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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. 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. If $x+3=n$, then $2x+6=?$

   A. $n+3$
   B. $n+6$
   C. $2n$
   D. $2n+3$
   E. $2n+6$

2. The expression $a(b-2c)$ is equivalent to:

   F. $ab-2a-2c$
   G. $ab-2ac$
   H. $ab-2bc$
   J. $ab-b-2c$
   K. $ab-2b-c$

3. Which 3 numbers should be placed in the blanks below so that the difference between consecutive numbers is the same?

   ___, 3, 10, ___, 24___

   A. −4, 17, 31
   B. 0, 17, 30
   C. 1, 13, 31
   D. 2, 17, 25
   E. 5, 15, 31

4. Diane bought 1 DVD for \$20.00 and 5 others that were on sale for \$8.49 each. What was the average price per DVD that she paid for these 6 DVDs?

   F. $\$20.00+\frac{\$8.49}{5}$
   G. $\frac{\$20.00+5(\$8.49)}{6}$
   H. $\frac{\$20.00+\$8.49}{6}$
   J. $\frac{\$20.00+\$8.49}{2}$
   K. $\frac{(\$20.00)+5(\$8.49)}{2}$

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5. Roberto needs $18\frac{1}{4}$ feet of lumber for a project. He has $10\frac{1}{2}$ feet of lumber. How many more feet does he need?
   A. $6\frac{7}{8}$
   B. $7\frac{1}{4}$
   C. $7\frac{3}{4}$
   D. $8\frac{1}{3}$
   E. $8\frac{2}{5}$

6. If x is a real number and $3^x = 81$, then $2^x \times 2 = ?$
   F. 4
   G. 8
   H. 16
   J. 32
   K. 64

7. A rectangular garden measures 60 feet by 25 feet. A fence completely encloses the garden. What is the length, in feet, of the fence?
   A. 85
   B. 170
   C. 256
   D. 625
   E. 1,500

8. If $x = -6$, then $-x^2 - 2x + 21 = ?$
   F. -27
   G. -3
   H. 21
   J. 45
   K. 69

9. The formula for the volume of a sphere is $V = \frac{4}{3}\pi r^3$. If the radius, r, of a spherical ball is 2 inches, what is its volume, to the nearest cubic inch?
   A. 8
   B. 19
   C. 25
   D. 34
   E. 96

10. The expression $4c - 2d$ is equivalent to which of the following?
    F. $4(c - 2d)$
    G. $2cd$
    H. $2(c - d)$
    J. $4(c - d)$
    K. $2(2c - d)$

11. For each day on the job, you receive \$20.00 plus a fixed amount for each lawn that you mow. Currently you are earning \$95.00 per day for mowing 5 lawns. Today you will mow an additional 2 lawns. What will be your new daily earnings?
    A. \$50.00
    B. \$75.00
    C. \$100.00
    D. \$125.00
    E. \$150.00

DO YOUR FIGURING HERE.

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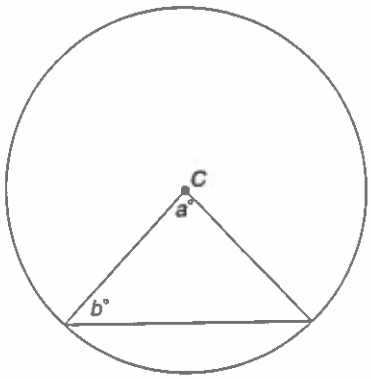
DO YOUR FIGURING HERE.

12. Which of the following is a simplified form of $4x + 2x + y - x$?
F. $3x + y$
G. $5x + y$
H. $2(x + 2)(x + y)$
J. $6x - y$
K. $x(6 + y)$

13. When graphed in the standard (x,y) coordinate plane, which of the following equations does NOT represent a line?
A. $x = 3$
B. $2y = 7$
C. $-y = 2x + 1$
D. $y = \frac{3}{4}x$
E. $x^2 = y - 7$

14. In the figure below, point C is the center of the circle. If $a = 40°$, what is the value of b?



F. 80°
G. 70°
H. 60°
J. 50°
K. 40°

15. Which of the following solution sets has both $x = 5$ and $x = 6$ as solutions?
A. $(x - 6)(x + 5) = 0$
B. $(x + 6)(x + 5) = 0$
C. $(x + 6)(x - 5) = 0$
D. $(x - 5)(x - 6) = 0$
E. $x - 6 = x - 5$

16. If $x = \frac{1}{2}$, then $\frac{1}{x} + \frac{1}{x} - 1 = ?$
F. -4
G. 0
H. 1
J. 2
K. 3

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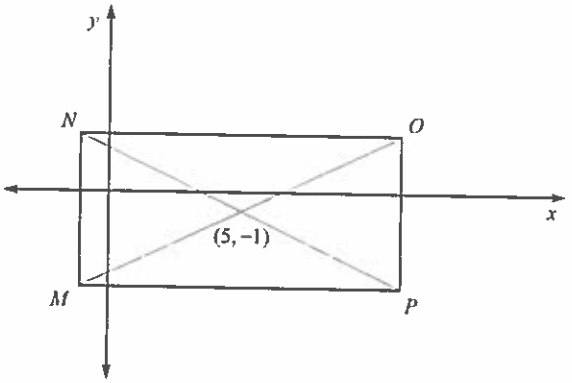
DO YOUR FIGURING HERE.

17. As shown below, the diagonals of rectangle $MNOP$ intersect at the point $(5,-1)$ in the standard (x,y) coordinate plane. Point M is at $(-1,-4)$. Which of the following are the coordinates for point O?



A. $(-6,2)$
B. $(-1,4)$
C. $(9,3)$
D. $(10,-3)$
E. $(11,2)$

18. Tony is participating in a charity event and must collect pledges for every mile that he runs in the next 30 days. His friend pledges 9 cents per mile for the first 25 miles that he runs, and 7 cents per mile for each additional mile. Tony's goal is to run 63 miles in the next 30 days. Assuming he meets but does not exceed his goal, what is the total amount Tony should collect from his friend?

F. \$2.25
G. \$4.91
H. \$6.66
J. \$8.33
K. \$10.08

19. If the inequality $|x|>|y|$ is true, then which of the following *must* be true?

A. $x > 0$
B. $x < y$
C. $x = y$
D. $x \neq y$
E. $x > y$

20. For which nonnegative value of x is the expression $\frac{1}{(100-4x^2)}$ undefined?

F. 0
G. 5
H. 10
J. 100
K. 400

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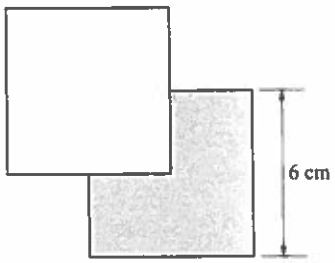
21. What is the slope-intercept form of $-3x+y+8=0$?

A. $y=-3x-8$
B. $y=-3x+8$
C. $y=3x-8$
D. $y=3x+8$
E. $y=\frac{1}{3}x+8$

DO YOUR FIGURING HERE.

22. The two squares below have the same dimensions. The vertex of one square is at the center of the other square. What is the area of the shaded region, in square centimeters?



F. 9
G. 12
H. 27
J. 36
K. 72

23. The lengths of the sides of a triangle are 3, 4, and 5 inches. What is the length, in inches, of the shortest side of a similar triangle that has a perimeter of 36 inches?

A. 6
B. 9
C. 12
D. 15
E. 18

24. If $4(a+b)(a-b)=40$ and $a-b=20$, then $a+b=?$

F. 30
G. 20
H. 10
J. 2
K. $\frac{1}{2}$

25. The total daily profit, p, in dollars, from producing and selling x units, is given by the function $p(x)=17x-(10x+c)$, where c is a constant. If 300 units were produced and sold last week for a profit of $1,900, then $c=?$

A. 200
B. 100
C. 0
D. -100
E. -200

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DO YOUR FIGURING HERE.

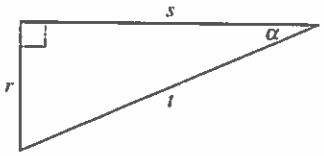
26. If, for all x, $(x^{7a-2})^3 = x^{57}$, then $a = ?$
F. 2
G. 3
H. $\frac{31}{5}$
J. $\frac{51}{21}$
K. 57

27. If 3 times a number n is added to 9, the result is negative. Which of the following gives the possible value(s) for n?
A. -3 only
B. 0 only
C. 6 only
D. all $n < -3$
E. all $n > -3$

28. One endpoint of a line segment in the (x,y) coordinate plane has coordinates $(-5,3)$. The midpoint of the segment has coordinates $(9,-1)$. What are the coordinates of the other endpoint of the segment?
F. $(-45,-3)$
G. $(-14,4)$
H. $(2,1)$
J. $(23,-5)$
K. $(4,2)$

29. In the standard (x,y) coordinate plane, what is the radius of the circle $(x-3)^2 + (y-4)^2 = 25$?
A. 3
B. 4
C. 5
D. 16
E. 25

30. In the right triangle pictured below, r, s, and t are the lengths of its sides. What is the value of $\tan \alpha$?



F. $\frac{r}{t}$
G. $\frac{s}{t}$
H. $\frac{t}{r}$
J. $\frac{r}{s}$
K. $\frac{t}{s}$

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DO YOUR FIGURING HERE.

31. For all $x > 0$, $\frac{1}{x} - \frac{3}{4} = ?$

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

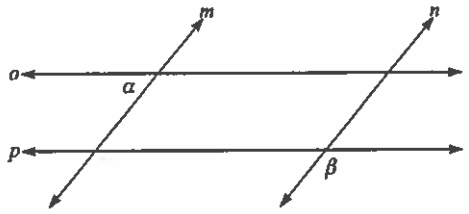
B. $3 - 4x$

C. $\frac{4}{x} - 3$

D. $\frac{3}{x} - \frac{4}{x}$

E. $\frac{4 - 3x}{4x}$

32. In the figure below, lines m and n are parallel, lines o and p are parallel, and the measure of angle α is 40°. What is the measure of angle β?

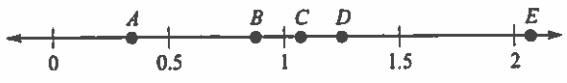


F. 40°
G. 50°
H. 110°
J. 140°
K. 180°

33. Which of the following degree measures is equivalent to 4.25π radians?

A. 270°
B. 360°
C. 594°
D. 765°
E. 945°

34. Among the points graphed on the number line below, which is the closest to $1\frac{3}{4}$?



F. A
G. B
H. C
J. D
K. E

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35. The sides of a triangle measure $3\sqrt{2}$ meters, 3 meters, and 3 meters. What are the measures of the angles of the triangle, in degrees?

A. 30°–60°–90°
B. 90°–30°–30°
C. 40°–50°–90°
D. 90°–45°–45°
E. 45°–60°–90°

DO YOUR FIGURING HERE.

36. What is the median of the data given below?

9, 13, 27, 22, 20, 31, 13

F. 13
G. 19
H. 20
J. 21
K. 22

37. If p is a positive integer that divides both 45 and 60, but divides neither 9 nor 10, what should you get when you add the digits in p?

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

38. What is the slope of any line perpendicular to the x-axis in the (x,y) coordinate plane?

F. -1
G. 0
H. 1
J. Undefined
K. Cannot be determined from the given information

39. In the (x,y) coordinate plane, line m is perpendicular to the y-axis and passes through the point $(5,-3)$. Which of the following is an equation for line m?

A. $x=0$
B. $x=5$
C. $y=-3$
D. $y=x+2$
E. $y=x+8$

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40. If $\tan \beta = \frac{3}{4}$, then $\sin \beta = ?$

F. $\frac{3}{5}$
G. $\frac{3}{4}$
H. $\frac{4}{5}$
J. $\frac{4}{3}$
K. $\frac{5}{4}$

DO YOUR FIGURING HERE.

41. Jenny can walk 4 miles in $(m + 3)$ minutes. At that pace, how many miles can she walk in 15 minutes?

A. $\frac{(m+3)}{60}$
B. $\frac{m}{180}$
C. $60(m+3)$
D. $\frac{60}{(m+3)}$
E. $\frac{15}{4(m+3)}$

42. Which of the following calculations will yield an even integer for any integer n?

F. $4n^2$
G. $3n^2 + 1$
H. $5n^2 - 1$
J. $3n$
K. $n^2 - 2n$

43. In triangle CAB, the measure of $\angle A$ is 45° and the measure of $\angle B$ is 45°. If $\overline{AC}$ is 12 units long, what is the perimeter, in units, of triangle CAB?

A. 36
B. $36\sqrt{2}$
C. 72
D. $24 + 12\sqrt{2}$
E. $24 + 12\sqrt{3}$

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Use the following information to answer questions 44 and 45.

The table below shows the number of households in the town of Potterville, situated in Eaton County, with a high-speed Internet connection for each year from 1999 through 2006.

Year	Number of households	Year	Number of households
1999	152	2003	516
2000	176	2004	647
2001	231	2005	780
2002	422	2006	825

44. Which of the following years had the greatest increase in the number of households with a high-speed Internet connection over the previous year?

F. 2000
G. 2002
H. 2003
J. 2005
K. 2006

45. Census data shows that there were approximately 652 households in Eaton County with a high-speed Internet connection in 2000. According to this information, the number of Potterville households with a high-speed Internet connection was approximately what percent of the total number of households in Eaton County with a high-speed Internet connection in 2000?

A. 15%
B. 27%
C. 35%
D. 50%
E. 73%

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46. For what value of a would the following system of equations have an infinite number of solutions?

$$12x - 19y = 20$$
$$36x - 57y = 30a$$

F. 2
G. 3
H. 10
J. 15
K. 50

DO YOUR FIGURING HERE.

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47. If $\log_x 169 = 2$, then $x = ?$
A. 2
B. 13
C. 84.5
D. 169
E. 338

DO YOUR FIGURING HERE.

48. Let $a \Xi b = (a + b)^3$ for all integers a and b. Which of the following is the value of $2 \Xi 4$?
F. 18
G. 24
H. 64
J. 216
K. 512

49. What is the area of quadrilateral $WXYZ$ if it has vertices with (x,y) coordinates $W(2,4)$, $X(5,4)$, $Y(4,1)$, and $Z(1,1)$?
A. $\sqrt{17}$
B. 6
C. 9
D. $8\sqrt{2}$
E. 18

50. In the standard (x,y) coordinate plane, if the x-coordinate of each point on a line is 3 more than twice the corresponding y-coordinate, the slope of the line is:
F. $-\frac{1}{2}$
G. $\frac{1}{2}$
H. 2
J. 3
K. 6

51. In the (x,y) coordinate plane, what is the radius of the circle having the points $(-4,4)$ and $(0,-2)$ as endpoints of a diameter?
A. $\sqrt{7}$
B. $2\sqrt{2}$
C. $\sqrt{13}$
D. $2\sqrt{7}$
E. $2\sqrt{13}$

52. If X, Y, and Z are real numbers, and $XYZ = 1$, then which of the following conditions *must* be true?
F. $XY = \frac{1}{Z}$
G. X, Y, and $Z > 0$
H. Either $X = 1$, $Y = 1$, or $Z = 1$
J. Either $X = 0$, $Y = 0$, or $Z = 0$
K. Either $X < 1$, $Y < 1$, or $Z < 1$

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DO YOUR FIGURING HERE.

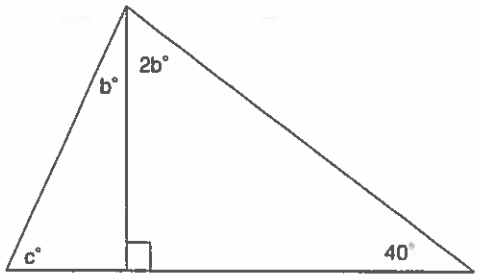
53. In the standard (x,y) coordinate plane, the y-intercept of the line $5x+y=9$ is?

A. -9
B. -5
C. $\frac{5}{9}$
D. 9
E. 45

54. The average of a set of 7 integers is 24. When an 8th number is included in the set, the average of the set increases to 31. What is the 8th number?

F. 31
G. 55
H. 80
J. 168
K. 217

55. In the figure shown below, $c=?$



A. 75°
B. 70°
C. 65°
D. 60°
E. 55°

56. The ratio of l to m is 3 to 4, and the ratio of p to m is 1 to 2. What is the ratio of l to p?

F. 6 to 1
G. 3 to 8
H. 3 to 2
J. 3 to 1
K. 1 to 1

57. Jordan has been hired to build a circular wading pool in his neighbor's backyard. The rectangular backyard measures 40 feet wide by 70 feet long. Jordan's neighbors want the pool to be as large as possible, with the edge of the pool at least 4 feet from the edge of the backyard all around. How long should the radius of the pool be, in feet?

A. 16
B. 32
C. 36
D. 40
E. 62

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58. Three distinct lines contained within a plane separate the plane into distinct regions. How many possible distinct regions of the plane may be separated by any 3 such lines?

F. 4, 7, 8
G. 4, 6, 7
H. 3, 6, 7
J. 3, 5, 8
K. 3, 4, 6

59. If the sum of the consecutive integers from -22 to n, inclusive, is 72, then $n = ?$

A. 94
B. 74
C. 50
D. 25
E. 23

60. In a set of 13 different numbers, which of the following CANNOT affect the value of the median?

F. Increasing the largest number only.
G. Decreasing the largest number only.
H. Increasing the smallest number only.
J. Increasing each number by 10.
K. Doubling each number.

DO YOUR FIGURING HERE.

END OF THE MATHEMATICS TEST

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