# 3.6 Exercises

## Concept Check

**Fill-in-the-Blank.** Complete each sentence using information found in this section.

1. To determine which half-plane is a solution of a linear inequality (and therefore should be shaded), _____ any point clearly on one side of the boundary line.
2. If a point is tested on one side of the boundary line and it _____ the inequality, shade that side of the boundary line. The shaded region is the solution set.
3. If a boundary line is not included in the solution set, the solution is a/an _____ half-plane.
4. A straight line that separates two half-planes is called a/an _____ line.
5. If a boundary line is part of the solution set, the graph of the solution set is a/an _____ half-plane.
6. The boundary line should be _____ if the inequality is $<$ or $>$.

**True/False.** Determine whether each statement is true or false. If a statement is false, explain how it can be changed so the statement will be true. (**Note:** There may be more than one acceptable change.)

7. A solid boundary line indicates that the points on that line are included in the solution.
8. If the solution set is an open half-plane, then the boundary line is included in the solution.
9. The boundary line is solid when the inequality uses a $<$ or $>$ symbol.
10. The slope of an inequality is used to determine whether the boundary line is included in the solution.

## Practice

Graph the solution set of each of the linear inequalities. See Examples 1 through 4.

1. $x + y \le 7$
2. $x - y > -2$
3. $x - y > 4$
4. $x + y \le 6$
5. $y < 4x$
6. $y < -2x$
7. $y \ge -3x$
8. $y > x$
9. $x - 2y > 8$
10. $x + 3y \le 3$
11. $4x + y \ge 2$
12. $5x - y < 4$
13. $y \le 5 - 3x$
14. $y \ge 8 - 2x$
15. $2y - x \le 0$
16. $x + y > 0$
17. $x + 4 \ge 0$
18. $x - 5 \le 0$
19. $y \ge -2$
20. $y + 3 < 0$
21. $4x < -3y + 9$
22. $3x < 2y - 4$
23. $3y > 4x + 6$
24. $5x < 2y - 6$
25. $x + 3y < 7$
26. $3x + 4y > 11$
27. $\frac{1}{2}x - y > 1$
28. $\frac{1}{3}x + y \ge 3$
29. $\frac{2}{3}x + y \ge 4$
30. $2x - \frac{4}{3}y > 8$

Use a graphing calculator to graph each of the linear inequalities. See Examples 5 and 6.

**31.** $y > \frac{1}{2}x$

**32.** $2x \geq -6y$

**33.** $x - y \leq 5$

**34.** $x + 2y > 8$

**35.** $y \geq -3$

**36.** $y \leq -4$

**37.** $2x + y \leq 6$

**38.** $x - 3y \geq 9$

**39.** $3x + 2y \geq 12$

**40.** $3x - 4y > 15$

## Applications

Solve.

**41.** The grade for a 1-credit-hour survey class is based on an exam and a project, which are worth a maximum of 50 points each. The sum of the two scores must be at least 75 points for a student to earn a passing grade.

**a.** Let the amount of points earned on the exam be represented by the variable $x$ and the amount of points earned on the project be represented by the variable $y$. Create a linear inequality to describe the solution set for a passing grade.

**b.** Graph the linear inequality from part a.

**c.** A student earns 45 points on their final exam and 22 points on their project. Plot this point on the graph. Did this student earn a passing grade?

**d.** Are there any points in the solution set that do not make sense for this situation?

**42.** A fail-safe is installed on a device with two electrical inputs. If the sum of the inputs is greater than 250 kilowatts, the fail-safe will activate and cause the machine to switch off.

**a.** Let one electrical input be represented by the variable $x$ and the other be represented by the variable $y$. Create a linear inequality to describe the values that will activate the fail-safe.

**b.** Graph the linear inequality.

**c.** The device has electrical inputs of 95 kilowatts and 145 kilowatts. Plot this point on the graph. Will the fail-safe activate and switch off the device? Explain why.

**43.** Janessa has been trying to live a heathier life, so she bought a wrist fitness tracker. At the end of the first week, she connected it to the computer to download the data. The line, given by $m = \frac{3}{10}d + 2$, best represents her first week's data, where $m$ represents miles walked in a day and $d$ represents the day number (for example, on day 1, $d = 1$). The given graph is meant to represent the best fit line for the data taken once a day at the same time each day.

**a.** Fill out the following table using $m = \frac{3}{10}d + 2$, where the input is the day number.

| **Domain, *d*** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
|---|---|---|---|---|---|---|---|
| **Range, *m*** | | | | | | | |

**b.** Assuming the best fit line continues, how many miles would you expect Janessa to walk by the end of the second week (day 14)? Round your answer to the nearest tenth.

## Writing & Thinking

**44.** Explain in your own words how to test to determine which side of the graph of an inequality should be shaded.

**45.** Describe the difference between a closed and an open half-plane.