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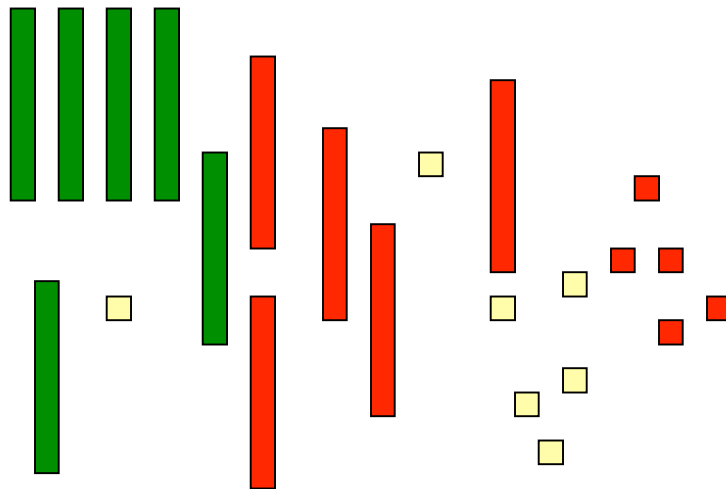
Math 7

Date: _____

Using Algebra Tiles for Adding/Subtracting Integers and to Solve 2-step Equations

Grade 7

By Rich Butera



Name: _____

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Overall Unit Objective

I am currently student teaching Seventh grade at Springville Griffith Middle School. We have just finished the chapter on Integers and solving 2 step equations. I felt the students that were unsuccessful with the final assessment happened to be very weak with the common arithmetic with integers. This then elevated to more confusion throughout the rest of the chapter. As a result, I decided to develop a similar unit with the use of algebra tiles. I will plan on using it in the near future if a situation presents itself.

Standards Used For Unit

- 7.PS.1 Use a variety of strategies to understand new mathematical content and to develop more efficient methods
- 7.PS.7 Understand that there is no one right way to solve mathematical problems but that different methods have advantages and disadvantages
- 7.CM.1 Provide a correct, complete, coherent, and clear rationale for thought process used in problem solving
- 7.CM.10 Use appropriate language, representations, and terminology when describing objects, relationships, mathematical solutions, and rationale
- 7.CN.4 Model situations mathematically, using representations to draw conclusions and formulate new situations
- 7.R.1 Use physical objects, drawings, charts, tables, graphs, symbols, equations, or objects created using technology as representations
- 7.N.12 Add, subtract, multiply, and divide integers
- 7.N.13 Add and subtract two integers (with and without the use of a number line)
- 7.A.2 Add and subtract monomials with exponents of one

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Material Used for the Unit

- Overhead Projector
- Overhead Markers
- Overhead Algebra Tiles
- Classroom Set of Algebra Tiles
- Chapter Worksheets
- Chapter Textbook
- Internet Software “Virtual Manipulatives”

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Unit Outline

Day	Objective	Example
Day 1	<ul style="list-style-type: none"> Introduce Algebra Tiles and clarify to the students what each tile represents The students will be able to add and subtract integers with the use of algebra tiles The students will be able to manipulate each subtraction problem into addition by “keep, change, flip” The students will be able to understand and use the zero pair (additive inverse) when adding negative integers. The students will be able to discover patterns (rules) when adding and subtracting like integers 	<ul style="list-style-type: none"> $2 + 4 = 6$ $-5 - 2$ “Keep, change, and flip” $-5 + -2$ Now, they solve by adding $+1 + -1 = 0$ When adding to negatives the answer will be a negative!! $-5 + -10 = -15$
Day 2	<ul style="list-style-type: none"> The students will review the rules for multiplying and dividing integers. The students understand the concept of a variable The students will be able solve basic one step equations using algebra tiles. 	
Day 3	<ul style="list-style-type: none"> Review to the students what a variable x looks like with algebra tiles. Review the Previous Lesson The students will be able to begin solving 2-step equations using algebra tiles using. They will refer to the concept of opposite and balance 	
Day 4	<ul style="list-style-type: none"> The students will be able to check their solution for solving 2 step equations. The students learn to solve more complex equations involves variables on both 	

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	sides of the equal sign.	
Day 5	<ul style="list-style-type: none">The students will use an activity on the Internet to review solving these 2 step equations.	

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Grade: 7

Subject: Mathematics

Number of Students: 25

Ability: Heterogeneous

Time: 45 minutes

Lesson # 1

Unit: Adding/Subtracting Integers and Solving 2 Step Equations

Topic: Adding/Subtracting Integers

Learning Outcomes (objectives):

- The students will be able to add and subtract integers with the use of algebra tiles
- The students will be able to manipulate each subtraction problem into addition.
- The students will be able to understand and use the zero property (additive Inverse) when adding negative numbers.
- The students will discover patterns (rules) when adding and subtracting like integers.

Materials:

- Overhead
- Overhead markers
- Overhead algebra tiles
- Classroom sets of algebra tiles
- Handout

Instructional Presentations:

1. Assign the students into pairs at the start of class.
2. Begin by Passing out the classroom set of algebra tiles.
3. Have the students take a minute to take a look at the tiles and try to justify what the class will be using it for.
4. Illustrate to the students that they will be using these tiles throughout this chapter to assist in solving arithmetic problems, and solving algebraic equations.
5. Pass out a handout that shows the meaning of each of the tiles. (Handout)
6. As a class go through the handout, while displaying each of the tiles on the overhead.
7. The Students will write the definition of a zero pair (additive inverse) in their notes, they will also illustrate an example of this using the tiles
 - a. **Zero Pair(Additive Inverse)-** The opposite of a number. The sum adds to zero





$$2 + -2 \quad \begin{array}{|c|c|} \hline \text{yellow} & \text{yellow} \\ \hline \end{array} \quad \begin{array}{|c|c|} \hline \text{red} & \text{red} \\ \hline \end{array} = 0$$

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8. As a class, we will go through an example to illustrate what is expected for homework.

		Model	Answer
a.			
$3 + 2$			5
b.			
$3 + -2$			1
c.			
$-2 + -2$			-4

9. Once the class feels comfortable with adding integers, they learn the rule to manipulate any subtraction problem into addition. They will remember it by the rule of “keep, change, flip”. That is keep the first integer, change the subtraction to addition, and flip the sign of the second integer. This will make every problem an addition problem, something that most students enjoy.

d.			
$-2 - 1$			
“K.C.F”		Now Model	
$-2 + -1$			-3

10. After completing these notes, I will pass out the their homework that will have time to complete in class.

Guided Practice/Closure

1. The Students will work with their partner to complete this activity.
2. They will be asked to model their work as they did in the notes.
3. As the students are working I will be walking around the room to answer any questions and to make sure everyone is on task
4. What ever is not finished will be done for homework.



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$$= X \quad = -X$$

$$\boxed{\text{yellow}} = +1 \quad \boxed{\text{red}} = -1$$

Variable: _____

Zero Pair: _____

Example: $+2 + (-2)$

Model

Subtracting Integers:

Manipulate each subtraction problem into addition by using a simple rule of “_____”.

“Keep the first integer, change subtraction to addition, and flip the sign of the second integer.”

Example: $4 - (-4)$

“K.C.F”

$$4 + 4$$

Model

Answer

Simplify:

Model

Answer

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1. $5 + 6$

2. $-4 + 5$

3. $-5 + -2$

4. $-3 + 3$

5. $-2 + -3$

6. $-2 - 5$

7. $-4 - (-3)$

8. $2 - 5$

9. $4 - 1$

10. $-2 - (-1)$

Now, that you have completed the 10 questions, you can now investigate some conjectures.

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What happens when you were adding integers that had the same signs? What rule can you make by your discovery? Explain.

What happens when you were adding integers that had different signs (a positive integer and a negative integer)? What rule can you make by your discovery? Explain.

When adding integers with the same sign, you _____ the numbers and _____ the sign.

When adding integers with different signs, you _____ the numbers, and use the sign of the _____ absolute value.

Rich Butera
Grade: 7
Subject: Mathematics

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Number of Students: 25

Ability: Heterogeneous

Time: 45 minutes

Lesson # 1

Unit: Adding/Subtracting Integers and Solving 2 Step Equations

Topic: Solving one-step equations.

Learning Outcomes (objectives):

- The students will review the rules for multiplying and dividing integers
- The students will be able to understand the concept of a **variable**.
- The students will be able to solve basic one step equations with the use of algebra tiles.

Materials:

- Overhead
- Overhead markers
- Overhead algebra tiles
- Classroom sets of algebra tiles
- Handout

Instructional Presentations:

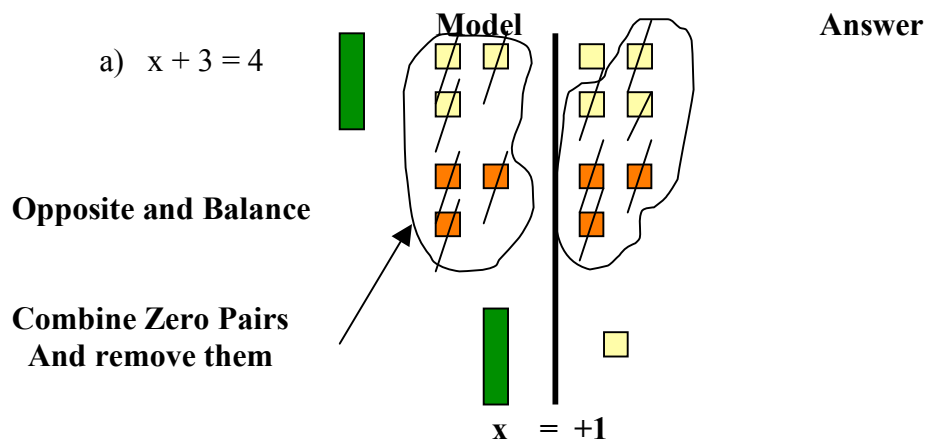
1. Will begin class by going over the homework on the overhead.
2. The students will volunteer and come to the overhead to model their answers to the class (using the same color transparency marker that they used while using the algebra tiles)
3. After going through the homework and answer any questions that may come about. The students will take out their notebook for notes.
4. As a class, we review the rules that apply when multiplying and dividing integers.
 - a. When multiplying/dividing Integers with the same sign, you multiply like usual and the answer will be positive.
 - b. When multiplying/dividing Integers with different signs, you multiply like usual and the answer will be negative.
5. The students will then write the definition of a variable in their notes.
 - a. **Variable: A symbol, usually a letter, that is used to represent one or more numbers.**
6. Explain to the students that we will be using variables throughout the rest of this chapter to get to a solution.
7. Then distribute the classroom set of algebra tiles to each of the students.
9. Explain to the students that we will now be using these algebra tiles to solve one-step equations.

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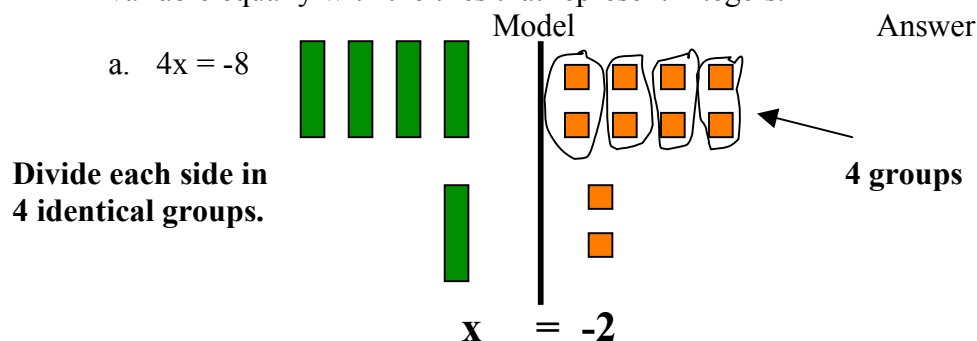
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10. Model to the students, that an equation is like a balance scale and it shows that two quantities are equal. The equal sign is considered to be the fulcrum balancing point of a scale. Our goal when solving equations is to get the variable alone.
11. Explain to the students we get the variable alone by the idea of “opposite and balance”. That is use the opposite operation and then take that value and balance it on both sides of the equal sign.
12. Before doing an example, make sure the students have their handout that was distributed yesterday. This was the handout that shows what each algebra tile represented.
13. Model a couple examples like the one below, while the students are getting used to the idea behind the algebra tiles and how they are used to solve equations.



14. Once the students are comfortable with solving adding/subtracting problems. Introduce a similar example that has the variable on the right hand side of the equal sign and explain to them the same procedure exists.
15. Show students what an equation that involves multiplication would look like. “ $4x = 8$ ”
16. Notify the students, that when solving equations that involve multiplication, the idea behind solving these problems is to group each variable equally with the tiles that represent integers.



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17. As the students feel more comfortable, they will be free to start their homework

Guided Practice/Closure

1. Explain to the students, the complexity of these problems will become more difficult as the chapter goes on.
2. Demonstrate to each of the students that showing all work is expected identical to the notes.
3. While the students are working individually on the homework, I will be walking around making sure the class is on task.

Solve each of these 2-Step Equations using algebra tiles.

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1. $x + 3 = 10$

Model

$x + 3$		10
<hr/>		
<hr/>		

2. $x - 2 = 8$

Model

$x - 2$		8
<hr/>		
<hr/>		

3. $x - 5 = -8$

Model

$x - 5$		-8
<hr/>		
<hr/>		

4. $x + 2 = 7$

Model

$x + 2$		7
<hr/>		
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5. $x - (-2) = 8$

Model	
$x - (-2)$	8

Model	
2x	6

Model

-5x -10

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Subject: Mathematics

Number of Students: 25

Ability: Heterogeneous

Time: 45 minutes

Lesson # 1

Unit: Adding/Subtracting Integers and Solving 2 Step Equations

Topic: Begin solving two-step equations.

Learning Outcomes (objectives):

- The students will review what a variable represents with algebra tiles.
- The students will review the procedure for solving one-step equations.
- The students will be able to begin solving 2-step equations using algebra tiles. They will remember the concept of “opposite and balance”.

Materials:

- Chalk
- Overhead
- Overhead markers
- Overhead algebra tiles
- Classroom sets of algebra tiles
- Handout

Instructional Presentations:

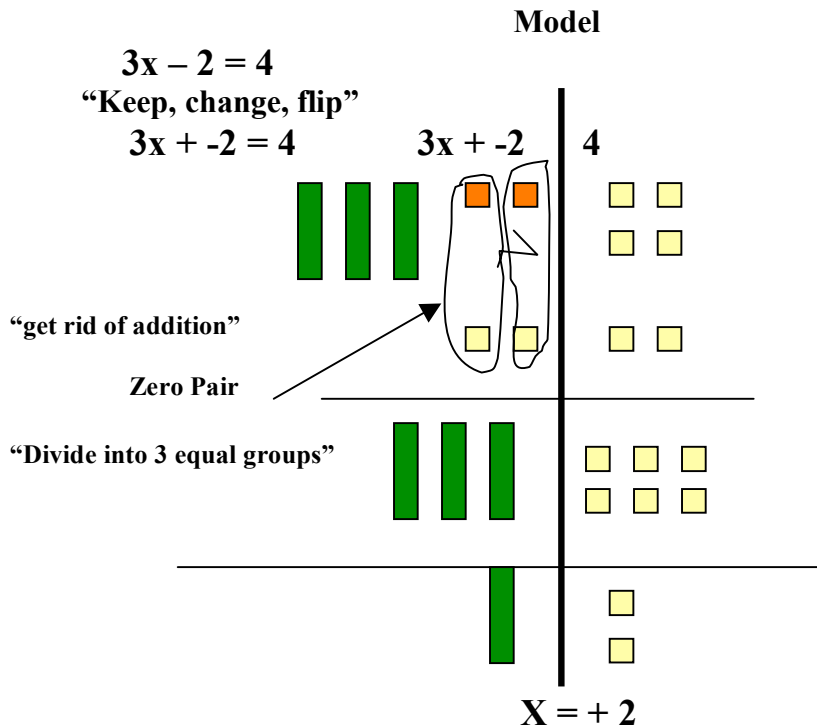
1. Will begin class by going over the homework on the overhead.
2. The students will volunteer and come to the chalk board to model their answers to the class (using the same color chalk that they used while using the algebra tiles)
3. While going through the homework I will make sure each of the students have thorough understanding of what is expected of them when solving these equations.
4. Explain to the students when subtraction is occurring in a problem; switch it to addition by the rule of “keep, change, flip”.
5. After going through the homework and answer any questions that may come about. The students will take out their notebook for notes.
6. While the students are taking out their notes, I will pass out the classroom set of algebra tiles.
7. On the overhead, I will write the 2 rules that apply for solving 2 step equations.
 1. Get rid of any addition or subtraction first.
 2. Then, get rid of any multiplication.

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8. As a class, I will model a couple examples to show the correct procedure. When a problem happens to have subtraction involved be sure to manipulate the problem to addition.
 - a. Example that will be displayed and modeled on the overhead



9. After going through similar examples like the one above the students will have an opportunity to start their homework.
10. While I pass out the worksheet, the students will count off by fives and get into groups where they will have an opportunity to work together on homework.

Guided Practice/Closure

10. Remind students that equations are like a balance scale and the variable can be written on the right side of the equal sign. The process in solving these problems are the same, be sure to follow the rules that are given.
11. As the students are working together on their homework, I will be walking around to make sure there is no confusion and to make sure the students stay on task.
12. With about 5 minutes remaining I will require the students to fill out an exit slip.
13. All this exit slip will ask is what are the two basic rules for solving 2-step equations. It will also ask if there happened to be any confusion when solving these types of problems. If so, explain where the confusion began.
14. I will read these slips before the next class, so I am aware of where the problems might occur.

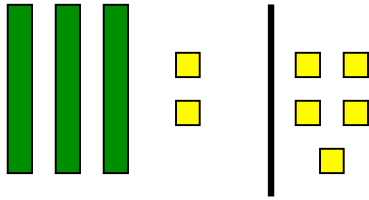
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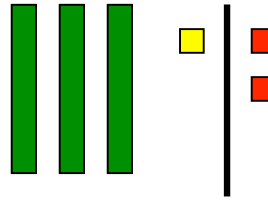
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Write an equation for each model. Do not solve.

1.



2.



3. $2n - 5 = 7$

Model

4. $0 = 3x - 3$

5. $3 + 4x = -1$

6. $4x + 9 = 1$

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Exit Slip

What are the two basic rules for solving 2-step equations?

Did you suffer from any confusion from this lesson? If so, what was your problem?

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Grade: 7

Subject: Mathematics

Number of Students: 25

Ability: Heterogeneous

Time: 45 minutes

Lesson # 1

Unit: Adding/Subtracting Integers and Solving 2 Step Equations

Topic: Solving two-step equations and checking the solution.

Learning Outcomes (objectives):

- The students will be able to check their solution to ensure complete proficiency
- The students will review the procedure for solving Two-step equations.
- The students will be able to solve 2-step equations using algebra tiles with variables on both sides of the equal sign. They will remember the concept of “opposite and balance”.

Materials:

- Chalk
- Overhead
- Overhead markers
- Overhead algebra tiles
- Classroom sets of algebra tiles
- Handout

Instructional Presentations:

1. Will begin class by going over the homework on the overhead.
2. The students will volunteer and come to the chalk board to model their answers to the class (using the same color chalk that they used while using the algebra tiles)
3. While going through the homework I will make sure each of the students have thorough understanding of what is expected of them when solving these equations.
4. Review to the students when subtraction is occurring in a problem; switch it to addition by the rule of “keep, change, flip”.
5. After going through the homework and answer any questions that may come about.
6. With the solutions are on the board I will model to the students how to check each solution. While I am explaining this to the student will be writing the check on their individual homework worksheets.

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7. Explain to the students the correct procedure for checking their solution.
 - a. First rewrite the original problem (Will demonstrate question 3)
 - i. $2n - 5 = 7$
 - b. Then substitute your solution back into your equation.
 - ii. $2*6 - 5 = 7$
 - c. Then evaluate your equation downward by using the rules for order of operations (Review PEMDAS).
 - iii. $2*6 - 5 \neq 7$

$12 - 5$
 7
 - d. Look to see if the left side of the equal sign is the same as the right side like above.
8. After going through the “checks” on our previous homework explain to the students that they will be required to check each of their solutions when solving any 2-step equation unless told otherwise.
9. While I pass out the classroom set of the algebra tiles have the students take out their notebook for notes.
10. Explain to the students that we will now solve more complex 2- Step equations using algebra tiles. That is solving equations that have variables on both sides of the equal sign.
11. Demonstrate this by going through a couple of examples on the overhead.
12. Explain to the students are plan of attack is to get rid of the smaller of the two variables (Pick on the little guy). Then attack the problem with same procedure as before.

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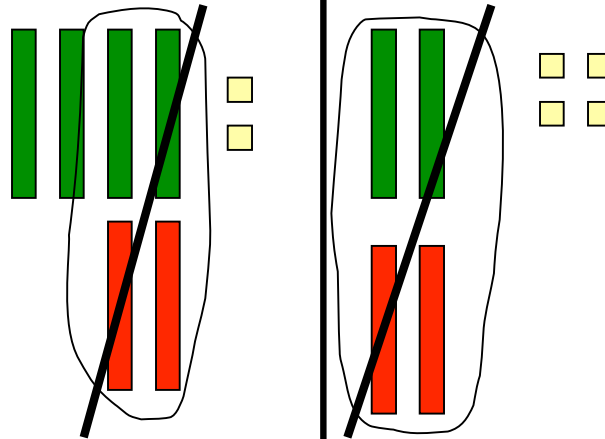
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Example that would be used on the overhead will also show the check.

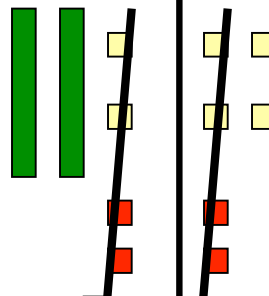
1. $4x + 2 = 2x + 4$

Model

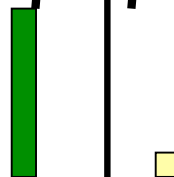
$4x + 2 = 2x + 4$



Add $-2x$ to each side, and simplify by removing zero pairs.



Add a -2 to each side, and simplify by removing zero pairs.



Now, Divide each side in 2 identical groups.

$x = +1$

Rewrite problem

Substitute

Solve using PEMDAS

Check

$4x + 2 = 2x + 4$

$4*1 + 2 = 2*1 + 4$

$4 + 2 = 2 + 4$

$6 = 6$



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Guided Practice/Closure

1. After going through a couple similar problems like the one above, I will give an opportunity for homework.
2. The homework will be on pg 166 1-7, 9, 13 in their textbook
3. I will be observing looking for any problems or questioning.
4. With about 5 minutes remaining I will explain to the students that tomorrow class will be held in the computer lab were we will be working with the **Virtual Manipulatives**.

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Rich Butera

Grade: 7

Subject: Mathematics

Number of Students: 25

Ability: Heterogeneous

Time: 45 minutes

Lesson # 1

Unit: Adding/Subtracting Integers and Solving 2 Step Equations

Topic: Solving two-step equations using a website.

Learning Outcomes (objectives):

- The students will review the procedure for solving Two-step equations.
- The students will be able to solve 2-step equations using algebra tiles with variables on both sides of the equal sign. They will remember the concept of “opposite and balance”.
- The students will be able to use an application on the Internet to solve Two-step equations.

Materials:

- Computer Lab
- Internet Access

Instructional Presentations:

1. Will begin class by having the students pass up their homework from the previous night.
2. The students will then sign on to a computer.
3. The students will then take out a sheet of paper as well as a writing utensil.
4. I will then explain the correct process to get to the website we will be working with.
 - a. Double click on the Internet.
 - b. Click on Favorites and go to **National Library of Virtual Manipulatives**
 - c. Click on the section Grades 6 – 8.
 - d. Scroll Down to Algebra Section.
 - e. Click on Algebra Balance Scales.
 - f. Now, go through a couple examples with the students so they are aware of what is expected.
5. The students will examine the algebraic problem, that appears on the website. They will then visually represent these problems using balloons and blocks that represent an x , $-x$, $+1$, -1 , which is very similar to algebra tiles.
6. Once balanced the students will click on continue.

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7. The students then solve for x . Once they get x alone, the students will be required to rewrite their problem that was asked and show their procedure for solving for x .

Guided Practice/Closure

1. The students will be assigned to answer 10 questions on this website.
2. They will be required to show all work and hand assignment in at the end of class.
3. The students will be informed that this assignment will be taken as a quiz grade.