

2.6 NOTES - Solving Absolute Value Inequalities

LESSON 2.6

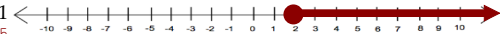
Solving Absolute Value Inequalities

LEARNING GOALS:


1) Solve absolute value inequalities and graph their solutions.

Common Core State Standards
HAS-CEO.A.1, HSA-REI.B.3

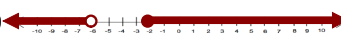
BELLWORK#1: Solve the inequality and graph.

A) $3x - 5 \geq 1$ 

$$\begin{aligned} 3x - 5 &\geq 1 \\ +5 &+5 \\ \hline 3x &\geq 6 \\ \frac{3x}{3} &\geq \frac{6}{3} \\ x &\geq 2 \end{aligned}$$

B) $-3 < 5x + 7 < 22$ 

$$\begin{aligned} -3 < 5x + 7 < 22 \\ -7 &-7 \quad -7 \quad -7 \\ \hline -10 < 5x < 15 \\ \frac{-10}{5} < \frac{5x}{5} < \frac{15}{5} \\ -2 < x < 3 \end{aligned}$$

C) $-4x + 3 \leq 11$ or $3x - 2 < -20$ 

$$\begin{aligned} -4x + 3 &\leq 11 & 3x - 2 &< -20 \\ -3 &-3 & +2 &+2 \\ \hline -4x &\leq 8 & 3x &< -18 \\ \frac{-4x}{-4} &\leq \frac{8}{-4} & \frac{3x}{3} &< \frac{-18}{3} \\ x &\geq -2 & x &< -6 \end{aligned}$$

$$x < -6 \text{ or } x \geq -2$$

BELLWORK#2: Solve the absolute value equation.

<p>A) $x + 5 = 2$</p> $\begin{aligned} x + 5 &= 2 \\ -5 &-5 \\ \hline x &= -3 \end{aligned}$ $\begin{aligned} x + 5 &= -2 \\ -5 &-5 \\ \hline x &= -7 \end{aligned}$	<p>B) $2x - 7 = 3$</p> $\begin{aligned} 2x - 7 &= 3 \\ +7 &+7 \\ \hline 2x &= 10 \\ \frac{2x}{2} &= \frac{10}{2} \\ x &= 5 \end{aligned}$ $\begin{aligned} 2x - 7 &= -3 \\ +7 &+7 \\ \hline 2x &= 4 \\ \frac{2x}{2} &= \frac{4}{2} \\ x &= 2 \end{aligned}$	<p>C) $5x + 2 = -3$</p> <p style="font-size: 2em; border: 1px solid red; border-radius: 50%; padding: 10px; display: inline-block;">NO SOLUTION</p>
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LESSON 2.6 - Solving Absolute Value Inequalities

- Last chapter, we learned how to solve absolute value equations, which have two solutions: one for the negative version of the equation and one for the positive.
- Last lesson, we learned how to solve compound inequalities, which have two bounds. The solutions of an "and" compound inequality lie in between two numbers. The solutions of an "or" compound inequality lie beyond two numbers.
- In today's lesson, we are going to combine the concepts of absolute value equations and compound inequalities.

ABSOLUTE VALUE INEQUALITIES

- The inequality $|ax + b| < c$, where $c > 0$, means that $ax + b$ is between $-c$ and c . This is equivalent to $-c < ax + b < c$
- In other words, if an absolute value expression is LESS THAN a number, set up an "and" compound inequality, with the negative answer on the left and the positive answer on the right.

ABSOLUTE VALUE INEQUALITIES

- The inequality $|ax + b| > c$, where $c > 0$, means that $ax + b$ is beyond $-c$ and c . This is equivalent to $ax + b < -c$ or $ax + b > c$
- In other words, if an absolute value expression is GREATER THAN a number, set up an "or" compound inequality, with one inequality less than the negative answer and the other inequality greater than the positive answer.

2.6 NOTES - Solving Absolute Value Inequalities

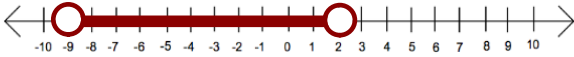
Rewrite the absolute value inequality as a compound inequality.
Then solve the inequality and graph your solution.

$$|2x + 7| < 11$$

$$\begin{array}{c} -11 < 2x + 7 < 11 \\ -7 \quad \quad -7 \quad -7 \end{array}$$

$$\frac{-18}{2} < \frac{2x}{2} < \frac{4}{2}$$

$$-9 < x < 2$$



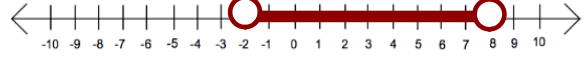
Rewrite the absolute value inequality as a compound inequality.
Then solve the inequality and graph your solution.

$$|4x - 12| < 20$$

$$\begin{array}{c} -20 < 4x - 12 < 20 \\ +12 \quad \quad +12 \quad +12 \end{array}$$

$$\frac{-8}{4} < \frac{4x}{4} < \frac{32}{4}$$

$$-2 < x < 8$$



Rewrite the absolute value inequality as a compound inequality.
Then solve the inequality and graph your solution.

$$|6x - 3| \geq 9$$

$$\begin{array}{l} 6x - 3 \leq -9 \\ +3 \quad +3 \\ \hline 6x \leq -6 \\ \hline x \leq -1 \end{array} \qquad \begin{array}{l} 6x - 3 \geq 9 \\ +3 \quad +3 \\ \hline 6x \geq 12 \\ \hline x \geq 2 \end{array}$$

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



Rewrite the absolute value inequality as a compound inequality.
Then solve the inequality and graph your solution.

$$|9 + 3x| > 12$$

$$\begin{array}{l} 9 + 3x < -12 \\ -9 \quad \quad -9 \\ \hline 3x < -21 \\ \hline x < -7 \end{array} \qquad \begin{array}{l} 9 + 3x > 12 \\ -9 \quad \quad -9 \\ \hline 3x > 3 \\ \hline x > 1 \end{array}$$

$$x < -7 \text{ or } x > 1$$



Rewrite the absolute value inequality as a compound inequality.
Then solve the inequality and graph your solution.

$$|6 - x| \leq 4$$

$$\begin{array}{c} -4 \leq 6 - x \leq 4 \\ -6 \quad -6 \quad \quad -6 \end{array}$$

$$\frac{-10}{-1} \leq \frac{-x}{-1} \leq \frac{-2}{-1}$$

$$10 \geq x \geq 2$$

$$2 \leq x \leq 10$$



Rewrite the absolute value inequality as a compound inequality.
Then solve the inequality and graph your solution.

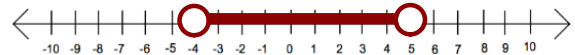
$$|-2x + 1| < 9$$

$$\begin{array}{c} -9 < -2x + 1 < 9 \\ -1 \quad \quad -1 \quad -1 \end{array}$$

$$\frac{-10}{-2} < \frac{-2x}{-2} < \frac{8}{-2}$$

$$5 > x > -4$$

$$-4 < x < 5$$



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Rewrite the absolute value inequality as a compound inequality.
Then solve the inequality and graph your solution.

$$|6 - 3x| \geq 21$$

$$\begin{array}{r} 6 - 3x \leq -21 \\ -6 \quad -6 \end{array} \quad \begin{array}{r} 6 - 3x \geq 21 \\ -6 \quad -6 \end{array}$$

$$\begin{array}{r} -3x \leq -27 \\ -3 \quad -3 \end{array} \quad \begin{array}{r} -3x \geq 15 \\ -3 \quad -3 \end{array}$$

$$x \geq 9 \quad x \leq -5$$

$$x \leq -5 \text{ or } x \geq 9$$



Rewrite the absolute value inequality as a compound inequality.
Then solve the inequality and graph your solution.

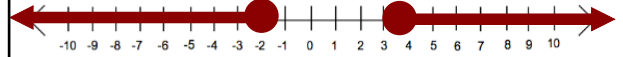
$$|3 - 4x| \geq 11$$

$$\begin{array}{r} 3 - 4x \leq -11 \\ -3 \quad -3 \end{array} \quad \begin{array}{r} 3 - 4x \geq 11 \\ -3 \quad -3 \end{array}$$

$$\begin{array}{r} -4x \leq -14 \\ -4 \quad -4 \end{array} \quad \begin{array}{r} -4x \geq 8 \\ -4 \quad -4 \end{array}$$

$$x \geq 3.5 \quad x \leq -2$$

$$x \leq -2 \text{ or } x \geq 3.5$$



Rewrite the absolute value inequality as a compound inequality.
Then solve the inequality and graph your solution.

$$|1 + 8x| < 7$$

$$\begin{array}{r} -7 < 1 + 8x < 7 \\ -1 \quad -1 \quad -1 \end{array}$$

$$\begin{array}{r} -8 < 8x < 6 \\ 8 \quad 8 \quad 8 \end{array}$$

$$-1 < x < 0.75$$



Rewrite the absolute value inequality as a compound inequality.
Then solve the inequality and graph your solution.

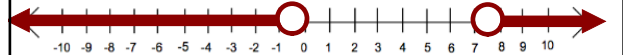
$$|2x - 7| > 8$$

$$\begin{array}{r} 2x - 7 < -8 \\ +7 \quad +7 \end{array} \quad \begin{array}{r} 2x - 7 > 8 \\ +7 \quad +7 \end{array}$$

$$\begin{array}{r} 2x < -1 \\ 2 \quad 2 \end{array} \quad \begin{array}{r} 2x > 15 \\ 2 \quad 2 \end{array}$$

$$x < -0.5 \quad x > 7.5$$

$$x < -0.5 \text{ or } x > 7.5$$



SPECIAL ABSOLUTE VALUE INEQUALITIES

$$|ax + b| < -c \text{ --- No Solution}$$

$$|ax + b| > -c \text{ --- All Real Numbers}$$

Rewrite the absolute value inequality as a compound inequality.
Then solve the inequality and graph your solution.

$$|2x + 6| < -5$$

NO SOLUTION

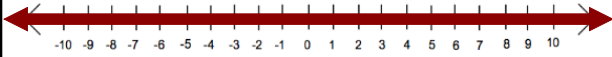


2.6 NOTES - Solving Absolute Value Inequalities

Rewrite the absolute value inequality as a compound inequality.
Then solve the inequality and graph your solution.

$$|4x - 1| > -9$$

ALL REAL NUMBERS or
INFINITELY MANY SOLUTIONS



HOMEWORK:

2.6 Worksheet - Solving Absolute Value
Inequalities