{6} = \frac{\sqrt{3}}{2}$ ,  $\tan \frac{\pi}{6} = \frac{\sqrt{3}}{3}$

Draw Unit Circle, split into 12s  $\frac{\pi}{6}$

$\frac{\pi}{6}$  family first

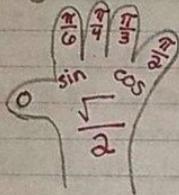
→ find coordinate  $(\cos \theta, \sin \theta)$   $(x, y)$

$\frac{\pi}{3}$  family, opposite  $\frac{\pi}{6}$ , memorize one then flip for other

→ find coordinate

throw  $\tan \theta$  after use wait time [want  $\frac{\sin \theta}{\cos \theta}$ ]

Use full way to remember is left palm trick



1) put finger down corresponding to angle you're solving for

2) number of digits still up LEFT down finger goes inside  $\frac{\sqrt{\quad}}{2}$  to solve for sin

3) number of digits still up RIGHT down finger goes inside  $\frac{\sqrt{\quad}}{2}$  to solve for cos

ex/ for  $\sin \frac{\pi}{6} = \frac{\sqrt{1}}{2} = \frac{1}{2}$   
 $\cos \frac{\pi}{6} = \frac{\sqrt{3}}{2}$

Check Hw, Hw - continue to memorize, STUDY UNIT CIRCLE

①  $\tan \frac{\pi}{2} = \tan \frac{3\pi}{2} = \text{undefined}$  cause  $\frac{1}{0} = \frac{\sin}{\cos}$

② remember if you know first quadrant then you know all

③ All Students Take Calculus

\* two versions of 5 to 6 problems for pop quiz

absent

Lesson Plan 4: Trig Identities

**Lesson Plan Title: Trig Identities**

**Teacher's Name:** Ms. Ford    **Subject/Course:** Pre-Calculus Honors  
**Unit:** Trigonometry                      **Grade Level:** 11&12

**Overview of and Motivation for Lesson:**

**Students will review reciprocal and quotient identities, which have already been used before. We will prove and begin to use Pythagorean identities.**

Stage 1-Desired Results	
<b>Standard(s):</b> <ul style="list-style-type: none"> <li>• Curriculum, Planning and Assessment Standard</li> <li>• Teaching All Students Standard</li> <li>• Professional Culture Standard</li> </ul>	
<b>Understanding(s):</b> <i>Students will understand that ...</i> <ul style="list-style-type: none"> <li>• Identities reduce equations</li> </ul>	<b>Essential Question(s):</b> How do the identities apply to trigonometry problems?
<b>Content Objectives:</b> <b>Knowledge:</b> <i>Students will know...</i> <ul style="list-style-type: none"> <li>• Where the Pythagorean Identities come from and how they relate to the unit circle</li> </ul> <b>Skills/Performance:</b> <i>Students will be able to ...</i> <ul style="list-style-type: none"> <li>• Rewrite trig expressions in order to simplify and evaluate</li> </ul>	<b>Language Objectives:</b> ELD Level <i>Students will be able to ... in English</i>  ELD Level <i>Students will be able to ... in English</i>
<b>Key Vocabulary</b>	
Stage 2-Assessment Evidence	
<b>Performance Task(s) or Key Evidence</b> <ul style="list-style-type: none"> <li>• Do Now</li> <li>• Practice Problems</li> </ul>	<b>Other Evidence:</b> <ul style="list-style-type: none"> <li>• In Class Participation</li> </ul>
<b>Key Criteria to measure Performance Task (s) or Key Evidence</b>	
Stage 3- Learning Plan	
<b>Learning Activities:</b> Do Now/Bell Ringer/Opener: Find $\csc\left(\frac{\pi}{3}\right)$ and $\sec\left(\frac{\pi}{3}\right)$	

<b>Learning Activity 1:</b> Lecture: 1) Reciprocal Identities and Examples 2) Quotient Identities and Examples 3) Pythagorean Identities with Proofs and Examples  <b>Learning Activity 2:</b> Practice Problems  Closing <b>Summary and final questions</b>  <b>Multiple Intelligences Addressed:</b> <input type="checkbox"/> Linguistic <input checked="" type="checkbox"/> Logical-Mathematical <input type="checkbox"/> Musical <input type="checkbox"/> Bodily-kinesthetic <input checked="" type="checkbox"/> Spatial <input type="checkbox"/> Interpersonal <input type="checkbox"/> Intrapersonal <input type="checkbox"/> Naturalistic  <b>Student Grouping</b> <input checked="" type="checkbox"/> Whole Class <input type="checkbox"/> Small Group <input type="checkbox"/> Pairs <input checked="" type="checkbox"/> Individual  <b>Instructional Delivery Methods</b> <input checked="" type="checkbox"/> Teacher Modeling/Demonstration <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Discussion <input type="checkbox"/> Cooperative Learning <input type="checkbox"/> Centers <input checked="" type="checkbox"/> Problem Solving <input type="checkbox"/> Independent Projects	
<b>Accommodations</b>	<b>Modifications</b>
<b>Homework/Extension Activities:</b> Page 354 #7-13, 17-18	
<b>Materials and Equipment Needed:</b> • White Board Markers	

Adapted from Grant Wiggins and Jay McTighe-*Understanding by Design*

Period 2

Hw - p 354 # 7-13, 17-18

Mon \*

Start Trig Identities

\* Reciprocal Identities

$$\sin x = \frac{1}{\csc x} \quad \cos x = \frac{1}{\sec x} \quad \tan x = \frac{1}{\cot x}$$

$$\csc x = \frac{1}{\sin x} \quad \sec x = \frac{1}{\cos x} \quad \cot x = \frac{1}{\tan x}$$

\* Quotient Identities

$$\tan x = \frac{\sin x}{\cos x} \quad \cot x = \frac{\cos x}{\sin x}$$

\* Pythagorean Identities

$$\sin^2 x + \cos^2 x = 1 \quad \rightarrow \sin x = \pm \sqrt{1 - \cos^2 x}$$

$$1 + \tan^2 x = \sec^2 x \quad \rightarrow \tan x = \pm \sqrt{\sec^2 x - 1}$$

$$1 + \cot^2 x = \csc^2 x$$

Cofunction Identities

$$\sin\left(\frac{\pi}{2} - x\right) = \cos x \quad \cos\left(\frac{\pi}{2} - x\right) = \sin x$$

$$\tan\left(\frac{\pi}{2} - x\right) = \cot x \quad \cot\left(\frac{\pi}{2} - x\right) = \tan x$$

$$\sec\left(\frac{\pi}{2} - x\right) = \csc x \quad \csc\left(\frac{\pi}{2} - x\right) = \sec x$$

Even/Odd Identities

$$\sin(-x) = -\sin x \quad \csc(-x) = -\csc x$$

$$\cos(-x) = \cos x \quad \sec(-x) = \sec x$$

$$\tan(-x) = -\tan x \quad \cot(-x) = -\cot x$$

Proof end in cot 2' cot 2' cot 2' cot 2' cot 2' - with

- ①  $\sin^2 x + \cos^2 x = 1$  when  $x = \frac{\pi}{2} \rightarrow 1^2 + 0^2 = 1 \rightarrow 1 = 1$   
 $\sin^2 x + \cos^2 x = 1$  when  $x = \frac{\pi}{3} \rightarrow \left(\frac{\sqrt{3}}{2}\right)^2 + \left(\frac{1}{2}\right)^2 = 1 \rightarrow \frac{3}{4} + \frac{1}{4} = 1$
- ②  $1 + \tan^2 x = \sec^2 x$  when  $x = \frac{\pi}{6}$       ③  $1 + \cot^2 x = \csc^2 x$  when  $x = \frac{\pi}{3}$
- $1 + \tan^2\left(\frac{\pi}{6}\right) = \sec^2\left(\frac{\pi}{6}\right)$        $1 + \left(\frac{1}{\tan\left(\frac{\pi}{3}\right)}\right)^2 = \left(\frac{1}{\sin\left(\frac{\pi}{3}\right)}\right)^2$
- $1 + \left(\frac{\sqrt{3}}{3}\right)^2 = \left(\frac{2}{\sqrt{3}}\right)^2$        $1 + \left(\frac{1}{\frac{1}{\sqrt{3}}}\right)^2 = \left(\frac{2}{\sqrt{3}}\right)^2$
- $1 + \frac{3}{9} = \frac{4}{3}$        $1 + \frac{1}{\frac{1}{3}} = \frac{4}{3}$
- $\frac{4}{3} = \frac{4}{3}$        $\frac{4}{3} = \frac{4}{3}$

$\sec \frac{\pi}{6} = \frac{1}{\cos \frac{\pi}{6}}$

★ SWBAT rewrite trig expressions in order to simplify and evaluate

① Reciprocals - multiplied = 1

② Pythagorean Identity Proof:



$(x, y) = (\cos \theta, \sin \theta)$

$$a^2 + b^2 = c^2$$

$$x^2 + y^2 = 1$$

$$(\cos \theta)^2 + (\sin \theta)^2 = 1$$

$$\rightarrow \cos^2 \theta + \sin^2 \theta = 1$$

$$\frac{\cos^2 \theta + \sin^2 \theta}{\cos^2 \theta} = \frac{1}{\cos^2 \theta}$$

$$\rightarrow 1 + \tan^2 \theta = \sec^2 \theta$$

$$\frac{1 + \tan^2 \theta}{\tan^2 \theta} = \frac{\sec^2 \theta}{\tan^2 \theta}$$

$$\cot^2 \theta + 1 = \frac{1}{\cos^2 \theta} \cdot \frac{\cos^2 \theta}{\sin^2 \theta}$$

$$\cot^2 \theta + 1 = \frac{1}{\sin^2 \theta}$$

$$\rightarrow \cot^2 \theta + 1 = \csc^2 \theta$$

③ Cofunction Identities

cofunctions of complementary angles (sum  $90^\circ$  or  $\frac{\pi}{2}$ ) are congruent (equal)

~~Algebraic identities...~~  
~~How to use...~~  
~~...~~

# Appendix D: Homework and In Class Activities

## Assistments Class Report

Assignment: Law of Sines

Student/Problem ... [Unanonimize]	Average	PRABCEG1	PRABCEG2	PRABCEG3	PRABCEG4	PRABCEG5	PRABCEG6	PRABCEG7	PRABCEG8	PRABCEG9	Total Hints	Time Spent		
Problem Average Graph	86%	80%	93%	95%	70%	94%	85%	95%	96%	84%	85%	70%	88%	
Common Wrong Answers			29, 80% feedback											
Correct Answer(s)		14	8	17	29, 1	33	54	43	13	15	59	32, 78	47, 88, 133, 2	
XXXXXXXXXX	93%	14/100	8/100	17/100	29/80	49/80	54/100	43/100	13/100	15/100	59/100	33, 77/60	47, 88/100	0 00:11:54
XXXXXXXXXX	93%	14/100	8/100	17/100	29/100	33/100	58/60	43/100	13/100	20/80	59/100	32, 78/80	47, 88/100	0 00:15:39
XXXXXXXXXX	97%	14/100	8/100	17/100	29, 1/100	28/80	54/100	43/100	13/100	15/100	59/100	32, 78/80	47, 88/100	0 00:25:23
XXXXXXXXXX	88%	33/60	8/100	17/100	29/80	33/100	54/100	43/100	13/100	20/60	59/100	77, 33/60	47, 88/100	3 00:23:35
XXXXXXXXXX	92%	14/100	8, 1/80	17/100	29, 1/100	33/100	54/100	43/100	13/100	15/100	57/80	78, 32/40	47, 88/100	1 00:28:38
XXXXXXXXXX	80%	19/0	8/100	17/100	29, 1/100	33/100	54/100	43/100	13/100	15/100	24/60	33, 77/0	47, 88/100	3 00:13:38
XXXXXXXXXX	90%	14/100	8/100	17/100	29, 1/100	33/100	54/100	43/100	13/100	20/80	59/100	32, 78/100	42, 93/0	1 00:22:14
XXXXXXXXXX	100%	14/100	8/100	17/100	29, 1/100	33/100	54/100	43/100	13/100	15/100	59/100	32, 78/100	47, 88/100	0 00:18:43
XXXXXXXXXX	90%	25/20	8/100	17/100	29, 1/100	33/100	54/100	43/100	13/100	15/100	60/60	32, 78/100	47, 88/100	1 00:27:21

## Assistments Homework Problems

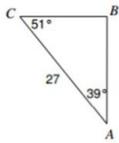
Assignment: Problem #PSABC8GT

Problem ID: PRABC8GT

[Comment on this problem](#)

Round to the nearest whole number.

3) Find BC



Type your answer below as a number (example: 5, 3.1, 4 1/2, or 3/2):

Submit Answer

100% ?

Show hint 1 of 3

Assignment: Problem #PSABC7AH

Problem ID: PRABC7AH

Use the fundamental identities to find an equivalent expression involving only sines and cosines, then simplify.

8)  $\sec^2\theta + \sin^2\theta$

A)  $\frac{1 + \sin^2\theta \cos^2\theta}{\cos^2\theta}$

B)  $\frac{1 + \cos^2\theta}{\cos^2\theta}$

C)  $\sin \theta$

D)  $\frac{1 + \sin \theta \cos \theta}{\cos \theta}$

Select one:

- A.  
 B.  
 C.  
 D.

Assignment: Problem #PSABC7AH

Problem ID: PRABC7AH

Use the fundamental identities to find an equivalent expression involving only sines and cosines, then simplify.

8)  $\sec^2\theta + \sin^2\theta$

A)  $\frac{1 + \sin^2\theta \cos^2\theta}{\cos^2\theta}$

B)  $\frac{1 + \cos^2\theta}{\cos^2\theta}$

C)  $\sin \theta$

D)  $\frac{1 + \sin \theta \cos \theta}{\cos \theta}$

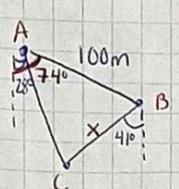
Select one:

- A.  
 B.  
 C.  
 D.

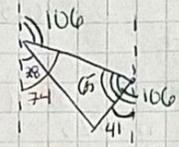
# Bookwork Homework Solution

42 77.05m   
 43 240.03°   
 46 d = 3.19m

---

42


Find angle



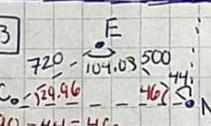
$A = 74 - 28 = 46$   
 $180 - 74 = 106$   
 $106 - 41 = 65$   
 $180 - 65 - 46 = 69^\circ$

$C = 69^\circ$      $A = 46$   
 $c = 100$      $a = ?$

$\frac{100}{\sin(69)} = \frac{a}{\sin(46)}$

$a = \frac{100 \sin(46)}{\sin(69)}$

---

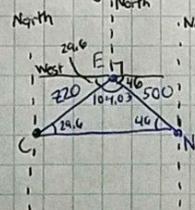
43


$C = 29.96$

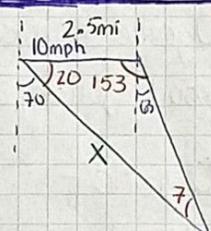
$180 - 46 - 29.96 = 104.03$

bearing is clockwise angle from North

$= 90^\circ + 46^\circ + 104.03^\circ$   
 $= 240.03^\circ$



---

46


$10 \frac{\text{mi}}{\text{hr}} \cdot \frac{1 \text{ hr}}{60 \text{ min}} \cdot \frac{15 \text{ min}}{1} = 2.5 \text{ mi}$

$90 + 63 = 153$

$90 - 70 = 20$

$180 - 153 - 20 = 7$

$\frac{2.5}{\sin(7)} = \frac{x}{\sin(153)}$

$x = \frac{2.5 \sin(153)}{\sin(7)}$   
 $x = 9.313$

$\cos(70) = \frac{d}{9.313}$   
 $d = 9.313 \cos 70$   
 $d = 3.19 \text{ m}$

Jeopardy Logarithm and Exponential Functions

Board:

Expanding	Condensing	Graphing	Solving	Rewriting
100	100	100	100	100
200	200	200	200	200
300	300	300	300	300
400	400	400	400	400
500	500	500	500	500

Example of slide:

Expanding 500

Question:  $y = \log_6 \left( \frac{x}{y^3} \right)^2$

Answer:  $y = 2\log_6 x - 6\log_6 y$

Jeopardy Board

# What is trigonometry?



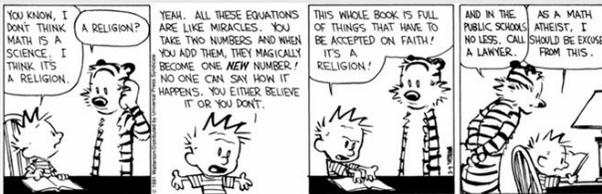
**Trigonometry (noun)**

-> the branch of mathematics that deals with the relationships between the sides and angles of triangles



Put simply it's calculations with triangles!

I know what you're thinking... I won't need this after high school



Guess what?! Believe it or not, trig is actually useful!

# People who use trigonometry



- ✓ Pilots
- ✓ Game Designers
- ✓ Animators
- ✓ Navigators
- ✓ Engineers
- ✓ Military
- ✓ Architects
- ✓ Welders
- ✓ Carpenter
- ✓ Audio synthesis
- ✓ Music editors and music industry

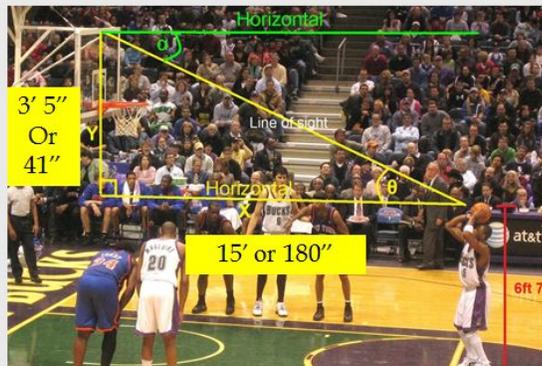


To name a few.....

# Basketball



- ⌘ Foul Shots
- ⌘ What angle should he take the foul shot to sink it every time?
- ⌘ How do I use this in real life? Replace his height with yours and go from there!



# Pilots



Q A pilot is flying from Houston to Oklahoma City (396mi). To avoid a thunderstorm, the pilot flies  $28^\circ$  off of the direct route for a distance of 175mi. He then makes a turn and flies straight on to Oklahoma City. To the nearest mile, how much farther should he tell the passengers they have left after the turning point?

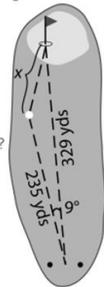


# Golf



9. A golfer hits the ball from the 18<sup>th</sup> tee. His shot is a 235 yard hook (curves to the left)  $9^\circ$  from the path straight to the flag on the green. If the tee is 329 yards from

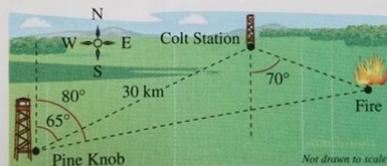
the flag, how far is the ball away from the flag?



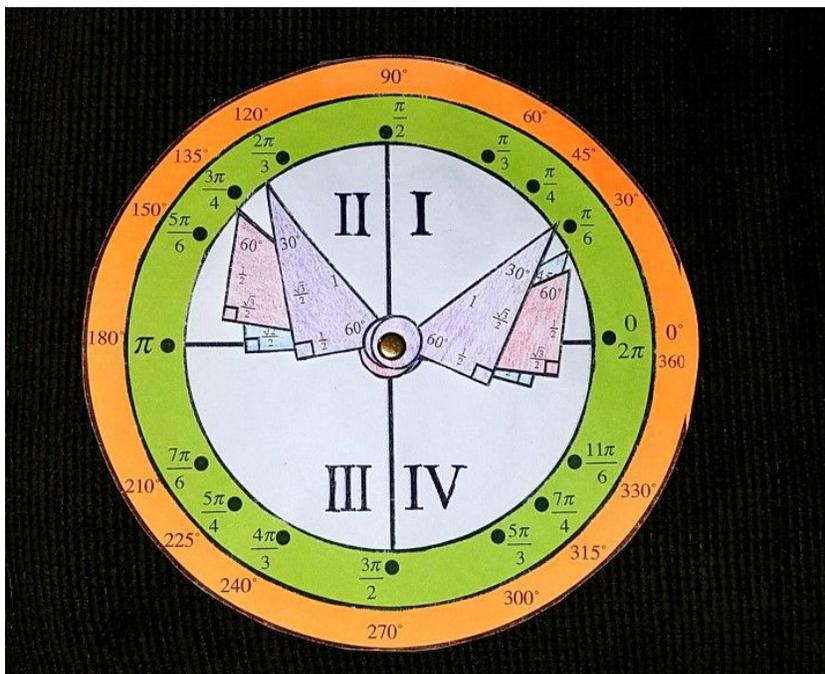
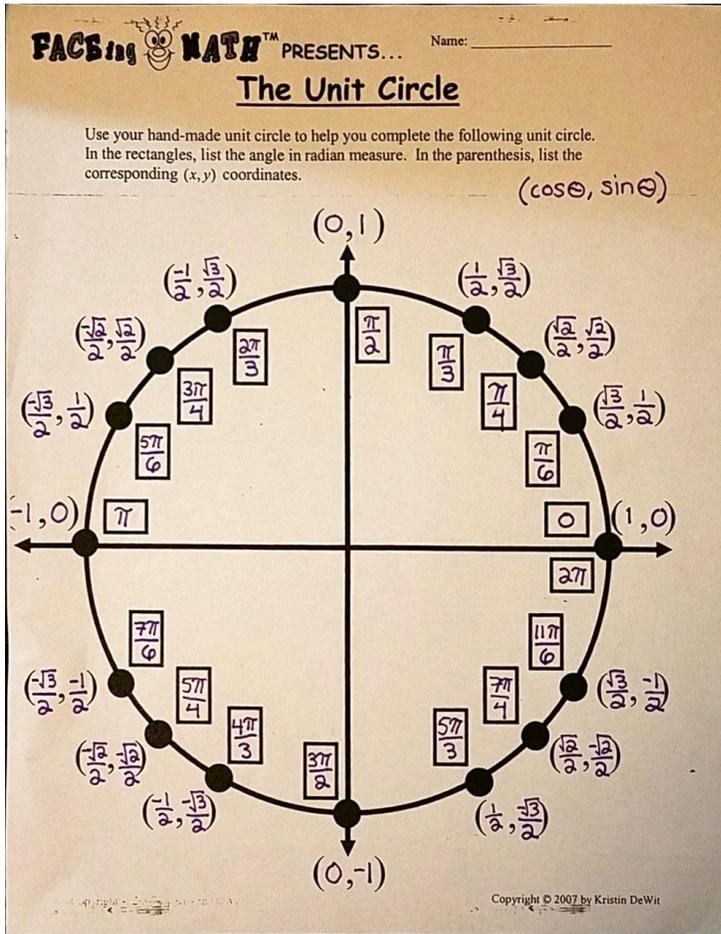
# Sighting



45. **Environmental Science** The bearing from the Pine Knob fire tower to the Colt Station fire tower is  $N 65^\circ E$ , and the two towers are 30 kilometers apart. A fire spotted by rangers in each tower has a bearing of  $N 80^\circ E$  from Pine Knob and  $S 70^\circ E$  from Colt Station. Find the distance of the fire from each tower.



Trigonometry Unit Circle - In Class Project for Student Reference



Trigonometry Challenge - Fill In the Blank

Simplify the following:

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1)  $\sin(x)\sec(x) =$

2)  $\cot(x)\sec(x)\sin(x) =$

3)  $\sec(x)\tan^2(x) + \sec(x) =$

4)  $\csc(x)\tan(x) =$

5)  $\sin\left(\frac{\pi}{2} - x\right)\cos(x) =$

6)  $\frac{1}{\cot^2(x)+1} =$

7)  $\cot(x)\sin(x) =$

8)  $1 - 2\cos^2(x) + \cos^4(x) =$

9)  $\frac{1-\cot(x)}{\tan(x)-1} =$

10)  $\frac{\cos^2(x)-4}{\cos(x)-2} =$

11)  $\csc(x)\sin^2(x) + \csc(x)\cos^2(x) =$

12)  $\frac{\cos^2(x)}{1-\sin(x)} =$

O =  $\sin^4(x)$

P =  $\tan(x)$

H =  $1 + \sin(y)$

L = 1

Y =  $\sec^3(x)$

T =  $\cos(x) + 2$

D =  $\sec(x)$

C =  $\csc(x)$

A =  $\cos^2(x)$

U =  $\cot(x)$

N =  $\sin^2(x)$

I =  $\cos(x)$

Happy

...

$$\frac{6}{6} \frac{5}{5} \frac{10}{10} \frac{7}{7} \frac{8}{8} \frac{6}{6} \frac{5}{5} \frac{2}{2} \quad \frac{1}{1} \frac{9}{9} \frac{1}{1} \frac{1}{1} \frac{3}{3} \quad \frac{4}{4} \frac{5}{5} \frac{3}{3} !$$

$$\frac{6}{6} \frac{5}{5} \frac{10}{10} \frac{7}{7} \frac{8}{8} \frac{6}{6} \frac{5}{5} \frac{2}{2} \quad \frac{11}{11} \frac{12}{12} \frac{7}{7} \frac{1}{1} \quad \frac{5}{5} \frac{6}{6} \frac{4}{4} \quad \frac{4}{4} \frac{7}{7} \frac{1}{1} \quad \frac{4}{4} \frac{5}{5} \frac{3}{3} !$$