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.

DO YOUR FIGURING HERE.

1. The monthly fees for single rooms at 5 colleges are \$370, \$310, \$380, \$340, and \$310, respectively. What is the mean of these monthly fees?

   A. \$310
   B. \$340
   C. \$342
   D. \$350
   E. \$380

2. Disregarding sales tax, how much will you save when you buy a \$12.00 compact disc that is on sale for 25% off?

   F. \$0.30
   G. \$0.48
   H. \$3.00
   J. \$5.00
   K. \$9.00

3. Given $f = cd^3$, $f = 450$, and $d = 10$, what is c ?

   A. 0.45
   B. 4.5
   C. 15
   D. 45
   E. 150

4. Jorge's current hourly wage for working at Denti Smiles is \$12.00. Jorge was told that at the beginning of next month, his new hourly wage will be an increase of 6% of his current hourly wage. What will be Jorge's new hourly wage?

   F. \$12.06
   G. \$12.60
   H. \$12.72
   J. \$18.00
   K. \$19.20

5. The first term is 1 in the geometric sequence $1, -3, 9, -27, \cdots$. What is the SEVENTH term of the geometric sequence?

   A. −243
   B. −30
   C. 81
   D. 189
   E. 729

DO YOUR FIGURING HERE.

6. If $\sqrt{a} = b$ and $b = 36$, $a = ?$

F. 6
G. 18
H. 72
J. 324
K. 1,296

7. The shipping rate for customers of Ship Quick consists of a fee per box and a price per pound for each box. The table below gives the fee and the price per pound for customers shipping boxes of various weights.

Weight of box (pounds)	Fee	Price per pound
Less than 10	\$ 5.00	\$1.00
10–25	\$10.00	\$0.65
More than 25	\$20.00	\$0.30

Gregg wants Ship Quick to ship 1 box that weighs 15 pounds. What is the shipping rate for this box?

A. \$ 9.75
B. \$16.50
C. \$19.75
D. \$20.00
E. \$24.50

8. The table below shows the number of cars Jing sold each month last year. What is the median of the data in the table?

Month	Number of cars sold
January	25
February	15
March	22
April	19
May	16
June	13
July	19
August	25
September	26
October	27
November	28
December	29

F. 13
G. 16
H. 19
J. 20.5
K. 23.5

9. Students studying motion observed a cart rolling at a constant rate along a straight line. The table below gives the distance, d feet, the cart was from a reference point at 1-second intervals from $t = 0$ seconds to $t = 5$ seconds.

t	0	1	2	3	4	5
d	14	20	26	32	38	44

Which of the following equations represents this relationship between d and t ?

A. $d = t + 14$
B. $d = 6t + 8$
C. $d = 6t + 14$
D. $d = 14t + 6$
E. $d = 34t$

DO YOUR FIGURING HERE.

10. If $x + \frac{5}{8} = \frac{5}{24}$, then $x = ?$

F. 3

G. $\frac{5}{6}$

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

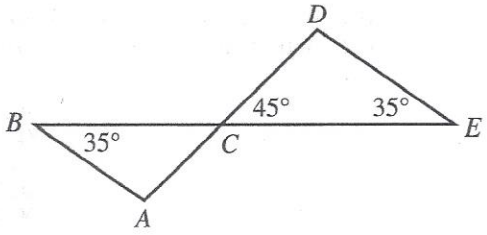
J. 0

K. $-\frac{5}{12}$

11. The absolute value of which of the following numbers is the greatest?

A. –0.4
B. –0.042
C. –0.0048
D. 0.04
E. 0.047

12. In the figure below, C is the intersection of $\overline{AD}$ and $\overline{BE}$. If it can be determined, what is the measure of $\angle BAC$?



F. 80°
G. 100°
H. 110°
J. 115°
K. Cannot be determined from the given information

13. This month, Kami sold 70 figurines in 2 sizes. The large figurines sold for $12 each, and the small figurines sold for $8 each. The amount of money he received from the sales of the large figurines was equal to the amount of money he received from the sales of the small figurines. How many large figurines did Kami sell this month?

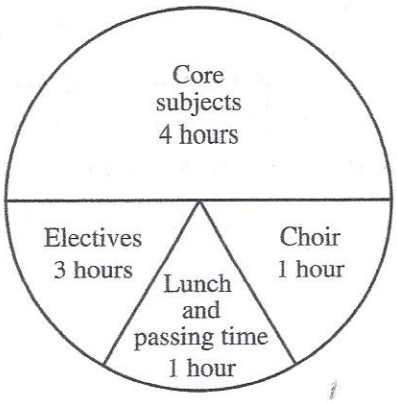
A. 20
B. 28
C. 35
D. 42
E. 50

14. Given that $\sqrt{2x} - 11 = 1$, $x = ?$

F. –50
G. 24
H. 36
J. 50
K. 72

DO YOUR FIGURING HERE.

15. Antwan drew the circle graph below describing his time spent at school in 1 day. His teacher said that the numbers of hours listed were correct, but that the central angle measures for the sectors were not correct. What should be the central angle measure for the Core subjects sector?



A. 72°
B. 80°
C. 160°
D. 200°
E. 288°

16. The area of a rectangular sheet of paper is 32 square inches. The length of the sheet of paper is twice its width. What is the perimeter, in inches, of the sheet of paper?

F. 4
G. 8
H. 12
J. 16
K. 24

17. A car accelerated from 88 feet per second (fps) to 220 fps in exactly 3 seconds. Assuming the acceleration was constant, what was the car's acceleration, in feet per second per second, from 88 fps to 220 fps ?

A. $\frac{1}{44}$
B. $29\frac{1}{3}$
C. 44
D. $75\frac{1}{3}$
E. $102\frac{2}{3}$

18. In scientific notation, 670,000,000 + 700,000,000 = ?

F. 1.37×10^{-9}
G. 1.37×10^{7}
H. 1.37×10^{8}
J. 1.37×10^{9}
K. 137×10^{15}

DO YOUR FIGURING HERE.

19. In a plane, the distinct lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ intersect at A, where A is between C and D. The measure of $\angle BAC$ is $47°$. What is the measure of $\angle BAD$?

A. $43°$
B. $47°$
C. $94°$
D. $133°$
E. $137°$

20. Which of the following expressions is equivalent to $\frac{(3x)^2}{x^5}$?

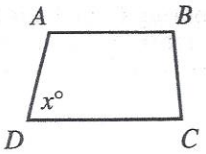
F. $\frac{3}{x^3}$
G. $\frac{6}{x^3}$
H. $\frac{9}{x^3}$
J. $3x^7$
K. $6x^7$

21. Whenever $4x + 7 = 2x - g$, which of the following expressions must be equal to x ?

A. $\frac{-g-7}{2}$
B. $\frac{-g+7}{2}$
C. $\frac{-g+7}{6}$
D. $\frac{g}{2}$
E. $-\frac{7}{4}$

22. For trapezoid $ABCD$ shown below, $\overline{AB} \parallel \overline{DC}$, the measures of the interior angles are distinct, and the measure of $\angle D$ is $x°$. What is the degree measure of $\angle A$ in terms of x ?

F. $(180 - x)°$
G. $(180 - 0.5x)°$
H. $(180 + 0.5x)°$
J. $(180 + x)°$
K. $x°$



23. Which of the following expressions is equivalent to $\frac{1}{2}y^2(6x + 2y + 12x - 2y)$?

A. $9xy^2$
B. $18xy$
C. $3xy^2 + 12x$
D. $9xy^2 - 2y^3$
E. $3xy^2 + 12x - y^3 - 2y$

DO YOUR FIGURING HERE.

24. Sara and Behzad are saving to make a down payment on a house. With an initial deposit of \$8,000, they have opened an account that compounds interest at an annual rate of 2.1%. Assuming that Sara and Behzad make no additional deposits or withdrawals, which of the following expressions gives the dollar value of the account 4 years after the initial deposit?

(Note: For an account with an initial deposit of P dollars that compounds interest at an annual rate of r%, the value of the account t years after the initial deposit is $P\left(1 + \frac{r}{100}\right)^t$ dollars.)

F. $8{,}000(1.021)^4$
G. $8{,}000(1.21)^4$
H. $8{,}000(3.1)^4$
J. $8{,}000(121)^4$
K. $8{,}000 + 8{,}000(0.21)^4$

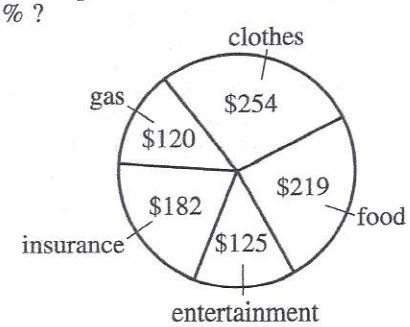
25. Right triangle $\triangle RST$ has its right angle at vertex S. The length of $\overline{ST}$ is 6.0 feet and the length of $\overline{RS}$ is 2.5 feet. Which of the following values is closest to the length, in feet, of $\overline{RT}$?

A. 3.5
B. 4.3
C. 5.5
D. 6.5
E. 8.5

26. An artist makes a profit of $(500p - p^2)$ dollars from selling p paintings. What is the fewest number of paintings the artist can sell to make a profit of at least \$60,000 ?

F. 100
G. 150
H. 200
J. 300
K. 600

27. Last month, Lucie had total expenditures of \$900. The pie chart below breaks down these expenditures by category. The category in which Lucie's expenditures were greatest is what percent of her total expenditures, to the nearest 1% ?



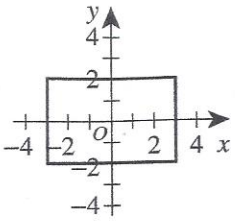
A. 24%
B. 28%
C. 32%
D. 34%
E. 39%

DO YOUR FIGURING HERE.

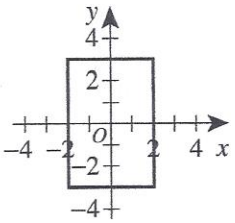
28. When the system of inequalities below is graphed in the standard (x,y) coordinate plane, one of the following graphs is that of the solution set of the system. Which graph?

$$\begin{cases} -3 \le x \le 3 \\ -2 \le y \le 2 \end{cases}$$

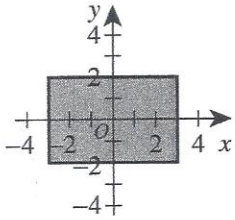
F.



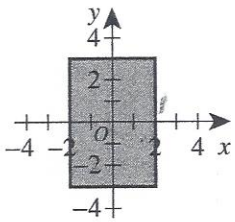
J.



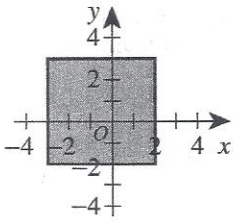
G.



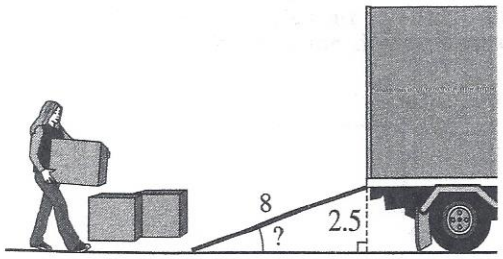
K.



H.



29. Janelle is loading a truck by using a ramp, as shown below. The ramp is 8 feet long, and the end of the ramp that is resting on the truck is 2.5 feet above the level ground. Which of the following expressions gives the angle of inclination of the ramp?



A. $\text{Arccos}\left(\frac{2.5}{8}\right)$

B. $\text{Arcsin}\left(\frac{2.5}{8}\right)$

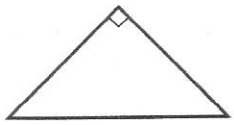
C. $\text{Arctan}\left(\frac{2.5}{8}\right)$

D. $\text{Arccos}\left(\frac{8}{2.5}\right)$

E. $\text{Arcsin}\left(\frac{8}{2.5}\right)$

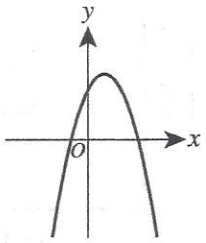
DO YOUR FIGURING HERE.

30. What is the perimeter, in inches, of the isosceles right triangle shown below, whose hypotenuse is $8\sqrt{2}$ inches long?



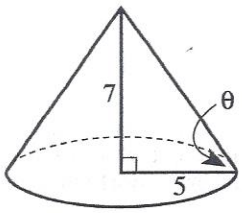
F. 8
G. $8 + 8\sqrt{2}$
H. $8 + 16\sqrt{2}$
J. 16
K. $16 + 8\sqrt{2}$

31. The equation $y = ax^2 + bx + c$ is graphed in the standard (x,y) coordinate plane below for real values of a, b, and c. When $y = 0$, which of the following best describes the solutions for x ?



A. 2 distinct positive real solutions
B. 2 distinct negative real solutions
C. 1 positive real solution and 1 negative real solution
D. 2 real solutions that are not distinct
E. 2 distinct solutions that are not real

32. The radius of the base of the right circular cone shown below is 5 inches, and the height of the cone is 7 inches. Solving which of the following equations gives the measure, θ, of the angle formed by a slant height of the cone and a radius?



F. $\tan \theta = \frac{5}{7}$
G. $\tan \theta = \frac{7}{5}$
H. $\sin \theta = \frac{5}{7}$
J. $\sin \theta = \frac{7}{5}$
K. $\cos \theta = \frac{7}{5}$

33. A formula to estimate the monthly payment, p dollars, on a short-term loan is

$$p = \frac{\frac{1}{2}ary + a}{12y}$$

where a dollars is the amount of the loan, r is the annual interest rate expressed as a decimal, and y years is the length of the loan. When a is multiplied by 2, what is the effect on p ?

A. p is divided by 6
B. p is divided by 2
C. p does not change
D. p is multiplied by 2
E. p is multiplied by 4

DO YOUR FIGURING HERE.

34. To make a 750-piece jigsaw puzzle more challenging, a puzzle company includes 5 extra pieces in the box along with the 750 pieces, and those 5 extra pieces do not fit anywhere in the puzzle. If you buy such a puzzle box, break the seal on the box, and immediately select 1 piece at random, what is the probability that it will be 1 of the extra pieces?

F. $\frac{1}{5}$

G. $\frac{1}{755}$

H. $\frac{1}{750}$

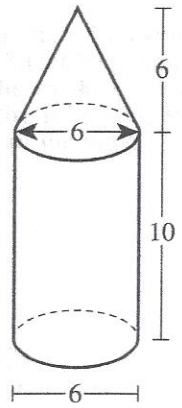
J. $\frac{5}{755}$

K. $\frac{5}{750}$

35. The length of a rectangle is 3 inches more than twice the width of the rectangle. The perimeter of the rectangle is 36 inches. What is the width of the rectangle, in inches?

A. 4
B. 5
C. 9
D. 11
E. 13

36. The solid shown below is composed of a right circular cylinder and a right circular cone with base diameters and heights given in centimeters. The cylinder and the cone have equal base diameters. What is the volume, in cubic centimeters, of the solid?



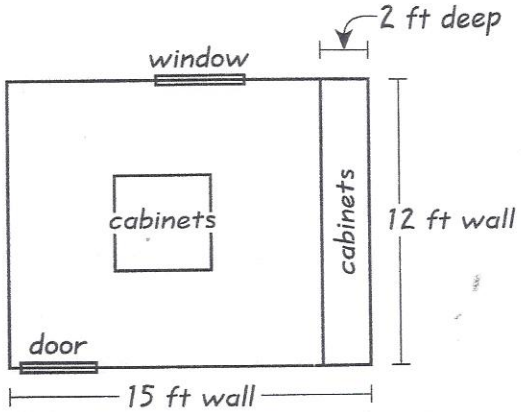
(Note: The volume of a right circular cylinder with base radius r and height h is $\pi r^2 h$. The volume of a right circular cone with base radius r and height h is $\frac{1}{3}\pi r^2 h$.)

F. 72π
G. 96π
H. 108π
J. 144π
K. 360π

DO YOUR FIGURING HERE.

Use the following information to answer questions 37–39.

Gianna is converting a 12-foot-by-15-foot room in her house to a craft room. Gianna will install tile herself but will have CC Installations build and install the cabinets. The scale drawing shown below displays the location of the cabinets in the craft room (0.25 inch represents 2 feet).



Cabinets will be installed along one of the 12-foot walls from floor to ceiling, and 4 cabinets that are each 3 feet tall will be installed in the middle of the room. These are the only cabinets that will be installed, and each of them will be 2 feet wide and 2 feet deep. CC Installations has given Gianna an estimate of $2,150.00 for building and installing the cabinets.

37. A 15-foot wall is how many inches long in the scale drawing?

A. 1.5
B. 1.875
C. 3
D. 3.375
E. 3.75

38. Gianna will install tile on the portion of the floor that will NOT be covered by cabinets. What is the area, in square feet, of the portion of the floor that will NOT be covered by cabinets?

F. 72
G. 90
H. 140
J. 156
K. 164

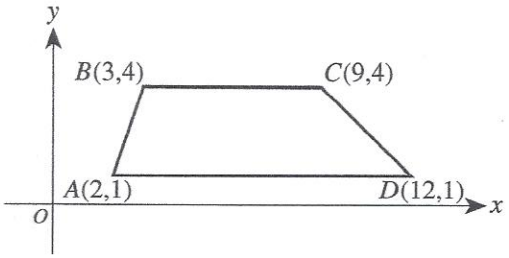
39. CC Installations' estimate consists of a $650.00 charge for labor, plus a fixed charge per cabinet. The labor charge and the charge per cabinet remain the same for any number of cabinets built and installed. CC Installations would give Gianna what estimate if the craft room were to have twice as many cabinets as Gianna is planning to have?

A. $2,800.00
B. $3,000.00
C. $3,450.00
D. $3,650.00
E. $4,300.00

DO YOUR FIGURING HERE.

Use the following information to answer questions 40–42.

Trapezoid $ABCD$ is graphed in the standard (x,y) coordinate plane below.



40. What is the slope of $\overline{CD}$?

F. -3

G. -1

H. 1

J. $\frac{5}{21}$

K. $\frac{3}{2}$

41. When $ABCD$ is reflected over the y-axis to $A'B'C'D'$, what are the coordinates of D' ?

A. $(-12, 1)$
B. $(-12, -1)$
C. $(12, -1)$
D. $(1, 12)$
E. $(1, -12)$

42. Which of the following vertical lines cuts $ABCD$ into 2 trapezoids with equal areas?

F. $x = 2.5$
G. $x = 3.5$
H. $x = 4.5$
J. $x = 5.5$
K. $x = 6.5$

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43. Given that $a\begin{bmatrix} 2 & 6 \\ 1 & 4 \end{bmatrix} = \begin{bmatrix} x & 27 \\ y & z \end{bmatrix}$ for some real number a, what is $x + z$?

A. $\frac{4}{3}$

B. $\frac{27}{2}$

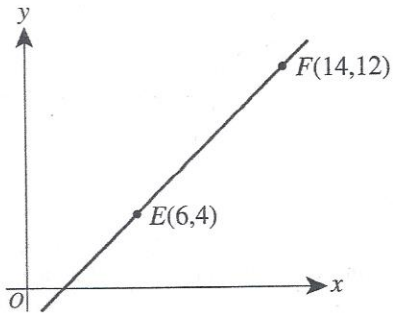
C. 26

D. 27

E. 48

DO YOUR FIGURING HERE.

44. The points $E(6,4)$ and $F(14,12)$ lie in the standard (x,y) coordinate plane shown below. Point D lies on $\overline{EF}$ between E and F such that the length of $\overline{EF}$ is 4 times the length of $\overline{DE}$. What are the coordinates of D ?



F. (7, 5)
G. (8, 6)
H. (8, 8)
J. (10, 8)
K. (12,10)

45. A certain triangle has a perimeter of x meters. One side of the triangle is 60 meters long, another side is $\frac{1}{3}$ the length of the perimeter, and the third side is $\frac{1}{4}$ the length of the perimeter. What is the perimeter, in meters, of the triangle?

A. 15
B. 35
C. 84
D. 95
E. 144

46. The difference (larger minus smaller) between 2 numbers is 15. If n represents the larger number, which expression below represents the average (arithmetic mean) of the 2 numbers?

F. 7.5
G. $n + 7.5$
H. $n + 15$
J. $n - 15$
K. $n - 7.5$

47. $\frac{4}{\sqrt{2}} + \frac{2}{\sqrt{3}} = ?$

A. $\frac{4\sqrt{3} + 2\sqrt{2}}{\sqrt{5}}$

B. $\frac{4\sqrt{3} + 2\sqrt{2}}{\sqrt{6}}$

C. $\frac{6}{\sqrt{2} + \sqrt{3}}$

D. $\frac{6}{\sqrt{5}}$

E. $\frac{8}{\sqrt{6}}$

DO YOUR FIGURING HERE.

48. A square in the standard (x,y) coordinate plane has vertices at (1,3), (2,1), (4,2), and (3,4). Where do the diagonals of the square intersect?

F. $\left(\frac{3}{2}, 2\right)$

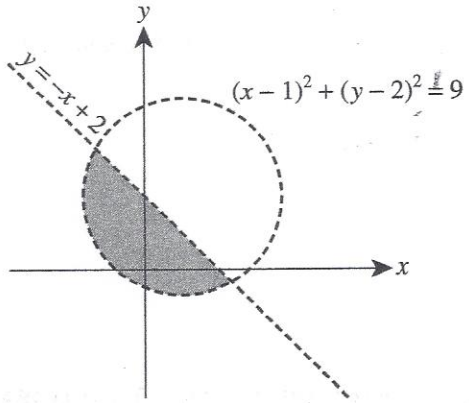
G. $(2, 3)$

H. $\left(2, \frac{3}{2}\right)$

J. $\left(\frac{5}{2}, \frac{5}{2}\right)$

K. $\left(\frac{7}{2}, 3\right)$

49. The shaded region in the graph below represents the solution set to which of the following systems of inequalities?



A. $\begin{cases} y < -x + 2 \\ (x-1)^2 + (y-2)^2 < 9 \end{cases}$

B. $\begin{cases} y > -x + 2 \\ (x-1)^2 + (y-2)^2 < 9 \end{cases}$

C. $\begin{cases} y > -x + 2 \\ (x-1)^2 + (y-2)^2 > 9 \end{cases}$

D. $\begin{cases} y < -x + 2 \\ (x-1)^2 + (y-2)^2 > 9 \end{cases}$

E. $\begin{cases} (y-2) < 3 \\ (x-1) > 3 \end{cases}$

50. In the standard (x,y) coordinate plane, line a contains the points (−4,2) and (−1,−3), and line b contains the points (3,0) and (7,0). At what point does line a intersect line b ?

F. $\left(-\frac{14}{5}, 0\right)$

G. $\left(\frac{107}{35}, \frac{3}{7}\right)$

H. $\left(0, -\frac{14}{3}\right)$

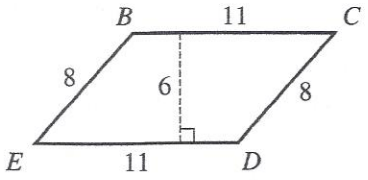
J. $\left(3, -\frac{29}{3}\right)$

K. $\left(7, -\frac{49}{3}\right)$

DO YOUR FIGURING HERE.

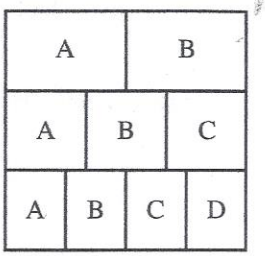
51. In the figure below, the side lengths and the length of an altitude of parallelogram $BCDE$ are given in feet. What is the area, in square feet, of $BCDE$?

A. 25
B. 38
C. 48
D. 66
E. 88



52. The square below is divided into 3 rows of equal area. In the top row, the region labeled A has the same area as the region labeled B. In the middle row, the 3 regions have equal areas. In the bottom row, the 4 regions have equal areas. What fraction of the square's area is in a region labeled A ?

F. $\frac{1}{9}$
G. $\frac{3}{9}$
H. $\frac{6}{9}$
J. $\frac{13}{12}$
K. $\frac{13}{36}$



53. Which of the following is a quadratic equation that has $-\frac{2}{3}$ as its only solution?

A. $9x^2 + 12x + 4 = 0$
B. $9x^2 - 12x + 4 = 0$
C. $9x^2 + 6x + 4 = 0$
D. $9x^2 + 4 = 0$
E. $9x^2 - 4 = 0$

54. Bonkosi mixes 60 milliliters of Solution A with 40 milliliters of Solution X. Solution A has a 40% hydrochloric acid concentration; Solution X has an unknown hydrochloric acid concentration. When Bonkosi tests the resulting 100-milliliter solution, she finds that it has a 36% hydrochloric acid concentration. What is the hydrochloric acid concentration of Solution X ?

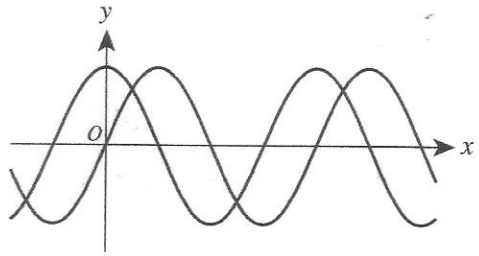
F. 19%
G. 24%
H. 30%
J. 32%
K. 38%

DO YOUR FIGURING HERE.

55. What are the real number values of x that make the equation $\sqrt[4]{x^{12}} = x^3$ true?

A. All real numbers
B. $x < 0$
C. $x > 0$
D. $x \leq 0$
E. $x \geq 0$

56. The functions $y = \sin x$ and $y = \sin(x + a) + b$, for constants a and b, are graphed in the standard (x,y) coordinate plane below. The functions have the same maximum value. One of the following statements about the values of a and b is true. Which statement is it?

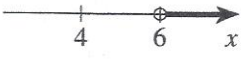


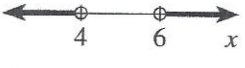
F. $a < 0$ and $b = 0$
G. $a < 0$ and $b > 0$
H. $a = 0$ and $b > 0$
J. $a > 0$ and $b < 0$
K. $a > 0$ and $b > 0$

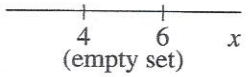
57. Which of the following number line graphs shows the solution set to the inequality $|x - 5| < -1$?

A.


B.


C.


D.


E.


(empty set)

DO YOUR FIGURING HERE.

58. The sides of an acute triangle measure 14 cm, 18 cm, and 20 cm, respectively. Which of the following equations, when solved for θ, gives the measure of the smallest angle of the triangle?

(Note: For any triangle with sides of length a, b, and c that are opposite angles A, B, and C, respectively, $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$ and $c^2 = a^2 + b^2 - 2ab \cos C$.)

F. $\frac{\sin \theta}{14} = \frac{1}{18}$

G. $\frac{\sin \theta}{14} = \frac{1}{20}$

H. $\frac{\sin \theta}{20} = \frac{1}{14}$

J. $14^2 = 18^2 + 20^2 - 2(18)(20)\cos \theta$

K. $20^2 = 14^2 + 18^2 - 2(14)(18)\cos \theta$

59. For all values of x where the expression is defined, $\frac{\frac{3}{x-5}}{1-\frac{2}{x-5}} = ?$

A. -3

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

C. $-\frac{3}{x^2-25}$

D. $\frac{3}{x-7}$

E. $\frac{3}{x-3}$

60. Mr. Martin wants to plant 7 trees evenly spaced along a straight fence 300 feet long, with 1 of the trees at each end of the fence. About how many feet apart should he plant the trees?

F. 33
G. 38
H. 43
J. 50
K. 60

END OF TEST 2

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

DO NOT RETURN TO THE PREVIOUS TEST.