1

The table summarizes the UV index value recorded by a research assistant at noon each day for 49 days.

UV index	Number of days
1	9
2	15
3	12
4	13

According to the table, a UV index value of 1 was recorded on how many days?

Ⓐ 4

Ⓑ 9

Ⓒ 40

Ⓓ 49

2

To make a bookcase, a woodworker charged a onetime fee plus $17 per hour worked. The equation $17h + 45 = 164$ represents this situation, where h is the number of hours worked. Which of the following is the best interpretation of 164 in this context?

Ⓐ The onetime fee, in dollars

Ⓑ The number of hours worked

Ⓒ The charge per hour, in dollars

Ⓓ The total charge, in dollars

3

In December 2017, the lowest temperature recorded in a certain city was 40 degrees Fahrenheit (°F) and the highest temperature recorded was 90°F. Which inequality is true for all values of t, where t represents any temperature, in °F, recorded in the city in December 2017?

Ⓐ $40 \leq t \leq 90$

Ⓑ $t \leq 40$

Ⓒ $t \leq 50$

Ⓓ $t \geq 90$

4

The function f is defined by $f(x) = 6(2x + 4)$. For what value of x does $f(x) = 48$?

Ⓐ 2

Ⓑ 6

Ⓒ 8

Ⓓ 22

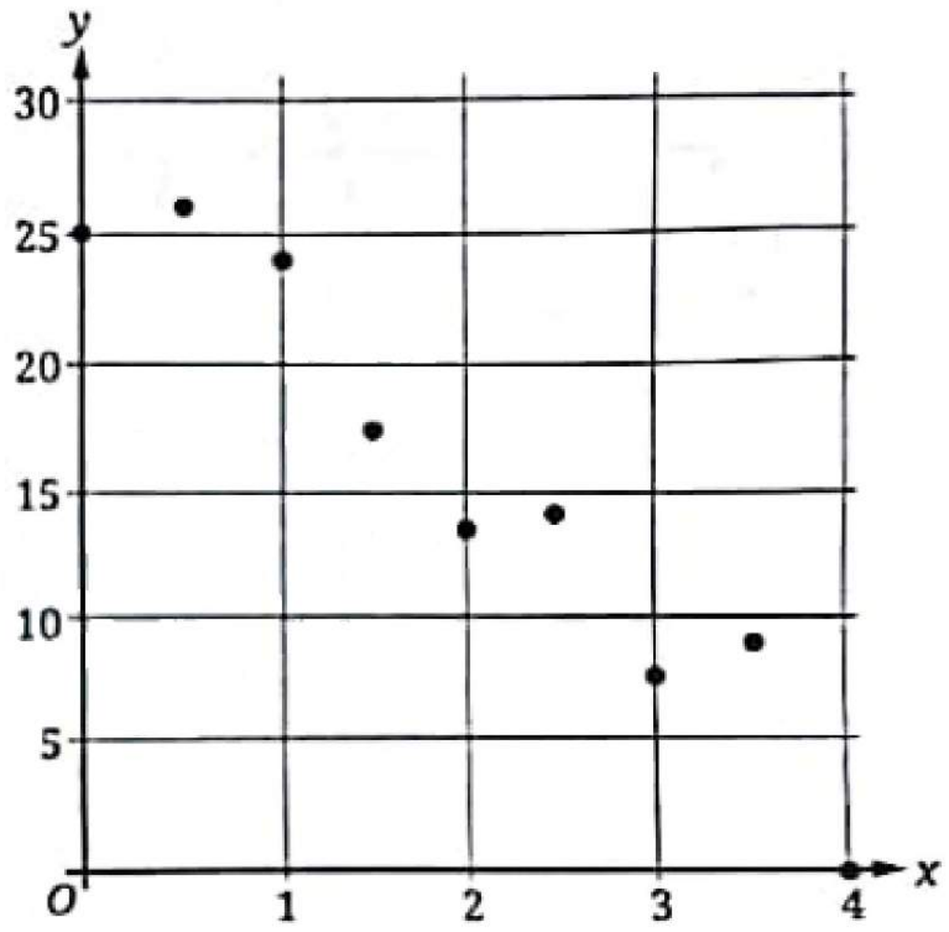
5

The ratio of green tiles to blue tiles in a piece of artwork is 5 to 2. If there are 16 blue tiles in the piece of artwork, how many green tiles are there?

_____

6

The scatterplot shows the relationship between two variables, x and y.



Which of the following equations is the most appropriate linear model for the data shown?

Ⓐ $y = -6 + 28x$

Ⓑ $y = -6 - 28x$

Ⓒ $y = 28 + 6x$

Ⓓ $y = 28 - 6x$

7

A scientist analyzed a soil sample with a mass of 900 grams and determined that it contained 189 grams of water. What is the percentage of water, by mass, in this soil sample?

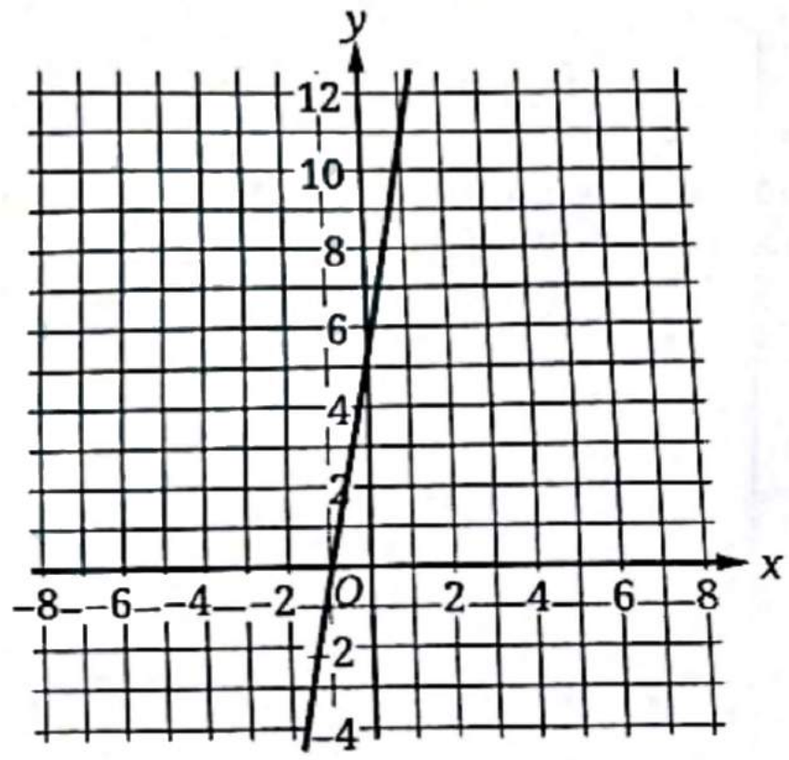
Ⓐ 9%

Ⓑ 9.9%

Ⓒ 18.9%

Ⓓ 21%

8



Line n is shown in the xy-plane. Line k (not shown) is perpendicular to line n. What is the slope of line k?

Ⓐ $-\frac{1}{5}$

Ⓑ $-\frac{1}{6}$

Ⓒ 5

Ⓓ 6

9

$$mx + ky = -83$$
$$2x + ky = 22$$

In the given system of equation, m and k are constants. The graphs of these equations in the xy-plane intersect at the point $(5, y)$. What is the value of m?

10

For the linear function f, the graph of $y = f(x)$ in the xy-plane passes through the point $(0, 2)$ and $(3, 3)$. What is the slope of $y = f(x)$?

11

A certain book has 250 pages, and 21 of these pages have an illustration. If one of the book's pages is selected at random, what is the probability of selecting a page with an illustration? (Express your answer as a decimal or fraction, not as a percent.)

12

$$b^2 + 5c = 9d$$

The given equation relates the real numbers b, c, and d, where $d > \frac{5}{9}c$. Which equation correctly express b in terms of c and d?

Ⓐ $b = \frac{9d + 5c}{2}$

Ⓑ $b = \frac{9d - 5c}{2}$

Ⓒ $b = \pm\sqrt{9d + 5c}$

Ⓓ $b = \pm\sqrt{9d - 5c}$

13

A right circular cylinder has a height of 4 meters (m) and a base with a radius of 18 m. What is the volume, in m^3, of the cylinder?

Ⓐ 4π

Ⓑ 22π

Ⓒ 288π

Ⓓ $1{,}296\pi$

14

What is the y-intercept of the graph of $3x + 2y = 96$ in the xy-plane?

Ⓐ (0, 5)

Ⓑ (0, 6)

Ⓒ (0, 32)

Ⓓ (0, 48)

15

If $\frac{6}{7}p + 12 = 54$, what is the value of $7p$?

_____

16

A certain neighborhood had a population of 1,340 in 2009. Each year for the next 5 years, the population of the neighborhood increased by approximately 3% of the population the previous year. Which of the following equations represents the population, N, of the neighborhood t years after 2009, where $t \leq 5$?

Ⓐ $N = 0.03(1{,}340)^t$

Ⓑ $N = 1{,}340(0.03)^t$

Ⓒ $N = 1{,}340(1.03)^t$

Ⓓ $N = 1.03(1{,}340)^t$

17

In the xy-plane, which of the following does NOT contain any points (x, y) that are solutions to $7x + 4y > 12$?

Ⓐ The region where $x > 0$ and $y > 0$

Ⓑ The region where $x < 0$ and $y > 0$

Ⓒ The region where $x < 0$ and $y < 0$

Ⓓ The region where $x > 0$ and $y < 0$

18

In triangle RST, the measure of angle R is 10 degrees and the measure of angle T is 50 degrees. Point L lies on $\overline{RS}$, point K lies on $\overline{ST}$, and $\overline{LK}$ is parallel to $\overline{RT}$. What is the measure, in degree, of angle SKL? (Disregard the degree symbol when entering your answer.)

19

An auditorium has seats for 3,200 people. Tickets to attend a show at the auditorium currently cost \$8.00. For each \$1.00 increase to the ticket price, 100 fewer tickets will be sold. This situation can be modeled by the equation $y = -100x^2 + 2{,}400x + 25{,}600$, where x represents the increase in ticket price, in dollars, and y represents the revenue, in dollars, from ticket sales.

If this equation is graphed in the xy-plane, at what value of x is the maximum of the graph?

Ⓐ 8

Ⓑ 12

Ⓒ 24

Ⓓ 32

20

$$(x+3)^2+(y-4)^2=25$$

In the *xy*-plane, the graph of the given equation is circle. Which point lies on this circle?

Ⓐ (−3, 4)

Ⓑ (3, −4)

Ⓒ $(\sqrt{11}+3,\sqrt{14}-4)$

Ⓓ $(\sqrt{11}-3,\sqrt{14}+4)$

22

Triangle *ABC* is similar to triangle *DEF*, where angle *A* corresponds to angle *D* and angle *C* and *F* are right angles. The length of *AB* is 2.4 times the length of *DE*. If $\tan A=\frac{21}{20}$, what is the value of $\sin D$?

21

The expression $\frac{x^{20}(x-4)}{5x^2}+\frac{4x^{20}}{5x^2}$ is equivalent to $\frac{1}{5}x^c$, where c is a constant and $x > 0$. What is the value of c?

Ⓐ 4

Ⓑ 5

Ⓒ 19

Ⓓ 21

1

The speed of a white-throated needletail, a type of bird, in flight was measured to be 49 miles per hour. What was the white-throated needletail's measured speed, in kilometers per hour? (Use 1 mile = 1.6 kilometers.)

Ⓐ 30.6

Ⓑ 47.4

Ⓒ 50.6

Ⓓ 78.4

2

Which expression is equivalent to $(3x^3 - x^2 + 4)(5x^2 + 8x)$?

Ⓐ $15x^5 + 19x^4 - 8x^3 - 20x + 32$

Ⓑ $15x^5 + 19x^4 - 8x^3 - 20x^2 + 32$

Ⓒ $15x^5 + 19x^4 - 8x^3 - 20x^2 + 32x$

Ⓓ $15x^5 + 29x^4 - 8x^3 - 20x^2 + 32x$

3

If $5(x + 1) = 25$, what is the value of $x + 1$?

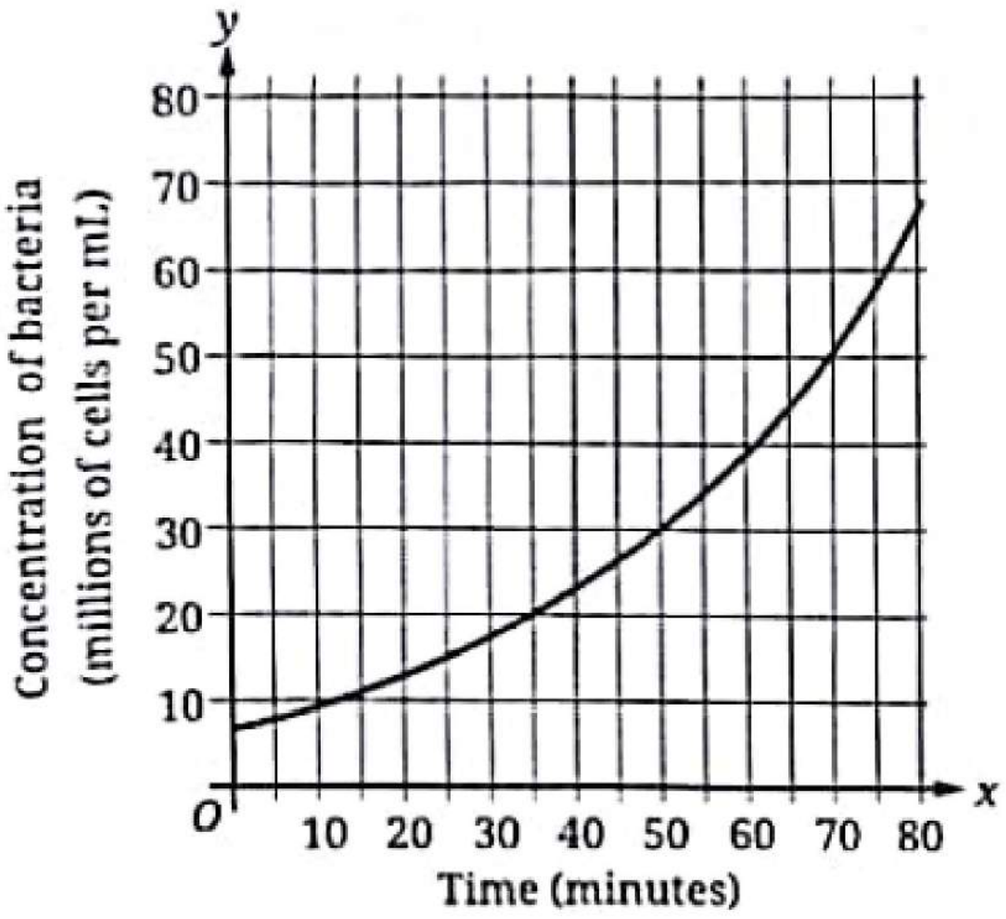
Ⓐ 4

Ⓑ 5

Ⓒ 19

Ⓓ 20

4



The graph shows the estimated concentration of a certain strain of bacteria, y, in millions of cells per mL of nutrient medium, over time x, in minutes since the initial measurement. According to the graph, which of the following is closest to the number of minutes it took for the estimated concentration of the bacteria to increase from 20 million cells per mL of nutrient medium to 30 million cells per mL of nutrient medium?

Ⓐ 15

Ⓑ 20

Ⓒ 30

Ⓓ 35

5

If $(x+3)^2 = 30$, what is the value of x^2+6x ?

Ⓐ 21

Ⓑ 30

Ⓒ 39

Ⓓ 60

6

$$y = 5x$$
$$y = 2x + 2$$

How many solutions does the given system of equations have?

Ⓐ Exactly one

Ⓑ Exactly two

Ⓒ Infinitely many

Ⓓ Zero

7

$$f(x) = |71 - 2x|$$

The function f is defined by the given equation. For which of the following values of k does $f(k) = 3k$?

Ⓐ $\frac{71}{5}$

Ⓑ $\frac{71}{2}$

Ⓒ $\frac{213}{5}$

Ⓓ 71

8

$$g(x) = 2(16x - 17)$$

What is the y-coordinate of the y-intercept of the graph of $y = g(x) - 3$ in the xy-plane?

Ⓐ −37

Ⓑ −34

Ⓒ −20

Ⓓ −17

9

x	y
0	n
4	$n + 19$
8	$n + 38$

There is a linear relationship between x and y. The table shows three values of x and their corresponding value of y in terms of a constant n. What is the slope of the line that represents this relationship in the xy-plane?

10

$$18x^2+24x+c=0$$

In the given equation, c is a constant. The equation has exactly one solution. What is the value of c?

11

$$(x-3)-8(y+9)=129$$

$$(x-3)+8(y+9)=432$$

The solution to the given system of equations is (x, y). What is the value of $8(x-3)$?

12

The volume of a right rectangular prism with a square base is 2,448 cubic centimeters. If the area of the square base is 144 square centimeters, what is the area, in square centimeters, of one of the four lateral faces of the prism?

Ⓐ 17

Ⓑ 204

Ⓒ 540

Ⓓ 816

13

$$y=5(x-2)^2$$

$$y=10(x-2)$$

A solution to the given system of equations is (x, y). What is one possible value of $x+y$?

Ⓐ -20

Ⓑ 4

Ⓒ 20

Ⓓ 24

14

The graph of the quadratic function $y = f(x)$ in the xy-plane intersects the x-axis when $x = 39$ and when $x = p$, where p is a constant. The maximum value of $y = f(x)$ occurs at the point $(14, m)$, where m is a constant. What is the value of p ?

15

$$\frac{x+1}{5x^2} = \frac{k}{x}$$

In the given equation, k is a constant. The solution to the given equation is $\frac{1}{174}$. What is the value of k ?

16

The area of a triangle is equal to x^2 square centimeters. The length of the base of the triangle is $2x + 6$ centimeters, and the height of the triangle is $x - 2$ centimeters. What is the value of x ?

17

The function g is a quadratic function. In the xy-plane, the graph of $y = g(x)$ has a vertex at $(-1, -4)$ and passes through the points $(-2, -43)$ and $(1, -160)$. What is the value of $g(0) - g(2)$?

Ⓐ -121

Ⓑ 0

Ⓒ 117

Ⓓ 312

18

Triangle ABC and DEF are congruent, where A corresponds to D, and B and E are right angles. The measure of angle A is 62°. What is the measure of angle F?

Ⓐ 28°

Ⓑ 62°

Ⓒ 90°

Ⓓ 118°

19

A business consultant charge $408 for the first hour and $204 for each additional hour of work. Which of the following functions gives the charge $C(h)$, in dollars, for h hours of work, where h is a positive integer?

Ⓐ $C(h) = 204h + 204$

Ⓑ $C(h) = 204h + 408$

Ⓒ $C(h) = 408h + 204$

Ⓓ $C(h) = 408h + 612$

20

An acceptable noise criterion rating for the background noise in a laundry room is 50. For a noise criterion rating of 50, the equation $y = 22(0.997)^{x-60} + 47$ gives the estimated sound pressure level, y, in decibels, as a function of the octave band center frequency, x, in hertz, where $x \geq 60$. Which of the following is the best interpretation of 47 in this context?

Ⓐ 47 is 22 less than the estimated sound pressure level, in decibels, at an octave band center frequency of 60 hertz.

Ⓑ 47 is 22 less than the estimated sound pressure level, in decibels, at an octave band center frequency of 0 hertz.

Ⓒ 47 is the estimated sound pressure level, in decibels, at an octave band center frequency of 60 hertz.

Ⓓ 47 is the estimated sound pressure level, in decibels, at an octave band center frequency of 0 hertz.

21

$$3x + 5y = 8$$
$$9x + 15y = 24$$

For each real number r, which of the following points lies on the graph of each equation in the xy-plane for the given system?

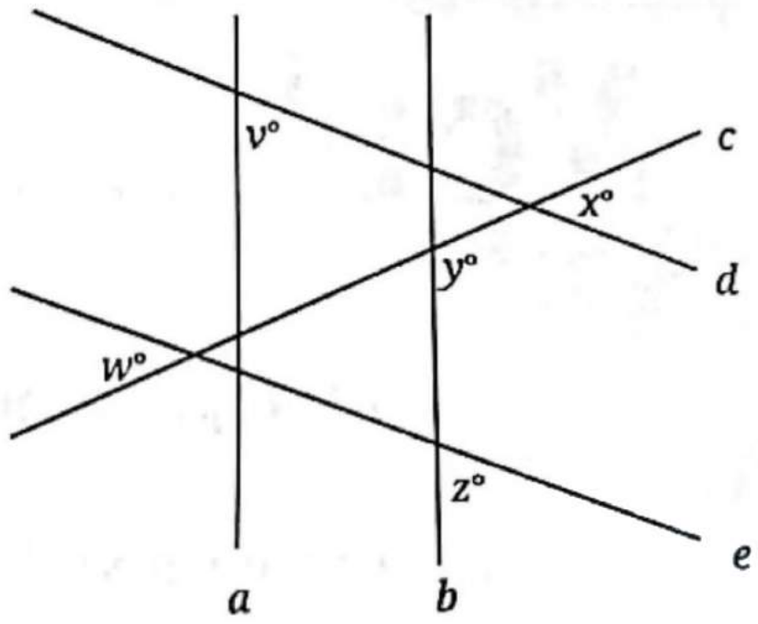
Ⓐ $(r, -\frac{5r}{3}+\frac{8}{3})$

Ⓑ $(r, \frac{3r}{5}+\frac{8}{5})$

Ⓒ $(-\frac{5r}{3}+\frac{8}{3}, r)$

Ⓓ $(\frac{r}{3}+8, -\frac{r}{3}+24)$

22



Note: Figure not drawn to scale.

In the figure, parallel lines a and b are intersected by lines c, d, and e. If $z = 49$, $y = 136$, and $v < z$, which statement about x and w must be true?

Ⓐ $x < w$

Ⓑ $x > w$

Ⓒ $x = w$

Ⓓ $x + w = 90$

Math			
module1		module2	
1	B	1	D
2	D	2	C
3	A	3	B
4	A	4	A
5	40	5	A
6	D	6	A
7	D	7	A
8	A	8	A
9	-19	9	19/4
10	1/3	10	8
11	21/250	11	2244
12	D	12	B
13	D	13	D
14	D	14	-11
15	343	15	35
16	C	16	6
17	C	17	D
18	50	18	A
19	B	19	A
20	D	20	A
21	C	21	C
22	21/29	22	B