

Math

22 QUESTIONS
(TIME: 35 MIN)

DIRECTIONS

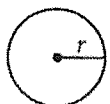
The questions in this section address a number of important math skills.
Use of a calculator is permitted for all questions.

NOTES

Unless otherwise indicated:

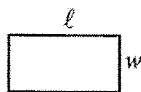
- All variables and expressions represent real numbers.
- Figures provided are drawn to scale.
- All figures lie in a plane.
- The domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE

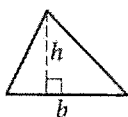


$$A = \pi r^2$$

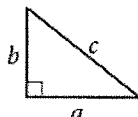
$$C = 2\pi r$$



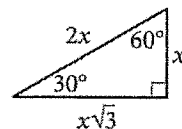
$$A = \ell w$$



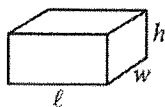
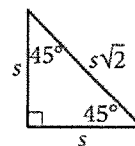
$$A = \frac{1}{2}bh$$



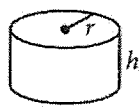
$$c^2 = a^2 + b^2$$



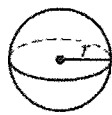
Special Right Triangles



$$V = \ell wh$$



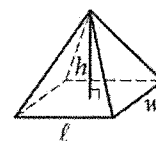
$$V = \pi r^2 h$$



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



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



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

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

x	y
12	56
18	80
27	116

The table above shows some values of x and their corresponding values of a linear function, $y = f(x)$. Line l is formed by translating $y = f(x)$ up 7 units in the XY -plane. What is the y -intercept of the line l ?

- A) (15,0)
- B) (0,15)
- C) (8, 0)
- D) (0, 8)

2

$$\begin{aligned} -x + 3y &= 2 \\ 8x - 24y &= -16 \end{aligned}$$

In the system of equations above, for any real number k , which of the following set of points lies on the graph of the system in the XY -plane?

- A) $\left(k, \frac{2-k}{3}\right)$
- B) $\left(k, \frac{k+2}{3}\right)$
- C) $(3k + 2, k)$
- D) $(3k - 1, k)$

3

The area of an equilateral triangle is $\sqrt{3} \text{ cm}^2$. The height of the triangle is $k\sqrt{3} \text{ cm}$, where k is a constant. What is the value of k ?

- A) 3
- B) 2
- C) 1
- D) $\frac{1}{2}$

4

$$p = 20 + 2x$$

The equation above gives the speed (p), in meters per second, of water x meters down from the top of the mountain. Which of the following best represents 20 in this context?

- A) The initial speed of water, in meters per second, at the top of the mountain.
- B) The initial height of mountain, in meters, at the top of the mountain.
- C) Average increase of the speed, meters per second, of water per second at the top of the mountain.
- D) Average speed of water, in meters per second, for the entire trip from the top of the mountain to the bottom.

5

The function f is defined by $f(x) = -\frac{1}{7}x^2$. In the XY -plane, the graph of $y = g(x)$ is the result of translating $f(x)$ 3 units down. Which of the following shows the equation of $g(x)$?

- A) $g(x) = -\frac{1}{7}x^2 + 3$
- B) $g(x) = -\frac{1}{7}(x - 3)^2$
- C) $g(x) = -\frac{1}{7}x^2 - 3$
- D) $g(x) = -\frac{1}{7}(x + 3)^2$

6

$$3(x + k) = ax + b$$

In the equation above, a , b , and k are constants. If the equation has infinitely many solutions, which of the following must be equal to b ?

- A) k
- B) $3k$
- C) 3
- D) $3a$

7

$$P(t) = 15(1.2)^t$$

The equation above gives the estimated number of customers at a restaurant, where t is the number of years since the restaurant opened. Which of the following best interprets the number 1.2 in the context?

- A) The estimated number of customers is increased by 1.2% every year.
- B) The estimated number of customers is increased by 1.2 every year.
- C) The estimated number of customers is increased by 20% every year.
- D) The estimated number of customers is decreased by 20% every year.

8

If $4x - 6y = 14t$, which of the following expressions is equivalent to $4x^2 - 12xy + 9y^2$?

- A) $49t^2$
- B) $7t$
- C) $7t^2$
- D) $49t$

9

$$f(x) = -3(x - 1)^2 + 5$$

In the function above, what is the maximum value of the function?

- A) 1
- B) 2
- C) 5
- D) -3

10

The equation $h = 24.5 - 2.1t$ approximate the height h , in yard, of a ball in free fall t seconds after it is dropped from the height of 24.5 yard from the ground. What is the decrease in height, in yard, 1 second after it was dropped?

- A) $\frac{1}{2.4}$
- B) 2.4
- C) 22.4
- D) 2.1

11

A wedding planner is planning a party dinner for guests. It costs the wedding planner a onetime fee of \$500 to rent the hall and \$25.75 per attendee. If the wedding planner has a budget of \$5,000. What is the greatest number of attendees for a party dinner within the budget?

- A) 176
- B) 175
- C) 174
- D) 173

12

A cylinder is inscribed in a cube such that the height of cylinder is equal to the length of side of the cube and the circumference of circular base of cylinder touches four sides of square base of the cube. If the side of the cube is a , what is the volume of the space in the cube not taken by the cylinder?

- A) $a^3 \left(1 - \frac{\pi}{2}\right)$
- B) $a^3 \left(1 - \frac{\pi^2}{4}\right)$
- C) $a^3 \left(1 - \frac{\pi}{4}\right)$
- D) $a \left(a^2 - \frac{\pi}{2}\right)$

13

Which of the following is equivalent to $x^{\frac{5}{7}}$, where $x > 0$?

- A) $\sqrt[56]{x^{40}}$
- B) $\sqrt[12]{x^{40}}$
- C) $\sqrt[40]{x^{56}}$
- D) $\sqrt[40]{x^{12}}$

14

The amount of money Tom has is 6% less than the amount of money Jerry has. If the amount of money Tom has is k times the amount of money Jerry has, what is the value of k ?

- A) 0.06
- B) 6
- C) 94
- D) 0.94

15

The value of an oil painting drawn by a famous artist increased 1% of its value of the previous year annually. Which of the following best models regarding the value of the oil painting over time?

- A) Linear decreasing
- B) Exponential increasing
- C) Linear increasing
- D) Exponential decreasing

16

$$2x^2 - 4x + 2y^2 + 8y = -4$$

The circle equation above is graphed in the XY -plane. The circle passes through two points on the y -axis. What is the sum of the y coordinates of two points?

- A) -4
- B) 4
- C) $2\sqrt{2}$
- D) $-2\sqrt{2}$

17

$$\begin{aligned}4x - 7y &= 2 \\ kx + my &= 5\end{aligned}$$

In the system of equations, k and m are constants. If two linear graphs are perpendicular in the XY -plane, which of the following system of equations also represents two perpendicular linear graphs in the XY -plane?

- A) $\begin{cases} 8x - 7y = 2 \\ kx + 2my = 6 \end{cases}$
- B) $\begin{cases} 8x - 7y = 9 \\ kx + my = 6 \end{cases}$
- C) $\begin{cases} 4x - 7y = 5 \\ 2kx + my = 0 \end{cases}$
- D) $\begin{cases} 4x - 7y = 4 \\ kx - 2my = 1 \end{cases}$

18

If the length of a diagonal of a square is $3\sqrt{2}$ inch, what is the perimeter of the square, in inches?

- A) $12\sqrt{2}$
- B) 12
- C) 24
- D) $24\sqrt{2}$

19

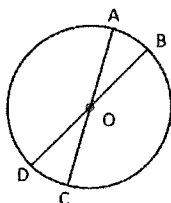
A soccer ball is kicked from the top of a building. The equation $h(t) = -4.9t^2 + 6t + 12$ represents the height, in meters, of the ball from the ground t seconds after it is kicked. What does the number 12 represent in the equation?

- A) The height, in meters, of the building from the ground to the top of the building.
- B) The distance the soccer ball can travel until it hit the ground.
- C) The maximum height of the soccer ball can reach after it was kicked.
- D) The time, in seconds, the soccer ball to reach the ground after it was kicked.

20

A school teacher has a budget \$700 to purchase wooden pencils and mechanical pencils. The teacher must purchase a minimum of 500 pencils to give out to all students in class. If the cost of a wooden pencil is \$0.70 and the cost of a mechanical pencil is \$2.50, what is the maximum number of mechanical pencils the teacher can purchase to stay within the budget?

21



In the circle O above, the diameter of the circle is 10. If $\angle BOC = 5\angle AOB$, what is the length of an arc \widehat{CD} ?

- A) $\frac{1}{6}\pi$
- B) $\frac{25}{12}\pi$
- C) $\frac{5}{6}\pi$
- D) $\frac{1}{2}\pi$

22

An electric car manufacturing company produced their electric cars 200% more than its number of electric cars produced in the previous year from 2,000 to 2,020. A model formulated based on the information above to compute the number of electric cars, $p(x)$, at the end of x years after the company first started to produce in the year 2,000, where $0 \leq x \leq 20$. If $p(0) = 130$, Which of the following functions best models this situation?

- A) $p(x) = 130(2)^x$
- B) $p(x) = 260(2)^x$
- C) $p(x) = 130(3)^{x-1}$
- D) $p(x) = 130(3)^x$

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.