

The Algebra 1 Semester A examination has the following types of questions:

- Selected Response
- Student Produced Response (Grid-in)
- Brief Constructed Response (BCR)
- Extended Constructed Response (ECR)
- Short Answer

A calculator may be used on the exam.

You will be provided with the BCR/ECR scoring rubrics in your exam booklet. Your teacher can provide you with a copy.

The formulas below are provided in the examination booklet.

Equations of a Line

Standard Form:

$$Ax + By = C$$

where A and B are not both zero

Slope-Intercept Form:

$$y = mx + b \text{ or } y = b + mx$$

where m = slope and b = y -intercept

Point-Slope Form:

$$y - y_1 = m(x - x_1)$$

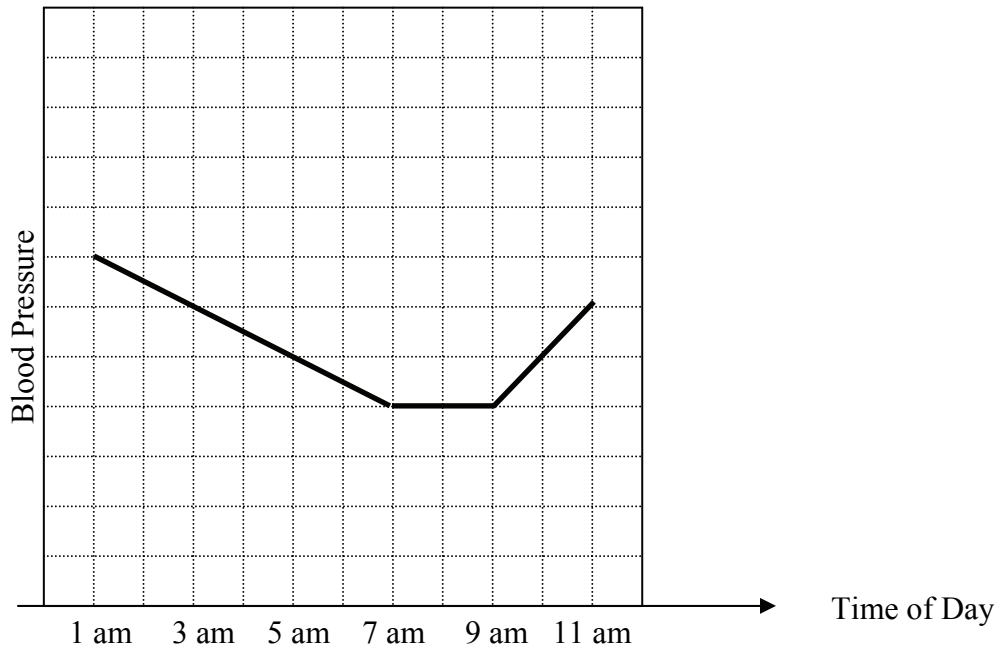
where m = slope, (x_1, y_1) = point on line

Slope Formula

Let (x_1, y_1) and (x_2, y_2) be two points in the plane.

$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1} \text{ where } x_2 \neq x_1$$

1. Look at the graph of blood pressure and time below:



Between which times was the blood pressure increasing?

- A 1 am and 7 am
- B 7 am and 9 am
- C 9 am and 11 am
- D The blood pressure was never increasing.

For items 2 through 6, solve.

2. $17 = 5 - \frac{1}{3}x$

3. $-12 + 4r = 2r + 12$

4. $8 - 2(2x - 5) = 6$

5. $5 + 3(-4x - 2) = -18$

6. $30 + 7(3 - 2x) = 21 - 9x$

7. Opposite sides of a rectangle have the same length. If one side is represented by $(2x + 3)$ and the opposite side is represented by $(5x - 6)$, what is the length of these sides? Grid-in and bubble your answer.

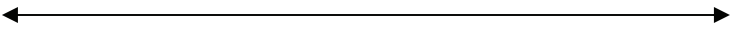
	7	7	7	
•	•	•	•	•
0	0	0	0	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9

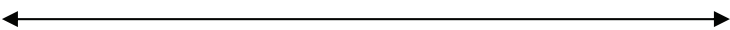
For items 8 and 9, solve for the indicated variable.


8. $2L + 2W = 12$, for W

9. $A = BH + C$, for H

For items 10 through 12, solve each inequality and graph the solution set on a number line.

10. $6x - 7 \leq 17$ 

11. $-2x + 9 > 11$ 

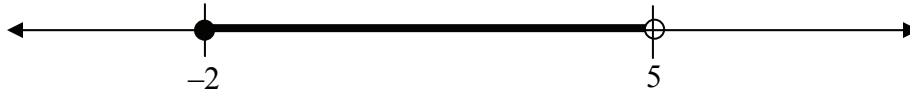
12. $x - 6 < 2x + 5$ 

13. Jerald has some money in a jar. He says that he has at least \$20 and at most \$30 in the jar. Let x represent the amount of money in the jar. Write a compound inequality to represent the amount of money in the jar.

14. Sketch the graph of the compound inequality $x \leq -4$ or $x > 3$



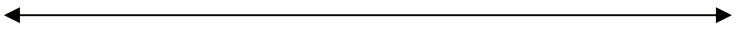
15. Look at the graph below.

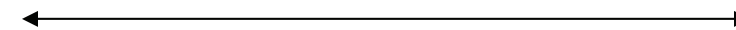


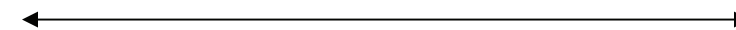
Which compound inequality has the solution set shown in the graph?

- A** $-2 \leq x < 5$
- B** $5 \leq x < -2$
- C** $x < 2$ or $x \geq 5$
- D** $x > -2$ or $x \leq 5$
16. Ball bearings are produced in a factory. A ball bearing is acceptable if its diameter is within 3 mm of the target of 50 mm. Let x represent the diameter of a ball bearing. Write an absolute value inequality that represents the range of diameters that are acceptable.
17. In an age-guessing game, you will win if your guess is within 3 years of the actual age of a person. Let x represent a person's guess. If the actual age of a person is 22, which of the following inequalities represents a winning guess?
- A** $|x - 3| \leq 22$
- B** $|x - 3| \geq 22$
- C** $|x - 22| \leq 3$
- D** $|x - 22| \geq 3$

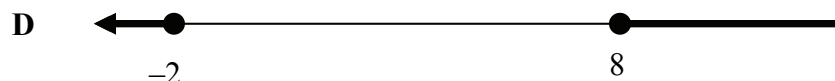
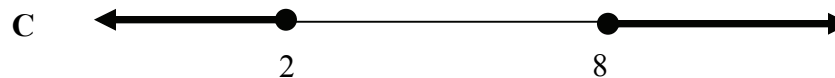
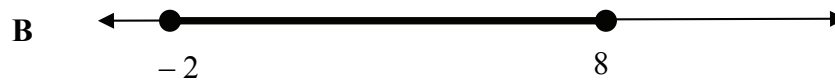
For items 18 through 20, solve each absolute value inequality, then graph the solution.

18. $|x| < 4$ 

19. $|x+3| < 8$ 

20. $|x-1| \geq 5$ 

21. Which graph below is a solution to the inequality $|x-3| \leq 5$?



22. How do you determine if a relation is a function?

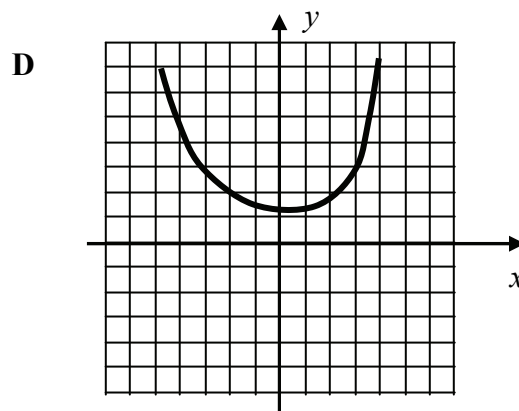
23. Which table, graph, equation, or set of ordered pairs does not represent a function?

A

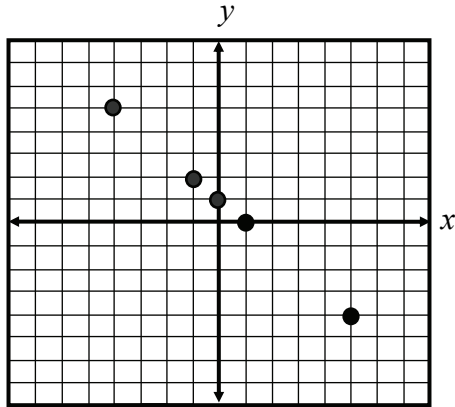
x	y
2	9
3	10
4	9
5	10
6	11

B $\{(2,4), (3,8), (3,9), (7,11)\}$

C $f(x) = 3x + 4$



For items 24 through 27, look at the scatter plot below. (One grid line equals one unit.)



24. Does this graph represent a function? Use mathematics to justify your answer.

25. $f(-1) = \underline{\hspace{2cm}}$

26. $f(\underline{\hspace{2cm}}) = -4$

27. $f(0) = \underline{\hspace{2cm}}$

28. Given the function $f(x) = 3x + 2$, fill in the blanks with the correct number:

a. $f(4) = \underline{\hspace{2cm}}$

b. $f(\underline{\hspace{2cm}}) = -4$

29. If $f(9) = 83$, which of the following does NOT represent $f(x)$?

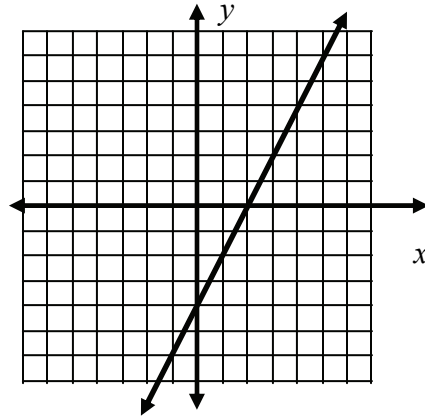
A $f(x) = 8x - 6$

B $f(x) = 10x - 7$

C $f(x) = x^2 + 2$

D $f(x) = |x - 90| + 2$

30. Look at the graph of the line below.



(One grid line equals one unit)

Which of these sets of ordered pairs lie on this graph?

- A $\{(-4, 0), (0, 2), (2, 3), (6, 5)\}$
- B $\{(-1, 6), (0, 4), (-2, 0), (-4, 4)\}$
- C $\{(-1, -6), (0, -4), (2, 0), (5, 6)\}$
- D $\{(6, -1), (4, 0), (0, -2), (4, -4)\}$

31. The table below shows the amount of gas (G) that is in a car t seconds after the gas pump is started.

BCR

Time (seconds) t	0	1	2	3	4	5
Gallons G	3.0	3.4	3.8	4.2	4.6	5.0

- If this pattern continues, how many gallons will be in the tank after 10 seconds? Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.
- Is this a linear relationship? Use mathematics to justify your answer.

32. Roberto is ordering rings from a catalog.
 There is a shipping charge of \$5 no matter how many rings are bought.
 Each ring costs \$6.
 If Roberto spends \$71, how many rings does he order?

33. What is the slope of the line that passes through the points (1, 3) and (5, 6)? Grid-in and bubble in your answer.

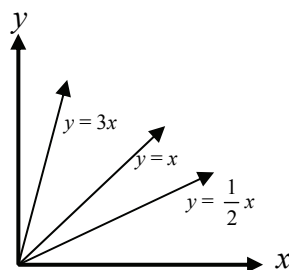
	0	1	2	3
•	•	•	•	•
0	0	0	0	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9

34. Jerome measured the height and weight of two teachers in his school. Below are the results.

	Height (x)	Weight (y)
Mr. Jones	180 cm	165 pounds
Mr. Johnson	186 cm	204 pounds

If these two points are plotted on a coordinate grid and a line drawn through them, what is the slope of this line?

35. Use the graph below to explain how change in the slope affects the steepness of a line.



36. There are four equations listed below. In the blanks before the equations, use the numbers 1 (steepest) to 4 (least steep) to order the equations in terms of the steepness of their lines.

_____ $y = 4x$

_____ $y = x - 4$

_____ $y = \frac{1}{4}x$

_____ $y = 4$

For items 37 through 39, write an equation that shows the relationship between the variables in each of the following situations.

37. The total cost (C) of gasoline varies directly with the price per gallon (g) of gas. The price of a gallon of gas is \$2.67.
38. Distance (d) is directly proportional to time (t). A car travels 65 miles per hour.
39. Wages (W) earned are directly proportional to hours (h) worked. Ryan earns \$7.50 an hour.
40. The amount a spring stretches (S) varies directly as the weight (w) of the object attached to it. A 10-ounce weight stretches the spring 12 centimeters.
- Write an equation that shows the relationship between the amount the spring stretches and the weight attached to the spring.
 - How much will a 15-ounce weight stretch the spring?

For items 41 and 42, write an equation relating the variables to represent each of the following situations, then solve.

41. Assume that y varies directly with x . If $y = 24$ when $x = 15$, determine y when $x = 40$.
42. The number of calories (C) consumed from nuts is directly proportional to the number of ounces (A) eaten. Eight ounces of dry-roasted cashews contains approximately 780 calories. How many ounces are eaten if 585 calories are consumed?

43. The table below shows the distance a runner is from the finish line during a race.

ECR

Time (sec) t	4	8	12	16	20
Distance from Finish in yards D	270	240	210	180	150

- Write a linear equation that models the relationship between time and distance. Use mathematics to explain how you determined your equation. Use words, symbols, or both in your explanation.
- How fast is the runner traveling? Use mathematics to justify your answer.
- How far will the runner be from the finish after 32 seconds? Use mathematics to justify your answer.

For items 44 and 45, complete the tables below so that the functions are linear.

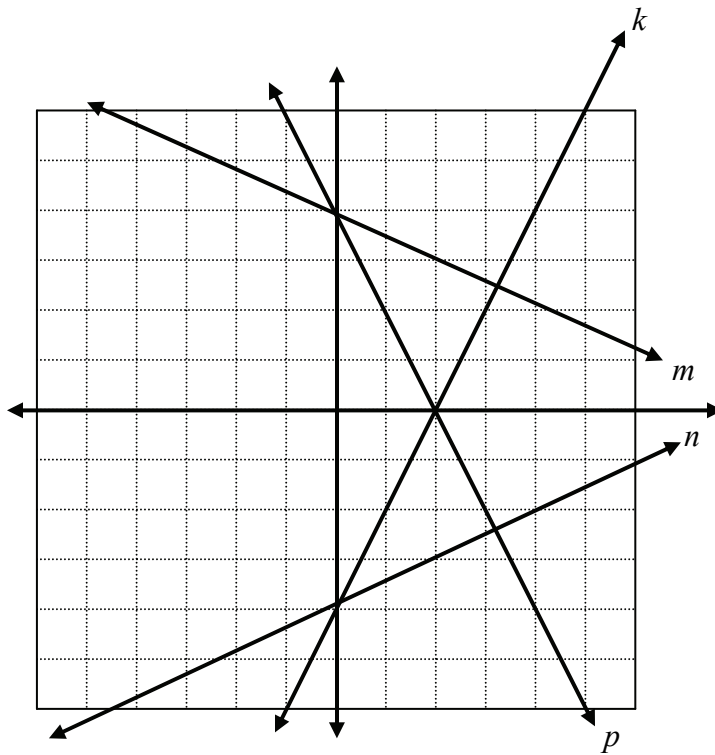
44.

x	y
-3	7
-2	4
-1	
0	
1	
2	-8
3	

45.

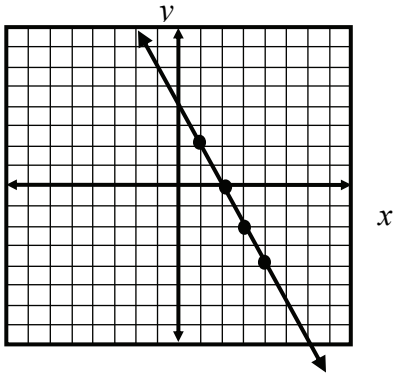
x	y
0	-4
1	
2	6
3	
4	16
5	
6	

46. Which line below is the graph of $f(x) = 2x - 4$? (One grid line equals one unit)



- A Line k
- B Line m
- C Line n
- D Line p

47. Look at the graph below.



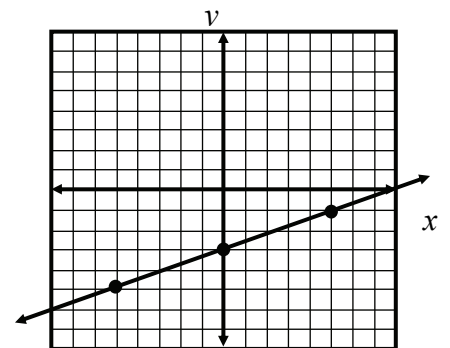
(One grid line equals one unit)

What is the slope and y -intercept of the line?

- A Slope $\frac{1}{2}$, y -intercept 4
 B Slope $-\frac{1}{2}$, y -intercept 4
 C Slope 2, y -intercept 4
 D Slope -2 , y -intercept 4

For items 48 through 51, write the equation of the line with the given description.

48. Passes through the point $(0,6)$ with a slope of 3.
 49. Passes through the point $(-2,3)$ with a slope of $\frac{1}{2}$.



50. The line has a slope of -2 and y -intercept of 4.
 51. The line is represented by the graph to the right. (One grid line equals one unit)

52. Great Oaks State Park charges \$10.00 admission to its camping area and \$1.50 per night for a campsite.

ECR

- Write an equation to represent the total cost (C) of camping at Great Oaks for the number of nights (n).
- Jamal camps at Great Oaks for 3 nights. What is his total cost? Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.
- Janice has \$31.00. What is the maximum number of nights she can camp at Great Oaks? Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.

For items 53 and 54, solve each equation for y .

53. $-3x + 4y = 8$

54. $x + 2y = 10$

For items 55 and 56, the ordered pairs (2, 12), (4, 9), (6, 6), and (8, 3) are points on the same line.

55. What is the x -intercept? Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.
56. What is the y -intercept? Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.

57. The table below shows the value of a lawn mower over the first five years of use.

BCR

Number of Years	1	2	3	4	5
Value (dollars)	210	180	150	120	90

- What was the value of the lawn mower when purchased? Use mathematics to explain your answer. Use words, symbols, or both in your explanation.
- When will the value of the lawn mower be zero? Use mathematics to explain your answer. Use words, symbols, or both in your explanation.

58. Jay collects baseball cards. His father gave him some cards to start his collection. Each year his uncle gives him new cards, the same number each year. A function for the number of cards $C(t)$ he has after t years is given by $C(t) = 40 + 15t$.

BCR

- What is the meaning of the number 15 in this function?
- What is the meaning of the number 40 in this function?

59. To calculate the charge for bricks, including delivery, the Redline Brick Company uses the equation $C = 0.42b + 25$, where C is the total cost (in dollars) of the bricks and delivery charge, and b the number of bricks. What is the delivery charge?

60. Jackson is starting a delivery service. He charges customers \$2 for each delivery. He uses his bicycle to make deliveries. He purchased a bicycle for \$100. Which equation gives the profit (p) that he earns for making d deliveries?

- A $p = 2d + 100$
- B $p = 2d - 100$
- C $p = 100d - 2$
- D $p = 100d + 2$

61. The rate of change of a linear function is 2. The graph of the function passes through the point $(0, -5)$. Which of the following represents the function?

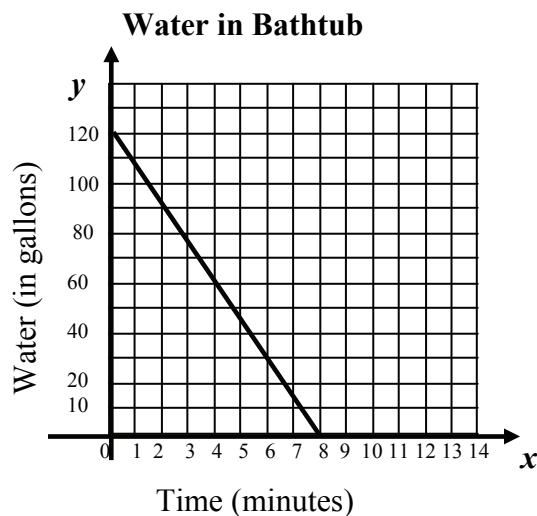
A $f(x) = -5x + 2$

B $f(x) = 5x + 2$

C $f(x) = 2x + 5$

D $f(x) = 2x - 5$

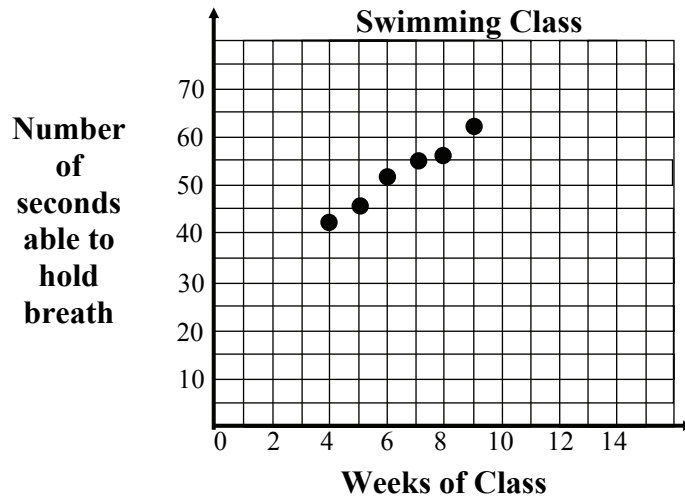
62. The graph below represents the number of gallons of water, y , in a bathtub as a function of the time, x , since the tank started draining.



- What is the rate of change of the amount of water in the bathtub? What does it mean in the context of this problem?
- What are the meanings of the x - and y -intercepts on this graph?
- Write a linear function for the amount of water in the tub x minutes after the tub starts draining.

63. The chart and graph below represent the number of weeks Jan was in a swimming class and the number of seconds Jan was able to hold her breath swimming underwater.

Weeks of Swimming Class (w)	4	5	6	7	8	9
Number of Seconds able to hold breath $S(w)$	42	45	52	55	56	62



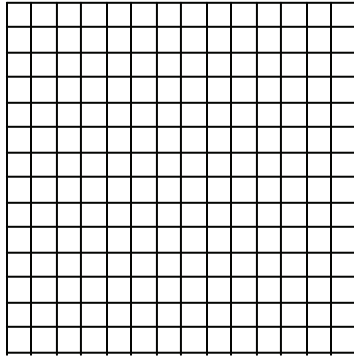
- Write an equation of a line of fit.
- In the context of this problem, what does the y-intercept of your equation represent?
- Based on your equation, what is the rate of change in the number of seconds Jan can hold her breath swimming underwater per week?
- Use your equation to predict the number of seconds Jan can hold her breath after 12 weeks of swimming class.
- Use your equation to predict the number of weeks of swimming class Jan would have to attend to build up to holding her breath for 95 seconds? Use mathematics to explain your answer. Use words, symbols, or both in your explanation.

64. Look at the table below.

BCR

Time studying (min) t	10	20	30	40	50
Score S	30	42	51	60	70

- Graph the data on the grid below



- Write an equation for a line of fit for this data.
 - Use your equation to predict a student's score if the student spends 7 minutes studying.
65. Jessica buys a pair of shoes for \$32.00 and 7 pairs of socks. Her total bill (before tax) is less than \$47.75. Write an inequality that best describes the cost (c) of one pair of socks.
66. Jackie needs at least \$400 to buy a new stereo system. She has \$120 and can save \$15 each week. If x represents the number of weeks that she saves, which inequality could be solved to determine the minimum number of weeks that she needs to save?
- A** $120 + 15x \geq 400$
- B** $120 - 15x \geq 400$
- C** $120 + x \geq 400$
- D** $120 - x \geq 400$

67. Given a system of equations, discuss how to determine whether the graph of the system consists of two parallel lines, lines that intersect at an infinite number of points, or lines that intersect at exactly one point.

For each system below in items 68 through 70,

- Describe the graph of each system.
- State the number of solutions for each system.

68. $y = 2x$
 $y = 2x + 3$

69. $y = \frac{3}{5}x - 10$
 $y = \frac{5}{3}x - 10$

70. $10x + 5y = 30$
 $y = -2x + 6$

For items 71 and 72, solve each system of equations.

71. $3x + 8y = 20$
 $3x + 6y = 14$

72. $2x - 3y = 19$
 $5x - y = 28$

73. Johnstown High School is selling candy to raise money. M&M's sell for \$1.50 per box and Reese's sell for \$2 per box. Sheri sold a total of 50 boxes of candy. She collected \$95.

ECR

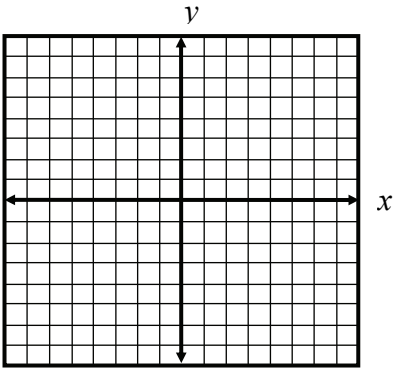
Let x represent the number of boxes of M&M's.
Let y represent the number of boxes of Reese's.

- Write a system of equations to model this situation.
- Solve the system. Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.
- How many of each type of candy did she sell?

74. Joe's Body Shop charges \$25 for parts and \$50 per hour to fix the brakes on a car. Kathy's Body Shop charges \$70 for parts and \$40 per hour for the same type of work.

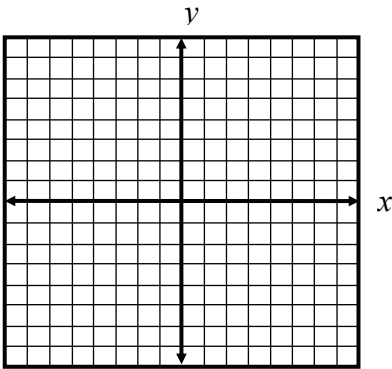
What length of job in hours would have the same cost at both shops? Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.

75. a. Sketch the graph of $4x + y \geq 2$.



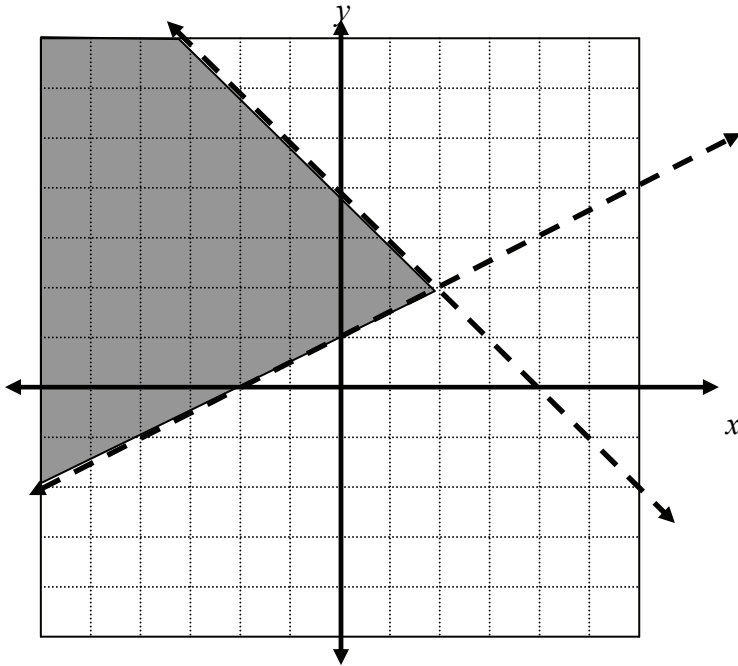
- b. Is $(6, 0)$ a solution to the inequality above? Use mathematics to justify your answer.

76. a. Sketch the graph of $y < \frac{1}{2}x + 3$.



- b. Is $(3, 7)$ a solution to the inequality above? Use mathematics to justify your answer.

77. Which set of inequalities gives the graphical solution to the system below? (One grid line equals one unit)



A $y < \frac{1}{2}x + 1$
 $y < -x + 4$

B $y > \frac{1}{2}x + 1$
 $y < -x + 4$

C $y > \frac{1}{2}x + 1$
 $y > -x + 4$

D $y < \frac{1}{2}x + 1$
 $y > -x + 4$

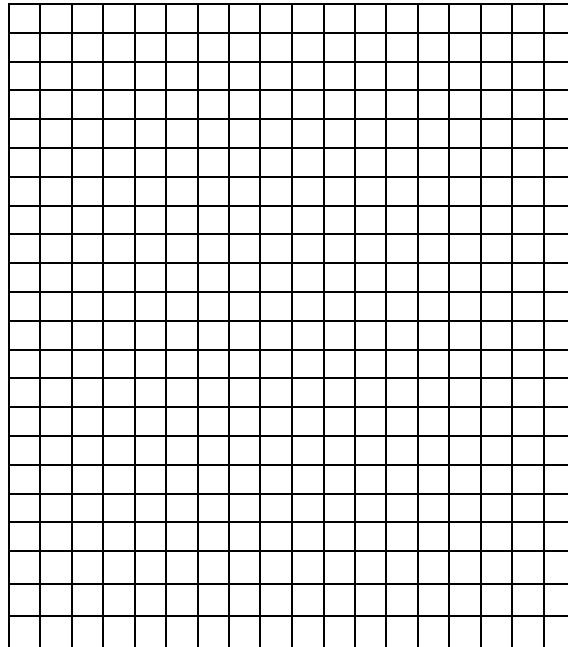
78. For her birthday, Johanna received a \$100 gift card to buy clothes. She bought sundresses for \$15 each and tees for \$10 each. She bought fewer than 12 items. How many of each type of clothing might she have purchased?

Let x represent the number of sundresses she can buy.

Let y represent the number of tees she can buy.

- a. Write a system of inequalities that can be used to solve this problem.

- b. Graph your system of inequalities.



- c. List three possible solutions for this problem.