

Lesson 2-6
Solving Two-Step Equations

Review: Solve the equations below.

$$x + 8 = 17$$

$$x = 9$$

$$\begin{array}{r} m - 5 = -12 \\ +5 \quad +5 \\ \hline \end{array}$$

$$m = -7$$

$$\begin{array}{r} 5n = 40 \\ -5 \quad -5 \\ \hline \end{array}$$

$$n = -8$$

The equations above are one-step equations. Why do you think we call them one-step equations?

because you do one operation to isolate the variable.
↑ (get by itself)

So, what is a two-step equation? you do two operations to isolate the variable.

Here are some examples of two-step equations:

$$2x + 6 = 14$$

$$3y - 2 = 16$$

$$\frac{4}{x} + 6 = 8$$

How do we solve two-step equations?

GOAL: To get the variable by itself!

What do you think?

$$\begin{array}{r} 3x - 8 = 2 \\ +8 \quad +8 \\ \hline \end{array}$$

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

$$x = \frac{10}{3} \text{ or } 3\frac{1}{3}$$

Solving Two-Step Equations

Step 1: Undo the addition or subtraction.

Step 2: Undo the multiplication or division.

Example:

Solve $5n - 18 = -33$.

$$5n - 18 = -33$$

$$5n - 18 + 18 = -33 + 18 \quad \leftarrow \text{To undo subtraction, add 18 to each side.}$$

$$5n = -15 \quad \leftarrow \text{Simplify.}$$

$$\frac{5n}{5} = \frac{-15}{5} \quad \leftarrow \text{To undo multiplication, divide each side by 5.}$$

$$n = -3 \quad \leftarrow \text{Simplify.}$$

Check

$$5n - 18 = -33 \quad \leftarrow \text{Check your solution with the original equation.}$$

$$5(-3) - 18 \stackrel{?}{=} -33 \quad \leftarrow \text{Substitute } -3 \text{ for } n.$$

$$-15 - 18 \stackrel{?}{=} -33 \quad \leftarrow \text{Multiply.}$$

$$-33 = -33 \checkmark \quad \leftarrow \text{The solution checks.}$$

Let's Try!

$$4x + 6 = 22$$

$$\begin{array}{r} -6 \quad -6 \\ \hline 4x = 16 \\ \hline 4 \quad 4 \end{array}$$

$$\boxed{x = 4}$$

$$\frac{x}{5} - 3 = 7$$

$$\begin{array}{r} +3 \quad +3 \\ \hline \frac{x}{5} = 10 \end{array}$$

$$8. \frac{x}{5} = 10 \cdot 5$$

$$\boxed{x = 50}$$

$$-7 - p = 35$$

$$\begin{array}{r} +p \quad +p \\ \hline -7 = 35 + p \\ -35 \quad -35 \\ \hline -42 = p \end{array}$$

$$\boxed{-42 = p}$$

OR

$$\begin{array}{r} -7 - p = 35 \\ +7 \quad +7 \\ \hline -p = 42 \\ \hline \frac{-p}{-1} = \frac{42}{-1} \end{array}$$

$$\frac{-p}{-1} = \frac{42}{-1}$$

$$\rightarrow \boxed{p = -42}$$

Remember:

p is the same as $1 \cdot p$

$-p$ is the same as $-1 \cdot p$

You Try!

$$\begin{array}{r} -5m + 14 = 19 \\ -14 \quad -14 \\ \hline + 5 \end{array}$$

$$\begin{array}{r} -5m = 5 \\ -5 \quad -5 \\ \hline -5 \end{array}$$

$$\boxed{m = -1}$$

$$\begin{array}{r} \frac{x}{3} - 11 = 1 \\ +11 \quad +11 \\ \hline \phantom{\frac{x}{3}} + 12 \end{array}$$

$$3 \cdot \frac{x}{3} = 12 \cdot 3$$

$$\boxed{x = 36}$$

$$\begin{array}{r} 108 - t = 27 \\ +t \quad +t \end{array}$$

$$\begin{array}{r} 108 = 27 + t \\ -27 \quad -27 \\ \hline -81 \end{array}$$

$$\boxed{81 = t}$$

$$\begin{array}{r} \frac{x}{2} + 15 = 5 \\ -15 \quad -15 \\ \hline \phantom{\frac{x}{2}} -10 \end{array}$$

$$2 \cdot \frac{x}{2} = -10 \cdot 2$$

$$\boxed{x = -20}$$

$$\begin{array}{r} 7x - 3 = -24 \\ +3 \quad +3 \end{array}$$

$$\begin{array}{r} 7x = -21 \\ 7 \quad 7 \end{array}$$

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

