Solving One and Two Step Equations

STRAND: Patterns, Functions and Algebra

STRAND CONCEPT: Equality/Solving Equations

SOL: 6.13, 7.12

Remediation Plan Summary

Students will apply properties of real numbers and properties of equality to solve one and two-step equations (only include the one-step problems if this lesson is done with a 6th grader).

Common Errors and Misconceptions

- Students attempt to solve equations mentally and not algebraically.
- Students make mistakes with integer operations.
- Students sometimes have difficulty solving equations with more than one step.
- Students have difficulty with fraction operations.
- Students often do not check their solution.

Materials
- Individual student whiteboards
- Dry-erase markers
- One-Step Equation Practice Sheet
- Rotation Activity Answer Sheet
- Rotation Activity Questions/Answers folded in half and hung up around classroom
- Clipboards
- Error Analysis with Property Application Activity Sheet

Introductory Activity

Present students with the following scenario as a think-pair-share activity: Joe and his friend, Bob, together have 17 games. If Joe has 6 games, how many does Bob have? Have students represent the scenario with an equation and solve it on their whiteboards.

Plan for Instruction

1. Throughout this lesson, remind students that they are using the properties of real numbers and the properties of equality when solving. Some properties that will discussed throughout the lesson are: commutative property, additive and multiplicative identity, additive and multiplicative inverses, substitution property, and property of equality for addition, subtraction, multiplication, and division. As the steps for solving equations are reviewed, mention the names of the properties that allow those steps to be completed. Students should have an understanding of how properties are used, but are not expected to memorize the names of properties.

2. Discuss the above introductory activity scenario and students' equations as a class, incorporating vocabulary when possible. Use different manipulatives to represent variables and numbers and a balance scale with pictures to model and solve the equation. Emphasize maintaining balance by applying properties. Make connections between the concrete, the pictorial, and the symbolic. Have students check the solution using substitution.

3. Continue the process above, being sure to use examples including all operations. Ask the students to complete the one-step equation review problems on their whiteboards.

4. For individual practice, students can complete the one-step equation practice sheet. If the students are 6th graders, the teacher can end the lesson at this point and go to the "Pulling it All Together (Reflection)."

5. For 7th graders, now that one-step equations have been reviewed (Grade 6 standard), begin exploring/reviewing two-step equations (Grade 7 standard). Give students pictures of equations represented on balances, ask them to translate them into equations, then solve and use a calculator to confirm that the solutions are correct. Reinforce that the students will continue to solve equations by isolating the variable through the inverse operation. Justify the properties of equality as the problems are solved. Complete several two-step examples together, asking the students to complete them on their whiteboards.

6. Tell the students that they will be doing a rotation activity to practice these skills. Post the folded rotation problems through-out the classroom. Provide the students with a clipboard to lean on as they complete their work, or allow them to lean on a book. Each student will start at a different problem. Set the timer for 3 to 4 minutes. Students work to solve their problems in the allotted time. When the timer rings, the students rotate to the next question. They check the answer to the question they just completed, and then start the next question. Set timer again. Repeat this process for all eight questions. Monitor students and assist as necessary. For students who finish their problem before the timer rings, provide them with an extra review or practice sheet to work on while they are waiting.

Pulling It All Together (Reflection)

Distribute the Error Analysis with Property Application activity sheet. Ask the students to locate the example where the mistake occurred.

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

Virginia Department of Education 2018

One-Step Equation Practice

Solve	Check	Solve	Check
1. 7w = 35		2. $\dfrac{y}{3} = 11$	
3. 40 = 12 + d		4. 3 = g - 17	
5. 27 = 3e		6. $\dfrac{y}{12} = 1$	

_____7. **How would you solve the following equation: 10r = 45**

     A. Divide by 10 on both sides
     B. Subtract 10 from both sides
     C. Multiply by 10 on both sides
     D. Add 10 to both sides

_____8. **How would you solve the following equation: 25 = z − 15**

     A. Subtract 15 from both sides
     B. Multiply by 15 on both sides
     C. Add 15 to both sides
     D. Divide by 15 on both sides

Rotation Activity Answer Sheet

1)	2)
3)	4)
5)	6)
7)	8)

Answer: #8) $m = \dfrac{1}{3}$

1)

$$2x + 18 = -3$$

Answer: #1) x=-10.5

2)

$$45 = 3d - 12$$

Answer: #2) d=19

3)

$$\frac{2}{3}x - 10 = 4$$

Answer: #3) x=21

4) There are 11 infielders on a baseball team. This is one less than three times the number of pitchers. **Write an equation** for this situation and **solve** for the number of pitchers.

Answer: #4) 3p-1=11, p=4

5)

$$-4 + \frac{2}{3}m = 4$$

Answer: #5) m=12

6)

$$9x - 7 = -7$$

Answer: #6) x= 0

7) A gym charges $8.75 for each swimming class and a one-time registration fee of $12.50. A student paid a total of $56.25. Write and solve an equation to find the number of swimming classes the student took.

Answer: #7) 8.75c+12.50=56.25
C=5 classes

8)

$$2m + \frac{1}{3} = 1$$

Error Analysis with Property Application

In which example has the student applied the properties of equality incorrectly to solve the equation?

$$3x + 5 = 26$$
$$3x + 5 + (-5) = 26 + (-5)$$
$$\frac{3x}{3} = \frac{21}{3}$$
$$x = 7$$

$$\frac{x}{3} - 2 = 4$$
$$\frac{x}{3} - 2 + (-2) = 4 + (-2)$$
$$3 \cdot \frac{x}{3} = 2 \cdot 3$$
$$X = 6$$

$$37 = -15z + 7$$
$$37 + (-7) = -15z + 7 + (-7)$$
$$\frac{30}{-15} = \frac{-15z}{-15}$$
$$z = -2$$