

April 2017

The SAT

Question- and-Answer Service

**Use this with your QAS Student Guide
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What's inside:

- Test questions
- The Essay prompts administered on your test day



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Math Test – No Calculator

25 MINUTES, 20 QUESTIONS

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

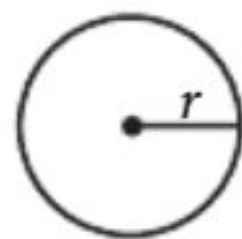
DIRECTIONS

For questions 1-15, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. For questions 16-20, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 16 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

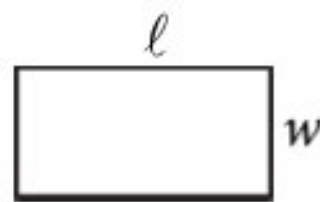
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- Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE

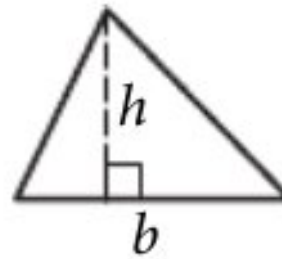


$$A = \pi r^2$$

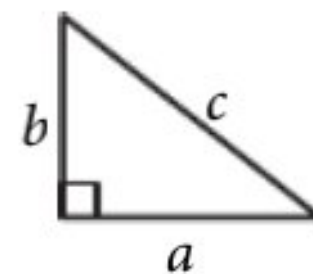
$$C = 2\pi r$$



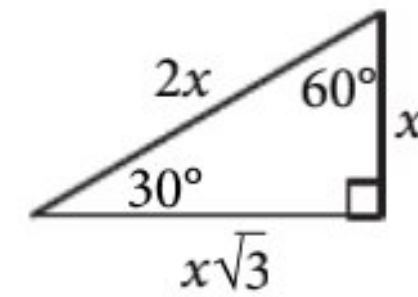
$$A = \ell w$$



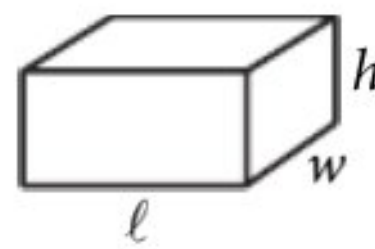
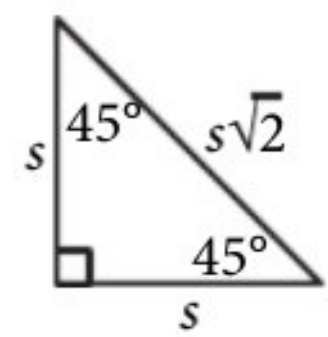
$$A = \frac{1}{2}bh$$



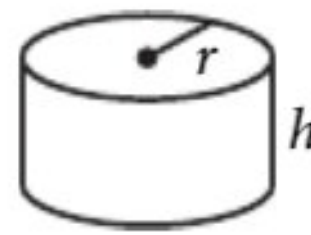
$$c^2 = a^2 + b^2$$



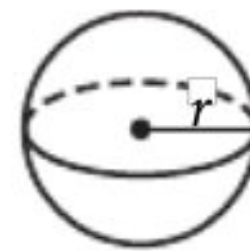
Special Right Triangles



$$V = \ell wh$$



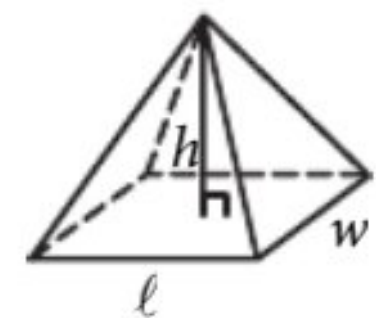
$$V = \pi r^2 h$$



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



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



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

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.



A farmer sold 108 pounds of produce that consisted of z pounds of zucchini and c pounds of cucumbers. The farmer sold the zucchini for \$1.69 per pound and the cucumbers for \$0.99 per pound and collected a total of \$150.32. Which of the following systems of equations can be used to find the number of pounds of zucchini that were sold?

- A)
$$\begin{cases} z + c = 150.32 \\ 1.69z + 0.99c = 108 \end{cases}$$
- B)
$$\begin{cases} z + c = 108 \\ 1.69z + 0.99c = 150.32 \end{cases}$$
- C)
$$\begin{cases} z + c = 108 \\ 0.99z + 1.69c = 150.32 \end{cases}$$
- D)
$$\begin{cases} z + c = 150.32 \\ 0.99z + 1.69c = 108 \end{cases}$$

$$\begin{aligned} z + c &= 108 \\ 1.69z + 0.99c &= 150.32 \end{aligned}$$

The formula above gives the monthly cost C in dollars, of operating a delivery truck when the driver works a total of x hours and when y gallons of gasoline are used. If, in a particular month, it cost no more than \$2,000 to operate the truck and at least 150 gallons of gas were used, what is the maximum number of hours the driver could have worked?

- A) 125
- B) 140
- C) 500
- D) 1,400

$$\begin{aligned} 2000 &\leq 10x + 4(150) \\ 2000 &\leq 10x + 600 \\ 1400 &\leq 10x \\ 140 &\leq x \end{aligned}$$

$$5x^2 - 3(1 - x) - 2x(x + 5)$$

Which of the following polynomials is equivalent to the expression above?

- A) $3x^2 - 7x - 3$ $5x^2 - 3 + 3x - 2x^2 - 10x$
- B) $3x^2 + 7x - 3$ $3x^2 - 7x - 3$
- C) $5x^2 - 5x - 3$
- D) $5x^2 - 9x - 3$

$$x(x + 2) = 8$$

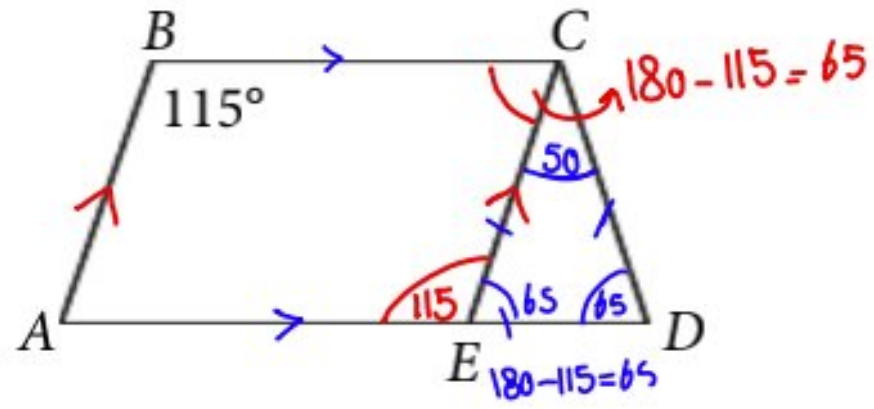
Which of the following lists all solutions to the quadratic equation above?

- A) 8 and 6
- B) 4 and -2
- C) -4 and 2
- D) $\sqrt{6}$

$$\begin{aligned} x^2 + 2x - 8 &= 0 \\ (x - 2)(x + 4) &= 0 \\ x_1 = 2, x_2 = -4 \end{aligned}$$



5



Note: Figure not drawn to scale.

In the figure above, \overline{BC} and \overline{AD} are parallel, \overline{AB} and \overline{EC} are parallel, $CD = CE$, and the measure of $\angle ABC$ is 115° . What is the measure of $\angle BCD$?

- A) 85°
 B) 115°
 C) 125°
 D) 140°

$$65 + 50 = 115$$

6

$$0.8p = t$$

At a store, a coat originally priced at p dollars is on sale for t dollars, and the relationship between p and t is given in the equation above. What is p in terms of t ?

- A) $p = t - 0.8$
 B) $p = 0.8t$
 C) $p = \frac{0.8}{t}$
 D) $p = \frac{t}{0.8}$

$$p = \frac{t}{0.8}$$

7

$$x + 2y = 16$$

$$(0.5x - y = 10) \times 2$$

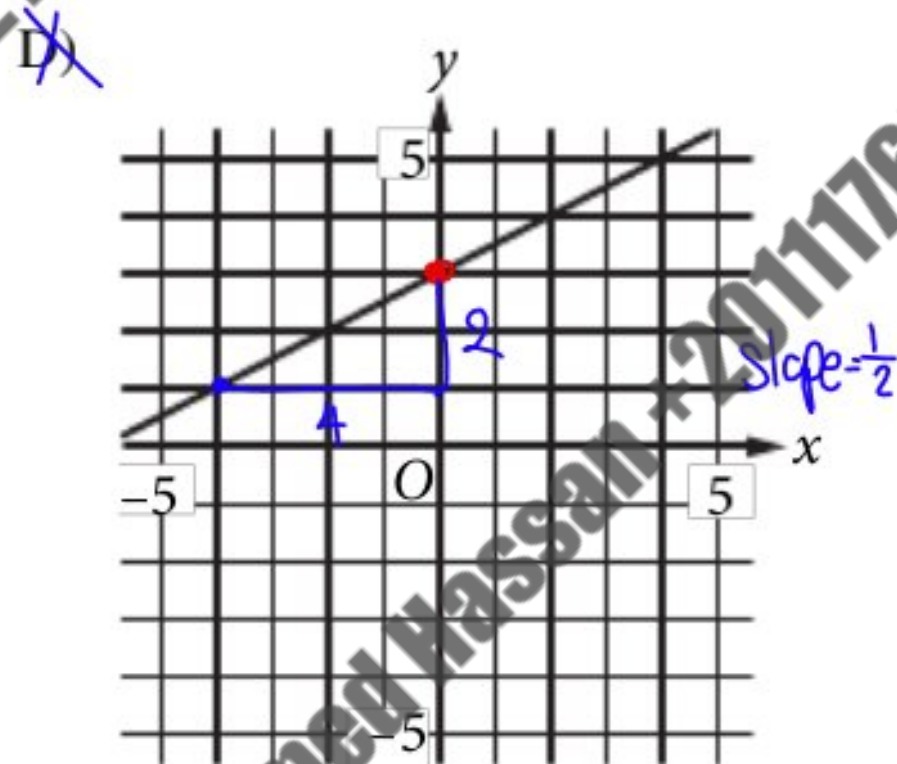
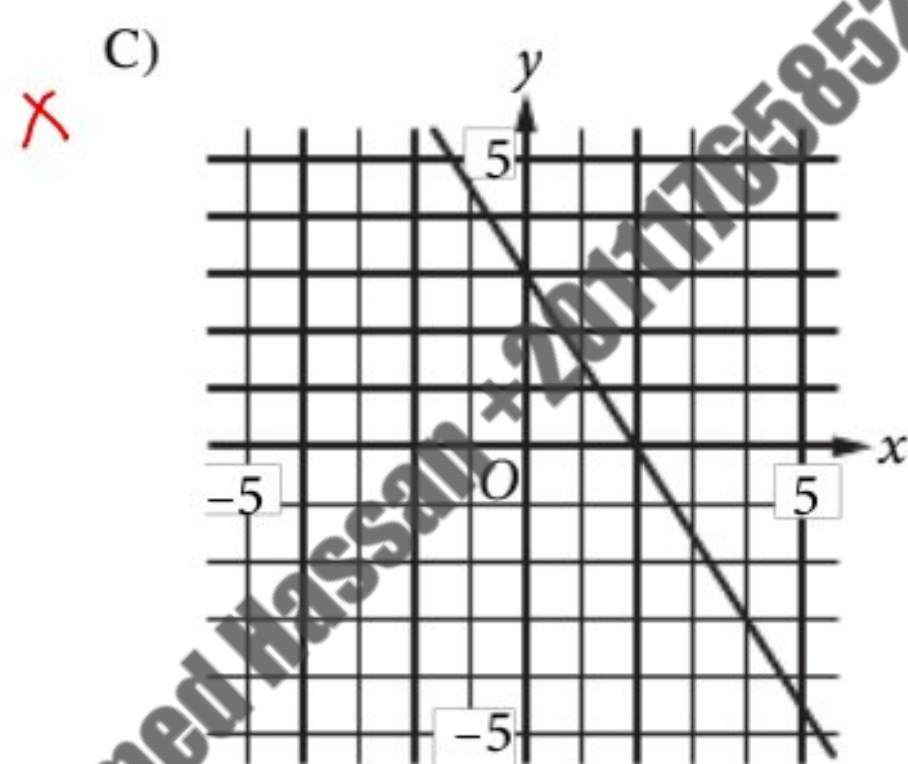
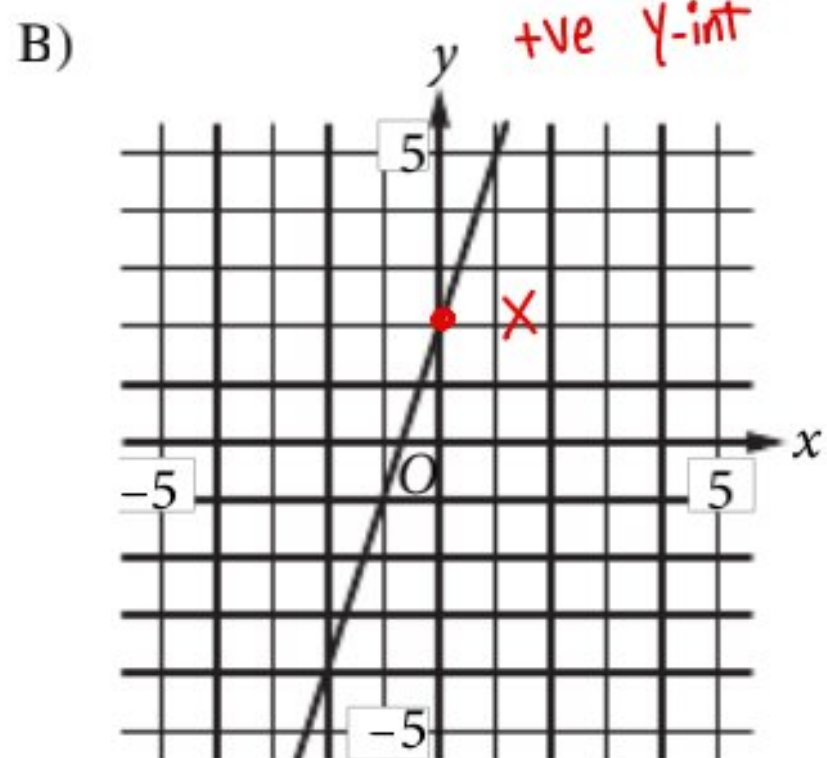
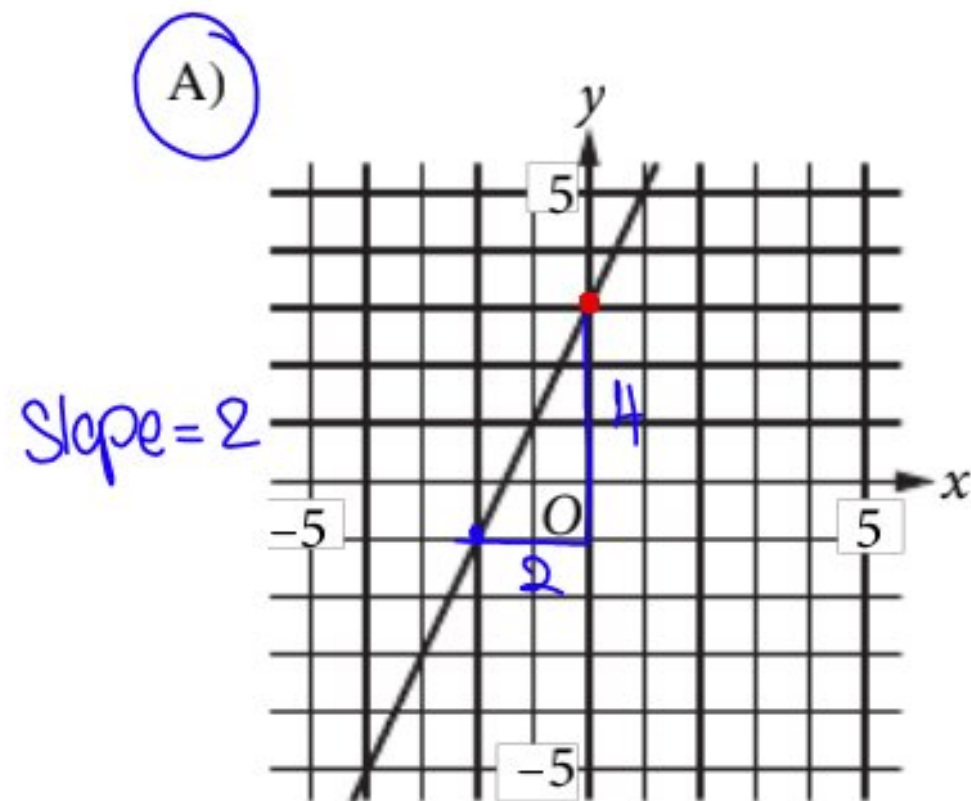
The solution to the system of equations above is (x, y) . What is the value of x ?

- A) -2
 B) 2
 C) 18
 D) 36

$$\begin{array}{r} x + 2y = 16 \\ x - 2y = 20 \\ \hline 2x = 36 \\ x = 18 \end{array}$$



Which of the following is the graph of the equation $y = 2x + 3$ in the xy -plane?



$$x^2 - 6x + 11 = y$$

$$x = y + 1$$

The system of equations above is graphed in the xy -plane. Which of the following is the y -coordinate of an intersection point (x, y) of the graphs of the two equations?

- A) -4
- B) -2
- C) 2
- D) 4

Handwritten work:

$$(y+1)^2 - 6(y+1) + 11 = y$$

$$y^2 + 2y + 1 - 6y - 6 + 11 = y$$

$$y^2 - 4y + 6 = y$$

$$y^2 - 5y + 6 = 0$$

$$(y-2)(y-3) = 0$$

$$y = 2, y = 3$$

April QAS 2017

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$$\frac{5}{x-1} + \frac{4-8}{2(x-1)}$$

Which of the following expressions is equivalent to the one above, where $x \neq 1$?

- A) $\frac{9}{x-1}$
 - B) $\frac{14}{x-1}$
 - C) $\frac{15}{2x-2}$
 - D) $\frac{21}{2x-2}$
- Handwritten work for A: $\frac{5}{x-1} + \frac{4}{x-1} = \frac{9}{x-1}$

CONTINUE



For a positive real number x , where $x^8 = 2$, what is the value of x^{24} ?

A) $\sqrt[3]{24}$

B) 4

C) 6

D) 8

$$(x^8)^3 = 2^3 = 8$$

11

Which of the following is an equivalent form of

$\sqrt[3]{f^{6a}k^2}$, where $f > 0$ and $k > 0$?

A) $f^{\frac{1}{3a}}k^{\frac{2}{3}}$

B) $f^{\frac{2}{3a}}k^{\frac{3}{2}}$

C) $f^{3a}k^{-1}$

D) $f^{2a}k^{\frac{2}{3}}$

$$\left(f^{\frac{6a}{3}}\right) \left(k^{\frac{2}{3}}\right)$$

$$f^{2a} \cdot k^{\frac{2}{3}}$$

$$g(t) = \frac{5(7t - 12c)}{2} - 25$$

The number of people who go to a public swimming pool can be modeled by the function g above, where c is a constant and t is the air temperature in degrees Fahrenheit ($^{\circ}\text{F}$) for $70 < t < 100$. If 350 people are predicted to go to the pool when the temperature is 90°F , what is the value of c ?

A) 20

B) 40

C) 60

D) 80

$$350 = \frac{5(7(90) - 12c)}{2} - 25$$

$$375 = \frac{5(630 - 12c)}{2}$$

$$750 = 5(630 - 12c)$$

$$150 = 630 - 12c$$

$$12c = 630 - 150$$

$$12c = 480$$

$$c = 40$$



14

The boiling point of water at sea level is 212 ^{initial} degrees Fahrenheit ($^{\circ}\text{F}$). For every increase of 1,000 feet above sea level, the boiling point of water ^{drops} _{dec} approximately 1.84°F . Which of the following equations gives the approximate boiling point B , in $^{\circ}\text{F}$, at h feet above sea level?

- A) $B = 212 - 1.84h$
 B) $B = 212 - (0.00184)h$
 C) $B = 212h$
 D) $B = 1.84(212) - 1,000h$

B h

1.84 1000

B 1

$$B = \frac{1.84}{1000} = 0.00184$$

$$B = 212 - 0.00184h$$

15

The graph of $x^2 - 4x + y^2 + 6y - 24 = 0$ in the xy -plane is a circle. What is the radius of the circle?

- A) $2\sqrt{6}$
 B) $\sqrt{11}$
 C) $\sqrt{37}$
 D) $\sqrt{76}$

$$\text{Center } \left(\frac{4}{2}, \frac{-6}{2} \right) = (2, -3)$$

$$r = \sqrt{(2)^2 + (-3)^2 + 24} = \sqrt{4 + 9 + 24} = \sqrt{37}$$



16

$$|5 - x| = 4$$

The value of one solution to the equation above is 1. What is the value of the other solution?

$$\begin{aligned} 5 - x &= -4 \\ 5 + 4 &= x \\ x &= 9 \end{aligned}$$

17

If $f(x) = x^2 - 4x + 10$ and c is a positive integer less than 5, what is one possible value of $f(c)$?

$$C = 4 \rightarrow f(4) = (4)^2 - 4(4) + 10 = 16 - 16 + 10 = 10$$

$$C = 3 \rightarrow f(3) = (3)^2 - 4(3) + 10 = 9 - 12 + 10 = 7$$

$$C = 2 \rightarrow f(2) = (2)^2 - 4(2) + 10 = 4 - 8 + 10 = 6$$

$$C = 1 \rightarrow f(1) = (1)^2 - 4(1) + 10 = 1 - 4 + 10 = 7$$

18

Students in a science lab are working in groups to build both a small and a large electrical circuit. A large circuit uses 4 resistors and 2 capacitors, and a small circuit uses 3 resistors and 1 capacitor. There are 100 resistors and 70 capacitors available, and each group must have enough resistors and capacitors to make one large and one small circuit. What is the maximum number of groups that could work on this lab project? = 14 groups

$$\text{Large} \rightarrow 4R, 2C$$

$$\text{Small} \rightarrow 3R, 1C$$

$$\text{Total (R)} = 7R \rightarrow \frac{100}{7} = 14 \frac{2}{7}$$

$$\text{Total (C)} = 3C \rightarrow \frac{70}{3} = 23 \frac{1}{3}$$

19

An angle with a measure of $\frac{7\pi}{6}$ radians has a measure of d degrees, where $0 \leq d < 360$. What is the value of d ?

$$\frac{7 \times 180}{6} = 7 \times 30 = 210$$

20

The function f is defined by $f(r) = (r - 4)(r + 1)^2$. If $f(h - 3) = 0$, what is one possible value of h ?

$$f(h-3) = (h-3-4)(h-3+1)^2$$

$$\begin{aligned} (h-7)(h-2)^2 &= 0 \\ h &= 7, h = 2 \end{aligned}$$

STOP

If you finish before time is called, you may check your work on this section only.

Do not turn to any other section.



Math Test – Calculator

55 MINUTES, 38 QUESTIONS

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

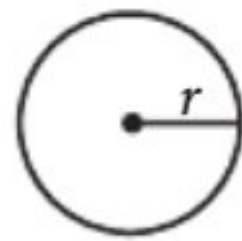
DIRECTIONS

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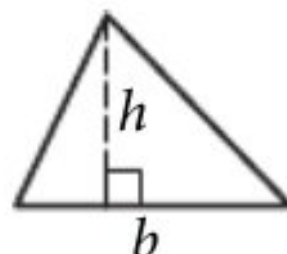


$$A = \pi r^2$$

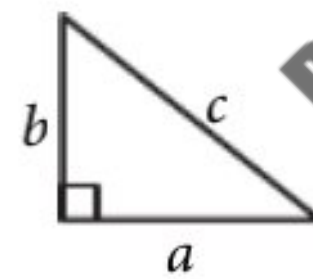
$$C = 2\pi r$$



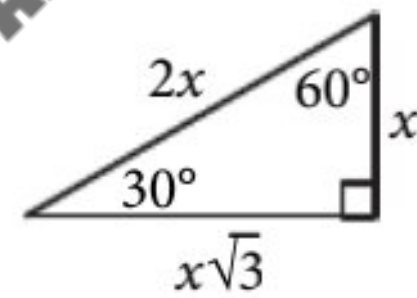
$$A = \ell w$$



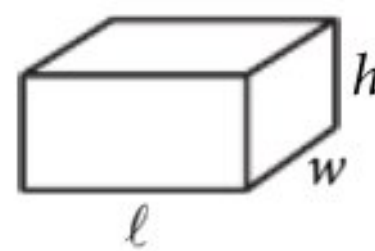
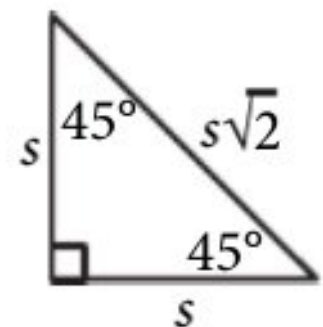
$$A = \frac{1}{2}bh$$



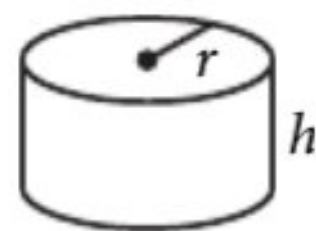
$$c^2 = a^2 + b^2$$



Special Right Triangles



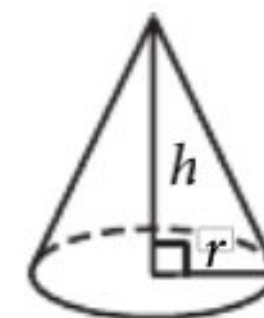
$$V = \ell wh$$



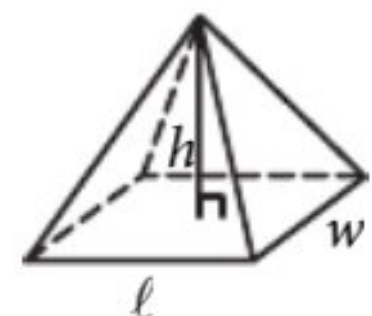
$$V = \pi r^2 h$$



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



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



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

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.



If $m = 3$, how much greater is $10m$ than $6m$?

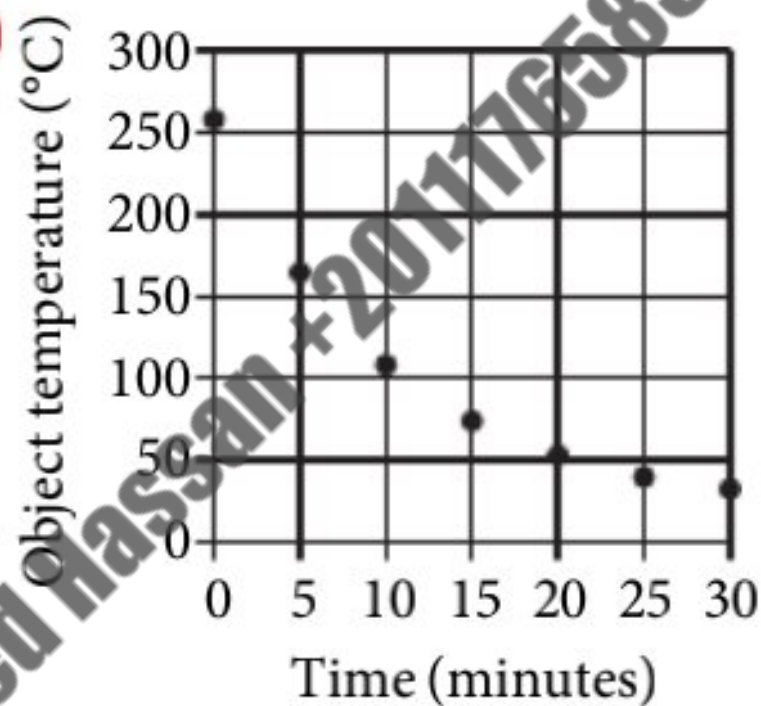
- A) 3
B) 4
C) 12
D) 30

$$10(3) - 6(3) = 30 - 18 = 12$$

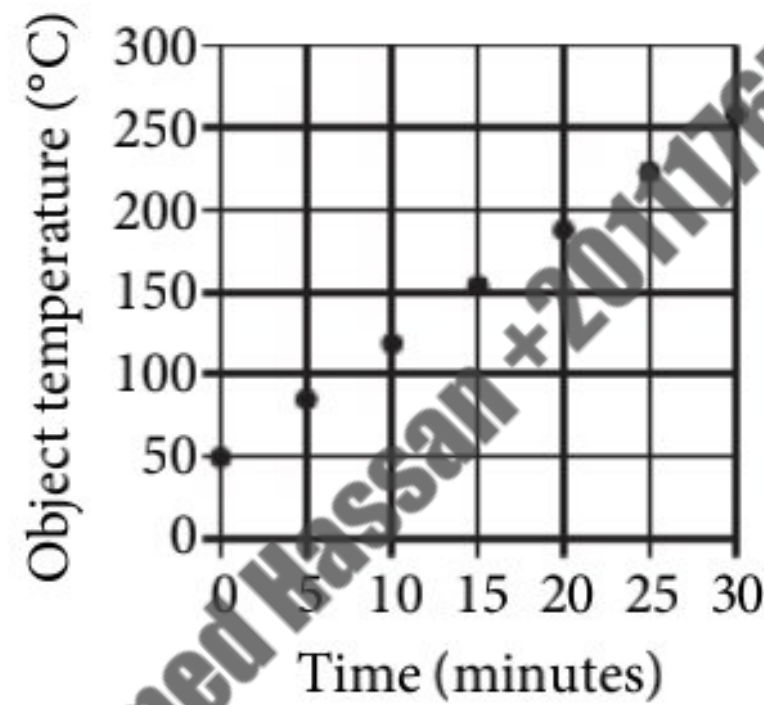
2

The temperature, in degrees Celsius ($^{\circ}\text{C}$), of a hot object placed in a room is recorded every five minutes. The temperature of the object decreases rapidly at first, then decreases more slowly as the object's temperature approaches the temperature of the room. Which of the following graphs could represent the temperature of this object over time?

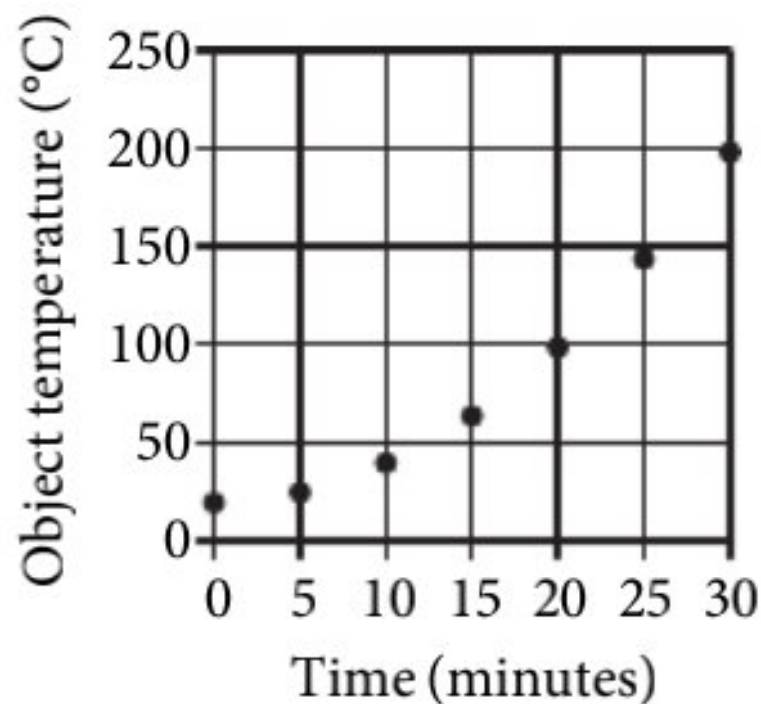
A)



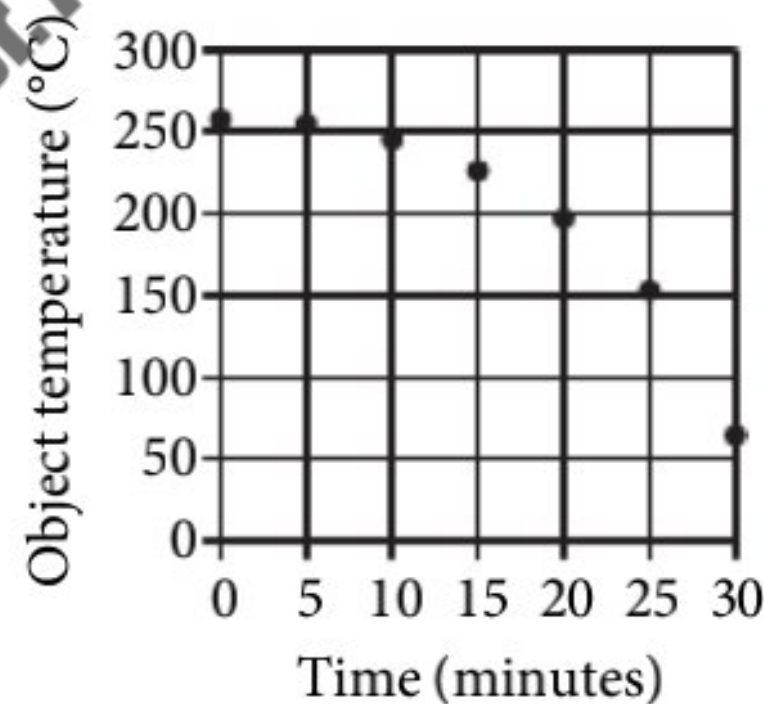
B)



C)



D)





3

$$(x-2)^2 = (\sqrt{x+10})^2$$

Which of the following values of x is a solution to the equation above?

- A) -1
 B) -1
 C) -4
 D) -6

$$x^2 - 4x + 4 = x + 10$$

$$x^2 - 5x - 6 = 0$$

$$(x-6)(x+1) = 0$$

$$x = 6, x = -1$$

$$x = -2 = \sqrt{x+10} \quad \text{xx}$$

4

Last year, 800 students attended the career fair at West High School. This year, the number of students who attended the career fair increased by 5%. How many students attended the career fair at West High School this year?

- A) 804
 B) 805
 C) 840
 D) 1,200

$$800(1+5\%) = 840$$

Questions 5 and 6 refer to the following information.

Nutritional Information for 1-Ounce Servings of Seeds and Nuts

Seed or nut	Calories	Total fat (grams)	Protein (grams)
Pecan	198	20.2	3.0
Pistachio	80	6.5	3.0
Pumpkin	159	13.9	8.5
Sunflower	166	14.6	5.9
Walnut	185	18.5	4.3

The table above shows the calories, grams of fat, and grams of protein in 1-ounce servings of selected seeds and nuts.

5

How many more grams of protein are in one pound of pumpkin seeds than are in one pound of pistachios? (1 pound = 16 ounces)

- A) 48
 B) 72
 C) 88
 D) 136

$$8.5 - 3 = 5.5$$

$$5.5 \times 16 = 88$$

$$1 \text{ pound} \rightarrow 16 \text{ ounces} \\ 16 \text{ ounces} \rightarrow 450 \text{ gram} \\ 8.5 \\ 3$$



6

Lionel purchases 1-pound bags of each of the five seeds and nuts shown in the table. Of the following, which best approximates the average (arithmetic mean) number of calories per bag? (1 pound = 16 ounces)

- A) 150
B) 250
C) 1,500
D) 2,500

$$\text{Sum} = 198 + 80 + 159 + 166 + 185 = 788$$

$$\frac{788}{5} \times 16 = 2521.6$$

8

At a snack bar, each medium drink costs \$1.85 and each large drink costs c more dollars than a medium drink. If 5 medium drinks and 5 large drinks cost a total of \$20.50, what is the value of c ?

- A) 0.45
B) 0.40
C) 0.30
D) 0.25

$$M = 1.85$$

$$L = 1.85 + c$$

$$5M + 5L = 20.50$$

$$5(1.85) + 5(1.85 + c) = 20.50$$

Shift solve

$$c = 0.40$$

7

A pool initially contains 1,385 cubic feet of water. A pump begins emptying the water at a constant rate of 20 cubic feet per minute. Which of the following functions best approximates the volume $v(t)$, in cubic feet, of water in the pool t minutes after pumping begins, for $0 \leq t \leq 69$?

- A) $v(t) = 1,385 - 20t$
B) $v(t) = 1,385 - 69t$
C) $v(t) = 1,385 + 20t$
D) $v(t) = 1,385 + 69t$

9

Kate bought a bus pass that had an initial value of \$90. For every bus ride Kate takes, \$1.80, the cost of one bus ride, is subtracted from the value of the pass. What percent of the initial value of Kate's bus pass is the cost of one bus ride?

- A) 1.8%
B) 2%
C) 5%
D) 98%

$$\frac{1.8}{90} \times 100$$



10

To determine whether residents of a community would vote in favor of a ballot proposal to use \$100,000 of local taxes for additional playground equipment at a community park, Jennifer surveyed 60 adults visiting the park with their children during one week in June. She found that 45 of those surveyed reported that they would vote in favor of the proposal. Which of the following statements must be true?

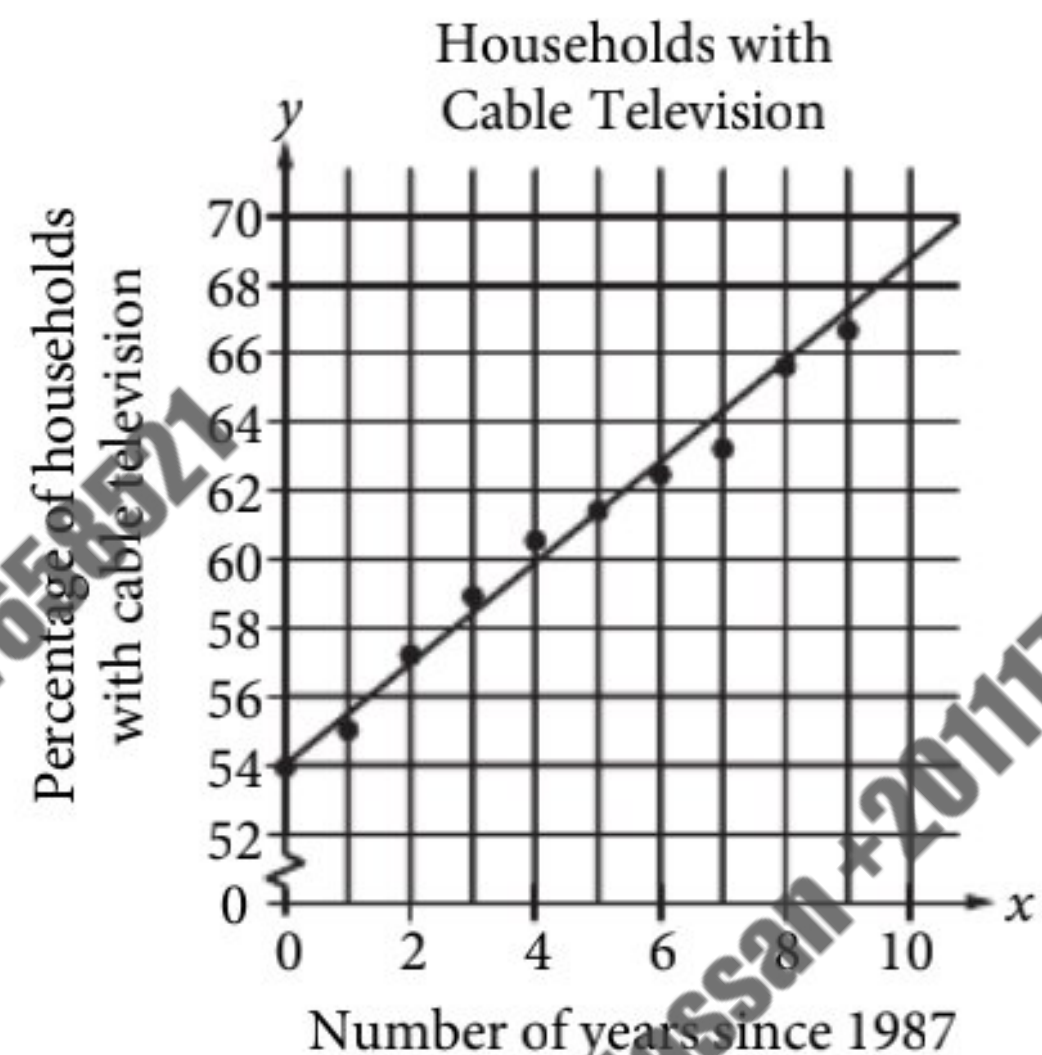
- A) When the actual vote is taken, 75 percent of the votes will be in favor of the proposal.
- B) No prediction should be made about the vote on the proposal because the sample size is too small.
- C) The sampling method is flawed and may produce biased results.
- D) The sampling method is not flawed and is likely to produce unbiased results.

If $x^4 - y^4 = -15$ and $x^2 - y^2 = -3$, what is the value of $|x^2 + y^2|$?

- A) 5
- B) 4
- C) 2
- D) 1
- $(x^2 - y^2)(x^2 + y^2) = -15$
 $-3(x^2 + y^2) = -15$
 $(x^2 + y^2) = 5$

Questions 12 and 13 refer to the following information.

A cable company recorded the percentage of households in the United States that had cable television from 1987 to 1997. In the scatterplot below, x represents the number of years since 1987 and y represents the percentage of households with cable television. The line of best fit for the data is shown.



Which of the following is closest to the equation of the line of best fit shown?

- A) $y = 54x + \frac{7}{5}$
- B) $y = \frac{7}{5}x - 54$
- C) $y = \frac{7}{5}x + 54$
- D) $y = \frac{7}{5}x$
- $(0, 54)$



13

Which of the following is the best interpretation of the slope of the line of best fit shown for these data?

- A) The actual increase in the percentage of households with cable television each year
- B) The predicted increase in the percentage of households with cable television each year
- C) The actual increase in the number of households with cable television each year
- D) The predicted increase in the number of households with cable television each year

14

A greenhouse owner purchases fertilizer in 60-gallon drums. The fertilizer is mixed with water to make several batches of solution. Each batch of solution is made by mixing 3 quarts of fertilizer with water. What is the maximum number of batches of solution that can be made from one 60-gallon drum of fertilizer? (1 gallon = 4 quarts)

- A) 45
- B) 60
- C) 80
- D) 180

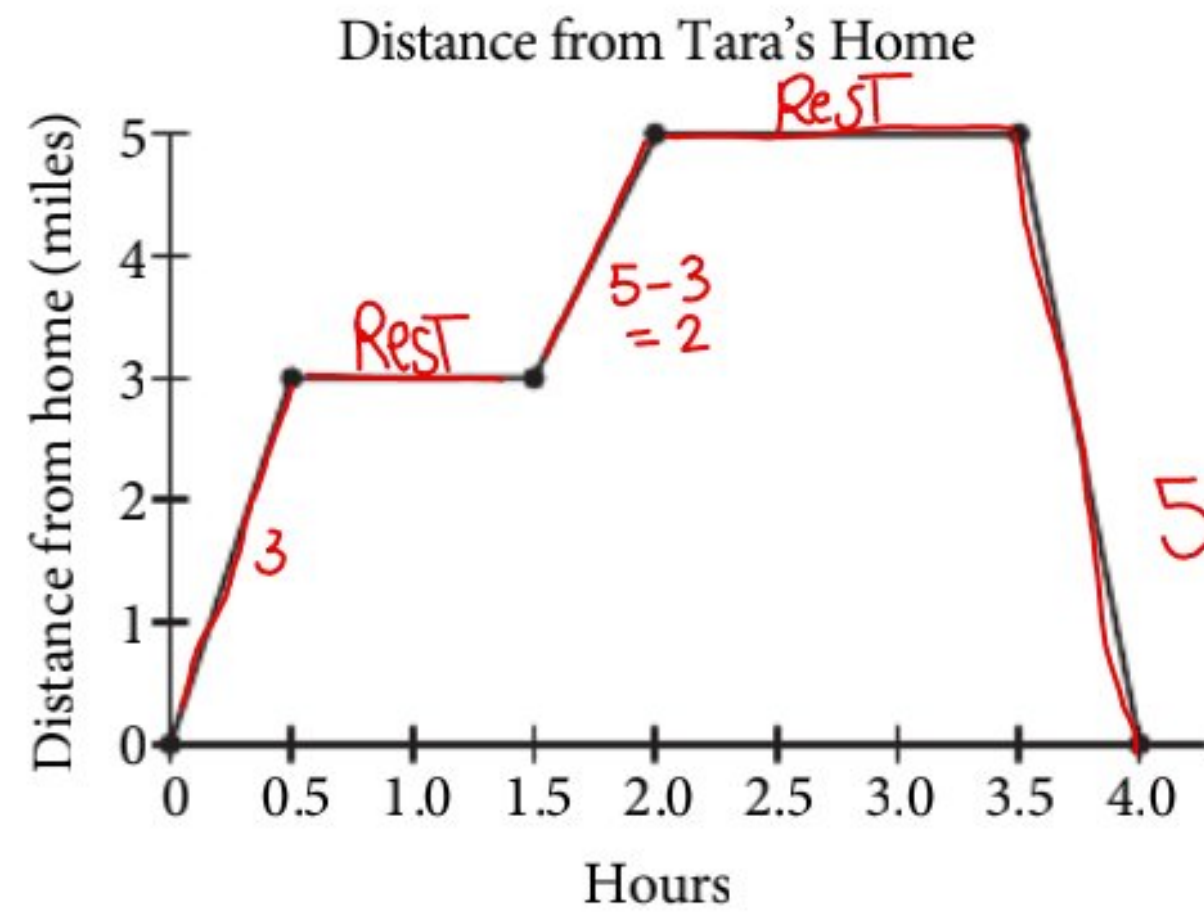
$$4(60) = 240 \text{ quarts}$$

$$1 \text{ batch} \rightarrow 3 \text{ quarts}$$

$$x \rightarrow 240$$

$$x = \frac{240}{3} = 80 \text{ batches}$$

15



Tara rode her bicycle along a straight road from her home to a restaurant and ate lunch. She then continued along the same road to a movie theater to see a movie. Finally, she returned home on the same road after the movie. Tara's distance from home during the 4 hours she was out is shown in the graph above. How many total miles did she ride her bicycle?

$$3 + 2 + 5 = 10$$

- A) 5
- B) 10
- C) 16
- D) 20



16

Ryan has 1,500 yards of yarn. He wants to knit at least 2 scarves and at least 3 hats. Each scarf requires 300 yards of yarn, and each hat requires 120 yards of yarn. If s represents the number of scarves and h represents the number of hats, which of the following systems of inequalities represents this situation?

A) $s + h \leq 1,500$
 $s \geq 2$
 $h \geq 3$

$s \geq 2$
 $h \geq 3$

B) $2s + 3h \leq 1,500$
 $s \geq 2$
 $h \geq 3$

$300s + 120h \leq 1500$

C) $2s + 3h \leq 1,500$
 $s \geq 300$
 $h \geq 120$

D) $300s + 120h \leq 1,500$
 $s \geq 2$
 $h \geq 3$

17

Michael performed an experiment where he tossed two coins, one dime and one nickel, at the same time and recorded whether each one landed on heads or tails. His results are shown in the table below.

		Nickel	
		Heads	Tails
Dime	Heads	27	26
	Tails	24	23

$27 + 26 = 53$
 $24 + 23 = 47$
 $53 + 47 = 100$

For what percent of the tosses did the dime Michael tossed land on heads?

- A) 47%
 B) 49%
 C) 51%
 D) 53%

$\frac{53}{100} \times 100$

18

During a storm, the atmospheric pressure in a certain location fell at a constant rate of 3.4 millibars (mb) per hour over a 24-hour time period. Which of the following is closest to the total drop in atmospheric pressure, in millimeters of mercury (mm Hg), over the course of 5 hours during the 24-hour time period? (Note: 1,013 mb = 760 mm Hg)

- A) 2.6
 B) 12.8
 C) 17.0
 D) 22.7

$3.4 \text{ (mb)} \rightarrow 1 \text{ hour}$
 $x \rightarrow 5$
 $x = 5(3.4) = 17 \text{ mb}$

$1013 \text{ mb} \rightarrow 760 \text{ mm Hg}$
 $17 \rightarrow x$
 $x = \frac{17 \times 760}{1013}$

19

On its opening day, a car dealership had an inventory of 29 cars. During the first 6 months, 18 additional cars were purchased by the dealership each week, and the sales team sold an average of 15 cars per week. During the first six months, which of the following equations best models the car inventory, c , at the dealership t weeks after opening day?

- A) $c = -t + 29$
 B) $c = t + 29$
 C) $c = \frac{3}{2}t + 29$
 D) $c = 3t + 29$

$1 \text{ month} = \frac{18}{6} = 3$



20

If $2\sqrt{2x} = a$, what is $2x$ in terms of a ?

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

B) $\frac{a^2}{4}$

C) $\frac{a^2}{2}$

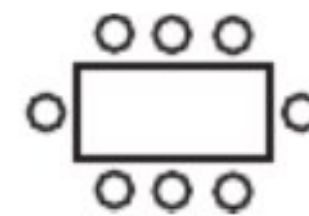
D) $4a^2$

$$\sqrt{2x} = \frac{a}{2}$$

$$2x = \frac{a^2}{4}$$

21

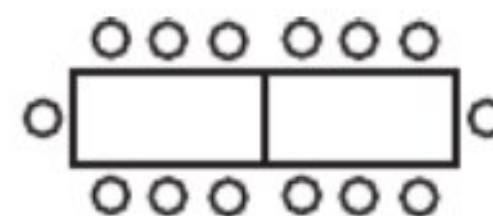
$n=1$



Arrangement I

8

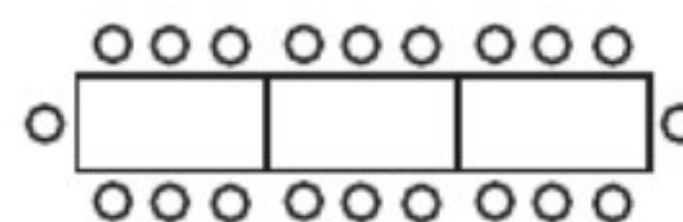
$n=2$



Arrangement II

14

$n=3$



Arrangement III

20



A project coordinator at a banquet hall is given the task of arranging seating for an awards ceremony.

The figure above shows the first three possible arrangements of tables and the maximum number of seats in each arrangement. If the number of seats in each successive arrangement is increased by 6 over the preceding arrangement, which of the following represents the maximum number of seats around n tables?

A) $6n$

B) $2(3n + 1)$

C) $6(n + 1)$

D) $6(n + 3)$

(1,8)

$$y = 6n + b$$

$$8 = 6(1) + b$$

$$b = 2$$

$$y = 6n + 2$$



22

The graphs in the xy -plane of the following quadratic equations each have x -intercepts of -2 and 4 . The graph of which equation has its vertex farthest from the x -axis?

A) $y = -7(x+2)(x-4) = -7$

$$a(x+2)(x-4)$$

$$\frac{-2+4}{2} = 1$$

B) $y = \frac{1}{10}(x+2)(x-4) = \frac{1}{10}$

C) $y = -\frac{1}{2}(x+2)(x-4) = -\frac{1}{2}$

D) $y = 5(x+2)(x-4) = 5$

23

$$2x + 3y = 5$$

$$4x + cy = 8$$

In the system of equations above, c is a constant. For what value of c will there be no solution (x, y) to the system of equations?

A) 3

B) 4

C) 5

D) 6

$$\frac{2}{4} = \frac{3}{c}$$

$$c = \frac{12}{2} = 6$$

24

The polynomial $p^4 + 4p^3 + 3p^2 - 4p - 4$ can be written as $(p^2 - 1)(p + 2)^2$. What are all of the roots of the polynomial?

A) -2 and 1

B) $-2, 1$, and 4

C) $-2, -1$, and 1

D) $-1, 1$, and 2

$$p^2 - 1 = 0$$

$$p = \pm 1$$

$$(p+2)^2 = 0$$

$$p = -2$$

25

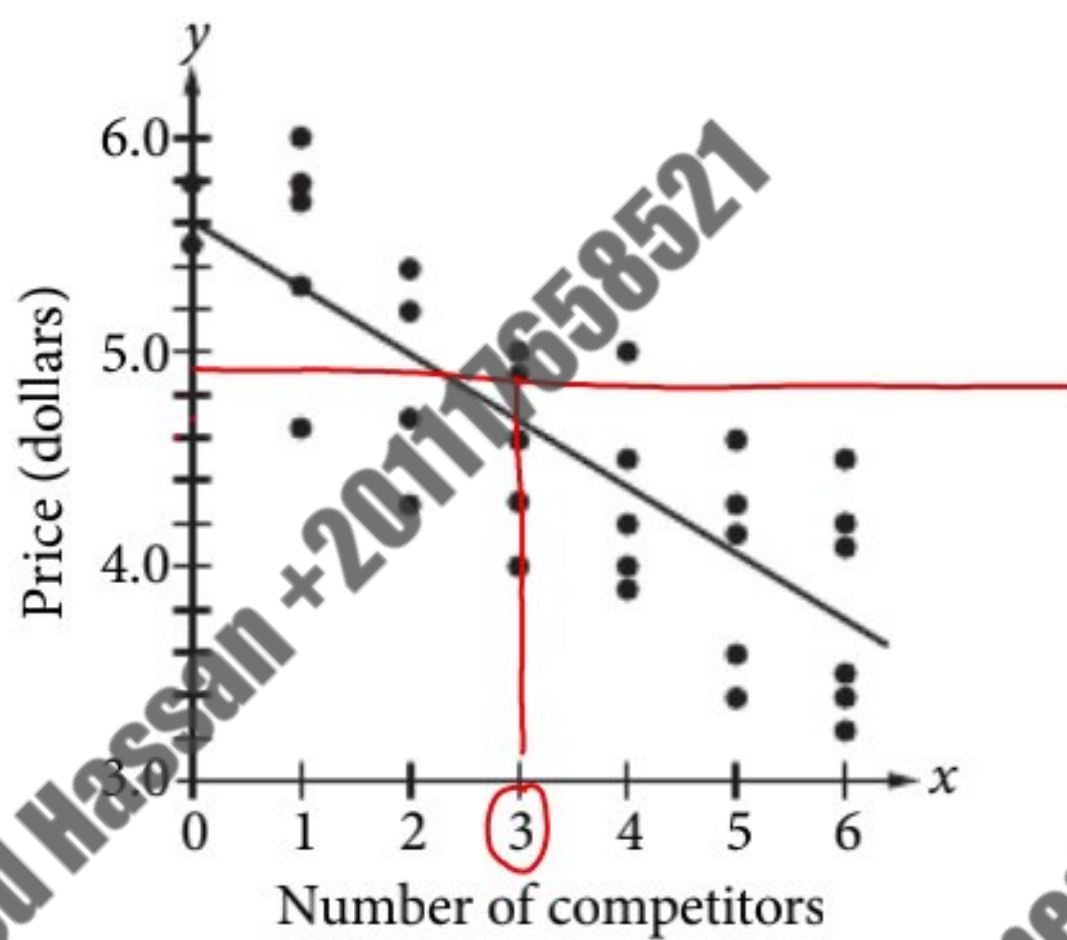
Which of the following describes an exponential relationship between the pair of variables listed?

- A) For every 3-millimeter increase m in the thickness of a piece of glass, the intensity of light I traveling through the glass decreases by 20%.
- B) Each second s , a car's speed C decreases at a constant rate of 10 meters per second.
- C) With every 33-foot increase in depth d below the surface of water, the pressure p on an object increases by 14.7 pounds per square inch.
- D) The depth d of water remaining in a reservoir decreases by 15 inches each minute m as the water is being pumped out at a constant rate.



Questions 26 and 27 refer to the following information.

A researcher is investigating the relationship between the price of a four-pack of AA batteries at a convenience store and the number of competitors the store has. She defines a store's competitor as another similar store within a 1-mile radius of the store she selects. She selects 32 convenience stores across a state at random, and for each store, she records the number of its competitors and its price for a four-pack of AA batteries. The results are shown, along with the line of best fit, in the scatterplot below.



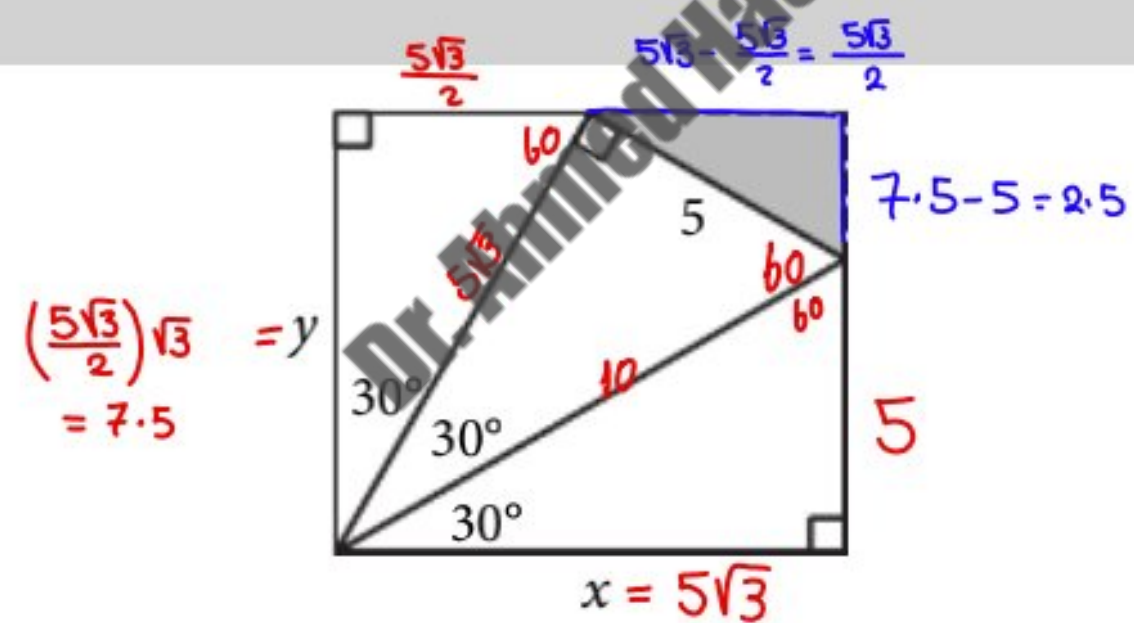
Another convenience store in the same state sells a four-pack of AA batteries for \$4.89. If the store's price is more than that predicted by the line of best fit, what is the least number of competitors the store could have?

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

The line of best fit passes through the point $(18, -0.12)$. Which of the following can be concluded from this?

- A) The line of best fit will not model the price well for a store with a large number of competitors.
- B) A convenience store with 17 competitors can no longer sell four-packs of AA batteries.
- C) A convenience store with 17 competitors cannot decrease its price any further.
- D) A convenience store cannot have more than 17 competitors.

28

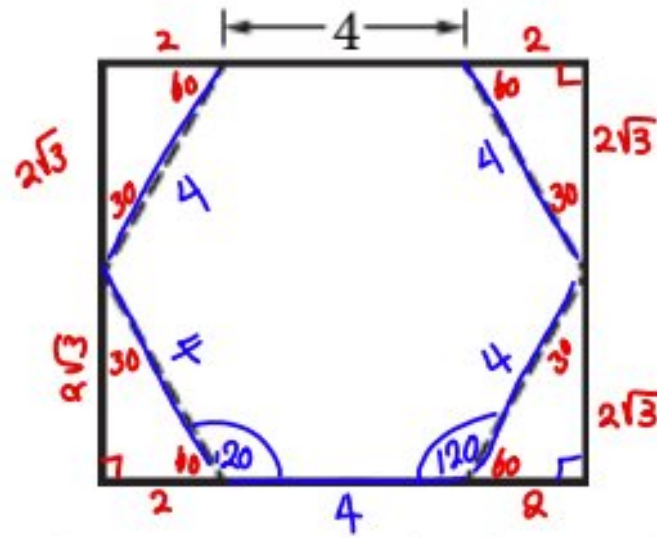


The figure above shows that the shaded triangular region with a hypotenuse of 5 centimeters (cm) has been removed from a rectangular tile with dimensions x cm by y cm. Of the following, which best approximates the area, in square centimeters, of the tile before the piece was removed?

- A) 15
 - B) 43
 - C) 50
 - D) 65
- $(5\sqrt{3})(7.5) = 64.95$



29



Thomas is making a sign in the shape of a regular hexagon with 4-inch sides, which he will cut out from a rectangular sheet of metal, as shown in the figure above. What is the sum of the areas of the four triangles that will be removed from the rectangle?

- A) $8\sqrt{3}$
 B) $8\sqrt{2}$
 C) $4\sqrt{2}$
 D) 16

$$4 \left(\frac{1}{2} (2)(2\sqrt{3}) \right) = 8\sqrt{3}$$

30

Which of the following equations describes a circle with radius 10 that passes through the origin when graphed in the xy -plane?

A) $(x - 5)^2 + (y + 5)^2 = 10$

B) $(x - 5)^2 + (y + 5)^2 = 100$

C) $(x - 10)^2 + (y - 10)^2 = 100$

D) $(x - 5\sqrt{2})^2 + (y + 5\sqrt{2})^2 = 100$

$r^2 = 100$ $(0,0) \rightarrow$ plug in to get 100

**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 $7/2$ (if $3\frac{1}{2}$ is entered into the grid, 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.

Write answer in boxes.

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

7	/	1	2
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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

← Decimal point

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

2	/	3	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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

.	6	6	6
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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

.	6	6	7
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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

Answer: 201 – either position is correct

2	0	1	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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

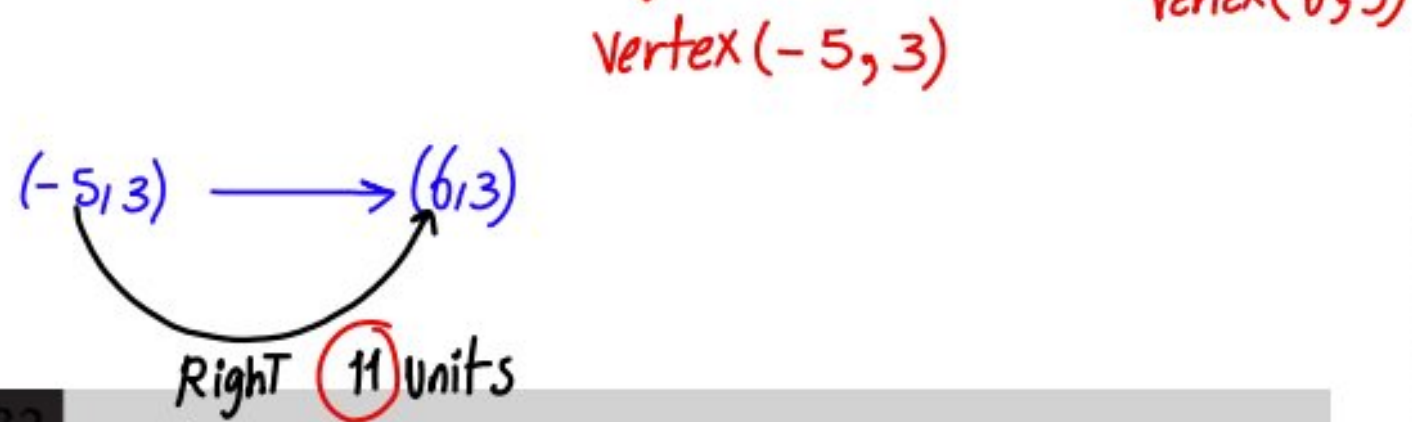
2	0	1	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

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



31

In the xy -plane, the graph of $y = (x - 6)^2 + 3$ is the image of the graph of $y = (x + 5)^2 + 3$ after a translation of how many units to the right?



32

When 9 is increased by $3x$, the result is greater than 36. What is the least possible integer value for x ?

$$9 + 3x > 36$$

$$3x > 27$$

$$x > 9$$

least possible integer = 10

Century and Region of United States Presidents' Births as of 2014

	Century		
	18th	19th	20th
Northeast	5	6	3
South	9	4	3
Midwest	0	9	2
West	0	0	2

The table above shows the distribution of United States presidents according to the century and the region of the country in which they were born. Based on the information in the table, what fraction of presidents who were not born in the nineteenth century were born in the South?

$$\frac{9 + 3}{5 + 9 + 0 + 0 + 3 + 3 + 2 + 2} = \frac{12}{24} = \frac{1}{2}$$

If $x \neq -1$, what is the value of $\left(\frac{1}{x+1}\right)(2+2x)$?

$$\left(\frac{1}{x+1}\right) \cdot 2(1+x) = 1 \cdot 2 = 2$$



Ticket Prices by Row Number

Row number	Ticket price
1-2	\$25
3-10	\$20
11-20	\$15

The price of a ticket to a play is based on the row the seat is in, as shown in the table above. A group wants to purchase 10 tickets for the play.

They will purchase 3 tickets for seats in row 1. = 25

They will purchase 2 tickets for seats in row 3.] 20

They will purchase 2 tickets for seats in row 4.] 20

They will purchase 3 tickets for seats in row 12. = 15

What is the average (arithmetic mean) ticket price, in dollars, for the 10 tickets? (Disregard the \$ sign when gridding your answer.)

$$\frac{3(25) + 2(20) + 2(20) + 3(15)}{10} = 20$$

A fashion buyer for a large retail store purchased 315 items directly from the manufacturer for a total of \$6000. Some of the items were dresses purchased for \$25 each, and the rest were shirts purchased for \$10 each. How many more dresses than shirts did the buyer purchase?

$$d + S = 315$$

$$25d + 10S = 6000$$

Mode 5, 1

$$d = 190, S = 125$$

$$190 - 125 = 65$$

STOP

If you finish before time is called, you may check your work on this section only.

Do not turn to any other section.

Questions 37 and 38 refer to the following information.

An instrument shows the number of revolutions per minute made by each tire of a car. In each revolution, the car travels a distance equal to the circumference of one of its tires. The circumference of each tire is equal to $2\pi r$, where r is the radius of the tire.

37 If the radius of each tire on Maria's car is 0.30 meter, what is the approximate speed of Maria's car, to the nearest kilometer per hour, when the instrument is showing 779 revolutions per minute? (1 kilometer = 1000 meters)

$$d = (2(0.0003)\pi) \times 779 \times 60 = 88.1 \approx 88$$

38 Maria gets new tires for her car. The radius of each of her old tires is 0.30 meter, and the radius of each of her new tires is 11% larger than the radius of one of her old tires. What is the circumference of each new tire, to the nearest tenth of a meter?

$$(1 + 0.11) \times 0.3 = 0.333$$

$$C = 2\pi(0.333) = 2.0923 \approx 2.1$$

Answer Key – Determine Raw Scores

Reading Test Answers

Question #	Correct Answer
1	C
2	A
3	C
4	B
5	B
6	A
7	D
8	C
9	C
10	A
11	D
12	D
13	B

Question #	Correct Answer
14	B
15	A
16	A
17	C
18	D
19	C
20	B
21	C
22	C
23	D
24	A
25	D
26	C

Question #	Correct Answer
27	D
28	A
29	C
30	C
31	B
32	A
33	A
34	B
35	B
36	D
37	D
38	C
39	C

Question #	Correct Answer
40	A
41	B
42	C
43	A
44	B
45	D
46	C
47	D
48	B
49	B
50	C
51	A
52	C

Reading Test Raw Score
(Number of Correct Answers)

Writing and Language Test Answers

Question #	Correct Answer
1	A
2	C
3	B
4	A
5	B
6	A
7	B
8	D
9	C
10	B
11	D

Question #	Correct Answer
12	A
13	B
14	D
15	C
16	C
17	A
18	B
19	A
20	A
21	C
22	C

Question #	Correct Answer
23	A
24	B
25	C
26	D
27	B
28	C
29	B
30	B
31	D
32	C
33	A

Question #	Correct Answer
34	C
35	D
36	B
37	C
38	C
39	B
40	D
41	A
42	D
43	C
44	D

Writing and Language Test Raw Score
(Number of Correct Answers)

"U" indicates a question that did not perform as expected and has been removed from scoring.

Answer Key – Determine Raw Scores (continued)

Math Test – No Calculator Answers

Question #	Correct Answer	Question #	Correct Answer	Question #	Correct Answer	Question #	Correct Answer
1	B	5	B	9	C	13	B
2	B	6	D	10	A	14	B
3	A	7	C	11	D	15	C
4	C	8	A	12	D		
Question #	Correct Answer						
16	9						
17	6,7,10						
18	14						
19	210						
20	2,7						

Math Test – No Calculator
Raw Score
(Number of Correct Answers)

Math Test – Calculator Answers

Question #	Correct Answer	Question #	Correct Answer	Question #	Correct Answer	Question #	Correct Answer
1	C	9	D	17	D	25	A
2	A	10	B	18	B	26	C
3	D	11	A	19	D	27	A
4	C	12	C	20	B	28	D
5	C	13	B	21	B	29	A
6	D	14	C	22	A	30	D
7	A	15	B	23	D		
8	B	16	D	24	C		
Question #	Correct Answer						
31	11						
32	10						
33	1/2, 5						
34	2						
35	20						
36	65						
37	88						
38	2, 1, 21/10						

Math Test – Calculator
Raw Score
(Number of Correct Answers)

"U" indicates a question that did not perform as expected and has been removed from scoring.