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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. The lowest temperature on a winter morning was $-7°$F. Later the same day the temperature reached a high of $21°$F. By how many degrees Fahrenheit did the temperature increase?
   A. 32
   B. 28
   C. 21
   D. 14
   E. 7

2. Disregarding sales tax, how much will you save when you buy a $12.00 video that is on sale for 20% off?
   F. $0.24
   G. $0.48
   H. $1.20
   J. $2.40
   K. $3.60

3. As part of a school report on the cost of gasoline, Raquel wants to find the average cost of purchasing a gallon of regular unleaded gasoline from local gas stations. She surveys 4 stations and finds the cost per gallon of regular unleaded gas from the 4 stations to be $2.45, $2.50, $2.49, and $2.56, respectively. Using this data, what is the average cost of purchasing one gallon of regular unleaded gasoline from these 4 gas stations?
   A. $2.55
   B. $2.53
   C. $2.50
   D. $2.49
   E. $2.45

4. What is the volume, in cubic inches, of a cube whose edges each measure 5 inches in length?
   F. 15
   G. 25
   H. 50
   J. 125
   K. 500

5. If $3(a - 6) = -21$, then $a = ?$
   A. -9
   B. $-\dfrac{3}{2}$
   C. -1
   D. $\dfrac{7}{3}$
   E. 5

**GO ON TO THE NEXT PAGE.**

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6. The price of a cantaloupe is directly proportional to its weight. If a cantaloupe that weighs 3.0 pounds costs \$3.87, approximately how much will a 2.25-pound cantaloupe cost?

  F. \$2.90
  G. \$2.65
  H. \$2.25
  J. \$1.87
  K. \$1.29

7. In the figure below, D is a point on segment AB, and the segment CD is perpendicular to the segment AB. Based on this information, which of the following conclusions can be made?
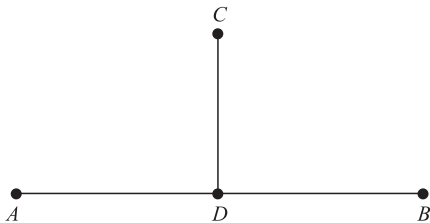
  A. Point C is equidistant from A to B.
  B. Segments AD and DB are equal in length.
  C. The segment CD bisects the segment AB.
  D. Angle CDA is larger than angle CDB.
  E. Angle CDA is congruent to angle CDB.

8. If $6x - 5 = 3x - 16$, then $x = $?

  F. -11
  G. -7
  H. $-\dfrac{11}{3}$
  J. $\dfrac{11}{3}$
  K. 7

9. Which of the following is always equal to $y(3 - y) + 5(y - 7)$?

  A. $8y - 35$
  B. $8y - 7$
  C. $-y^2 + 8y - 7$
  D. $-y^2 + 8y - 35$
  E. $8y^3 - 35$

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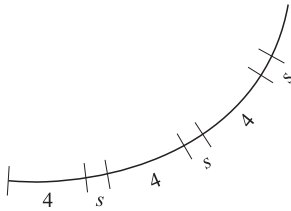
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10. The figure below shows part of a circle whose circumference is 40. If arcs of length 4 and length s continue to alternate around the entire circle so that there are 8 arcs of each length, what is the degree measure of each of the arcs of length s?

  F. 6°
  G. 9°
  H. 12°
  J. 18°
  K. 36°

11. In a poll, 44 people were in favor of constructing a new high school, 58 were against it, and 8 people had no opinion. What fraction of those people polled were in favor of constructing a new high school?

  A. $\dfrac{1}{9}$

  B. $\dfrac{1}{5}$

  C. $\dfrac{2}{5}$

  D. $\dfrac{3}{5}$

  E. $\dfrac{4}{9}$

12. On the line segment below, the ratio of lengths AB to BC is 1:4. What is the ratio of AB to AC?

  F. 1:5
  G. 1:4
  H. 1:3
  J. 5:1
  K. Cannot be determined from the given information

13. If a board 9 feet 6 inches in length is cut into 2 equal parts, what will be the length of each part?
  A. 3 feet 8 inches
  B. 4 feet 5 inches
  C. 4 feet 8 inches
  D. 4 feet 9 inches
  E. 5 feet 2 inches

DO YOUR FIGURING HERE.
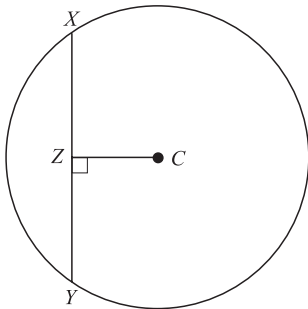
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14. The speed of a car exceeds twice the speed of a truck by 15 mph. If t is the speed of the truck, which of the following expresses the speed, in miles per hour, of the car?

  F. $t + 15$
  G. $t + 30$
  H. $t - 30$
  J. $2t + 15$
  K. $2t + 30$

15. The circle shown below has a radius of 5 meters, and the length of chord XY is 8 meters. If C marks the center of the circle, what is the length, in meters, of segment CZ?

  A. $2\sqrt{3}$
  B. 3
  C. $\sqrt{13}$
  D. 5
  E. 9

16. What is the value of the expression $2x^3 - x^2 + 3x + 5$ for $x = -2$?

  F. -21
  G. -13
  H. 8
  J. 11
  K. 21

17. What is the next term after $-\dfrac{1}{3}$ in the geometric sequence $9, -3, 1, -\dfrac{1}{3}, \ldots$?

  A. $-\dfrac{1}{9}$
  B. 0
  C. $\dfrac{1}{9}$
  D. $\dfrac{1}{6}$
  E. $\dfrac{1}{3}$

DO YOUR FIGURING HERE.

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18. On the blueprint for Roger's house, $\frac{1}{4}$ inch represents an actual length of 1 foot. What is the area, in square feet, of Roger's rectangular living room, which is 3 inches by $4\frac{1}{4}$ inches on the blueprint?

  F. 51
  G. 104
  H. 144
  J. 204
  K. 244

19. If $m > 0$ and $n < 0$, then $m - n$:
  A. is always positive.
  B. is always negative.
  C. is always zero.
  D. cannot be zero, but can be any real number other than zero.
  E. can be any real number.

20. If $x + \frac{2}{3} = \frac{8}{21}$, then $x = $?

  F. $-\frac{8}{21}$

  G. $-\frac{2}{7}$

  H. $-\frac{1}{21}$

  J. $\frac{1}{21}$

  K. $\frac{2}{7}$

21. What is the slope of the line given by the equation $3x + 4y = -12$?
  A. -3

  B. $-\frac{4}{3}$

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

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

  E. 4

22. The length of a side of a square is represented as $(3x - 2)$ inches. Which of the following general expressions represents the area of the square, in square inches?
  F. $12x - 8$
  G. $9x^2 - 4$
  H. $9x^2 - 6x + 4$
  J. $9x^2 - 12x - 4$
  K. $9x^2 - 12x + 4$

23. Which of the following is a polynomial factor of $x^2 - 2x - 24$?
  A. $x - 4$
  B. $x + 4$
  C. $x + 6$
  D. $6 - x$
  E. x

DO YOUR FIGURING HERE.

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24. In the equation $r = \dfrac{4}{(2+k)}$, k represents a positive integer. As k gets larger without bound, the value of r:
 F. gets closer and closer to 4.
 G. gets closer and closer to 2.
 H. gets closer and closer to 0.
  J. remains constant.
 K. gets larger and larger.

25. While doing research on the climates of South American countries, Andrea notices that all of the temperatures are given in degrees Celsius. Because she is not as familiar with the Celsius temperature scale, it is difficult for her to know whether a location with an average temperature of 25°C has a warm climate. Fahrenheit, F, and Celsius, C, are related by the formula $F = \left(\dfrac{9}{5}\right)C + 32$. What is the temperature in degrees Fahrenheit of the location with an average temperature of 25°C?
 A. 103
 B. 88
 C. 83
 D. 77
 E. 69

26. The length of a rectangle is 5 inches longer than its width. If the perimeter of the rectangle is 38 inches, what is the width, in inches?
 F. 5
 G. 7
 H. 12
  J. 17
 K. 28

27. What are all the solutions for x if $3x^2 - 2x - 21 = 0$?
 A. $x = -21$ only
 B. $x = -7$ or $x = 3$
 C. $x = -3$ or $x = \dfrac{7}{3}$
 D. $x = -\dfrac{7}{3}$ or $x = 3$
 E. $x = -3$ or $x = 7$

28. In Sulema's geography class, all tests count equally. So far, Sulema has taken 2 of the 3 tests in geography this marking period and earned scores of 88% and 79%, respectively. What is the minimum score Sulema needs on the third test to have a test average of 87%?
 F. 99%
 G. 94%
 H. 91%
  J. 87%
 K. 84%

29. If, a, b, and c are positive integers such that $a^b = m$ and $c^{2b} = n$, then $mn = $?
 A. $(ac^2)^b$
 B. $(ac)^{3b}$
 C. $2(ac)^b$
 D. ac^{2b}
 E. $a^b c$

DO YOUR FIGURING HERE.

GO ON TO THE NEXT PAGE.

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30. What is the area, in square inches, of a circle with a diameter equal to 12 inches?
 F. 144
 G. 36
 H. 12π
 J. 36π
 K. 144π

31. In Mrs. Hartley's foreign language class, students must take both a written exam and an oral exam. In the past, 85% of her students passed the written exam and 70% of those who passed the written exam also passed the oral exam. Based on these figures, about how many students in a random group of 100 students would you expect to pass both exams?
 A. 85
 B. 78
 C. 70
 D. 65
 E. 60

32. If $\sin A = \dfrac{3}{5}$, then which of the following could be $\tan A$?
 F. $\dfrac{1}{4}$
 G. $\dfrac{3}{4}$
 H. 1
 J. $\dfrac{4}{3}$
 K. 4

33. If x is any number other than 3 and 6, then $\dfrac{(x-3)(x-6)}{(3-x)(x-6)} = ?$
 A. 18
 B. 1
 C. 0
 D. -1
 E. -18

34. $\sqrt{27} + \sqrt{48} = ?$
 F. $5\sqrt{3}$
 G. $7\sqrt{3}$
 H. $3\sqrt{3} + 3\sqrt{4}$
 J. $12\sqrt{3}$
 K. $3 + 4\sqrt{3}$

35. $\triangle ABC$ is similar to $\triangle XYZ$. AB is 5 inches long, BC is 8 inches long, and AC is 3 inches long. If the longest side of $\triangle XYZ$ is 20 inches long, what is the perimeter, in inches, of $\triangle XYZ$?
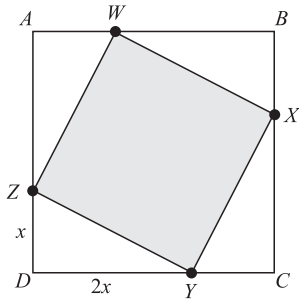 **A.** 16
 B. 28
 C. 40
 D. 64
 E. 88

DO YOUR FIGURING HERE.

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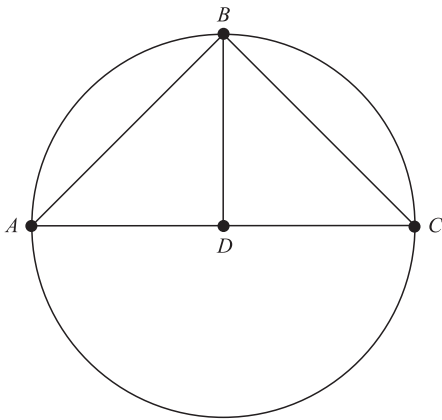
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36. Sides $\overline{AB}$, $\overline{BC}$, $\overline{CD}$, and $\overline{DA}$ of square $ABCD$ are broken up by points W, X, Y, and Z as shown below. If $\overline{AB}$ is 6 inches long, what is the area, in square inches, of the shaded region?

DO YOUR FIGURING HERE.

   F. 36
  G. 32
  H. 20
   J. 16
  K. 12

37. In the figure below, AC is the diameter of the circle, B is a point on the circle, AB is congruent to BC, and D is the midpoint of AC. What is the degree measure of angle ABD?

  A. 30°
  B. 45°
  C. 60°
  D. 90°
  E. Cannot be determined from the given information

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38. In the standard (x,y) coordinate plane, what are the coordinates of the midpoint of a line segment with endpoints $(-1,3)$ and $(2,5)$?

  F. $(1,8)$

  G. $(3,2)$

  H. $\left(\dfrac{3}{2},1\right)$

  J. $\left(\dfrac{1}{2},4\right)$

  K. $\left(\dfrac{3}{2},4\right)$

39. Maria posted a time of 37 minutes and 29 seconds for a 5-mile running course. About how many miles per hour did she average during the run?

  A. 12

  B. 10

  C. 8

  D. 7

  E. 5

40. For the 2 functions $f(x)$ and $g(x)$, tables of values are shown below. What is the value of $g(f(-1))$?

x	$f(x)$		x	$g(x)$
-3	-6		1	0
-1	2		2	3
1	-3		3	8
3	9		4	15

  F. -3

  G. 0

  H. 2

  J. 3

  K. 8

41. For positive real numbers x, y, and z, which of the following expressions is equivalent to $x^{\frac{1}{2}}y^{\frac{3}{4}}z^{\frac{5}{8}}$?

  A. $\sqrt[4]{xy^3z^5}$

  B. $\sqrt[8]{x^2y^3z^5}$

  C. $\sqrt[8]{x^4y^3z^5}$

  D. $\sqrt[8]{x^4y^6z^5}$

  E. $\sqrt[14]{xy^3z^5}$

DO YOUR FIGURING HERE.

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42. The formula for the area of a trapezoid is $A = \frac{1}{2}h(b_1 + b_2)$, where b_1 and b_2 are the lengths of the two parallel sides and h is the height. Which of the following is an expression for b_1?
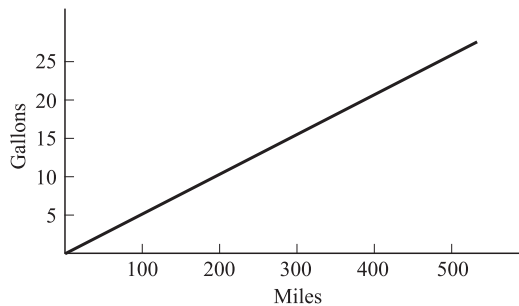
F. $\dfrac{2A}{h} - b_2$

G. $\dfrac{2A}{h + b_2}$

H. $\dfrac{2h}{A - b_2}$

J. $2(Ah - b_2)$

K. $\dfrac{1}{2}Ah + b_2$

43. The line graphed below shows the predicted gasoline use for a certain truck. Which of the following is the closest estimate of this truck's predicted rate of gasoline use, in miles per gallon?
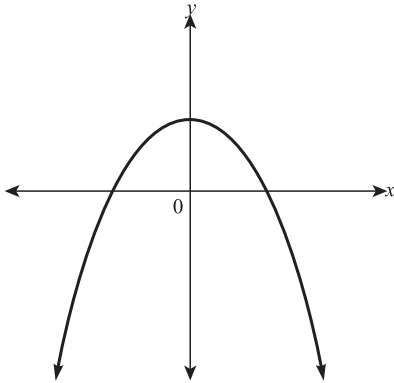

A. 25
B. 20
C. 16
D. 10
E. 8

DO YOUR FIGURING HERE.

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44. The graph of $y = ax^2 + bx + c$ in the standard (x,y) coordinate plane is shown below. When $y = 0$, which of the following best describes the solution set for x?

  F. 2 imaginary solutions
  G. 1 double imaginary solution
  H. 1 real and 1 imaginary solution
  J. 1 double imaginary solution
  K. 2 real solutions

45. If $|x| = x + 12$, then $x = $?
  A. -12
  B. -6
  C. 0
  D. 6
  E. 12

46. What fraction lies exactly halfway between $\dfrac{1}{3}$ and $\dfrac{1}{2}$?
  F. $\dfrac{3}{8}$
  G. $\dfrac{11}{24}$
  H. $\dfrac{5}{12}$
  J. $\dfrac{1}{6}$
  K. $\dfrac{2}{5}$

47. When entering information about the budget of her charity ball, Laura records an expense of $20.00. However, Laura accidentally enters the $20.00 as income instead of an expense. The balance of the charity ball budget now shows:
  A. $40 less than it should.
  B. $20 less than it should.
  C. the correct amount.
  D. $20 more than it should.
  E. $40 more than it should.

DO YOUR FIGURING HERE.

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48. Rebecca is trying to schedule volunteers to help at a school carnival. There are 5 one-hour shifts to be filled by 5 different volunteers. If each shift must have one and only one volunteer, how many different arrangements can the schedule have?

   F. 5
   G. 20
   H. 25
   J. 50
   K. 120

49. In the standard (x,y) coordinate plane, what is the distance between the points $(4,-7)$ and $(-1,5)$?

   A. 5
   B. 12
   C. 13
   D. 20
   E. 26

50. A formula for the volume, V, of a right circular cylinder is $V = \pi r^2 h$, where r is the radius and h is the height. If a tanker truck has a tank as shown below with a diameter of 3 meters and a length of 10 meters and is filled with water, then the weight, in pounds, of the water cargo is: (Note: 1 cubic meter of water weighs approximately 2,205 pounds.)
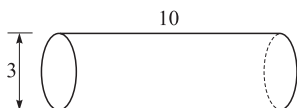
   F. less than 75,000.
   G. between 125,000 and 175,000.
   H. between 175,000 and 225,000.
   J. between 225,000 and 275,000.
   K. more than 275,000.

51. In the figure below, line AB is parallel to the base of the triangle and creates a smaller triangle inside of the original triangle. If the lengths of segments are as shown and the smaller triangle has an area of 8 cm^2, what is the area, in centimeters, of the original triangle?
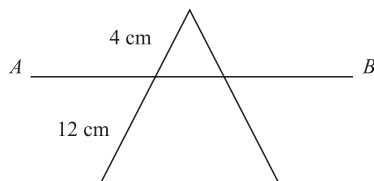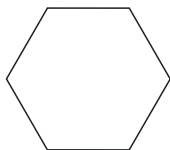

   A. 16
   B. 24
   C. 32
   D. 64
   E. 128

DO YOUR FIGURING HERE.

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52. The figure below is a regular hexagon. What is the measure of one of the interior angles of the hexagon?

  F. 108°
  G. 120°
  H. 135°
  J. 150°
  K. 720°

53. It is estimated that, from the beginning of 1993 to the end of 1997, the average number of CDs bought by teenagers increased from 7 per year to 15 per year. During the same time period, the average number of video games purchased by teenagers increased from 6 per year to 18 per year. Assuming that in each case the rates or purchase are the same, in what year did teenagers buy the same average number of CDs and video games?
  A. 1993
  B. 1994
  C. 1995
  D. 1996
  E. 1997

54. If $x^2 - 45b^2 = 4xb$, what are the 2 solutions for x in terms of b?
  F. $15b$ or $-3b$
  G. $5b$ or $-9b$
  H. $15b$ or $3b$
  J. $45b$ or $-4b$
  K. $9b$ or $-5b$

55. Which of the following is (are) equivalent to the mathematical operation $a(b - c)$ for all real numbers a, b, and c?
    I. $ca - ba$
    II. $ab - ac$
    III. $(b - c)a$
  A. II only
  B. I and II only
  C. I and III only
  D. II and III only
  E. I, II and III

DO YOUR FIGURING HERE.

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56. For values of x where $\sin x$, $\cos x$, and $\tan x$ are all defined, $\dfrac{(\cos x)}{(\tan x)(\sin x)} = ?$

  F. $\dfrac{\cos^2 x}{\sin^2 x}$

  G. $\tan^2 x$

  H. 1

  J. $\sin^2 x$

  K. $\sec x$

57. If a is inversely proportional to b and $a = 36$ when $b = 12$, what is the value of a when $b = 48$?

  A. 0

  B. $\dfrac{1}{3}$

  C. $\dfrac{1}{4}$

  D. 4

  E. 9

58. For which of the following values of c will there be 2 distinct real solutions to the equation $5x^2 + 16x + c = 0$?

  F. 3

  G. 12

  H. 14

  J. 15

  K. 20

59. If the volume of a cube is 64, what is the shortest distance from the center of the cube to the base of the cube?

  A. 2

  B. 4

  C. $2\sqrt{4}$

  D. $\sqrt{32}$

  E. 16

60. What is the slope of a line that is perpendicular to the line determined by the equation $5x + 8y = 17$?

  F. -3

  G. $-\dfrac{5}{8}$

  H. $\dfrac{17}{8}$

  J. $\dfrac{3}{17}$

  K. $\dfrac{8}{5}$

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