Math Module 2

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:

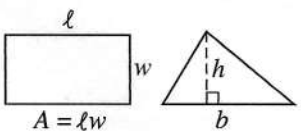
- If you find **more than one correct answer,** enter just one answer.
- You can enter up to five characters for a **positive** answer and up to six characters (this includes the negative sign) for a **negative** answer.
- If your answer is a **fraction** that does not fit in the given space, enter the 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:

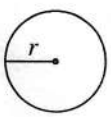
- Calculators **ARE PERMITTED** in this section.
- All variables and expressions represent real numbers unless indicated otherwise.
- All figures are drawn to scale unless indicated otherwise.
- All figures are in a plane unless indicated otherwise.
- Unless indicated otherwise, the domain of a given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

REFERENCE INFORMATION

Area Facts

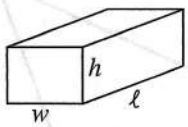


$A = \frac{1}{2}bh$



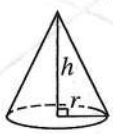
$A = \pi r^2$
$C = 2\pi r$

Volume Facts

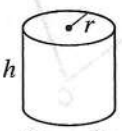


$V = \ell wh$

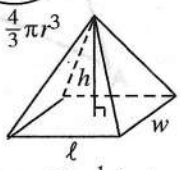
$V = \frac{4}{3}\pi r^3$



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

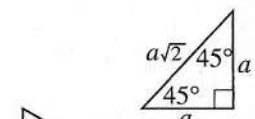


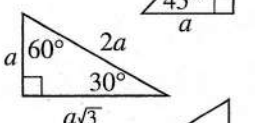
$V = \pi r^2 h$

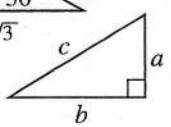


$V = \frac{1}{3}\ell wh$

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°.

1

$$\frac{\sqrt[8]{x^5}}{\sqrt[4]{x^3}},\ x>0$$

The given expression is equivalent to which of the following?

Ⓐ $\sqrt[8]{x}$

Ⓑ $\frac{1}{\sqrt[8]{x}}$

Ⓒ $\sqrt{x^{\frac{5}{3}}}$

Ⓓ $\frac{1}{\sqrt[6]{x^5}}$

2

George spent 25% of the money he had on lunch and 60% of the remaining money on dinner. If he then had $9.00 left, how much money did he spend on lunch and dinner?

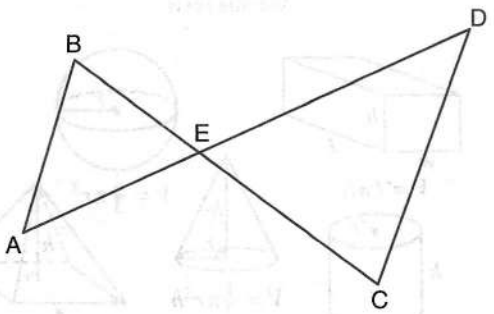
Ⓐ $19

Ⓑ $20

Ⓒ $21

Ⓓ $27

3



Note: Figure is not drawn to scale.

In the figure above, $\overline{AB} \parallel \overline{CD}$, $AD = 42$, $AB = 12$, and $CD = 16$. What is the length of $\overline{DE}$?

Ⓐ 21

Ⓑ 24

Ⓒ 27

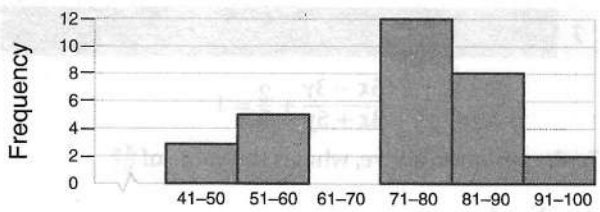
Ⓓ 30

4

A gardener wants to buy enough mulch to cover a rectangular garden that is 3 feet by 10 feet. One bag contains 2 cubic feet of mulch and costs $3.66. How much will the minimum number of bags cost to cover the garden with mulch 3 inches deep?

Ⓐ $10.98
Ⓑ $14.64
Ⓒ $29.28
Ⓓ $164.70

5



The histogram above shows the distribution of 30 test scores. If a test score is selected at random, what is the probability that the score falls in the interval that contains the median score?

Ⓐ $\frac{4}{15}$
Ⓑ $\frac{2}{5}$
Ⓒ $\frac{1}{2}$
Ⓓ $\frac{3}{5}$

6

An inheritance of $5,000 is placed into an account that yields an annual interest rate of 3.75%. If the investment were to be compounded monthly, which expression best represents the value, A, in the account after t years assuming no further deposits or withdrawals?

Ⓐ $A = 5{,}000\left(\frac{1.0375}{12}\right)^{12t}$

Ⓑ $A = 5{,}000\left(\frac{1.0375}{12}\right)^{\frac{t}{12}}$

Ⓒ $A = 5{,}000(1.003)^{12t}$

Ⓓ $A = 5{,}000(1.003)^{\frac{t}{12}}$

7

$$\frac{5x-3y}{3x+5y}+\frac{2}{3}=1$$

In the equation above, what is the value of $\frac{x}{y}$?

Ⓐ $\frac{1}{3}$

Ⓑ $\frac{2}{3}$

Ⓒ $\frac{5}{6}$

Ⓓ $\frac{7}{6}$

8

The equation of a parabola in the xy-plane is $y = 2x^2 - 12x + 7$. What is the distance between the vertex of the parabola and the point (3, 4)?

Ⓐ 6

Ⓑ 8

Ⓒ 11

Ⓓ 15

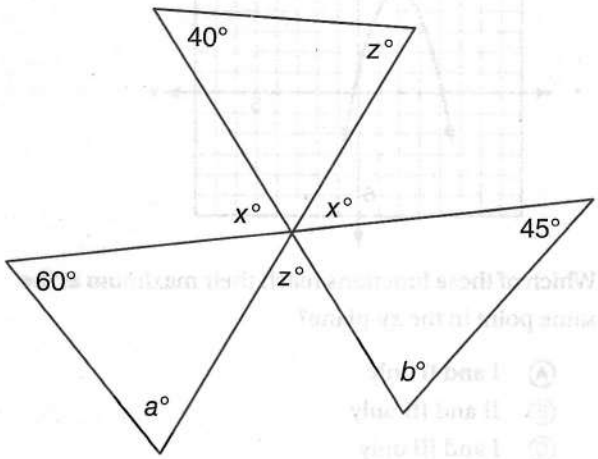
9

$$(ax+7)(bx-1)=12x^2+kx+(b-13)$$

If the equation above is true for all values of x where a, b, and k are non-zero constants, what is the value of k?

Ⓐ 40
Ⓑ 25
Ⓒ 17
Ⓓ 8

10



In the figure above, the measures of the angles are as marked. What is the value of $a+b$?

11

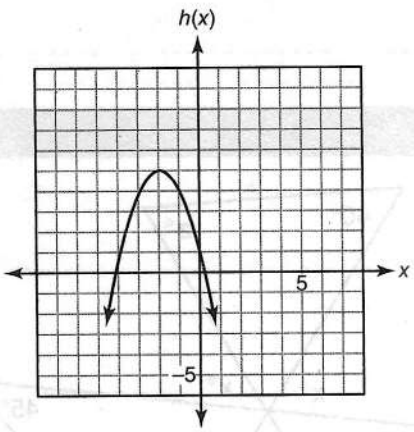
Three quadratic functions are described below.

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

II.

x	-5	-4	-3	-2	-1	0	1
$g(x)$	2	3	4	5	4	3	2

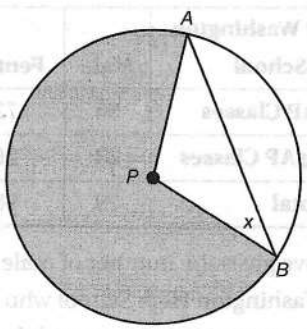
III.



Which of these functions reach their maximum at the same point in the xy-plane?

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

12



(Figure is not drawn to scale.)

In circle P above, $\overline{PA}$ and $\overline{PB}$ are radii and chord AB is drawn. The area of the shaded region is $\frac{7}{10}$ of the area of the circle. If angle x measures $k\pi$ radians, what is the value of k?

Ⓐ $\frac{1}{10}$

Ⓑ $\frac{1}{8}$

Ⓒ $\frac{1}{5}$

Ⓓ $\frac{2}{9}$

13

The amount of bacteria b growing in a laboratory setting can be modeled by the function $b(x) = 1{,}300\,(2.65)^x$. Which statement or statements are true?

I. x represents the number of time periods.

II. 1,300 represents the amount of bacteria currently present.

III. The bacteria are growing exponentially at a rate of 265% over each time period.

Ⓐ I only

Ⓑ I and II only

Ⓒ II and III only

Ⓓ I, II, and III

14

Students at Washington High School	Male	Female	Total
Taking AP Classes	56	72	128
Not Taking AP Classes	23	26	49
Total	79	98	177

The table above gives the number of male and female students at Washington High School who are taking Advanced Placement (AP) classes and those who are not. What is the proportion of the total number of students at the school who are both male and NOT taking AP classes?

Ⓐ $\frac{23}{177}$

Ⓑ $\frac{79}{177}$

Ⓒ $\frac{23}{49}$

Ⓓ $\frac{23}{56}$

15

$$f(x) = \frac{x^4 + 2x^3 - 3x^2 + 4x + 12}{x + 3}$$

Which of the following functions is equivalent to the function above for all values of x for which function f is defined?

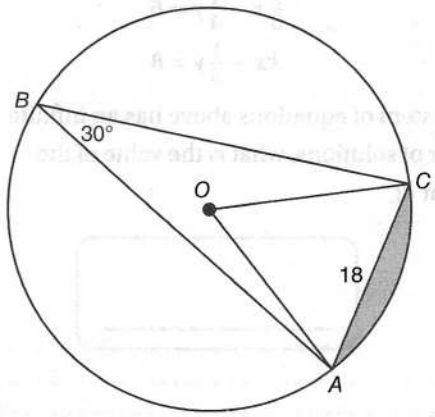
Ⓐ $g(x) = x^3 - x^2 + 4$

Ⓑ $g(x) = x^2 - x + 4$

Ⓒ $g(x) = x^3 - x^2 + 4x$

Ⓓ $g(x) = x^4 + 2x^3 - 3x^2 + 4$

16



In circle O above, chord $AC = 18$ centimeters, inscribed angle ABC measures 30 degrees, and radii OA and OC are drawn to the endpoints of chord AC. What is the number of square centimeters in the area of the shaded region?

Ⓐ $27\pi - 36\sqrt{3}$
Ⓑ $54\pi - 81\sqrt{3}$
Ⓒ $54\pi - 72\sqrt{3}$
Ⓓ $36\pi - \frac{81\sqrt{3}}{2}$

17

A student rewrote the function $h(m) = 81\,(3)^{2m-1}$ in three different ways:

I. $h(m) = (3)^{2m+3}$

II. $h(m) = 243\,(3)^{2m-1}$

III. $h(m) = 27(9^m)$

Which of these representations are correct?

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

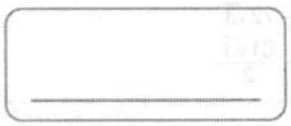
18

$$\frac{2}{3}x - \frac{1}{4}y = 6$$
$$kx - \frac{1}{3}y = 8$$

If the system of equations above has an infinite number of solutions, what is the value of the constant k?

19

Eleven seconds after a deep-sea diver jumps into the ocean, he is 69 feet below sea level and 28 seconds later, he is 195 feet below sea level. If he is descending under water at a constant rate, how many feet below sea level will he be 1.5 minutes after his initial descent?

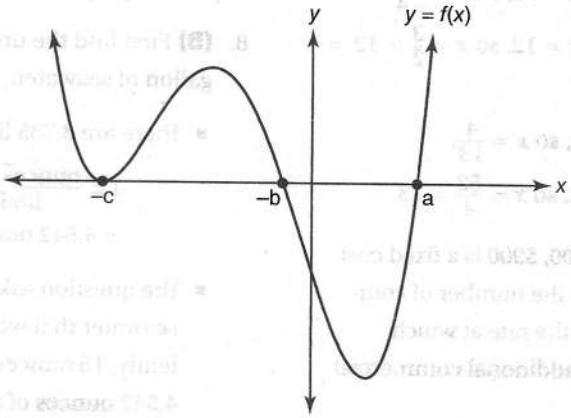


20

Function f is defined by the equation $f(x) = ax^2 + \frac{2}{a}x$. If $f(3) - f(2) = 11$, what is the *smallest* possible value of a?

Ⓐ $\frac{1}{6}$
Ⓑ $\frac{1}{5}$
Ⓒ $\frac{1}{2}$
Ⓓ 2

21



A sketch of function f with its x-intercepts is shown above. An equation of function f could be which of the following?

Ⓐ $f(x) = (x - a)(x + b)(x + c)$
Ⓑ $f(x) = (x + a)(x - b)(x - c)^2$
Ⓒ $f(x) = (x + a)(x - b)(x - c)$
Ⓓ $f(x) = (x - a)(x + b)(x + c)^2$

22

Given $f(x) = x^4 - x^3 - 6x^2$, for what values of x will $f(x) > 0$?

Ⓐ $x < -2$ only
Ⓑ $x < -2$ or $x > 3$
Ⓒ $x < -2$ or $0 < x \leq 3$
Ⓓ $x < 3$ only