

Chapter 4 - Equations



4.1 Solving Simple Equations

Part 1: Do It Now

Byron spent a total of \$11 on two magazines. The cost of one magazine is \$5. You can use an equation to find the cost of the other magazine.

a) Write an equation to represent this situation

$$x + 5 = 11$$

b) What value of the variable makes the equation true? Describe the math operations you used to find the value?

$x = 6$ makes the equation true.

You can calculate this value by subtracting 5 from 11.

Part 2: Keeping Equations Balanced

An equation is still true if you apply identical operations to both sides

$$5 = 5$$

$$5 + 1 = 5 + 1$$

If I add 1 to each side; both sides are still equal

$$5 \times 2 = 5 \times 2$$

If I multiply both sides by 2; both sides are still equal

Keeping Equations Balanced

Solve for x (what value of x makes the equation true?)

$$x + 4 = 12$$

when solving an equation, the goal is to isolate the variable

$$x + 4 - 4 = 12 - 4$$

Subtract 4 from the left because you will be left with just x by itself because $4 - 4 = 0$. That means you will have to subtract 4 from the right as well to keep the equation equivalent

$$x = 12 - 4$$

$$x = 8$$

Part 3: Solving Simple Equations Examples

1) $x - 2 = 8$

$$x - 2 + 2 = 8 + 2$$

$$x = 8 + 2$$

$$x = 10$$

2) $x + 7 = 5$

$$x + 7 - 7 = 5 - 7$$

$$x = 5 - 7$$

$$x = -2$$

3) $-4 + x = -1$

$$-4 + 4 + x = -1 + 4$$

$$x = -1 + 4$$

$$x = 3$$

4) $10 + x = 5$

$$10 - 10 + x = 5 - 10$$

$$x = 5 - 10$$

$$x = -5$$

Now You Try!

5) $x - 7 = 8$

$$x - 7 + 7 = 8 + 7$$

$$x = 8 + 7$$

$$x = 15$$

6) $x + 5 = 5$

$$x + 5 - 5 = 5 - 5$$

$$x = 5 - 5$$

$$x = 0$$

*Hopefully you are starting to notice that the trick to isolating a variable is to move numbers away from the variable by applying the **opposite** operation!*

$$7) 3x = 18$$

$$\frac{\cancel{3}x = 18}{\cancel{3} \quad 3}$$

$$x = \frac{18}{3}$$

$$x = 6$$

The opposite of multiplication is: DIVISION

$$8) \frac{x}{4} = 3$$

$$4\left(\frac{x}{4}\right) = 4(3)$$

$$x = 4(3)$$

$$x = 12$$

The opposite of division is: MULTIPLICATION

Now You Try!

$$9) -x = 9$$

$$\frac{-x = 9}{\cancel{-1} \quad \cancel{-1}}$$

$$x = \frac{9}{-1}$$

$$x = -9$$

$$10) 5x = 30$$

$$\frac{\cancel{5}x = 30}{\cancel{5} \quad 5}$$

$$x = \frac{30}{5}$$

$$x = 6$$

$$11) \frac{x}{7} = 3$$

$$7\left(\frac{x}{7}\right) = 7(3)$$

$$x = 7(3)$$

$$x = 21$$

Part 4: Two Step Equations

$$5x + 25 = 500$$

Isolate variable term first. (you will perform BEDMAS in reverse when isolating variables)

$$5x + 25 - 25 = 500 - 25$$
 Step 1: Subtract 25 from both sides

$$\begin{array}{r} \cancel{5}x = 475 \\ \cancel{5} \quad \cancel{5} \\ x = 95 \end{array}$$

Step 2: Divide both sides by 5

Remember: isolate variable term first!

$$12) 2x - 7 = 9 + 7$$

$$\begin{array}{l} 2x = 9 + 7 \\ \cancel{2}x = \frac{16}{\cancel{2}} \\ x = \frac{16}{2} \end{array}$$

$$x = 8$$

$$13) \frac{x}{2} + 4 = 20 - 4$$

$$\frac{x}{2} = 20 - 4$$

$$\cancel{2}\left(\frac{x}{\cancel{2}}\right) = 2(16)$$

$$x = 2(16)$$

$$x = 32$$

$$14) 16x + 3 = 15 - 3$$

remember to always put fraction in lowest terms!

$$16x = 15 - 3$$

$$\frac{16x}{16} = \frac{12}{16}$$

$$x = \frac{12}{16}$$

$$x = \frac{3}{4}$$

Before Moving On...

Solve the following equation:

$$\frac{2x}{3} + 7 = 15 - 7$$

$$\frac{2x}{3} = 15 - 7$$

$$3\left(\frac{2x}{3}\right) = 3(8)$$

$$\frac{2x}{2} = \frac{24}{2}$$

$$x = \frac{24}{2}$$

$$x = 12$$

Summary of Key Concepts

- To solve an equation means to find the value of the variable that makes the statement true.
- To solve a one step equation, isolate the variable by performing the opposite operation.
- In a two-step equation, isolate the variable term first, then isolate the variable.
- You can check a solution by substituting the root back in to the equation.