



Math Test – Calculator

55 MINUTES, 38 QUESTIONS

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

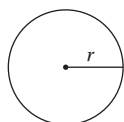
DIRECTIONS

For questions 1–30, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle 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

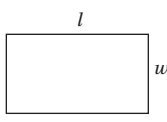
1. The use of a calculator **is permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated,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

REFERENCE

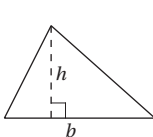


$$A = \pi r^2$$

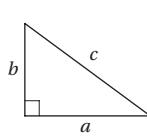
$$C = 2\pi r$$



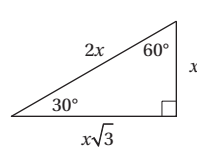
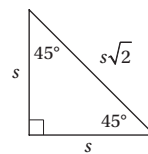
$$A = lw$$



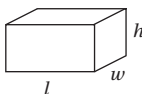
$$A = \frac{1}{2}bh$$



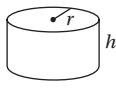
$$c^2 = a^2 + b^2$$



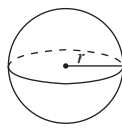
Special Right Triangles



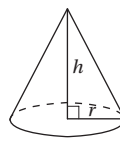
$$V = lwh$$



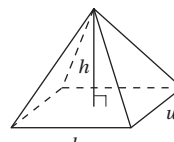
$$V = \pi r^2 h$$



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



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



$$V = \frac{1}{3}lwh$$

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

$$a - b = 10$$

$$a - 2b = 8$$

Based on the system of equations above, what is the value of b ?

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

2

The average (arithmetic mean) of three numbers is 50. If two of the numbers have a sum of 85, what is the third number?

- A) 75
- B) 70
- C) 65
- D) 55

3

What number is the same percent of 225 as 9 is of 25?

- A) 27
- B) 54
- C) 64
- D) 81

4

RESULTS OF FAVORABILITY POLL

	Favorable	Unfavorable	No Opinion	Total
Men	26		12	
Women			13	89
Total	59			162

The table above shows the partial results of a favorability poll for a local politician. If the data shown are correct, how many of the women who were polled viewed the politician unfavorably?

- A) 33
- B) 43
- C) 61
- D) It cannot be determined by the information given.

5

If $2^{2n-2} = 32$, what is the value of n ?

- A) 2.0
- B) 2.5
- C) 3.0
- D) 3.5

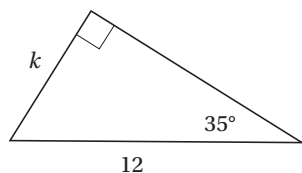
6

A bag of Nellie's Nut Mix contains x ounces of walnuts, 15 ounces of peanuts, and 20 ounces of pecans. Which of the following expresses the fraction of the mix, by weight, that is walnuts?

- A) $\frac{x}{35}$
- B) $\frac{x}{35-x}$
- C) $\frac{x}{35+x}$
- D) $\frac{35-x}{35+x}$



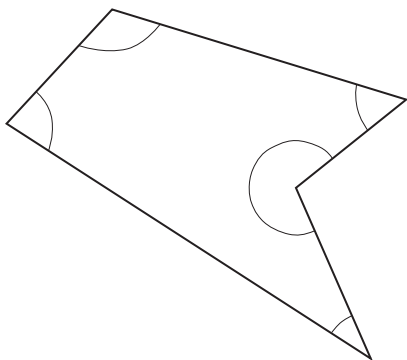
7



In the triangle above, what is the value of k ?
 ($\sin 35^\circ = 0.574$, $\cos 35^\circ = 0.819$, $\tan 35^\circ = 0.700$)

- A) 6.00
- B) 6.88
- C) 8.40
- D) 9.83

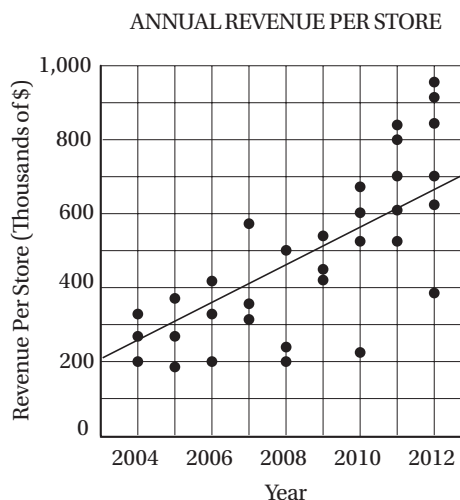
8



The figure above shows a polygon with five sides. What is the average (arithmetic mean) of the measures, in degrees, of the five angles shown?

- A) 108°
- B) 110°
- C) 112°
- D) 114°

Questions 9 and 10 are based on the graph below.



9

The scatterplot above shows the annual revenue for each of the individual retail stores operated by a clothing company for each year from 2004 through 2012. Based on the line of best fit to the data shown, which of the following is closest to the average annual increase in revenue per store?

- A) \$5,000
- B) \$50,000
- C) \$100,000
- D) \$500,000



10

Which of the following statements is most directly justified by the data shown in the scatterplot above?

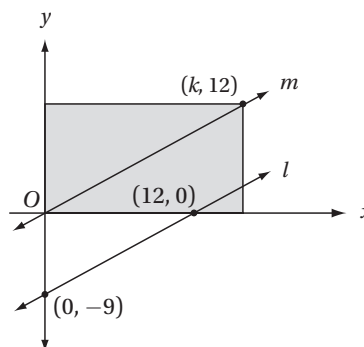
- A) The average revenue per store increased by over 100% from 2005 to 2009.
- B) The total number of retail stores increased by 50% from 2005 to 2012.
- C) The total revenue from all stores in 2012 was more than three times the total revenue from all stores in 2004.
- D) The total revenue from all stores in 2008 was over \$1 million.

11

Which of the following statements expresses the fact that the product of two numbers, a and b , is 6 greater than their sum?

- A) $ab + 6 > a + b$
- B) $ab = a + b + 6$
- C) $ab + 6 = a + b$
- D) $ab > a + b + 6$

12



Note: Figure not drawn to scale.

In the figure above, if $m \parallel l$, what is the area, in square units, of the shaded rectangle?

- A) 156
- B) 168
- C) 180
- D) 192

13

The Glenville Giants have played a total of 120 games and have a win-to-loss ratio of 2 to 3. How many more games have they lost than won?

- A) 24
- B) 30
- C) 40
- D) 48



14

A culture of bacteria initially contained p cells, where $p > 100$. After one hour, this population decreased by $\frac{1}{3}$. In the second and third hours, however, the population increased by 40% and 50%, respectively. At the end of those first three hours, what was the population of the culture?

- A) $1.3p$
- B) $1.4p$
- C) $1.5p$
- D) $1.6p$

15

If $(6^{-2})(m^{-2}) = \frac{1}{16}$, what is the value of m^2 ?

- A) $\frac{1}{9}$
- B) $\frac{4}{9}$
- C) $\frac{9}{16}$
- D) $\frac{9}{4}$

16

A jar contains only red, white, and blue marbles. It contains twice as many red marbles as white marbles and three times as many white marbles as blue marbles. If a marble is chosen at random, what is the probability that it is not red?

- A) $\frac{1}{5}$
- B) $\frac{2}{5}$
- C) $\frac{3}{5}$
- D) $\frac{4}{5}$

17

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

In the xy -plane, line l passes through the point $(-1, 3)$ and the vertex of the parabola with equation above. What is the slope of line l ?

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

18

A certain function takes an input value and transforms it into an output value according to the following three-step procedure:

Step 1: Multiply the input value by 6.

Step 2: Add x to this result.

Step 3: Divide this result by 4.

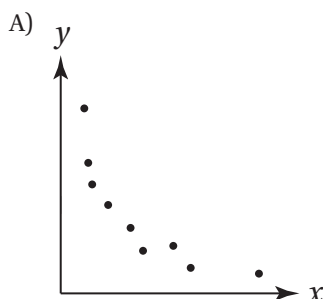
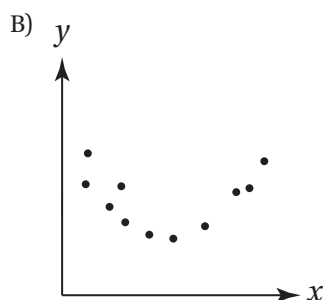
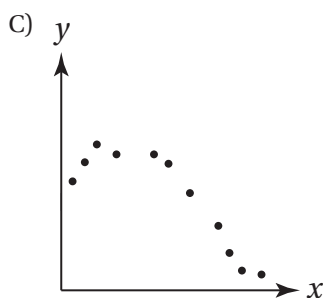
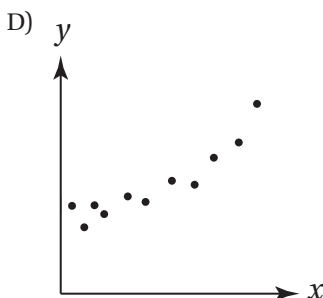
If an input of 7 to this function yields an output of 15, what is the value of x ?

- A) 12
- B) 16
- C) 18
- D) 24



19

The variables x and y are believed to correlate according to the equation $y = ax^2 + bx + c$, where a , b , and c are constants. Which of the following scatterplots would provide the strongest evidence in support of the hypothesis that $a < 0$?



20

On a number line, the coordinates of points P and R are p and r , respectively, and $p < r$. If the point with coordinate x is closer to p than to r , then which of the following statements must be true?

- A) $x < \frac{p-r}{2}$
- B) $x < \frac{p+r}{2}$
- C) $|x-p| < r$
- D) $|x+p| < r-p$

21

Let function $f(x)$ be defined by the equation

$$f(x) = \frac{1}{2-x}. \text{ If } m \text{ is a positive integer, then } f\left(\frac{1}{m}\right) =$$

- A) $\frac{m}{2m-1}$
- B) $\frac{m}{m^2-1}$
- C) $\frac{1}{2-m}$
- D) $2-m$

22

The value of y varies with x according to the equation $y = a(x-2)(x+1)$, where $a < 0$. As the value of x increases from 0 to 5, which of the following best describes the behavior of y ?

- A) It increases and then decreases.
- B) It decreases and then increases.
- C) It increases only.
- D) It decreases only.



23

If the expression $\frac{n^2-9}{n^2+3}$ is equivalent to the expression $1 - \frac{k}{n^2+3}$ for all values of n , what is the value of k ?

- A) -12
- B) -6
- C) 6
- D) 12

24

An online trading company charges a 3% commission for all stock purchases. If a trader purchases 200 shares of a stock through this company and is charged \$3,399 including commission, what is the cost per share for this stock?

- A) \$16.45
- B) \$16.48
- C) \$16.50
- D) \$16.52

25

For nonzero numbers w and y , if w is 50% greater than y , then what is the ratio of w^{-2} to y^{-2} ?

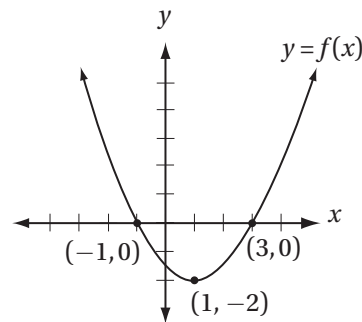
- A) 4 to 9
- B) 2 to 3
- C) 9 to 4
- D) 4 to 1

26

Every athlete in a group of 60 female varsity athletes at Greenwich High School either runs track, plays soccer, or does both. If one-third of the athletes in this group who play on the soccer team also run on the track team, and one-half of the athletes in this group who run on the track team also play on the soccer team, which of the following statements must be true?

- A) This group contains 40 soccer players.
- B) This group contains 20 athletes who play soccer but do not run track.
- C) This group contains 20 athletes who play both track and soccer.
- D) The number of soccer players in this group is 15 greater than the number of track team members in this group.

27



A portion of the graph of the quadratic function $y = f(x)$ is shown in the xy -plane above. The function g is defined by the equation $g(x) = f(x) + b$. If the equation $g(x) = 0$ has exactly one solution, what is the value of b ?

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



28

If $\cos x = a$, where $\frac{\pi}{2} < x < \pi$, and $\cos y = -a$, then which of the following could be the value of y ?

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

Questions 29 and 30 refer to the following table.

OPINION POLL ON PROPOSAL 81A

Age of Voter	Approve	Disapprove	No Opinion	Total
18 to 39	918	204	502	1,624
40 to 64	1,040	502	102	1,644
65 and older	604	420	115	1,139
Total	2,562	1,126	719	4,407

29

Of those surveyed who expressed an opinion on Proposal 81A, approximately what percentage are under 40 years of age?

- A) 30%
- B) 38%
- C) 68%
- D) 72%

30

If the data in the table above are assumed to be representative of the general voting population, which of the following statements is most directly justified by these data?

- A) The approval rate for Proposal 81a generally decreases with the age of the voter.
- B) The disapproval rate for Proposal 81a generally increases with the age of the voter.
- C) Those who express an opinion on Proposal 81a are more likely to be over 64 than they are to be under 40.
- D) In all three age categories, voters are more than twice as likely to approve of Proposal 81a than to have no opinion about it.



DIRECTIONS

For questions 31–38, 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 circles accurately. You will receive credit only if the circles are filled in correctly.
- Mark no more than one circle 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 $\frac{7}{2}$.
(If $3\frac{1}{2}$ is entered into the grid as

3	1	/	2
☐	☐	☐	☐
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
8	8	8	8
9	9	9	9

, 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.

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

Write answer in boxes. →

7	/	1	2
☐	☐	☐	☐
0	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
8	8	8	8
9	9	9	9

Grid in result. →

← Fraction line

Answer: 2.5

2	.	5
☐	☐	☐
0	0	0
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9

← Decimal point

Answer: 201
Either position is correct.

2	0	1
☐	☐	☐
0	0	0
1	1	1
2	2	2
3	3	3
4	4	4

2	0	1
☐	☐	☐
0	0	0
1	1	1
2	2	2
3	3	3
4	4	4

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

2	/	3
☐	☐	☐
0	0	0
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6

.	6	6	6
☐	☐	☐	☐
0	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

.	6	6	7
☐	☐	☐	☐
0	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



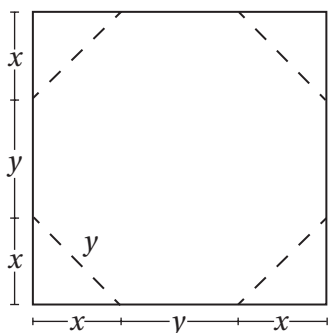
31

If y varies inversely as x , and $y = 0.5$ when $x = 10$, then for what value of x does $y = 25$?

32

If $x^2 + 12x = 13$, and $x < 0$, what is the value of x^2 ?

33



Four triangles are to be cut and removed from a square piece of sheet metal to create an octagonal sign with eight equal sides, as shown in the figure above. If the total area of the removed material is 196 square centimeters, what is the perimeter, in centimeters, of the octagon?

34

If m and n are integers such that $m^2 + n^2 = 40$ and $m < 0 < n$, what is the value of $(m + n)^2$?

35

If $(\cos x)(\sin x) = 0.2$, what is the value of $(\cos x + \sin x)^2$?

36

MONTHLY SALES (FEBRUARY)

Item	Price Per Item	Number Sold
Model AT350	\$120	20
Model U32	\$98	80
Model GY53	\$140	62
Model CDP3	\$162	38
Model AP14	\$110	40

The table above shows information about the February sales for five different cell phone models at a local store. What was the median price, to the nearest dollar, of the 240 phones sold in February?



Questions 37 and 38 refer to the following information.

Performance Banner Company creates promotional banners that include company logos. The Zypz Running Shoe Company would like a 4-foot high and 20-foot long rectangular banner that includes its logo, which has a height-to-length ratio of 5:8.

37

If the logo were scaled so that its height matched the height of the banner and then were placed in the center of the banner, then what would be the width, in feet, of each margin on either side of the logo?

38

Performance Banner Company charges its customers \$1.20 per square foot for the banner material, \$2.50 per square foot of any printed logo, and \$32 in fixed costs per banner. The Zypz Running Shoe Company is considering two options for the banner: one with a single logo, and another with two logos. If these logos are all to be the same size as described in Part 1, what percent of the banner costs would the company save by choosing the single-logo option instead of the two-logo option? (Ignore the % symbol when entering into the grid. For example, enter 27% as 27.)

STOP

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

No test material on this page.