

Problem 3 Using a System of Inequalities

Time Management You are planning what to do after school. You can spend at most 6 h daily playing basketball and doing homework. You want to spend less than 2 h playing basketball. You must spend at least $1\frac{1}{2}$ h on homework. What is a graph showing how you can spend your time?

Know

- At most 6 h playing basketball and doing homework
- Less than 2 h playing basketball
- At least $1\frac{1}{2}$ h doing homework

Need

To find different ways you can spend your time

Plan

Write and graph an inequality for each restriction. Find the region where all three restrictions are met.

Let x = the number of hours playing basketball.

Let y = the number of hours doing homework.

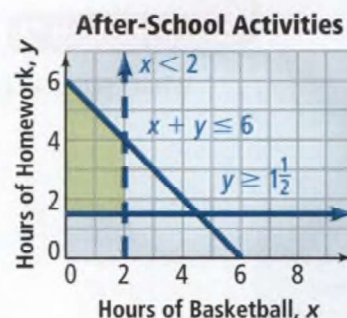
Write a system of inequalities.

$$x + y \leq 6 \quad \text{At most 6 h of basketball and homework}$$

$$x < 2 \quad \text{Less than 2 h of basketball}$$

$$y \geq 1\frac{1}{2} \quad \text{At least } 1\frac{1}{2} \text{ h of homework}$$

Graph the system. Because time cannot be negative, the graph makes sense only in the first quadrant. The solutions of the system are all of the points in the shaded region, including the points on the solid boundary lines.

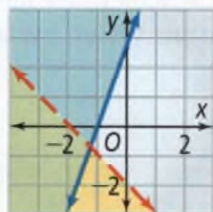


- Got It?** 3. You want to build a fence for a rectangular dog run. You want the run to be at least 10 ft wide. The run can be at most 50 ft long. You have 126 ft of fencing. What is a graph showing the possible dimensions of the dog run?

Lesson Check

Do you know HOW?

1. What is the graph of the system? $y > 3x - 2$
 $2y - x \leq 6$
2. What system of inequalities is represented by the graph at the right?
3. Cherries cost \$4/lb. Grapes cost \$2.50/lb. You can spend no more than \$15 on fruit, and you need at least 4 lb in all. What is a graph showing the amount of each fruit you can buy?



Do you UNDERSTAND? MATHEMATICAL PRACTICES

4. **Vocabulary** How can you determine whether an ordered pair is a solution of a system of linear inequalities?
5. **Reasoning** Suppose you are graphing a system of two linear inequalities, and the boundary lines for the inequalities are parallel. Does that mean that the system has no solution? Explain.
6. **Writing** How is finding the solution of a system of inequalities different from finding the solution of a system of equations? How is it the same? Explain.

A Practice

Determine whether the ordered pair is a solution of the given system.

See Problem 1.

7. $(2, 12);$

$$y > 2x + 4$$

$$y < 3x + 7$$

8. $(8, 2);$

$$3x - 2y \leq 17$$

$$0.3x + 4y > 9$$

9. $(-3, 17);$

$$y > -5x + 2$$

$$y \geq -3x + 7$$

Solve each system of inequalities by graphing.

10. $y < 2x + 4$

$$-3x - 2y \geq 6$$

11. $y < 2x + 4$

$$2x - y \leq 4$$

12. $y > 2x + 4$

$$2x - y \leq 4$$

13. $y > \frac{1}{4}x$

$$y \leq -x + 4$$

14. $y < 2x - 3$

$$y > 5$$

15. $y \leq -\frac{1}{3}x + 7$

$$y \geq -x + 1$$

16. $x + 2y \leq 10$

$$x + 2y \geq 9$$

17. $y \geq -x + 5$

$$y \leq 3x - 4$$

18. $y \leq 0.75x - 2$

$$y > 0.75x - 3$$

19. $8x + 4y \geq 10$

$$3x - 6y > 12$$

20. $2x - \frac{1}{4}y < 1$

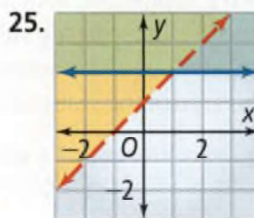
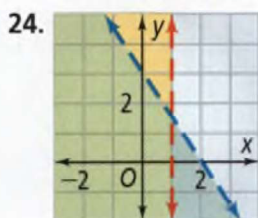
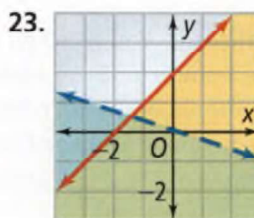
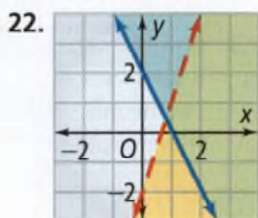
$$4x + 8y > 4$$

21. $6x - 5y < 15$

$$x + 2y \geq 7$$

Write a system of inequalities for each graph.

See Problem 2.



26. **Earnings** Suppose you have a job mowing lawns that pays \$12 per hour. You also have a job at a clothing store that pays \$10 per hour. You need to earn at least \$350 per week, but you can work no more than 35 h per week. You must work a minimum of 10 h per week at the clothing store. What is a graph showing how many hours per week you can work at each job?

See Problem 3.

27. **Driving** Two friends agree to split the driving on a road trip from Philadelphia, Pennsylvania, to Denver, Colorado. One friend drives at an average speed of 60 mi/h. The other friend drives at an average speed of 55 mi/h. They want to drive at least 500 mi per day. They plan to spend no more than 10 h driving each day. The friend who drives slower wants to drive fewer hours. What is a graph showing how they can split the driving each day?