# Math

22 QUESTIONS
(TIME: 35 MIN)

DIRECTIONS

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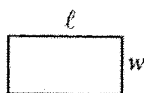Use of a calculator is permitted for all questions.

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.
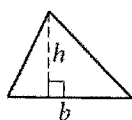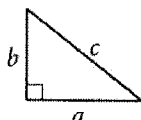
REFERENCE
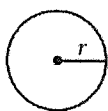
$A = \pi r^2$
$C = 2\pi r$
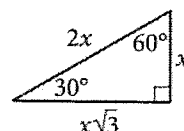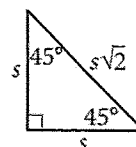
$A = \ell w$

$A = \frac{1}{2}bh$
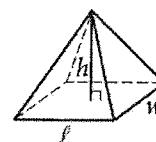
$c^2 = a^2 + b^2$

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).

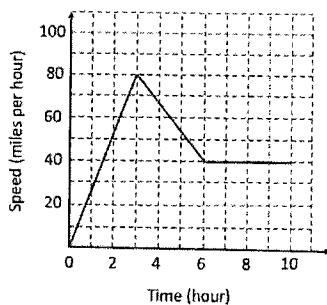- Don't include **symbols** such as a percent sign, comma, or dollar sign in your circled answer.

1
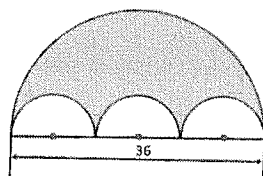
In the figure above, three small congruent semi-circles are inscribed to the bigger semi-circle as shown. If the diameter of the bigger semi-circle is 36, what is the value of the area of the shaded region?
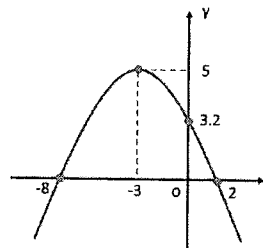
A) 270π
B) 216π
C) 108π
D) 54π

3

Which of the following quadratic forms shows the maximum value of the function as a constant in the equation?

A) $y = -\frac{1}{5}x^2 - \frac{6}{5}x + \frac{16}{5}$
B) $y = -\frac{1}{5}(x - 2)(x + 8)$
C) $y = -\frac{1}{5}(x + 3)^2 + 5$
D) $y = -\frac{1}{5}(x^2 + 6x) + \frac{16}{5}$

2

The graph above shows the speed profile for James's car while he was traveling LA to San Francisco. What is the total distance, in miles, traveled for 10 hours trip?

4

If a line is perpendicular to $y = -\frac{1}{2}x + 3$ and passes through (0, -3) in the XY-plane, what is the equation of the line?

A) $y = -2x - 3$
B) $y = 2x - 3$
C) $y = \frac{1}{2}x - 3$
D) $y = 2x + 3$

5

$$x(3x + 1)^2(x - 1)^3 = 0$$

In the equation above, what is the solution set to the equation?

A) $\left\{0, 1, -\frac{1}{3} \cdot \frac{1}{3}\right\}$

B) $\left\{0, 1, -1, -\frac{1}{3}\right\}$

C) $\left\{0, 1, -\frac{1}{3}\right\}$

D) $\left\{0, 1, \frac{1}{3}\right\}$

7

$$10^x \cdot 1000^{2x} = 100^{4x} \cdot 10$$

In the equation above, what is the value of x?

E) -1
F) 0
G) 1
H) 2

6

$$f(x) = 120{,}000 \cdot (0.95)^x$$

The function above represent to estimate the value of a certain luxury vehicle, in dollars, where x is the number of years after 2000. Which of the following best interpret the number 0.95 in this context?

E) The estimated value of the vehicle, in dollars, in 2000.

F) The estimated percent increase in value each year from 2000.

G) The estimated percent, in decimal, of the value of the vehicle each year after 2000.

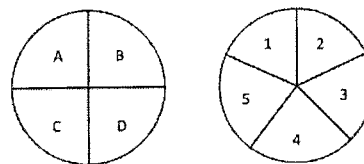H) The estimated percent of decrease in total value after 2000.

8

In two dart boards above, assuming that letters and numbers are equally spaced out on both circle boards, what is the probability that a dart will land on C and the other dart will land on even number if two darts are thrown?

A) $\frac{1}{5}$ B) $\frac{1}{10}$ C) $\frac{2}{9}$ D) $\frac{1}{9}$

9

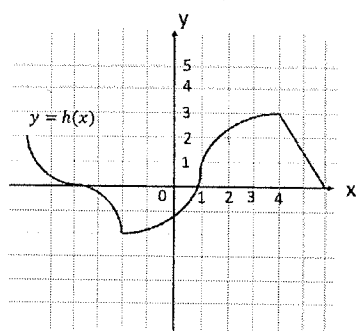In the XY-plane, the equations $y = 2x - 5$ and $-4x + ky = -10$ represent the same line. What is the value k?

11

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

In the equation above, which of the following is the solution set to the equation?

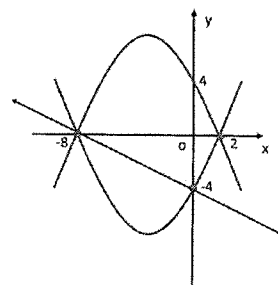A) $\{0, -5\}$
B) $\{-5\}$
C) $\{0, 3\}$
D) $\{3, -5\}$

10

x	F(x)
-2	-2
-1	0
0	5
1	8
2	12
3	1/2

The complete graph of the function $y = h(x)$ and some values for F(x) are shown in the table above. If the function $h(x)$ has a maximum at $x = k$, what is the value of $F(k - 2)$?

A) 2
B) -2
C) ½
D) 12

12

A system of 3 equations is shown above in the XY-plane. How many solution(s) does the system have?

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

13

$$y \le -2x - 1$$
$$-y - 1 \le 0$$

In the system of inequalities above, which of the following ordered pairs (x, y) satisfies the system?

I) $(0, 0)$
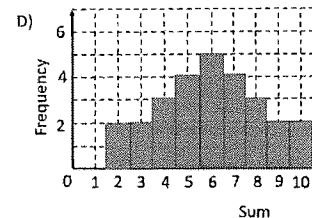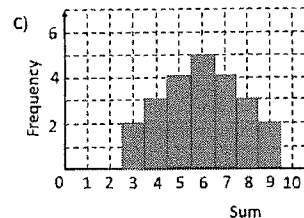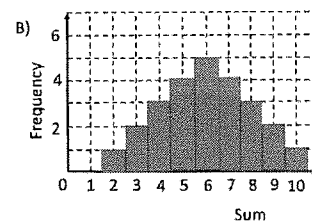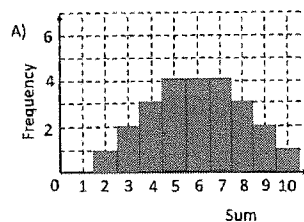J) $(0, 1)$
K) $(0, -1)$
L) $(1, 1)$

14

$$\sqrt{2x + 3} + x = 0$$

What is the solution set to the equation above?

A) $\{3\}$
B) $\{-1, 3\}$
C) $\{-1\}$
D) *No solution*

15

Suppose that you have two spinners and each spinner has numbers 1 through 5, equally spaced out. Which of the following graphs correctly represents for the sum of the numbers in two spinners?

16

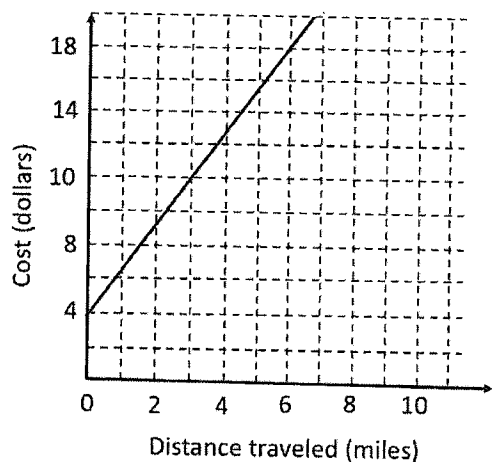Which of the following statements are always true?

I. $|a - b| = |b - a|$

II. $-\dfrac{|a|}{|b|} = \left|\dfrac{-a}{b}\right|$

III. $\dfrac{1}{|a-b|} = \dfrac{1}{|b-a|}$

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

CONTINUE

17

Distance traveled (miles)

The line graphed in the XY-plane above models the total cost, in dollars, for Uber ride, y, in a certain area based on the number of miles in distance traveled, x. Based on the graph, what is the meaning of slope in the line graph?

A) Total cost, in dollars, for x miles traveled.
B) Rate of cost, dollars per each additional mile traveled.
C) Rate of speed which the driver drive.
D) Rate of cost, dollars per every 2 miles traveled.

18

Sam visited a bridge (Danyang-Kunshan Grand Bridge) in China over the summer and he found out that it is officially the longest bridge in the world which stretches out 164.8 kilometers.
Approximately how many miles is the bridge? (1 kilometer ≈ 0.6214 miles)

A) 98
B) 100
C) 102
D) 104

19

$$(2 - 3ax)(x + 3) + x^2 - 6$$

In the equation above, a is a constant. If the expression is equal to $-kx$, where k is a constant, what is the value of k?

20

A manufacturing company bought a robot automation system valued at $500,000. The marketing department expected that the cost would pay off after some time by saving the cost for employee's labor. If the company saves the same amount, $70,000 every six months, which of the following equations gives the value of time (t), in year, that the company would take to pay off the purchasing cost?

A) $y = 500,000 + 70,000t$
B) $y = -70,000t + 500,000$
C) $y = 500,000 - 140,000t$
D) $y = 500,000 + 140,000t$

Some radio channel host invited listeners to respond a poll on the show's website that asked, "Do you support the proposition discussed during the show? The show host reported that 80% responded "No" and 18% responded "Yes" on the next session of the show. Which of the following best explains why these results are **unlikely** to represent the sentiments of the entire population?

A) The response must be 50% "Yes" and 50% "No" to be fair discussion in the show.

B) The percentage don't add up to 100%, so no conclusion can be made.

C) Those who responded to the poll were volunteered, not a random sample of the population.

D) The show host could be against the proposition such that 80% of responders were against it.

$$\dfrac{\dfrac{9}{x+1}+\dfrac{9}{x^2+x}}{\dfrac{x^2}{x+1}-\dfrac{3x+4}{x+1}}$$

For $x \neq 1, 3$, which of the following expressions is equivalent to the above?

A) $\dfrac{9(x+1)}{x(x+4)(x-1)}$

B) $\dfrac{9}{x(x-4)}$

C) $\dfrac{-9}{x(x-4)}$

D) $\dfrac{x+1}{x(x-4)}$

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.