

Distance Boundaries

Solve absolute value inequalities and show where x can be.

HIGH SCHOOL • MA.912.AR.4.2

MA.912.AR.4.2 "Given a mathematical or real-world context, write and solve one-variable absolute value inequalities. Represent solutions algebraically or graphically."

NAME _____

DATE _____

DISTANCE RULES

Absolute value shows distance from zero. For $|\text{expression}| < \text{a positive number}$, the expression is between the positive and negative values, so use AND. For $|\text{expression}| > \text{a positive number}$, the expression is outside those values, so use OR.

WORKED EXAMPLE

Solve and graph $|x + 17| > 6$.

- $|x + 17| > 6$ means $x + 17 > 6$ or $x + 17 < -6$.
- Subtract 17 from each inequality: $x > -11$ or $x < -23$.

Answer: $x < -23$ or $x > -11$

PRACTICE 6 problems

1 Solve and graph $|x - 9| < 4$.

ANSWER _____

2 Solve and graph $|x + 7| \geq 3$.

ANSWER _____

3 Solve and graph $|3x - 1| \leq 8$.

ANSWER _____

4 Solve and graph $|5x + 4| > 9$.

ANSWER _____

5 Solve and graph $|x/3 - 4| \leq 5$.

ANSWER _____

6 Solve and graph $|4x - 7| < 13$.

ANSWER _____

APPLY IT Show your work

- 1** A student who streams games wants an upload speed within 5 Mbps of 30 Mbps. Let x be the actual upload speed in Mbps. Write and solve an absolute value inequality for the acceptable speeds.

WORK SPACE

ANSWER _____

- 2** A drone club sets a drone's test height at 50 meters. A flight is flagged if its measured height differs from 50 meters by more than 12 meters. Let x be the measured height in meters. Write and solve an absolute value inequality for flagged flights.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Solve and graph $3|x - 4| - 2 > 13$.

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Solve and graph $ x - 9 < 4$.	$5 < x < 13$
2	Solve and graph $ x + 7 \geq 3$.	$x \leq -10$ or $x \geq -4$
3	Solve and graph $ 3x - 1 \leq 8$.	$-7/3 \leq x \leq 3$
4	Solve and graph $ 5x + 4 > 9$.	$x < -13/5$ or $x > 1$
5	Solve and graph $ x/3 - 4 \leq 5$.	$-3 \leq x \leq 27$
6	Solve and graph $ 4x - 7 < 13$.	$-3/2 < x < 5$

PART 2 · APPLY IT

1. **$|x - 30| \leq 5$; $25 \leq x \leq 35$ Mbps** Within 5 Mbps means the distance between x and 30 is at most 5. Solve $|x - 30| \leq 5$ to get speeds from 25 Mbps through 35 Mbps.
2. **$|x - 50| > 12$; $x < 38$ or $x > 62$ meters** More than 12 meters from 50 is represented by $|x - 50| > 12$. The measured height must be below 38 meters or above 62 meters.

CHALLENGE

$$x < -1 \text{ or } x > 9$$

Accept equivalent inequality order, such as $x > -11$ or $x < -23$. For graphs, use open circles for $<$ or $>$ and closed circles for $\leq$ or $\geq$.