Math Test – No Calculator

25 MINUTES, 20 QUESTIONS

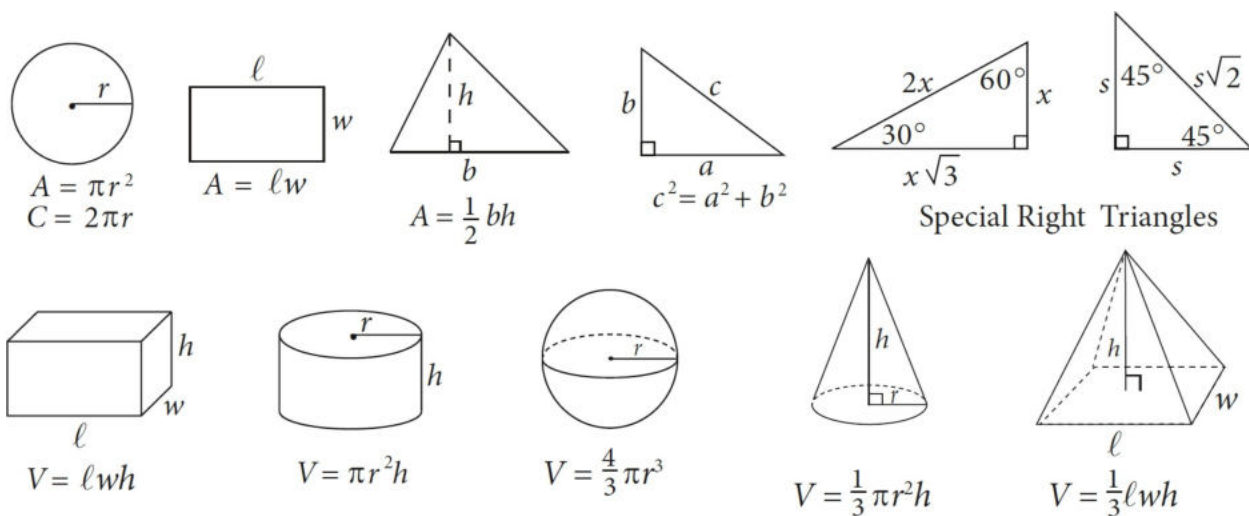**Turn to Section 3 of your answer sheet to answer the questions in this section.**

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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REFERENCE

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

$$A = \ell w$$

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

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

Special Right Triangles

$$V = \ell w h$$

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

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

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

$$V = \tfrac{1}{3} \ell w h$$

The number of degrees of arc in a circle is 360.

The number of radians of arc in a circle is 2π.

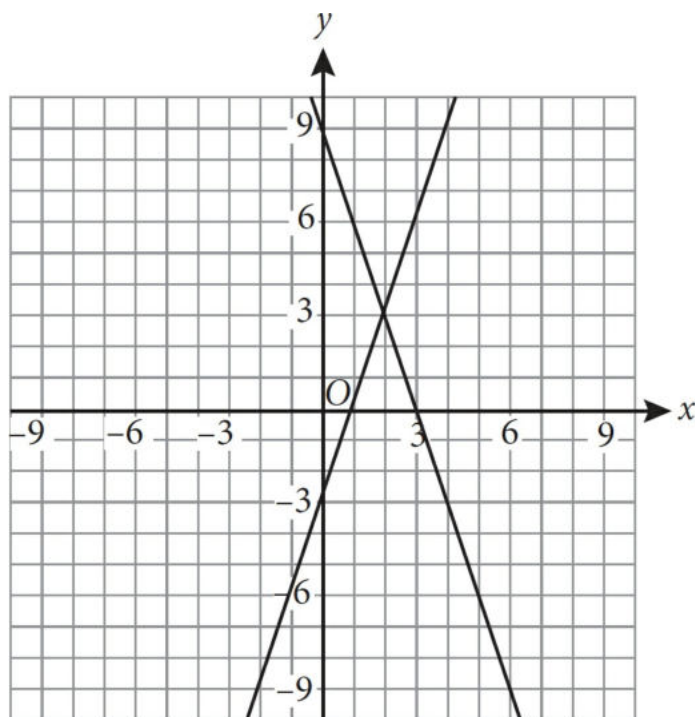The sum of the measures in degrees of the angles of a triangle is 180.

1

$$(3x^4 + 2x^3 - 7) + (4x^6 - 5x^3 + 9)$$

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

A) $4x^6 + 3x^4 - 3x^3 + 2$

B) $4x^6 + 3x^4 + 7x^3 + 2$

C) $4x^6 + 3x^4 - 5x^3 + 2$

D) $7x^{10} - 3x^3 + 2$

2

The lines graphed in the *xy*-plane above represent a system of two linear equations. What is the solution (x, y) to the system?

A) $(-1, -6)$

B) $(0, -3)$

C) $(2, 3)$

D) $(3, 0)$

3

Rosa has already eaten 10 pretzels from a bag that originally contained p pretzels. If Rosa is able to eat each remaining pretzel in 18 seconds, which of the following represents the amount of additional time, in seconds, needed for Rosa to eat all the pretzels in the bag?

A) $10(18 - p)$

B) $10(p - 18)$

C) $18(10 - p)$

D) $18(p - 10)$

4

$$0 = 7y - 5x + 9$$

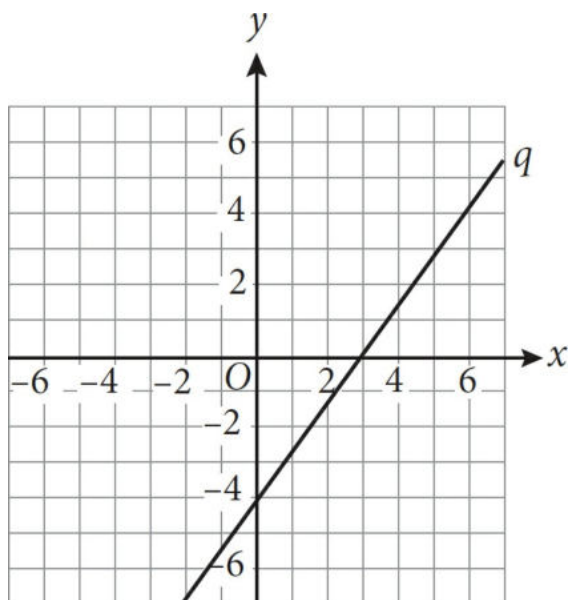What are the y-intercept and the slope of the line defined by the equation above?

A) The slope is $-\dfrac{5}{7}$, and the y-intercept is $-\dfrac{9}{7}$.

B) The slope is $-\dfrac{5}{7}$, and the y-intercept is $\dfrac{9}{7}$.

C) The slope is $\dfrac{5}{7}$, and the y-intercept is $-\dfrac{9}{7}$.

D) The slope is $\dfrac{5}{7}$, and the y-intercept is $\dfrac{9}{7}$.

5

If $5+n=9-\dfrac{1}{3}n$, what is the value of n ?

A) 3

B) 4

C) 6

D) $\dfrac{21}{2}$

6

Line p (not shown) is perpendicular to line q shown above and passes through the point (0, 4). Which of the following equations could represent line p ?

A) $y = -\dfrac{4}{3}x + 4$

B) $y = -\dfrac{3}{4}x + 4$

C) $y = \dfrac{3}{4}x + 4$

D) $y = \dfrac{4}{3}x + 4$

7

$$(4 + 7i) - (6 + 2i)$$

What complex number is equivalent to the expression above if $i = \sqrt{-1}$?

A) 2

B) 2 − 5i

C) −2 + 5i

D) −10 − 9i

8

$$\frac{4}{n-3} = \frac{5}{n+2}$$

Given the equation above, what is the value of n ?

A) −7

B) −2

C) 8

D) 23

9

What is the solution set to the equation $0 = (3a + 1)^2(a - 4)$?

A) $\left\{\dfrac{1}{3}, -4\right\}$

B) $\left\{-\dfrac{1}{3}, 4\right\}$

C) $\left\{-\dfrac{1}{3}, \dfrac{1}{3}, -4\right\}$

D) $\left\{-\dfrac{1}{3}, \dfrac{1}{3}, 4\right\}$

10

What is the solution set to the equation $\dfrac{2}{7-m} = \dfrac{4}{m} - \dfrac{5-m}{7-m}$?

A) $\{4, 7\}$
B) $\{4, 5\}$
C) $\{1, 7\}$
D) $\{4\}$

If 3 is a root of the function $f(x) = x^2 + 13x + c$ and c is a constant, what is the value of c ?

A) -48
B) -3
C) 5
D) 48

$$\frac{7}{12b^3} - \frac{3}{4b^3}$$

The above expression is equivalent to which of the following expressions for all $b > 0$?

A) $-\dfrac{1}{6b^3}$

B) $-\dfrac{1}{4b^3}$

C) $\dfrac{1}{4b^3}$

D) $\dfrac{1}{6b^3}$

$$y = x^2 + 3$$
$$y = 15x - 33$$

The system of equations shown above is graphed in the xy-plane. If system has two solutions, what is the product of the x-coordinates of the two solutions?

A) 36

B)   4

C) −4

D) −36

$$\left(-27a^{10}\right)^{\frac{3}{5}}$$

For all values of a, which of the following is equivalent to the expression above?

A) $3a^6 \sqrt[5]{3}$

B) $-3a^6 \sqrt[5]{81}$

C) $3a^5 \sqrt[5]{81}$

D) $-3a^5 \sqrt[5]{3}$

The amount of carbon-15 in a given sample decays exponentially

with time. If the function $C(m) = 100\left(\dfrac{1}{2}\right)^{24m}$ models the amount of carbon-15 remaining in the sample after m minutes, which of the following must be true?
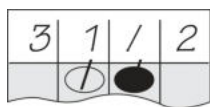
A) The amount of carbon in the sample halves every minute.
B) The amount of carbon in the sample halves every 24 minutes.
C) The amount of carbon in the sample halves 24 times every minute.
D) The amount of carbon in the sample reduces by a factor of 24 every 2 minutes.

DIRECTIONS

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    is entered into the grid, it will be interpreted as $\frac{31}{2}$, not as $3\frac{1}{2}$.)

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.

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

Write answer in boxes. → Fraction line

Grid in result.

Answer: 2.5 ← Decimal point

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.

If $0 = \dfrac{2}{n-2} - \dfrac{6}{n+1}$, what is the value of n ?
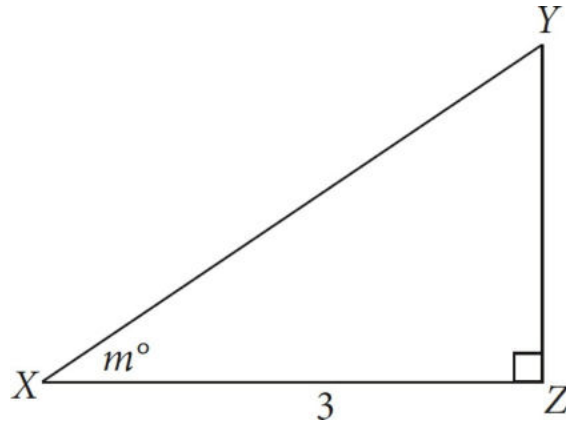
In the figure above, triangle XYZ is a right triangle with $XZ = 3$. If $\tan m = \sqrt{3}$, what is XY ?

An angle in the xy-plane has measure 5π radians. What is the measure of the angle in degrees?

Robert is selling televisions at an electronics store. The televisions normally cost $545 each but are being sold at an 8% discount. What is the minimum number of televisions Robert must sell if he wants to meet his quota of $100,000 in total sales?

The linear function $y = g(x)$ is graphed in the xy-plane. If $g(-3) = 4$ and $g(2) = 19$, what is the slope of line g ?

S T O P

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

Do not turn to any other section in the test.

Math Test – Calculator

55 MINUTES, 38 QUESTIONS

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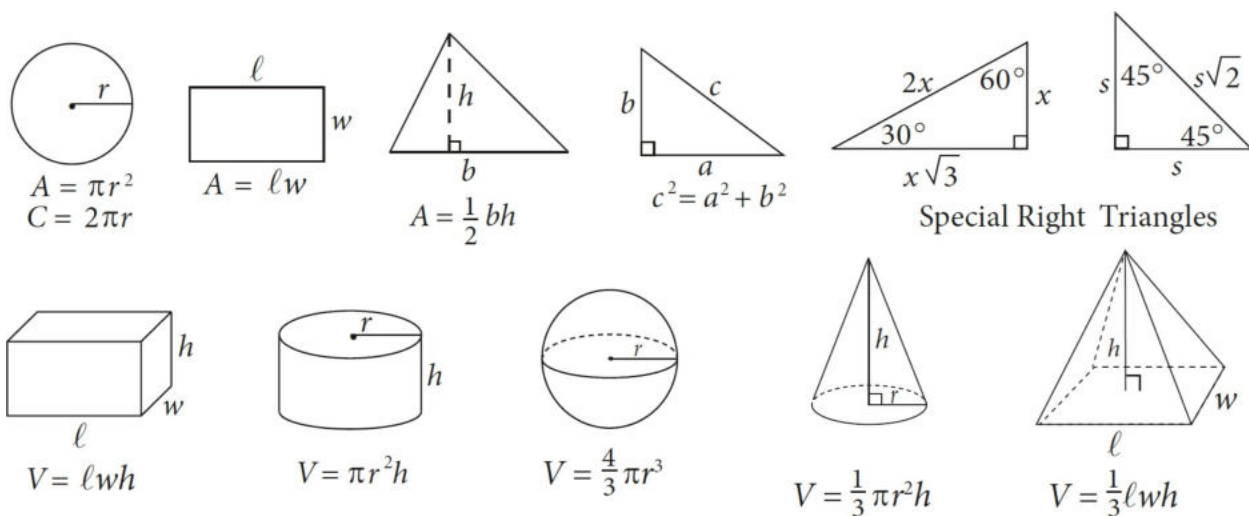

DIRECTIONS

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REFERENCE

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$V = \pi r^2 h$

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

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

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

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.

1

If the function g is defined by $g(x) = 3x + 5$, what is the value of $g(-5)$?

A) −20

B) −10

C) 20

D) 60

2

Number of Lightbulbs Produced at Levington Lights in a Day

	Working	Defective	Total
60-Watt	1,230	127	1,357
100-Watt	2,384	271	2,655

Total	3,614	398	4,012

According to the table above, 100-Watt bulbs made up what fraction of the working lightbulbs?

A) $\dfrac{1{,}230}{3{,}614}$

B) $\dfrac{2{,}384}{3{,}614}$

C) $\dfrac{271}{398}$

D) $\dfrac{2{,}384}{2{,}655}$

3

The expression $(4n - 5)(5n - 4)$ is equivalent to which of the following?

A) $20n^2 - 41n + 20$

B) $20n^2 - 39n + 9$

C) $9n^2 - 41n + 20$

D) $4n^2 - 18n + 9$

4

The ratio of $\dfrac{2.7}{1.2}$ is equivalent to the ratio of $\dfrac{b}{4.8}$. What is the value of b ?

A) 2.13

B) 4

C) 6.3

D) 10.8

5

$$60 = 15mn + 20$$

What is the value of $3mn + 4$, according to the equation above?

A) 20

B) 15

C) 12

D) 4

6

A high school principal is seeking to determine the likelihood that students in Santana High School will attend the upcoming dance. Which of the following data collection methods is most likely to yield an accurate prediction by the principal?

A) Polling a randomly selected group of 1,500 teenagers in the town

B) Conducting a survey of 180 randomly selected students in the senior class at Santana High School

C) Polling a group of 250 randomly selected Santana High School students

D) Posting an Internet poll on the school's website open only to Santana High School students

Questions 7–9 refer to the following information.

Thomas was hired for a new job in 1977, with a starting salary of $40,000. Beginning in 1978, Thomas received an annual raise, increasing his salary by $2,300 each year.

7

If Thomas retired at the end of 1999, what was his salary in his final year?

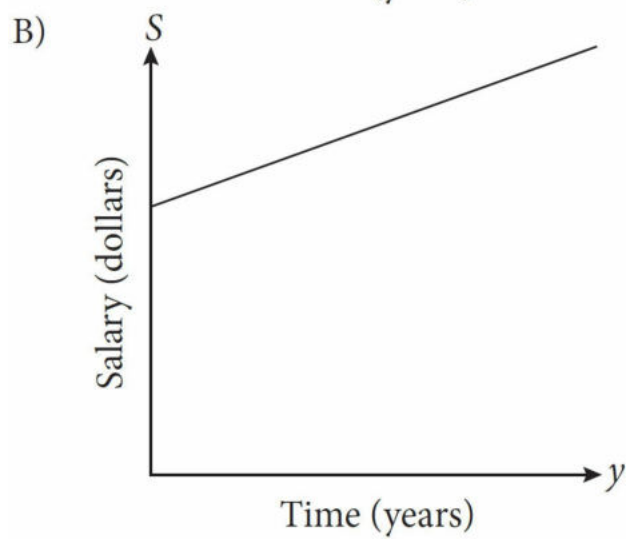A) $90,600

B) $76,000

C) $54,600

D) $40,000
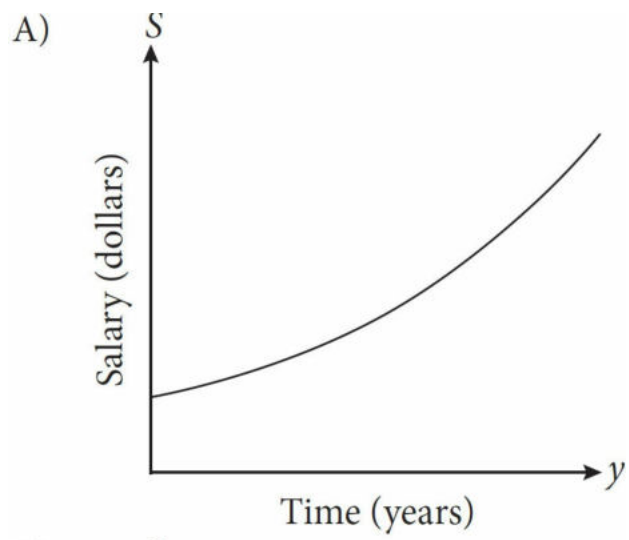
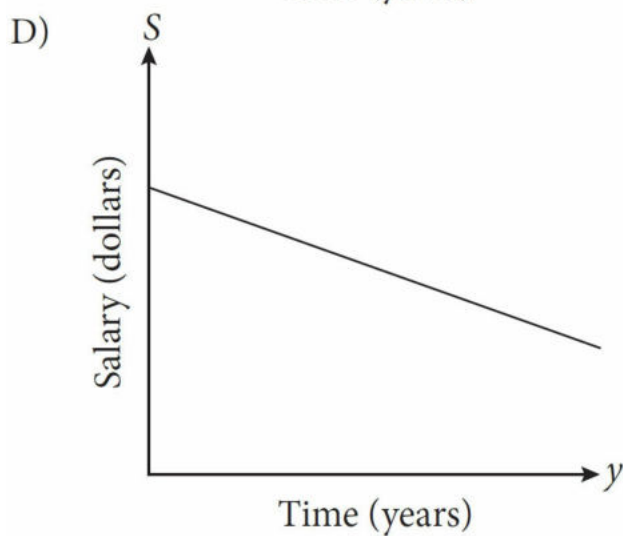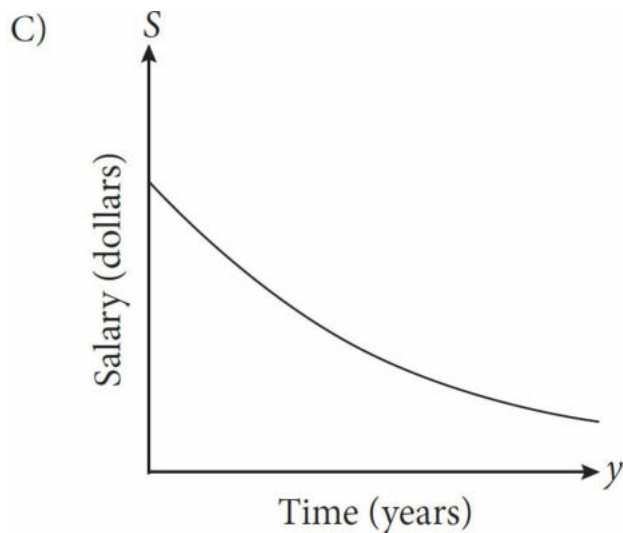## 8

Which of the following must be true, given that Thomas's salary after y years was between $54,000 and $60,000 ?

A) $3 < y < 6$

B) $6 < y < 9$

C) $9 < y < 12$

D) $y > 12$

9

Which of the following graphs could represent Thomas's salary, S, in dollars, as a function of the number of years, y, after 1977 ?

A)

B)

C)

Salary (dollars)

Time (years)

D)

Salary (dollars)

Time (years)

10

An investor is deciding between two options for a short-term investment. One option has a return R, in dollars, t months after investment, and is modelled by the equation $R = 100(3^t)$. The other option has a return R, in dollars, t months after investment, and is modeled by the equation $R = 350t$. After 4 months, how much less is the return given by the linear model than the return given by the exponential model?

A) $1,400

B) $4,050

C) $6,700

D) $8,100

11

$$n - \sqrt{2n+22} = 1$$

Given the equation above, which of the following is a possible value of n ?

   I.   7

   II. −3

   III. −5

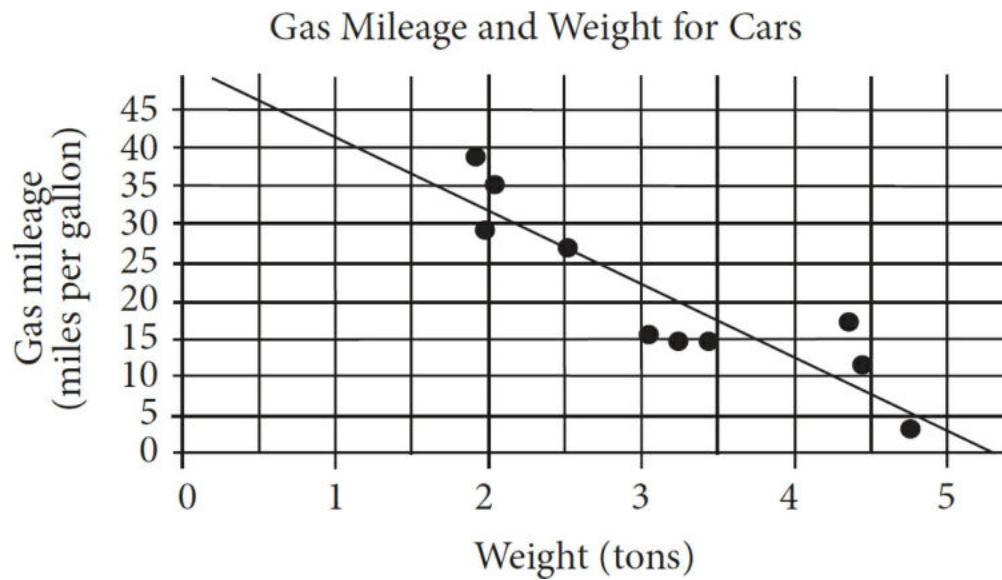A) I only

B) III only

C) I and III only

D) II and III only

12

$$3x - 6 = 5x - 2$$

Based on the equation above, what is the value of $2x - 4$?

A) −8

B) −2

C) 2

D) 6

13

Gas Mileage and Weight for Cars

The scatterplot above shows the relationship between gas mileage, in miles per gallon, and weight, in tons, for 10 cars selected at random. The line of best fit models the gas mileage based on the weight of the car. What is the weight, in tons, of the car for which the actual gas mileage was closest to the predicted value?

A) 2.5

B) 4.5

C) 15

D) 27

14
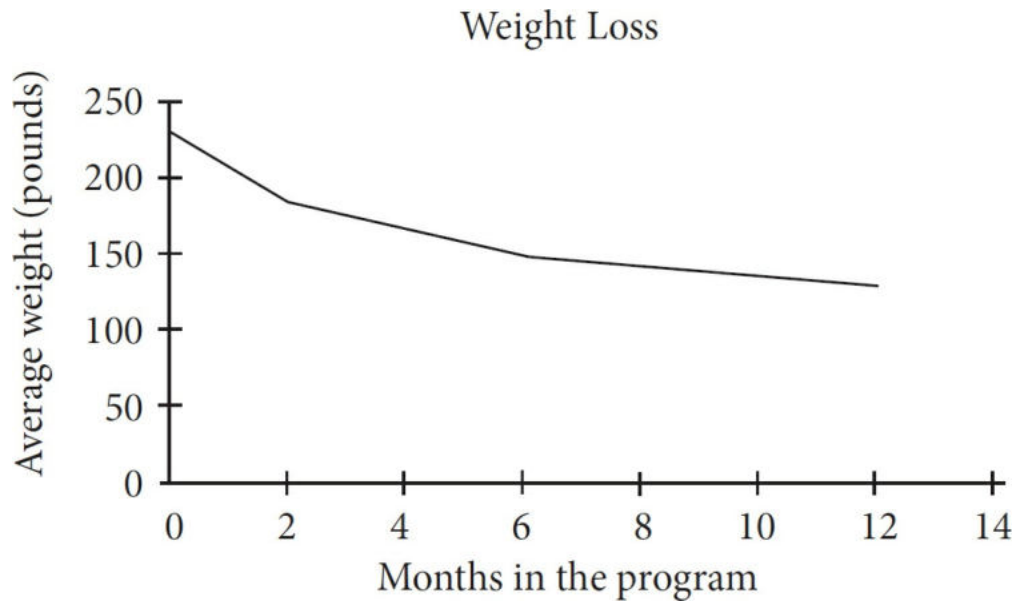
Weight Loss

The graph above shows the average weight for the members of a weight loss program, for each month a member is in the program. According to the information in the graph, which of the following must be true?

A) The average weight loss per month is the same regardless of the number of months a member is in the program.

B) The average weight loss per month for members who are in the program more than 150 months is less than that for members who are in the program less than 150 months.

C) The average weight loss per month for members who are in the program more than 6 months is less than that for members who are in the program less than 6 months.

D) The average weight loss per month for members who are in the program more than 6 months is greater than that for members who are in the program less than 6 months.

15
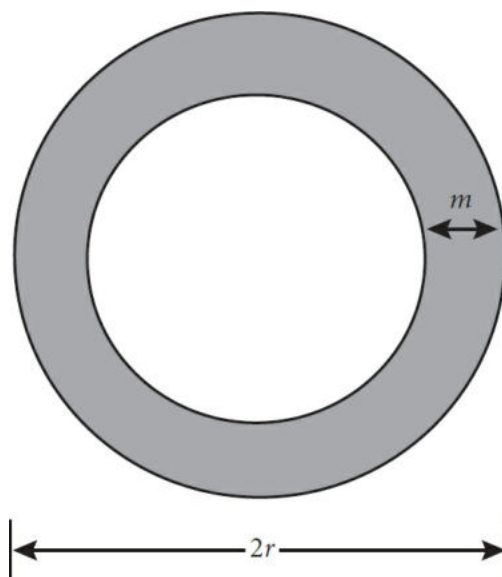
The figure above represents a circular lake with the walking path that is m meters wide. If the expression $\pi r^2 - \pi(r - m)^2$ represents the area of the walking path, in square meters, what does the quantity $(r - m)$ represent?

A) The radius of the lake

B) The combined radius of the lake and walking path

C) The combined area of the surface of the lake and walking path

D) The area of the surface of the lake

16

Kanaka took 8 tests for her social studies class. Each test has a maximum score of 100 and a minimum score of 0. On the 8 tests, Kanaka's mean score was 90. More than a quarter of her tests have scores less than 85. If the average of the remaining tests is x, which of the following must be true?

A) $x \leq 85$

B) $85 < x < 90$

C) $x = 90$

D) $x > 90$

17

A poll of 400 randomly selected likely voters in Seanoa City was taken to determine the support for the mayoral candidates in the upcoming election. Of the likely voters selected, 190 stated that they are likely to vote for Candidate A. If the conclusion is drawn that "approximately 3,120 voters are likely to vote for Candidate A," which of the following is closest to the number of likely voters in Seanoa City?

A) 1,482

B) 3,120

C) 4,741

D) 6,568

18

$$y^2 = 21 - x$$
$$x = 5$$

The solutions to the system of equation above are (a_1, b_1) and (a_2, b_2). What are the values of b_1 and b_2 ?

A) −4 and 4

B) $-\sqrt{21}$ and $-\sqrt{21}$

C) −5 and 5

D) $-\sqrt{26}$ and $-\sqrt{26}$

19

The function p is defined as $p(x) = x^2 - 3x$. If the function q is defined as $q(x) = p(x) - 4$, what is the value of $q(10)$?
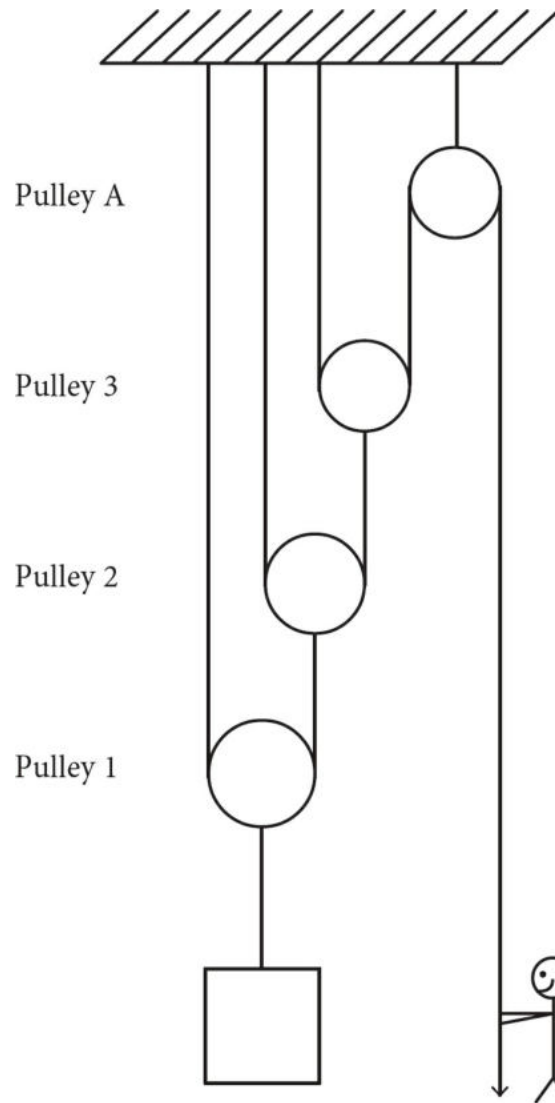
A) −30

B)   6

C) 66

D) 70

If $c > 0$ and m and n are positive integers, which of the following is equivalent to $c^{\frac{m}{n}}$?

A) $\dfrac{c^m}{c^n}$

B) $cm - n$

C) $\left(\sqrt[m]{c}\right)^n$

D) $\left(\sqrt[n]{c}\right)^m$

Pulley A

Pulley 3

Pulley 2

Pulley 1

In the figure above, each pulley added to the pulley system after Pulley A reduces the amount of force required to lift an object to 50% of the original amount. If the system has three additional pulleys, what would be the approximate force, in <u>Newtons</u>, that is exerted to lift a weight that normally requires 200 pounds of force to lift? (1 Newton = 0.224 pounds)

A)   5.6

B)   11.2

C) 111.6

D) 223.2

$$Q = 17.6T$$

The equation above shows the heat energy, Q, in Joules that is absorbed by a 10 g block of wood as temperature, T, in degrees Celsius, increases. Which of the following best describes the meaning of the number 17.6 in this equation?

A) The heat energy absorbed by the block of wood at a constant temperature

B) The heat energy absorbed by the block of wood with a change in temperature of T°C

C) The heat energy absorbed by the block of wood with every increase in temperature of 1°C

D) The heat energy absorbed by the block of wood when the temperature reaches 0°
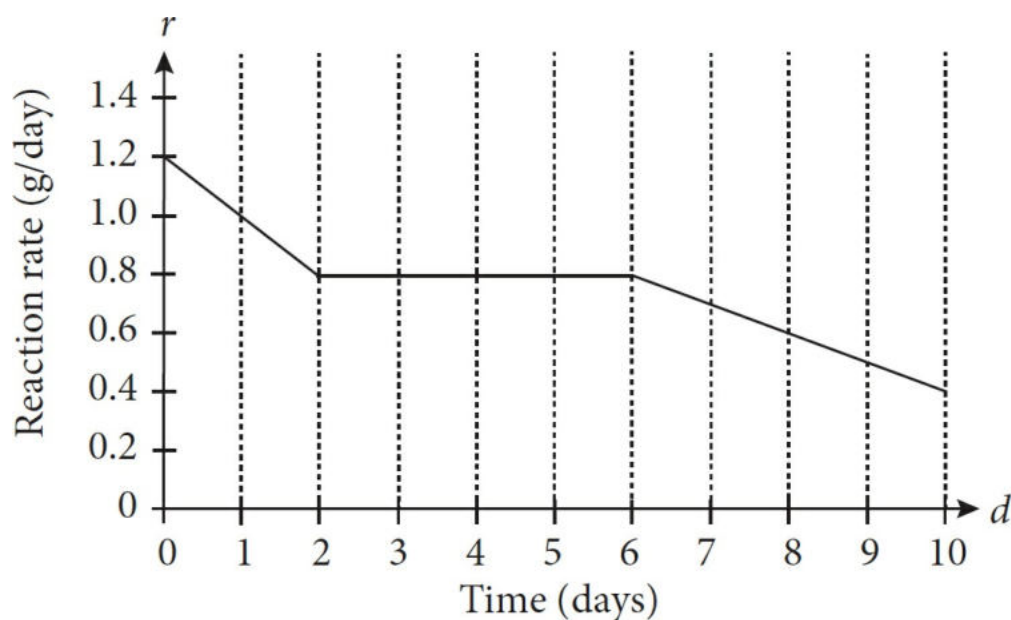
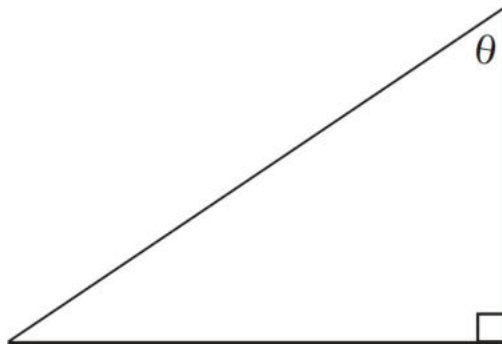The graph above represents the reaction rate, r, at which an unfinished iron nail rusts in water during the first 10 days of an

experiment, where d gives time measured in days. What was the total amount of rust produced from $d = 2$ to $d = 6$?

A) 0.8 grams

B) 1.6 grams

C) 2.4 grams

D) 3.2 grams

24

Note: Figure not drawn to scale.

In the figure above, if $\cos\theta = \dfrac{3}{5}$, what is the value of $\cos(90 - \theta)$?

A) $\dfrac{3}{5}$

B) $\dfrac{3}{4}$

C) $\dfrac{4}{5}$

D) $\dfrac{5}{4}$

25

$$x + 7y = -10$$
$$3x - 4y = k$$

In the system of equations above, k is a constant. If (a, b) is the solution to the system, what is the value of a, in terms of k ?

A) $\dfrac{-k-30}{25}$

B) $\dfrac{3k+10}{25}$

C) $\dfrac{6k-8}{25}$

D) $\dfrac{7k-40}{25}$

26

According to the U.S. Department of Labor, the unemployment rate in January of 2012 in the United States was 8.3%. According to the same department, the unemployment rate in January of 2016 was 4.9%. According to the U.S. Department of Labor, how did the unemployment rate change from January 2012 to January 2016 ?

A) It decreased by 79%.
B) It decreased by 41%.
C) It decreased by 34%.
D) It increased by 41%.

Questions 27 and 28 refer to the following information.

In a particular college, the test scores of the most recent test given for

a particular Physics class and a particular Literature class were studied. Both tests were scored from 0 to 100 and had a total of 20 questions, which were equally weighted with no partial credit. The Physics class had 128 students and the Literature class had 75 students. The test results are shown in the two graphs below.

Literature Test Results
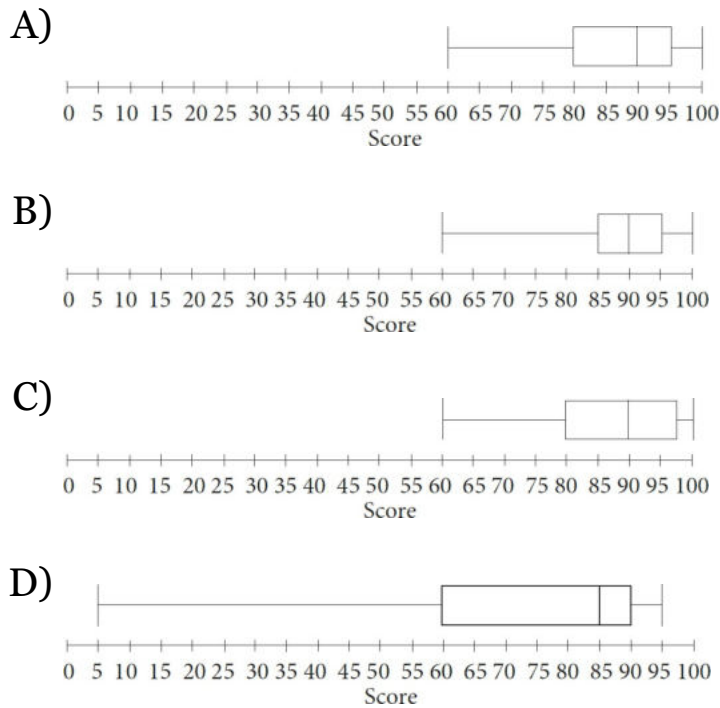

Physics Test Results

27
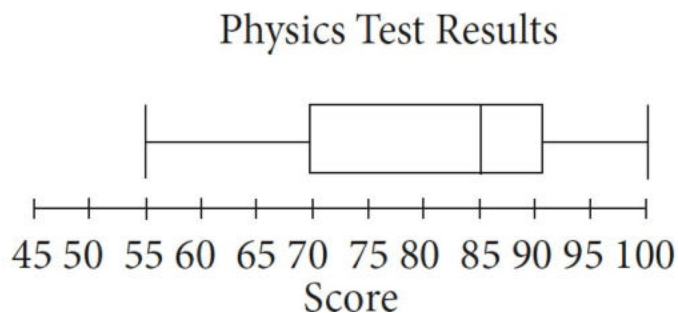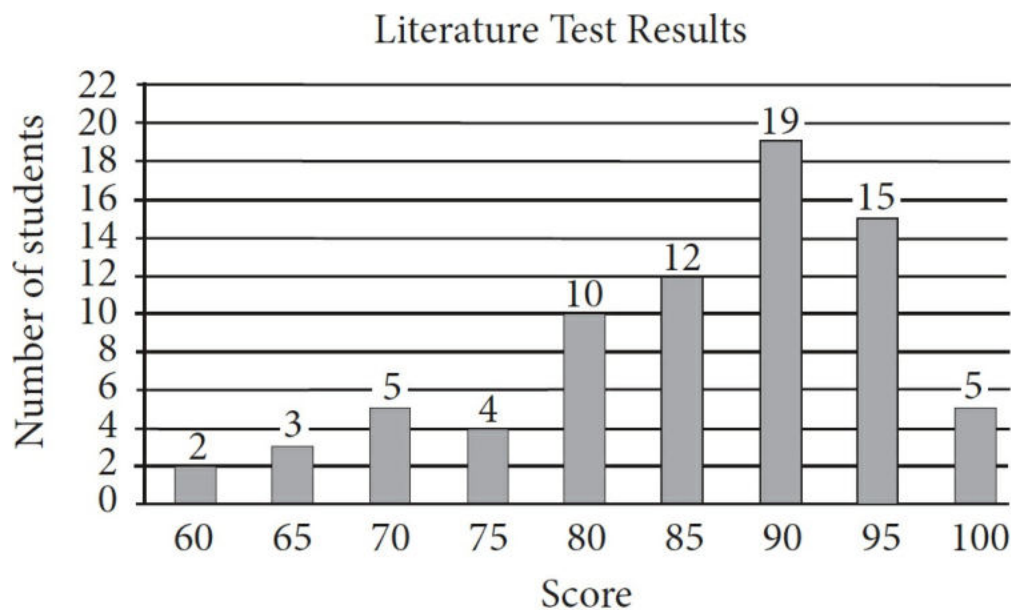
The dean of the college is comparing the scores from the two classes and calculates the median for each class. If the dean labels the median score of the Physics class P and the median score of the Literature class L, what is the sum of P and L?
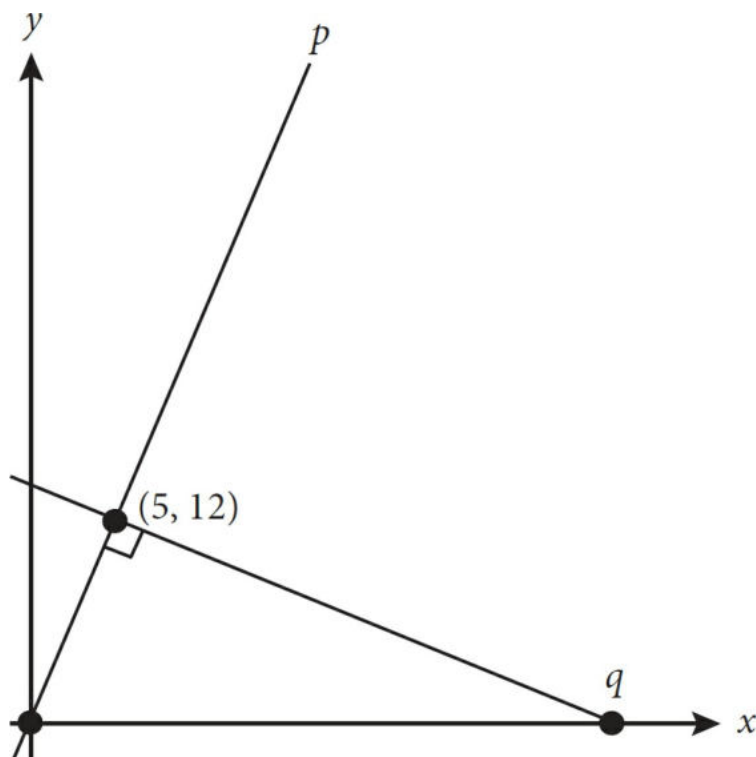
A) 175

B) 170

C) 85

D) 80

28

Which of the following box plots most accurately represents the result of the Literature test?

A)

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Score

B)

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Score

C)

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Score

D)

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Score

29

In the figure above, lines p and q are graphed on the xy-plane. What is the x-intercept of line q ?

A) 24

B) 27.6

C) 33.8

D) 38.4

$$y = x^2 + 16x + 28$$

The equation above represents the graph of a parabola in the xy-plane. Which of the following represents an equivalent form of the equation that includes the minimum value of y as a constant?

A) $y - 28 = x(x + 16)$

B) $y = x^2 + 2(8x + 14)$

C) $y = x(x + 16) + 28$

D) $y = (x + 8)^2 - 36$
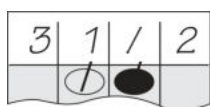
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Fraction line

Grid in result.

Answer: 2.5

Decimal point

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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.

In the figure above, triangle *PQR* is similar to triangle *XYZ* (not shown). If *PQ:XY* = *QR:YZ* = *PR:XZ* = 4:5, what is the measure, in degrees, of angle *Y* ?

A new homeowner drew a floor plan of her new house, in which 1 inch on the floor plan is equivalent to 18 inches on the actual floor. If the actual longest side of the floor in one of the bedrooms is 153 inches, what is the length of the longest side of the same bedroom in the floor plan?

What is the number of pallets, each with an area of 60 square yards, that would be needed to cover a field that is 3 acres in area? (1 acre = 4,840 square yards)

If $b + \dfrac{22}{25} = \dfrac{7}{5}b$, what is the value of b ?

The point (p, 0) lies on a circle in the xy-plane. The points (2, 3.5) and (–2, 0.5) are the endpoints of a diameter of the circle. If $p > 0$, what is the value of p ?

$$7y = 11x$$

$$\frac{1}{5}x - \frac{1}{4}y = -\frac{81}{80}$$

If (x, y) is the solution to the system of equations above, what is the value of $\dfrac{y}{x}$?

Questions 37 and 38 refer to the following information.

Sales Summary			
Day Number	Day	Daily Sales	Total Weekly Sales at the End of Each Day
1	Monday	$520	$520
2	Tuesday	$290	$810
3	Wednesday	$350	$1,160
4	Thursday	$810	$1,970
5	Friday	$480	$2,450

A salesperson recorded her sales during a particular 5-day work week, shown in the table above, in order to study her daily sales.

The salesperson wants to increase her average sales per day by

20% in the following week. Given the information in the chart above, what should her daily sales average be for the following week?

38

During her eight-hour shift on Wednesday, the salesperson sold items that had an average price of $8.10. To the nearest tenth of an item, what is the number of items she sold per hour on Wednesday?

▲

STOP

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

Do not turn to any other section in the test.