Math Module 1

35 MINUTES, 22 QUESTIONS

DIRECTIONS ∨

*For **multiple-choice questions**, solve the problem and pick the correct answer from the provided choices. Each multiple-choice question has only one correct answer.*

For **student-produced response questions**, solve each problem and enter your answer following these guidelines:

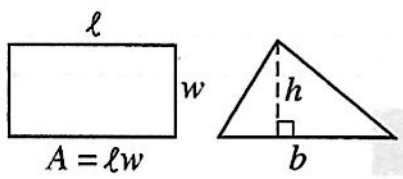
- If you find **more than one correct answer,** enter just one answer.
- You can enter up to five characters for a **positive** answer and up to six characters (this includes the negative sign) for a **negative** answer.
- If your answer is a **fraction** that does not fit in the given space, enter the decimal equivalent instead.
- If your answer is a **decimal** that does not fit in the given space, enter it by stopping at or rounding up at the fourth digit.
- If your answer is a mixed number (like 4½), enter it as an improper fraction (9/2) or its decimal equivalent (4.5).
- Do not enter symbols like a comma, dollar sign, or percent sign.

NOTES:

- All variables and expressions represent real numbers unless indicated otherwise.
- All figures are drawn to scale unless indicated otherwise.
- All figures are in a plane unless indicated otherwise.
- Unless indicated otherwise, the domain of a given function is the set of all real numbers x for which the function has real values.

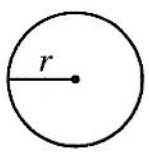
REFERENCE INFORMATION

Area Facts



$A = \ell w$

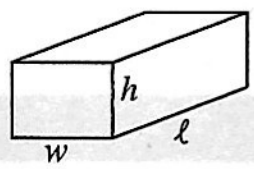
$A = \frac{1}{2}bh$



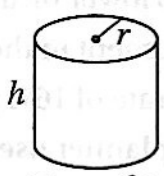
$A = \pi r^2$

$C = 2\pi r$

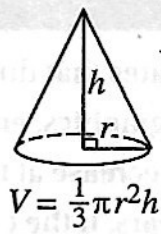
Volume Facts



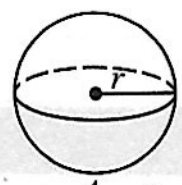
$V = \ell wh$



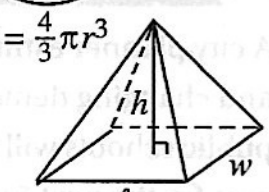
$V = \pi r^2 h$



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

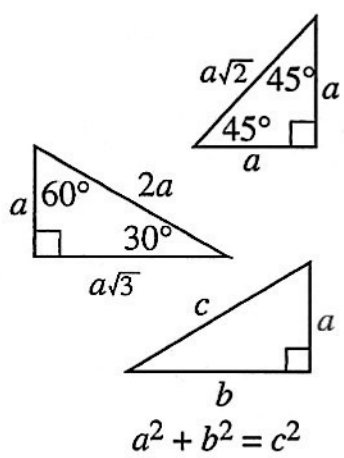


$V = \frac{4}{3}\pi r^3$



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

Triangle Facts



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

The arc of a circle contains 360°.
The arc of a circle contains 2π radians.
The sum of the measures of the angles in a triangle is 180°.

MODULE 1

1

$$5x - 1 = x + 51$$

Which equation has the same solution as the given equation?

Ⓐ $1 - 4x = 53$

Ⓑ $x - \frac{1}{3}x = 12$

Ⓒ $\frac{x}{2} = \frac{2}{13}$

Ⓓ $\frac{4}{26} = \frac{2}{x}$

2

$$C(n) = 110n + 900$$

The cost of airing a commercial on television, C, is modeled by the function above where n is the number of times the commercial is aired. Based on this model, which statement is true?

Ⓐ The commercial costs $0 to produce and $110 per airing up to $900.

Ⓑ The commercial costs $110 to produce and $900 each time it is aired.

Ⓒ The commercial costs $900 to produce and $110 each time it is aired.

Ⓓ The commercial costs $110 to produce and can air an unlimited number of times.

3

A city planner estimates that due to lower birth rates and changing demographics, enrollment in the city's public schools will decrease at the rate of 16% per year for the next 5 years. If the city planner uses the equation $P = P_0(r)^n$ to estimate the school enrollment, P, after n years, what value should be used for the value of r?

Ⓐ 1.16

Ⓑ 0.84

Ⓒ 0.80

Ⓓ 0.16

4

If function g is defined by $g(x) = x - 1$ and $2g(c) = 10$, what is the value of $g(3c)$?

Ⓐ 6
Ⓑ 9
Ⓒ 15
Ⓓ 17

5

In right triangle JKL, angle K is a right angle. If $\cos J = \frac{21}{29}$, what is the value of $\tan L$?

6

Mikala exercises in her gym by jogging on the treadmill at an average rate of 4 miles per hour and then pedaling on a stationary bicycle at an average rate of 8 miles per hour. In her workout, she jogs the equivalent of x miles and bicycles the equivalent of y miles. If Mikala works out for at least 45 minutes, which of the following is true?

Ⓐ $\frac{x}{4} + \frac{y}{8} \geq \frac{3}{4}$
Ⓑ $x + \frac{y}{2} \geq \frac{3}{4}$
Ⓒ $4x + 8y \geq 45$
Ⓓ $\frac{4}{x} + \frac{8}{y} \geq 45$

7

$$3y - 6 = 2x$$
$$2y - 3x = 4$$

Which of the following best describes the solution(s) to the given system of equations when graphed in the xy-plane?

Ⓐ No solution
Ⓑ One solution with the lines intersecting at right angles
Ⓒ One solution with the lines intersecting but not at right angles
Ⓓ Infinitely many solutions

8

Seawater contains approximately 1.2 ounces of salt per liter on average. How many gallons of seawater, to the nearest tenth of a gallon, would contain 1 pound of salt?

[Note: 1 gallon = 3.785 liters]

Ⓐ 3.3
Ⓑ 3.5
Ⓒ 4.7
Ⓓ 13.3

9

Which of the following statements is true about the parabola whose equation in the xy-plane is $y = (2x - 6)(x + 1)$?

I. The line $x = 2$ is a vertical line of symmetry.
II. The minimum value of y is -8.
III. The y-intercept is -6.

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

10

A survey is conducted in which 60% of the individuals who responded indicated that they do *not* support issuing a bond to help raise money to fund the construction of a new sports arena in their city. A statistician calculates the confidence level to be 95% for an interval of 5% below and above the 60% mark. Which conclusion is best supported by this information?

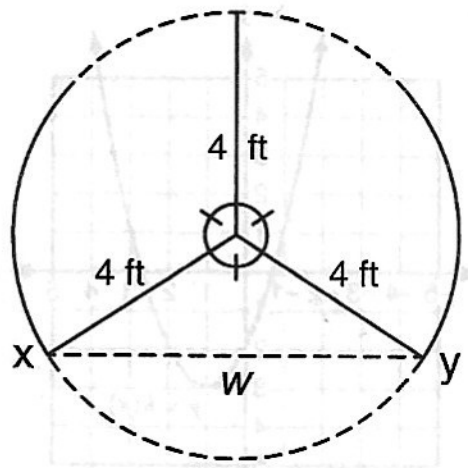
Ⓐ 95% of the people surveyed do not support the issuing of the bond.

Ⓑ The probability that a person selected at random from the sample does not support the issuing of the bond ranges from 0.57 to 0.63.

Ⓒ The probability that a person selected at random from the sample supports the issuing of the bond is 0.4.

Ⓓ If the survey were to be repeated 100 times, 95% of the time the number of people who would *not* support the issuing of the bond would range from 55% to 65% of those surveyed.

11



The accompanying diagram shows a revolving door with three panels, each of which is 4 feet long. What is the number of feet in the width, w, of the opening between points x and y?

Ⓐ $\frac{4}{\sqrt{3}}$

Ⓑ $4\sqrt{3}$

Ⓒ $8\sqrt{2}$

Ⓓ $8\sqrt{3}$

12

An opinion poll survey was conducted in which 120 sports fans and 75 non-sports fans participated. If the sample size was increased by 65 non-sports fans, how many sports fans should be added so that $\frac{3}{5}$ of those polled are sports fans?

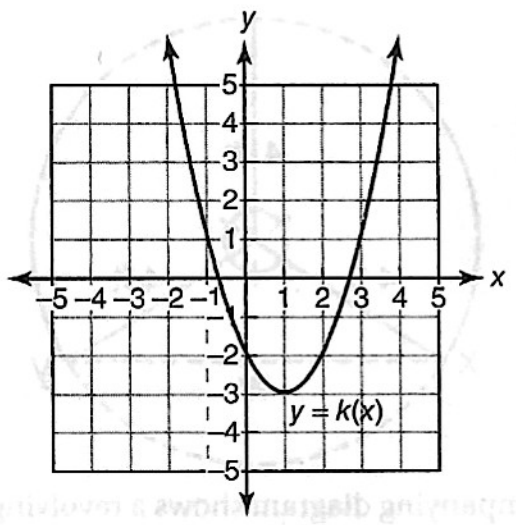
13

When graphed in the *xy*-plane, which of the given functions has the smallest *y*-intercept?

Ⓐ Function *f*:

x	$f(x)$
–4	0
–1	4
0	–1
2	–3

Ⓑ Function *k*:



Ⓒ Function *h* whose equation is $h(x) = \sqrt{x+2} - 4$

Ⓓ Function *g* whose equation is $g(x) = (x-5) \cdot 2^{x-1}$

14

	Vaccination and Flu Status				
Age	Unvaccinated No Flu	Unvaccinated Got Flu	Vaccinated No Flu	Vaccinated Got Flu	Total
Under 21	6	4	8	2	20
21–50	17	15	22	14	68
Over 50	2	9	32	19	62

The table above summarizes the results of a survey taken at the end of last year's flu season. What fraction of the people who got the flu were unvaccinated?

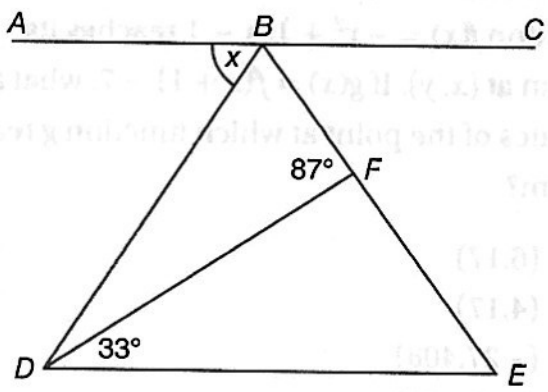
Ⓐ $\frac{2}{3}$

Ⓑ $\frac{4}{9}$

Ⓒ $\frac{3}{8}$

Ⓓ $\frac{1}{12}$

15



In the given figure, $\overline{ABC}$ is parallel to $\overline{DE}$, the measure of angle EDF is 33 degrees, the measure of angle DFB is 87 degrees, and $\overline{BE}$ bisects angle DBC. What is the degree measure of x?

16

Given the polynomial function $p(x)$, if $p(-2) = 0$, which statement is true?

Ⓐ $x + 2$ is a factor of $p(x)$.
Ⓑ $(0, -2)$ is the y-intercept of the graph of $y = p(x)$ in the xy-plane.
Ⓒ When $p(x)$ is divided by 2, the remainder is 0.
Ⓓ When $p(x)$ is divided by -2 the remainder is 0.

17

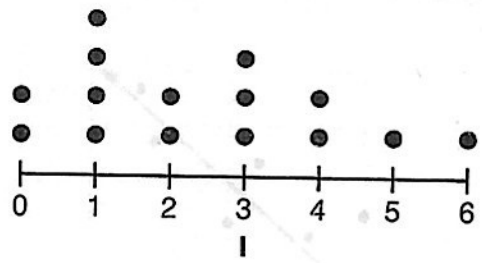
If $a^{\frac{2}{1-x}} = \frac{1}{\sqrt[5]{a^9}}$, what is the value of x?

18

The function $f(x) = -x^2 + 10x - 1$ reaches its maximum at (x, y). If $g(x) = f(x + 1) - 7$, what are the coordinates of the point at which function g reaches its maximum?

Ⓐ (6,17)
Ⓑ (4,17)
Ⓒ (−27,408)
Ⓓ (−25,408)

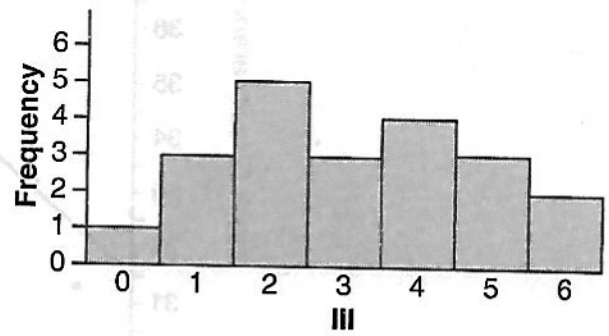
19



I

Data Value	Cumulative Frequency
0	1
1	7
2	8
3	10
4	14
5	14
6	17

II



III

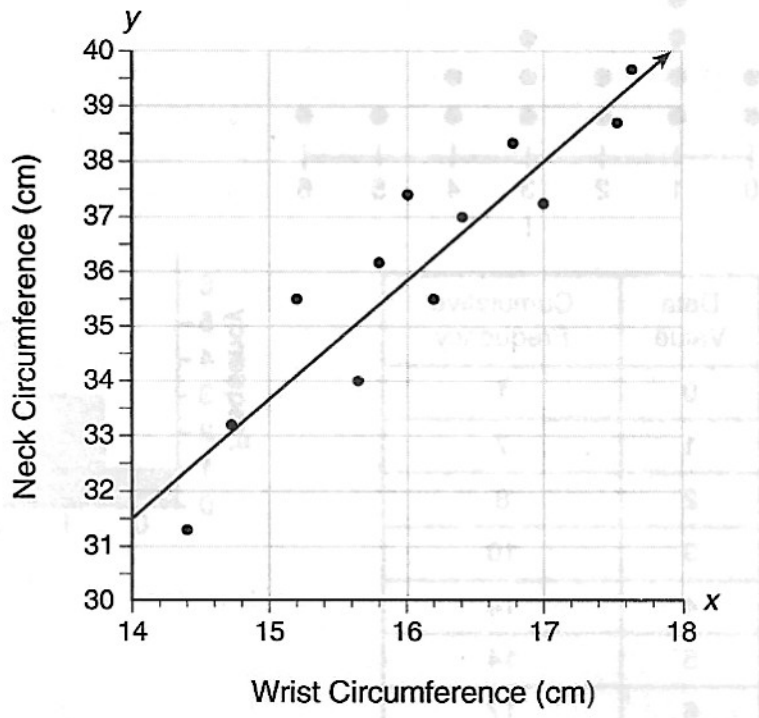
Which of the sets of data described above has a median of 3?

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

20

The equation of a circle in the xy-plane is $x^2 + 4x + y^2 - 10y = 20$. If the line $x = k$ intersects the circle in exactly one point, what is a possible value of k?

21



The scatterplot above summarizes the wrist and neck circumference measurements, in centimeters, for 12 people. The line of best fit is drawn. What proportion of the 12 measurements satisfy the inequality $|o - p| \leq d$ where o is the observed measurement, p is the corresponding measurement predicted by the line of best fit, and d is 0.5 centimeters?

Ⓐ $\frac{1}{6}$

Ⓑ $\frac{1}{4}$

Ⓒ $\frac{1}{3}$

Ⓓ $\frac{1}{2}$

22

$$d(t) = 5\sin\left(\frac{\pi}{6}(t-5)\right) + 7$$

The given function represents the depth of water, $d(t)$, in feet, at a particular beach location t hours past noon. Which statement or statements must be true?

I. The minimum depth occurred at 2:00 A.M.

II. The maximum depth occurred at 11:00 P.M.

III. The difference between the lowest and greatest depths is 10 feet.

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