

Alg 3.1

Build and Solve Equations

Lesson Summary: In these lessons, students use Hands On Equation manipulatives to model and solve from simple to complex equations.

Utah Core Indicators: Algebra Content Standards 2 Process Standards 1-4

Broad Understanding: Equations enable us to find missing information.

Essential questions:

- How do equations help us in finding missing information?
- Why is the idea of balance so important in solving equations?

Knowledge and Skills:

- Solving basic 1 and 2 step equations.

Assessment Evidence: Use the worksheets themselves. Then give a traditional test—allow students to use manipulatives if they wish.

Learning Plan

Materials:

- Precision School Balance (if possible). Some kind model for a balance scale to place manipulative on.
- “Hands-On” Equations® or teacher created manipulatives.
- One baggie per student that contains 4 number cubes (2 cubes numbered from 1-6 and 2 cubes numbered from 7-12) and 8 to 10 triangles to represent the variable (the green triangles from pattern blocks would work well).
- Mats for students that are divided into two equal parts representing 2 sides of the balance scale.
- Worksheets and Homework (Attached)

Time: 3 days

Lesson Type: Teacher Directed Investigation, Use cooperative groups or teams.

Directions:

To create number cubes, use unnumbered dice or plain 1inch wooden cubes. Prepare 4 cubes for each student, 2 cubes with the numbers 0-5 written on and 2 cubes with the numbers 6-12 written on.

****In all the worksheets below, have students check their answers by substituting in to the original problem or the equation. They can write the numbers above the symbols.

Introduce the idea of a balance scale. Show the balance scale using grams weights.


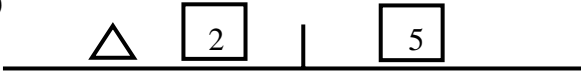

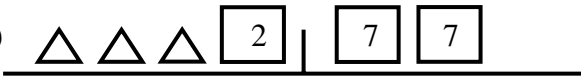


1. Set the scale so that both sides are balanced.
2. Put a 2 gram weight on both sides. The scale is still in balance because the same thing happened to both sides.
3. Put two 5 gram weights on one side and one 10gram weight on the other. The scale is still in balance because even though each side looks different, each side has the same value.
4. Model taking the same thing off both sides and maintaining the balance.
5. Demonstrate the use of manipulatives to represent variables and numbers. Place equivalent blocks on both sides of the balance scale model. Then use a triangle \triangle to balance a 5, then a 3 etc. The variable varies.
6. Show these others: \triangle with a 7, a 2, two triangles with an 8, three triangles with a 12. How can we find out what one triangle is equal to? What can you do to both sides so that you are left with $\triangle = \underline{\quad}$
7. State the rule: Each side of the balance must always equal the other. Your job is to find out the value of one of the triangles
8. Have students complete the worksheet. Teacher moves around the room to listen and assess progress.

Build and Solve Equations

Worksheet #1

How can we find out what one triangle \triangle is equal to in the problems below? The triangle stands for the unknown. Use the letter x to represent the unknown when writing an equation



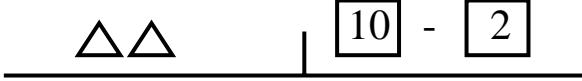



1. Write each equation represented by the balance scale.
2. What can you do to both sides of the balance scale to find what the $\triangle = \underline{\quad}$
3. Write every step you perform on the balance scale as a step in solving the equation.

Problem	Equation & Solution
1) 	$2x = 8$
2) 	
3) 	
4) 	
5) 	$4x = 2x + 10$
6) 	$2x+5 = 3x+1$

What is the secret to solving equations? Be prepared to explain your groups' ideas.

Build and Solve Equations


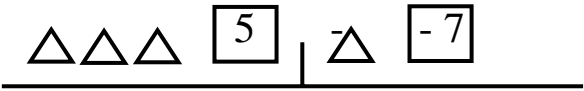
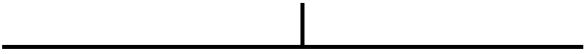


Worksheet #2

Problem	Equation & Solution
1) 	$x + 5x = 4x + 10$
2) 	$2x + 4 + 3x = x + 12$
3) 	
4) 	
5) 	$2x+3+3x = x+11$
6) 	$x + 3x - x = 30$

What are some rules you could use to help you solve equations? Be prepared to explain.

Build and Solve Equations







Worksheet #3







Problem	Equation & Solution
<p>1)</p> 	$x + 3x - 6 = 30 - 2x$
<p>2)</p> 	
<p>3)</p> 	$2(x+5) = 13$
<p>4)</p> 	$2(2x+3) = 3x+9$
<p>5)</p> 	$2(3x+1) = x+22$

What new ideas did you get today about solving equations? Be prepared to explain.

Introduction to Equation #5

Build and/or solve the equations. Use manipulatives to help you if necessary. Otherwise show steps.

Problem	Equation and Solution
1) 	$2(x+5) = 13$
2) 	$2(x+5) = 11 + x$
3) 	$2(2x+3) = 3x+9$
4) 	$2(x+5) = x+4$
5) 	$3x+x = 2x+2$
6) 	$4x = 2x+4$

<p>7)</p> 	$3x+7 = 4x$
<p>8)</p> 	$x+ 2x- x+7=3x+2$
<p>9)</p> 	$2(3x+1) = x+22$
<p>10)</p> 	$5x-3x+x+8 = 2x+1+ x+x$
<p>11)</p> 	$4x-2x+3 = 2x+2x-x$
<p>12)</p> 	$2(x+4) = x+10$

Homework

$$\begin{array}{c} \odot \odot \quad \blacktriangle \square \\ \hline \blacklozenge \end{array}$$

$$\begin{array}{c} \blacktriangle \quad \odot \square \square \\ \hline \blacklozenge \end{array}$$

Order from least to greatest weight.