

## Math

35 MINUTES, 22 QUESTIONS

## 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:

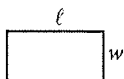
- All variables and expressions represent real numbers.
- Figures provided are drawn to scale.
- All figures lie in a plane.
- The domain of a given function  $f$  is the set of all real numbers  $x$  for which  $f(x)$  is a real number.

## REFERENCE

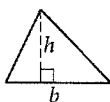


$$A = \pi r^2$$

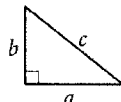
$$C = 2\pi r$$



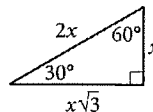
$$A = \ell w$$



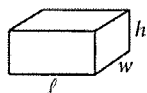
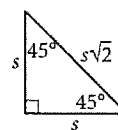
$$A = \frac{1}{2}bh$$



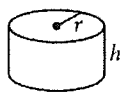
$$c^2 = a^2 + b^2$$



Special Right Triangles



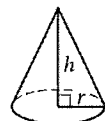
$$V = \ell wh$$



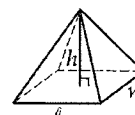
$$V = \pi r^2 h$$



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



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



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

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

If  $\frac{8}{7}x^2 + 2 = 10$ , what is the value of  $x^2 + 2$ ?

2

If  $f(x) = x - 5$  and  $f(h(2)) = 3$ , which of the following equations could be  $h(x)$ ?

- A)  $h(x) = 2x + 5$
- B)  $h(x) = 5x - 1$
- C)  $h(x) = 3x + 2$
- D)  $h(x) = 2x + 2$

3

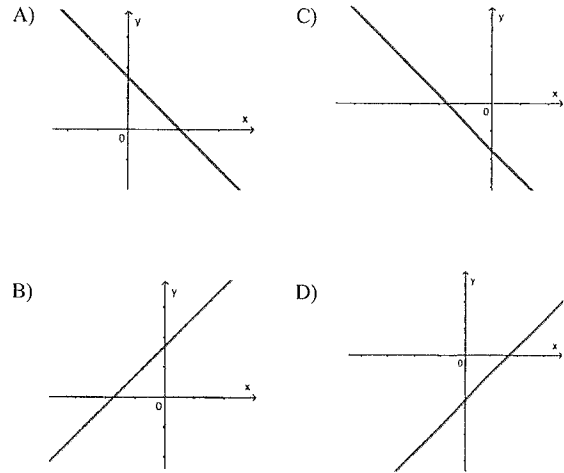
$$\begin{aligned} 2x + 3y &= 3 \\ 3x - 3y &= 4 \end{aligned}$$

Based on the system of equations above, what is the value of  $x^2 - y^2$ ?

- A) 6
- B) 4
- C)  $\frac{1}{2}$
- D) 2

4

Which of the following graphs represents the line  $l$ ,  $y = ax + b$ , where  $a$  and  $b$  are constants and  $a < 0$ ,  $b < 0$ ?



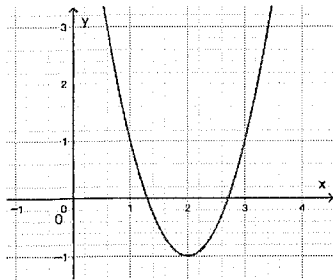
5

9, 5, 2, 6, 11, 18

A list of 6 data values is shown above. What is the difference between the mean and the median of the data values?

- A) 1
- B) 4.5
- C) 2.5
- D) 0

6



The graph of  $f(x)$  is shown above. Which of the following functions defines  $f(x)$ ?

- A)  $f(x) = 2x^2 - 4x$
- B)  $f(x) = 2x^2 - 8x + 7$
- C)  $f(x) = 2x^2 - 4x - 2$
- D)  $f(x) = 2x^2 - 4x + 3$

7

In a right triangle, angle  $A$  is an acute angle and the length of the hypotenuse is 9. What is the length of the leg opposite to the angle  $A$ ?

- A)  $9 \sin A$
- B)  $9 \cos A$
- C)  $9 \tan A$
- D) 9

8

The price of a coffee machine is marked as \$168 after a 40% discount. What is the original sale price of the coffee machine?

9

The population of wild elephants decreases by 7.52% each year. If there were 4,500 elephants in the wild initially, how many will remain after 10 years?

- A) 2,059
- B) 1,125
- C) 2,437
- D) 3,375

10

If the function  $f$  is defined by  $f(x) = \frac{1}{3}x + \frac{1}{2}$ , what is the  $y$ -intercept of the graph of  $y = f(x)$  in the  $xy$ -plane?

- A)  $(\frac{1}{2}, 0)$
- B)  $(0, \frac{1}{2})$
- C)  $(0, -\frac{3}{2})$
- D)  $(-\frac{3}{2}, 0)$

11

The side of a cube is 0.4 meters. What is the volume, in cubic centimeters, of the cube?

- A) 6400
- B) 1640
- C) 64000
- D) 64

12

$$5x + 4 = 27$$

Which equation has the same solution as the given equation?

- A)  $2x - 1 = 8$
- B)  $2x + 1 = 6 + x$
- C)  $5x = 24$
- D)  $x - 5 = 6x - 28$

13

$$p = 65 + 5t$$

The equation above gives the speed  $p$ , in kilometers per hour, of a certain car  $t$  seconds after it begins to accelerate on a highway. What is the speed, in kilometers per hour, of the car 6 seconds after it begins to accelerate?

- A) 90
- B) 70
- C) 95
- D) 85

14

$$3x^2 - 6x + \frac{10}{4} = 0$$

One solution to the given equation can be written as  $1 - \sqrt{p}$ , where  $p$  is a constant. What is the value of  $p$ ?

15

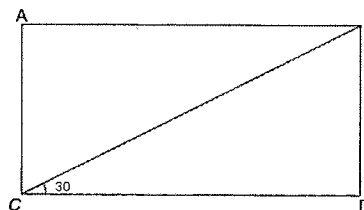
$$y = 52$$

$$y = 9(x - 5)^2 - 12$$

The graphs of the given equations in the  $x$   $y$ -plane intersect at the point  $(x, y)$ . Which of the following is not a possible value of  $x$ ?

- A)  $\frac{23}{3}$
- B)  $\frac{7}{3}$
- C)  $5 + \frac{8}{3}$
- D)  $\frac{8}{3}$

16



A rectangle  $ABCD$  and triangle  $BCD$  is shown above, where the measure of  $\angle BCD$  is  $30^\circ$  and  $BD = 4\sqrt{3}$  inches. What is the area of the rectangle  $ABCD$ , in square inches?

- A)  $48\sqrt{3}$
- B)  $32\sqrt{3}$
- C) 48
- D) 32

17

A drink is sold in large bottles and small bottles. A large bottle is \$2.50 more expensive than a small bottle. 3 large bottles and 2 small bottles cost \$32.50 in total. How much does a large bottle cost?

18

Which expression is equivalent to  $\frac{9x^2(x-2) - (x-2)}{(3x+1)(x-2)}$ ,

where  $x \neq -\frac{1}{3}$  and  $x \neq \frac{2}{3}$ ?

- A)  $3x + 1$
- B)  $3x - 1$
- C)  $\frac{9x^2}{3x + 1}$
- D)  $\frac{9x^2}{3x - 1}$

19

$$a^{(m+n)} + b^{2n} = a^8 + b^{12}$$

What is the value of  $m$  in the equation above, where  $a$ ,  $b$ ,  $m$ , and  $n$  are constants and  $a$  and  $b$  are positive?

20

Circle A:  $(x + 2)^2 + (y - 3)^2 = 9$

Circle B:  $(x - 1)^2 + (y - 7)^2 = 9$

What is the distance from the center of circle A to the center of circle B in the  $xy$ -plane?

21

After School Activities (per week)

Hours	1	2	More than 3	Total
Number of sophomores	20	25	30	75
Number of juniors	5	40	30	80
Total	25	65	60	155

In a recent school survey, sophomores and juniors were asked about how many hours they spent on activities after school each week. The results of the survey are shown in the table above. If one of the sophomores were chosen at random, what is the probability that the person spent less than 3 hours on after school activities each week?

22

The function  $f$  is defined by  $f(x) = 3x^2 + x - 6$ . In the  $xy$ -plane, the graph of  $y = p(x)$  is the result of shifting the graph  $y = f(x)$  right 3 units and up 2 units. Which equation defines the function  $p$ ?

A)  $p(x) = 3x^2 - 17x + 18$

B)  $p(x) = 3x^2 + x - 9$

C)  $p(x) = 3x^2 + x - 3$

D)  $p(x) = 3x^2 - 17x + 20$