

Objectives

- **Solve absolute value inequalities** and **categorize** solutions as ‘and’ or ‘or’ **inequalities** using a graphic organizer.
- **Success Criteria**
 - Understand why there is a case 1 and case 2 for absolute value inequalities
 - Graph solutions on a number line using test points
 - Rewrite in inequality and interval notation
- **Vocabulary:** absolute value, test points

AND Absolute Value Inequalities

$$|?| < \#$$

$$|?| \leq \#$$

$$\# > |?|$$

$$\# \geq |?|$$

AM:Solve Absolute Value Linear Inequalities

- This question is asking you to solve an **AND** inequality!
- We want to find all real numbers such that if you subtract 1 and apply the absolute value the result will be less than five.

Solve: $|x - 1| < 5$

- A) $-4 < x < 6$ B) $x < -4$ or $x > 6$
C) $x \leq -4$ or $x \geq 6$ D) $-4 \leq x \leq 6$

How to Solve Absolute Value Problems

- There are two cases for absolute values

- WHY?

- $x-1$ could be positive (case 1)
- $x-1$ could be negative and mapped to a positive number through the $||$ (case 2)

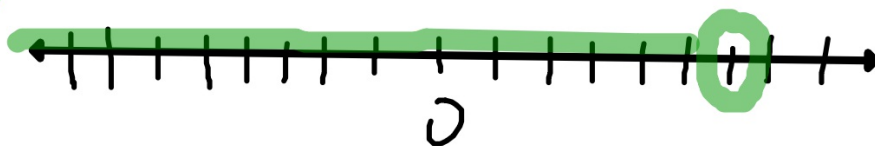
- Case 1:

$$\begin{array}{cc} \blacksquare & x-1 < 5 \\ & +1 & +1 \\ & x < 6 \end{array}$$

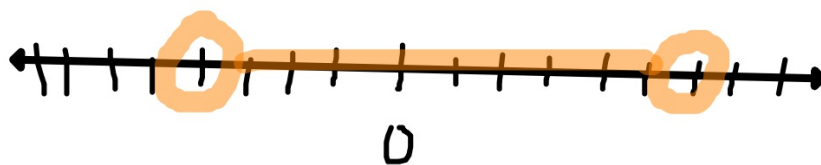
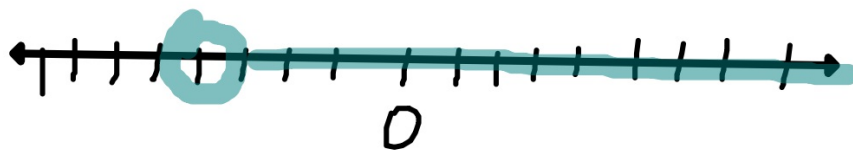
- Case 2:

$$\begin{array}{cc} \blacksquare & \overbrace{-(x-1)} < 5 \\ & -x+1 < 5 \\ & -1 & -1 \\ & -x < 4 \\ & \textcircled{-1} & \textcircled{-1} \\ & x > -4 \end{array}$$

case 1 $x < b$



case 2 $x > -4$



$-4 < x < b$ $(-4, b)$

AM:Solve Absolute Value Linear Inequalities

- This question is asking you to solve an **AND** inequality!
- We want to find all real numbers such that if you add seven and apply the absolute value the result will be less than or equal to six.

Solve: $|x + 7| \leq 6$

A) $-13 < x < -1$

B) $x \leq -13$ or $x \geq -1$

C) $-13 \leq x \leq -1$

D) $x < -13$ or $x > -1$

$$|x+7| \leq 6$$

$$x+7 \leq 6$$

$$x \leq -1$$

$$-(x+7) \leq 6$$

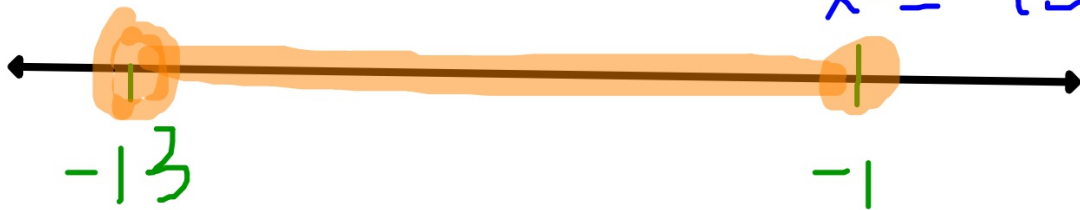
$$-x - 7 \leq 6$$

$$+7 \quad +7$$

$$\underline{-x} \leq \underline{13}$$

$$\underline{-1}$$

$$x \geq -13$$



OR Absolute Value Inequalities

$$|?| > \#$$

$$|?| \geq \#$$

$$\# \leq |?|$$

$$\# < |?|$$

Solve Absolute Value Linear Inequalities

- This question is asking you to solve an **OR** inequality!
- We want to find all real numbers such that if you multiply the number by two add three and apply the absolute value to the quantity the result will be greater than thirteen. This requires you to stretch your imagination.

Solve: $|2x + 3| > 13$

$$2x+3>13$$

$$\begin{array}{r} -3 \quad -3 \\ \hline 2x > 10 \\ \hline x > 5 \end{array}$$

$$-(2x+3)>13$$

$$-2x-3>13$$

$$\begin{array}{r} +3 \quad +3 \\ \hline -2x > 16 \\ \hline \end{array}$$

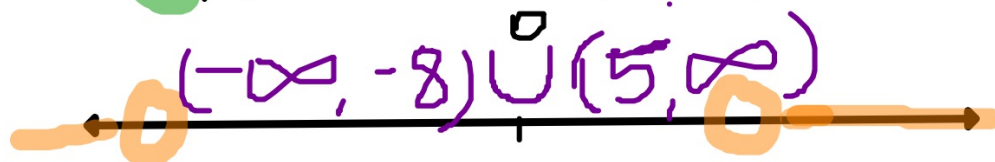
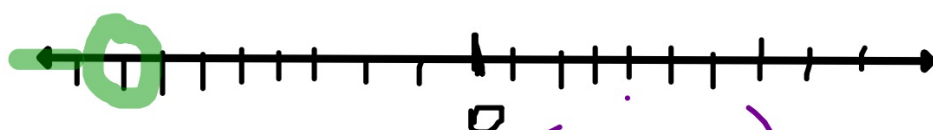
$$\frac{-2x}{-2} > \frac{16}{-2}$$

$$x < -8$$

$$x > 5$$

OR

$$x < -8$$



$(-\infty, \infty)$

\mathbb{R}



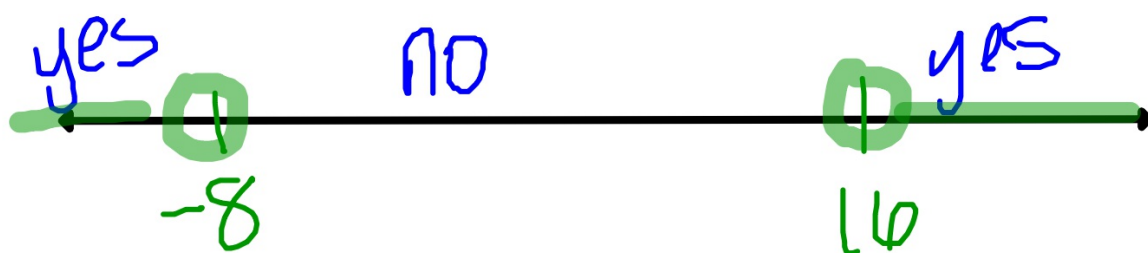
$x \in \mathbb{R}$
is an element of

Solve Absolute Value Linear Inequalities

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$$\text{Solve: } |-x + 4| > 12$$

$$x < -8 \text{ OR } x > 16$$



$$|x+4| > 12$$

$$| -(-9) + 4 | > 12$$

$$| 13 | > 12$$

$$| -18 + 4 | > 12$$

$$| -14 | > 12$$

$$14 > 12$$

AM: Solve absolute value inequalities

2. $|4x+4| \geq 3$

[A] $x \leq -\frac{7}{4}$ or $x \geq -\frac{1}{4}$ [B] $-\frac{7}{4} < x < -\frac{1}{4}$ [C] $-\frac{7}{4} \leq x \leq -\frac{1}{4}$ [D] none of these

$$|4x+4| \geq 3$$

Solve the following inequalities and write in all four representations:

$$|3x+7| \leq -4$$

Case 1

$$3x+7 \leq -4$$

Case 2

$$-(3x+7) \leq -4$$

$$|x+7| \leq 0$$

Case 1

$$x+7 \leq 0$$

Case 2

$$-(x+7) \leq 0$$

H_S
 R

absolute
value

$R \geq 0$