

Absolute Value Equations

Isolate the absolute value expression, then create two equations; one positive, and one negative. Solve each, then check!

1. $|x| = 2$

$$x = 2 \quad \neq \quad x = -2$$

2. $|2x - 9| = 15$

$$2x - 9 = 15 \quad \neq \quad 2x - 9 = -15$$

$$2x = 24 \quad \quad \quad 2x = -6$$

$$x = 12 \quad \checkmark \quad \quad \quad x = -3 \quad \checkmark$$

3. $|9 - 2x| = 10 + 3x$

$$9 - 2x = 10 + 3x \quad \neq \quad 9 - 2x = -(10 + 3x)$$

$$-1 = 5x$$

$$\boxed{-\frac{1}{5} = x}$$

check: $|9 + \frac{2}{5}| = 10 - \frac{3}{5}$

$$9\frac{2}{5} = 9\frac{2}{5}$$

$$\checkmark$$

$$9 - 2x = -10 - 3x$$

$$\boxed{x = -19}$$

$$|9 - 2(-19)| = 10 + 3(-19)$$

$$|47| = -47$$

$$47 \neq -47$$

extraneous

4. $|2 + 3x| - 5 = 11 + 5x$

$$\quad \quad \quad +5 \quad +5$$

$$|2 + 3x| = 16 + 5x$$

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Absolute Value Inequalities

Create and solve a compound inequality.

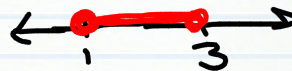
If the inequality is $<$ or \leq then the compound inequality is "and.*"

$$|x - 2| \leq 1$$

$$x - 2 \leq 1 \text{ AND } x - 2 \geq -1$$

$$x \leq 3 \text{ AND } x \geq 1$$

$$1 \leq x \leq 3$$

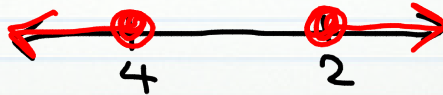


If the inequality is $>$ or \geq then the compound inequality is "or."

$$|x + 1| \geq 3$$

$$x + 1 \geq 3 \text{ OR } x + 1 \leq -3$$

$$x \geq 2 \text{ OR } x \leq -4$$



Absolute Value Inequalities

Inequality ($c > 0$)	Equivalent form	Graph of solution
$ ax + b < c$	$-c < ax + b < c$ *	
$ ax + b \leq c$	$-c \leq ax + b \leq c$ *	
$ ax + b > c$	$ax + b < -c$ or $ax + b > c$	
$ ax + b \geq c$	$ax + b \leq -c$ or $ax + b \geq c$	