



Math Test – No Calculator

25 MINUTES, 20 QUESTIONS

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

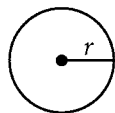
DIRECTIONS

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

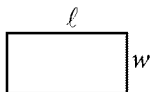
1. The use of a calculator **is not permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated,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

REFERENCE

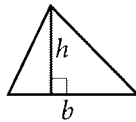


$$A = \pi r^2$$

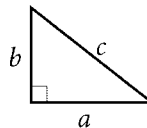
$$C = 2\pi r$$



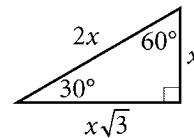
$$A = \ell w$$



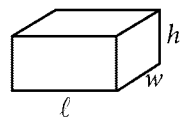
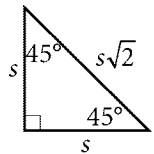
$$A = \frac{1}{2}bh$$



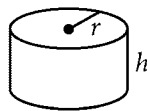
$$c^2 = a^2 + b^2$$



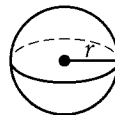
Special Right Triangles



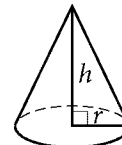
$$V = \ell wh$$



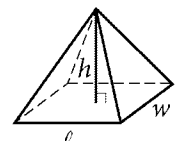
$$V = \pi r^2 h$$



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



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



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

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

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

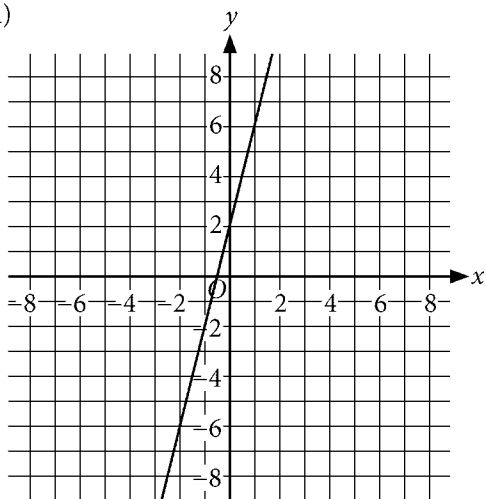
The sum of the measures in degrees of the angles of a triangle is 180.



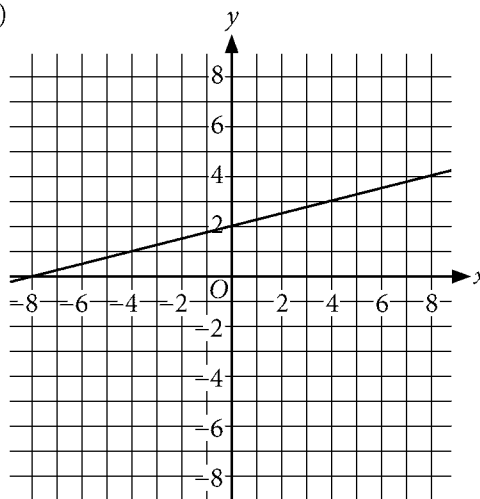
1

The function h is defined by $h(x) = -\frac{1}{4}x - 2$. Which is the graph of $y = h(x)$?

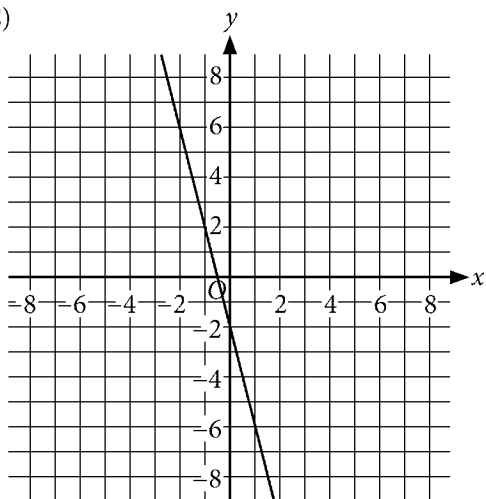
A)



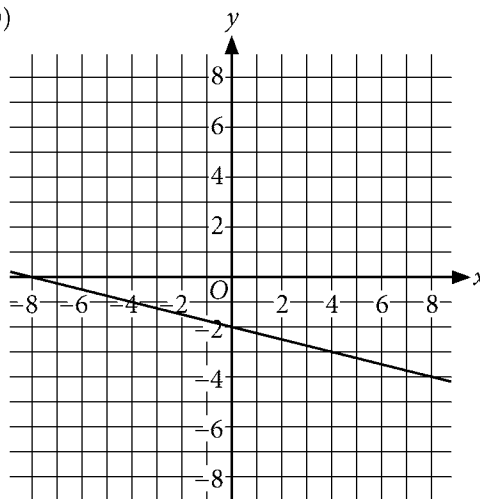
B)



C)



D)





2

$$x^2 + 10 = 91$$

What is the positive solution to the given equation?

- A) 9
- B) 10
- C) 41
- D) 51

3

$$x + 7 = 3(x - 3)$$

What value of x satisfies the given equation?

- A) 4
- B) 8
- C) 9
- D) 16

4

A line in the xy -plane has a slope of 1 and passes through the point $(0, 2)$. Which is an equation of the line?

- A) $y = \frac{x}{2}$
- B) $y = 2x$
- C) $y = x + 2$
- D) $y = x - 2$

5

From 1990 to 2001, German currency included coins called *pfennigs*, worth 1 pfennig each, and *groschen*, worth 10 pfennigs each. Which equation represents the number of pfennig coins, p , and groschen coins, g , that have a combined value of 85 pfennigs?

- A) $p + g = 85$
- B) $p + 10g = 85$
- C) $10p + g = 85$
- D) $10(p + g) = 85$



6

If $x > 0$, which of the following is equivalent

to $\frac{1}{x} + \frac{1}{2x}$?

- A) $\frac{1}{x}$
- B) $\frac{1}{2x}$
- C) $\frac{3}{2x}$
- D) $\frac{2}{3x}$

7

$$x^2 - 10x + y^2 + 6y = 2$$

The graph in the xy -plane of the equation above is a circle. What are the coordinates of the center of the circle?

- A) $(-5, -3)$
- B) $(-5, 3)$
- C) $(5, -3)$
- D) $(5, 3)$

8

$$y > 4x$$

$$y < -x$$

When graphed in the xy -plane, what point (x, y) is a solution to the given system of inequalities?

- A) $(1, 1)$
- B) $(-2, -2)$
- C) $(3, -3)$
- D) $(-4, 4)$

9

The equation $h = 150 + 10t$ gives the total number of housing units, h , in a community t months after a new zoning law was passed. How many housing units are added to the community each month after the zoning law was passed?

- A) 10
- B) 150
- C) 160
- D) 1,500



10

Which expression is equivalent to

$$(2x^2 + 3x - 2) - (5x^2 - x - 7) ?$$

- A) $7x^2 + 4x + 9$
- B) $3x^2 + 4x + 5$
- C) $-3x^2 + 2x - 9$
- D) $-3x^2 + 4x + 5$

11

$$y = (x - 1)(x + 1)(x + 2)$$

The graph in the xy -plane of the equation above contains the point (a, b) . If $-1 \leq a \leq 1$, which of the following is NOT a possible value of b ?

- A) -2
- B) -1
- C) 0
- D) 1

12

Two beach balls are each in the shape of a sphere. The larger beach ball has a diameter of $3x$, and the smaller beach ball has a diameter of x . What is the ratio of the volume of the larger beach ball to the volume of the smaller beach ball?

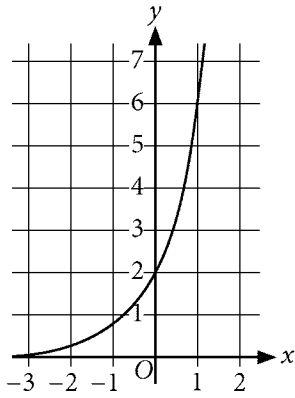
- A) 3 to 1
- B) 6 to 1
- C) 9 to 1
- D) 27 to 1



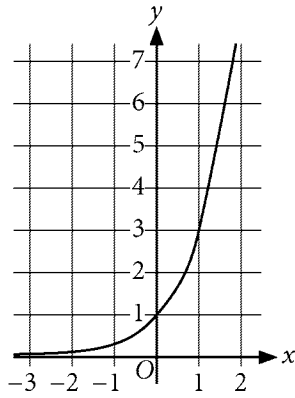
13

What is the graph of the equation $y = 2(3)^x$?

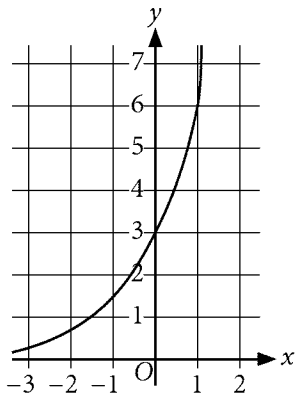
A)



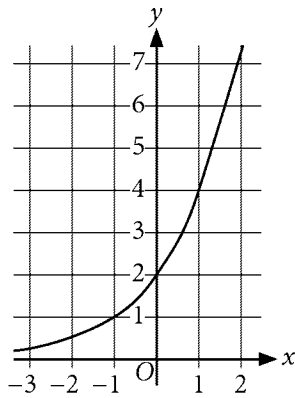
B)



C)

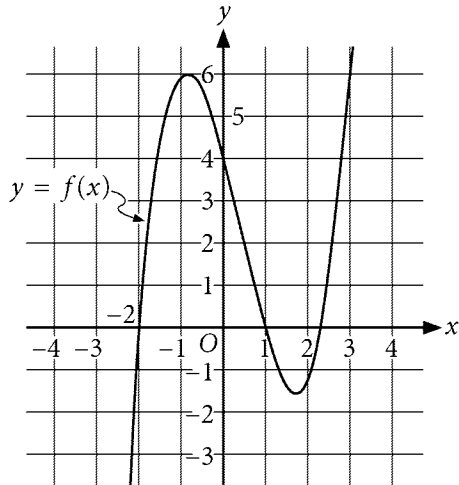


D)





14



The graph of the function f is shown. Which of the following is a value of x for which $f(x) = 0$?

- A) -1
- B) 0
- C) 1
- D) 4

15

The function $A(t) = 12(2)^{\frac{t}{6}}$ models the number of water hyacinths in a population over time, where $A(t)$ is the number of water hyacinths and t is the time, in days, since the population was first measured. Which is the best interpretation of $(2)^{\frac{t}{6}}$ in this context?

- A) The number of water hyacinths doubled t times.
- B) The number of water hyacinths doubled every 6 days.
- C) The number of water hyacinths increased by 2 every $\frac{t}{6}$ days.
- D) The number of water hyacinths increased by 2 every t days.

**DIRECTIONS**

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

- 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.
- Mark no more than one bubble in any column.
- No question has a negative answer.
- Some problems may have more than one correct answer. In such cases, grid only one answer.
- Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or $7/2$. (If

3	1	/	2
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

 is entered into the grid, it will be interpreted as $\frac{31}{2}$, not $3\frac{1}{2}$.)
- 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.

Write answer in boxes. →

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

7	/	1	2
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
<input checked="" type="radio"/>	7	7	7
8	8	8	8
9	9	9	9

← Fraction line

Grid in result.

Answer: 2.5

	2	.	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	1	1	1
2	<input checked="" type="radio"/>	2	2
3	3	3	3
4	4	4	4
5	5	5	<input checked="" type="radio"/>
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
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	1	1	1
2	<input checked="" type="radio"/>	2	2
3	3	3	<input checked="" type="radio"/>
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

.	6	6	6
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
7	7	7	7
8	8	8	8
9	9	9	9

.	6	6	7
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	<input checked="" type="radio"/>	<input checked="" type="radio"/>	6
7	7	7	<input checked="" type="radio"/>
8	8	8	8
9	9	9	9

Answer: 201 – either position is correct

	2	0	1
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	1	1	<input checked="" type="radio"/>
2	<input checked="" type="radio"/>	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

2	0	1	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	1	<input checked="" type="radio"/>	1
<input checked="" type="radio"/>	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

NOTE:

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

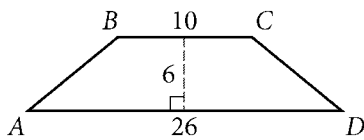


16

$$4T - 8D = 12H$$

The given equation can be rewritten as $T = aD + bH$, where a and b are constants. What is the value of a ?

17



In the figure shown, \overline{BC} is parallel to \overline{AD} and $AB = CD$. What is the perimeter of quadrilateral $ABCD$?

18

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

The equation above has solutions $x = n + \sqrt{k}$ and $x = n - \sqrt{k}$, where n and k are positive integers. What is the value of $n + k$?

19

$$4x + y = 7$$

$$2x - 7y = 1$$

If (x, y) is the solution to the given system of equations, what is the value of x ?

20

$$\frac{1}{2}x + 5 = kx + 7$$

In the given equation, k is a constant. The equation has no solution. What is the value of k ?

STOP

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