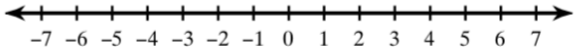
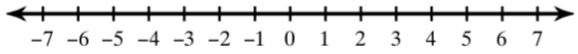
5.6 Graphing Linear Inequalities in Two Variables

Do Now: Graph the following:

1) $r \leq -3$



2) $r > 4$



Example 1: Checking Solutions

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

a) $2x + y < -3; (-1,9)$

b) $x - 3y \geq 8; (2, -2)$

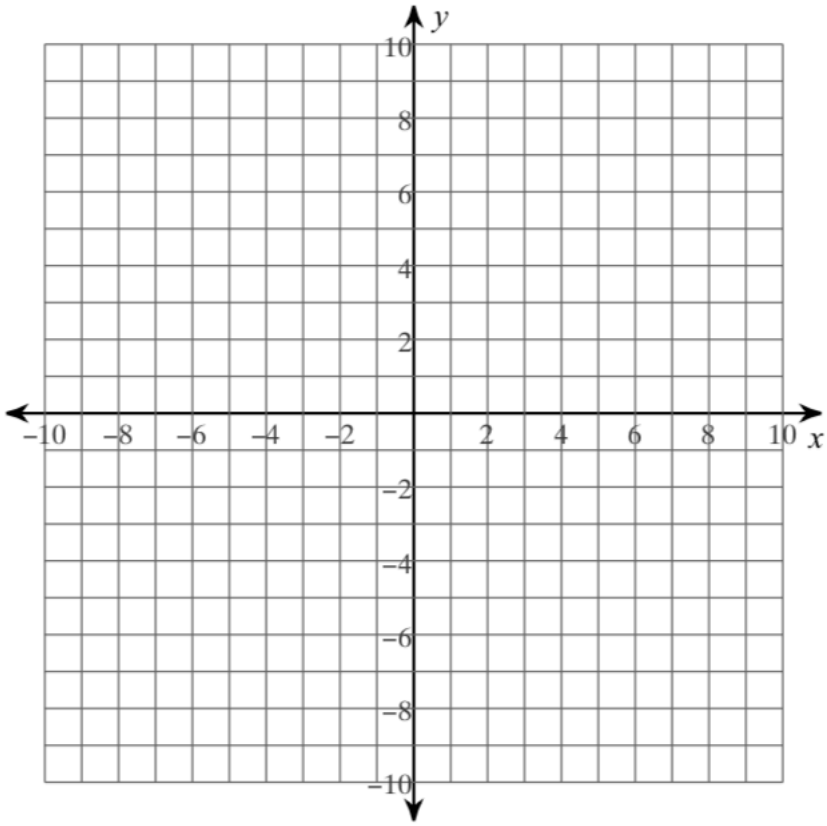
Example 2: Graphing a linear inequality in one variable

Spiral Review:

Graph $y = 2$

Now think… How can you graph;

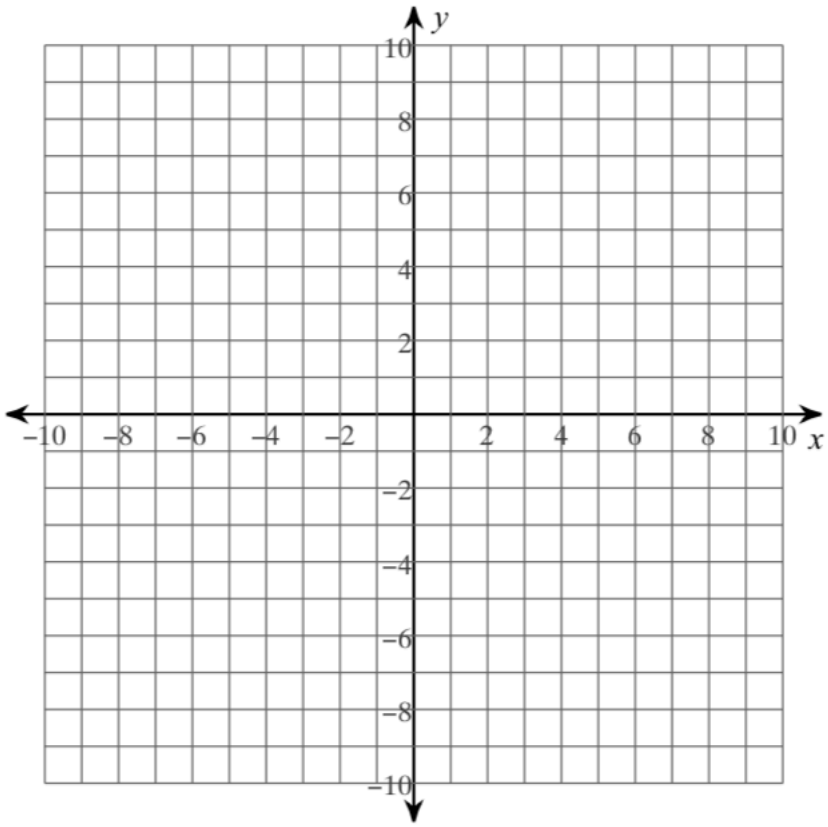
Graph $y \leq 2$



Example 3: Graphing a linear inequality in two variables

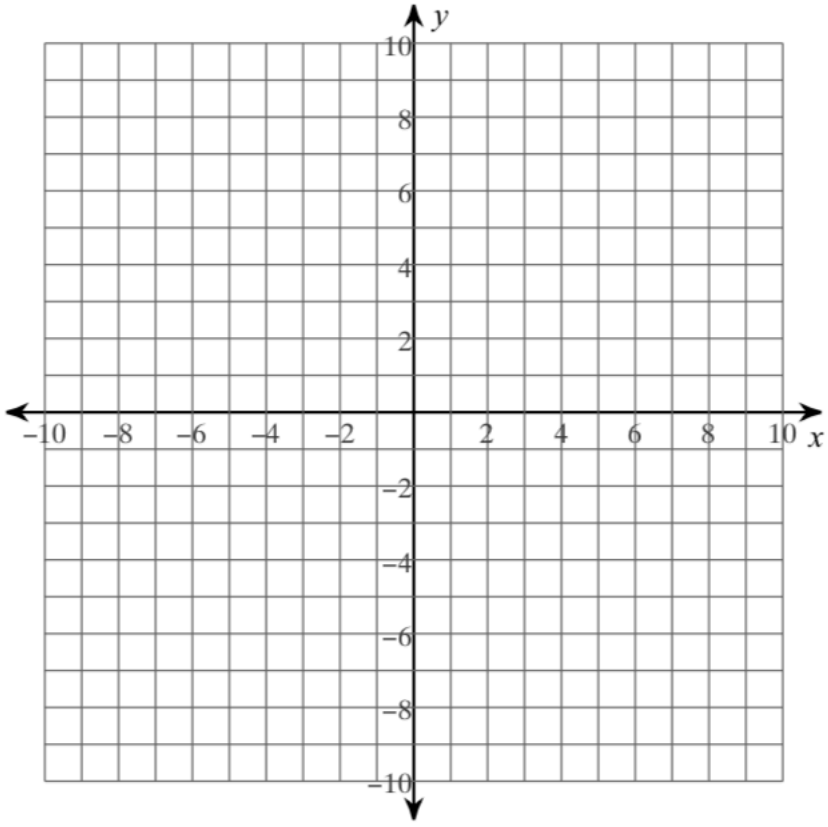
Graph $-x + 2y > 2$

(treat the inequality as an equal sign)



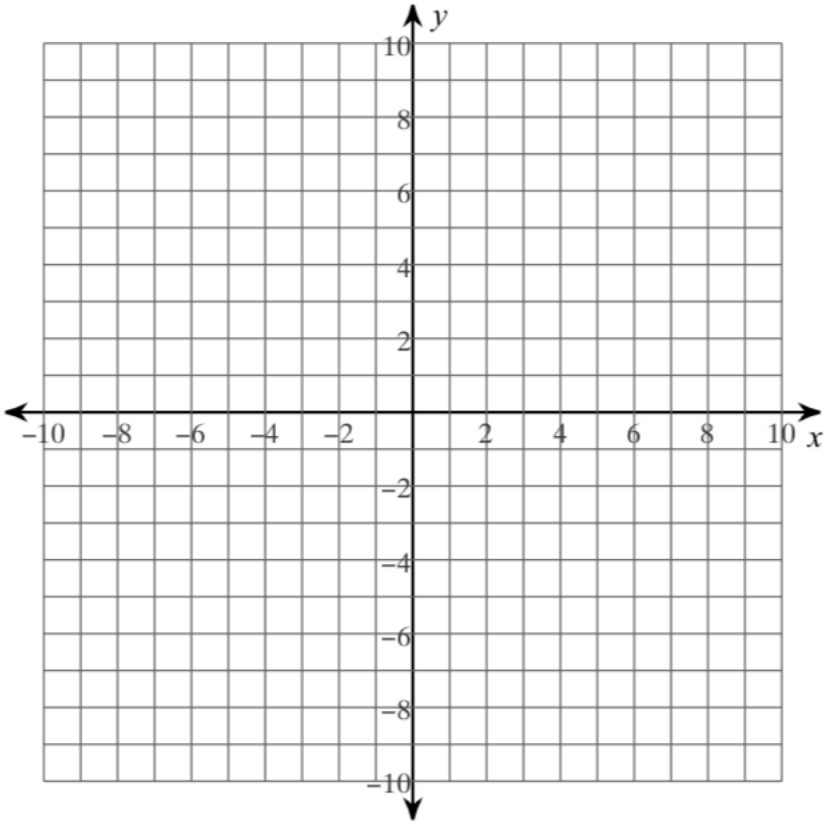
Try on your own!

Graph $x - 2y \leq 2$



Example 4: Modeling with mathematics

You can spend at most $10 on grapes and apples for a fruit salad. Grapes are $2.50 per pound, and apple cost $1 per pound. Write and graph an inequality that represents the amounts of grapes and aples you can buy? Identify and interpret two solutions of the inequality.



Classwork/Homework
3, 5, 8, 11-17, 19, 24, 25, 28, 33, 35,38, 40

5.6 Exercises

Dynamic Solutions available at *BigIdeasMath.com*

Vocabulary and Core Concept Check

1. **VOCABULARY** How can you tell whether an ordered pair is a solution of a linear inequality?
2. **WRITING** Compare the graph of a linear inequality in two variables with the graph of a linear equation in two variables.

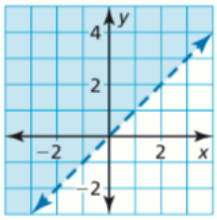
Monitoring Progress and Modeling with Mathematics

In Exercises 3–10, tell whether the ordered pair is a solution of the inequality. *(See Example 1.)*

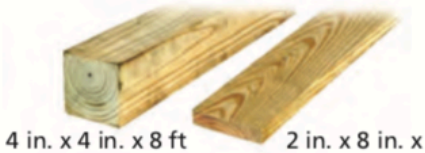
3. $x + y < 7; (2, 3)$
4. $x - y \leq 0; (5, 2)$
5. $x + 3y \geq -2; (-9, 2)$
6. $8x + y > -6; (-1, 2)$
7. $-6x + 4y \leq 6; (-3, -3)$
8. $3x - 5y \geq 2; (-1, -1)$
9. $-x - 6y > 12; (-8, 2)$
10. $-4x - 8y < 15; (-6, 3)$

In Exercises 11–16, tell whether the ordered pair is a solution of the inequality whose graph is shown.

11. $(0, -1)$
12. $(-1, 3)$
13. $(1, 4)$
14. $(0, 0)$
15. $(3, 3)$
16. $(2, 1)$



17. **MODELING WITH MATHEMATICS** A carpenter has at most \$250 to spend on lumber. The inequality $8x + 12y \leq 250$ represents the numbers x of 2-by-8 boards and the numbers y of 4-by-4 boards the carpenter can buy. Can the carpenter buy twelve 2-by-8 boards and fourteen 4-by-4 boards? Explain.



4 in. x 4 in. x 8 ft
\$12 each

2 in. x 8 in. x 8 ft
\$8 each

18. **MODELING WITH MATHEMATICS** The inequality $3x + 2y \geq 93$ represents the numbers x of multiple-choice questions and the numbers y of matching questions you can answer correctly to receive an A on a test. You answer 20 multiple-choice questions and 18 matching questions correctly. Do you receive an A on the test? Explain.

In Exercises 19–24, graph the inequality in a coordinate plane. *(See Example 2.)*

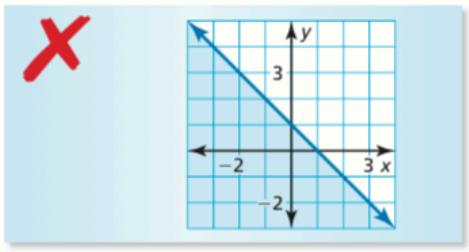
19. $y \leq 5$
20. $y > 6$
21. $x < 2$
22. $x \geq -3$
23. $y > -7$
24. $x < 9$

In Exercises 25–30, graph the inequality in a coordinate plane. *(See Example 3.)*

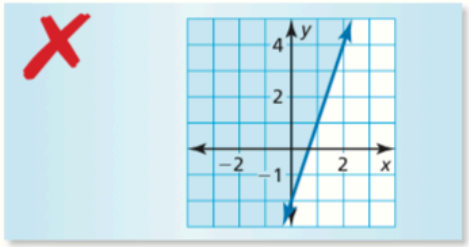
25. $y > -2x - 4$
26. $y \leq 3x - 1$
27. $-4x + y < -7$
28. $3x - y \geq 5$
29. $5x - 2y \leq 6$
30. $-x + 4y > -12$

ERROR ANALYSIS **In Exercises 31 and 32, describe and correct the error in graphing the inequality.**

31. $y < -x + 1$



32. $y \leq 3x - 2$

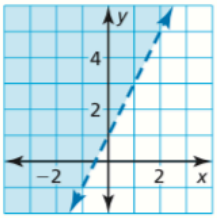


33. MODELING WITH MATHEMATICS You have at most \$20 to spend at an arcade. Arcade games cost \$0.75 each, and snacks cost \$2.25 each. Write and graph an inequality that represents the numbers of games you can play and snacks you can buy. Identify and interpret two solutions of the inequality. *(See Example 4.)*

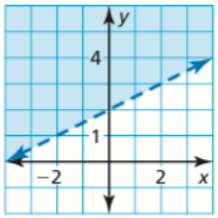
34. MODELING WITH MATHEMATICS A drama club must sell at least \$1500 worth of tickets to cover the expenses of producing a play. Write and graph an inequality that represents how many adult and student tickets the club must sell. Identify and interpret two solutions of the inequality.

In Exercises 35–38, write an inequality that represents the graph.

35.



36.



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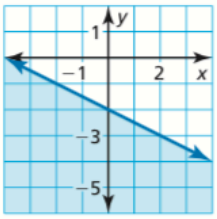

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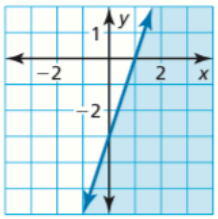


39. PROBLEM SOLVING Large boxes weigh 75 pounds, and small boxes weigh 40 pounds.

a. Write and graph an inequality that represents the numbers of large and small boxes a 200-pound delivery person can take on the elevator.

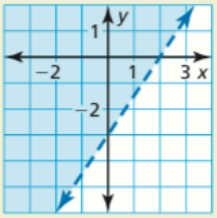
b. Explain why some solutions of the inequality might not be practical in real life.

40. HOW DO YOU SEE IT? Match each inequality with its graph.

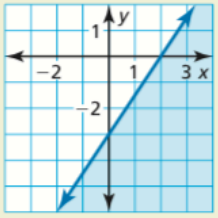
a. $3x - 2y \leq 6$ **b.** $3x - 2y < 6$

c. $3x - 2y > 6$ **d.** $3x - 2y \geq 6$

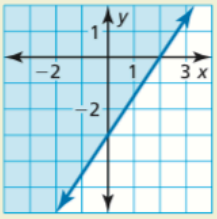
A.



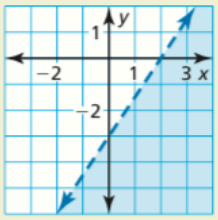
B.



C.



D.



41. REASONING When graphing a linear inequality in two variables, why must you choose a test point that is *not* on the boundary line?

42. THOUGHT PROVOKING Write a linear inequality in two variables that has the following two properties.

- (0, 0), (0, −1), and (0, 1) are not solutions.
- (1, 1), (3, −1), and (−1, 3) are solutions.

43. WRITING Can you always use (0, 0) as a test point when graphing an inequality? Explain.

CRITICAL THINKING In Exercises 44 and 45, write and graph an inequality whose graph is described by the given information.

44. The points (2, 5) and (−3, −5) lie on the boundary line. The points (6, 5) and (−2, −3) are solutions of the inequality.

45. The points (−7, −16) and (1, 8) lie on the boundary line. The points (−7, 0) and (3, 14) are *not* solutions of the inequality.

Maintaining Mathematical Proficiency

Reviewing what you learned in previous grades and lessons

Write the next three terms of the arithmetic sequence. *(Section 4.6)*

46. 0, 8, 16, 24, 32, . . . **47.** −5, −8, −11, −14, −17, . . . **48.** $-\frac{3}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{3}{2}, \frac{5}{2}, \ldots$