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?)

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

$x + 4 = 12$

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

$x + 4 - 4 = 12 - 4$

$x = 12 - 4$

$x = 8$

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) $3x = 18$

The opposite of multiplication is: DIVISION

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

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

$x = 6$

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

The opposite of division is: MULTIPLICATION

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

$x = 4(3)$

$x = 12$

Now You Try!

9) $-x = 9$

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

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

$x = -9$

10) $5x = 30$

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

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

$x = 6$

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

$\frac{5x}{5}=\frac{475}{5}$ **Step 2**: Divide both sides by 5

$x = 95$

Remember: isolate variable term first!

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

$2x = 9+7$

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

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

$x = 8$

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

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

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

$x = 2(16)$

$x = 32$

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.