

Algebra/Geometry Summer Institute 2006

Modeling 2-Step Equations



Faculty Name: Lauren Zarandona

School: Chambers Middle, Arcola, Mississippi

Grade Level: 7th-8th Pre-Algebra

1. Teaching Objectives

- a. The student will model and solve 2-step linear equations using algebra tiles. (2c)
- b. The students will translate real-world situations into algebraic equations. (2a)

1. Instructional Activities

- a. Bell-ringer: "Solve: $x + 5 = 10$. Explain how you solved for your answer." (4 minutes)
- b. After discussing the bell-ringer, ask students to model basic figures or numbers (such as triangles, acute angles, or the number 1) with their bodies. For example, if you ask students to model the number 1, they might hold up 1 finger or stand up straight and tall like the numbers. Say, "Models are a way to represent a given situation. Today we are going to use Algebra Tiles to model and solve 2-step equations." Pass out 1 worksheet, 1 piece of typing paper, and 1 set of Algebra Tiles to each pair of students. Instruct students to use the typing paper as a work mat for the Algebra Tiles throughout the lesson. Students should fold the paper in half to represent the equals sign. Ask the pairs to study their Algebra Tiles and identify models for $+x$, $-x$, $+1$, and -1 . (6 minutes)

Note: Green rectangles represent $+x$, red rectangles represent $-x$, yellow squares represent $+1$, and red squares represent -1 . Remind students that any letter can be used as the variable without changing the model.

- c. Part I: Modeling 2-step Equations (15 minutes)
 - i. Use Algebra Tiles to demonstrate Model 1. (Attachment 1)
 - ii. Guide students through Model 2 using Algebra Tiles. (Attachment 1)
 - iii. Students should work with their partners and Algebra Tiles to solve and justify problems 1-3 from the "2-steps to a Solution" (Attachment 3)

- worksheet. Select students to discuss and demonstrate solutions and justifications.
- d. Part II: 2-step Equations in the Real World (20 minutes)
 - i. Use Algebra Tiles to demonstrate Model 3. (Attachment 2)
 - ii. Guide students through Model 4. (Attachment 2)
 - iii. Students should work with their partners and Algebra Tiles to solve and justify problems 4-6 from the "2-steps to a Solution" (Attachment 3) worksheet. Select students to discuss and demonstrate solutions and justifications.
 - e. Discussion Questions (8 minutes)
 - i. Why are these equations called "2-step" equations?
 - ii. In what order do you solve each equation?
 - iii. How can we solve $4x - 9 = 7$ without using Algebra Tiles? (Show inverse operations on board and ask students to do the same for questions 1-3 on the worksheet.)

3. Materials and Resources

a. Materials

- i. Models and guided practice examples for teacher use (Attachments 1 and 2)
- ii. 1 set of overhead Algebra Tiles
- iii. 1 set of Algebra Tiles per pair
- iv. 1 piece of typing paper per pair
- v. 1 "2-steps to a Solution" worksheet per pair (Attachment 3)

b. Resources

- i. Burton, Grace M. and Evan M. Maletsky, et. al. *Math Advantage Middle School III Teacher's Edition*. Harcourt Brace and Company, 1998, pg. 122-126.
- ii. Holden, Hilde. *Algebra Tiles for the Overhead Projector*. Cuisenaire, 1985.
- iii. Mississippi Department of Education Practice Tests for grades 7 and 8




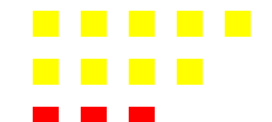
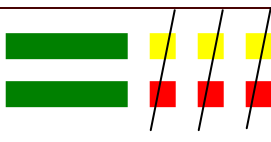
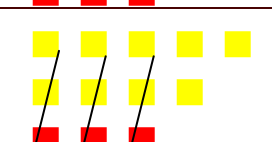
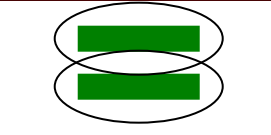
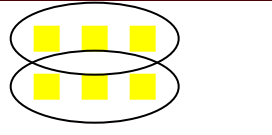


4. Assessment

- a. Observe student models and listen to student discussions.
- b. Grade "2-steps to a Solution" worksheets.




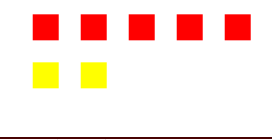

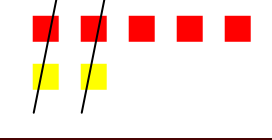
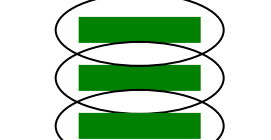
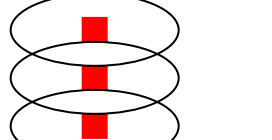


2-step Equation Models

Attachment 1

Model 1) $2x + 3 = 9$

Explanation	Model	
*Draw a line on the overhead to separate the sides of the equation.		
1. Place 2 x's and 3 1's on the left side of the equals line. Place 9 1's on the right side.		
2. Add -3 to each side.		
3. Cancel any zero pairs.		
4. Divide each side into two equal groups.		
The solution is $x = 3$.		

Model 2) $3x - 2 = -5$

Explanation	Model	
1. Place 3 x's and 2 -1's on the left side of the equals line. Place 5 -1's on the right side.		
2. Add 2 to each side.		
3. Cancel any zero pairs.		
4. Divide each side into three equal groups.		
The solution is $x = -1$.		

Real-world Equation Models

Attachment 2

Model 3) "Clifton's dog just had 8 puppies. This is 2 more than 3 times the amount in the previous litter, x . How many puppies were in the previous litter?"

Explanation	Model	
1. Place 3 x 's (3 times the puppies in previous litter) and 2 1's (2 more than) on the left side of the equals line. Place 8 1's (8 puppies) on the right side. Write the equation $3x + 2 = 8$.		
2. Add -2 to each side.		
3. Cancel any zero pairs.		
4. Divide each side into three equal groups.		
The solution is $x = 2$ puppies.		

Model 4) "Jake bought 2 king-sized Chocolate Madness bars and a soda for \$4. If the soda cost \$2, how much did each candy bar cost? Use x to represent the cost of one candy bar."

Explanation	Model	
1. Place 2 x 's (cost of 2 candy bars) and 2 1's (cost of soda) on the left side of the equals line. Place 4 1's (total cost) on the right side. Write the equation $2x + 2 = 4$.		
2. Add -2 to each side.		
3. Cancel any zero pairs.		
4. Divide each side into 2 equal groups.		
The solution is $x = \$1$.		

Name _____

Date _____ Period _____

2-steps to a Solution

Solve each equation using Algebra Tiles. Write your solution on the line provided then justify your solution by explaining step-by-step how you arrived at your answer.

<p>1) $5x + 6 = 1$</p> <p style="text-align: center;">$x =$ _____</p> <p>Justification: _____</p> <p>_____</p> <p>_____</p> <p>_____</p>
<p>2) $3b - 6 = 12$</p> <p style="text-align: center;">$b =$ _____</p> <p>Justification: _____</p> <p>_____</p> <p>_____</p> <p>_____</p>
<p>3) $4k - 3 = 9$</p> <p style="text-align: center;">$k =$ _____</p> <p>Justification: _____</p> <p>_____</p> <p>_____</p> <p>_____</p>

Read each situation. Use Algebra Tiles to model the situation and write an equation. Solve the equation using Algebra Tiles. Write your solution on the line provided then justify your solution by explaining step-by-step how you arrived at your answer.

3) Charlie's sister is 3 less than 3 times Charlie's age, c . If Charlie's sister is 9 years old, how old is Charlie?

Equation and Solution: _____

Justification: _____

4) Rene bought 6 pencils for p dollars per pencil and a box of pens for \$4. If Rene spent \$10 total, how much did each pencil cost?

Equation and Solution: _____

Justification: _____

6) A certain baby animal gains 2 pounds per week for the first year of its life. If the baby animal weighed 5 pounds at birth and weighs 17 pounds now, how many weeks old, w , is the baby animal?

Equation and Solution: _____

Justification: _____
