Mathematical Practices

1 Make sense of problems and persevere in solving them.

3 Construct viable arguments and critique the reasoning of others.

4 Model with mathematics.

7 Look for and make use of structure.

Content Standards

A.CED.1 Create equations and inequalities in one variable and use them to solve problems.

A.REI.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

A.REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

Then

You solved multi-step equations.

Now

- Solve equations with the variable on each side.

- Solve equations involving grouping symbols.

Example 1   **Solve an Equation with Variables on Each Side**

Solve $8 + 5c = 7c - 2$. Check your solution.

$8 + 5c = 7c - 2$	Original equation
$\underline{\quad -7c = -7c\quad}$	Subtract 7c from each side.
$8 - 2c = -2$	Simplify.
$\underline{-8 \qquad = -8\quad}$	Subtract 8 from each side.
$-2c = -10$	Simplify.
$\dfrac{-2c}{-2} = \dfrac{-10}{-2}$	Divide each side by –2.

Answer: $c = 5$ Simplify.

To check your answer, substitute 5 for c in the original equation.

Example 2   **Solve an Equation with Grouping Symbols**

Solve $\frac{1}{3}(18 + 12q) = 6(2q - 7)$. **Check your solution.**

$\frac{1}{3}(18 + 12q) = 6(2q - 7)$	Original equation
$6 + 4q = 12q - 42$	Distributive Property
$6 + 4q - 12q = 12q - 42 - 12q$	Subtract $12q$ from each side.
$6 - 8q = -42$	Simplify.
$6 - 8q - 6 = -42 - 6$	Subtract 6 from each side.
$-8q = -48$	Simplify.

Example 2   **Solve an Equation with Grouping Symbols**

$$\frac{-8q}{-8} = \frac{-48}{-8}$$ Divide each side by –8.

$$q = 6$$ Simplify.

Answer: $q = 6$

To check, substitute 6 for q in the original equation.

Example 3   **Find Special Solutions**

A. Solve $8(5c - 2) = 10(32 + 4c)$.

$8(5c - 2) = 10(32 + 4c)$	Original equation
$40c - 16 = 320 + 40c$	Distributive Property
$40c - 16 - 40c = 320 + 40c - 40c$	Subtract $40c$ from each side.
$-16 = 320$	This statement is false.

Answer: Since $-16 = 320$ is a false statement, this equation has no solution.

Example 3   **Find Special Solutions**

B. Solve $4(t + 20) = \dfrac{1}{5}(20t + 400).$

$4(t + 20) = \dfrac{1}{5}(20t + 400)$ Original equation

$4t + 80 = 4t + 80$ Distributive Property

Answer: Since the expression on each side of the equation is the same, this equation is an identity. The statement $4t + 80 = 4t + 80$ is true for all values of t.

Example 3

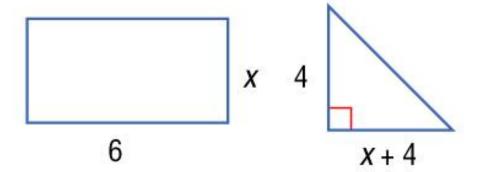**A. Solve** $2(4a + 8) = 3\left(\dfrac{8a}{3} - 10\right).$

Example 3

B. Solve $\dfrac{1}{7}(21c - 56) = 3\left(c - \dfrac{8}{3}\right).$

Example 4

Find the value of x so that the figures have the same area.

🔷 Key Concept   Steps for Solving Equations

Step 1   Simplify the expressions on each side. Use the Distributive Property as needed.

Step 2   Use the Addition and/or Subtraction Properties of Equality to get the variables on one side and the numbers without variables on the other side. Simplify.

Step 3   Use the Multiplication or Division Property of Equality to solve.