

## Math

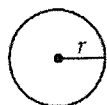
22 QUESTIONS  
(TIME: 35 MIN)**DIRECTIONS**

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

**NOTES**

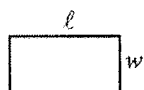
Unless otherwise indicated:

- 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.

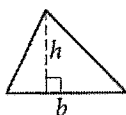
**REFERENCE**

$$A = \pi r^2$$

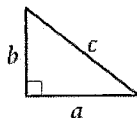
$$C = 2\pi r$$



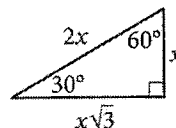
$$A = \ell w$$



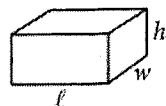
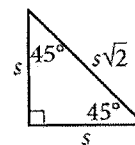
$$A = \frac{1}{2}bh$$



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



Special Right Triangles



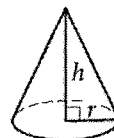
$$V = \ell wh$$



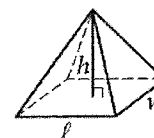
$$V = \pi r^2 h$$



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



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



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

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

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

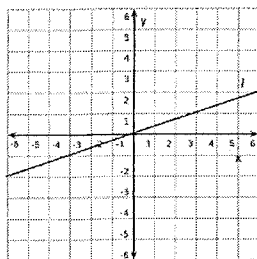
The sum of the measures in degrees of the angles of a triangle is 180.

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

1



The graph of a line  $l$  is shown above in the  $XY$ -plane. The slope of a line  $k$  is twice the slope of the line  $l$ . If the graph of a line  $k$  passes through a point  $(3, 6)$ , what is the coordinates on a line  $k$  in the  $XY$ -plane?

- A)  $(-3, 3)$
- B)  $(0, 0)$
- C)  $(-3, 4)$
- D)  $(-3, 2)$

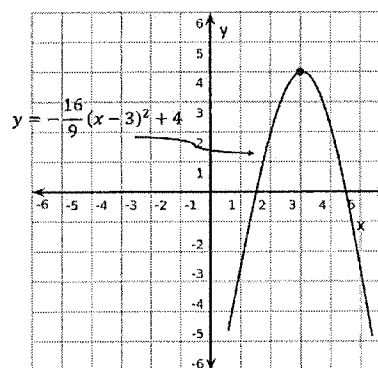
2

$$y = 3x^2 - k$$

In the equation above,  $k$  is a positive constant. Which of the following is an equivalent form of the given equation?

- A)  $y = (3x - \sqrt{k})(x + \sqrt{k})$
- B)  $y = (\sqrt{3x} - \sqrt{k})(\sqrt{3x} + \sqrt{k})$
- C)  $y = (\sqrt{3x} + \sqrt{k})(\sqrt{3x} - \sqrt{k})$
- D)  $y = (\sqrt{3x} - k)(\sqrt{3x} + k)$

3



The quadratic graph above models the daily profit ( $y$  value), in hundred dollars, that a vendor expects to make from selling churros for a unit price of  $x$  dollar. Based on the model, what is the unit price, in dollars, of churros to make the same profit when the vendor sells it for a unit price of 4 dollars?

4

Isaiah works as sales associate at a retail store. He is paid 15% of the sales he made. He also gets a bonus which is additional 10% of his pay if his sales is over \$1,000 during a pay period. If he earns a total of \$ 587.40 including a bonus on his pay period, what was the amount of the sales, in dollars, he made during one pay period?

5

$$C(x) = 350 + kx$$

A manufacturing company's total cost, in dollars, to produce  $x$  calculators is given by the function  $C(x)$  above, where  $k$  is a constant. The total cost, in dollars, to produce 200 calculators is \$5,350. What is the total cost, in dollars, to produce 250 calculators?

6

The total population,  $P$ , of rabbits in a certain area can be modeled by a quadratic function that is defined in terms of  $t$ , where  $t$  is the time in months. At a time of 5 months, the total population of rabbits is 300, and at a time of 12 months, the total population of rabbits is 1,252. If the initial population of rabbits is 100, then what is the total population of rabbits in this area after 2 years?

- A) 132
- B) 13,200
- C) 4,708
- D) 4,608

7

Score	Score frequencies	
	Class A	Class B
5	2	0
10	0	0
15	4	8
20	2	4
25	7	2
30	0	2
Total	15	16

For a certain math game, players can score from 0 to 30 for 6 games. If a player wins the game, the person gains 5 points but if a player loses the game, no point gains or loses. The table shows the distribution of the scores of 31 players in two classes. How much is the median of class B is greater than the median of class A?

- A) 0
- B) 2.5
- C) 5
- D) 7.5

8

$$x^2 - 8x + k = 0$$

In the quadratic equation above,  $k$  is a constant. The equation has two real solutions if  $k < m$ . What is the least possible value of  $m$ ?

9

Max is folding paper cranes for a friend's birthday party. He plans to make 2,000 paper cranes to decorate the reception table. If it takes 5 minutes to fold one paper crane and he already made  $k$  paper cranes, which of the following expressions represents the number of hours needed for him to complete the rest of work?

- A)  $5(2,000 - k)$
- B)  $12(2,000 - k)$
- C)  $\frac{1}{12}(2,000 - k)$
- D)  $\frac{1}{12}(k - 2,000)$

10

A circle is graphed in the  $xy$ -plane and the end points of the diameter of a circle are  $(2, 0)$  and  $(2, -4)$ . How many points will the circle intersect with  $y$ -axis?

- A) 0
- B) 1
- C) 2
- D) 3

11

Which of the following expressions is equivalent to  $(-3a^{\frac{1}{2}})^{\frac{2}{3}}$ , where  $a > 0$ ?

- A)  $6\sqrt[3]{3a}$
- B)  $\sqrt[3]{9a}$
- C)  $-\sqrt[3]{9a^2}$
- D)  $-\sqrt[3]{9a}$

12

$$\begin{aligned} 2x + 4 &= k \\ 5x - 3y &= 4 \end{aligned}$$

In the system of equations above,  $k$  is a constant. What is the value of  $y$  of the solution to the system in terms of  $k$ ?

- A)  $\frac{28-5k}{6}$
- B)  $\frac{5k-28}{6}$
- C)  $\frac{5k+4}{6}$
- D)  $\frac{5k-4}{6}$

13

$$\begin{aligned}20 &\leq a \leq 80 \\ 60 &\leq b \leq 130\end{aligned}$$

The intervals of  $a$  and  $b$  are shown above. Which of the following inequalities represents correctly for the interval of  $c$  if  $c = b - a$ ?

- A)  $|45 - c| \leq 65$
- B)  $|c - 45| \geq 65$
- C)  $|c - 45| \leq 5$
- D)  $|c - 45| \geq 5$

14

$$f(t) = \sqrt[3]{2 - 2x^2}$$

In the function above, what values of  $x$  are defined for which  $f(x)$  is a real number?

- A)  $-1 \leq x \leq 1$
- B)  $-\sqrt{2} \leq x \leq \sqrt{2}$
- C)  $-2 \leq x \leq 2$
- D) *all real numbers*

15

$$\begin{aligned}f(x) &= (x - 3)(x + 7) \\ h(x) &= x^2\end{aligned}$$

In the quadratic functions above, what change could be made from  $h(x)$  to be  $f(x)$ ?

- A)  $h(x)$  was translated 2 units right and 25 units down.
- B)  $h(x)$  was translated 2 units left and 25 units down.
- C)  $h(x)$  was translated 2 units left and 25 units up.
- D)  $h(x)$  was translated 2 units right and 25 units up.

16

Thomas wants to share 1.5 gallons of orange juice with his friends. He distributed 8 fluid ounce cups to 7 friends and himself. How many of full 8 fluid ounce cups of orange juice each person would get if 1.5 gallons of orange juice was divided equally to all? (1 gallon = 128 fluid ounces)

- A) 2
- B) 3
- C) 4
- D) 5

17

During the end-of-year sale, Elon bought a electric car at a 20% discount. He paid a total of  $k$  dollars, which included the discounted price and a 9.5% sales tax on the discounted price. What is the original price of the electric car before the discount in term of  $k$ ?

- A)  $\frac{k}{(0.8)(1.095)}$   
 B)  $\frac{k}{(0.2)(0.095)}$   
 C)  $\frac{k}{(0.8)(0.095)}$   
 D)  $k(0.8)(1.095)$

18

$$f(x) = x^2 - 4x - 5$$

The quadratic function is shown above. Which of the following equivalent forms of the function shows the minimum value of the function as constant?

- A)  $f(x) = x(x - 4) - 5$   
 B)  $f(x) = (x - 2)^2 - 9$   
 C)  $f(x) = (x - 5)(x + 1)$   
 D)  $f(x) + 5 = x(x - 4)$

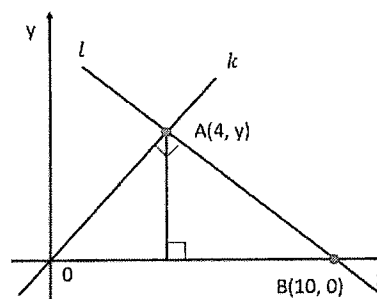
19

$$h(x) = 2x^4 + 4$$

In the  $xy$ -plane, the equation  $y = h(x)$  is graphed. which of the following could be the value of  $h(x)$ ?

- A) 0  
 B) 1  
 C) 2  
 D) 4

20



Lines  $k$  and  $l$  are shown in the  $xy$ -plane above. If two lines are perpendicular and intersect at point  $A$ , what is the area of triangle  $OAB$ ?

- A) 20  
 B)  $5\sqrt{6}$   
 C)  $10\sqrt{3}$   
 D)  $10\sqrt{6}$

21

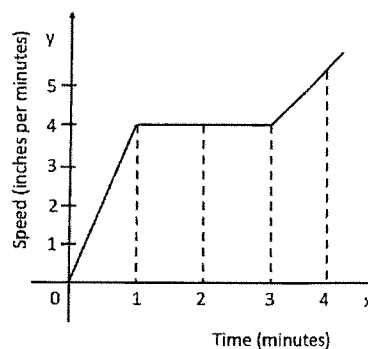
$$f(x) = 3x^2 - 12$$

$$f(x - k) = 3x^2 - 12x$$

If the first function  $f(x)$  is translated  $k$  units horizontally, the function will be  $3x^2 - 12x$  as shown above. What is the value of  $k$ ?

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

22



The graph above models the speed,  $y$ , in inches per minutes, of a snail during the first 4 minutes of travel time,  $x$ . What is the total distance traveled by the snail between 1 min to 3 min?

- A) 16 inches
- B) 12 inches
- C) 10 inches
- D) 8 inches

### 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.