1 Linear Equations and Algebra

1. Line l is defined by the equation $3y - 6x = 18$. Line m is perpendicular to line l in the xy-plane, what is the slope of line m?

2. A line with a slope of $\frac{3}{4}$ lies in the xy-plane. If k is a constant and the points $(4, 5)$ and $(k, -4)$ lie on the line, what is the value of k?

3. Given the equation $y = 8x - 96$, what is the x value of the x-intercept of the graph in the xy-plane?

4.

$$f(x) = -1.5x + 24$$

Natalie used simple syrup to make a sweet tea. The function above shows the volume, in fluid ounces, of simple syrup that was left after Natalie made x cups of sweet tea. In this context, which statement is the best interpretation of the y-intercept of $y = f(x)$ in the xy-plane?

(A) Natalie used 1.5 fluid ounces of simple syrup for each cup of sweet tea.
(B) Natalie had 1.5 fluid ounces of simple syrup when she started making tea.
(C) Natalie had 24 fluid ounces of simple syrup when she started making tea.
(D) Natalie used 24 fluid ounces of simple syrup for each cup of tea.

5. The table below gives some values of a linear equation. Which equation defines y?

x	y
0	23
1	27
2	31

(A) $y = 2x + 31$ **(B)** $y = 4x + 23$ **(C)** $23x + 27$ **(D)** $27x + 31$

6. What is the distance between the points $(-2, 4)$ and $(6, -17)$?

(A) $\sqrt{285}$ **(B)** $\sqrt{233}$ **(C)** $\sqrt{377}$ **(D)** $\sqrt{505}$

7. In the standard xy-coordinate plane, line p passes through $(4, 2)$ and $(-2, 7)$. If line r is parallel to line p, which of the following is a possible equation for line r?

(A) $y = \frac{6}{5}x - 4$ **(B)** $y = \frac{5}{6}x - 4$ **(C)** $y = -\frac{5}{6}x + 4$ **(D)** $y = -\frac{6}{5}x + 4$

8. In the standard xy-coordinate plane, line h passes through $(0, 2)$ and $(2, 3)$. If h is perpendicular to k, and line k passes through $(-2, 5)$, what is the y-intercept of line k?

(A)$(0, 2)$ **(B)** $(0, 1)$ **(C)** $(0, 0)$ **(D)** $(2, 0)$

9. The function $g(k) = -0.12k + 108.9$ models approximately how many gallons of rocket fuel are left in a rocket after traveling k kilometers. According to the function, about how many gallons of fuel are used to travel each kilometer?

(A) 0.12 **(B)** 9 **(C)** 12 **(D)** 108.9

x	-1	2	7
y	-5	$k + 3$	3

10. The table shows values of x and their corresponding values of y. If there is a linear relationship between x and y, what is the value of $k + 3$?

11. If $4x + 6y = 38$ and $y = 3x - 1$, what is the value of xy?

12. If $5a + 8b = 22$ and $a + 4b = 14$, which of the following ordered pairs (a, b) is the solution to this system of equations?

(A) $(-6, 5)$ **(B)** $(-2, 4)$ **(C)** $(2, 3)$ **(D)** $(5, -1)$

13.

$$4y - 5x = 24$$
$$kx = 2y + 4$$

In the given system of equations, k is a constant. If the system has no solution, what is the value of k?

14.

$$y \leq 2x + 4$$
$$y \geq -\frac{1}{3}x - 2$$

Which point (x, y) is a solution to the given system of inequalities shown above?

(A) $(-8, 0)$ **(B)** $(0, -8)$ **(C)** $(0, 8)$ **(D)** $(8, 0)$

15.

$$3x - 4y = 7$$
$$5x + \frac{1}{2}y = 26$$

What is the value of x in the (x, y) solution to the system of equations above?

16. If Seya gives each of her classmates 2 pieces of candy, she'll have 5 pieces left over. If she wants to give each of her classmates 3 pieces of candy, she'll need 10 more pieces of candy. How many pieces of candy does Seya have?

17.

$$2x - 3y = 15$$
$$ax + 4y = c$$

In the system of linear equations above, a and c are constants such that the system has more than one solution. What is the value of a?

18.

$$y \leq 8x - 10$$

In which table is every x and y pair a solution to the inequality above?

(A)

x	2	4	6
y	6	24	38

(B)

x	2	4	6
y	5	32	36

(C)

x	2	4	6
y	5	22	30

(D)

x	2	4	6
y	10	32	38

19. Line m has a slope of 3 and passes through the point $(1, -1)$. Which of the following is the equation for line m?

(A) $y = 3x - 2$ **(B)** $y = 3x + 4$ **(C)** $y = 3x - 4$ **(D)** $y = -\frac{1}{3}x - \frac{2}{3}$

20.

$$f(m) = 1570 + 55m$$

The function above models the amount of money in Jordan's bank account after m months. In this context, what is the best interpretation of the slope of the function?

(A) Jordan had \$1,570 in her bank account to begin with.
(B) Jordan adds \$1,570 to her bank account each month.
(C) Jordan had \$55 in her bank account to begin with.
(D) Jordan adds \$55 to her bank account each month.

x	3	6	9	12
$f(x)$	34	25	16	7

21. The table above shows 4 values of x and their corresponding values of $f(x)$. The linear function is defined by the equation $f(x) = hx + 43$. What is the value of h?

22.

$$4x - 3y = 18$$
$$3x + 2y = 5$$

Given the system of equations above, what is the value of $\frac{x}{y}$?

23. A line in the xy-plane passes through the origin and is perpendicular to a line that has a slope of $\frac{2}{7}$. Which of the following points must lie on this line?

(A) $(-14, 2)$ **(B)** $(4, -14)$ **(C)** $(4, 14)$ **(D)** $(2, -14)$

24. James earns money by mowing lawns and cleaning pools. He earns \$35 per lawn that he mows and \$50 per pool that he cleans. He needs to earn a minimum of \$500 per week to cover his expenses. Which of the following inequalities represents the possible number of lawns he mows, m, and the number of pools he cleans, p, each week to meet or exceed his budget requirement?

(A) $35m + 50p \geq 500$ **(B)** $35m + 50P > 500$ **(C)** $\frac{35}{m} + \frac{50}{p} \geq 500$ **(D)** $\frac{35}{m} + \frac{50}{p} > 500$

25.

$$2x + 3y = 15$$
$$ax - 7y = c$$

The system of equations above has no solution. What is the value of a?

26.

$$3y < 4$$
$$x < 6y + 3$$

For the system of inequalities shown above, which of the following points falls within the solution set?

(A) $(-2, 11)$ **(B)** $(1, 12)$ **(C)** $(-5, -1)$ **(D)** $(-10, -3)$

27. If $4x - 2y = 8$ and $2y = 4$, what is the value of x?

28. If line m is parallel to line n and the equation of line m is $y = \frac{2}{3}x + 1$, which of the following could be the equation of line n?

(A) $2x + 3y = 4$ **(B)** $3x + 2y = 5$ **(C)** $3x - 2y = 5$ **(D)** $2x - 3y = 5$

29. The average number of fish, f per aquarium at an indoor nature reserve can be estimated by the equation $f = 0.75m + 15$ where m represents the number of months since January of 2014 and $m \leq 11$. Which of the following statements best explains the function that the number 0.75 serves within the context of the problem?

(A) It is the estimated average number of fish per aquarium in January of 2014.
(B) It is the estimated monthly decrease in the average number of fish per aquarium.
(C) It is the estimated monthly increase in the avearge number of fish per aquarium.
(D) It is the estimated avearge number of fish per aquarium in December of 2014.

30. JT's fruit stand sells only peaches and oranges. Peaches sell for \$4 per pound, and oranges sell for \$1.50 per pound. To make a profit, JT must sell at least twice as many pounds of peaches as pounds of oranges and must have sales of no less than \$100 per day. If x is the number of pounds of peaches he sells and y is the number of pounds of oranges he sells per day, which of the following systems of inequalities represents this situation?

(A) $x \geq 2y \quad 4x + 1.5y \leq 100$ **(B)** $x \geq 2y \quad 4x + 1.5y \geq 100$ **(C)** $y \geq 2x \quad 4x + 1.5y \geq 100$ **(D)** $y \geq 2x \quad 4x + 1.5y \leq 100$

31.

$$3x - 4y = 14$$
$$x = -8y$$

Based on the system of equations above, what is the value of xy?

32. Which of the following systems of linear equations has no solution?

(A) $x = 4 \quad y = 2x + 3$ **(B)** $y = 2x - 5 \quad y = 2x + 3$ **(C)** $x = -5 \quad y = 5$ **(D)** $y = 4x - 5 \quad y = 2x - 5$

33. The minimum value of b is 8 less than 3 times another number c. Which inequality gives the possible values of b?

(A) $b \geq 8 - 3c$ **(B)** $b \leq 8 - 3c$ **(C)** $b \leq 3c - 8$ **(D)** $b \geq 3c - 8$

34. Which of the following is a characteristic of the graph of the equation $y + x = k(x - y)$ if k is a constant greater than 1?

I. It has a y-intercept of 1.
II. It passes through the origin.
III. It has a slope between 0 and 1.

(A) II only **(B)** III only **(C)** I and III **(D)** II and III

Solutions

1. $\frac{1}{2}$

2. -8

3. 12

4. C

5. B

6. D

7. C

8. B

9. A

10. -2

11. 10

12. B

13. 10/4

14. D

15. 5

16. 15

17. $-\frac{8}{3}$

18. C

19. C

20. D

21. -9

22. $-\frac{3}{2}$

23. B

24. A

25. $-\frac{14}{3}$

26. C

27. 3

28. D

29. C

30. B

31. -2

32. B

33. D

34. D