Math

22 QUESTIONS
(TIME: 35 MIN)

DIRECTIONS

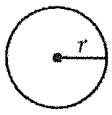
The questions in this section address a number of important math skills.
Use of a calculator is permitted for all questions.

NOTES

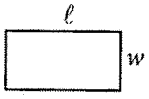
Unless otherwise indicated:

- All variables and expressions represent real numbers.
- Figures provided are drawn to scale.
- All figures lie in a plane.
- The domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

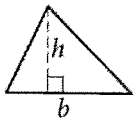
REFERENCE



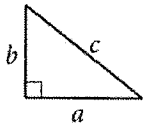
$A = \pi r^2$
$C = 2\pi r$



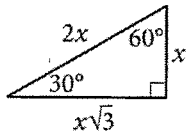
$A = \ell w$

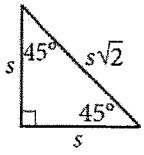


$A = \frac{1}{2}bh$

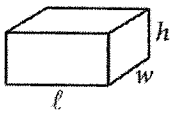


$c^2 = a^2 + b^2$

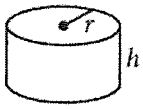




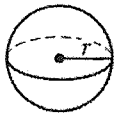
Special Right Triangles



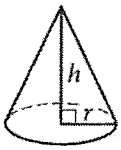
$V = \ell wh$



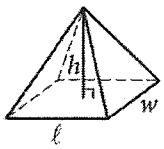
$V = \pi r^2 h$



$V = \frac{4}{3}\pi r^3$



$V = \frac{1}{3}\pi r^2 h$



$V = \frac{1}{3}\ell wh$

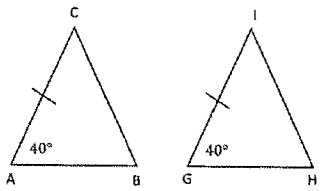
The number of degrees of arc in a circle is 360.
The number of radians of arc in a circle is 2π.
The sum of the measures in degrees of the angles of a triangle is 180.

For multiple-choice questions, solve each problem, choose the correct answer from the choices provided, and then circle your answer in this book. Circle only one answer for each question. If you change your mind, completely erase the circle. You will not get credit for questions with more than one answer circled, or for questions with no answers circled.

For student-produced response questions, solve each problem and write your answer next to or under the question in the test book as described below.

- Once you've written your answer, circle it clearly. You will not receive credit for anything written outside the circle, or for any questions with more than one circled answer.
- If you find **more than one correct answer**, write and circle only one answer.
- Your answer can be up to 5 characters for a **positive** answer and up to 6 characters (including the negative sign) for a **negative** answer, but no more.
- If your answer is a **fraction** that is too long (over 5 characters for positive, 6 characters for negative), write the decimal equivalent.
- If your answer is a **decimal** that is too long (over 5 characters for positive, 6 characters for negative), truncate it or round at the fourth digit.
- If your answer is a **mixed number** (such as $3\frac{1}{2}$), write it as an improper fraction (7/2) or its decimal equivalent (3.5).
- Don't include **symbols** such as a percent sign, comma, or dollar sign in your circled answer.

1



In triangle ABC and triangle GHI, $m\angle A = m\angle G = 40°$and $\overline{AC} = \overline{GI}$. Which of the following information is sufficient to prove that the triangles are congruent?

I. $\overline{AC} \cong \overline{HI}$
II. $m\angle B = m\angle H$
III. $\angle C \cong \angle I$

A) I and II
B) I and III
C) II and III
D) I, II, and III

2

$$y = a(b)^x + k$$

In the exponential function above, $a, b, and\ k$ are constants. What is the y-intercept of the graph of the function in the XY-plane?

A) $(0, ab + k)$
B) $(0, k)$
C) $(0, a + k)$
D) $(0, b + k)$

3

$$T = 2\pi\sqrt{\frac{l}{g}}$$

The equation above shows the formula for the period of the pendulum (T), where g is a gravitational acceleration. If g is halved in a certain planet and l, the length of the pendulum, is doubled, how does the change affect to the period of the pendulum, T?

E) No effect on T.
F) T will be doubled.
G) T will be $\frac{1}{2}$ times.
H) T will be 4 times.

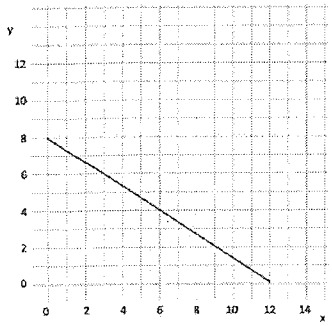
4

Value	Frequency
10	2
12	3
18	1
22	4
25	7

Which of the following statements best explains for the mean and median values from the frequency table above?

A) The mean is equal to the median.
B) The mean is greater than the median.
C) The median is greater than the mean.
D) Not enough information to calculate.

5



Jonathan sells tickets for music concert and play in theater. The graph above models the possible number of tickets for both music concerts and play. Total amount he collected for tickets is $240. If he sold a fixed amount of each ticket for music concert and another fixed amount of each ticket for the play, which of the following equations best represent this situation?

A) $20x + 30y = 240$
B) $30x + 20y = 240$
C) $8x + 12y = 240$
D) $12x + 8y = 240$

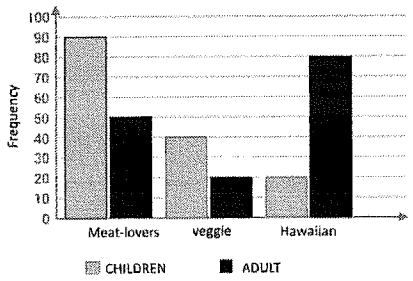
6

$$\left(\frac{1}{a}\right)^{x^2+2x-1} = a^{-2}$$

In the equation above, what is the sum of $x\ values, where\ a$ is a positive constant?

I) -1
J) 2
K) 4
L) -2

7



The bar graph above summarizes the distribution of favorite topping of pizza for both adults and children during one week at a certain Pizza restaurant. What is the ratio of the adults' percent for meat-lover favorite to the children's percent for meat-lover favorite?

A) 9: 5
B) 5: 9
C) 9: 4
D) 4: 9

8

In the XY-plane, the graph of quadratic function $y = ax^2 + bx + c$ has a vertex at $(2, -3)$ and the graph passes through two points on the x-axis. Which of the following can NOT be the value of $a + b + c$?

A) -3
B) -2
C) 0
D) 2

9

$$x + 3y = -7$$
$$-15y = 5x + 35$$

In the system of equations above, for a real number k, which of the following points could lie on the graph of the given system of equations in the XY-plane?

A) $\left(k, -\frac{1}{3}k - \frac{7}{3}\right)$
B) $\left(k, \frac{1}{3}k + \frac{7}{3}\right)$
C) $(3k - 7, k)$
D) $(k, -3k - 7)$

10

$$x^2 + 16x - k = 0$$

In the equation above, k is a constant. If the equation has two real solutions, where $m < k$, what is the greatest value of m?

A) -63
B) -64
C) -65
D) -66

11

An isosceles right triangle ABC has a perimeter of $16 + 16\sqrt{2}\ cm$. What is the length, in inches, of a leg of the triangle?

A) 8
B) 16
C) $8\sqrt{2}$
D) $16\sqrt{2}$

12

A ball is dropped from a height of 15 meters above the ground and hit the ground several times. Assuming that the ball bounces off $\frac{2}{3}$ its previous height, which of the followings would approximate the maximum height, in meters, of the ball between the second and third time it hit the ground?

A) 10m
B) 6.7m
C) 2.2m
D) 1.5m

13

To determine if turmeric reduces the risk of type 2 diabetes for men, study was conducted by interviewing random sample of 20,000 men who had no history of diabetes. Participants reported they were turmeric users in their diet. Seven years later, participants were interviewed again and the researcher found out that the proportion of men who diagnosed type 2 diabetes was significantly lowered for men identified as regular turmeric users. Which of the following statements is the most appropriate conclusion of this study?

A) This study shows that turmeric is a medical cure of type 2 diabetes to anyone.
B) Turmeric definitely caused the reduction in the risk of type 2 diabetes.
C) There is an association between turmeric use and the risk of type 2 diabetes for men, but it is not necessarily a cause-and-effect relationship, and the association may not exist for women.
D) There is an association between turmeric use and the risk of type 2 diabetes for both men and women, but it is not necessarily a cause-and-effect relationship.

14

$$x^2 + y^2 \leq 81$$
$$y - 7 \geq 0$$

In the inequalities above, what is the least x value to satisfy the given constraints?

E) 7
F) -7
G) $4\sqrt{2}$
H) $-4\sqrt{2}$

15

A quadratic function can be modeled for Projected Annual Revenue (f), in millions of dollars, based on the unit price in dollars, x, of the products as follows.

$$f(x) = a(x - 1{,}200)^2 + 20$$

If the quadratic function is open-downward parabola, which of the following best represents the number 1,200 in the context?

A) The company could approximate a maximum annual revenue 20 million dollars if the price per unit is $\$1{,}200$.
B) The company could approximate a maximum annual avenue 20 million dollars if the company makes 1,200 product units per year.
C) The company could approximate a maximum avenue 20 million dollars as long as the company sells 1,200 units of their products.
D) The company could approximate a maximum revenue 1,200 million dollars if the price per unit is \$20.

16

$$D = 2{,}777 - 505t$$

The equation above shows the estimated distance (D), in miles, from Los Angeles airport (LAX) of the airplane t hours after taking off from New York airport (JFK). Which of the following statement best represents the number, 505, in the context?

A) Average distance, in miles, the airplane flies every hour.
B) Average speed, in mph, of the airplane for the entire trip.
C) The time, in minutes, it takes the airplane from JFK to LAX.
D) Total distance, in miles, between JFK and LAX.

17

A scientist observes the population of bees in a hive for his project. At the beginning of his observation, there were 12 bees visible in the hive and he found out that the population of bees in the same hive quadruples every week. Which of the following equations best models the number, f, of bees $\underline{x \text{ months}}$ after the beginning of his observation?

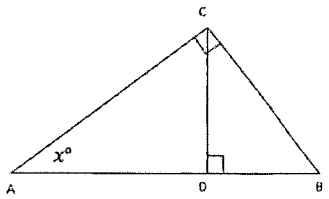
A) $f = 12(1 + 4x)$
B) $f = 12(4)^x$
C) $f = 12(4)^{\frac{x}{4}}$
D) $f = 12(4)^{4x}$

18

Sam harvested 60,000 pounds of barley last year in his farm. He increased the harvest by 20% this year by applying new method of irrigation system. And he expects another increment to the next year at the same rate as this year by expanding the area of his farm. How many pounds of barley does he expect to harvest in his farm for the next year?

A) 72,000
B) 84,000
C) 86,400
D) 96,000

19



In the figure above, $sinx° = 0.75$ and the lengths of AC and BD are 10 inches and 7 inches, respectively. What is the length of BC, in inches?

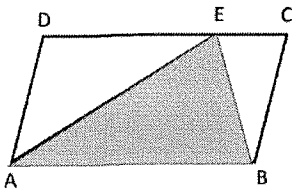
A) 7.00
B) 10.26
C) 9.33
D) 7.50

20

The area of a forest is decreasing at a rate of 1.2 acre per year in a certain developing country. If 1 square mile is equivalent to 640 acres and 1 kilometer is equivalent to 0.62 miles, which of the following converts the rate correctly which the area of forest is decreasing, in square kilometers per year?

A) 0.0049
B) 0.0030
C) 1997.92
D) 0.0015

21



In the figure above, point E is located on the side CD of the parallelogram. If $DE:EC = 4:1$ and the area of shaded region is 20, what is the area of triangle BCE?

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

22

Amount of money spend by each customer

Number of customers	Amount of money spent in dollars
5	Above 300
25	200-300
134	100-200
17	Below 100

The table shows four separated ranges of money, in dollars, spent by each customer in ABC whole sale market during the independence sale. Which of the following can be obtained from the table given?

I. Average amount of money, in dollars each customer spent.
II. The median amount of money, in dollars for total 181 customers.
III. The range of money, in dollars, spent by more than half of all customers during the sale.

A) I only
B) I and II only
C) III only
D) I, II, and III

STOP

If you finish before time is called, you may check your work on this module only. Do not turn to any other module in the test.