

Solve each equation. If there is no solution, write *no solution*.

1.  $|b| = 2$

2.  $4 = |y|$

3.  $|w| = \frac{1}{2}$

4.  $|n| + 2 = 8$

5.  $7 = |s| + 4$

6.  $|x| - 10 = -3$

7.  $4|d| = 20$

8.  $-3|m| = -6$

9.  $|y| + 3 = 3$

10.  $12 = -4|k|$

11.  $2|z| - 5 = 1$

12.  $16 = 5|p| - 4$

Example 2  
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Solve each equation. If there is no solution, write *no solution*.

13.  $|r - 8| = 5$

14.  $|c + 2| = 6$

15.  $2 = |g + 1|$

16.  $3 = |m + 2|$

17.  $|v - 2| = 7$

18.  $-3|y - 3| = 9$

19.  $2|d + 3| = 8$

20.  $-2|7d| = -14$

21.  $1.2|5p| = 3.6$

Example 3  
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22. Complete each statement with *less than* or *greater than*.  
a. For  $|x| < 5$ , the graph includes all points whose distance is ? 5 units from 0.  
b. For  $|x| > 5$ , the graph includes all points whose distance is ? 5 units from 0.

Solve each inequality. Graph your solution.

23.  $|k| > 2.5$

24.  $|w| < 2$

25.  $|x + 3| < 5$

26.  $|n + 8| \geq 3$

27.  $|y - 2| \leq 1$

28.  $|p - 4| \leq 3$

29.  $|2c - 5| < 9$

30.  $|2y - 3| \geq 7$

31.  $|3t + 1| > 8$

32.  $|4x + 1| > 11$

33.  $|5t - 4| \geq 16$

34.  $|3 - r| < 5$

Example 4  
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35. **Manufacturing** The ideal diameter of a gear for a certain type of clock is 12.24 mm. An actual diameter can vary by 0.06 mm. Find the range of acceptable diameters.

36. **Manufacturing** The ideal width of a certain conveyor belt for a manufacturing plant is 50 in. An actual conveyor belt can vary from the ideal by at most  $\frac{7}{32}$  in. Find the acceptable widths for this conveyor belt.

Skills

Solve each equation or inequality.

37.  $|2d| + 3 = 21$

38.  $|-3n| - 2 = 7$

39.  $|p| - \frac{2}{3} = \frac{5}{6}$

40.  $|r| + 2.7 = 4.5$

41.  $4|k + 1| = 16$

42.  $-2|c - 4| = -8$

43.  $|3d| \geq 6$

44.  $|n| - 3 > 7$

45.  $9 < |c + 7|$

46.  $\frac{|x|}{3} = -4.2$

47.  $|6.5x| < 39$

48.  $4|n| = 32$

49.  $|\frac{1}{2}a| + 1 = 5$

50.  $|a| + \frac{1}{2} = 3\frac{1}{2}$

51.  $4 - 3|m + 2| > -14$

Write an absolute value inequality that represents each situation.

52. all numbers less than 3 units from 0
53. all numbers greater than 7.5 units from 0
54. all numbers more than 2 units from 6
55. all numbers at least 3 units from -1
56. **Manufacturing** A pasta manufacturer makes 16-ounce boxes of macaroni. The manufacturer knows that not every box weighs exactly 16 ounces. The allowable difference is 0.05 ounce. Write and solve an absolute value inequality that represents this situation.
57. **Elections** In a poll for the upcoming mayoral election, 42% of likely voters said they planned to vote for Lucy Jones. This poll has a margin of error of  $\pm 3$  percentage points. Use the inequality  $|v - 42| \leq 3$  to find the least and greatest percent of voters  $v$  likely to vote for Lucy Jones according to this poll.

58. **Quality Control** A box of one brand of crackers should weigh 454 g. The quality-control inspector randomly selects boxes to weigh. The inspector sends back any box that is not within 5 g of the ideal weight.
- Write an absolute value inequality for this situation.
  - What is the range of allowable weights for a box of crackers?
59. **Gears** Acceptable diameters for one type of gear are from 6.25 mm to 6.29 mm. Write an absolute value inequality for the acceptable diameters for the gear.
60. **Writing** Explain why the absolute value inequality  $|2c - 5| + 9 < 4$  has no solution.
61. **Open-Ended** Write an absolute value equation using the numbers 5, 3, -12. Then solve your equation.

Write an absolute value equation that has the given values as solutions.

Sample 8, 2

$$|x - 5| = 3 \quad \text{Since 8 and 2 are both 3 units from 5, write } |x - 5| = 3.$$

62. 2, 6                      63. -2, 6                      64. -3, 9                      65. 9, 16  
66. -1, 7                      67. 3, 8                      68. -15, -3                      69. 2, 10

70. **Banking** The ideal weight of a nickel is 0.176 ounce. To check that there are 40 nickels in a roll, a bank weighs the roll and allows for an error of 0.015 ounce in the total weight.
- What is the range of acceptable weights if the wrapper weighs 0.05 ounce?
  - Critical Thinking** For any given roll of nickels, can you be certain that all the coins are acceptable? Explain.
71. **a. Meteorology** A meteorologist reported that the previous day's temperatures varied 14 degrees from the normal temperature of 25°F. What were the maximum and minimum temperatures possible on the previous day?
- Write an absolute value equation for the temperature.

**Challenge**

Solve each equation. Check your solution.

72.  $|x + 4| = 3x$                       73.  $|4x - 5| = 2x + 1$                       74.  $\frac{4}{3}|2x + 3| = 4x$

Replace the  $\equiv$  with  $\leq$ ,  $\geq$ , or  $=$ .

75.  $|a + b| \equiv |a| + |b|$                       76.  $|a - b| \equiv |a| - |b|$   
77.  $|ab| \equiv |a| \cdot |b|$                       78.  $\left|\frac{a}{b}\right| \equiv \frac{|a|}{|b|}, b \neq 0$

Write an absolute value inequality that each graph could represent.

