

## 5.7 Graph a System of Inequalities

### Essential Question: How can you graph a system of inequalities?

#### 5.7 Lesson

##### Core Vocabulary

system of linear inequalities,  
p. 274  
solution of a system of linear  
inequalities, p. 274  
graph of a system of linear  
inequalities, p. 275

**Previous**  
linear inequality in two  
variables

##### What You Will Learn

- ▶ Check solutions of systems of linear inequalities.
- ▶ Graph systems of linear inequalities.
- ▶ Write systems of linear inequalities.
- ▶ Use systems of linear inequalities to solve real-life problems.

##### Systems of Linear Inequalities

A **system of linear inequalities** is a set of two or more linear inequalities in the same variables. An example is shown below.

$$y < x + 2 \quad \text{Inequality 1}$$

$$y \geq 2x - 1 \quad \text{Inequality 2}$$

A **solution of a system of linear inequalities** in two variables is an ordered pair that is a solution of each inequality in the system.

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### Example 1:

Tell whether each ordered pair is a solution of the system of linear inequalities.

$$y < 2x \quad \text{Inequality 1}$$

$$y \geq x + 1 \quad \text{Inequality 2}$$

a.  $(3, 5)$  Yes

$$5 < 2(3)$$

$$5 < 6 \quad \checkmark$$

$$5 \geq 3 + 1$$

$$5 \geq 4 \quad \checkmark$$

b.  $(-2, 0)$

$$0 < 2(-2)$$

$$0 < -4 \quad \times$$

NO

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Example 2:

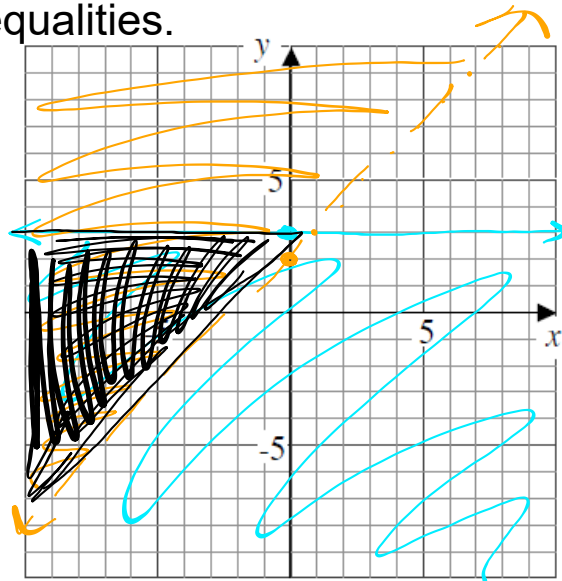
Graph the system of linear inequalities.

$$y \leq 3$$

$$y > x + 2$$

$$b = 2$$

$$m = 1 \quad \uparrow 1 \rightarrow 1$$



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Example 3:

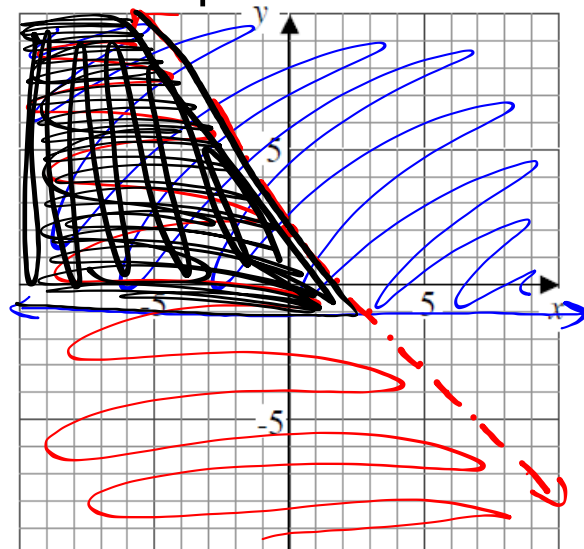
Graph the system of linear inequalities.

$$y \geq -1$$

$$y \leq -x + 2$$

$$b = 2$$

$$m = -1 \quad \downarrow 1 \rightarrow 1$$



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**YOUR TURN:**

Graph the linear inequalities.

$$2x + y \leq 5$$

$$\begin{array}{r} -2x \\ -2x \end{array}$$

$$y + 2 \geq -2x$$

$$\begin{array}{r} -2 \\ -2 \end{array}$$

$$y \leq -2x + 5$$

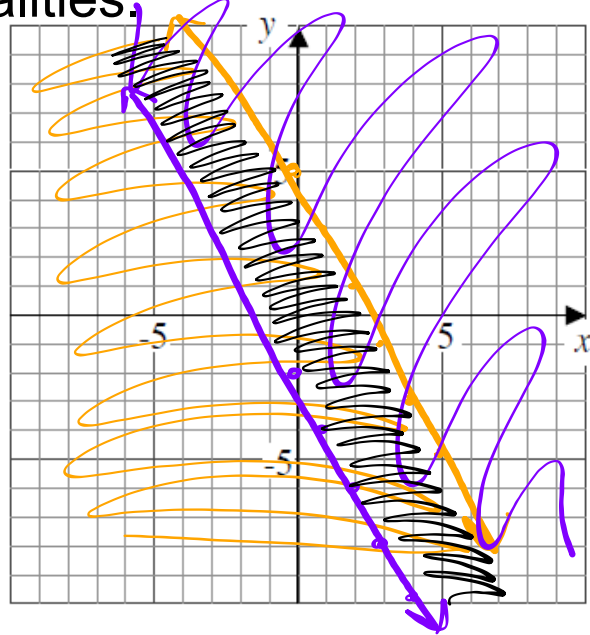
$$b = 5$$

$$m = -2 \quad \downarrow 2 \rightarrow 1$$

$$y \geq -2x - 2$$

$$m = -2 \quad \downarrow 2 \rightarrow 1$$

$$b = -2$$

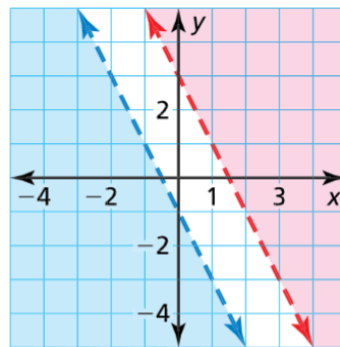


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Graph the system of linear inequalities.

$$2x + y < -1 \quad \text{Inequality 1}$$

$$2x + y > 3 \quad \text{Inequality 2}$$

**Example 4:**

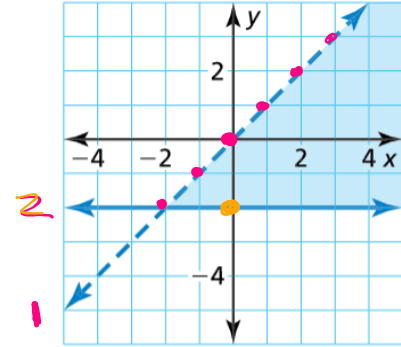
What is/are the solution(s) for the graph above?

No solution because the shading never overlaps.

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Example 5:

Write a system of linear inequalities represented by the graph.



Equation 1:  $y < x$

solid or dashed  $> <$

above or below  $<$

y-int:  $b = 0$

slope:  $m = 1$   $\uparrow 1 \rightarrow 1$

Equation 2:

solid or dashed  $\leq \geq$

above or below  $\geq$

y-int:  $b = -2$

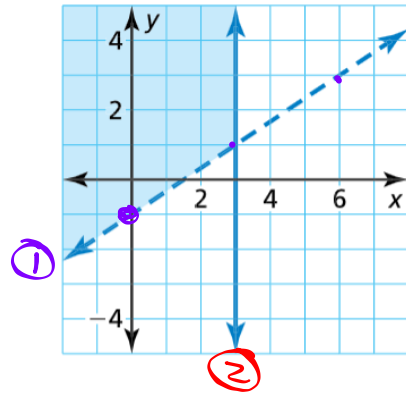
slope:  $m = 0$

$y \geq 0x - 2$   
 $y \geq -2$

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Your Turn:

Write a system of linear inequalities represented by the graph.



Equation 1:  $y > \frac{2}{3}x - 1$

solid or dashed  $< >$

above or below  $>$

y-int:  $b = -1$

slope:  $\uparrow 2 \rightarrow 3$   $m = \frac{2}{3}$

Equation 2:

solid or dashed  $\leq \geq$   $x \leq 3$

above or below  $\leq$

y-int:  $b \neq$

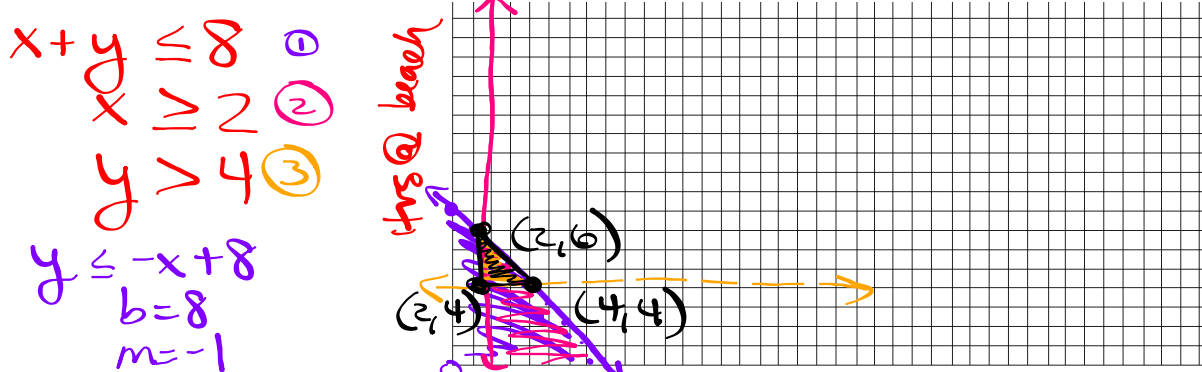
slope: undefined

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### Example 6: (3 inequalities)

You have at most 8 hours to spend at the mall and at the beach. You want to spend at least 2 hours at the mall and more than 4 hours at the beach.

a) Write and graph a system that represents the situation.



b) How much time can you spend at each location?  
 2 hrs at the mall,  
 and 6 hrs @ the beach.

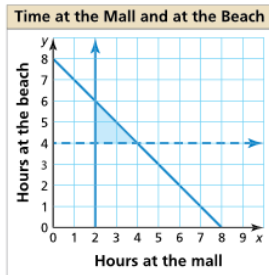
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**SOLUTION**

- Understand the Problem** You know the total amount of time you can spend at the mall and at the beach. You also know how much time you want to spend at each location. You are asked to write and graph a system that represents the situation and determine how much time you can spend at each location.
- Make a Plan** Use the given information to write a system of linear inequalities. Then graph the system and identify an ordered pair in the solution region.
- Solve the Problem** Let  $x$  be the number of hours at the mall and let  $y$  be the number of hours at the beach.

$x + y \leq 8$       at most 8 hours at the mall and at the beach  
 $x \geq 2$           at least 2 hours at the mall  
 $y > 4$           more than 4 hours at the beach

Graph the system.



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## Homework Assignment

DAY ONE: 5.7 WS

DAY TWO: pg. 278

A: 6, 10, 20, 24, 26, 28, 30, 40, 50, 54

B: 1, 2, 4 - 8(e), 12, 16, 20, 22, 24, 29, 30, 54

C: 4 - 30(e), 54