

1.3 Solving Absolute Value Equations & Inequalities

Vocabulary:

Absolute Value - $|x|$, the distance from x to 0 on a number line (distance is positive).

Solving Absolute Value Equation

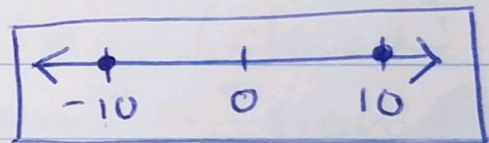
- ① Isolate the absolute value.
- ② Set up two equations with opposite signs.
- ③ Graph and check your answers.
- ④ Box your answer.

Ex #1 $|x| = 10$

$$\boxed{x = 10}$$

$$\cancel{x} = \frac{10}{-1}$$

$$\boxed{x = -10}$$

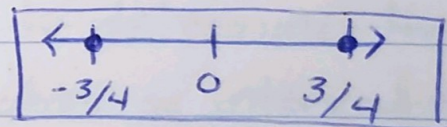


Ex #2 $|x| = 3/4$

$$\boxed{x = 3/4}$$

$$\cancel{x} = \frac{3/4}{-1}$$

$$\boxed{x = -3/4}$$



Ex #3 $|x| = -2$

$\boxed{\text{No solution}}$

Ex #4 $|x+15| = 37$

$$\begin{array}{r} x+15 = 37 \\ -15 \quad -15 \\ \hline \end{array}$$

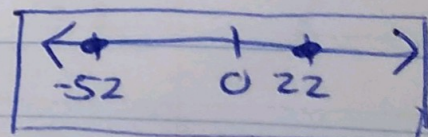
$$\boxed{x = 22}$$

$$-(x+15) = 37$$

$$\begin{array}{r} -x-15 = 37 \\ +15 \quad +15 \\ \hline \end{array}$$

$$\cancel{-x} = \frac{52}{-1}$$

$$\boxed{x = -52}$$



$$\text{Ex \#5} \quad |t-4| - \cancel{5} = \cancel{0} \quad \begin{matrix} +5 \\ +5 \end{matrix}$$

$$|t-4| = 5$$

$$t - \cancel{4} = 5 \quad \begin{matrix} +4 \\ +4 \end{matrix}$$

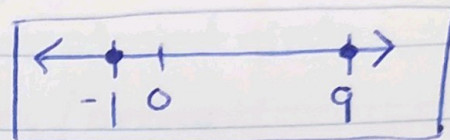
$$\boxed{t = 9}$$

$$-(t-4) = 5$$

$$-t + \cancel{4} = 5 \quad \begin{matrix} -4 \\ -4 \end{matrix}$$

$$-t = 1$$

$$\boxed{t = -1}$$



Solving Inequalities

> greater than (open)

≥ greater than or equal to (closed)

< less than (open)

≤ less than or equal to (closed)

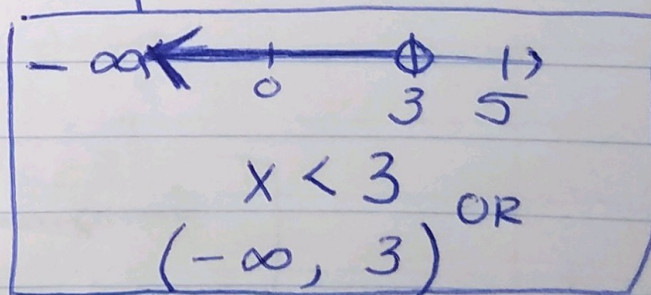
- ① Change the inequality to an "=" sign & solve
- ② Graph on a number line & use open/closed circles
- ③ Check a point on each side to determine the arrow
- ④ Write the solution in inequality or interval notation.

$$\text{Ex \#6} \quad 2x + 3 < 9$$

$$2x + \cancel{3} = \cancel{9} \quad \begin{matrix} -3 \\ -3 \end{matrix}$$

$$\cancel{2}x = \frac{6}{2}$$

$$x = 3$$

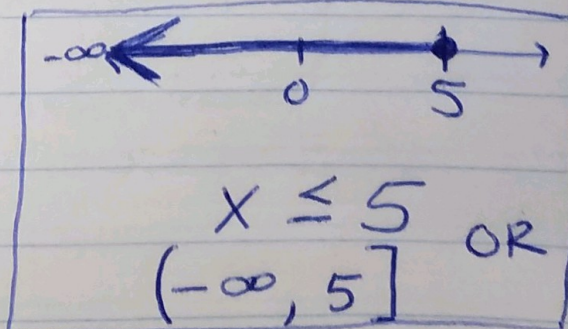


$$\text{Ex \#7} \quad 14 - 5x \geq -11$$

$$\cancel{14} - 5x = \cancel{-11} \quad \begin{matrix} -14 \\ -14 \end{matrix}$$

$$\cancel{-5}x = \frac{-25}{-5}$$

$$x = 5$$



Solving Absolute Value Inequalities

- ① Turn the ~~equal~~ ^{inequality} sign into an "=" sign & solve.
- ② Graph the solutions w/ an open or closed circle.
- ③ Check points on each side for shading / arrow.
- ④ Write the solution in inequality or interval notation.

Ex #8 $|2x+15| \geq 37$

$$|2x+15| = 37$$

$$2x+15=37$$

$$2x=22$$

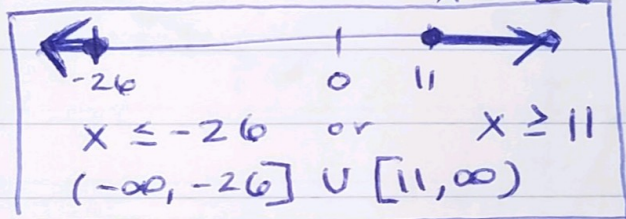
$$x=11$$

$$-(2x+15)=37$$

$$-2x-15=37$$

$$-2x=52$$

$$x=-26$$



Ex #9 $|t-4|+5 > 0$

$$|t-4|+5=0$$

$$|t-4| = -5 \quad \leftarrow \text{The equation has no solution!}$$

$$t-4=-5$$

$$t=-1$$

$$-(t-4)=-5$$

$$-t+4=-5$$

$$-t=-9$$

$$t=9$$

