

Bellringer

Solve each equation.

1. $3x + 5 = -x - 7$

2. $3 - 5x = -9 + x$

3. Joe's Canoes charges an initial fee of \$20 plus \$4 an hour. Callie's Canoes charges a flat rate of \$14 an hour. Find the number of hours for which the total amount that both places charge would be the same.

7.2 Equations with Rational Numbers

8.EE.7

Solve linear equations in one variable

8.EE.7b

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

Solving an Equation that Involves Fractions

Goal: Eliminate the fractions in the equation before solving for variable

★ Use Least Common Multiple (LCM) of denominator to help eliminate fractions

EXAMPLE 1

Solve $\frac{7}{10}n + \frac{3}{2} = \frac{3}{5}n + 2$.

STEP 1Find the LCM of the denominators $LCM(2, 5, 10): 10$ **STEP 2**

Multiply both sides of the equation by LCM

$$\frac{10}{1} \times \frac{7}{10}$$

$$\frac{10}{1} \times \frac{3}{2}$$

$$\frac{10}{1} \left(\frac{7}{10}n + \frac{3}{2} \right) = \left(\frac{3}{5}n + 2 \right) \frac{10}{1}$$

$$\frac{10}{1} \times \frac{3}{5}$$

$$\frac{10}{1} \times \frac{2}{1}$$

$$\frac{70}{10}n + \frac{30}{2} = \frac{30}{5}n + 20$$

$$7n + 15 = 6n + 20$$

STEP 3

Use Inverse operation to solve for variable

$$\begin{array}{r} 7n + 15 = 6n + 20 \\ -6n \quad -6n \\ \hline \end{array}$$

$$\begin{array}{r} n + 15 = 20 \\ -15 \quad -15 \\ \hline \end{array}$$

$$\boxed{n = 5}$$

ADDITIONAL EXAMPLE 1

Solve $\frac{3}{5}x + \frac{1}{4} = \frac{7}{20}x - 4$.

$$\frac{20}{1} \left[\frac{3}{5}x + \frac{1}{4} \right] = \left[\frac{7}{20}x + -4 \right] \frac{20}{1}$$

$$\frac{60}{5}x + \frac{20}{4} = \frac{140}{20}x + -80$$

$$\begin{array}{r} 12x + 5 = 7x + -80 \\ \underline{-7x} \quad \quad \underline{-7x} \end{array}$$

$$\begin{array}{r} 5x + 5 = -80 \\ \underline{-5} \quad \quad \underline{-5} \end{array}$$

$$\frac{5x}{5} = \frac{-85}{5}$$

$$\boxed{x = -17}$$

$$\text{LCM}(4, 5, 20) : 20$$

$$\frac{20}{1} \times \frac{3}{5} = \frac{60}{5}$$

$$\frac{20}{1} \times \frac{1}{4} = \frac{20}{4}$$

$$\frac{20}{1} \times \frac{7}{20} = \frac{140}{20}$$

YOUR TURN**Solve.**

3. $\frac{1}{7}k - 6 = \frac{3}{7}k + 4$ LCM: 7

$$\uparrow \left(\frac{1}{7}k - 6 \right) = \left(\frac{3}{7}k + 4 \right) \uparrow$$

$$\frac{1}{7}k + -42 = \frac{21}{7}k + 28$$

$$\cancel{k} + -42 = 3k + 28$$

$$\begin{array}{r} -42 = 2k + 28 \\ \underline{-28} \quad \underline{-28} \end{array}$$

$$\frac{-70}{2} = \frac{2k}{2}$$

$$k = -35$$

4. $\frac{5}{6}y + 1 = -\frac{1}{2}y + \frac{1}{4}$ LCM: 12

$$\uparrow \left(\frac{5}{6}y + 1 \right) = \left(-\frac{1}{2}y + \frac{1}{4} \right) \uparrow$$

$$\frac{60}{6}y + 12 = \frac{-12}{2}y + \frac{12}{4}$$

$$10y + 12 = -6y + 3$$

$$\begin{array}{r} 16y + 12 = 3 \\ \underline{-12} \quad \underline{-12} \end{array}$$

$$\frac{16y}{16} = \frac{-9}{16}$$

$$y = \frac{-9}{16}$$

Solving an Equation that Involves Decimals

Goal: Eliminate decimals in equation before solving for the variable

★ Use powers of 10 to eliminate decimals

$$\text{ex: } 0.3 \Rightarrow \underbrace{.3}_{\times 10} = 3$$

$$0.32 \Rightarrow \underbrace{.32}_{\times 100} = 32$$

$$0.321 \Rightarrow \underbrace{.321}_{\times 1000} = 321$$

EXAMPLE 2

Javier walks from his house to the zoo at a constant rate. After walking 0.75 mile, he meets his brother, Raul, and they continue walking at the same constant rate. When they arrive at the zoo, Javier has walked for 0.5 hour and Raul has walked for 0.2 hour. What is the rate in miles per hour at which the brothers walked to the zoo?

STEP 1

STEP 2

STEP 3

$$y = .2x + .75$$

$$y = .5x$$

$$100 [.2x + .75] = [.5x] 100$$

$$\begin{array}{r} 20x + 75 = 50x \\ -20x \quad \quad -20x \end{array}$$

$$\frac{75}{30} = \frac{30x}{30}$$

$$x = 2.5$$

$$\begin{array}{r} 20 \\ \cdot 75 \end{array}$$

$$\cdot 50$$

ADDITIONAL EXAMPLE 2

Sasha walks to school at a constant rate. She meets her friend Hannah 0.6 kilometers along the way, and they continue walking at the same constant rate. When they get to school, Sasha has walked for 0.6 hour and Hannah has walked for 0.45 hour. What is the rate in kilometers per hour at which they walked to school?

YOUR TURN

5. Logan has two aquariums. One aquarium contains 1.3 cubic feet of water and the other contains 1.9 cubic feet of water. The water in the larger aquarium weighs 37.44 pounds more than the water in the smaller aquarium. Write an equation with a variable on both sides to represent the situation. Then find the weight of 1 cubic foot of water.

Guided Practice

1. Sandy is upgrading her Internet service. Fast Internet charges \$60 for installation and \$50.45 per month. Quick Internet has free installation but charges \$57.95 per month. (Example 2)
 - a. Write an equation that can be used to find the number of months at which the Internet service would cost the same.

 - b. Solve the equation.

Solve. (Examples 1 and 2)

↻ 206 (2-7)

3. $6 + \frac{4}{5}b = \frac{9}{10}b$

5. $2.25t + 5 = 13.5t + 14$

