Lesson 1

Grade: 9th

Subject: Algebra I

Materials: Notebook, Pencil, Notes, Student Computers

Technology Needed: Computer with PowerPoint and SMART Board

Instructional Strategies:

- ☐ Direct instruction
- ☐ Guided practice
- ☐ Socratic Seminar
- ☐ Learning Centers
- ☐ Lecture
- ☐ Technology integration
- ☐ Other (list)
- ☐ Peer teaching/collaboration/ cooperative learning
- ☐ Visuals/Graphic organizers
- ☐ PBL
- ☐ Discussion/Debate
- ☐ Modeling

Guided Practices and Concrete Application:

- ☐ Large group activity
- ☐ Independent activity
- ☐ Pairing/collaboration
- ☐ Simulations/Scenarios
- ☐ Other (list)
- ☐ Hands-on
- ☐ Technology integration
- ☐ Imitation/Repeat/Mimic

Explain:

Standard(s)

- HS.A.CED.3 - Create equations and inequalities in one variable and use them to solve problems.

Objective(s)

- TLW identify linear functions containing one variable
- TLW solve one-step, one variable equations using addition and subtraction
- TLW solve one-step, one variable equations using division and multiplication

Bloom's Taxonomy Cognitive Level:

- Knowledge
- Apply

Differentiation

Below Proficiency: For below proficiency students, I will work with them during the individual activity later in class. I will have the students do an activity on the computer where they solve one-step, one-variable problems on a game site. At this point, I will go around and help them with the areas they're struggling on.
Another option would be to have them watch a Khan Academy video during the individual activity while others are doing the game. They will get more instruction and there is also a chance to answer questions at the end of the Khan Academy videos, so they will not miss out on the game aspect either.

Above Proficiency: For above proficiency students, I will introduce them to problems with two steps. This will be an early introduction as to a lesson we will cover a couple days later. Another option would be to have them work with the below proficiency students so they can explain how they approach these problems, and this may help the below proficiency student to pick up on new methods to understand the problems better.

Approaching/Emerging Proficiency: For approaching/emerging proficiency, I will have these students continue along with the activities as scheduled. I will give the students the option to try and solve two-step equations if they feel they are ready. They will have the option as to whether they want to do one-step or two-step equations.

Modalities/Learning Preferences: The learning preferences this lesson appeals to are those who are auditory and visual learners.

Classroom Management- (grouping(s), movement/transitions, etc.)	**Behavior Expectations- (systems, strategies, procedures specific to the lesson, rules and expectations, etc.)**
• Students will be expected to observe normal classroom procedures. • When grabbing computers, students will be dismissed one pod at a time to grab their computers, and they are expected to follow the procedure of respect for others and property as they gather their computers.	• Students will be expected to respect others and the property of others as they gather their computers for the individual activity. • Also, students are expected to be responsible and only go to the website that I have given them for the activity.

Minutes	**Procedures**
2	**Set-up/Prep:** Make sure the website URL that I give the students works. Have the PowerPoint up and ready to go on the screen for when the students arrive.
3	**Engage: (opening activity/ anticipatory Set – access prior learning / stimulate interest /generate questions, etc.)** There will be a bell-ringer question on the board that reads "in your own words, what is a variable? What does a variable represent?" The students will get their notebooks out and answer this question when they come into class. Once the bell rings and everyone has had a chance to write a response, we will have a brief discussion about what they think a variable is and what it represents, as this will lead us into the lesson for the day.
25	**Explain: (concepts, procedures, vocabulary, etc.)** First, I will talk with the class about equations with one variable and touch on the fact that we want to get the variable by itself to solve for it. This will lead me into the vocabulary part of the lesson, which will include: • <u>Variable</u> – A symbol for a number that we do not know yet. It is usually denoted by a letter such as x, y, n, etc. • <u>Inverse Operations</u> – An operation that reverses the effect of another operation. (i.e. addition is the inverse of subtraction, multiplication is the inverse of division.) • Also, at this point I would have a brief discussion with the class to remind them that when multiplying and dividing, signs are very important. If you multiply/divide one positive and one negative, the number is what? Negative. If you multiply/divide two negative numbers, then the answer is what? POSITIVE!! 1.) At this point I will present they class with an equation that looks like x + 8 = 14. I will then ask them how we can tie our definitions into this problem. We would discuss how x is the variable in this problem and ultimately what we are going to solve for. 2.) This will lead us into a discussion about how do we exactly do that? I will look to field answers at this point if someone believes they know the correct answer. I am looking for getting x alone by using inverse operations. So in this problem above, we can see that we need to get the 8 to the other side of the equation to solve. We can now apply the inverse operations that we talked about and see that you must subtract 8 to get it to the other side. 3.) This will lead to another important topic. **When you do an operation to one side of the equation, you must do it to the other side!!!!** I will do my best to drive this point home because it is such an important concept and one that I commonly see that is misunderstood/left out. So then we will see that since we subtracted 8 from the left side to get it to cancel out and leave x by itself, we MUST subtract 8 from the right side. If we do this, we can now see that we are left with x = 14 – 8. If we simplify this problem, we can see that x = 6. 4.) Now, I am a firm believer in checking answers to see if they are correct. I will tell the students that at this point, we should plug 6 back into the original equation for the x and see if we get the right answer. So, we now see that 6 + 8 = 14, therefore we did the problem correct and got the right answer. 5.) Now I will introduce another problem with a concept that I see misunderstood commonly. I will present a problem with the variable on the right side of the equals sign, instead of the left. 3 = 4 + y.

6.) At this point, we will discuss what the variable is in this problem, and come up with the variable being y. Now that we have identified the variable, what should we do? I will be looking for get y alone. And how do we do that? We must do the inverse of 4 to get y alone. At this point, we will discuss that since there is nothing in front of the 4, we can assume that it is positive, otherwise there would be a negative in front of it. Since it is positive, we can look at it as a +4, so how should we get it to the other side? We need to subtract it. Since we subtract 4 from the right side, what do we do to the left side? We subtract 4 there as well. If we do that, we can see that we end up with 3-4 = y. This means that y comes out to be -1 in this problem. Now does it matter that the variable is on the right side of the equals sign? NO it does not matter in this case. I want you to remember that when there is an equals sign, it does not matter which side the variable and answer are on. However, when we get to inequalities later, we will need to pay attention to that. Now let's do the last step and check our answer. 3 = 4+-1. Is this true? Yes!

7.) Now we will do one example where we see subtraction right away. X – 9 = 6

8.) Let's identify the variable. X is the variable in this problem. Now how do we get it alone since we see subtraction this time? We should do the inverse of subtraction, which we discussed as addition. So we see now that we must add 9 on the left to cancel the 9's. However, since we added 9 on the left, we must add 9 on the right. Therefore, we end up with x = 6 + 9. From here, we can see that we end up with 15. Now let's plug it back in to the original and we see that we have 15 – 9 = 6. Is this true? Yes!

9.) Now we will discuss how to solve one-step equations with multiplication and division. Since we have discussed multiplication and division are inverse operations, we must use one to undo the other. We will also carry the same principle that if you do something to one side of the equation, you must do it to the other as well.

10.) The first example we will look at it 4x = 12. Now this problem may look a little weird right away, but we will walk through how to solve it and it will make much more sense. Since the 4 and the x are together, what does that represent? I would be looking for the answer of multiplication. This is a topic I will go a little bit more in depth with during this part of the lesson and explain that when we see numbers together like this, it means multiplication.
Now, what do we do since we see multiplication? I would be looking for the answer of division to get x alone. So, we need to divide both sides by 4 and we end up with x = 12/4. Then we have a division problem that we have seen many times before and can say that x = 3. If we plug this problem back into the equation, we can see that 4(3) = 12.

11.) Now we will do an example of division. (y/6) = -6. Identify the variable: y. Once we have identified, what is the inverse operation we are going to have to use here? Multiplication. How do you use multiplication to cancel out division? You multiply by the reciprocal. In this case, we essentially have (1/6), so that means the reciprocal would be (6/1) or 6. So we now see that we have to multiply by 6 on each side to get y alone. So if we multiply by 6, we see that we have y = -6(6). Now be careful here, we are taking a negative number and multiplying by a positive number. What does that mean? That means that our answer should be NEGATIVE. So now we can see that y = -36.
Plug it back in and see if -36/6 = -6. Yes it does, we're good to go!

12.) At this point, we will continue to go through examples together.

13.) –x + 12 = 9.
subtract 12 to get –x = -3
This is a great example to illustrate that we need to pay attention to signs! We want to express the variable in a positive form, so now we need to divide by a negative 1 to get our x to be positive!!
Therefore, we end up with x = 3.

14.) -14 = 8 – x
Since the 8 is positive, we can see that we need to subtract it. So if we subtract 8 on both sides, we get -22 = -x. Notice here how we end up like the last problem where have our variable as negative. We need to divide by -1 to get our x to be positive. So we end up with 22 = x. Do I need to switch variable and answer around? No.

	15.) Here's another example. (2/3)x = 12. What inverse operation do we need to do? Multiplication. Good. So we need to multiply by reciprocal to get the answer. Reciprocal of (2/3) is (3/2). If we multiply by (3/2) on each side we end up with 12(3/2), which is equal to 18. Let's plug it back in and see that (2/3) times 18 is equal to 12. **16.)** The last example we will cover together is -8x = -32. Variable? X. Inverse operation? Division. However, let's be careful as we proceed here. We end up having to take -32/-8, so we have a negative divided by a negative. What does that give us? A positive number. -32/-8 is equal to 4. Let's plug 4 back in. (-8)(4) = -32. The answer checks out so we are good. **17.)** At this point, I will ask the students if they have any questions before we move on to our next part of the lesson. **18.)** After questions have been answered, I will tell the group that we are going to be working with our computers to do some practicing with solving one-step, one variable equations. Students will be instructed to grab their appropriate computers when told to do so. Also, observe proper behavior when grabbing computers. Once everyone has grabbed computer, I will further instruct them.
15	**Explore: (independent, concreate practice/application with relevant learning task -connections from content to real-life experiences, reflective questions- probing or clarifying questions)** Students will now be instructed to go to the website https://www.thatquiz.org/ . When they get to the website, they are to go under the "integers" section and click on "algebra" Then on the left side, they are go change the length of questions to 20, and change the "level" to 1 or 2. 1 is addition and subtraction. 2 is multiplication and division. They are to complete the 20 questions and then try to move up and "level" and see how they do. Or they can stay on their current level and try to get more right in a shorter amount of time. While explaining this to the students, I will have it brought up on the SMART Board through my computer so they can follow along. If they have questions, they are to raise their hands and I will help.
5	**Review (wrap up and transition to next activity):** At this point, I will have the students wrap up by putting their computers away through the proper classroom procedure. Once they are all seated, we will recap the main points for the day. • Definitions of variable and inverse operations • Pay attention to signs when multiplying and dividing especially. • Then they will be given one problem to solve on an exit slip upon which I will collect as they exit the classroom. I will use these to gain where student understanding is at. The problem is -9x = 27.

Formative Assessment: (linked to objectives) **Progress monitoring throughout lesson- clarifying questions, check-** **in strategies, etc.** I will walk around the room during the time the students are working on https://www.thatquiz.org/ to see how their understanding is and clarify any questions. I will also collect exit slips at the end of class to see if students have a good grasp on the subject. **Consideration for Back-up Plan:** For a back up plan, I would consider extending this lesson into day 2 of the unit plan to give the students more practice. I would also try to incorporate outside materials such as something like a Khan Academy video.	**Summative Assessment (linked back to objectives)** **End of lesson:** Students will complete activity on https://www.thatquiz.org/. **If applicable- overall unit, chapter, concept, etc.:** There will be questions from this lesson on both a quiz and the end of unit test.

Reflection (What went well? What did the students learn? How do you know? What changes would you make?):	

Lesson 2

Grade: 9th

Subject: Algebra I

Materials: Notes, Pencil, Notebooks, Assignment from textbook, Jeopardy game questions, Sheet with teams predetermined

Technology Needed: Computer with PowerPoint and SMARTBOARD

Instructional Strategies:

- ☐ Direct instruction
- ☐ Guided practice
- ☐ Socratic Seminar
- ☐ Learning Centers
- ☐ Lecture
- ☐ Technology integration
- ☐ Other (list)
- ☐ Peer teaching/collaboration/ cooperative learning
- ☐ Visuals/Graphic organizers
- ☐ PBL
- ☐ Discussion/Debate
- ☐ Modeling

Guided Practices and Concrete Application:

- ☐ Large group activity
- ☐ Independent activity
- ☐ Pairing/collaboration
- ☐ Simulations/Scenarios
- ☐ Other (list)
- ☐ Hands-on
- ☐ Technology integration
- ☐ Imitation/Repeat/Mimic

Explain:

Standard(s)

- HS.A-CED.1 - Create equations and inequalities in one variable and use them to solve problems.
- HS.A-REI.1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution.

Objective(s)

- TLW solve one-step, one variable equations using addition and subtraction and justify each step along the way.
- TLW solve one-step, one variable equations using division and multiplication and justify each step along the way.
- TLW create a one-step, one-variable equation that requires addition, subtraction, multiplication, or division and justify their steps in solving the problem.

Bloom's Taxonomy Cognitive Level:

- Apply
- Create

Differentiation

Below Proficiency: For below proficiency students, I will present them with examples of equations that have one step and one variable, this way they can use it as a template as they are working. They will be able to reference this sheet to help them compare with their work and understand the material better. I will also pair below proficiency students with above proficiency students for the jeopardy game so they can see how the other students approach solving these problems.

Above Proficiency: For above proficiency students, I will have them work with below proficiency students to help them understand the material at a deeper level as they are teaching it. I will also present them with two-step equations and have them justify their steps along the way to see let them have a preview of what is coming. I will give them some two-step problems they can do on their homework assignment if they'd like, I will not grade them but I will provide them with feedback on them.

Approaching/Emerging Proficiency: I will have these students progress along with the material as normal. I will also pair students at this proficiency level together for the Jeopardy game as they will be able to help each other out.

Modalities/Learning Preferences: The learning styles that I cater to in this lesson are those auditory and visual learners through the direct instruction. This lesson also appeals to those who work well in groups through the use of the Jeopardy game.

Classroom Management- (grouping(s), movement/transitions, etc.)	**Behavior Expectations- (systems, strategies, procedures specific to the lesson, rules and expectations, etc.)**
• The main part of this lesson where classroom management will be important is when we break into groups for Jeopardy. Students will observe the procedure of group work, in which they are to respect one another and work with an voice level of 2 out of 4.	• The behavior expectation is that students will follow the behavior expectations set forth in the procedure for group work. They are to be respectful of one another and keep their voices at an appropriate level.

Minutes	**Procedures**
2	**Set-up/Prep:** Get PowerPoint presentation ready to go for the lesson for the day. Also, have the groups prepared for the Jeopardy game that we will play in the later part of the class. Also, have Jeopardy questions ready. Last thing will be to have homework assignments ready to give to students when class session is finished for the day.
3	**Engage: (opening activity/ anticipatory Set – access prior learning / stimulate interest /generate questions, etc.)** Students will be expected to complete bell ringer question that I have prepared. The question for today is going to be "create a one-step, one-variable equation and solve the equation. After students have had sufficient time to complete the question, I will ask them to use the procedure set forth for handing in papers and hand in their results. They will not be graded on these bell ringer questions, it is something I will collect to judge the level of understanding.
20	**Explain: (concepts, procedures, vocabulary, etc.)** The first thing we will do is a quick recap of the main points covered during yesterday's lesson. We will talk about inverse functions and recap what the variable is. 1. At this point, we will talk about justifying steps in solving an equation. I will ask the students what they think that means to justify their step(s). I am looking for the answer of writing down what they did at each step to justify it. I will tell them that the reason that I want to see them justify their steps is because it helps to deepen their level of understanding. This way they cannot just guess on a certain step and hope they get it right. They have to recognize what operation or procedure they have to do in order to continue to solve the problem. 2. Now I will show them an example of justifying steps in a one-step problem. We will take the problem of $3x = -15$. In justifying my steps, I need to identify what operation I need to do. Since I see that multiplication is being done first, I need to do division to get x alone. So I will write my step of "division" and then proceed to divide both sides by 3. When I do this, I end up with $x = -5$. One may think that we are done, but at this point I will tell the students that I want them to write "simplify." This answer is already simplified, so they do not have to do anything else. However, as we move further in this unit, we will see that there will be answers that need to be simplified at this point. So now we have solved the problem and justified our steps by writing "division" or "divide" and then justifying our answer by writing "simplify." 3. Now we still look at doing examples of other problems. 4. The first example we are going to take a look at is $14 – x = 19$ $14 – x = 19$. What do we do first? I would be looking for subtract $-x = 5$. at this point we would talk about writing the justification, which would be what? "Subtract" Now we see that we have a variable equal to a number so we're done right? Not so fast! We have $–x = 5$, but we talked about always expressing x as a positive value so what do we need to do? Divide by -1 to end up with a positive x, so we can write "divide and simplify" Now at this point we can see that we have $x = -5$ If we do what we talked about yesterday and plug it back in, we can see that $14 – (-5) = 19$ is correct. 5. Now we will look at another example of $(n/8) = 4$. What should we do first? Identify that we have division, we are going to have to do multiplication. What do we multiply by? We want to multiply by the reciprocal of (1/8), which would be (8/1) or 8.

	So at this point for our justification, we need to write down "multiply" Then we can see that we end up with 8(4), which is what? 32. So now we end up with something that looks like n = 32. Are we done? No. We need to justify our last step by writing "simplify" and we see that n = 32 is simplified. 6. Next example: x – 13 = 26. The first step is identifying that we have a negative 13, so what is the inverse operation we need to use? Addition. Now we continue by adding 13 to both sides, and this gives us x = 13 +26, which equals? We need to write "addition" as well to justify out step. At this point are we done? No. The next step will look like: x = 39 "simplify" 7. The next example will include -7x = -28. What is the inverse operation that we need to use here? Division. Good! So let's show this step and justify it. x = (-28/-7) "division" What is something we need to be careful of at this step? We are dividing 2 negatives, so the answer will be POSITIVE Now the last step is going to be x = 4 "simplify" Now, let's just make sure and plug the answer back in and we see that -7(4) does indeed = -28. Good! 8. Let's do a few more examples: 9. (3/4)x = 12. first step: Multiply by (4/3) on each side. "multiply" Then we are left with x = 16 "simplify" check our answer and see that (3/4)16 = 12 10. Another example: 32 – x = 24 We have a positive 32, so we need to do inverse of subtract. This way we end up with –x = -8 "subtraction" Now we have –x = -8, which we always want the x in terms of a positive value Divide each side by -1. Then we end up with x = 8 and justification of "divide and simplify" Check our answer and we see that 32 – 8 = 24 11. -18 + x = -4 What should we recognize first here? There is – sign in front of the 18, so what should we do? Add! So our next step looks like x = -4 + 18 "addition" Then we see that we have x = 14 "simplify" plug 14 back in and see that -18 + 14 = -4 and we are correct! 12. At this point, I will ask the class if they have any questions and we will discuss any topics that need to be clarified. If no further clarification is needed, then we will move on to our next activity, which is Jeopardy.
20	**Explore: (independent, concreate practice/application with relevant learning task -connections from content to real-life experiences, reflective questions- probing or clarifying questions)** At this point in the lesson, we are going to play a fun game of Jeopardy to get the kids involved and hopefully deepen their understanding. My plan is to create the teams beforehand and make sure to pair below proficiency students with above proficiency students. I will also pair students who are around normal proficiency with other students who are around proficiency. The way the game is going to work is that students will choose a category of "addition, subtraction, multiplication, division, or random." From there students will select the amount for the question, as each questions gets harder as the point values increase. Students are given 1 minute to complete each question, then submit their answers. Their answers must include all work, justifications, and the correct answer in order to receive the points. Instead of only having one group go at a time, I will randomly choose a team that got the correct answer to choose the next question. By having each team attempt to answer every question, it keeps everyone involved the whole time. I will award to 1st place team a 3 question omission on their homework assignment.

	Students will be expected to behave by the rules that are set forth for group activities. If behavior becomes an issue, we will stop the game and do homework problems.
5	**Review (wrap up and transition to next activity):** Once we have completed Jeopardy, students will be asked to return to their desks by using the procedures set forth at the beginning of the year. I will have them do two things at this point. They will be asked to fill out another exit slip, which will be creating their own one-step, one-variable equation and answering it while providing the justifying steps along the way. This is a formative assessment I will use. Also, at this time I will give the students their homework assignment that will be due in 3 days. The assignment is going to come from the book and will be problems from section 2.1 and 2.2. They will be asked to create an additional 2 problems for each section, a total of 4, and for section 2.1, simply solve the equation they made up. For 2.2, they will solve the equation along with providing justifying steps along the way. Once these 2 things are completed, I will dismiss the students from class.

Formative Assessment: (linked to objectives)	**Summative Assessment (linked back to objectives)**
Progress monitoring throughout lesson- clarifying questions, check-in strategies, etc. Homework assignment: Section 2.1: 2-6; 20-24(create your own 2 problems and solve) Section 2.2: 7-11; 24-28 (create your own 2 problems and solve, while using justification steps along the way as well) **Consideration for Back-up Plan:** For a backup plan, I will plan to allot more time to cover this information during the next day of class. I feel as though this is the absolute important foundation to continue in algebra, so I need to make sure students understand before we can move on. Also, I may consider asking another teacher for some new ideas to try to differentiate my instruction if students are struggling. One other thing could be to use Khan Academy videos in class to provide a different perspective.	**End of lesson:** Students will answer questions from this lesson on an upcoming quiz and also a test. Also, there will be a question on the test where students must create their own problem and solve it with justification steps. **If applicable- overall unit, chapter, concept, etc.:**

Reflection (What went well? What did the students learn? How do you know? What changes would you make?):

Lesson 3

Grade: 9th Grade

Subject: Algebra 1

Materials: Pen/Pencil, Notes, Calculator, Textbook

Technology Needed: Computer with PowerPoint and a SmartBoard to present lesson

Instructional Strategies:

- ☐ Direct instruction
- ☐ Guided practice
- ☐ Socratic Seminar
- ☐ Learning Centers
- ☐ Lecture
- ☐ Technology integration
- ☐ Other (list)
- ☐ Peer teaching/collaboration/ cooperative learning
- ☐ Visuals/Graphic organizers
- ☐ PBL
- ☐ Discussion/Debate
- ☐ Modeling

Guided Practices and Concrete Application:

- ☐ Large group activity
- ☐ Independent activity
- ☐ Pairing/collaboration
- ☐ Simulations/Scenarios
- ☐ Other (list)

Explain:

- ☐ Hands-on
- ☐ Technology integration
- ☐ Imitation/Repeat/Mimic

Standard(s)

- HS.A-CED.1 - Create equations and inequalities in one variable and use them to solve problems. I
- HS.A-REI.1 - Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

Objective(s)

- TLW identify 2-step equations with one variable
- TLW solve 2-step equations with one variable.
- TLW justify each step in solving 2-step equations with one variable
- TLW distinguish which order of operations must be done first in solving a 2-step equation.
- TLW create an equation from a word problem and solve the word problem.

Bloom's Taxonomy Cognitive Level:

- Knowledge
- Apply
- Analyze
- Evaluation

Differentiation

Below Proficiency:

Below proficiency students will be given a "cheat" sheet to use that gives them the order of operations. Also, they will be given example problems of 2-step equations that have been solved. Their example problems will include all the different kinds of operations and examples of how to use each. This way, they can compare similar problems to help them solve the problems they are working on. One more differentiation tactic is going to be giving students 15 minutes at the end of class to work on homework questions that they are struggling with.

Above Proficiency:

Above proficiency students will continue to be presented with future topics, I will introduce them to multi-step problems and ones with variables on both sides of the equation. I will let them solve these and I will provide feedback for them. Also, I may have these students help during homework time in class. This way, they can help below proficiency students by presenting them with a different way to approach the problems.

Approaching/Emerging Proficiency: For students who are at proficiency, I will have them continue along the material as usual. I will tell the class that I will present them with a few tougher examples that they can feel free to attempt and I will provide feedback on them.

Modalities/Learning Preferences: The learning preferences this lesson appeals to are students who learn are auditory and visual learners as I will be presenting the topic verbally and also writing out examples on the board. Also, this lesson appeals to those who work in groups as I

	will allow students to work on homework problems together in a group of 2 if they'd like.
Classroom Management- (grouping(s), movement/transitions, etc.) • Normal classroom management applies in this lesson. Students will be expected to sit down and complete bell ringer when they arrive then be respectful during the lecture. • They will also be expected to follow the group work procedure when I allow them to do homework. This means staying on the relevant task and keeping their voices to an acceptable level set forth in the procedure.	**Behavior Expectations- (systems, strategies, procedures specific to the lesson, rules and expectations, etc.)** • Students will be expected to follow the group work procedure when I allow them to do homework with each other. This is a time for them to ask questions and get help on things they are having trouble understanding.

Minutes	Procedures
2	**Set-up/Prep:** Get bell-ringer activity ready for the class. Also, have the PowerPoint presentation ready to go for the notes.
3	**Engage: (opening activity/ anticipatory Set – access prior learning / stimulate interest /generate questions, etc.)** For the bell ringer activity today, I am going to pose the question of "what do you know about the order of operations? Is there an acronym that you have learned to help you remember the order of operations?" Once the students have sat down and had a chance to complete the bell ringer, I will ask them what they got for an answer. I will tell them that this is going to lead us into the topic for today, which is going to be solving one variable equations as we have been doing, but this time we are going to have 2 steps instead of 1 step.
28	**Explain: (concepts, procedures, vocabulary, etc.)** • **PEMDAS** • **Combining like terms** Our main goal in these problems is going to be to get the x variable alone as we have talked about before. The only difference between yesterday and what we are going to do today are you may have to do an extra step to get the x variable alone. The principles are all going to stay the same, we are just going to have to take one more step the get the x variable by itself. The first thing we are going to touch on brings us back to the bell ringer question. During our discussion, I would be looking to get an answer along the line of PEMDAS to remember the order of operations. For those students who are not familiar, I will walk through the PEMDAS acronym and explain what it means. First off, we can remember it by the saying "Please Excuse My Dear Aunt Sally" or we can come up with another phrase as a class if they'd like. If there is something to help them remember more, I am on board for using that as well. We will then talk about how the letters go together in 2 letter increments. Example: PE (please excuse) – stands for parentheses and exponents MD (my dear) – stands for multiplication and division AS (Aunt Sally) – stands for addition and subtraction. We are going to discuss how you have to do PE first if there is any, then MD next, and then the last operations you do are AS. Next, we will discuss things such as "combining like terms." Combining like terms means that if we have multiple of the same variable or non-variable numbers on the same side of the equation, we can simplify and combine them before we start solving the problem: Ex: $4x + 8x – 16 = 20$ – in this problem we can see that there are two "x" terms on the left side, so we can combine like terms before we begin to solve this problem and get $12x$, then we can solve the problem from there.

- **Examples (w/o justification)**

Now we will start to go into example problems. We will start simple without justifications to get the hang of solving these problems. After we have done a couple, we will move into the justification step.

- First example: 3x – x = 38 (what do we notice about this equation?) – There are multiple x terms on the same side
- Now we need to combine them: 3x – x = 2x so now we have 2x = 38
- Now what do we do since we are multiplying? Divide. Divide by 2 on both sides to get x alone.
- This leaves us with x = 19.
- Let's plug it back in and see if we're correct. 2(19) = 38, so we see we are correct.

Let's do one more example problem before we get into the justification steps:

- 4x + 3x = 16 -2 (what do we notice about this equation?)
- We can see that we have x terms together on one side of the equation and on the other side we have non-x terms, so we should look to combine them.
- If we combine them, what do we get? 4x + 3x is equal to what? 7x. so then on the other side we have 16-2, which is equal to what? 14
- Now that we combined like terms, we can see that we have 7x = 14 and this problem looks similar to yesterday.
- At this point, we see multiplication, so what should we do? Divide.
- (14/7) = 2. So, then we can see that x = 2.
- Let's plug it back in and check to make sure.
- 7(2) = 14, and we see this is correct so we are good to move on!

At this point, we are going to look to incorporate what we did yesterday, and justify all of our steps along the way. As we talked about yesterday, justifying our steps shows that we understand why we are doing things, not just guessing and getting the right answer. The only difference between yesterday and today is that we are going to have 2 justification steps instead of 1. So let's take a look at some examples:

First example: 4x + 16 = 20

- What should we do first? In order to get the x variable alone, we need to get all the things that do not have an x to the other side of the equation. This means that we have a +16 and what is the inverse? Subtract 16.
- SO this step will look like 4x = 20 – 16 and we write "subtraction"
- Now we see that we have the x variable alone, but there is a 4 with it, so what should we do next?
- The inverse of multiplication is division, so we need to divide by 4 on both sides of the equation.
- This will look like x = (4/4) "divide"
- Now we end up with our x variable alone and see that x = 1.
- Let's plug the answer back in and see if it is correct.
- 4(1) + 16 = 20. This is true and our answer is correct!

Next Example: 14 + 37 = (2/3)x

- First step: is everything combined? No. So, let's combine them: 14 + 37 = (2/3)x "combine like terms"
- Now, we have simplified both sides of the equation to where we can solve it. 51 = (2/3)x
- We have multiplication so we need to do the inverse which is what? Divide by 2/3, or multiply be reciprocal, which is 3/2.
- So then we see that we have 51(3/2) = x. "divide" or "multiply by reciprocal"
- Then we can see that we end up with x = 76.5. Let's plug this back into our calculators and see if we got the right answer.
- 51 = (2/3)(76.5). We see we got the right answer! Good job class!

Let's do a few more examples together.

Next example: (x/4) + 7 = 14.

- Need to get x alone, first step? Subtract 7 from both sides. (x/4) = 7 "subtract"
- Then we can see that we have division, so what is the inverse? Multiplication

- Multiply both sides by the reciprocal of (1/4), which is (4/1) or 4. So then we have x = (7)(4) “multiply”
- Now we end up with x = 28.
- Plug the answer back in and see what we get.
- (28/4) = 7 so we then have 7 = 7 =14, which is correct!

Next example: (3x)(3) = 6 + 21

- we need to get x alone, so what is our first step here? Combining like terms.
- So now we see that we can combine on both sides: 9x = 27 “combine like terms”
- At this point, the x’s are on one side and non-x’s on the other, so we can solve.
- X = (27/9) which gives us x = 3 “division”
- Let’s plug the answer in and we see that 9(3) = 27, which is correct!

Now we are going to introduce word problems.
We are going to look at how we can be presented a question in word form and extrapolate information to turn it into an equation that we can solve. Keys to remember when looking at word problems: **Look for context clues. There are certain words that imply equals, subtraction, multiplication, division, addition, etc.** We need to use our reasoning skills to make this work.

First example: Johnny starts with 14 apples and he end up picking 7 a day. Johnny has a total of 56 apples. How many days did johnny pick apples for?
Let’s first look at the problem and pick out the key words. We are told he starts with 14 so that means we are going to need a 14 apples somewhere in the equation. We also know that he ends up with a total of 56, which we can use context clues and since he “has a total of 56 apples” this means that our equation is going to have to equal 56. Now what do we do with the 7? So if he picks 7 a day, we can deduce that we need to put the variable there to represent the fact that he is picking 7 a day.

So our equation should look something like 14 + 7x = 56.
Now this looks like an equation we have solved before, so let’s use our information to see how many days Johnny picked apples for.

- **14 + 7x = 56**
- To get x alone, subtract 14 from each side, we end up with 7x = 42 “subtraction”
- Now we can use the inverse of multiplication and divide to get x by itself.
- X = (42/7) = 6 **“**division”
- So now we see that we end up with 6 days.
- Let’s plug it back into our equation to see if we were right. 14 + 42 = 56, so we were right.
- DON’T FORGET TO LABEL YOUR ANSWER FOR WORD PROBLEMS, THIS IS 1 POINT OFF
- Our final answer is 6 days.

A bike shop in town charges 16 dollars plus 6 dollars an hour for renting a bike. Anne paid 40 dollars to rent a bike. How many hours did she pay to rent the bike for?

- Let’s look at this problem and pick out our context clues. So we know she paid 40 dollars total, so this means this is probably what our equation is going to be equal to. How do we set the other side of the equation up? Well we can say that she paid the 16 dollar base fee, so is there a variable with that? No. why not? Because it is just the base, one-time fee. Then we can deduce that we need a variable with the 6, since it represents how many hours she rents the bike for.
- So we have the equation : 16 + 6y = 40
- Now, let’s do our steps and justifications.
- 6y = 40-16 “subtraction”
- y = (24/6) “division”
- y = 4
- plug it back in and see that 6(4) + 16 = 40.
- Label. 4 hours.

Good job class, is there any questions at this point?

Now, I will give students their homework assignment for the day, which will come from the book:

	Chapter 2.3 : 1-7; 22-26; 40, 42 (due in 4 days.)
15	**Explore: (independent, concreate practice/application with relevant learning task -connections from content to real-life experiences, reflective questions- probing or clarifying questions)** If no, then I am going to give you time to do homework in class, this is an opportunity to catch up and also ask questions with areas you are struggling with. You may also choose to work with 1 other individual if you would like. • Remember if you choose to work with another individual, you must follow the procedure we have set forth for working with others. At this point, I am going to walk around the classroom and see how everyone is doing. I will focus on students who I know are struggling and try to help them out a little bit more with one-on-one instruction. Also, if I have some students who have a good grasp of the concept and are done with their assignments, I will ask them to help the below proficiency students.
2	**Review (wrap up and transition to next activity):** At this point, I will have students back at their seats, and we will touch over some of the main points for the day • PEMDAS • Combining like terms • Justifying steps along the way

Formative Assessment: (linked to objectives) **Progress monitoring throughout lesson- clarifying questions, check-in strategies, etc.** I will be walking around the room during the time the students are working on their homework assignment in class and use this to gauge where the students are at with their understanding. **Consideration for Back-up Plan:** As a backup plan, I will use the same as the previous two lessons. This information is so important for algebraic foundations that if we need to spend extra time on it, we will devote more time to it another day to try and further the student understanding.	**Summative Assessment (linked back to objectives)** **End of lesson:** Questions from this lesson will appear on their quiz and end of chapter test. **If applicable- overall unit, chapter, concept, etc.:**

Reflection (What went well? What did the students learn? How do you know? What changes would you make?):

Lesson 4

Grade: 9th Grade

Subject: Algebra I

Materials: Pen/Pencil, Notebooks, Calculator, Notes, Student Computers for Activity at end of Class

Technology Needed: Computer with PowerPoint for Lesson; computer for each student for equation-solving game.

Instructional Strategies:

- ☐ Direct instruction
- ☐ Guided practice
- ☐ Socratic Seminar
- ☐ Learning Centers
- ☐ Lecture
- ☐ Technology integration
- ☐ Other (list)
- ☐ Peer teaching/collaboration/ cooperative learning
- ☐ Visuals/Graphic organizers
- ☐ PBL
- ☐ Discussion/Debate
- ☐ Modeling

Guided Practices and Concrete Application:

- ☐ Large group activity
- ☐ Independent activity
- ☐ Pairing/collaboration
- ☐ Simulations/Scenarios
- ☐ Other (list)
- ☐ Hands-on
- ☐ Technology integration
- ☐ Imitation/Repeat/Mimic

Explain:

Standard(s)

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

Objective(s)

- TLW solve a linear equation involving multiple steps
- TLW solve a linear equation with variables on both sides
- TLW evaluate linear equations that include multiple steps and have variables on both side.

Bloom's Taxonomy Cognitive Level:

- Apply
- Evaluate

Differentiation

Below Proficiency: For below proficiency students, I will spend extra time with them towards the end of class while students are solving linear equations on the website I provide for them.
I will provide a "cheat sheet" as I have mentioned before, where I solve some problems and give them a sheet to be able to reference it with their problems. This way they can correlate the two and help to solve. One more thing would be to have them continue on two-step problems until they have a grasp, then they can move to multi-step.

Above Proficiency: For above proficiency students, I will allow them to check out problems that have 2 variables in the equation and let them see if they can solve these problems. I will tell them they can submit these problems, but I will not grade them. I will provide feedback.

Approaching/Emerging Proficiency: For students at or near proficiency, I will have them continue along with the lesson as usual.

Modalities/Learning Preferences: This lesson appeals to students who do well with auditory/visual learning from direct instruction.
Also, this lesson appeals to those who do well with technology.

Classroom Management- (grouping(s), movement/transitions, etc.)

- Students will be expected to observe normal classroom procedures.
- When grabbing computers, students will be dismissed one pod at a time to grab their computers, and they are expected to follow the

Behavior Expectations- (systems, strategies, procedures specific to the lesson, rules and expectations, etc.)

- Students will be expected to respect others and the property of others as they gather their computers for the individual activity.

procedure of respect for others and property as they gather their computers.	• Also, students are expected to be responsible and only go to the website that I have given them for the activity.

Minutes	Procedures
1	**Set-up/Prep:** Get PowerPoint presentation ready to go. Make sure attendance is taken.
4	**Engage: (opening activity/ anticipatory Set – access prior learning / stimulate interest /generate questions, etc.)** Today, the bell ringer is going to be a two-step, one-variable equation. The problem is going to look like "Solve. 4x – 20 = 20 be sure to show all of your justification steps along the way." My intention is going to be to collect the bell ringers today. They will not be graded on correctness, simply just handing them in will get the students credit. My plan is to collect these and use them as a form of formative assessment for yesterday's lesson. This way I can gather some quick information and see where the student understanding level is.
27	**Explain: (concepts, procedures, vocabulary, etc.)** We will move on to main lesson: Solving multi step equations with variables on each side. We will start out by having a discussion to point out some main topics to look out for. • These problems are not too much different from the equations we have been solving over the past couple of days. The only difference is a couple more steps and you may see variables on each side of the equation, but you still use the same rules. • PEMDAS becomes even more important now that we are going to have variables on each side of the equation. Remember that the order of operations can affect the value we get for a number, so be sure to use PEMDAS as you are solving these problems. • **NEW CONCEPT: Distribution- Multiplying each of the terms within the parentheses by another term that is outside the parentheses.** This is going to look something like 6(x-3), which distributes to 6x – 18. Let's look at another example: -3(x-9) which distributes to -3x +27. • At this point, I would see if the students get the basic idea. If they do we will continue as we will see more examples of this in our upcoming problems. First example: 4x + 13 = 6x – 9 • What should we do first?? • Ultimate goal – end up with x's on one side and non-x's on the other • First, can subtract 4x or 6x, does not matter, but whichever side you do it to, you must do it to the other. • Let's subtract 4x from each side, this leaves us with what? 13 = 2x – 9. Now does this look familiar?? • Move non-x terms to one side, so we must add 9 to both sides. • Gives us 22 = 2x Once again at familiar stage • What should we do to finish? • Divide both sides by 2, this gives us x =11. • Let's plug it back in and check if our answer is correct. • 4(11) +13 = 57 and 6(11) – 9 = 57. So we have 57 on both sides, therefore we are correct. Next Example: x + 9 + 2x = -3 + 6x -6 • What should we do first here? • It is much more difficult to solve for x if we do not combine, so let's combine like terms on each side. • We then end up with 3x + 9 = 6x – 9 , now this looks familiar to last problem. • What should we do first? Does not really matter, as long as we get x's to one side and non-x's to the other. • Subtract 3x, which leaves us with 9 = 3x – 9

	• Now, get non-x's to the other side. Add 9 to both sides • 18 = 3x, now this looks really familiar! • Divide by 3 on each side to get x alone. • X = 6. • Plug it back in to see. 3(6) = 9 = 27 and 6(6) – 9 = 27 so we are correct! Remember class: IT IS IMPORTANT THAT WHEN WE ARE DOING THINGS ON THE SAME SIDE OF THE EQUALS SIGN, YOU COMBINE TERMS, OR DO THE OPERATION ATTACHED TO THE QUANTITY/VARIABLE. WHEN YOU GO TO MOVE THINGS TO THE OTHER SIDE OF THE EQUATION, YOU MUST DO THE INVERSE! These concepts are easy to confuse, but in order to solve these problems correctly, you must remember this. Use this to remember: **same side, same operation (both use same) = Opposite side, opposite operation (both use opposite)** Let's do a couple more examples together. Next example. This one is a little bit more difficult as it contains distribution. -4(x-2) = -5x -2 • What should we do first? Simplify by distributing • End up with -4x + 8 = -5x – 2. What should we do now? Doesn't matter. • Add 5x to both sides, leaves us with x + 8 = -2. How about now? • To get x alone, subtract 8 from both sides, this gives us x = -2 – 8 , which is -10 • Therefore, x = -10. • Let's plug it back in and see if this works for us. • (-4)(-10) + 8 = 48 and (-5)(-10) – 2 = 48, so we are correct! Couple more examples Next: (2/3)x + 16 = 2x – 4 We see that we have a fraction here, so let's see what we have in store! • What should we do first? Doesn't matter again as long as we get x's on one side and non-x's on the other. • Let's subtract (2/3)x from both sides, which gives us 16 = (4/3)x – 4. • Get non-x's on one side by adding 4. 20 = (4/3)x • Divide or multiply by reciprocal to get x = 15 • Plug it back in and see that (2/3)(15) + 16 = 26 and 2(15) – 4 = 26, so we're right! One last example: 2(5x+3) = 2x + 9 • Remember that when we distribute, we need to give the term outside the parentheses to both of the terms inside the parentheses. So we end up with 10x + 6 • Our equation then looks like 10x + 6 = 2x + 9 • Solve it by using methods we have been using. • Subtract 2 x from both sides, we have 8x + 6 = 9 • Now, subtract 6 from both sides to get x terms on one side, non-x on other. • End up with 8x = 3. Divide by 8, end up with 3/8, so x = (3/8) • Don't let an answer like this intimidate you, as you will get answers of this form sometimes. This is why we always plug the answer back into the equation, this way we can be sure that it is correct. • 10(3/8) + 6 = 9.75 and 2(3/8) + 9 = 9.75, so we can see they are equal. Good job class! At this point I will ask for questions, if there are none, we will start the activity.
16	**Explore: (independent, concreate practice/application with relevant learning task -connections from content to real-life experiences, reflective questions- probing or clarifying questions)** Now we will move on to an individual activity where the students will grab their computers and use them to go on a website I have found that has algebra games, specifically a game for solving multi step equations with variables on both sides. Students will be instructed that if they have any questions about any of the problems they are on, they are to raise their hand and I will help them.

	The URL for the website I am going to have the kids go to is http://www.coolmath.com/algebra/06-solving-equations and they will click on the link that I tell them, which is entitled " Solving Equations: AX + B = CX + D CRUNCHER" Students are going to be able to use this independent activity and technology to get ample amounts of practice and further advance their knowledge in solving multi-step equations with variables on each side.
2	**Review (wrap up and transition to next activity):** At this point, students will have their computers put away and be seated back at their desks. We will go over the main points from today, which include: • PEMDAS • Distribution • Not panicking if you get a "weird answer." Plug the answer back in and see if it works. If not, rework the problem.

Formative Assessment: (linked to objectives) **Progress monitoring throughout lesson- clarifying questions, check-in strategies, etc.** There are two specific things I will do. I will use the bell ringer from the beginning of class to gauge student understanding. This is a form of formative assessment. Also, I will monitor students as they are working on problems on the computer. **Consideration for Back-up Plan:** For a back-up plan, I will have some more "basic" examples that I will use to present to the class if they are having a hard time understanding. This way, we can start with the basics and slowly build our way into more complex examples. If this does not work, we will revisit the lesson from yesterday and work to slowly incorporate that information into today's lesson.	**Summative Assessment (linked back to objectives)** **End of lesson:** Questions from this lesson are going to be included on the quiz and the chapter test at the end of the chapter. **If applicable- overall unit, chapter, concept, etc.:**

Reflection (What went well? What did the students learn? How do you know? What changes would you make?):

Lesson 5

Grade: 9th Grade

Subject: Algebra I

Materials: Notes, Pencil, Paper, Notebook, Calculator, List of pairs for quiz review for next class period.

Technology Needed: Computer with PowerPoint and SMART Board for lesson

Instructional Strategies:

- ☐ Direct instruction
- ☐ Guided practice
- ☐ Socratic Seminar
- ☐ Learning Centers
- ☐ Lecture
- ☐ Technology integration
- ☐ Other (list)
- ☐ Peer teaching/collaboration/ cooperative learning
- ☐ Visuals/Graphic organizers
- ☐ PBL
- ☐ Discussion/Debate
- ☐ Modeling

Guided Practices and Concrete Application:

- ☐ Large group activity
- ☐ Independent activity
- ☐ Pairing/collaboration
- ☐ Simulations/Scenarios
- ☐ Other (list)
- ☐ Hands-on
- ☐ Technology integration
- ☐ Imitation/Repeat/Mimic

Explain:

Standard(s)

- **HS.A-REI.1** - Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
- **HS.A-REI.3 -** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

Objective(s)

- TLW solve a linear equation involving multiple steps
- TLW solve a linear equation with variables on both sides
- TLW evaluate linear equations that include multiple steps and have variables on both side.
- TLW justify each step in solving a linear equation in multiple steps with variables on both sides.
- TLW be able to solve a multi-step word-problem with variables on both sides.

Bloom's Taxonomy Cognitive Level:

- Apply
- Evaluate

Differentiation

Below Proficiency:

For below proficiency students, I will have them again provide them with a "cheat" sheet that gives examples problems similar to the ones we will solve in class. This way they will be able to follow along and correlate it to the problems they will be asked to solve.

Also, I will pair them with above proficiency students to complete some review questions for the quiz that will be given in the next class period.

Above Proficiency:

For above proficiency, I will pair these students with below proficiency students to complete a review guide for the test tomorrow. This way they will be able to teach the material to get a better understanding along with helping to bring the below proficiency students to understanding.

Approaching/Emerging Proficiency:

For these students, I will have them continue along with the curriculum as scheduled. I will pair these students together with other students at the same proficiency level to complete review guide for the upcoming quiz.

Modalities/Learning Preferences:

This lesson plan appeals to those who are visual and auditory learners as this is what is presented most during direct instruction. Also, this lesson appeals to those who work well in groups, as we will work in groups of 2 for quiz review.

Classroom Management- (grouping(s), movement/transitions, etc.)

Behavior Expectations- (systems, strategies, procedures specific to the lesson, rules and expectations, etc.)

• Students will be grouped for the quiz review according to groups I have put together ahead of time. • Students will be expected to observe the procedure for working in groups. • When transitioning to group work, students will have 1 minute while a song is playing to signal transition to and from group work, and are expected to be seated and ready to go when the music stops. • Observe procedure for handing in homework.	• Students will be expected to observe the group work procedure, which is to stay on task and work in a quiet, respectful manner. • Students will also be expected to follow the transitioning procedure when going to group work, which means no horseplay and doing so in a quiet manner.

Minutes	Procedures
1	**Set-up/Prep:** I will prepare the PowerPoint to get ready for the lesson for the day. Also, I will have the groups ready for when it is time to do group work for the quiz review. Make sure the bell ringer is on the board and ready to go. Collect homework assignment given after lesson 2.
4	**Engage: (opening activity/ anticipatory Set – access prior learning / stimulate interest /generate questions, etc.)** Students will complete a bell ringer question, which will be asking them to solve the problem and justify their steps along the way. The question will ready "Solve. –y + 2 = 7y + 2. Justify all of your steps in solving this problem." Students will not be graded for correctness on this bell ringer, just for completion. I want to see if they can apply previously learned information to new material. I will be able to get an understanding of where the class is. Once students have had time to complete, we will talk about the problem and how it pertains to what the lesson is for today. I will post the solution on the next slide which will look like • 2 = 8y + 2 "subtraction" • 0 = 8y "subtraction" • 0 = y "division" • 0 + 2 = 2 and 0 + 2 = 2 "check your work" We will go through step by step and talk about how to solve this problem and justify the steps along the way. I will then tell them how this is information we have previously learned, we are just tying it to problems with more steps now, which will lead us into the lesson for the day.
27	**Explain: (concepts, procedures, vocabulary, etc.)** First, we will start by recapping the concepts we have talked about that will help us to this point. • PEMDAS – the order of operations is very important and something we always need to look out for. • Distribution – We must distribute in these problems before we can start to solve them. • Combine like terms – ON THE SAME SIDE OF THE EQUALS SIGN, we must combine like terms, which means that we need to combine terms with the same variable and then the terms that do not have a variable with them • Isolate the variable – In order to solve these problems, we need to isolate the variable by doing inverse operations to move terms to the other side of the equation. Once we have the variable term by itself on one side, we must divide/multiply (whichever is necessary) to fully solve the problem • Always remember to express the variable in a positive term (i.e. we do not want negative signs with the variable for our final answer.) • Justify our steps when asked. We must justify our steps when it is asked so we can show that we have an understanding of why we are doing the things we are doing. • Check your answer. Take the answer you got and plug it back into the equation (or simplified version of the equation) to make sure that the answer checks out. If you plug it back in and the two sides do not equal each other, then you need to go back and check your work. This is a simple way to ensure that you got the right answer.

	Now we will move into the topic for today: Solving multi-step equations with variables on each side of the equation and justifying our steps along the way. We will have a discussion that we are simply building ideas on top of each other. Nothing new is going to be presented in the information today, we are simply just going to have more steps to get to our answer. Also, we must justify these steps along the way, so there are going to be more justification steps as we proceed along. Also, we are going to take a look at a word problem at the end of class to see how we can set up multi-step equation with a variable on both sides and justify our steps in solving this problem. Let's start with some examples of these kinds of problems. (In class I will explain the problems in more detail, but in my examples I will work the problems out and give the justification steps.) First example: 2n + 11 = 4n + 1 • First step in solving this problem is to make sure it is simplified. Is it? yes. • Now we can start working it. Subtract 2n from each side and get 11 = 2n + 1 "subtraction" • Next, get variable alone. Subtract 1 from right side. 10 = 2n "subtraction" • Now to solve, we must get n by itself through division. Divide both sides. 10/2 = n "division" • N = 5 simplified? Yes. • Let's plug it back in and see. 2(5) +11 = 21 and 4(5) + 1 = 21. We see we are correct Next example: 9d – 5 = 4d + 35 • First step is to make sure it is simplified. Is it? yes. • Let's start working it by getting like terms on different sides. Subtract 4d from right. 5d – 5 = 35 "subtraction" • Now get d terms by itself by moving 5 from the left to the right. 5d = 40 "addition" • Now what do we do to solve? 5d is multiplication so we divide. d = (40/5) "division" • D = 8 • Let's plug it back in and see. 9(8) – 5 = 67 and 4(8) +35 = 32 + 35 = 67. We see that we solved correctly. Another example: 2(5x + 1) = 3x +23 • First step is to make sure it is simplified. Is it? no. • What do we need to do? Distribute and we end up with 10x + 2 = 3x + 23 "distribute" • Now that the problem is simplified, let's move to solve. Subtract 2 from left side: 10x = 3x + 21 "subtract" • Now, get variable terms together: 7x = 21 "subtraction" • From this point, can we solve? Yes. How? Divide by 7. X = (21/7) = 2 so x = 3 "division" • Let's check our answer: 10(3) + 2 = 32 and 3(3) + 23 = 32 so we see that we are correct. Next example: 6c + 3c – 12 + 2c = 5c +24 + 2c ; I want you to solve this problem class and then we will go through it together. At this point, I will give the students approximately 2-3 minutes to solve the problem and we will go through it together. I will ask for volunteers to tell me what they did at each step. (1-2, then you) We will start from the beginning: • Who can tell me the first step? "combining like terms." Good! As we can see here, we have like terms on both sides that are not combined, so before we solve we need to combine them and what do we end up with? • 11c – 12 = 7c + 24 "combine like terms" • Good, what should we do next? "move the 7c to the left side by subtracting it" Great job of recognizing that we can move it to the left! So then we end up with 4c – 12 = 24 "subtraction" • What do you guys think we need to do next? "move the 12 from the right to the left so we can get non-like terms on opposite sides of the equation" Great job of recognizing that! So we now see that we have 4c = 36 "addition" • Now where do we go? "to get c alone, we need to divide by 4 on both sides" Class, you are doing a great job of recognizing the steps in these problems! So if we divide by 4 on each side, we get c = 36/4, which is 9. "division" • C = 9. We're done right? "no, we need to check our answers!" I tried to trick you guys but good job!

	• Let's plug it back in and we see that 11(9) – 12 = 87 and 7(9) + 24 = 87 so you guys got it right! Let's do one more example together then we will move on to our next topic: 3(5 + 2x) = 45 + 8x • 15 + 6x = 45 + 8x "distribute" • 15 = 45 + 2x "subtract" • -30 = 2x "subtract" • x = -15 "divide" • Check the answer: 6(-15) + 15 = -75 and 8(-15) + 45 = -75 so we see that we are correct. You guys are doing a great job with solving these equations. Now we are going to use our prior knowledge of word problems and look to see how that can apply to this topic. Remember when we are solving word problems that we should look for: • Key words within the problem that provide context clues as to what we should do. (add, subtract, equals, divide, etc.) • I will not give you a trick problem, so we have talked about equations with one variable and it will either be a question with one variable on one side or both sides, so we must end up with an equation like that. • Here we are talking about one variable on both sides of the equation, so what should our problem look like? "an equation with one variable on each side of the equation" Here is the question: Container R has 200 L of fluid, and is being filled at a rate of 6 liters per minute. Container P has 500 L of fluid, and is being drained at 6 liters per minute. How many minutes, m, will it take for the two containers to have the same amount of fluid? Okay class, let's look at this problem and see how we can break it down to make an equation: • We know R starts with 200 L of fluid, so we can probably say we do not need a variable. It also tells us that the RATE is being filled at 6L/min, and since it is a rate, it is probably changing and will probably need a variable, which it tells us is m. We are ADDING water, so we can say we need addition. So, I think we can make the equation 200 + 6m • We are comparing R and P, so that means we can probably put an equals sign after what we found for R, since it is being compared to P. • Now let's find what we have on the other side of the equation. We know we start with 500, so we can leave that number alone for now. Then we are told that P is being DRAINED, so that means water is going out. What operation can we tie this to? SUBTRACTION. So from the information provided, we can say that we need a variable with the rate that is being drained because it is changing, so we have 6m again. But, we talked about it being subtracted, so how does this equation look? 500 – 6m. • Now, we see that we have 200 + 6m = 500 – 6m. Here, this looks familiar and we can solve. I want you to show your steps as we have been doing. • 6m = 300 – 6m "subtraction" • 12m = 300 "Addition" • m = 300/12 = 25; m = 25 "division" • Plug it back in and see. 200 + 6(25) = 350 and 500 – 6(25) = 350, so we see that we are correct. However, we need a label for our answer since it is a word problem. What is our label? Minutes. • M = 25 minutes. Great job so far class, does anyone have any questions? If so, I will answer them, and if not, we will move on.
15	**Explore: (independent, concreate practice/application with relevant learning task -connections from content to real-life experiences, reflective questions- probing or clarifying questions)** At this point, I am going to have the class do an activity in groups of 2. I will predetermine the groups based on proficiency level. The activity is going to be completing a brief review sheet together. My goal is to prepare the students for the upcoming quiz tomorrow. I will signal for them to get into their groups by playing a 1 minute

	song. When it ends, they are to be ready and start working. During the activity I will be walking around and answering any questions that the students may have at this point. At the end of the review time, I will play a song for 1 minute and students are to be in their seats and ready to listen when the song ends.
3	**Review (wrap up and transition to next activity):** At this point in class, I will ask the students for any further questions. If not, we will recap the main points from the lesson today. • PEMDAS • Distribution • Combine like terms • Isolate the variable • Always remember to express the variable in a positive term (i.e. we do not want negative signs with the variable for our final answer.) • Justify our steps when asked. • Check your answer. When finished, I will remind the students of the quiz tomorrow one last time and dismiss them.

Formative Assessment: (linked to objectives) **Progress monitoring throughout lesson- clarifying questions, check-in strategies, etc.** For formative assessment I will use 3 things: • Bell ringer activity before class • Observe students when solving one problem during class • Observe students while working in groups for the quiz review. **Consideration for Back-up Plan:** • If students are really struggling, I will consider postponing the quiz for a day as to allow more time to cover the material.	**Summative Assessment (linked back to objectives)** **End of lesson:** Questions from this lesson will be included on the mid-chapter quiz and end of the lesson teset. **If applicable- overall unit, chapter, concept, etc.:**

Reflection (What went well? What did the students learn? How do you know? What changes would you make?):

Lesson 6 (Lesson Plan and Quiz)

Grade: 9th Grade	**Subject:** Algebra I
Materials: Pen, Pencil, Calculator, Scratch Paper,	**Technology Needed:** Computer w/ PowerPoint and SMART Board to present brief review.
Instructional Strategies: ☐ Direct instruction ☐ Guided practice ☐ Socratic Seminar ☐ Learning Centers ☐ Lecture ☐ Technology integration ☐ Other (list) Quiz ☐ Peer teaching/collaboration/ cooperative learning ☐ Visuals/Graphic organizers ☐ PBL ☐ Discussion/Debate ☐ Modeling	**Guided Practices and Concrete Application:** ☐ Large group activity ☐ Independent activity ☐ Pairing/collaboration ☐ Simulations/Scenarios ☐ Other (list) Explain: ☐ Hands-on ☐ Technology integration ☐ Imitation/Repeat/Mimic
Standard(s) • Standards covered in Days 1-5 of Unit so far **Objective(s)** • TLW demonstrate their understanding of the material so far by taking the quiz. **Bloom's Taxonomy Cognitive Level:** • Apply	**Differentiation** **Below Proficiency:** Allow more time if necessary to complete the quiz either after school or by some other arrangement. **Above Proficiency:** **Approaching/Emerging Proficiency:** **Modalities/Learning Preferences:**
Classroom Management- (grouping(s), movement/transitions, etc.) Students will be expected to follow the procedure for taking a quiz. Students will be expected to follow procedure for when they are done taking quizzes/test.	**Behavior Expectations- (systems, strategies, procedures specific to the lesson, rules and expectations, etc.)** Students are expected to follow the procedure to taking a quiz which means no talking to anyone. The only questions they can ask are to me. They are expected to keep their eyes on their own tests and have all notes, other materials put away except pen, pencil, calculator, and scratch paper. If students finish early, they are expected to work on homework for this class or another class if they are finished with their math homework. If finished with all of that, read a book or partake in a quiet activity that does not disrupt others.

Minutes	Procedures
2	**Set-up/Prep:** Make sure tests are ready to go and review is ready to be covered shortly.
7	**Engage: (opening activity/ anticipatory Set – access prior learning / stimulate interest /generate questions, etc.)** Bell ringer – for the bell ringer, I will have the students write down 2 of their most positive thoughts. "Write down 2 positive thoughts." The reason I am doing this is so that students have a positive mental attitude before they take their quiz. Hopefully this clears their minds and gets them in the right state of mind before the quiz. At this point we will do a quick review on everything covered to this point:

	• Inverse operations • Isolating x • Combining like terms • Distribution • Simplifying • Justification of steps in solving equations At this point, I will ask the students for any last minute questions they may have, and we will go over them together.
40	**Explain: (concepts, procedures, vocabulary, etc.)** Quiz. See document labeled "Quiz Over Chapter 2: Lessons 1-5"
	Explore: (independent, concreate practice/application with relevant learning task -connections from content to real-life experiences, reflective questions- probing or clarifying questions)
1	**Review (wrap up and transition to next activity):** Students will be prompted to hand in their quiz. They will be reminded that there is a homework assignment due tomorrow.

Formative Assessment: (linked to objectives) **Progress monitoring throughout lesson- clarifying questions, check-in strategies, etc.** **Consideration for Back-up Plan:**	**Summative Assessment (linked back to objectives)** **End of lesson:** **If applicable- overall unit, chapter, concept, etc.:**

Reflection (What went well? What did the students learn? How do you know? What changes would you make?):

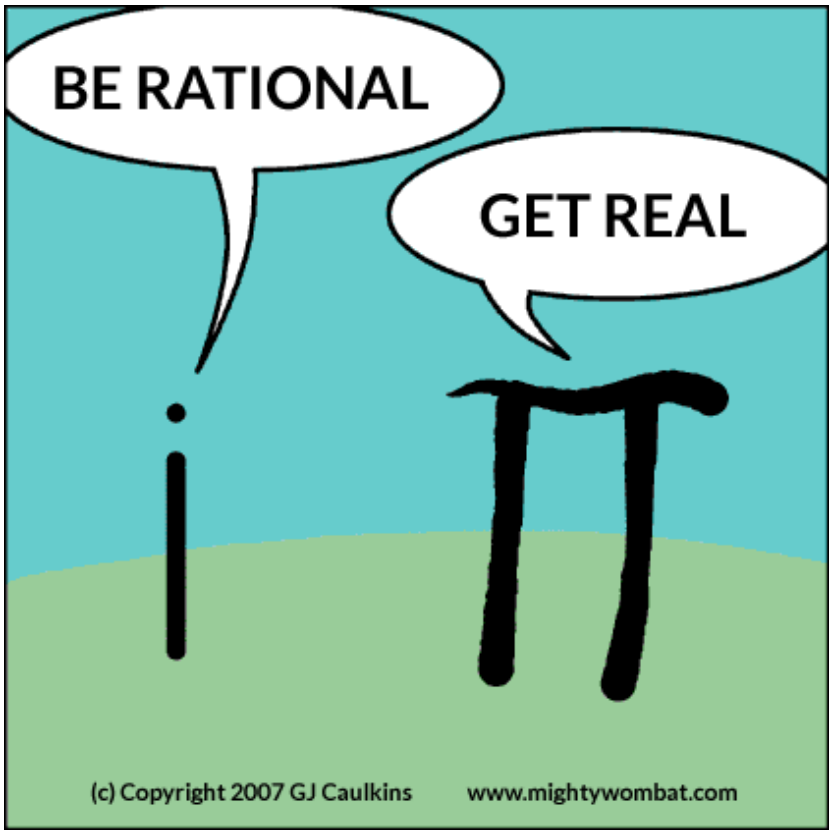
Quiz (Lessons 1-5)

Name:_____

Chapter 2 Quiz – Sections 1-4

Make sure you read and follow the directions for each section. **Be sure to show all of your work as you will be given partial credit for doing correct steps even if you end up at the wrong answer**. You will have until the end of class time to finish this quiz. Upon completion, please bring it up to my desk to hand in. The only things you are allowed to use on this quiz are pencil/pen, calculator, and scratch papter. You may not talk with anyone or use notes. You may come and ask me questions for clarification.

Good luck with your quiz and remember to keep a positive mental attitude!



Solve the equation for the variable.

1.) $x + 15 = 26$

2.) $x - 21 = -32$

3.) $-5y = 40$

4.) $\frac{5}{6}x = 10$

Solve the following equations. Give each justification step you use in solving the equation.

STEPS:

5.) $m + 21 = 14$

STEPS:

6.) $23 - n = 40$

STEPS:

7.) $3x = -30$

STEPS:

8.) $\frac{3}{4}y = -60$

Solve each equation for the variable.

9.) 6x – 12 = 24

10.) $\frac{2}{3}x + 8 = 16$

Solve each of the follow equations for the variable. Justify each of your steps along the way in solving each equation.

STEPS:

11.) $\frac{1}{4}x + 20 = 23$

STEPS:

12.) $17 - 5x = 7$

Solve the following word problem. You must include the following: 1.) the equation for the problem, 2.) solving the problem with justification steps at each point, and 3.) your answer with a label.

13.) A local motor sports store in Bismarck charges $40 to rent a jetski. They charge an additional $15 per hour for every hour that you have the jetski. Shelly paid $130 to rent a jetski. How many hours did she have the jetski for?

STEPS:

Solve the following equations for the variable.

14.) $3x + 6 = 2x + 3$

15.) $4(x - 4) = 2(x + 2)$

Solve each equation for the variable. Justify all of your steps along the way.

STEPS:

16.) $3y - 6y + 10 = -4y - y + 1$

STEPS:

17.) $\frac{2}{3}x + 7 = \frac{4}{3}x + 1$

STEPS:

18.) $6(-y - 2) = 7y + 14$

Solve the following word problem. You must include the following: 1.) the equation for the problem, 2.) solving the problem with justification steps at each point, and 3.) your answer with a label.

19.) Bill weighs 120 pounds and is gaining ten pounds each month. Phil weighs 150 pounds and is gaining 4 pounds each month. How many months, m, will it take for Bill to weigh the same as Phil?

STEPS:

BONUS QUESTION (2 points): What is the acronym we use for remembering the order of operations?

Lesson 7

Grade: 9th Grade

Subject: Algebra 1

Materials: Notebook, Pen/Pencil, Notes, Calculator

Technology Needed: Computer with PowerPoint and SMART Board to do lesson on

Instructional Strategies:

- ☐ Direct instruction
- ☐ Guided practice
- ☐ Socratic Seminar
- ☐ Learning Centers
- ☐ Lecture
- ☐ Technology integration
- ☐ Other (list)
- ☐ Peer teaching/collaboration/ cooperative learning
- ☐ Visuals/Graphic organizers
- ☐ PBL
- ☐ Discussion/Debate
- ☐ Modeling

Guided Practices and Concrete Application:

- ☐ Large group activity
- ☐ Independent activity
- ☐ Pairing/collaboration
- ☐ Simulations/Scenarios
- ☐ Other (list)
- ☐ Hands-on
- ☐ Technology integration
- ☐ Imitation/Repeat/Mimic

Explain:

Standard(s)

- HS.A-REI.3 - Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
- HS.A-CED.1 - Create equations and inequalities in one variable and use them to solve problems.
- 8.EE.7 - Solve examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers).

Objective(s)

- TLW solve equations with variables on both sides of the equation.
- TLW differentiate between the terms: no solution, one solution, and identity
- TLW determine whether the answer they get to an equation is an identity, one solution, or no solutions

Bloom's Taxonomy Cognitive Level:

- Application
- Analysis
- Evaluation

Differentiation

Below Proficiency: Below proficiency students will be given a sheet that has notes pre-written so they can follow along with the lecture and notes more instead of worrying about writing everything down. This will include definitions of identity, no solution and one solution along with worked out examples for each situation. Also, I will allow 10 minutes at the end of class to let students start homework problems in class. This way, they can ask questions if they need help.

Above Proficiency: For above proficiency students, I will ask them to help students who are struggling when we have 10 minutes at the end of class for homework. This will allow them to gain a deeper understanding while bringing other students to proficiency as well. I will also give above proficiency students some extra homework problems they can complete if they'd like that are more difficult. They can complete these for feedback if they would like extra practice.

Approaching/Emerging Proficiency: For approaching/emerging proficiency I will have these students progress along the material as usual.

Modalities/Learning Preferences: The learning preferences are visual, auditory, logical, and social, and intrapersonal.

Classroom Management- (grouping(s), movement/transitions, etc.)

- The classroom management portion of this lesson deals with students being respectful during homework time in class. They will be asked to follow the respect procedure.

Behavior Expectations- (systems, strategies, procedures specific to the lesson, rules and expectations, etc.)

- Students will be expected to observe the classroom rule of respect. I will allow them to work on

• Another part where classroom management will be important is handing in and getting homework assignments back.	homework at the end of class for the benefit of them being able to ask questions and get help. • Students will be expected to follow the procedure for handing in and getting papers back. These procedures were covered during the first days of class.

Minutes	Procedures
1	**Set-up/Prep:** Get PowerPoint presentation ready to go for lesson. Have papers ready to hand back from homework turned in two days ago.
4	**Engage: (opening activity/ anticipatory Set – access prior learning / stimulate interest /generate questions, etc.)** Bell ringer question: "what can you say about the following 3 results? Write down anything that comes to mind about each result." 1.) 2 = 6 2.) x = -4 3.) 3 = 3 This bell ringer is a brief introduction into one solution, no solution, or identity problems. I want to know what the students think about each of these statements before we start the lesson. After students have completed the bell ringer, I will give them a couple of minutes to **turn and talk** to a partner about what they wrote down for each statement. This way they will be able to verbalize their thoughts with each other and possibly build off each other's ideas. Hand in homework assignment using the procedure for handing papers in. This assignment is from section 3. Hand back homework papers from section 2.
32	**Explain: (concepts, procedures, vocabulary, etc.)** To start this lesson, we will start with definitions and examples of no solution and identity to build the base for the rest of the material we are going to cover for the day. • **No solution** – An equation where NO value of the variable will make the equation true. In other words, there is no value we can substitute in for the variable to make the equation hold true. • **Examples:** some examples of no solution are 3x = 3x +1. There is nothing we can plug in for x to make it true because if we subtracted a 3x from the right side, it would cancel the 3x on the left. This would give us 0 = 1. Does 0 ever equal 1? No. Another example of a no solution would be 3x + 2 = 3x + 4. If we were to work this equation out, we could subtract a 3x from the left and it would cancel the one on the right to get 2 = 4. And then we are able to see that 2 = 4 is never true, so this would have no solution. • **Identity –** An equation that holds true no matter what value is substituted in for the variable. In other words, the statement will always be true no matter what. • **Examples:** 2x + 3 = 2x + 3. Right off the bat, we can see that both sides of the equation are exactly the same as one another. However, not everyone can pick that up right away so let's see what happens if we work it out for x. Subtract 3 from the left and also the right, in which they cancel out and we get 2x = 2x. We can take this another step further and divide by 2 on the right in which we would divide the left side by 2 as well, and we end up with x = x. In this case, we can see that no matter what we plug in for x, it will always be true and therefore we have an identity. Another example would be if we started with 10 – 8z = 2(5 – 4z). From the rules we have talked about in the past couple days we would distribute first and we end up with 10 – 8z = 10 – 8z. We can see these are the exact same on both sides, but we will work it out another step to see. Add 8z on the left and then we have to also on the right and we see they cancel. At this point we end up with 10 = 10. When does 10 = 10? **Always.** Therefore, we have an identity.

- **<u>One Solution -</u>** An equation that is true with only one value of the variable. In other words, the examples we have been doing for the past week or so are one solution problems. This looks something like x = 7 or y = -4. We have done lots of examples like this and will see some more throughout homework and in-class examples.

Remember, when solving equations like this, it is important that we remember the rules we have talked about thus far.

- When solving for x and you and –x, divide by -1 to express x as a positive value
- PEMDAS – ORDER OF OPERATIONS IS IMPORTANT
- Simplifying before solving – distribute, combine like terms, etc.

Let's look at some examples:

First example: 3(x + 4) = 3x + 11

- First step is to distribute: 3x + 12 = 3x + 11
- At this point we have simplified, now let's solve. Subtract 3x from the left side and this gives us 12 = (3x – 3x) + 11.
- At this point, we see that the 3x's cancel so now we are left with 12 = 11
- What can we say about the statement 12 = 11?
- This is a NO SOLUTION because 12 is never equal to 11. This means that no matter what we plug in for x, the equation is never going to hold true, so this is a no solution.

2nd example: 10 + x = 5 (1/5x + 2)

- First step? Distribute. This gives us 10 + x = x + 10.
- Let's get like terms to the same side by subtracting 10 from right side to left. Then we see that we have (10 – 10) + x = x.
- We see that the tens cancel and we are left with x = x
- Now, someone give me a value for x. "300". Okay, let's plug in 300 for x. and we see that we get the statement 300 = 300.
- When does 300 = 300? "All the time"
- Good, so we see that this holds true for any value that we plug in for x.
- What does this mean for our answer.
- Identity since the statement is always true no matter what value goes in for x.

3rd example: 2(x + 2) + 3x = 2(x + 1) + 1

- First step: distribute by order of operations P is parentheses. This give us 2x + 4 + 3x = 2x + 2 + 1
- Now what do we do? Continue to simplify by combining like terms on same side of equation.
- This leaves us with 5x + 4 = 2x + 3, now we have simplified and we can continue to solve.
- We can subtract 2x from the right and also the left, which gives us (5x – 2x) + 4 = 3 → 3x + 4 = 3
- Now, we move non-x's to opposite side by subtracting 4, gives us 3x = -1
- What do we do now? Divide by 3 to get x alone and leaves us with x = (-1/3)
- If we plug (-1/3) back in we see both sides equal (-7/3) so we are correct!
- Since we ended up with the variable equal to a value and it was true, what does this say about our answer.
- One solution!

4th example: x + 2x + 3 + 3 = 3(x + 2)

- First step? Distribute → x + 2x + 3 + 3 = 3x + 6
- Next step? Combine like terms → 3x + 6 = 3x + 6.
- At this point, both sides look the exact same, so we can have an idea that it may be an identity, but I want to see you work it out just to make sure
- Get like terms on one side → subtract 3x from left to the right and end up with 6 = (3x – 3x) + 6.
- We see that 3x's cancel to make 0, so we're left with 6 = 6 .
- What can we say about this statement? 6 always equals 6, so we have what?
- IDENTITY!

5th example: 4x + 2x + 2 = 3x – 7

	• First step? Combine like terms on left side → 6x + 2 = 3x – 7 • Get like terms on same side → subtract 3x from left and we get (6x – 3x) + 2 = -7 • Then we are left with 3x + 2 = 7 • Subtract 2 from left and right to get → 3x = -9 • Divide by 3 on each side to get x alone so we have x = (-9/3), which is -3 • Then we see we have x = -3 • Let's plug it back in and check. 6(-3) + 2 = -16 and 3(-3) – 7 = -16 • So we were right and what can we say about the solution? • One solution! 6th example: x + 2x + 1 = 3x + 2 + 3 • First step? Combine like terms on both sides of equation → 3x + 1 = 3x + 5 • Simplified now what do we do? Subtract 1 from right and left side in which we get 3x = 3x + 4 • Now, get the x's to the left side by subtracting 3x from both sides → (3x – 3x) = 4 • This leaves us with 0 = 4. • What can we say about this? It is never true since 0 never equals 4, so therefore we have no solution. • NO SOLUTION At this point, I will ask for some questions. Either no questions or after questions are answered, I will ask the students to work on their own and solve an example. The example I will give them is 5(x+2) – 3x = 2(x + 5). Students will be given 3-5 minutes to solve this example, at which point we will go over it togerther. • 5x + 10 – 3x = 2x +10 – distribute • 2x + 10 = 2x + 10 combine like terms • 10 = (2x – 2x) + 10 – Get x terms to one side • 10 = 10 – what can we say about this • Always true, so the answer is IDENTITY. Again, at this point I will field questions pertaining to the lesson today. If not, we will move on to the next part of class.
10	**Explore: (independent, concreate practice/application with relevant learning task -connections from content to real-life experiences, reflective questions- probing or clarifying questions)** At this point I am going to assign the homework , which will be due in 2 days. Homework assignment – Chapter 2.5 4-8; 20-27 Then, I am going to give the students approximately 10 minutes to work on this homework assignment in class so I can address any questions that they may have. Also, I will allow the students to work with 1 other student if they like or by themselves if that is what they prefer. I may ask some of my above proficiency students to help me out with students who are having a tough time. I will use this time to answer any questions and get a judgment of how the class in understanding the material.
3	**Review (wrap up and transition to next activity):** Once I have given the students approximately 10 minutes, we will come back together as a class and go over a few things before I allow them to be dismissed. Things we will touch upon in the recap are: • Meanings of: • Identity • No solution • One solution Before I dismiss students, I will remind them that we have a test coming up in 4 days. If they would like, it would be beneficial to them to start studying the material we have covered to this point. Also, they can schedule a time to meet with me before or after school to go over topics that they may be having a difficult time with.

	Once this is finished, I will dismiss students.

Formative Assessment: (linked to objectives) **Progress monitoring throughout lesson- clarifying questions, check-in strategies, etc.** I will be using the example they do in class as a formative assessment where I can observe how they are working and get a feeling for their understanding. Also, I will use the homework time to gain an understanding of students who really get the material, ones who are at proficiency, and ones who are struggling. Finally, I will use the homework problems as a form of formative assessment based off of students understanding on the homework problems. **Consideration for Back-up Plan:** For a backup plan, I would have a few extra examples handy to use in case we end a little soon. Also, I will have a video from the internet that is brief, but does a good job of explaining what identities, no solutions, and one solution means.	**Summative Assessment (linked back to objectives)** **End of lesson:** Questions from this unit will be included on the end of chapter test. **If applicable- overall unit, chapter, concept, etc.:**

Reflection (What went well? What did the students learn? How do you know? What changes would you make?):

Lesson 8

Grade: 9th

Subject: Algebra 1

Materials: Pen/Pencil, Notes, Notebook, Calculator,

Technology Needed: Computer with PowerPoint to present notes/lesson, Computer for percent games

Instructional Strategies:

- ☐ Direct instruction
- ☐ Guided practice
- ☐ Socratic Seminar
- ☐ Learning Centers
- ☐ Lecture
- ☐ Technology integration
- ☐ Other (list)
- ☐ Peer teaching/collaboration/ cooperative learning
- ☐ Visuals/Graphic organizers
- ☐ PBL
- ☐ Discussion/Debate
- ☐ Modeling

Guided Practices and Concrete Application:

- ☐ Large group activity
- ☐ Independent activity
- ☐ Pairing/collaboration
- ☐ Simulations/Scenarios
- ☐ Other (list)
- ☐ Hands-on
- ☐ Technology integration
- ☐ Imitation/Repeat/Mimic

Explain:

Standard(s)

HS.A-CED.1 - Create equations and inequalities in one variable and use them to solve problems.

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

Extension of 7.EE.3 - Solve multi-step real-life and mathematical problems posed with rational numbers in any form (positive and negative, fractions, decimals, and integers), using tools strategically (percent change)

Objective(s)

- TLW interpret percent problems presented in word form to create a proportion they can solve.
- TLW solve proportions containing one variable.
- TLW apply the proportion and percent equations to solve percent problems.
- TLW solve percentage problems using real-world examples such as interest, etc.

Bloom's Taxonomy Cognitive Level:

- Understand
- Apply
- Create

Differentiation

Below Proficiency: For below proficiency students, I will provide them with some pre-printed notes so they can follow along with the material instead of having to worry about writing everything down and missing something. Also, the class will be doing an online game with percent and proportion problems at the end of class. I will use this time to work with students who are below proficiency and try to help further their understanding.

Above Proficiency: For above proficiency students, I will have some more difficult problems dealing with percent and proportion problems and I will let them work on those problems to see if they can reason their way to the answer. This will help them to gain a deeper understanding of the material.

Approaching/Emerging Proficiency: For approaching/emerging proficiency students, I will have them continue along as usual. The purpose of the online game with percent and proportion problems is to expose the students to more problems and get them more practice in dealing with a semi-foreign topic. This will hopefully deepen their understanding.

Modalities/Learning Preferences:

This lesson appeals most to visual and auditory learners. Also, it caters more to the intrapersonal learners.

Classroom Management- (grouping(s), movement/transitions, etc.)

- Students will be expected to follow the classroom procedure for using computers.

Behavior Expectations- (systems, strategies, procedures specific to the lesson, rules and expectations, etc.)

- Students will be expected to behave in a responsible and respectful manner while follow procedures for

• Also, students will be expected to follow the procedure for getting and putting away their computers.	using computers as well as for putting them away and grabbing them.

Minutes	Procedures
2	**Set-up/Prep: -** Students will be given a Jing video to watch on proportions and percentages to get an idea of the basics. This will be done to be able to hop right into things when class starts so we can get to the fun activity at the end! Jing link: https://www.screencast.com/t/YwJR9iIT - Have colored pieces of paper ready to hand out as students walk into class for group work later on. - I will have the PowerPoint presentation ready to go. Also, I will be prepping to give homework papers back by the procedure we discussed at the beginning of the year. Bell-ringer will be posted on the board.
4	**Engage: (opening activity/ anticipatory Set – access prior learning / stimulate interest /generate questions, etc.)** I will have a bell ringer activity on the board for students to complete when the get into class. Today, the question will read "What are the different areas where you see percents/percentage used? How does a percentage look when it is written out? List all that you can think of." Once everyone has had a chance to complete the bell ringer, we will have a discussion about this question. I will ask the students for what answers they came up with and see just how many different places percentage is used throughout the world. Also, we will talk about how percentages can be expressed in several different ways. We will also talk about how we can convert things to percents in many different ways. This will be the introduction to the lesson for the day.
30	**Explain: (concepts, procedures, vocabulary, etc.)** At this point, we will start with the foundation for the lesson. Vocabulary. • Proportion – Setting two ratios or fractions equal to each other. Looks like $\frac{a}{b}=\frac{c}{d}$ • Cross-Multiplication – The technique we use to solve proportions. We multiply the numerator from one side with the denominator from the opposite side. We then set it equal to the other numerator multiplied with the opposite denominator. In the example of proportion, it would be *bc* = *ad* • Percent – a ratio out of 100. For example, 10 out of 100 people is 10%. I will ask if there is any questions on definitions, if not, we will move on to the material. The first subject we will talk about is solving a proportion, just to recap it and make sure everyone is on the same page. We will discuss how cross-multiplication is used to help us solve these problems such as $\frac{8}{14}=\frac{c}{7}$. IN this problem, we would discuss that since we see we have a proportion, we can cross-multiply and set up an equation. Since we multiply opposite numerator and denominator, we end up with 14c = 56. Now we have gotten this problem to a form that looks very familiar to the equations we have been solving over the past week or so. What do we do now? Divide by 14 on each side to get c alone and then we should have an answer. 56/14 = 4. At this point, let's plug it back in and see. And indeed we see that (8/14) is equivalent to (4/7). Now lets look at some more problems. First example: $\frac{36}{20}=\frac{45}{d}$

- First step? Cross multiply → 900 = 36d
- Next step? Divide to get d alone → (900/36) = d
- D = 25.
- Plug it back in and we see that (36/20) is equal to (45/25) and we are correct!

Next Example: $\frac{4.2}{b} = \frac{8.4}{13.6}$

- It is very possible that you will get decimals in proportions, so here is an example of a decimal problem. Do not let the decimal intimidate you at all, we proceed by using the same process as before.
- First step? Cross-multiply → 57.12 = 8.4d
- Next step? Divide both sides by 8.4 to get d alone.
- (57.12/8.4) = 6.8 = d
- Plug 6.8 back in for d and check to see if our answer is correct. $\frac{4.2}{6.8} = \frac{8.4}{13.6}$ is true so we're correct!

One last example of proportion problems. $\frac{a}{38} = \frac{50}{100}$ **Can Skip if time is tight.**

- First step? Cross multiply and get 1900 = 100a
- Next step? Divide by 100 on both sides to get a alone → (1900/100) = a = 19
- Last step? Plug it back in and see that we are correct. $\frac{19}{38} = \frac{50}{100}$ we then see that our statement is true making our answer correct!

Great job on solving proportions class! Now we are going to see how proportions and percentages tie together. I used the last example on purpose to lead us into percentages. What number are percentages based off of usually? 100 percent is the correct answer. How we can tie that last problem into percentages? I would be looking to hear something like the right side of the proportion is 50 out of 100 percent, or one-half. When you punch a score into your calculator after a test and punch in something such as 23/26, the number you would get is .8846 and if you multiply that number by 100 to convert to a percent, you would get 88.46%. You may not have realized it before, but this is how your calculator expresses the number you punch in for your test scores.

Whenever we do percentages, they can be expressed in 2 ways, as a number out of 100, such as 14% or 38.732% or something of the sort. However, there is an alternative way to express percentages, and that is through decimal form.
Can anyone tell me how many decimal places we move the decimal to represent one-hundredths? I would be looking for the answer of 2 decimal places to the left. So when I talked earlier about 14%, we can also express that as .14, and they are equivalent to each other. Now let's use this new information to solve some percentage problems.

Let's look at the two basic equations to solve percentages:

They are: $\frac{a}{b}x100$, which is used if just given two numbers, such as your test scores. Another equation similar to that is $\frac{a}{b} = \frac{c}{100}$, where you are asked something like 56 percent of 200 is what?

The other formula we would use is the decimal form of a percentage, such as (percentage as a decimal) times the number you are trying to find the percentage of. For example, 5 percent of 200 would be written as .05(200) = 10.

Something to keep in mind and really consider is that if you have a percentage ranging from 1 to 9, the decimal still has to be moved 2 decimal places. (i.e. 4 percent is .04 in decimal form, NOT .4) be care of this common mistake!!

Let's take a look at some examples of how to use these formulas.

What is 40% of 50?

Two ways to go about this: let's use the proportion equation first and plug in missing numbers.
We are given that we have 40 percent, which we know is 40 percent of 100 percent, so how would we set that up? We would put 40 over 100. Now, how do we decide whether to put the 50 on the top or bottom on the other side? Well, we are looking for 40 percent of 50, which means it is going to be smaller than 50 and 40 is smaller than 100. SO we should put the 50 on the denominator on the other side, in which we are left with $\frac{a}{50} = \frac{40}{100}$. Now we can see this is similar to what we had before, let's solve it.

- First step → cross multiply to get 100a = 2000
- Next step → divide by 100 on each side to get a alone
- This leaves us with a = (2000/100)
- A = 20
- Plug 20 back in for a in the original equation and let's see if we are correct. Yes!

Next problem: 30 is what percent of 120?

- Okay, now we are looking for a percentage and we know 30 is the part and 120 is the whole, so we put the part on the numerator and 120 (the whole) on the denominator. This gives us a fraction of 30/120. If we are trying to find the percent, we know that it is out of 100, so we can set up the right side as x/100 and then solve for x.
- Let's solve again using the proportion method. $\frac{30}{120} = \frac{x}{100}$
- First step: cross-multiply to get 3000 = 120x
- Divide both sides to get x alone, → x = (3000/120)
- X = 25
- Plug it back in and we see that we are correct!

Now let's solve some problems using the decimal equation.
50 is 20% of what number?

- So we need to use the decimal form, and we know we have 20 percent, so we are going to use .2 somewhere in the equation. Also, we have a 50 so we know we have to use that. However, the problem asks for 20 percent of what number, so our variable needs to go with the percent.
- Gives us equation of .2h = 50
- To solve this, we need to divide by .2 on each side to get h alone.
- H = (50/.2)
- H = 250
- Plug this back into the original equation to see if we are correct and we are!

Next problem: now we will look at a problem like the first and see how we can use the decimal equation to solve the same type of problem. Question reads: f is 62% of 350. **Can Skip if need be.**

- Set it up based on information we know. 62 percent is .62 as decimal.
- Multiply is by the number we are given. (.62)(350)
- F = 217
- Divide 217 by 350 to check our answer and we get 62 percent. Good!

Now, where can we apply these equations in real-life situations? A couple are examples are finding discount prices at the store or calculating simple interest for money. Let's look at an example of each situation.

	You are shopping for a new pair of sunglasses that originally cost $80. You see in a weekly ad that the sunglasses are on sale for 20% off. What is the cost of the discounted sunglasses? Let's break this question down and extract the information we need to solve the problem. • Original cost = $80; discounted price is 20% off. • We can approach this problem two ways. An simple way and a more difficult way. • More difficult would be to calculate 20 percent of 80 and subtract that amount from 80 to get our answer. • This would like .2(80) = 16; then we have to subtract 16 from 80 to get our answer • OR let's approach this from more simple way. Since it is 20 percent off, you are only paying 80% of the original price. So then you can convert 80% to a decimal (.8) and take that times the original price to get the new price. • This would look like (.8)(80) • This comes out to 64. Are we done? No. • It is a word problem so we need to label our answer. • $64 is the discounted price for the sunglasses. Now let's look at simple interest problem. Our equation for simple interest is I = prt • I = interest • p = investment or amount of money originally put into the account • r = interest rate (percentage) • t = time (years) Now, let's say that you invest $100 and it earns 5 percent interest. How much is your investment worth in 2 years? Let's extract the information we need to solve this problem. • Do we know how much interest we accrued? No, that is what we are solving for. • Do we know investment? Yes. $100 • Interest rate? Yes. 5 percent or (.05) • Time? Yes. 2 years. • Let's plug this information in and see how much interest we accrued in 2 years. • I = prt • I = (100)(.05)(2) • I = $10. • Now you add the interest to your original investment and see that 100 + 10 = $110 • Your investment is worth $110 in 2 years' time. Independent Activity You want to buy a new car that originally costs $14,000. The dealership is running an offer of 15% off. What is the new price of the car after the discount is applied? Let's say you invest $5000 and it earns 7.5% interest over a 6 year span. How much is your investment worth in 6 years?? Any questions? If so, I will answer them at this point. If not, we will move on to next activity, which is solving percent equations by going to the link https://www.quia.com/cb/34887.html . Students will be able to play jeopardy to solve percent equations and gain practice in solving these types of problems.
12	**Explore: (independent, concreate practice/application with relevant learning task -connections from content to real-life experiences, reflective questions- probing or clarifying questions)** At this point, students will be asked to grab their computer using the procedure established at the beginning of the year and group up with another student who received the same color as them. Students will then be directed to go to the link https://www.quia.com/cb/34887.html which is a Jeopardy game for solving

	percentages. They will be expected to stay on task while using the Jeopardy game. I will give the students a target score of 2000 to reach before class ends. This Jeopardy game does a good job of giving questions that are basic and moving on to more complex problems, so the students will get a good variety of questions. At this time, I will answer any questions that the students have. I will shift my main focus to students who I know are struggling and help them to try and understand how we solve percentage problems. I will refer them to their guided notes and how to use that information to apply it to the different questions they will encounter throughout the Jeopardy game. When finished, students will be asked to put their computer away using the same procedure as grabbing computers.
2	**Review (wrap up and transition to next activity):** Once all computers are put away and everyone is seated, I will ask for questions one more time. If there are no questions, we will revisit the main topics from the day. I will remind the students to start studying if they have not, as we have a test in 3 or 4 days. We will have a review game the day before the test. Students will be dismissed.

Formative Assessment: (linked to objectives) **Progress monitoring throughout lesson- clarifying questions, check-in strategies, etc.** I will keep an eye on students as we are working on problems during the class period. Also, I will use the time when students are playing Jeopardy to move around and see how students are comprehending the material. **Consideration for Back-up Plan:** For a back-up plan, I would allot some time in class the next day, or take an extra day to cover some of this material, as it is not an easy concept to grasp right away. Also, I would consider doing more examples in class that we can all go over together.	**Summative Assessment (linked back to objectives)** **End of lesson:** Questions from this section are going to be included on a homework given after the next lesson. Also, questions will be included on the review and final exam. **If applicable- overall unit, chapter, concept, etc.:**

Reflection (What went well? What did the students learn? How do you know? What changes would you make?):

Overall, the lesson went pretty well. Some positives were the use of the website and groups for the group activity. Students were able to learn from each other and work collaboratively to learn new information. However, I need to leave some time at the end of the activity for questions that may arise. Also, having students do individual work on some problems went well. One thing to consider would be having them come to the board to model how to do each step instead of just asking them what they did. This allows peer modeling. One more thing would be to have a check to see if students watched the Jing video before coming to class. The video worked well, but I need to implement a check to see that they watched the video.

Lesson 9

<table>
<tr><td>Grade: 9th Grade</td><td>Subject: Algebra I</td></tr>
<tr><td>Materials: Pen/Pencil, Notebook, Notes, Calculator, Homework Assignment, Guided Notes for Below Proficiency Students</td><td>Technology Needed: Computer with PowerPoint for notes and SMART Board to present the notes on.</td></tr>
<tr><td>Instructional Strategies:
☐ Direct instruction
☐ Guided practice
☐ Socratic Seminar
☐ Learning Centers
☐ Lecture
☐ Technology integration
☐ Other (list)
☐ Peer teaching/collaboration/ cooperative learning
☐ Visuals/Graphic organizers
☐ PBL
☐ Discussion/Debate
☐ Modeling</td><td>Guided Practices and Concrete Application:
☐ Large group activity
☐ Independent activity
☐ Pairing/collaboration
☐ Simulations/Scenarios
☐ Other (list)
Explain:
☐ Hands-on
☐ Technology integration
☐ Imitation/Repeat/Mimic</td></tr>
<tr><td>Standard(s)
• HS.A-CED.1 - Create equations and inequalities in one variable and use them to solve problems.
• Extension of 7.EE.3 - Solve multi-step real-life and mathematical problems posed with rational numbers in any form (positive and negative, fractions, decimals, and integers), using tools strategically (percent change)

Objective(s)
• TLW solve equations involving percentage change.
• TLW analyze and solve problems involving relative error.

Bloom’s Taxonomy Cognitive Level:
• Apply
• Analyze</td><td rowspan="2">Differentiation
Below Proficiency: For below proficiency students, I will again provide them with guided notes so they can follow along instead of having to worry about writing information down during lecture. Also, I will have students start on homework at the end of class so they can ask questions if they have any before they leave and start on their own. Also, I will ask some above proficiency students to help if they are willing to do some to work with below students.

Above Proficiency: For above proficiency students, I will ask them to help me with some below proficiency students during the homework. This way they can teach the material and gain a better understanding while also helping to bring the below proficiency students to understanding.

Approaching/Emerging Proficiency: For these students, I will have them proceed along material as usual. I will also allow them to pair together with other students to work together on some of the homework problems as they will be able to help each other out.

Modalities/Learning Preferences: This lesson appeals to students who are visual, auditory, intrapersonal, and interpersonal.</td></tr>
<tr><td>Classroom Management- (grouping(s), movement/transitions, etc.)
• Classroom management procedure will be group work. Students will be expected to</td><td>Behavior Expectations- (systems, strategies, procedures specific to the lesson, rules and expectations, etc.)
• Students will be expected to follow the classroom rule of respect fellow classmates and their property when they ar working together.</td></tr>
</table>

follow group work guidelines set forth at the beginning of the year.	

Minutes	Procedures
2	**Set-up/Prep:** I will collect homework that was given 2 days ago. Also, I will have the homework ready for students for when the lesson is over today. Also, have PowerPoint presentation ready to go for direct instruction
4	**Engage: (opening activity/ anticipatory Set – access prior learning / stimulate interest /generate questions, etc.)** Bell ringer will be posted on the board and the question will be "what is 46 percent of 72. Round your answer to the nearest tenth." Students will complete the bell ringer when they come into class and are seated. They will be given a couple minutes to answer, once everyone has answered, we will go over the problem together. • Steps for bell ringer • Covert 46% to a decimal → .46 • Take .46 times the number we are trying to find the percentage of. (.46)(72) • X = 33.1 • Any questions? Once we have covered this, I will then put a fun picture up pertaining to what we are talking about for today.  This picture will be used as an introduction to the lesson for today. Percent change and relative error.
25	**Explain: (concepts, procedures, vocabulary, etc.)** First, we will discuss what percent change and relative error are. • Percent Change – Percent change is when a value increases or decreases and we calculate how much change occurred. This value is expressed as a percentage. The way that we calculate percent change is by calculating the change |New amount – original amount|. We use absolute value because we want this number to be positive. However, make sure to note that is the new amount is smaller than the original, then it is a DECREASE. If the new amount is bigger than the original, then it is an INCREASE. Once we find this change value, we divide it by the original amount. We then take that number and make it a percentage by multiplying by 100.

- So the formula looks like $\frac{|new\ amount - original\ amount|}{original\ amount}$ x 100 = % change

Now let's look at relative error. Relative error is in essence very comparable to percent change, however it deals with errors as you can tell from its title.

- Relative error – the difference between the exact or measured value and the approximation.
- So this formula is going to look very comparable to percent change, it is just used with measurements and approximations.
- The formula reads: $\frac{|approximated\ amount - actual\ amount|}{actual\ amount}$ x 100 = relative error.

Now that we've seen both formulas, we can see that they are not much different from one another. They just represent different things. We end up using the same calculations for both. So, let's take a look at some examples of both problems.

First example: Find the rate of change and express if it is a decrease or increase.

- New amount: 78 Original amount – 65
- First is it an increase or decrease? Increase because new is bigger than original.
- Let's plug the numbers into the formula → first , |new – original| → 78 – 65 = 13
- Now we the amount we get, 13 and divide it by the original amount (13/65) = .2
- Now we take this number times 100 to get the percentage. (.2)(100) same as moving decimal two places to the right.
- This gives us 20%, so we have a 20% increase

Next example: Find the rate of change. Is it an increase or decrease? Round to the nearest percent.

- New amount – 382.50 Original amount 450
- First, is it an increase or decrease? Decrease. Why? New is smaller than original.
- Plug the numbers into the equation to first find numberator, |382.5 – 450| = |-67.5| = 67.5
- Now, take this value divided by the original → 67.5/450 = .15
- Now multiply by 100 or move decimal two to the right → 15%
- We can say we had a 15% decrease

Let's take a look at an example of a word problem: Jason's hourly wage increased from $10.45 to $13.60. What rate of change does this represent? State whether it is an increase or decrease and round to the nearest tenth.

- Let's break this problem down into parts so we can plug it into the equation.
- If he got a raise to 13.60, that means he started at 10.45, so this should represent our original amount. That means 13.60 represents our new amount.
- Is this an increase or decrease? Increase because new is bigger than original.
- Let's plug our info into the equation → |13.60 – 10.45| = 3.15
- Now we take this amount divided by the original amount: (3.15 / 10.45) → .30143
- Multiply by 100 or move decimal 2 places to the right to get 30.143 %
- Round to the nearest tenth which is 30.1 % increase.

Now let's take a look at a couple of relative error problems. Upon finishing these examples, I will give you guys some time to work on your homework assignment in class so you can ask questions if you have some.

Here's a couple relative error problems.
Question: A student estimated a mass to be 325 g, but upon carefully measuring it, found the actual mass to be 342 g. Calculate the percent error and round to the nearest tenth, if necessary.

- Let's extract some numbers to plug into our formula:
- Our approximated value is the same as an estimate, so we can say our approx.. value is 325 and the actual value is 342. Let's plug this into our formula.

	• |325-342| = |-17| = 17 • take this value and divide it by the actual amount of 342 → (17/342) = .0497 • Multiply by 100 or move decimal 2 to the right to get 4.97 → 5.0 % Let's look at one more example: You estimate your friend Sally's dog to be 13 years old. Sally's dog is actually 16 years old. What is the relative error of your guess rounded to the nearest tenth of a percent? • Let's extract our info. • Your guess – 13 years old = approximated value; sally's dog is actually 16 years old = actual value • |13 – 16| = |-3| = 3 • take this divided by the actual amount → 3/16 = .1875 • Multiply by 100 or move decimal two places to the right to get 18.75 • Round to the nearest tenth to get 18.8 % Good job class, you guys are getting a good handle on this! At this point, are there any questions? If not, we will proceed. If there are, I will answer them before proceeding. Next I will give them their homework assignment, due tomorrow at the beginning of class. Assignment: Chapter 2.8 – 3-4, 14, 18, 30 Chapter 2.9 – 5-7, 20, 24, 27
16	**Explore: (independent, concreate practice/application with relevant learning task -connections from content to real-life experiences, reflective questions- probing or clarifying questions)** At this point, I am going to give students time to work on the homework assignment for the rest of class. My intention is to have students start so they can ask questions on problems they are having difficulty with. Also, this will give me an opportunity to help the below proficiency students and give them some more individualized help on their homework assignment and to help try to bring them to proficiency. I may also ask some of the above proficiency students to help with the students who are struggling with the content of the lesson. Students will be allowed to work together if they so choose. However, there will be no more than 3 students per group. Students are expected to follow the procedure for group work while working on the homework assignment.
3	**Review (wrap up and transition to next activity):** As class is ending, I will have students return to their seats and we will do a short recap and talk about the upcoming days. I will remind them that tomorrow we are doing a review game as we have a test in two days. • Start studying if you haven't! • If you are struggling with something, please come talk to me! • Homework assignment due at the beginning of class tomorrow. Once we are finished discussing this stuff, students will be dismissed.

Formative Assessment: (linked to objectives) **Progress monitoring throughout lesson- clarifying questions, check-in strategies, etc.** For a formative assessment, I will collect the bell ringer question from the students to gain an understanding of their grasp on percentages. Also, I will walk around the room and monitor how students are doing when I give	**Summative Assessment (linked back to objectives)** **End of lesson:** Questions from this section will be on the chapter test as well as the review game. **If applicable- overall unit, chapter, concept, etc.:**

them time for homework during class. This way I can see who is doing okay and also get an idea of who may be struggling.

Consideration for Back-up Plan:
If students are having a tough time comprehending the information from the last couple of days, I would consider pushing off the review and test by a day. This way, I could spend another class period talking about this information and getting the students to a deeper level of understanding.
Also, I may recommend a video such as Khan Academy or something like it if some students want more practice outside of class.

Reflection (What went well? What did the students learn? How do you know? What changes would you make?):

Lesson 10 (Review)

Grade: 9th Grade	**Subject:** Algebra I
Materials: Pen, Pencil, Scratch Paper, Calculator, Phone/Computer	**Technology Needed:** Computer and Kahoot quizzes as well as game PINs.
Instructional Strategies: ☐ Direct instruction ☐ Guided practice ☐ Socratic Seminar ☐ Learning Centers ☐ Lecture ☐ **Technology integration** ☐ Other (list) ☐ Peer teaching/collaboration/ cooperative learning ☐ Visuals/Graphic organizers ☐ PBL ☐ Discussion/Debate ☐ Modeling	**Guided Practices and Concrete Application:** ☐ Large group activity ☐ Independent activity ☐ Pairing/collaboration ☐ Simulations/Scenarios ☐ Other (list) Explain: ☐ Hands-on ☐ **Technology integration** ☐ Imitation/Repeat/Mimic
Standard(s) • All standards addressed and covered throughout chapter 2. **Objective(s)** • Demonstrate knowledge of material learned so far in chapter 2. **Bloom's Taxonomy Cognitive Level:** • Apply	**Differentiation** **Below Proficiency:** Allow these students to have their notes out to help with the problems on the review. **Above Proficiency:** **Approaching/Emerging Proficiency:** **Modalities/Learning Preferences:**
Classroom Management- (grouping(s), movement/transitions, etc.) Students will be expected to observe the classroom management procedure of using technology and staying on task. Students will use procedure for handing in homework assignments.	**Behavior Expectations- (systems, strategies, procedures specific to the lesson, rules and expectations, etc.)** • Students will be expected to be respectful during the review activity. • Students would be expected to stay on task during the review game.

Minutes	Procedures
2	**Set-up/Prep:** Get Kahoot game ready to go for the students. Have the game pins ready to go. Collect homework from students.
1-3	**Engage: (opening activity/ anticipatory Set – access prior learning / stimulate interest /generate questions, etc.)** At this point, students will be asked if they have any questions. I will cover any questions they have. If not, we will jump right into the review game.
45	**Explain: (concepts, procedures, vocabulary, etc.)** Kahoot games: Linear equations in one variable: https://create.kahoot.it/details/linear-equations-in-one-variable/05dceae4-f8e6-4685-9aff-4c43595ed97e One Solution, No solution, Identity: https://create.kahoot.it/details/no-solution-one-solution-or-infinite-solution/c35ee59a-52e8-4244-9704-168a64b91bfe

	Percent Equations: https://create.kahoot.it/details/percent-equations/51511a01-70fd-431e-946e-a4e842edc3f1 Percent Change, Percent Error: https://create.kahoot.it/details/percent-change-percent-error/e1a7ffdc-bb21-4854-b14e-df0f4a1e6b6d Not all questions on all quizzes will be used for the sake of time and relevance to material we have covered.
	Explore: (independent, concreate practice/application with relevant learning task -connections from content to real-life experiences, reflective questions- probing or clarifying questions)
3	**Review (wrap up and transition to next activity):** Remind students of test tomorrow.

Formative Assessment: (linked to objectives) **Progress monitoring throughout lesson- clarifying questions, check-in strategies, etc.** **Consideration for Back-up Plan:**	**Summative Assessment (linked back to objectives)** **End of lesson:** **If applicable- overall unit, chapter, concept, etc.:**

Reflection (What went well? What did the students learn? How do you know? What changes would you make?):

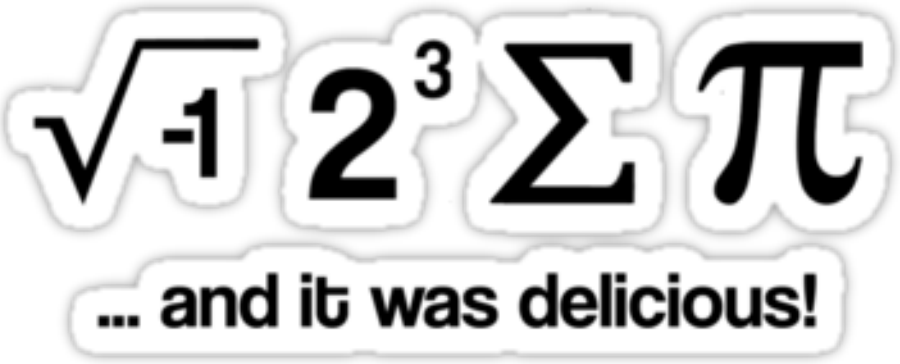
Chapter Test

Name:_____

Chapter 2 Test

Make sure you read and follow the directions for each section. **Be sure to show all of your work as you will be given partial credit for doing correct steps even if you end up at the wrong answer**. You will have until the end of class time to finish this test. Upon completion, please bring it up to my desk to hand in. The only things you are allowed to use on this test are pencil/pen, calculator, and scratch paper. You may not talk with anyone or use notes. You may come and ask me questions for clarification.

Good luck with your test and remember to keep a positive mental attitude!



Solve the equation for the variable.

1.) $\frac{3}{2}y = 24$

2.) $-8y = -64$

Solve the equations for the variable. Justify all of your steps along the way.

STEPS:

3.) $x - 14 = 10$

STEPS:

4.) $\frac{3}{4}x = 30$

Solve the follow equations for the variable.

5.) $-7x + 21 = 42$

6.) $\frac{1}{3}x$ - 16 = 4

Solve the following equations for the variable. Justify all of your steps along the way.

STEPS:

7.) 8 – 6y = 20

STEPS:

8.) 10x + 17 = -13

Solve the following word problem. You must include the following: 1.) the equation for the problem, 2.) solving the problem with justification steps at each point, and 3.) your answer with a label.

9.) The bowling alley charges $10 to rent a pair of shoes. Each game you bowl costs $6. You end up spending $40 at the bowling alley. How many games did you bowl?

STEPS:

Solve the following equations for the variable.

10.) $-8x + 3 = 6x - 4$

11.) $-3x - 9 = -2x - 3$

Solve the following equations for the variable. Justify all of your steps along the way.

STEPS:

12.) $-4x - 2x + 5 = -2x - x - 1$

STEPS:

13.) $8(y + 1) = 8y - y - 5$

Solve the following word problem. You must include the following: 1.) the equation for the problem, 2.) solving the problem with justification steps at each point, and 3.) your answer with a label.

14.) Container A has 300 L of water, and is being filled at a rate of 5 liters per minute. Container B has 550 L of water, and is being drained at 5 liters per minute. How many minutes, m, will it take for the two containers to have the same amount of water?

STEPS:

Solve the following equations. Identify if the equation is an identity (infinitely many solutions), has no solution, or has one solution.

15.) $2(-5x + 7) = -10x + 12$

16.) $5(x + 4) = 4x + 12 + x + 8$

17.) 7 (y + 2) = 5y + 8

Solve the following proportion.

18.) $\frac{2.6}{7.8} = \frac{5.2}{d}$

Solve the following equations using either of the percentage formulas.

19.) What is 35% of 123?

20.) 56 is 40% of what number?

Solve the following word problem. You must include the following: 1.) the equation for the problem and 2.) your answer with a label.

21.) You are out shopping and notice that the headphones you want are on sale. They are originally $70. Right now, they are marked as 20% off. What is the sale price of the headphones?

Find the rate of change. State whether it is an increase or a decrease. Round your answer to the nearest percent.

22.) Original amount: 95 New amount: 115

23.) Original amount: 22 New amount: 14

Solve the following word problem. State whether the percent change is an increase or decrease. Then, solve for the percent change and round to the nearest percent.

24.) Gas prices started the year at $3.15, they are now currently at $2.90. State whether gas prices have increased or decreased from the beginning of the year and find the percent change, rounded to the nearest percent.

Find the relative error.

25.) A scientist doing an experiment estimated a foreign object to weigh 45 pounds. Upon measuring the object, he finds out that it actually weighs 52 pounds. What is the relative error? Round your answer to the nearest percent.

BONUS (3pts): Finish the phrase: "In West Philadelphia born and raised_____"