Just in Time Quick Check

Standard of Learning 8.PFA.4

Strand: Patterns, Functions, and Algebra

Standard of Learning 8.PFA.4

The student will write and solve multistep linear equations in one variable, including problems in context that require the solution of a multistep linear equation in one variable.

Students will demonstrate the following Knowledge and Skills:

a) 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.

b) 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 combining like terms to solve.

c) Write a multistep linear equation in one variable to represent a verbal situation, including those in context.

d) Create a verbal situation in context given a multistep linear equation in one variable.

e) Solve problems in context that require the solution of a multistep linear equation.

f) Interpret algebraic solutions in context to linear equations in one variable.

g) Confirm algebraic solutions to linear equations in one variable.

Just in Time Quick Check

Just in Time Quick Check Teacher Notes

Supporting and Prerequisite SOL: 7.PFA.3

Just in Time Quick Check 8.PFA.4

1. Solve for *x*: $5x + 17 = 3x - 7$

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

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

4. Solve the following equation: $\frac{1}{3}x - 7 = 2$. Confirm your solution by substituting your value of *x* back into the original equation.

5. Steve buys 4 packs of trading cards that each contain the same number of cards. Steve also finds 3 extra cards in his backpack. In total, Steve has 23 cards.
   Create and solve a linear equation to determine *x,* the number of cards each pack contains.

6. Create a real-world example that could be represented by the equation $4x + 2 = 34$.

7. Choose one of the following sentence starters to write a real-world example or create your own example. Be sure to also write the algebraic equation that matches your example.
   - I read *x* pages per day for ____ days and then read ___ more pages on the weekend. I read a total of ____ pages.
   - I had *x* dollars. I earned ____ more from doing chores and now I have ____ dollars.
   - A recipe needs *x* cups of sugar per batch. If I make _____ batches and spill _____ cups, I end up using ____ cups.
   - I purchased _____ items. Each one cost *x* dollars, and I also paid ____ in tax. The total cost was _____.
   - I downloaded *x* songs per day for ____ days. Then I deleted _____ songs. I now have ____songs.

8.PFA.4 Just in Time Quick Check Teacher Notes

Common Errors/Misconceptions and their Possible Indications

1. Solve for *x*: $5x + 17 = 3x - 7$

   One common misconception that students may demonstrate is believing that they can combine like terms that are not part of the same expression. For example, students may combine $5x$ and $3x$ without using inverse operations and show the result as $8x$. This implies that students may not have a strong understanding of the definition of an equation and the use of inverse operations. They may benefit from additional modeling with algebra tiles. Additionally, 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 symbol in between. This will remind students that they should simplify each expression before applying equality properties to solve for the variable.

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

   A common error students may make is to ignore the negative sign in front of the $\frac{3}{4}x$ when combining like terms. This may indicate that students do 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.

3. Write an equation to match the sentence:

   A number is equal to twice the sum of the same number and ten.

   A common error that students may make is failing to recognize the need for the use of parentheses in writing the equation. For example, students may incorrectly write the equation $x = 2x + 10$. This implies that students may be translating individual words in a verbal sentence and do not have a strong understanding of the vocabulary. Students may 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.

4. Solve the following equation: $\frac{1}{3}x - 7 = 2$. Confirm your solution by substituting your value of *x* back into the original equation.

   Common errors students may make when solving $\frac{1}{3}x - 7 = 2$ is to ignore the fractional coefficient of the equation and only solve for $x - 7 = 2$, or to subtract 7 from both sides instead of adding 7, resulting in the equation $\frac{1}{3}x = -5$. Students may also make errors when eliminating the fraction by not multiplying both sides of the equation by the reciprocal of $\frac{1}{3}$. Teachers can help by using visual fraction models or algebra tiles to represent multiplying a variable by a fraction and provide additional practice rewriting fractional coefficients as multiplication by fraction or division by whole numbers.

5. Steve buys 4 packs of trading cards that each contain the same number of cards. Steve also finds 3 extra cards in his backpack. In total, Steve has 23 cards.
   Create and solve a linear equation to determine *x,* the number of cards each pack contains.

   An error students may make when creating their equation is confusing the coefficient and constant. Students may also make arithmetic errors, neglect to show their steps, or may not correctly interpret the solution in context. Teachers can help by reinforcing the importance of labeling variables and constraints, practice translations between words and mathematics symbols, and provide additional practice with step-by-step solutions with explanations that connect back to the example to help students justify their solution.

6. Create a real-world example that could be represented by the equation $4x + 2 = 34$.

   When creating a real-world example, students may mix up the variables and constraints by confusing the part of the example that should be the variable x with the part should be a fixed number. Students may write an equation that does not match the quantities described, they may create an equation that does not match (e.g., the student creates an example that mentions 6 chairs, but the equation shows 4x), or students may use an unrealistic context where the variable does not represent a countable or reasonable quantity.

7. Choose one of the following sentence starters to write a real-world example or create your own example. Be sure to also write the algebraic equation that matches your example.
   - I read *x* pages per day for ____ days and then read ___ more pages on the weekend. I read a total of ____ pages.
   - I had *x* dollars. I earned ____ more from doing chores and now I have ____ dollars.
   - A recipe needs *x* cups of sugar per batch. If I make _____ batches and spill _____ cups, I end up using ____ cups.
   - I purchased _____ items. Each one cost *x* dollars, and I also paid ____ in tax. The total cost was _____.
   - I downloaded *x* songs per day for ____ days. Then I deleted _____ songs. I now have ____songs.

   Common errors students may make when creating algebraic equations from sentence stems include choosing variables that represent the wrong quantities, misinterpreting the connection between the real-world situation and the algebraic expression, overlooking key details, or leaving out parts of the equation. Teachers can support students by modeling how to use sentence stems effectively by demonstrating how the language and algebraic terms used connect both the equation and the real-world example. Teachers can also provide sentence stems that prompt students to describe quantities, actions, and relationships that guide them in constructing meaningful equations and encourage students to clearly define variables that help them better understand and interpret their solutions.