# Math

27 QUESTIONS

DIRECTIONS

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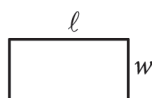
NOTES

Unless otherwise indicated:

- All variables and expressions represent real numbers.
- Figures provided are drawn to scale.
- All figures lie in a plane.
- The domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.
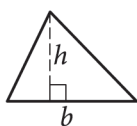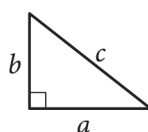
REFERENCE
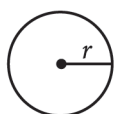
$A = \pi r^2$
$C = 2\pi r$
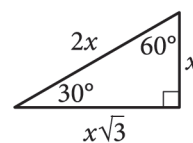
$A = \ell w$
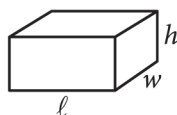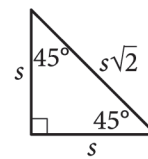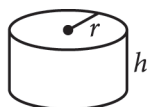
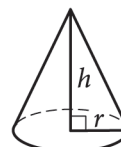$A = \dfrac{1}{2} bh$

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

Special Right Triangles

$V = \ell wh$

$V = \pi r^2 h$

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

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

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

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

The number of radians of arc in a circle is 2π.

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

CONTINUE ▶

For multiple-choice questions, solve each problem, choose the correct answer from the choices provided, and then circle your answer in this book. Circle only one answer for each question. If you change your mind, completely erase the circle. You will not get credit for questions with more than one answer circled, or for questions with no answers circled.

For student-produced response questions, solve each problem and write your answer next to or under the question in the test book as described below.

- Once you've written your answer, circle it clearly. You will not receive credit for anything written outside the circle, or for any questions with more than one circled answer.

- If you find **more than one correct answer**, write and circle only one answer.

- Your answer can be up to 5 characters for a **positive** answer and up to 6 characters (including the negative sign) for a **negative** answer, but no more.

- If your answer is a **fraction** that is too long (over 5 characters for positive, 6 characters for negative), write the decimal equivalent.

- If your answer is a **decimal** that is too long (over 5 characters for positive, 6 characters for negative), truncate it or round at the fourth digit.

- If your answer is a **mixed number** (such as $3\frac{1}{2}$), write it as an improper fraction (7/2) or its decimal equivalent (3.5).

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

CONTINUE

1

Tilly earns p dollars for every w hours of work. Which expression represents the amount of money, in dollars, Tilly earns for $39w$ hours of work?

A) $39p$

B) $\dfrac{p}{39}$

C) $p + 39$

D) $p - 39$

2

For a training program, Juan rides his bike at an average rate of 5.7 minutes per mile. Which function m models the number of minutes it will take Juan to ride x miles at this rate?

A) $m(x) = \dfrac{x}{5.7}$

B) $m(x) = x + 5.7$

C) $m(x) = x - 5.7$

D) $m(x) = 5.7x$

3

$$3x = 12$$
$$-3x + y = -6$$

The solution to the given system of equations is (x, y). What is the value of y ?
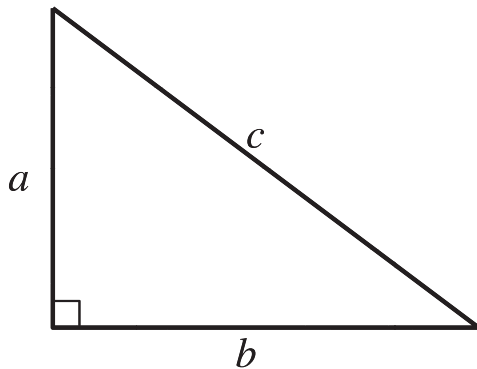
A) -3

B) 6

C) 18

D) 30

4

$$s = 40 + 3t$$

The equation gives the speed s, in miles per hour, of a certain car t seconds after it began to accelerate. What is the speed, in miles per hour, of the car 5 seconds after it began to accelerate?

A) 40

B) 43

C) 45

D) 55

5

Note: Figure not drawn to scale.

For the right triangle shown, $a = 4$ and $b = 5$. Which expression represents the value of c ?

A) $4 + 5$

B) $\sqrt{(4)(5)}$

C) $\sqrt{4 + 5}$

D) $\sqrt{4^2 + 5^2}$

6

$$4x + 5 = 165$$

What is the solution to the given equation?

7
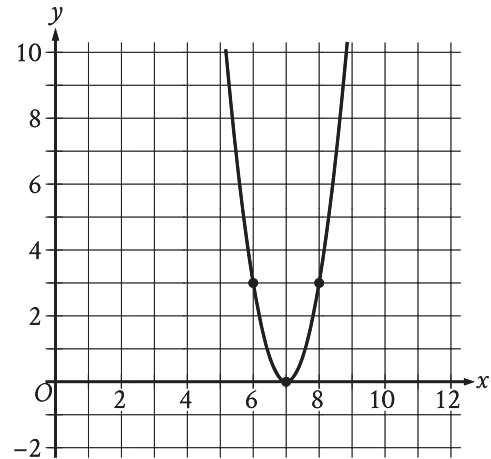
The x-intercept of the graph shown is $(x, 0)$. What is the value of x ?

8

The function f is defined by $f(x) = \dfrac{1}{10}x - 2$. What is the y-intercept of the graph of $y = f(x)$ in the xy-plane?

A) $(-2, 0)$

B) $(0, -2)$

C) $\left(0, \dfrac{1}{10}\right)$

D) $\left(\dfrac{1}{10}, 0\right)$

CONTINUE

9

The function f is defined by $f(x) = 7x^3$. In the xy-plane, the graph of $y = g(x)$ is the result of shifting the graph of $y = f(x)$ down 2 units. Which equation defines function g ?

A) $g(x) = \dfrac{7}{2}x^3$

B) $g(x) = 7x^{\frac{3}{2}}$

C) $g(x) = 7x^3 + 2$

D) $g(x) = 7x^3 - 2$

10

$$x + 7 = 10$$
$$(x + 7)^2 = y$$

Which ordered pair (x, y) is a solution to the given system of equations?

A) $(3, 100)$

B) $(3, 3)$

C) $(3, 10)$

D) $(3, 70)$

11

Which expression is equivalent to $(7x^3 + 7x) - (6x^3 - 3x)$?
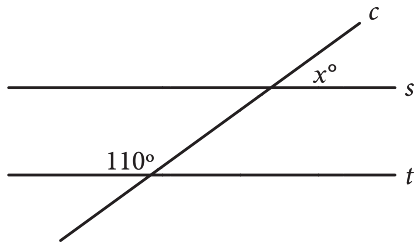
A) $x^3 + 10x$

B) $-13x^3 + 10x$

C) $-13x^3 + 4x$

D) $x^3 + 4x$

12

The function p is defined by $p(n) = 7n^3$. What is the value of n when $p(n)$ is equal to 56?

A) 2

B) $\dfrac{8}{3}$

C) 7

D) 8

CONTINUE

13

Note: Figure not drawn to scale.

In the figure shown, line *c* intersects parallel lines *s* and *t*. What is the value of *x* ?

14

A list of 10 data values is shown.

6, 8, 16, 4, 17, 26, 8, 5, 5, 5

What is the mean of these data?

15

The equation $E(t) = 5(1.8)^t$ gives the estimated number of employees at a restaurant, where *t* is the number of years since the restaurant opened. Which of the following is the best interpretation of the number 5 in this context?

A) The estimated number of employees when the restaurant opened

B) The increase in the estimated number of employees each year

C) The number of years the restaurant has been open

D) The percent increase in the estimated number of employees each year

16

$$g(x) = x^2 + 55$$

What is the minimum value of the given function?

A) 0

B) 55

C) 110

D) 3,025

CONTINUE

17

Each year, the value of an investment increases by 0.49% of its value the previous year. Which of the following functions best models how the value of the investment changes over time?

A) Decreasing exponential

B) Decreasing linear

C) Increasing exponential

D) Increasing linear

18

The population of Greenville increased by 7% from 2015 to 2016. If the 2016 population is k times the 2015 population, what is the value of k ?

A) 0.07

B) 0.7

C) 1.07

D) 1.7

19

Which expression is equivalent to $a^{\frac{11}{12}}$, where $a > 0$?

A) $\sqrt[12]{a^{132}}$

B) $\sqrt[144]{a^{132}}$

C) $\sqrt[121]{a^{132}}$

D) $\sqrt[11]{a^{132}}$

20

An event planner is planning a party. It costs the event planner a onetime fee of $35 to rent the venue and $10.25 per attendee. The event planner has a budget of $200. What is the greatest number of attendees possible without exceeding the budget?

21

If $|4x - 4| = 112$, what is the positive value of $x - 1$?

22

A cube has an edge length of 68 inches. A solid sphere with a radius of 34 inches is inside the cube, such that the sphere touches the center of each face of the cube. To the nearest cubic inch, what is the volume of the space in the cube <u>not</u> taken up by the sphere?

A) 149,796

B) 164,500

C) 190,955

D) 310,800

CONTINUE ▶

23

What is the diameter of the circle in the xy-plane with equation $(x - 5)^2 + (y - 3)^2 = 16$?

A) 4

B) 8

C) 16

D) 32

24

For the exponential function f, the value of $f(1)$ is k, where k is a constant. Which of the following equivalent forms of the function f shows the value of k as the coefficient or the base?

A) $f(x) = 50(1.6)^{x+1}$

B) $f(x) = 80(1.6)^{x}$

C) $f(x) = 128(1.6)^{x-1}$

D) $f(x) = 204.8(1.6)^{x-2}$

25

A model estimates that at the end of each year from 2015 to 2020, the number of squirrels in a population was 150% more than the number of squirrels in the population at the end of the previous year. The model estimates that at the end of 2016, there were 180 squirrels in the population. Which of the following equations represents this model, where n is the estimated number of squirrels in the population t years after the end of 2015 and $t \le 5$?

A) $n = 72(1.5)^{t}$

B) $n = 72(2.5)^{t}$

C) $n = 180(1.5)^{t}$

D) $n = 180(2.5)^{t}$

CONTINUE

26

$$5x + 7y = 1$$
$$ax + by = 1$$

In the given pair of equations, a and b are constants. The graph of this pair of equations in the xy-plane is a pair of perpendicular lines. Which of the following pairs of equations also represents a pair of perpendicular lines?

A) $10x + 7y = 1$
    $ax - 2by = 1$

B) $10x + 7y = 1$
    $ax + 2by = 1$

C) $10x + 7y = 1$
    $2ax + by = 1$

D) $5x - 7y = 1$
    $ax + by = 1$

27

$$x^2 - 34x + c = 0$$

In the given equation, c is a constant. The equation has no real solutions if $c > n$. What is the least possible value of n?

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.