Math

22 QUESTIONS
(TIME: 35 MIN)

DIRECTIONS

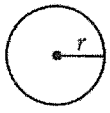
The questions in this section address a number of important math skills.
Use of a calculator is permitted for all questions.

NOTES

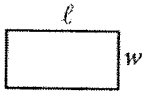
Unless otherwise indicated:

- 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.

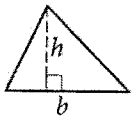
REFERENCE



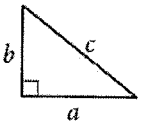
$A = \pi r^2$
$C = 2\pi r$



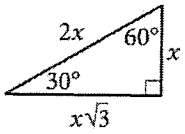
$A = \ell w$

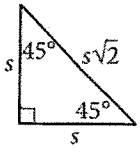


$A = \frac{1}{2}bh$

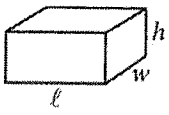


$c^2 = a^2 + b^2$

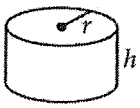




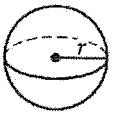
Special Right Triangles



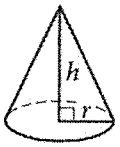
$V = \ell wh$



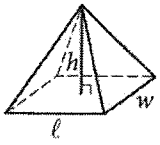
$V = \pi r^2 h$



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



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



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

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.

CONTINUE

1

Thomas Realty Inc. purchased a property at $250,000 in a certain town. The company received a 30% discount off the original price along with an additional 10% off the discounted price for purchasing the property within a week. Which of the following best approximates the original price, in dollars, of the property?

A) $8,333,000
B) $3,571,000
C) $750,000
D) $396,800

2

The perimeter of one face of a cube is $\frac{a}{4}$ inches, where a is a constant. Which of the following gives the volume of the cube, in cubic inches?

A) $\frac{a^3}{4096}$
B) $\frac{a^3}{512}$
C) $\frac{a^3}{64}$
D) a^3

3

An airplane is flying at an altitude of 15,000 feet from the ground. The pilot wants to land smoothly to the runway at an angle of depression of θ degrees. Which of the following equations can be used to find the horizontal distance, x, from the runway that the pilot should begin to descend?

E) $x = \frac{15{,}000}{sin\theta}$
F) $x = \frac{15{,}000}{tan\theta}$
G) $x = \frac{15{,}000}{cos\theta}$
H) $x = 15{,}000 \cdot tan\theta$

4

Which of the following expressions is equivalent to $\frac{x^2+10x+24}{x^3-x^2-20x}$?

A) $\frac{x+6}{x-5}$
B) $\frac{x+6}{x(x+4)}$
C) $\frac{x+6}{x+4}$
D) $\frac{x+6}{x(x-5)}$

5

The mean score of 9 players in a bowling game was 150 points. If the lowest individual score is dropped, the mean score of the remaining players becomes 160 points. What was the lowest score?

A) 60
B) 70
C) 80
D) 90

6

$$N = 2 + t \cdot \frac{2}{3}$$

The total number of dark rings in the cross-section of wood represents the age of the tree in years. The equation above represents the number of rings, N, in the cross-section of a certain tree t years after it was planted. Which of the following best interprets the number $\frac{2}{3}$ in this context?

A) The tree will gain 2 rings every 3 years of its age.
B) The tree will grow 2 feet every 3 years of its age.
C) The tree will lose $\frac{1}{3}$ ring every year of its age.
D) The tree will gain 2 rings every $\frac{2}{3}$ years of its age.

7

In isosceles triangle ABC, the measure of one angle is 80 degrees. Which of the following could be other angles in the triangle?

I. 50 degrees.
II. 20 degrees.
III. 100 degrees.

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

8

An educational institution has three small groups by the ages of students. Twelve students less than 10 years old are placed in the class Yellow. Ten students at least 10 years old but less than 15 years old are placed in the class Blue. Thirteen students at least 15 years old are placed in the class Red. Which of the following could be the median of the ages, in years, of 35 students?

A) 9
B) 10
C) 15
D) 19

9

A statistics researcher wants to study the tendency of people to watch basketball games on television or go to the stadium to see the real game. The researcher visited the local pub on Sunday evening to ask 70 people who were watching sports in the pub. Which of the following statements best explains why this survey is NOT trustworthy?

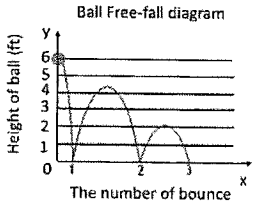
A) The researcher should ask more people in the larger pub.
B) This survey is biased in the place because the interviewees are likely to answer that they want to watch it on television in the pub.
C) This survey is not trustworthy because the interviewees could be drunk when they were interviewed.
D) This survey is biased because people in the pub usually couldn't afford to go to the stadium to see the real game.

10

Two points on a number line are both 4 units from the number -2. Which of the following absolute equations gives the coordinates of both points on the number line?

A) $|x - 2| = 4$
B) $|x + 2| = 4$
C) $|x - 4| = 2$
D) $|x + 4| = 2$

11



In the diagram above, a ball was dropped from the height of 6ft and bounced off the ground until it came to rest. After it was dropped from the height of 6ft, how many time was the ball at a height of 3ft?

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

12

x	f(x)
4	0
2	-1
10	3

In the table above, some values of x and their corresponding $f(x)$ values are shown. If the function f is a linear, what is the value of $f(20)$?

A) 10
B) 8
C) 6
D) 4

13

A homeowners association invited community members in a meeting to discuss for the construction of children's library in the community. Of those invited to the meeting, 20% are HOA administrators, 60% were residents, the remaining 5 individuals were from the construction company. How many more residents were invited to the meeting than HOA administrators?

14

Masses of rare coins (grams)

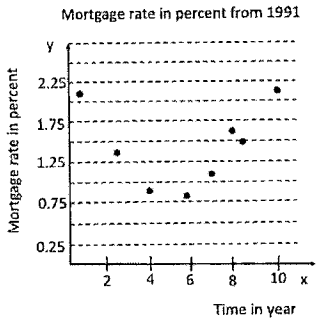
Marcus	Francis
0.90	0.75
0.98	0.90
0.99	0.80
0.90	0.78
0.91	0.82
1.02	x

Marcus and Francis each collected rare coins while they were traveling other countries and the masses of the coins are shown in the table above. The mean of the coins collected by Marcus is 0.1 gram greater than the mean of the coins collected by Francis. What is the value of x?

15

A group of friends decided to go to travel together and divided the $1,200 cost of the trip package equally among themselves. However, two of the friends decided not to go to the travel later. If the remaining people still divide the cost equally and each share of the cost was increased by $30, how many friends ended up going to travel?

16



The scatter plot above shows the mortgage rate, in percent, in a certain country from 1991 for a decade. Which of the following equations best represents the scatter plot?

A) $y = -6(x-5)^2 + 0.75$
B) $y = 6(x-5)^2 + 2.25$
C) $y = 6(x-5)^2 + 0.75$
D) $y = 6(x+5)^2 + 0.75$

17

$$f(x) = x^2 - 2x - 3$$
$$h(x) = a$$

In the system of equations above, a is a constant. If $h(x) \leq f(x)$ for all values of x, what is the max value of a?

E) 0
F) 2
G) -2
H) -4

18

If the ratio of the number of teeth of two connected gears is $a:b$, then the ratio of the rotational speeds, in revolution per minute (rpm), of two gears is $b:a$. If gear A has 40 teeth and is rotated by the motor at a speed of 50 rpm and gear B has 80 teeth, what would the gear B's rotational speed, in revolution per minutes?

A) 50
B) 40
C) 25
D) 100

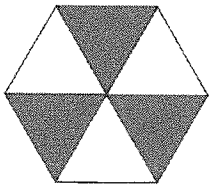
19

Matthew's driving records for a trip

	Distance (Miles)	Average Speed (mph)
Highway	120	60
Local	30	30

Matthew drove his car from his home to his friend's house in the other state. His driving records are shown in the table above assuming no traffic delay for the drive. If there is a traffic delay on the local and the travel time on the local roads will be expected to increase 40% due to slower traffic, what should be the average speed, in mph, on the highway in order to have the same total traveling time with no traffic delay?

20



In the pattern above, the regular hexagon consists of six equilateral triangles. If the area of one equilateral triangle is $4\sqrt{3}\ in^2$, what is the perimeter, in inches, of the shaded regions?

21

$$a(2-x)=4x-8$$

In the equation above, a is a constant. If the solution to the equation exists, which of the following statements must be true?

I. If $a \neq -4$, then $x = 2$.
II. If $a = -4$, then the equation has infinitely many solutions.
III. If $a = -4$, then the equation has no solutions.

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

22

The Survey results of two groups of samples for a new prototype

Sample	Percent in favor	Margin of error
A	72%	5.6%
B	57%	1.5%

The distribution of the survey results of two groups of samples for a new prototype of the launching product is shown in the table above. The samples were selected at random from the same population. The margin of error for each sample were calculated using the same method. Which of the following could be a valid statement for the reason that sample A has a greater margin of error than that of sample B?

A) Sample A had a larger sample size.
B) Sample A had a smaller sample size.
C) Sample A had a higher percent in favor.
D) Sample A had more unresponsive participants of the survey.

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.