Math Test – Calculator

45 MINUTES, 31 QUESTIONS

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

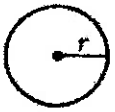
DIRECTIONS

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.

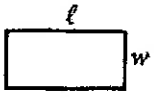
NOTES

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.

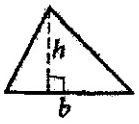
REFERENCE



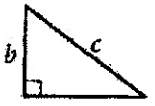
$A = \pi r^2$
$C = 2\pi r$



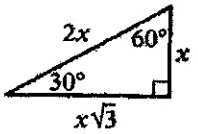
$A = \ell w$

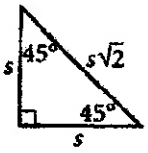


$A = \frac{1}{2}bh$

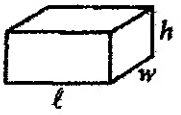


$c^2 = a^2 + b^2$

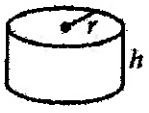




Special Right Triangles

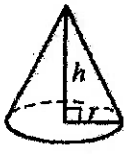


$V = \ell wh$

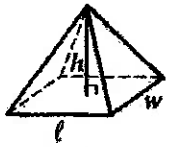


$V = \pi r^2 h$

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



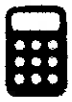
$V = \frac{1}{3}\pi r^2 h$



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

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

For what value of x does $\frac{1}{2}(x+9) = 3$?

A) -6

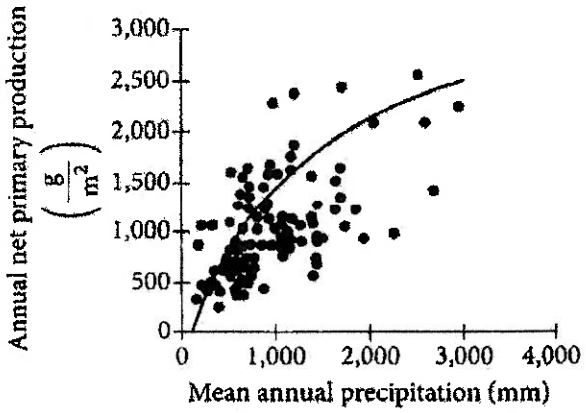
B) -3

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

D) $\frac{3}{2}$

2

The scatterplot below shows the relationship between annual net primary production, in grams of dry plant biomass per square meter (g/m^2), and mean annual precipitation, in millimeters (mm), for different types of ecosystems. The curve in the figure models the relationship.



Based on the curve in the figure, the predicted annual net primary production, in g/m^2, for an ecosystem that receives a mean annual precipitation of 3,000 mm lies in which of the following intervals?

A) Between 500 and 1,000

B) Between 1,000 and 2,000

C) Between 2,000 and 3,000

D) Greater than 3,000

CONTINUE

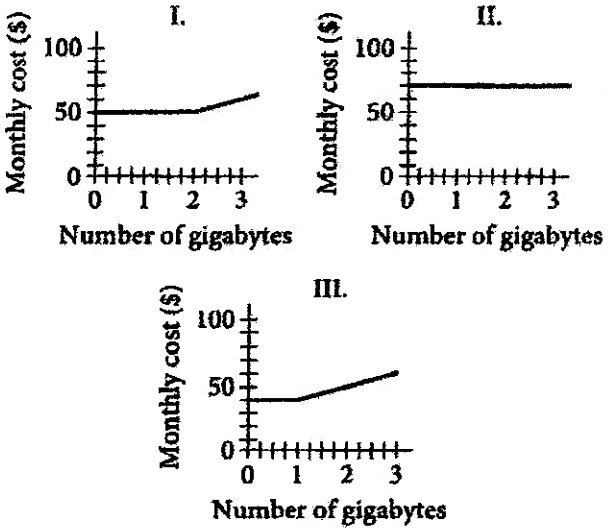
3

A mobile network provider offers the following types of monthly data plans for a mobile phone.

Basic plan: \$40 for the first gigabyte of data and a rate of \$10 per gigabyte after the first gigabyte

Deluxe plan: \$50 for the first 2 gigabytes of data and a rate of \$10 per gigabyte after the first 2 gigabytes

Unlimited plan: \$70 per month with no additional charge



The graphs above illustrate the three service plans, not necessarily in the same order. Which of the following statements correctly identifies the graph with the service plan it represents?

A) Graph I represents the basic plan.

B) Graph II represents the basic plan.

C) Graph II represents the unlimited plan.

D) Graph III represents the deluxe plan.

CONTINUE

4

Questions 4-6 refer to the following information.

Annie's Moving Company rents trucks and provides professional movers. The charges per moving truck and for professional movers are as follows:

Moving truck: $40 per day plus $0.75 per mile driven
Professional movers: $15 per hour per person

4

Mayumi rented a moving truck for one day and drove it a total of 122 miles. What was the total cost of renting the moving truck?

A) $40.00
B) $91.50
C) $131.50
D) $162.00

5

Roberto is moving from one apartment to another in the same building. He would like to hire 2 professional movers from 9 a.m. to 11 a.m. to move his furniture. What will be the cost to hire the professional movers?

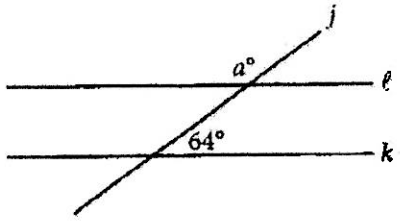
A) $15
B) $30
C) $45
D) $60

6

Annie's Moving Company provided a quote for a truck and 2 professional movers. The truck will be used for one day, and the total distance traveled will be 40 miles. The 2 professional movers will be needed from 3 p.m. to 7 p.m. To the nearest whole percent, what percent of the total cost is the cost of the professional movers?

A) 60%
B) 63%
C) 75%
D) 80%

7



Note: Figure not drawn to scale.

In the figure above, lines ℓ and k are parallel. What is the value of a ?

A) 26
B) 64
C) 116
D) 154

CONTINUE

8

An elementary school teacher is ordering x workbooks and y sets of flash cards for a math class. The teacher must order at least 20 items, but the total cost of the order must not be over \$80. If the workbooks cost \$3 each and the flash cards cost \$4 per set, which of the following systems of inequalities models this situation?

A) $x + y \geq 20$
$3x + 4y \leq 80$

B) $x + y \geq 20$
$3x + 4y \geq 80$

C) $3x + 4y \leq 20$
$x + y \geq 80$

D) $x + y \leq 20$
$3x + 4y \geq 80$

9

$$PV = nRT$$

The equation above represents the ideal gas law, where P is the pressure of an ideal gas, V is the volume of the gas, n is the amount of the gas, R is the gas constant, and T is the absolute temperature of the gas. Which of the following equations can be used to calculate absolute temperature?

A) $T = \frac{PV}{nR}$

B) $T = \frac{nR}{PV}$

C) $T = PVnR$

D) $T = PV - nR$

10

In retail stores, the conversion rate is the quotient of the number of people who make a purchase during a certain time period by the total number of people who enter the store during the same time period. Data were collected at one store for five hours, and the results are shown in the table below.

Hour	Period of time	Number of people who entered the store	Number of people who made a purchase
1	9:00 a.m.–10:00 a.m.	8	5
2	10:00 a.m.–11:00 a.m.	12	9
3	11:00 a.m.–12:00 p.m.	17	8
4	12:00 p.m.–1:00 p.m.	42	23
5	1:00 p.m.–2:00 p.m.	20	15

Based on the data above, which two hours have the same conversion rate?

A) 1 and 5

B) 2 and 3

C) 2 and 5

D) 3 and 4

CONTINUE

11

$$4a^2 + 20ab + 25b^2$$

Which of the following is a factor of the polynomial above?

A) $a + b$

B) $2a + 5b$

C) $4a + 5b$

D) $4a + 25b$

12

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

A) x^2

B) $2x^2$

C) $2x^2 + x$

D) $2x^2 + 2x$

13

Which of the following is equivalent to $\sqrt[n]{2^{3n} \cdot 5^{n+2}}$, where $n > 0$?

A) 200

B) $40 \cdot \sqrt[n]{25}$

C) $40 + \sqrt[n]{25}$

D) $10{,}000 \cdot \sqrt[n]{100}$

14

Net Tangible Assets (billions of dollars)

Company	2012	2013
A	112.8	117.8
B	49.8	61.2
C	10.4	13.8

The table above lists the value of the net tangible assets of three companies in two consecutive years. What is the mean increase in the value of the net tangible assets, in billions of dollars, for the three companies from 2012 to 2013?

A) 5.9

B) 6.3

C) 6.6

D) 6.7

15

On a certain day, the exchange rate for 1 euro is 1.36 US dollars. On the same day, the exchange rate for 1 British pound is 1.70 US dollars. On that day, if Sally exchanges 1 British pound for US dollars and then exchanges that amount for euros, how many euros will she receive?

A) 0.34

B) 0.80

C) 0.91

D) 1.25

CONTINUE

16

Thomas installed a new stove in his restaurant. At the time of installation, the stove had a value of $800. Thomas estimates that each year the value of the stove will depreciate by 20% of the previous year's estimated value. What is the estimated value of the stove exactly 2 years after Thomas installed it?

A) $480

B) $512

C) $556

D) $640

17

A 2014 Gallup-Purdue Index Report describes a survey of people with an associate's degree and a survey of people with a bachelor's degree. It was reported that in the samples studied, 54% of associate's degree holders and 57% of bachelor's degree holders work full time for an employer. The two statements below are included in the 2014 report.

1. For results based on the total sample of associate's degree respondents, the margin of sampling error is ±3.8 percentage points.
2. For results based on the total sample of bachelor's degree respondents, the margin of sampling error is ±0.9 percentage points.

Assuming the margin of error was calculated in the same way for both samples, which of the following statements explains why the two reported margins of error are different?

A) The samples might not have been random samples.

B) There are more people with an associate's degree than with a bachelor's degree.

C) The sample size of the associate's degree sample was smaller than the sample size of the bachelor's degree sample.

D) The sample size of the associate's degree sample was larger than the sample size of the bachelor's degree sample.

CONTINUE

18

$$x + 2y = 5$$
$$3x + 4y = 15$$

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

A) -5

B) 0

C) 2

D) 5

19

The kinetic energy E_k of an object of mass m moving at speed v is $E_k = \frac{1}{2}mv^2$. If the speed of an object is increased by a factor of 3, how will its kinetic energy change?

A) Its kinetic energy will increase by a factor of 9.

B) Its kinetic energy will decrease by a factor of 9.

C) Its kinetic energy will increase by a factor of 3.

D) Its kinetic energy will decrease by a factor of 3.

20

Sara has a 45-minute study hall period each day and plans to use several of these periods to read a 720-page book. Assuming that Sara will read 40 pages of the book per hour, how many entire study hall periods will she need to read the entire book?

A) 16

B) 18

C) 22

D) 24

21

As part of a promotion, a radio show host gave away 3 pairs of tickets each day until all the tickets were gone. The relationship between the number of pairs of tickets, y, that remained at the end of each day and the number of days, x, since the promotion began can be modeled by the equation $y = 60 - 3x$. If this equation is graphed on the xy-plane, what will the x-intercept of the graph represent?

A) The number of pairs of tickets that were given away each day

B) The number of pairs of tickets at the start of the promotion

C) The number of days it took to give away 3 pairs of tickets

D) The number of days it took to give away all the pairs of tickets

CONTINUE

Questions 22-25 refer to the following information.

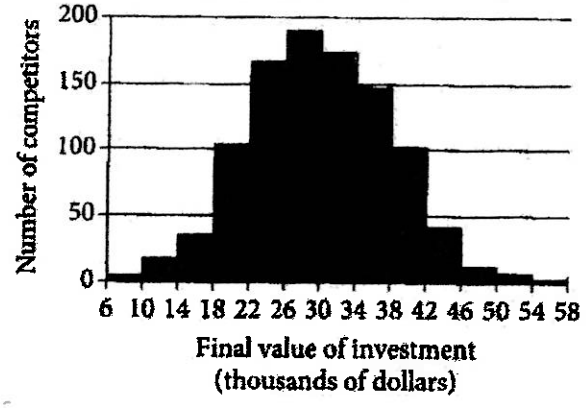
A brokerage company held a virtual stock investment competition. Each of 1,001 competitors submitted a selection of stocks worth $25,000, and the company tracked the value of the virtual investments for one year. The table and histogram below summarize the value of the competitors' investments after one year.

Results of a Virtual Investment Competition

Final value of investment	Number of competitors
$6,000 to $9,999	5
$10,000 to $13,999	17
$14,000 to $17,999	35
$18,000 to $21,999	104
$22,000 to $25,999	167
$26,000 to $29,999	190
$30,000 to $33,999	173
$34,000 to $37,999	147
$38,000 to $41,999	101
$42,000 to $45,999	41
$46,000 to $49,999	11
$50,000 to $53,999	8
$54,000 to $57,999	2

Mean	$29,926
Median	$29,476

Results of a Virtual Investment Competition



22

Of the following, which is closest to the percent increase in the mean value of the $25,000 virtual investment for the 1,001 competitors?

A) 5%
B) 18%
C) 20%
D) 30%

23

If the brokerage company chooses 35 of the competitors at random for a reception, about how many of the 35 competitors chosen would be expected to have had their $25,000 virtual investment decrease in value by more than $7,000 ?

A) 2
B) 7
C) 10
D) 14

24

If the brokerage company chooses one competitor at random from those whose virtual investments gained at least $13,000, which of the following is closest to the probability that the competitor chosen at least doubled the $25,000 virtual investment?

A) 1%
B) 6%
C) 9%
D) 17%

CONTINUE

25

The histogram shows that the results for the 1,001 competitors are approximately normally distributed. A normal distribution has the property that about 68% of the data fall within one standard deviation of the mean. Which of the following is closest to the standard deviation of the data in the histogram?

A) $4,000
B) $8,000
C) $12,000
D) $16,000

26

The table below shows the atmospheric pressure at various heights above sea level.

Height above sea level in kilometers (x)	Atmospheric pressure in kilopascals (y)
2.5	77.96
5	55.33
7.5	39.50
10	27.14
12.5	19.03
15	13.55

Which of the following equations would best model the data shown in the table, where a and b are constants?

A) $y = ax + b$, where $a < 1$ and $b > 1$
B) $y = ax + b$, where $a > 1$ and $b > 1$
C) $y = a(b)^x$, where $a > 1$ and $0 < b < 1$
D) $y = a(b)^x$, where $0 < a < 1$ and $b > 1$

27

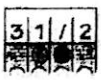
A metal rod with an initial temperature of 85 degrees Fahrenheit (°F) is heated so that its temperature increases at a constant rate of 1.5°F per minute. At the same time, another rod with an initial temperature of 92°F is being heated so that its temperature increases at a constant rate of 0.25°F per minute. After how many seconds will the two metal rods be at the same temperature?

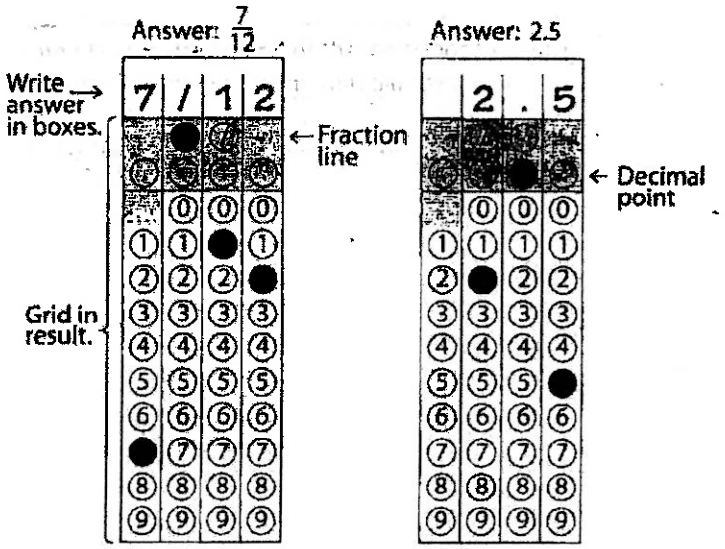
A) 6
B) 7
C) 336
D) 380

CONTINUE

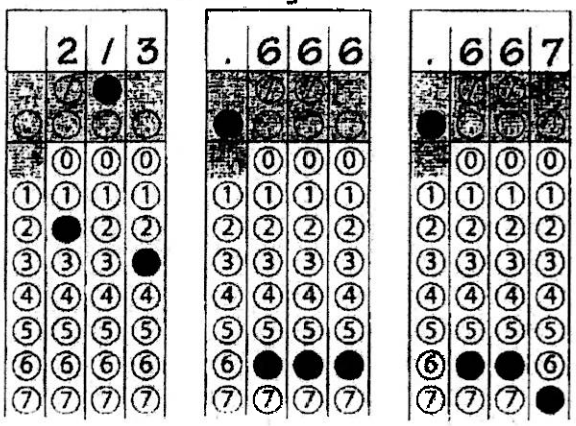
DIRECTIONS

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

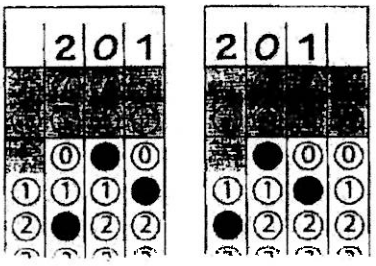
1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
2. Mark no more than one circle in any column.
3. No question has a negative answer.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

4

28

What is the x-coordinate of the x-intercept of the line with equation $5y + \frac{2}{3}x = 10$ in the xy-plane?

29

A rubber ball bounces upward one-half the height that it falls each time it hits the ground. If the ball was originally dropped from a distance of 20.0 feet above the ground, what was its maximum height above the ground, in feet, between the third and fourth time it hit the ground?

CONTINUE

Questions 30 and 31 refer to the following information.

Flowers in Leta's Assortment by Color and Type

Color	Type			Total
	Petunia	Rose	Zinnia	
Pink	6	6	4	16
Red	8	4	4	16
White	2	8	6	16
Total	16	18	14	48

Leta has a large assortment of petunia, rose, and zinnia flowers. All of the flowers in the assortment are either pink, red, or white. The table above shows the number of flowers by color and type.

30

Leta separates out the white flowers and picks one of them at random. What is the probability that the flower Leta picks is a rose? (Express your answer as a decimal or as a fraction, not as a percent.)

31

Leta wants to create a floral arrangement using two additional types of flowers, calla lilies and carnations. The ratio of calla lilies to carnations in the floral arrangement will be the same as the ratio of roses to petunias displayed in the table. If Leta uses 27 calla lilies, how many carnations will she use?

STOP

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