LESSON 6-6

Practice A

Solving Systems of Linear Inequalities

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

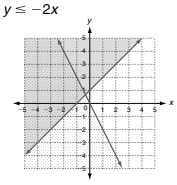
1. $(4, 5)$; $\begin{cases} y \le x + 2 \\ y \ge x - 1 \end{cases}$ yes

2. $(1, 3)$; $\begin{cases} y > 3x \\ y < x + 2 \end{cases}$ no

3. $(2, 3)$; $\begin{cases} y < 5x - 3 \\ y \ge -x \end{cases}$ yes

Graph the system of linear inequalities. a. Give two ordered pairs that are solutions. b. Give two ordered pairs that are not solutions.

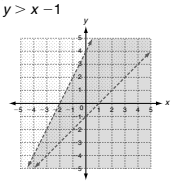
4. $\begin{cases} y \ge x + 1 \\ y \le -2x \end{cases}$



a. $(-1, 0)$ and $(-3, 2)$

b. $(0, -3)$ and $(4, 0)$

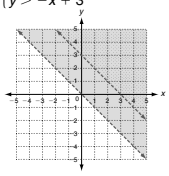
5. $\begin{cases} y < 2x + 4 \\ y > x - 1 \end{cases}$



a. $(0, 0)$ and $(1, 2)$

b. $(1, 0)$ and $(-4, 3)$

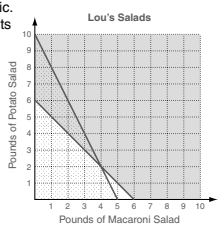
6. $\begin{cases} y > -x \\ y > -x + 3 \end{cases}$



a. $(3, 3)$ and $(4, 4)$

b. $(0, 0)$ and $(0, 3)$

7. Lou is buying macaroni salad and potato salad for a picnic. Macaroni salad costs \$4 per pound and potato salad costs \$2 per pound. Lou would like to buy at least 6 pounds of salads and wants to spend no more than \$20.



a. Write a system of linear equations.
Let x = pounds of macaroni salad
Let y = pounds of potato salad

$$\begin{cases} x + y \ge 6 \\ 4x + 2y \le 20 \end{cases}$$

b. Graph the solutions of the system.

c. Describe all the possible combinations of pounds of salads that Lou could buy.

Any combination represented by the ordered pairs in the solution region.

d. List two possible combinations. 2 lbs mac. salad, 5 lbs potato salad; 3 lbs mac. salad, 4 lbs potato salad

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LESSON 6-6

Practice B

Solving Systems of Linear Inequalities

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

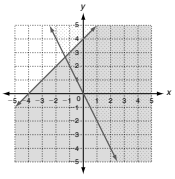
1. $(2, -2)$; $\begin{cases} y < x - 3 \\ y > -x + 1 \end{cases}$ no

2. $(2, 5)$; $\begin{cases} y > 2x \\ y \ge x + 2 \end{cases}$ yes

3. $(1, 3)$; $\begin{cases} y \le x + 2 \\ y > 4x - 1 \end{cases}$ no

Graph the system of linear inequalities. a. Give two ordered pairs that are solutions. b. Give two ordered pairs that are not solutions.

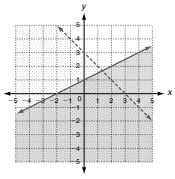
4. $\begin{cases} y \le x + 4 \\ y \ge -2x \end{cases}$



a. $(0, 3)$ and $(3, -2)$

b. $(-2, 0)$ and $(-4, 3)$

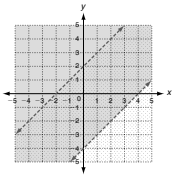
5. $\begin{cases} y \le \frac{1}{2}x + 1 \\ x + y < 3 \end{cases}$



a. $(0, 0)$ and $(-2, 0)$

b. $(3, 0)$ and $(2, 3)$

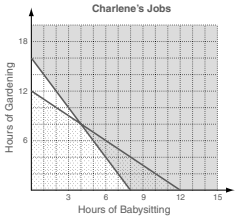
6. $\begin{cases} y > x - 4 \\ y < x + 2 \end{cases}$



a. $(0, 0)$ and $(-2, -2)$

b. $(-3, 3)$ and $(4, 0)$

7. Charlene makes \$10 per hour babysitting and \$5 per hour gardening. She wants to make at least \$80 a week, but can work no more than 12 hours a week.



a. Write a system of linear equations.

x = babysitting hours,
y = gardening hours,

$$\begin{cases} x + y \le 12 \\ 10x + 5y \ge 80 \end{cases}$$

b. Graph the solutions of the system.

c. Describe all the possible combinations of hours that Charlene could work at each job.

Any combination of hours represented by the ordered pairs in the solution region.

d. List two possible combinations. 6 h babysitting, 4 h gardening; 8 h babysitting, 2 h gardening

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LESSON 6-6

Practice C

Solving Systems of Linear Inequalities

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

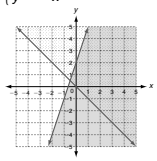
1. $(-2, 3)$; $\begin{cases} y \le x + 5 \\ y > -2x - 1 \end{cases}$ no

2. $(-3, 3)$; $\begin{cases} y < -x + 1 \\ y > x - 4 \end{cases}$ yes

3. $(-1, -2)$; $\begin{cases} y > x - 2 \\ y < 3x \end{cases}$ no

Graph the system of linear inequalities. a. Give two ordered pairs that are solutions. b. Give two ordered pairs that are not solutions.

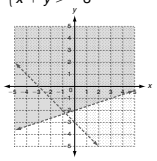
4. $\begin{cases} y \le 3x + 2 \\ y \ge -x \end{cases}$



a. $(0, 2)$ and $(3, 0)$

b. $(0, -3)$ and $(-4, 0)$

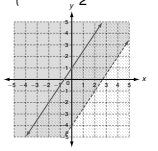
5. $\begin{cases} y > \frac{1}{3}x - 2 \\ x + y > -3 \end{cases}$



a. $(-2, 0)$ and $(0, 3)$

b. $(-4, -2)$ and $(0, -4)$

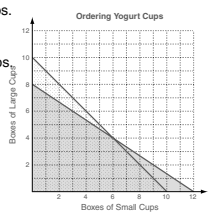
6. $\begin{cases} 3x - 2y < 8 \\ y - 1 \le \frac{3}{2}x \end{cases}$



a. $(0, 1)$ and $(0, 0)$

b. $(4, -4)$ and $(0, -4)$

7. Dennis works at a frozen yogurt store in the summer. He needs to order boxes of small cups and boxes of large cups. The storage room can hold up to 10 more boxes of cups. Each box of small cups costs \$100 and each box of large cups costs \$150. A maximum of \$1200 is budgeted for cups.



a. Write a system of linear equations.

x = boxes of small cups,
y = boxes of large cups,

$$\begin{cases} x + y \le 10 \\ 100x + 150y \le 1200 \end{cases}$$

b. Graph the solutions of the system.

c. Describe all the possible combinations of boxes of cups that Dennis can order.

Any combination of cups represented by the whole number ordered pairs in the solution region.

d. List two possible combinations. 6 small, 4 large; 3 small, 5 large

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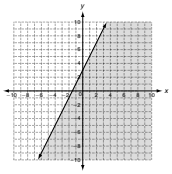
LESSON 6-6

Reteach

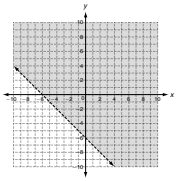
Solving Systems of Linear Inequalities

You can graph a system of linear inequalities by combining the graphs of the inequalities.

Graph of $y \le 2x + 3$

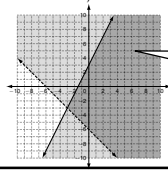


Graph of $y > -x - 6$



Graph of the system

$\begin{cases} y \le 2x + 3 \\ y > -x - 6 \end{cases}$

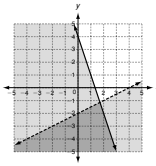


All solutions are in this double shaded area.

Two ordered pairs that are solutions: $(3, 4)$ and $(5, -2)$.

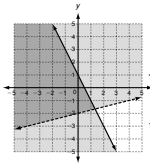
For each system below, give two ordered pairs that are solutions and two that are not solutions.

1.



Possible Answers: Sol: $(1, -3)$, $(-2, -4)$; not sol: $(3, -3)$, $(-3, 2)$

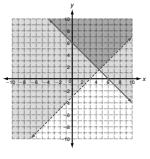
2.



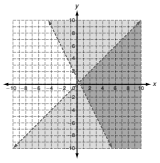
Possible Answers: Sol: $(-4, 3)$, $(-3, 1)$; not sol: $(3, -3)$, $(2, 2)$

Graph each system of linear inequalities

3. $\begin{cases} y > x - 3 \\ y \ge -x + 6 \end{cases}$



4. $\begin{cases} y < x \\ y > -2x + 1 \end{cases}$



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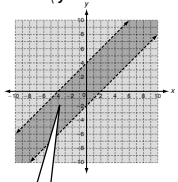
LESSON 6-6

Reteach

Solving Systems of Linear Inequalities (continued)

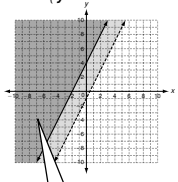
A system of equations with parallel lines has no solutions.
Parallel lines in a system of inequalities might have solutions.

Graph $\begin{cases} y < x + 4 \\ y > x - 2 \end{cases}$.



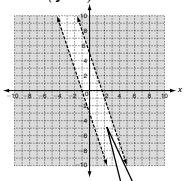
Solutions are in the double shaded area between the parallel lines.

Graph $\begin{cases} y \geq 2x + 4 \\ y > 2x - 1 \end{cases}$.



Solutions are in the double shaded area to one side of the line.

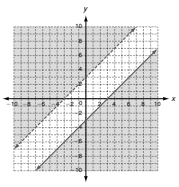
Graph $\begin{cases} y > -3x + 5 \\ y < -3x - 3 \end{cases}$.



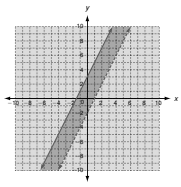
There are no overlapping areas. There are no solutions.

Graph the solutions of each linear inequality.

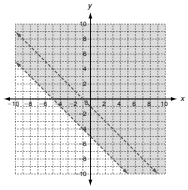
5. $\begin{cases} y \leq x - 3 \\ y > x + 3 \end{cases}$



6. $\begin{cases} y > 2x - 2 \\ y \leq 2x + 3 \end{cases}$



7. $\begin{cases} y > -x - 1 \\ y > -x - 5 \end{cases}$



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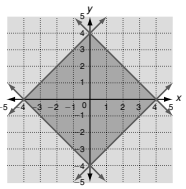
LESSON 6-6

Challenge

Solving Systems of Linear Inequalities

Recall that $|x|$ has two parts in its definition. If $x \geq 0$, then $|x| = x$. If $x < 0$, then $|x| = -x$. This definition is useful when dealing with systems of inequalities that involve absolute value.

In Exercises 1 and 2, consider $\begin{cases} y \geq |x| - 4 \\ y \leq -|x| + 4 \end{cases}$.



1. Consider $y \geq |x| - 4$.

a. On the grid at right, graph $y = |x| - 4$. Shade the part of the plane that is the solution to $y \geq |x| - 4$. (Test points to help decide on what part of the plane to shade.)

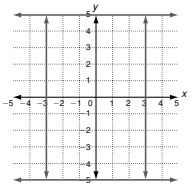
b. On the grid at right, graph $y = -|x| + 4$. Shade that part of the plane that is the solution to $y \leq -|x| + 4$.

2. Describe the region that is the common solution to the two absolute-value inequalities.

The solution is the interior and boundary of the square formed by the absolute value inequalities.

You can reverse the process and represent a specified region by using a system of inequalities.

3. On the grid at right, graph the vertical lines $x = 3$ and $x = -3$. Also graph the horizontal lines $y = 5$ and $y = -5$.



a. Write a pair of absolute-value inequalities whose graphs are the interior of the rectangle formed.

$|x| < 3, |y| < 5$

b. Write a pair of absolute-value inequalities whose graphs are the exterior of the rectangle formed.

$|x| > 3, |y| > 5$

4. Explain how to modify the solution to Exercise 3 in order to represent the rectangle whose sides are bounded by the vertical lines $x = -1$ and $x = 3$ and the horizontal lines $y = -2$ and $y = 8$. Then write the system of absolute-value inequalities.

Explanations may vary but should give the following absolute value inequalities: $|x - 1| \leq 2$ and $|y - 3| \leq 5$

5. The sides of a square are horizontal and vertical line segments whose diagonals meet at the origin. Represent the square and its interior by using a system of absolute-value inequalities.

$\begin{cases} |x| \leq a \\ |y| \leq a \end{cases}$, where $a > 0$

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LESSON 6-6

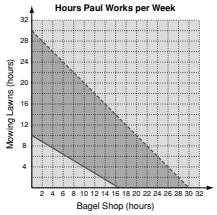
Problem Solving

Solving Systems of Linear Inequalities

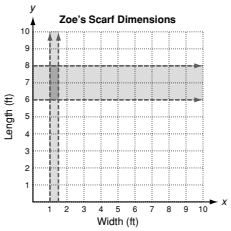
Write the correct answer.

1. Paul earns $7 per hour at the bagel shop and $12 per hour mowing lawns. Paul needs to earn at least $120 per week, but he must work less than 30 hours per week. Write and graph the system of linear inequalities that describes this situation.

$\begin{cases} 7x + 12y \geq 120 \\ x + y < 30 \end{cases}$



2. Zoe plans to knit a scarf. She wants the scarf to be more than 1 but less than 1.5 feet wide, and more than 6 but less than 8 feet long. Graph all possible dimensions of Zoe's scarf. List two possible combinations.



width of 1.25 ft, length of 7 ft;
width of 1.4 ft, length of 7.5 ft

The graph shows the numbers of two types of custom wood tables that can be made to fit a client's needs. Select the best answer.

3. Which system of linear inequalities represents the graph?

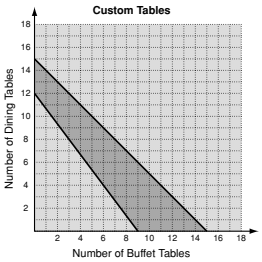
Ⓐ $\begin{cases} x + y \leq 15 \\ y \geq 12 - \frac{4}{3}x \end{cases}$ **C** $\begin{cases} x + y \geq 15 \\ y \geq \frac{4}{3}x - 12 \end{cases}$

B $\begin{cases} y \leq x + 15 \\ y \geq 12 - \frac{4}{3}x \end{cases}$ **D** $\begin{cases} y \leq 15 - x \\ y \leq \frac{4}{3}x - 12 \end{cases}$

4. If 6 buffet tables are built, which can NOT be the number of dining tables built?

F 4 **H** 8

G 6 Ⓙ 10



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LESSON 6-6

Reading Strategies

Analyze Information

To solve a real-world problem involving inequalities, there is a lot of information that must be analyzed. Study the example below.

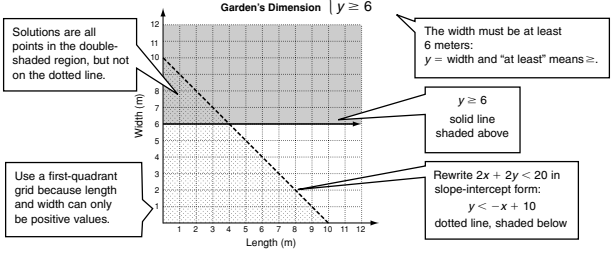
The perimeter of a garden must be less than 20 meters.
The width must be at least 6 meters.
Show all possible combinations of the garden's length and width.
Identify two possible solutions.

- Let x = length of garden
- Let y = width of garden

Define variables for the unknowns: "the garden's length and width."

The perimeter must be less than 20 meters: $P = 2l + 2w$; and "less than" means $<$.

$\begin{cases} 2x + 2y < 20 \\ y \geq 6 \end{cases}$



Solutions are all points in the double-shaded region, but not on the dotted line.

The width must be at least 6 meters: y = width and "at least" means $\geq$.

$y \geq 6$ solid line shaded above

Use a first-quadrant grid because length and width can only be positive values.

Rewrite $2x + 2y < 20$ in slope-intercept form: $y < -x + 10$ dotted line, shaded below

Possible solutions: $l = 2$ m, $w = 7$ m and $l = 1$ m, $w = 8$ m

Manuel is going to build a rabbit cage with a rectangular base.
The perimeter can be no greater than 30 feet.
The length must be greater than 8 feet.
Let x = length and y = width.

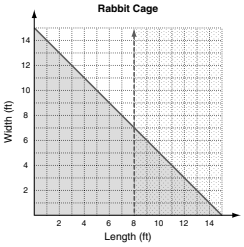
1. Write a system of linear inequalities to describe the possible cage sizes.

$\begin{cases} 2x + 2y \leq 30 \\ x > 8 \end{cases}$

2. Graph the system to show possible dimensions.

3. Give two possible dimensions for the cage.

$l = 10$ ft, $w = 5$ ft and
$l = 11$ ft, $w = 4$ ft



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