

Solving Absolute Value Equations and Inequalities

Recall that the absolute value of a number is its distance from 0 on the number line. In order to solve an absolute value equation or inequality, we must first get the equation or inequality into the form $|x|=a$ or $|x|=-a$ for an equation and $|x|<a$ and $|x|>a$.

For an absolute value equation, we will have one equation to solve and for an absolute value inequality, we will have two inequalities to solve. To be able to solve these problems, you need to get the absolute value part of the equation or inequality on one side by itself.

Examples of absolute value equations:

$ x-7 =5$	$ x+3 -2=8$	$5- 4x+3 =2$	$5- 4x+3 =2$
$x-7=5$	$ x+3 =10$	$- 4x+3 =-3$	$- 4x+3 =-3$
$x=-12$	$x+3=10$	$ 4x+3 =3$	$ 4x+3 =3$
<i>or</i>	$x=7$	$4x+3=3$	or $4x+3=-3$
$x-7=-5$	<i>or</i>	$4x=0$	$4x=-6$
$x=2$	$x+3=-10$	$x=0$	$x=-\frac{6}{4}=-\frac{3}{2}$
	$x=-13$		

Examples of absolute value inequalities:

$ 5x \leq 4$	$ 2x+3 \leq 9$	$\left \frac{2x-1}{3}\right \geq \frac{5}{6}$
rewrite it as	$-9\leq 2x+3\leq 9$	$-\frac{5}{6}\geq \frac{2x-1}{3}\geq \frac{5}{6}$
$-4\leq 5x\leq 4$	$-12\leq 2x\leq 6$	$-5\geq 2(2x-1)\geq 5$
$-\frac{4}{5}\leq x\leq \frac{4}{5}$	$-\frac{12}{2}\leq x\leq \frac{6}{2}$	$-5\geq 4x-2\geq 5$
	$-6\leq x\leq 3$	$-3\geq 4x\geq 7$
		$-\frac{3}{4}\geq x\geq \frac{7}{4}$

$$|3x+5|<0$$

No solution. Absolute values cannot equal a negative number.