# Math

**22 QUESTIONS**
**(TIME: 35 MIN)**

**DIRECTIONS**

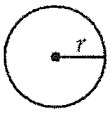
The questions in this section address a number of important math skills.
Use of a calculator is permitted for all questions.

**NOTES**

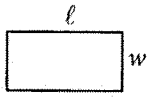
Unless otherwise indicated:

- 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.

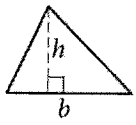
**REFERENCE**



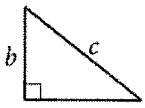

$A = \pi r^2$
$C = 2\pi r$



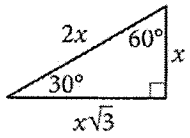

$A = \ell w$

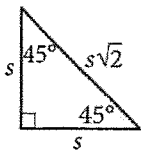



$A = \frac{1}{2}bh$

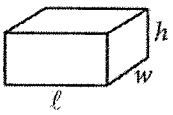



$c^2 = a^2 + b^2$

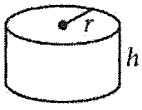


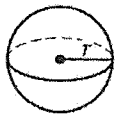

Special Right Triangles



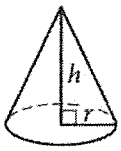

$V = \ell wh$



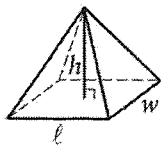

$V = \pi r^2 h$




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




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




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

The number of degrees of arc in a circle is 360.

The number of radians of arc in a circle is $2\pi$.

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**

$$AB = 25$$
$$BC = 60$$
$$AC = 65$$

In a triangle ABC, the lengths of all sides are shown as above. If the triangle KLM is similar to the triangle ABC, where A corresponds to K and B corresponds to L, what is the value of $sinK$?

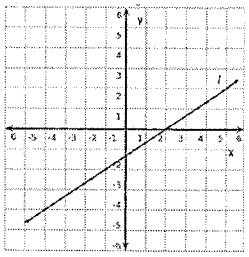
A) $\frac{5}{12}$
B) $\frac{12}{13}$
C) $\frac{5}{13}$
D) $\frac{12}{13}$

**2**

The number k is 80% less than the number m and the number m is 120% greater than 58. What is the value of k?

A) 55.68
B) 13.92
C) 25.52
D) 102.08

**3**




The graph of line $l$ is shown above. If the equation of the line $l$ is $y = h(x) - 5$, which of the following defines $h(x)$?

A) $h(x) = \frac{2}{3}x - \frac{4}{3}$
B) $h(x) = \frac{2}{3}x + \frac{11}{3}$
C) $h(x) = \frac{2}{3}x + \frac{7}{2}$
D) $h(x) = \frac{2}{3}x - \frac{13}{2}$

**4**

One gallon of gasoline will cover 6 day-use of a power generator. The north pole explorers need to use z days of power generator in order to complete their project. Which of the following equations enable to figure out the total amount of gasoline $(g)$, in liters, needed to finish the project? (1 gal =3.785 $l$)

A) $g = \frac{(3.785)\cdot(z)}{\frac{6}{z}}$
B) $g = \frac{z}{(6)\cdot(3.785)}$
C) $g = \frac{(3.785)\cdot(6)}{z}$
D) $g = \frac{(6)\cdot(z)}{3.785}$

5

There are 67 students in international culture club in a certain college. A sample of the international culture club were selected randomly and asked whether they intend to visit other countries over the summer break. Of those surveyed, about 30% responded that they intend to visit other countries over the summer. Based on the result of this survey, which of the following best estimates the total number of students in the international club who does NOT intend to visit other countries over the summer?

A) 20
B) 47
C) 30
D) 67

6

Kaitlyn participated Honolulu triathlon Olympic in Hawaii. She ran at the average speed of 4.5 miles per hour for $r$ hours and swam at the average speed of 2 miles per hour for $s$ hours and cycled at the average speed of 43 miles per hour for $c$ hours for a combined total distance of 32 miles. Which of the following equations correctly represents this situation?

A) $4.5r + 2c + 43s = 32$
B) $\frac{4.5}{r} + \frac{2}{s} + \frac{43}{c} = 32$
C) $4.5r + 43c + 2s = 32$
D) $4.5r + 43c + 2s = 96$

7

$$2a - \frac{1}{6b} = 1 - \frac{1}{c}$$

The given equation relates the positive real numbers $a, b, and\ c$. Which of the following equations correctly solve for $c$ in term of $a\ and\ b$?

A) $c = \frac{1}{6b-12ab+6a}$
B) $c = \frac{6b}{6b-12ab+1}$
C) $c = \frac{12ab}{6b+1}$
D) $c = \frac{6b}{12ab+6b+1}$

8

$$y \leq -2$$
$$x < 2y - 4$$

If the point (-10, k) is a solution to the system of inequalities in the XY-plane. Which of the following could not be the value of $k$?

A) 0
B) 2
C) -2
D) -3

**9**

$$f(x) = 5{,}000(1.13)^x$$

The given function $f$ models the number of hand fans a company manufactured at the end of each year, where $x$ is the number of years since the end of 2001, where $0 \leq x \leq 10$. If $y = f(x)$ is graphed in the XY-plane, what does y-intercept represent in this context?

A) The number of hand fans the company manufactured at the end of 2001.
B) The percent increase in the number of hand fans the company manufactured since at the end of 2001.
C) The minimum number of hand fans the company could manufacture at the end of 2001.
D) The maximum number of hand fans the company could manufacture at the end of 2001.

**10**

$$-\frac{1}{2}x^2 - 3x + 4 = 0$$

In the quadratic equation above, how many real solutions the given equation have?

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

**11**

$$y = \frac{2}{3}x - 3$$

In the system of linear equations, one of the equations is given above. If the system has no solution in the XY-plane, which of the following could be the other equation in the system?

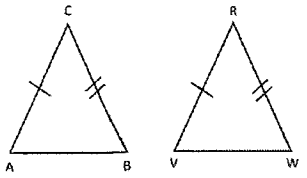
A) $2x + 3y = 9$
B) $2x - 3y = 0$
C) $3x - 2y = -1$
D) $-3x - 2y = 4$

**12**

Which of the following circle equations will intersect the x-axis at exactly one point?

A) $(x-2)^2 + (y-1)^2 = 1$
B) $(x-1)^2 + (y+1)^2 = 2$
C) $(x+2)^2 + y^2 = 1$
D) $x^2 + y^2 = 1$

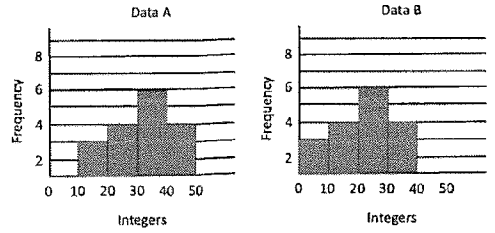
**13**




In the two triangles above, if $\overline{AC} \cong \overline{VR}, \overline{BC} \cong \overline{WR}$, Which of the following additional piece of information is sufficient to prove whether two triangles are congruent?

A) $\angle A \cong \angle V$
B) $\angle C \cong \angle R$
C) $\angle B \cong \angle W$
D) $\angle A \cong \angle W$

**14**




Two sets of 17 integer distribution each is shown in the histogram above. For each of the histograms, for example, the first interval in data A represents the frequency of the integers greater than or equal to 10, but less than 20. What is the greatest possible difference to the nearest whole number between the mean of data A and the mean of data B?

**15**

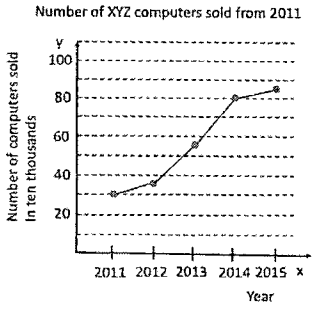
$$f(x) = \frac{2}{(2-x)^2 + 4(2-x) + 4}$$

In the rational expression above, what is the sum of x values which make the function $f$ undefined?

**16**

Kyle opened a bank account which earns 4% annual interest. His initial deposit amount was $1,300. He wants to find the balance of the account after t years. If he set up the equation, $Balance = 1{,}300(x)^t$, what is the value of $x$ in the equation?

17




According to the graph above, the number of computers sold in 2012 is what fraction of the number of computers sold in 2014?

A) $\frac{3}{8}$
B) $\frac{7}{17}$
C) $\frac{7}{16}$
D) $\frac{6}{17}$

18

Min paid $200,000 in total for his sport car. He made a down payment of $50,000 plus M monthly payments of $x each. Which of the following equations could represent this situation?

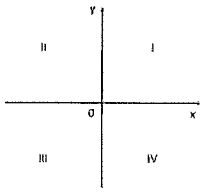
A) $200{,}000 = 50{,}000x + M$
B) $200{,}000 = 50{,}000M + x$
C) $200{,}000 = 50{,}000xM$
D) $200{,}000 = 50{,}000 + xM$

19

Mary Ellen rent a truck at a cost of $65 per day plus one-time charge of $45 for insurance and processing fee. Which of the following equations could represents the total cost, $f(x)$, in dollars, to rent a truck for $x$ days?

A) $f(x) = 65 + 45x$
B) $f(x) = (65 + 45)x$
C) $f(x) = 45 + 65x$
D) $f(x) = 45 + (65 + 45)x$

20




$$y < 1$$
$$2x + y \leq -8$$

If the system of inequalities is graphed in the xy-plane above, which quadrant contains no solutions to the system?

A) I
B) II
C) III
D) IV

21

A survey was conducted by an electric car company found that the average battery life of a random sample is 9.8 years with an associated margin of error is 0.7 years. Then another survey was conducted with a much larger size of sample size, with the mean and margin of error of the new sample size being calculated in the same way as the first survey. Which of the following is valid most likely?

A) The margin of error from the new survey would be larger than the margin of error from the first survey.
B) The margin of error from the new survey would be smaller than the margin of error from the first survey.
C) The mean of the new survey must be larger than the mean of the first survey.
D) The mean of the new survey must be smaller than the mean of the first survey.

22

Square A has a perimeter of 16 inches. The length a side of square B is three times the length of a side of square A. what is the length of a diagonal of square B, in inches?

A) $6\sqrt{2}$
B) $12\sqrt{2}$
C) $16\sqrt{2}$
D) $18\sqrt{2}$

## 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.