

3-2 Solving Systems of Linear Inequalities

Example 1 Intersecting Regions

Solve the system of inequalities.

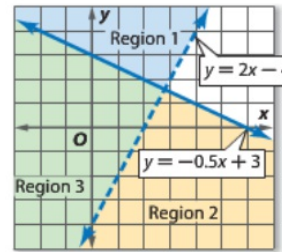
$$y > 2x - 4$$

$$y \leq -0.5x + 3$$

Solution of $y > 2x - 4 \rightarrow$ Regions 1 and 3

Solution of $y \leq -0.5x + 3 \rightarrow$ Regions 2 and 3

Region 3 is part of the solution of both inequalities, so it is the solution of the system.



You will need graph paper for this assignment!

CHECK Notice that the origin is part of the solution of the system. The origin can be used as a test point. You can test the solution by substituting $(0, 0)$ for x and y in each equation.

$$y > 2x - 4$$

$$0 \stackrel{?}{>} 2(0) - 4$$

$$0 \stackrel{?}{>} 0 - 4$$

$$0 > -4 \quad \checkmark$$

$$y \leq -0.5x + 3$$

$$0 \stackrel{?}{\leq} -0.5(0) + 3$$

$$0 \stackrel{?}{\leq} 0 + 3$$

$$0 \leq 3 \quad \checkmark$$

Examples 1-2 Solve each system of inequalities by graphing. 1-3. See margin.

1. $y \leq 6$

$y > -3 + x$

$0 \leq 6$
 $0 > -3$

2. $y \leq -3x + 4$

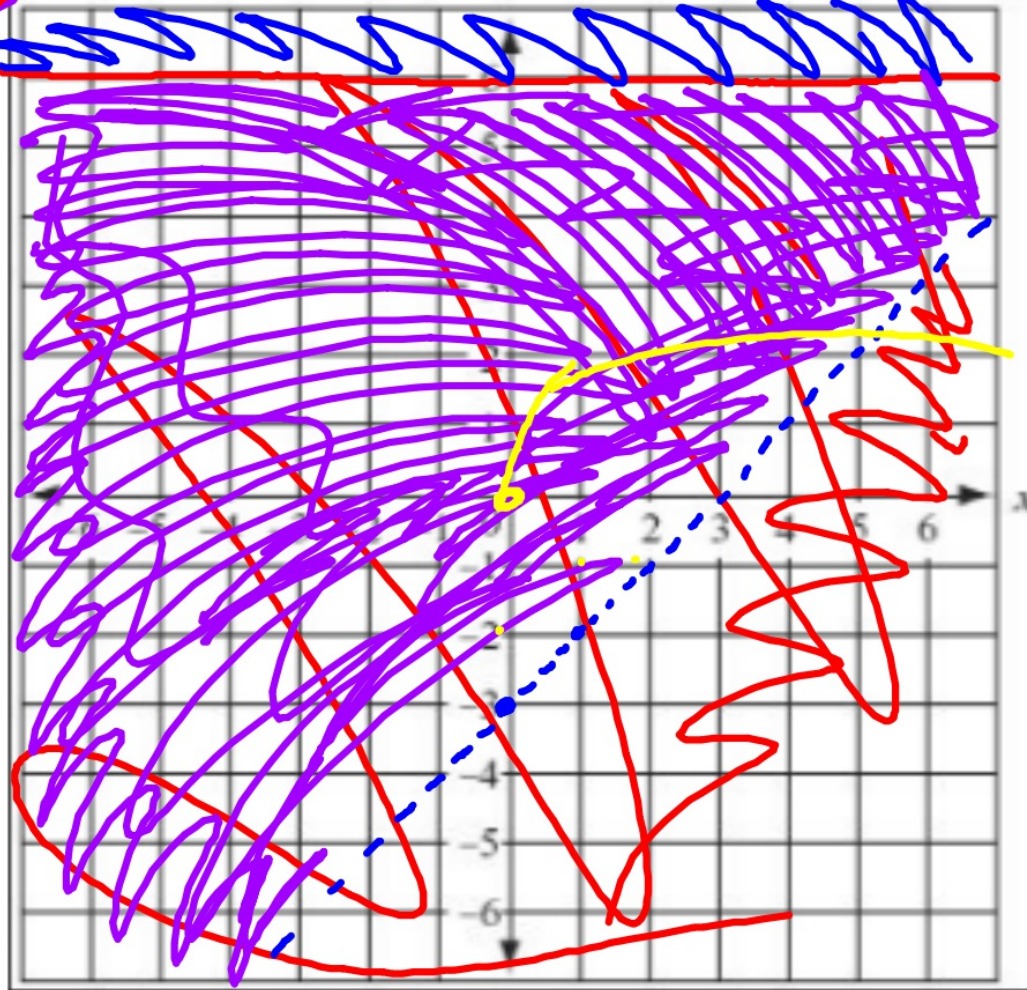
$y \geq 2x - 1$

3. $y > -2x + 4$

$y \leq -3x - 3$

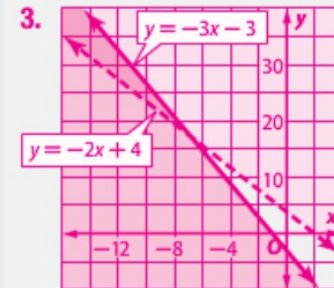
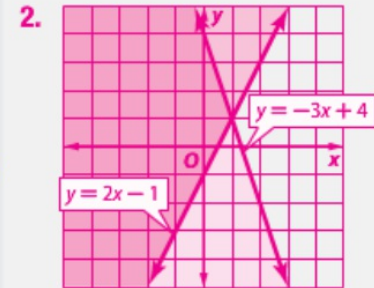
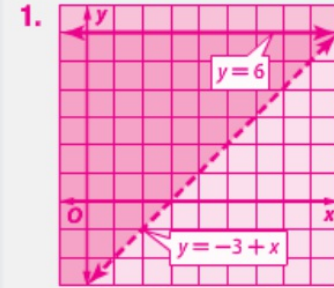
①

$y > x - 3$



$(0, 0)$
 x
 y

Additional Answers



Example 2 Separate Regions

Solve the system of inequalities by graphing.

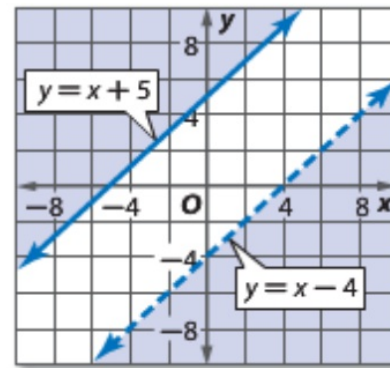
$$y \geq x + 5$$

$$y < x - 4$$

Graph both inequalities.

Since the graphs of the inequalities do not overlap, there are no points in common and there is no solution to the system.

The solution set is the empty set.



Real-World Example 3 Write and Use a System of Inequalities

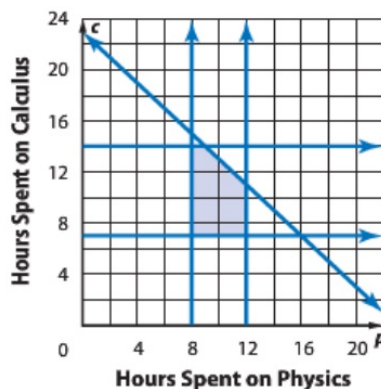
TIME MANAGEMENT Chelsea has final exams in calculus, physics, and history. She has up to 25 hours to study for the exams. She plans to study history for 2 hours. She needs to spend at least 7 hours studying for calculus, but over 14 is too much. She hopes to spend between 8 and 12 hours on physics. Write and graph a system of inequalities to represent the situation.

Calculus: at least 7 hours, but no more than 14
 $7 \leq c \leq 14$

Physics: at least 8 hours, but no more than 12
 $8 \leq p \leq 12$

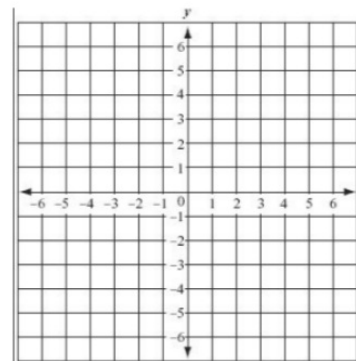
Chelsea has 25 hours available, and 2 of those will be spent on history. She has up to 23 hours left for calculus and physics.
 $c + p \leq 23$

Graph all of the inequalities. Any ordered pair in the intersection is a solution of the system. One solution is 10 hours on physics and 12 hours on calculus.



Example 3

4. **CCSS REASONING** The most Kala can spend on hot dogs and buns for her cookout is \$35. A package of 10 hot dogs costs \$3.50. A package of buns costs \$2.50 and contains 8 buns. She needs to buy at least 40 hot dogs and 40 buns. **a, b. See margin.**
- Graph the region that shows how many packages of each item she can purchase.
 - Give an example of three different purchases she can make.



Examples 1–2 Solve each system of inequalities by graphing. **7–15. See Chapter 3 Answer Appendix.**

7. $x < 3$
 $y \geq -4$

8. $y > 3x - 5$
 $y \leq 4$

9. $y < -3x + 4$
 $3y + x > -6$

10. $y \geq 0$
 $y < x$

11. $6x - 2y \geq 12$
 $3x + 4y > 12$

12. $-8x > -2y - 1$
 $-4y \geq 2x - 5$

13. $5y < 2x + 10$
 $y - 4x > 8$

14. $3y - 2x \leq -24$
 $y \geq \frac{2}{3}x - 1$

15. $y > -\frac{2}{5}x + 2$
 $5y \leq -2x - 15$

Example 3

16. **RECORDING** Jane's band wants to spend no more than \$575 recording their first CD. The studio charges at least \$35 per hour to record. Graph a system of inequalities to represent this situation. **See Chapter 3 Answer Appendix.**
17. **SUMMER TRIP** Rondell has to save at least \$925 to go to Rome with his Latin class in 8 weeks. He earns \$9 an hour working at the Pizza Palace and \$12 an hour working at a car wash. By law, he cannot work more than 25 hours per week. Graph two inequalities that Rondell can use to determine the number of hours he needs to work at each job if he wants to make the trip. **See Chapter 3 Answer Appendix.**

