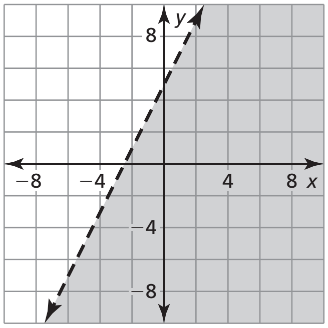
5.6 Start Thinking



Is the point $(2, 9)$ on the dashed line? Find an equation of the line represented by the dashed line, replacing the equal sign with a "less than" symbol. Does the point $(2, 9)$ satisfy the inequality?

5.6 Warm Up

Tell whether the value is a solution of the inequality.

1. $4x > 11;\ x = 3$
2. $16 \geq 4y;\ y = 4$
3. $17x \geq 15;\ x = 0$
4. $-7x < 9;\ x = 6$
5. $-7b < 25;\ b = -4$
6. $x + \frac{2}{9} > 0;\ x = -1$

5.6 Cumulative Review Warm Up

Solve the literal equation for *x*.

1. $y = 3x - 9x$
2. $a = x - 7xz$
3. $y = 3x - rx - 7$
4. $sx - tx = r$
5. $11 + 6x + 3kx = y$
6. $C = 86x - 59$

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5.6 Practice A

In Exercises 1–4, tell whether the ordered pair is a solution of the inequality.

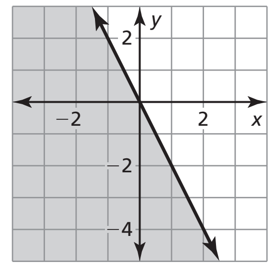
1. $x - y > 2;\ (5, 4)$

2. $x + y \le -3;\ (-1, -4)$

3. $5x + y \le 12;\ (2, 2)$

4. $x - 3y > 6;\ (3, -1)$

In Exercises 5–10, tell whether the ordered pair is a solution of the inequality whose graph is shown.



5. $(1, 0)$

6. $(-1, -1)$

7. $(0, 0)$

8. $(-3, 1)$

9. $(2, -4)$

10. $(0, 3)$

11. You have \$150 to spend on video games. The inequality $7x + 32y \le 150$ represents the number x of used video games and the number y of new video games that you can purchase. Can you purchase 10 used video games and 3 new video games? Explain.

In Exercises 12–17, graph the inequality in a coordinate plane.

12. $y \ge 2$

13. $x < -3$

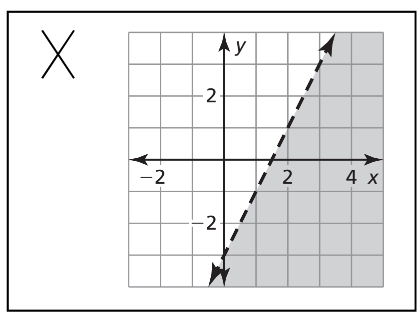
14. $y < -1$

15. $y < 2x - 5$

16. $y \ge -x + 3$

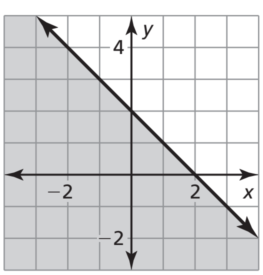
17. $-3x + y \le 1$

18. Describe and correct the error in graphing $y > 2x - 3$.

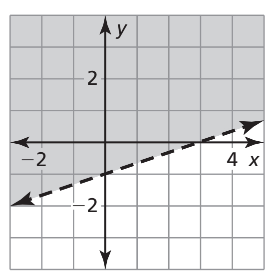


In Exercises 19 and 20, write an inequality that represents the graph.

19.



20.



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5.6 Practice B

In Exercises 1–4, tell whether the ordered pair is a solution of the inequality.

1. $5x + 7y \leq 10;\ (-1, 2)$

2. $4x - y > 2;\ (-2, -2)$

3. $-3x - 2y \geq 0;\ (3, -3)$

4. $-8x - y < 4;\ (0, 2)$

5. The inequality $9x + 5y \geq 60$ represents the number x of newspapers and the number y of magazines you must sell to earn enough points to earn a special school lunch. You sell four newspapers and six magazines. Do you receive a special school lunch? Explain.

In Exercises 6–11, graph the inequality in a coordinate plane.

6. $x \geq 4$

7. $y < -6$

8. $x < 0$

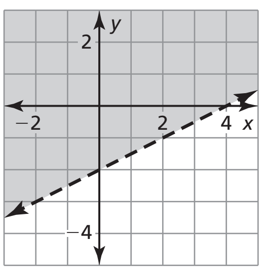
9. $y < 2x + 2$

10. $-3x + y \leq -2$

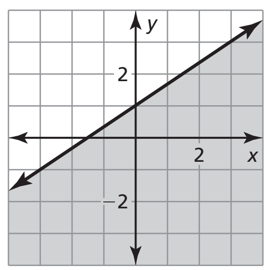
11. $x - 2y \geq 6$

In Exercises 12 and 13, write an inequality that represents the graph.

12.



13.



14. Write a linear inequality in two variables that has the following two properties.

- $(2, -1)$, $(2, 3)$, and $(3, 1)$ are not solutions.
- $(0, -3)$, $(-2, 1)$, and $(1, -5)$ are solutions.

In Exercises 15 and 16, write and graph an inequality whose graph is described by the given information.

15. The points $(4, 10)$ and $(-2, -8)$ lie on the boundary line. The points $(1, -3)$ and $(-1, -7)$ are *not* solutions of the inequality.

16. The points $(-3, 7)$ and $(9, -5)$ lie on the boundary line. The points $(-4, 2)$ and $(6, -5)$ are solutions of the inequality.

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5.6 Enrichment and Extension

Linear Programming

Linear Programming is a modeling technique that is useful for guiding quantitative decisions in engineering, business, and the sciences. In order to solve a linear programming problem, you must find the maximum and minimum values of a linear equation within a set of constraints expressed as inequalities. This is called the *feasible region*, or the solution set to a system of linear inequalities. The extreme values, or maximum and minimum values, of any objective function $f(x, y)$ must occur at the vertices of the feasible region.

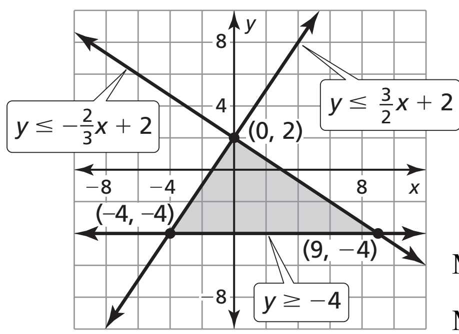
Example: Evaluate the function f at the vertices of the feasible region in order to obtain the maximum and minimum values. At which vertex does f attain its minimum value? At which vertex does f attain its maximum value?

$2x + 3y \le 6$

$3x - 2y \ge -4$

$y \ge -4$

$f(x, y) = x + 3y$



(x, y)	$x + 3y$	$f(x, y)$
$(0, 2)$	$(0) + 3(2)$	6
$(-4, -4)$	$(-4) + 3(-4)$	−16
$(9, -4)$	$(9) + 3(-4)$	−3

Maximum: 6 at $(0, 2)$

Minimum: −16 at $(-4, -4)$

In Exercises 1–4, evaluate the function *f* at the vertices of the feasible region in order to obtain the maximum and minimum values. At which vertex does *f* attain its minimum value? At which vertex does *f* attain its maximum value?

1. $x + y \ge 2$
$2y \ge 3x - 6$
$4y \le x + 8$
$f(x, y) = 3y + x$

2. $x + y \ge 4$
$3x - 2y \le 12$
$x - 4y \ge -16$
$f(x, y) = x - 2y$

3. $2 \le x \le 6$
$x + y \le 7$
$-3x - 2y \le -4$
$f(x, y) = -x + 3y$

4. $x \ge 0$
$y \ge 0$
$x + 2y \le 6$
$2y - x \le 2$
$f(x, y) = 3x - 5y$

5. The vertices of a feasible region are $A(1, 3)$, $B(5, 3)$, and $C(1, 4)$. Write a function that satisfies each condition.

a. *A* is the maximum and *B* is the minimum.

b. *C* is the maximum and *B* is the minimum.

c. *B* is the maximum and *A* is the minimum.

d. *A* is the maximum and *C* is the minimum.

e. *A* and *C* are both the maxima and *B* is the minimum.

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5.6 Puzzle Time

What Kind Of Television Show Is Relaxing To Watch?

Write the letter of each answer in the box containing the exercise number.

Tell whether the ordered pair is a solution of the inequality.

1. $9x - 7y \geq 6; (1, -2)$

A. yes **B.** no

2. $4x + 3y < -3; (6, -9)$

L. yes **M.** no

3. $8x - 2y < -1; (-3, -12)$

H. yes **I.** no

4. $x - 10y \leq 13; \left(8, -\frac{1}{2}\right)$

A. yes **B.** no

Match the inequality with its graph.

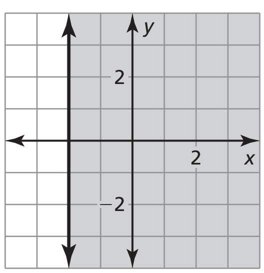
5. $y \geq 2$

6. $x \geq -2$

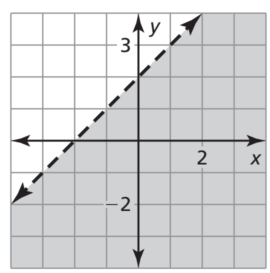
7. $y < x + 2$

8. $3x + y > -2$

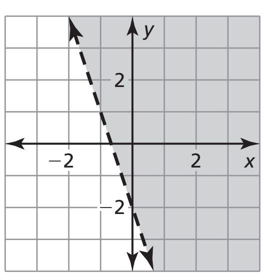
L.



C.



S.



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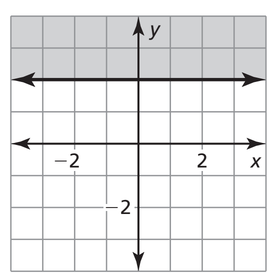

4		8	3	5		7	1	6	2