

# Absolute Value Equations and Inequalities

Algebra 1 • Section 3.4

Name: \_\_\_\_\_

Date: \_\_\_\_\_

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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

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