1.

A baker uses the equation $T = cdL + a$ to calculate the total cost T to bake L loaves of bread with c cups of flour that cost d dollars per cup using equipment which costs a to run. The bakery switches to a different, cheaper brand of flour. Which of the factors will change?

A) c
B) d
C) a
D) L

2.

If $5z = 25$ what is the value of $12z + 7$?

A) 12
B) 20
C) 67
D) 74

3.

Which of the following is equal to $b^{4/5}$ power for all values of b?

A) $\sqrt{b^{2/5}}$
B) $\sqrt{b^5}$
C) $\sqrt[5]{b^4}$
D) $\sqrt[4]{b^5}$

4.

The number of waterfalls in the United States is three times the number of waterfalls in England. If there are 315 waterfalls in the United States, and x waterfalls in England, which of the following equations is true?

A) $315x = 3$
B) $3x = 315$
C) $\frac{x}{3} = 315$
D) $x + 3 = 315$

5.

If $\frac{3}{x} = \frac{9}{x+24}$, what is the value of $\frac{x}{3}$?

A) 10
B) 4
C) 3
D) 1

6.

$-2y - 3x = 12$
$y = -4x - 1$

If (x, y) is a solution to the system of equations above, what is the value of $x - y$?

A) 11
B) 7
C) 2
D) -11

7.

x	$f(x)$
0	-6
1	0
4	30
5	44

The function f is defined by a polynomial. Some values of x and $f(x)$ are given in the table above. Which of the following must be a factor of $f(x)$?

A) $(x + 6)$
B) $(x + 1)$
C) $(x - 1)$
D) $(x - 6)$

8.

The line $y = 4x + b$, where b is a constant, is graphed in the xy-plane. If the line contains point (c, d) where $c \neq 0$ and $d \neq 0$. What is the y- intercept of the line in terms of c and d?

A) $d - 4c$
B) $d - \frac{c}{4}$
C) $c - 4d$
D) $c + 4d$

9.

$3y - kx = 9$
$4y - 6x = 28$

In the system of equations above, k is a constant. For what value of k will the system of equations have no solution?

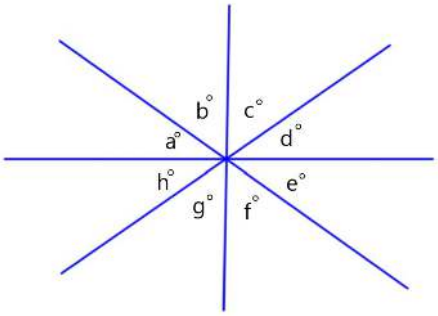
A) $\frac{9}{2}$
B) $\frac{14}{3}$
C) $-\frac{9}{2}$
D) $-\frac{14}{3}$

10.

In the xy- plane the equation of $y = (x + 2)^2$ intersects the equation $y = 36$ at two points, A and B. What is the length of line AB?

A) 12
B) 8
C) 4
D) 2

11.



Note: Figure not drawn to scale.

In the figure above, four lines intersect at a point. If $h + f = d + e$, which of the following must be true?

I. $f = a$
II. $h + d = f + e$
III. $a = d$

A) I only
B) I & II only
C) I & III only
D) II & I II only

12.

In the quadratic equation $y = a(x + 2)(x - b)$, the vertex is located at $(-3, c)$. Which of the following is equal to c?

A) $-3a$
B) $4a$
C) $-a$
D) $2a$

13.

The equation $\frac{8x^2+2x+4}{ax+1} = 4x - 1 + \frac{5}{ax+1}$ is true for all values of $x \neq -\frac{1}{a}$, where a is a constant. What is the value of a?

A) 1
B) 2
C) 4
D) 8

3

14.

What are the solutions to the equation $7x^2 + 12x - 3 = 0$?

A) $x = -\frac{6}{7} \pm \frac{\sqrt{57}}{7}$

B) $x = \frac{6}{7} \pm \sqrt{228}$

C) $x = \frac{12 \pm \sqrt{228}}{14}$

D) $x = \frac{-12 \pm \sqrt{228}}{-14}$

15.

$$K = \frac{5}{9}(F - 32) + 273.15$$

The equation above shows how to convert a temperature F, measured in degrees Fahrenheit, to a temperature K, measured in degrees Kelvin.

Based on the equation, which of the following must be true?

I. A temperature decrease of 1 degree Fahrenheit is equivalent to a temperature decrease of $\frac{5}{9}$ degree Kelvin.

II. A temperature increase of 1 degree Kelvin is equivalent to a temperature increase of $\frac{9}{5}$ degrees Fahrenheit.

III. A temperature increase of $\frac{5}{9}$ Fahrenheit is equivalent to a temperature increase of 1 degree Kelvin.

A) I only

B) III only

C) I & III only

D) I & II only

16.

$$4x(x - 8)(x + 3) = 0$$

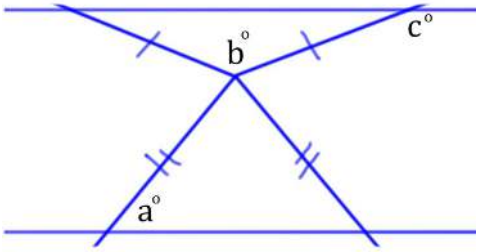
If $x > 0$, what is one possible value of x in the equation above?

17.

$$\frac{1}{12}x + \frac{1}{18}x = \frac{2}{9} + \frac{1}{18}$$

What is the value of x in the equation above?

18.



Note: Figure not drawn to scale

If $2b + 3a = 360$ and $a = 40$, what is the value of c?

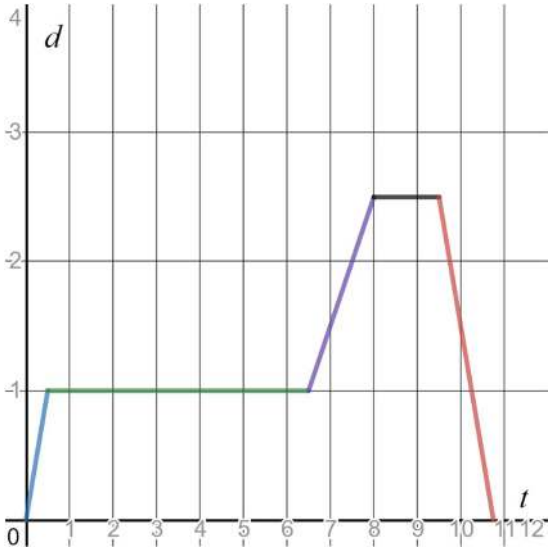
19.

A baby store sells large boxes of baby diapers and small boxes of diapers. The large boxes have 30 more diapers than the small boxes. 6 small boxes and 5 large boxes combine for a total of 612 diapers. How many diapers are in a small box?

20.

In triangle QRS, the measure of $\angle R = 90^o$ and QR=16. If $\sin Q = 0.28$, what is $\cos S$?

1.



The graph above shows Amanda's distance from her home on a typical school day starting from when she is in the car with her mom driving to school. She spends 6 hours at school and then goes to her friend's house before going home. About how many hours does she spend at her friend's house?

A) 1
B) 1.5
C) 2.5
D) 9.5

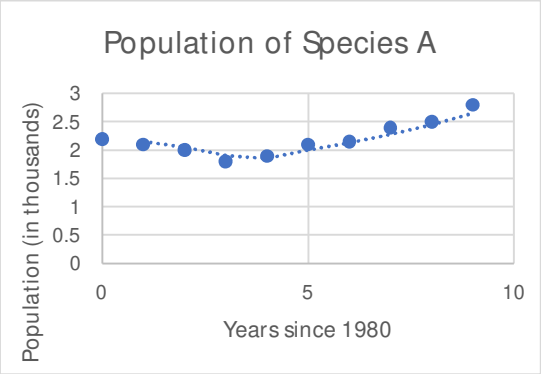
2.

	Older than 6 years	Younger than 6 years	Total
Cats	5	12	17
Dogs	12	31	43
Total	17	43	60

The table above shows the number of pets who entered a pet show and organizes them by age and species. If you were to select a contestant at random, what are the odds that the pet will be either a cat older than 6 or a dog younger than 6?

A) $\frac{1}{12}$
B) $\frac{3}{5}$
C) $\frac{31}{60}$
D) $\frac{17}{60}$

3.



The graph above shows the population, in thousands, of species A in a small town each year from 1980 through 1989. Based on the graph, which of the following best describes the trend in the population for species A from 1980 through 1989?

A) Population generally increased each year since 1980.
B) Population generally decreased each year since 1980.
C) Population generally remained steady from 1980 through 1989.
D) Population decreased until 1983 and then generally increased.

4.

n	1	4	5	7
$f(n)$	11	23	27	35

The table above shows some values for linear function f. Which of the following defines f?

A) $f(n) = 2n$
B) $f(n) = 3n + 8$
C) $f(n) = 4n + 7$
D) $f(n) = 12n - 1$

5.

At a supermarket one year, $33\frac{1}{3}$ percent of the clerks and 25 percent of cashiers received outstanding performance reports at least once. If there are 21 clerks and 12 cashiers, what is the total number of employees who received outstanding performance reports?

A) 10
B) 11
C) 15
D) 20

6.

$4x^2 - 7x + 9$
$2x^2 + 4x + 6$

Which of the following is the sum of the two polynomials shown above?

A) $6x^2 - 3x + 15$
B) $6x^2 + 11x + 15$
C) $6x^4 + 11x^2 + 15$
D) $8x^4 + 28x^2 + 54$

7.

If $\frac{5}{7}w = \frac{3}{4}$, what is the value of w?

A) $\frac{20}{21}$
B) $\frac{15}{28}$
C) $\frac{1}{28}$
D) $\frac{21}{20}$

8.

The average number of locations per U.S. state of a popular fast food chain is modelled by the equation $y = .42x + 16$ where x represents the number of years since 1998. Which of the following best describes the meaning of 16 in the equation?

A) The total number of locations in the U.S. in 1998
B) The estimated increase in the average number of locations per U.S. state each year.
C) The average number of locations per U.S. state in 1998.
D) The estimated difference between the number of locations per U.S. state in 1998 and 2018.

9.

Katie runs 150 inches in 1 second. If she keeps this pace, how many feet can she run in a minute?

A) 12.5 feet
B) 750 feet
C) 9,000 feet
D) 9,012.5 feet

_____∇_____

Questions 10 and 11 refer to the following information.

	Conversion Factor, k
Euro	0.89
British Pound	0.76
Indian Rupee	71.32
Swiss Franc	0.97
Japanese Yen	108.89

The chart above shows approximate conversion factors used to convert US dollars to other currencies. The value of any dollar amount can be estimated using the formula $\frac{c}{d} = k$, where c is the value in the other currency, d is the value in US dollars, and k is the conversion factor.

10.

What is the approximate value, in Swiss francs, of 240 US dollars?

A) 206.40
B) 232.80
C) 239.03
D) 247.42

11.

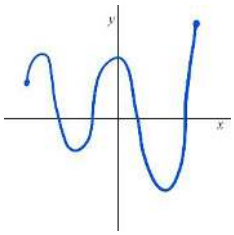
A one-ounce Gold America Eagle coin is currently worth $1,356. In which of the listed currencies is the coin worth about $1,030?

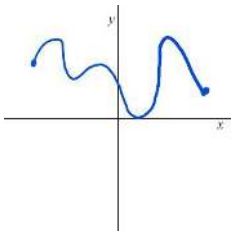
A) Euro
B) British Pound
C) Swiss Franc
D) Japanese Yen

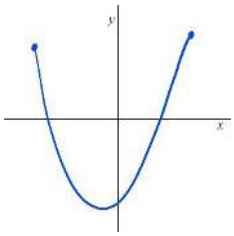
_____Δ_____

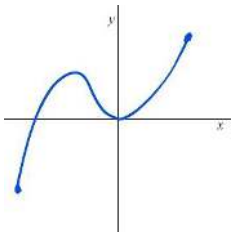
12.

If the function f has one distinct zero, which of the following could represent the complete graph of f in the xy-plane?

A)


B)


C)


D)


13.

$$K = \frac{1}{2}mv2$$

The equation above gives the kinetic energy, K, of an object of mass m moving at the speed v feet per second. Which of the following gives v in terms of m and K?

A) $\frac{2K}{m} + 2$

B) $\sqrt{\frac{1}{2}Km}$

C) $\sqrt{\frac{2K}{m}}$

D) $\frac{1}{2}Km + 2$

14.

The cost of running a widget machine is $5 per hour. Which equation models the cost, c, in dollars for m minutes of the machine running?

A) $c = 5(60m)$

B) $c = 5m$

C) $c = 60m/5$

D) $c = 5m/60$

15.

To test the effectiveness of a cold medicine, 300 patients with the common cold were surveyed. Of those surveyed, half were given Treatment Z while the other half were given nothing. After a week, the number of patients who were given Treatment Z and still had a cold was much less than the number of patients who were given nothing and still had a cold. Based on the design and result of the study, which of the following is an appropriate conclusion?

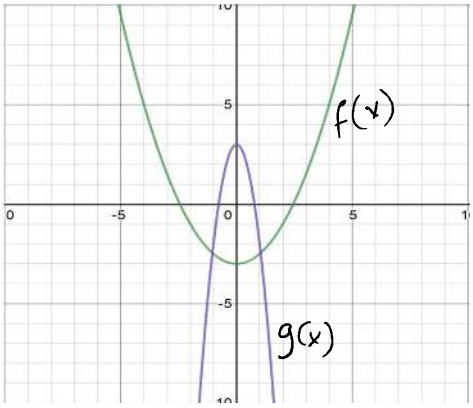
A) Treatment Z may help a patient get over a common cold.

B) Treatment Z will help a patient get over a common cold better than any other medication.

C) Treatment Z will cure a common cold.

D) Treatment Z will help any patient get over a common cold.

16.



Graphs of the functions $f(x)$ and $g(x)$ are shown above. For which of the following values of x does $f(x) + g(x) = 0$?

A) -1

B) 0

C) 1

D) 2

_____∇_____

Questions 17 and 18 refer to the following information.

$$S(P) = \frac{1}{3}P + 30$$

$$D(P) = 380 - \frac{1}{2}P$$

The quantity of a product supplied and the quantity of the product demanded in an economic market are functions of the price of the product. The functions above are the estimated supply and demand functions for a certain product. The function $S(P)$ gives the quantity of the product supplied to the matket when the price is P dollars, and the function $D(P)$ gives the quantity of the product demanded when the price is P dollars.

17.

How will the quantity of the product supplied to the market change if the price of the product is increased by $30?

A) The quantity supplied will decrease by 15 units.
B) The quantity supplied will increase by 15 units.
C) The quantity supplied will decrease by 10 units.
D) The quantity supplied will increase by 10 units.

18.

At what price will the quantity of the product supplied to the market equal the quantity of the product demanded by the market?

A) $170
B) $350
C) $380
D) $420

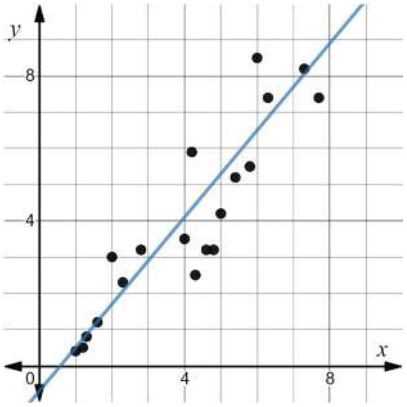
_____Δ_____

19.

A one-pound bag of grass seeds can cover 1,500 square feet. A football field is 120 yards long and $53\frac{1}{3}$ yards wide. How many one-pound bags of grass seeds would you need to cover a football field twice?

A) 9
B) 27
C) 39
D) 77

20.



Data from a chemistry report was recorded and plotted on the graph above. The line of best fit for the data is also shown. For the x-value of 6, how much greater is the actual y-value than the y-value predicted by the line of best fit?

A) 1
B) 1.5
C) 2
D) 2.5

21.

Of the following four types of savings account plans, which option would **not** yield exponential growth of the money in the account?

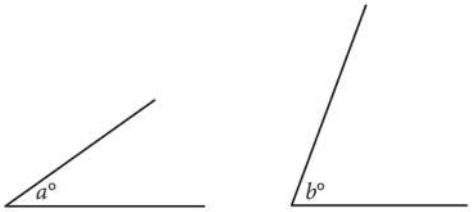
A) Each successive year, $\frac{1}{30}$ of the current value is added to the value of the account.
B) Each successive year, 2.4% of the current value is added to the value of the account.
C) Each successive year, 5% of the initial deposit is added to the value of the account.
D) Each successive year, the new value is 103% of the current value.

22.

The average of three numbers is 75. One of the numbers, z, is 20 percent less than the sum of the other two. What is the value of z?

A) 62.5
B) 100
C) 125
D) 75

23.



The complementary angles a and b are shown above. $sin(a) = 3k + 3$ and $cos(b) = 5k - 7$. Which of the following is the value of k?

A) 3
B) 4
C) 5
D) 6

24.

Mrs. Tennerman has a box of n cookies to distribute to her students. If she gives 2 cookies to each student, she will have 8 left over. In order to give each student 3 cookies, she would need 20 more cookies. How many students are in the class?

A) 18
B) 28
C) 32
D) 64

25.

A cone shaped container is used to collect rainwater. The overall height of the container is 12 feet and the diameter at the top base of the container is 6 feet. The container is partially filled. There is 4 feet from the top of the container to the top of the water in the container. What is the volume of water in the container?

A) $\frac{32}{3}\pi\ ft^3$
B) $\frac{128}{3}\pi\ ft^3$
C) $96\pi\ ft^3$
D) $144\pi\ ft^3$

26.

In the xy-plane, the line determined by the points $(2, t)$ and $(t, 18)$ passes through the origin. Which of the following could be the value of t?

A) 0
B) 4
C) 6
D) 9

27.

A right triangle was altered by increasing one leg by 20% and decreasing the other by 30%. This resulted in a decrease in the area of p percent. What is the value of p?

A) 10
B) 50
C) 16
D) 26

28.

A chemist expects a colony of bacteria to increase its population by 60% every 4 hours. If there are currently 1,600 bacteria, which of the following expressions models the chemist's predictions of total population p in t hours?

A) $16{,}000(.60)^{t/4}$
B) $16{,}000(.60)^{4t}$
C) $16{,}000(1.6)^{4t}$
D) $16{,}000(1.6)^{t/4}$

29.

	Pink	Blue
Male		
Female		
Total	76	76

The table above summarizes the number of students who prefer blue or green by gender for the 6th grade students at Logico Middle School. There are 5 times as many male students who like blue than there are male students who like pink. There are 4 times as many female students who like pink that there are female students who like blue. If there is a total of 76 students who like pink and 76 students who like blue, which of the following is closest to the probability that a male student chosen at random likes pink?

A) 0.079
B) 0.158
C) 0.167
D) 0.200

30.

$5x + 4b = 2x + 3$
$5y + 4c = 2y + 2$

In the equations above, b and c are constants. If the value of b minus c is $\frac{7}{4}$, what is the value of $x - y$?

A) -2
B) -1
C) 0
D) 1

31.

At a bake sale, cookies are \$2 each and brownies are \$3 each. If Nichelle spends at least \$13 but no more than \$17 on n cookies and 1 brownie, what is one possible value of n?

32.

10 students participated in a project to grow a plant during the school year. The heights of their plants at the end of the school year are shown in the table below. According to the table, what was the mean height, in inches, of these plants at the end of the school year? (Round your answer to the nearest tenth.)

Student	Plant Height (inches)	Student	Plant Height (inches)
Anne	54	Favrol	44
Ben	42	Guy	47
Charlie	36	Helen	51
Desean	61	Indira	58
Edna	48	Jaqueline	39

33.

$$(-5x^2 + 2x - 9) - 3(x^2 - 4x + 1)$$

If the expression above is rewritten in the form $ax^2 + bx + c$, where a, b, and c are constants, what is the value of b?

34.

In a circle with center O, central angle AOB has a measure of 80^o. The area of the sector formed by central angle AOB is what fraction of the area of the circle?

35.

Michael will compete in 20 archery contests this year. Each contest is scored out of a maximum of 80 points. It's his goal to finish the year with an average of 60 points per contest. So far, he already competed in 10 contests with an average of 56 points. What is the least score he can receive in the 11^{th} contest and still be able to accomplish his goal for the 20 contests?

36.

$$y \leq 4x$$
$$y \leq -20x + 60$$

In the xy-plane, if a point with coordinates (a, b) lies in the solution set of the system of inequalities above, what is the maximum value of b?

_____∇_____

Questions 37 and 38 refer to the following information.

The total distance travelled, d, by a vehicle can be found by multiplying the average speed, $\bar{s}$, by time, t.

For example, a truck dispatcher can estimate the distance travelled by one of the drivers using known average speeds in different parts of the country at different times of day. He can estimate that Brett should have travelled 110 miles over the last two hours, because traffic typically allows for the truck to be driven at an average speed of 55 miles per hour.

37.

The dispatcher used this formula to estimate the total number of miles driven by the one of the truck drivers, Alex, over the last 8 hours. The dispatcher estimates that the average speed of the driver is 44 miles per hour while he is actively driving. During the 8-hour shift, the driver stopped for a 45-minute lunch break. Based on this information, what is the estimated number of miles driven?

38.

The dispatcher used the formula to estimate the total number of miles driven by a different driver, Brad, in a different part of the country. The dispatcher estimates an average speed of 40 miles per hour while the driver is actively driving. During the 8-hous shift, the driver stopped for a 30-minute lunch break. Based on this information, the estimated number of miles driven by Brad is what percent less than the estimated number of miles driven by Alex? (Note: Ignore the percent symbol when entering your answer. For example, if the answer is 53.4%, enter 53.4)

_____Δ_____