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The Playoffs
Graphing Inequalities

Vocabulary

Define the term in your own words

1. half-plane

Problem Set

Write a linear inequality in two variables to represent each problem situation.

1. Tanya is baking zucchini muffins and pumpkin muffins for a school event. She needs at least 500 muffins for the event.
   $x + y \geq 500$

2. Hiro needs to buy new pens and pencils for school. Pencils cost $1 each and pens cost $2.50 each. He has $10 to spend.

3. Patti makes decorative flower pots. It costs her $20 to purchase the materials for each pot. She wants to charge more than $6 per hour of labor plus her materials cost for each pot.

4. Jose and Devon are working on a construction job together. Devon can put in 4 times as many hours per week as Jose. Together they must work at least 80 hours per week.

5. The Foxes are playing the Titans. The Titans have been scoring 28 or more points per game this season. Between 7-point touchdowns and 3-point field goals, the Foxes need to score more than the Titan's lowest score to have a hope of winning the game.

6. Jack made twice his fundraising goal, which was less than the total that Cameron raised. Cameron raised $14 more than 5 times her goal.

Tell whether the graph of each linear inequality will have a dashed line or a solid line. Explain your reasoning.

7. $x - 3y \leq 32$

The line will be solid because the symbol is $\leq$.

8. $8y + 7x > 15$

9. $y < 14x + 9$

10. $-5.2y - 8.3x \leq -28.6$

11. $\frac{2}{3}x + \frac{4}{9}y \geq 3$

12. $y - 17 > x + 8$

13. $185x + 274y \geq 65$

14. $36 < 9y - 2x$

For each inequality, use the test point (0, 0) to determine which half-plane should be shaded.

15. $5x + 7y > -13$

$5(0) + 7(0) > -13$

$0 > -13$

The half-plane that includes (0, 0) should be shaded because the inequality is true for that point.

16. $y - 30 \leq 9x$

17. $-8y > 6x + 12$

18. $46 \geq -5y + 10x$

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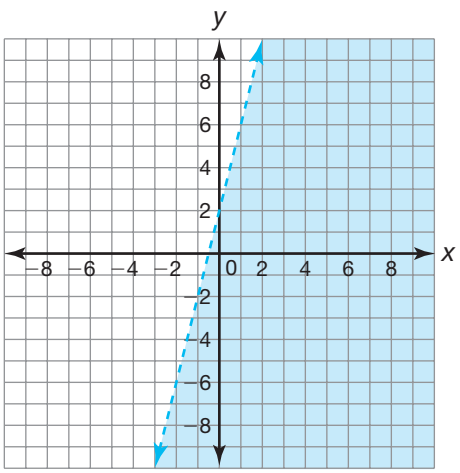
19. $31.9x + 63.7y < -44.5$

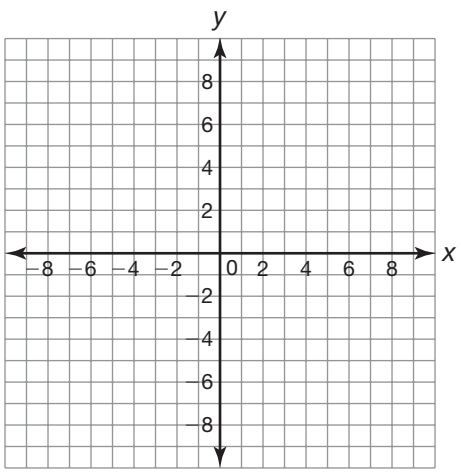
20. $y - \frac{5}{6} > \frac{1}{2}x + \frac{1}{3}$

Graph each linear inequality.

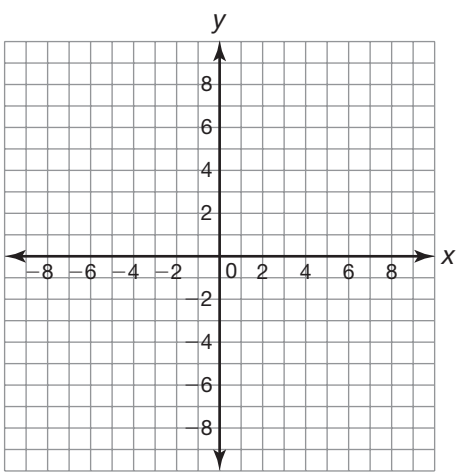
21. $y < 4x + 2$



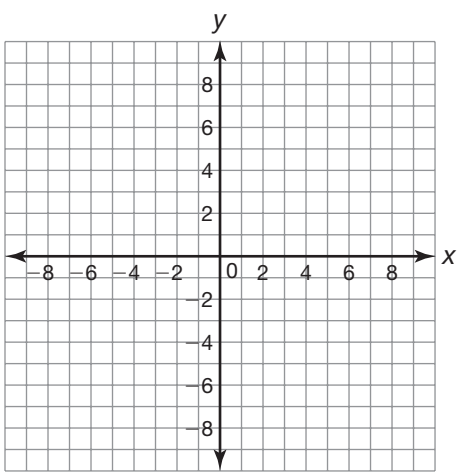
22. $y \geq 10 - x$



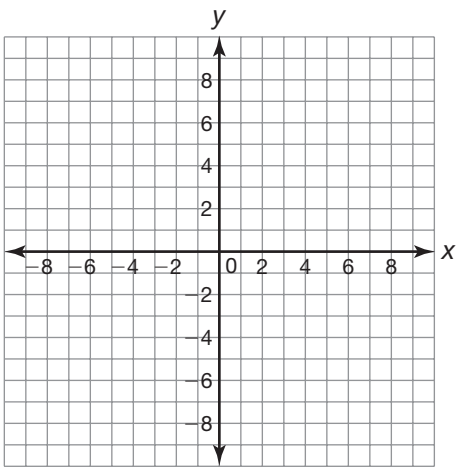
23. $y \geq \frac{1}{2}x - 3$



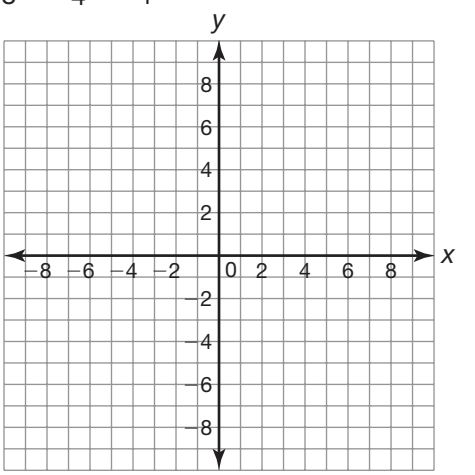
24. $-x + y > 1$



25. $3x - 4y \geq 8$



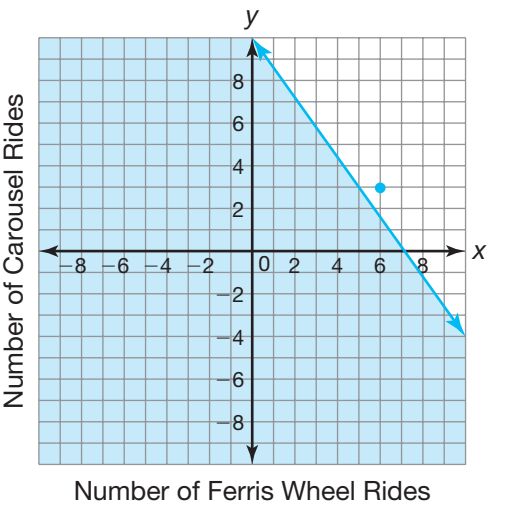
26. $\frac{3}{8}y - \frac{1}{4}x < \frac{3}{4}$



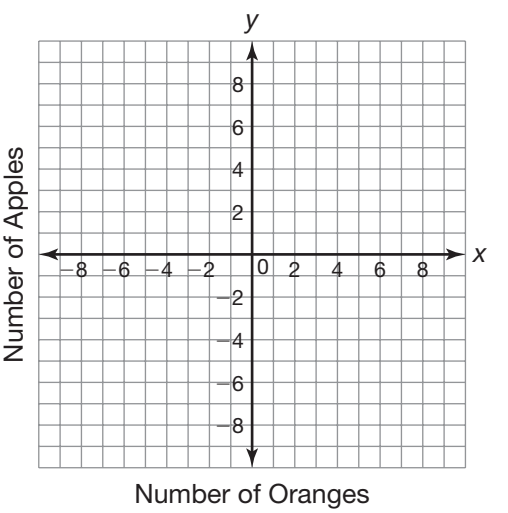
Graph each inequality and determine if the ordered pair is a solution for the problem situation.

27. Marcus has 50 tokens to spend at the school carnival. The Ferris wheel costs 7 tokens and the carousel costs 5 tokens. The inequality $7x + 5y \leq 50$ represents the possible ways Marcus could use his tokens on the two rides. Is the ordered pair (6, 3) a solution for the problem situation?

No. The ordered pair (6, 3) is not a solution to the inequality. It is not in the shaded half-plane.



28. Sophia has \$2 to buy oranges and apples. Oranges cost \$0.45 each and apples cost \$0.25 each. The inequality $0.45x + 0.25y \leq 2$ represents the possible ways Sophia could spend her \$2. Is the ordered pair (2, 3) a solution for the problem situation?



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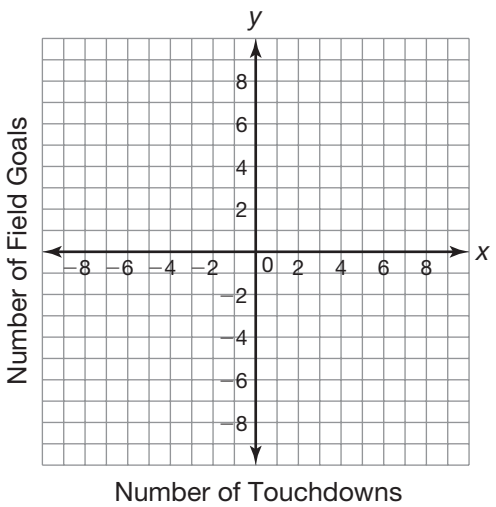
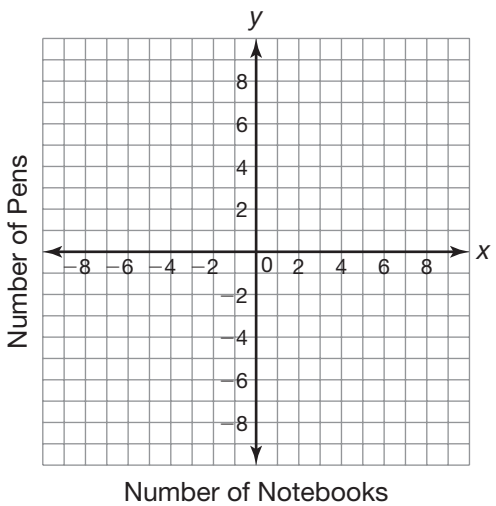
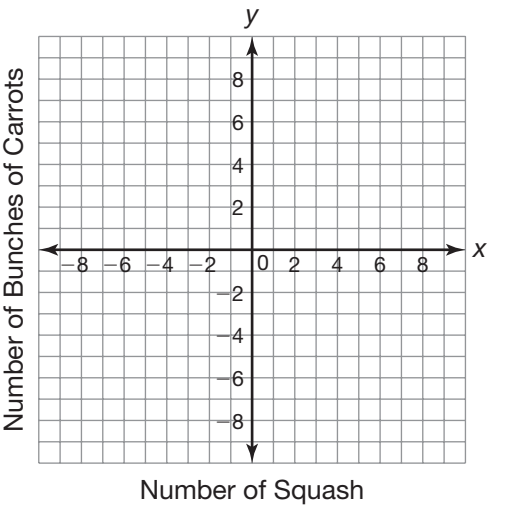
29. Noah plays football. His team's goal is to score at least 15 points per game. A touchdown is worth 6 points and a field goal is worth 3 points. Noah's league does not allow teams to try for the extra point after a touchdown. The inequality $6x + 3y \geq 15$ represents the possible ways Noah's team could score points to reach their goal. Is the ordered pair $(6, -1)$ a solution for the problem situation?



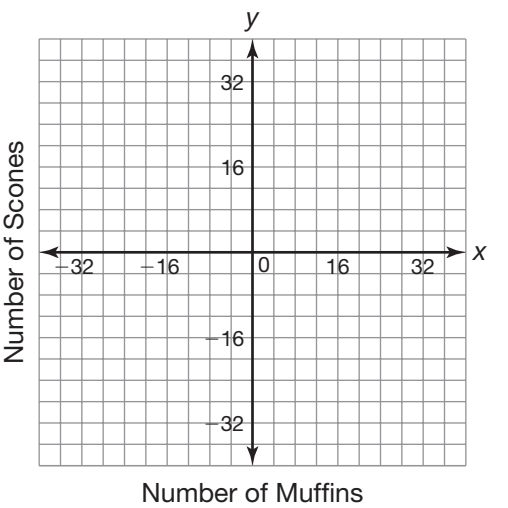
30. Lea has \$5 to buy notebooks and pens. Notebooks cost \$1.25 each and pens cost \$0.75 each. The inequality $1.25x + 0.75y \leq 5$ represents the possible ways Lea could spend her \$5. Is the ordered pair $(5, 2)$ a solution for the problem situation?



31. Leon has \$10 to buy squash and carrots. Squash cost \$1.50 each and carrots cost \$2.75 per bunch. The inequality $1.50x + 2.75y \leq 10$ represents the possible ways Leon could spend his \$10. Is the ordered pair $(-2, 4)$ a solution for the problem situation?



32. Olivia makes and sells muffins and scones at a school bake sale. She sells muffins for \$0.50 each and scones for \$0.80 each. She hopes to raise at least \$20. The inequality $0.50x + 0.80y \geq 20$ represents the possible ways Olivia could reach her goal. Is the ordered pair (20, 32) a solution for the problem situation?



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Working the System
Systems of Linear Inequalities

Vocabulary

Define each term in your own words.

1. constraints

2. solution of a system of linear inequalities

Problem Set

Write a system of linear inequalities that represents each problem situation. Remember to define your variables.

1. Jamal runs the bouncy house at a festival. The bouncy house can hold a maximum of 1200 pounds at one time. He estimates that adults weigh approximately 200 pounds and children under 16 weigh approximately 100 pounds. For 1 four-minute session of bounce time, Jamal charges adults $3 each and children $2 each. Jamal hopes to charge at least $24 for each session.

   x = the number of adults

   y = the number of children

   $$\begin{cases} 3x + 2y \geq 24 \\ 200x + 100y \leq 1200 \end{cases}$$

2. Carlos works at a movie theater selling tickets. The theater has 300 seats and charges $7.50 for adults and $5.50 for children. The theater expects to make at least $2000 for each showing.

3. The maximum capacity for an average passenger elevator is 15 people and 3000 pounds. It is estimated that adults weigh approximately 200 pounds and children under 16 weigh approximately 100 pounds.

4. Pablo's pickup truck can carry a maximum of 1000 pounds. He is loading his truck with 20-pound bags of cement and 80-pound bags of cement. He hopes to load at least 10 bags of cement into his truck.

5. Eiko is drawing caricatures at a fair for 8 hours. She can complete a small drawing in 15 minutes and charges $10 for the drawing. She can complete a larger drawing in 45 minutes and charges $25 for the drawing. Eiko hopes to make at least $200 at the fair.

6. Sofia is making flower arrangements to sell in her shop. She can complete a small arrangement in 30 minutes that sells for $20. She can complete a larger arrangement in 1 hour that sells for $50. Sofia hopes to make at least $350 during her 8-hour workday.

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Determine whether each given point is a solution to the system of linear inequalities.

7. $\begin{cases} 2x - y > 4 \\ -x + y \leq 7 \end{cases}$

Point: $(-2, -10)$

$2x - y > 4$ | $-x + y \leq 7$

$2(-2) - (-10) > 4$ | $-(-2) + (-10) \leq 4$

$-4 + 10 > 4$ | $2 - 10 \leq 7$

$6 > 4$ ✓ | $-8 \leq 7$ ✓

Yes. The point $(-2, -10)$ is a solution to the system of inequalities.

8. $\begin{cases} x + 5y < -1 \\ 2y \geq -3x - 2 \end{cases}$

Point: $(0, -1)$

9. $\begin{cases} 4x + y < 21 \\ \frac{1}{2}x \leq 36 - 5y \end{cases}$

Point: $(3, 7)$

10. $\begin{cases} 5x + 3y > 6 \\ -2x + 2y < 20 \end{cases}$

Point: $(-2, 6)$

11. $\begin{cases} 15x + 25y \geq 300 \\ 20x + 30y \leq 480 \end{cases}$

Point: $(14, 8)$

12. $\begin{cases} -2.1x + 7y \geq -49.5 \\ -y \leq -6.3x + 78 \end{cases}$

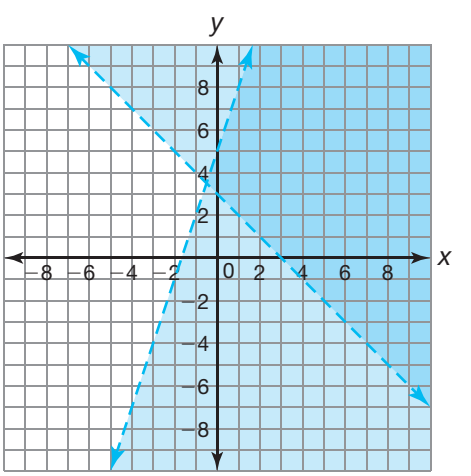
Point: $(10, -8)$

Graph each system of linear inequalities and identify two solutions.

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

Answers will vary.

(2, 3) and (6, 0)



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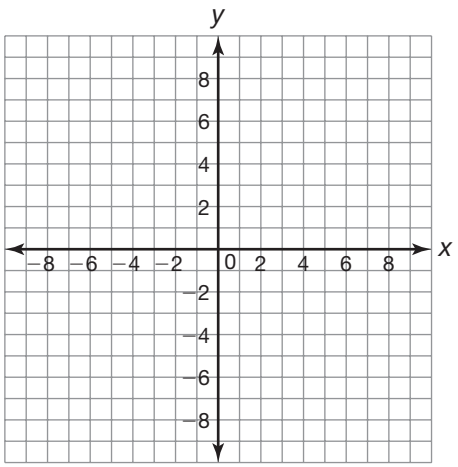
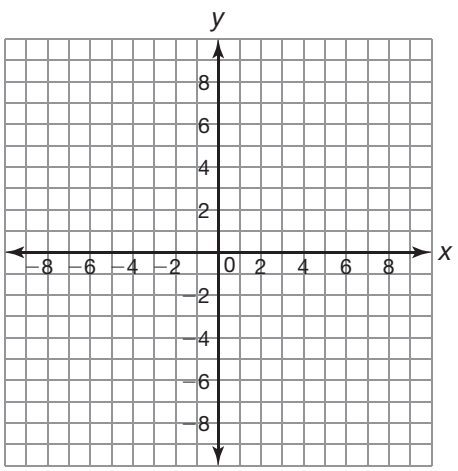
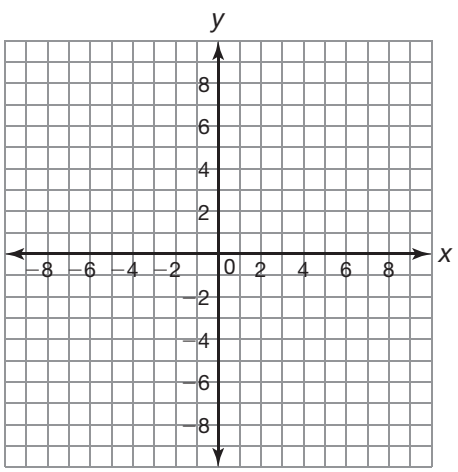
14. $\begin{cases} y > 2x + 3 \\ y < 2x - 5 \end{cases}$



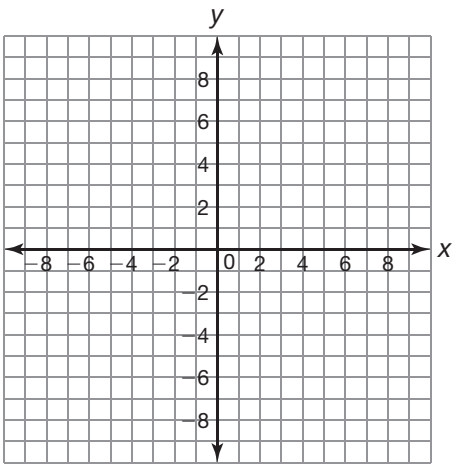
15. $\begin{cases} y \leq -\frac{2}{3}x + 3 \\ y \geq 3x - 4 \end{cases}$



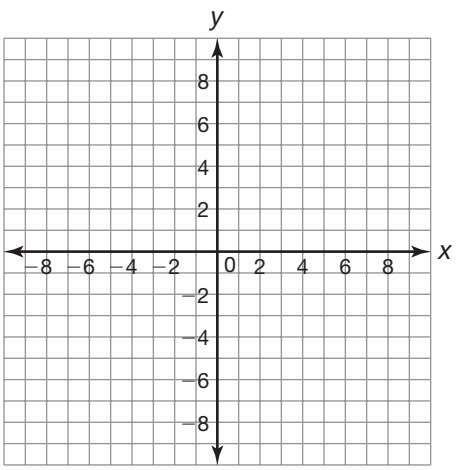
16. $\begin{cases} y < -\frac{1}{2}x + 6 \\ y < 2x + 1 \end{cases}$



17. $\begin{cases} y \geq -\frac{1}{3}x + 4 \\ y \geq 2x + 5 \end{cases}$



18. $\begin{cases} y > -4x + 8 \\ y < -4x - 2 \end{cases}$



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Our Biggest Sale of the Season!

Systems with More Than Two Linear Inequalities

Problem Set

Write a system of linear inequalities that represents each problem situation. Remember to define your variables.

1. Ronna is shopping for a winter coat. The regular price of a winter coat is between $65 and $180. The store is running a special promotion where all coats are up to 35% off the regular price. Write a system of linear inequalities that represents the amount Ronna could spend.

   Let r represent the regular price.

   Let s represent the amount Ronna could spend.

   $$\begin{cases} r \geq 65 \\ r \leq 180 \\ s \leq 0.65r \end{cases}$$

2. Stephen is shopping for a snowboard. The regular price of a snowboard is between $120 and $425. The store is running a special promotion where all snowboards are between 25% and 75% off the regular price. Write a system of linear inequalities that represents the amount Stephen could spend.

3. Ling is shopping for a gold necklace. The regular price of a necklace is between $55 and $325. The store is running a special promotion where all necklaces are between 20% and 40% off the regular price. Write a system of linear inequalities that represents the amount Ling could spend.

4. Mario is shopping for a watch. The regular price of a watch is between $45 and $120. The store is running a special promotion where all watches are at least 25% off the regular price. Write a system of linear inequalities that represents the amount Mario could spend.

5. A company manufactures at most 20 mattresses each day. The company produces a twin size mattress and a queen size mattress. Its daily production goal is to produce at least 5 of each type of mattress. Write a system of linear inequalities that represents the number of each type of mattress that can be produced.

6. A company manufactures at most 200 tires each day. The company produces an all-weather tire and a snow tire. Its daily production goal is to produce at least 75 of each type of tire. Write a system of linear inequalities that represents the number of each type of tire that can be produced.

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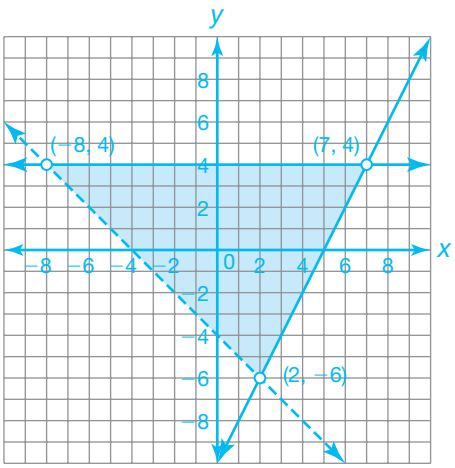
Graph the solution set for each system of linear inequalities. Label all points of intersection of the boundary lines. Then determine a point that satisfies all of the linear inequalities in the system.

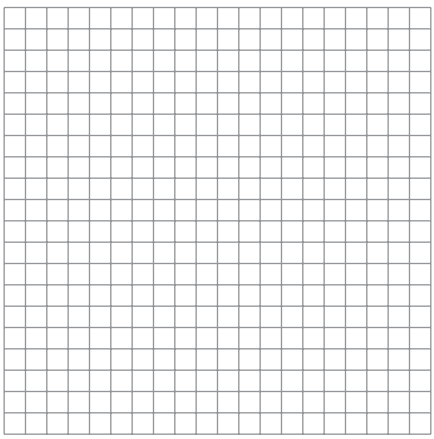
7. $\begin{cases} y \leq 4 \\ 2x - y \leq 10 \\ y > -x - 4 \end{cases}$



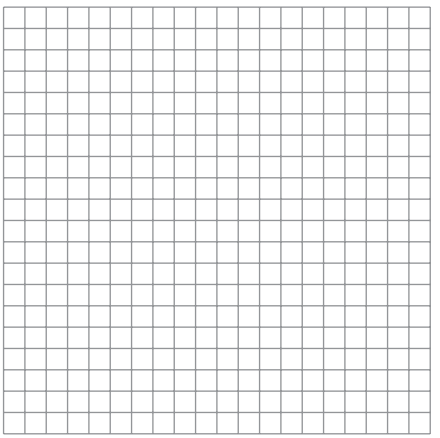
Answers will vary.

A solution to the system of inequalities would be (0, 0).

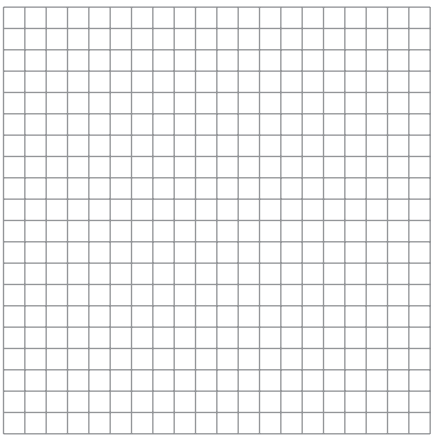
8. $\begin{cases} y \geq -2 \\ y \leq 4 \\ x + 1 > y \\ x - 1 < y \end{cases}$



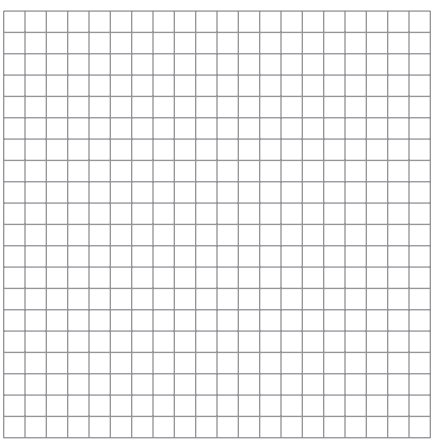
9. $\begin{cases} y \leq 2 + x \\ y > x - 1 \\ 2x + y \geq -3 \\ -x + 1 > y \end{cases}$



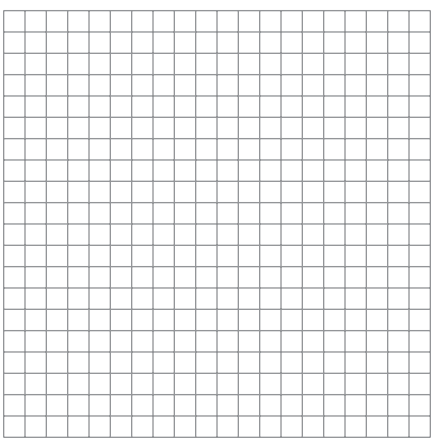
10. $\begin{cases} y > -2 \\ y \leq x + 1 \\ -x \leq y + 3 \\ y \leq -x + 1 \\ y \leq 0 \end{cases}$



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



12. $\begin{cases} y \leq 3x + 2 \\ y < 4 - x \\ -2x + 3y \leq 2 \\ 3y \geq 2x - 8 \end{cases}$



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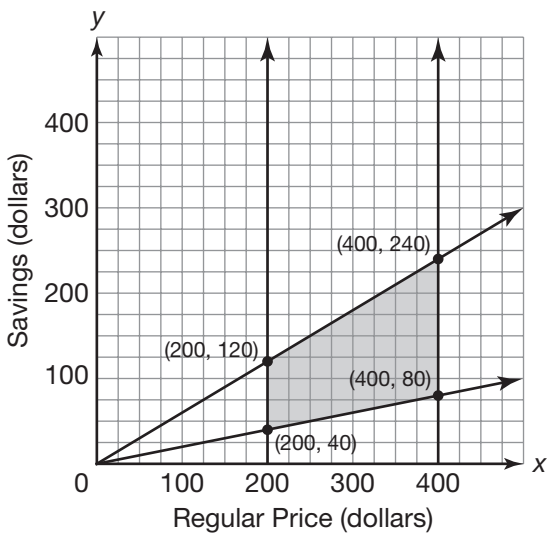
Analyze the solution set for the system of linear inequalities to answer each question.

Pedro is shopping for a surfboard. The regular price of a surfboard is between $200 and $400. The store is running a special promotion where all surfboards are between 20% and 60% off the regular price. The system of linear inequalities represents the amount Pedro can save.

Let r represent the regular price.

Let s represent the amount Pedro can save.

$$\begin{cases} r \geq 200 \\ r \leq 400 \\ s \leq 0.60r \\ s \geq 0.20r \end{cases}$$



13. What is the most that Pedro can save?

The most Pedro can save is $240 represented by the point (400, 240).

14. What is the least that Pedro can save?

15. What is the most that Pedro will pay for the most expensive surfboard?

16. What is the most that Pedro will pay for the least expensive surfboard?

17. What is the least that Pedro will pay for the most expensive surfboard?

18. What is the least that Pedro will pay for the least expensive surfboard?

Name _____ Date _____

Take It to the Max . . . or Min
Linear Programming

Vocabulary

Define the term in your own words.

1. linear programming

Problem Set

Write a system of linear inequalities to represent each problem situation. Remember to define your variables.

1. A company is manufacturing two different models of lamps, a table lamp and a floor lamp. A table lamp takes 1 hour to make and a floor lamp takes 2 hours to make. The company has 9 employees working 8-hour days. The total manufacturing capacity is 40 lamps per day.

   Let t represent the number of table lamps.

   Let f represent the number of floor lamps.

   9 employees $\times$ 8 hours per day = 72 work hours per day

   $$\begin{cases} t \geq 0 \\ f \geq 0 \\ t + f \leq 40 \\ t + 2f \leq 72 \end{cases}$$

2. A company is manufacturing calculators. A financial calculator costs \$65 to make and a graphing calculator costs \$105 to make. The budget available for materials is \$2500 per day. The manufacturing capacity is 20 calculators per day.

3. A company is manufacturing computers. A tablet computer costs $300 to make and a laptop computer costs $600 to make. The budget available for materials is $20,000 per day. The manufacturing capacity is 50 computers per day.

4. A furniture company is manufacturing sofas and loveseats. A loveseat takes 5 hours and $650 to make. A sofa takes 8 hours and $950 to make. The company has 30 employees working 8-hour days. The daily operating budget is $25,000 per day for materials to make at most 40 pieces of furniture.

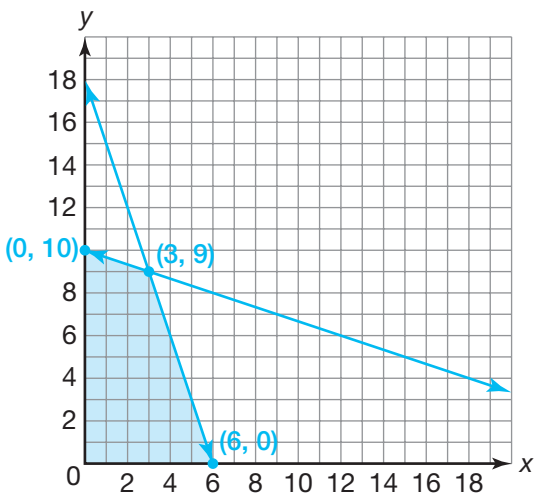
5. An electronics company is manufacturing headphones. In-ear headphones take 2 hours and $65 to make. Around-ear headphones take 3 hours and $85 to make. The company has 14 employees working 12-hour days. The daily operating budget is $5000 per day for materials to make at most 65 pairs of headphones.

6. A company is manufacturing golf clubs. A putter takes 2 hours and $80 to make. A driver takes 2 hours and $120 to make. The company has 6 employees working 12 hour days. The daily operating budget is $3000 per day for materials. The company wants to make at least 10 of each kind of club per day.

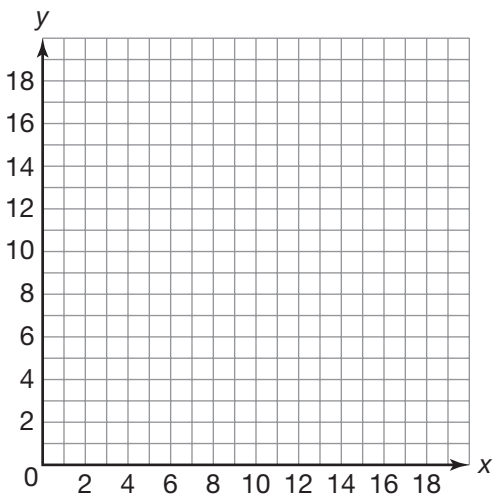
Name _____ Date _____

Graph the solution set for each system of linear inequalities. Label all points of intersection of the boundary lines.

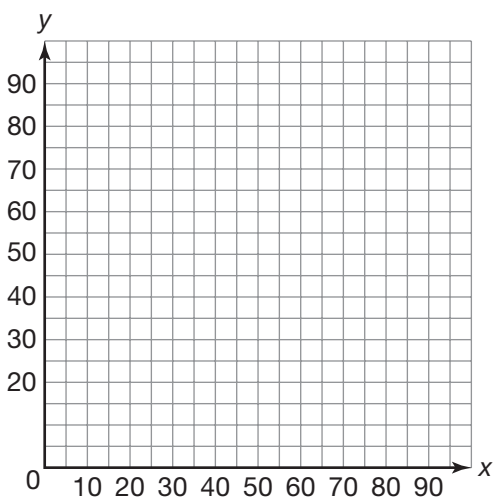
7. $\begin{cases} y \geq 0 \\ x \geq 0 \\ 3x + y \leq 18 \\ x + 3y \leq 30 \end{cases}$



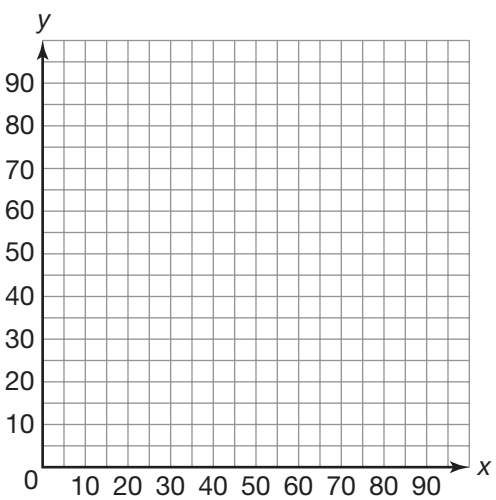
8. $\begin{cases} y \geq 0 \\ x \geq 0 \\ x + y \leq 20 \\ 4x + 9y \leq 135 \end{cases}$



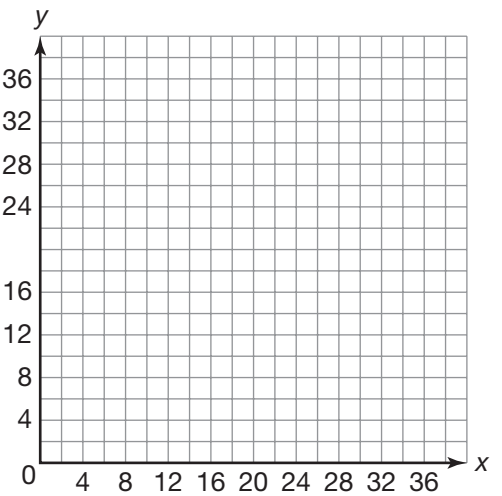
9. $\begin{cases} y \geq 15 \\ x \geq 10 \\ 3x + 2y \leq 90 \\ x + 2y \leq 70 \end{cases}$



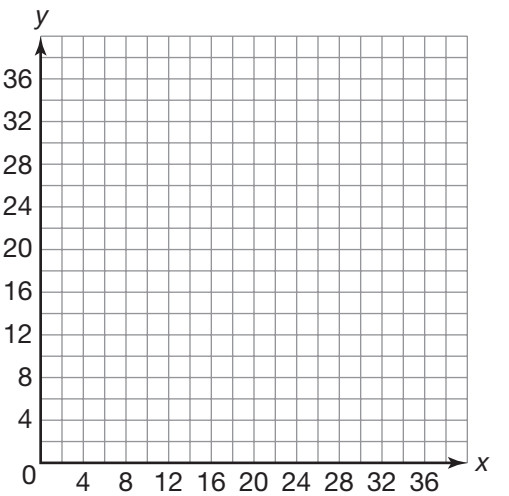
10. $\begin{cases} y \geq 10 \\ x \geq 20 \\ x + y \leq 90 \\ x + 4y \leq 240 \end{cases}$



11. $\begin{cases} y \geq 0 \\ x \geq 0 \\ x + y \leq 26 \\ x + 4y \leq 80 \end{cases}$



12. $\begin{cases} y \geq 14 \\ x \geq 10 \\ x + 5y \leq 130 \\ 2x + 5y \leq 150 \end{cases}$



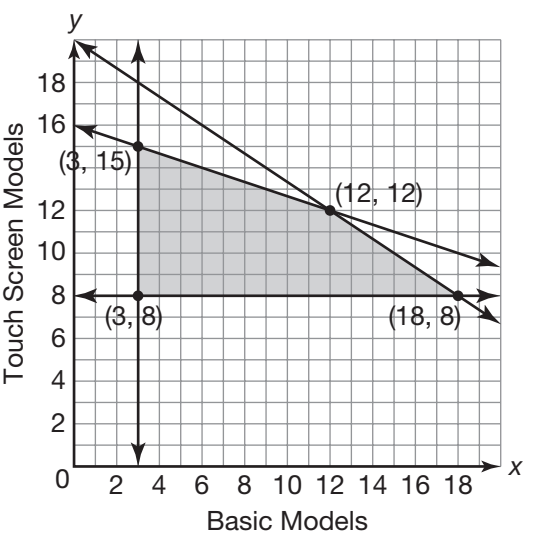
Analyze the solution set for the system of linear inequalities to answer each question.

An electronics company is manufacturing electronic book readers. A basic model takes 4 hours and $40 to make. A touch screen model takes 6 hours and $120 to make. The company has 10 employees working 12-hour days. The daily operating budget is $1920 per day for materials. The company would like at least 3 basic models and 8 touch screen models produced per day. The system of linear inequalities represents the problem situation. The graph shows the solution set for the system of linear inequalities.

Let x represent the number of basic models.

Let y represent the number of touch screen models.

$$\begin{cases} y \geq 8 \\ x \geq 3 \\ 4x + 6y \leq 120 \\ 40x + 120y \leq 1920 \end{cases}$$



Name _____ Date _____

13. How many of each model should the company produce to minimize their daily cost?

$C(x, y) = 40x + 120y$

$C(3, 8) = 40(3) + 120(8) = 1080$

$C(18, 8) = 40(18) + 120(8) = 1680$

$C(3, 15) = 40(3) + 120(15) = 1920$

$C(12, 12) = 40(12) + 120(12) = 1920$

The minimum daily cost is $1080. To minimize their daily cost, the company should produce 3 basic models and 8 touch screen models.

14. How many of each model should the company produce to maximize the number of work hours utilized per day?

15. The company earns $30 for each basic model sold and $50 for each touch screen model sold. How many of each model should the company produce to maximize their profit?

16. How many of each model would have to be produced to maximize the company's daily cost?

17. How many of each model would have to be produced to minimize the number of work hours utilized per day?

18. During a special promotion, the company earns $20 for each basic model sold and $30 for each touch screen model sold. How many of each model should the company produce to maximize their profit?