Math

22 QUESTIONS
(TIME: 35 MIN)

DIRECTIONS

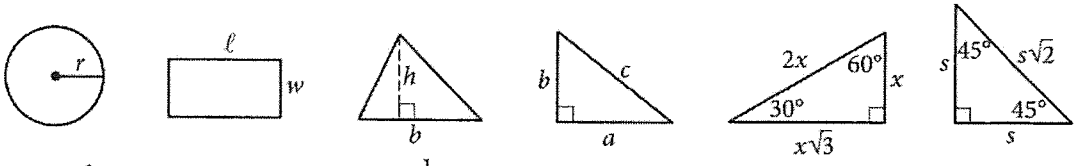
The questions in this section address a number of important math skills.
Use of a calculator is permitted for all questions.

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



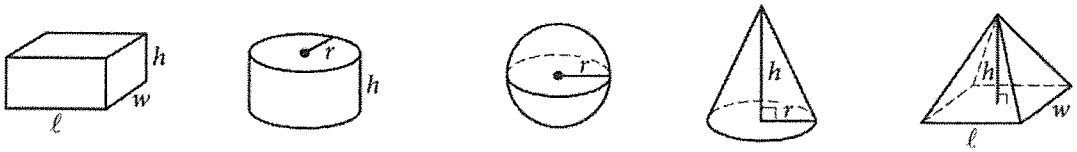
$A = \pi r^2$
$C = 2\pi r$

$A = \ell w$

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

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

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 xy-plane, what is a point of intersection between two graphs of $y = 2x - 4$ and $y = x^2 + x - 6$?

A) $(-2, -8)$
B) $(2, 0)$
C) $(1, -2)$
D) $(-1, 2)$

2

Function f is graphed in the xy-plane by translating the function h up 4 units. If the function h is defined by $h(x) = 3x^2 - x$, what is the value of $f(2)$?

A) 10
B) 12
C) 14
D) 6

3

There are 620 students in ABC college. 110 of the students were randomly chosen and surveyed on whether or not they will travel abroad over the summer. The results of the survey show that 66 of the surveyed students were planning to travel abroad over the summer. The margin of error on this survey is $\pm 5\%$. What is the range of students in the entire college that would travel abroad over the summer?

A) 55-65
B) 79-141
C) 341-403
D) 217-279

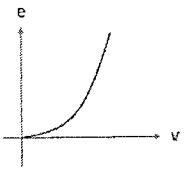
4

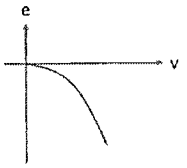
A technician manufactured 6 more lamps on Tuesday than he manufactured on Monday. If he manufactured 20% more lamps on Tuesday than on Monday, how many lamps did he manufactured on Tuesday?

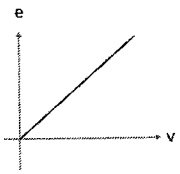
5

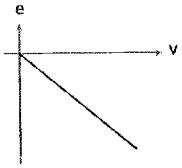
Kinetic Energy (J)	Velocity (m/s)
100	10
400	20
900	30
1,600	40

In physics lab, a student found that the velocity of a miniature cart affected the kinetic energy, as shown in the table above. Which of the following graphs best represents the relationship between the velocity (v) of cart, in m/s, and the kinetic energy (e), joule, as indicated in the table?

A) 

B) 

C) 

D) 

6

$$\frac{3x-3}{(x-3)^2}-\frac{3}{x-3}$$

If the expression above is equivalent to $\frac{k}{(x-3)^2}$, where k is a constant and $x \neq 2$, what is the value of k?

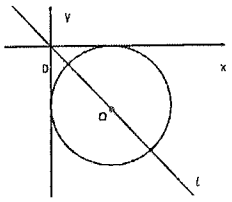
7

Ages	Frequency
17	50
18	150
19	170
20	80
21	34
22	16

The table above shows the distribution of ages of 500 freshmen in a certain college. What is the positive difference between the mean and the median of the data in the table?

A) 0.500
B) 0.108
C) 1.080
D) 5.000

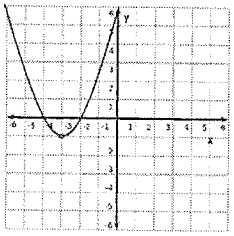
8



A circle O with radius 3 is tangent to both x-axis and y-axis in the xy-plane as shown above. If a line l passes through the origin and the center of the circle O, what is the equation of the line l?

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

9



The graph of quadratic function of $y = f(x)$ is shown in the xy-plane above. Which of the following equations shows the minimum value of the function in the equation?

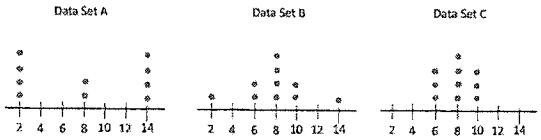
A) $y = (x + 2)(x + 4)$
B) $y = x^2 + 6x + 8$
C) $y = x(x + 6) + 8$
D) $y = (x + 3)^2 - 1$

10

Veronica has 1.2 miles left after running k percent of the entire trail in the morning. Which of the following expressions represents the distance of the entire trail in terms of k?

A) $\frac{120}{100-k}$
B) $\frac{100-k}{120}$
C) $\frac{120-1.2k}{100}$
D) $\frac{100}{120-k}$

11



The dot plots of three data sets are shown above. Which data set has the least standard deviation?

A) Data set A
B) Data set B
C) Data set C
D) All data sets have the same standard deviation.

12

If $f(x - 1) = x^2 - 3x - 2$ for all values of x, which of the following could be the function f?

A) $f(x) = x^2 - 5x + 2$
B) $f(x) = x^2 - 3x - 3$
C) $f(x) = x^2 - x - 4$
D) $f(x) = x^2 + x - 4$

13

The census shows that the number of labor force population in a certain country-side town is reduced by one-fifth every year. If the number of labor force population in the country-side town t years after the first census surveyed is represented by P and the initial labor population on the country-side town was k, where k is a constant, which of the following equations best represents this situation after t years of the first census surveyed?

A) $P(t) = \frac{1}{5}k^t$
B) $P(t) = k\left(\frac{1}{5}\right)^t$
C) $P(t) = t\left(\frac{1}{5}\right)^k$
D) $P(t) = k\left(\frac{4}{5}\right)^t$

14

$$f(x) = 2\left(\frac{1}{4}\right)^x - 2$$

If the exponential function of $y = f(x)$ is graphed in the xy-plane, what is the coordinates of x-intercept of the function?

A) $(0, 0)$
B) $(1, 0)$
C) $(-1, 0)$
D) $(-2, 0)$

15

Two triangles, ΔABC and ΔKML, are similar. The area of triangle ΔABC is 46 in^2. If the length of sides $AB = 4\ in\ and\ KM = 8\ in$, what is the area of ΔKML?

A) 184
B) 92
C) 46
D) 23

16

Circle A: $(x-1)^2 + y^2 = 4$
Circle B: $x^2 - 2x + y^2 - c = 0$

In the xy-plane, two circles A and B are co-centered. If the radius of circle A is two less than the radius of circle B, what is the value of constant c in the equation of circle B?

A) 36
B) 35
C) 16
D) 15

17

A triangle has a height that is 125% of its base. If the height is increased by 2 cm, how much does the base need to change in order to keep the same proportion of the original triangle?

A) The base needs to increase 1.6 cm.
B) The base needs to decrease 1.6 cm.
C) The base needs to increase 2 cm.
D) The base needs to decrease 2 cm.

18

A quadratic function f is graphed in the xy-plane. If one of the x-intercept is $(2, 0)$ and the vertex is located at $(4, 3)$, what is the coordinates of the other x-intercept of the function?

A) (4, 0)
B) (5, 0)
C) (6, 0)
D) (7, 0)

19

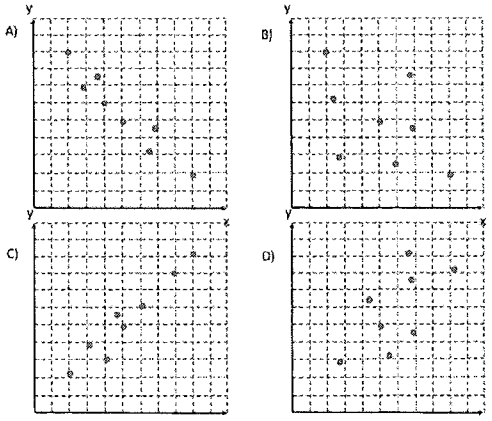
If $x > 0$, which of the following is equivalent to $\sqrt[7]{x^5}$?

I. $x^{\frac{5}{7}}$
II. $\frac{x}{x^{\frac{2}{7}}}$
III. $x \cdot \left(x^{\frac{1}{7}}\right)^{-2}$

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

20

Which of the following scatter plots best represent a strong negative association between x and y?



21

For $x > 0$ *and* $y > 0$, the quotient of the square root of x and twice the square of y is 56, and the cube root of the sum of 5 and y is the square of x. Which of the following equations best represents the statements above.

A) $\begin{cases} \frac{\sqrt{x}}{2y^2} = 56 \\ (5+y)^3 = \sqrt{x} \end{cases}$

B) $\begin{cases} \frac{\sqrt{x}}{(2y)^2} = 56 \\ \sqrt[3]{(5+y)} = \sqrt{x} \end{cases}$

C) $\begin{cases} \sqrt[3]{(y+5)} = \sqrt{x} \\ \frac{\sqrt{x}}{2y^2} = 56 \end{cases}$

D) $\begin{cases} \frac{\sqrt{x}}{2y^2} = 56 \\ \sqrt[3]{(y+5)} = x^2 \end{cases}$

22

A right triangle has angles measuring $45°, 45°, and\ 90°$. If the length of the hypotenuse is 4, what is the area of the right triangle?

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.