

Absolute Value

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Absolute Value: The number of units that a number or expression is from zero on a number line.

Notation: the absolute value of x is represented by $|x|$

Example: Solve

$$\begin{aligned} |-5| &= 5 \\ |0| &= 0 \\ \left|\frac{2}{7}\right| &= \frac{2}{7} \\ -|-3| &= -(3) = -3 \\ |7-4| &= |3| = 3 \\ |4-7| &= |-3| = 3 \end{aligned}$$

$$|x-3| = 2$$

Case #1: $x-3 \geq 0$

$$\begin{aligned} x-3 &= 2 \\ +3 &+3 \\ \underline{x} &= 5 \end{aligned}$$

$$|3x+2| = 4$$

Case #1: $3x+2 \geq 0$

$$\begin{aligned} 3x+2 &= 4 \\ -2 &-2 \\ \underline{3x} &= 2 \\ \frac{3x}{3} &= \frac{2}{3} \\ \underline{x} &= \frac{2}{3} \end{aligned}$$

$$|x+1| = -5$$

No Solution

Case #1: $x+1 \geq 0$

$$\begin{aligned} x+1 &= -5 \\ -1 &-1 \\ \underline{x} &= -6 \end{aligned}$$

Case #2: $x-3 < 0$

$$\begin{aligned} (-1)(x-3) &= 2 \\ -x+3 &= 2 \\ -3 &-3 \\ (-1)(-x) &= (-1)(-1) \\ \underline{x} &= 1 \end{aligned}$$

Case #2: $3x+2 < 0$

$$\begin{aligned} (-1)(3x+2) &= 4 \\ -3x-2 &= 4 \\ +2 &+2 \\ -3x &= 6 \\ -3 &-3 \\ \underline{x} &= -2 \end{aligned}$$

Absolute Values
always make things
positive

Ex
1a

$$\begin{aligned} |-4-(-2)| \\ |-4+2| \\ |-2| \\ \underline{\underline{2}} \end{aligned}$$

2a

$$\begin{aligned} -|-2-(-3)|-|(-4)| &= -5 \quad \text{or} \quad -2-(-3)-(-4) = |-5| \\ -|2-3-4| &= -5 \\ -|-5| &= -5 \\ -5 &= -5 \end{aligned}$$

3a

$$\begin{aligned} &|-3|, |-3|, |-2|, |-(-2)| \\ &-3, 3, -2, 2 \end{aligned}$$

From $\rightarrow 6$

$$|-3|, |-2|, |-(-2)|, |-3|$$