

(4-3) Absolute-Value Equations

When you see a variable inside two bars: like $|x|$ or $|x + 2|$

Absolute-value equations have 3 types of solutions:

- 1) one solution: when $|x| = 0$
- 2) two solutions: when $|x| = (+)$ number
- 3) no solution: when $|x| = (-)$ number

Absolute-value means: distance of a number from zero on the number line

Since the number line has a negative and a positive side, there are two possibilities of distance from zero

To solve an absolute-value equation:

First: use any inverse operations to get the $|x|$ term by itself on one side of the equation.

Second: Write two equations without the absolute value bars...one with the positive value on the right side and the second with the negative value on the right side

Third: Solve each equation separately

Last: Check all solutions in the original equation

EX 1: $|x| + 5 = 11$

EX 2: $|p - 9| = 3$

EX 3: $8 = 12 + |s|$

EX 4: $|2c| - 17 = -11$

EX 5: $2|5 + d| = 14$

EX 6: $\frac{|t|}{3} = 2$

EX 7: $\frac{1}{2} = \frac{|c|}{10}$

EX 8: $3\frac{3}{4} = |f|$

EX 9: $2|x + 4| = 0$

EX 10: $|x + 6| = -7$