Math Test – Calculator

55 MINUTES, 38 QUESTIONS

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

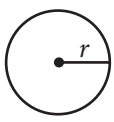
DIRECTIONS

For questions 1-30, solve each problem, choose the best answer from the choices provided, and fill in the corresponding bubble on your answer sheet. **For questions 31-38**, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 31 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

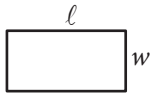
NOTES

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.

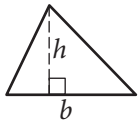
REFERENCE



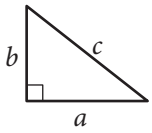
$A = \pi r^2$
$C = 2\pi r$



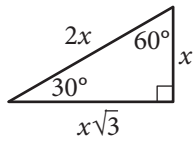
$A = \ell w$

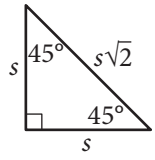


$A = \frac{1}{2}bh$

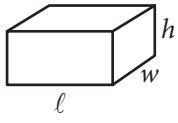


$c^2 = a^2 + b^2$

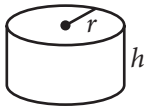




Special Right Triangles

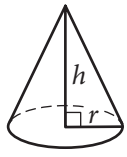


$V = \ell wh$

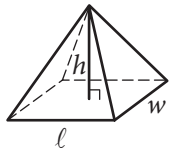


$V = \pi r^2 h$

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



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



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

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.

Unauthorized copying or reuse of any part of this page is illegal.

CONTINUE

1

A helicopter, initially hovering 40 feet above the ground, begins to gain altitude at a rate of 21 feet per second. Which of the following functions represents the helicopter's altitude above the ground y, in feet, t seconds after the helicopter begins to gain altitude?

A) $y = 40 + 21$

B) $y = 40 + 21t$

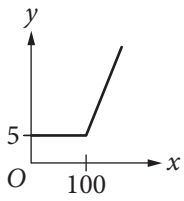
C) $y = 40 - 21t$

D) $y = 40t + 21$

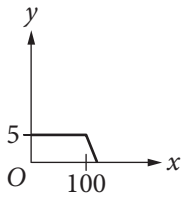
2

A text messaging plan charges a flat fee of \$5 per month for up to 100 text messages sent plus \$0.25 for each additional text message sent that month. Which of the following graphs represents the cost, y, of sending x texts in a month?

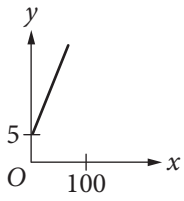
A)



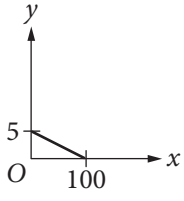
B)



C)



D)



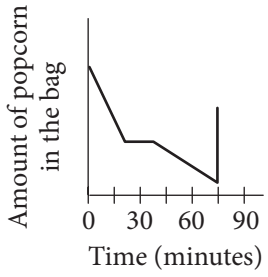
Unauthorized copying or reuse of any part of this page is illegal.

CONTINUE

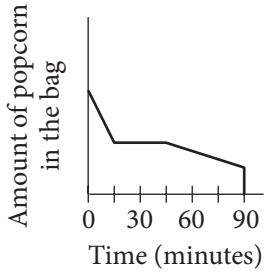
3

Jake buys a bag of popcorn at a movie theater. He eats half of the popcorn during the 15 minutes of previews. After eating half of the popcorn, he stops eating for the next 30 minutes. Then he gradually eats the popcorn until he accidentally spills all of the remaining popcorn. Which of the following graphs could represent the situation?

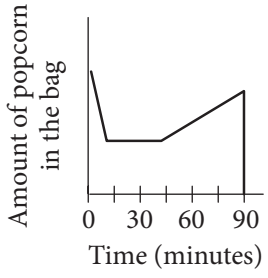
A)



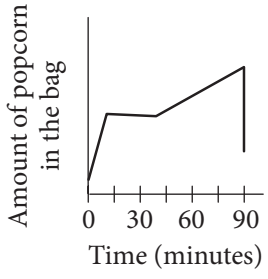
B)



C)



D)



4

If $20 - x = 15$, what is the value of $3x$?

A) 5

B) 10

C) 15

D) 35

5

$$f(x) = \frac{x+3}{2}$$

For the function f defined above, what is the value of $f(-1)$?

A) -2

B) -1

C) 1

D) 2

Unauthorized copying or reuse of any part of this page is illegal.

CONTINUE

6

Which of the following is equivalent to $2x(x^2 - 3x)$?

A) $-4x^2$

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

C) $2x^3 - 3x$

D) $2x^3 - 6x^2$

7

A retail company has 50 large stores located in different areas throughout a state. A researcher for the company believes that employee job satisfaction varies greatly from store to store. Which of the following sampling methods is most appropriate to estimate the proportion of all employees of the company who are satisfied with their job?

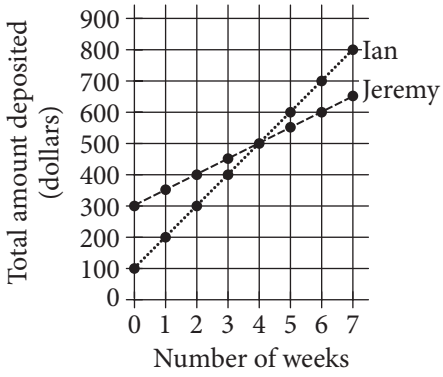
A) Selecting one of the 50 stores at random and then surveying each employee at that store

B) Selecting 10 employees from each store at random and then surveying each employee selected

C) Surveying the 25 highest-paid employees and the 25 lowest-paid employees

D) Creating a website on which employees can express their opinions and then using the first 50 responses

8



The two graphs above show the total amounts of money that Ian and Jeremy each have deposited into their savings accounts for the first seven weeks after opening their accounts. After they made their initial deposits, how much more did Ian deposit each week than Jeremy?

A) $200

B) $100

C) $50

D) $25

9

$$h(x) = 2^x$$

The function h is defined above. What is $h(5) - h(3)$?

A) 2

B) 4

C) 24

D) 28

Unauthorized copying or reuse of any part of this page is illegal.

CONTINUE

10

A researcher surveyed a random sample of students from a large university about how often they see movies. Using the sample data, the researcher estimated that 23% of the students in the population saw a movie at least once per month. The margin of error for this estimation is 4%. Which of the following is the most appropriate conclusion about all students at the university, based on the given estimate and margin of error?

A) It is unlikely that less than 23% of the students see a movie at least once per month.

B) At least 23%, but no more than 25%, of the students see a movie at least once per month.

C) The researcher is between 19% and 27% sure that most students see a movie at least once per month.

D) It is plausible that the percentage of students who see a movie at least once per month is between 19% and 27%.

11

List A	1	2	3	4	5	6
List B	2	3	3	4	4	5

The table above shows two lists of numbers. Which of the following is a true statement comparing list A and list B ?

A) The means are the same, and the standard deviations are different.

B) The means are the same, and the standard deviations are the same.

C) The means are different, and the standard deviations are different.

D) The means are different, and the standard deviations are the same.

12

A book was on sale for 40% off its original price. If the sale price of the book was $18.00, what was the original price of the book? (Assume there is no sales tax.)

A) $7.20

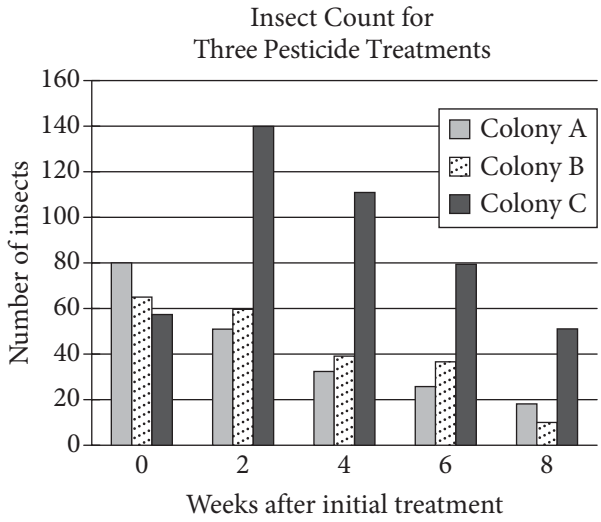
B) $10.80

C) $30.00

D) $45.00

Unauthorized copying or reuse of any part of this page is illegal.

Questions 13 and 14 refer to the following information.



Three colonies of insects were each treated with a different pesticide over an 8-week period to test the effectiveness of the three pesticides. Colonies A, B, and C were treated with Pesticides A, B, and C, respectively. Each pesticide was applied every 2 weeks to one of the three colonies over the 8-week period. The bar graph above shows the insect counts for each of the three colonies 0, 2, 4, 6, and 8 weeks after the initial treatment.

13

Which of the following colonies showed a decrease in size every two weeks after the initial treatment with pesticide?

I. Colony A
II. Colony B
III. Colony C

A) I only
B) III only
C) I and II only
D) I, II, and III

14

Of the following, which is closest to the ratio of the total number of insects in all three colonies in week 8 to the total number of insects at the time of initial treatment?

A) 2 to 5
B) 1 to 4
C) 3 to 5
D) 1 to 2

15

A right circular cone has a volume of 24π cubic inches. If the height of the cone is 2 inches, what is the radius, in inches, of the base of the cone?

A) $2\sqrt{3}$
B) 6
C) 12
D) 36

Unauthorized copying or reuse of any part of this page is illegal.

CONTINUE

16

In 2015 the populations of City X and City Y were equal. From 2010 to 2015, the population of City X increased by 20% and the population of City Y decreased by 10%. If the population of City X was 120,000 in 2010, what was the population of City Y in 2010?

A) 60,000

B) 90,000

C) 160,000

D) 240,000

17

The volume of a sphere is given by the formula $V = \frac{4}{3}\pi r^3$, where r is the radius of the sphere. Which of the following gives the radius of the sphere in terms of the volume of the sphere?

A) $\frac{4\pi}{3V}$

B) $\frac{3V}{4\pi}$

C) $\sqrt[3]{\frac{4\pi}{3V}}$

D) $\sqrt[3]{\frac{3V}{4\pi}}$

18

Survey Results

Answer	Percent
Never	31.3%
Rarely	24.3%
Often	13.5%
Always	30.9%

The table above shows the results of a survey in which tablet users were asked how often they would watch video advertisements in order to access streaming content for free. Based on the table, which of the following is closest to the probability that a tablet user answered "Always," given that the tablet user did not answer "Never"?

A) 0.31

B) 0.38

C) 0.45

D) 0.69

19

$$y = -(x - 3)^2 + a$$

In the equation above, a is a constant. The graph of the equation in the xy-plane is a parabola. Which of the following is true about the parabola?

A) Its minimum occurs at $(-3, a)$.

B) Its minimum occurs at $(3, a)$.

C) Its maximum occurs at $(-3, a)$.

D) Its maximum occurs at $(3, a)$.

Unauthorized copying or reuse of any part of this page is illegal.

CONTINUE

20

The maximum value of a data set consisting of 25 positive integers is 84. A new data set consisting of 26 positive integers is created by including 96 in the original data set. Which of the following measures must be 12 greater for the new data set than for the original data set?

A) The mean
B) The median
C) The range
D) The standard deviation

21

$$0.10x + 0.20y = 0.18(x + y)$$

Clayton will mix x milliliters of a 10% by mass saline solution with y milliliters of a 20% by mass saline solution in order to create an 18% by mass saline solution. The equation above represents this situation. If Clayton uses 100 milliliters of the 20% by mass saline solution, how many milliliters of the 10% by mass saline solution must he use?

A) 5
B) 25
C) 50
D) 100

22

The first year Eleanor organized a fund-raising event, she invited 30 people. For each of the next 5 years, she invited double the number of people she had invited the previous year. If $f(n)$ is the number of people invited to the fund-raiser n years after Eleanor began organizing the event, which of the following statements best describes the function f?

A) The function f is a decreasing linear function.
B) The function f is an increasing linear function.
C) The function f is a decreasing exponential function.
D) The function f is an increasing exponential function.

23

x	a	$3a$	$5a$
y	0	$-a$	$-2a$

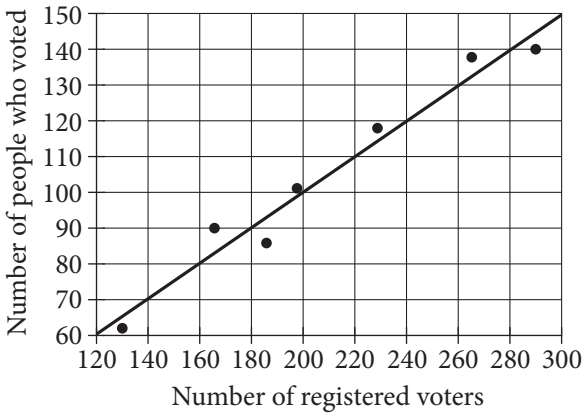
Some values of x and their corresponding values of y are shown in the table above, where a is a constant. If there is a linear relationship between x and y, which of the following equations represents the relationship?

A) $x + 2y = a$
B) $x + 2y = 5a$
C) $2x - y = -5a$
D) $2x - y = 7a$

Unauthorized copying or reuse of any part of this page is illegal.

CONTINUE

24



The scatterplot above shows the number of registered voters, x, and the number of people who voted in the last election, y, for seven districts in a town. A line of best fit for the data is also shown. Which of the following could be the equation of the line of best fit?

A) $y = -0.5x$

B) $y = 0.5x$

C) $y = -2x$

D) $y = 2x$

25

$$2.4x - 1.5y = 0.3$$
$$1.6x + 0.5y = -1.3$$

The system of equations above is graphed in the xy-plane. What is the x-coordinate of the intersection point (x, y) of the system?

A) -0.5

B) -0.25

C) 0.8

D) 1.75

26

Keith modeled the growth over several hundred years of a tree population by estimating the number of the trees' pollen grains per square centimeter that were deposited each year within layers of a lake's sediment. He estimated there were 310 pollen grains per square centimeter the first year the grains were deposited, with a 1% annual increase in the number of grains per square centimeter thereafter. Which of the following functions models $P(t)$, the number of pollen grains per square centimeter t years after the first year the grains were deposited?

A) $P(t) = 310^t$

B) $P(t) = 310^{1.01t}$

C) $P(t) = 310(0.99)^t$

D) $P(t) = 310(1.01)^t$

Unauthorized copying or reuse of any part of this page is illegal.

CONTINUE

27

$$\frac{2}{3}(9x-6)-4=9x-6$$

Based on the equation above, what is the value of $3x-2$?

A) -4

B) $-\frac{4}{5}$

C) $-\frac{2}{3}$

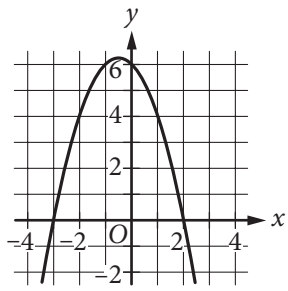
D) 4

28

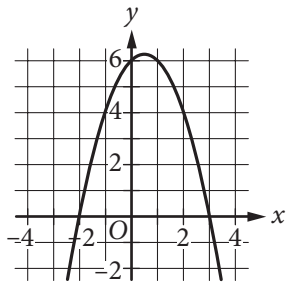
$$f(x)=(x+3)(x-k)$$

The function f is defined above. If k is a positive integer, which of the following could represent the graph of $y=f(x)$ in the xy-plane?

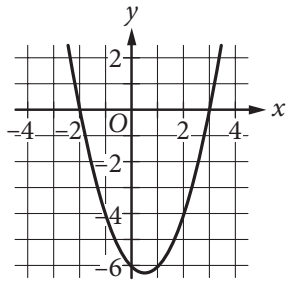
A)



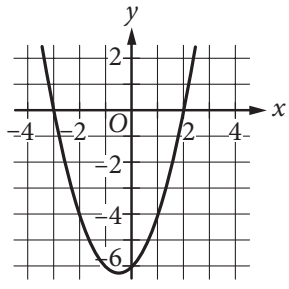
B)



C)



D)



Unauthorized copying or reuse of any part of this page is illegal.

CONTINUE

29

$$H = 1.88L + 32.01$$

The formula above can be used to approximate the height H, in inches, of an adult male based on the length L, in inches, of his femur. What is the meaning of 1.88 in this context?

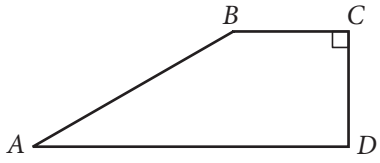
A) The approximate femur length, in inches, for a man with a height of 32.01 inches

B) The approximate increase in a man's femur length, in inches, for each increase of 32.01 inches in his height

C) The approximate increase in a man's femur length, in inches, for each one-inch increase in his height

D) The approximate increase in a man's height, in inches, for each one-inch increase in his femur length

30



In quadrilateral $ABCD$ above, $\overline{AD} \parallel \overline{BC}$ and $CD = \frac{1}{2}AB$. What is the measure of angle B ?

A) 150°

B) 135°

C) 120°

D) 90°

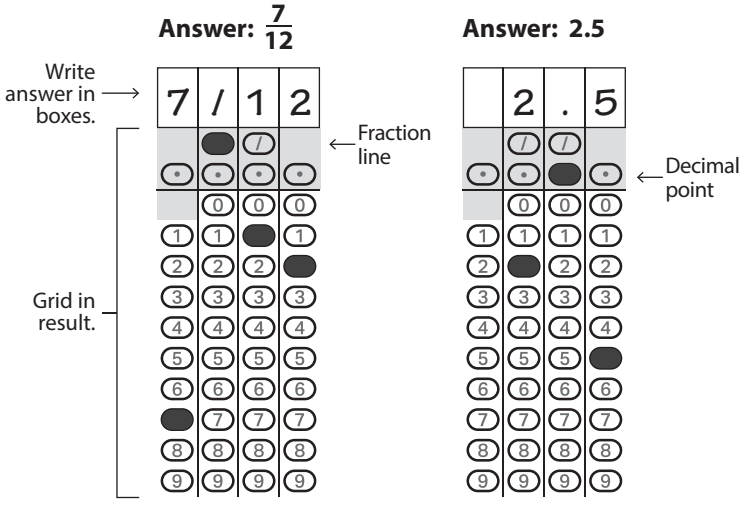
Unauthorized copying or reuse of any part of this page is illegal.

CONTINUE

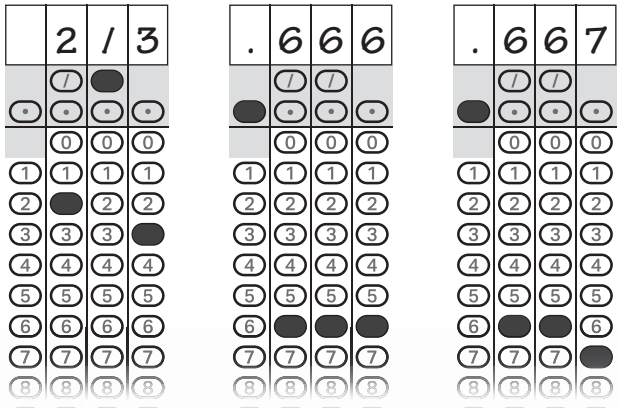
DIRECTIONS

For questions 31-38, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

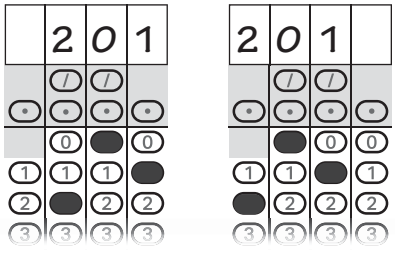
1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the bubbles accurately. You will receive credit only if the bubbles are filled in correctly.
2. Mark no more than one bubble in any column.
3. No question has a negative answer.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

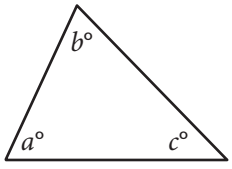
Unauthorized copying or reuse of any part of this page is illegal.

CONTINUE

31

Lynne has \$8.00 to spend on apples and oranges. Apples cost \$0.65 each, and oranges cost \$0.75 each. If there is no tax on this purchase and she buys 5 apples, what is the maximum number of whole oranges she can buy?

32



Note: Figure not drawn to scale.

In the triangle above, $a = 34$. What is the value of $b + c$?

33

700, 1200, 1600, 2000, x

If the mean of the five numbers above is 1600, what is the value of x ?

34

The relationship between x and y can be written as $y = mx$, where m is a constant. If $y = 17$ when $x = a$, what is the value of y when $x = 2a$?

Unauthorized copying or reuse of any part of this page is illegal.

CONTINUE

35

$$a(x + b) = 4x + 10$$

In the equation above, a and b are constants. If the equation has infinitely many solutions for x, what is the value of b ?

36

In the xy-plane, a line that has the equation $y = c$ for some constant c intersects a parabola at exactly one point. If the parabola has the equation $y = -x^2 + 5x$, what is the value of c ?

Questions 37 and 38 refer to the following information.

The peregrine falcon can reach speeds of up to 200 miles per hour while diving to catch prey, making it the fastest animal on the planet when in a dive.

37

What is a peregrine falcon's maximum speed while diving to catch prey, in feet per second? (Round your answer to the nearest whole number.
1 mile = 5280 feet)

38

If a peregrine falcon dove at its maximum speed for half a mile to catch prey, how many seconds would the dive take? (Round your answer to the nearest second.)

STOP

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

Unauthorized copying or reuse of any part of this page is illegal.

No Test Material On This Page