

Solving Two-Step and Multi-Step Equations

Warm Up: Simplify the following \* on pink sheet \*

1.)  $3m + 5 + 6m$

2.)  $x + 5 - 3x - 3$

3.)  $4(2x - 5)$

4.)  $-3(4x - 1)$

5.)  $2(3x - 4) + 5$

6.)  $3 - 4(x+4)$

To solve two-step equations, you need to use more than one inverse operation to isolate the variable.

Examples:

1.)  $3x + 5 = 13$

$$\begin{array}{r} -5 \quad -5 \\ \hline 3x = 8 \\ \frac{3x}{3} = \frac{8}{3} \end{array}$$

$x = 8/3$

2.)  $-4 + 7x = 3$

$$\begin{array}{r} +4 \quad +4 \\ \hline 7x = 7 \\ \frac{7x}{7} = \frac{7}{7} \end{array}$$

$x = 1$

3.)  $10 = 6 - 2x$

$$\begin{array}{r} -6 \quad -6 \\ \hline 4 = -2x \\ \frac{4}{-2} = \frac{-2x}{-2} \end{array}$$

$x = -2$

4.)  $6 - x = 10$

$$\begin{array}{r} -6 \quad -6 \\ \hline -x = 4 \\ \frac{-x}{-1} = \frac{4}{-1} \end{array}$$

$x = -4$

5.)  $-18 = 7x - 4$

$$\begin{array}{r} +4 \quad +4 \\ \hline -14 = 7x \\ \frac{-14}{7} = \frac{7x}{7} \end{array}$$

$x = -2$

6.)  $\frac{x}{5} - 6 = 1$

$$\begin{array}{r} +6 \quad +6 \\ \hline \frac{x}{5} = 7 \\ 5 \cdot \frac{x}{5} = 7 \cdot 5 \end{array}$$

$x = 35$

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

$$\begin{array}{r} +4 \quad +4 \\ \hline 3 = \frac{x}{3} \\ 3 \cdot 1 = \frac{x}{3} \cdot 3 \end{array}$$

$x = 3$

8.)  $\frac{2}{5}x + 2 = 10$

$$\begin{array}{r} -2 \quad -2 \\ \hline \frac{2}{5}x = 8 \\ \frac{5}{2} \cdot \frac{2}{5}x = 8 \cdot \frac{5}{2} \end{array}$$

$x = 20$

9.)  $\frac{q}{15} - \frac{1}{5} = \frac{3}{5}$

$$\begin{array}{r} +\frac{1}{5} \quad +\frac{1}{5} \\ \hline \frac{q}{15} = \frac{4}{5} \\ 15 \cdot \frac{q}{15} = \frac{4}{5} \cdot \frac{15}{1} \end{array}$$

$q = 12$

\*\*\*You may need to simplify the equation first before solving\*\*\*

10.)  $2y - 3 + 8 = 1$

$$\begin{array}{r} 2y + 5 = 1 \\ -5 \quad -5 \\ \hline \end{array}$$

$$\frac{2y}{2} = \frac{-4}{2}$$

$$y = -2$$

11.)  $8x - 21 - 5x = -15$

$$\begin{array}{r} 3x - 21 = -15 \\ +21 \quad +21 \\ \hline \end{array}$$

$$\frac{3x}{3} = \frac{6}{3}$$

$$x = 2$$

12.)  $3(x - 4) = 18$

$$\begin{array}{r} 3x - 12 = 18 \\ +12 \quad +12 \\ \hline \end{array}$$

$$\frac{3x}{3} = \frac{30}{3} \quad x = 10$$

13.)  $-2(3 - d) = 4$

$$\begin{array}{r} -6 + 2d = 4 \\ +6 \quad +6 \\ \hline \end{array}$$

$$\frac{2d}{2} = \frac{10}{2} \quad d = 5$$

14.)  $4(x - 2) + 2x = 40$

$$4x - 8 + 2x = 40$$

$$\begin{array}{r} 6x - 8 = 40 \\ +8 \quad +8 \\ \hline \end{array}$$

$$\frac{6x}{6} = \frac{48}{6} \quad x = 8$$

15.)  $10y - (4y + 8) = -20$

$$10y - 4y - 8 = -20$$

$$\begin{array}{r} 6y - 8 = -20 \\ +8 \quad +8 \\ \hline \end{array}$$

$$\frac{6y}{6} = \frac{-12}{6} \quad y = -2$$

Find the missing value:

16.) If  $2x + 3 = 1$ , find the value of  $x - 5$ .

$$\begin{array}{r} -3 \quad -3 \\ 2x + 3 = 1 \\ \hline 2x = -2 \\ \frac{2x}{2} = \frac{-2}{2} \\ x = -1 \end{array}$$

$$\begin{array}{r} -1 - 5 \\ \hline -6 \end{array}$$

17.) If  $-2(3y + 5) = -4$ , find the value of  $5y$ .

$$\begin{array}{r} -6y - 10 = -4 \\ +10 \quad +10 \\ \hline \end{array}$$

$$\frac{-6y}{-6} = \frac{6}{-6} \quad y = -1$$

$$\begin{array}{r} 5(-1) \\ \hline -5 \end{array}$$

18.) Sara paid \$15.95 to become a member at a gym. She then paid a monthly membership fee. Her total cost for 12 months was \$735.95. How much was the monthly fee?

$x =$  monthly fee

$$\begin{array}{r} 15.95 + 12x = 735.95 \\ -15.95 \quad -15.95 \\ \hline \end{array}$$

$$\frac{12x}{12} = \frac{720}{12}$$

$$x = 60$$

$$\boxed{\$60}$$

19.) Joseph is 2 years older than twice Kelsey's age. The sum of their ages is 35. How old is Kelsey?

$x =$  Kelsey's age

$2x + 2 =$  Joseph's age

11 years old

$$x + 2x + 2 = 35$$

$$\begin{array}{r} 3x + 2 = 35 \\ -2 \quad -2 \\ \hline \end{array}$$

$$\frac{3x}{3} = \frac{33}{3}$$

$$x = 11$$