Math Test – No Calculator

25 MINUTES, 17 QUESTIONS

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

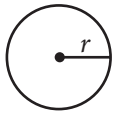
DIRECTIONS

For questions **1-13**, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. For questions **14-17**, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 14 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

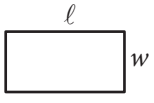
NOTES

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.

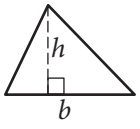
REFERENCE



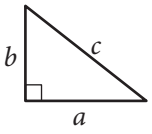
$A = \pi r^2$
$C = 2\pi r$



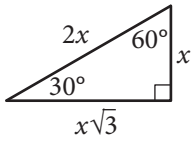
$A = \ell w$

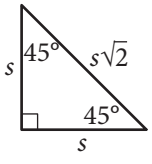


$A = \frac{1}{2}bh$

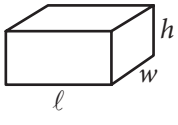


$c^2 = a^2 + b^2$

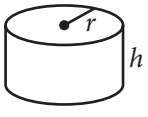




Special Right Triangles

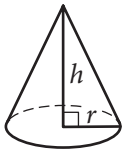


$V = \ell wh$

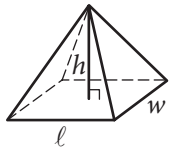


$V = \pi r^2 h$

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



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



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

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.

CONTINUE

1

A babysitter earns \$8 an hour for babysitting 2 children and an additional \$3 tip when both children are put to bed on time. If the babysitter gets the children to bed on time, what expression could be used to determine how much the babysitter earned?

A) $8x + 3$, where x is the number of hours

B) $3x + 8$, where x is the number of hours

C) $x(8 + 2) + 3$, where x is the number of children

D) $3x + (8 + 2)$, where x is the number of children

2

$$3(x + y) = y$$

If (x, y) is a solution to the equation above and $y \neq 0$, what is the ratio $\frac{x}{y}$?

A) $-\frac{4}{3}$

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

C) $\frac{1}{3}$

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

3

$$\frac{1}{2}x - \frac{1}{4}y = 10$$
$$\frac{1}{8}x - \frac{1}{8}y = 19$$

Which ordered pair (x, y) satisfies the system of equations above?

A) $(-112, -264)$

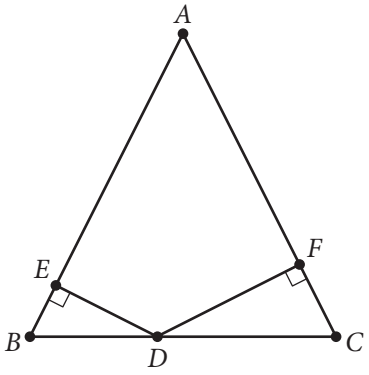
B) $(64, 88)$

C) $\left(\frac{232}{3}, \frac{224}{3}\right)$

D) $(288, 536)$

CONTINUE

4



Note: Figure not drawn to scale.

Triangle ABC above is isosceles with $AB = AC$ and $BC = 48$. The ratio of DE to DF is $5 : 7$. What is the length of $\overline{DC}$?

A) 12

B) 20

C) 24

D) 28

5

In a certain game, a player can solve easy or hard puzzles. A player earns 30 points for solving an easy puzzle and 60 points for solving a hard puzzle. Tina solved a total of 50 puzzles playing this game, earning 1,950 points in all. How many hard puzzles did Tina solve?

A) 10

B) 15

C) 25

D) 35

6

$$2x^2 + 7x - 15 = 0$$

If r and s are two solutions of the equation above and $r > s$, which of the following is the value of $r - s$?

A) $\frac{15}{2}$

B) $\frac{13}{2}$

C) $\frac{11}{2}$

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

7

To cut a lawn, Allan charges a fee of \$15 for his equipment and \$8.50 per hour spent cutting a lawn. Taylor charges a fee of \$12 for his equipment and \$9.25 per hour spent cutting a lawn. If x represents the number of hours spent cutting a lawn, what are all the values of x for which Taylor's total charge is greater than Allan's total charge?

A) $x > 4$

B) $3 \leq x \leq 4$

C) $4 \leq x \leq 5$

D) $x < 3$

CONTINUE

8

$$n = 456 - 3T$$

The equation above is used to model the relationship between the number of cups, n, of hot chocolate sold per day in a coffee shop and the average daily temperature, T, in degrees Fahrenheit. According to the model, what is the meaning of the 3 in the equation?

A) For every increase of 3°F, one more cup of hot chocolate will be sold.

B) For every decrease of 3°F, one more cup of hot chocolate will be sold.

C) For every increase of 1°F, three more cups of hot chocolate will be sold.

D) For every decrease of 1°F, three more cups of hot chocolate will be sold.

9

A truck enters a stretch of road that drops 4 meters in elevation for every 100 meters along the length of the road. The road is at 1,300 meters elevation where the truck entered, and the truck is traveling at 16 meters per second along the road. What is the elevation of the road, in meters, at the point where the truck passes t seconds after entering the road?

A) $1{,}300 - 0.04t$

B) $1{,}300 - 0.64t$

C) $1{,}300 - 4t$

D) $1{,}300 - 16t$

10

If $f(x-1) = 2x + 3$ for all values of x, what is the value of $f(-3)$?

A) -7

B) -5

C) -3

D) -1

11

Which of the following is equivalent to $(s-t)\left(\frac{s}{t}\right)$?

A) $\frac{s}{t} - s$

B) $\frac{s}{t} - st$

C) $\frac{s^2}{t} - s$

D) $\frac{s^2}{t} - \frac{s}{t^2}$

CONTINUE

12

$$p(x) = 3(x^2 + 10x + 5) - 5(x - k)$$

In the polynomial $p(x)$ defined above, k is a constant. If $p(x)$ is divisible by x, what is the value of k ?

A) -3

B) -2

C) 0

D) 3

13

In the xy-plane, if the parabola with equation $y = ax^2 + bx + c$, where a, b, and c are constants, passes through the point $(-1, 1)$, which of the following must be true?

A) $a - b = 1$

B) $-b + c = 1$

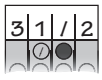
C) $a + b + c = 1$

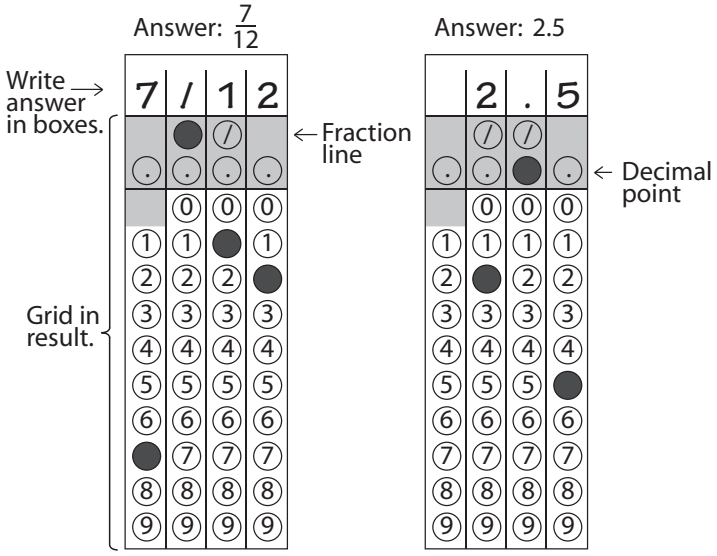
D) $a - b + c = 1$

CONTINUE

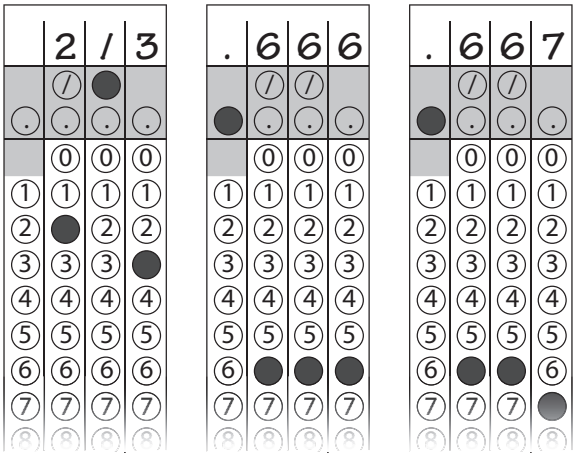
DIRECTIONS

For questions 14–17, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

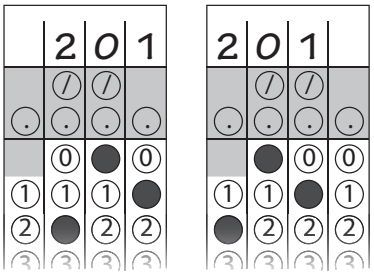
1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
2. Mark no more than one circle in any column.
3. No question has a negative answer.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

14

For what value of h is $24 = \frac{h}{10} - 6$?

15

What is the value of a if $(2a + 3) - (4a - 8) = 7$?

16

If x is not equal to zero, what is the value of $\frac{4(3x)^2}{(2x)^2}$?

17

If $x - 2$ is a factor of $x^2 - bx + b$, where b is a constant, what is the value of b ?

STOP

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

No Test Material On This Page

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

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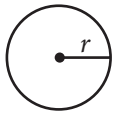
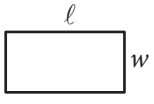
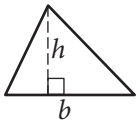


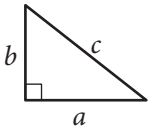
$A = \pi r^2$
$C = 2\pi r$



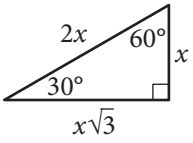
$A = \ell w$

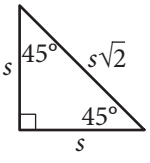


$A = \frac{1}{2}bh$

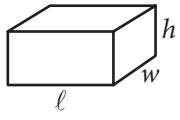


$c^2 = a^2 + b^2$

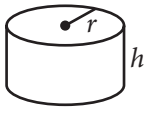




Special Right Triangles

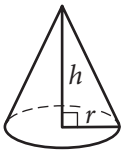


$V = \ell wh$

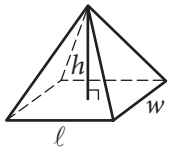


$V = \pi r^2 h$

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



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



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

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

Tyra subscribes to an online gaming service that charges a monthly fee of $5.00 and $0.25 per hour for time spent playing premium games. Which of the following functions gives Tyra's cost, in dollars, for a month in which she spends x hours playing premium games?

A) $C(x) = 5.25x$

B) $C(x) = 5x + 0.25$

C) $C(x) = 5 + 0.25x$

D) $C(x) = 5 + 25x$

2

A grocery store sells a brand of juice in individual bottles and in packs of 6 bottles. On a certain day, the store sold a total of 281 bottles of the brand of juice, of which 29 were sold as individual bottles. Which equation shows the number of packs of bottles, p, sold that day?

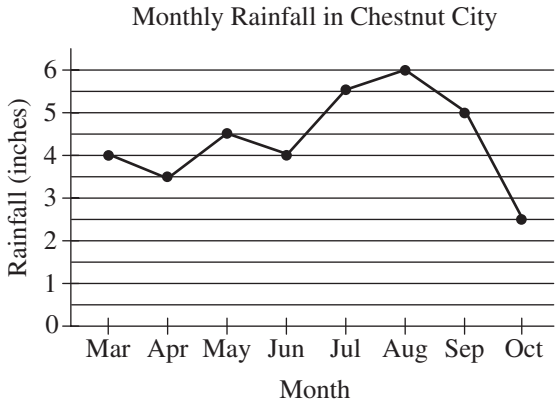
A) $p = \frac{281 - 29}{6}$

B) $p = \frac{281 + 29}{6}$

C) $p = \frac{281}{6} - 29$

D) $p = \frac{281}{6} + 29$

3



The line graph above shows the monthly rainfall from March to October last year in Chestnut City. According to the graph, what was the greatest change (in absolute value) in the monthly rainfall between two consecutive months?

A) 1.5 inches

B) 2.0 inches

C) 2.5 inches

D) 3.5 inches

CONTINUE

4

A rectangle has perimeter P, length ℓ and width w. Which of the following represents ℓ in terms of P and w ?

A) $\ell = P - w$

B) $\ell = \dfrac{2P - w}{2}$

C) $\ell = \dfrac{P - 2w}{2}$

D) $\ell = 2P - 2w$

5

Which ordered pair (x, y) satisfies the system of equations shown below?

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

A) $(-6, 2)$

B) $(-2, 2)$

C) $(2, -2)$

D) $(4, 2)$

6

A soda company is filling bottles of soda from a tank that contains 500 gallons of soda. At most, how many 20-ounce bottles can be filled from the tank? (1 gallon = 128 ounces)

A) 25

B) 78

C) 2,560

D) 3,200

7

A car traveled at an average speed of 80 miles per hour for 3 hours and consumed fuel at a rate of 34 miles per gallon. Approximately how many gallons of fuel did the car use for the entire 3-hour trip?

A) 2

B) 3

C) 6

D) 7

CONTINUE

8

What is the slope of the line in the xy-plane that passes through the points $\left(-\frac{5}{2}, 1\right)$ and $\left(-\frac{1}{2}, 4\right)$?

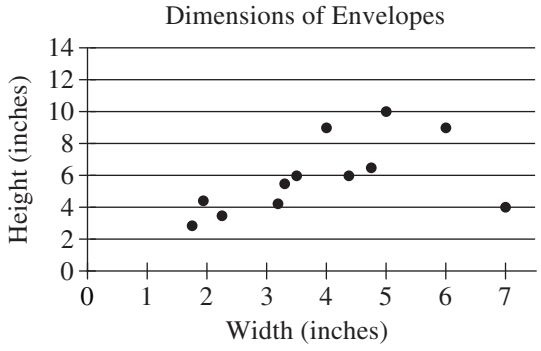
A) -1

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

C) 1

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

9



The scatterplot above shows the widths and the heights of 12 types of rectangular envelopes. What is the width, in inches, of the envelope represented by the data point that is farthest from the line of best fit (not shown) ?

A) 2

B) 5

C) 7

D) 12

10

A high school basketball team won exactly 65 percent of the games it played during last season. Which of the following could be the total number of games the team played last season?

A) 22

B) 20

C) 18

D) 14

11

$$110x + y = 1{,}210$$

A coffee shop is running a promotion where a number of free coffee samples are given away each day. The equation above can be used to model the number of free coffee samples, y, that remain to be given away x days after the promotion began. What does it mean that $(11, 0)$ is a solution to this equation?

A) During the promotion, 11 samples are given away each day.

B) It takes 11 days during the promotion to see 1,210 customers.

C) It takes 11 days during the promotion until none of the samples are remaining.

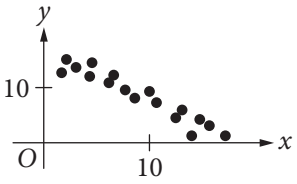
D) There are 11 samples available at the start of the promotion.

CONTINUE

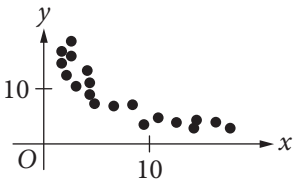
12

Which scatterplot shows a negative association that is not linear? (Note: A negative association between two variables is one in which higher values of one variable correspond to lower values of the other variable, and vice versa.)

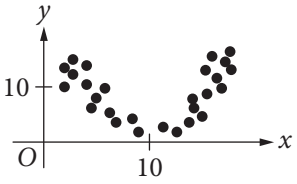
A)



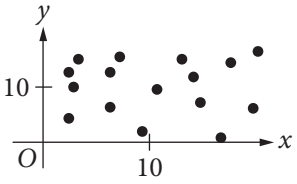
B)



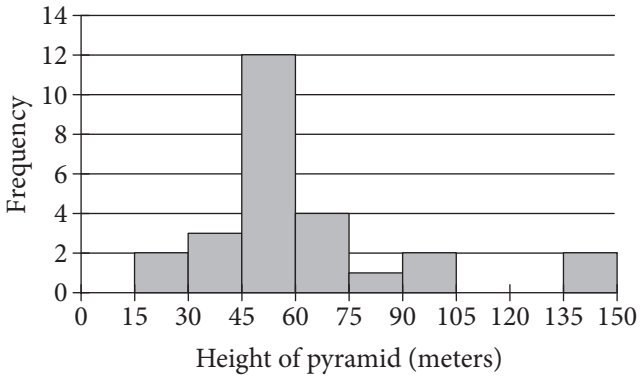
C)



D)



13



The histogram above shows the distribution of the heights, in meters, of 26 pyramids in Egypt. Which of the following could be the median height of the 26 pyramids represented in the histogram?

A) 44 meters

B) 48 meters

C) 63 meters

D) 77 meters

CONTINUE

Questions 14-16 refer to the following information.

A survey of 170 randomly selected teenagers aged 14 through 17 in the United States was conducted to gather data on summer employment of teenagers. The data are shown in the table below.

	Have a summer job	Do not have a summer job	Total
Ages 14–15	20	69	89
Ages 16–17	39	42	81
Total	59	111	170

14

Which of the following is closest to the percent of those surveyed who had a summer job?

A) 22%

B) 35%

C) 47%

D) 53%

15

In 2012 the total population of individuals in the United States who were between 14 and 17 years old (inclusive) was about 17 million. If the survey results are used to estimate information about summer employment of teenagers across the country, which of the following is the best estimate of the total number of individuals between 16 and 17 years old in the United States who had a summer job in 2012 ?

A) 8,200,000

B) 3,900,000

C) 2,000,000

D) 390,000

16

Based on the data, how many times more likely is it for a 14 year old or a 15 year old to NOT have a summer job than it is for a 16 year old or a 17 year old to NOT have a summer job? (Round the answer to the nearest hundredth.)

A) 0.52 times as likely

B) 0.65 times as likely

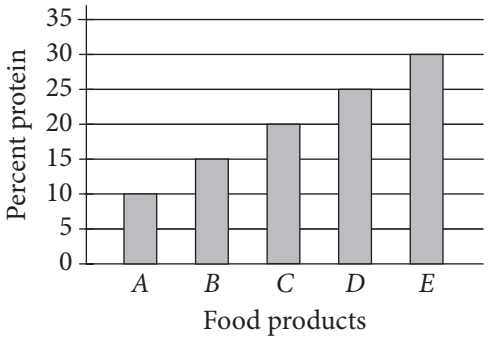
C) 1.50 times as likely

D) 1.64 times as likely

CONTINUE

17

Percent Protein in Five Food Products



The graph above shows the amount of protein supplied by five different food products, *A*, *B*, *C*, *D*, and *E*, as a percentage of their total weights. The costs of 10 grams of products *A*, *B*, *C*, *D*, and *E* are \$2.00, \$2.20, \$2.50, \$4.00, and \$5.00, respectively. Which of the five food products supplies the most protein per dollar?

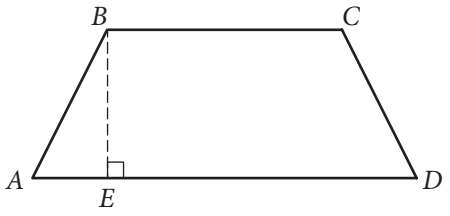
A) *A*

B) *B*

C) *C*

D) *E*

18



In quadrilateral *ABCD* above, $\overline{BC}$ is parallel to $\overline{AD}$, and $AB = CD$. If *BC* and *AD* were each doubled and *BE* was reduced by 50 percent, how would the area of *ABCD* change?

A) The area of *ABCD* would be decreased by 50 percent.

B) The area of *ABCD* would be increased by 50 percent.

C) The area of *ABCD* would not change.

D) The area of *ABCD* would be multiplied by 2.

19

Boyd grows only tomatoes and raspberries in his garden. Last year, he grew 140 pounds of tomatoes and 60 pounds of raspberries. This year, the production, by weight, of tomatoes declined by 20 percent, and the production, by weight, of raspberries declined by 50 percent. By what percentage did the total yield, by weight, of Boyd's garden decline?

A) 29 percent

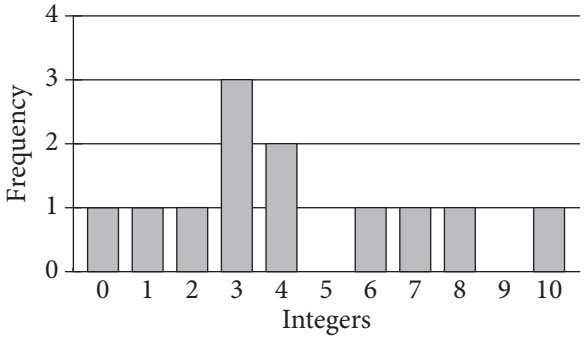
B) 30 percent

C) 35 percent

D) 70 percent

CONTINUE

20



The graph above shows the frequency distribution of a list of randomly generated integers between 0 and 10. What is the mean of the list of numbers?

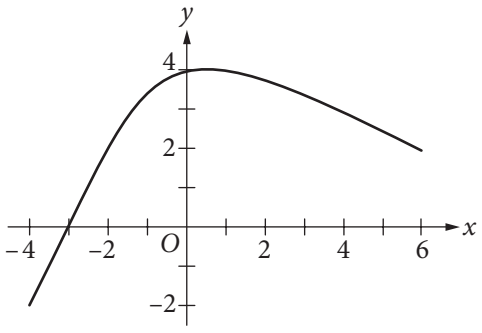
A) 3.0

B) 3.5

C) 4.25

D) 12.0

21



What is the minimum value of the function graphed on the xy-plane above, for $-4 \le x \le 6$?

A) $-\infty$

B) -4

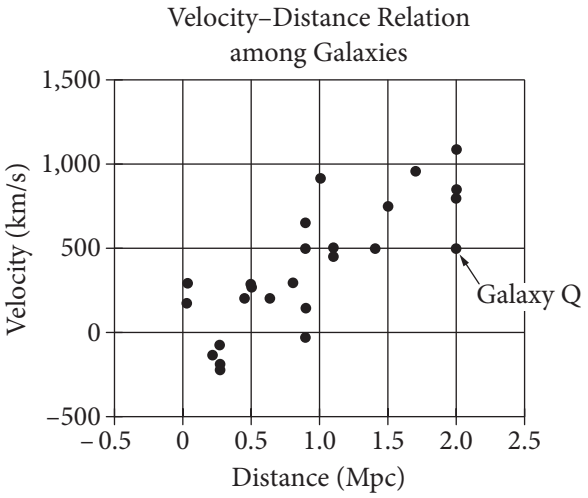
C) -2

D) 1

CONTINUE

Questions 22-24 refer to the following information.

In 1929, the astronomer Edwin Hubble published the data shown. The graph plots the velocity of galaxies relative to Earth against the distances of galaxies from Earth.



Hubble's data can be modeled by the equation $v = 500d$, where v is the velocity, in kilometers per second, at which the galaxy is moving away from Earth and d is the distance, in megaparsecs, of the galaxy from Earth. Assume that the relationship is valid for larger distances than are shown in the graph. (A megaparsec (Mpc) is 3.1×10^{19} kilometers.)

22

According to Hubble's data, how fast, in meters per second, is Galaxy Q moving away from Earth?

A) 2×10^6 m/s

B) 5×10^5 m/s

C) 5×10^2 m/s

D) 2.5×10^2 m/s

23

There are four galaxies shown in the graph at approximately 0.9 Mpc from Earth. Which of the following is closest to the range of velocities of these four galaxies, in kilometers per second?

A) 100

B) 200

C) 450

D) 700

24

Based on the model, what is the velocity, in kilometers per second, of a galaxy that is 15 Mpc from Earth?

A) 7,500 km/s

B) 5,000 km/s

C) 1,100 km/s

D) 750 km/s

CONTINUE

25

Janice puts a fence around her rectangular garden. The garden has a length that is 9 feet less than 3 times its width. What is the perimeter of Janice's fence if the area of her garden is 5,670 square feet?

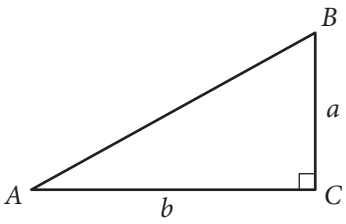
A) 342 feet

B) 318 feet

C) 300 feet

D) 270 feet

26



Given the right triangle ABC above, which of the following is equal to $\frac{b}{a}$?

A) $\sin A$

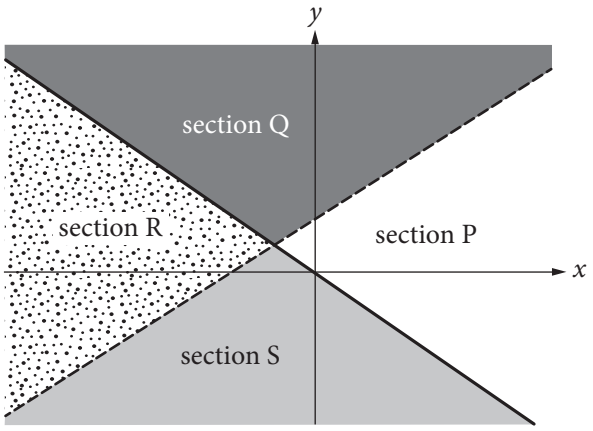
B) $\sin B$

C) $\tan A$

D) $\tan B$

27

$$\begin{cases} y \leq -x \\ 2y > 3x + 2 \end{cases}$$



A system of inequalities and a graph are shown above. Which section or sections of the graph could represent all of the solutions to the system?

A) Section R

B) Sections Q and S

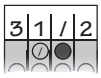
C) Sections Q and P

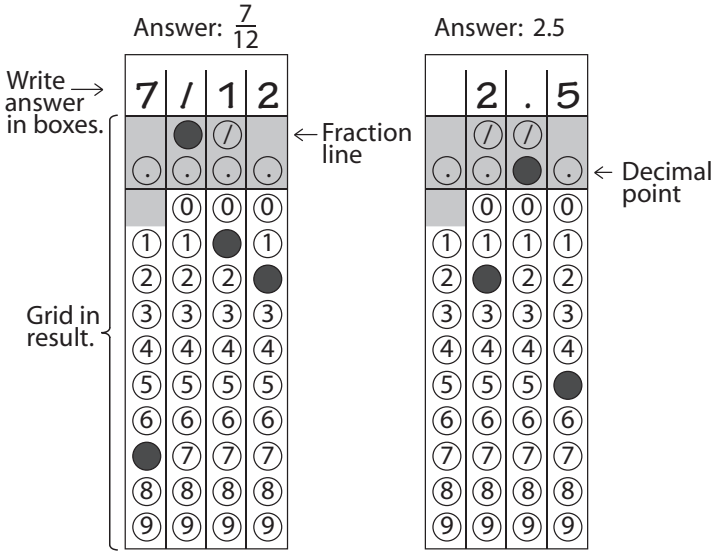
D) Sections Q, R, and S

CONTINUE

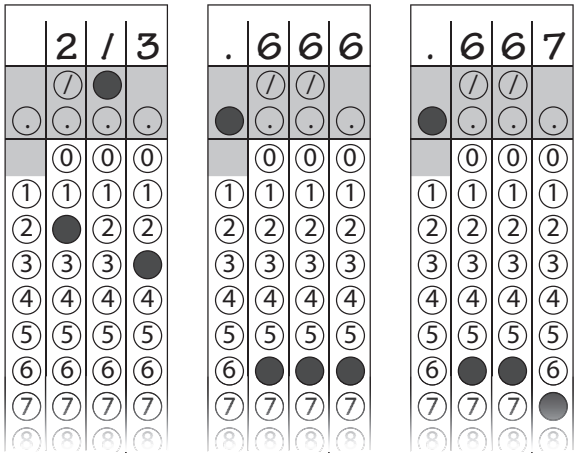
DIRECTIONS

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

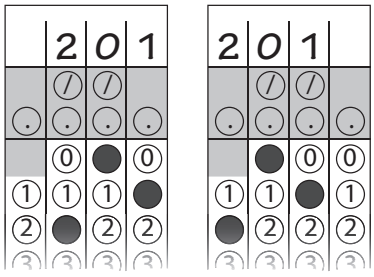
1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
2. Mark no more than one circle in any column.
3. No question has a negative answer.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



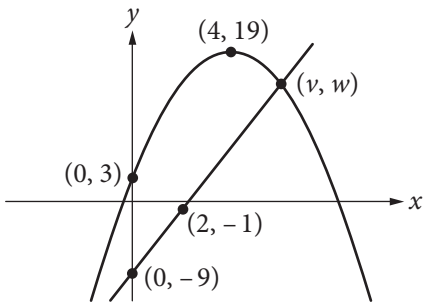
Answer: 201 – either position is correct



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

CONTINUE

28



The xy-plane above shows one of the two points of intersection of the graphs of a linear function and a quadratic function. The shown point of intersection has coordinates (v, w). If the vertex of the graph of the quadratic function is at $(4, 19)$, what is the value of v ?

29

In a college archaeology class, 78 students are going to a dig site to find and study artifacts. The dig site has been divided into 24 sections, and each section will be studied by a group of either 2 or 4 students. How many of the sections will be studied by a group of 2 students?

CONTINUE

Questions 30 and 31 refer to the following information.

$v = v_0 - gt$ (speed-time)

$h = v_0 t - \frac{1}{2} g t^2$ (position-time)

$v^2 = v_0^2 - 2gh$ (position-speed)

An arrow is launched upward with an initial speed of 100 meters per second (m/s). The equations above describe the constant-acceleration motion of the arrow, where v_0 is the initial speed of the arrow, v is the speed of the arrow as it is moving up in the air, h is the height of the arrow above the ground, t is the time elapsed since the arrow was projected upward, and g is the acceleration due to gravity (9.8 m/s^2).

30

What is the maximum height from the ground the arrow will rise to the nearest meter?

31

How long will it take for the arrow to reach its maximum height to the nearest tenth of a 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.

No Test Material On This Page

YOUR NAME (PRINT) .....

LAST FIRST MI

TEST CENTER .....

NUMBER NAME OF TEST CENTER ROOM NUMBER

PSAT/NMSQT®

GENERAL DIRECTIONS

- You may work on only one section at a time.
- If you finish a section before time is called, check your work on that section. You may NOT turn to any other section.

MARKING ANSWERS

- Be sure to mark your answer sheet properly.

COMPLETE MARK ● EXAMPLES OF INCOMPLETE MARKS 

- You must use a No. 2 pencil.
- Carefully mark only one answer for each question.
- Make sure you fill the entire circle darkly and completely.
- Do not make any stray marks on your answer sheet.
- If you erase, do so completely. Incomplete erasures may be scored as intended answers.
- Use only the answer rows that correspond to the question numbers.

USING YOUR TEST BOOK

- You may use the test book for scratch work, but you will not receive credit for anything that you write in your test book.
- After time has been called, you may not transfer answers from your test book to your answer sheet or fill in circles.
- You may not fold or remove pages or portions of a page from this book, or take the book or answer sheet from the testing room.

SCORING

- For each correct answer, you receive one point.
- You do not lose points for wrong answers; therefore, you should try to answer every question even if you are not sure of the correct answer.

IMPORTANT

The codes below are unique to your test book. Copy them on your answer sheet in boxes 21 and 22 and fill in the corresponding circles exactly as shown.

22 TEST ID
(Copy from back of test book.)

21 FORM CODE
(Copy and grid as on back of test book.)

A	A	A	A	0	0	0
B	B	B	B	1	1	1
C	C	C	C	2	2	2
D	D	D	D	3	3	3
E	E	E	E	4	4	4
F	F	F	F	5	5	5
G	G	G	G	6	6	6
H	H	H	H	7	7	7
I	I	I	I	8	8	8
J	J	J	J	9	9	9
K	K	K	K			
L	L	L	L			
M	M	M	M			
N	N	N	N			
O	O	O	O			
P	P	P	P			
Q	Q	Q	Q			
R	R	R	R			
S	S	S	S			
T	T	T	T			
U	U	U	U			
V	V	V	V			
W	W	W	W			
X	X	X	X			
Y	Y	Y	Y			
Z	Z	Z	Z			

Follow this link for more information on scoring your practice test: **www.collegeboard.org/psatscoring**

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5KPT06

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