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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 $2x+5=17$, then $x=?$
   A. 3
   B. 6
   C. 10
   D. 11
   E. 24

2. Consider the three statements below to be true.

   All horses that run fast are brown.
   Horse A is not brown.
   Horse B runs fast.

   Which of the following statements is true?

   F. Horse B is not brown.
   G. Horse B is brown.
   H. All brown horses run fast.
   J. Horse A runs fast.
   K. Both horse A and horse B are brown.

3. How much greater than $x-2$ is $x+5$?
   A. 7
   B. 6
   C. 5
   D. 3
   E. 2

4. A group of students sold boxes of greetings cards to raise money. The net amount A, in dollars, raised by selling b boxes of greeting cards is given by the function $A(b)=4b-30$. If the students sold 15 boxes of greeting cards, what is the net amount they raised?

   F. $10
   G. $15
   H. $20
   J. $25
   K. $30

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DO YOUR FIGURING HERE.

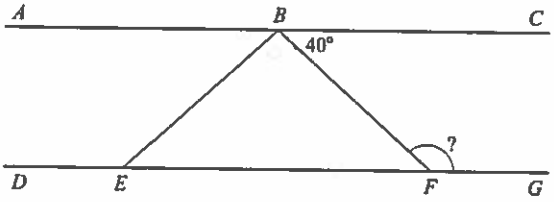
5. A carton of 12 cans of soda is priced at $6.60 now. If the soda goes on sale for 20% off the current price, what will be the price of the carton?

   A. $0.55
   B. $1.32
   C. $5.28
   D. $6.36
   E. $6.40

6. If $a^2 = 64$ and $b^2 = 81$, which of the following CANNOT be the value of $a + b$?

   F. -17
   G. -1
   H. 1
   J. 17
   K. 145

7. In the figure below, B is the midpoint of $\overline{AC}$, $\overline{AC}$ is parallel to $\overline{DG}$, and $\overline{BE}$ is congruent to $\overline{BF}$. What is the measure of angle BFG?



   A. 40°
   B. 80°
   C. 90°
   D. 140°
   E. 180°

8. If $x = -3$, then $x^2 - 6x - 18 = ?$

   F. 9
   G. 0
   H. -9
   J. -27
   K. -45

9. What is the value of $|1 - a|$ if $a = 12$?

   A. -13
   B. -11
   C. 11
   D. 12
   E. 13

10. If $ab = c$, $c = kb$, and $bc \neq 0$, then $k = ?$

    F. 1
    G. $1/a$
    H. $a - 1$
    J. a
    K. $a + 1$

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DO YOUR FIGURING HERE.

11. $(x^3)^{13}$ is equivalent to:

A. x^{39}
B. x^{16}
C. $3x^{10}$
D. $3x^{13}$
E. $3x^{16}$

12. If $\frac{2}{x} \geq \frac{1}{7}$, what is the largest possible value for x?

F. $\frac{1}{2}$
G. 7
H. 14
J. 15
K. 28

13. A circle with a circumference of 46π is divided evenly into 12 sectors. What is the total measure, in degrees, of 5 sectors?

A. 46°
B. 60°
C. 115°
D. 150°
E. 230°

14. Every day at 7:30 A.M. during one school week, Rachel and Ross counted the number of students who entered the school through the main entrance and recorded the results in the table below. For that school week, what was the average number of students who entered the school through the main entrance?

Day	Number of students
M	450
Tu	427
W	462
Th	433
F	398

F. 427
G. 434
H. 448
J. 453
K. 462

15. Which of the following equations has both $x=-3$ and $x=6$ as solutions?

A. $(x-6)(x+3)=0$
B. $(x+6)(x+3)=0$
C. $(x+6)(x-3)=0$
D. $(x-6)(x-3)=0$
E. $x-6=x+3$

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16. For all x, $7 - 2(x - 10) = ?$

F. $5x + 27$
G. $5x - 27$
H. $-2x + 27$
J. $-2x - 13$
K. $-2x + 3$

DO YOUR FIGURING HERE.

17. If 60% of x equals 90, then $x = ?$

A. 5.4
B. 15
C. 54
D. 150
E. 1,500

18. The price of 1 box of popcorn and 1 drink together is \$5.10. The price of 2 boxes of popcorn and 1 drink together is \$8.35. What is the cost of 1 drink?

F. \$0.75
G. \$1.85
H. \$2.15
J. \$2.55
K. \$3.25

19. You are standing in line at the cash register to pay for 2 lamps priced at \$8.99 each. A sales tax of 7% of the cost of the lamps will be added (rounded to the nearest cent) to the price of the 2 lamps. You have 20 one-dollar bills. How much will you need in coins if you want to have exact change ready?

A. \$0.24
B. \$0.38
C. \$0.62
D. \$0.76
E. \$0.87

20. If $r^3 = 343$, then $3r = ?$

F. 7
G. 21
H. 49
J. 114
K. 2,229

21. What is the correct order of π, $\frac{7}{3}$, and $\frac{9}{2}$ from least to greatest?

A. $\frac{9}{2} < \pi < \frac{7}{3}$
B. $\frac{7}{3} < \pi < \frac{9}{2}$
C. $\pi < \frac{9}{2} < \frac{7}{3}$
D. $\pi < \frac{7}{3} < \frac{9}{2}$
E. $\frac{9}{2} < \frac{7}{3} < \pi$

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22. What number can you add to the numerator and denominator of $\frac{9}{13}$ to get $\frac{3}{4}$?
F. -3
G. $-1\frac{1}{4}$
H. $1\frac{1}{2}$
J. 3
K. 6

23. In the standard (x,y) coordinate plane, what is the slope of the line joining the points (5,4) and (2,−7)?
A. 9
B. $\frac{11}{3}$
C. 1
D. $\frac{3}{11}$
E. $\frac{1}{9}$

24. If p is the greatest prime factor of 38 and f is the greatest prime factor of 100, then $p+f=?$
F. 7
G. 12
H. 24
J. 29
K. 44

25. If $(t+v)^2=289$ and $tv=30$, then $t^2+v^2=?$
A. −11
B. 1
C. 11
D. 61
E. 229

26. If, for all x, $(x^{3a+5})^4=x^{44}$, then $a=?$
F. 1
G. 2
H. $\frac{16}{3}$
J. $\frac{53}{12}$
K. 5

27. Which of the following is a value of x that satisfies $\log_x 16=2$?
A. 2
B. 4
C. 8
D. 16
E. 32

28. One endpoint of a line segment in the (x,y) coordinate plane has coordinates (−2,9). The midpoint of the segment has coordinates (4,4). What are the coordinates of the other endpoint of the segment?
F. (−8,13)
G. (−6,5)
H. (2,13)
J. (10,−1)
K. (−8,36)

DO YOUR FIGURING HERE.

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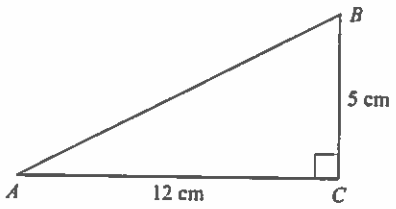
29. In the (x,y) coordinate plane, what is the radius of the circle $(x-4)^2+(y-1)^2=14$?

DO YOUR FIGURING HERE.

A. 7
B. 14
C. $\sqrt{7}$
D. $\sqrt{14}$
E. 296

30. In the right triangle shown below, $\cos \angle A = ?$



F. $\frac{5}{12}$
G. $\frac{5}{13}$
H. $\frac{12}{13}$
J. $\frac{13}{12}$
K. $\frac{12}{5}$

31. For all nonzero a and b, $\frac{(13a^2b^4)(-8a^3b^5)}{(4a^2b^6)} = ?$

A. $26a^3b^{14}$
B. $-26a^3b^3$
C. $\frac{a^3b^3}{-26}$
D. $-26a^4b^9$
E. $\frac{-26}{ab}$

32. Which of the following set of three numbers could be the side lengths, in feet, of a right isosceles triangle?

F. 1, 2, 3
G. 2, 2, 2
H. 2, $2\sqrt{3}$, 4
J. 1, 2, $2\sqrt{2}$
K. 2, 2, $2\sqrt{2}$

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DO YOUR FIGURING HERE.

33. In the standard (x,y) coordinate plane, at what point does the line given by the equation $3x + 7y - 2 = 0$ cross the y-axis?

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

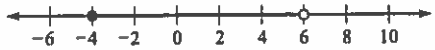
B. 0

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

D. 2

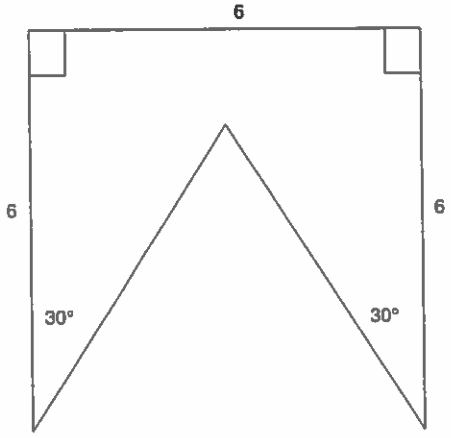
E. 3

34. Which of the following logical statements identifies the same set as the graph shown below?



F. $x \geq -4$ and $x < 6$
G. $x > -4$ and $x < 6$
H. $x \geq -4$ or $x < 6$
J. $x \leq -4$ and $x > 6$
K. $x \leq -4$ or $x > 6$

35. What is the perimeter of the figure shown below?



A. 36
B. 30
C. 28
D. 25
E. 24

36. If x and y are real and $\sqrt{3\left(\frac{x^3}{2y}\right)} = 4$, then what must be true of the values of x and y?

F. x and y must both be negative
G. x and y must both be positive
H. x and y must both be positive or both be negative
J. x and y must have opposite signs
K. x and y may have any value

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37. For all pairs of real numbers A and S where $A=2S+9$, $S=?$

A. $\frac{A}{9}+2$

B. $\frac{A}{9}-2$

C. $9A-2$

D. $\frac{A-9}{2}$

E. $\frac{A+9}{2}$

DO YOUR FIGURING HERE.

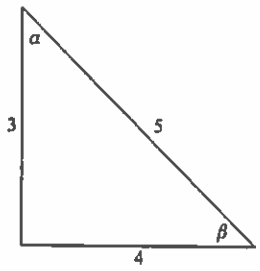
38. What is the slope of any line perpendicular to the y-axis in the (x,y) coordinate plane?

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

39. In the (x,y) coordinate plane, the line with equation $5y=25x-50$ crosses the x-axis at the point with coordinates (a,b). What is the value of a?

A. -10
B. -2
C. 0
D. 2
E. 5

40. A right triangle has side lengths as shown below. What is $(\tan \alpha)(\cos \beta)$?



F. $\frac{5}{12}$

G. $\frac{4}{9}$

H. $\frac{15}{20}$

J. $\frac{2}{15}$

K. $\frac{16}{15}$

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41. Amy can run 3 miles in s minutes. At that pace, how many miles can she run in 50 minutes?

A. $\frac{3s}{50}$
B. $\frac{50s}{3}$
C. $50\frac{s}{3}$
D. $3(50s)$
E. $\frac{150}{s}$

DO YOUR FIGURING HERE.

42. An oil tank contains 4,800 gallons of oil. Each gallon of oil weighs approximately 6 pounds. About how many pounds does the oil in the tank weigh?

F. 800
G. 4,806
H. 6,000
J. 28,800
K. 46,800

43. In triangle ABC, the measure of $\angle A$ is 30° and the measure of $\angle B$ is 60°. If $\overline{AB}$ is 16 units long, what is the area, in square units, of triangle ABC?

A. 16
B. $16\sqrt{3}$
C. $32\sqrt{3}$
D. 256
E. $256\sqrt{3}$

44. In the standard (x,y) coordinate plane, which of the following lines goes through (0,3) and is perpendicular to $y = 2x + 1$?

F. $y = -1/2x + 3$
G. $y = 1/2x + 3$
H. $y = 2x + 4$
J. $y = 3x + 1$
K. $y = 3x + 2$

45. A certain rectangle is 2 times as long as it is wide. Suppose the length is tripled and the width is doubled. The area of the second rectangle is how many times as large as the area of the first?

A. 2
B. 3
C. 6
D. 9
E. 12

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DO YOUR FIGURING HERE.

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

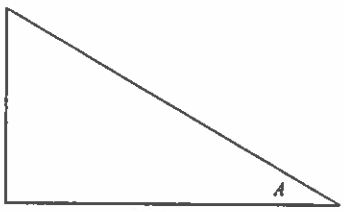
$$24x - 15y = 108$$
$$72x - 45y = 9z$$

F. 3
G. 9
H. 12
J. 36
K. 108

47. How many prime numbers are there between 36 and 54?

A. 4
B. 5
C. 6
D. 7
E. 8

48. If $\tan A = \frac{x}{y}$, $x > 0$, $y > 0$, and $0 < A < 90°$, what is $\sin A$?



F. $\frac{x}{y}$
G. $\frac{y}{x}$
H. $\frac{x}{\sqrt{x^2 + y^2}}$
J. $\frac{y}{\sqrt{x^2 + y^2}}$
K. $\frac{\sqrt{x^2 + y^2}}{x}$

49. Aishah will create a circle graph to show how she spends her time during a 24-hour day. The size of the sector representing each activity is proportional to the time spent on that activity. Among other activities, Aishah plays the piano for 1.5 hours. How many degrees should the central angle measure in the sector representing playing the piano?

A. 15
B. 22.5
C. 31
D. 48.3
E. 240

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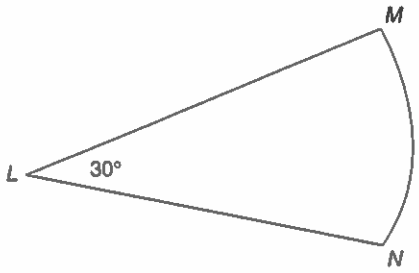
DO YOUR FIGURING HERE.

50. Points A, B, and C lie on the same line. If the length of $\overline{AB}$ is 9 meters and the length of $\overline{BC}$ is 11 meters, then what are all the possible lengths, in meters, for $\overline{AC}$?

F. 20 only
G. 2 only
H. 2 and 20 only
J. Any number less than 2 or greater than 20
K. Any number greater than 20 or less than 2

51. In the figure shown below, MN is the arc of a circle with center L. If the length of arc MN is 6π, what is the area of sector LMN?



A. 9π
B. 36π
C. 54π
D. 72π
E. 108π

52. If $6a^5b^7 < 0$, then which of the following *must* be true?

F. $a > 0$ and $b > 0$ or $a < 0$ and $b < 0$
G. $a > 0$ and $b < 0$ or $a < 0$ and $b > 0$
H. $a = b$
J. $a < 0$ and $b < 0$
K. $a > b$

53. Mandy visited 7 patients on her first day as a nurse. Her goal was to visit 3 more patients on each successive day than she had visited the day before. If Mandy met, but did not exceed her goal, how many patients did she visit in all during her first 5 days as a nurse?

A. 19
B. 35
C. 65
D. 105
E. 325

54. What is the smallest possible value for the product of 2 real numbers that differ by 8?

F. 8
G. 6
H. −2
J. −4
K. −16

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55. If $0° \leq x \leq 90°$ and $\cos x = \frac{4}{5}$, then $\sin x = ?$

A. $\frac{3}{5}$

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

C. $\frac{4}{5}$

D. $\frac{5}{4}$

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

DO YOUR FIGURING HERE.

56. For every dollar decrease in price of a set of books, the bookstore sells 1,200 more sets of books per month. The bookstore normally sells 1,750 sets of books per month at $9.50 per set of books. Which of the following expressions represents the number of sets of books sold per month if the cost is reduced by x dollars per set of books?

F. $1{,}750 + 1{,}200x$

G. $1{,}750 - 1{,}200x$

H. $(9.50 - x)(1{,}750 + 1{,}200x)$

J. $9.50 + 1{,}200x$

K. $1{,}750 + 9.50x$

57. In a game, 45 marbles numbered 00 through 44 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 the numbers on both marbles drawn have a sum greater than 45 (that is, the sum of Marble 1 and Marble 2 exceeds 45), the player is a winner. If the first marble Martin draws is numbered 17, what is the probability that Martin will be a winner on the next draw?

A. $\frac{4}{11}$

B. $\frac{16}{46}$

C. $\frac{17}{44}$

D. $\frac{17}{45}$

E. $\frac{16}{43}$

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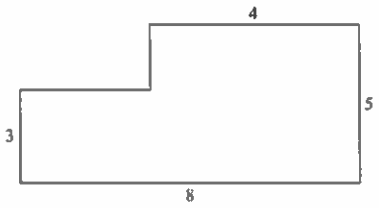
58. In the figure below, all of the line segments are either horizontal or vertical, as shown, and the dimensions are given in centimeters. What is the perimeter, in centimeters, of the figure?



F. 26
G. 29
H. 31
J. 32
K. 81

DO YOUR FIGURING HERE.

59. In the standard (x,y) coordinate plane, the vertices of a square have coordinates (0,4), (4,4), (4,0), and (0,0). Which of the following is an equation of a circle that is inscribed in the square?

A. $(x+2)^2+(y+2)^2=2$
B. $(x-2)^2+(y-2)^2=2$
C. $(x-2)^2+(y-2)^2=4$
D. $(x+2)^2+(y-2)^2=4$
E. $(x+2)^2+(y+2)^2=8$

60. On Monday, a skirt was priced at $60.00. On Wednesday, the price was reduced by 15%. Two weeks later, the price was further reduced by 20%. What percent of the original price is this last price?

F. 35%
G. 40%
H. 51%
J. 65%
K. 68%

END OF THE MATHEMATICS TEST

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