Math

22 QUESTIONS
(TIME: 35 MIN)

DIRECTIONS

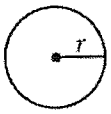
The questions in this section address a number of important math skills.
Use of a calculator is permitted for all questions.

NOTES

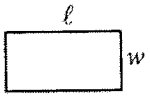
Unless otherwise indicated:

- 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.

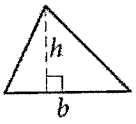
REFERENCE



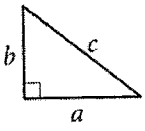
$A = \pi r^2$
$C = 2\pi r$



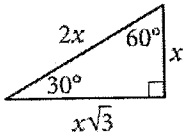
$A = \ell w$

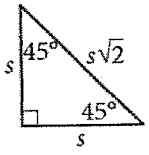


$A = \frac{1}{2}bh$

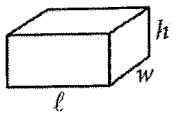


$c^2 = a^2 + b^2$

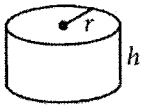




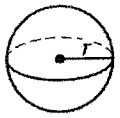
Special Right Triangles



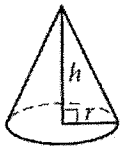
$V = \ell wh$



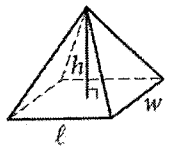
$V = \pi r^2 h$



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



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



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

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

Adrian receives monthly allowance from his parents. He started to deposit some fixed amount of money from his allowance into his piggy bank every month. The function $f(t) = 125 + 35t$ gives the total amount of money he saved, in dollars, in his piggy bank after t monthly deposits. What could 125 represent in this context?

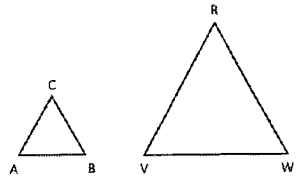
A) Monthly deposit from his allowance.
B) Total amount of money he saved after t months.
C) The amount of money he saved already before the first deposit.
D) The price of his piggy bank when he purchased.

2

A customer purchased 5 shower curtains that were each the same price. She used a coupon for 20% off the entire purchase. She paid $145 in total after using the discount coupon. If the sales tax was ignored, what was the original price of one shower curtain?

A) $36.25
B) $23.20
C) $145.00
D) $29.00

3



In two triangles ABC and VWR above, if $\angle A \cong \angle V$, what other pieces of information are sufficient to prove whether two triangles are similar?

I. $\angle C \cong \angle R$
II. $\frac{\overline{AC}}{\overline{VR}} = \frac{\overline{AB}}{\overline{VW}}$

A) I only
B) II only
C) Either I or II
D) None

4

$$30m + 45w = 480$$

The equation given above describes the relationship between the number of men, m, and the number of women, w, that can be serviced for haircut at a local haircut shop on a given day. If the business gave services for 6 women on a certain day, how many men could the business give the haircut service on this day?

5

For a certain triangular region, the ratio of the height to its base is always a constant. If the ratio of the height to its base is 3: 5 and the height of the triangular region is increased by 9, by how much does the base of the region need to be increased to maintain the ratio?

A) 9
B) 12
C) 13
D) 15

6

Circle A has a radius length of k inches. Circle B has a circumference that is 10π inches greater than the circumference of circle A. The function h gives the area of circle B, in square inches. Which of the following defines h correctly?

A) πk^2
B) $\pi(k+5)^2$
C) $\pi(k+10)^2$
D) $\pi(k+2)^2$

7

$$g(x) = 1{,}200(1.22)^x$$

The function $g(x)$ models the value, in dollars, of a certain stock at the end of the year, where x is the number of years after the stock was bought in 2000. Which of the following best interprets the meaning of "$g(3)$=2,179.02" in this context?

A) The value of the stock will be approximately $2,179.02 by the end of 2003.
B) The value of the stock will be increased by $2,179.02 by the end of 2003.
C) The value of the stock will be increased by $3 by the end of 2003.
D) The value of the stock will be increased by $2,179.02 every three years from 2000.

8

$$2\sqrt{3+p} = \frac{4x+w}{3w}$$

The equation above relates three distinct positive real numbers $p, x, and\ w$. Which of the following correctly solve for w in terms of $x\ and\ p$?

A) $\frac{4x}{3(1+\sqrt{3+p})}$
B) $\frac{4x}{6\sqrt{3+p}-1}$
C) $\frac{4x}{1-6\sqrt{3+p}}$
D) $\frac{4x}{1+6\sqrt{3+p}}$

9

A triangle has length of three sides; $2\sqrt{3}, 6\sqrt{2}, and\ 2\sqrt{21}$ inches. What is the area of the triangle, in square inches?

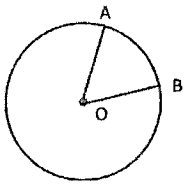
A) $2\sqrt{6}$
B) $3\sqrt{6}$
C) $4\sqrt{6}$
D) $6\sqrt{6}$

10

The quadratic expression $5x^2 + ax - 68$, where a is a constant, can be factored as $(mx + k)(x + l)$, where $m, k, and\ l$ are integers. Which of the following must be an integer?

A) $\frac{6}{m}$
B) $\frac{68}{m}$
C) $\frac{m}{k}$
D) $\frac{68}{l}$

11



In the circle O above, the measure of central angle AOB is 30°. What is the measure, in radians, of its associated arc AB?

A) $\frac{\pi}{3}$
B) $\frac{\pi}{4}$
C) $\frac{\pi}{6}$
D) $\frac{\pi}{2}$

12

$$8\sqrt[3]{27x^{81}} \cdot \sqrt[7]{2^{14}x^{21}}$$

The expression above is equivalent to kx^m, where $k\ and\ m$ are constants and $x > 1$. What is the value of $\frac{k}{m}$ in the simplest fraction?

A) $\frac{4}{5}$
B) $\frac{5}{16}$
C) $\frac{8}{5}$
D) $\frac{16}{5}$

13

$$y = 3x^2 - x - 2$$
$$y = 2x - k$$

In the system of equations above, k is a constant. The graphs of the system will intersect at exactly one point, (x, y), in the XY-plane. What is the value of k?

A) $\frac{11}{4}$
B) $-\frac{11}{4}$
C) $\frac{25}{12}$
D) $-\frac{25}{12}$

14

An isosceles right triangle has $6\sqrt{2}$ cm as the length of the hypotenuse. What is the area, in square cm, of the isosceles right triangle?

15

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

In the rational expression above, for what value of x is the function f undefined?

I. $x = 1$
II. $x = -2$
III. $x = -1$

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

16

A parabola has a vertex at $(-2, 5)$ and intersects the x-axis twice in the XY-plane. If the equation of parabola can be written as $y = ax^2 + bx + c$, where $a, b, and\ c$ are constants. Which of the following could be $a + b + c$?

A) 5
B) 6
C) 7
D) 0

17

A sample was selected at random to estimate the proportion of a population for a certain characteristic. The estimated proportion of the population for a certain characteristic is 0.78, with an associated margin of error of 0.02. Based on the information given, what can you conclude about the proportion of the population regarding the characteristic surveyed?

A) The proportion of the population for the characteristic is exactly 0.78.
B) It is plausible that the proportion of the population for the characteristic is between 0.76 and 0.80.
C) It is plausible that the proportion of the population for the characteristic is greater than 0.80.
D) It is plausible that the proportion of the population for the characteristic is less than 0.76.

18

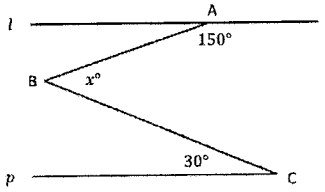
A truck driver wanted to figure out how many cargo containers can load on his truck to drive safely in a bridge. The bridge allows a truck that weighs no more than 5,000 pounds, including all loads on the truck. What is the maximum number of cargo containers allowed to load on the truck if the weight of truck with no loads is 1,200 pounds and each cargo container weighs 150 pounds?

A) 24
B) 25
C) 26
D) 27

19

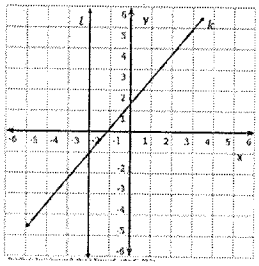
If $2x + k$ is a factor of $2x^3 + 13x^2 - 7x$, where k is an integer, what is the value of $|k|$?

20



In the figure above, $l \parallel p$. What is the measure of angle x?

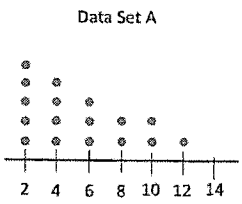
21



The system of equations is graphed above. If a new graph of $4x - y + 7 = 0$ is also graphed in the same XY-plane, how many solutions (x, y) will the system of three equations have?

A) One
B) Two
C) Three
D) Infinitely many

22



There are 17 values in the dot plot in the Data set A above. If one more number 14 is added to the Data set A. which of the following is valid statement based on the dot plots.

I. The median is unchanged.
II. The mode is unchanged.
III. The range is unchanged.

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

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.