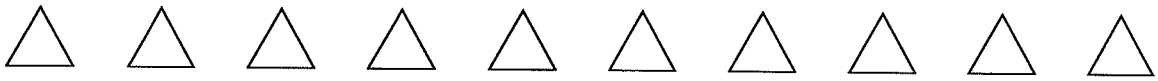


MATHEMATICS TEST

60 Minutes—60 Questions

DIRECTIONS: Solve each of the problems in the time allowed, then fill in the corresponding bubble on your answer sheet (page 167). Do not spend too much time on any one problem; skip the more difficult problems and go back to them later. You may use a calculator on this test. For this test you should assume that figures are NOT necessarily drawn to scale, that all geometric figures lie in a plane, and that the word *line* is used to indicate a straight line.

DO YOUR FIGURING HERE.

1. $(4x - 5)(3x + 1)$ is equivalent to:
   A. $7x - 4$
   B. $12x^2 - 5$
   C. $7x^2 + 11x - 4$
   D. $12x^2 - 11x - 5$
   E. $16x + 20$

2. What is the perimeter, in inches, of a rectangle if it has a length of 11 inches and a width of 6 inches?
   F. 17
   G. 34
   H. 36
   J. 66
   K. 132

3. Adam attempted 33 field goals throughout the football season and made 26 of them. Approximately what percentage of his field goals did he make during the season?
   A. 27%
   B. 33%
   C. 66%
   D. 72%
   E. 79%

4. What (x, y) pair is the solution to the system of equations below?

$$-2x + 4y = -18$$
$$4x - 5y = 30$$

   F. (5, −2)
   G. (3, 3)
   H. (0, 0)
   J. (−3, −3)
   K. (−5, 2)

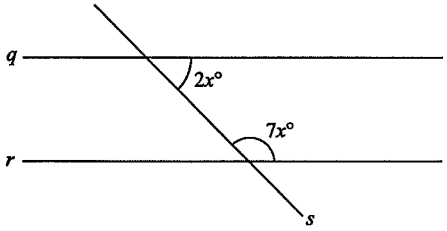
5. If the measure of each interior angle in a regular polygon is 90, how many sides does the polygon have?
   A. 8
   B. 6
   C. 5
   D. 4
   E. 3

DO YOUR FIGURING HERE.

6. For all positive integers x, what is the greatest common factor of the numbers $256x$ and $144x$?
   F. 12
   G. 16
   H. x
   J. $16x$
   K. $24x$

7. Kathleen and Natalie are putting new carpet in their apartment. Kathleen used $22\frac{3}{4}$ square yards of carpet in the living room, and Natalie used $12\frac{1}{2}$ square yards of carpet in the dining room. If 50 square yards of carpet was purchased, how many square yards were left after laying new carpet down in both rooms?
   A. $12\frac{3}{4}$
   B. $14\frac{1}{4}$
   C. $14\frac{1}{2}$
   D. $14\frac{3}{4}$
   E. $16\frac{1}{4}$

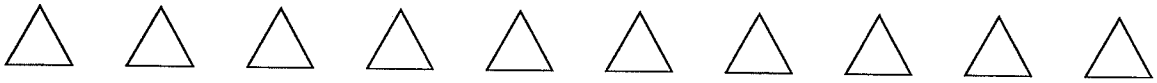
8. In the figure below, parallel lines q and r are intersected by line s. What is the value of x ?



   F. 9
   G. 16
   H. 20
   J. 40
   K. 55

9. The equation of a circle is $x^2 + y^2 = 81$. If this circle is graphed in the standard (x, y) coordinate plane, what will be the y-intercepts?
   A. (0, 3) and (0, −3)
   B. (0, 9) and (0, −9)
   C. (0, 12) and (0, −12)
   D. (0, 18) and (0, −18)
   E. (0, 27) and (0, −27)

10. A new rectangular soccer field is being constructed at John Adams High School. The length of the field must be $(4x - 3)$ yards and the width must be $5x$ yards. Which of the following expressions in terms of x gives the number of square yards of grass needed to cover the field?
    F. $x - 3$
    G. $9x - 3$
    H. $20x - 15x^2$
    J. $15x^2 + 9x$
    K. $20x^2 - 15x$



11. In the geometric sequence

$$4, 10, 25, 62\frac{1}{2}, N, \ldots$$

what is the 5th term, N?

A. $144\frac{3}{4}$

B. $148\frac{1}{2}$

C. $156\frac{1}{4}$

D. $156\frac{1}{2}$

E. $162\frac{1}{4}$

DO YOUR FIGURING HERE.

12. A recent survey was conducted on a group of households, each of which was watching one of three television programs on a certain evening. The survey indicated that 45% of the households watched Program A, 35% watched Program B, and the remaining 20% watched Program C. The results showed that 2,250 households watched Program A. About how many households watched Program B?

F. 350
G. 780
H. 1,012
J. 1,750
K. 1,900

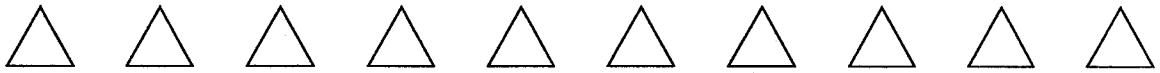
13. What is the value of $|-7|+|5-13|$?

A. -15
B. -1
C. 1
D. 15
E. 25

14. Each night at closing time over a full workweek, Cory counted the number of customers who shopped at his store that day and recorded it in the table shown below. For that workweek, what was the average number of customers per day at Cory's store?

Day	Number of customers
Monday	20
Tuesday	26
Wednesday	21
Thursday	17
Friday	31

F. 26
G. 23
H. 21
J. 20
K. 18



15. Sasha is going to Italy over his spring break. When he arrives, he has to exchange his U.S. dollars for euros. If the exchange rate between the number of U.S. dollars (u) and euros (e) is expressed in the equation $0.77u = e$, approximately how many euros will Sasha receive in exchange for his 675 U.S. dollars?

A. 877
B. 730
C. 520
D. 493
E. 465

DO YOUR FIGURING HERE.

16. At approximately what speed, in miles per hour, would you be traveling on your bike if you traveled 3.5 miles in 12 minutes?

F. 3.4
G. 8.3
H. 14.0
J. 15.2
K. 17.5

17. There is a bowl with 48 different marbles in it. In the bowl, there are 14 red marbles, 12 blue, 9 green, 8 yellow, and 5 white. If Corbin reaches into the bowl without looking, what is the probability that he will draw a marble that is either blue or white?

A. $\frac{21}{48}$
B. $\frac{17}{48}$
C. $\frac{12}{48}$
D. $\frac{9}{48}$
E. $\frac{5}{48}$

18. If $n = 2$, what is the value of $n(-6)^n - 9n$?

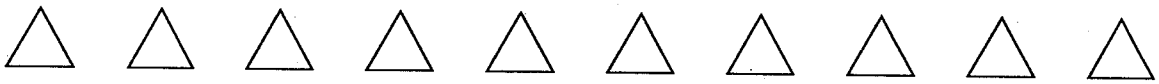
F. 126
G. 81
H. 54
J. 18
K. −90

19. Which of the following is a factor of $(2z^2 - z - 15)$?

A. $2z - 5$
B. $2z - 15$
C. $z^2 - 3$
D. $z + 15$
E. $z - 3$

20. If the point with coordinates $(-2, y_1)$ lies on the graph of $y = -4x + 5$, what is the value of y_1?

F. 13
G. 8
H. 3
J. 1
K. −3



DO YOUR FIGURING HERE.

21. If $8y = 6x + 14$, then $x =$?
A. $y - 14$
B. $\frac{8y}{6} + 14$
C. $\frac{4y + 7}{3}$
D. $\frac{4y - 7}{3}$
E. $\frac{8y + 14}{6}$

22. A packet of fruit snacks is filled by weight in the factory. If each fruit snack weighs about 0.04 ounces, about how many are needed to fill a packet with 1.2 ounces of fruit snacks?
F. 12
G. 30
H. 36
J. 48
K. 75

23. If $-5 + 3(x - 7) = -14$, then $x =$?
A. 4
B. $\frac{4}{3}$
C. $\frac{2}{3}$
D. 0
E. -10

24. The area of a circle is 121π square units. What is the diameter, in units, of the circle?
F. π
G. 11
H. 22
J. 11π
K. 121

25. For all x, $\frac{-5(-2x)^3}{10x}$ is equivalent to:
A. $100x^2$
B. $4x^2$
C. x^3
D. $-4x^2$
E. $-100x^2$

26. For $p^2 = 2$, what does $(4 - 3p)(7 + 2p)$ equal?
F. $-4 + 6p$
G. $4 - 13p$
H. $16 + 29p$
J. $16 - 13p$
K. $40 - 13p$

27. Two numbers are *reciprocals* if their product is 1. If m and n are reciprocals and $0 < m < 1$, then n must be:
A. less then -1.
B. between 0 and -1.
C. equal to 0.
D. between 0 and 1.
E. greater than 1.

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

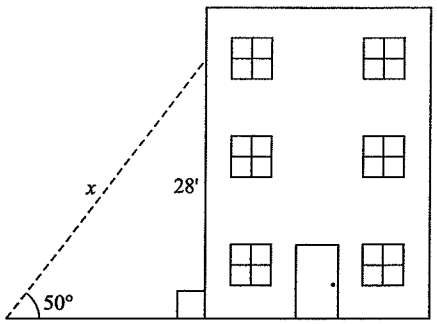
28. Which of the following is equivalent to

$$(5x - 2x^2) - (3x - 11) + (x^2 - 6)?$$

F. $x^4 - 2x^2 - 17$
G. $-x^4 + 2x^2 + 5$
H. $-x^4 + 2x^2 - 17$
J. $-x^2 + 2x + 5$
K. $-x^2 + 2x - 17$

29. The edges of a cube are 4 inches long. What is the surface area, in square inches, of this cube?
A. 144
B. 96
C. 64
D. 24
E. 16

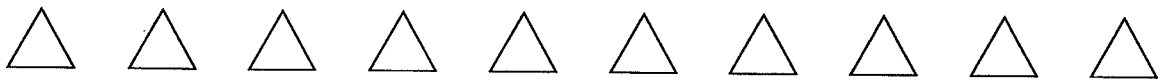
30. A ladder is set up at a 50° angle to the second-store window of a house, which is 28 feet tall. Which of the following equations gives the height x, in feet, of the ladder?



F. $\cos 50° = \frac{28}{x}$
G. $\sec 50° = \frac{28}{x}$
H. $\tan 50° = \frac{28}{x}$
J. $\csc 50° = \frac{28}{x}$
K. $\sin 50° = \frac{28}{x}$

31. Ian's points-per-game average was exactly 26 after the first 6 games of the basketball season. He scored 18, 30, 21, 24, and 36 points, respectively, in the first 5 games. How many points did he score in the 6th game?
A. 18
B. 23
C. 26
D. 27
E. 32

GO ON TO THE NEXT PAGE.



32. In the standard (x, y) coordinate plane, what is the slope of the line $3x - 9y = 12$?

F. -3

G. $-\frac{1}{3}$

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

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

K. 3

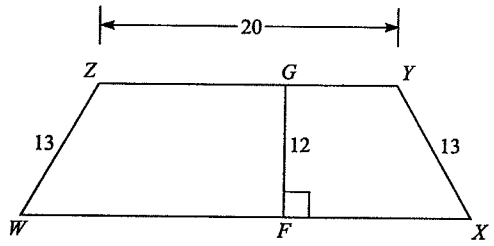
DO YOUR FIGURING HERE.

33. What is the mode of the following set of scores?

47, 89, 75, 77, 56, 89, 46, 89, 72

A. 47
B. 56
C. 71
D. 75
E. 89

34. In isosceles trapezoid $WXYZ$ shown below, $\overline{GF}$ is an altitude, and all lengths are given in inches. What is the perimeter of trapezoid $WXYZ$, in inches?



F. 71
G. 76
H. 78
J. 90
K. 98

35. For what positive values of x is it true that $x^2 > 5x > x + 24$?

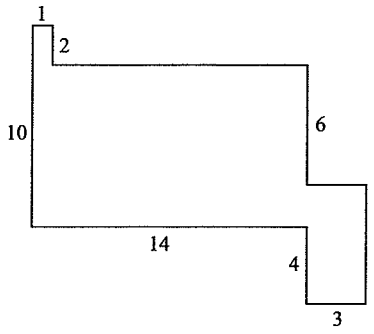
A. No positive values
B. Only positive values less than 3
C. Only values between 3 and 6
D. Only values greater than 6
E. All positive values

36. What is the smallest positive whole number that is divisible with zero remainder by both 14 and 16?

F. 2
G. 32
H. 84
J. 112
K. 224

DO YOUR FIGURING HERE.

37. If all the angles in the figure shown below are right angles and each dimension given is in centimeters, then what is the area of the figure, in square centimeters?



A. 62
B. 106
C. 132
D. 156
E. 166

38. What is the distance, in units, between the points (5, 2) and (−3, 6) in the standard (x, y) coordinate plane?

F. $4\sqrt{5}$
G. 8
H. $4\sqrt{3}$
J. 2
K. $-\frac{1}{2}$

39. What is the slope of the line through (−4, 7) and (2, −9) in the standard (x, y) coordinate plane?

A. $\frac{8}{3}$
B. $\frac{2}{6}$
C. $-\frac{1}{3}$
D. $-\frac{3}{8}$
E. $-\frac{8}{3}$

40. On the local television station, commercial airtime sells for p dollars per minute. Which of the following expressions gives the cost, in dollars, of x minutes and y seconds of commercial airtime?

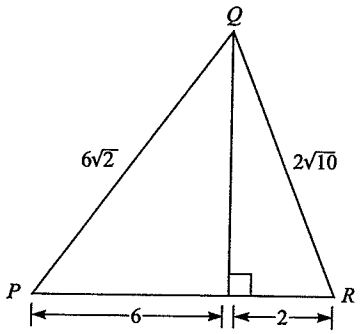
F. $p\left(\frac{x}{60}+y\right)$
G. $p(x+60y)$
H. $p\left(x+\frac{y}{60}\right)$
J. $\frac{p(x+y)}{60}$
K. $p(60x+y)$

DO YOUR FIGURING HERE.

41. For all positive values of j, k, and s, which of the following is equivalent to $\frac{j^5(j^2)(k^3)^4}{s^{-7}}$?

A. $j^{10}k^7s^7$
B. $j^7k^7s^7$
C. $j^7k^{12}s^7$
D. $\frac{j^{10}k^7}{s^7}$
E. $\frac{j^7k^{12}}{s^7}$

42. The dimensions of triangle PQR, shown below, are given in inches. What is the area, in square feet, of triangle PQR?



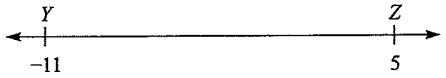
F. $17 + 2\sqrt{10}$
G. 24
H. 36
J. 48
K. $72 + 2\sqrt{10}$

43. On February 1, Mr. Weiss' electric meter read 5,468 kilowatt-hours (kwh). On March 1, the meter read 7,678 kwh, but the utility company did not send an agent to take the reading. Instead, they estimated that Mr. Weiss had used 2,150 kwh of electricity that month and billed him for that estimated amount. If each kwh costs \$0.12, what, if any, amount of money will Mr. Weiss owe the utility company beyond what he was actually billed?
A. \$3.87
B. \$4.08
C. \$5.25
D. \$7.20
E. He does not owe them any money

44. If 2 interior angles of a triangle measure 40° and 85°, respectively, which of the following describes the location of the shortest side of the triangle?
F. Always opposite the 40° angle
G. Always between the 40° and the 85° angle
H. Always opposite the 85° angle
J. Opposite either the 85° or the unknown angle
K. Cannot be determined from the information given

DO YOUR FIGURING HERE.

45. On the number line below, what is the coordinate of the point between Y and Z that is three times as far from point Z as from point Y?

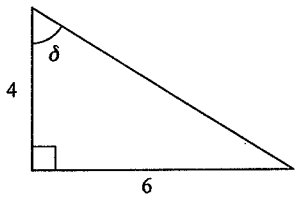


A. -9
B. -7
C. -3
D. -1
E. 1

46. Some friends have constructed a ramp for skateboarding with a piece of wood and a stack of large bricks. On the ground, the bottom of the ramp is 8 feet away from the bricks, which are stacked 6 feet high. Assuming that the bricks, ground, and the ramp are all straight, and that the bricks are stacked perpendicular to the ground, how many feet long is the ramp?
F. 9
G. 10
H. 14
J. $\sqrt{10}$
K. $\sqrt{14}$

47. What is the total when the product of 57 and 0.22 is added to 7% of 57?
A. 16.99
B. 16.53
C. 12.54
D. 8.55
E. 3.99

48. In the triangle below, the lengths given are expressed in feet. Which of the following is equal to $\tan \delta$?



F. $\frac{2\sqrt{13}}{4}$
G. $\frac{6}{4}$
H. $\frac{6}{2\sqrt{13}}$
J. $\frac{4}{6}$
K. $\frac{4}{2\sqrt{13}}$

49. Coach McLeod will use a circle graph to show how the members of his team spend their time during a 3-hour practice. The size of the sector representing each drill is proportional to the time spent in that drill. During practice, the team members spend 36 minutes on the punt return drill. How many degrees should the central angle measure in the sector representing the punt return drill?

A. 30.5°
B. 36°
C. 49.75°
D. 72°
E. 144°

DO YOUR FIGURING HERE.

50. If $r \neq 0$, s is a real number, $r^3 = 2s$, and $r^5 = 18s$, then what is one possible value of r?

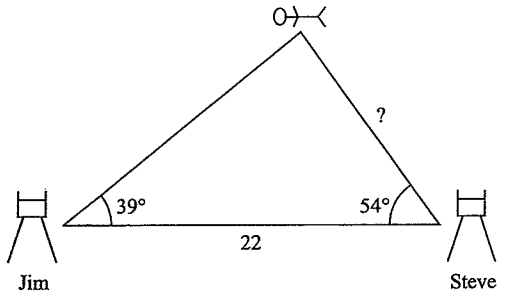
F. 3
G. 5
H. 9
J. s^2
K. Cannot be determined from the information given

51. The volume of a sphere is given by the formula $V = \frac{4}{3}\pi r^3$ and its surface area by the formula $S = 4\pi r^2$, where r is the radius of the sphere. What is the surface area of a sphere, in square inches, if its volume is $\frac{2{,}048\pi}{3}$?

A. 32π
B. 144π
C. 256π
D. 324π
E. 512π

DO YOUR FIGURING HERE.

52. Jim and Steve both work as lifeguards at the local beach. Their lookout towers are located about 22 yards apart, at the same elevation. A victim is spotted waving for help in the water at angles of 39° and 54° from the line of sight between the lookout towers, as indicated in the diagram below. Which of the following expressions, if any, gives the approximate distance, in yards, between the victim and Steve's tower?
(Note: The *law of sines* states that the ratio of the sine of an angle to the length of the side opposite an angle is the same for all interior angles in the same triangle.)



F. $\sqrt{39^2} + 54^2$

G. $\dfrac{22 \tan 54°}{\tan 87°}$

H. $22 \sin 54°$

J. $\dfrac{22 \sin 39°}{\sin 87°}$

K. The distance cannot be approximated without more information.

53. For a population that grows at a constant rate of $r\%$ per year, the formula $P(t) = p_o\left(1 + \dfrac{r}{100}\right)^t$ models the population t years after an initial population of p_o is counted. The population of the city of Midtown was 557,000 in 2005. Assume the population grows at a constant rate of 2% per year. According to this formula, which of the following is an expression for the population of Midtown in the year 2010?

A. $(557{,}000 \times 1.02)^5$
B. $(557{,}000 \times 1.2)^5$
C. $557{,}000(1.02)^5$
D. $557{,}000(1.2)^5$
E. $557{,}000(3)^5$

54. In the standard (x, y) coordinate plane, line k_1 has an equation of $2x + 6y = 11$. If line k_2 is perpendicular to line k_1, what is the slope of line k_2?

F. 3

G. $\dfrac{11}{6}$

H. 1

J. $-\dfrac{1}{3}$

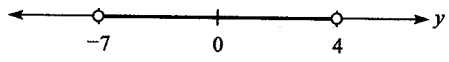
K. -3

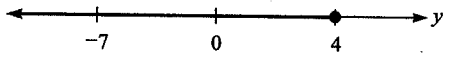
55. A parabola with an equation of the form $y = ax^2 + bx + c$ has the point $(-4, 2)$ as its vertex. If $(0, -5)$ also lies on this parabola, which of the following is another point on the parabola?

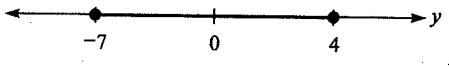
A. $(-8, -5)$
B. $(-5, 8)$
C. $(-2, 3)$
D. $(0, 5)$
E. $(3, -2)$

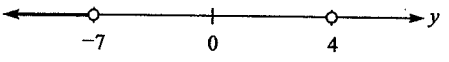
DO YOUR FIGURING HERE.

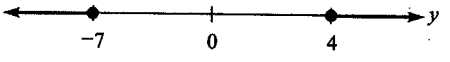
56. Which of the following is a graph of the solution set for the inequality $|2y + 3| \leq 11$?

F.


G.


H.


J.


K.


57. A function G is defined as follows:

for $x > 0$, $G(x) = x^3 + 3x^2 - 3x + 1$
for $x < 0$, $G(x) = x^3 + 3x^2 + 3x + 1$

What is the value of $G(-1)$?

A. 6
B. 3
C. 0
D. −3
E. −6

58. A number is increased by 40% and the resulting number is then decreased by 25%. The final number is what percent of the original number?

F. 115%
G. 105%
H. 85%
J. 15%
K. Cannot be determined with the given information

8 △ △ △ △ △ △ △ △ 8

59. If $a > 0$ and $b < 0$, which of the following *must* be true for the value of $b - a$?

A. $b - a > a$
B. $b - a > 0$
C. $b - a > b$
D. $b - a > ab$
E. $b - a < b$

DO YOUR FIGURING HERE.

60. The length of one side of a square is decreased by 40%. By approximately what percent would the length of an adjacent side have to be *increased* so that the area of the new figure (a rectangle) is the same as the area of the original square?

F. 33%
G. 40%
H. 55%
J. 67%
K. 75%

END OF THE MATHEMATICS TEST

STOP! IF YOU HAVE TIME LEFT OVER, CHECK YOUR WORK ON THIS SECTION ONLY.