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Jacob Swaim: Teaching Methods in Math and Science - DHS

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Worcester Polytechnic Institute
Teaching Practicum IQP
at
Doherty Memorial High School

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Fall 2016
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Abstract

This paper outlines the experience of teaching at Doherty Memorial High School in Worcester, MA during the fall of 2016. I observed some classes and taught other classes that Mr. Edi Naćo taught ranging from his BC Calculus class, to his honors and college Geometry classes, to his two honors Algebra classes. This paper will also outline the culture of Worcester public schools, provide evidence that I have achieved competence in the components of the teaching practicum, as well as address the challenges faced during this practicum.

Dedication

I would like to dedicate this paper to my mentor teacher, Mr. Edi Naćo, and my practicum advisors, Mrs. Shari Weaver and Ms. Katie Elmes. These people were integral to my success in this program in so many different ways. Mr. Naćo was able to teach me how to connect to students in an academic way that challenged them and pushed them to do their best. He also pushed me to the max of my abilities in order to make me a better teacher. My practicum advisors were able to see past my personality barriers and helped me to develop into the teacher I wanted to be. Without their patience and guidance, I would not have made it throughout the project. Thank you Mrs. Weaver and Ms. Elmes for all you have done for me and especially Mr. Naćo for never going easy on me.
Chapter One: Background

1.1 Massachusetts Ed Reform Act of 1993

The Education Reform Act was passed on June 18, 1993 mandated sweeping changes for public education in the Commonwealth of Massachusetts. The changes promise adjust programs as well as fiscal adjustments. The act created organizational modifications, changes in the administration, and the method for funding education in Massachusetts was completely changed. This was the first step in creating consistent education standards by creating a more equitable system to allocate funds that awarded schools with increasing academic achievement as well as providing funds to underfunded schools in order to allow them to succeed. The graph shows the allocation of the budget, where Chapter 70 refers to financial assistance given to districts [1]

![Figure 1 - DESE's FY15 State Budget Appropriations](image)

While the primary focus of this act was to create a better funding system the Reform Act also created statewide testing that let each district to be judged according to the success of their
students and by producing a design for teaching different courses. It also pushed for educators to further their education. They would need to be monitored and continue their own learning to be able to more successfully provide assistance to the students. [2]

1.2 Trends in International Mathematics and Science Study (TIMSS)

The TIMSS or Trends in International Mathematics and Science Study is a series of international assessments of the mathematics and science knowledge of students around the world and Massachusetts is a consistently high performer. In 2011 (the most recent year for which results have been released) [3], Massachusetts had an average mathematics score of 561 and an average science score 567 where the average scores in the U.S. respectively were 509 and 525 outperforming many states and regions across the world. [3] The United States appears 11th on the list in Mathematical achievement and 7th in Science achievement. However, Massachusetts was only out achieved by Singapore in Science. Massachusetts also appeared within the top ten for Mathematics compared to other countries. [4]

1.3 Socio-Economic, Demographic, and Educational Profile of Doherty High School

1.3.1 Socio-Economic and Demographic Profile of Doherty High School

Based on the information from U.S. News & World Report, approximately 57% of 1337 students at Doherty High School are classified as minorities with 30% being Hispanic, 14% Black, 9% Asian, 1% Native American, and 2% other races. The school is also basically split based on gender with 49% being female and 51% being male. Furthermore, 59% of the students at Doherty are considered “economically disadvantaged.” This is determined by the number of
students who qualify for the reduced price lunch program (53%) and the free lunch program (6%). The graph below depicts the demographic breakdown of students at Doherty.

![Figure 2 - Breakdown of Ethnicity](image)

With such a high proportion of ethnically/culturally diverse students, many students are also have a language barrier and are sometimes classified as ELL (English Language Learners) students.[6] These are students who do not speak English as their first language. When a new student enters the district, their English skills are assessed in order to show the school how to offer students the needed supports to become more proficient in English. Based on information from Massachusetts Department of Education from the academic year 2015-2016, the ELL population in Massachusetts is approximately 87,000 with 10,000 ELL students in the Worcester
Public school system alone (11% of the total) [8]. The percent distribution of the total population of Doherty in regards to their ELL status is shown below. [5]

![Bar Chart](image)

**Figure 3 - Percent of Population with ELL**

On average, it takes ELLs in Massachusetts 3.5 years to transition out of LEP status based on the Massachusetts Department of Elementary and Secondary education. In Worcester, 20.16% of Level 5 ELLs transitioned. Overall, the average time it takes for an ELL in Worcester to transition is 4.4 (longer than the course of a high school education).

**1.3.2 Educational Profile of Doherty High School**

As reported in 2014, Doherty is among the lowest performers when it comes to MCAS scores. Less than 95% of the students at Doherty High school participate in MCAS. The school is in the 20th percentile when compared other school’s performance that serve the same or similar grades. With 85% scoring proficient or above on the English Language arts sections, 72% in Mathematics, and 62% in Science. [9] As compared to state averages, this underperforms by 5%, 7%, and 9% respectively in each score category. In regards to graduation rates, 85.6% of students graduate with a 2.3% annual dropout rate. [9] This is at the same rates as the state standards for
graduation and dropout rates. In regards to the SAT scores, Doherty performed below state averages in all categories with scores of 463 in reading, 454 in writing, and 496 in math. Doherty also has 75.3% of students pursuing college degrees after graduation. [9]

1.4 Classes Taught

During my time at Doherty, I taught three classes, two Geometry and one Algebra and assisted in one BC Calculus class. The classes ranged in skills and work ethic as well as in number and in attitude toward school. Every class was different and required different methods of approaching the students in order to teach them effectively.

The college level Geometry class taught during sixth period was the first class I picked up. The number of students fluctuated during the year due to course changes and faculty issues, it started at 21 students and at the end of the year it had 15 students in the class. This class has the lowest performance of my three classes with seven of the students with grades below 60%. This class was also the one with the highest difficulty to control as many of the kids exhibited behavior issues. This class also contained the highest of amount of students that required IEP with a total of seven of the 15 students at the end of the year requiring specific academic attention.

The honors level Geometry class taught during seventh period was the second class I picked up. This class also fluctuate in number and ranged from 25 students to 31 students by the end of the year. This class was my achieving class that always came after school for extra help and pushed themselves to do their best. This class still had students getting below 65% on their
grades but far less than the sixth period class. This class contained only two students who had IEPs.

The final class that I taught as the teacher of record was an honors Algebra II class third period. This class was also a high achieving class with a class size of 23 students. Mr. Naco and I collaborated on materials to use in this class as well as his period one class in order to keep the students on the same level but also to push them based on their individual needs. No student in this class was below 65% on their grade when I left the school even tho their peers who were taught the same material in period one had lower grades on average than the class that I taught. Only one student in this class had an IEP.

The final class was one that I assisted in but was never the teacher of record. That class was the BC Calculus class held during fifth period. This was an all senior class consisting of ten students. (A very small class) In comparison, the AB calculus classes had to split between three teachers. These students were high achieving as well and none of the student had IEPs in this class.

All of the classes listed above were held to the Massachusetts Curriculum Framework for Mathematics, adopted by the Board of Elementary and Secondary Education in December 2010. This framework merges the Common Core State Standards for Mathematics with additional Massachusetts standards and other features. These standards can be found in Massachusetts Curriculum Framework for Mathematics pdf found on the website for the Massachusetts Department of Elementary and Secondary Education. [10]
Chapter 2: Well-Structured Lessons

Creating well-structured lesson plans is integral in assisting in a student education. Without proper planning, lessons will not be delivered in a way that meets student needs and lessons can not be refined for improvement if they are not planned and structured well. A teacher must “Develop well structured and highly engaging lessons with challenging, measurable objectives and appropriate student engagement strategies, pacing, sequence, activities, materials, resources, technologies, and grouping to attend to every student’s needs” [11]. Key parts of lesson plans include an objective, do now activity, a description of learning activities and a formal or an informal assessments on this learning, as well as a plan for homework or continued work. This will also include making accommodations for IEP students in order to provide the supports they need to gain the needed knowledge.

In order to become effective in this area, I would need to develop the skills as well as practice them. In order to learn what went into creating a well structured lesson, I watched Mr. Naco teach his classes for the first few weeks of the semester. I took notes and studied patterns and tricks that he used to connect with his students. I also viewed other teachers in the school teach their respective subjects to not only learn tricks for teaching my subject, but also strategies to handle disrespectful students as well as IEP students. Once I felt confident in the information I had gathered, I was able to put it into action. I practiced writing lessons plans and submitted them to the teacher of record (Mr. Naco) for his review. These lesson plans were based around the material that Mr. Naco would be presenting in class during that week. He would review them and give them back to me with his feedback and analysis of the plan in order to refine it. These
would skills were quickly refined as Mr. Naco began using some of my ideas in his classroom so that I could see them being implemented in order to judge their effectiveness. Examples of my lessons plans are shown in appendix A. This skill of creating well structured lesson plans is important in order to effectively transmit the information to the student.

This leads into the execution phase of well structured lessons. I began teaching classes as the student of record by taking over the college class first (Geometry period six), followed by the honors Geometry class period seven, and finally the honors Algebra II class period three. This is where the planning and preparation paid off. By studying the different approaches the Mr. Naco took to address the different needs of his class and by getting the know the students better, I was able to craft individual lesson plans for each class and present them in different ways that kept the standards set by the state of Massachusetts in tact. For the college level class, I was required to involve the class in a more “active” environment by constantly having students working on class work or presenting material at the front of the class. This class also required writing the notes on the board before hand in order to allow me to monitor the students as they took notes. This needed to be planned for but was totally different from the style used in my honors classes. They were allowed more freedom and time to think and develop answers to solutions rather than me showing them the answers. This allowed me time to work one on one with students and push them to learn in their specific style. These classes had lots of group work and puzzles to solve pushed students to explore and learn. When I needed to teach a concept, I was able to lead students in a discussion or lecture style depending upon the class make up and difficulty of the material. My students thrived under this environment and were, for the most part, engaged in the
subject matter. I was only able to achieve this level of success by creating well structured lesson plans through observation and practice.

Chapter 3: Adjustment to Practice

Without the previous skill of creating well structured lesson plans a teacher would not be able to adjust his or her practices to meet the needs of the student. As teacher we need to be able to organizes and analyzes results from assessments to determine progress toward intended goals and uses these findings to adjust practice. A teacher who does not have the flexibility to adjust their teaching style is an ineffective teacher. One style does not fit all students and a teacher will never have just one type of students in their class. They will have some who thrive in lecture format while others work well in groups and others learn through self discovery. Structuring lessons plans for these diverse needs is important but being able to adapt is just as important.

This area of skill took awhile for me to get the hang of. I was very confident in my skills before the start of my teaching experience and believed that the way I learned was the only way people should learn. I quickly realized the flaws in this philosophy as I did not connect with some of the students. They felt ignored in the classroom and did not get the attention they deserved. In order to learn how to adjust teaching, I had Mr. Naco take notes in the back of the classroom and identify all of the students that were not learning the subject. This was a very direct form of feedback that highlighted the types of students I need to focus on. But this was not enough. Mr. Naco also forced me to teach in different styles to show me how I could reach other students. The combination of these two things enabled me to find ways to change my teaching style to fit the exact needs of my students no matter how big or small the class was.
An example of this would be best exhibited in my seventh period honors Geometry class. This was my largest class and it had the most diversity of skills and learning styles. In the class, there were twins who both learned very differently. One was able to learn in the same way I did. He enjoyed lectures and taking notes and quickly grasped the material and was able to put it into practice while the other one struggled to understand what was being presented in class and took twice as long to grasp the material. The first student was easy to connect to, he fit my preferred style of teaching but the second one struggled meet my standards. He came for extra help all the time and was constantly asking questions and still performed at a lower level than his brother. This was clear sign to me that I needed to adjust my teaching. I realized that when he came for extra help he was able learn the material when we collaborated together to find the answer. With this in mind, I began to introduce more group work into the class along with the original way of presenting the information (Lecture style). I also began changing my lectures to involve more self discovery and student involvement. I began to see the second twin do well in my class and he got a firm grasp of the material without needed to come to extra help. I also saw the class as a whole connect with me more as they got more involved in the class and they felt like they were working with me and not for me. This one observation of a student struggling in my class allowed me to adjust my practice to help him out and help my class connect with me better. Without this being able to adjust, I would not have been able to teach as effectively as I did.

**Chapter 4: Meeting Diverse Needs**

Adjusting one practice ties very closely with meeting diverse needs. In order to fully utilize the potential of every student, a teacher must be able to teach a large pool of needs.
Teachers need to use a variance of practices to create opportunities for each student to meet or exceed the standards and expectations. Every student needs to be taught to the fullness of their ability, and that requires meeting every student's individual needs however difficult.

One of the ways to meet the needs of students is through tiered instruction. Allowing students who excel to be pushed harder by adding extra problems for having extra work allows them to reach their full potential. This strategy also works in the reverse by providing allowances for kids who can’t pick up the material as fast. A teacher can give students who struggle the chance to work on fewer problems but master the concepts while working through less problems. I was able to implement this strategy to great success through fun and challenging ways. Students who finished ahead of time were given a puzzle to solve that was based on the concepts taught in class. These puzzles ranged from simple logic puzzles to impossibly complex puzzles that required a couple days of dedicated work. The high achieving students loved this opportunity and began to come up with puzzle they thought would stump me. The students who struggled with the material were given problems and assignments that focused on the skills they needed to improve without apply extra work that would make them fall even further behind. Sometimes students who struggled immensely with a concept were given fewer homework problem but the problems still encompassed the entire scope of the material required.

Meeting diverse needs also extends into the students with special needs. Some of my students had IEP’s and most of them were for ADHD and other attention problems. To attend to this need, I gave students (in accordance with their IEP) extra time on tests and projects in order allow them to finish. I also constantly monitored students progress in class and reminded students to focus on their work and not get distracted. Other students required special seating
arrangements in order to focus properly. Other students did not head verbal instructions well and required instructions to be written on the board and others needed verbal instructions. All of these needs were met and planned for in my structured lesson plans as well as special care and emphasis was provided to students to allow them to exceed the standards set to them.

Creating instruction that fits the needs of each student can be difficult. Thankfully there are many strategies teachers can use to help students with different learning styles, disabilities, and different language backgrounds. While teaching at Doherty High school I was able to successfully implement strategies to work with students with diverse needs.

Chapter 5: Safe Learning Environment

Creating a safe learning environment for students comes from all the above skills a teacher must have but they must be implemented correctly in order for the desired learning environment to be achieved. In addition to using the before described skills, a teacher must also exhibit good classroom management as well as create an atmosphere where students feel comfortable around the teacher and other students. Students should feel comfortable asking the teacher or other students for help while pursuing their academics. If the student feels safe within the classroom, the teacher can connect with their students and teach them effectively.

To create this safe learning environment I had to first break away from the students thinking of me as the assistant to my supervising practitioner. To do this I clearly made it know that I was in charge by setting clear guideline for the class that improved on and adjusted the guidelines set by Mr. Naco. I set down rules for communication, (razing your hand and only having one person speaking at a time) but I improved this rule by requiring all students to control
their tongues and not swear in my class. I implemented punishments for infractions and made sure students understood that I was capable of executing punishments. This was most prevalent in my sixth period class where the most of the behavior issues came up. The students tested weather or not I would enforce rules and I had to punish a couple students at the beginning of the semester and when I did, the students began to respect me as an adult and leader of the classroom.

Once the rules were in place I was able to treat the students the way I wanted to invest in and give everything I had to them. I treated students with respect and courtesy and always tried to exemplify theirs strengths and improve the areas where they were weak. I encouraged students to come to me with problems weather it was related to school or personal life. This let them know that I was making myself available to them if they ever needed something. To add on to this, I allowed students to contact me whenever they need to and I promised I would respond within 12 hrs. This created an environment that allowed the students to trust me because I was fully supporting them. This created a safe learning environment that kept the students active in class and made them want to learn from me as a teacher. This bond actually became so effective that students were afraid to go back to Mr. Naco because they wouldn’t get the same level of respect and courtesy that I gave them.

Chapter 6: High Expectations

Along with creating a safe learning environment, teachers also need to be able to push their students in order to further their potential. Creating the safe environment described above is great but without high expectation, it turns into a frivolous affair. Students feel safe and
comfortable around the teacher but without the teacher using that to push her students both academically and in character, the students will not gain anything other than a friend from your teaching. Setting high expectations also sets up students for success in the future as they will be expected to perform and if they perform above and beyond the marks set before them, they will do well in everything they try to achieve.

In order to set high expectations, a teacher must model the expectations set forth. Students will be able to tell if you say one thing and do another and that will undermine your credibility. An example of this from my teaching experience is my no swearing rule. Students were always on the lookout to see if I would swear at them or at something so that they could point out my flaws. (This was made clear when they misheard me and thought I swore and the whole class noticed) I stressed the importance of not swearing for not just my class but also for the students futures. If the students showed they had the ability to control their tongue then they would be more highly regarded in the public than if they showed no constraint. I set the bar high for my students character in other ways as well. Whenever I saw students bickering or not acting mature in my class, I would have them wait after class and I would talk to them about the repercussion of their behavior. I am sure most of them did not heed my advice but it set a standard of excellence in my class that bleed through into the classroom. If I did not model any of the advice I gave or the students found me being hypocritical in some way, all of my efforts would have been for nothing.

I also set high expectation academically. I required my students to pursue knowledge instead of it being handed to them. I also regularly checked in with my students about how their grades were in other classes. Students would come to me after school and ask for help in other
subjects and I would help them as best I could but also encourage them to not rely on me for the answers. These expectations also applied to the short term classroom experience. I regularly had students present their work on the board and sometimes they would not have prepared as much as they would have liked to. Once they were presenting however, I would not let them give up no matter how much they wanted to. I pushed them to find answers and guided them to where they needed to be. This told my students that I expected them to finish whatever job they started.

Setting high expectations can change the dynamic of the class but setting them too high can cause negative feedback. I experienced this first had in my college geometry class. I wanted my student to do the same things my honors kids were doing. Work in group, solve problems that I had not shown them how to do yet, and collaborate to find the answers. This did not work well. These students had different values and styles for learning and setting a honors level expectations was not what they were prepared for. Needless to say, the class did not get much of the work done. I had to change my standards to meet my students abilities and then they were able to succeed. The perfect balance of expectations is what can drive a class to do great things and learn more than what the teacher can teach by themselves.

**Chapter 7: Reflective Practice**

The final skill that a teacher must have is that of reflective practice. Taking all of the above skills and evaluating them based on results or effectiveness is the most important step in a teacher’s growth. Without the ability to judge how well your expectations, or lesson plans, or how well you create a safe environment, etc. a teacher will not be able to change if they are doing something that is not effective. Teacher need to constantly evaluate and change their
teaching to meet diverse needs and to improve their teaching ability. What works for one class will not always work for another class and teachers need to be able to reflective on what they have done and what they can improve on in order to stay effective as teachers.

As a teacher, I initially had trouble with this. I believed that I was already expectational and I had something to teach others, not the other way around. It took the strong hand of Mr. Naco to show me the error of that thought. He would sternly evaluate my teaching and write handwritten notes about everything I did wrong. Everything from spelling words wrongs, to stuttering, to presenting wrong material. And after class he would sit me down and go through it step by step and tell me that I needed to work on this. This humbled me in more ways than anyone had before. I began to look at all of my work, from notes I took, to projects I gave, to assignments I handed out, to see if I could make them better. At first it was just so Mr. Naco had nothing to hold against me, but I soon realized there was a better reason. Eventually Mr. Naco left the classrooms and let me teach on my own, and I began to see how my missteps affected students and I did not want my students to suffer because of me. I began to refine everything I did until eventually when Mr. Naco came into my class to evaluate my teaching he would write on that hand written slip; “Well done”. I still had things to improve but he had broken my stubborn spirit and shown me that one always needs to reflect and improve and no one is perfect. Many teacher who have been teaching for a long time believe they are untouchable and can’t be shown anything new and these teachers are the ones that can’t connect with students or peers and this makes them ineffective as a teacher.

Students were also a great resource for feedback. Many students are too scared to voice their thoughts to a teacher but I encouraged it and even gave them an anonymous survey to
evaluate me. The feedback I got was amazing. It showed me how to better teach to each class individually. One class said I taught too fast while another wanted more time at the board to solve problems. Being able to take this info and apply it to my class shows my ability to exhibit reflective practice. Of all of the skills mentioned before this, this is the one I believe I am the best at, I learned how important it is to reflect and change even when you think you are the best, there is always something more to fix.

**Chapter 8: WPI Education**

Being a civil engineer at Worcester Polytechnic Institute allowed me to have great insight into the practical world of math. After taking all the calculus math provided at WPI and the statics class that civil department offers, I was able to connect the material I was teaching to my students in a real way. Outside of the indirect classes mentioned before ID 3100: Teaching Methods in Math and Science was a huge help in preparing me for the practicum. The heads of the Science and Math department at Doherty High School, John Staley and Renah Razzaq, lead the class and taught us all of the skills we needed to take over class as well as reviewing the issues we may face during our experience. One of the best things we did during the class was doing practice presentation of lessons that we had to create. These presentation were based on the subject matters we were teaching and required a well structured lesson plan to be created. During these presentations, the participants in the class were given scenarios to act out that would be things we might encounter in classroom such as sleeping students or shouting kids. This taught us classroom management and skills to handle the many things we might encounter.
The WPI Civil Engineering curriculum incorporates a mathematics into almost all of its classes. This helped me to make real life applications in my Algebra II and Geometry classes. Algebra is used in every mathematics class no matter how advanced or basic. This makes it important for all problem solving issues such as doing finances or building a building. Geometry also plays a big role in my Civil classes as all of it based on trig and the use of shapes to create the best structures. My experience in these courses helped me illustrate the potential applications for the math that I was teaching. My WPI education gave me the tools I needed to provide examples that the students could relate to and see the value in.

Chapter 9: Classes

Period 6: College Geometry

The college level Geometry class taught during sixth period was the first class I picked up. This class was my hardest class in terms of classroom management. The students tended to speak out whenever they felt like and didn’t do most of their work. It was sometimes a struggle to get them to take notes and understand the material because many of them did not want to learn anything. I quickly enforced the aforementioned rules and implemented punishments related to those rules. One student in particular continuously tested me and pushed me in order to see if I would follow up on my action, or maybe it was just to be annoying. Some of the other students caused distractions in class that caused other students to ask me to kick them out so they could pay attention. Eventually this class had to be reshuffled because the other teachers in the department couldn’t handle the students. This caused the class size to shrink to 15 students. Of the remaining students none were ELL and seven had IEP’s. All of them required that the
material be written on the board as well as spoken to them verbally while two to them required extra time on all quizzes and exams. One student got a concussion half way through the year and had to have an IEP created specifically for her. This specialized plan allowed her to do half of the assigned homework (odds or evens) and gave her extra time to work on all exams and quizzes. Throughout the time I spent in this class, students would constantly ask questions to try to do a little work as possible. Most of the kids did not do their homework and would ask for extensions. As a class policy for this class alone, I allowed students to hand in homework late for half credit and they had till the end of the term hand in all missing homework. This meant at the end of the quarter I had a lot of homework to check. Eventually this class gained a close bond with me and we were able to teach material and then discuss the material as well in a more informal way creating an atmosphere where we could reach the standards and reinforce it with the students.

**Period 7: Honors Geometry**

The honors level Geometry class taught during seventh period was the second class I picked up. This class also fluctuate in number and ranged from 25 students to 31 students by the end of the year. This class was my achieving class that always came after school for extra help and pushed themselves to do their best. This class still had students getting below 65% on their grades but far less than the sixth period class. This class contained only two students who had IEPs and these students only needed extra times on the exams. This was my favorite class just due to the students enthusiasm. All of the students wanted to get to know me and had a love for the information I was teaching them. This class was taught in self discovering style in which the a problem was introduced at the beginning of class and the students were asked to find a way to
solve it using the skills they had already learned. My favorite example of this was when I asked the kids to find the center of a triangle. I had already solved the problem and all they needed to do was use their knowledge of creating lines and intersection points to find the center of the triangle. I however did not tell them what they needed to do. I just put them in groups and asked them to find the answer. They spent the whole class frantically trying methods and giving me answers. I spent most of the class helping correct math errors but only providing tips at scheduled times during the class. The students were eventually able to find out how to do it and loved this style of learning. I also took lots of time to give students practical advice on life whenever I could. Two students in particular met up with me everyday after school to talk about classes and life and they viewed me as a mentor. This connection was present with all of the students and was made evident when the kids through me an end of the year party when I left.

**Period 3: Honors Algebra**

The final class that I taught as the teacher of record was an honors Algebra II class third period. This class was also a high achieving class with a class size of 23 students. Mr. Naco and I collaborated on materials to use in this class as well as his period one class in order to keep the students on the same level but also to push them based on their individual needs. No student in this class was below 65% on their grade when I left the school even tho their peers who were taught the same material in period one had lower grades on average than the class that I taught. Only one student in this class had an IEP and this student needed to be constantly brought back on topic because he would lead the class on tangents. This class was the most boring of all of my classes. Students were still trying to wake up and didn’t put much effort into participating in
class. These kids were smart and many of them were doing both Geometry and Algebra II and this allowed them to make connections between the two classes. This became especially obvious when students were asked to present and they would use skills and equations that I had not taught them yet. Students in this class loved to be challenged. During lectures of materials, I would ask students how this information could be applied. If they came up with a way, I would develop a problem for them to solve around it. The students loved the ability to influence the class in way that they could see. I also had the chance to teach these kids Chemistry as Mr. Naco had to take over their chemistry class.

Additional Experiences

During my time at Doherty High School I had the opportunity to interact with many parents about their students. Several times I had to call parents to make them aware that their students were failing as well as meet with them in person. This experiences were usually very awkward for both the students and parents but was required by school. These calls were designed to let parents know about the status of their kids in order to allow them to push their kids to do better. One of the most interesting parental interactions that I had was when one of my students had a concussion. We met with the parent to discuss and IEP for her and we created one to help her do well with her concussion. The second meeting was the interesting one. We met with mom and the student to talk about her progress, which was minimal, and we had to address it with her parent and teachers present. The mom realized that her kid was not living up to her end of the bargain and was not impressed. The teachers and student however came up with a new plan that would help both parties, the mother and student, reach their goals. The student was crying at one
point but I was able to come in and reassure the student and parent that I would give all I could to make sure that her student would succeed. The parent and the student left satisfied and I felt like I had made a difference in some way.

The final thing that I participated in was professional development. It allowed the teacher to discuss strategies with other teachers. I attended one of the afterschool Mathematics Department meetings. The department head, Mrs. Razzaq, ran the meeting and at this particular meeting, the teachers were learning how to use a new piece of software and take care of a few logistical. This showed me how teacher collaborated to make sure the department ran smoothly.
Conclusion

My time as a student teacher at Doherty Memorial High School was a memorable experience. I was able to implement the skill in CAP to become an excellent teacher: well-structured lessons, adjustment to practice, meeting diverse needs, safe learning environment, high expectations, and reflective practice. There are still areas I still need improvement. One goal I will always focus on is that no matter what the students thought of themselves, they will always know that I believed in them. My students recognized my faith in them, and as a result, always wanted to do their best for me. Showing your students that you believe in them is the most powerful force a teacher can have on a classroom. Even though I was only at the school for a few months, observing and teaching classes shaped how I viewed teaching and how I will teach. Student teaching at Doherty High School for a semester was the most rewarding experiences at WPI, and I am so lucky for having had this opportunity. I plan to go back to teaching and use all the skill I learned from this practicum to be the best teacher I can be.
Bibliography


5. "Massachusetts School and District Profiles." 2014 MCAS Results by Subgroup by Grade and Subject. N.p., n.d. Web


code=03480512&fyc=2014&orgtypecode=6&


http://www.doe.mass.edu/frameworks/math/0311.pdf
Appendixes
Appendix A: Feedback
Dominique did not pay attention once to what you said (Katie too out of you have to)

Nestor sometimes
still only your hand writing on the board

if you give them time to do something themselves go around and help, don't do it on board till at least half of them are done on their notebooks.

You're their geometry teacher; do not say "line" if you mean "segment," sides of triangles are not lines.

You're going too fast! It's not a class at WPI.
10/27/16  Period 3
- never said what x was
- never defined revenue explicitly
- never wrote a formula for revenue
- dry lesson
- several students bored
- move around the class
- let other handwritings (students) appear on the board
- don't tell them everything; let them think and come up with it
- on "down time," move around room, don't sit down on chairs
- do the problem yourself beforehand so you know the answer (shouldn't have jumped over $1.75)
Appendix B: Student work
Use the Pythagorean Theorem to find the missing variable.

\[ a^2 + b^2 = c^2 \]

\[ 9^2 + 15^2 = x^2 \]

\[ 81 + 225 = x^2 \]

\[ 306 = x^2 \]

\[ x = \sqrt{306} \]

\[ x = 12 \]

Find the values of each variable. Simplify in simplest radical form.

1.

\[ \text{y} = \frac{7}{\sqrt{2}} \]

\[ x = \frac{7}{\sqrt{2}} \]

2.

\[ \text{y} = \frac{3\sqrt{2}}{\sqrt{2}} \]

\[ x = \frac{3\sqrt{2}}{1} \]

3.

\[ \text{y} = \frac{7\sqrt{3}}{\sqrt{3}} \]

\[ x = \frac{7\sqrt{3}}{1} \]

4.

\[ \text{y} = \frac{4\sqrt{3}}{4\sqrt{3}} \]

\[ x = \frac{4\sqrt{3}}{1} \]
Bonus (20 pts) In the diagram, find AD. Show how you found your answer and justify each step.

\[
\begin{align*}
\frac{7}{5} \cdot \frac{5}{2} &= \frac{2 \cdot 5}{2} = \frac{5 \cdot 2}{2} = \frac{5 \cdot 1}{1} = \frac{5}{1} \\
2 \cdot \sqrt{5} &= 2 \cdot \sqrt{5} \cdot \sqrt{5} = \sqrt{5} \\
2 \cdot \sqrt{2} &= 2 \cdot \sqrt{2} \cdot \sqrt{3} = \sqrt{6}
\end{align*}
\]

\[
R = 100 \cdot \sqrt{3} + 2 \\
AB = 2\theta \\
CA = 16 \sqrt{3} + 2
\]

\[
\begin{align*}
\frac{BE}{BC} &= \frac{\sqrt{3}}{5} \\
\frac{BA}{BC} &= 2 \cdot \sqrt{3} \\
AC &= \sqrt{3} + 2 \\
BF &= \sqrt{3} + \sqrt{6}
\end{align*}
\]

\[
18 \cdot 78 = AD
\]

Quiz-Period 6 Geometry

Indicate if the statement is TRUE or FALSE. If FALSE, explain why.

1) If two lines are cut by a transversal and the Alternate Interior angles are supplements, then the lines are parallel. (√ True or False)

2) If two lines are cut by a transversal and the Consecutive Interior angles are supplements, then they add up to 180°. Does not mean they are parallel. (√ True or False)

Choose the angle that makes the u ll v.

\[
\begin{align*}
\text{A) } 130^\circ & \quad \text{B) } 100^\circ \\
\text{C) } 39^\circ & \quad \text{D) } 105^\circ \\
\text{A) } 139^\circ & \quad \text{B) } 93^\circ \\
\text{C) } 107^\circ & \quad \text{D) } 142^\circ \\
\text{A) } 98^\circ & \quad \text{B) } 50^\circ \\
\text{C) } 60^\circ & \quad \text{D) } 75^\circ
\end{align*}
\]

Name: [Redacted]
LESSON 7.4 Practice A
For use with pages 457-464

Find the value of $x$. Write your answer in simplest radical form.

1. $45^\circ \quad x = 4\sqrt{2}$
2. $45^\circ \quad x = 6\sqrt{2}$
3. $45^\circ \quad x = 3\sqrt{2}$
4. $\quad x = 5\sqrt{2}$
5. $\quad x = \sqrt{2}$
6. $\quad x = \sqrt{3}$

Find the value of each variable. Write your answers in simplest radical form.

7. $y = \sqrt{3}$
8. $y = 3\sqrt{3}$
9. $y = \sqrt{3}$

Copy and complete the table.

13. $45^\circ \quad 45^\circ \quad x$

<table>
<thead>
<tr>
<th>$x$</th>
<th>2</th>
<th>4</th>
<th>8</th>
<th>5</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y$</td>
<td>$\sqrt{2}$</td>
<td>$\sqrt{2}$</td>
<td>$\sqrt{3}$</td>
<td>$\sqrt{3}$</td>
<td>$\sqrt{3}$</td>
</tr>
</tbody>
</table>

14. $30^\circ \quad 60^\circ \quad 75^\circ$

<table>
<thead>
<tr>
<th>$a$</th>
<th>5</th>
<th>2</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>$b$</td>
<td>$2\sqrt{3}$</td>
<td>$3\sqrt{3}$</td>
<td>$10$</td>
</tr>
<tr>
<td>$c$</td>
<td>$2\sqrt{2}$</td>
<td>$4\sqrt{2}$</td>
<td>$6\sqrt{2}$</td>
</tr>
<tr>
<td>$d$</td>
<td>$8\sqrt{2}$</td>
<td>$12\sqrt{2}$</td>
<td>$22$</td>
</tr>
</tbody>
</table>

Geometry
Chapter 7 Resource Book 49
Geometry (H) Quiz

Determine whether each statement is true or false. If false, draw a counterexample.

(1) All isosceles triangles are acute. **False**
(2) A acute triangle can be equilateral. **True**
(3) An scalene triangle is never obtuse. **False**
(4) A right triangle can be isosceles. **True**

Use the given conditions to classify each triangle by its angles and sides.

(5) $\triangle WHO$, m$\angle W = 110$, WH = WO = 5 isosceles obtuse triangle
(6) $\triangle BAG$, m$\angle B = 90$, GB = 4, BA = 3 scalene right triangle

Find the value of x:

(7) $5x = 27^\circ$, $(7x + 9)^\circ$

\[
7x + 9 + 5x + 27 = 180 \\
12x + 36 = 180 \\
-36 \\
12x = 144 \\
x = 12
\]

(8) $34^\circ$, 49°, $(4x - 3)^\circ$, 80°, $4x + 4 = 180$

\[
x = 62.5
\]

Write a congruence statement for the triangles in each diagram.

(9) SSS

\[
\text{Reason: Given}
\]

(10) ASA

\[
\text{Reason: Given}
\]
Geometry (H) ETA Exam #3

MULTIPLE CHOICE Choose the statement that is true about the given numbers. (4 pts Each)
A. The number is Column A is bigger
B. The number is Column B is bigger
C. The two numbers are Equal
D. The relationship cannot be determined from the given numbers

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>The slope of $y = 3x + 1$</td>
</tr>
<tr>
<td>b.</td>
<td>The y-intercept of $y = \frac{2}{3}x - 4$</td>
</tr>
<tr>
<td>c.</td>
<td>The x-intercept of $y = 10(x + 1)$</td>
</tr>
<tr>
<td>d.</td>
<td>The slope of $y = \frac{12}{4}x + 5$</td>
</tr>
<tr>
<td>e.</td>
<td>The slope of $y = -\frac{1}{3}x + 2$</td>
</tr>
<tr>
<td>f.</td>
<td>The x-intercept of $y = mx + b$</td>
</tr>
<tr>
<td>g.</td>
<td>The y-intercept of $Ax + y = 14$</td>
</tr>
</tbody>
</table>
Geometry (H) ETA Exam #3

Write an equation using the given information in standard form and graph each equation on the Cartesian Plane provided. (5 pts Each)

8) 
\[ y = 2x + 3 \]

9) 
\[ 5x + 2y = \frac{3}{2} \]

10) Contains (2,1) and (-2,5)

11) Parallel to \( y = -2x + 1 \) but goes through (3, -2)

12) Determine if \( \overrightarrow{AB} \) and \( \overrightarrow{MN} \) are parallel, perpendicular, or neither. (10 pts)

\( A(-4, -8), B(4, -6), M(-3, 5), N(-1, -3) \)
Appendix C: Exams and quizzes
1. MULTIPLE CHOICE Choose the statement that is true about the given numbers. (4 pts each)
A. The number in column A is bigger.
B. The number in column B is bigger.
C. The numbers are equal.
D. The relationship cannot be determined from the given information.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. C</td>
<td>The x-coordinate of the vertex of ( y = x^2 )</td>
</tr>
<tr>
<td></td>
<td>(0, 0)</td>
</tr>
<tr>
<td>b. A</td>
<td>The x-coordinate of the vertex of ( y = x^2 - 2 )</td>
</tr>
<tr>
<td></td>
<td>( x_v = 0 )</td>
</tr>
<tr>
<td>c. B</td>
<td>The x-coordinate of the vertex of ( y = 2x(x - 3) )</td>
</tr>
<tr>
<td></td>
<td>( x_v = \frac{0+3}{2} = \frac{3}{2} )</td>
</tr>
<tr>
<td>d. A</td>
<td>The y-coordinate of the vertex of ( y = -\frac{1}{2}x^2 + \frac{3}{2}x )</td>
</tr>
<tr>
<td></td>
<td>( y_v = -\frac{1}{2}(-1)^2 - \frac{3}{2}(-1) = \frac{9}{8} )</td>
</tr>
<tr>
<td>e. B</td>
<td>The smaller x-intercept of ( y = \frac{1}{2}x(x + 5) )</td>
</tr>
<tr>
<td></td>
<td>( x = 0 )</td>
</tr>
<tr>
<td></td>
<td>( x = -5 )</td>
</tr>
<tr>
<td>f. A</td>
<td>The y-intercept of ( y = 4x^2 - 3x + 6 )</td>
</tr>
</tbody>
</table>

2. Find the maximum values of the two functions below. (5 pts each)
   a. \( y = x(x - 8) \)
   b. \( y = -0.005x(x - 2000) \)

\[ x_v = \frac{0+2000}{2} = 1000 \]
\[ y_v = -0.005(1000)(-1000) = 5000 \]

3. In the three forms of parabolas, what do the following parameters mean? (10 pts)
   a) \( p - \) \( x \)-int
   b) \( c - \) \( y \)-int
   c) \( k - \) \( y \)-int
   d) \( h - \) \( x \)-int
   e) \( q - \) \( x \)-int

4. Write the equations below in standard form. (10 pts)
   a) \( y = -\frac{3}{2}(x - 5)(2x + 2) \)
   b) \( y = -2(x - 2)^2 - 2 \)

\[ y = -\frac{3}{2}(2x^2 + 2x - 10x - 10) \]
\[ y = -2(x^2 - 4x + 4) - 2 \]
\[ y = -3x^2 + 12x + 15 \]
\[ y = -2x^2 + 8x - 8 - 2 \]
\[ y = -2x^2 + 8x - 10 \]
5. TRUE or FALSE. Determine whether the statement is true or false. Justify your reasoning. (16 pts)
   a. It is possible for quadratic function to have only 1 x-intercept.
   \[ \text{True, if vertex is on } X\text{-axis.} \]
   b. The graph of \[ y = a(x - 2)^2 + 3 \] is the parabola \[ y = ax^2 \] translated horizontally 3 units and then vertically 2 units.
   \[ \text{False, vertically 3 and horizontally 2.} \]
   c. You cannot write every parabola in intercept form.
   \[ \text{True, } \rightarrow \text{ no x-intercepts.} \]
   d. The quadratic function \[ y = ax(x - p) \] has two x-intercepts.
   \[ \text{False, not if } p=0. \]
   \[ \text{True if } p \neq 0. \]

6. A publishing company expects to sell 5000 copies of a new book from its website, if the company charges $30 per book. The company expects that 500 more books would be sold for each price reduction of $2. Can the company make $160000 in revenues from sales of the book? Explain. (11 pts)
   \[ \text{Revenue} = \text{price} \times \text{quantity} \]
   \[ = (30 - 2x)(5000 + 500x) \]
   \[ = 150000 - 10000x + 15000x - 1000x^2 \]
   \[ = -1000x^2 + 50000x + 150000 \]
   \[ Xv = \frac{-5000}{2(-1000)} = 2.5 \]
   \[ \text{Max revenue } = Yv = 25 \times 6250 = $156,250 \]
   It is not possible to make $160000 since max revenue is $156,250.

7. Match the equation with the graph. (9 pts)
   \[ 1. \ y = 2(x - 2)^2 + 1 \]
   \[ 2. \ y = -(x - 3)(x - 1) \]
   \[ 3. \ y = -(x + 1)^2 + 2 \]
   
   8. The path of motocross dirt bike rider follows during a jump is given by \[ y = -0.6x^2 + 6x + 13 \] where \( x \) is the horizontal distance (in feet) from the edge of the ramp and \( y \) is the height (in feet). What is the maximum height of the rider during the jump? (10 pts)
   \[ \text{Concave down so max at vertex } \]
   \[ Xv = \frac{-6}{2(-0.6)} = \frac{-6}{1.2} = -5 \]
   \[ Yv = -0.6(5)^2 + 6(5) + 13 \]
   \[ Yv = 28 \]
   \[ \text{Max height of rider is 28 feet.} \]
Parallel lines $q$ and $m$ are cut by transversal lines $j$ and $k$. The lines, and the measures of some of the angles created by the intersections of the lines, are shown in the diagram below.

![Diagram](https://via.placeholder.com/150)

a.) What is the measure, in degrees, of $\angle 1$? Show or explain how you got your answer.

b.) What is the measure, in degrees, of $\angle 3$? Show or explain how you got your answer.

c.) What is the measure, in degrees, of $\angle 5$? Show or explain how you got your answer.

d.) What is the measure, in degrees, of $\angle 6$? Show or explain how you got your answer.
Find the Slope Requested (5 pts Each)

6. \( y = \frac{1}{2}x - 10 \)
   Parallel Slope \( m = \frac{\sqrt{2}}{2} \)

7. \( 3x + 2y = 10 \)
   \( -3x \quad -3x \)
   \( 2y = \frac{3x - 10}{2} \)
   \( y = \frac{3}{2}x + 5 \)
   Perpendicular Slope \( m = \frac{-3}{2} \)

8. \( y - 2 = \frac{1}{2}(x - 3) \)
   Parallel Slope \( m = \frac{\sqrt{2}}{2} \)

9. \( 2x + y = 12 \)
   \( -2x \quad -2x \)
   \( y = -2x + 12 \)
   Perpendicular Slope \( m = \frac{x}{2} - \frac{5}{2} \)

10. \( 5y = -\frac{12}{5}x - 5 \)
    Parallel Slope \( m = \frac{\sqrt{2}}{2}x - \frac{5}{2} \)
Write an equation using the given information in standard form and graph each equation on the Cartesian Plane provided. (10 pts Each)

11. \[ y = 2x + 3 \]

12. \[ 5x + 2y = \frac{3}{2} \]

13) Contains (2,1) and (-2,5)

14) Parallel to \( y = -2x + 1 \) but goes through (3, -2)

Determine if \( \overline{AB} \) and \( \overline{MN} \) are parallel, perpendicular, or neither. Write the equations of the lines in Standard form (10 pts)

15. A(-4, -8), B(4, -6) \( M(-3, 5) \), \( N(-1, -3) \)

\[ y - y_1 = m(x - x_1) \]

\[ y - (-8) = \frac{\frac{5}{2}}{4} (x + 4) \]

\[ y + 8 = \frac{5}{2}x + 12 \]

\[ y - \frac{5}{2} = \frac{5}{2}x + \frac{12}{2} \]

\[ y = \frac{5}{2}x + 7 \]

Perpendicular
Write the equation in Standard form of the line that contains the given points. (20 pts)

16) A line through \((2, 3)\) that is perpendicular to \(y = \frac{1}{2}x + 3\)

\[ A + B y = C \]

\[ y = \frac{1}{2}x + 3 \]

17) A line through \((-2, 5)\) that is perpendicular to \(3x + 4y = 3\)

\[-3x + 4y = 3 \quad \Rightarrow \quad -3x \quad \text{and} \quad -\frac{1}{4} \]

\[ \frac{1}{4}y = \frac{3}{4}x + \frac{3}{4} \]

\[ y = \frac{3}{4}x + \frac{3}{4} \]
Appendix D: Lesson plans
Lesson Plan Title: Analyze Conditional Statements
Teacher’s Name: Jacob Swaim       Subject/Course: Geometry: College
Unit: Section 2.2 and 3.1        Grade Level: 10th

Overview of and Motivation for Lesson:
Students will be able to read and understand Conditional statements in order to know how to rearrange the statement and make logical conclusions about them.

### Stage 1-Desired Results

<table>
<thead>
<tr>
<th>Standard(s):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Click here to enter text.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Understanding(s):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students will understand how . . .</td>
</tr>
<tr>
<td>• The converse, inverse, and contrapositive affect a statement.</td>
</tr>
<tr>
<td>• Using this, they will also understand what a bi-conditional statement is</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Essential Question(s):</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is Inverse, converse, and contrapositive?</td>
</tr>
<tr>
<td>What is the hypothesis and conclusion?</td>
</tr>
<tr>
<td>What is a bi-conditional statement?</td>
</tr>
<tr>
<td>How do we use these in Geometry?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Content Objectives:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge:  Students will know . . .</td>
</tr>
<tr>
<td>• How to write the converse, inverse, and contrapositive of a conditional statement</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Language Objectives:</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELD Level Choose an item. Students will be able to . . . in English</td>
</tr>
<tr>
<td>• Click here to enter text.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Skills/Performance:  Students will be able to . . .</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Logically reason if the statements are true or false</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ELD Level Choose an item. Students will be able to . . . in English</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Click here to enter text.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Key Vocabulary:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Converse, Inverse, Contrapositive, Bi-conditional statement, hypothesis, and conclusion</td>
</tr>
</tbody>
</table>

### Stage 2-Assessment Evidence

<table>
<thead>
<tr>
<th>Performance Task(s) or Key Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Students will complete the worksheet provided and will be called on to exemplify completion and understanding of assignment</td>
</tr>
<tr>
<td>• If needed, more time will be spent on each statement individually</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other Evidence:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Students will be able to verbally reason how they created the statements and if they are true or false.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Key Criteria to measure Performance Task (s) or Key Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Successful completion of worksheet</td>
</tr>
<tr>
<td>• Accurate verbal reasoning for how they created each statement</td>
</tr>
</tbody>
</table>
## Stage 3 - Learning Plan

**Learning Activities:**

**Do Now/Bell Ringer/Opener:**
- Take notes from definitions on the board
  - Conditional Statement
  - Converse
  - Inverse
  - Contrapositive
  - Biconditional Statement

**Learning Activity 1:**
- The first part of the worksheet will be completed by students on their own and then they will be called on randomly to present their answers.
- All students need to exhibit competency in skill set of logical reasoning.

**Learning Activity 2:**
- Introduce Biconditional statements and have students complete second half of the worksheet and present randomly to the class the answers that they obtained

**Closing**
- Students will understand how to use the statements and then a postulate will be written on the board and the students will use the methods learned in class to analyze the postulate. Students will then understand how we use conditional statements in Geometry

### Multiple Intelligences Addressed:

- ☒ Linguistic
- ☒ Logical-Mathematical
- ☐ Musical
- ☐ Bodily-kinesthetic
- ☐ Spatial
- ☑ Interpersonal
- ☐ Intrapersonal
- ☐ Naturalistic

**Student Grouping**

- ☒ Whole Class
- ☐ Small Group
- ☐ Pairs
- ☒ Individual

**Instructional Delivery Methods**

- ☒ Teacher Modeling/Demonstration
- ☐ Lecture
- ☒ Discussion
- ☐ Cooperative Learning
- ☐ Centers
- ☒ Problem Solving
- ☐ Independent Projects

**Accommodations**
- Some Students have a language barrier. Be sure to speak clearly and repeat yourself

**Homework/Extension Activities:**

- P. 38 # 3-150

**Materials and Equipment Needed:**

- Worksheet: Provided by instructor

---

*Adapted from Grant Wiggins and Jay McTighe-Understanding by Design*
Lesson Plan 1 – Converse, Inverse, and Contrapositive

Goals:
- Statements
- Converse Statements
- Inverse Statements
- Contrapositive Statements

Structure:
- Do Now
  - Defining Statements and notation for writing them
    - Consider the statement: If the weather is nice, then I will wash the car.
      - P = The weather is nice
      - Q = I will wash the car
      - The variables represent the arguments (Hypothesis and Conclusion)
      - When a (~) is place in front of the arguments, it makes it negative
        - ~P (The weather is not nice)
        - ~Q (I will not wash my car)
  - Converse Statement
    - This is when the arguments switch positions
      - If I wash my car, then the weather is nice.
  - Linear pair
    - Supplementary angles
    - Definition: Adjacent angles are a linear pair if their noncommon sides are opposite rays
    - Draw an example
  - Vertical Angles
    - Definition: Sides form 2 pairs of opposite rays
    - Draw an example
    - Prove using supplementary angles that opposite angles are equal
- Worksheet in group
  - Project answers to homework so they can check themselves
- Homework: Worksheet, p. 38 3-5, p. 39 20-27, 32-33
Appendix E: Homework
#1: If \( x - y = -4 \), evaluate the expression:
\[
\frac{x - y}{2} - 5(x - y) - 3(x - y)^2
\]
Answer: 14

### #________: The difference of two numbers is -18. The sum of the same two numbers is -2. What is the smaller of the two numbers?
Answer: 35

#________: What is the longest possible side length that is an integer of a triangle whose two shorter sides are 15 and 21?
Answer: 9

### #________: For what value, \( k \), would the equation \( x^2 + kx - 15 = 0 \) have the solution set \( \{-5, 3\} \)?
Answer: 3

#________: For \( g(x) = -2x^2 + 4x \), what is the value of \( g(3) \)?
Answer: 4

### #________: If \( 4x^5 \cdot 2x^k \cdot 3x^2 = 24x^{21} \), then \( k = \)_______.
Answer: 21

#________: What is the slope of a line perpendicular to \( 12y + 4x = 11 \)?
Answer: 105

### #________: The circle whose equation is \( (x - 4)^2 + y^2 = 25 \) intersects the x-axis at \( x = 9 \). At what other x-value does the circle intersect the x-axis?
Answer: -10

#________: What is the slope of a line perpendicular to \( 12y + 4x = 11 \)?
Answer: -4

### #________: The circle whose equation is \( (x - 4)^2 + y^2 = 25 \) intersects the x-axis at \( x = 9 \). At what other x-value does the circle intersect the x-axis?
Answer: -6

#________: In a \( 45^\circ - 45^\circ - 90^\circ \) triangle, the legs are \( 5\sqrt{2} \) units long. What is the length of the hypotenuse?
Answer: 7

### #________: If \( f(k) = 14 \) for \( f(x) = x^2 - 5x \), what is one possible value of \( k? \)
Answer: -30

#________: If \( |4x + 2| - 3 = 7 \), then one possible value of \( x \) is:
Answer: 7

### #________: If the coordinate \((-5, 4)\) is translated right 2 units and down 3 units, what would be the sum of the numbers in the new coordinate?
Answer: -30

Jenny Simmons
Geometry

Assignment

Solve for $x$.

1) $22x + 4$
   $24x - 2$

2) $9x$
   $45^\circ$

3) $10x - 5$
   $2 + 9x$

4) $16x - 4$
   $60^\circ$

5) $25x - 4$
   $96^\circ$

6) $85^\circ$
   $x + 94$

7) $58^\circ$
   $x + 127$

8) $62^\circ$
   $32x - 2$

9) $50^\circ$
   $x + 137$

10) $7 + 9x$
    $11x - 7$
Radicals

Simplify.

1) \( \sqrt{8} \)

2) \( \sqrt{45} \)

3) \( \sqrt{18} \)

4) \( \sqrt{80} \)

5) \( \sqrt{32} \)

6) \( \sqrt{64} \)

7) \( \sqrt{36} \)

8) \( \sqrt{100} \)

9) \( \sqrt{50} \)

10) \( \sqrt{12} \)

11) \( \sqrt{75} \)

12) \( \sqrt{125} \)

13) \( \sqrt{20} \)

14) \( \sqrt{48} \)

15) \( \sqrt{16} \)

16) \( \sqrt{27} \)

17) \(-4\sqrt{5} - 3\sqrt{5}\)

18) \(-3\sqrt{3} - 4\sqrt{3}\)

19) \(3\sqrt{10} + 2\sqrt{10}\)

20) \(-4\sqrt{8} + 4\sqrt{8}\)

21) \(-5\sqrt{5} + 3\sqrt{5}\)

22) \(-2\sqrt{8} - \sqrt{8}\)

23) \(-2\sqrt{10} + 4\sqrt{10}\)

24) \(4\sqrt{8} + 5\sqrt{8}\)

25) \(-4\sqrt{6} - 5\sqrt{6}\)

26) \(-3\sqrt{2} - 5\sqrt{2}\)
Radicals

Simplify.

1) \(10 \sqrt{640n^2}\)

2) \(-10 \sqrt{576k^5}\)

3) \(9 \sqrt{320x^5}\)

4) \(-\sqrt{200x^3}\)

5) \(-4 \sqrt{98r}\)

6) \(7 \sqrt{729k^3}\)

7) \(-3 \sqrt{32n^2}\)

8) \(-8 \sqrt{300b^4}\)

9) \(-2 \sqrt{162v^4}\)

10) \(-6 \sqrt{64x}\)

11) \(8 \sqrt{512m^2}\)

12) \(-10 \sqrt{300v^3}\)

13) \(3 \sqrt{18x^4}\)

14) \(-5 \sqrt{147x}\)

15) \(5 \sqrt{64x^2}\)

16) \(-4 \sqrt{45b^2}\)

17) \(3 \sqrt[6]{384} + 2 \sqrt[6]{384} + 2 \sqrt[6]{6}\)

18) \(-2 \sqrt[4]{405} + 2 \sqrt[4]{5} - 3 \sqrt[3]{32}\)

19) \(-2 \sqrt[3]{16} - 3 \sqrt[3]{6} - 2 \sqrt[3]{48}\)

20) \(2 \sqrt[18]{18} - 3 \sqrt[45]{3} + 3 \sqrt[18]{18}\)

21) \(3 \sqrt[3]{48} - 3 \sqrt[3]{6} - 3 \sqrt[3]{2}\)

22) \(-\sqrt[3]{4} + 2 \sqrt[3]{108} + 2 \sqrt[3]{5}\)

23) \(-2 \sqrt[4]{162} - \sqrt[4]{2} - 2 \sqrt[4]{5}\)

24) \(2 \sqrt[5]{5} - \sqrt[20]{20} + 2 \sqrt[27]{27}\)

25) \(3 \sqrt[4]{2} - \sqrt[4]{2} - 3 \sqrt[4]{48}\)

26) \(-2 \sqrt[3]{135} - 2 \sqrt[3]{6} - 2 \sqrt[5]{5}\)
Circuit Training – Slope / Rate of Change

Directions: Begin in cell #1. Read the question and show the work necessary to answer it. You may need additional sheets of paper, and graph paper would be useful (but not required)! No technology is needed. Circle your answer and then search for it. When you find it, call that cell #2 and proceed in this manner until you complete the circuit.

<table>
<thead>
<tr>
<th>Answer: $\frac{5}{12}$</th>
<th>Answer: $\frac{3}{2}$</th>
</tr>
</thead>
<tbody>
<tr>
<td># <em><strong>1</strong></em> Calculate the slope between the points (7, 5) and (3, 3).</td>
<td># ___ A line has an x-intercept of –2 and a y-intercept of 6. What is the slope of the line?</td>
</tr>
<tr>
<td>Answer: $\frac{4}{3}$</td>
<td>Answer: $-\frac{2}{5}$</td>
</tr>
<tr>
<td># ___ What is the slope of a vertical line?</td>
<td># ___ For the line $y = \frac{3}{5}x - 1$, each increase of 10 in the x-coordinate results in an increase of ___ in the y-coordinate.</td>
</tr>
<tr>
<td>Answer: 0</td>
<td>Answer: 0.25</td>
</tr>
<tr>
<td># ___ Find the slope of the line $5x + 3y = 12$.</td>
<td># ___ Are these points collinear? In other words, do they lie on the same line? (5, 3) (0, -1) (-25, -21)</td>
</tr>
<tr>
<td>Answer: $\frac{1}{2}$</td>
<td>Answer: $\frac{1}{5}$</td>
</tr>
<tr>
<td># ___ The line segment AB has endpoints A(0, -4) and B(-3, -2). What is the slope of line segment AB?</td>
<td># ___ The vertices of a right triangle are (-5, 0), (7, 0), and (7, 5). What is the slope of the hypotenuse?</td>
</tr>
<tr>
<td>Answer: -8</td>
<td>Answer: $\frac{3}{4}$</td>
</tr>
<tr>
<td># ___ If two lines are parallel then their slopes are the same but their y-intercepts are different. What is the slope of a line parallel to the line $4x - 3y = 12$?</td>
<td># ___ The slope of the line which connect points G(-3, -2) and H(x, 11) is undefined. What is the value of x?</td>
</tr>
</tbody>
</table>

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Appendix G: Support to diverse learners
<table>
<thead>
<tr>
<th>Question</th>
<th>What did you do wrong (explain in words)?</th>
<th>Corrected Problem (show all work)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Wrong Slope</td>
<td>$2x + y = 12$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$y = 2x + 12$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Perpendicular Slope</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question</th>
<th>What did you do wrong (explain in words)?</th>
<th>Corrected Problem (show all work)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td></td>
<td>$\frac{12}{25}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question</th>
<th>What did you do wrong (explain in words)?</th>
<th>Corrected Problem (show all work)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td></td>
<td>$3x + 4y = 3$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$4y = 3x + 3$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$y = \frac{3}{4}x + \frac{3}{4}$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question</th>
<th>What did you do wrong (explain in words)?</th>
<th>Corrected Problem (show all work)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td></td>
<td>$3x + 2y = 10$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$2y = \frac{3x}{2}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$y = \frac{3}{2}x + 5$</td>
</tr>
</tbody>
</table>
Geometry Honors – Bonus (20 points)

Find the Area of the square in terms of $c^2$

Simplify it:

\[ 4 \left( \frac{1}{2}ab \right) + c^2 \]
\[
(\sqrt{a^2 + 2ab + b^2})^2 = 2ab + c^2 \]
\[
a^2 + 2ab + b^2 = 2ab + c^2 \]
\[
c^2 = a^2 + b^2 \]

Find the Area of the square in terms of $c^2$

Simplify it:

\[ c^2 = 4 \frac{1}{2} ab + b^2 \]
\[
c^2 = 2ab + \sqrt{(a-b)^2} \]
\[
c^2 = 2ab + a^2 - 2ab + b^2 \]
\[
c^2 = a^2 + b^2 \]
DIRECTIONS:

There are 32 cards.
8 story cards (S1, S2, S3, ...),
8 inequality cards (I1, I2, I3, ...),
8 answer cards (A1, A2, A3, ...),
and 8 graph cards (G1, G2, G3, ...).

Each story card will match with an inequality card, an answer card, and a graph card. Record your matches in this grid. Show how you solved the cards on the back.

<table>
<thead>
<tr>
<th>Story Cards</th>
<th>Inequality Cards</th>
<th>Answer Cards</th>
<th>Graph Cards</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>I13</td>
<td>A5</td>
<td>G9</td>
</tr>
<tr>
<td>S2</td>
<td>I18</td>
<td>A7</td>
<td>G6</td>
</tr>
<tr>
<td>S3</td>
<td>I2</td>
<td>A1</td>
<td>G8</td>
</tr>
<tr>
<td>S4</td>
<td>I4</td>
<td>A4</td>
<td>G7</td>
</tr>
<tr>
<td>S5</td>
<td>I7</td>
<td>A2</td>
<td>G1</td>
</tr>
<tr>
<td>S6</td>
<td>I5</td>
<td>A6</td>
<td>G3</td>
</tr>
<tr>
<td>S7</td>
<td>I6</td>
<td>A3</td>
<td>G6</td>
</tr>
<tr>
<td>S8</td>
<td>I4</td>
<td>A8</td>
<td>G2</td>
</tr>
</tbody>
</table>