

Bellringer

Solve $\frac{7}{8}x - \frac{1}{2} = \frac{3}{16}x + 5$

The perimeter of one square is given as $4x$. Its perimeter is equal to the perimeter of a rectangle given as $2.5x + 3.75$. What is the perimeter of each figure?

7.3 Equations with the Distributive Property

8.EE.7b

Solve linear equations with rational coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms

EXAMPLE 1

A Solve: $3(x + 5) + 1 = 2 + x$

STEP 1

Use Distributive Property then combine like terms

$$3x + -15 + 1 = 2 + x$$

$$3x + -14 = 2 + x$$

STEP 2

Use inverse operation to solve for variable

$$\begin{array}{r} 3x + -14 = 2 + x \\ \underline{-3x} \quad \underline{-3x} \\ -14 = 2 + -2x \\ \underline{-2} \quad \underline{-2} \end{array}$$

$$\begin{array}{r} -16 = -2x \\ \underline{-2} \quad \underline{-2} \end{array}$$

$$\boxed{8 = x}$$

EXAMPLE 1

B Solve: $5 + 7k = -4(k + 1) + 3$

$$5 + 7k = -4k + -4 + -3$$

$$5 + 7k = -4k + -7$$

$$\begin{array}{r} 5 + 7k = -7 \\ \underline{-5} \qquad \qquad \underline{-5} \end{array}$$

$$\begin{array}{r} -7k = -12 \\ \underline{-3} \qquad \qquad \underline{-3} \end{array}$$

$$k = 4$$

$$5 + -28 = -16 + -4 + -3$$

$$-23 = -23 \checkmark$$

ADDITIONAL EXAMPLE 1

A Solve: $2(x + 6) + 3 = 4 + x$

$$2x + 12 + 3 = 4 + x$$

$$2x + 15 = 4 + x$$

$$\begin{array}{r} 2x + 15 = 4 + x \\ -x \quad \quad -x \\ \hline x + 15 = 4 \end{array}$$

$$\begin{array}{r} x + 15 = 4 \\ -15 \quad -15 \\ \hline x = -11 \end{array}$$

$x = -11$

B Solve: $3x + 8 = 10 + 3(x + 4)$

$$3x + 8 = 10 + 3x + 12$$

$$3x + 8 = 22 + 3x$$

$$\begin{array}{r} 3x + 8 = 22 + 3x \\ -8 \quad -8 \\ \hline 3x = 14 + 3x \end{array}$$

$$\begin{array}{r} 3x = 14 + 3x \\ -3x \quad -3x \\ \hline 0 = 14 \end{array}$$

$\frac{0}{3} = \frac{14}{3}$

$x = 5$

YOUR TURN

Solve each equation.

1. $y - 5 = 3 + 9(y + 2)$

2. $2(x - 7) - 10 = 12 - 4x$

EXAMPLE 2

Solve: $\frac{3}{4}(x - 13) = -2(9 + x)$

STEP 1 Eliminate the fractions (LCM)

$$\frac{4}{1}x \cdot \frac{3}{4}(x - 13) = -2(9 + x) \cdot \frac{4}{1}$$

$$\frac{4}{1} \times \frac{3}{4} = \frac{12}{4} = 3$$

$$3(x - 13) = -8(9 + x)$$

STEP 2 Use distributive property

$$3(x - 13) = -8(9 + x)$$

$$3x + -39 = -72 + -8x$$

STEP 3

Use inverse operation to solve for variable

$$3x + -39 = -72 + \cancel{-8x}$$

$$\underline{+8x} \qquad \underline{+8x}$$

$$11x + \cancel{-39} = -72$$

$$\underline{+39} \qquad \underline{+39}$$

$$\frac{11x}{11} = \frac{-33}{11}$$

$$\boxed{x = -3}$$

ADDITIONAL EXAMPLE 2

Solve: $-\frac{3}{5}(5 - 2y) = -3(y - 5) - 18$

YOUR TURN**Solve each equation.**

3. $-4(-5 - b) = \frac{1}{3}(b + 16)$

4. $\frac{3}{5}(t + 18) = -3(2 - t)$

EXAMPLE 3

The Coleman family had their bill at a restaurant reduced by \$7.50 because of a special discount. They left a tip of \$8.90, which was 20% of the reduced amount. How much was their bill before the discount?

YOUR TURN

5. The Smiths spend 8% of their budget on entertainment. Their total budget this year is \$2,000 more than last year, and this year they plan to spend \$3,840 on entertainment. What was their total budget last year?

Guided Practice

1. $4(x + 8) - 4 = 34 - 2x$ (Ex. 1)

$$\square x + \square - 4 = 34 - 2x$$

$$\square x + \square = 34 - 2x$$

$$\square x + \square = 34$$

$$\square x = \square$$

$$\frac{\square x}{\square} = \frac{\square}{\square}$$

$$\square = \square$$

$$x = \square$$

Guided Practice

3. $-3(x + 4) + 15 = 6 - 4x$ (Ex. 1)

5. $x - 9 = 8(2x + 3) - 18$ (Ex. 1)

