Name ______________________________ Date __________ Class __________

LESSON 2-5

Review for Mastery

Linear Inequalities in Two Variables

Graphing a linear inequality is similar to graphing a linear function.

Graph $y \leq \frac{2}{3}x + 1$ using the slope-intercept form.

Step 1 Write the corresponding equation. Then identify the slope and the y-intercept.

$y = \frac{2}{3}x + 1$

$m = \frac{2}{3}$ and $b = 1$

Step 2 Draw the graph of $y = \frac{2}{3}x + 1$.

Draw a solid boundary line for $\leq$ or $\geq$.

Draw a dashed boundary line for $<$ or $>$.

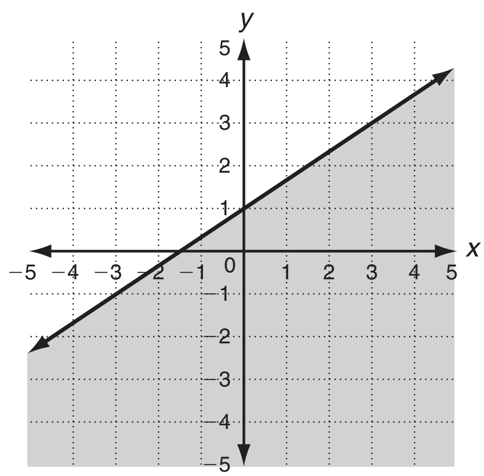
Step 3 Shade the half-plane below the line for $<$ or $\leq$. Shade the half-plane above the line for $>$ or $\geq$.

Step 4 Check using a point in the shaded region. Use $(0, 0)$.

$y \leq \frac{2}{3}x + 1$

$0 \overset{?}{\leq} \frac{2}{3}(0) + 1$

$0 \overset{?}{\leq} 1$ ✓



Graph each inequality.

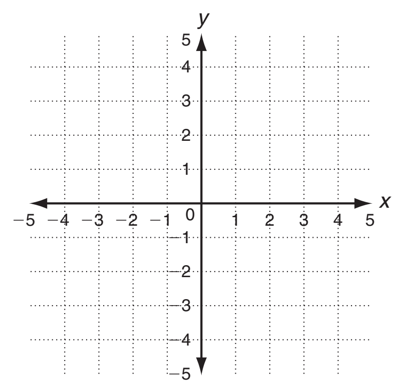
1. $y \leq x + 2$

a. $m =$ ______________

b. $b =$ ______________

c. boundary line is ______________

d. shade half-plane ______________ the line



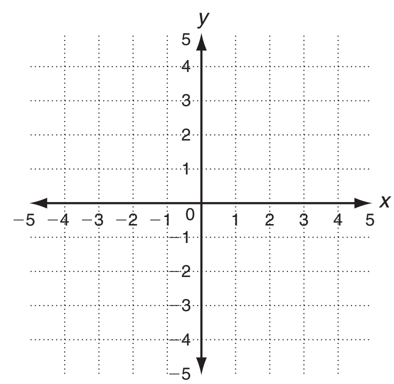
2. $y > -2x + 1$

a. $m =$ ______________

b. $b =$ ______________

c. boundary line is ______________

d. shade half-plane ______________ the line



Name ______________________________ Date __________ Class __________

LESSON 2-5

Review for Mastery

Linear Inequalities in Two Variables (continued)

The intercepts can be used to graph a linear inequality.

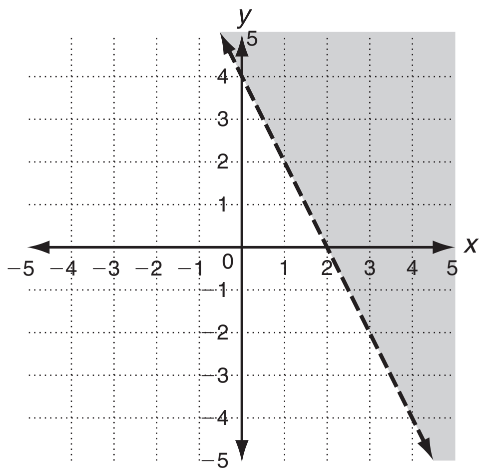
Graph $2x + y > 4$ using the intercepts.

Step 1 Write the corresponding equation. Then identify the x-intercept and the y-intercept.

$2x + y = 4$.

When $y = 0$, $x = 2$; plot $(2, 0)$.

When $x = 0$, $y = 4$; plot $(0, 4)$.



Step 2 Draw the graph of $2x + y = 4$ using a dashed line.

Step 3 Choose a point to check which half-plane to shade. Use $(0, 0)$.

$2x + y > 4$

$2(0) + (0) \overset{?}{>} 4$

$0 \overset{?}{>} 4$ ✕

Step 4 The inequality is false, so shade the half-plane above the line.

Graph each inequality.

3. $2x + 4y > 8$

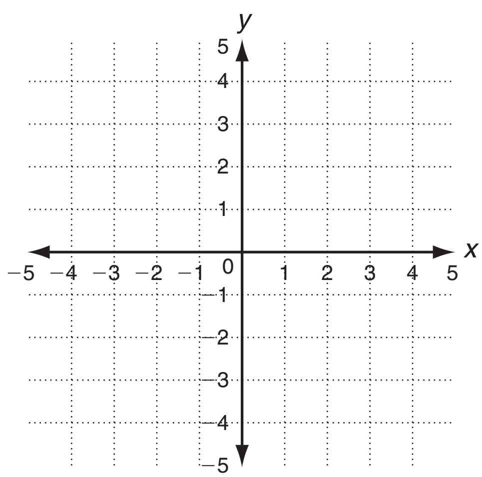
a. x-intercept ______________

b. y-intercept ______________

c. boundary line ______________

d. test $(0, 0)$ ______________

e. shade ______________ the line



4. $-3x + y \leq -1$

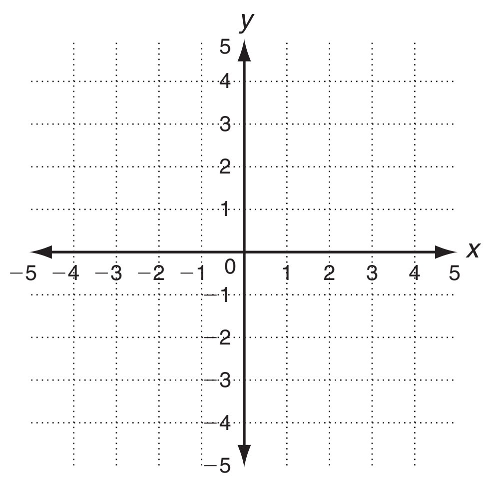
a. x-intercept ______________

b. y-intercept ______________

c. boundary line ______________

d. test $(0, 0)$ ______________

e. shade ______________ the line



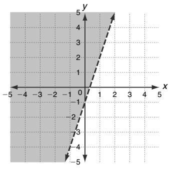
LESSON 2-5

Practice A

Linear Inequalities in Two Variables

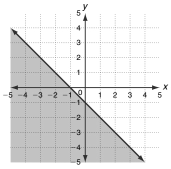
Choose a point in the shaded solution region of each graph and test it in the inequality. Does it satisfy the inequality? Tell whether the solution region is *correct* or *incorrect*.

1. $y > 3x - 1$



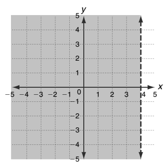
Correct

2. $y \geq -x - 1$



Incorrect

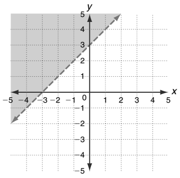
3. $x < 4$



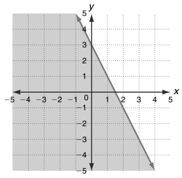
Correct

Graph each inequality.

4. $y > x + 3$

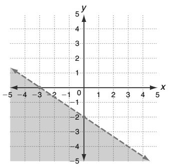


5. $y \leq -2x + 3$

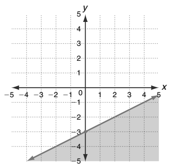


Solve each inequality for *y*. Graph the solution.

6. $2x + 3y < -6$



7. $5x - 10y \geq 30$



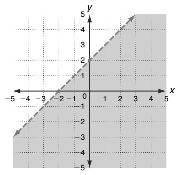
LESSON 2-5

Practice B

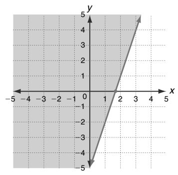
Linear Inequalities in Two Variables

Graph each inequality.

1. $y < x + 2$

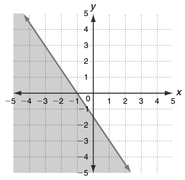


2. $y \geq 3x - 5$

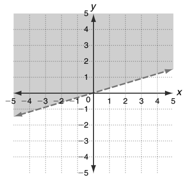


Solve each inequality for *y*. Graph the solution.

3. $-2(3x + 2y - 3) \geq 12$



4. $\frac{-x}{5} + \frac{2y}{3} > 0$



Solve.

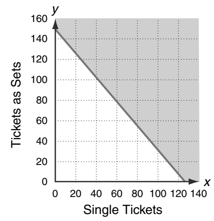
5. Marcus volunteers to work at a carnival booth selling raffle tickets. The tickets cost \$2 each or 3 for \$5. His goal is to have at least \$250 in sales during his shift.

   a. Let *x* be the number of tickets sold for \$2 each. Let *y* be the number of tickets sold in sets of 3 for \$5. Write and graph an inequality for the total number of tickets Marcus must sell to meet his goal.

   $2x + \frac{5y}{3} \geq 250$

   b. If Marcus sells 75 tickets for \$2 each, what is the least number of tickets he must sell in sets of 3 to meet his goal?

   60 tickets



LESSON 2-5

Practice C

Linear Inequalities in Two Variables

Solve.

1. Ticket prices for Wonderful Wave Water Park are \$25.00 for each child under 12 and \$35.00 for each adult. When Cassie ends her shift, the total value of her credit card receipts is \$2400. She also has cash receipts. Let *x* be the number of child tickets sold and *y* be the number of adult tickets sold.

   a. Write an inequality that shows the minimum number of tickets Cassie could have sold during her shift. $25x + 35y > 2400$

   b. Graph the inequality on a graphing calculator. If Cassie sold 25 adult tickets, what is the minimum number of child tickets she could have sold? 61 tickets

2. The cost to rent a car from Jumpin' Jalopies is \$15.00 a day from Monday through Thursday. Friday through Sunday the rental fee is \$10.75 a day. Let *x* be the number of days Monday through Thursday that a car is rented. Let *y* be the number of weekend days that a car is rented.

   a. Write an inequality that shows the maximum you would pay to rent the car for 10 consecutive days. $15x + 10.75y \leq 137.25$

   b. Graph the inequality on a graphing calculator. Describe the appropriate domain of *x* and *y*. $4 \leq x \leq 7;\ 3 \leq y \leq 6$

   c. Explain why the domain is limited.

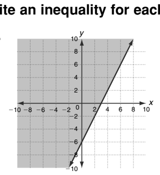
   Possible answer: Depending on when you start the 10-day period, the number of weekdays and weekend days will vary.

   d. How should you configure the 10 consecutive days in order to spend the minimum to rent a car? Explain your answer.

   Possible answer: Pick up the car on a Friday and return it the following Sunday. This gives you 6 weekend days at the lower rate and 4 weekdays at the higher rate.

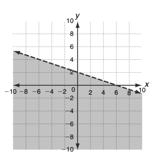
Write an inequality for each graph.

3.



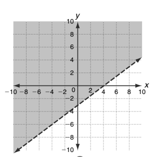
$y \geq 2x - 6$

4.



$y < -\frac{1}{3}x + 2$

5.



$y > \frac{3}{4}x - 3$

LESSON 2-5

Review for Mastery

Linear Inequalities in Two Variables

Graphing a linear inequality is similar to graphing a linear function.

Graph $y \leq \frac{2}{3}x + 1$ using the slope-intercept form.

Step 1 Write the corresponding equation. Then identify the slope and the *y*-intercept.

$y = \frac{2}{3}x + 1$

$m = \frac{2}{3}$ and $b = 1$

Step 2 Draw the graph of $y = \frac{2}{3}x + 1$.

Draw a solid boundary line for $\leq$ or $\geq$.

Draw a dashed boundary line for $<$ or $>$.

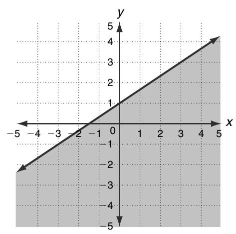
Step 3 Shade the half-plane below the line for $<$ or $\leq$. Shade the half-plane above the line for $>$ or $\geq$.

Step 4 Check using a point in the shaded region. Use $(0, 0)$.

$y \leq \frac{2}{3}x + 1$

$0 \overset{?}{\leq} \frac{2}{3}(0) + 1$

$0 \overset{?}{\leq} 1$ ✓



Graph each inequality.

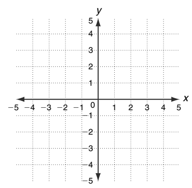
1. $y \leq x + 2$

   a. $m =$ 1

   b. $b =$ 2

   c. boundary line is Solid

   d. shade half-plane Below the line



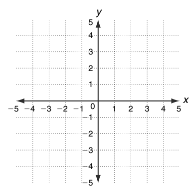
2. $y > -2x + 1$

   a. $m =$ −2

   b. $b =$ 1

   c. boundary line is Dashed

   d. shade half-plane Above the line



LESSON **2-5**

Review for Mastery

Linear Inequalities in Two Variables (continued)

The intercepts can be used to graph a linear inequality.

Graph $2x + y > 4$ using the intercepts.

Step 1 Write the corresponding equation. Then identify the x-intercept and the y-intercept.

$2x + y = 4.$

When $y = 0$, $x = 2$; plot $(2, 0)$.

When $x = 0$, $y = 4$; plot $(0, 4)$.

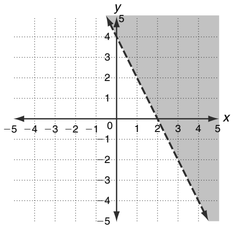
Step 2 Draw the graph of $2x + y = 4$ using a dashed line.

Step 3 Choose a point to check which half-plane to shade. Use $(0, 0)$.

$2x + y > 4$

$2(0) + (0) \overset{?}{>} 4$

$0 \overset{?}{>} 4$ ✗



Step 4 The inequality is false, so shade the half-plane above the line.

Graph each inequality.

3. $2x + 4y > 8$

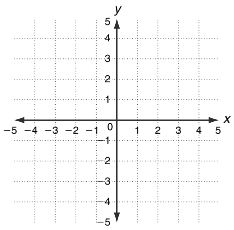
a. x-intercept 4

b. y-intercept 2

c. boundary line Dashed

d. test $(0, 0)$ False

e. shade Above the line



4. $-3x + y \le -1$

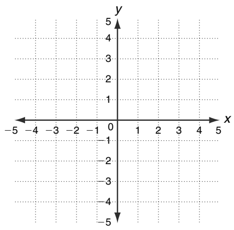
a. x-intercept $\frac{1}{3}$

b. y-intercept -1

c. boundary line Solid

d. test $(0, 0)$ False

e. shade Below the line

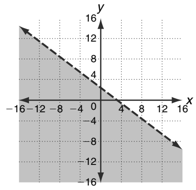


LESSON **2-5**

Challenge

What's in the Solution Region?

The graph shows the linear inequality $3x + 4y < 12$. The solution is represented by the shaded half-plane below the dashed line.



Answer the following questions.

1. Does point $J(-4, 2)$ satisfy this inequality? Why or why not?

   Yes; point J lies in the solution region.

2. Does point $K(4, -2)$ satisfy this inequality? Why or why not?

   Yes; point K lies in the solution region.

3. Write an equation for line R that passes through points J and K. Give the equation in slope-intercept form.

   $y = -\frac{1}{2}x$

4. Draw a line segment from point J to point K on the graph. Do all points on this line segment satisfy the inequality $3x + 4y < 12$? How do you know?

   Yes; all points on the line segment JK lie in the solution region.

5. What restrictions need to be placed on the domain to limit line R to only the points on the line segment from J to K?

   $-4 \le x \le 4$

6. a. Use your equation for line R to replace y with an expression in terms of x for the inequality $3x + 4y < 12$. Solve this inequality for x.

   $3x + 4\left(-\frac{1}{2}x\right) < 12,\ x < 12$

   b. Explain the meaning of this solution.

   Possible answer: All the points on line R where the domain is limited to $x < 12$ are in the shaded half-plane and therefore in the solution region.

LESSON **2-5**

Problem Solving

Linear Inequalities in Two Variables

Mr. and Mrs. Zaragosa are planning a landscape garden for their new house. They have set a budget of $200 for native grasses, at $12 each, and flowering plants, at $8.50 each.

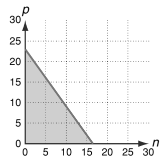
1. Let n be the number of native grasses and p be the number of flowering plants. Write an inequality for the number of each that they can buy.

   $12n + 8.5p \le 200$

2. Find the intercepts of the boundary line.

   n-intercept 16.7

   p-intercept 23.5



3. Graph the inequality on the coordinate plane.
4. Define the domain for variables n and p. $0 < n < 16;\ 0 < p < 23$
5. Should the boundary line be dashed or solid? Why?

   Solid, because the total cost could be equal to $200

6. What is the solution region on the graph? How do you know?

   The solution region is the area below the line, because they cannot spend any more than $200.

7. Use your graph to determine if they can buy 10 flowering plants and 15 native grasses. How do you know?

   No; Possible answer: because the point (10, 15) is not in the shaded region of the graph, so it is not a solution.

8. What is the greatest number of grasses they can buy if they want to buy at least 5 flowering plants? 13
9. Use your graph to estimate the number of each they could buy if they want the same number of each type of plant. 9 of each type.

Choose the letter for the best answer.

10. What is the greatest number of grasses they can buy if they have already bought 8 flowering plants?

   A 8

   B 9

   C 10

   (D) 11

11. What is the greatest number of flowering plants they can buy if they decide to buy a dozen native grasses?

   (A) 6

   B 7

   C 8

   D 9

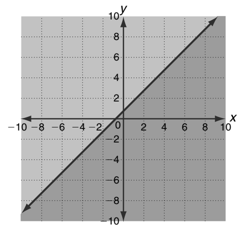
LESSON **2-5**

Reading Strategies

Understand Symbols

The solution set of a linear inequality is a region in the plane. The linear equation $y = x + 1$ is shown on the graph. The line is the boundary between the two shaded portions. You can describe each shaded portion with or without the boundary by using one of the four inequality symbols: $\le$, $<$, $\ge$, or $>$. The resulting inequalities are:

$y \le x + 1 \quad y < x + 1 \quad y \ge x + 1 \quad y > x + 1$



Answer each question. Use the inequalities shown above.

1. a. Which inequality describes both the shaded area above the line and the boundary line? $y \ge x + 1$

   b. Give two points that are solutions of that inequality.

   Possible answer: $(0, 6)$ and $(-4, 4)$

   c. Is the point $(-4, -3)$ a solution of that inequality? Yes

2. Write the inequality that describes just the shaded area above the line. $y > x + 1$
3. How would you change the graph to show that the boundary line is not included in the solution region?

   Change the solid boundary line to a dashed line.

4. Describe the region represented by $y \le x + 1$.

   The boundary line and the shaded area below it

5. Write the inequality that describes just the shaded area below the line? $y < x + 1$
6. The points $(0, -3)$ and $(1, 2)$ are in the solution region of which inequality? $y \le x + 1$