

SWBAT solve absolute value equations.**Homework:****What is Absolute Value?**

The absolute value of a number is its distance from zero on the number line.

$|4| = 4$, since 4 is 4 units away from zero.

$|-4| = 4$, since -4 is 4 units away from zero.

Since distance can never have a negative value (you can't be -3 feet away from something), absolute value is always positive.

Absolute Value Equations

Example #1: $|x| = 3$

Since absolute value makes all numbers positive, all absolute value equations have potentially two answers.

$$x = 3$$

$$x = -3$$

Check your answer: $|3| = 3$ and $|-3| = 3$

Final Answer: $\{3, -3\}$

Example #2: $|x + 2| = 10$

Since we know this equation has potentially two answers, we must rewrite our equation two ways. In the first, we **remove the absolute value sign**. In the second, we **remove the sign and negate the other side**.

$$\begin{array}{r} x + 2 = 10 \\ -2 \quad -2 \\ \hline x = 8 \end{array}$$

$$\begin{array}{r} x + 2 = -10 \\ -2 \quad -2 \\ \hline x = -12 \end{array}$$

Check your answer: $|8 + 2| = 10$ and $|-12 + 2| = 10$

Final Answer: $\{8, -12\}$

Example #3

$$\begin{array}{r} 3|x - 1| + 4 = 16 \\ -4 \quad -4 \\ \hline 3|x - 1| = 12 \\ |x - 1| = 4 \end{array}$$

The very first thing we must do is get the absolute value expression by itself using inverse operations. In this example, this means subtract 4 and divide by 3. Then we solve using the means we saw before- write two equations.

$$\begin{array}{r} x - 1 = 4 \\ +1 \quad +1 \\ \hline x = 5 \end{array}$$

$$\begin{array}{r} x - 1 = -4 \\ +1 \quad +1 \\ \hline x = -3 \end{array}$$

Check your answer: $3|5 - 1| + 4 = 16$ and $3|-3 - 1| + 4 = 16$

Final Answer: $\{5, -3\}$

Example #4

$$|x + 2| = -3$$

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

$$\begin{array}{r} x + 2 = 3 \\ - 2 \quad -2 \\ \hline x = 1 \end{array}$$

With absolute value equations, checking your answer is required. One or more of the answers you get may not check out in the end, and stating them as part of your answer makes it incorrect.

Check your answer: $|-5 + 2| = -3$

$$|-3| = -3$$

$$3 = -3$$

No!

$$|1 + 2| = -3$$

$$|3| = -3$$

$$3 = -3$$

No!

Final Answer: $\{ \}$

Answer the following questions with your group members.

1. What is absolute value? _____
2. Why is absolute value always positive? _____
3. When solving absolute value equations, we must re-write the original problem into two new equations. How do we write these new equations? _____

4. What do we do if the absolute value expression isn't isolated on one side? _____

5. Why do we always have to check our answers with absolute value equations? _____

6. If you see the equation $|2x + 3| = 13$, what two equations should you write to solve it? _____

7. If you see the equation $|2x + 3| = 3x$, what two equations should you write to solve it? _____

8. If you see the equation $|2x + 3| = 3x - 1$, what two equations should you write to solve it? _____

Solve and Check:

1. $|4z + 1| = 3$

2. $|6x - 1| + 7 = 18$