

Math

27 QUESTIONS

DIRECTIONS

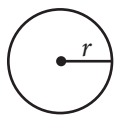
The questions in this section address a number of important math skills.
Use of a calculator is permitted for all questions.

NOTES

Unless otherwise indicated:

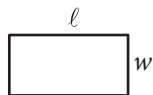
- All variables and expressions represent real numbers.
- Figures provided are drawn to scale.
- All figures lie in a plane.
- The domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE

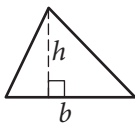


$$A = \pi r^2$$

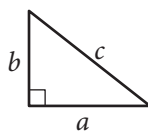
$$C = 2\pi r$$



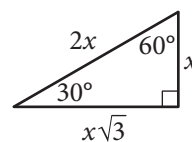
$$A = \ell w$$



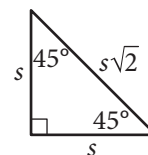
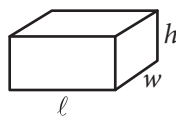
$$A = \frac{1}{2}bh$$



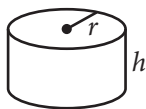
$$c^2 = a^2 + b^2$$



Special Right Triangles



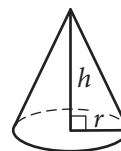
$$V = \ell wh$$



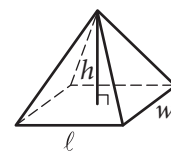
$$V = \pi r^2 h$$



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



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



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

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

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

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

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

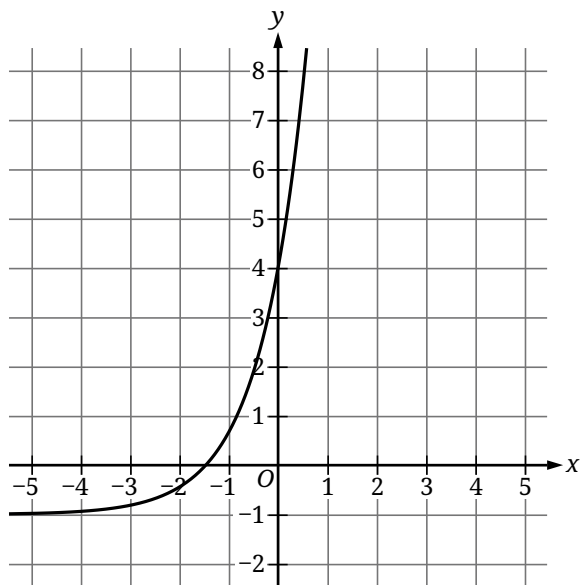
For student-produced response questions, solve each problem and write your answer next to or under the question in the test book as described below.

- Once you've written your answer, circle it clearly. You will not receive credit for anything written outside the circle, or for any questions with more than one circled answer.
- If you find **more than one correct answer**, write and circle only one answer.
- Your answer can be up to 5 characters for a **positive** answer and up to 6 characters (including the negative sign) for a **negative** answer, but no more.
- If your answer is a **fraction** that is too long (over 5 characters for positive, 6 characters for negative), write the decimal equivalent.
- If your answer is a **decimal** that is too long (over 5 characters for positive, 6 characters for negative), truncate it or round at the fourth digit.
- If your answer is a **mixed number** (such as $3\frac{1}{2}$), write it as an improper fraction ($\frac{7}{2}$) or its decimal equivalent (3.5).
- Don't include **symbols** such as a percent sign, comma, or dollar sign in your circled answer.

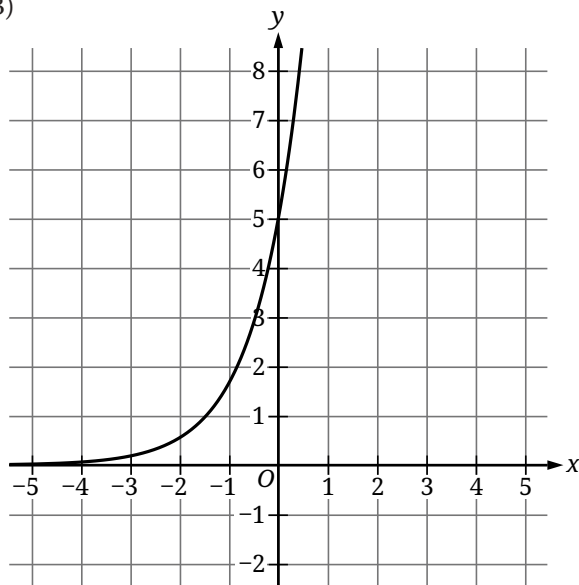
1

Which of the following graphs has a y -intercept of $(0, 5)$?

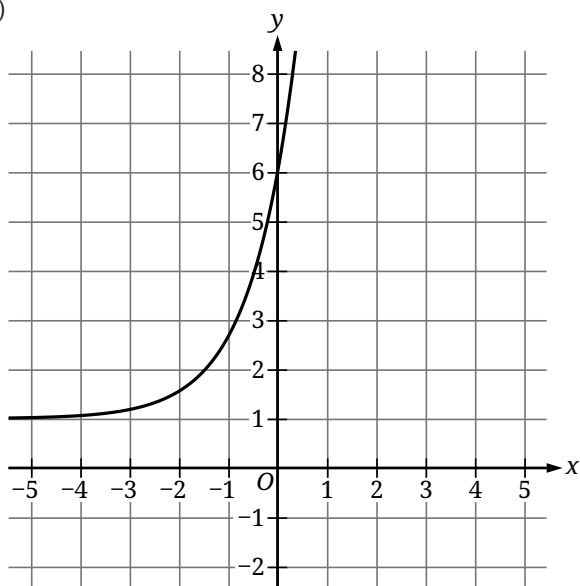
A)



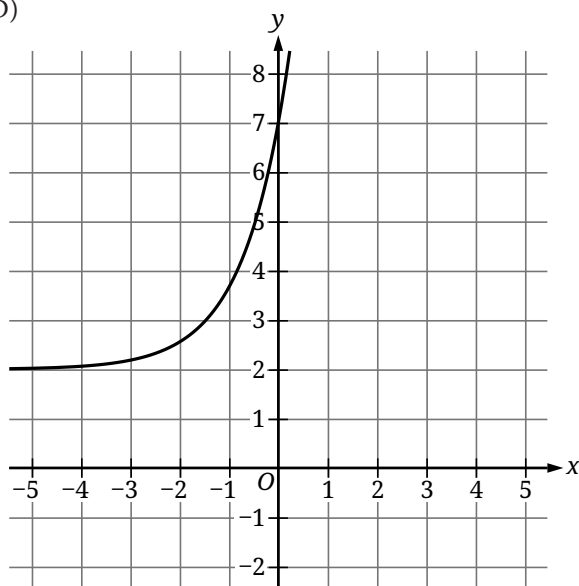
B)



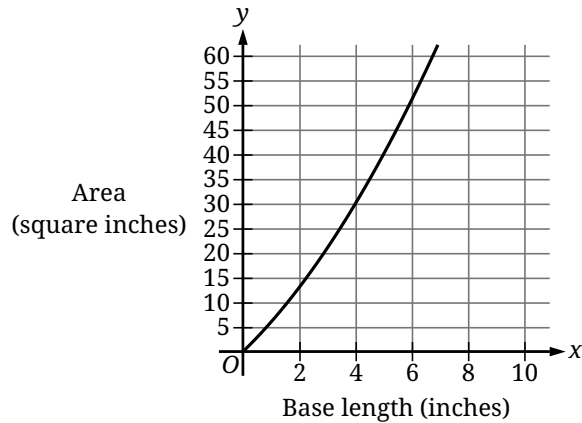
C)



D)



2



Karl cuts triangular pieces of plywood to be used in a wall art project. The graph gives the area y , in square inches, for each piece of plywood, where x is the base length, in inches, of the piece of plywood and $x > 0$. According to the graph, what is the best estimate of the area, in square inches, of one of Karl's triangular pieces of plywood with a base length of 4 inches?

- A) 4
- B) 8
- C) 16
- D) 30

3

An object's average acceleration, in meters per second squared, is the change in the object's speed, in meters per second, divided by the time during which the change occurred, in seconds. A car's speed changes by 58 meters per second in 8 seconds. What is the car's average acceleration, in meters per second squared, during this time period?

- A) 0.14
- B) 7.25
- C) 50
- D) 66

4

The length of each side of triangle A is 280 millimeters. The length of each side of triangle B is double the length of each side of triangle A. What is the length, in millimeters, of each side of triangle B?

- A) 280
- B) 282
- C) 560
- D) 1,120

5

The relationship between the variables x and y is defined by an exponential equation. When $x = 0$, the value of y is 60, and for every increase in the value of x by 1, the corresponding value of y increases by 10% of its previous value. Which equation represents this relationship?

- A) $y = 60(1.10)^x$
- B) $y = 60(1.01)^x$
- C) $y = 10(1.60)^x$
- D) $y = 10(1.06)^x$

6

A certain recreational speedboat can travel at a maximum speed of 20 meters per second. At this maximum speed, how many meters would this boat travel in 4 seconds?

7

What is 10% of 640?

8

Which expression is equivalent to $4xy(2x^2 + 6y)$?

- A) $6x^3y + 10xy^2$
- B) $8x^2y + 6y$
- C) $8x^2y + 24xy$
- D) $8x^3y + 24xy^2$

9

In one week, Sophia earned a total of \$1,007 by working at her full-time job and at a part-time job. The equation $23h + 10c = 1,007$ represents this situation, where h is the number of hours worked at her full-time job and c is the number of hours worked at her part-time job. Which of the following is the best interpretation of 23 in this context?

- A) The amount, in dollars, Sophia earned for each hour she worked at her full-time job
- B) The amount, in dollars, Sophia earned for each hour she worked at her part-time job
- C) The number of hours Sophia worked in one week at her full-time job
- D) The number of hours Sophia worked in one week at her part-time job

10

The function f is defined by $f(x) = \frac{5}{11}x$. What is the slope of the graph of $y = f(x)$ in the xy -plane?

A) 0

B) $\frac{5}{11}$ C) $\frac{11}{5}$

D) The slope is undefined.

11

A food manufacturer advertises that bags of cereal produced by the manufacturer weigh, on average, 1 pound each. To test this, Jordan selected at random 35 bags of cereal produced by the manufacturer and weighed each bag. Based on his measurements, Jordan estimated that for all bags of cereal produced by the manufacturer, the average weight per bag is 1.03 pounds, with a margin of error of 0.05 pounds. For all bags of cereal produced by the manufacturer, which of the following is the most appropriate conclusion about the average weight w , in pounds, per bag?

A) $w = 1.03$ B) $0.98 \leq w \leq 1.03$ C) $0.98 \leq w \leq 1.08$ D) $1.03 \leq w \leq 1.08$

12

A cylinder has a diameter of 12 inches and a height of 21 inches. What is the volume, in cubic inches, of the cylinder?

A) 36π B) 252π C) 756π D) $3,024\pi$

13

A rectangle has a length of 20 inches and a width of 1 inch. What is the area, in square inches, of the rectangle?

14

The function f is defined by $f(x) = 9x + 21$. What is the value of $f(x)$ when $x = 1$?

15

Luca plants 205 seedlings per hour. On Monday, he planted seedlings for 1 hour. On Tuesday, he planted seedlings for t hours. Which function s gives the total number of seedlings Luca planted on Monday and Tuesday?

- A) $s(t) = 205t$
- B) $s(t) = 205t + 205t$
- C) $s(t) = 205 + 205(t + 1)$
- D) $s(t) = 205(t + 1)$

16

For 5 years, an arborist measured the growth rates of two trees that were growing near each other: a silver maple tree and a red maple tree. Each year, the silver maple tree's height increase was 2.3 feet. Each year, the red maple tree's height increase was 32% less than the silver maple tree's height increase in the same year. Which of the following types of functions best models how the height of the red maple tree changed over time during these 5 years?

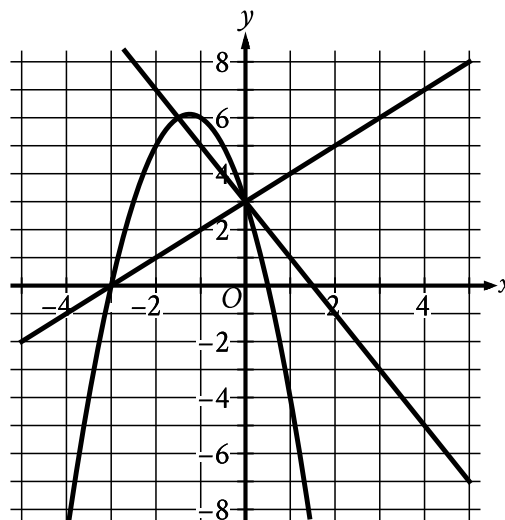
- A) Decreasing exponential
- B) Increasing exponential
- C) Decreasing linear
- D) Increasing linear

17

If $\frac{x - 19}{24} = \frac{x - 19}{8}$, what is the value of $x + 19$?

- A) 0
- B) 3
- C) 19
- D) 38

18



The graph of a system of three equations is shown. The system consists of two linear equations and one quadratic equation. How many solutions does this system have?

- A) 1
- B) 2
- C) 3
- D) 4

19

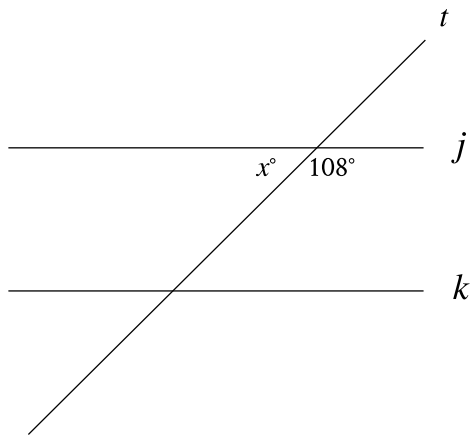
$$y < 48 - 8x$$

$$\frac{y}{8} > 10$$

Which inequality represents the x values for all solutions (x, y) that satisfy the given system of inequalities in the xy -plane?

- A) $x > 6$
- B) $x < 6$
- C) $x > -4$
- D) $x < -4$

20



Note: Figure not drawn to scale.

In the figure, line j is parallel to line k . What is the value of x ?

21

The expression $4x^3 + 32$ is equivalent to $k(x^3 + 8)$, where k is a constant. What is the value of k ?

22

$$3x^2 - 3x - 1 = 0$$

What are all possible solutions to the given equation?

- A) $x = \frac{1}{2} \pm \frac{\sqrt{3}}{6}$
- B) $x = -\frac{1}{2} \pm \frac{\sqrt{3}}{6}$
- C) $x = \frac{1}{2} \pm \frac{\sqrt{21}}{6}$
- D) $x = -\frac{1}{2} \pm \frac{\sqrt{21}}{6}$

23

When several resistors are connected in series in a circuit, the total resistance of the circuit is the sum of the resistances of these resistors. A certain circuit consists of 7 resistors connected in series, where the resistance of each resistor is positive. This circuit has a total resistance of 110 ohms. The total resistance of 3 resistors in this circuit is 90 ohms. Which inequality best represents all possible values of the resistance x , in ohms, of one of the other 4 resistors in this circuit?

- A) $0 < x < 5$
- B) $0 < x < 20$
- C) $20 < x < 90$
- D) $20 < x < 110$

24

A scientist combines two different concentrations of an oxygen-nitrogen gas mixture at a constant temperature to fill a tank to a total pressure of 80 atmospheres (atm), of which 36% is contributed by oxygen. Gas mixture A contributes x atm of pressure to the tank, of which 27% is contributed by oxygen. Gas mixture B contributes y atm of pressure to the tank, of which 45% is contributed by oxygen. Which system of equations represents this situation?

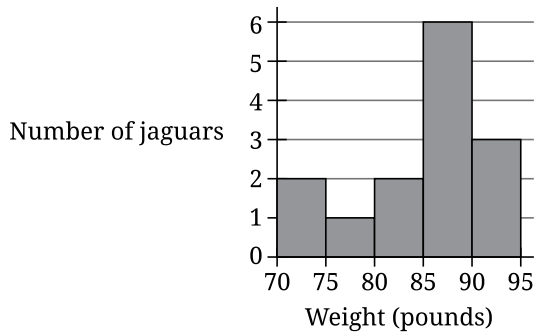
- A) $x + y = 80$
 $0.45x + 0.27y = 0.36(80)$
- B) $x + y = 80$
 $0.27x + 0.45y = 0.36(80)$
- C) $x + y = 0.36(80)$
 $0.45x + 0.27y = 80$
- D) $x + y = 0.36(80)$
 $0.27x + 0.45y = 80$

25

In the xy -plane, line k and line ℓ are perpendicular and intersect at the point $(2, 8)$. If line k is defined by the equation $y = mx + b$, where m and b are constants and $m > 1$, which of the following points lies on line ℓ ?

- A) $\left(3, 8 - \frac{1}{m}\right)$
- B) $\left(3, 8 + \frac{1}{m}\right)$
- C) $(3, 8 - m)$
- D) $(3, 8 + m)$

26



The histogram summarizes a data set of the weights, in pounds, of 14 young female jaguars. If an additional weight of 32 pounds is added to the original data set to create a new data set of 15 weights, which of the following measures must be less for the new data set than for the original data set?

- I. The median
 - II. The mean
- A) I only
B) II only
C) I and II
D) Neither I nor II

27

$$(x - 245)(x + 246) = 0$$

What is a solution to the given equation?

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.**