



MATHEMATICS TEST

60 Minutes—60 Questions

DIRECTIONS: Solve each problem, choose the correct answer, and then fill in the corresponding oval on your answer document.

Do not linger over problems that take too much time. Solve as many as you can; then return to the others in the time you have left for this test.

You are permitted to use a calculator on this test. You may use your calculator for any problems you choose,

but some of the problems may best be done without using a calculator.

Note: Unless otherwise stated, all of the following should be assumed.

1. Illustrative figures are NOT necessarily drawn to scale.
2. Geometric figures lie in a plane.
3. The word *line* indicates a straight line.
4. The word *average* indicates arithmetic mean.

1. There are 42 tuna and 49 salmon in a fish tank. What is the ratio of tuna to salmon?

- A. 1:6
- B. 1:7
- C. 6:7
- D. 6:13
- E. 7:6

DO YOUR FIGURING HERE.

2. The only solution to the equation $(x - 2)(x - 10) = c$ is $x = 6$. What is c ?

- F. -16
- G. -12
- H. 16
- J. 20
- K. 24

3. Samantha, Larry, and Maria own shares of stock in the Plentiful Peanuts company. Samantha owns 50 shares, Larry owns 30 shares, and Maria owns 70 shares. Today, the value of 1 share of Plentiful Peanuts stock is \$4.05. What is the total value of Samantha's, Larry's, and Maria's shares of Plentiful Peanuts stock?

- A. \$154.05
- B. \$190.50
- C. \$405.00
- D. \$605.00
- E. \$607.50

4. $5p^6 \cdot 3p^2$ is equivalent to:

- F. $8p^4$
- G. $8p^8$
- H. $8p^{12}$
- J. $15p^8$
- K. $15p^{12}$



5. Simeon ordered graduation announcements from 'Nouncements & Notes. He was charged \$35.00 for his announcements and was charged 8% of that amount for shipping. How much was Simeon charged for his announcements and shipping?

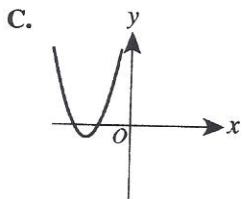
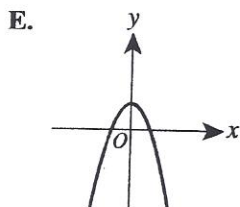
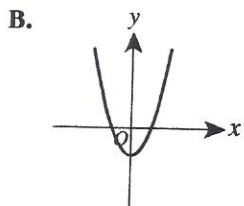
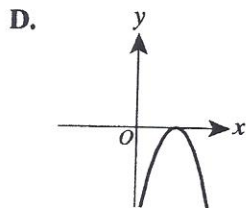
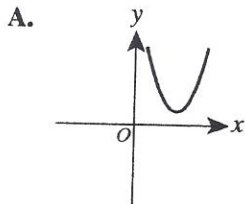
- A. \$35.08
 B. \$35.70
 C. \$36.08
 D. \$37.80
 E. \$43.00

DO YOUR FIGURING HERE.

6. A jar contains only 11 red balls, 9 yellow balls, 5 green balls, and n white balls. Each ball is a solid color. What is the probability that a ball randomly chosen from the jar is yellow?

- F. $\frac{1}{9}$
 G. $\frac{1}{25}$
 H. $\frac{9}{25}$
 J. $\frac{9+n}{25+n}$
 K. $\frac{9}{25+n}$

7. Each of the following (x,y) coordinate planes shows the graph of a quadratic function. Only one of the functions has no real zeros. Which one?

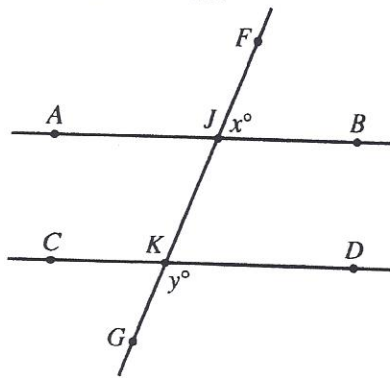




DO YOUR FIGURING HERE.

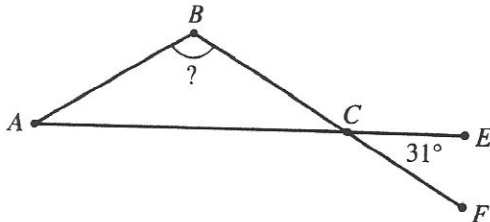
8. On a certain day in 2008, the population of the United States was estimated to be 303,488,509. Which of the following values is closest to this estimate?
- F. 3.03×10^6
 - G. 3.04×10^6
 - H. 3.03×10^8
 - J. 3.03×10^9
 - K. 3.04×10^9

9. In the figure below, \overleftrightarrow{AB} is parallel to \overleftrightarrow{CD} , and \overleftrightarrow{FG} intersects \overleftrightarrow{AB} and \overleftrightarrow{CD} at J and K , respectively. Which of the following equations *must* be true?



- A. $x = \frac{1}{2}y$
- B. $x = y$
- C. $x + y = 90$
- D. $x + y = 180$
- E. $x + y = 360$

10. In the figure below, \overline{AB} is congruent to \overline{BC} , and \overline{AE} intersects \overline{BF} at C . What is the measure of $\angle B$?



- F. 28°
- G. 31°
- H. 62°
- J. 118°
- K. 149°

11. The expression $\frac{7 + \frac{1}{5}}{1 + \frac{1}{10}}$ is equal to:

- A. $3\frac{3}{11}$
- B. 4
- C. $4\frac{1}{2}$
- D. $6\frac{6}{11}$
- E. 9



DO YOUR FIGURING HERE.

12. Consider all products xy such that x is divisible by 6 and y is divisible by 10. Which of the following whole numbers is NOT a factor of each product xy ?

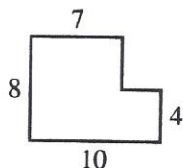
F. 2
G. 6
H. 8
J. 30
K. 60

13. Kaya rented a boat from a marina for a fee of \$50, plus \$3 for every gallon of gas she used. When she returned the boat, Kaya was given a bill of \$98. She had kept track of her gas usage and thought that the bill was in error—specifically, that the bill was \$21 more than it should have been. If Kaya was correct, how many gallons of gas did Kaya use during her rental?

A. 2
B. 7
C. 9
D. 16
E. 23

14. In the figure shown below, all angles are right angles, and the side lengths given are in meters. What is the area, in square meters, of the figure?

F. 12
G. 52
H. 68
J. 80
K. 96



15. $|6 - 4| - |3 - 9| = ?$

A. -8
B. -4
C. 4
D. 8
E. 22

16. Which of the following proportions, when solved for n , gives the correct answer to the problem given below?

Find the value of n that equals 28% of 96.

F. $\frac{28}{100} = \frac{n}{96}$
G. $\frac{28}{100} = \frac{96}{n}$
H. $\frac{96}{28} = \frac{n}{100}$
J. $\frac{96}{100} = \frac{28}{n}$
K. $\frac{96}{n} = \frac{n}{28}$



17. In the standard (x,y) coordinate plane, the point $(2,-6)$ is the midpoint of the line segment with endpoints $(8,-8)$ and:

A. $(-4,-20)$
 B. $(-4,-4)$
 C. $(3,-1)$
 D. $(4,4)$
 E. $(5,-7)$

DO YOUR FIGURING HERE.

18. The function g is defined by $g(x) = 2x^2 - 3x$. What is the value of $g(-3)$?

F. -27
 G. -21
 H. -9
 J. 21
 K. 27

19. The graph below is that of the solution set to one of the following statements. Which one?



A. $x < 9$ and $x > -1$
 B. $x < 9$ or $x > -1$
 C. $x > 9$ and $x < -1$
 D. $x > 9$ or $x < -1$
 E. $x \neq 9$ and $x \neq -1$

20. The inequality $5(x + 2) > 6(x - 5)$ is equivalent to which of the following inequalities?

F. $x < -20$
 G. $x < -3$
 H. $x < 7$
 J. $x < 37$
 K. $x < 40$

21. A right triangle has legs of length 3 cm and 5 cm. The length of the hypotenuse, in centimeters, is between:

A. 2 and 3
 B. 3 and 5
 C. 5 and 6
 D. 6 and 7
 E. 7 and 9

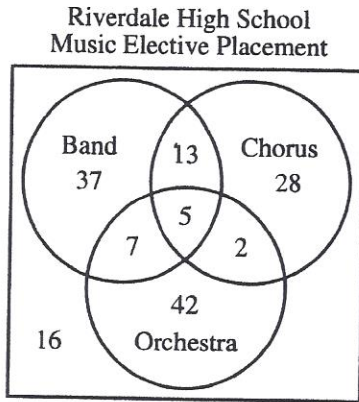
22. Each side of a square is 5 cm long. One vertex of the square is at $(2,3)$ on a square coordinate grid marked in centimeter units. Which of the following points on the grid could be another vertex of the square?

F. $(7,3)$
 G. $(6,1)$
 H. $(3,1)$
 J. $(1,-1)$
 K. $(-5,3)$

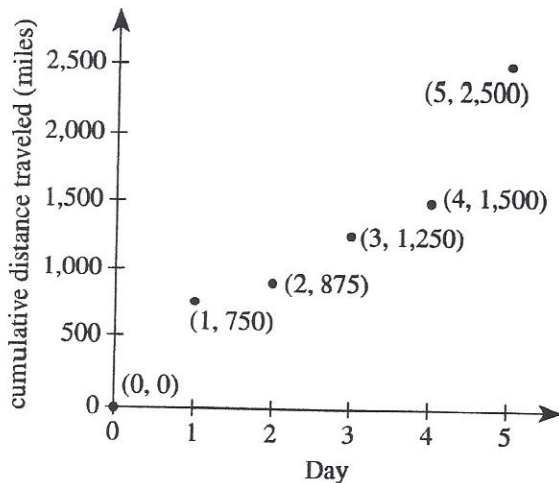


23. The counselors at Riverdale High School created the Venn diagram below to show the distribution of music elective placements of 150 students. Students could request placement in 3 different music electives: Band, Orchestra, and Chorus. What is the number of students who were placed in at least 2 of these music electives?

DO YOUR FIGURING HERE.



- A. 5
 B. 13
 C. 16
 D. 22
 E. 27
24. The DeJong family drove 2,500 miles in 5 days from Albany, New York, to the Puye Cliff Dwellings in New Mexico. The points on the graph below show the family's cumulative distance traveled at the end of each day.



After the DeJong family began their trip, they traveled the least number of miles on which of these 5 days?

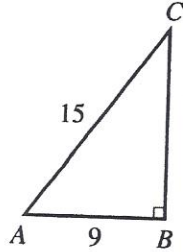
- F. Day 1
 G. Day 2
 H. Day 3
 J. Day 4
 K. Day 5



25. For the right triangle shown below, with the given dimensions in inches, which of the following trigonometric expressions has a value of $\frac{4}{5}$?

DO YOUR FIGURING HERE.

- A. $\sin A$
- B. $\cos A$
- C. $\tan A$
- D. $\sin B$
- E. $\tan B$

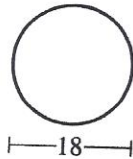


26. The expression $a^2 - 2a + 1$ is equivalent to:

- F. $(a - 1)^2$
- G. $(a + 1)^2$
- H. $(a + 1)(a - 1)$
- J. $(a - 2)\left(a + \frac{1}{2}\right)$
- K. $(a + 2)\left(a - \frac{1}{2}\right)$

27. The diameter of the circle shown below is 18 centimeters. What is the circle's circumference, in centimeters?

- A. 9π
- B. 18π
- C. 36π
- D. 81π
- E. 324π



28. Which of the following number line graphs represents the solution set of the equation $x^2 + 2 = 3$?

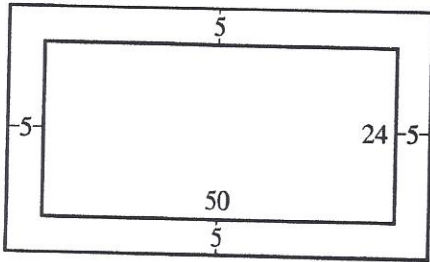
- F.
- G.
- H.
- J.
- K.



Use the following information to answer questions 29–31.

DO YOUR FIGURING HERE.

A rectangular region of grass is 50 feet long by 24 feet wide and has an area of 1,200 square feet. A gardener planted a 5-foot-wide flower border along all 4 sides of this region of grass, as shown below. The outer edge of the flower border is 60 feet long and 34 feet wide.



29. The gardener plans to fertilize the region of grass. The gardener can buy only full bags of fertilizer and will use at least 1 bag per 225 square feet of grass. What is the minimum number of bags of fertilizer the gardener needs to buy?
- A. 1
B. 4
C. 5
D. 6
E. 9
30. How many feet of decorative fencing would be needed to enclose the flower border along its outer edge?
- F. 74
G. 94
H. 148
J. 168
K. 188
31. A cement walkway will be added along one of the longest sides of the flower border and will be equal in length to that side. The top of the walkway will be a rectangle with a width of 3 feet. The walkway will be 4 inches ($\frac{1}{9}$ yard) thick. How many cubic yards of cement will be needed for this walkway?
- A. $1\frac{7}{27}$
B. $2\frac{2}{9}$
C. $3\frac{7}{9}$
D. $6\frac{2}{3}$
E. 20



32. A fair coin has 2 sides: 1 side is heads and 1 side is tails. A fair cube has 6 sides: 2 sides are solid green, 2 sides are solid yellow, and 2 sides are solid red. The coin and the cube are each tossed once. What is the probability they will land so that the side facing up on the coin is tails and the side facing up on the cube is yellow?

DO YOUR FIGURING HERE.

F. $\frac{1}{12}$

G. $\frac{1}{8}$

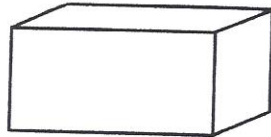
H. $\frac{1}{6}$

J. $\frac{1}{3}$

K. $\frac{1}{2}$

33. The length of the rectangular prism shown below is twice the width. The height and the width are the same. The volume of the prism is 128 cubic inches. What is the length, in inches, of the prism?

- A. 2
B. 4
C. 8
D. 16
E. 32



34. For what values of x is the expression $\frac{1}{x^2-4}$ undefined?

F. -4 and 4

G. -2 and 2

H. -1 and 1

J. $-\frac{1}{2}$ and $\frac{1}{2}$

K. $-\frac{1}{4}$ and $\frac{1}{4}$

35. Triangle $\triangle ABC$ is shown in the standard (x,y) coordinate plane below. Which of the following is an equation of \overleftrightarrow{AC} ?

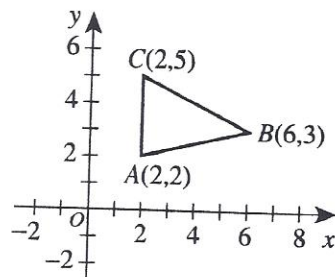
A. $x = 2$

B. $y = 2$

C. $y = -2x + 9$

D. $y = -\frac{1}{2}x + 6$

E. $y = \frac{1}{4}x + \frac{3}{2}$



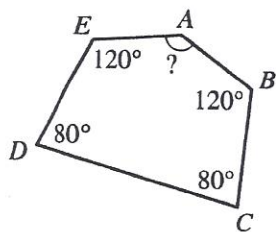


36. When a certain map is drawn in the standard (x,y) coordinate plane, one city has coordinates $(5,6)$ and another city has coordinates $(9,12)$. If 1 coordinate unit corresponds to 25 miles, which of the following is closest to the straight-line distance, in miles, between these 2 cities?

F. 100
G. 150
H. 180
J. 250
K. 500

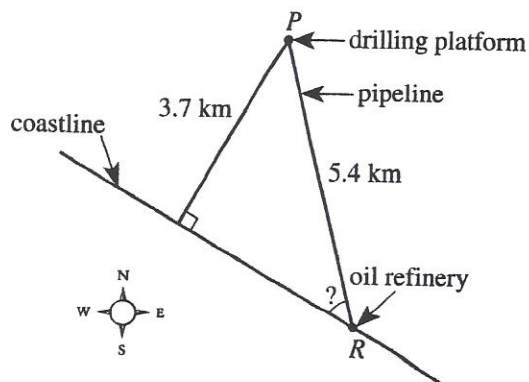
DO YOUR FIGURING HERE.

37. In the figure below, the measures of 4 angles of pentagon $ABCDE$ are given. What is the measure of $\angle A$?



A. 100°
B. 108°
C. 120°
D. 140°
E. 160°

38. Engineers are building a straight underwater pipeline from a drilling platform at P to an oil refinery located at R on a straight stretch of coastline, as shown on the map below. The distance from the platform to the refinery is 5.4 km, and the distance from the platform to the coastline is 3.7 km. Which of the following expressions gives the measure of the acute angle formed by the pipeline and the coastline?

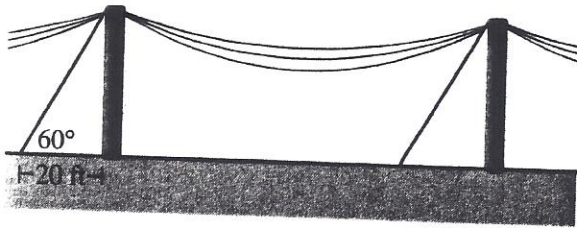


F. $\cos^{-1}\left(\frac{3.7}{5.4}\right)$
G. $\cos^{-1}\left(\frac{5.4}{3.7}\right)$
H. $\tan^{-1}\left(\frac{3.7}{5.4}\right)$
J. $\tan^{-1}\left(\frac{5.4}{3.7}\right)$
K. $\sin^{-1}\left(\frac{3.7}{5.4}\right)$



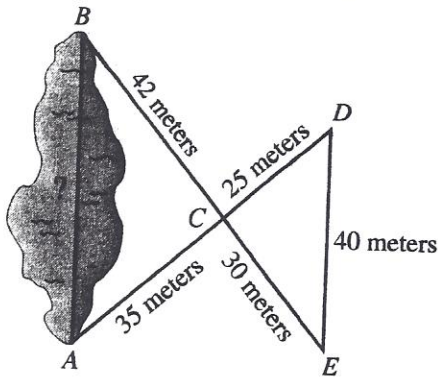
DO YOUR FIGURING HERE.

39. A support wire is attached to the top of a vertical pole, as shown below. The wire makes an angle of 60° with level ground at a point exactly 20 feet from the base of the pole. Approximately how many feet above the ground is the top of the pole?



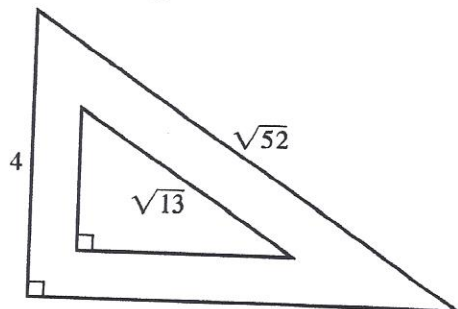
- A. 20
- B. 23
- C. 28
- D. 35
- E. 40

40. Surveyors want to determine a pond's length, represented by \overline{AB} in the figure below. They place stakes at points $A, B, C, D,$ and E so that C is the intersection of \overline{BE} and \overline{AD} and so that \overline{AB} is parallel to \overline{DE} . The distances between certain stakes are shown in the figure. What is the pond's length, in meters?



- F. $46\frac{2}{3}$
- G. 52
- H. 56
- J. 62
- K. $67\frac{1}{5}$

41. Given the 2 similar right triangles shown below with dimensions given in inches, what is the area, in square inches, of the smaller triangle?



- A. $1\frac{1}{2}$
- B. 3
- C. 4
- D. 6
- E. 12

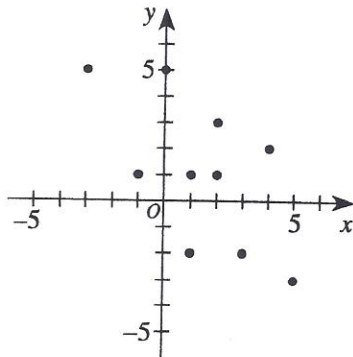


DO YOUR FIGURING HERE.

42. A band has only junior and senior band members. To raise money for new band uniforms, the members sold candy. Candy sales averaged \$50 for each junior and \$40 for each senior. If the ratio of juniors to seniors in the band was 3:2, candy sales averaged how many dollars per band member?

F. \$43
 G. \$44
 H. \$45
 J. \$46
 K. \$47

43. One of the following values is the slope of a line of best fit for the points shown below in the standard (x,y) coordinate plane. Which value?

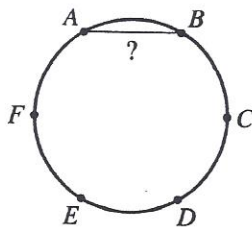


A. -8
 B. -1
 C. 0
 D. $\frac{1}{4}$
 E. 6

44. Min and Blanca answered the same homework question with different, yet equivalent, expressions. Min's expression was $(x + 3)^2 - x^2$. Blanca said her expression was a simplified form of Min's expression. Which of the following expressions could be Blanca's?

F. $6x + 6$
 G. $6x + 9$
 H. $6 + 2x - x^2$
 J. $9 + 2x - x^2$
 K. 9

45. Points A through F lie on the circle shown below so that the distance between any 2 adjacent points is equal. The circle has diameter $\frac{9}{2}$ inches. What is the length, in inches, of \overline{AB} ?



A. $\frac{3}{4}$
 B. $\frac{9}{4}$
 C. 3
 D. $\frac{9\sqrt{3}}{4}$
 E. $\frac{9}{2}$



DO YOUR FIGURING HERE.

46. Whenever $a^2b = 1$ for positive values of a and b , which of the following equations gives a in terms of b ?
- F. $a = b^2$
- G. $a = \sqrt{b}$
- H. $a = \frac{1}{b}$
- J. $a = \frac{1}{b^2}$
- K. $a = \frac{1}{\sqrt{b}}$
47. The slope of line l in the standard (x,y) coordinate plane is $\frac{2}{3}$. Which of the following is an equation of a line that is perpendicular to line l ?
- A. $3x + 2y = 5$
- B. $3x - 2y = 5$
- C. $2x + 3y = 5$
- D. $2x - 3y = 5$
- E. $-2x + 3y = 5$
48. Given that x and $\frac{7-x}{2}$ are integers, which of the following statements about x *must* be true?
- F. x is odd.
- G. x is even.
- H. x is prime.
- J. x is positive.
- K. x is negative.
49. Miles sells Baby Laugh dolls. The number of dolls, x , that Miles sells in 1 year depends on the price he sells them for that year, p dollars per doll. The equation $x = 52 - 2p$, where $0 < p \leq 26$, gives the relationship between x and p . Miles's *revenue* is the money collected from selling x dolls. The maximum revenue Miles can make from the sale of Baby Laugh dolls in 1 year occurs at what price per doll?
- A. \$13
- B. \$16
- C. \$20
- D. \$24
- E. \$26
50. A *geometric sequence* is a sequence of numbers in which each term is multiplied by a constant to obtain the following term. What is the 4th term in the geometric sequence with first 3 terms 4, 6, and 9?
- F. 10.5
- G. 12
- H. 13
- J. 13.5
- K. 15



Use the following information to answer questions 51–53.

DO YOUR FIGURING HERE.

The value of a used car can be modeled by the formula $V = V_0(1 - r)^t$, where V_0 is the car's purchase price, in dollars; r is the car's constant annual rate of decrease in value, expressed as a decimal; and V is the car's dollar value at the end of t years.

51. Which of the following equations shows the formula solved for r ?

A. $r = 1 - \sqrt[t]{\frac{V}{V_0}}$

B. $r = 1 + \sqrt[t]{\frac{V}{V_0}}$

C. $r = \sqrt[t]{\frac{V}{V_0}} - 1$

D. $r = 1 - t \log\left(\frac{V}{V_0}\right)$

E. $r = t \log\left(\frac{V}{V_0}\right) - 1$

52. A used car with a purchase price of \$20,000 has a constant annual rate of decrease in value of 0.1. According to the model, what is the value of the car, to the nearest dollar, at the end of 3 years?

F. \$13,122

G. \$14,000

H. \$14,580

J. \$16,200

K. \$18,000

53. A used car has a constant annual rate of decrease in value of 0.075. According to the model, which of the following expressions gives the number of years after purchase for the car to reach a value that is 50% of its purchase price?

A. $\frac{50}{7.5}$

B. $\frac{1 - 0.075}{0.5}$

C. $\frac{2}{1 - 0.0075}$

D. $\frac{\log(50)}{\log(7.5)}$

E. $\frac{\log(0.5)}{\log(1 - 0.075)}$

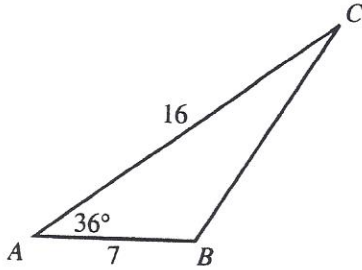


DO YOUR FIGURING HERE.

54. In $\triangle ABC$ shown below, lengths given are in inches, and the measure of $\angle A$ is 36° . Which of the following values is closest to the length, in inches, of \overline{BC} ?

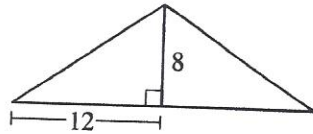
(Note: For any triangle with side lengths a , b , and c , $a^2 = b^2 + c^2 - 2bc \cos \theta$, where θ is the measure of the angle opposite the side of length a . The value of $\cos 36^\circ$ is approximately 0.81.)

- F. 11.1
- G. 14.4
- H. 17.5
- J. 19.7
- K. 22.1

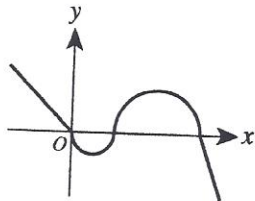


55. The pitch of a roof is given in a rise:run ratio. An 8:12 pitch is shown below. Which of the following pitches would result in the steepest roof?

- A. 1:3
- B. 2:5
- C. 4:6
- D. 6:8
- E. 10:16



56. The graph of $y = f(x)$ is shown in the standard (x,y) coordinate plane below. One of the following graphs is that of $y = |f(x)|$. Which graph is it?



- F.
- G.
- H.
- J.
- K.



57. Fifteen cars containing a total of 60 people crossed a toll bridge. Each of the 15 cars contained at least 1 person but no more than 5 people. At most how many cars contained exactly 3 people?

A. 3
 B. 5
 C. 7
 D. 8
 E. 10

DO YOUR FIGURING HERE.

58. Let θ be the radian angle measure that satisfies $\sin^2\theta - \sin\theta = -\frac{1}{4}$ for $0 < \theta < \frac{\pi}{2}$. What is $\cos\theta$?

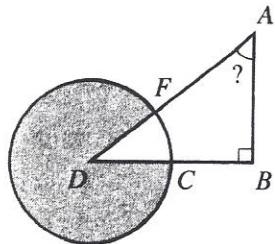
F. $\frac{1}{16}$
 G. $\frac{1}{4}$
 H. $\frac{1}{2}$
 J. $\frac{\sqrt{3}}{2}$
 K. $\frac{\sqrt{15}}{4}$

59. The system of equations below has multiple solutions, all of which satisfy the equation $y = \frac{4}{3}x - 2$. If it can be determined, what is the value of a ?

$$\begin{aligned} 8x - 6y &= 12 \\ 12x - ay &= 18 \end{aligned}$$

A. -6
 B. 9
 C. 14
 D. 18
 E. Cannot be determined from the given information

60. As shown in the figure below, D is the center of the circle, and right triangle $\triangle ABD$ intersects the circle at C and F . Point C is the midpoint of \overline{BD} , which is 12 cm long. The shaded region inside the circle and outside the triangle has an area of 32π square centimeters. What is the measure of $\angle A$?



F. 40°
 G. 45°
 H. 50°
 J. 58°
 K. 67.5°

END OF TEST 2

STOP! DO NOT TURN THE PAGE UNTIL TOLD TO DO SO.

DO NOT RETURN TO THE PREVIOUS TEST.