

# Math

22 QUESTIONS  
(TIME: 35 MIN)

## DIRECTIONS

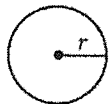
The questions in this section address a number of important math skills.  
Use of a calculator is permitted for all questions.

## NOTES

Unless otherwise indicated:

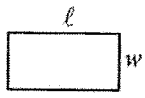
- All variables and expressions represent real numbers.
- Figures provided are drawn to scale.
- All figures lie in a plane.
- The domain of a given function  $f$  is the set of all real numbers  $x$  for which  $f(x)$  is a real number.

## REFERENCE

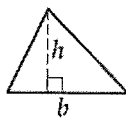


$$A = \pi r^2$$

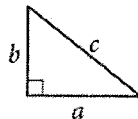
$$C = 2\pi r$$



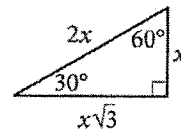
$$A = \ell w$$



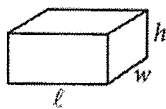
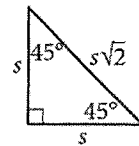
$$A = \frac{1}{2}bh$$



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



Special Right Triangles



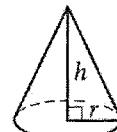
$$V = \ell wh$$



$$V = \pi r^2 h$$



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



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



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

The number of degrees of arc in a circle is 360.

The number of radians of arc in a circle is  $2\pi$ .

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 ( $\frac{7}{2}$ ) or its decimal equivalent (3.5).
- Don't include **symbols** such as a percent sign, comma, or dollar sign in your circled answer.

1

$$(x + 1)^2 + (y - 2)^2 = 64$$

In the circle equation above, if the circle is translated 3 units right in the  $XY$ -plane, which of the following represents the equation of the new circle?

- A)  $(x - 4)^2 + (y - 2)^2 = 64$
- B)  $(x - 2)^2 + (y - 2)^2 = 64$
- C)  $(x + 4)^2 + (y - 2)^2 = 64$
- D)  $(x + 1)^2 + (y + 1)^2 = 64$

2

Characteristics of customers at a Hotel in Las Vegas

	Buffet	No Buffet	Total
Gambling	650	150	800
No Gambling	180	20	200
Total	830	170	1,000

The table shows a distribution of characteristics on a certain day for 1,000 customers at a hotel in Las Vegas. The table shows the number of customers who did gambling, visited buffet restaurant, both, or neither. Based on the data, what is the probability that a customer, if selected at random, didn't visit buffet restaurant given that the customer did gambling?

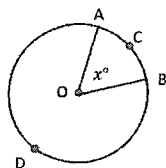
3

Two identical cylinders, each has a radius of 2 inches on the circular bases and  $h$  inches on their heights, are attached together along the circular bases. The volume of the new cylinder is  $k\pi$  cubic inches. If the surface area of one cylinder before attached is also  $k\pi$  square inches, what is the value of height ( $h$ ), in inches, of one cylinder?

4

If 540 is  $k\%$  less than 2,000, what is the value of  $k$ ?

5



In the circle O above, the length of a small arc  $\widehat{ACB}$  is  $3\pi$  and  $x = 45$ . What is the area of large sector ADB?

- A)  $126\pi$
- B)  $21\pi$
- C)  $18\pi$
- D)  $6\pi$

6

$$P = 92t + 80$$

A plumber charges for a job as shown above. The equation gives the total cost, in dollars, of a job that takes  $t$  hours. Two customers A and B hired this plumber for their jobs and the plumber worked 3 hours longer for customer B's job. How much more did the plumber charge, in dollars, on customer B than customer A?

- A) 80
- B) 92
- C) 184
- D) 276

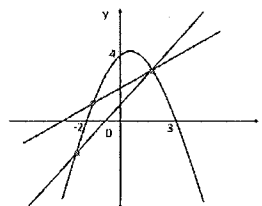
7

$$(x + a)(bx - 3) = 4x^2 - 5x - 6$$

The equation above is true for all  $x$ , where  $a$  and  $b$  are constants. What is the value of  $ab$ ?

- A) 4
- B) -4
- C) 8
- D) -8

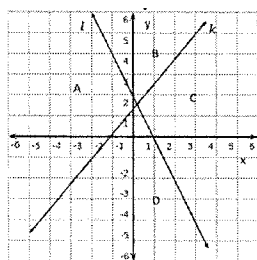
8



A system of three equations is graphed in the  $XY$ -plane above. How many solutions does the system have?

- A) Zero
- B) One
- C) Two
- D) Three

9



$$\begin{aligned} 5y - 6x &\leq 7 \\ 3x + 2y &\geq 3 \end{aligned}$$

The system of inequalities is graphed in the  $XY$ -plane. Which region in A through D is the solution located based to the system above?

- A) A
- B) B
- C) C
- D) D

10

$$\sqrt{\frac{x+4}{2}} = -3x$$

In the equation above, what is the set of all possible solutions to the equation?

- A)  $\left\{-\frac{4}{9}, \frac{4}{9}\right\}$
- B)  $\left\{-\frac{4}{9}\right\}$
- C)  $\left\{\frac{4}{9}\right\}$
- D) No solution.

11

Shipping Cost in local UPS

Weight (pounds)	Shipping Cost (dollars)
10	18.30
20	30.60
40	55.20

The table above shows the shipping cost, in dollars, in local UPS of packages by its weight, in pounds. If there is a linear relationship between the shipping cost and the weight of the packages, which of the following can be used to determine the total shipping cost ( $y$ ), in dollars, of packages with a weight of  $x$  pounds?

- A)  $y = 1.23x$
- B)  $y = 1.23x + 6$
- C)  $y = 12.3x + 0.6$
- D)  $y = 12.3x + 6$

12

In Peter's math class, the class average (arithmetic mean) for math unit test was 85 percent for 36 students. However, three of his class students dropped the course. So, the teacher recalculated the mean for the remaining class and figured that the new mean was 87 percent. What was the mean score for three student who dropped the course?

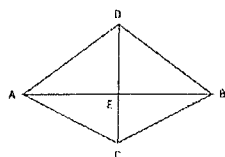
- A) 61
- B) 62
- C) 63
- D) 64

13

Nathan purchased an old rare coin in auction at \$180. He found out that the value of the coin increases 15% of its value the previous year. The estimated value of the coin, in dollars, 3 years after purchase can be written as  $180k$ , where  $k$  is a constant. What is the approximate value of  $k$ ?

- A) 1.32
- B) 1.52
- C) 1.15
- D) 0.0034

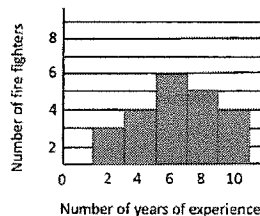
14



In the figure above,  $AD = BD$ ,  $AC = BC$ . If  $CD = 7$  and  $AE = 4$ , what is the area of kite ACBD?

- A) 28
- B) 30
- C) 56
- D) 60

15



The bar graph above shows the distribution of the number of years of experience for 22 fire fighters who have served in a certain local fire department. If a new fire fighter who has 6 years of experience joins the local fire department, what will be the effect on the mean and median of the data set?

- A) The mean and median will remain the same.
- B) The mean will decrease but the median will increase.
- C) The mean will increase but the median will decrease.
- D) The mean will decrease but the median will remain the same.

16

The expression  $x^2 + kx + 20$  is equivalent to  $(x - 2)^2 + m$ , where  $k$  and  $m$  are constants. What is the value of  $-\frac{m}{k}$ ?

17

$$y = ax(x^2 - 1)(x^2 - 4)$$

In the equation above,  $a$  is a constant. How many distinct  $x$ -intercepts does the graph of the equation in the  $XY$ -plane have?

- A) Five
- B) Four
- C) Three
- D) Two

18

Let  $y = f(x)$  is a linear function with a negative slope and graphed in the  $XY$ -plane. Which of the following must be true?

- I.  $f(a) > f(b)$  if  $a > b$
- II.  $f(b) < 0$  if  $b > 0$
- III.  $f(a) < 0$  if  $a < 0$

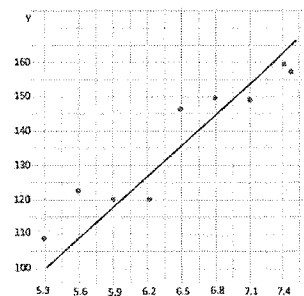
- A) I only
- B) I and II only
- C) I and III only
- D) None

19

Kevin walked three fourth of the distance from his home to the library. For the rest of the way to the library, he ran 2 times as fast as he walked. If he took 30 minutes to walk three fourth of the way, how much time, in minutes, did it take him from his home to the library?

- A) 32
- B) 35
- C) 40
- D) 45

20



The scatter plot above shows the distribution of heights ( $y$  values) of women based on their shoe sizes ( $x$  values). The line of best fit is also drawn in the  $XY$ -plane. What is the number of women for which the line of best fit predicts a value less than the actual value?

21

Ashley has a budget of \$50 to spend on notebooks and binders for her school. Notebooks cost \$2.50 each and binders cost \$5.25 each. Which of the following inequalities represents this situation, where  $n$  is the number of notebooks she can purchase, and  $b$  is the number of binders she can purchase? (Assume there is no other costs)

- A)  $2.50b + 5.25n = 50$
- B)  $2.50b + 5.25n \leq 50$
- C)  $2.50n + 5.25b > 50$
- D)  $2.50n + 5.25b \leq 50$

22

What is the  $y$ -intercept of the exponential graph of  $y = 2k\left(\frac{1}{2}\right)^{\frac{x}{3}+1}$  in the  $XY$ -plane, where  $k$  is a constant?

- E)  $(0, k)$
- F)  $(k, 0)$
- G)  $\left(0, \frac{k}{2}\right)$
- H)  $\left(-\frac{k}{2}, 0\right)$

**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.