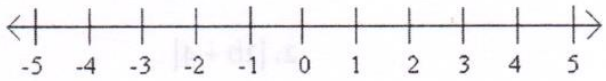
1-4 Solving Absolute Value Equations

Absolute Value of x: $|x|$ = the distance the number is from zero on a number line.
Since this value is a distance it can never be negative!



Intro: If $|2|$ = _____ and $|-2|$ = _____, then what is x if $|x| = 5$? x = _____ or x = _____

Steps to Evaluate an Expression with an Absolute Value:

1. Replace the variable with the given value.
2. Follow the order of operations to simplify the expression.

Examples:

1. $2.7 + |6 - 2x|$ if $x = 4$
2. $2.3 - |3y - 10|$ if $y = 2$

Always follow these steps for success!

Steps to Solving Absolute Value Equations:

1. Isolate the absolute value on one side of the equation.
2. Check to make sure that the equation is possible!! $|x| \neq -\#$
3. Set up two equations, considering both the positive and negative values:
   - Drop the absolute value and keep the sign of the expression on the right.
   - Drop the absolute value and switch the sign of the expression on the right.
4. Solve both equations.
5. Check both solutions with the original equation. *Even if the correct procedure is used, the answers may not be actual solutions to the original equation. Such a number is called an* ***extraneous solution.***
6. Write your final answer. *Because the absolute value of a number is always positive or zero, an equation like $|x| = -4$ is never true. This means it has no solution and would be an* ***empty set*** *written { } or Ø.*

Example: $|11 + 2x| = 5$

$11 + 2x = 5$ and $11 + 2x = -5$

$2x = -6$ $\quad$ $2x = -16$

$x = -3$ $\quad$ $x = -8$

Therefore, $\boxed{x = -3}$ and $\boxed{x = -8}$ or $\{-8, -3\}$

Check your solution:

$|11 + 2(-3)| = 5$

$|11 - 6| = 5$

$|5| = 5$

$5 = 5$

$|11 + 2(-8)| = 5$

$|11 - 16| = 5$

$|-5| = 5$

$5 = 5$

Examples: Solve each equation. Check your solution before writing your final answer

1. $|2x + 5| = 15$

$2x+5=15$ $\quad$ $2x+5=-15$

$2x=10$ $\quad$ $2x=-20$

$x=5$ $\quad$ $x=-10$

Viti: $|15|=15$ ✓ $\quad$ $|-20+5|=15$ ✓

$\{-10, 5\}$

2. $-3|6 - 4t| - 6 = 0$

$-3|6-4t| = 6$

$|6-4t| = -2$

{ } or Ø

an absolute value can never = a -#!

3. $|3x - 5| = 2x + 1$

$3x-5=2x+1$ $\quad$ $3x-5=-2x-1$

$x=6$ $\quad$ $5x=4$

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

$|18-5|=13$ ✓

Viti: $\left|\frac{12}{5}-5\right| = \frac{8}{5}-1$ ✓

$\{6\}$ $\quad$ Ø