Math Test – Calculator

45 MINUTES, 31 QUESTIONS

Turn to Section 4 of your answer sheet to answer the questions in this section.

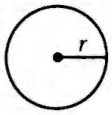
DIRECTIONS

For questions 1-27, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. **For questions 28-31**, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 28 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

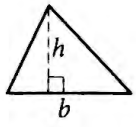
1. The use of a calculator **is permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE

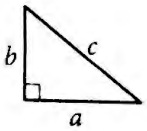


$A = \pi r^2$
$C = 2\pi r$

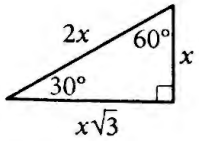
$A = \ell w$



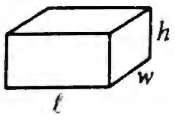
$A = \frac{1}{2}bh$



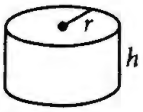
$c^2 = a^2 + b^2$



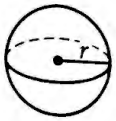
Special Right Triangles



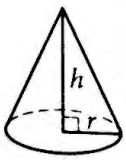
$V = \ell wh$



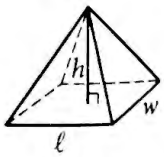
$V = \pi r^2 h$



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



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



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

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.

CONTINUE

1

A scale model of a building is created such that 1 inch of the model corresponds to 3 feet of the actual building. The height of a window on the model is 2.3 inches. What is the height of the actual window?

A) 0.575 inches
B) 0.575 feet
C) 6.9 inches
D) 6.9 feet

2

Ms. Keaton wants to invest her money in an account that will double the amount of money in the account every eight years. Which type of function best models the relationship between the amount of money in the account and the number of eight-year time periods?

A) Exponential growth
B) Exponential decay
C) Increasing linear
D) Decreasing linear

3

A city's parks department currently offers a ceramics program and a basketball program. The parks department director is considering offering a soccer program and wants to determine how many city residents would sign up if the soccer program was offered. Which of the following groups would be the best sample for the survey?

A) 100 residents of the city who are currently enrolled in the ceramics program
B) 100 members of a park district soccer program in a neighboring state
C) 100 randomly selected residents of the city
D) 100 randomly selected residents of the state

4

A company is hiring an interior designer to decorate the reception area of a new office building. The designer charges a one-time fee of $250 plus $175 per hour of work. Which of the following represents the amount, in dollars, the company will be charged if the designer works on the reception area 4 hours each day for x days?

A) $175 + 250(4)x$
B) $250 + 175x$
C) $250 + 175(4)x$
D) $250(4) + 175x$

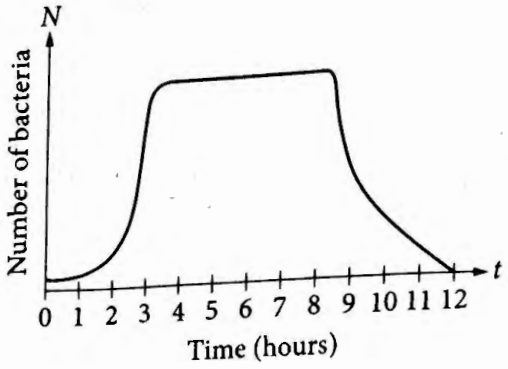
CONTINUE

5

Juan spent 15 percent of a 4-hour drive waiting at traffic lights. How many minutes did he spend waiting at traffic lights on the drive?

A) 36
B) 45
C) 60
D) 75

6



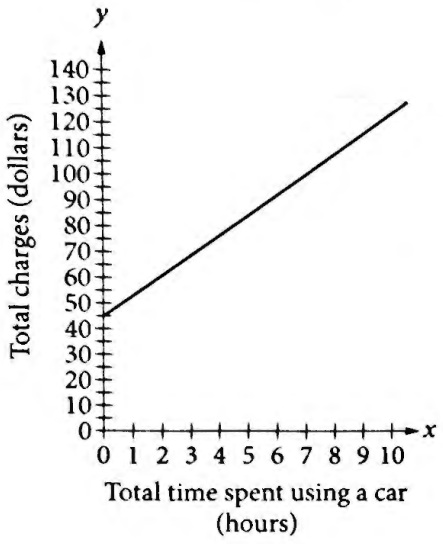
The graph above shows the number of bacteria N present in a colony t hours after the start of an experiment. During which of the following time intervals is the population always decreasing?

A) $1 < t < 3$
B) $2 < t < 6$
C) $2.5 < t < 9$
D) $9.5 < t < 12$

CONTINUE

Questions 7 and 8 refer to the following information.

A car-sharing service near a university offers short-term car rentals to students. The graph below represents the current pricing for the car-sharing service, which includes a one-time membership fee and a charge based on the amount of time spent using a car.



7

Which of the following equations best represents the total charge for the car-sharing service, y, in dollars, in terms of the time spent using a car, x, in hours?

A) $y = 8 - 45x$

B) $y = 8x + 45$

C) $y = 45 - 8x$

D) $y = 45 + \frac{1}{8}x$

8

Next year, the membership fee will increase by a fixed amount of dollars, A. How will this affect the graph shown above?

A) The slope will increase by A and the y-intercept will not change.

B) The slope will decrease by A and the y-intercept will not change.

C) The y-intercept will increase by A and the slope will not change.

D) The y-intercept will decrease by A and the slope will not change.

CONTINUE

9

The capacity of a fish tank to support a group of fish depends on x, the surface area of water (in square inches) that comes in contact with air. A fish tank can support a group of fish as long as the sum of the lengths of the fish is no more than M inches, where the value of M depends on x. The table below shows several pairs of values of x and M.

x	M
75	6
325	26
450	36

Which of the following could represent the relationship between x and M?

A) $M = 8x$

B) $M = 8x + 6$

C) $M = 0.08x$

D) $M = 12.5x + 26$

10

A sales representative for a bread manufacturer surveyed grocery store customers at random. The representative asked each customer which of three types of bread the customer preferred. The results of the survey are summarized in the table below.

Bread Preference Survey

Type of Bread	Male	Female
Rye bread	5	12
Wheat bread	11	10
Sourdough bread	5	8
No preference	4	2

To the nearest percent, what percent of the customers surveyed preferred sourdough bread?

A) 12%

B) 20%

C) 23%

D) 30%

11

$$y = x$$
$$y = 0.5x + 3$$

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

A) 1.5

B) 2.5

C) 3.0

D) 6.0

CONTINUE

12

n	$t(n)$
2	18
4	162
8	13,122

Some values of function t are shown in the table above. Which of the following could define t?

A) $t(n) = \frac{1}{3}(2)^n$

B) $t(n) = 2(3)^n$

C) $t(n) = 2(9)^n$

D) $t(n) = 3(2)^n$

13

A botanist measures the height of a two-year-old spruce tree each week. The tree is growing by a constant amount each week. If h is the height of the tree in inches, w is the number of weeks the botanist has been measuring the height of the tree, and g and t are constants, which of the following is the best model of the relationship between h and w?

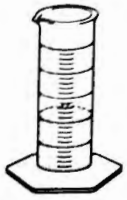
A) $h = gw$

B) $h = gw + t$

C) $h = g^w$

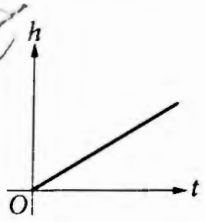
D) $h = t(g)^w$

14



The graduated cylinder above contains p milliliters of water. More water begins flowing into the cylinder at a constant rate. Which of the following graphs best models the height h of the water in the cylinder as a function of time t after the additional water began flowing into the cylinder?

A)



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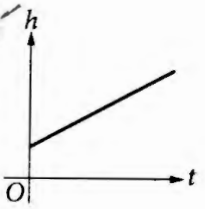
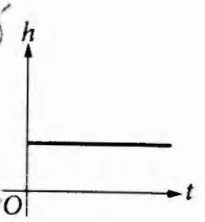
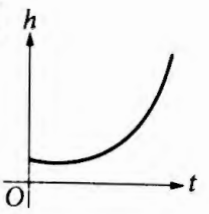


C)



D)



CONTINUE

15

The kinetic energy T, in joules, of a car with mass m, in kilograms, that travels at a velocity v, in meters per second, can be calculated by the formula below.

$$T = \frac{1}{2}mv^2$$

Assuming the mass remains the same, the car's kinetic energy is multiplied by a factor of 4 if the velocity is multiplied by which of the following factors?

A) $\frac{\sqrt{2}}{2}$

B) $\sqrt{2}$

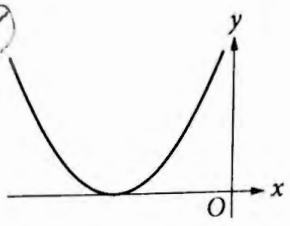
C) 2

D) 4

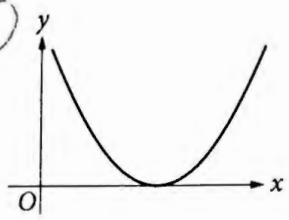
16

The function h is defined by the equation $h(x) = (x - k)^2$, where k is a positive constant. Which of the following could be the graph of $y = h(x)$ in the xy-plane?

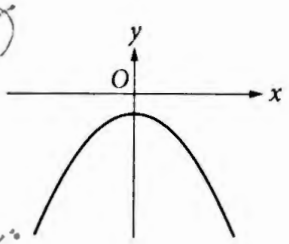
A)



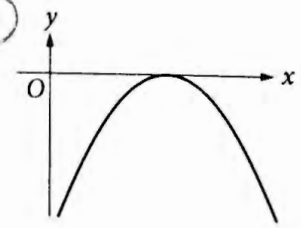
B)



C)



D)



CONTINUE

Questions 17-19 refer to the following information.

The tables below show the distribution, by size, of four types of cases that can be ordered by a retail shoe store. There are two types of cases for one style of women's sandals and two other types of cases for one style of men's sandals. The cost per case includes all fees and shipping charges.

Women's sandals													
Size	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10	10.5	11	Total	Cost per case
Case A	1	2	2	2	3	3	2	2	0	1	0	0	18	$117
Case B	0	0	0	2	2	3	3	3	0	3	0	2	18	$117

Men's sandals								
Size	8	9	10	11	12	13	Total	Cost per case
Case C	1	2	3	3	2	1	12	$102
Case D	3	6	9	9	6	3	36	$288

17

What is the difference between the cost per pair of sandals in Case C and the cost per pair of sandals in Case D?

A) $0.50
B) $1.50
C) $3.00
D) $3.88

18

If the Eli Shoe Store orders one Case A and one Case B, what is the range of the shoe sizes in the order?

A) 4.5
B) 5.5
C) 6.5
D) 8.0

19

The median shoe size of sandals in Case B is how much greater than the median shoe size of sandals in Case A?

A) 0.5
B) 1.0
C) 1.5
D) 2.0

CONTINUE

20

If $y = x - 2$ and $z = x + 2$, what is y^2z in terms of x ?

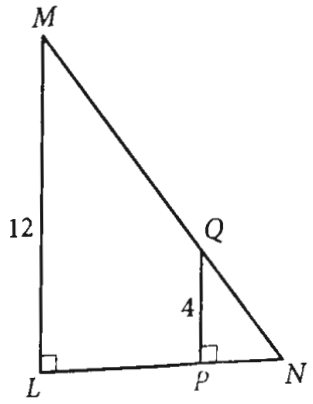
A) $x^3 - 2x^2 - 4x + 8$

B) $x^3 - 2x^2 - 4x - 8$

C) $x^2 + x - 2$

D) $x^2 - 4$

21



In the figure above, $MN = 15$. What is the area of triangle PQN ?

A) 3

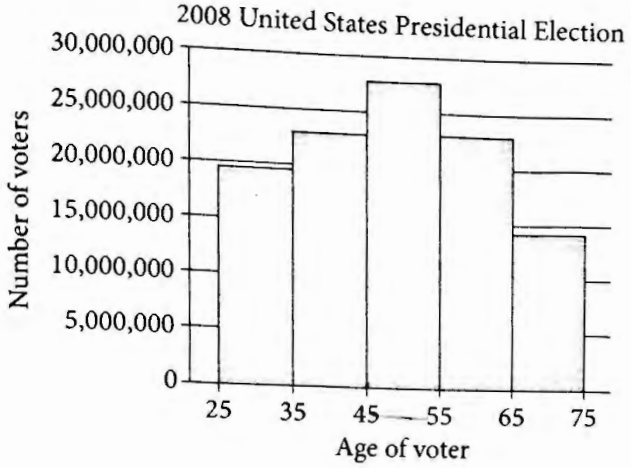
B) 6

C) 9

D) 12

CONTINUE

Questions 22 and 23 refer to the following information.



The histogram above shows the distribution of the ages of US citizens who voted in the 2008 presidential election from the age of 25 up to but not including the age of 75. The first bar represents voters from age 25 up to but not including 35. The second bar represents voters from age 35 up to but not including 45, and so on.

22

Approximately 107,500,000 voters are represented in the histogram. Which of the following is closest to the percentage of voters represented in the histogram who were ages 45 up to but not including 55 ?

A) 25%
B) 30%
C) 44%
D) 50%

23

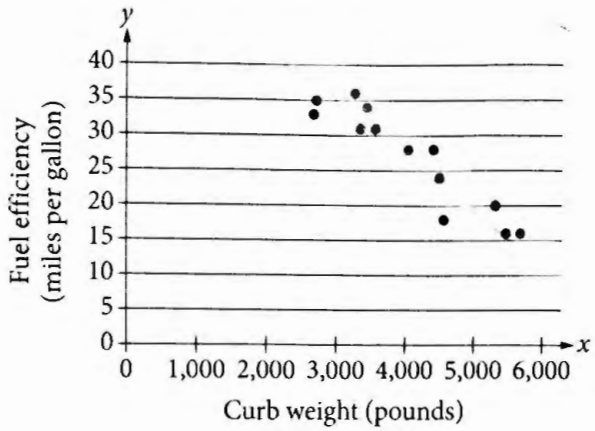
Looking at these data, Janice wants to estimate the percentage of all voters in 2008 who were at least 25 but less than 35 years old. Which of the following is information that would allow Janice to make this estimation?

A) The number of voters who are exactly 25
B) The number of voters who are younger than 25
C) The number of voters who are 75 or older
D) The number of voters who are younger than 25 and the number of voters who are 75 or older

CONTINUE

24

The curb weight of a vehicle describes the total weight of the vehicle with all standard operating equipment and consumables such as gasoline, coolant, and oil. The graph below shows the average fuel consumption, in miles per gallon, and the curb weight, in pounds, for several vehicles.



Which of the following equations is the best approximation of the line of best fit for the data?

A) $y = -\frac{2}{1{,}000}x + 27$

B) $y = -\frac{4}{1{,}000}x + 41$

C) $y = -\frac{7}{1{,}000}x + 55$

D) $y = -\frac{20}{1{,}000}x + 86$

25

Lusio exercises each day by jogging at 5 miles per hour and then running at 8 miles per hour. The total time he jogs and runs is at least 1 hour. If j is the distance, in miles, Lusio jogs, and r is the distance, in miles, he runs, which of the following inequalities represents this situation?

A) $5j + 8r \leq 1$

B) $5j + 8r \geq 1$

C) $\frac{1}{5}j + \frac{1}{8}r \leq 1$

D) $\frac{1}{5}j + \frac{1}{8}r \geq 1$

CONTINUE

26

$$x - y = -1$$
$$x^2 = 1 + y$$

A system consisting of a linear equation and a quadratic equation is shown above. If $(x, y) = (a, b)$ is a solution to the system, which of the following could be the value of a?

A) 1

B) 0

C) -1

D) -2

27

$$y = 10x^2 - 25x - 60$$

The graph of the equation above is a parabola in the xy-plane. In which of the following equivalent forms of the equation does the minimum value of y appear as a term?

A) $y = 5(2x + 3)(x - 4)$

B) $5(4x - 5)^2 - 8y = 605$

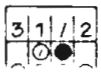
C) $\left(x - \frac{5}{4}\right)^2 = \frac{y}{10} + \frac{121}{16}$

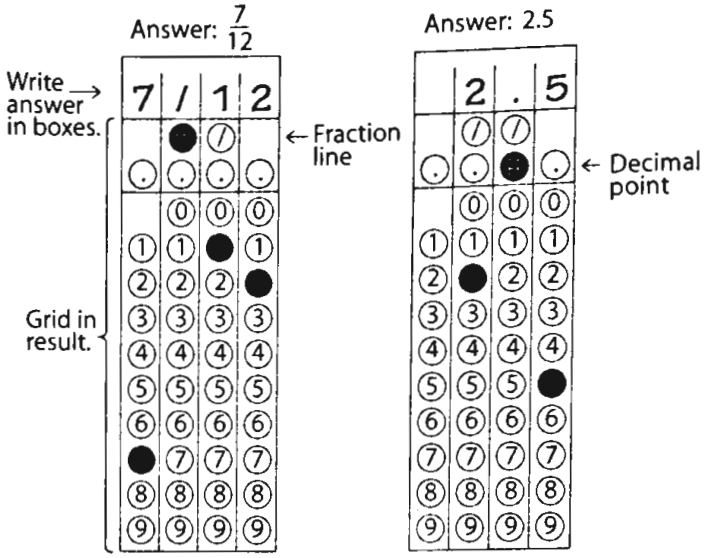
D) $y = 10\left(x - \frac{5}{4}\right)^2 - \frac{605}{8}$

CONTINUE

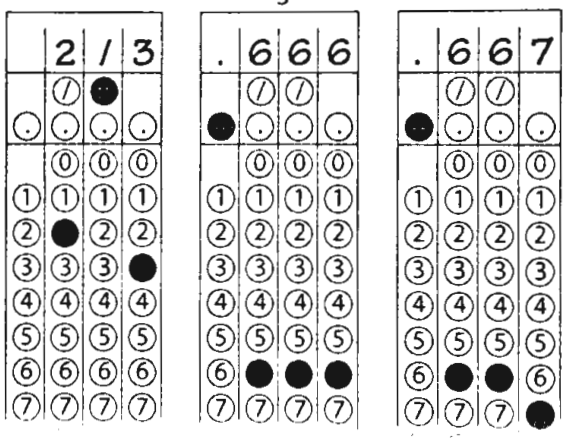
DIRECTIONS

For questions 28-31, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

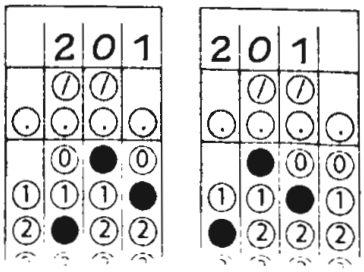
1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
2. Mark no more than one circle in any column.
3. No question has a negative answer.
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.



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

28

A meteorologist releases a weather balloon from a rooftop. The balloon is released 100 feet above the ground. If the balloon rises at a constant rate of 2 feet per second, how many seconds will it take the balloon to reach a height of 2000 feet above the ground?

29

$$7 < 0.04x - 2y < 8$$

In the inequality above, if $x = 320$, what is one possible value for y ?

CONTINUE

Questions 30 and 31 refer to the following information.

Gender of Animal Owner and
Type of Animal Licensed, in 2012

Type of animal	York, PA		Eugene, OR		Total
	Male resident	Female resident	Male resident	Female resident	
Dogs	7,228	5,900	9,197	6,132	28,457
Cats	5,873	5,072	6,684	6,184	23,813
Birds	568	548	712	608	2,436
Horses	190	360	410	132	1,092
Other	204	120	234	144	702
Total	14,063	12,000	17,237	13,200	56,500

The table above shows the number and type of animals licensed by male and female residents of York, Pennsylvania, and Eugene, Oregon, in 2012.

30

If the combined number of male and female residents of York, Pennsylvania, was 43,760 in 2012, what was the ratio of the number of licensed dogs in York to the number of male and female residents of York? (Express your answer as a fraction or a decimal.)

31

One licensed animal with a female owner is to be selected at random from York, and one licensed animal with a female owner is to be selected at random from Eugene. The probability that the animal selected from York will be a horse is how many times the probability that the animal selected from Eugene will be a horse?

STOP

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