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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. One pound is equivalent to 16 ounces. If a book weighs 1.5 pounds, how many ounces, to the nearest tenth, does the book weigh?
   A. 10.7
   B. 17.5
   C. 24.0
   D. 61.5
   E. 165.0

2. Which of the following expressions is equivalent to $(3x + 4)(x - 5)$?
   F. $3x^2 + 9x - 9$
   G. $3x^2 + 9x + 20$
   H. $3x^2 - 19x - 9$
   J. $3x^2 - 11x - 20$
   K. $3x^2 + 20x - 20$

3. Let a function of 2 variables be defined by $f(a, b) = ab - (a - b)$. What is the value of $f(8, 9)$?
   A. 89
   B. 73
   C. 71
   D. 34
   E. 0

4. What is 1/5 of 16% of $24,000?
   F. $160
   G. $768
   H. $3,840
   J. $4,032
   K. $7,500

5. If $5x + 5 = 25 + 3x$, then $x =$?
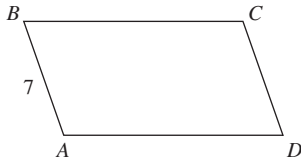   A. 2.5
   B. 10
   C. 20
   D. 50
   E. 62.5

GO ON TO THE NEXT PAGE.
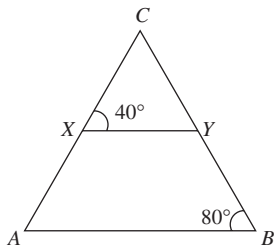
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6. In parallelogram *ABCD* shown below, *AB* is 7 inches long. If the parallelogram's perimeter is 46 inches, how many inches long is *AD*?

DO YOUR FIGURING HERE.

B ———— *C*

7

A ———— *D*

  F. $6\frac{1}{2}$
  G. 16
  H. 28
  J. 39
  K. 49

7. $|14| \times |-2| = ?$
  A. -28
  B. -16
  C. -12
  D. 16
  E. 28

8. In the figure below, *X* and *Y* lie on the sides of $\triangle ABC$, and $\overline{XY}$ is parallel to $\overline{AB}$. What is the measure of $\angle C$?

C

X 40° *Y*

80°

A   *B*

  F. 120°
  G. 90°
  H. 80°
  J. 60°
  K. 40°

9. If $x = -3$ and $y = 2$, then $x^3y + xy^3 = ?$
  A. 78
  B. 30
  C. -6
  D. -30
  E. -78

GO ON TO THE NEXT PAGE.

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10. Two professors were hired to begin work at the same time. Professor A's contract called for a starting salary of $50,000 with an increase of $1,500 after each year of employment. Professor B's contract called for a starting salary of $42,000 with an increase of $2,800 after each year of employment. If y represents the number of full years of employment (that is, the number of yearly increases each professor has received), which of the following equations could be solved to determine the number of years until B's yearly salary equals A's yearly salary?

F. $50,000 + 1,500y = 42,000 + 2,800y$
G. $50,000 + 2,800y = 42,000 + 1,500y$
H. $1,500y + 2,800y = y$
J. $1,500y + 2,800y = 42,000$
K. $1,500y + 2,800y = 50,000$

11. If $W = XYZ$, then which of the following is an expression for Z in terms of W, X, and Y?

A. $\dfrac{XY}{W}$
B. $\dfrac{W}{XY}$
C. WXY
D. $W - XY$
E. $W + XY$

12. Two whole numbers have a greatest common factor of 8 and a least common multiple of 48. Which of the following pairs of whole numbers will satisfy the given conditions?

F. 4 and 9
G. 5 and 10
H. 10 and 16
J. 14 and 20
K. 16 and 24

13. A rope 55 feet long is cut into two pieces. If one piece is 23 feet longer than the other, what is the length, in feet, of the shorter piece?

A. 2
B. 16
C. 23
D. 32
E. 51

DO YOUR FIGURING HERE.

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DO YOUR FIGURING HERE.

14. If $(x + r)^2 = x^2 + 22x + r^2$ for all real numbers x, then $r = ?$
  F. 11
  G. 22
  H. 44
  J. 88
  K. 176

15. Jenny ran $3\frac{1}{3}$ miles on Saturday and $2\frac{4}{5}$ miles on Sunday. The total distance, in miles, Jenny ran during those 2 days is within which of the following ranges?

  A. At least $6\frac{1}{2}$ and less than $6\frac{2}{3}$

  B. At least $6\frac{1}{3}$ and less than $6\frac{1}{2}$

  C. At least 6 and less than $6\frac{1}{3}$

  D. At least $5\frac{2}{3}$ and less than 6

  E. At least $5\frac{1}{2}$ and less than $5\frac{2}{3}$

16. A car leaves a parking lot and travels directly north for 6 miles. It then turns and travels 8 miles east. How many miles is the car from the parking lot?
  F. 6
  G. 8
  H. 10
  J. 14
  K. 68

17. In the standard (x,y) coordinate plane, how many times does the graph of $(x + 1)(x - 2)(x + 3)(x + 4)$ intersect the x-axis?
  A. 1
  B. 4
  C. 6
  D. 10
  E. 24

18. Marcia's horse's rectangular corral is 50 feet wide by 125 feet long. Marcia wants to increase the area by 1,850 square feet by increasing the width and length by the same amount. What will be the new dimensions (width by length), in feet?
  F. 55 by 130
  G. 60 by 135
  H. 65 by 135
  J. 65 by 140
  K. 70 by 145

19. The lengths of the sides of a triangle are 3 consecutive even integers. If the perimeter of the triangle is 48 inches, what is the length, in inches, of the longest side?
  A. 12
  B. 14
  C. 16
  D. 18
  E. 24

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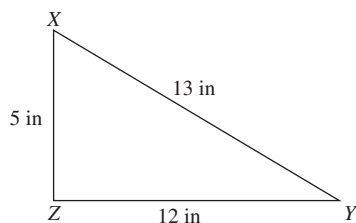
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20. In the standard (x,y) coordinate plane, what is the slope of the line with equation $4y - 6x = 8$?

  F. $-\dfrac{3}{2}$

  G. -6

  H. $\dfrac{3}{2}$

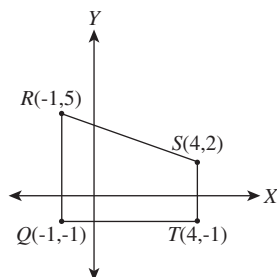 **J.** 3

  K. 6

21. In the right triangle shown below, which of the following statements is true about $\angle X$?

  A. $\cos X = \dfrac{13}{5}$

  B. $\sin X = \dfrac{12}{13}$

  C. $\tan X = \dfrac{5}{12}$

  D. $\cos X = \dfrac{12}{5}$

  E. $\sin X = \dfrac{13}{12}$

Use the following information to answer Questions 22–24.

Quadrilateral $QRST$ is shown below in the standard (x,y) coordinate plane. For this quadrilateral, $QT = 5$, $RS = \sqrt{34}$, $ST = 3$, and $RQ = 6$, all in coordinate units.

DO YOUR FIGURING HERE.

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22. What is the length of QS in coordinate units?

  F. $\sqrt{34}$
  G. $\sqrt{10}$
  H. $\sqrt{8}$
  J. 8
  K. 4

23. Which of the following are the coordinates of the image of R under a 90° counterclockwise rotation about the origin?

  A. $(5,-1)$
  B. $(1,5)$
  C. $(1,-5)$
  D. $(-1,-5)$
  E. $(-5,-1)$

24. Which of the following is closest to the perimeter of quadrilateral $QRST$, in coordinate units?

  F. 26.0
  G. 22.5
  H. 19.8
  J. 15.0
  K. 14.0

25. If 5 times a number x is subtracted from 15, the result is negative. Which of the following gives the possible value(s) for x?

  A. All $x < 3$
  B. All $x > 3$
  C. 10 only
  D. 3 only
  E. 0 only

26. The temperature, t, in degrees Fahrenheit, in a certain city on a certain spring day satisfies the inequality $|t - 34| \leq 40$. Which of the following temperatures, in degrees Fahrenheit, is NOT in this range?

  F. 74
  G. 16
  H. 0
  J. -6
  K. -8

27. What is the slope-intercept form of $10x - y - 8 = 0$?

  A. $y = -2x$
  B. $y = -10x - 8$
  C. $y = -10x + 8$
  D. $y = 10x - 8$
  E. $y = 10x + 8$

DO YOUR FIGURING HERE.

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28. A chord 32 centimeters long is 6 centimeters from the center of a circle, as shown below. What is the radius of the circle, to the nearest tenth of a centimeter?
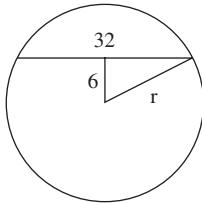
   F. 5.3
   G. 13.9
   H. 17.1
   J. 26.0
   K. 38.0

29. What is the least common multiple of 3, $4a$, $5b$, and $6ab$?
   A. $15ab$
   B. $60ab$
   C. $60a^2b$
   D. $120ab$
   E. $120a^2b$

30. What is the y-coordinate of the point in the standard (x,y) coordinate plane at which the 2 lines $y = 3x + 4$ and $y = 2x + 6$ intersect?
   F. 1
   G. 2
   H. 4
   J. 6
   K. 10

31. For $x^2 \neq 169$, $\dfrac{(x-13)^2}{x^2-169} =$?

   A. $\dfrac{1}{13}$

   B. $-\dfrac{1}{13}$

   C. $\dfrac{1}{(x+13)}$

   D. $\dfrac{1}{(x-13)}$

   E. $\dfrac{(x-13)}{(x+13)}$

32. If $n = m + 2$, then $(m - n)^4 =$?
   F. 16
   G. 8
   H. 1
   J. -8
   K. -16

DO YOUR FIGURING HERE.

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33. The larger of two numbers exceeds twice the smaller number by 9. The sum of twice the larger and 5 times the smaller number is 74. If a is the smaller number, which equation below determines the correct value of a?
   A. $5(2a + 9) + 2a = 74$
   B. $5(2a - 9) + 2a = 74$
   C. $(4a + 9) + 5a = 74$
   D. $2(2a + 9) + 5a = 74$
   E. $2(2a - 9) + 5a = 74$

34. When $x/y = 4$, $x^2 - 12y^2 = ?$
   F. 0
   G. $4y^2$
   H. $-4y^2$
   J. $-8y^2$
   K. $4y$

35. The ratio of the side lengths for a triangle is exactly 15:14:12. In a second triangle similar to the first, the longest side is 10 inches long. To the nearest tenth of an inch, what is the length of the shortest side of the second triangle?
   A. 6.4
   B. 8.0
   C. 9.3
   D. 12.0
   E. Cannot be determined from the given information

36. If a and b are positive integers such that the greatest common factor of a^2b^2 and ab^3 is 45, then which of the following could b equal?
   F. 3
   G. 5
   H. 9
   J. 15
   K. 45

37. The costs of carriage rides of different lengths, given in half miles, are shown in the table below:

Number of half miles	5	6	7	10
Cost	$8.00	$8.50	$9.00	$10.50

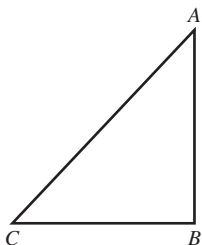Each cost consists of a fixed charge and a charge per half mile. What is the fixed charge?
   A. $0.50
   B. $1.00
   C. $5.50
   D. $5.00
   E. $1.50

GO ON TO THE NEXT PAGE.

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38. The hypotenuse of right triangle *ABC* shown below is 16 inches long. The sine of angle *A* is $\frac{3}{5}$. About how many inches long is $\overline{BC}$?

  F. 8.0
  G. 9.6
  H. 12.4
  J. 14.3
  K. 15.6

39. A circle in the standard (x, y) coordinate plane has center $(12, -5)$ and radius 4 coordinate units. Which of the following is an equation of the circle?
  A. $(x - 12)^2 + (y - 5)^2 = 4$
  B. $(x - 12)^2 - (y + 5)^2 = 4$
  C. $(x - 12)^2 - (y - 5)^2 = 8$
  D. $(x - 12)^2 + (y - 5)^2 = 16$
  E. $(x - 12)^2 + (y + 5)^2 = 16$

40. What is the largest integer value of *t* that satisfies the inequality $\frac{24}{30} > \frac{t}{24}$?
  F. 30
  G. 19
  H. 18
  J. 10
  K. 8

41. What is the distance in the standard (x, y) coordinate plane between the points $(5, 5)$ and $(1, 0)$?
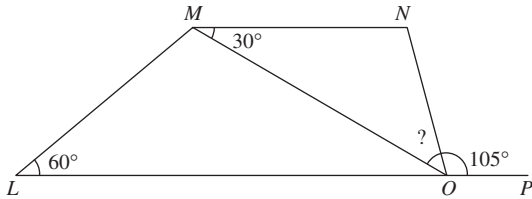 **A.** $\sqrt{26}$
  B. $\sqrt{41}$
  C. 4
  D. 6
  E. 16

DO YOUR FIGURING HERE.

GO ON TO THE NEXT PAGE.

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42. In the figure below, *LMNO* is a trapezoid, *P* lies on *LO*, and angle measures are as marked. What is the measure of angle *MON*?

DO YOUR FIGURING HERE.

F. 15°
G. 25°
H. 30°
J. 35°
K. 45°

43. In $\triangle ABC$, $AB \cong AC$ and the measure of $\angle B$ is 34°. What is the measure of $\angle A$?
A. 34°
B. 56°
C. 68°
D. 73°
E. 112°

44. In a certain budget, 30% of the money goes toward housing costs, and, of that portion, 20% goes toward rent. If the amount of money that goes toward rent is $630, what is the total amount of the budget?
F. $1,680
G. $2,100
H. $4,095
J. $7,560
K. $10,500

45. What is the matrix product $\begin{bmatrix} 2x \\ 3x \\ 5x \end{bmatrix}$ [1, 0, −1]?

A. $\begin{bmatrix} 2x & 0 & -2x \\ 3x & 0 & -3x \\ 5x & 0 & -5x \end{bmatrix}$

B. $\begin{bmatrix} 2x & 0 & -2x \\ 0 & 0 & 0 \\ 10x & 0 & -10x \end{bmatrix}$

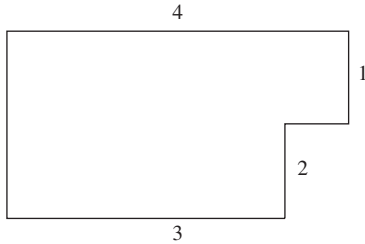**C.** $[2x \quad 3x \quad 5x]$
D. $[9x \quad 0 \quad -9x]$
E. [0]

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46. In the figure below, all line segments are either horizontal or vertical and the dimensions are given in feet. What is the perimeter in feet, of the figure?

DO YOUR FIGURING HERE.

  F. 16
  G. 14
  H. 13
  J. 12
  K. 10

47. The average of a and b is 6 and the average of a, b, and c is 11. What is the value of c?
  A. 21
  B. 17
  C. 13
  D. 8
  E. 5

48. The greatest integer of a set of consecutive even integers is 12. If the sum of these integers is 40, how many integers are in this set?
  F. 5
  G. 6
  H. 12
  J. 20
  K. 40

49. On the number line shown below, t, u, v, w, x, y, and z are coordinates of the indicated points. Which of the following is closest in value to $|w - u|$?

  A. t
  B. v
  C. x
  D. y
  E. z

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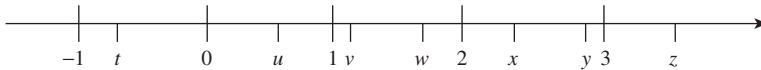
50. The length of arc *XY* of a circle is equal to $\frac{1}{6}$ of the circumference of the circle. The length of the arc is 7π inches. What is the radius, in inches, of the circle?
  F. 42
  G. 21
  H. 14
  J. 7
  K. 3

51. Let *S* be the set of all integers that can be written as $2n^2 - 6n$, where *n* is a nonzero integer. Which of the following integers is in *S*?
  A. 6
  B. 30
  C. 46
  D. 64
  E. 80

52. Let the function *g* be defined by $g(x) = 3(x^2 - 2)$. When $g(x) = 69$, what is a possible value of $2x - 3$?
  F. -7
  G. -5
  H. 2
  J. 5
  K. 7

53. If $a + b = 25$ and $a > 4$, then which of the following *must* be true?
  A. $a = 22$
  B. $b < 21$
  C. $b > 4$
  D. $b = 0$
  E. $a < 25$

54. If *m*, *n*, and *p* are positive integers such that $m + n$ is even and the value of $(m + n)^2 + n + p$ is odd, which of the following *must* be true?
  F. *m* is odd
  G. *n* is even
  H. *p* is odd
  J. If *n* is even, *p* is odd
  K. If *p* is odd, *n* is odd

DO YOUR FIGURING HERE.

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55. A bag contains only quarters, dimes, and nickels. The probability of randomly selecting a quarter is 1/6. The probability of randomly selecting a nickel is 1/4. Which of the following could be the total number of coins in the bag?
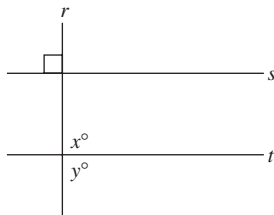**A.** 15
B. 24
C. 30
D. 32
E. 40

56. In the *xy*-coordinate system, if (r,s) and $(r+2, s+t)$ are two points on the line defined by the equation $y = 4x+5$, then $t =$?
F. 4
G. 5
H. 8
J. 9
K. 11

57. In the figure shown below, $s \perp r$ and $x > 90$. Which of the following *must* be true?

A. $s \mathbin{/\!/} t$
B. $r \perp t$
C. $y = 90$
D. $y > 90$
E. $y < 90$

58. Let $x = 2y + 3z - 5$. What happens to the value of x if the value of y decreases by 1 and the value of z increases by 2?
F. It decreases by 2
G. It is unchanged
H. It increases by 1
J. It increases by 2
K. It increases by 4

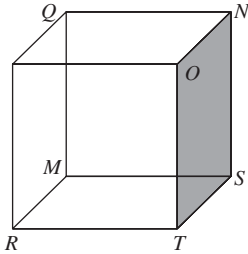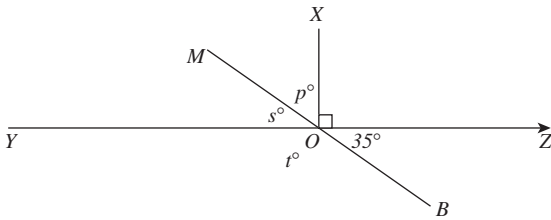**DO YOUR FIGURING HERE.**

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59. On the cube in the figure shown below, each of the following points is the same distance from R as it is from S EXCEPT:

A. M
B. O
C. T
D. Q
E. N

60. In the figure shown below, $\overline{YZ}$ and $\overline{MB}$ intersect at O and $\overline{XO}$ is perpendicular to $\overline{YZ}$. What is the value of $3p + 4s - 2t$?

F. $15°$
G. $35°$
H. $55°$
J. $135°$
K. $150°$

DO YOUR FIGURING HERE.

END OF THE MATHEMATICS TEST.
STOP! IF YOU HAVE TIME LEFT OVER, CHECK YOUR WORK ON THIS SECTION ONLY.

Mathematics Test

1. C	21. B	41. B
2. J	22. F	42. K
3. B	23. E	43. E
4. G	24. H	44. K
5. B	25. B	45. A
6. G	26. K	46. G
7. E	27. D	47. A
8. J	28. H	48. F
9. E	29. B	49. B
10. F	30. K	50. G
11. B	31. E	51. E
12. K	32. F	52. K
13. B	33. D	53. B
14. F	34. G	54. J
15. C	35. B	55. B
16. H	36. F	56. H
17. B	37. C	57. E
18. G	38. G	58. K
19. D	39. E	59. E
20. H	40. G	60. F