

Absolute Value Equations and Inequalities

Algebra 1 • Section 3.4

Name: _____

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Quick Review and Helpful Hints

Inequalities solve almost like equations, but dividing or multiplying by a negative reverses the sign. For absolute value, think distance: less-than makes a band, while greater-than usually splits into two rays.

▷ **Example:** Solve $-2x + 5 < 13$.

Work: Subtract 5 to get $-2x < 8$. Divide by -2 and reverse the inequality: $x > -4$.

★ **Answer:** $x > -4$

◆ Practice Problems

Solve each problem. Show enough work that another student could follow your thinking.

1. Solve $|x| = 9$.

6. Solve $|x| > 7$.

2. Solve $|x - 4| = 6$. _____

7. Solve $|2x + 1| = 9$. _____

3. Solve $|2x| = 14$. _____

8. Solve $|3x - 6| \leq 12$. _____

4. Solve $|x + 3| < 5$. _____

9. Solve $|x + 8| = -2$. _____

5. Solve $|x - 1| \leq 4$. _____

10. Solve $|x - 5| > 3$. _____

◆ Word Problems

11. A machine part may be within 0.02 inch of 1.50 inches. Write an absolute value inequality.

12. A score is considered close if it is less than 6 points from 80. Write and solve.



Answer Keys

- $x = \pm 9$
- $x = 10$ or $x = -2$
- $x = \pm 7$
- $-8 < x < 2$
- $-3 \leq x \leq 5$
- $x < -7$ or $x > 7$
- $x = 4$ or $x = -5$
- $-2 \leq x \leq 6$
- No solution
- $x < 2$ or $x > 8$
- $|x - 1.50| \leq 0.02$
- $|s - 80| < 6$; $74 < s < 86$

Step-by-Step Explanations

- Absolute value asks 'how far from zero?' — both 9 and -9 sit exactly 9 steps away.
- The inside could be 6 or -6 , so solve $x - 4 = 6$ and $x - 4 = -6$ to catch both answers.
- Since $2x$ must be 14 or -14 , halving each option gives the pair $x = \pm 7$.
- 'Less than' means staying close, so $x + 3$ lives between -5 and 5; subtract 3 across.
- Think of x as no farther than 4 from 1 — that stretches from $1 - 4$ up to $1 + 4$.
- 'Greater than' pushes x far from zero, landing outside the band — either below -7 or above 7.
- Split into the two cases $2x + 1 = 9$ and $2x + 1 = -9$, then solve each for its own value.
- Sandwich the inside: $-12 \leq 3x - 6 \leq 12$, then add 6 everywhere and divide each part by 3.
- Distance is never negative, so an absolute value can't equal -2 — nothing makes this work.
- Being more than 3 away from 5 means landing outside 2 to 8, on either side.
- 'Within' is distance language — the gap between x and 1.50 stays at most 0.02.
- 'Less than 6 away' is a distance, written $|s - 80| < 6$; unwrapping it around 80 gives the range.



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