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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. Which of the following lists all the positive factors of 32?
   A. 1, 32
   B. 2, 16
   C. 2, 4, 8, 16
   D. 2, 4, 8, 16, 32
   E. 1, 2, 4, 8, 16, 32

2. All CDs are equally priced. If 8 CDs cost $76.00, what is the cost of 1 CD?
   F. $0.10
   G. $2.05
   H. $7.60
   J. $9.50
   K. $10.50

3. $2x^2 \times 3x^2y^2 \times 5x^2y$ is equivalent to:
   A. $30x^8y^3$
   B. $30x^8y^2$
   C. $30x^6y^3$
   D. $11x^8y^3$
   E. $11x^6y^2$

4. What is the value of the expression $10(100x - 10,000) + 100$ when $x = 250$?
   F. 2,500
   G. 150,100
   H. 160,000
   J. 210,000
   K. 300,100

5. $4a^3 \times 5a^8 = ?$
   A. $9a^5$
   B. $9a^{11}$
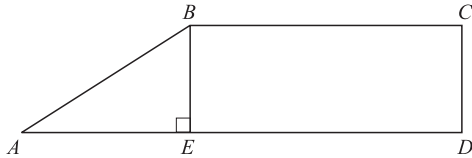   C. $9a^{24}$
   D. $20a^{11}$
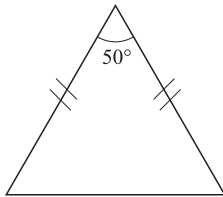   E. $20a^{24}$

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6. In the figure shown below, $AD = 16$, $ED = 11$, and AE is congruent to CD. What is the length of AB?

F. 5
G. $5\sqrt{2}$
H. 6
J. $11\sqrt{2}$
K. 25

7. Which of the following numbers is the least in value?
A. 0.02×10^4
B. 0.2×10^3
C. 2.0×10^{-2}
D. 20.0×10^2
E. 0.002×10^5

8. The isosceles triangle below has one angle measure as shown. What is the measure of each of the other angles?

F. 30°
G. 45°
H. 50°
J. 65°
K. 130°

9. The sum of the real numbers a and b is 13. Their difference is 5. What is the value of ab?
A. 5
B. 8
C. 18
D. 36
E. 65

10. 37 is what percent of 144, to the nearest percent?
F. 26%
G. 37%
H. 44%
J. 74%
K. 107%

DO YOUR FIGURING HERE.

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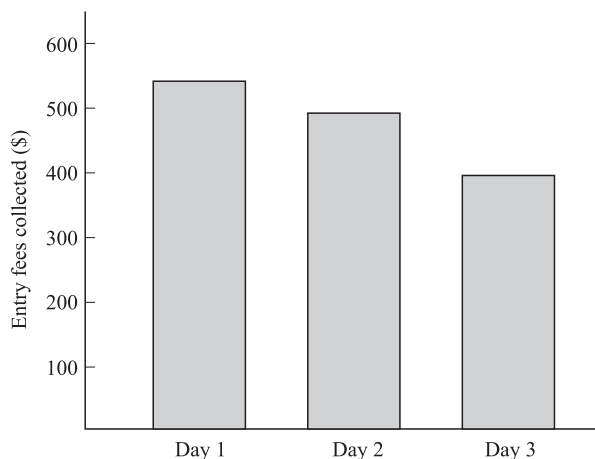
Use the following information to answer Questions 11–12.

The Moondance Riding Academy held its annual horse show for 3 days. The total amount collected in entry fees for the 3 days was $1,450. The amount collected, in dollars, is shown for each of the 3 days in the bar graph below:

DO YOUR FIGURING HERE.

11. Approximately what percent of the money collected from entry fees over the 3 days was collected on Day 2?
A. 29%
B. 34%
C. 38%
D. 66%
E. 90%

12. The mean amount collected per day during the 3-day period is what, to the nearest dollar?
F. $300
G. $483
H. $577
J. $1,450
K. $4,350

13. For all n, $(3n + 5)^2 = ?$
A. $6n^2 + 15n + 10$
B. $6n^2 + 30n + 25$
C. $9n^2 + 6n + 10$
D. $9n^2 + 15n + 25$
E. $9n^2 + 30n + 25$

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14. A certain brand of cereal costs $3.25 per box before sales tax is added. When you buy 5 or more boxes of this cereal you receive 1 additional box for free. What is the average cost per box of cereal for 6 boxes before sales tax is added?

   F. $2.17
   G. $2.71
   H. $2.80
   J. $3.25
   K. $3.79

15. Rana and Tom own a pizza shop, which offers 3 kinds of cheese, 4 kinds of meat toppings, and 5 kinds of vegetable toppings. Each type of pizza on the menu has a combination of exactly 3 ingredients: 1 cheese, 1 meat, and 1 vegetable. How many types of pizzas are possible?

   A. 12
   B. 24
   C. 36
   D. 50
   E. 60

16. On the real number line, what is the midpoint of -3 and 11?

   F. -5
   G. 0
   H. 4
   J. 7
   K. 14

17. Which real number satisfies $(2^n)(8) = 16^3$?

   A. 3
   B. 4
   C. 6
   D. 9
   E. 12

18. If $f(x) = -3x^2 - 8$, then $f(-4) = $?

   F. -56
   G. -40
   H. 8
   J. 24
   K. 40

DO YOUR FIGURING HERE.

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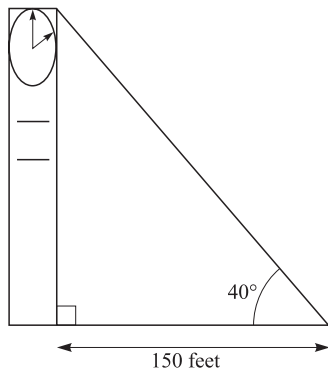**19.** A clock tower casts a 150-foot shadow on level ground, as shown below. The angle of elevation from the tip of the shadow to the top of the tower is 40°. To the nearest tenth of a foot, what is the height of the clock tower?

150 feet

(Note: $\cos 40° = \sin 50° \approx 0.77$

$\cos 50° = \sin 40° \approx 0.64$

$\tan 50° \approx 1.19$

$\tan 40° \approx 0.84$)

A. 194.8
B. 178.5
C. 150.0
D. 126.0
E. 115.5

20. If $4(x - 2) + 5x = 3(x + 3) - 11$, then $x = ?$
  F. -3
  G. -1
  H. 0
  J. 1
  K. 2

21. What is the least common multiple of 40, 70, and 60?
  A. 240
  B. 420
  C. 840
  D. 1,680
  E. 168,000

22. If $4\frac{2}{5} = a - 1\frac{2}{3}$, then $a = ?$

  F. $\dfrac{95}{15}$

  G. $\dfrac{91}{15}$

  H. $\dfrac{41}{15}$

  J. $\dfrac{27}{8}$

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

DO YOUR FIGURING HERE.

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23. A system of linear equations is shown below.

$$4y - 2x = 8$$

$$4y + 2x = 8$$

Which of the following describes the graph of this system of linear equations in the standard (x, y) coordinate plane?
A. A single line with positive slope
B. A single line with negative slope
C. Two distinct intersecting lines
D. Two parallel lines with positive slope
E. Two parallel lines with negative slope

24. A house painter charges $24.00 per hour for a painting job that requires more than 5 hours to complete. For any job requiring 5 hours or less, the house painter charges a flat fee of $100. If n represents the number of hours the job requires, which of the following expressions gives the charge, in dollars, for a job requiring more than 5 hours to complete?
F. 124.0
G. $-24n + 100$
H. $24n - 100$
J. $24n$
K. $24n + 100$

25. The average (arithmetic mean) 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
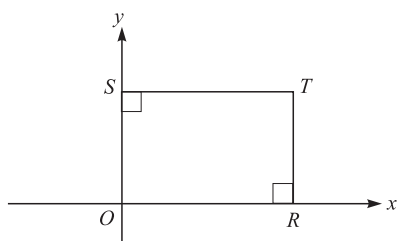
26. In the figure above, $OS = ST$ and the coordinates of T are $(k, 5)$. What is the value of k?
F. -5
G. -3
H. -2
J. 0
K. 5

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27. At a summer camp, one boy and one girl will be selected to lead the weekly activities. If there are 130 boys and 145 girls at the camp, how many different 2-person combinations of 1 boy and 1 girl are possible?

   A. 15
   B. 275
   C. 550
   D. 9,425
   E. 18,850

28. If 3 times a number x is added to 12, the result is negative. Which of the following gives the possible value(s) for x?

   F. All $x > 4$
   G. All $x < -4$
   H. 36 only
   J. 4 only
   K. 0 only

29. The figure below shows 2 tangent circles such that the 9-inch diameter of the smaller circle is equal to the radius of the larger circle. What is the approximate area, in square inches, of the shaded region?
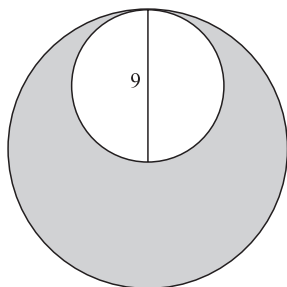
   A. 28.27
   B. 56.55
   C. 63.62
   D. 190.74
   E. 254.47

30. $(x^3 + 2x^2 + 3x - 2) - (2x^3 - x^2 - 4)$ is equivalent to:

   F. $-x^3 + x^2 + 3x - 6$
   G. $-x^3 + 3x^2 + 3x + 2$
   H. $2x^3 - 2x^2 + 3x - 2$
   J. $2x^6 + x^4 + 3x - 6$
   K. $2x^6 + 3x^4 + 3x + 2$

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x	0	1	2	3
$f(x)$	-6	-5	-2	3

DO YOUR FIGURING HERE.

31. The table above gives values of the quadratic function f for selected values of x. Which of the following defines the quadratic function f?

A. $f(x) = x^2 - 6$
B. $f(x) = x^2 + 6$
C. $f(x) = 2x^2 - 10$
D. $f(x) = 2x^2 - 6$
E. $f(x) = 2x^2 - 7$

32. What is the median of the following 6 test scores?
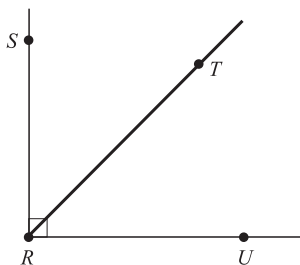
   64, 72, 85, 80, 72, 89

F. 64
G. 72
H. 76
J. 77
K. 82.5

33. For all numbers x and y, let the operation ¤ be defined as $x ¤ y = 2xy - 4x$. If a and b are positive integers, which of the following can be equal to zero?

   I. $a ¤ b$
   II. $(a - b) ¤ b$
   III. $b ¤ (a - b)$

A. I only
B. II only
C. III only
D. I and II only
E. I, II, and III

34. In the figure shown below, the measure of $\angle SRT$ is $(x + 15)°$ and the measure of $\angle SRU$ is $90°$. What is the measure of $\angle TRU$?

F. $(105 + x)°$
G. $(105 - x)°$
H. $(75 + x)°$
J. $(75 - x)°$
K. $(x - 75)°$

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35. $(6a - 12) - (4a + 4) = ?$

   A. $2(a + 2)$
   B. $2(a + 4)$
   C. $2(a - 2)$
   D. $2(a - 4)$
   E. $2(a - 8)$

DO YOUR FIGURING HERE.

36. In the standard (x, y) coordinate plane below, the points $(0,2)$, $(8,2)$, $(3,6)$, and $(11,6)$ are the vertices of a parallelogram. What is the area, in square units, of the parallelogram?
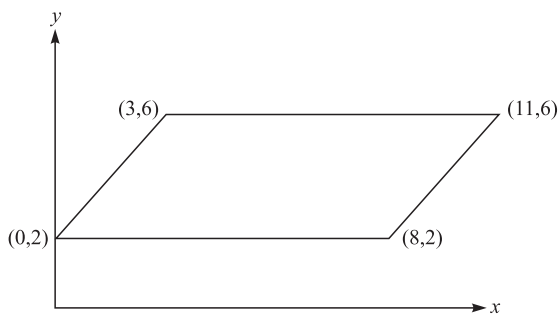
   F. $6\sqrt{2}$
   G. 16
   H. 32
   J. 56
   K. 88

37. Which of the following equations expresses z in terms of x for all real numbers x, y, and z, such that $x^5 = y$ and $y^3 = z$?

   A. $z = x$
   B. $z = \dfrac{3}{5}x$
   C. $z = 3x^5$
   D. $z = x^8$
   E. $z = x^{15}$

38. Which of the following statements is NOT true about the geometric sequence 36, 18, 9, ...?

   F. The fourth term is 4.5.
   G. The sum of the first five terms is 69.75.
   H. Each consecutive term is $\dfrac{1}{2}$ of the previous term.
   J. Each consecutive term is evenly divisible by 3.
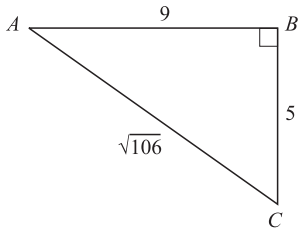   **K.** The common ratio of consecutive terms is 2:1.
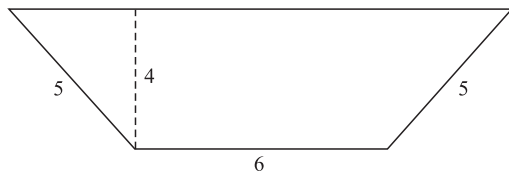
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39. For right triangle ABC with dimensions in centimeters as given below, what is $\tan C$?

A —— 9 —— B (right angle at B)
B —— 5 —— C
A —— $\sqrt{106}$ —— C

A. $\dfrac{5}{9}$

B. $\dfrac{5}{\sqrt{106}}$

C. $\dfrac{9}{\sqrt{106}}$

D. $\dfrac{\sqrt{106}}{9}$

E. $\dfrac{9}{5}$

40. The area of a trapezoid is found by using the equation $\dfrac{1}{2}h(b_1 + b_2)$, where h is the height and b_1 and b_2 are the lengths of the bases. What is the area of the trapezoid shown below?

5   4   5
         6

F. 18
G. 20
H. 24
J. 30
K. 36

41. The diagonal of a rectangular garden is 15 feet, and one side is 9 feet. What is the perimeter of the garden?
A. 135
B. 108
C. 68
D. 48
E. 42

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42. $\left(\frac{1}{3}a - b\right)^2 = ?$

  F. $\frac{1}{9}a^2 + b^2$

  G. $\frac{1}{9}a^2 - \frac{2}{3}ab + b^2$

  H. $\frac{1}{3}a^2 - \frac{2}{3}ab + b^2$

  J. $a^2 + b^2$

  K. $a^2 - \frac{1}{3}ab + b^2$

43. Which of the following inequalities defines the solution set for the inequality $23 - 6x \geq 5$?
  A. $x \geq -3$
  B. $x \geq 3$
  C. $x \geq 6$
  D. $x \leq 3$
  E. $x \leq -6$

44. What is the approximate distance between the points $(4, -3)$ and $(-6, 5)$ in the standard (x, y) coordinate plane?
  F. 8.92
  G. 12.81
  H. 16.97
  J. 17.95
  K. 19.22

45. The ratio of x to z is 3 to 5, and the ratio of y to z is 1 to 5. What is the ratio of x to y?
  A. 5:3
  B. 5:1
  C. 3:1
  D. 1:3
  E. 1:1

46. If $\tan \alpha = \frac{x}{y}$, $x > 0$, $y > 0$, and $0 < \alpha < \frac{\pi}{2}$, then what is $\cos \alpha$?

  F. $\dfrac{\sqrt{x^2 + y^2}}{y}$

  G. $\dfrac{y}{\sqrt{x^2 + y^2}}$

  H. $\dfrac{x}{\sqrt{x^2 + y^2}}$

  J. $\dfrac{y}{x}$

  K. $\dfrac{x}{y}$

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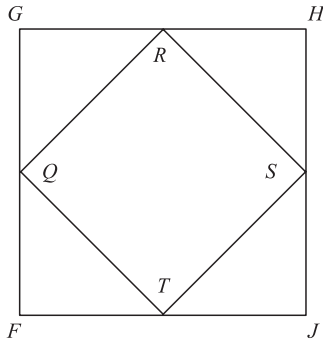**GO ON TO THE NEXT PAGE.**
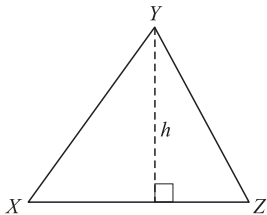
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47. In the figure below, *FGHJ* is a square and *Q*, *R*, *S*, and *T* are the midpoints of its sides. If $\overline{GH} = 10$ inches, what is the area of *QRST*, in inches?

(figure: square FGHJ with inscribed square QRST; G top-left, H top-right, F bottom-left, J bottom-right; R top, S right, T bottom, Q left)

A. 100
B. 50
C. 25
D. 20
E. $5\sqrt{2}$

48. In $\triangle XYZ$ below, $\overline{XZ}$ is $\dfrac{7}{8}$ of *h*, the length of the altitude. What is the area of $\triangle XYZ$ in terms of *h*?

(figure: triangle XYZ with apex Y, base XZ, altitude h drawn from Y to base)

F. $\dfrac{7h}{8}$

G. $\dfrac{7h^2}{8}$

H. $\dfrac{7h}{16}$

J. $\dfrac{7h^2}{16}$

K. $\dfrac{7h^2}{12}$

49. On Friday, a computer was priced at $800. On the following Wednesday, the price was reduced by 15%. On the following Friday, the price was further reduced by 20%. What percent of the original price was the final price?
A. 82.5
B. 68
C. 65
D. 35
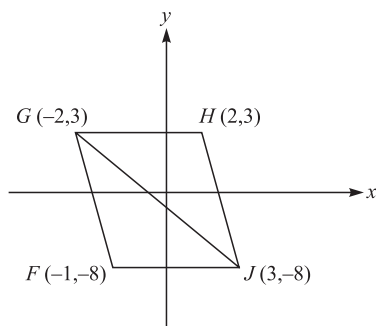**E.** 32

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50. If $ghjk = 24$ and $ghkl = 0$, which of the following must be true?

   F. $g > 0$
   G. $h > 0$
   H. $j = 0$
   J. $k = 0$
   K. $l = 0$

51. Given the vertices of parallelogram *FGHJ* in the standard (x, y) coordinate plane below, what is the area of triangle *GHJ*, in square units?

   A. 11
   B. 15
   C. 22
   D. 44
   E. 88

52. If *X*, *Y*, and *Z* are real numbers, and $XYZ = 1$, then which of the following conditions must be true?

   F. $XZ = \dfrac{1}{Y}$
   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 $Z < 1$

53. In the standard (x,y) coordinate plane, the *y*-intercept of the line $6x + 2y = 14$ is?

   A. -6
   B. -3
   C. 2
   D. 7
   E. 14

54. The average of a set of six integers is 38. When a seventh number is included in the set, the average of the set increases to 47. What is the seventh number?

   F. 38
   G. 47
   H. 101
   J. 228
   K. 329

DO YOUR FIGURING HERE.

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55. The area of a rectangular kitchen is 80 square feet. If the length of the floor is 4 feet less than four times the width, what is the width of the floor in feet?

   A. 4
   B. 5
   C. 8
   D. 16
   E. 17

56. For every cent increase in price of a pound of apples, the grocery store sells 25 fewer pounds per day. The grocery store normally sells 800 pounds of apples per day at $1.09 per pound. Which of the following expressions represents the number of pounds of apples sold per day if the cost is increased by $3x$ cents per pound of apples?

   F. $(1.09 + 3x)(800 - 75x)$
   G. $800 - 25x$
   H. $800 - 75(1.09)x$
   J. $800 + 75x$
   K. $800 - 75x$

57. Jason has been hired to build a circular wading pool in his neighbor's backyard. The rectangular backyard measures 60 feet wide by 50 feet long. Jason's neighbors want the pool to be as large as possible, with the edge of the pool at least 8 feet from the edge of the backyard all around. How long should the radius of the pool be, in feet?

   A. 8
   B. 17
   C. 22
   D. 34
   E. 44

58. If $f(x) = x^2 + 3$, then $f(x + y) = $?

   F. $x^2 + 2xy + y^2 + 3$
   G. $x^2 + 2xy + y^2$
   H. $x^2 + 2xy + 3$
   J. $x^2 + 3 + y$
   K. $x^2 + y^2$

DO YOUR FIGURING HERE.

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59. In a game, 84 marbles numbered 00 through 83 are placed in a box. A player draws 1 marble at random from the box. Without replacing the first marble, the player draws a second marble at random. If both marbles drawn have the same tens digit (that is, both marbles are numbered between 00 and 09, or 10 and 19, or 20 and 29, etc.), the player is a winner. If the first marble Dave draws is numbered 23, what is the probability that Dave will be a winner on the next draw?

A. $\dfrac{9}{84}$

B. $\dfrac{74}{83}$

C. $\dfrac{9}{83}$

D. $\dfrac{75}{84}$

E. $\dfrac{10}{83}$

60. What is the smallest possible value for the product of 2 real numbers that differ by 6?
   F. -9
   G. -8
   H. -5
   J. 0
   K. 7

DO YOUR FIGURING HERE.

English Test

1. C	21. A	41. A	61. B
2. H	22. J	42. J	62. F
3. B	23. C	43. B	63. D
4. H	24. F	44. G	64. F
5. A	25. A	45. C	65. D
6. H	26. J	46. F	66. F
7. D	27. B	47. B	67. C
8. G	28. G	48. H	68. J
9. A	29. A	49. A	69. B
10. H	30. H	50. F	70. J
11. A	31. C	51. D	71. D
12. F	32. F	52. J	72. J
13. B	33. A	53. D	73. C
14. H	34. G	54. H	74. G
15. D	35. D	55. C	75. D
16. F	36. F	56. H	
17. C	37. D	57. A	
18. H	38. J	58. G	
19. D	39. A	59. D	
20. F	40. H	60. G	