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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 of what we see to make 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 = 4.

Try these examples:

$\frac{4}{5}x = 16$

$\frac{\frac{4}{5}x}{4/5} = \frac{16}{4/5}$

$x = \frac{\cancel{16}^{4}}{1} \cdot \frac{5}{\cancel{4}_{1}} = \boxed{20}$

$12 - c = 67$

$-12 \quad -12$

$-c = 55$

$\boxed{c = -55}$

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]* ~~subtraction~~ addition first by *[operation]* subtracting a *[number]* 3.
- Then we would undo the *[operation]* multiplication by *[operation]* dividing a *[number]* 5.

Try these examples:

$\frac{4}{5}x - 3 = 16$

$+3 \quad +3$

$\frac{4}{5}x = 19$

$\frac{\frac{4}{5}x}{4/5} = \frac{19}{4/5}$

$x = \frac{19}{1} \cdot \frac{5}{4} = \frac{95}{4}$

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

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

$12 - c = 55$

$-12 \quad -12$

$-c = 43$

$c = -43$

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

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

Now try this one!

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

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

$2x-2=44+2x$

$2x-2x=44+2$

$0x=46$

$x=$ no solution!

*Sorry this was tricky! :)

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Equations with Absolute Value

$\boxed{\text{ANSWER KEY}}$

- 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

$$m - 9 = 4$$
$$+9 \quad +9$$
$$\boxed{m = 13}$$

Set-Up #2

$$m - 9 = -4$$
$$+9 \quad +9$$
$$\boxed{m = 5}$$

**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:

$$|12 - p| + \cancel{4} = 9$$
$$\cancel{-4} \quad -4$$
$$\leftarrow |12 - p| = 5 \rightarrow$$

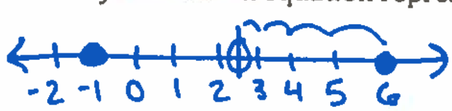
Set-up #1

$$\cancel{12} - p = 5$$
$$\cancel{-12} \quad -12$$
$$-p = -7$$
$$\boxed{p = 7}$$

Set-Up #2

$$\cancel{12} - p = -5$$
$$\cancel{-12} \quad -12$$
$$-p = -17$$
$$\boxed{p = 17}$$

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



mid: 2.5
dist.: 3.5

$$|x - 2.5| = 3.5$$

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.

$$|x - 3| = 2.5$$

$$x - \cancel{3} = 2.5$$
$$\cancel{+3} \quad +3$$
$$\boxed{x = 5.5 \text{ mi}}$$

$$x - \cancel{3} = -2.5$$
$$\cancel{+3} \quad +3$$
$$\boxed{x = 0.5 \text{ mi}}$$

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Replacement Sets $\boxed{\text{ANSWER KEY}}$

****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 $\{0, 1, 2, 3\}$

$2(0)+4 = 0+4 = 4$ ✗

$2(1)+4 = 2+4 = 6$ ✗

$2(2)+4 = 4+4 = 8$ ✓

$2(3)+4 = 6+4 = 10$ ✗

$\{8\}$

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! ☺