

## 2025 SAT Summer Class

Week 7

Jaehoon Song (Lecturer)

SAT/DSAT/SSAT

Hans edu LLC (Columbia Academy)

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Written by Jaehoon Song (Lecturer)

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# Math

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

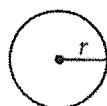
**DIRECTIONS**

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Use of a calculator is permitted for all questions.

**NOTES**

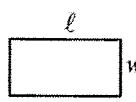
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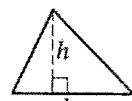
**REFERENCE**

$$A = \pi r^2$$

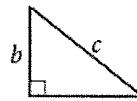
$$C = 2\pi r$$



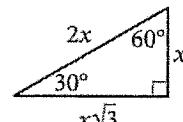
$$A = lw$$



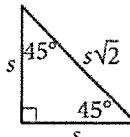
$$A = \frac{1}{2}bh$$



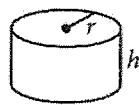
$$c^2 = a^2 + b^2$$



Special Right Triangles



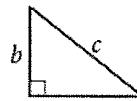
$$V = lwh$$



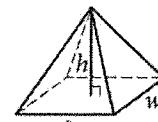
$$V = \pi r^2 h$$



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



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



$$V = \frac{1}{3}lwh$$

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.

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- Don't include **symbols** such as a percent sign, comma, or dollar sign in your circled answer.

1

3

x	y
12	56
18	80
27	116

The table above shows some values of  $x$  and their corresponding values of a linear function,  $y = f(x)$ . Line  $l$  is formed by translating  $y = f(x)$  up 7 units in the XY-plane. What is the  $y$ -intercept of the line  $l$ ?

- A) (15, 0)
- B) (0, 15)
- C) (8, 0)
- D) (0, 8)

2

$$\begin{aligned}-x + 3y &= 2 \\ 8x - 24y &= -16\end{aligned}$$

In the system of equations above, for any real number  $k$ , which of the following set of points lies on the graph of the system in the XY-plane?

- A)  $\left(k, \frac{2-k}{3}\right)$
- B)  $\left(k, \frac{k+2}{3}\right)$
- C)  $(3k + 2, k)$
- D)  $(3k - 1, k)$

The area of an equilateral triangle is  $\sqrt{3} \text{ cm}^2$ . The height of the triangle is  $k\sqrt{3} \text{ cm}$ , where  $k$  is a constant. What is the value of  $k$ ?

- A) 3
- B) 2
- C) 1
- D)  $\frac{1}{2}$

4

$$p = 20 + 2x$$

The equation above gives the speed ( $p$ ), in meters per second, of water  $x$  meters down from the top of the mountain. Which of the following best represents 20 in this context?

- A) The initial speed of water, in meters per second, at the top of the mountain.
- B) The initial height of mountain, in meters, at the top of the mountain.
- C) Average increase of the speed, meters per second, of water per second at the top of the mountain.
- D) Average speed of water, in meters per second, for the entire trip from the top of the mountain to the bottom.

5

The function  $f$  is defined by  $f(x) = -\frac{1}{7}x^2$ . In the XY-plane, the graph of  $y = g(x)$  is the result of translating  $f(x)$  3 units down. Which of the following shows the equation of  $g(x)$ ?

- A)  $g(x) = -\frac{1}{7}x^2 + 3$
- B)  $g(x) = -\frac{1}{7}(x - 3)^2$
- C)  $g(x) = -\frac{1}{7}x^2 - 3$
- D)  $g(x) = -\frac{1}{7}(x + 3)^2$

7

$$P(t) = 15(1.2)^t$$

The equation above gives the estimated number of customers at a restaurant, where  $t$  is the number of years since the restaurant opened. Which of the following best interprets the number 1.2 in the context?

- A) The estimated number of customers is increased by 1.2% every year.
- B) The estimated number of customers is increased by 1.2 every year.
- C) The estimated number of customers is increased by 20% every year.
- D) The estimated number of customers is decreased by 20% every year.

6

$$3(x + k) = ax + b$$

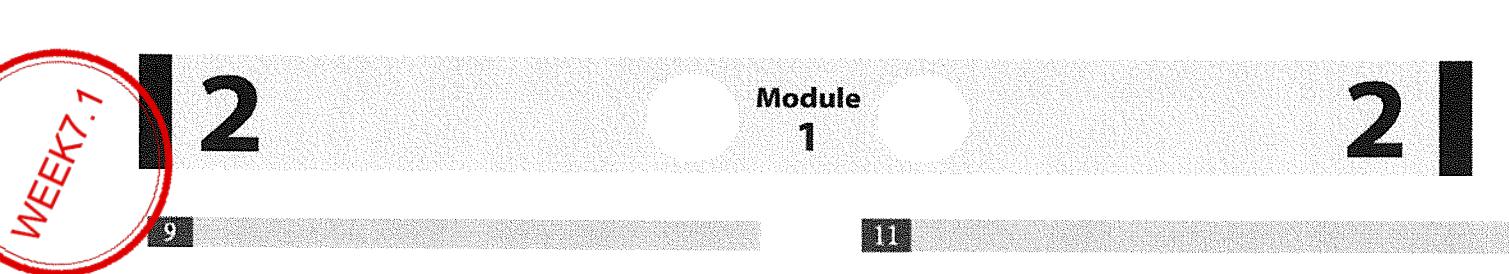
In the equation above,  $a$ ,  $b$ , and  $k$  are constants. If the equation has infinitely many solutions, which of the following must be equal to  $b$ ?

- A)  $k$
- B)  $3k$
- C)  $3$
- D)  $3a$

8

If  $4x - 6y = 14t$ , which of the following expressions is equivalent to  $4x^2 - 12xy + 9y^2$ ?

- A)  $49t^2$
- B)  $7t$
- C)  $7t^2$
- D)  $49t$



9

$$f(x) = -3(x - 1)^2 + 5$$

In the function above, what is the maximum value of the function?

- A) 1
- B) 2
- C) 5
- D) -3

10

The equation  $h = 24.5 - 2.1t$  approximate the height  $h$ , in yard, of a ball in free fall  $t$  seconds after it is dropped from the height of 24.5 yard from the ground. What is the decrease in height, in yard, 1 second after it was dropped?

- A)  $\frac{1}{2.4}$
- B) 2.4
- C) 22.4
- D) 2.1

11

A wedding planner is planning a party dinner for guests. It costs the wedding planner a onetime fee of \$500 to rent the hall and \$25.75 per attendee. If the wedding planner has a budget of \$5,000. What is the greatest number of attendees for a party dinner within the budget?

- A) 176
- B) 175
- C) 174
- D) 173

12

A cylinder is inscribed in a cube such that the height of cylinder is equal to the length of side of the cube and the circumference of circular base of cylinder touches four sides of square base of the cube. If the side of the cube is  $a$ , what is the volume of the space in the cube not taken by the cylinder?

- A)  $a^3 \left(1 - \frac{\pi}{2}\right)$
- B)  $a^3 \left(1 - \frac{\pi^2}{4}\right)$
- C)  $a^3 \left(1 - \frac{\pi}{4}\right)$
- D)  $a \left(a^2 - \frac{\pi}{2}\right)$

13

Which of the following is equivalent to  $x^{\frac{5}{7}}$ , where  $x > 0$ ?

- A)  $\sqrt[56]{x^{40}}$
- B)  $\sqrt[12]{x^{40}}$
- C)  $\sqrt[40]{x^{56}}$
- D)  $\sqrt[40]{x^{12}}$

14

The amount of money Tom has is 6% less than the amount of money Jerry has. If the amount of money Tom has is  $k$  times the amount of money Jerry has, what is the value of  $k$ ?

- A) 0.06
- B) 6
- C) 94
- D) 0.94

15

The value of an oil painting drawn by a famous artist increased 1% of its value of the previous year annually. Which of the following best models regarding the value of the oil painting over time?

- A) Linear decreasing
- B) Exponential increasing
- C) Linear increasing
- D) Exponential decreasing

16

$$2x^2 - 4x + 2y^2 + 8y = -4$$

The circle equation above is graphed in the XY-plane. The circle passes through two points on the y-axis. What is the sum of the y coordinates of two points?

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

17

$$\begin{aligned}4x - 7y &= 2 \\kx + my &= 5\end{aligned}$$

In the system of equations,  $k$  and  $m$  are constants. If two linear graphs are perpendicular in the XY-plane, which of the following system of equations also represents two perpendicular linear graphs in the XY-plane?

- A)  $\begin{cases} 8x - 7y = 2 \\ kx + 2my = 6 \end{cases}$
- B)  $\begin{cases} 8x - 7y = 9 \\ kx + my = 6 \end{cases}$
- C)  $\begin{cases} 4x - 7y = 5 \\ 2kx + my = 0 \end{cases}$
- D)  $\begin{cases} 4x - 7y = 4 \\ kx - 2my = 1 \end{cases}$

18

If the length of a diagonal of a square is  $3\sqrt{2}$  inch, what is the perimeter of the square, in inches?

- A)  $12\sqrt{2}$
- B) 12
- C) 24
- D)  $24\sqrt{2}$

19

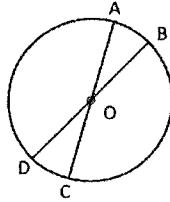
A soccer ball is kicked from the top of a building. The equation  $h(t) = -4.9t^2 + 6t + 12$  represents the height, in meters, of the ball from the ground  $t$  seconds after it is kicked. What does the number 12 represent in the equation?

- A) The height, in meters, of the building from the ground to the top of the building.
- B) The distance the soccer ball can travel until it hit the ground.
- C) The maximum height of the soccer ball can reach after it was kicked.
- D) The time, in seconds, the soccer ball to reach the ground after it was kicked.

20

A school teacher has a budget \$700 to purchase wooden pencils and mechanical pencils. The teacher must purchase a minimum of 500 pencils to give out to all students in class. If the cost of a wooden pencil is \$0.70 and the cost of a mechanical pencil is \$2.50, what is the maximum number of mechanical pencils the teacher can purchase to stay within the budget?

21



In the circle  $O$  above, the diameter of the circle is 10. If  $\angle BOC = 5\angle AOB$ , what is the length of an arc  $\widehat{CD}$ ?

- A)  $\frac{1}{6}\pi$
- B)  $\frac{25}{12}\pi$
- C)  $\frac{5}{6}\pi$
- D)  $\frac{1}{2}\pi$

22

An electric car manufacturing company produced their electric cars 200% more than its number of electric cars produced in the previous year from 2,000 to 2,020. A model formulated based on the information above to compute the number of electric cars,  $p(x)$ , at the end of  $x$  years after the company first started to produce in the year 2,000, where  $0 \leq x \leq 20$ . If  $p(0) = 130$ , Which of the following functions best models this situation?

- A)  $p(x) = 130(2)^x$
- B)  $p(x) = 260(2)^x$
- C)  $p(x) = 130(3)^{x-1}$
- D)  $p(x) = 130(3)^x$

## 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.

**Math**

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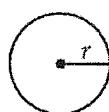
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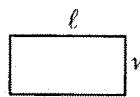
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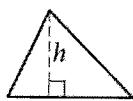
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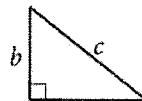
$$C = 2\pi r$$



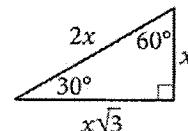
$$A = \ell w$$



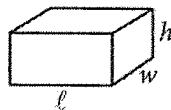
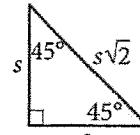
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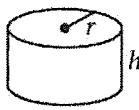
$$c^2 = a^2 + b^2$$



Special Right Triangles



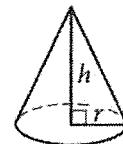
$$V = \ell wh$$



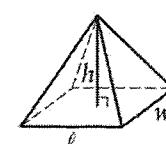
$$V = \pi r^2 h$$



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



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



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

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.

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1

$$AB = 25$$

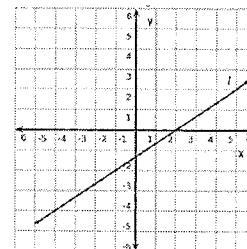
$$BC = 60$$

$$AC = 65$$

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  $\sin K$ ?

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

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)  $h(x) = \frac{2}{3}x - \frac{13}{2}$

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

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)  $g = \frac{(3.785) \cdot (z)}{6}$
- B)  $g = \frac{(6) \cdot (3.785)}{z}$
- 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

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)  $c = \frac{6b}{12ab+6b+1}$

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)  $4.5r + 43c + 2s = 96$

8

$$\begin{aligned}y &\leq -2 \\x &< 2y - 4\end{aligned}$$

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?

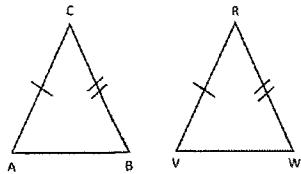
- A)  $2x + 3y = 9$
- B)  $2x - 3y = 0$
- C)  $3x - 2y = -1$
- D)  $-3x - 2y = 4$

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)  $x^2 + y^2 = 1$

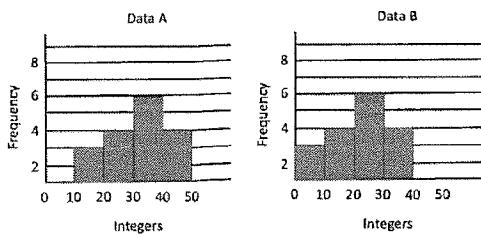
13



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

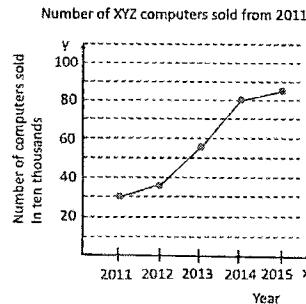
$$f(x) = \frac{2}{(2-x)^2 + 4(2-x) + 4}$$

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?

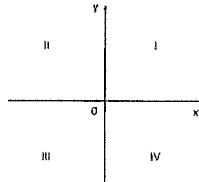
- A)  $200,000 = 50,000x + M$
- B)  $200,000 = 50,000M + x$
- C)  $200,000 = 50,000xM$
- D)  $200,000 = 50,000 + xM$

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



$$\begin{aligned}y &< 1 \\ 2x + y &\leq -8\end{aligned}$$

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.

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# Math

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

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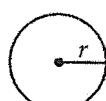
**DIRECTIONS**

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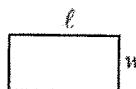
**NOTES**

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**REFERENCE**

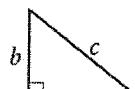
$$\begin{aligned}A &= \pi r^2 \\C &= 2\pi r\end{aligned}$$



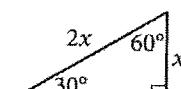
$$A = \ell w$$



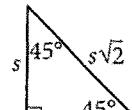
$$A = \frac{1}{2}bh$$



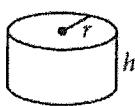
$$c^2 = a^2 + b^2$$



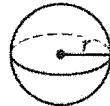
Special Right Triangles



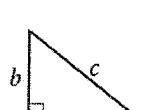
$$V = \ell wh$$



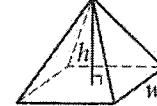
$$V = \pi r^2 h$$



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



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



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

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.

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- 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?

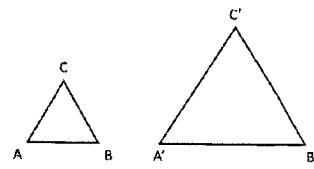
- A)  $\frac{amnk}{b}$
- B)  $\frac{amk}{bn}$
- C)  $\frac{ank}{bm}$
- D)  $\frac{ak}{bmn}$

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.

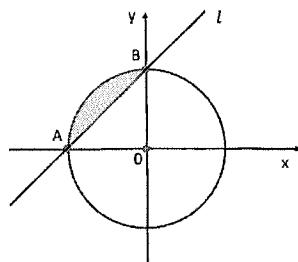
7

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 are the coordinates of  $x$  intercept of the function?

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

6



A circle with area  $25\pi \text{ in}^2$  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)  $\frac{25(\pi-50)}{4}$

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

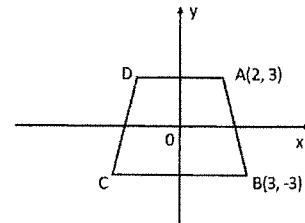
9

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

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)  $\frac{7}{6}$

11

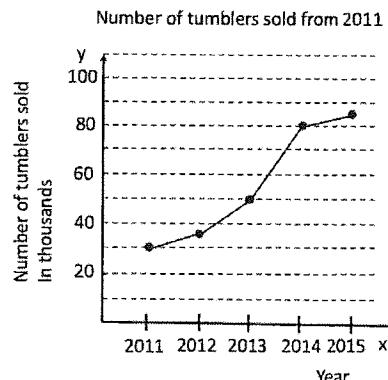


An isosceles trapezoid ABCD is graphed in the XY-plane above. If two points, A and D, are symmetrical with respect to y axis, what is the slope of the segment  $\overline{CD}$ ?

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?

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?

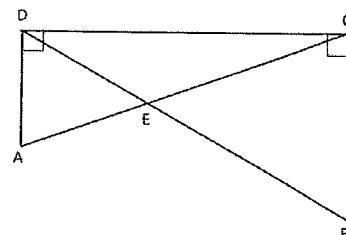
- If another survey is conducted with the same sample size in a different city, 65% would respond they are satisfied with current marriage.
  - If another survey is conducted in a different size sample size in the same city, 65% would respond they are satisfied with current marriage.
  - If all adults 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  $ADE$ ?

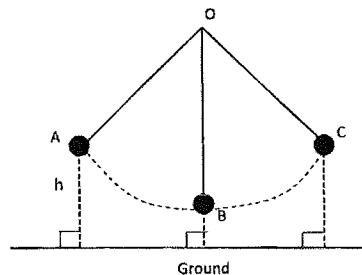
20

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

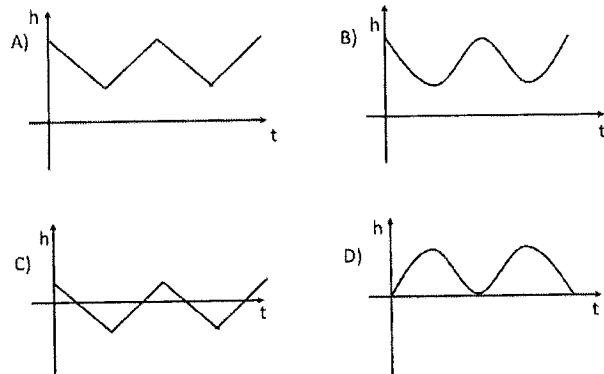
In the equation above, if  $x, y$  are negative integers, which of the following is true about  $k$ ?

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

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?



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?

**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.

# Math

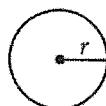
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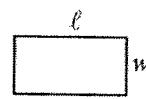
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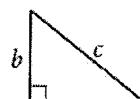
$$A = \pi r^2$$
$$C = 2\pi r$$



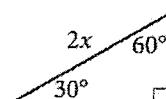
$$A = lw$$



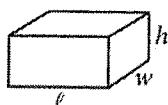
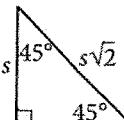
$$A = \frac{1}{2}bh$$



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



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.

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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  $\theta$  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?

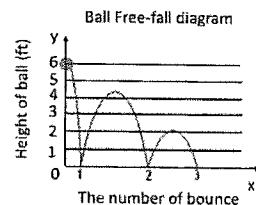
- A) The researcher should ask more people in the larger pub.
- B) This survey is biased in the place because the interviewees are likely to answer that they want to watch it on television in the pub.
- C) This survey is not trustworthy because the interviewees could be drunk when they were interviewed.
- 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 value 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 times 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?

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?

14

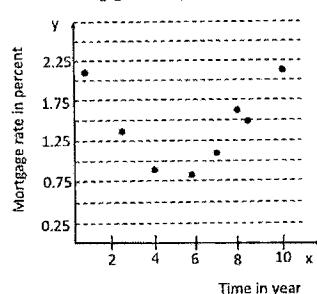
Masses of rare coins (grams)

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  $x$ ?

16

Mortgage rate in percent from 1991



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

$$\begin{aligned}f(x) &= x^2 - 2x - 3 \\h(x) &= a\end{aligned}$$

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

19

Matthew's driving records for a trip

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

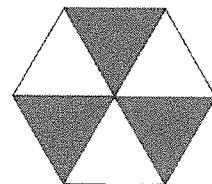
Matthew drove his car from his home to his friend's house in the other state. His driving records are shown in the table above assuming no traffic delay for the drive. If there is a traffic delay on the local and the travel time on the local roads will be expected to increase 40% due to slower traffic,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

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

20



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

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# Math

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

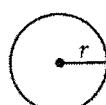
**DIRECTIONS**

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**NOTES**

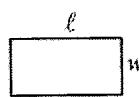
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**REFERENCE**

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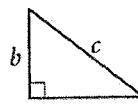
$$C = 2\pi r$$



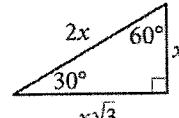
$$A = lw$$



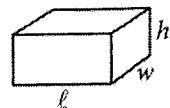
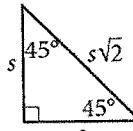
$$A = \frac{1}{2}bh$$



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



Special Right Triangles



$$V = lwh$$



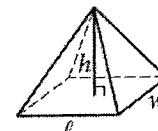
$$V = \pi r^2 h$$



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



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

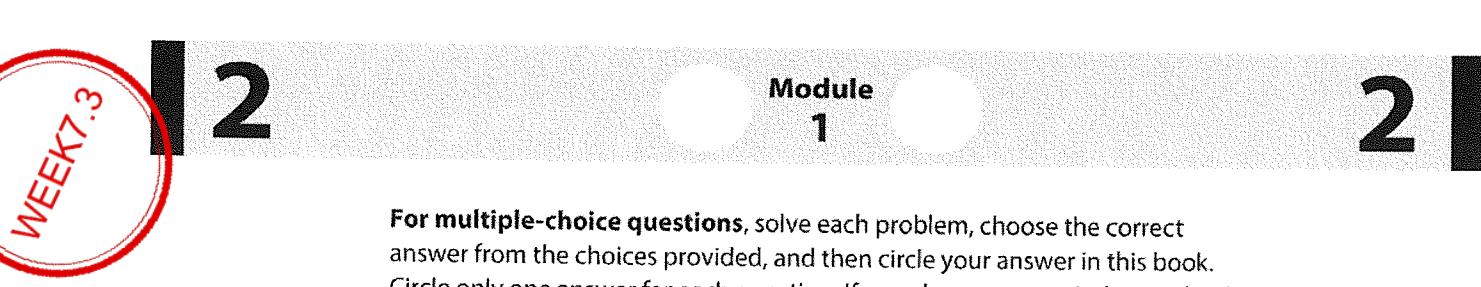


$$V = \frac{1}{3}lwh$$

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

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

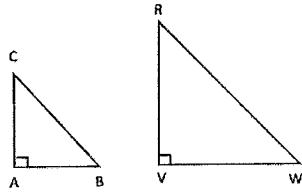
The sum of the measures in degrees of the angles of a triangle is 180.



**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.

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- Don't include **symbols** such as a percent sign, comma, or dollar sign in your circled answer.



Triangle ABC is similar to triangle VWR as shown above. If  $\cos\angle B = \frac{5}{13}$ , what is the value of  $\sin\angle R$ ?

- A)  $\frac{12}{13}$
- B)  $\frac{5}{13}$
- C)  $\frac{5}{12}$
- D)  $\frac{8}{13}$

3

At the special sale of headphones, the store offers 35% discount of the regular price. If the sales tax is 9% of the regular price and the customer paid \$12.50 for the sales tax, Approximately, what is the final sale price including the sales tax of the headphones?

- A) \$138.89
- B) \$102.78
- C) \$104.17
- D) \$90.28

4

$$\sqrt{(x - 1)^2} = \sqrt{3x - 3}$$

What is the largest solution to the given equation?

- A) -1
- B) 1
- C) 2
- D) 4

2

The product of two positive integers is 204. If the first number is 5 less than the second number, what is the greater number?

5

A sample of granite has a density of  $2.7 \text{ g/cm}^3$ . If this sample shape is a cube, where the length of an edge is  $1\text{m}$ , which of the following expressions correctly set up to find the mass, in kg, of this sample of granite?

- A)  $\frac{2.7\text{g}}{\text{cm}^3} \times 100\text{cm}^3 \times \frac{1\text{kg}}{1,000\text{g}}$
- B)  $\frac{2.7\text{g}}{\text{cm}^3} \times 100^3\text{cm}^3 \times \frac{1,000\text{kg}}{1\text{g}}$
- C)  $\frac{2.7\text{g}}{\text{cm}^3} \times 100^3\text{cm}^3 \times \frac{1\text{kg}}{1,000\text{g}}$
- D)  $\frac{2.7\text{g}}{\text{cm}^3} \times 1,000^3\text{cm}^3 \times \frac{1\text{kg}}{1,000\text{g}}$

6

Which of the following is an equation of a circle in the XY-plane if the circle has a center at  $(1, -3)$  and passes through  $(0, 0)$ ?

- A)  $(x - 1)^2 + (y + 3)^2 = \sqrt{10}$
- B)  $(x - 1)^2 + (y + 3)^2 = 10$
- C)  $(x - 1)^2 + (y + 3)^2 = 20$
- D)  $(x + 1)^2 + (y - 3)^2 = 10$

7

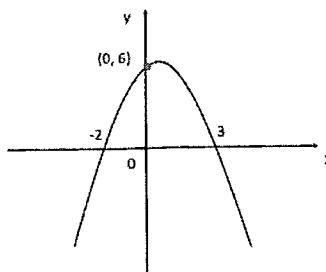
A circle has center O, and two points A and B are located on the circle. If  $m\angle AOB = 68^\circ$ , what is the measure of  $\angle OAB$ , in degrees?

- A)  $112^\circ$
- B)  $56^\circ$
- C)  $68^\circ$
- D)  $34^\circ$

8

Math class A has 65 students and the mean score of class A is 83 percent. Math class B has 38 students and the mean score of class B is 95 percent. What is the mean score, in percent, of the combined classes A and B to the nearest tenth?

9



The graph of a quadratic function is shown in the XY-plane above. Which of the following is an equivalent form that could show y-intercept as a constant in the equation?

- A)  $y = (x + 2)(-x + 3)$
- B)  $y = -x^2 + x + 6$
- C)  $y = -\left(x - \frac{1}{2}\right)^2 + \frac{25}{4}$
- D)  $y = x(-x + 3) + 2(-x + 3)$

10

$$h(t) = -4.9t^2 + 14.7t$$

The equation  $h$  approximates the height of an object, in meters,  $t$  seconds after it was launched vertically straight up from the ground level. About how many seconds will the object take to hit the ground after it reached the maximum height?

- A) 1
- B) 1.5
- C) 2.5
- D) 3

11

$$P(3) = -7$$

In the polynomial function  $P(x)$ , the value of the function for one value of  $x$  is shown above. Which of the following must be true about  $P(x)$ ?

- A)  $x - 3$  is a factor of  $P(x)$ .
- B)  $x + 3$  is a factor of  $P(x)$ .
- C) The remainder is -7 when  $P(x)$  is divided by  $x - 3$ .
- D)  $(-3, -7)$  is one of the solutions of the polynomial function  $P(x)$ .

12

Region	# of clam shells	Region	# of clam shells
A	22	F	3
B	18	G	27
C	19	H	18
D	25	I	22
E	15	J	26

Ocean scientists studied about the radiation effect on the ocean life from the near nuclear power plant. A square area for their research in the mudflats near the nuclear power plant measures 10 feet by 10 feet. The ocean scientists randomly chose 10 regions, A through J in the research location as shown; each region measures 1 foot by 1 foot and they counted the number of clam shells, found in each region. Which of the following is a reasonable approximate number of clam shells in the entire square area (10 ft by 10 ft)?

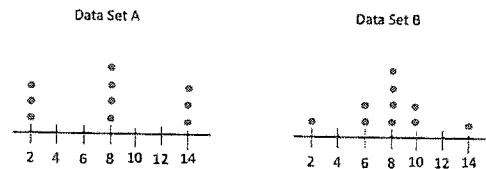
- A) 19.5
- B) 195
- C) 1,950
- D) 19,500

13

If the height of an isosceles right triangle, when the base is the hypotenuse of the isosceles right triangle, is  $2\sqrt{2}$  inch, what is the area of the isosceles right triangle, in square inches?

- E) 2
- F)  $2\sqrt{2}$
- G) 4
- H)  $4\sqrt{2}$

14



The dot plots for data set A and B are shown above. Which of the following statements must be valid?

- I. The median value of data set A and B are equal.
  - II. The mean value of data set B is higher than the mean value of data set A.
  - III. The standard deviation of data set A and B are not the same value.
- A) I only
  - B) I and II
  - C) I and III
  - D) I, II, and III

15

$$x^2 - 10x + k = 0$$

The solutions to the equation above, where  $k$  is a constant, are  $x = 5 \pm \sqrt{7}$ . What is the value of  $k$ ?

16

$$\begin{aligned} -py - \frac{5}{3}x &= \frac{1}{3}(x + 1) \\ \frac{2}{3}x - \frac{1}{2}y &= -\frac{1}{2}y + 3 \end{aligned}$$

In the system of equations,  $p$  is a constant. If the system has no solutions, what is the value of  $p$ ?

17

The measure of angle P is  $\frac{2}{5}\pi$  radians less than the measure of angle R. How much greater is the measure of angle R than the measure of angle P, in degrees?

18

Swimming instructors and students will have swim lessons in the swimming pool. Each instructor will lead a group of no more than 5 students. The maximum capacity of the swimming pool is 120. Which of the following systems best describes the possible numbers of instructors and students in the swimming pool if  $x$  represents the number of swimming instructors and  $y$  represents the number of students?

- A)  $\begin{cases} x + y < 120 \\ 5x > y \end{cases}$
- B)  $\begin{cases} x + y < 120 \\ 5x < y \end{cases}$
- C)  $\begin{cases} x + y \leq 120 \\ 5x \geq y \end{cases}$
- D)  $\begin{cases} x + y \leq 120 \\ 5x \leq y \end{cases}$

19

What is the  $y$ -intercept of the exponential graph of  $y = k(2)^{\frac{x}{3}} - l$  in the  $xy$ -plane, where  $k$  and  $l$  are constants?

- A)  $(0, k - l)$
- B)  $(k - l, 0)$
- C)  $(0, -l)$
- D)  $(-l, 0)$

20

Program at the gym	Year		
	2000	2001	2002
Kickboxing	53	64	85
Aerobic	35	40	44
Zumba	67	88	103
Cycling	15	20	26

Which of the following best represents the average rate of change in the annual number of registrations for Zumba program at the gym from the year 2000 to 2002?

- A) 15 per year
- B) 16 per year
- C) 17 per year
- D) 18 per year

21

$f(x)$  equals 330% of  $x$

For  $x > 0$ , the function  $f$  is defined as the above.  
Which of the following could describe the function  $f$ ?

- A) Linearly increasing
- B) Linearly decreasing
- C) Exponentially increasing
- D) Exponentially decreasing

22

The graph of  $2x - 7y - 3 = 0$  is translated 3 units up in the XY-plane. What is the coordinate of x-intercept?

- A)  $(-9, 0)$
- B)  $(9, 0)$
- C)  $(3, 0)$
- D)  $(-3, 0)$

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# Math

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

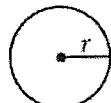
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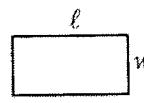
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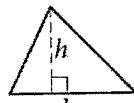
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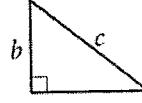
$$C = 2\pi r$$



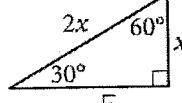
$$A = lw$$



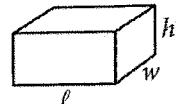
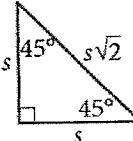
$$A = \frac{1}{2}bh$$



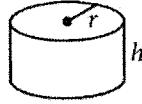
$$c^2 = a^2 + b^2$$



Special Right Triangles



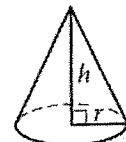
$$V = lwh$$



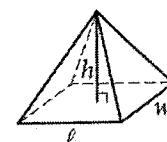
$$V = \pi r^2 h$$



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



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



$$V = \frac{1}{3}lwh$$

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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.

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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?

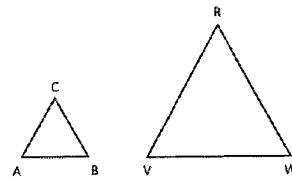
- A) Monthly deposit from his allowance.
- B) Total amount of money he saved after  $t$  months.
- C) The amount of money he saved already before the first deposit.
- D) The price of his piggy bank when he purchased.

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.  $\frac{AC}{VR} = \frac{AB}{VW}$

- 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  $10\pi$  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)  $\pi k^2$
- 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  $p$ ?

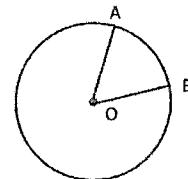
- A)  $\frac{4x}{3(1+\sqrt{3+p})}$
- B)  $\frac{4x}{6\sqrt{3+p}-1}$
- C)  $\frac{4x}{1-6\sqrt{3+p}}$
- D)  $\frac{4x}{1+6\sqrt{3+p}}$

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)  $6\sqrt{6}$

11



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

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

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)  $\frac{68}{l}$

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

$$\begin{aligned}y &= 3x^2 - x - 2 \\y &= 2x - k\end{aligned}$$

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

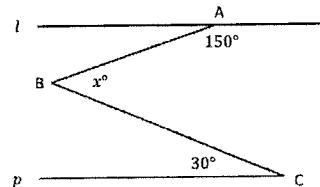
A truck driver wanted to figure out how many cargo containers can load on his truck to drive safely in a bridge. The bridge allows a truck that weighs no more than 5,000 pounds, including all loads on the truck. What is the maximum number of cargo containers allowed to load on the truck if the weight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

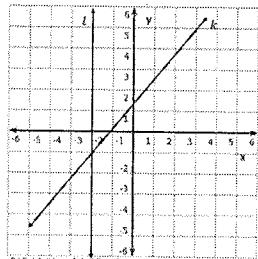
20



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

21

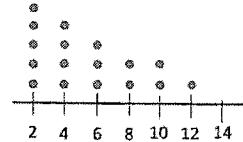
22



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

Data Set A



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.

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**Math**

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

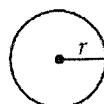
**DIRECTIONS**

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**NOTES**

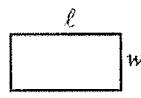
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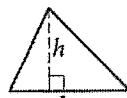
**REFERENCE**

$$A = \pi r^2$$

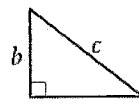
$$C = 2\pi r$$



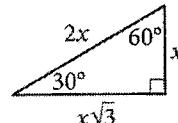
$$A = lw$$



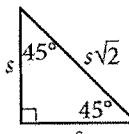
$$A = \frac{1}{2}bh$$



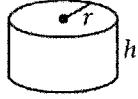
$$c^2 = a^2 + b^2$$



Special Right Triangles



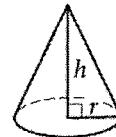
$$V = lwh$$



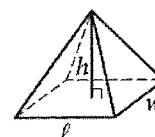
$$V = \pi r^2 h$$



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



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



$$V = \frac{1}{3}lwh$$

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

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

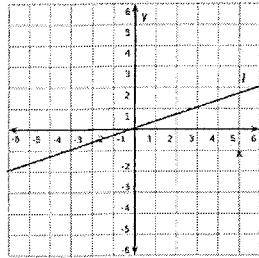
The sum of the measures in degrees of the angles of a triangle is 180.

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- Don't include **symbols** such as a percent sign, comma, or dollar sign in your circled answer.

1



The graph of a line  $l$  is shown above in the XY-plane. The slope of a line  $k$  is twice the slope of the line  $l$ . If the graph of a line  $k$  passes through a point  $(3, 6)$ , what are the coordinates on a line  $k$  in the XY-plane?

- A)  $(-3, 3)$
- B)  $(0, 0)$
- C)  $(-3, 4)$
- D)  $(-3, 2)$

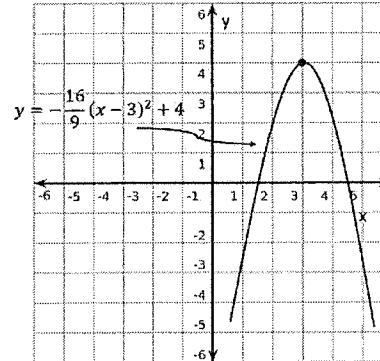
2

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

In the equation above,  $k$  is a positive constant. Which of the following is an equivalent form of the given equation?

- A)  $y = (3x - \sqrt{k})(x + \sqrt{k})$
- B)  $y = (\sqrt{3x} - \sqrt{k})(\sqrt{3x} + \sqrt{k})$
- C)  $y = (\sqrt{3}x + \sqrt{k})(\sqrt{3}x - \sqrt{k})$
- D)  $y = (\sqrt{3}x - k)(\sqrt{3}x + k)$

3



The quadratic graph above models the daily profit ( $y$  value), in hundred dollars, that a vendor expects to make from selling churros for a unit price of  $x$  dollar. Based on the model, what is the unit price, in dollars, of churros to make the same profit when the vendor sells it for a unit price of 4 dollars?

4

Isaiah works as sales associate at a retail store. He is paid 15% of the sales he made. He also gets a bonus which is additional 10% of his pay if his sales is over \$1,000 during a pay period. If he earns a total of \$ 587.40 including a bonus on his pay period, what was the amount of the sales, in dollars, he made during one pay period?

5

7

$$C(x) = 350 + kx$$

A manufacturing company's total cost, in dollars, to produce  $x$  calculators is given by the function  $C(x)$  above, where  $k$  is a constant. The total cost, in dollars, to produce 200 calculators is \$5,350. What is the total cost, in dollars, to produce 250 calculators?

Score	Score frequencies	
	Class A	Class B
5	2	0
10	0	0
15	4	8
20	2	4
25	7	2
30	0	2
Total	15	16

For a certain math game, players can score from 0 to 30 for 6 games. If a player wins the game, the person gains 5 points but if a player loses the game, no point gains or loses. The table shows the distribution of the scores of 31 players in two classes. How much is the median of class B is greater than the median of class A?

6

The total population,  $P$ , of rabbits in a certain area can be modeled by a quadratic function that is defined in terms of  $t$ , where  $t$  is the time in months. At a time of 5 months, the total population of rabbits is 300, and at a time of 12 months, the total population of rabbits is 1,252. If the initial population of rabbits is 100, then what is the total population of rabbits in this area after 2 years?

- A) 132
- B) 13,200
- C) 4,708
- D) 4,608

- A) 0
- B) 2.5
- C) 5
- D) 7.5

8

$$x^2 - 8x + k = 0$$

In the quadratic equation above,  $k$  is a constant. The equation has two real solutions if  $k < m$ . What is the least possible value of  $m$ ?

9

Max is folding paper cranes for a friend's birthday party. He plans to make 2,000 paper cranes to decorate the reception table. If it takes 5 minutes to fold one paper crane and he already made  $k$  paper cranes, which of the following expressions represents the number of hours needed for him to complete the rest of work?

- A)  $5(2,000 - k)$
- B)  $12(2,000 - k)$
- C)  $\frac{1}{12}(2,000 - k)$
- D)  $\frac{1}{12}(k - 2,000)$

10

A circle is graphed in the  $xy$ -plane and the end points of the diameter of a circle are  $(2, 0)$  and  $(2, -4)$ . How many points will the circle intersect with  $y$ -axis?

- A) 0
- B) 1
- C) 2
- D) 3

11

Which of the following expressions is equivalent to  $(-3a^{\frac{1}{2}})^{\frac{2}{3}}$ , where  $a > 0$ ?

- A)  $6\sqrt[3]{3a}$
- B)  $\sqrt[3]{9a}$
- C)  $-\sqrt[3]{9a^2}$
- D)  $-\sqrt[3]{9a}$

12

$$\begin{aligned}2x + 4 &= k \\5x - 3y &= 4\end{aligned}$$

In the system of equations above,  $k$  is a constant. What is the value of  $y$  of the solution to the system in terms of  $k$ ?

- A)  $\frac{28-5k}{6}$
- B)  $\frac{5k-28}{6}$
- C)  $\frac{5k+4}{6}$
- D)  $\frac{5k-4}{6}$

13

$$\begin{aligned}20 \leq a &\leq 80 \\60 \leq b &\leq 130\end{aligned}$$

The intervals of  $a$  and  $b$  are shown above. Which of the following inequalities represents correctly for the interval of  $c$  if  $c = b - a$ ?

- A)  $|45 - c| \leq 65$
- B)  $|c - 45| \geq 65$
- C)  $|c - 45| \leq 5$
- D)  $|c - 45| \geq 5$

14

$$f(t) = \sqrt[3]{2 - 2x^2}$$

In the function above, what values of  $x$  are defined for which  $f(x)$  is a real number?

- A)  $-1 \leq x \leq 1$
- B)  $-\sqrt{2} \leq x \leq \sqrt{2}$
- C)  $-2 \leq x \leq 2$
- D) all real numbers

15

$$\begin{aligned}f(x) &= (x - 3)(x + 7) \\h(x) &= x^2\end{aligned}$$

In the quadratic functions above, what change could be made from  $h(x)$  to be  $f(x)$ ?

- A)  $h(x)$  was translated 2 units right and 25 units down.
- B)  $h(x)$  was translated 2 units left and 25 units down.
- C)  $h(x)$  was translated 2 units left and 25 units up.
- D)  $h(x)$  was translated 2 units right and 25 units up.

16

Thomas wants to share 1.5 gallons of orange juice with his friends. He distributed 8 fluid ounce cups to 7 friends and himself. How many full 8 fluid ounce cups of orange juice each person would get if 1.5 gallons of orange juice was divided equally to all? (1 gallon = 128 fluid ounces)

- A) 2
- B) 3
- C) 4
- D) 5

17

During the end-of-year sale, Elon bought a electric car at a 20% discount. He paid a total of  $k$  dollars, which included the discounted price and a 9.5% sales tax on the discounted price. What is the original price of the electric car before the discount in term of  $k$ ?

- A)  $\frac{k}{(0.8)(1.095)}$
- B)  $\frac{k}{(0.2)(0.095)}$
- C)  $\frac{k}{(0.8)(0.095)}$
- D)  $k(0.8)(1.095)$

18

$$f(x) = x^2 - 4x - 5$$

The quadratic function is shown above. Which of the following equivalent forms of the function shows the minimum value of the function as constant?

- A)  $f(x) = x(x - 4) - 5$
- B)  $f(x) = (x - 2)^2 - 9$
- C)  $f(x) = (x - 5)(x + 1)$
- D)  $f(x) + 5 = x(x - 4)$

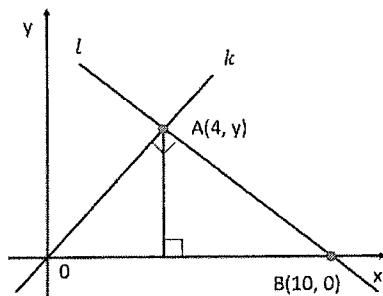
19

$$h(x) = 2x^4 + 4$$

In the  $xy$ -plane, the equation  $y = h(x)$  is graphed. Which of the following could be the value of  $h(x)$ ?

- A) 0
- B) 1
- C) 2
- D) 4

20



Lines  $l$  and  $k$  are shown in the  $xy$ -plane above. If two lines are perpendicular and intersect at point A, what is the area of triangle OAB?

- A) 20
- B)  $5\sqrt{6}$
- C)  $10\sqrt{3}$
- D)  $10\sqrt{6}$

21

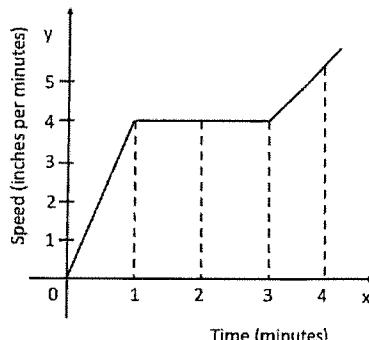
$$f(x) = 3x^2 - 12$$

$$f(x - k) = 3x^2 - 12x$$

If the first function  $f(x)$  is translated  $k$  units horizontally, the function will be  $3x^2 - 12x$  as shown above. What is the value of  $k$ ?

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

22



The graph above models the speed,  $y$ , in inches per minutes, of a snail during the first 4 minutes of travel time,  $x$ . what is the total distance traveled by the snail between 1 min to 3 min?

- A) 16 inches
- B) 12 inches
- C) 10 inches
- D) 8 inches

## STOP

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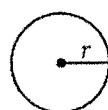
**Math****22 QUESTIONS****(TIME: 35 MIN)****DIRECTIONS**

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**NOTES**

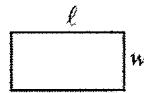
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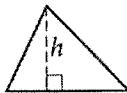
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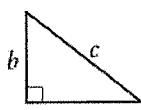
$$C = 2\pi r$$



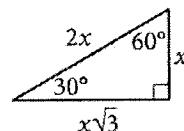
$$A = l \cdot w$$



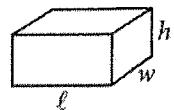
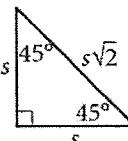
$$A = \frac{1}{2}bh$$



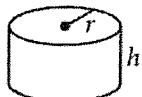
$$c^2 = a^2 + b^2$$



Special Right Triangles



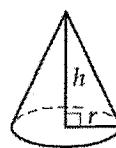
$$V = lwh$$



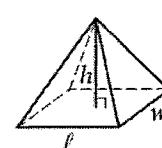
$$V = \pi r^2 h$$



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



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



$$V = \frac{1}{3}lwh$$

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.

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1

A rowing team entered a 500-meter race. The team rowed at an average speed of 32 strokes per minutes. If the team took 350 seconds to complete the 500-meter race, how many strokes did it take the team during the race to the nearest whole number?

2

The measure of an angle is  $\frac{2}{3}\pi$  radians. If it is converted into degrees, it has a measure of  $m$  degrees. What is the value of  $m$ ?

3

The value of function  $f$  will increase by 30% for every value of  $x$  increase by 1 in the function. Which of the following could be the function  $f$ ?

- A)  $f(x) = 2(0.3)^x$
- B)  $f(x) = 23(1.3)^{x+2}$
- C)  $f(x) = 0.13(1.3)^{-x}$
- D)  $f(x) = 25(1.3)^{2x}$

4

$$f(x) = (x - 5)(x + 2)^2$$

The function  $f$  is defined above. If  $f(x - 2) = 0$ , what could be the value of  $x$ ?

- A) 0
- B) 1
- C) 2
- D) 5

5

Participants in the international model airplane competition need to build a light-weight (less than 30 pounds) airplane model and a heavy-weight (more than or equal to 30 pounds) airplane model for the competition. A heavy-weight airplane model uses 2 small wheels and 4 large wheels, and a light-weight airplane model uses 1 small wheel and 2 large wheels for their landing gears, respectively. There are 40 large wheels and 30 small wheels available in the competition, and each participant must build one heavy-weight airplane model and one light-weight airplane model. What is the maximum number of participants that could attend the competition?

7

Jimmy bought a \$90 daily pass for unlimited rides in Magic Mountain theme park. The average price for a ride in the theme park is \$6.50. If he took 8 different rides in the morning, at least how many rides does he need to take in the afternoon in order to save money in the cost?

- A) 4
- B) 5
- C) 6
- D) 7

6

Nutritional information for 1 ounce servings of seeds

	Total fat (grams)	Protein (grams)	Calories
Barley	0.65	3.54	100
Brown rice	0.26	0.73	31

The table above shows nutritional information for 1-ounce of barley and brown rice. How many more grams of total fat are in one pound of barley than are in one pound of brown rice?  
(1 pound = 16 ounces)

- A) 2.81
- B) 33.72
- C) 0.39
- D) 6.24

8

$$\begin{aligned}x^6 - y^6 &= 16 \\x^3 - y^3 &= 8\end{aligned}$$

In the two equations above, what is the value of  $x^3 + y^3$ ?

9

Sarah surveyed 80 people who visited in a local library and asked if they are in favor of the proposal to use \$150,000 of local taxes for upgrading desks and chairs for the libraries in the city. She found that 60 of those surveyed were in favor of the proposal. Which of the following statements is the most reasonable conclusion?

- A) This sampling method was flawed and could be biased because of the survey place.
- B) No prediction should be made because the sample size is too small.
- C) 75% of the votes will be in favor of the proposal when the actual votes were taken.
- D) The result of this survey is valid, unbiased, and must forecast the actual votes fairly.

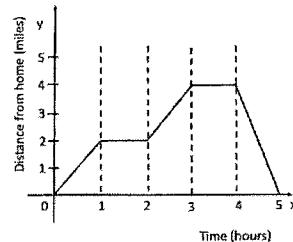
10

Distribution of tossing two coins

	Quarter	
	Heads	Tails
Nickel	12	9
Tails	10	11

The two-way table shows the distribution of the results of tossing two coins. For what percent of the tosses were the Quarters landed on tails to the nearest tenth?

11



Charles walked from home to his friend's house. He stopped by a restaurant on the way to have a lunch for an hour and walked again to reach his friend's house and stayed there with his friend for an hour and finally he ran straight back to his home on the same road. The graph above show distance from his home by hours. How many times faster in speed, in miles per hour, was he running back home than walking to his friend's house?

- A) 1.5
- B) 2.0
- C) 2.5
- D) 4.0

12

The graphs of the following quadratic equations each have x-intercepts of -3 and 7 in the XY-plane. Which equation has its vertex farthest from the x-axis?

- A)  $y = \frac{1}{2}(x + 3)(x - 7)$
- B)  $y = -\frac{1}{5}(x + 3)(x - 7)$
- C)  $y = 6(x + 3)(x - 7)$
- D)  $y = -12(x + 3)(x - 7)$

13

With greater depth of the atmosphere, more air is pressing down from above. Therefore, air pressure is greatest at sea level and falls with increasing altitude. Michael hiked the Mt. Everest in winter and the air pressure dropped at a constant rate of 0.768 kPa per every 100 meters vertical distance. The height of Mt. Everest is about 8.85 kilometers from the sea level. Which of the following is closest to the total drop in air pressure, in psi (pounds per square inch), over the course of the entire hike from the sea level to the top of the mountain? (1 kPa = 0.145 psi)

- A) 0.99
- B) 468.7
- C) 68.0
- D) 9.86

14

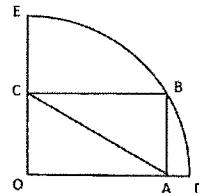
If  $\frac{3x}{y} = 7$ , what is the value of  $\left(\frac{4xy}{3}\right) \cdot (2y)^{-2}$ ?

15

Which of the following describes exponential relationship between two variables listed?

- A) Airplane's speed  $v$ , in feet per minute, will decrease at a constant rate of 1,500 feet per minute every minute  $m$ .
- B) The depth  $h$  of water in a water container decreases by 10 inches each minute  $m$  as the water is going out at a constant rate.
- C) The air pressure  $p$  decreases by 7.68 Pa when the height  $h$  increases every meter.
- D) The sales of a product  $s$ , in dollars, in a company is expected to grow 20% every year  $t$  for the next decade.

16



Rectangle OABC is inscribed into the quarter circle O as shown above. The length of OA is  $5\sqrt{3}$  and the measure of  $\angle OAC$  is  $30^\circ$ . What is the area of the quarter circle O?

- A)  $100\pi$
- B)  $50\pi$
- C)  $25\pi$
- D)  $20\pi$

17

Science classes enrollment at Valencia High School

	Males	Females	Total
Physics	65		100
Chemistry			
Total	110		200

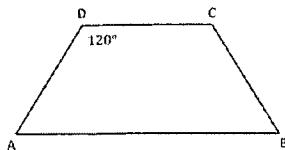
The table above shows the distribution of science classes (Physics and Chemistry) at Valencia high school partially. After completing the table, what percent of female students are taking Chemistry class to the nearest whole number?

19

Which of the following transformation should be made for the graph of  $f(x) = (x - 2)^2$  to become the graph of  $g(x) = -(x - 2)^2 + 3$ ?

- A) Translate 3 units left.
- B) Reflect over x-axis and translate 3 units right.
- C) Reflect over y-axis and translate 3 units up.
- D) Reflect over x-axis and translate 3 units up.

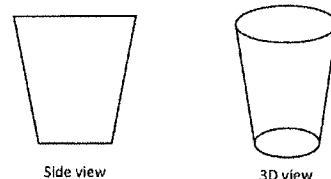
18



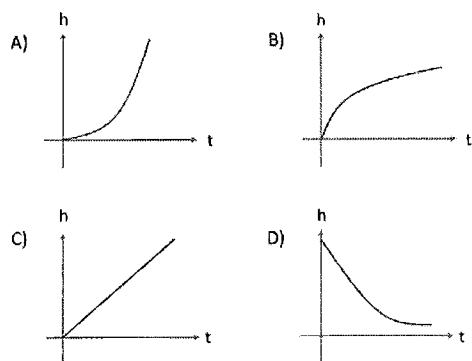
An isosceles trapezoid ABCD is formed by cutting the regular hexagon into half as shown above and the perimeter of trapezoid ABCD is 10, what is the area of the trapezoid?

- A)  $3\sqrt{3}$
- B)  $5\sqrt{3}$
- C)  $6\sqrt{3}$
- D) 6

20

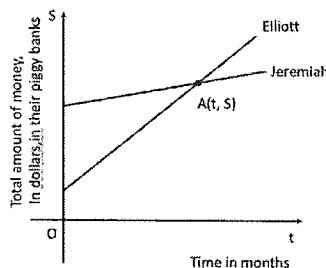


Two different views for a water cup are shown above. Assuming that water is being poured at a constant rate, which of the following best represents the height of water  $h$  in the water cup as time  $t$  elapses in the x-axis?



21

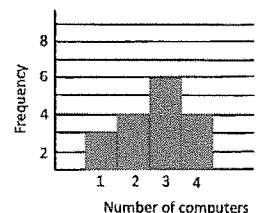
Jeremiah has \$120 in his piggy bank and deposits \$30 every month of his allowance from parents. Elliott has \$40 in his piggy bank and deposits \$50 every month from his part-time job. The linear graphs for this situation are shown below.



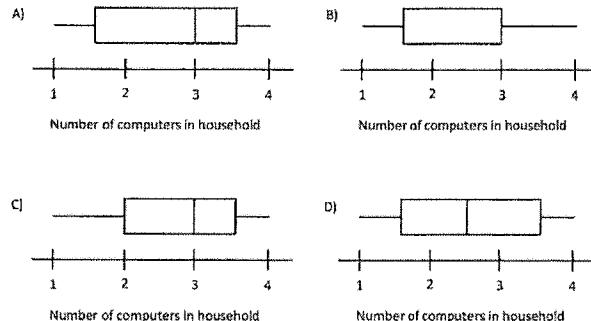
If two lines are graphed in the  $tS$ -plane. What is the value of  $S$ , in dollars, when they have the same amount of money in their piggy banks?

22

Number of computers in household



A teacher surveyed her class for the number of computers in the household. The results are shown in the bar graph above. Which of the following box plots best represents her survey result?

**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.

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# Math

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

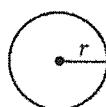
**DIRECTIONS**

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**NOTES**

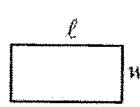
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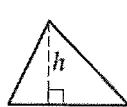
**REFERENCE**

$$A = \pi r^2$$

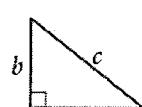
$$C = 2\pi r$$



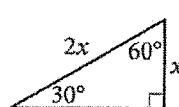
$$A = \ell w$$



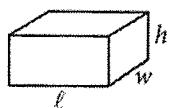
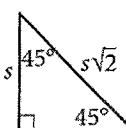
$$A = \frac{1}{2}bh$$



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



Special Right Triangles



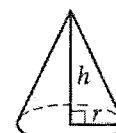
$$V = \ell wh$$



$$V = \pi r^2 h$$



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



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



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

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.

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- 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

$$(x + 1)^2 + (y - 2)^2 = 64$$

In the circle equation above, if the circle is translated 3 units right in the XY-plane, which of the following represents the equation of the new circle?

- A)  $(x - 4)^2 + (y - 2)^2 = 64$
- B)  $(x - 2)^2 + (y - 2)^2 = 64$
- C)  $(x + 4)^2 + (y - 2)^2 = 64$
- D)  $(x + 1)^2 + (y + 1)^2 = 64$

2

Characteristics of customers at a Hotel in Las Vegas

	Buffet	No Buffet	Total
Gambling	650	150	800
No Gambling	180	20	200
Total	830	170	1,000

The table shows a distribution of characteristics on a certain day for 1,000 customers at a hotel in Las Vegas. The table shows the number of customers who did gambling, visited buffet restaurant, both, or neither. Based on the data, what is the probability that a customer, if selected at random, didn't visit buffet restaurant given that the customer did gambling?

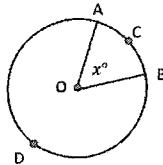
3

Two identical cylinders, each has a radius of 2 inches on the circular bases and  $h$  inches on their heights, are attached together along the circular bases. The volume of the new cylinder is  $k\pi$  cubic inches. If the surface area of one cylinder before attached is also  $k\pi$  square inches, what is the value of height ( $h$ ), in inches, of one cylinder?

4

If 540 is  $k\%$  less than 2,000, what is the value of  $k$ ?

5



In the circle O above, the length of a small arc  $\widehat{ACB}$  is  $3\pi$  and  $x = 45$ . What is the area of large sector ADB?

- A)  $126\pi$
- B)  $21\pi$
- C)  $18\pi$
- D)  $6\pi$

7

$$(x + a)(bx - 3) = 4x^2 - 5x - 6$$

The equation above is true for all  $x$ , where  $a$  and  $b$  are constants. What is the value of  $ab$ ?

- A) 4
- B) -4
- C) 8
- D) -8

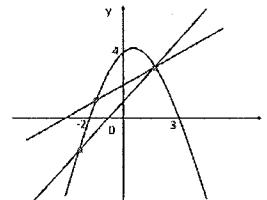
6

$$P = 92t + 80$$

A plumber charges for a job as shown above. The equation gives the total cost, in dollars, of a job that takes  $t$  hours. Two customers A and B hired this plumber for their jobs and the plumber worked 3 hours longer for customer B's job. How much more did the plumber charge, in dollars, on customer B than customer A?

- A) 80
- B) 92
- C) 184
- D) 276

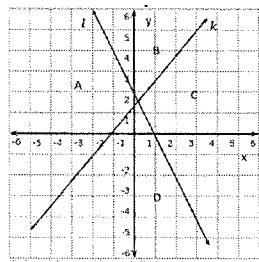
8



A system of three equations is graphed in the XY-plane above. How many solutions does the system have?

- A) Zero
- B) One
- C) Two
- D) Three

9



$$\begin{aligned}5y - 6x &\leq 7 \\3x + 2y &\geq 3\end{aligned}$$

The system of inequalities is graphed in the XY-plane. Which region in A through D is the solution located based to the system above?

- A) A
- B) B
- C) C
- D) D

11

Shipping Cost in local UPS

Weight (pounds)	Shipping Cost (dollars)
10	18.30
20	30.60
40	55.20

The table above shows the shipping cost, in dollars, in local UPS of packages by its weight, in pounds. If there is a linear relationship between the shipping cost and the weight of the packages, which of the following can be used to determine the total shipping cost ( $y$ ), in dollars, of packages with a weight of  $x$  pounds?

- A)  $y = 1.23x$
- B)  $y = 1.23x + 6$
- C)  $y = 12.3x + 0.6$
- D)  $y = 12.3x + 6$

10

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

In the equation above, what is the set of all possible solutions to the equation?

- A)  $\left\{-\frac{4}{9}, \frac{4}{9}\right\}$
- B)  $\left\{-\frac{4}{9}\right\}$
- C)  $\left\{\frac{4}{9}\right\}$
- D) No solution.

12

In Peter's math class, the class average (arithmetic mean) for math unit test was 85 percent for 36 students. However, three of his class students dropped the course. So, the teacher recalculated the mean for the remaining class and figured that the new mean was 87 percent. What was the mean score for three student who dropped the course?

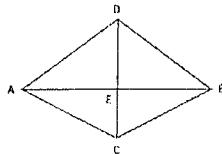
- A) 61
- B) 62
- C) 63
- D) 64

13

Nathan purchased an old rare coin in auction at \$180. He found out that the value of the coin increases 15% of its value the previous year. The estimated value of the coin, in dollars, 3 years after purchase can be written as  $180k$ , where  $k$  is a constant. What is the approximate value of  $k$ ?

- A) 1.32
- B) 1.52
- C) 1.15
- D) 0.0034

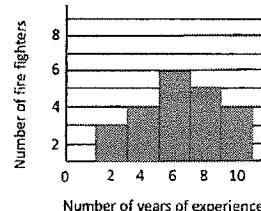
14



In the figure above,  $AD = BD$ ,  $AC = BC$ . If  $CD = 7$  and  $AE = 4$ , what is the area of kite  $ACBD$ ?

- A) 28
- B) 30
- C) 56
- D) 60

15



The bar graph above shows the distribution of the number of years of experience for 22 fire fighters who have served in a certain local fire department. If a new fire fighter who has 6 years of experience joins the local fire department, what will be the effect on the mean and median of the data set?

- A) The mean and median will remain the same.
- B) The mean will decrease but the median will increase.
- C) The mean will increase but the median will decrease.
- D) The mean will decrease but the median will remain the same.

16

The expression  $x^2 + kx + 20$  is equivalent to  $(x - 2)^2 + m$ , where  $k$  and  $m$  are constants. What is the value of  $-\frac{m}{k}$ ?

17

$$y = ax(x^2 - 1)(x^2 - 4)$$

In the equation above,  $a$  is a constant. How many distinct  $x$ -intercepts does the graph of the equation in the XY-plane have?

- A) Five
- B) Four
- C) Three
- D) Two

18

Let  $y = f(x)$  is a linear function with a negative slope and graphed in the XY-plane. Which of the following must be true?

- I.  $f(a) > f(b)$  if  $a > b$
- II.  $f(b) < 0$  if  $b > 0$
- III.  $f(a) < 0$  if  $a < 0$

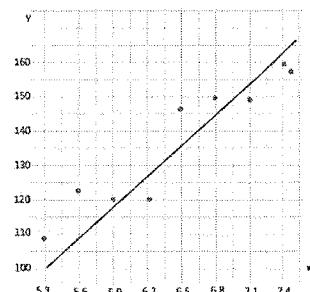
- A) I only
- B) I and II only
- C) I and III only
- D) None

19

Kevin walked three fourth of the distance from his home to the library. For the rest of the way to the library, he ran 2 times as fast as he walked. If he took 30 minutes to walk three fourth of the way, how much time, in minutes, did it take him from his home to the library?

- A) 32
- B) 35
- C) 40
- D) 45

20



The scatter plot above shows the distribution of heights (y values) of women based on their shoe sizes (x values). The line of best fit is also drawn in the XY-plane. What is the number of women for which the line of best fit predicts a value less than the actual value?

21

Ashley has a budget of \$50 to spend on notebooks and binders for her school. Notebooks cost \$2.50 each and binders cost \$5.25 each. Which of the following inequalities represents this situation, where  $n$  is the number of notebooks she can purchase, and  $b$  is the number of binders she can purchase? (Assume there is no other costs)

- A)  $2.50b + 5.25n = 50$
- B)  $2.50b + 5.25n \leq 50$
- C)  $2.50n + 5.25b > 50$
- D)  $2.50n + 5.25b \leq 50$

22

What is the  $y$ -intercept of the exponential graph of  $y = 2k\left(\frac{1}{2}\right)^{\frac{x+1}{3}}$  in the XY-plane, where  $k$  is a constant?

- E)  $(0, k)$
- F)  $(k, 0)$
- G)  $\left(0, \frac{k}{2}\right)$
- H)  $\left(-\frac{k}{2}, 0\right)$

**STOP**

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**Math**

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

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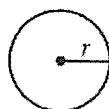
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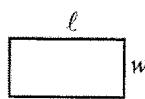
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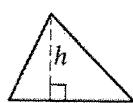
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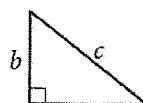
$$\begin{aligned} A &= \pi r^2 \\ C &= 2\pi r \end{aligned}$$



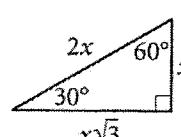
$$A = \ell w$$



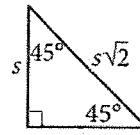
$$A = \frac{1}{2}bh$$



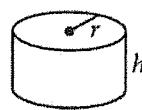
$$c^2 = a^2 + b^2$$



Special Right Triangles



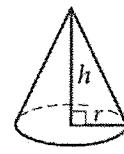
$$V = \ell wh$$



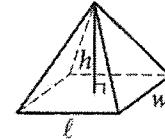
$$V = \pi r^2 h$$



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



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



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

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

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- 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

If  $x > 0$ , which of the following is equivalent to  $\sqrt[3]{x^8}$ ?

- I.  $(x^8)^{\frac{1}{3}}$
- II.  $(x^3)^{\frac{1}{8}}$
- III.  $\left(x^{\frac{1}{3}}\right)^2 \cdot x^2$

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

2

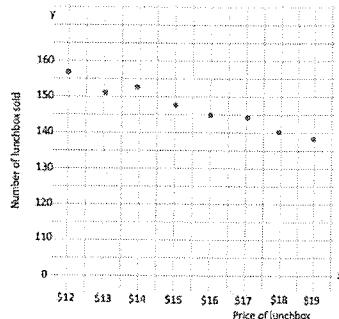
$$8^x \cdot y^2 = 8^{x-1} \cdot y$$

In the equation above,  $x$  and  $y$  are positive numbers. What is the value of  $y$ ?

3

If  $3x + 2y = -7$ , what is the value of  $9x^2 + 12xy + 4y^2$ ?

4



A certain restaurant sells take-out lunch boxes ranging in price from \$12 to \$19 in increments of \$1. The scatter plot above shows the total number of lunchboxes sold at each price. Approximately how much more revenue did the restaurant get from the lunchboxes it sold priced at \$17 than it did at \$12?

- A) \$400
- B) \$580
- C) \$820
- D) \$1,100

5

A party planner is ordering balloons for a party. The planner wants to have at least 100 balloons in her order, and she will order no more than twice as much red balloons as white balloons. Each cost for red balloon and white balloon is \$1.25 and \$1.50, respectively. If  $r$  represents the number of red balloons and  $w$  represents the number of white balloons and her budget is \$1,000, which of the following inequalities below best represents this situation?

- A)  $\begin{cases} r + w \geq 100 \\ 1.25r + 1.50w \leq 1,000 \\ r \leq 2w \\ r + w \geq 100 \end{cases}$
- B)  $\begin{cases} 1.25w + 1.50r \leq 1,000 \\ r \leq 2w \\ r + w \geq 100 \end{cases}$
- C)  $\begin{cases} 1.25r + 1.50w \leq 1,000 \\ w \leq 2r \\ r + w \geq 100 \end{cases}$
- D)  $\begin{cases} 1.25w + 1.50r \leq 1,000 \\ w \leq 2r \end{cases}$

6

$$k(x+1)(x-1) + 3x^2 - 2x = ax^2 + bx + c$$

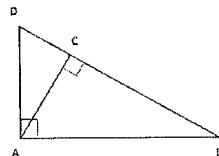
In the equation above,  $a$ ,  $b$ ,  $c$ , and  $k$  are constants. If the equation is true for all values of  $x$ , what is the value of  $a + b + c$ ?

7

Jeremiah deposited his allowance \$150 into a bank savings account which earns an annual interest rate of 6%. If he doesn't withdraw any money nor make any additional deposits, how long will it take him, in years, to increase the value of account by at least 40%?

- A) 4
- B) 5
- C) 6
- D) 7

8



Note: Not drawn to scale.

In the right triangle ABD above, the value of  $\cos B$  is 0.2 and the length of BC is 5. What is the length of CD?

- A) 5
- B) 25
- C) 120
- D) 125

9

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

The volume of sphere is shown above, where  $r$  is the radius of the sphere. If the value of the radius is double, what happens to the value of the volume of the sphere?

- A) Double the original value
- B) Triple the original value
- C) Eight times the original value
- D) 27 times the original value

11

Jerome usually spends  $3\frac{3}{4}$  hours a day working on his math and English homework. It takes him  $\frac{1}{2}$  hour to complete one of his math assignments and  $\frac{3}{4}$  hour to complete one of his English assignments. If  $m$  represents the number of math assignments and  $e$  represents the number of English assignments, which of the following best represents this situation?

- A)  $(m + \frac{1}{2})(e + \frac{3}{4}) = \frac{15}{4}$
- B)  $(\frac{m}{2})(\frac{3e}{4}) = 1$
- C)  $(\frac{1}{2}m)(\frac{3}{4}e) = \frac{15}{4}$
- D)  $\frac{1}{2}m + \frac{3}{4}e = \frac{15}{4}$

10

An invasive insect was found to have a population of  $P$  after  $t$  weeks of uninhibited growth.

$$P(t) = C(2)^{\frac{t}{4}}$$

The equation above gives the number of populations,  $P$ , of the insects, where  $t$  is the number of weeks after the uninhibited growth began, and  $C$  is the number of initial population. Which of the following statements is valid based on the equation above?

- A) The population will be increased by 100% every 4 weeks.
- B) The population will be increased by 200% every 4 weeks.
- C) The population will be double every 2 weeks.
- D) The population will be double every week.

12

$$|3x + 1| = |-x|$$

In the equation above, how many solutions to the equation exists?

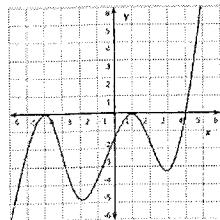
- A) None
- B) One
- C) Two
- D) Three

13

The sum of three numbers is 220. If the largest number is 20 percent more than the sum of the other two numbers, what is the value of the largest number?

- A) 200
- B) 100
- C) 150
- D) 120

14



The graph of function  $f$  is shown in the  $xy$ -plane, where  $y = f(x)$ . Which of the following functions could be  $f$ ?

- A)  $f(x) = (x + 4)(x - 1)^2(x - 4)$
- B)  $f(x) = -(x + 4)^2(x - 1)^2(x - 4)$
- C)  $f(x) = (x + 4)^2(x - 1)^2(x - 4)$
- D)  $f(x) = (x + 4)^2(x - 1)^3(x - 4)$

15

$$t = \sqrt{\frac{k}{4hl}}$$

The experimental equation above gives the estimate time, called a half-life( $t$ ), for a certain element to decay 50% of its original amount.  $k$ ; the average temperature of soil,  $h$ ; the ph. level of the soil, and the humidity index ;  $l$ .

Which of the following correctly expresses the humidity index in terms of other variables?

- A)  $l = \left(\frac{16th}{k}\right)^2$
- B)  $l = \frac{k}{4ht^2}$
- C)  $l = \frac{k}{2ht^2}$
- D)  $l = \left(\frac{k}{4ht}\right)^2$

16

A parabola of  $y = f(x)$  is graphed in the  $xy$ -plane, where  $f(x) = (x - 1)(x - 4)$ . Which of the following intervals contains the  $x$ -coordinate of the vertex of the graph of  $f(x)$ ?

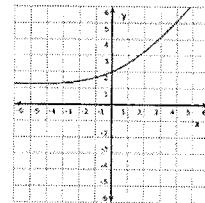
- A)  $0 < x < 1$
- B)  $1 < x < 3$
- C)  $4 < x < 5$
- D)  $5 < x < 6$

17

During a special sale, Edward spent a total of  $d$  dollars, which includes the discounted price at 25% discount and the sales tax 9.5% on the discounted price, on a certain item. In terms of  $d$ , what was the original price of the item?

- A)  $\frac{(0.75)(d)}{1.095}$
- B)  $(1.095)(d)(0.75)$
- C)  $\frac{d}{(1.095)(0.25)}$
- D)  $\frac{d}{(1.095)(0.75)}$

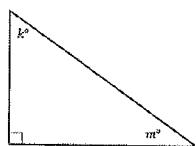
19



The graph of  $y = f(x) + 2$  is shown above. Which of the following could define  $f$ ?

- A)  $f(x) = -3^x + 2$
- B)  $f(x) = -3^x + 1$
- C)  $f(x) = 3^x + 1$
- D)  $f(x) = 3^x - 1$

18



In the right triangle above,  $k$  and  $m$  are two acute angles of the right triangle. Which of the following operations is correct for the following expressions based on the figure?

$$\cos(m^\circ) \quad \sin(k^\circ)$$

- A)  $>$
- B)  $<$
- C)  $=$
- D) Can't be determined.

20

The area of circle is increasing at a rate of 15 square inches per hour. Which of the following expressions correctly expresses to this rate in square meters per min? (1 inch = 2.54 centimeters, 1 meter = 100 centimeters)

- A)  $\frac{(15)(2.54^2)}{(100^2)(60)}$
- B)  $\frac{(15)(100^2)}{(2.54)^2(60)}$
- C)  $\frac{(2.54)^2}{(15)(100)^2}$
- D)  $\frac{(15)(60)^2}{(2.54)^2(100)}$

21

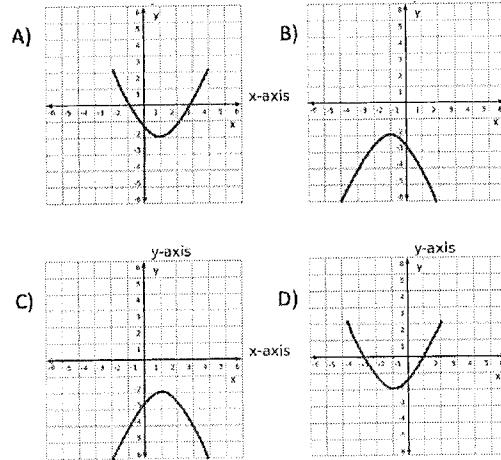
$$\begin{aligned}x^2 + 4x + y^2 - 2y - 4 &= 0 \\x - k &= 0\end{aligned}$$

In the system of equations above, what is a possible value of  $k$  if the system has exactly two real solutions?

- A) 0
- B) 1
- C) 2
- D) 3

22

The quadratic function  $h$  is defined by  $h(x) = -(x - 1)^2 - 2$ . Which of the following could be the graph of  $y = h(x)$  shifted 2 units to the left?

**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.