

Math

22 QUESTIONS
(TIME: 35 MIN)

DIRECTIONS

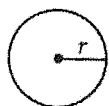
The questions in this section address a number of important math skills. Use of a calculator is permitted for all questions.

NOTES

Unless otherwise indicated:

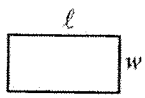
- All variables and expressions represent real numbers.
- Figures provided are drawn to scale.
- All figures lie in a plane.
- The domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE

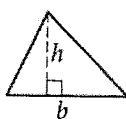


$$A = \pi r^2$$

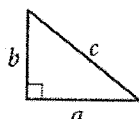
$$C = 2\pi r$$



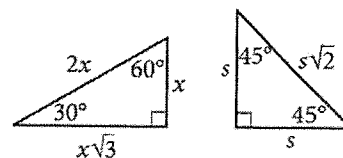
$$A = \ell w$$



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



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



Special Right Triangles



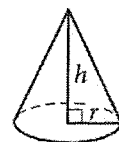
$$V = \ell wh$$



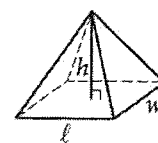
$$V = \pi r^2 h$$



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



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



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

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

1

$$144 = 8x + y$$

The equation above can be used to model the amount of money (y), in dollars, left after buying boba drinks for x times in a month. If $(18, 0)$ is a solution to the equation, what does it mean in this context?

- A) The unit price of a boba drink is \$18.
- B) It will take 18 days to use all the money in the budget.
- C) The person bought 18 boba drinks and no money left in the budget.
- D) The person's budget was \$18.

2

If $\frac{\sqrt{2x}}{4} = 2\sqrt{2}$, what is the value of x ?

- A) 64
- B) 16
- C) 8
- D) 4

3

Which of the following must be true if $xy < 0$?

- I. $xy \neq 0$
- II. $x^2 - y^2 < 0$
- III. $x^2 + y^2 > 0$

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

4

Which of the following is an example of a function whose graph has exactly one x intercept in the XY -plane?

- A) A linear function whose rate of change is zero.
- B) A quadratic function whose vertex is located at $(-1, -3)$ and opens upwards.
- C) A quadratic function whose vertex is located at the origin and opens downwards.
- D) A quadratic function whose vertex is located at $(1, 3)$ and opens upwards.

5

On a certain test, all correct answers earn the same points and all incorrect answers lose the same points, and no response earns one point. The equation $P = 5c - 2i + s$ represents a score obtained by the number of correct answers, c , and the number of incorrect answers, i , and the number of unanswered, s . If a student got 25 correct answers and 5 incorrect answers, and got 120 points on the final score, how many problems did the student leave no answers on the test?

6

$$ax^2 - 10x + 5 = 0$$

In the quadratic equation above, where a is a constant. If the equation has exactly one solution, what is the value of a ?

7

Adrian has two part-time jobs. He works as a caterer at \$25 per hour, and he also works as a math tutor at \$45 per hour. He can work no more than 30 hours per week, but he will need to earn at least \$1,500 in order to pay his rent. Which of the following inequalities represents this situation if x represents the number of hours he worked as a tutor and y represents the number of hours he worked as a caterer?

- A) $\begin{cases} x + y \leq 30 \\ 25x + 45y \leq 1,500 \end{cases}$
B) $\begin{cases} x + y \geq 30 \\ 25x + 45y \geq 1,500 \end{cases}$
C) $\begin{cases} x + y \leq 30 \\ 45x + 25y \geq 1,500 \end{cases}$
D) $\begin{cases} x + y \geq 30 \\ 45x + 25y \geq 1,500 \end{cases}$

8

In a certain college, 40% of students take fine arts classes. Of those who doesn't take fine arts classes 50% take graphic design classes. If all students in the college must take only one art related class and there are 320 students in total, how many students will take other art related classes than fine art classes or graphic design classes?

- A) 128
B) 96
C) 64
D) 48

9

$$\begin{aligned}ax - by &= 12 \\ 2x + 7y &= -36\end{aligned}$$

In the system of equations above, a and b are constants. If the system has infinitely many solutions, what is the value of $\frac{b}{a}$?

- A) $-\frac{7}{2}$
- B) $\frac{7}{2}$
- C) $-\frac{2}{7}$
- D) $\frac{2}{7}$

10

$$x^2 + 10x + y^2 - 8y + 40 = 0$$

In the circle equation above, if the circle is graphed in the XY -plane, how many units horizontally need to be translated in order to be tangent to the y -axis?

- A) 5 units to the right.
- B) 4 units to the right.
- C) 5 units to the left.
- D) 5 units to the right.

11

$$f(x) = a \cdot 2^{x-1}$$

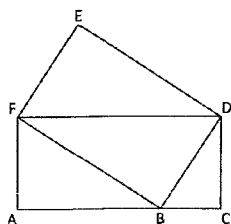
In the exponential function f above, where a is a constant. What is the value of $f(2)$ if $f(1) = 3$?

12

The height above the ground, in feet, of the riding cart in a certain roller coaster is given by $h(t) = -1.75(t - 8)^2 + 120$, t seconds after the ride starts, where $0 \leq t \leq 16$. If the riding cart is 113 ft above the ground, after how many seconds will the riding cart be at the same height, in feet, when it moves downward?

- A) 8
- B) 6
- C) 4
- D) 2

13



In the figure above, rectangle $ACDF$ is overlapped with parallelogram $BDEF$ as shown. If the area of parallelogram $BDEF$ is 50, what is the area of rectangle $ACDF$?

14

The landlord in a commercial building sent letters to all tenants that the lease amount will be raised 12% every year. If a tenant is paying \$15,000 for one-year lease in the beginning of 2020, Approximately, how much will the tenant need to pay in the beginning of 2023?

- A) \$18,816
- B) \$20,400
- C) \$21,074
- D) \$23,603

15

The mean of 7 numbers in a list is x . When an additional number is added to the list, the mean of all numbers is $2x - 1$. What is the value, in terms of x , of the number added to the list?

- A) $9x - 1$
- B) $8x - 8$
- C) $9x - 8$
- D) $8x - 1$

16

If $x^2 + y^2 = a$ and $xy = b$, which of the following is equivalent to $-4b + 2a$?

- A) $-2(y - x)^2$
- B) $2(y - x)^2$
- C) $4(x - y)^2$
- D) $-4(y - x)^2$

17

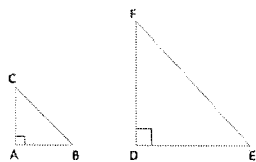
The amount of Carbon in milligrams.					
	A	B	C	D	E
Basalt	0.41	0.40	0.42	0.39	0.41
Sandstone	0.02	0.54	0.35	0.42	0.13

Five samples of each of two different rock types are collected from a mountain in California. The values in the table shows the amount of Carbon, in milligrams, found in 1 gram of each rock sample. Which of the following statements is valid based on the values in the table?

- I. The standard deviation of Basalt samples is greater than that of Sandstone samples.
- II. The median of Sandstone samples is smaller than that of Basalt samples.
- III. The range of Sandstone samples is greater than that of Basalt samples.

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

18



In the right triangles above, if two triangles are similar and $AB = 3$ and $BC = 5$, then what is the value of $\sin \angle E$?

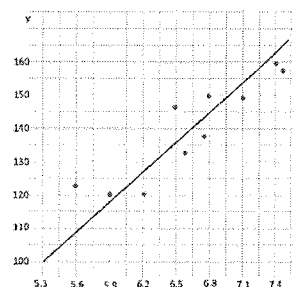
- A) $\frac{3}{4}$
- B) $\frac{2}{5}$
- C) $\frac{3}{5}$
- D) $\frac{4}{5}$

19

A right triangular prism has a height of 8 cm and the area of right triangle (Base) is 10 cm^2 . If the mass of the prism is 146 g , what is the density, in g/cm^3 , of the prism?

- A) 1.825
- B) 3.650
- C) 0.548
- D) 0.274

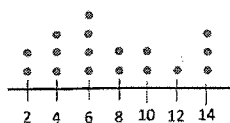
20



The scatter plot above shows the distribution of heights (y values), in centimeters, of women based on their shoe sizes (x values). The line of best fit is also drawn in the XY -plane. What is the number of women for which the line of best fit predicts a value greater than the actual value?

21

Data Set A



Data set A is shown above. Data set B is created by adding 2 to each of the values in the data set A. Which of the following statements is valid for the data?

- A) The range of data set A is smaller than that of data set B.
- B) The mean of data set A is equal to that of data set B.
- C) The median of data set A is equal to that of data set B.
- D) The standard deviation of data set A is equal to that of data set B.

22

A survey was conducted randomly at a local shopping mall to determine the proportion of people who know a recent new dancing boys' group. Out of 360 participants sampled, 234 knew the dancing boys' group. The margin of error of the survey was 5%. Which of the following statements best represents a possible conclusion about the percentage of people who know the dancing boys' group?

- A) Exactly 65% of the people in the mall know the dancing boys' group.
- B) More than 70% of the people in the mall know the dancing boys' group.
- C) Less than 60% of the people in the mall don't know the dancing boys' group.
- D) It is plausible that between 60% and 70% of the people in the mall know the dancing boys' group.

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.