Just In Time Quick Check

Standard of Learning (SOL) 8.17

Strand: Patterns, Functions, and Algebra

Standard of Learning (SOL) 8.17

The student will solve multistep linear equations in one variable with the variable on one or both sides of the equation, including practical problems that require the solution of a multistep linear equation in one variable.

Grade Level Skills:

- Represent and solve multistep linear equations in one variable with the variable on one or both sides of the equation (up to four steps) using a variety of concrete materials and pictorial representations.
- Apply properties of real numbers and properties of equality to solve multistep linear equations in one variable (up to four steps). Coefficients and numeric terms will be rational. Equations may contain expressions that need to be expanded (using the distributive property) or require collecting like terms to solve.
- Write verbal expressions and sentences as algebraic expressions and equations.
- Write algebraic expressions and equations as verbal expressions and sentences.
- Solve practical problems that require the solution of a multistep linear equation.
- Confirm algebraic solutions to linear equations in one variable.

Just in Time Quick Check

Just in Time Quick Check Teacher Notes

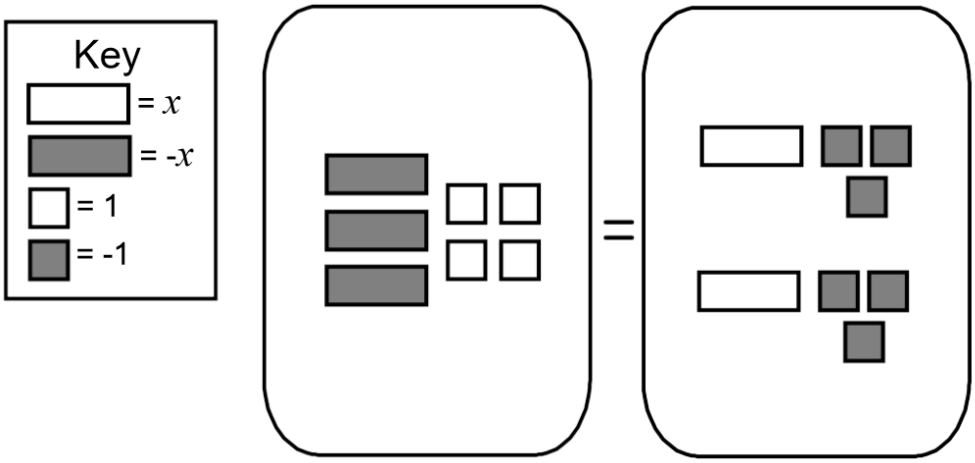
Supporting Resources:

- VDOE Mathematics Instructional Plans (MIPS)
  - 8.17 - Sort and Verify Multistep Equations (Word) / PDF Version
- VDOE Co-Teaching Mathematics Instruction Plans (MIPS)
  - 8.17 - Solving Equations (Word) / PDF Version
- VDOE Algebra Readiness Formative Assessments
  - SOL 8.17 (Word) / (PDF)
- VDOE Algebra Readiness Remediation Plans
  - Solving Two-Step and Multi-Step Equations (Word) / (PDF)
- VDOE Word Wall Cards: Grade 8 (Word) | (PDF)
  - Term, Constant, Like Terms
  - Multistep Equations and Multistep Equations (model)
  - Verbal and Algebraic Expressions and Equations
- Desmos Activity
  - Smallest Solution
  - 8.17 Expressions Mash-Up
  - Solving Equations - Double Clothesline

Supporting and Prerequisite SOL: 8.14a, 8.14b, 7.12, 6.5a, 6.6a, 6.6c, 6.13

SOL 8.17 - Just in Time Quick Check

1) Find the value of x in the model.



2) Solve for *x*: $5x + 17 = 3x - 7$

3) Solve for *x*: $\frac{1}{2}x + 7 - \frac{3}{4}x = 15$

4) Solve for *x*: $10 - \frac{2}{3}(3x - 12) = 2$

5) Write an equation to match the verbal sentence:
A number is equal to twice the sum of the same number and ten.

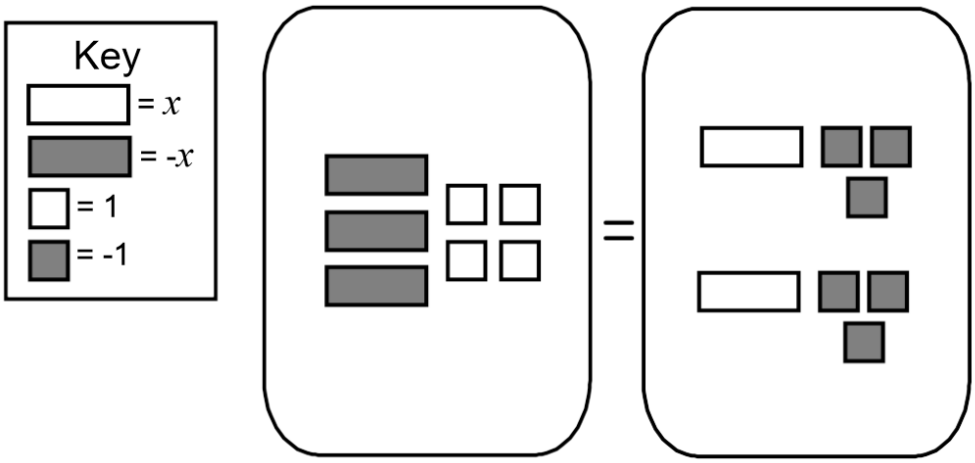
6) Jack has $37 and saves $6.50 per week. Diane has $9 and saves $8.25 per week. Write and solve an equation to find out how many weeks it would take for Jack and Diane to have saved the same amount of money.

7) Jane was asked to solve the equation $2x - 4 = 2(-5x + 1)$. She believes the solution to the equation is $x = \frac{1}{2}$. Explain how Jane could confirm that her solution is correct.

SOL 8.17 - Just in Time Quick Check Teacher Notes

Common Errors/Misconceptions and their Possible Indications

1) Find the value of x in the model.



A common error for students is to neglect to discriminate between the positive and negative tiles in a model. This indicates that the student may not have a strong conceptual understanding of the effect a sign error can make. A student may benefit from additional practice solving equations with manipulatives. In addition, students could benefit from exploring the Algebra Tiles that NCTM Illuminations has to offer and practice recording work algebraically as they work through examples using manipulatives.

2) Solve for *x*: $5x + 17 = 3x - 7$

One common misconception that students may make is to believe that they can combine like terms that are not part of the same expression. Students may combine $5x$ and $3x$ without using inverse operations and show the result as 8x. This implies that the student does not have a strong conceptual understanding of the definition of an equation and the use of inverse operations. This student could benefit from revisiting the Equation word wall card from the VDOE Word Wall Cards: Math 6. They may also benefit from additional modeling with algebra tiles. The equation mat provides a visual connection between the definition of an equation and the process of solving an equation. The equation mat contains each expression separately and displays an equal's sign in between. This will remind the student that they should simplify each expression before applying equality properties to solve for the variable.

3) Solve for *x*: $\frac{1}{2}x + 7 - \frac{3}{4}x = 15$

A common error a student may make is to ignore the negative sign in front of the $\frac{3}{4}x$ when combining like terms. This indicates that students may not have a conceptual understanding of combining like terms, particularly with negative coefficients. Students would benefit from more experience modeling and simplifying expressions using algebra tiles. Students would also benefit from the Simplifying Algebraic Expressions Exploration that begins on page 5 of the VDOE Mathematics Instructional Plan (MIP) for 8.14b, which supports students understanding of including negative signs with the terms.

4) Solve for *x*: $10 - \frac{2}{3}(3x - 12) = 2$

A common error a student may make is inappropriately applying the Distributive Property when simplifying the left side of the equation. A student may neglect to distribute -$\frac{2}{3}$ to the constant in the parentheses, resulting in $10 - 2x - 12 = 2$ and obtain a solution of $x = -2$. A student may also record "10 – " and only distribute a $\frac{2}{3}$, resulting in the equation $10 - 2x - 8 = 2$ and obtain a solution of $x = 0$. This implies that the student does not have a strong conceptual understanding of the Distributive Property. A student could benefit from additional practice simplifying expressions involving the Distributive Property (SOL 8.14b).

5) Write an equation to match the verbal sentence:
A number is equal to twice the sum of the same number and ten.

A common error that students may make is to fail to recognize the need for the use of parentheses in writing the equation. This implies that a student may be translating individual words in a verbal sentence and does not have a strong conceptual understanding of the vocabulary. A student could benefit from a discussion regarding why phrases like twice the sum require grouping symbols. In addition, using a similar phrase in a context may help a student to understand when grouping symbols are required. A student could also benefit from working through the VDOE Mathematics Instructional Plan (MIP) for 7.12, Translating Expressions and Equations.

6) Jack has $37 and saves $6.50 per week. Diane has $9 and saves $8.25 per week. Write and solve an equation to find out how many weeks it would take for Jack and Diane to have saved the same amount of money.
A common error a student may make is to fail to recognize that the equations should be set equal to each other and try to solve them independently. This would imply that a student may not understand within the context that determining the number of weeks to have saved the same amount of money requires two expressions to be set equal to each other. A more specific error that a student may make is to think Diane needs to save $28 to reach the $37 that Jack has and then consequently determine that it would take Diane approximately 3.4 weeks to save the $28 since she saves $8.25 per week. This may indicate that students are having difficulty conceptualizing the scenario. Students may benefit from approaching the problem more visually by using a graph or number line to record the initial amount and weekly increments. Examples of practical problems can be found in the MIP 8.17 - Sort and Verify Multistep Equations.

7) Jane was asked to solve the equation $2x - 4 = 2(-5x + 1)$. She believes the solution to the equation is $x = \frac{1}{2}$. Explain how Jane could confirm that her solution is correct.
A common error students may make is to confirm the solution by solving the equation a second time. This may indicate that students may not understand that a solution to an equation is a value that makes the statement true. Students may benefit from opportunities to verify solutions to equations using substitution to determine if the value makes the equation true. Refer to the MIP 8.17 - Sort and Verify Multistep Equations, which includes an example of an equation's solution steps and a verification of the solution, along with several examples for students to complete.