

Solving Absolute Value Equations

Absolute Value – measures the distance from zero on a number line.

Since distance is always positive, absolute value is always positive too.

$$|27| = 27 \quad |-27| = 27$$

Examples

$$|x| = 4$$

$$x = 4 \text{ or } x = -4$$

$$|x+3| = 10$$

$$\begin{array}{l} x+3=10 \quad x+3=-10 \\ \boxed{x=7} \quad \boxed{x=-13} \end{array}$$

Check

$$\begin{array}{l} |7+3|=10 \quad |-13+3|=10 \\ |10|=10\checkmark \quad |-10|=10\checkmark \end{array}$$

$$|2x+5| = 7$$

$$\begin{array}{l} 2x+5=7 \quad 2x+5=-7 \\ 2x=2 \quad 2x=-12 \\ \boxed{x=1} \quad \boxed{x=-6} \end{array}$$

Check

$$\begin{array}{l} |2(1)+5|=7 \quad |2(-6)+5|=7 \\ |2+5|=7 \quad |-12+5|=7 \\ |7|=7\checkmark \quad |-7|=7\checkmark \end{array}$$

Setup two equations. One is set = positive answer, one is set = negative answer. You will never change what was inside the absolute value bars. Solve both equations. Check your answers in the original.

Solve for x.

$$|3x-9|=21$$

$$3x-9=21 \quad 3x-9=-21$$

$$3x=30 \quad 3x=-12$$

$$x=10$$

$$x=-4$$

Check

$$|3(10)-9|=21$$

$$|30-9|=21$$

$$|21|=21 \checkmark$$

$$|3(-4)-9|=21$$

$$|-12-9|=21$$

$$|-21|=21 \checkmark$$

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

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

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

$$x=3$$

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

$$x=1$$

Check

$$|3|+3=2(3)$$

$$3+3=6 \checkmark$$

$$|1|+3=2(1)$$

$$1+3 \neq 2$$

get the abs. value alone before you setup your 2 equations