Practice 1: Solving One-Step Equations with an Equation Balance Mat

STRAND: Patterns, Functions and Algebra

STRAND CONCEPT: Equality/Solving Equations

SOL: 6.13

Remediation Plan Summary

Students solve one-step linear equations in one variable.

Common Errors and Misconceptions

Students may confuse the variable "x" with "x" the multiplication symbol.

Students may misapply integer operation rules when solving equations.

Students may misunderstand the process using inverse operations because they are using mental math to solve for the variable.

Materials

- Cups (1 per student)
- Two-Color Counters (about 25 per student)
- "Warm-up" handout
- "Equation Balance Mat Practice 1" worksheets

Introductory Activity

Write the following equations on the board, and ask students to complete them:

1. $7 + \square = 16$ 2. $18 - 4 = \square$ 3. $\square \bullet 7 = 21$ 4. $\square \div 6 = 9$

Allow students three to five minutes to solve the equations. Observe the student work to determine the types of strategies students are using to solve each equation. Explain that in an algebraic equation, the box can be replaced with a variable, which is any lowercase letter that is used to represent the unknown number. For example, the first equation would be written algebraically as $7 + x = 16$. Have the students write the other three equations, using a variable instead of the box.

Distribute the "Warm-up" handouts, cups, and counters. Give directions for students to solve the equations. Provide assistance as needed.

Plan for Instruction

- Tell students that one way to visualize and understand an algebraic equation is by using models, such as cups, counters, and an "equation balance mat." Explain that the cup represents the unknown value or variable (x) in the equation, and each counter represents 1.
- Model the algebraic equation $x + 3 = 5$ for the students by placing 1 cup (x) and 3 counters on the left side of an equation balance mat and placing 5 counters on the other right of the

mat. Tell the student that this equation on the mat is *balanced*. That means that the combination of the 1 cup and 3 counters <u>is the same as</u> or <u>is equal to</u> 5 counters.
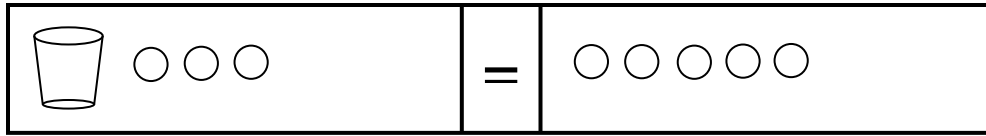

- Remind the students that the goal is to find the value of the cup. To do this, we need to get the cup by itself on one side of the equation balance mat and still have the equation in balance. To get the cup by itself, we remove the 3 counters from the left side, and to keep the equation balanced, we must also remove 3 counters from the right side of the equal sign. We then can see that the cup equals 2 counters (ones), or $x = 2$.
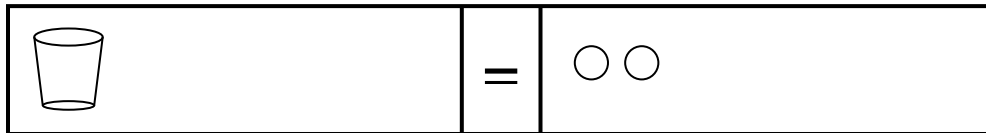
- Explain to students that this process not only works with addition but with subtraction also. Model the algebraic equation $x - 3 = 5$ for the students by placing 1 cup (x) and 3 negative counters (●) on the left side of an equation balance mat and placing 5 positive counters on the other right of the mat. Tell the student that this equation on the mat is *balanced*. That means that the combination of the 1 cup and 3 negative counters <u>is the same as</u> or <u>is equal to</u> 5 positive counters.
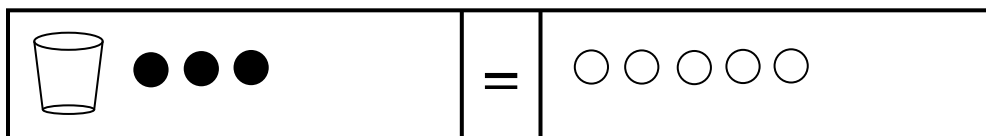

- Remind the students again that the goal is to find the value of the cup. To do this, we need to get the cup by itself on one side of the equation balance mat and still have the equation in balance. To get the cup by itself, we will add 3 positive counters to both the left and the right side. Adding one positive to one negative will equal zero, also known as zero pair.
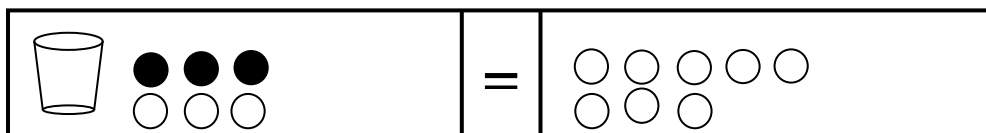
- Because adding three negatives to three positives will equal zero we then can see that the cup equals 8 positive counters (ones), or $x = 8$.
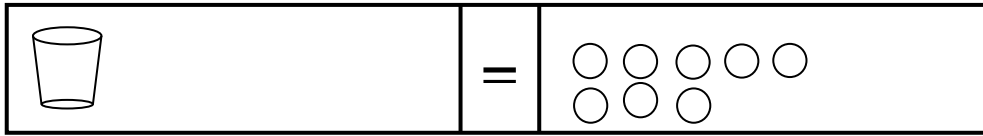
- Distribute the "Equation Balance Mat Practice 1" worksheets, cups, and counters, and direct the students to solve equations 1 - 8 using the manipulatives on the mat. Allow students to work in teams of two and provide assistance to partners as needed.

Pulling It All Together (Reflection)

Have students create, model, solve and check 2 one-step equations. One equation involving addition and one equation involving subtraction.

Note: The following pages are intended for classroom use for students as a visual aid to learning.

Virginia Department of Education 2018

Name:

Equation Balance Mat Practice I

Solve the following equations, using cups and counters on the equation balance mat shown below. Show a check for each.

1. $a + 3 = 12$
2. $g - 6 = 4$
3. $b - 8 = 5$
4. $h + 7 = 15$
5. $c - 9 = 2$
6. $s + 6 = 15$
7. $d + 5 = 9$
8. $x - 3 = 17$

$$=$$