

Name: _____

Date: _____

Essential Questions: How do we solve equations when variables appear on both sides of the equals sign? How do we solve equations in the form of a proportion?

Do Now: Solve for x and check your solution.

$$\begin{array}{r|l}
 8x + 2 = 2x - 22 & \\
 \underline{-2x} & \underline{-2x} \\
 6x + 2 = -22 & \\
 \underline{-2} & \underline{-2} \\
 6x = -24 & \\
 \underline{6} & \underline{6} \\
 x = -4 &
 \end{array}$$

Check

$$\begin{aligned}
 8x + 2 &= 2x - 22 \\
 8(-4) + 2 &= 2(-4) - 22 \\
 -32 + 2 &= -8 - 22 \\
 -30 &= -30 \quad \checkmark
 \end{aligned}$$

Let's Review

Solving Equations with Variables on Both Sides



How do we solve equations when variables appear on both sides of the equals sign?

- 1) Simplify each side of the equation as much as possible. → **Distributive Property**
- 2) Bring variable terms to one side of the equation and constants to the other side of the equation using properties of equality.
- 3) Solve for the variable.
- 4) Check solution with the original equation.

↓
Combine Like Terms

Examples:

1. $3x - 4 = 9x$

$$\begin{aligned}
 \underline{-3x} \quad \underline{-3x} \\
 -4 = 6x \\
 \underline{-6} \quad \underline{6} \\
 -\frac{4}{6} = x \\
 \underline{\underline{x = -\frac{2}{3}}}
 \end{aligned}$$

2. $6x + 1 = 5 - x$

$$\begin{aligned}
 -3x + 1 &= 5 - x \\
 \underline{-1} \quad \underline{-1} \\
 -3x &= 4 - x \\
 \underline{+x} \quad \underline{+x} \\
 -2x &= 4 \\
 \underline{-2} \quad \underline{-2} \\
 x &= -2
 \end{aligned}$$

3. $2(x + 3) = 10 + x$

$$\begin{array}{r|l}
 2x + 6 = 10 + x & \\
 \underline{-6} & \underline{-6} \\
 2x = 4 + x & \\
 \underline{-x} & \underline{-x} \\
 x = 4 &
 \end{array}$$

Solving Equations in the form of Proportions

What is a proportion?

A proportion is an equation that states that two ratios are equal. Ex: $\frac{4}{8} = \frac{1}{2}$

How do we solve proportions?

A proportion can be solved by cross multiplying. $\frac{a}{b} = \frac{c}{d} \rightarrow ad = cb$

Important: Put all polynomial numerators and denominators in ()

Solve for x in each proportion. Check your solution.

4. ~~$\frac{2}{3} = \frac{4x}{42}$~~

$$\begin{array}{r|l} \frac{12x}{12} = \frac{84}{12} & \\ \hline x = 7 & \end{array}$$

6. $\frac{2x+12}{x} = \frac{-4}{1}$

5. ~~$\frac{x+1}{4} = \frac{5}{2}$~~

$$\begin{array}{r|l} \frac{20}{2} = \frac{2(x+1)}{2} & \\ \hline 10 = x+1 & \\ -1 & -1 \\ \hline 9 = x & \end{array}$$

$$\begin{array}{r|l} 20 = 2(x+1) & \\ \hline 20 = 2x+2 & \\ -2 & -2 \\ \hline 18 = 2x & \end{array}$$

$$\begin{array}{r|l} \frac{18}{2} = \frac{2x}{2} & \\ \hline 9 = x & \end{array}$$

7. $\frac{x-4}{x+3} = \frac{2}{3}$