

Exercises

Communicate

1. Explain why the equation $|3x - 5| + 4 = 3$ has no solution.
2. Discuss why it is necessary to always check your solution when solving absolute-value equations.
3. Explain why an absolute-value equation can have two solutions.
4. Discuss the meanings of the words *and* and *or*. Compare the mathematical meanings of these words with their common meanings.
5. Use a graph to describe the type of absolute-value inequality whose solution is any real number.

Guided Skills Practice

Solve each equation. Check your solution. (EXAMPLES 1 AND 2)

6. $|x - 10| = 4$
7. $|2x - 5| = 3$
8. $10 = |7 - 3x|$
9. $x + 4 = |x - 2|$
10. $\frac{1}{2}x + 1 = |x - 2| - 1$
11. $\frac{1}{2}x + 1 = |x + 3|$

Solve each inequality. Graph the solution on a number line.

(EXAMPLES 3 AND 4)

12. $2 < |4 - x|$
13. $|2x + 1| \geq 5$
14. $|5 + x| < \frac{1}{2}$
15. $\frac{1}{2}|2x + 1| \geq 2$
16. $3|x + 1| \leq 2$
17. $3|x + 1| + 3 > 2$

APPLICATION

18. **RECREATION** Ashley tosses a horseshoe at a stake 25 feet away. The horseshoe lands no more than 2 feet from the stake.

(EXAMPLE 5)

- a. Write an absolute-value inequality that represents the range of distances that the horseshoe traveled.
- b. Solve this inequality and graph it on a number line.

Practice and Apply

Match each statement on the left with a statement or sentence on the right.

- | | |
|--------------------|--------------------------------------|
| 19. $ x + 2 = 4$ | a. $x < 2$ and $x > -6$ |
| 20. $ x + 2 < 4$ | b. $x = 2$ or $x = -6$ |
| 21. $ x + 2 < -4$ | c. $x > 2$ or $x < -6$ |
| 22. $ x + 2 > -4$ | d. There is no solution. |
| 23. $ x + 2 > 4$ | e. The solution is all real numbers. |
| 24. $ x + 2 = -4$ | f. none of the above |

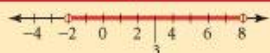
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 for Exercises 25–57

Solve each equation.


25. $|x + 4| = 8$ 26. $|x - 5| = 12$ 27. $|2 + x| = 10$
 28. $|8 - x| = 1$ 29. $|x - 2| = 9$ 30. $|x + 5| = 11$
 31. $|2x - 15| = 11$ 32. $|3x + 12| = 18$ 33. $|10 - 4x| = 28$
 34. $|5 + 4x| = 17$ 35. $|5x - 6| = 2$ 36. $|10 - 3x| + 5 = 2$
 37. $|10x + 2| - 18 = -12$ 38. $|4 - 3x| - 9 = 3$ 39. $|2x - 8| + 2 = 1$

Solve each inequality. Graph the solution on a number line. If the equation has no solution, write *no solution*.

40. $|x - 4| > 1$ 41. $|x + 5| \leq 7$ 42. $|3x| > 15$
 43. $|-2x| \leq 12$ 44. $|4x| \leq -8$ 45. $|3 - x| \geq -5$
 46. $|2 + 5x| \leq 3$ 47. $|2x - 3| < 11$ 48. $|4x + 6| \leq 14$
 49. $\left| \frac{2x + 3}{-5} \right| < 3$ 50. $|4x - 5| \geq 15$ 51. $|2x - 1| \geq -5$
 52. $|5x + 3| > -2$ 53. $|7 - 6x| < -4$ 54. $|9x + 4| \leq -11$
 55. $-2|4x + 1| \leq -4$ 56. $-2|4x + 1| \geq -4$ 57. $\left| \frac{3}{2} - \frac{5}{2}x \right| < -\frac{7}{2}$

SUMMARY		
Three different representations of an inequality are given below.		
Verbal	Algebraic	Graphic
The distance between x and 3 is less than 5.	$ x - 3 < 5$	

Examine the summary box above. For Exercises 58–60, write the two missing representations for each inequality.

58. The distance between x and 7 is less than 4.
 59. $|x - 4| < 1$
 60. 

CHALLENGE

61. Solve the inequality $\left| \frac{4x}{3} \right| \leq 2x + 5$.

APPLICATIONS

For Exercises 62–65, write and solve an absolute-value inequality.

62. **HEALTH** Antonio weighs 120 pounds, and his doctor said that his weight differs from his ideal body weight by less than 5 percent. What are the possible values, to the nearest pound, for Antonio's ideal body weight?
 63. **ENTERTAINMENT** A tightrope walker is 10 feet from one end of the rope. If he then takes 3 steps and each step is 11 inches long, how far is he now from the same end of the rope? Give both possible answers.