

## REVIEW: Solving Equations!

Our end goal when solving any kind of equation is to get the variable by itself

### Single-Step Equations

#### ANSWER KEY

- To isolate our variable, we need to get rid of anything standing in the way. To do that, we...  
(explain in your own words)

Use the opposite operation <sup>of what</sup> we see to make ~~the~~ numbers cancel out.

- For example, in the equation  $x + 3 = 7$ , we subtract 3 from both sides. On the left side, the 3's cancel, and we find that  $x = \underline{4}$ .

Try these examples:

$$\begin{array}{r} \frac{4}{5}x = 16 \\ \hline \frac{4}{5} \quad \frac{5}{4} \\ \hline x = \frac{4}{1} \cdot \frac{5}{4} = \boxed{20} \end{array}$$

$$\begin{array}{r} 17 - c = 67 \\ -17 \quad -12 \\ \hline -c = 55 \\ \hline c = \boxed{-55} \end{array}$$

### Two-Step Equations

#### ANSWER KEY

- When we have to undo multiple steps to get the variable by itself, have to use order of operations backwards.
- For example, in the equation  $5x + 3 = 7$ , we would undo the [operation] addition first by [operation] ~~subtracting~~ subtraction a [number] 3.
- Then we would undo the [operation] multiplication by [operation] dividing a [number] 5.

Try these examples:

$$\begin{array}{r} \frac{4}{5}x - 3 = 16 \\ +3 \quad +3 \end{array}$$

$$\begin{array}{r} \frac{4}{5}x = 19 \\ \hline \frac{4}{5} \quad \frac{5}{4} \\ \hline x = \frac{19}{1} \cdot \frac{5}{4} = \frac{95}{4} \end{array}$$

$$\frac{12-c}{11} = 5 \cdot 11$$

$$\begin{array}{r} 12 - c = 55 \\ -12 \quad -12 \\ \hline -c = 43 \\ \hline c = \boxed{-43} \end{array}$$

← ...psst! Don't forget about the invisible parentheses. How does that affect the order in which we undo this problem?

$$\begin{array}{r} 4 \\ 19 \\ \times 5 \\ \hline 95 \end{array}$$

**Multi-Step Equations****ANSWER KEY**

For any equation with variables on both sides, we follow four specific steps. Label and perform those steps on the following example:

$$2(x + 3) - 5 = 6(7 - 8x)$$

STEP NAME HERE

SHOW WORK HERE

1. Distribute :

$$2x + 6 - 5 = 42 - 48x$$

2. C.L.T. :

$$2x + 1 = 42 - 48x$$

3. SWITCH SIDES :

$$2x + 48x = 42 - 1$$

4. SIMPLIFY :

$$50x = 41$$

$$x = \frac{41}{50}$$

Now try this one!

$$2 + 2(x - 2) = 2(22 + x)$$

$$2 + 2x - 4 = 44 + 2x$$

$$2x - 2 = 44 + 2x$$

$$2x - 2x = 44 + 2$$

$$0x = 46$$

$x = \text{no solution!}$

\*Sorry this was tricky! 😊

Equations with Absolute Value

**ANSWER KEY**

- It is possible to get a positive value as a final answer when taking the absolute value of both positive and negative values.
- Therefore, to make the absolute value bars disappear, we have to set up two equations, one for the positive case and one for the negative case.

For example:

$$|m - 9| = 4$$

Because of the absolute value bars, the quantity  $m - 9$  could be equal to either 4 or -4.

Solve it!

Set-Up #1

$$\begin{array}{r} m - 9 = 4 \\ + 9 \quad + 9 \\ \hline m = 13 \end{array}$$

Set-Up #2

$$\begin{array}{r} m - 9 = -4 \\ + 9 \quad + 9 \\ \hline m = 5 \end{array}$$

*\*Don't forget: If there is anything on the same side as the absolute value bars, we have to get rid of it first!*

Now try this:

Set-up #1

$$\begin{array}{r} 12 - p = 5 \\ -12 \quad -12 \\ \hline -p = -7 \\ \hline p = 7 \end{array}$$

$$|12 - p| + 4 = 9$$

$$\begin{array}{r} -4 \quad -4 \\ \hline |12 - p| = 5 \end{array}$$

Set-Up #2

$$\begin{array}{r} 12 - p = -5 \\ -12 \quad -12 \\ \hline -p = -17 \\ \hline p = 17 \end{array}$$

Now can you make an equation representing the solutions shown on this number line?



$$|x - 2.5| = 3.5$$

What about a word problem?

*Martha runs an average of 3 miles per day, give or take a 2.5 miles. Write and solve an equation to find the maximum and minimum distances she runs.*

$$|x - 3| = 2.5$$

$$\begin{array}{r} x - 3 = 2.5 \\ + 3 \quad + 3 \\ \hline x = 5.5 \text{ mi} \end{array}$$

$$\begin{array}{r} x - 3 = -2.5 \\ + 3 \quad + 3 \\ \hline x = 0.5 \text{ mi} \end{array}$$

**Replacement Sets** | **ANSWER KEY****\*\*\*Key Idea: Plug 'n' chug!\*\*\***

- With these problems, we are picking from a pool of numbers called the replacement set.
- We plug each one into the given equation to see if it makes the equation true.
- If it does, we include it in the collection of numbers called the solution set.

For example:

Give the solution set for the equation  $2x + 4 = 8$  for the replacement set  $\{0, 1, 2, 3\}$ 

$$2(0) + 4 = 0 + 4 = 4 \quad \times$$

$$2(1) + 4 = 2 + 4 = 6 \quad \times$$

$$2(2) + 4 = 4 + 4 = 8 \quad \checkmark$$

$$2(3) + 4 = 6 + 4 = 10 \quad \times$$

 $\{8\}$ 

A few important reminders:

- A number can only be included in a solution set if it is included in the replacement set
- A solution set doesn't always have to have just one value; it can have multiple, or even none!

*Feeling ready?! I'm sure you are! ☺*