Math

22 QUESTIONS
(TIME: 35 MIN)

DIRECTIONS

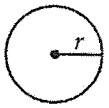
The questions in this section address a number of important math skills.
Use of a calculator is permitted for all questions.

NOTES

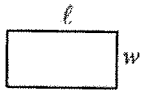
Unless otherwise indicated:

- 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.

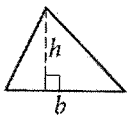
REFERENCE



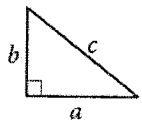
$A = \pi r^2$
$C = 2\pi r$



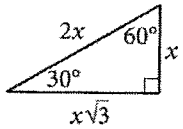
$A = \ell w$

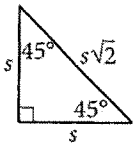


$A = \frac{1}{2}bh$

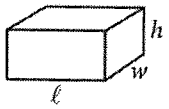


$c^2 = a^2 + b^2$

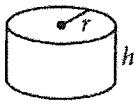




Special Right Triangles

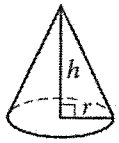


$V = \ell wh$

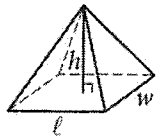


$V = \pi r^2 h$

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



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



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

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

Suppose that a cows give b gallons of milk in k days. At this rate, how many days will take for m cows to give n gallons of milk?

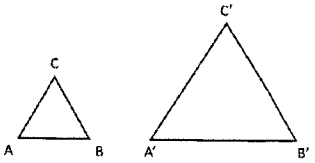
A) $\frac{amnk}{b}$
B) $\frac{amk}{bn}$
C) $\frac{ank}{bm}$
D) $\frac{ak}{bmn}$

2

The skyline rider in amusement park charges $7 for a child and $ 12 for an adult for a ride. If a riding operator collected $4,150 from 450 riders in one day, which of the following system of equations could be used to determine the number of children riders, x, and the number of adults riders, y, for the day?

A) $\begin{cases} x + y = 450 \\ 7y + 12x = 4{,}150 \end{cases}$
B) $\begin{cases} x + y = 450 \\ 12y + 7x = 4{,}150 \end{cases}$
C) $\begin{cases} x + y = 4{,}150 \\ 7x + 12y = 450 \end{cases}$
D) $\begin{cases} x + y = 4{,}150 \\ 12x + 7y = 450 \end{cases}$

3



In the two similar triangles above, if triangle ABC is dilated by a factor of 2 to form another triangle A'B'C'. Which of the following statements is NOT valid?

A) The length of side A'B' is twice the length of side AB.
B) The measure of angle C is a half of the measure of angle C'.
C) The perimeter of triangle A'B'C' is twice the perimeter of triangle ABC.
D) Angle A is congruent to angle A'.

4

In the XY-plane, the function f has two x-intercepts at (2,0) and (6, 0) and one y-intercept at (0, -4). Which of the statements is true for the function f?

I. $-f(0) = 4$
II. $f(6) = 0$
III. $f(0) = 2$

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

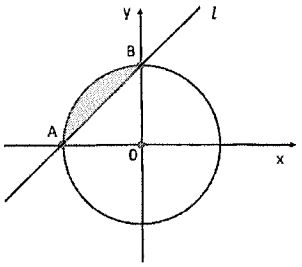
5

$$f(x) = x^2 - 2x + 3$$
$$g(x) = x^2$$

In two functions, f and g, above in the xy-plane, which of the following statements describes correctly the relationship between two functions?

A) $f(x)$ is formed when $g(x)$ is translated 1 unit right and 3 units up.
B) $f(x)$ is formed when $g(x)$ is translated 2 units right and 2 units up.
C) $f(x)$ is formed when $g(x)$ is translated 1 unit left and 2 units up.
D) $f(x)$ is formed when $g(x)$ is translated 1 unit right and 2 units up.

6



A circle with area $25\pi\ in^2$ is centered at the origin in the XY-plane shown above. A line l passes through x, y intercepts, A and B, respectively. what is the area, in square inches, of shaded region?

A) $\frac{25(\pi-1)}{4}$
B) $\frac{25(\pi-2)}{4}$
C) $\frac{25(\pi-2)}{2}$
D) $\frac{25(\pi-50)}{4}$

7

x	f(x)
-1	6
$\frac{1}{2}$	9

The table gives some values of x and the corresponding values of f(x). if a linear function f(x) is graphed in the XY-plane, what is the coordinates of x intercept of the function?

A) $(0, 8)$
B) $(8, 0)$
C) $(-4, 0)$
D) $(0, -4)$

8

$$\frac{5x^2 - 16}{x^2 - 4} - \frac{8}{x + 2} = \frac{1}{x - 2}$$

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

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

9

$$\frac{m^{\frac{2}{3}} \cdot (m^{-2})^{\frac{1}{4}}}{\left(m \cdot m^{\frac{1}{2}}\right)^{-2}} = m^n$$

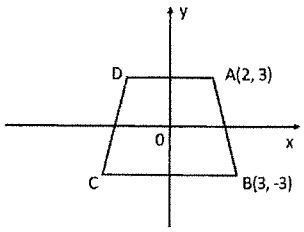
In the equation above, where m and n are positive constants. Which of the following is the value of n?

A) $\frac{19}{6}$
B) $\frac{1}{6}$
C) $\frac{13}{6}$
D) $\frac{7}{6}$

10

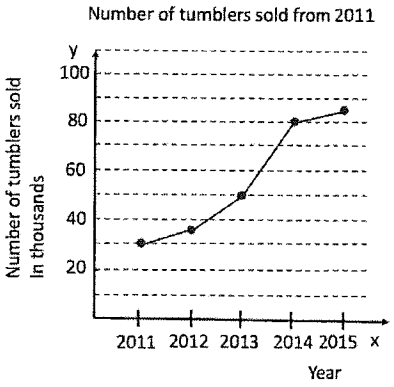
Elliott plans to rent a scooter near ocean. The scooter's hourly rental cost is $65. And he will also need to pay $25 for one-time cleaning & set fee. If he has a budget of $300 to spend and the rental is available only for a whole number of hours, what is the maximum number of hours that he can rent a scooter?

11



An isosceles trapezoid ABCD is graphed in the XY-plane above. If two points, A and D, are symmetrical with respect to y axis, what is the slope of the segment $\overline{CD}$?

12



According to the line graph above, between which two consecutive years was the greatest rate of change in the number of tumblers sold?

A) 2011-2012
B) 2012-2013
C) 2013-2014
D) 2014-2015

13

The weight of an object on mars is about 40% of the weight on Earth. The weight of an object on mars is approximately $\frac{1}{9}$ the weight on Venus. If an object is 180 pounds on Earth, what is the weight, in pounds, of the object on Venus?

A) 8
B) 4050
C) 408
D) 648

14

The local adult school in a certain town plans to increase its language programs by x classes every six months. If there are p classes available now at this adult school, which of the following best models the total number of classes, y, the adult school will have t years from now?

A) $y = xp + t$
B) $y = tp + x$
C) $y = xp + t$
D) $y = 2xt + p$

15

Majors	Professional Activity		Total
	Research	Teaching	
Humanities	75	175	250
Technical	350	200	550
Total	375	375	800

A survey was conducted on 800 Professors' activities in a county. The results are summarized in the table above. If one of the professors is selected at random in the survey, which of the following is the probability that the professor is teaching in technical majors?

A) 0.36
B) 0.70
C) 0.25
D) 0.22

16

$$y = -x^2 + 8$$

The graph of the quadratic equation above intersects with the graph of a line l at two points $A(m, 4)$ and $B(b, -8)$ in the XY-plane. What is the greatest possible value of the slope of line l?

17

A community social worker surveyed 200 adults selected at random from a large city and asked whether or not they are satisfied with their current marriage life. Of those surveyed, 65% responded that they were satisfied with their current marriage life. Based on the results of this survey, which of the following statements must be true?

I. If another survey is conducted with the same sample size in a different city, 65% would respond they are satisfied with current marriage.

II. If another survey is conducted in a different size sample size in the same city, 65% would respond they are satisfied with current marriage.

III. If all adults in the same city are surveyed, 65% would respond they are satisfied with current marriage.

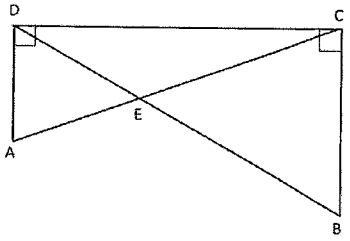
A) I only
B) I and II only
C) I and III only
D) None

18

$$f(x+1) = \frac{f(x-2) \cdot f(x-1)}{f(x)}$$

The function f has a relation above. If $f(1) = 2, f(2) = 3, f(3) = 4$, what is the value of $f(5)$?

19



In the figure above, $AD = 5, BC = 7, and\ AC = 13$. What is the difference between the area of triangle BCE and the area of triangle ADE?

20

$$\frac{x}{x+y} = k$$

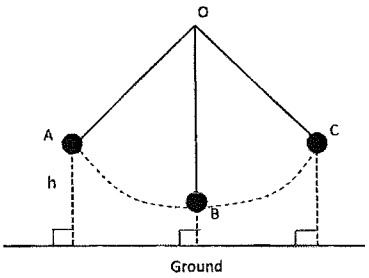
In the equation above, if x, y are negative integers, which of the following is true about k?

A) $k < 0$
B) $k > 1$
C) $0 < k < 1$
D) $-1 < k < 0$

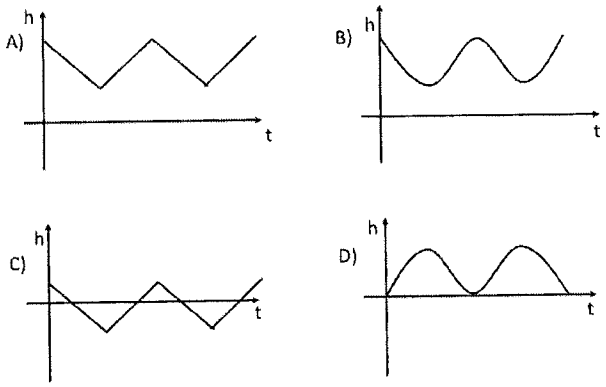
21

If the radius of the base of a cone-shaped container is increased by 100%, by what percent of the height of the container must be decreased in order to keep the same volume?

22



The figure above shows the position of a pendulum when it swings back and forth from A to C. Assuming no air friction, which of the following best represents the height of the pendulum if the pendulum release from the position A?



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.