Solve each system of inequalities by graphing.

1. $y \le 6$
   $y > -3 + x$

ANSWER:

2. $y \le -3x + 4$
   $y \ge 2x - 1$

ANSWER:

3. $y > -2x + 4$
   $y \le -3x - 3$

ANSWER:

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.
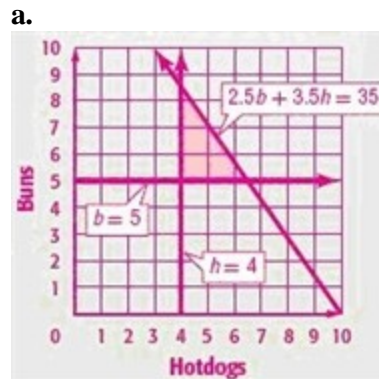
a. Graph the region that shows how many packages of each item she can purchase.

b. Give an example of three different purchases she can make.
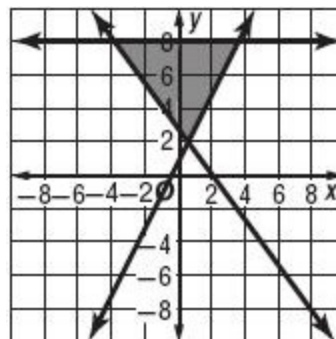
ANSWER:

a.

b. Sample answer: 4 packages of hotdogs, 5 packages of buns; 5 packages of hotdogs, 6 packages of buns; 6 packages of hotdogs, 5 packages of buns

Find the coordinates of the vertices of the triangle formed by each system of inequalities.

5. $y \ge 2x + 1$
   $y \le 8$
   $4x + 3y \ge 8$

ANSWER:

(3.5, 8), (–4, 8), (0.5, 2)

6. $3y \geq -7x - 16$
   $7y \leq x + 32$
   $y \geq 15x - 40$
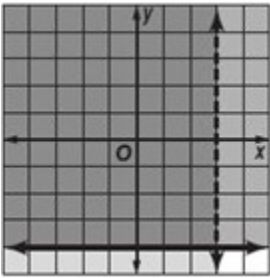
ANSWER:
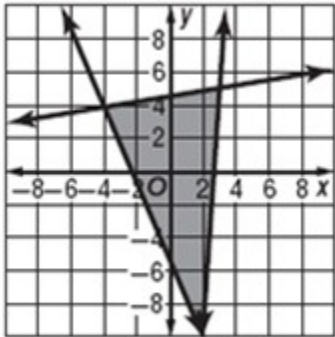
$(2, -10), (3, 5), (-4, 4)$

Solve each system of inequalities by graphing.

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

ANSWER:
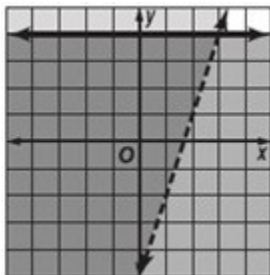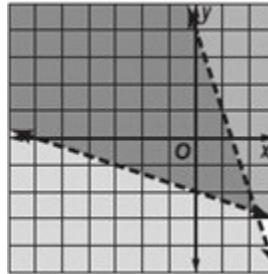

8. $y > 3x - 5$
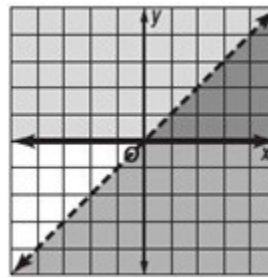 $y \leq 4$

ANSWER:

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

ANSWER:

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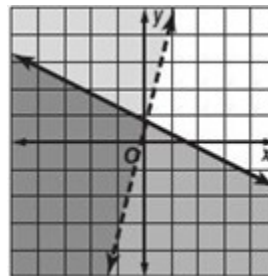 $y < x$

ANSWER:

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

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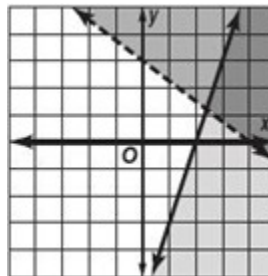
12. $-8x > -2y - 1$
    $-4y \geq 2x - 5$

ANSWER:

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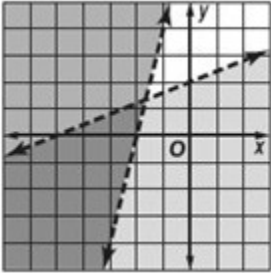
ANSWER:

14. $3y - 2x \le -24$
$y \ge \dfrac{2}{3}x - 1$

ANSWER:
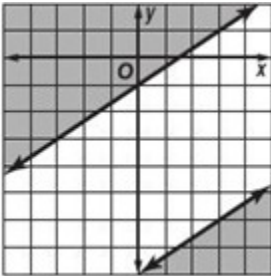
15. $y > -\dfrac{2}{5}x + 2$
$5y \le -2x - 15$

ANSWER:
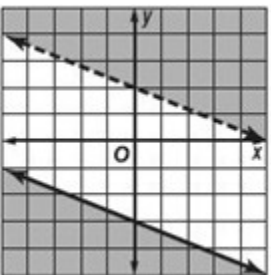
16. **RECORDING** Jane's band wants to spend no more than $575 recording their first CD. The studio charges at least $35 an hour to record. Graph a system of inequalities to represent this situation.

ANSWER:
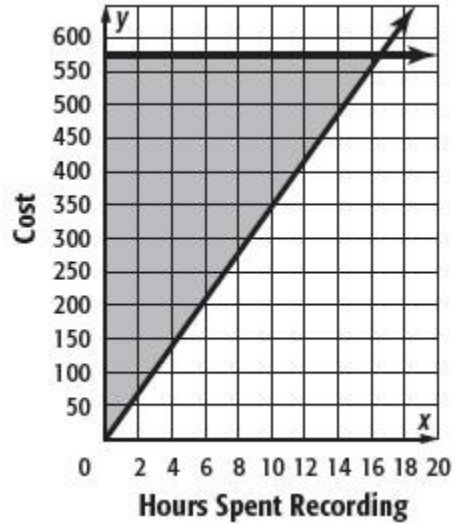
17. **SUMMER TRIP** Rondell has to save at least $925 to go to Rome with his Latin class in 8 weeks. He earns $9 an hour working at the Pizza Palace and $12 an hour working at a car wash. By law, he cannot work more than 25 hours per week. Graph two inequalities that Rondell can use to determine the number of hours he needs to work at each job if he wants to make the trip.

ANSWER:
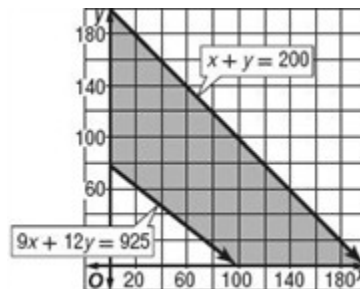
Find the coordinates of the vertices of the triangle formed by each system of inequalities.

18. $x \geq 0$
$y \geq 0$
$x + 2y < 4$

ANSWER:
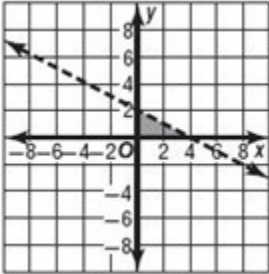
$(0, 2), (4, 0), (0, 0)$

19. $y \geq 3x - 7$
$y \leq 8$
$-4x + -4y < -4$

ANSWER:
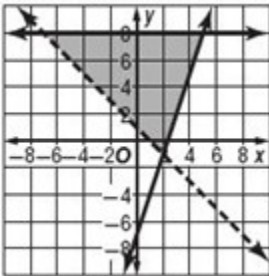
$(2, -1), (5, 8), (-7, 8)$

20. $x \leq 4$
$y > -3x + 12$
$y \leq 9$

ANSWER:

$(1, 9), (4, 0), (4, 9)$

21. $-3x + 4y \leq 15$
$2y + 5x > -12$
$10y + 60 \geq 27x$

ANSWER:

$(-3, 1.5), (5, 7.5), (0, -6)$

22. $8y - 19x < 74$
$38y + 26x \leq 119$
$54y - 12x \geq -198$

ANSWER:

$(-6, -5), (-2, 4.5), (7.5, -2)$

23. $6y - 24x \geq -168$
$8y + 7x > 10$
$20y - 2x \leq 64$

ANSWER:
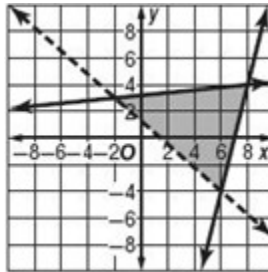
$(8, 4), (6, -4), (-2, 3)$

24. **BAKING** Rebecca wants to bake cookies and cupcakes for a bake sale. She can bake 15 cookies at a time and 12 cupcakes at a time. She needs to make at least 120 baked goods, but no more than 360, and she wants to have at least three times as many cookies as cupcakes. What combination of batches of each could Rebecca make?

    ANSWER:

    Sample answer: 15 batches of cookies and 6 batches of cupcakes.

25. **CELL PHONES** Dale has a maximum of 800 minutes on his cell phone plan that he can use each month. Daytime minutes cost $0.15, and nighttime minutes cost $0.10. Dale plans to use at least twice as many daytime minutes as nighttime minutes. If Dale uses at least 200 nighttime minutes and does not go over his limit, what is his maximum bill? his minimum bill?
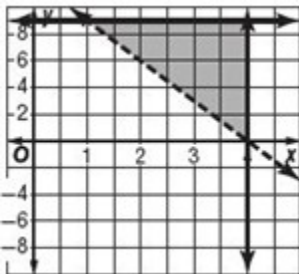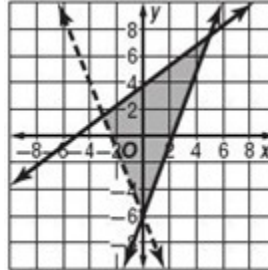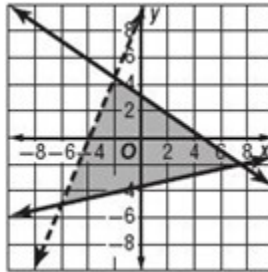
    ANSWER:

   maximum = $110, minimum = $80

26. **TREES** Trees are divided into four categories according to height and trunk circumference. In one forest, the trees are categorized by the heights and circumferences described in the table.

Crown Class	dominant	co-dominant	intermediate	suppressed
Height (in feet)	over 72	56–72	40–55	under 39
Trunk Circumference (in inches)	over 60	48–60	34–48	under 33

    a. Write and graph the system of inequalities that represents the range of heights h and circumferences c for a co-dominant tree.
    b. Determine the crown class of a basswood that is 48 feet tall. Find the expected trunk circumference

    ANSWER:

    a. $h \geq 56$, $h \leq 72$, $c \geq 48$, $c \leq 60$
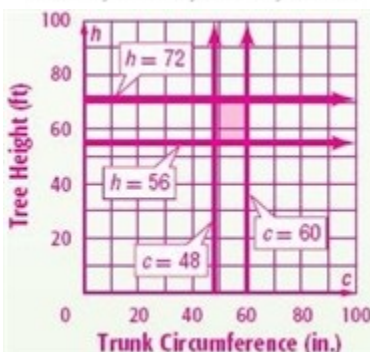
    b. intermediate; 34–48 *in*.

27. **CCSS REASONING** On a camping trip, Jessica needs at least 3 pounds of food and 0.5 gallon of water per day. Marc needs at least 5 pounds of food and 0.5 gallon of water per day. Jessica's equipment weighs 10 pounds, and Marc's equipment weighs 20 pounds.
    A gallon of water weighs approximately 8 pounds. Each of them carries their own supplies, and Jessica is capable of carrying 35 pounds while Marc can carry 50 pounds.
    a. Graph the inequalities that represent how much they can carry.
    b. How many days can they camp, assuming that they bring all their supplies in at once?
    c. Who will run out of supplies first?

    ANSWER:

    a.
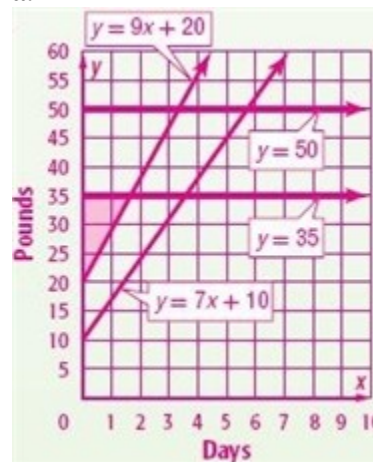
    b. $3\frac{1}{3}$ days

    c. Marc; Jessica could last about a quarter of a day longer than Marc.

    Solve each system of inequalities by graphing.

28. $y \geq |2x + 4| - 2$
    $3y + x \leq 15$

    ANSWER:

29. $y \geq |6 - x|$
$|y| \leq 4$
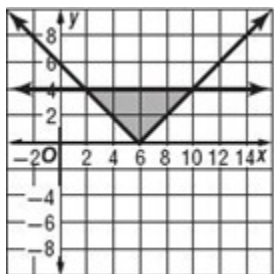
ANSWER:

30. $|y| \geq x$
$y < 2x$

ANSWER:

31. $y > -3x + 1$
$4y \leq x - 8$
$3x - 5y < 20$

ANSWER:
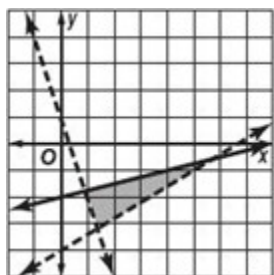
32. $6y + 2x \leq 9$
$2y + 18 \geq 5x$
$y > -4x - 9$

ANSWER:
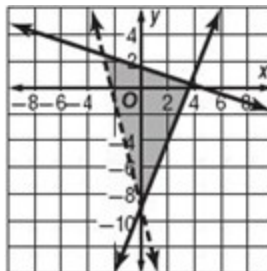
33. $|x| > y$
$y \leq 6$
$y \geq -2$

ANSWER:
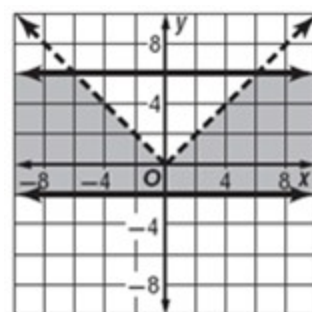
34. $2x + 3y \geq 6$
$y \leq |x - 6|$

ANSWER:
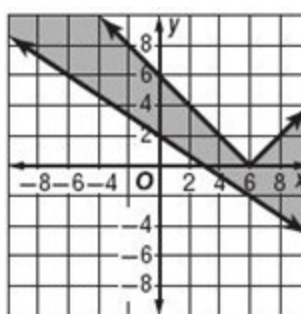
35. $8x + 4y < 10$
    $y > |2x - 1|$
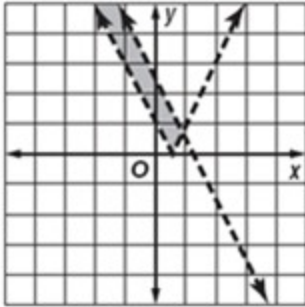
ANSWER:

36. $y \geq |x - 2| + 4$
    $y \leq [\![x]\!] - 3$

ANSWER:
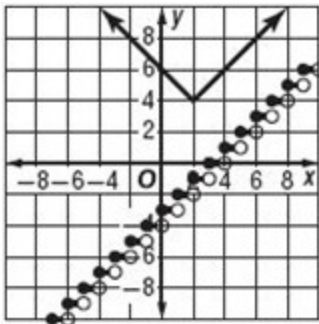
37. **MUSIC** Steve is trying to decide what to put on his MP3 player. Audio books are 3 hours long and songs are 2.5 minutes long. Steve wants no more than 4 audio books on his MP3 player, but at least ten songs and one audio book. Each book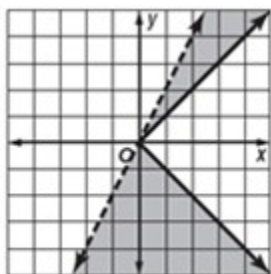 costs $15.00 and each song costs $0.95. Steve has $63 to spend on books and music. Graph the inequalities to show possible combinations of books and songs that Steve can have.

ANSWER:
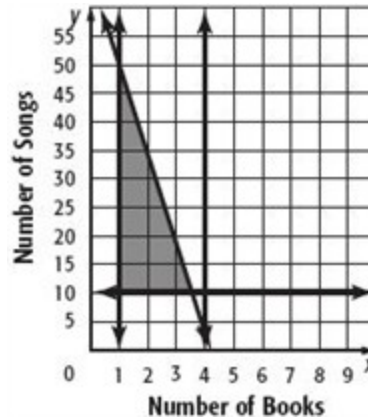
38. **JOBS** Louie has two jobs and can work no more than 25 total hours per week. He wants to earn at least $150 per week. Graph the inequalities to show possible combinations of hours worked at each job that will help him reach his goal.

Job	Pay
Busboy	$6.50
Clerk	$8.00

ANSWER:
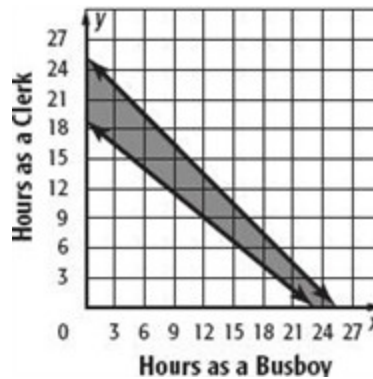
39. **TIME MANAGEMENT** Ramir uses his spare time to write a novel and to exercise. He has budgeted 35 hours per week. He wants to exercise at least 7 hours a week but no more than 15. He also hopes to write between 20 and 25 hours per week. Write and graph a system of inequalities that represents this situation.

ANSWER:

Let w = the number of hours writing, and let e = the number of hours exercising.

$w + e \leq 35$

$7 \leq e \leq 15$

$20 \leq w \leq 25$
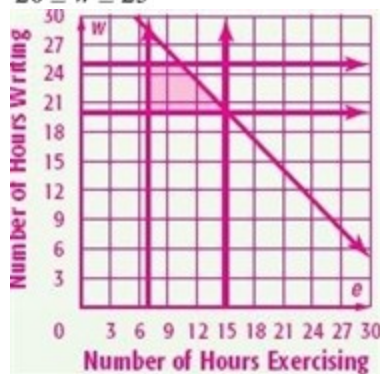
Find the coordinates of the vertices of the figure formed by each system of inequalities.

40. $y \geq 2x - 12$

$y \leq -4x + 20$

$4y - x \leq 8$

$y \geq -3x + 2$

ANSWER:

$(0,2), \left(5\frac{1}{3}, -1\frac{1}{3}\right), \left(4\frac{4}{17}, 3\frac{1}{17}\right)(2.8, -6.4)$

41. $y \geq -x - 8$

$2y \geq 3x - 20$

$4y + x \leq 24$

$y \leq 4x + 22$

ANSWER:

$(-6,-2), \left(-3\frac{13}{17}, 6\frac{16}{17}\right), \left(9\frac{1}{7}, 3\frac{5}{7}\right), (0.8, -8.8)$

42. $2y - x \geq -20$

$y \geq -3x - 6$

$y \leq -2x + 2$

$y \leq 2x + 14$

ANSWER:

$(-4,6), (-3,8), (4.8, -7.6), \left(1\frac{1}{7}, -9\frac{3}{7}\right)$

43. **FINANCIAL LITERACY** Mr. Hoffman is investing $10,000 in two funds. One fund will pay 6% interest, and a riskier second fund will pay 10% interest. What is the least amount Mr. Hoffman can invest in the risky fund and still earn at least $740 after one year?

ANSWER:

$3500

44. **DODGEBALL** A high school is selecting a dodgeball team to play in a fund-raising exhibition against their rival. There can be between 10 and 15 players on the team and there must be more girls than boys on the team.
a. Write and graph a system of inequalities to represent the situation.
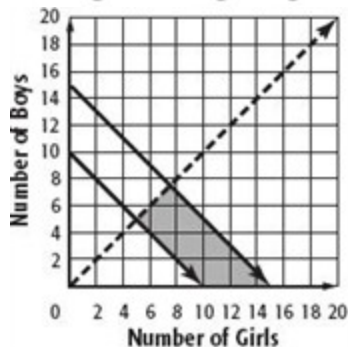**b.** List all of the possible combinations of boys and girls for the team.
c. Explain why there is not an infinite number of possibilities.

ANSWER:
a. $10 \leq g + b \leq 15; g > b; g \geq 0; b \geq 0;$

b. (6, 4), (6, 5), (7, 3), (7, 4), (7, 5), (7, 6), (8, 2), (8, 3), (8, 4), (8, 5), (8, 6), (8, 7), (9, 1), (9, 2), (9, 3), (9, 4), (9, 5), (9, 6), (10, 0), (10, 1), (10, 2), (10, 3), (10, 4), (10, 5), (11, 0), (11, 1), (11, 2), (11, 3), (11, 4), (12, 0), (12, 1), (12, 2), (12, 3), (13, 0), (13, 1), (13, 2), (14, 0), (14, 1), (15, 0)
c. Sample answer: You cannot have a fraction of a person.

45. **CHALLENGE** Find the area of the region defined by the following inequalities.
$y \geq -4x - 16$
$4y \leq 26 - x$
$3y + 6x \leq 30$
$4y - 2x \geq -10$

ANSWER:
75 square units

46. **OPEN ENDED** Write a system of two inequalities in which the solution:
a. lies only in the third quadrant.
b. does not exist.
c. lies only on a line.
d. lies on exactly one point.

ANSWER:
a. Sample answer: $y \leq -2, x < -1$
b. Sample answer: $y > 2, y < -2$
c. Sample answer: $y \geq x, y \leq x$
d. Sample answer: $y \geq |x|, y < -|x|$; solution at (0, 0)

47. **CHALLENGE** Write a system of inequalities to represent the solution shown. How many points with integer coordinates are solutions of the system?
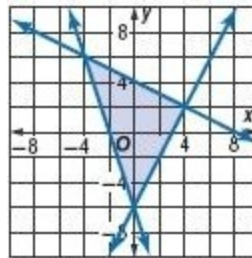
ANSWER:

$y \geq 2x - 6;$
Sample answer: $y \leq -0.5x + 4;$; 47
$y \geq -3x - 6$

48. **CCSS ARGUMENTS** Determine whether the following statement is *true* or *false*. If false, give a counterexample.
A system of two linear inequalities has either no points or infinitely many points in its solution.

ANSWER:
true

49. **WRITING IN MATH** Write a how-to manual for determining where to shade when graphing a system of inequalities.

    ANSWER:

    Sample answer: Shade each inequality in its standard way, by shading above the line if $y >$ and shading below the line if $y <$ (or you can use test points). Once you determine where to shade for each inequality, the area where every inequality needs to be shaded is the actual solution. This is only the shaded area.

50. **WRITING IN MATH** Explain how you would test to see whether $(-4, 6)$ is a solution of a system of inequalities.

    ANSWER:

    Sample answer: Determine whether the point falls in the shaded area of the graphs and/or determine whether the values satisfy each inequality.

51. To be a member of the marching band, a student must have a grade-point average of at least 2.0 and must have attended at least five after-school practices. Choose the system of inequalities that best represents this situation.

    A $x \geq 2$
       $y \geq 5$

    B $x \leq 2$
       $y \leq 5$

    C $x < 2$
       $y < 5$

    D $x > 2$
       $y > 5$

    ANSWER:

    A

52. **ACT/SAT** The table at the right shows a relationship between x and y. Which equation represents this relationship?

x	y
1	5
2	8
3	11
4	14
5	17
6	20

    F $y = 3x - 2$
    G $y = 3x + 2$
    H $y = 4x + 1$
    J $y = 4x + 2$
    K $y = 4x - 1$

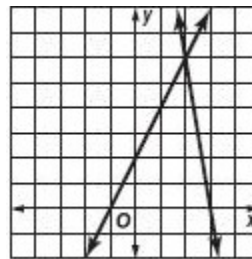   *ANSWER:*

    G

53. **SHORT RESPONSE** If $3x = 2y$ and $5y = 6z$, what is the value of x in terms of z?

    ANSWER:

    $\dfrac{4}{5}z$

54. **GEOMETRY** Look at the graph below. Which of these statements describes the relationship between the two lines?

    A They intersect at $(6, 2)$.
    B They intersect at $(0, 2)$.
    C They intersect at $(3.5, 0)$.
    D They intersect at $(2, 6)$.

    ANSWER:

    D

55. **GEOMETRY** Find the coordinates of the vertices of the parallelogram whose sides are contained in the lines with equations

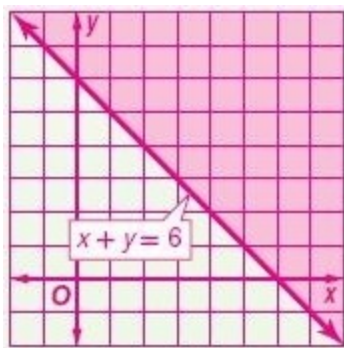$y = 3, y = 7, y = 2x, \text{and } y = 2x - 13.$

ANSWER:

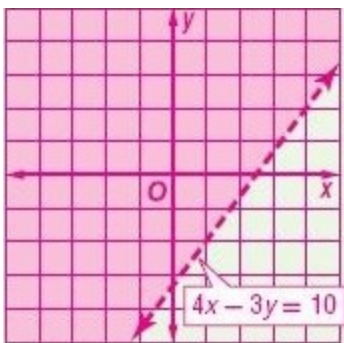$(1.5, 3), (3.5, 7), (8, 3), (10, 7)$

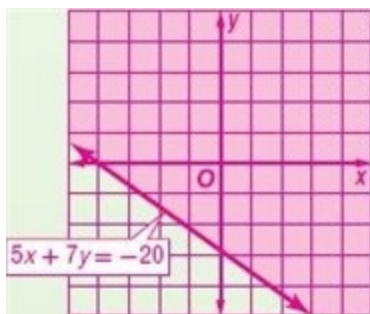**Graph each inequality.**

56. $x + y \geq 6$

ANSWER:

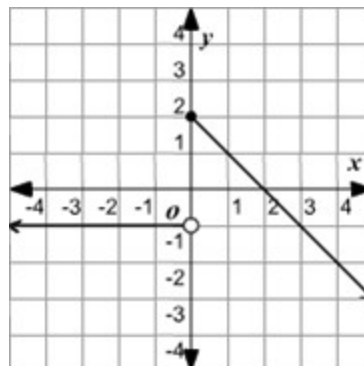57. $4x - 3y < 10$

ANSWER:

58. $5x + 7y \geq -20$

ANSWER:

Graph each function. Identify the domain and range.

59. $g(x) = \begin{cases} -1 \text{ if } x < 0 \\ -x + 2 \text{ if } x \geq 0 \end{cases}$
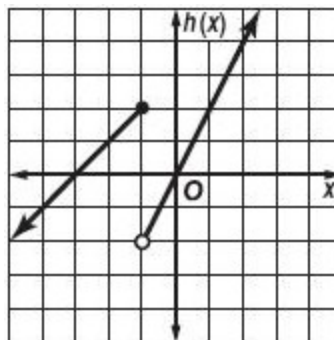
ANSWER:

$D = \{\text{all real numbers}\},$

$R = \{g(x) | g(x) \leq 2\}$

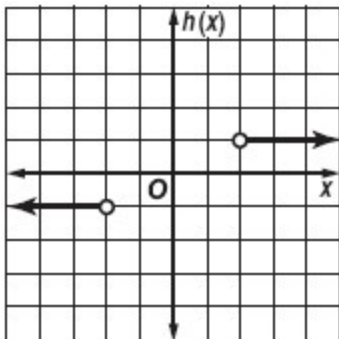60. $h(x) = \begin{cases} x + 3 \text{ if } x \leq -1 \\ 2x \text{ if } x > -1 \end{cases}$

ANSWER:

$D = \{\text{all real numbers}\},,$

$R = \{\text{all real numbers}\},$

61. $h(x)=\begin{cases}-1\text{ if } x<-2\\1\text{ if } x>2\end{cases}$

ANSWER:

$D=\{x|x<-2\text{ or }x>2\}, R=\{-1,1\}$

62. **BOOK CLUB** For each meeting of the Putnam High School book club, $25 is taken from the activities account to buy snacks and materials. After their sixth meeting, there will be $350 left in the activities account.
a. If no money is put back into the account, what equation can be used to show how much money is left in the activities account after having x number of meetings?
b. How much money was originally in the account?
c. After how many meetings will there be no money left in the activities account?

ANSWER:
a. $y = 500 - 25x$
b. $500
c. 20

Find each value if $f(x) = 2x + 5$ and $g(x) = 3x - 4$.

63. $f(-3)$

ANSWER:
−1

64. $g(-2)$

ANSWER:
−10

65. $f(-1)$

ANSWER:
3

66. $g(-0.5)$

ANSWER:
−5.5

67. $f(-0.25)$

ANSWER:
4.5

68. $g(-0.75)$

ANSWER:
−6.25