

6.6

Solve Absolute Value Inequalities

Goal • Solve absolute value inequalities.

Your Notes

Example 1 Solve an absolute value inequality

Solve the inequality. Graph your solution.

a. $|x| \leq 9$

b. $|x| > \frac{1}{4}$

Solution

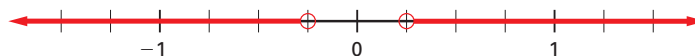
a. The distance between x and 0 is less than or equal to 9. So, $-9 \leq x \leq 9$. The solutions are all real numbers less than or equal to 9 and greater than or equal to -9.



b. The distance between x and 0 is greater than $\frac{1}{4}$.

So, $x > \frac{1}{4}$ or $x < -\frac{1}{4}$. The solutions are all real

numbers greater than $\frac{1}{4}$ or less than $-\frac{1}{4}$.



Note that $<$ can be replaced by \leq and $>$ can be replaced by \geq .

SOLVING ABSOLUTE VALUE INEQUALITIES

- The inequality $|ax + b| < c$ where $c > 0$ is equivalent to the compound inequality $-c < ax + b < c$.
- The inequality $|ax + b| > c$ where $c > 0$ is equivalent to the compound inequality $ax + b < -c$ or $ax + b > c$.

Example 2 Solve an absolute value inequality

Solve $|2x - 7| < 9$. Graph your solution.

Solution

$$|2x - 7| < 9$$

Write original inequality.

$$-9 < 2x - 7 < 9$$

Rewrite as compound inequality.

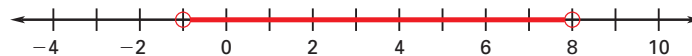
$$-2 < 2x < 16$$

Add 7 to each expression.

$$-1 < x < 8$$

Divide each expression by 2.

The solutions are all real numbers greater than -1 and less than 8 . Check several solutions in the original inequality.



Example 3 Solve an absolute value inequality

Solve $|x + 8| \geq 4$. Graph your solution.

Solution

$$|x + 8| \geq 4$$

Write original inequality.

$$|x + 8| \geq 4$$

Add 4 to each side.

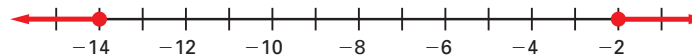
$$x + 8 \geq 4 \quad \text{or} \quad x + 8 \leq -4$$

Rewrite as compound inequality.

$$x \geq -4 \quad \text{or} \quad x \leq -12$$

Subtract 8 from each side.

The solutions are all real numbers greater than or equal to -4 or less than or equal to -12 .

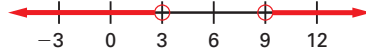


Your Notes

✓ **Checkpoint** Solve the inequality. Graph your solution.

1. $3x - 6 > 9$

$x < 9$ or $x < 3$



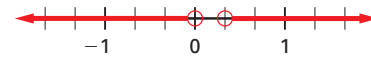
2. $2x - 11 \leq 7$

$\frac{2}{3} \leq x \leq 3$



3. $-2x - 1 \leq 5$

$x \geq -\frac{1}{3}$ or $x < 0$



SOLVING INEQUALITIES

One-Step and Multi-Step Inequalities

- Follow the steps for solving an equation, but reverse the inequality symbol when multiplying or dividing by a negative number.

Compound Inequalities

- If necessary, rewrite the inequality as two separate inequalities. Then solve each inequality separately. Include and or or in the solution.

Absolute Value Inequalities

- If necessary, isolate the absolute value expression on one side of the inequality. Rewrite the absolute value inequality as a compound inequality. Then solve the compound inequality.

Homework