A Teaching Practicum at Doherty Memorial High School

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Abstract

This paper talks about my time as an aspiring teacher at Doherty Memorial High School in Worcester, Massachusetts. I, myself, have always wanted to be a math teacher since childhood, and have learned under countless fantastic teachers. In high school, I was a teacher's assistant in a Geometry class, in addition to helping my other classmates in other math courses with homework.

When I heard about the Teaching Program at WPI, where I could actually teach in front of the classroom for the first time, I latched on and planned my schedule to get all of my requirements done. As the time for me to step in charge approached, I thought, "This should be easy, right? Even if Worcester Public Schools has more inner-city students…" The rest of this paper shows how it went.

Chapter 1: Background Information

1. The Massachusetts Education Reform Act of 1993 (MERA) did several things: one was that it increased state funding for the education system. State funding doubled from $1.3 billion in 1993 to $2.6 in 2000. MERA also implemented the state's standardized assessment: the Massachusetts Comprehensive Assessment System (MCAS). All classes starting from the Class of 2003 must perform beyond the "Needs Improvement" level to graduate from high school. MERA instructed the Board of Education to develop basic standards such as curriculum frameworks, as well as supporting each district's implementation of standards.

2. Massachusetts has, for years, ranked amongst the top 10, often top 5, for public education. Graduation rate was 83.4% in 2011, and increased to 84.7% in 2012. During a debate in the 2012 presidential election, Republican candidate Mitt Romney brought up how Massachusetts has the best schools out of all the 50 states. This is reflective of Massachusetts's dominance in standardized testing. Eighth graders have routinely ranked #1 for advanced-proficiency in the Mathematics section of the National Assessment of Education Progress (NAEP) since 2007, while fourth graders have scored or tied for first in Reading. The Trends in International Mathematics and Science Study (TIMSS) is an international standardized test given that measures achievement in the aforementioned subjects. Since 1995, the test has been administered to fourth and eighth graders around the world. The latest assessment occurred in 2011, where Massachusetts's own eighth graders statistically tied with Japan while being

surpassed by 4 other countries. For Science, Massachusetts statistically tied with 4 other countries and was surpassed only by Singapore.

3. The Curriculum Frameworks were one of the crucial results of MERA. They provide the ideal guidelines and standards for each and every subject provided by Massachusetts's public education. To ensure the success of each generation, the state continually revises the Frameworks, as they are "works in progress". The Massachusetts Department of Elementary and Secondary Education website describes the Frameworks as high quality, results driven, and focused on world-class standards. The most recent notable changes to the Frameworks occurred when they were upgraded to incorporating the Common Core, which is the topic of the next section.

4. The drive behind the Common Core Standards Initiative is to bring together the curricula of each state within the country. The standards give concrete guidelines for every grade within elementary and secondary education for teachers to educate their students for Mathematics and English Language Arts. Massachusetts adopted the Standards of the Common Core on July 21, 2010, with the state fully implementing it this upcoming scholastic year (2013-2014).

5. Socioeconomic Profile for Doherty Memorial High School:

Race	**% of School**	**% of District**	**% of State**
African American	14.0	14.2	8.6

Asian	9.7	8.1	5.9
Hispanic	29.5	38.1	16.4
Native American	0.7	0.3	0.2
White	43.7	35.8	66.0
Native Hawaiian, Pacific Islander	0.0	0.0	0.1
Multi-Race, Non-Hispanic	2.5	3.5	2.7

6. MCAS Profile, Annual Comparisons

Note: All Numbers within the table (apart from years) denote percent of school

English Language Arts

Achievement Level	**2009**	**2010**	**2011**	**2012**
Advanced	20	15	30	31
Proficient	55	56	48	49
Needs Improvement	20	24	17	15
Failing	5	6	5	5

Mathematics

Achievement Level	**2009**	**2010**	**2011**	**2012**
Advanced	43	42	45	48
Proficient	23	25	28	24

Needs Improvement	20	21	16	18
Failing	14	11	11	10

Science and Technology/Engineering

Achievement Level	**2009**	**2010**	**2011**	**2012**
Advanced	8	5	12	12
Proficient	37	40	48	46
Needs Improvement	45	47	31	30
Failing	10	8	9	12

7. An ELL-student, or English Language Learner, neither speaks English as a primary language nor has developed fluency. Such students are identified through multiple assessments:
    - A home language survey given to the parent or guardian of all children when they enter Worcester Public Schools,
    - An oral test to measure children's understanding of English when listening or speaking (Oral Idea Proficiency Test©:oral IPT),
    - A test of the child's writing and reading for 3rd grade and higher (Language Assessment Scale: LAS), and
    - A sample of each child's writing in the child's native language (for children in the 3rd grade and higher).

    Formed in 2002, Sheltered English Immersion (SEI) is a set of programs where ELL students are instructed by registered teachers to rapidly develop proficiency

in English. Components include English language instruction and sheltered content instruction. Sheltered English instruction must be delivered for any ELL student in a general classroom, and such a classroom has to be considered an SEI classroom. In 2011, 94% of ELL students in Massachusetts were enrolled in SEI programs.

Chapter 2: Planning the Curriculum

I taught three classes at Doherty Memorial High School. The first was Algebraic Reasoning/Math IV, the second Algebra II Honors, and the third Math IV. I was also in charge of a Study Hall with my mentor, Lucas Markgren, during another period.

My time at Doherty taught me how to effectively formulate weekly lesson plans, using the textbook material with additional citations from the Curriculum Frameworks, which this past scholastic year implemented the Common Core. The lessons everyday almost always went according to plan based on what I wrote for the week. The progress from one week then determined the preliminary outlook of the following week, which I used to plan out the next five lessons. This cycle continued until the end of my time.

Another problem I faced while I planned a week was how to balance it. For Math IV, I typically gave 2 or 3 lectures a week, a day of group work, and a quiz or test. The days where I assigned group work allowed students to work with each other to solve problems that I gave directly from the textbook. I originally felt more lenient towards quizzes and tests, but I could not wait too long to assess my students because what I taught them could have gone to waste. In the end I generally gave a quiz a week, usually on a Friday. However, if I did not cover enough material, I would wait until the following Monday or Tuesday. Tests came at the conclusion of a chapter in the textbook, which happened every 3 or 4 weeks. While the tests I gave increased in difficulty, class averages tended to grow, particularly with students struggling with the material. The next chapter will deal with assessment in general.

For Algebra II, weeks looked very similar, but it was harder to implement a day of group work due to the fact that it was a more conventional high school math class.

However, before a test I would review with the class by posing questions based on the material. Additionally I would take one day the following week after grading the test to go over questions with the class to clear up any confusion anyone may have had. Often a day from a week would be missing because of holidays, events, or in the rare case, snow days.

Chapter 3: Delivering Effective Instruction

In the classroom, I started off by simply lecturing in front of the room, but that did not completely work. Some students slept while I talked because of the lack of interaction between the classroom and myself. Even so, other students found it hard to ask questions since I would be talking for the majority of class. In the end, I purposefully did not finish some of the points and called on students to fill in the blank. Additionally, I posed more questions while I wrote on the board as a quick check on the students' abilities. This allowed for me to see who was still struggling. As a result, I would call on him or her more often, providing helpful hints whenever necessary.

Assessment, on the other hand, was in my personal opinion where my skills in instruction grew the most. In the beginning I felt sympathy for my students after my mentor ransacked them with difficult tests, which averaged between 50 and 70 depending on the class. However, I came to realize that assessment is not about handing good grades; it was to ask the students questions that made them think and to see just how well they understood the material. Over time, I made the quizzes and tests progressively harder while also improving my ability to instruct the classroom effectively. As a result, my students improved in their comprehension and stood triumphant after three months of hard work.

Chapter 4: Managing the Classroom

Classroom Management by far gave me the biggest challenge. Because of this, I took the most time thinking about how to improve my effectiveness in keeping the class together and focused.

Despite starting off with three well-disciplined classes, the mischievous students in the first class (Math IV) I taught caught on to my passive style and began to misbehave. The class itself had a tremendous amount of energy, which I tried to channel into the days where I assigned group work (where they usually excelled). Despite this, those students went on regardless, testing me at every chance they had. In hindsight, I knew that I had the wrong approach, but I still had a constant fear of being the overly strict, condescending teacher that no student would ever want. After some advice from one of the aides in another one of my classes, my mentor, and even my advisor, Professor Goulet, I tried to be more direct. Over time, I began to directly address classroom standards, threatening numerous times to have students pay attention, which included "eyes on the board", "that phone belongs in your pocket", and "why aren't you copying this down". After the week where I struggled most, I issued several detentions for various misbehaving students, which gradually subsided by the time I finished teaching at Doherty.

Chapter 5: Promoting Equity

In my classes, I made sure to keep students motivated to well, and commend them for their accomplishments, such as doing well on a quiz or test, improving in the grand scheme of the class, and coming to understand the deeper meanings of the material. For the latter, I remember working with a student who asked me on how to do the homework I assigned. I only gave subtle hints and some general examples, because just giving the answer does not help in the long run. This did, however, make something click in the student's head so that she understood how to solve the problems, and she thanked me for the help.

I also had to address the quiet students in each of my classes. I had students who loved to talk and answer my questions, but there were times where I had to stop them. I would say something like, "I know you know the answer, but I'm going to let someone else take a shot." I knew that if the regulars dominate the class discussion, I would have no gauge on how the other students were doing. Thus, I would call on different students to bring them in and include them to avoid the "left out" feeling.

Chapter 6: Professional Responsibilities

There were plenty of times where I reflected on bad days in the classroom. At the conclusion of my second day teaching, I remember feeling disappointed about my performance and began to doubt myself on whether or not I was cut out for the job. I thought that the previous day went well, but how things turned the other way overnight discouraged me. I talked with Lucas (my mentor) about it, and he said that it was only my second day and that I should not be beating myself up over it. While things did improve, the day of my second observation came as a build up of the things I was not doing to manage a good classroom. I knew I did not do as well, but it really came as a wake-up call saying, "Maybe you should start addressing your issues, because at this rate you won't make it!" The day after, I talked with Lucas about it and he gave some encouraging words: "Remember that your Algebra II class is going very well for you. I told him that next time he should observe that class to get additional perspective."

Chapter 7: My WPI Experience

My time at WPI valiantly prepared me for my practicum at Doherty. Already having completed several high-level math courses such as Linear Algebra II and Graph Theory, I had a vast background of knowledge that I used to my advantage. Also during the practicum, I took the mandatory Real Analysis sequence and attended a seminar that taught the LaTeX document language. At first during the practicum, I used Microsoft Word to produce documents such as homework and assessments. By the second half of the practicum, I produced all documents using LaTeX.

A major mathematical concept of which I have a large background to is Matrices and Linear Algebra. As mentioned above, I took both fundamental Linear Algebra courses at WPI and had previous experience with matrices in high school. In one of my classes, I reached the chapter that covered matrices as a build up to find different ways to solve a basic system of linear equations. I used my skill in the topic to teach my students the techniques to solve a variety of related problems. At the end of the chapter came a two-part assessment on the material presented in class.

WPI also taught me not only the theories behind math, but also its practices. This allowed me to teach the students various applications of math in real life problems, a common issue within WPI. In two classes, I gave a weeklong project where I worked to solve difficult word problems that required basic algebraic techniques. This included the distance equation as well as percent and mixture problems. In my third class, I used quadratic functions to model free fall and taught how to find the total impedance of a basic electrical circuit using complex numbers. To add to this, one of my students remarked that he was learning about circuits in his engineering class.

Finally, as part of the practicum requirements, I took a class my sophomore year titled, "ID 3100: Teaching Methods in Mathematics and Science". There, I and other students went to Doherty (after their school day) to learn how to plan lessons, teach in front a class, and discuss student disabilities and learning problems, all under Doherty's Math and Science Department Heads, Renah Razzaq and John Staley. It was here where I developed a true understanding of not only the challenges behind teaching, but also the excitements. I remember the times I spent in front of the classroom did not always go well, but I reflected afterward so I could prepare for the fall when I would actually be in charge of a full-fledged classroom full of surprises.

Chapter 8: My Classroom Experience

I taught students from a very wide demographic. The Advanced Algebra Class, or Algebra II, had African-American, Asian American, Latino-American, and Caucasian students, as well as one Iraqi immigrant. There was a general mix in terms of both dynamic and skill: some rarely spoke during class while others asked many questions. There were those who understood the material well and those who needed more time before full comprehension. However, this class ultimately gave their best effort everyday. With my personal encouragement and advice, the students continued to improve on their abilities and ultimately stood strong at the end of my time there.

In Algebraic Reasoning, or Math IV, the majority were inner-city students from around Worcester, which included African-Americans, Latinos, and a mix of immigrants and government refugees. There were also a few Caucasians in a Special Education Program that allows them to take exams with a designated instructor. The students from an immigrant background had a wide range of ability to speak the English language: Some were practically fluent but were still classified as low processing. It is clear however, that there are still some who continue to struggle speaking it. Of the two classes, one was very lively and rambunctious while the other was more quiet and lacked confidence. This gave me the challenge with managing the classroom as mentioned before.

Now for how the day usually went (on next page):

Period 2: Math IV

I came in at around 8:00 every morning, with five to ten minutes left in Period 1. This class was a homeroom, so I could take advantage of this to set up the whiteboard with notes or plans for the day.

When the bell rings after every period, I stand outside to greet students as they come in. Many of my good students in Period 2 came in before the bell rang to start the class, while the rest came at varying times. To my left, away from the whiteboard, were my good students who did well with the material. They behaved well during class and caused little trouble, apart from one student who simply liked to talk. The right formed much of the rambunctious group that gave me trouble with managing the classroom. During class, I usually directed questions towards those students to get their attention.

On a day where I lecture in front of the class, I let the class settle, which usually took about 15 seconds. Afterwards I check homework, walking around the class and taking down who did in my notebook, so I could put the numbers onto the online gradebook. Then, I go over questions that students had, then go into the day's notes. I asked questions as I went over the material to check on the students' comprehension.

On Group Work days, however, I only talked when students needed help. I gave problems from the textbook, tell the students to get with their assigned groups, and then do the work for the rest of class. On quiz and test days, students with IEPs go to designated instructor to take the quizzes and tests, while the rest stay with me in the classroom. Often times in the classroom, I had to tell students to stay quiet while others finished.

Period 3: Algebra II

Algebra II was definitely my favorite class to teach. As mentioned above, this class gave their all every day.

In an opposite to the previous class, my quiet side formed the right (again, away from the whiteboard) and the vivacious side formed the left. Unlike Period 2, however, the vivacious side asked questions related to the material while I talked. Whenever I gave problems to solve during class, I directed questions to any student, although one student in particular liked to volunteer, to the point where I often had to skip her over.

Test days always varied. As mentioned before, I gave a relatively easy test at first with a formula sheet provided. This boosted the students' confidence in doing well. As I added difficulty, most students began to worry more and more, but I reassured them that if they studied well, they would do well on the test. As mentioned before, test scores generally stayed consistent across the class for one particular test, but averages improved in the course of three months.

Period 4: Math IV

This second Math IV class is the quiet one mentioned above. Many lacked confidence, and just watched me talk. Some asked clarification questions, but other than that, few talked besides me, at least in the early days. Soon I began to ask, "Everyone get that?" to get a true picture, and if I saw people shaking heads, I would go further in depth.

For the setup of the classroom, I had many quiet students to my left (same as above), one student in the center of the front row, another two seats behind him, one near the

back corner, and an additional four to my right. These four students like to socialize amongst each other, two of them in particular, as they were best friends. The catch, though, was that one was smart and understood the material easily while the other genuinely despised math as it came.

Class days, however, went similarly to Period 2 with few differences. This class moved through material a tad bit faster as the students behaved much better.

Period 5: AP Statistics

I observed AP Statistics everyday due to restrictions on AP courses. This allowed me to observe Lucas as Mr. Markgren for a while longer and see how he teaches a class. The one thing I always noticed was that when he spoke, everyone listened. As soon as he started speaking at the start of class, all students were quiet. I then tried successfully to convey that aura when I spoke during my other classes.

This period was also the lunch period, and during the lunch break I got to meet the other teachers in the math department. Through their various personalities, I absorbed their stories into my own thoughts to develop my ways in teaching in addition to Professor Goulet and Lucas.

Period 6: Study Hall

I only began to manage Study Hall half way into November, but nonetheless I could get my taste at more classroom management tasks. After this class I left for the day, leaving my mentor to teach the final class, Period 7.

Lucas and I had a few good students who did their work during this period, as they should. However, there were several who talked endlessly and had no work whatsoever, because they simply would either not bring it or say, “I’ll do it when I get home.” I had to raise my voice several times when Lucas was away and yell, “QUIET!!!” which often times worked.

During the last few days in December, I forced three students into detention when I found them tossing a crunched up paper ball around. At first, both Lucas and I saw them, and we both kindly asked them to stop. I often kept my eyes on them while I did my own homework from my lone class in B term. They tried to throw it when I was not looking, and I let it go a few times, acting as if nothing happened. In reality, I was waiting for the proper time to expose them. Eventually after about ten tosses, I said, “Saw it.” Lucas then said, “Wait… are you guys seriously still throwing stuff? You now have detention after school tomorrow.” In my head, I said, “serves you right.”

Conclusion

What I ultimately learned from this experience is the true nature of the teaching profession: It is not only a difficult and rigorous job, but also something to be treasured in the long run. I definitely enjoyed helping students grow in their academic abilities. However, having students to grow attached to you within a short span of three months was ultimately the most rewarding part of this experience. Just as they learned to be better math students from me, I learned to be a better math teacher from them.

With this experience, I am now confident that down the road, taking the Massachusetts Test for Educator Licensure (MTEL), I can succeed in this profession. Now that I have taught in a classroom full of surprises, I am ready.

References (For Chapter 1)

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http://www.doe.mass.edu/frameworks/

About the Common Core Standards
Common Core: State Standards Initiative
http://www.corestandards.org/about-the-standards/

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Massachusetts Department of Elementary and Secondary Education
http://profiles.doe.mass.edu/mcas/mcascharts2.aspx?linkid=33&orgcode=03480512&fycode=2012&orgtypecode=6&

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Office of English Language Learners, Worcester Public Schools
http://ell-support.worcesterschools.org/modules/locker/files/get_group_file.phtml?gid=1577641&fid=7238147

SEI Guidelines
Massachusetts Department of Elementary and Secondary Education
www.doe.mass.edu/retell/sei-guidelines.docx

Appendix A: Selected Lesson Plans

COURSE : ALGEBRA 2					Week of : 10/21.2013 WEEK 9
Weekly Objectives : N-CN: THE COMPLEX NUMBER SYSTEM. A-SSE.3b: COMPLETE THE SQUARE IN A QUADRATIC EXPRESSION TO REVEAL THE MAXIMUM OR MINIMUM VALUE OF THE FUNCTION IT DEFINES.					
Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Notes/Comments:**
Framework N-CN	Framework A-SSE.3b	Framework A-SSE.3b	Framework	Framework	**Vocabulary:** IMAGINARY UNIT, COMPLEX NUMBER, IMAGINARY NUMBER, COMPLEX CONJUGATE, COMPLEX PLANE, COMPLETE THE SQUARE, QUADRATIC FORMULA, DISCRIMINANT
Standard #(s)	Standard #(s)	Standard #(s)	Standard #(s)	Standard #(s)	
SAP	SAP	SAP	SAP	SAP	
Methodologies	**Methodologies**	**Methodologies**	**Methodologies**	**Methodologies**	
☑ Lecture	☑ Lecture	☑ Lecture	☑ Lecture	☐ Lecture	MONDAY: Chapter 4.6
☑ Teacher Modeling	☑ Teacher Modeling	☑ Teacher Modeling	☑ Teacher Modeling	☐ Teacher Modeling	TUESDAY: Continue Chapter 4.6, Start 4.7
☐ Media Presentation	☐ Media Presentation	☐ Media Presentation	☐ Media Presentation	☐ Media Presentation	WEDNESDAY: Continue Chapter 4.7, Start 4.8
☐ Small Group	☐ Small Group	☐ Small Group	☐ Small Group	☐ Small Group	THURSDAY: REVIEW
☑ Class/Group Discussion	☑ Class/Group Discussion	☑ Class/Group Discussion	☑ Class/Group Discussion	☐ Class/Group Discussion	FRIDAY: TEST: Chapter 4
☑ Question/answer	☑ Question/answer	☑ Question/answer	☑ Question/answer	☐ Question/answer	NOTES: Chapters 4.6 to 4.8.
☑ Guided Practice	☑ Guided Practice	☑ Guided Practice	☑ Guided Practice	☐ Guided Practice	
☑ Independent practice	☑ Independent practice	☑ Independent practice	☑ Independent practice	☑ Independent practice	
☐ Computer Lab	☐ Computer Lab	☐ Computer Lab	☐ Computer Lab	☐ Computer Lab	
☐ Science Lab	☐ Science Lab	☐ Science Lab	☐ Science Lab	☐ Science Lab	
☐ Calculator	☐ Calculator	☐ Calculator	☐ Calculator	☐ Calculator	
Assessments of learning:	**Assessments of learning:**	**Assessments of learning:**	**Assessments of learning:**	**Assessments of learning:**	
☑ Individual	☑ Individual	☑ Individual	☑ Individual	☑ Individual	
☐ Group	☐ Group	☐ Group	☐ Group	☐ Group	
☑ Written	☑ Written	☑ Written	☑ Written	☑ Written	
☐ Oral	☐ Oral	☐ Oral	☐ Oral	☐ Oral	
Homework :	**Homework :**	**Homework :**	**Homework :**	**Homework :**	
Page 279: 4-52, every fourth (Due Thursday)	**Page 288: 3-27, every third, 42-48 even (Due Friday)**	**Page 296: 24-39, every third (Due Friday)**		**Read 4.9, 4.10**	

Sample Algebra II Lesson Plan 1

COURSE : ALGEBRA 2 — **Week of : 11/12/2013 WEEK 12**

Weekly Objectives : A.REI: SOLVE SYSTEMS OF EQUATIONS

Monday	Tuesday	Wednesday	Thursday	Friday
Framework	Framework A.REI	Framework	Framework	Framework A.REI
Standard #(s)	Standard #(s)	Standard #(s)	Standard #(s)	Standard #(s)
SAP	SAP	SAP	SAP	SAP
Methodologies	**Methodologies**	**Methodologies**	**Methodologies**	**Methodologies**
☐ Lecture	☑ Lecture	☑ Lecture	☐ Lecture	☑ Lecture
☐ Teacher Modeling	☑ Teacher Modeling	☑ Teacher Modeling	☐ Teacher Modeling	☑ Teacher Modeling
☐ Media Presentation	☐ Media Presentation	☐ Media Presentation	☐ Media Presentation	☐ Media Presentation
☐ Small Group	☐ Small Group	☐ Small Group	☐ Small Group	☐ Small Group
☐ Class/Group Discussion	☑ Class/Group Discussion	☑ Class/Group Discussion	☐ Class/Group Discussion	☑ Class/Group Discussion
☐ Question/answer	☑ Question/answer	☑ Question/answer	☐ Question/answer	☑ Question/answer
☐ Guided Practice	☑ Guided Practice	☑ Guided Practice	☐ Guided Practice	☑ Guided Practice
☐ Independent practice	☑ Independent practice	☑ Independent practice	☑ Independent practice	☑ Independent practice
☐ Computer Lab	☐ Computer Lab	☐ Computer Lab	☐ Computer Lab	☐ Computer Lab
☐ Science Lab	☐ Science Lab	☐ Science Lab	☐ Science Lab	☐ Science Lab
☐ Calculator	☐ Calculator	☐ Calculator	☐ Calculator	☐ Calculator
Assessments of learning:	**Assessments of learning:**	**Assessments of learning:**	**Assessments of learning:**	**Assessments of learning:**
☐ Individual	☑ Individual	☑ Individual	☑ Individual	☑ Individual
☐ Group	☐ Group	☐ Group	☐ Group	☐ Group
☐ Written	☑ Written	☑ Written	☑ Written	☑ Written
☐ Oral	☐ Oral	☐ Oral	☐ Oral	☐ Oral
Homework :	**Homework :**	**Homework :**	**Homework :**	**Homework :**
	Page 164: 5-35, every fifth			**Page 182: 5-35, every fifth (Due Tuesday)**

Notes/Comments:

Vocabulary:
ORDERED TRIPLE

MONDAY:
No School

TUESDAY:
Chapter 3.2

WEDNESDAY:
Review

THURSDAY:
Test 3

FRIDAY:
Chapter 3.4

NOTES:
Test 3: 4.10, 5.1, 6.1, 6.6, 3.2

Sample Algebra II Lesson Plan 2

COURSE : ALGEBRA 2 | **Week of : 12/2/2013 WEEK 15**

Weekly Objectives : N-VM: PERFORM OPERATIONS ON MATRICES AND USE MATRICES IN APPLICATIONS

Monday	Tuesday	Wednesday	Thursday	Friday
Framework N-VM	Framework N-VM	Framework N-VM	Framework N-VM	Framework N-VM
Standard #(s)	Standard #(s)	Standard #(s)	Standard #(s)	Standard #(s)
SAP	SAP	SAP	SAP	SAP
Methodologies	**Methodologies**	**Methodologies**	**Methodologies**	**Methodologies**
☑ Lecture	☑ Lecture	☑ Lecture	☑ Lecture	☐ Lecture
☑ Teacher Modeling	☑ Teacher Modeling	☑ Teacher Modeling	☑ Teacher Modeling	☐ Teacher Modeling
☐ Media Presentation	☐ Media Presentation	☐ Media Presentation	☐ Media Presentation	☐ Media Presentation
☐ Small Group	☐ Small Group	☐ Small Group	☐ Small Group	☐ Small Group
☑ Class/Group Discussion	☑ Class/Group Discussion	☑ Class/Group Discussion	☑ Class/Group Discussion	☐ Class/Group Discussion
☑ Question/answer	☑ Question/answer	☑ Question/answer	☑ Question/answer	☐ Question/answer
☑ Guided Practice	☑ Guided Practice	☑ Guided Practice	☑ Guided Practice	☐ Guided Practice
☑ Independent practice	☑ Independent practice	☑ Independent practice	☑ Independent practice	☑ Independent practice
☐ Computer Lab	☐ Computer Lab	☐ Computer Lab	☐ Computer Lab	☐ Computer Lab
☐ Science Lab	☐ Science Lab	☐ Science Lab	☐ Science Lab	☐ Science Lab
☐ Calculator	☐ Calculator	☐ Calculator	☐ Calculator	☐ Calculator
Assessments of learning:	**Assessments of learning:**	**Assessments of learning:**	**Assessments of learning:**	**Assessments of learning:**
☑ Individual	☑ Individual	☑ Individual	☑ Individual	☑ Individual
☐ Group	☐ Group	☐ Group	☐ Group	☐ Group
☑ Written	☑ Written	☑ Written	☑ Written	☑ Written
☐ Oral	☐ Oral	☐ Oral	☐ Oral	☐ Oral
Homework :	**Homework :**	**Homework :**	**Homework :**	**Homework :**
Homework: Page 207, 3-13 odd, 23, 29, 33*, 44	**Homework: Page 199, 3-17 odd, 23-29 odd, 37, 40**	**Page 214: 3-9 odd, 13-17 odd, 25-33 odd, 43**		

Notes/Comments:

Vocabulary:
DETERMINANT, CRAMER'S RULE, COEFFICIENT MATRIX, INVERSE MATRIX, IDENTITY MATRIX, MATRIX OF VARIABLES, MATRIX OF CONSTANTS

MONDAY:
Chapter 3.7, Continued

TUESDAY:
Chapter 3.5 Revisited

WEDNESDAY:
Chapter 3.8

THURSDAY:
Review

FRIDAY:
Test 4

NOTES:
Test 4: Chapter 3

Sample Algebra II Lesson Plan 3

COURSE : ALGEBRA 2 — **Week of : 10/28/2013 WEEK 10**

Weekly Objectives : 7.EE.1: APPLY PROPERTIES OF OPERATIONS AS STRATEGIES TO ADD, SUBTRACT, FACTOR, AND EXPAND LINEAR EXPRESSIONS WITH RATIONAL COEFFICIENTS.

Monday	Tuesday	Wednesday	Thursday	Friday	Notes/Comments:
Framework	Framework 7.EE.1	Framework 7.EE.1	Framework 7.EE.1	Framework 7.EE.1	**Vocabulary:**
Standard #(s)	Standard #(s)	Standard #(s)	Standard #(s)	Standard #(s)	
SAP	SAP	SAP	SAP	SAP	
Methodologies	**Methodologies**	**Methodologies**	**Methodologies**	**Methodologies**	
☐ Lecture	☑ Lecture	☑ Lecture	☐ Lecture	☐ Lecture	
☐ Teacher Modeling	☑ Teacher Modeling	☑ Teacher Modeling	☐ Teacher Modeling	☐ Teacher Modeling	
☐ Media Presentation	☐ Media Presentation	☐ Media Presentation	☐ Media Presentation	☐ Media Presentation	
☐ Small Group	☐ Small Group	☐ Small Group	☐ Small Group	☐ Small Group	
☐ Class/Group Discussion	☐ Class/Group Discussion	☐ Class/Group Discussion	☐ Class/Group Discussion	☐ Class/Group Discussion	
☐ Question/answer	☑ Question/answer	☑ Question/answer	☑ Question/answer	☑ Question/answer	
☐ Guided Practice	☑ Guided Practice	☑ Guided Practice	☑ Guided Practice	☑ Guided Practice	
☑ Independent practice	☑ Independent practice	☑ Independent practice	☑ Independent practice	☑ Independent practice	
☐ Computer Lab	☐ Computer Lab	☐ Computer Lab	☐ Computer Lab	☐ Computer Lab	
☐ Science Lab	☐ Science Lab	☐ Science Lab	☐ Science Lab	☐ Science Lab	
☐ Calculator	☐ Calculator	☐ Calculator	☐ Calculator	☐ Calculator	
Assessments of learning:	**Assessments of learning:**	**Assessments of learning:**	**Assessments of learning:**	**Assessments of learning:**	MONDAY: Quiz: Sections 2.1 to 2.3
☑ Individual	☑ Individual	☑ Individual	☑ Individual	☑ Individual	TUESDAY: Sections 2.4 and 2.5
☐ Group	☐ Group	☑ Group	☑ Group	☑ Group	WEDNESDAY: Section 2.6, Start Project
☑ Written	☑ Written	☑ Written	☑ Written	☑ Written	THURSDAY: Continue Project
☐ Oral	☐ Oral	☐ Oral	☐ Oral	☐ Oral	FRIDAY: Conclusion of Project
Homework :	**Homework :**	**Homework :**	**Homework :**	**Homework :**	NOTES: Sections 2.4 to 2.6
Classwork: Quiz on Sections 2.1 to 2.3		**Work on Project**	**Work on Project**		

Sample Math IV Lesson Plan 1

COURSE : MATH IV: ALGEBRAIC REASONING — **Week of : 11/12/2013 WEEK 12**

Weekly Objectives : 8.EE.1: KNOW AND APPLY THE PROPERTIES OF INTEGER EXPONENTS TO GENERATE EQUIVALENT NUMERICAL EXPRESSIONS

Monday	Tuesday	Wednesday	Thursday	Friday	Notes/Comments:
Framework	Framework 8.EE.1	Framework 8.EE.1	Framework 8.EE.1	Framework 8.EE.1	**Vocabulary:** EXPONENTIAL EXPRESSION, SCIENTIFIC NOTATION
Standard #(s)	Standard #(s)	Standard #(s)	Standard #(s)	Standard #(s)	
SAP	SAP	SAP	SAP	SAP	
Methodologies	**Methodologies**	**Methodologies**	**Methodologies**	**Methodologies**	MONDAY: No School
☐ Lecture	☑ Lecture	☑ Lecture	☑ Lecture	☑ Lecture	TUESDAY: Section 3.1
☐ Teacher Modeling	☑ Teacher Modeling	☑ Teacher Modeling	☑ Teacher Modeling	☑ Teacher Modeling	WEDNESDAY: Continue 3.1, Cover 3.2
☐ Media Presentation	☐ Media Presentation	☐ Media Presentation	☐ Media Presentation	☐ Media Presentation	THURSDAY: 3.1 and 3.2 Practice
☐ Small Group	☐ Small Group	☐ Small Group	☐ Small Group	☐ Small Group	FRIDAY: Continued Practice with 3.1 and 3.2
☐ Class/Group Discussion	☐ Class/Group Discussion	☐ Class/Group Discussion	☐ Class/Group Discussion	☐ Class/Group Discussion	NOTES: Start Chapter 3: Exponents and Polynomials
☐ Question/answer	☑ Question/answer	☑ Question/answer	☑ Question/answer	☑ Question/answer	
☐ Guided Practice	☑ Guided Practice	☑ Guided Practice	☑ Guided Practice	☑ Guided Practice	
☐ Independent practice	☑ Independent practice	☑ Independent practice	☑ Independent practice	☑ Independent practice	
☐ Computer Lab	☐ Computer Lab	☐ Computer Lab	☐ Computer Lab	☐ Computer Lab	
☐ Science Lab	☐ Science Lab	☐ Science Lab	☐ Science Lab	☐ Science Lab	
☐ Calculator	☐ Calculator	☐ Calculator	☐ Calculator	☐ Calculator	
Assessments of learning:	**Assessments of learning:**	**Assessments of learning:**	**Assessments of learning:**	**Assessments of learning:**	
☐ Individual	☑ Individual	☑ Individual	☑ Individual	☑ Individual	
☐ Group	☐ Group	☐ Group	☑ Group	☑ Group	
☐ Written	☑ Written	☑ Written	☑ Written	☑ Written	
☐ Oral	☐ Oral	☐ Oral	☐ Oral	☐ Oral	
Homework :	**Homework :**	**Homework :**	**Homework :**	**Homework :**	
No School	**Worksheet 3.1-3.2 (Due Thursday)**		**Classwork: Page 197, 8-96 every eighth, Page 207, 7-84 every seventh**	**Classwork: See Thursday**	

Sample Math IV Lesson Plan 2

COURSE : MATH IV: ALGEBRAIC REASONING — **Week of : 12/9/2013 WEEK 16**

Weekly Objectives : A-APR: PERFORM ARITHMETIC OPERATIONS ON POLYNOMIALS

Monday	Tuesday	Wednesday	Thursday	Friday	Notes/Comments:
Framework A-APR	Framework A-APR	Framework A-APR	Framework A-APR	Framework	**Vocabulary:**
Standard #(s)	Standard #(s)	Standard #(s)	Standard #(s)	Standard #(s)	
SAP	SAP	SAP	SAP	SAP	
Methodologies	**Methodologies**	**Methodologies**	**Methodologies**	**Methodologies**	
☐ Lecture	☑ Lecture	☑ Lecture	☐ Lecture	☐ Lecture	MONDAY:
☐ Teacher Modeling	☑ Teacher Modeling	☑ Teacher Modeling	☐ Teacher Modeling	☐ Teacher Modeling	All-School Delay: No Class
☐ Media Presentation	☐ Media Presentation	☐ Media Presentation	☐ Media Presentation	☐ Media Presentation	TUESDAY:
☐ Small Group	☐ Small Group	☐ Small Group	☐ Small Group	☐ Small Group	Finish 3.7
☐ Class/Group Discussion	☑ Class/Group Discussion	☑ Class/Group Discussion	☐ Class/Group Discussion	☐ Class/Group Discussion	WEDNESDAY:
☐ Question/answer	☑ Question/answer	☐ Question/answer	☐ Question/answer	☐ Question/answer	Review
☐ Guided Practice	☑ Guided Practice	☑ Guided Practice	☑ Guided Practice	☐ Guided Practice	THURSDAY:
☐ Independent practice	☑ Independent practice	☑ Independent practice	☑ Independent practice	☑ Independent practice	Review
☐ Computer Lab	☐ Computer Lab	☐ Computer Lab	☐ Computer Lab	☐ Computer Lab	FRIDAY:
☐ Science Lab	☐ Science Lab	☐ Science Lab	☐ Science Lab	☐ Science Lab	Test 3
☐ Calculator	☐ Calculator	☐ Calculator	☐ Calculator	☐ Calculator	NOTES:
Assessments of learning:	**Assessments of learning:**	**Assessments of learning:**	**Assessments of learning:**	**Assessments of learning:**	Test 3 on Chapter 3
☐ Individual	☑ Individual	☑ Individual	☑ Individual	☑ Individual	
☐ Group	☐ Group	☐ Group	☑ Group	☐ Group	
☐ Written	☑ Written	☑ Written	☑ Written	☑ Written	
☐ Oral	☐ Oral	☐ Oral	☐ Oral	☐ Oral	
Homework :	**Homework :**	**Homework :**	**Homework :**	**Homework :**	
Worksheet 3.7	**Worksheet 3.7**		**Classwork: Page 262, 2-30 evens**	**TEST 3**	

Sample Math IV Lesson Plan 3

Appendix B: Selected Math IV Worksheets

Name: _____

Problems to Solve 1

1. Suppose the ratio between the length, width, and height of a box is 4:2:3. If the volume of the box is 72 ft^3, what is the measurement of the height in feet?
2. Suppose that a laboratory needs 10 liters of a 50% solution. You have only 80% and 30% solutions. How much of each do you need?
3. Suppose a store is currently selling sneakers at 40% off. The price tag on one pair reads 20 dollars. How much do the sneakers actually cost?
4. Think of a number. Double it and add twenty. After halving your result, subtract it from the number you thought of. Explain why the final answer is always ten.
5. Let C represent the current temperature in Celsius. If it also C degrees Fahrenheit, what is the value of C?
6. Suppose that Brandon is currently three times as old as Alice. Twelve years from now, Brandon will only be twice as old as Alice. How old is Brandon now?
7. Heron's Formula for the area of the triangle is given as the square root of the product of p, p – a, p – b, and p – c, where a, b, and c are the side lengths and p is half of the perimeter (sum of the side lengths). If a triangle's side lengths are given as 13, 14, and 15, what is the area of the triangle (Use a calculator to find the square root of your product)?
8. Suppose a runaway freight train is traveling westward at 90 kilometers per hour. 20 kilometers west of the runaway, a passenger train is heading eastward at 54 kilometers per hour. The runaway needs to be switched onto a siding to avoid a collision. The closest one is 12.45 kilometers away. Can an accident be avoided?

Additional Exercises 3-7

Name_____

Date_____

Divide.

1. $\dfrac{36x^2 - 24x - 18}{6}$ **1.** _____

2. $\dfrac{17x^4 - 11x^6}{x}$ **2.** _____

3. $\dfrac{42p^3 - 21p^2}{7p}$ **3.** _____

4. $\dfrac{16a^3 - 12a + 6}{4a}$ **4.** _____

5. $\dfrac{5x^5 - 4x^4 + 9}{-5x^5}$ **5.** _____

6. $\dfrac{a^3b - a^2b^4}{ab}$ **6.** _____

7. $\dfrac{27x^2y^3 - 33xy^4 - x^2y}{3xy}$ **7.** _____

8. $\dfrac{x^2 + 10x + 21}{x + 7}$ **8.** _____

9. $\dfrac{5x^3 - 37x - 24}{x - 8}$ **9.** _____

10. $\dfrac{7x^2 - 11x + 4}{x - 1}$ **10.** _____

11. $\dfrac{12x^2 - 5x - 2}{3x - 2}$ **11.** _____

12. $\dfrac{3a^3 + 20a^2 + 21a - 20}{a + 5}$ **12.** _____

13. $\dfrac{6x^3 - 23x^2 + 24x - 10}{2x - 5}$ **13.** _____

14. $\dfrac{5x^3 + 5x^2 - 32x - 10}{x + 3}$ **14.** _____

Appendix C: Selected Math IV Quizzes and Tests

Name: _____

Quiz 4

Solve the following equations for x. SHOW ALL WORK.

Note: If the equation is an identity, write "All Real Numbers". If the equation has no solution, then say so.

1. $x - 10 = 12$
2. $x + 12 = -1$
3. $4x + 3 = 5x - 1$
4. $10x - 9 = 9x + 17$
5. $6x = 12$
6. $-8x + 12 = -20$
7. $8x + 10 = 2x - 50$
8. $2x - 3 = 5x - 9$
9. $3x + 14 = x - 28$
10. $4(x - 3) = 3x + 8$
11. $5(2x + 5) = 4x - 5$
12. $\frac{2}{3}x = 8$
13. $0.1(x - 2) + 0.2 = 0.5x$
14. $2x + 5 = 2x + 5$
15. $3(2x + 10) = 6(x + 10)$

BONUS QUESTION (Worth 2 points)

16. Does the equation $|x + 2| = -5$ have a solution? Explain why.

Name: _____

CHAPTER 2 TEST

1. A Linear _____ is written as $ax + b = c$, where a, b, and c are real numbers.
2. A Linear _____ can be written as $ax + b < c$, where a, b, and c are real numbers.

Solve for x. SHOW YOUR WORK!

3. $x + 3 = 4$
4. $2x = 18$
5. $5x + 3 = 4x + 5$
6. $8x - 9 = 10x - 17$
7. $3(x + 2) = 5x - 10$
8. $5x - 1 - x = 2x + 4 + 3x$
9. $8(x - 1) = -(x + 8)$
10. $x + \frac{3}{2} = 2x + \frac{1}{2}$
11. $\frac{3}{5}x = 9$
12. $\frac{2(x+7)}{3} = 10$
13. $2x + 3 - x = 3(x + 5) - 2x - 12$
14. $9x + 20 = 5x + 2(2x + 20)$

Solve the following inequalities and graph the solution set on a separate sheet of paper.

15. $x \geq -2$

16. $2x - 10 < x - 5$

17. $3x + 10 \leq 2(4x - 5)$

Solve.

18. The Area of Rectangle is the product of the length and the width. Suppose a rectangle had a length of 10 and an area of 40. What is the width?

19. What is 30% of 140?

20. A car was travelling at 50 miles per hour for 4 hours. How far did it travel?

Quiz 6

Name:

Determine whether the following expressions are polynomials. Write "Yes/No".

1. $x^7 + 6x^3 + 2x^4 - x - x^{-2}$
2. $x^2 + x^{-5} + 1$

Simplify the following expressions. Leave every answer in descending powers.

3. $(x + 4) + (3x + 5)$
4. $(3x^2 + 5x - 3) + (5x - 2)$
5. $(6x^2 + 9x - 18) - (9x - 22)$
6. $(11x + 19) - (10x^2 + 20)$
7. $x \cdot (x + 1)$
8. $(4x^2 - 9x) \cdot 7x$
9. $3x^2 \cdot (x + 4x^2)$
10. $(x + 3) \cdot (x - 7)$
11. $(8x + 9) \cdot (2x - 10)$
12. $(x - 13)^2$
13. $(2x + 5) \cdot (2x - 5)$
14. $(x^4 - x) \cdot (x^2 + x^7 - 1)$
15. $(7x + 1) \cdot (x^3 + 5x - 2)$

BONUS QUESTION

16. Simplify $(a + b)^3$.

Test 3

Name:

Simplify the following expressions.

1. $x^2 \cdot x^5$
2. $(-8x)^3$
3. $\dfrac{x^2y^7z^5}{xyz}$
4. $\dfrac{y^{-1}}{x^{-1}}$
5. $(x+4)-(x+4)$
6. $(12x^5-2)\cdot 2x$
7. $(2x-5)\cdot(x+7)$
8. $(6x+13)^2$
9. $(x+1)\cdot(x^2-x+1)$
10. $\dfrac{9x^3+12x^2+6x}{3x}$
11. $\dfrac{2x^2+13x+6}{x+6}$

Evaluate the following expressions when $x=2$.

12. $6x^2-10x+13$
13. $\dfrac{x^3-1}{x^2+x+1}$

TURN PAGE

1

14. Recall that the area of a triangle is equal to half the product of the base and the height ($A = \frac{1}{2}bh$). Suppose that the base is $2x + 4$ and the height is x. What is the area of the triangle?

15. Match the words to the letters to satisfy the following equation:

$$a \cdot b + c = d$$

- dividend
- divisor
- quotient
- remainder

BONUS QUESTION

16. For #11 (on this test), what can x **not** be equal to?

Appendix D: Selected Algebra II Quizzes and Tests

Name: _____

TEST 2: Chapter 4

Remember to show your work!

1. A Quadratic Function with a > 1 reaches its minimum value at its _____.
2. Graph the Equation $y = x^2$. Label the Vertex and Axis of Symmetry (Give a proper equation i.e. $x = h$).

Solve the following equations for x by factoring.

3. $x^2 + 9x + 20 = 0$
4. $x^2 - 49 = 0$

Solve the following equations for x by using the Quadratic Formula.

5. $x^2 - 6x + 10 = 0$
6. $x^2 - 14x + 33 = 0$

Simplify the following radicals.

7. $\sqrt{72}$
8. $\frac{11}{7+\sqrt{5}}$

Simplify the following expressions.

9. $(7 + 3i) - (5 - 2i)$
10. $(7 - 2i)(8 + 9i)$
11. Suppose that $z = 8 - 6i$. What is $|z|$?

12. Let $y = x^2 + 4x - 5$. What is the minimum y-value of this function?
    Hint: Look at Question 1.

Name: _____

QUIZ 5

Write a Quadratic Function Based on the Information Below.

1. Vertex: (1, 6).

   Point: (-1, 2)

2. x-intercepts: -5, -1

   Point: (-7, -24)

Simplify the following expressions.

3. $4^2 \bullet 4^5$
4. $(5^3)^{-1}$
5. $6^3 \bullet 4^3$
6. 7^0
7. $(7 \times 10^3) \bullet (3 \times 10^4)$
8. $b^{-2}b^4b^5$
9. $(a^3b^4)(a^{-2}b^{-5})$

Bonus:

10. Evaluate $512^{2/3}$.

Test 4, Part 1

Name:

Find the solution of the following system. If no solution exists, say so.

1. $\begin{cases} 2x - y + z &= -2 \\ 6x + 3y - 4z &= 8 \\ -3x + 2y + 3z &= -6 \end{cases}$

Given the matrices below, perform the operations listed below.

$$A = \begin{bmatrix} -2 & 3 \\ -3 & 4 \end{bmatrix} \qquad B = \begin{bmatrix} 4 & 0 \\ 6 & 1 \end{bmatrix}$$

2. $A + B$
3. BA (**Not** AB)
4. $\det B$
5. A^{-1}

6. For any $n \times n$ matrix, what must be true so that the inverse matrix exists?

7. Recall that Mr. Markgren has a set of pens and markers as listed below. Suppose he has a projected list for next year, as shown on the right. Construct a matrix that shows the average amount of pens and markers that Mr. Markgren will have after three years.

Color	Pens	Markers
Red	2	4
Blue	9	10
Green	0	5
Black	26	12

Color	Pens	Markers
Red	1	3
Blue	10	7
Green	0	4
Black	40	9

Color	Pens	Markers
Red	1	7
Blue	14	7
Green	0	3
Black	51	11

Test 4, Part 2

Name:

8. Solve the system using 2 of the following methods. Make sure to check your solution!
   - Algebraically (Substitution or Elimination)
   - Cramer's Rule
   - Inverse Matrices

$$\begin{cases} 4x + 7y &= -16 \\ 2x + 3y &= -4 \end{cases}$$

9. Find the area of the triangle formed by the following points: (0,0), (5,2), and (3,6)

10. Suppose that on Field Day at a high school, awards are given out at the end to the top performers of each event. The table below shows how many students from each class earned Gold, Silver, and Bronze. A Gold Medal is worth 3 points, a Silver worth 2, and a Bronze worth 1. After the points are totaled, which class won (i.e. which class scored the most points)?

Class	Gold	Silver	Bronze
Freshmen	17	3	20
Sophomores	12	13	15
Juniors	17	4	19
Seniors	20	4	16