Absolute Value Equations and Inequalities

Algebra 1 •Section 3.4

Name: _____	Date: _____	Score: _____ / 12

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 $|x| = 9$.

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

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

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

_____

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

_____

6. Solve $|x| > 7$.

_____

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

_____

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

_____

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

_____

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.

_____

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Answer Keys

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

Step-by-Step Explanations

1. Absolute value asks 'how far from zero?' — both 9 and -9 sit exactly 9 steps away.

2. The inside could be 6 or -6, so solve $x - 4 = 6$ and $x - 4 = -6$ to catch both answers.

3. Since $2x$ must be 14 or -14, halving each option gives the pair $x = \pm 7$.

4. 'Less than' means staying close, so $x + 3$ lives between -5 and 5; subtract 3 across.

5. Think of x as no farther than 4 from 1 — that stretches from $1 - 4$ up to $1 + 4$.

6. 'Greater than' pushes x far from zero, landing outside the band — either below -7 or above 7.

7. Split into the two cases $2x + 1 = 9$ and $2x + 1 = -9$, then solve each for its own value.

8. Sandwich the inside: $-12 \leq 3x - 6 \leq 12$, then add 6 everywhere and divide each part by 3.

9. Distance is never negative, so an absolute value can't equal -2 — nothing makes this work.

10. Being more than 3 away from 5 means landing outside 2 to 8, on either side.

11. 'Within' is distance language — the gap between x and 1.50 stays at most 0.02.

12. 'Less than 6 away' is a distance, written $|s - 80| < 6$; unwrapping it around 80 gives the range.

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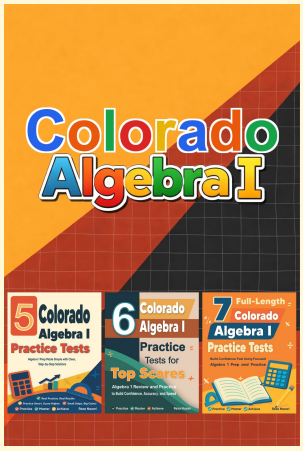

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