Solving Linear Equations

Teacher Work Sample

Element 1: Learning Context

Platte County is a primarily rural county on the edge of Kansas City with varying levels of diversity, affluence, and education. According to 2010 census data, the population of the county is approximately 90,000 with a median income of $65,948. Around 94.1% of the adult population have their high school diploma and 36.9% have their bachelor’s degree or higher. The population of the district is around 22,548 people and 75.8% are 18 or over (DESE). Additionally, the unemployment rate of Platte County is around 5.7% which means most students have working parents and the median house price is $166,200 which also indicates an affluent area. The ethnic breakdown of Platte County is as follows: 88.2% are white, 6.3% are black, 0.6% are American Indian or Alaskan native, and 5.1% are Hispanic (Census).

The community statistics indicates a fairly affluent area with middle and upper middle class incomes with little diversity. This indicates some affluence and the availability of financial resources. This means that there will be some financial support for some students at home. Since, there is not much diversity in Platte County, this can be an issue as Platte County is close to and the district includes part of Kansas City. Kansas City is much more diverse, so the students will work with a diverse population throughout their daily lives due to proximity. It is essential that the students learn and respect the various cultures and ethnicities. In addition, it will also be important to be on the lookout for any racial or tensions caused by diversity. The best way to combat this would be to create an open and accepting classroom that does not tolerate ignorant and discriminatory behaviors.
Platte County R-3 has reasonable average family incomes with low free and reduced lunch rates, low diversity, and fairly high test scores. According to DESE, within the members of the school district, the average salary is $46,291. This indicates a middle class community, but approximately 22% of the students at Platte County are on free and reduced lunch. So, there are students whose families struggle financially. Platte County R-3 has a population of 3,719 students and the high school has 1,032 students. A high majority of the students are Caucasian (97.7%) followed by African American (6.3%), Hispanic (5.1%), Asian (1.6%), and finally Alaskan Native and Native American (0.5%) (DESE). The mathematics department sees all the students at one point as all students are required to take three mathematics credits to graduate and Algebra 1 is required to be tested by the state. Platte County High school performed well on the Algebra 1 End-Of-Course (EOC) exams during this last year, but Algebra 1 is a high stakes area. Approximately, 9.8% of students scored below Basic, 30.5% scored Basic, 39.8% at Proficient, and 19.9% as Advanced on last year’s Algebra EOC (DESE).

Students at Platte County will mostly have financial and academic support at home, but for those students that struggle, we can adapt the assignments. Due to the financial stability of the families, there will probably be sufficient financial support for the student to cover their needs, but the free and reduced lunch percentage indicates that there will be students that do struggle to buy supplies or don’t have technology at home like computers and internet. This need will be eased by providing calculators at school and CDs with the textbook on them or printing off assignments. The mathematics test scores of the district are fairly good, but there are still too many students that are not achieving proficiency. Thus, there will be some focus to increase those percentages. To raise these scores, there is a new program called the core lab. Basically, the students that are struggling in these core classes can be referred to the core lab during their 50
minute seminar period of Tuesday and Thursday. These students will receive additional
instruction in the appropriate core lab until they are brought back up to speed.

The classroom provides a conducive environment for learning with many tools available
for instruction. The classroom is a fairly large classroom with light paint and shelving on one
side of the room. There are approximately 30 desks lined out in six rows with five seats in each
row. There are white boards on the side of the room with a projector screen in the front of the
room. The teacher desk is in the front left of the room with little space between the desks and
the teacher desk. There is a smart slate that allows the teacher to write lessons and show
examples on the projector screen. In addition, there is a set of graphing calculators and scientific
calculators for student use. There is a class set of textbooks for students and an extra set of
textbooks for the Algebra 1 students to take home and leave. The students also have access to an
online textbook so some of the students will be able to access that and use the interactive features
of the online textbook.

This classroom is conducive for lectures but not really any other instruction styles. In
order to encourage collaboration, we will need to make a conscious effort to group the students
and let them alter the desk arrangement during grouping. The technology and resources will
allow us to differentiate learning for the students by using activities. This should keep students
engaged and will allow us to teach to different learning styles. For Algebra 1, we can give them
book assignments to do at home, but since there are no take home books for Algebra II, we need
to make sure the assignments are still available to those students that do not have internet access
at home.

Platte county high school has a differentiated time schedule with little diversity in any
given classroom. The school day consists of seven periods with an extra seminar period on
Tuesday and Thursday. The average class period on Monday Wednesday Friday is 51 minutes, and the 5th hour is split for lunch. On Tuesday and Thursday, each class is shortened by 8 minutes in order to have seminar. The specific class that I am teaching is during 5th hour and is Algebra 1. There are 17 students in this classroom with 5 female and 12 male students. There is one African American student and no IEPs in this class. All the students can speak English and their families range in socioeconomic status.

Teaching to any range of students is difficult, not to mention challenges with schedules, so alterations to the teaching style are necessary. Since, we are teaching during the lunch shift, our class is split in half so that suggests the need to have an activity that concludes itself before lunch and another that picks up after lunch. In addition, having lunch in the middle of a class strongly affects the student learning. Before lunch, the students will be distracted by hunger and be antsy to get out of the room and often after lunch students are sleepy and unmotivated. This will be a challenge that will need to be met with engaging activities. Since periods are shorter on Tuesday and Thursday it will be important to have shorter lessons on those days. The few number of female students in the course will make it important to make sure that the female students are represented and not left out. With so little diversity, it will be important to make sure the minority students feel comfortable and not alienated. The incorporation of different cultures and a culture of acceptance in the classroom will be extremely important. Even though there are no IEPs, we must remain aware of missed learning disabilities. For the students that are struggling, there is also the core math lab that they students can be referred to for extra assistance during their seminar period. In addition, we will make ourselves available for assistance after and before classes, and the students from families from poorer backgrounds will need alterations to assignments that use technology at home if needed.
There doesn’t seem to be any clear message on a district plan for classroom management and mostly the decision seems to rest with each school and in the high school, each classroom. It seems that Platte County R-3 has, in the past, used the BIST models. Basically, the district leaves the policies for classroom management for each school to decide and Platte County High School has emphasized departmentally consistent grading and classroom management plans. As I mentioned with the district, it seems that Platte County high school uses elements of Marzano’s ideas for classroom management such as the importance for motivating students and curriculum design.

For our individual classroom, there will be some differences in classroom management and will focus on nonverbal management, engagement, and the integration of culture and background. In particular, since the 5th period will be broken up by lunch, the activities will need to be engaging, but in general I plan on using Jones’s philosophy regarding classroom management. One struggle with the physical environment is that it is not easy to make it to each student in a few steps, something crucial to Jones’s philosophy. I will need to make a conscious effort to stay with easy distance of all students and to keep the desks spaced so I can move throughout the room. To handle misbehavior, I will use Jones’s ideas of proximity and nonverbal cues to prevent and stop misbehavior. Jones also feels that you need to keep the students active. I will constantly be asking students questions by using names and also will have activities for the students to do to keep them engaged. As part of my management plan, I will contact the parents early on to discuss their children. These will not be negative contacts but positive ones. This will help me establish a better relationship with the students and parents, and help me better understand my student’s background. This will also ease future communication with the parents. Since, there is not a lot of diversity; the ethnic groups will be dispersed when grouping. The
same will be done with the different socioeconomic background. Also since there is a difference in affluence, when grouping for projects there needs to be a mixture of affluent and poor in order to mix students up.

The students realize that there are multitudes of support for their learning. Between the smallish class sizes and the core lab, there is always additional help if the students need it. During their seminar, students have time to work on homework. The library is also open after school to allow students to work on homework and then get a later bus ride home when they are done. This means if students do not have technology like computers at home then the students have the option to use the technology after school. As another resource for students, I will always be at school at least 30 minutes before and after the day begins and ends. If the student wants to meet earlier, later, or at a different time, I would be more than happy to accommodate them.

Due to the implementation of the common core standards, many of the students in middle school are learning Algebra I concepts before they take the course. As a result, the material in Algebra I is not new for several months for freshmen students. This means the material must be taught in a deeper way in order to add to the student knowledge. The objectives will also need to focus on critical thinking skills and reinforce the lessons the students have previously learned.

The students that are in today’s school are born in the age of technology! This means technology will be brought into the classroom with or without the teacher. Thus, more technology will be incorporated into the lessons in order for the students to connect with the material. These technological tools such as smart boards, graphing calculators, and interactive software programs also provide dynamic opportunities for lessons. This will also aid in engaging the students.
Mrs. Jessica Anderson, my cooperating teacher, and I discussed learning context in terms of background and the change of instructional strategies. Jessica indicated that instead of looking at white v. nonwhite groupings it is a matter of geographical area. The students from Platte City (area) are typically white and the students from North Kansas City (area) consist of lower income housing and have more nonwhite individuals. The students from the more urban areas are found to be less academic and have lower educational environment. To combat this, Platte County high school has a Class within a Class (CWC) teacher for the subjects that students struggled in. Instruction would then be based off of previous test scores and the CWC teacher or Mrs. Anderson would take the lower scoring students for additional instruction. Basically this model gave additional instruction to the students who needed it. With these geographical groups, there were also some issues with having technology and resources at home to do work. To aid those students, there is a program called homework haven which is the after school program that gives access to students and allows them to grab a later bus home. In addition, we also print off many resources including notes and assignments. An audio recording of this conversation is available at request.

The learning context for these students is extremely important. It demonstrates to us what the students will be able to do at home and what their current understanding and background is. We can provide extra support to those students that need it while educating about differences in culture and background. In addition, it is important to keep a well maintained classroom that encourages learning. This can be done through engaging activities and a culture of acceptance and learning. Overall, these factors play a role in student learning and need to be reflected our teaching practices.
## Element 2: Learning Objectives

<table>
<thead>
<tr>
<th>Learning Objectives</th>
<th>National, State, or Local Standards</th>
<th>List of appropriate instructional strategy</th>
<th>List of appropriate technology to improve learning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Students will be able to solve one variable linear equations with variables on either or both sides by using the addition, subtraction, multiplication, or division rules of equality correctly when given a linear equation 80% of the time.</strong></td>
<td><strong>GLEs</strong>&lt;br&gt;AR.2C Grade 9&lt;br&gt;Use and solve equivalent forms of equations and inequalities (linear)&lt;br&gt;AR.2A Grade 9&lt;br&gt;Use symbolic algebra to represent and solve problems that involve linear relationships, including absolute value and recursive relationships&lt;br&gt;<strong>CCSS</strong>&lt;br&gt;8.EE 7.b.&lt;br&gt;Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.&lt;br&gt;A-REI 3.&lt;br&gt;Solve linear equations and inequalities in one variable, including equations with coefficient represented by letters.</td>
<td>• Lecture&lt;br&gt;• Small Learning Groups&lt;br&gt;• Independent practice</td>
<td>• Smart slates&lt;br&gt;• Marker boards&lt;br&gt;• Dynamic internet software&lt;br&gt;• Notes pages</td>
</tr>
</tbody>
</table>

| **2. Students will be able to correctly solve linear equations with one variable by combining like terms first and then using the addition, subtraction, multiplication, and division properties of equality when given a linear equation with multiple instances.** | **GLEs**<br>AR.2C Grade 9<br>Use and solve equivalent forms of equations and inequalities (linear)<br>AR.2A Grade 9<br>Use symbolic algebra to represent and solve problems that involve linear relationships, including absolute value and recursive relationships<br>**CCSS**<br>8.EE 7.b.<br>Solve linear equations with rational number coefficients, including equations whose solutions require | • Lecture<br>• Independent Practice<br>• Use of graphics and images. | • Smart slates<br>• Marker boards<br>• Dynamic internet software<br>• Notes pages |
of the same variable 80% of the time.

| Expanding expressions using the distributive property and collecting like terms. |
| **A-REI 3.** Solve linear equations and inequalities in one variable, including equations with coefficient represented by letters. |

3. **Students will be able to correctly solve one variable linear equations by using the distributive property to simplify first and the solve using the addition, subtraction, multiplication, and division properties of equality when given a linear equation 80% of the time.**

| **GLEs**  
No.3E Grade 9  
Solve problems involving proportions |
| AR.2C Grade 9  
Use and solve equivalent forms of equations and inequalities (linear) |
| **AR.2A Grade 9**  
Use symbolic algebra to represent and solve problems that involve linear relationships, including absolute value and recursive relationships |

**CCSS**  
**A-REI 3.** Solve linear equations and inequalities in one variable, including equations with coefficient represented by letters.

| **• Lecture**  
**• Discussion** |
| **• Smart Slate**  
**• Notes pages** |

4. **Students will be able to solve proportions by using cross products and if necessary the distribution property when given a proportional problem with 80% accuracy.**

| **GLEs**  
No.3E Grade 9  
solve problems involving proportions |
| **CCSS**  
7.RP 2.c.  
Represent proportional relationships by equations. |
| 7.RP 3.  
Use proportional relationships to solve multistep ratio and percent problems. |

| **• Lecture**  
**• Independent practice** |
| **• Smart Slate**  
**• Notes pages** |

5. **Students will be able to correctly solve a percent problem by using a proportion or equation 4 out of 5 times.**

| **GLEs**  
NO.1B Grade 8  
use fractions, decimals and percents to solve problems |
| **CCSS**  
6.RP 3.c.  
Find a percent of a quantity as a |

| **• Media hunts**  
**• Independent practice**  
**• Small group activities** |
| **• Tutorial Videos**  
**• Smart Slates**  
**• Notes pages** |
rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.

7.RP 3.
Use proportional relationships to solve multistep ratio and percent problems.

6. Students will be able to solve a problem in the context of real world situation by solving linear equations, using proportions, or using percents correctly 1 of out 2 times.

<table>
<thead>
<tr>
<th>GLEs</th>
<th>Media hunts</th>
<th>Internet websites</th>
<th>Smart Slate</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO.3D Grade 9</td>
<td>- Judge the reasonableness of numerical computations and their results</td>
<td>• Media hunts</td>
<td>• Internet websites</td>
</tr>
<tr>
<td>AR.2A Grade 9</td>
<td>• Discussion</td>
<td>• Smart Slate</td>
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<td>• Media hunts</td>
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<td>• Smart Slate</td>
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</tr>
<tr>
<td>A-REI 3.</td>
<td>• Solve linear equations and inequalities in one variable, including equations with coefficient</td>
<td>• Solve linear equations and inequalities in one variable, including equations with coefficient</td>
<td></td>
</tr>
<tr>
<td>A-CED 1</td>
<td>represented by letters.</td>
<td>represented by letters.</td>
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I chose to link the first and second objective with lecture, independent practice, and small learning groups due to the knowledge of the students. The 1st and 2nd objectives are on an 8th grade and lower level, but are essential for the students to know and understand for future content. Lecture is the most common form of instruction in mathematics and the one the students are most comfortable with. Some students may have forgotten the knowledge they should have learned and will need instruction on the material and lecture is one of the
best avenues for this. Lecture can quickly review an old topic and clear up any misconceptions. However, since the material is not new for most students, this opens the possibilities for peer instruction and learning groups especially if the pre-test demonstrates high understanding. Another instructional strategy that can be used for objectives 1 and 2 are graphical or alternative representations of the problems. These alternative views of the concept might not have been demonstrated for the students in the past and so we can deepen the student’s conceptual understanding if we show them this alternative views. We can also give more time for independent work which allows us to correct misconceptions. The technology used such as smart slates allow us to easily demonstrate examples and create graphics. Dynamic software such as internet applets can demonstrate the balancing act that is solving equations. Finally, notes pages provide guidance for the students to take notes and saves time since students do not have to copy the problem down.

For similar reasons as objectives one and two, lecture is chosen as the main instructional strategy for objectives three and four. We can also use graphical representations of the distributive property and use tables and charts to demonstrate proportions. These will help deepen conceptual understanding of these relatively familiar concepts and link them to the new material. If we use solely traditional methods that the students have already seen, they will quickly become bored and apathetic with regards to the material. Smart slates are the easiest way to demonstrate the material and notes pages can guide student thinking.

For the fifth objective, I decided that it might be good to branch away from the traditional model of lecturing. Students see percents on a daily basis and can easily relate to the questions. It is also a topic already seen by most students. Thus, there might be some possible
activities we can do with the student bringing in real life examples and we can explore as a class the use of percents in realistic context. We can also experiment with a flipped classroom if the results on the pre-test are good. After a discussion with my cooperating teacher, I decided to use an activity where we explore the percents in the media, connecting the material in real life. We also might use tutorial videos to explain percents in a different manner. We will still provide notes pages to guide the students and use the smart slate during discussions.

This last objective is integrated throughout each lesson. When approaching word problems, I like to use a discussion model. I think many student struggle with word problems because they are intimidated and don’t know how to think through the questions. Thus, a discussion model is where we talk about the thinking required and break the problem down. This will be the best model for me to use on this objective. I think it also might help for the students to experiment finding examples of the concepts in real world situations through the media or internet but that might be difficult to integrate. The best technology to use will be the smart slate and internet websites to assist students in their media searches.

For assessment, I think I will probably use traditional methods. For formative assessments, students will have regular homework assignments to practice and reinforce these essential skills. There will also be a midpoint quiz to make sure the students are grasping objective one, two, and three which are the most essential skills for future success in the class and unit. During each lecture, I also have checkpoints built in which are essentially guided practice exercises. I will present the problem, let the students work and then check their answers to clear up misconceptions and errors. As for summative assessments, students will have a unit test that covers the unit objectives. The mathematics department at Platte County
uses an assessment tool called learning targets which are loosely translated unit objectives.

The test will be broken up into these learning target sections and students will have the
opportunity to retake three of these learning target sections to improve their score if after they
take their test and do poorly. My unit objectives are loosely based off these learning targets
and to see if my students have met my objectives, I will base it off of their original score and not
the retaken scores. I encourage the students to retake those portions of their tests in order to
improve their scores and understand material that may have eluded the before they took the
test.

The following are the scores from the pre-test. A student copy and key of the pre-test can
be found in element 3 The best and worse examples of student work can be found at the end
of this element. The test consisted of 6 questions, one over each of the objectives. Students
got a 1 if they got the question correct and a 0 if they got it incorrect. The rightmost column is
the percentage score for each student and the bottom row is the percentage correct for each
question.

<table>
<thead>
<tr>
<th>Pre-Test Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question</td>
</tr>
<tr>
<td>Student</td>
</tr>
<tr>
<td>#1</td>
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<tr>
<td>#2</td>
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<tr>
<td>#3</td>
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<td>#4</td>
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<td>#10</td>
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<td>#11</td>
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</tbody>
</table>
Overall, the pre-test scores were not completely surprising. Thus, it looks like most students understand how to solve a simple equation and combine like terms (objectives 1 and 2). Thus, less emphasis should be put on those lessons. I think I can try to do more group and peer teaching during the lessons that cover these objectives. Student understanding drops off significantly when incorporating the distributive property and proportions. In fact, none of the students got the proportion problem correct. There will need to be particular emphasis on the days during which we cover proportions and I will need to be sure to incorporate the distribution property into equation solving. A majority of the students seem to have done well with the percent problem, so I might experiment with the instructional strategy during that lesson with flipping the lecture and work and trying a media activity as mentioned above. It also demonstrates that the percent objective can be quickly covered. Finally, I noticed that most students for the last objective and question could come up with a final answer but not write the equation. I only gave a correct response to the student if they wrote an equation. Some of the students didn’t include the variable and substituted in while still writing an equation, so I counted that correct. This means that there needs to be an emphasis on interpreting and writing equations for word problems. Students can see the answers easily early due to the simplicity of the problems but when these problems get more complicated the
answer will not come so easily and the algebra will help. As for changes to the objectives, I think I would like to break apart the first objective. The first objective can be to just to solve an equation using those properties with the variable on one side of the equation and the other objective can be to solve an equation using those properties with variables on both sides. While there was not a question on the pretest that had variables on both sides until question 4 (which was also a proportion), I do not think it is an obvious step for students. Thus, I think it is important to break apart that objective. I also realized that objective one was very broad with just all the properties, so it is important to narrow it some to test comprehension.

Here are my revised objectives:

1. Students will be able to solve one variable equations with variables on one side of the equation by using the addition, subtraction, multiplication, or division rules of equality correctly when given an equation 80% of the time.

2. Students will be able to correctly solve one variable equations with the variable on both sides of the equation by using the addition, subtraction, multiplication, or division rules of equality when given an equation 75% of the time.

3. Students will be able to correctly solve linear equations with one variable by combining like terms first and then using the addition, subtraction, multiplication, and division properties of equality when given a linear equation with multiple instances of the same variable 4 out of 5.

4. Students will be able to correctly solve one variable linear equations by using the distributive property to simplify first and the solve using the addition, subtraction,
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multiplication, and division properties of equality when given a linear equation 80% of the time.

5. Students will be able to solve proportions by using cross products and if necessary the distribution property when given a proportional problem with 80% accuracy.

6. Students will be able to correctly solve a percent problem by using a proportion or equation 4 out of 5 times.

7. Students will be able to solve a problem in the context of real world situation by solving linear equations, using proportions, or using percents correctly 1 out of 2 times.

Best Score:
Worst Score:

Pre-Quiz – Chapter 3

Solve the following equations.

1. $12 = 2x - 8$
2. $x + 11 + 8x = 38$
3. $50 = -5(3n + 5)$
4. $\frac{8}{m-3} = \frac{4}{m}$

5. 90 is what percent of 200. 
   \[ \frac{90}{200} \times 100 = 45\% \]

6. Kim is tutoring John in math. Kim charges $20 plus $10 per hour of tutoring. How many hours does she have to tutor to make $300? (Write and solve an equation)

   \[ 10 \times 28 = 280 \]
   \[ 280 + 20 = 300 \]
## Element 3: Assessment Plan

<table>
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<tr>
<th>Learning Objectives</th>
<th>Assessment Methods</th>
<th>Standard of Performance /Expectation</th>
<th>Rationale</th>
<th>Adaptations</th>
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</thead>
<tbody>
<tr>
<td>Students will be able to solve one variable equations with variables on one side of the equation by using the addition, subtraction, multiplication or division rules of equality.</td>
<td><strong>Pre-Test</strong> (Formative): Question: 1 <strong>Quiz</strong> (Formative) Questions: 1, 2, 3, 4, 5, 6 <strong>Homework</strong> (Formative) Section 3.1, 3.2, &amp; 3.3 <strong>Lecture Checkpoints</strong> (Formative) <strong>Unit Test</strong> (Summative) Questions: 1, 2, 3, 4, 5, 6</td>
<td>Students must achieve the following accuracy in order to have met the objective: • 4 out of 6 on the unit test</td>
<td>I gave my students the indicated assessments in order to do the following: • The pre-test allows me to see what prior knowledge the students have. • The quiz provides a checkpoint in the middle of the unit to see progress on reaching the objective. • Homework provides exercises to practice and perfect the skills needed to achieve the objectives. • The unit test formally assesses the student understanding of the material covered in the unit, provides criteria for reaching the objectives and creates a starting point from which to base future unit objectives.</td>
<td>Students with learning disabilities can have extra time with the test and quiz. To help students with visual impairments, we can provide larger print copies of the quizzes and tests. For the struggling students, we can provide a list of steps for them to follow while doing their homework and in class activities. Students that are more kinesthetic can be introduced to the use of algebra tiles to solve equations.</td>
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</tbody>
</table>

| Students will be able to correctly | **Homework** (Formative) | Students must achieve the following | I gave my students the indicated assessments in order to do the following: • The pre-test allows me to | Students with learning disabilities can |
solve one variable equations with the variable on both sides of the equation by using the addition, subtraction, multiplication, or division rules of equality.

<table>
<thead>
<tr>
<th>Section 3.4 #1 and 3.4 #2 Lecture Checkpoints (Formative)</th>
<th>accuracy in order to have met the objective:</th>
<th>see what prior knowledge the students have.</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-Class Activity (Formative)</td>
<td>• 1 out of 2 on the Unit Test</td>
<td>• The quiz provides a checkpoint in the middle of the unit to see progress on reaching the objective.</td>
</tr>
<tr>
<td>Unit Test (Summative)</td>
<td></td>
<td>• Homework provides exercises to practice and perfect the skills needed to achieve the objectives.</td>
</tr>
<tr>
<td>Questions: 11, 12</td>
<td></td>
<td>• Homework provides exercises to practice and perfect the skills needed to achieve the objectives.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Pre-Test (Formative)</th>
<th>Students must achieve the following accuracy in order to have met the objective:</th>
<th>I gave my students the indicated assessments in order to do the following:</th>
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</thead>
<tbody>
<tr>
<td>Question: 2</td>
<td>• 2 out of 3 on the unit test</td>
<td>• The pre-test allows me to see what prior knowledge the students have.</td>
</tr>
<tr>
<td>Quiz (Formative)</td>
<td></td>
<td>• The quiz provides a checkpoint in the middle of the unit to see progress on reaching the objective.</td>
</tr>
<tr>
<td>Questions: 7, 8</td>
<td></td>
<td>• Homework provides exercises to practice and perfect the skills needed to achieve the objectives.</td>
</tr>
<tr>
<td>Homework (Formative)</td>
<td></td>
<td></td>
</tr>
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</table>

Students will be able to correctly solve linear equations with one variable by combining like terms first and then using the addition, subtraction, addition, subtraction, multiplication, or division rules of equality.

Students with learning disabilities can have extra time with the test and quiz.

To help students with visual impairments, we can provide larger print copies of the quizzes and tests.

Students that are more kinesthetic can be introduced to the use of algebra tiles to solve equations.

For the struggling students, we can provide a list of steps for them to follow while doing their homework and in class activities.
Students will be able to correctly solve one variable linear equations by using the distributive property to simplify first and the solve using the addition, subtraction, multiplication, and division properties of equality when given a linear equation.

<table>
<thead>
<tr>
<th>Students must achieve the following accuracy in order to have met the objective:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 2 out 3 on the unit test</td>
</tr>
</tbody>
</table>

I gave my students the indicated assessments in order to do the following:

- The pre-test allows me to see what prior knowledge the students have.
- The quiz provides a checkpoint in the middle of the unit to see progress on reaching the objective.
- The unit test formally assesses the student understanding of the material covered in the unit, provides criteria for reaching the objectives and creates a starting point from which to base future unit objectives.

Students with learning disabilities can have extra time with the test and quiz.

To help students with visual impairments, we can provide larger print copies of the quizzes and tests.

For the struggling students, we can provide a list of steps for them to follow while doing their homework and in class activities.

Students that are more kinesthetic can...
Students will be introduced to the use of algebra tiles to solve equations.

<table>
<thead>
<tr>
<th></th>
<th>Pre-Test (Formative)</th>
<th>Students must achieve the following accuracy in order to have met the objective:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Question: 4</td>
<td>• 3 out 4 on the unit test</td>
</tr>
<tr>
<td></td>
<td>Homework (Formative)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Section 3.5 and 3.6</td>
<td></td>
</tr>
<tr>
<td>Lecture Checkpoints</td>
<td>(Formative)</td>
<td></td>
</tr>
<tr>
<td>Unit Test</td>
<td>(Summative)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Questions: 13, 14, 15, 16</td>
<td></td>
</tr>
</tbody>
</table>

Students with learning disabilities can have extra time with the test and quiz.

To help students with visual impairments, we can provide larger print copies of the quizzes and tests.

Proportions are can be demonstrated with “parts” or “wholes” of objects and can help the visual learners.

For the struggling students, we can provide a list of steps for them to follow while doing their homework and in class activities.
Students will be able to solve a problem in the context of real-world situations by solving linear equations, using proportions, or using percents correctly.

<table>
<thead>
<tr>
<th>Pre-Test (Formative)</th>
<th>Students must achieve the following accuracy in order to have met the objective:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question: 6</td>
<td>2 out of 3 on the unit test.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quiz (Formative)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question: 11</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Homework (Formative)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All sections</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lecture Checkpoints (Formative)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Unit Test (Summative)</th>
</tr>
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I gave my students the indicated assessments in order to do the following:

- The pre-test allows me to see what prior knowledge the students have.
- The quiz provides a checkpoint in the middle of the unit to see progress on reaching the objective.
- Homework provides exercises to practice and perfect the skills needed to achieve the objectives.
- The unit test formally assesses the student understanding of the material covered in the unit, providing criteria for reaching the objectives and creating a starting point from which to base future unit objectives.

Students will be able to solve a percent problem by using a proportion or equation 4 out of 5 times.

**Homework (Formative)**

Section 3.7

**Lecture Checkpoints (Formative)**

**Unit Test (Summative)**

Questions: 18, 19, 20

accuracy in order to have met the objective:

- 2 out of 3 times on the unit test.

see what prior knowledge the students have.
- The quiz provides a checkpoint in the middle of the unit to see progress on reaching the objective.
- Homework provides exercises to practice and perfect the skills needed to achieve the objectives.
- The unit test formally assesses the student understanding of the material covered in the unit, providing criteria for reaching the objectives and creating a starting point from which to base future unit objectives.

Students with learning disabilities can have extra time with the test and quiz.

To help students with visual impairments, we can provide larger print copies of the quizzes and tests.

For the struggling students, we can provide a list of steps for them to follow while doing their homework and in-class activities.

When it comes to word problems, we can provide...
Most of my instructional strategies involved lecture and checkpoints for skills. This was reflected in the skill based nature of the questions on the assessments. I have included some graphical representations as instructional strategies but those would be difficult to use in assessments. The media usages and use of real-life situations help the students with the word problems on the different assessments. Overall, the assessments really reflect the performance of the students using specific skills and performing specific tasks. This follows along with how the notes and the lectures were set up in class.

Assessments are attached.
Pre-Quiz – Chapter 3

Name: ______________________  Hr: ____

Solve the following equations.

1. $12 = 2x - 8$
2. $x + 11 + 8x = 38$

3. $50 = -5(3n + 5)$
4. $\frac{8}{m - 3} = \frac{4}{m}$

5. 90 is what percent of 200.

6. Kim is tutoring John in math. Kim charges $20 plus $10 per hour of tutoring. How many hours does she have to tutor to make $300? (Write and solve an equation)

Pre-Quiz – Chapter 3

Name: ANSWER KEY  Hr: ____

Solve the following equations.

1. $12 = 2x - 8$
2. $x + 11 + 8x = 38$

$x = 10$  \hspace{1cm} [x = 3]

3. $50 = -5(3n + 5)$
4. $\frac{8}{m - 3} = \frac{4}{m}$

$n = -5$  \hspace{1cm} [m = -3]

5. 90 is what percent of 200.

[45%]

6. Kim is tutoring John in math. Kim charges $20 plus $10 per hour of tutoring. How many hours does she have to tutor to make $300? (Write and solve an equation)

[20 + 10x = 300, x = 28 hours]
Algebra I Quiz: Sections 3.1 - 3.3  
Name: _____________________  Hour: _____

**Solve the one-step equation.** (LT 3.1)

1. \( 9 + x = 7 \)  
2. \( y - 5 = -11 \)  
3. \( -7b = -56 \)  
4. \( \frac{f}{-3} = -30 \)

**Solve the two-step equation.** (LT 3.2)

5. \( 9w - 4 = 14 \)  
6. \( 23 = 1 - d \)

**Solve the equation.** (LT 3.3 and 3.4)

7. \( 33 = 4m - 7m \)  
8. \( 23x - 8 - 14x = 10 \)

9. \( 7(h + 3) + 4 = -3 \)  
10. \( \frac{2}{3} (4x - 7) = -2 \)

**Apply concepts in real world situations.** (LT 3.A)

11. You are moving. You rented a truck for $15 an hour and rented a dolly for $5 per hour. The dolly and the truck are rented for the same amount of time. You also paid a friend $20 to help out. The total cost of your move was $80. How long did you rent the truck and dolly?
Algebra I Quiz: Sections 3.1 - 3.3

Name: Answer Key  Hour: _____

Solve the one-step equation. (LT 3.1)

1. \(9 + x = 7\)  
   \[x = -2\]

2. \(y - 5 = -11\)  
   \[y = -6\]

3. \(-7b = -56\)  
   \[b = 8\]

4. \(\frac{f}{3} = -30\)  
   \[f = 90\]

Solve the two-step equation. (LT 3.2)

5. \(9w - 4 = 14\)  
   \[w = 2\]

6. \(23 = 1 - d\)  
   \[d = -22\]

Solve the equation. (LT 3.3 and 3.4)

7. \(33 = 4m - 7m\)  
   \[m = -11\]

8. \(23x - 8 - 14x = 10\)  
   \[x = 2\]

9. \(7(h + 3) + 4 = -3\)  
   \[h = -4\]

10. \(\frac{2}{3}(4x - 7) = -2\)  
    \[x = 1\]

Apply concepts in real world situations. (LT 3.A)

11. You are moving. You rented a truck for $15 an hour and rented a dolly for $5 per hour. The dolly and the truck are rented for the same amount of time. You also paid a friend $20 to help out. The total cost of your move was $80. How long did you rent the truck and dolly?

   \[80 = 15h + 5h + 20; h = 3\]
Algebra I

Name: ____________________________ Hour: _____

TEST Chapter 3  **SHOW ALL YOUR WORK TO RECEIVE MAXIMUM CREDIT!!!**

Solve the following equations. (LT 3.1, LT 3.2, LT 3.3, LT 3.4, & LT 3.5)

1. $-8 + x = 12$
2. $15 = \frac{3}{5}n$
3. $x + \frac{3}{2} = \frac{1}{2}$

4. $\frac{b}{4} + 1 = 3$
5. $-\frac{2}{3}c + 6 = -12$
6. $17 = 9 - 4y$

7. $x + 11 + 8x = 38$
8. $7m - 4 - 2m = 6$

9. $10x - 9(x + 6) = 31$
10. $50 = -5(3n + 5)$

11. $9 - 5z = 12 - (6z + 7)$
12. $0.5n + 2.8 - 0.4n = 6.2 - 0.1n$

Solve proportions using cross products. (LT 3.6)

13. $\frac{c}{4} = \frac{3}{2}$
14. $\frac{16}{9} = -\frac{4t}{27}$

Solve proportions using the distributive property. (LT 3.7)
Solve percent problems. (LT 3.8)

Show your work either in a PROPORTION or PERCENT EQUATION

18. 48 is 12% of what number?  
19. What number is 15% of 40?

20. What percent of 80 is 36?

Apply concepts in real world situations. (LT 3.A)

21. A contractor purchases ceramic tile to remodel a kitchen floor. The cost of is $4 per tile and $17.82 for grouting material. If the contractor is charged a total of $545.82, how many ceramic tiles did the contractor purchase? (Write and solve an equation)

22. Central High’s enrollment decreases at an average rate of 55 students per year, while Washington High’s enrollment increases at an average rate of 70 students per year. Central High has 2176 students and Washington High has 1866 students. If enrollments continue to change at the same rate, when will the two schools have the same number of students? (Write and solve an equation)

23. In a recent election, 16,400 registered voters voted, which was a 32% turnout. How many total registered voters are there in the county? (Write and solve a percent proportion)
TEST Chapter 3  
SHOW ALL YOUR WORK TO RECEIVE MAXIMUM CREDIT!!!!

Solve the following equations. (LT 3.1, LT 3.2, LT 3.3, LT 3.4, & LT 3.5)

1. \(-8 + x = 12\)  
   \[x=20\]

2. \(15 = \frac{3}{5} n\)  
   \[n=25\]

3. \(x + \frac{3}{2} = \frac{1}{2}\)  
   \[x=-1\]

4. \(\frac{b}{4} + 1 = 3\)  
   \[b=8\]

5. \(-\frac{2}{3} c + 6 = -12\)  
   \[c=27\]

6. \(17 = 9 - 4y\)  
   \[y=-2\]

7. \(x + 11 + 8x = 38\)  
   \[x=3\]

8. \(7m - 4 - 2m = 6\)  
   \[m=2\]

9. \(10x - 9(x + 6) = 31\)  
   \[x=85\]

10. \(50 = -5(3n + 5)\)  
    \[n=-5\]

11. \(9 - 5z = 12 - (6z + 7)\)  
    \[n=17\]

12. \(0.5n + 2.8 - 0.4n = 6.2 - 0.1n\)  
    \[z=-4\]

Solve proportions using cross products. (LT 3.6)

13. \(\frac{c}{4} = \frac{3}{2}\)  
    \[c=6\]

14. \(\frac{16}{9} = \frac{-4t}{27}\)  
    \[t=-12\]
Solve proportions using the distributive property. (LT 3.7)

15. \( \frac{8}{m-3} = \frac{4}{m} \)  
\[ m = -3 \]

16. \( \frac{5}{2d-3} = \frac{10}{d+3} \)  
\[ d = 3 \]

Solve percent problems. (LT 3.8)

Show your work either in a PROPORTION or PERCENT EQUATION

18. 48 is 12% of what number?  
\[ x = 400 \]

19. What number is 15% of 40?  
\[ x = 6 \]

20. What percent of 80 is 36?  
\[ x = 45\% \]

Apply concepts in real world situations. (LT 3.A)

21. A contractor purchases ceramic tile to remodel a kitchen floor. The cost of is $4 per tile and $17.82 for grouting material. If the contractor is charged a total of $545.82, how many ceramic tiles did the contractor purchase? (Write and solve an equation)

\[ 4t + 17.82 = 545.82; \ t = 132 \]

22. Central High’s enrollment decreases at an average rate of 55 students per year, while Washington High’s enrollment increases at an average rate of 70 students per year. Central High has 2176 students and Washington High has 1866 students. If enrollments continue to change at the same rate, when will the two schools have the same number of students? (Write and solve an equation)

\[ 2175 - 55y = 1866 + 70y; \ y = 2.48 \text{ years} \]

23. In a recent election, 16,400 registered voters voted, which was a 32% turnout. How many total registered voters are there in the county? (Write and solve a percent proportion)

\[ x = 51,250 \]
### Element 4: Instructional Plans

<table>
<thead>
<tr>
<th>Chapter or Unit Topic: Chapter 3 - Solving Linear Equations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time: 50 minute</td>
</tr>
<tr>
<td>Grade Level: 9th - Algebra I</td>
</tr>
<tr>
<td>Lesson Topic: Solving One Step Equations</td>
</tr>
<tr>
<td>Big Idea (Concept): Solving one step linear equations can be done by isolating the variable by using the inverse operation of the operation that appears in the equation. This is done using the addition, subtraction, multiplication, and division properties of equality.</td>
</tr>
<tr>
<td>Lesson Objective(s):</td>
</tr>
<tr>
<td>1. Students will be able to solve one variable equations with variables on one side of the equation by using the addition, subtraction, multiplication, or division rules of equality correctly when given an equation 80% of the time.</td>
</tr>
<tr>
<td>2. Students will be able to use the addition property of equality to solve a one-step linear equation correctly 2 out 3 times.</td>
</tr>
<tr>
<td>3. Students will be able to use the subtraction property of equality to solve a one-step linear equation correctly 2 out 3 times.</td>
</tr>
<tr>
<td>4. Students will be able to use the multiplication property of equality to solve a one-step linear equation correctly 2 out 3 times.</td>
</tr>
<tr>
<td>5. Students will be able to use the division property of equality to solve a one-step linear equation correctly 2 out 3 times.</td>
</tr>
<tr>
<td>6. Students will be able to find the equation that represents a real world situation and solve it correctly 50% of the time.</td>
</tr>
</tbody>
</table>

**Grade Level Expectations/ Common Core State Standards:**

**Grade Level Expectations**

**AR.2C Grade 9**

Use and solve equivalent forms of equations and inequalities (linear)

**AR.2A Grade 9**

Use symbolic algebra to represent and solve problems that involve linear relationships, including absolute value and recursive
relationships

**Common Core State Standards**

8.EE 7.b.

Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

A-REI 3.

Solve linear equations and inequalities in one variable, including equations with coefficient represented by letters.

**Prerequisites:** ability to add, subtract, multiply, and divide.
Understanding of inverse operations

**Materials Needed:** (including integration of technology)

- Smart slate or smart board technology, calculators for all students

**Vocabulary to be Introduced/Reviewed:**

- Equation, expression, inverse operations

**Instructional Strategies Used:**

1. Bellwork
2. Think, Pair, Share
3. Independent Practice
4. Lecture/Demonstration

**Before the Lesson:**

*Anticipatory Set* (gain students’ attention) (3 minutes):

Have the students try two problems from today’s lesson. Some will be able to do this because of past lessons.

Larger print notes can be provided to help visually impaired students.
1. \( a - 3 = 7 \)
\[ a = 10 \]

2. \( 3b = 21 \)
\[ b = 7 \]

Transition Statement: “Some of you might have seen these types of problems before, today we are going to learn how to solve these types of problems.”

**During the Lesson (Procedure):**

*Instructional Input* (2 minutes):

Introduce the idea that equality means that things are the same on both sides. Show a graphic of a scale.

Ask the students what would happen if we moved something from one side of the scale and not the other side.

Make sure students understand that when the scale is balanced, you have to move the same amount of things on both sides to keep it balanced. In equation solving, this means if you add/subtract/divide/multiply something to one side, you must do it to the other side or the equation is no longer equal.

Transition statement: “Now let’s look at an example.”

*Modeling* (3 minutes):

Set up a simple problem:

\[ a - 3 = 7 \]
\[ a = 10 \]

Tell the students that our goal is to isolate the variable.

Ask the students what they should do in order to accomplish this? Most likely, they will know and will easily indicate that you subtract three from both sides. Ask how and why they can do that? Introduce the idea of inverse operations in order to undo existing...
operations (addition/subtraction and multiplication/division).

Remind them to CHECK THEIR SOLUTION by substituting in their answer and making sure that the equality holds true.

Introduce another problem:

\[ m + 9 = -2 \]

\[ [m=-11] \]

Have the students guide me through the process of solving this one.

Transition statement: “Now, I would like you to try and solve these problems on your own sheet of paper.”

**Guided Practice** (1 minute):

Give the students 4 problems to do independently and work the way around the room helping students.

\[ 4 = z - 2 \]
\[ x + 3 = 2 \]
\[ y + \frac{1}{2} = \frac{3}{4} \]
\[ k - 0.9 = 1.4 \]

\[ [z=6, x=-1, y=1/4, k=2.3] \]

At this point, it will probably be around time for lunch.

**Check for Understanding** (5 minutes):

After the students have come back for lunch, go around and check the student understanding of these problems and that all students have the correct solutions.

**Modeling** (5 minutes):

Transition statement: “Let’s take a look at two additional problems.”
Ask the students what the goal of solving equations is.
[Isolate variable]

What operation do I need to undo in order to isolate the variable?
[Divide, multiply]

Help them realize when they divide or multiple they are creating a 1 in order to cancel.

Present one more problem:

\[ \frac{2}{5}t = 6 \]

[t=15]

Hold a small discussion with the students and have them talk though solving this by previous methods (multiplying and dividing). Ask them if they can combine the methods. Discuss solving by multiplying by a reciprocal in order to get one t.

Transition Statement: “Now, try these on your own paper.”

**Guided Practice** (1 minute):

Give students time to work on 4 additional problems.

144 = 6k
\[ \frac{s}{6} = -7 \]
5.7x = -11.4
\[-\frac{9}{10}r = 36\]
Check for Understanding (5 minutes):

Walk around and assist students with the previous four problems and check that they have the correct solutions.

Transition statement: “Now, we will try a couple of word problems.”

Modeling (2-3 minutes depending on time):

Give a couple of examples of word problems:

1. Rachelle is three times as older than her little brother Mike. Rachelle is 18. How old is Mike? Set up and solve an equation. \[3m=18, m=6\]

2. In 2012, my salary increased by $2,500. I now make $35,000. What did I make before my raise? Write and solve an equation. \[x+2,500=35,000, x=32,500\]

3. Movie theaters pay a certain price for the movies that they play in their theater. Suppose a theater pays $1,500 in order to have that movie played at their theater. If each ticket cost $7.50, how many tickets do they need to sell in order to break even. Please write and solve and equation. \[7.50t=1500, t=200\]

For each example, have the students think about the problem and share their ideas with a partner on how to solve it. Work through these examples with the students.

If needed, some of these problems can be omitted.

Independent Practice (rest of class period):

Have the students do exercises out of section 3.1 for homework.
Transition statement: “Now, the following is your homework assignment. It is due the next class period. Please come in early or stay after school if you have questions. Please get started.”

p. 137-139

#4, 6, 8, 13, 14, 18, 19, 20, 24, 28,

30, 38, 43, 44, 46, 50, 53, 54

**After the Lesson:**

**Closure (summary):**

I will have the students to tell you how to solve an equation with one step, why they can perform these operations and what are the steps to solving an equation.
Chapter or Unit Topic: Chapter 3
Time: 50 minute
Grade Level: 9th - Algebra I

Lesson Topic: Solving Two-Step Equations

Big Idea (Concept):
To solve two step linear equations you typically apply the inverse operations in reverse order of operations. This is done until you isolate the variable on one side and a number of the other side of the equality.

Lesson Objective(s):
1. Students will be able to solve one variable equations with variables on one side of the equation by using the addition, subtraction, multiplication, or division rules of equality correctly when given an equation 80% of the time.
2. Students will be able to correctly solve a two-step linear equation by applying the inverse operations and isolate the variable one side blank out of blank times.
3. Students will be able to create and solve a two-step linear equation in a real world context correctly 50% of the time.

Grade Level Expectations/ Common Core State Standards:

Grade Level Expectations

AR.2C Grade 9
Use and solve equivalent forms of equations and inequalities (linear)

AR.2A Grade 9
Use symbolic algebra to represent and solve problems that involve linear relationships, including absolute value and recursive relationships

Common Core State Standards
8.EE 7.b.  
Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

A-REI 3.  
Solve linear equations and inequalities in one variable, including equations with coefficient represented by letters.

**Prerequisites:**
- Understanding of inverse operations
- Solving one-step linear equations

**Materials Needed:** (including integration of technology)
- Marker boards and markers for 4 leaders
- Notes pages for students
- Guiding notes for leaders

**Vocabulary to be Introduced/Reviewed:**
Inverses and equations

**Instructional Strategies Used:**
1. Peer teaching
2. Lecture/Demonstration
3. Small group work

If there are several weaker students, have the students pair up to work together on these problems.

**Before the Lesson:**

*Anticipatory Set (gain students’ attention):*

Have the students get out a new sheet of paper and get out their book.

The students are to work on review problems quietly while I take four students to work on a small lesson.
Problems: p. 940 #1-8

If those students get done, their instructions will be to pair up and try to help each other answer any homework questions.

The four students will come with me to get instruction while the other students work.

Transition statement: “Everyone needs to get out a sheet of paper and work on these problems quietly. If you have questions, please ask your fellow students.”

**During the Lesson (Procedure):**

*Instructional Input:*

While the other students are working on the extra exercises, I will teach the four students the lesson for the day in the corner or out in the hallway.

When solving equations, the goal is to isolate the variable on one side with the numbers on the other side.

This is done using inverse operations:

- Subtraction is the inverse operation of Addition & Vice Versa
- Multiplication is the inverse operation of Division & Vice Versa

To solve a two-step equation, you need to perform the order of operations in reverse.

The order of operations can be remembered by **PEMDAS**

OR

**Please Excuse My Dear Aunt Sally**

P - Parenthesis
E - Exponents
M&D - Multiplication and Division (left to right)
A&D – Addition and Subtraction (left to right)

**Modeling:**
Transition Statement: “Now, we will try a couple of examples.”
I will work through these two examples with the 4 students.

Example 1: \(5x - 12 = 8\)
\([x=4]\)

Example 2: \(-\frac{y}{3} + 6 = -24\)
\([y=90]\)

Transition Statement: “Now try these problems.”

**Check for Understanding/ Guided Practice:**
The 4 students will attempt these problems with me assisting as needed.

\(6h + 4 = 16\)
\([h=2]\)

\(\frac{1}{2}x - \frac{3}{4} = 2\)
\([x = \frac{11}{2} \text{ or } 5 \frac{1}{2}]\)

I will make sure all four students arrived at the correct answers.

Transition statement: “Now, we will go through an additional problem of combining like terms.”

**Modeling:**
I will demonstrate this problem for the four students.
$2x + 7x = 54$

$[x=6]$

**Check for Understanding/ Guided Practice:**

The 4 students will attempt this problem with me assisting as needed.

$-4y - 2y = -12$

$[y=2]$

I will make sure all four students arrived at the correct answers.

The students will be each provided with notes sheets for their fellow classmates and marker boards, clipboards, and markers.

Transition statement: “Now, let’s go back into class and you will each teach your small groups what I have taught to you.”

I will plan on having taken 10 minutes to teach those four students.

At this point, I will be bringing the four students back into the classroom. I have broken the class into four groups as follows:

**Groups:**

- Leader: Alyssa
- Aaron
- Karson
- Kyle V.
- Connor

If the students struggle with the word problems, a list of steps to follow can be provided.

Gifted students can be provided with a more challenging word problem.
Leader: Andrew
Tyler M.
Rachel
Keoni

Leader: Michaella
Emily
Jakob
Tyler O.

Leader: Alex
Taylor
Kyle K.
Lloyd

Each of the group leaders will instruct their groups using the examples and problems that I did with them. I will tell the leader to teach not just show and give them to expectation to guide their peers to the correct answers rather than give them to them. For the other students, their expectations will be to listen to their leader, ask them questions, and act respectfully to their Leader.

I will give approximately 15 minutes for this part. This part might be broken up by lunch.

After all four groups have completed the mini lectures. I will bring them all together for additional checks.

Transition statement: “Ok, now we are all going to do these problems. Please return to your seat and on a separate sheet of
Check for Understanding/ Guided Practice (10 minutes):

I will give the class these two problems:

\[-10x + 2x = -32\]

\[x = 4\]

\[\frac{2}{7}y - 3 = 2\]

\[y = \frac{10}{7}\]

We will work through these two problems with the class guiding me through the process.

Transition statement: “We will now go through the following word problem together.”

Modeling/Check for Understanding/ Guided Practice:

The band needs to buy new equipment. The equipment will cost $3,000. The band has collected $1,200 in previous fundraisers. If the band sells sandwiches at $5 each, how many sandwiches will they need to sell to raise the remaining funds?

[360 sandwiches]

I will work through this problem with the students and assist them as they need it.

Transition statement: “Now, you will do the following problems for homework.”
Independent Practice:
Students will be given a homework assignment.

HW: pg 144 - 145
   # 4, 6, 7, 9, 12, 16, 19, 28, 30, 34, 35, 37, 38, 40

Students should have around 15 to 20 minutes to complete this assignment.

After the Lesson:
   Closure (summary):
Before the minute bell, I will have the students talk me through what they have learned and remind them that they may come early or stay late to ask questions.

Follow-up Activities (may be done as homework):
Guide for Student Leader

To solve a two-step equation, you need to perform the order of operations in reverse.

**PEMDAS** OR **Please Excuse My Dear Aunt Sally**

- **P** - Parenthesis
- **E** - Exponents
- **M&D** – Multiplication and Division (left to right)
- **A&D** – Addition and Subtraction (left to right)

Now you will guide your peers through a couple of examples.

**Example 1:**

\[ 5x - 12 = 8 \]

1st Step: Add 12 to both sides

\[ 5x = 20. \]

2nd Step: Divide each side by 5

\[ x = 4 \]

**Example 2:**

\[ -\frac{y}{3} + 6 = -24 \]

1st Step: Subtract 6 from both sides of the equations

\[ -\frac{y}{3} = -30 \]

2nd Step: Multiply each side of the equation by -3.

\[ y = 90 \]
Checkpoint:

Have your peers try these problems. They will be on their notes sheets. If they struggle help them out!

\[6h + 4 = 16\]  Answer: \(h = 2\)

\[\frac{1}{2}x - \frac{3}{4} = 2\]  Answer: \(x = \frac{11}{2}\) or \(5\frac{1}{2}\)

In the next example we have to combine like terms first!

Example 3:

\[2x + 7x = 54\]

1\(^{\text{st}}\) Step: Combine like terms.

\[9x = 54\]

2\(^{\text{nd}}\) Step: Divide each side by 9.

\[x = 6\]

Checkpoint:

\[-4y - 2y = -12\]  Answer: \(y = 2\)
Chapter or Unit Topic: Chapter 2 – Solving Linear Equations

Time: 50 minutes

Grade Level: 9th Grade - Algebra I

Lesson Topic: Solving Multi-Step Equations

Big Idea (Concept): Solving equations can take multiple steps. The first step is to simplify both sides and then apply inverse operations to isolate the variable. These inverse operations should be done in reverse order of the order of operations.

Lesson Objective(s):

1. Students will be able to solve one variable equations with variables on one side of the equation by using the addition, subtraction, multiplication, or division rules of equality correctly when given an equation 80% of the time.
2. Students will be able to correctly solve linear equations with one variable by combining like terms first and then using the addition, subtraction, multiplication, and division properties of equality when given a linear equation with multiple instances of the same variable 4 out of 5.
3. Students will be able to correctly write an equation, simplify equations by combining like terms or performing the distributive property, and solving the equation by performing inverse operations in a real world context 1 out 2 times.

MO Performance Goals/ Common Core State Standards:

Grade Level Expectations

AR.2C Grade 9

Use and solve equivalent forms of equations and inequalities (linear)

AR.2A Grade 9
Use symbolic algebra to represent and solve problems that involve linear relationships, including absolute value and recursive relationships

**Common Core State Standards**

8.EE 7.b.

Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

A-REI 3.

Solve linear equations and inequalities in one variable, including equations with coefficient represented by letters.

**Prerequisites:**

Solving two-step equations, understanding of like terms, application of the distributive property, and multiplying by reciprocals.

**Materials Needed:** (including integration of technology)

Smart Slate, Calculators for each student.

**Vocabulary to be Introduced/Reviewed:** Inverse operations & reciprocal

**Instructional Strategies Used:**

- Bellwork
- Lecture
- Think-Pair-Share

**Before the Lesson** (5 minutes):

Anticipatory Set (gain students’ attention):

Their instructional when they walk into the room will be to perform on their homework sheet to do as review:

Students with LDs can be provided with easier problems.

Tactile learners can demonstrate the distributive property with algetiles.
The first two problems will help the students recall previously learned information and the last two serve reinforce the previous day's lesson.

Transition Statement: “Now that you have finished these problems, let's go over some homework questions.”

We will then go over any problems the students have over their homework.

I will then collect the homework after a couple of questions.

**During the Lesson (Procedure) (25 minutes):**

*Instructional Input:*

Transition statement: “We have been working on two-step and one-step solutions to equations, and now we will advance and solve multi-step linear equations.”

When solving a multi-step problem sometimes you have to simplify first. Then you perform the inverse operations in reverse order of operations.

*Modeling:*

I will give the students the following example.

\[ 15x - 3x - 11 = 13 \quad [x=2] \]

I will remind the students that they have to combine like terms first. Also, that when combing like terms you have to add the coefficient including the sign in front and the variable does not change. After that, I will have the students guide me through the two-step problem.
I will give the students the next example:

\[ 4(5m + 12) - 5m = 3 \]  \hspace{1cm} [m = -3]

I will talk to the students about distributing first. I will then have the students work through the rest of the problem by themselves.

Transition statement: “Alright, now I want you to work through the following problems by yourself and then check your answer with your elbow partner.”

**Check for Understanding/Guided Practice:**

I will give the students these next two problems as a guided practice for the students. I will go around the room and assist students as needed.

\[ -7x - 8 + 19x + 53 = 1 \]  \hspace{1cm} \[ 6k - 8(k - 12) - 2 = 96 \]

\( [x = \frac{-11}{3}] \hspace{1cm} [k = 1] \)

**Modeling:**

Transition statement: “Sometimes simplifying means different things. Let’s try some new problems.”

I will give the following problem to the students:

\[ \frac{3}{5}(n - 12) = -24 \]  \hspace{1cm} [n = -28]

Following the same reasoning students can simplify this problem by distributing the fraction. However, that creates a messy situation.

I will offer the suggestion of multiplying by the reciprocal. We will work through the problem both ways to demonstrate the ease of doing this.
Transition Statement: “Now try the following problems on your own.”

**Check for Understanding/ Guided Practice:**

I will give the students the following problem to do on their own. I will help them as needed.

\[-\frac{6}{7}(x+3) = 42\]

\[-24 = \frac{8}{9}(q - 63)\]

\[x = 52\]

\[q = 90\]

Transition Statement: “Let’s take a look at the use of these equations in a real-life context.”

**Modeling:**

I will model the following word problem by having the students walk me through it.

*It takes 70 inches of ribbon to make a bow and wrap the ribbon around a box. The bow takes 32 inches of ribbon. The width of the box is 14 inches. What is the height of the box?*

\[5 \text{ inches}\]

**Check for Understanding/ Guided Practice:**

I will give the students the following problem to do on their own. I will help them as needed.

The length of a rectangle is 5 inches more than twice the width. The perimeter of the rectangle is 34 inches. Find the length and width.

\[w = 4, l = 13\]

I will help the students as needed with these problems.

**Independent Practice:**
The students will be given the following homework assignment. There will be time for them to work on this in class. I will be available to help the students with questions.

HW: p. 150-152
#4, 5, 9-12, 15-17, 20, 23, 24, 31, 32, 34, 38, 39

Students will work on this the rest of the class period.

After the Lesson:

Closure (summary):
I will have the students talk to me about what they learned. I will offer help if they need it after school or before school.

Follow-up Activities (may be done as homework):

Their homework assignment.
Chapter or Unit Topic: Chapter 2 - Solving Linear Equations

Time: 50 minutes

Grade Level: 9th Grade - Algebra I

Lesson Topic: Solving linear equations with variables on both sides. (Part 1)

Big Idea (Concept): Linear equations can have variables on both sides of the equation. In order to solve this you collect the variables on one side and the constants on the other side by simplifying and using the addition, subtraction, multiplication, and division properties of equality.

Lesson Objective(s) (Parts 1 & 2):

1. Students will be able to correctly solve one variable equations with the variable on both sides of the equation by using the addition, subtraction, multiplication, or division rules of equality when given an equation 75% of the time.
2. Students will be able to correctly solve one variable equations with the variable on both sides of the equation by first combining like terms and then using the addition, subtraction, multiplication, or division rules of equality when given an equation 80% of the time.
3. Students will be able to correctly solve one variable equations with the variable on both sides of the equation by first using the distribution property, secondly combining like terms, and finally using the addition, subtraction, multiplication, or division rules of equality when given an equation 70% of the time.
4. Students will be able to solve a problem in the context of real world situation by solving linear equations, using proportions, or using percents correctly 1 out of 2 times.

Grade Level Expectations/ Common Core State Standards:

Grade Level Expectations

AR.2C Grade 9

Use and solve equivalent forms of equations and inequalities (linear)

AR.2A Grade 9
Use symbolic algebra to represent and solve problems that involve linear relationships, including absolute value and recursive relationships

**Common Core State Standards**

8.EE 7.b.

Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

A-REI 3.

Solve linear equations and inequalities in one variable, including equations with coefficient represented by letters.

**Prerequisites:**

Solving linear equations with variables on one side.

**Materials Needed:** (including integration of technology)

Smart Slate with Smart notebook technology, calculators for the students.

**Vocabulary to be Introduced/Reviewed:**

None

**Instructional Strategies Used:**

- Review
- Lecture
- Pair work

**Before the Lesson** (5 minutes):

*Anticipatory Set* (gain students’ attention):

We will hand out the quizzes that the students took the last class period.

I will ask the students if they have any questions on their quizzes. We will work through any of the questions with the students.

If needed notes pages can be provided with larger font for visually impaired students.
**During the Lesson (Procedure):**

**Instructional Input:**

I will have a scale on the first slide. I will talk about how previously we had to keep the scales balanced by doing the same operation to both sides of the equality.

I will pose the question: “What do we do if we have variables on both sides?”

I will illustrate the following example using the scales on the screen by drawing the x’s on both sides.

\[ 2x + 1 = x + 5 \]

\[ [x=4] \]

We will talk about how we can move the x’s to one side by adding and/or subtracting them and we have to isolate the variables on one side and the numbers on the other side.

After we have completed that mini example, I will have the students guide me through writing steps to solve an equation:

1. Perform Distribution property
2. Combine like terms on each side
3. Add/subtract to move all the variables to one side and the numbers to the other side.
4. Divide/multiply to isolate the variable.

(6 minutes)

Transition Statement: “Now, let’s work through an example with you guiding me through the steps.”

I will focus on students with LDs during this time.
**Modeling:**

We will then work through the example with the students guiding me through the students.

\[ 6 + 7x = 15x - 10 \]

\[[x=2]\]

Transition Statement: “Now pair up with your elbow partner and work through the following example together.”

**Check for Understanding** (3 minutes):

I will then give the students this practice problem:

\[ 4 - 3x = 2(3x - 7) \]

\[[x=2]\]

I will walk around to make sure that all the students understand as we work through the problem.

Transition Statement: “Complete the following problems by yourself and raise your hand to confirm your answer with me.”

**Guided Practice** (7 minutes):

I will then give the students these problems to complete by themselves:

\[ 11m + 3 - 4m = 6(2m - 5) - 9(m - 1) \]

\[[m=-6]\]

\[ 8y + 1 = y - \frac{3}{2}(4y - 20) \]

I will go around and check the student’s answers and help those who need it.

After I have gone around, we will quickly go through the problems.
<table>
<thead>
<tr>
<th>Transition Statement: “Now you will work on your homework assignment.”</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Independent Practice</strong> (Remaining Time):</td>
</tr>
<tr>
<td>We will have the students work on a homework assignment that reinforces the skills they have learned for the rest of the class period. They will be encouraged to work in groups.</td>
</tr>
<tr>
<td><strong>After the Lesson:</strong></td>
</tr>
<tr>
<td><strong>Closure (summary):</strong></td>
</tr>
<tr>
<td>As the students pack up, I will remind them about learning target retakes and that we will continue the lesson the next class period.</td>
</tr>
<tr>
<td>Homework: p.157 #3-14</td>
</tr>
</tbody>
</table>
Chapter or Unit Topic: Chapter 2 – Solving Linear Equations

Time: 50 minutes

Grade Level: 9th Grade - Algebra I

Lesson Topic: Solving linear equations with variables on both sides. (Part 2)

Big Idea (Concept): Linear equations have no solution if, in the process of solving the equation, the variables are eliminated entirely, you reach a contradiction, and the two sides of the equation are no longer equal. A linear equation is an identity if during the process of solving the equation you eliminate all the variables, there is no contradiction, and the two sides remain equal.

Lesson Objective(s) (Parts 2):

1. Students will be able to correctly solve one variable equations with the variable on both sides of the equation by using the addition, subtraction, multiplication, or division rules of equality when given an equation 75% of the time.
2. Students will be able to correctly identify whether a linear equation has no solution when given a linear equation 80% of the time.
3. Students will be able to correctly identify that an equation is an identity when given a linear equation 80% of the time.

Grade Level Expectations/ Common Core State Standards:

Grade Level Expectations

AR.2C Grade 9

Use and solve equivalent forms of equations and inequalities (linear)
AR.2A Grade 9

Use symbolic algebra to represent and solve problems that involve linear relationships, including absolute value and recursive relationships

Common Core State Standards

8.EE 7.b.

Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

A-REI 3.

Solve linear equations and inequalities in one variable, including equations with coefficient represented by letters.

Prerequisites:

Solving Equations with variables on both sides

Materials Needed: (including integration of technology)

Index cards with 15 exercises written on them, clipboards, Smart Notebook Software, and Smart Slate

Vocabulary to be Introduced/Reviewed:

Reciprocal, Identity, Contradiction

Instructional Strategies Used:

- Bell work
- Discussion
- Station Teaching

Before the Lesson (5 minutes):

Anticipatory Set (gain students’ attention):

I will have the students get out a separate sheet of paper as they walk in that they will do their homework on and have the students

Struggling students or LD students could be paired with stronger students.

Gifted students could be given wall problems that have all word problems on them.
do the following problems:

$7x - 3 = 9x - 3$

$x=0$

$2(x+1) = x - 6 + 3x$

$x=4$

These are review problems from the previous lesson.

After a few minutes we will go over these problems to clear up any confusion if there are issues.

Then we will quickly grade the previous day's assignment. No questions on it will be asked.

**During the Lesson (Procedure):**

*Instructional Input/Modeling* (10 minutes):

I will introduce the topic by presenting an example to the students.

Transition Statement: “Please try to solve this example.”

$$\frac{1}{2}(4t - 6) = 2t$$

[No solution]

Students realize something is wrong as they go through and solve it.

I will then work through the problem showing the students how the equation results in a contradiction. I will tell the student that this means there is no solution.

I will then show the next example and have the students work out this example.

Transition Statement: “Now try this problem.”

$$10m - 4 = -2(2 - 5m)$$
[Identity]

Students will quickly realize that a similar problem arises when solving this problem. I will then show them that this results in an identity which means that we can substitute any number as a solution.

Transition Statement: “Now we are going to do an activity.”

**Check for Understanding/ Guided Practice** (25 minutes):

I will then have the students split up into pairs. Their instructions will be as follows:

- Each person will need a sheet of notebook paper, a pencil, a calculator, and a clipboard.
- Each partnership will go to one question, number it accordingly on your paper, and each of you solve it.
- Once you and your partner have completed the problem, you should compare answers and talk it out if there are problems.
- After you and your partner agree on the answer, you will rotate to the next problem and the cycle continues.
- After you complete all the problems on the walls, you will return to your seat.
- Your sheet of paper with your problems on it will be your ticket to leave. It will be graded and counted as homework.

I will let the students get started and then go around and help each student pairs as needed.

**Independent Practice:**

With five minutes left, students will be given a homework assignment to complete before the next class period.

**After the Lesson:**

**Closure (summary):**

Students will be reminded that we are available before and after school. Students will also be reminded that there will be a test that Friday and that they should all be studying hard.

HW: p.157 #15, 16, 18-20, 24-26, 32, 33, 36, 37, 40-43, 49
Chapter or Unit Topic: Chapter 2

Time: 50 Minutes

Grade Level: 9th Grade - Algebra I

Lesson Topic: Solving Proportions

Big Idea (Concept): A proportion with variables in the numerator and/or denominator in either or both ratios can be solved for the variable by cross multiplying the two ratios and solving the resulting equation.

Lesson Objective(s):

1. Students will be able to solve proportions by using cross products and if necessary the distribution property when given a proportional problem with 80% accuracy.
2. Students will be able to set up and solve proportions occurring in a real life situation with 50% accuracy.

Grade Level Expectations/ Common Core State Standards:

Grade Level Expectations

NO. 3E Grade 9

Solve problems involving proportions

Common Core State Standards

7.RP.2C

Represent proportional relationships by equations.

7.RP.3

Use proportional relationships to solve multistep ratio and percent problems.
**Prerequisites:**
Solving linear equations, the method of cross multiplying in order to solve proportions

**Materials Needed:** (including integration of technology)
Smart Notebook, Smart Slates, guided notes for each student

**Vocabulary to be Introduced/Reviewed:**
Proportion, ratio, and equivalence.

**Instructional Strategies Used:**
- Bell work
- Discussion
- Pair work

**Before the Lesson:**

*Anticipatory Set* (gain students’ attention) (3 minutes):
As the students come into the room, they will work on the following problems that will be up on the board.

\[ \frac{x}{20} = \frac{1}{2} \]

[x=10]

The football team has won 7 games and lost 3. Write the ratio of the number of wins the football team has to the total number of games played.

[7/10]

Transition Statement: “Now, please get out your homework from last time and let’s go over these two problems.”
We will go over the solutions to the bell work and grade the homework from the last class period.

**During the Lesson (Procedure):**

*Instructional Input* (10 minutes)

Transition statement: “Today we will be discussing proportions.”

I will show the students the following:

“Proportions are equations that state that two ratios are equivalent. The General form of a proportion is given as:

\[
\frac{a}{b} = \frac{c}{d} \quad \text{where} \quad b \neq 0, d \neq 0
\]

Cross products of a proportion are equal:

Thus, \( ad = cb \)

I will hold a discussion with the students to discover why the cross product property holds true. This is because when you find common denominators and then set the resulting numerators equal, it ends up being the cross products of the proportion.

*Modeling* (1 minute):

Transition Statement: “Let’s take a look at an example of the use of cross products.”

I will then work through this problem showing the students how to cross multiply and then solve.

Struggling students will be given notes that have these properties written down. They will be encouraged to write the ideas in their own words.
\[
\frac{7}{x} = \frac{14}{32}
\]

\[x=16\]

**Check for Understanding** (5 minutes):

Transition Statement: “Now, go ahead and try the following example on your own.”

I will then give the following for the students to do on their own. I will walk around and check to see how they are doing and help with problems.

\[
\frac{-6}{2y} = \frac{7}{28}
\]

\[x=-24\]

**Modeling** (1 minute):

Transition Statement: “Let’s take a look at another example of the use of cross products. This time we have an extra step.”

I will then work through the following problem with the students. I will make sure to emphasize that you will have to distribute the 3.

\[
\frac{3}{z} = \frac{2}{z-6}
\]

\[z=18\]

**Check for Understanding** (5 minutes):

Transition Statement: “Now, go ahead and try the following example on your own.”

\[
\frac{m}{5} = \frac{m-6}{4}
\]

\[m=30\]

I will go ahead and check the student’s solution after they have

Students with learning disabilities will be given a list of steps to follow to solve these problems.

1. Cross multiply
2. Distribute as needed
3. Isolate the variable

I will focus on helping the weaker students at this point.
completed this checkpoint problem.

**Modeling/Check for Understanding** (5 minutes):

Transition statement: “Now, I will pair you up and in your pair try to set up and solve the following word problem proportion.”

Ming was planning a trip to Western Samoa. Before going, she did some research and learned that the exchange rate is 6 Tala for $2. How many Tala would she get if she exchanged $6?

[___ ___ ___ ___]

I will then go around to each pair and check they have the correct solution.

Transition statement: “Now, for next time you need to do the following homework problems, watch the video for percent proportions, and fill out the guided notes.”

**Independent Practice** (Rest of class period):

Students will be given a homework assignment that practices proportions and an assignment to watch a video over the next lessons (percent proportions)

Homework assignment:

p. 171

#5-9, 19-22, 33

Watch a video and fill out the guided notes for the next class period.

**After the Lesson:**

Gifted students will be given an alternative problem with fractions in the proportions.

Stronger students will be paired with weaker students.

Guided notes are on the following page.
## Closure (summary):

Students will be reminded that they need to watch the video and complete the homework assignment before the next class period.

Link to video: [http://www.youtube.com/watch?v=yl0Rb6T09VM](http://www.youtube.com/watch?v=yl0Rb6T09VM)
Section 3.7 Percents

For Wednesday’s lesson you will be watching a video at home before class. It is extremely important that you watch these videos and follow along.

What you need to know:
- The link for the video is on the following slide.
- Follow along and fill out the notes as you watch including working out examples and filling in blanks.
- Each example in the video will correspond to the example in the notes.
- Pause the video if you are confused and replay as needed.
- When you see STOP that means to pause the video and work out an example on your own. This example will not be in the video, we will check it in class.
- START means to begin the video again.
- Come to class with questions!

Here’s the link:
http://www.youtube.com/watch?v=yI0Rh8T09VM

Fill in the blanks as you watch

In any proportions, the ______ ________ are equal.

Use cross products to solve the proportion:

\[
\frac{x}{36} = \frac{24}{100}
\]

Fill in the blanks as you watch

The Percent Proportion Using Key Words

\[ \underline{\text{_______}} = \underline{\text{100}} \]

Example 1:
What is 4% of 1,400?

Example 2:
56 is what percent of 40?

Example 3:
6 is 2% of what number?

After Example 3 is done, STOP.
Try this problem:
What percent of 56 is 49?

START the video again

Example 4: To finance her education, Lupe takes out $4,000 loan for 1 year. If she is charged 12% simple interest per year, how much interest will she pay in the first year?

Example 5: One cup of regular ice cream has 360 calories. The light version advertises 25% less calories. How many calories are there in two cups of the light ice cream?

Ok, that was it! Come to class with your filled out notes and any questions you might have had!

If you think you might need some extra assistance or would like to see more examples, here are some more videos to watch:
- http://www.youtube.com/watch?v=3Vs4pD4hQ&feature=related
- http://www.youtube.com/watch?v=Djv6juQGJf4
**Parallel Instructional/ Lesson Plan (Hunter/ Betts)**

<table>
<thead>
<tr>
<th><strong>Chapter or Unit Topic:</strong> Chapter 2 - Solving Linear Equations</th>
<th><strong>Modifications</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time:</strong> 50 Minutes</td>
<td><strong>Accommodations/ Modifications</strong></td>
</tr>
<tr>
<td><strong>Grade Level:</strong> 9th Grade - Algebra I</td>
<td></td>
</tr>
<tr>
<td><strong>Lesson Topic:</strong> Solving Percent Problems</td>
<td></td>
</tr>
<tr>
<td><strong>Big Idea (Concept):</strong></td>
<td></td>
</tr>
<tr>
<td>Percent problems can be set up by an equation or by a proportion. The percent over 100 has to be equal to the ratio of the part to the whole.</td>
<td></td>
</tr>
<tr>
<td><strong>Lesson Objective(s):</strong></td>
<td></td>
</tr>
<tr>
<td>1. Students will be able to correctly solve a percent problem by using a proportion or equation 4 out of 5 times.</td>
<td></td>
</tr>
<tr>
<td>2. Students will be able to correctly set up and solve a percent problem in a real world context 2 out 3 times.</td>
<td></td>
</tr>
<tr>
<td><strong>Grade Level Expectations/ Common Core State Standards:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Grade Level Expectations</strong></td>
<td></td>
</tr>
<tr>
<td>NO.1B Grade 8</td>
<td></td>
</tr>
<tr>
<td>Use fractions, decimals and percents to solve problems</td>
<td></td>
</tr>
<tr>
<td><strong>Common Core State Standards</strong></td>
<td></td>
</tr>
<tr>
<td>6.RP.3C</td>
<td></td>
</tr>
<tr>
<td>Find a percent of a quantity as a rate per 100</td>
<td></td>
</tr>
<tr>
<td>7.RP.3</td>
<td></td>
</tr>
<tr>
<td>Use proportional relationships to solve multistep ratio and percent problems.</td>
<td></td>
</tr>
</tbody>
</table>
Prerequisites:
Solving proportions, understanding of percents, solving equations.

Materials Needed: (including integration of technology)
Smart board and smart slate

Vocabulary to be Introduced/Reviewed:
Proportion, percent

Instructional Strategies Used:
- Bell work
- Flipping the Classroom
- Small group discussion
- Independent work

Before the Lesson (5 minutes):

Anticipatory Set (gain students’ attention):
When the students come into the classroom they will be instructed to take out the guided notes sheet they SHOULD have filled out while watching the video the previous night.

They will also get out their homework assignment and check their answers with a partner.

After the bell has rung and I have taken attendance, I will go over any questions on their assignment. We will grade the assignment in class.

During the Lesson (Procedure):

Students with learning difficulties will be spread among the groups.

Gifted students will be grouped together and given a more complex problem.
MATH TEACHER WORK SAMPLE

**Instructional Input** (1 minute):

Transition Statement: “Now, who watched the videos last night?”

I will ask the students who had watched the video that was assigned at the end of the last class period.

Instead of lecturing on the material, I will quickly demonstrate the big idea of the lesson on two examples and remind them of the memory device:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>

**Modeling** (3 minutes)

What number is 75% of 164?

\[
[\quad \quad \quad \quad \quad ]
\]

21 is 37.5% of what number?

\[
[\quad \quad \quad \quad \quad ]
\]

**Check for Understanding/Guided Practice** (15 minutes):

After the examples are done, I will break the students up into groups of four. I will give each group a word problem to work through on their own.

A student earned a grade of 80% on a math test that had 20 problems. How many problems on this test did the student answer correctly? (round to the nearest whole number) \[16\]

There are 36 carpenters in a crew. On a certain day, 29 were present. What percent showed up for work? (round to the nearest tenth) \[80.6\%\]

A metal bar weighs 8.15 ounces. 93% of the bar is silver. How many ounces of silver are in the bar? (round to the nearest thousandth) \[7.580\]

A woman put $580 into a savings account for one year. The rate of interest on the account was 6½%. How much was the interest for the year in dollars and cents? (Round to the nearest cent)
A student answered 86 problems on a test correctly and received a grade 98%. How many problems were on the test, if all the problems were worth the same number of points? (Round to the nearest whole number) [88 questions]

Manuel found a wrecked Trans-Am that he could fix. He bought the car for 65% of the original price of $7200. What did he pay for the car? (Round to nearest dollar) [$4,680]

Pamela bought an electric drill at 85% of the regular price. She paid $32.89 for the drill. What was the regular price? (Round to the nearest cent) [$38.69]

After each group has written up a solution, they will present their problem and solution to the class.

*Independent Practice* (Rest of class period):

Transition Statement: “Now, you will work on a homework assignment that is due next class period.”

After everyone is done, the students will work on their homework assignment the rest of the class period

*After the Lesson:*

**Closure (summary):**

Have the students complete a homework assignment and remind them that we are available before and after school for assistance.

Also, remind the students that the next day will be a review and they will have a test in two days over this unit.

**Follow-up Activities (may be done as homework):**

Homework: p. 179 #4-18, 33, 34
Element 5: Instructional Decision-Making

Instructional decision-making is an important ability of a teacher. Each student and classroom is different and in the age of technology (and failing technology) it becomes essential for the teacher to be able to switch their instruction mid-lesson to reflect the needs of the students in the classroom. There are a couple of specific instances when the behavior and learning of my students prompted a change in the lesson instruction.

One of the first instances I used instructional decision-making was when I was teaching a lesson on solving equations with variables on both sides. I planned on breaking the lesson up into two different days, the first day was to be spent covering how to solve general equations and the second day would be spent on demonstrating situations, when solving equations, that result in no solution or an infinite number of solutions. The first day, I planned on having a station activity for the students to complete in pairs in order to gain extra practice. They would go from station to station to solve the problems at each one. However, the lesson took longer to go through because the students were struggling to gain understanding of the concepts and I was going through more examples. I wanted to give the students to have time to work on their homework and allow me to help them reinforce the lesson. I decided to scrap the station activity for sake of time and give a shorter assignment to make sure the students got time to work on it and so I could help them with any problems. For future lessons of algebra I that day, I also eliminated an example to condense the lecture to allow the students more time to work in class. This helped students because it allowed them time to work in class and ask me questions. In particular, this helped when working with the weaker students because I could
spend extra time with those students to clear up misconceptions and help them gain a firmer understanding of the material.

Another instance that I exhibited instructional decision-making was during the percent lesson. The students were required to watch a video the night before and take notes on the video to bring to class. Our plan was to have a quick activity and let the students work on the homework the remaining time in class. However, a quick poll of the students demonstrated that most of the students did not watch the video and take notes. The lesson hinged on the students watching the video. Even though the concepts were not completely new to the students, many of the students would have struggled to understand if I started the activity. So, what I decided to do was to allow the students who had watched the video to move to the back of the room and begin working on their assignment. I then had the other students move to the front and watch the video and take notes. I then went around and made sure the students who had watched the video understood the material and cleared up any misconceptions those students. After the other students had watched the videos, I had them start on the homework assignment.

Ultimately, this was a great instructional change for the students. The students who had watched the video were rewarded by getting extra time to work on the homework. It also allowed me to stagger instruction and help groups that needed it at different points. This definitely helped the students gain progress towards solving these types of problems and reaching the objective.
Cooperating Teacher Feedback Form

This Reflection Sheet should be completed by the cooperating teacher following observations of lessons taught in the Teacher Work Sample (TWS) sequence. Please meet with your teacher candidate after they have taught the lesson to discuss/compare reactions to the following items. A signed copy of this form should be included with the TWS documents.

Teacher Candidate: ___________ Cooperating Teacher: Jessica Anderson

School: Platte County High School Grade/Subject: 9th – Algebra I Date: 10/05/2012

1. As you observed this lesson, to what extent were students productively engaged in the work?

   The lesson was presented and students were asked to take notes using a guided note sheet and participate in a discussion over the related topic. For the majority of the time students were actively engaged. The lesson went over the expected time and it was noticed that students were disengaging in the lesson not actively processing the information.

2. Did the lesson allow for students to engage in activities and learning situations which were consistent with the planned lesson and/or the district’s curriculum guide?

   The original plan of the lesson was for students to take notes from [name redacted] and then separate into partners to participate in a stationed activity. They could work with another student to answer equation solving questions and gain help from their peer if needed. Unfortunately, time did not allow for students to participate in the activity due to time constraints.

3. How did the teacher candidate act on feedback from students that they did/did not achieve understanding and/or that the goal/objective(s) of the lesson were met?

   Due to the lengthiness of instruction and questions of students, [name redacted] was not able to complete the full activity as planned. After the class period was over [name redacted] made immediate adjustments to the note-taking process for the other Algebra I classes of that day in order to shorten the lecture time and allowed them additional time for questions as well as complete a short assignment in class. He postponed the activity to the following class period so that students would be able to have an adequate amount of time to complete the activity and be more actively engaged.

4. Did the teacher candidate adjust their goals and/or plans as the lesson was taught? Why? How?

   [name redacted] saw during the lesson that there would not be enough time to complete the lesson plan that had been originally created. He was able to quickly make a decision on what to assign the students that would give them practice in a short amount of time to assess their learning for what was instructed that class period. He also had a plan of action on how to re-structure the other class periods of the day so that the same problem did not happen.

5. What suggestions would you make if the teacher candidate were to teach this lesson again?
MATH TEACHER WORK SAMPLE

Shorten the lecture time or change the way the material was presented all together so that the activity could have still be used in that class period.

Teacher Candidate: 

Cooperating Teacher:
Element 6: Analysis of Student Learning

Whole Group Analysis

The following graph in Figure 1 is based on the percentage of students that met each objective in the pre- and post-tests. On the pre-test, there was one question that covered each objective with the exception of objective two. Objective two was added based on the pre-test results as indicated in element two. Thus, the percentage on the pre-test for each objective is the percentage of students that answered that question correctly. The post-test percentages are the percentage of students that met the objective criteria as outlined in element three.

![Percent of Students that Met Each Objective](image)

Figure 1.

The exact percentage of students that met each objective are outlined in Figure 2 and the additional number of students that met each objective on the post-test as compared to the pre-test are displayed in Figure 3. A negative number indicates that the number of students that met the objective decreased from the pre- to post-test. These figures are located on the following page.
### Performance on Objectives

<table>
<thead>
<tr>
<th>Objective</th>
<th>Pre-Test</th>
<th>Post-Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective 1</td>
<td>61%</td>
<td>76%</td>
</tr>
<tr>
<td>Objective 2</td>
<td>76%</td>
<td>76%</td>
</tr>
<tr>
<td>Objective 3</td>
<td>76%</td>
<td>71%</td>
</tr>
<tr>
<td>Objective 4</td>
<td>24%</td>
<td>59%</td>
</tr>
<tr>
<td>Objective 5</td>
<td>0%</td>
<td>76%</td>
</tr>
<tr>
<td>Objective 6</td>
<td>53%</td>
<td>76%</td>
</tr>
<tr>
<td>Objective 7</td>
<td>47%</td>
<td>41%</td>
</tr>
</tbody>
</table>

Figure 2.

As indicated by the Figures 1, 2, and 3, the number of students that met the criteria for each objective increased from the pre-test to the post-test for each objective with the exception of objective three and objective seven. This prompts a closer look at each of these objectives.

**Objective three**: Students will be able to correctly solve linear equations with one variable by combining like terms first and then using the addition, subtraction, multiplication, and division properties of equality when given a linear equation with multiple instances of the same variable.

The decrease in percentages is probably partly due to the difficulty of the questions on the post-test. The pre-test question was a standard combining like terms question. It had the students combine only two terms and they were whole, positive numbers. The variables were also only on one side. On the post-test, questions number 7, 8, and 12 assessed the objective. Number 7 is the exact same problem as the pre-test question and number 8 is a very similar problem. On number 8, the problem requires that the student combine like-terms including one that has a negative sign. Students often forget to include the negative sign when combining like terms. Number 12 is a different story. Not only does it require combining like-

### Student Improvement on Objectives

<table>
<thead>
<tr>
<th>Objective</th>
<th>Number of Improved</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>3</td>
<td>-1</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>-1</td>
</tr>
</tbody>
</table>

Figure 3.
terms, it also requires that students solve an equation with variables on both sides of the equation and it has decimals. Students struggle greatly with decimals and when you have an additional step of moving the variables to one side, this could cause issues. Only nine students got this question completely right. Twelve students got each of the other two questions correct. It is evident that question 12 is the problem question. If the students missed this question, they were one step away from not meeting the objective. It is probably due to the decimals and the negative in question number 8 that many students did not meet that objective. In the future, I will concentrate on adding more problems in instruction with decimals and negatives when combining like terms. I will also use a slightly more difficult problem for the pre-test to hopefully get more accurate results.

**Objective seven:** Students will be able to solve a problem in the context of real world situation by solving linear equations, using proportions, or using percents correctly.

This was another situation where the performance on the post-test was one less than the pre-test. This objective pretty much covers word problems that use the concepts in the other objectives. On the pre-test, there was a simple two step equation to set-up and solve. On the post-test there was a percent proportion word problem, a two-step equation word problem, and a word problem that sets up an equation with variables on both sides. To meet the objective, the student must get two out of the three questions correct on the post-test. The percent proportion equation and the equation with variables on both sides caused the students the most trouble yielding 9 and 7 correct responses respectively. If the students missed these two questions they would not meet the objective.
There are many reasons why the students struggled with these additional two problems. The percent proportion problem is a difficult one because of how we taught percent proportions. We tended to focus on the key words such as “is” and “of” and where they correspond in the proportion, we forgot to relate it as the “part” to the “whole.” This understanding is essential for students to correctly solve a word problem of this type. The problem with variables on both sides becomes difficult for students because there is a lot of information to sort through. The students struggle separating the pieces out and figuring out that they have to set the two expressions equal to one another. More often than not, the students combine the various parts incorrectly. Another aspect that the students forget on that word problem is the key word “decreases.” That indicates a negative slope and if the students do manage to put the various parts in the correct locations, many of the students will forget the negative sign.

This information definitely informs my future instruction. I will plan on discussing percent proportions more generically by describing the “part” and the “whole.” I will also spend more time emphasizing word problems that use percents. For the word problem that has variables on both sides of the equation, I will emphasize sorting the different information to create the expression. I will also emphasize writing what is happening down in words first to inform the grouping and relation of the numbers. This should help the student create the expressions and equations. I will plan on including different word problems on the pre-test in the future to compare more directly to the different types of word problems.
Subgroup Analysis

There is not a tremendous amount of diversity in the classroom at Platte County nor are there obvious subgroups for me to look at. I have noticed that because of the classroom arrangement and my own tendencies that I tend to stray towards the left side of the room. From what I have reflected on, I think there is the possibility that the left hand side of the room gets more questions asked of them and quicker assistance from me when they need help. If this is correct, the left hand side should have performed better on the objectives than the right hand side. Figure 4 demonstrates the percentage of the students that met the objective on the post-test on the left side of the room as compared to the right side.

Figure 4.

As you can see the results demonstrate a consistent higher achievement rate by the left side of the classroom. As mentioned before, this probably partly due to the amount of attention these students receive on a daily basis because they are in my proximity. Another factor that plays into this is how the students are seated. Based on previous tests and work,
the three weakest students sit on the right side of the room but slightly towards the middle and some of the best students sit on the left hand side of the room. This would definitely skew the results. I will make an effort to be more balanced in my instruction in the future. However, let’s take a closer look at objective one and objective four, objective one because the results are very consistent with one another and objective four because there is such a difference in the results.

**Objective one:** Students will be able to solve one variable equations with variables on one side of the equation by using the addition, subtraction, multiplication or division rules of equality.

Both sides of the room experienced similar high results. I think this objective was relatively unaffected by the classroom orientation because this is a skill previously learned. This skill is emphasized strongly in middle school math, thus most the students were probably moderately proficient before they began the unit. This was demonstrated by the pre-test where 71% of the students got the question correct that covered that objective. Less emphasis could be placed on this objective in the future.

**Objective four:** Students will be able to correctly solve one variable linear equations by using the distributive property to simplify first and the solve using the addition, subtraction, multiplication, and division properties of equality when given a linear equation.

The high contrast in the achievement levels of this objective is truly surprising. This objective typically involves a lot of steps because when you distribute it often means changing signs and then combining like terms afterwards. This can cause a lot of trouble to weaker
students. I am not sure, but I would guess the reason the left side excelled, other than extra reinforcement by me, would be that the stronger students on the left side catch all the little errors and excel at following the extra steps. The weaker students on the right side would struggle more with the extra steps and potentially mess up the distribution and sign changes. This would only heighten the gap between students. In the future, I will be sure to continually integrate more distribution problems especially for the weaker students.

Overall the students did well with the objectives and I was pleased with their performance. There were two objectives where the students did worse on the post-test but this probably due to instructional error, the ease of the pre-test problem, and the difficulty of the post-test problems. With my subgroup analysis, I found that the left half of the room did better on all the objectives. This is probably due to my tendency to stay on that side of the room and the stronger students on that side of the room.
Element 7: Reflection

Overall, I felt as though my classroom management was moderately effective. There were things that I would like to change but there are many things that I did that worked well. I tried to use Jones’ philosophies but many times this didn’t work. For example, I thought I would use more proximity to manage the class, but it didn’t work in the reality of my classroom because of the way the class is set up. You cannot easily get to another seat, and the students often had so many questions that I would be helping students and not walking around to make sure they are working. One thing that did work with Jones’ philosophy was the nonverbal cues. Many times, I would just need to look at a student to stop behavior. To combat future issue of classroom arrangement, I shall create a better classroom design to easily move throughout the classroom and to stop certain students from monopolizing all of my time; I will implement a “ask one then me” rule. The students will need to ask a friend the question they have before they ask me for assistance. This can free up my time to work the crowd.

Another minor issue I had with classroom management was engagement. In mathematics, it is a difficult task to keep the student fully engaged the whole lesson. I am getting better at combating that by using students’ names more often to actively engage them in the lecture. I will continue to do this. At first, I had hardly used their names at all. I am also working on using more realistic situations to spark interest and create motivation. The other day we showed a video of the problem situation. It was kind of funny, so it perked interest and engagement in the material.

I have learned that developing a relationship is a very powerful tool when it comes to classroom management and consistency is the way to maintain respect. I make an effort to get to know each of my students. They know that I know who they are and that I care about them
and their success. This really helps me motivate the students and get them to do what I need them to do. I know a lot about some of my weaker students so that I can relate to them and try to motivate them to come in and do better. Developing a relationship might get the respect, but consistency is what will keep it. When dealing with classroom management issues, I try to deal with them in a consistent manner. I need to work on this further, but I try to make sure that if I get onto a student for talking, I get after all the students that are talking. This way the students know what to expect and they think they are being treated fairly.

Probably the biggest thing I have learned is that you sometimes have to be tough. It is much easier to loosen up then it is to tighten your classroom management. This is noticeable in my class. I was a little too loose with them at first and they have taken advantage of that by starting to joke around more in class and not stay focused. I think it would be better to be strict and unyielding at first and work on building the relationship and your expectations. Then it would be time to lighten up.

Another thing I have learned was when I had classroom management issues, I worked hard to not embarrass the students. I would talk to them privately, but I think that sometimes, making the student accountable in front of their peers can be the pressure need to maintain their focus. This doesn’t have to been done in a threatening or embarrassing way. For example if one particular student is talking, I can say that we aren’t going to move on until everyone is focused. It sends the message to the only student that is talking that I mean him. Most of the class realizes it was that student, but I haven’t called him out in a threatening or confrontational manner. I discovered that different strategies work differently for different classes.

In larger school districts, collaboration and collegial activities are expected and I think it is beneficial to participate anyways. The teachers are expected to discuss teaching, but there are
varying levels of the amount. Sometimes, it is just a quick check to make sure that they are close to the same plan for the same classes. Sometimes it is full blown daily meetings to organize assignments and instruction. We do this daily meeting for Algebra I. We meet to discuss students that are struggling, intervention methods, assignments, tests, and instructional strategies. We present a united front for all our assignments and activities. In addition, the whole department collects data to analyze instruction and student learning. I think this is a valuable tool and creates information that can be used to improve learning. I am planning on using the same data collecting techniques to improve my own teaching.

Another thing that Platte County does is exchange ideas with each other regarding teaching. I have seen that many of the teachers meet with each other to exchange ideas, share the work for assessment, and create interesting projects. I think that it is important to exchange ideas for teaching with fellow teachers because it creates a system of best practices. This type of system also creates a support network for the teachers as well as the students.

There is the strong possibility that I will teach a small school and be the only person in the math department. I think I have realized the need to collaborate with local teachers (in other schools) as much as I can and create connections with my fellow building teachers to build a collaborative and supportive environment for my fellow teachers and students. I think this could possibly take the form of co-teaching, mixed content units, guest lecturers, and exchange of instructional strategies.

In order to stay current and exhibit best practices, teachers are always changing. While I have strengths, I plan on continuing to grow and develop them. Some of my strengths are working one on one with students. I think this comes from the massive amount of tutoring I have done for the last four years. I plan on incorporating more independent work in class so that
I can help students one-on-one. Another strength I have is establishing a rapport with students. I have such a wide variety of experiences that it is easy to relate to all students. I do this by asking the students about their dislikes and likes and try to relate the material to mutual experiences. I am going to try to continue to integrate more experiences into the classroom. I am very strong with my content knowledge and that will only grow the more I teach with the material. Finally, I think I am organized. However, I think it will be easier when I have my own classroom and system. I plan on looking at other teacher’s systems to better my own system of organization.

Even though I have many strengths, there are many areas that I need to work on for the future. One is I need to work on my classroom engagement. I don’t struggle to keep the students engaged but I think there are better and easier ways to engage the students. I am looking for more activities and real life situations in order to keep the students engaged. In this particular unit, I think I would plan on using more concrete manipulative to better explain the material and maybe take a couple more days to go through this foundational material. Another weakness is classroom management. Once again, my management is not bad but it could definitely be better. I plan on reading up on different classroom management styles to have a menu of strategies to use for a variety of different situations. I am also planning on talking to other teachers about their styles to see what works. Something that I think I will gain with time is pacing. I have trouble pacing myself to make sure that I get everything accomplished. I think I can manage to change that by using a timer and keeping a careful watch on the clock in order that I remain on time. I also plan on going through my lessons more realistically to figure out the appropriate pacing. One last weakness is simplifying the material. I have great content knowledge but sometimes I don’t realize what the students do or do not know. When this happens, I often accidently talk over their head or brush through content that needs more time. Sometimes, I even
spend too long explaining simpler concepts. To combat this, I plan on trying to organize little sound bites of information that will be more concise when I present it. I can also take a closer look at the standards to see exactly what the students’ prior knowledge should be.

Overall, the unit was an incredible learning experience. I think that the unit was an eye opening experience about how I teach and better ways to teach certain information. I’ve learned a teacher must always be flexible and not get set in their ways. To be comfortable and set is probably the quickest way to becoming a bad teacher. Teachers need to focus on the students and think what is best for them and their learning. This is what I am planning on doing in order to become the best teacher I can.