# Math Test – No Calculator

## 25 MINUTES, 20 QUESTIONS

**Turn to Section 3 of your answer sheet to answer the questions in this section.**

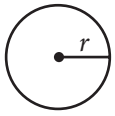
### DIRECTIONS

**For questions 1-15**, solve each problem, choose the best answer from the choices provided, and fill in the corresponding bubble on your answer sheet. **For questions 16-20**, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 16 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

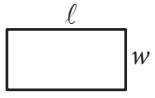
### NOTES

1. The use of a calculator **is not permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated, the domain of a given function $f$ is the set of all real numbers $x$ for which $f(x)$ is a real number.

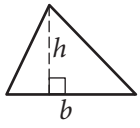
### REFERENCE



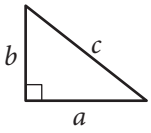

$A = \pi r^2$
$C = 2\pi r$



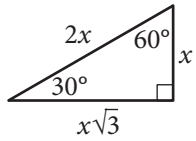

$A = \ell w$

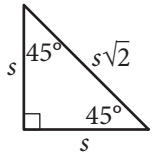



$A = \frac{1}{2}bh$

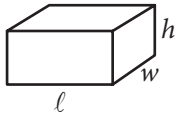



$c^2 = a^2 + b^2$

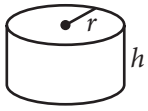


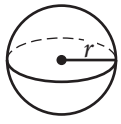

Special Right Triangles



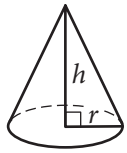

$V = \ell wh$



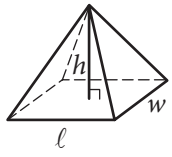

$V = \pi r^2 h$




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




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




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

The number of degrees of arc in a circle is 360.
The number of radians of arc in a circle is $2\pi$.
The sum of the measures in degrees of the angles of a triangle is 180.



CONTINUE

1

$$2z + 1 = z$$

What value of $z$ satisfies the equation above?

A) $-2$

B) $-1$

C) $\frac{1}{2}$

D) $1$

2

A television with a price of $300 is to be purchased with an initial payment of $60 and weekly payments of $30. Which of the following equations can be used to find the number of weekly payments, $w$, required to complete the purchase, assuming there are no taxes or fees?

A) $300 = 30w - 60$

B) $300 = 30w$

C) $300 = 30w + 60$

D) $300 = 60w - 30$

3

Shipping Charges

| Merchandise weight (pounds) | Shipping charge |
|---|---|
| 5 | $16.94 |
| 10 | $21.89 |
| 20 | $31.79 |
| 40 | $51.59 |

The table above shows shipping charges for an online retailer that sells sporting goods. There is a linear relationship between the shipping charge and the weight of the merchandise. Which function can be used to determine the total shipping charge $f(x)$, in dollars, for an order with a merchandise weight of $x$ pounds?

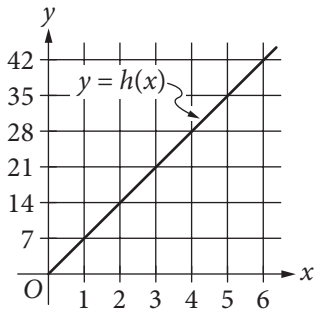
A) $f(x) = 0.99x$

B) $f(x) = 0.99x + 11.99$

C) $f(x) = 3.39x$

D) $f(x) = 3.39x + 16.94$

4




The line in the $xy$-plane above represents the relationship between the height $h(x)$, in feet, and the base diameter $x$, in feet, for cylindrical Doric columns in ancient Greek architecture. How much greater is the height of a Doric column that has a base diameter of 5 feet than the height of a Doric column that has a base diameter of 2 feet?

A) 7 feet

B) 14 feet

C) 21 feet

D) 24 feet

5

$$\sqrt{9x^2}$$

If $x > 0$, which of the following is equivalent to the given expression?

A) $3x$

B) $3x^2$

C) $18x$

D) $18x^4$

6

$$\frac{x^2 - 1}{x - 1} = -2$$

What are all values of $x$ that satisfy the equation above?

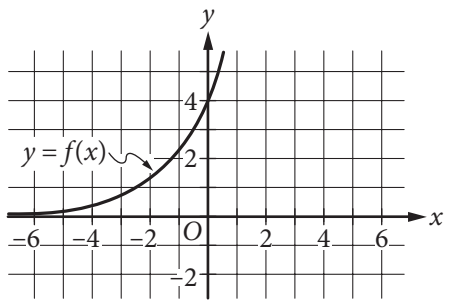
A) $-3$

B) 0

C) 1

D) $-3$ and $-1$

7




The graph of $y = f(x)$ is shown in the $xy$-plane. What is the value of $f(0)$ ?

A) 0

B) 2

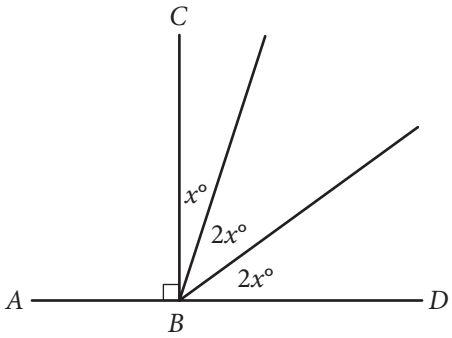
C) 3

D) 4



CONTINUE

8




In the figure above, point $B$ lies on $\overline{AD}$. What is the value of $3x$ ?

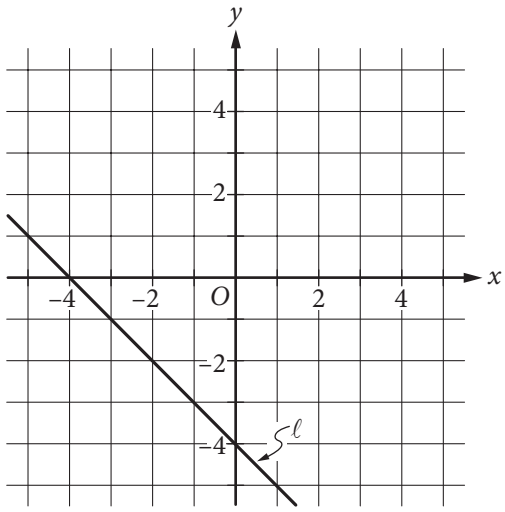
A) 18

B) 36

C) 54

D) 72

9




Which of the following is an equation of line in the $xy$-plane above?

A) $x - y = -4$

B) $x - y = 4$

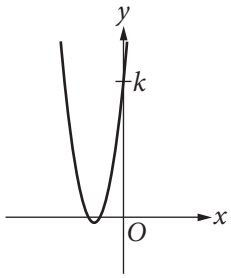
C) $x + y = -4$

D) $x + y = 4$



CONTINUE

**10**




The graph of $y = 2x^2 + 10x + 12$ is shown. If the graph crosses the $y$-axis at the point $(0, k)$, what is the value of $k$ ?

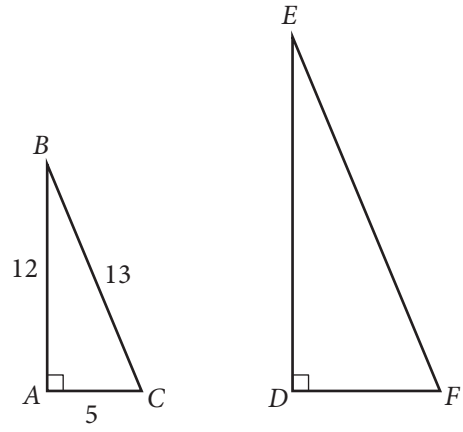
A) 2
B) 6
C) 10
D) 12

**11**

A circle in the $xy$-plane has center $(5, 7)$ and radius 2. Which of the following is an equation of the circle?

A) $(x-5)^2 + (y-7)^2 = 4$
B) $(x+5)^2 + (y+7)^2 = 4$
C) $(x-5)^2 + (y-7)^2 = 2$
D) $(x+5)^2 + (y+7)^2 = 2$

**12**




In the figure above, triangle $ABC$ is similar to triangle $DEF$. What is the value of $\cos(E)$ ?

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



CONTINUE

13

In the $xy$-plane, the graph of the function $f(x) = x^2 + 5x + 4$ has two $x$-intercepts. What is the distance between the $x$-intercepts?

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

14

$$\sqrt{4x} = x - 3$$

What are all values of $x$ that satisfy the given equation?

I. 1
II. 9

A) I only
B) II only
C) I and II
D) Neither I nor II

15

$$-3x + y = 6$$

$$ax + 2y = 4$$

In the system of equations above, $a$ is a constant. For which of the following values of $a$ does the system have no solution?

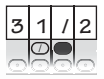
A) $-6$
B) $-3$
C) 3
D) 6

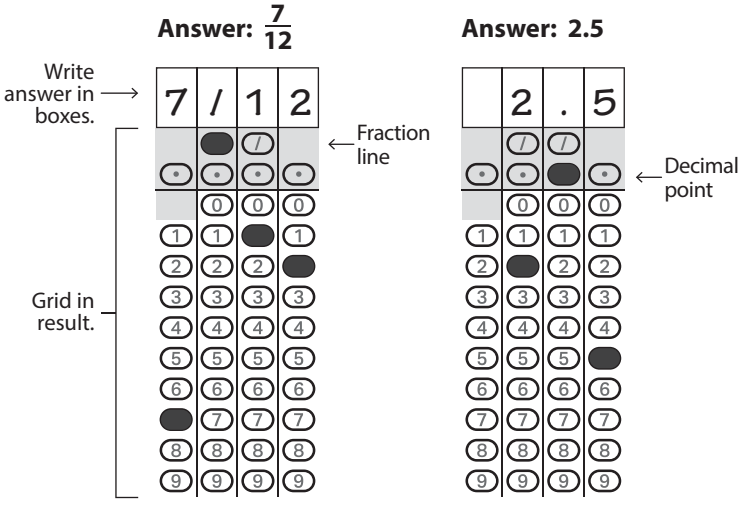


CONTINUE

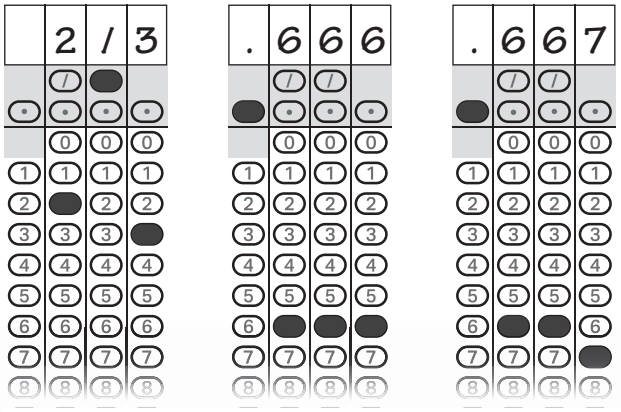
**DIRECTIONS**

**For questions 16-20**, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

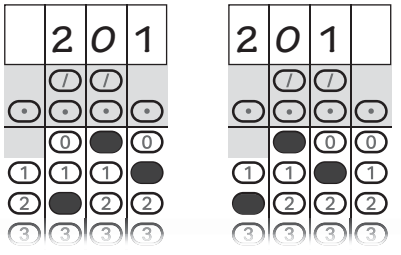
1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the bubbles accurately. You will receive credit only if the bubbles are filled in correctly.
2. Mark no more than one bubble in any column.
3. No question has a negative answer.
4. Some problems may have more than one correct answer. In such cases, grid only one answer.
5. **Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or 7/2. (If  is entered into the grid, it will be interpreted as $\frac{31}{2}$, not $3\frac{1}{2}$.)
6. **Decimal answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.




**Acceptable ways to grid $\frac{2}{3}$ are:**



**Answer: 201 – either position is correct**



**NOTE:**
You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.



CONTINUE

16

$$T = 5c + 12f$$

A manufacturer shipped units of a certain product to two locations. The equation above shows the total shipping cost $T$, in dollars, for shipping $c$ units to the closer location and shipping $f$ units to the farther location. If the total shipping cost was \$47,000 and 3000 units were shipped to the farther location, how many units were shipped to the closer location?

17

$$|2x + 1| = 5$$

If $a$ and $b$ are the solutions to the equation above, what is the value of $|a - b|$ ?

18

Juan purchased an antique that had a value of \$200 at the time of purchase. Each year, the value of the antique is estimated to increase 10% over its value the previous year. The estimated value of the antique, in dollars, 2 years after purchase can be represented by the expression $200a$, where $a$ is a constant. What is the value of $a$ ?

19

$$2x + 3y = 1200$$
$$3x + 2y = 1300$$

Based on the system of equations above, what is the value of $5x + 5y$ ?

20

If $u + t = 5$ and $u - t = 2$, what is the value of $(u - t)(u^2 - t^2)$ ?

# STOP

**If you finish before time is called, you may check your work on this section only. Do not turn to any other section.**