

8.2 – Solving Two-Step Equations with Fractions and Decimals: $ax + b = c$; $\frac{x}{a} + b = c$

To solve two-step equations involving fractions, you may prefer to rewrite the equation and work with integers than to perform fraction operations. For example:

Example 1: $\left(\frac{w}{5}\right) - \left(\frac{3}{2}\right) = \left(\frac{1}{10}\right)$ $CM = 10$

$$2w - 15 = 1$$

$$+ 15 \quad + 15$$

$$\frac{2w}{2} = \frac{16}{2}$$

$$w = 8$$

Check

$$2(8) - 15 = 1$$

$$16 - 15 = 1$$

$$1 = 1 \checkmark$$

To work with integers, Multiply all terms by a common multiple of the Denominator. For the denominators 5, 2, and 10, a common multiple is 10.

Practice: Solve each equation

(*Note: if the question uses fractions, answer should be a fraction. If the question is given as a decimal, solve using decimals)

a. $2x + \left(\frac{1}{4}\right) = \left(\frac{1}{2}\right)$ $CM = 4$

$$8x + 1 = 2$$

$$- 1 \quad - 1$$

$$\frac{8x}{8} = \frac{1}{8}$$

$$x = \frac{1}{8}$$

check:

$$2\left(\frac{1}{8}\right) + \frac{1}{4} = \frac{1}{2}$$

$$\frac{1}{4} + \frac{1}{4} = \frac{1}{2}$$

$$\frac{2}{2} = \frac{1}{1} = \frac{1}{2} \checkmark$$

b. $\left(\frac{x}{2}\right) - \left(\frac{3}{4}\right) = 2\frac{3}{8}$ $CM = 8$

$$4x - 6 = 19$$

$$+ 6 \quad + 6$$

$$\frac{4x}{4} = \frac{25}{4}$$

$$x = \frac{25}{4}$$

check:

$$4\left(\frac{25}{4}\right) - 6 = 19$$

$$25 - 6 = 19$$

$$19 = 19 \checkmark$$

c. $\frac{x}{1.6} + 3.3 = 1.8$

$$- 3.3 \quad - 3.3$$

$$1.6\left(\frac{x}{1.6}\right) = (-1.5)1.6$$

$$x = -2.4$$

check:

$$\frac{-2.4}{1.6} + 3.3 = 1.8$$

$$-1.5 + 3.3 = 1.8$$

$$1.8 = 1.8 \checkmark$$

d. $\frac{x}{2.5} + 1.5 = 0.8$

$$- 1.5 \quad - 1.5$$

$$2.5\left(\frac{x}{2.5}\right) = (-0.7)2.5$$

$$x = -1.75$$

check:

$$\frac{-1.75}{2.5} + 1.5 = 0.8$$

$$-0.7 + 1.5 = 0.8$$

$$0.8 = 0.8 \checkmark$$

e. $\frac{x}{-0.6} + 0.23 = 1.93$

$$- 0.23 \quad - 0.23$$

$$-0.6\left(\frac{x}{-0.6}\right) = (1.7)0.6$$

$$x = -1.02$$

check:

$$\frac{-1.02}{-0.6} + 0.23 = 1.93$$

$$1.7 + 0.23 = 1.93$$

$$1.93 = 1.93 \checkmark$$

f. $\left(\frac{1}{4}\right) + \left(\frac{x}{3}\right) = \left(\frac{1}{6}\right) - \left(\frac{1}{2}\right)$ $CM = 12$

$$3 + 4x = 2 - 6$$

$$- 3 \quad - 3$$

$$\frac{4x}{4} = \frac{-7}{4}$$

$$x = \frac{-7}{4}$$

check:

$$3 + 4\left(\frac{-7}{4}\right) = 2 - 6$$

$$3 - 7 = -4$$

$$-4 = -4 \checkmark$$

Example 3: Solve each problem.

- a) Enrico delivers pizza for Pepe's Pepperoni Pizza. He earns \$15.60 plus \$0.60 per pizza delivered. How many pizzas does he need to deliver to earn a total of \$30?

$x = \#$ of pizzas
 base fare \$15.60
 total earned = \$30
 cost of individual pizza = \$0.60

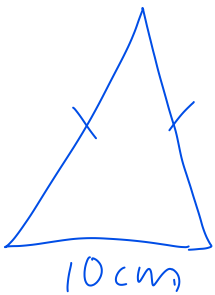
$$\begin{array}{r} \$0.60x + \$15.60 = \$30 \\ - \$15.60 \quad - \$15.60 \\ \hline \$0.60x = \$14.4 \\ \underline{\quad 0.60} \quad \underline{\quad 0.60} \\ x = 24 \text{ pizzas} \end{array}$$

- b) The cost of a banquet at Nick's Catering is \$215 plus \$27.50 per person. If the total cost of a banquet was \$2827.50, how many people were invited?

$x = \#$ of people
 base fare = \$215
 total earned = \$2827.50
 cost of individual people = \$27.50

$$\begin{array}{r} \$27.50x + \$215 = \$2827.50 \\ - \$215 \quad - \$215 \\ \hline \$27.50x = \$2612.5 \\ \underline{\quad 27.50} \quad \underline{\quad 27.50} \\ x = 95 \text{ people} \end{array}$$

- c) An isosceles triangle with a perimeter of 50.6 cm has one short side and two equal longer sides. The short side is 10.8 cm. Write and solve an equation to determine the length of one longer side?



perimeter (total length) = 50.6 cm
 short side = 10.8 cm
 $x =$ length of long side
 number of long sides = 2

$$\begin{array}{r} 2x + 10.8 \text{ cm} = 50.6 \text{ cm} \\ - 10.8 \text{ cm} \quad - 10.8 \text{ cm} \\ \hline \end{array}$$

check:

$$19.9 + 19.9 + 10.8 = 50.6$$

$$50.6 = 50.6 \checkmark$$

$$\frac{2x}{2} = \frac{39.8}{2}$$

$$x = 19.9 \text{ cm}$$