

# Algebra 1A

## Lesson 3.2 Solve Two - Step Equations

### Warm-Up

Write each as an equation.

(a) 60 is 4 more than twice a number,  $x$ .

$$60 = 4 + 2x$$

(b) A number,  $y$ , divided by 3 equals 8.

$$\frac{y}{3} = 8$$

### Example 1. Solve a Two-Step Equation

(a) Solve  $\frac{x}{4} - 3 = 2$ .

$$\begin{array}{r} \frac{x}{4} - 3 = 2 \\ +3 \quad +3 \\ \hline \frac{x}{4} = 5 \\ \cdot 4 \quad \cdot 4 \\ \hline x = 20 \end{array}$$

(b) Solve  $3x + 7 = 19$ .

$$\begin{array}{r} 3x + 7 = 19 \\ -7 \quad -7 \\ \hline 3x = 12 \\ \div 3 \quad \div 3 \\ \hline x = 4 \end{array}$$

When Solving Two Step Equations:

- Use the **OPPOSITE** steps  
 $\times$  with  $\div$                        $+$  with  $-$
- In the **OPPOSITE** order  
*Backwards Order of Operations*

SADMEP

### Example 2. Solve by Combining Like Terms

(a) Solve  $5b - 7b = 4$ .

$$\begin{array}{r} 5b - 7b = 4 \\ -2b = 4 \\ \div -2 \quad \div -2 \\ \hline b = -2 \end{array}$$

(b) Solve  $8y + 3y = 44$

$$\begin{array}{r} 8y + 3y = 44 \\ 11y = 44 \\ \div 11 \quad \div 11 \\ \hline y = 4 \end{array}$$

### Try It!

Solve each of the following equations.

(a)  $5x + 9 = 24$

$$\begin{array}{r} 5x + 9 = 24 \\ -9 \quad -9 \\ \hline 5x = 15 \\ \div 5 \quad \div 5 \\ \hline x = 3 \end{array}$$

(b)  $\frac{z}{3} - 7 = -1$

$$\begin{array}{r} \frac{z}{3} - 7 = -1 \\ +7 \quad +7 \\ \hline \frac{z}{3} = 6 \\ \cdot 3 \quad \cdot 3 \\ \hline z = 18 \end{array}$$

(c)  $-5r + 13r = -32$

$$\begin{array}{r} -5r + 13r = -32 \\ 8r = -32 \\ \div 8 \quad \div 8 \\ \hline r = -4 \end{array}$$

**Example 3. Writing a Function and Finding an Input**

The output of a function is 7 more than two times the input. Find the input when the output is 15.

- (a) Write an equation for the function with  $X$  as the input and  $y$  as the output.

$$y = 7 + 2x \quad \text{or} \quad y = 2x + 7$$

- (b) Use your equation and plug in 15 for  $y$ .

$$15 = 2x + 7$$

- (c) Solve for  $X$ .

$$\begin{array}{r} 15 = 2x + 7 \\ -7 \quad -7 \\ \hline 8 = 2x \\ \frac{8}{2} = \frac{2x}{2} \end{array}$$

$$x = 4$$

**Steps for finding the input**

1. Turn the words into an equation.
2. Plug in for the value given.
3. Find the missing variable.

**Example 4. Writing a Function and Finding an Input**

The output of a function is 4 less than 4 times the input. Find the input when the output is 3.

$$\begin{array}{r} y = 4x - 4 \\ 3 = 4x - 4 \\ +4 \quad +4 \\ \hline 7 = 4x \\ \frac{7}{4} = \frac{4x}{4} \end{array}$$

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

**Example 5. Writing an Equation for a Real Life Example**

Arnold is a waiter and he makes \$3 per hour plus anything he earns in tips. On Saturday, Arnold earned \$41. He knows that \$23 was from tips. How many hours did he work?

$$\boxed{\text{TOTAL EARNINGS}} = \boxed{\text{\$ PER HOUR}} \cdot \boxed{\text{\# OF HOURS}} + \boxed{\text{TIPS}}$$

$$\begin{array}{r} 41 = 3 \cdot h + 23 \\ -23 \quad -23 \end{array}$$

$$\frac{18}{3} = \frac{3h}{3} \quad h = 6$$

**Suggestions for Solving Word Problems**

1. Try writing a Verbal Model to describe the situation
2. Turn your model into an equation.
3. Solve and check to make sure your answer makes sense.

ARNOLD WORKED FOR 6 HOURS

**Assignment:** Pages 144 - 145 (4 - 34) even

**Review:**

Solve the equation. Show work.

1.  $4 + y = 12$       2.  $t - 2 = 1$       3.  $5 - (-t) = 14$

4.  $x - 2 = 28$       5.  $19 - x = 37$       6.  $-9 - (-a) = -2$

7. A veterinary assistant steps on a scale while holding a cat. The scale reads 161 pounds. Alone the assistant weighs 147 pounds. Write and solve an equation to find the weight of the cat.