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.
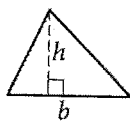- The domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.
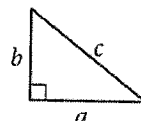
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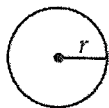
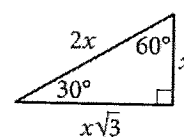
$$A = \pi r^2$$
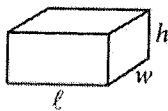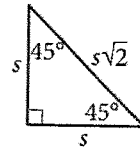$$C = 2\pi r$$

$$A = \ell w$$

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

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

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
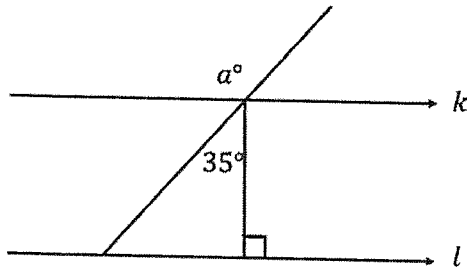
In the figure above, $l \parallel k$. What is the value of measure of $\angle a°$?

3

$$E(m) = 68 - 1.76m$$

The linear function above shows how much battery kWh left in the Electric Vehicle after m miles traveled. The capacity of this car battery is 68 kWh. What does 1.76 mean in the context?

A) The EV will take 1.76 hours to travel every mileage.
B) The EV battery will use 1.76 kWh for m miles.
C) The EV battery will use 1.76 kWh per mile.
D) The EV will take 1.76 hours to recharge the battery.

2

A meal set in a fast-food restaurant consists of a drink, a chip, and a sandwich. There are 5 types of drinks, 4 types of chips, and 3 types of sandwiches to choose from. How many different sets are possible?

4

$$y = k(x - 1)(x - 3)(x - 5)$$

In the equation above, where k is a positive constant. If the graph passes through the point (a, b), where $1 < a < 3$, which of the following is NOT a possible value of b?

A) 0
B) 1
C) 2
D) -1

5

$$6K - 18L = 24M$$

From the given equation above, it can be rewritten as $L = aK + bM$, where a and b are constants. What is the value of a?

7

GPA	Frequency
2.0-2.4	1
2.5-2.9	3
3.0-3.4	4
3.5-4.0	3

A GPA distribution of Mr. Peter's class is shown in the table above. What percent of the students in Mr. Peter's class got a GPA of 3.0 or above to the nearest tenth?

A) 0.6%
B) 0.7%
C) 63.6%
D) 63.7%

6

$$x^2 + 1 = 4x$$

The equation has solutions $x = k \pm \sqrt{m}$, where k and m are positive constants. What is the value of $m - k$?

A) -1
B) 0
C) 1
D) 2

8

$$f(x) = x^2 - 3$$
$$h(x) = 2f(x) - 1$$

In the two functions above, if $h(k) = 1$, where k is a positive constant, what is the value of k?

9

x	f(x)
-2	3
4	0
6	-1
8	-2

The table above shows some values of x and their corresponding values of a linear function $f(x)$. What is the y-intercept of the graph of $y = f(x)$?

A) $(0, 4)$
B) $(0, 2)$
C) $(0, 1)$
D) $(0, 0.5)$

10

FAVORITE SNACK	GRADES			
	9th	10th	11th	Total
COOKIES	25	18	25	68
VEGGIE STICKS	5	7	17	29
CUPCAKES	21	15	17	53
Total	51	40	59	150

The table above shows the distribution of favorite snacks for 150 students, 9th-11th graders in a certain high school. If one of the students is selected at random, what is the probability of selecting a student whose favorite snack was a cupcake?

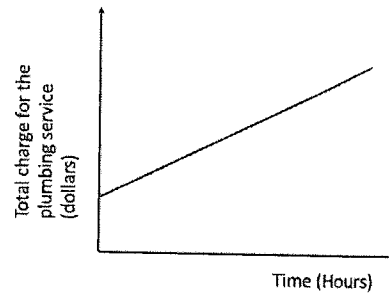A) $\frac{21}{53}$ B) $\frac{21}{51}$ C) $\frac{53}{150}$ D) $\frac{68}{150}$

11

$$8^{a-b} = 16^3$$
$$27^{a+b} = 9^3$$

In the system of equations above, what is the value of $b^2 - a^2$?

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

12

The graph represents the total charge for the plumbing service for x hours of job. The plumber charges a one-time basic charge plus hourly rate charge for the hours worked. Which of the following best interpret the slope of the graph above?

A) The plumber's one-time fee.
B) The plumber's total charge for x hours of job.
C) The plumber's hourly rate.
D) The trend of plumber's inconsistent hourly rate.

13

$$\frac{x^{\frac{5}{3}}(x^4)^3}{x^{-\frac{2}{3}}}$$

Which of the following expressions is equivalent to the expression above, where $x > 0$?
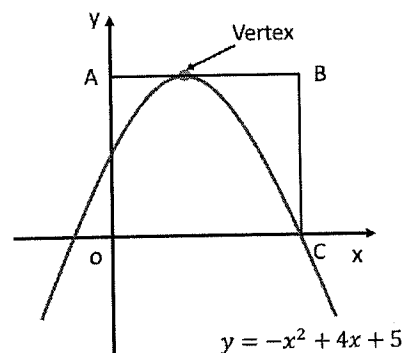
I) x^{14}

J) $x^{14}\sqrt[3]{x}$

K) $\sqrt[3]{x^{14}}$

L) $x^3\sqrt{x^{14}}$

14

In the graph of $3x^2 - 6x + 3y^2 + 12y = 2$ in the xy-plane, what is the circumference of the circle?

A) $\frac{2\sqrt{51}\pi}{3}$

B) $2\sqrt{17}\pi$

C) $\frac{2\sqrt{17}\pi}{3}$

D) $\frac{17}{3}\pi$

15

$$y = -x^2 + 4x + 5$$

The graph of $y = -x^2 + 4x + 5$ is in XY-plane. If the horizontal $\overline{AB}$ goes through the vertex of the graph and vertical $\overline{BC}$ goes through the x intercept, Point C, of the graph as shown above, what is the area of rectangle OABC?

16

A scale drawing of a bookcase shows the scale 1 cm = 2 feet. A bookcase has a dimension of the base 2.5 cm by 3 cm in the drawing. What is the actual area of the base, in square feet, of this bookcase?

A) $7.5 \, ft^2$

B) $15 \, ft^2$

C) $30 \, ft^2$

D) $45 \, ft^2$

17

In a group of 50 tourists, 20% of them have never been abroad. If three tourists are selected at random and are asked about their past travel experience, what is the probability that at least one person has been abroad?

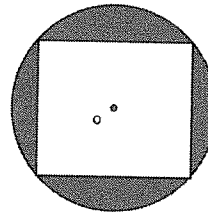A) $\frac{487}{490}$ B) $\frac{3107}{3125}$ C) $\frac{243}{490}$ D) $\frac{1643}{3125}$

18

$$g(x) = \sqrt{\frac{2x}{3}}$$
$$h(x) = 2g(x) + k$$

In the system of equations above, where k is a constant, if $h(6) = 8$, then what is the value of k?

19

In the figure shown above, point O is the center of the circle. If all four vertices of the square are on the circle and the area of circle is 16π, what is the area of the shaded region?

A) $16\pi - 32$
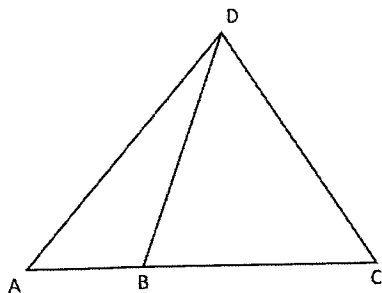B) $16\pi - 16$
C) $16\pi - 20$
D) $16\pi - 36$

20

$$f(x) = 1500 \cdot 1.05^x$$

In the exponential function above, $f(x)$ represents the balance x years after deposit on a certificate of deposit account (CD). If the CD accounts offers p percent annual interest rate, what is the value of p in the function above?
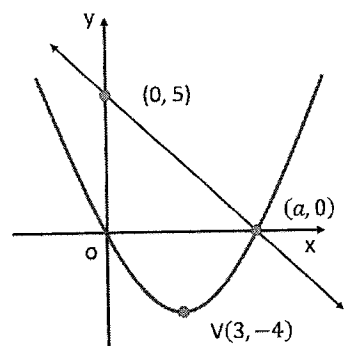
A) 1.05
B) 0.05
C) 0.5
D) 5

21

Note: Not drawn to scale.

In the figure above, the ratio of $\overline{AB}$ to $\overline{BC}$ is 3:7. If the area of triangle ABD is 210, what is the area of triangle BCD?

A) 210
B) 420
C) 490
D) 630

22

Two graphs of linear function, l, and quadratic function are shown above. One of intersections of two functions is $(a, 0)$, where $a > 0$. What is the equation of line l?

A) $y = -\dfrac{5}{4}x + 5$
B) $y = -x + 5$
C) $y = -\dfrac{5}{6}x + 5$
D) $y = -\dfrac{3}{2}x + 5$

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.

CONTINUE