



# Math Test – No Calculator

25 MINUTES, 20 QUESTIONS

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

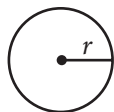
## DIRECTIONS

For questions 1-15, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle 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

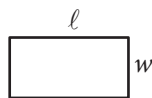
1. The use of a calculator **is not permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated,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

## REFERENCE

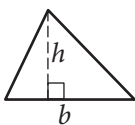


$$A = \pi r^2$$

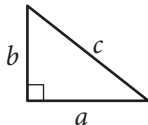
$$C = 2\pi r$$



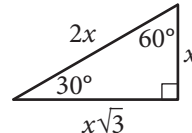
$$A = \ell w$$



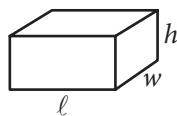
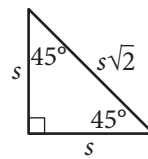
$$A = \frac{1}{2}bh$$



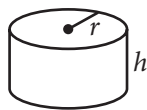
$$c^2 = a^2 + b^2$$



Special Right Triangles



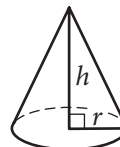
$$V = \ell wh$$



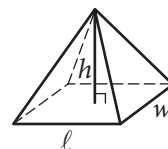
$$V = \pi r^2 h$$



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



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



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

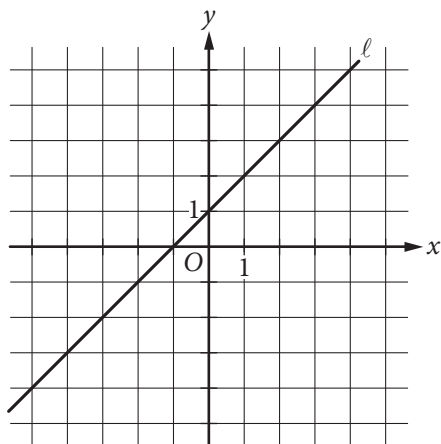
The number of degrees of arc in a circle is 360.

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.



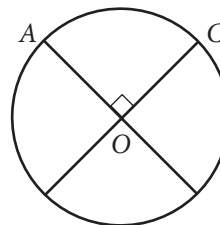
1



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

- A)  $x = 1$
- B)  $y = 1$
- C)  $y = x$
- D)  $y = x + 1$

2



The circle above with center  $O$  has a circumference of 36. What is the length of minor arc  $\widehat{AC}$  ?

- A) 9
- B) 12
- C) 18
- D) 36

3

What are the solutions of the quadratic equation  $4x^2 - 8x - 12 = 0$  ?

- A)  $x = -1$  and  $x = -3$
- B)  $x = -1$  and  $x = 3$
- C)  $x = 1$  and  $x = -3$
- D)  $x = 1$  and  $x = 3$



4

Which of the following is an example of a function whose graph in the  $xy$ -plane has no  $x$ -intercepts?

- A) A linear function whose rate of change is not zero
- B) A quadratic function with real zeros
- C) A quadratic function with no real zeros
- D) A cubic polynomial with at least one real zero

5

$$\sqrt{k+2} - x = 0$$

In the equation above,  $k$  is a constant. If  $x = 9$ , what is the value of  $k$ ?

- A) 1
- B) 7
- C) 16
- D) 79

6

Which of the following is equivalent to the sum of the expressions  $a^2 - 1$  and  $a + 1$ ?

- A)  $a^2 + a$
- B)  $a^3 - 1$
- C)  $2a^2$
- D)  $a^3$

7

Jackie has two summer jobs. She works as a tutor, which pays \$12 per hour, and she works as a lifeguard, which pays \$9.50 per hour. She can work no more than 20 hours per week, but she wants to earn at least \$220 per week. Which of the following systems of inequalities represents this situation in terms of  $x$  and  $y$ , where  $x$  is the number of hours she tutors and  $y$  is the number of hours she works as a lifeguard?

- A)  $12x + 9.5y \leq 220$   
 $x + y \geq 20$
- B)  $12x + 9.5y \leq 220$   
 $x + y \leq 20$
- C)  $12x + 9.5y \geq 220$   
 $x + y \leq 20$
- D)  $12x + 9.5y \geq 220$   
 $x + y \geq 20$



8

In air, the speed of sound  $S$ , in meters per second, is a linear function of the air temperature  $T$ , in degrees Celsius, and is given by  $S(T) = 0.6T + 331.4$ . Which of the following statements is the best interpretation of the number 331.4 in this context?

- A) The speed of sound, in meters per second, at  $0^\circ\text{C}$
- B) The speed of sound, in meters per second, at  $0.6^\circ\text{C}$
- C) The increase in the speed of sound, in meters per second, that corresponds to an increase of  $1^\circ\text{C}$
- D) The increase in the speed of sound, in meters per second, that corresponds to an increase of  $0.6^\circ\text{C}$

9

$$y = x^2$$
$$2y + 6 = 2(x + 3)$$

If  $(x, y)$  is a solution of the system of equations above and  $x > 0$ , what is the value of  $xy$  ?

- A) 1
- B) 2
- C) 3
- D) 9

10

If  $a^2 + b^2 = z$  and  $ab = y$ , which of the following is equivalent to  $4z + 8y$  ?

- A)  $(a + 2b)^2$
- B)  $(2a + 2b)^2$
- C)  $(4a + 4b)^2$
- D)  $(4a + 8b)^2$



11

The volume of right circular cylinder A is 22 cubic centimeters. What is the volume, in cubic centimeters, of a right circular cylinder with twice the radius and half the height of cylinder A?

- A) 11
- B) 22
- C) 44
- D) 66

12

Which of the following is equivalent to  $9^{\frac{3}{4}}$ ?

- A)  $\sqrt[3]{9}$
- B)  $\sqrt[4]{9}$
- C)  $\sqrt{3}$
- D)  $3\sqrt{3}$

13

At a restaurant,  $n$  cups of tea are made by adding  $t$  tea bags to hot water. If  $t = n + 2$ , how many additional tea bags are needed to make each additional cup of tea?

- A) None
- B) One
- C) Two
- D) Three

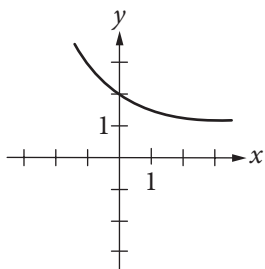


14

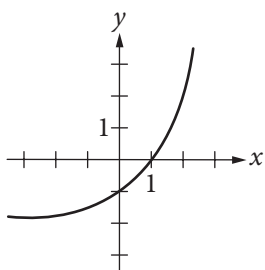
$$f(x) = 2^x + 1$$

The function  $f$  is defined by the equation above. Which of the following is the graph of  $y = -f(x)$  in the  $xy$ -plane?

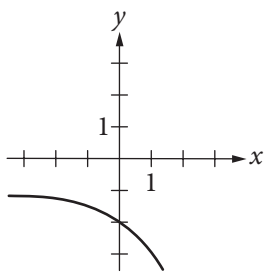
A)



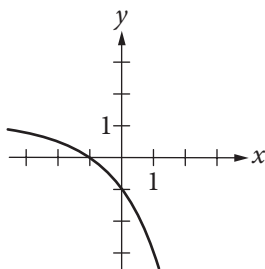
B)



C)



D)



15

Alan drives an average of 100 miles each week. His car can travel an average of 25 miles per gallon of gasoline. Alan would like to reduce his weekly expenditure on gasoline by \$5. Assuming gasoline costs \$4 per gallon, which equation can Alan use to determine how many fewer average miles,  $m$ , he should drive each week?

A)  $\frac{25}{4}m = 95$


B)  $\frac{25}{4}m = 5$

C)  $\frac{4}{25}m = 95$

D)  $\frac{4}{25}m = 5$

### 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 circles accurately. You will receive credit only if the circles are filled in correctly.
2. Mark no more than one circle 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.

**Mixed numbers** such as  $3\frac{1}{2}$  must be gridded

as 3.5 or 7/2. (If 

3	1	/	2
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 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.

Answer:  $\frac{7}{12}$

Write answer →  
in boxes.

	7	/	1	2
		0	0	0
	①	①		①
	②	②	②	
	③	③	③	③
	④	④	④	④
	⑤	⑤	⑤	⑤
	⑥	⑥	⑥	⑥
		⑦	⑦	⑦
	⑧	⑧	⑧	⑧
	⑨	⑨	⑨	⑨

← Fraction line

Grid in result.

Answer: 2.5

	2	.	5
●	/	/	●
●	0	0	0
①	①	①	①
②	●	②	②
③	③	③	③
④	④	④	④
⑤	⑤	⑤	●
⑥	⑥	⑥	⑥
⑦	⑦	⑦	⑦
⑧	⑧	⑧	⑧
⑨	⑨	⑨	⑨

← Decimal point

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

	2	/	3
.	.	.	.
	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7

Answer: 201 – either position is correct

	2	0	1
	/	/	
	.	.	.
	0	●	0
①	①	①	●
②	●	②	②
③	③	③	③

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



16

Maria plans to rent a boat. The boat rental costs \$60 per hour, and she will also have to pay for a water safety course that costs \$10. Maria wants to spend no more than \$280 for the rental and the course. If the boat rental is available only for a whole number of hours, what is the maximum number of hours for which Maria can rent the boat?

17

$$2(p + 1) + 8(p - 1) = 5p$$

What value of  $p$  is the solution of the equation above?

18

$$\begin{aligned}\frac{1}{2}(2x + y) &= \frac{21}{2} \\ y &= 2x\end{aligned}$$

The system of equations above has solution  $(x, y)$ .  
What is the value of  $x$  ?





19

$$\frac{2x+6}{(x+2)^2} - \frac{2}{x+2}$$

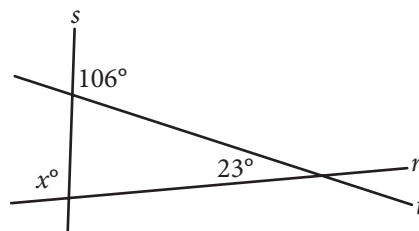
The expression above is equivalent to  $\frac{a}{(x+2)^2}$ ,

where  $a$  is a positive constant and  $x \neq -2$ .

What is the value of  $a$  ?

20

Intersecting lines  $r$ ,  $s$ , and  $t$  are shown below.



What is the value of  $x$  ?

**STOP**

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