

**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.

1. The minimum fine for driving in excess of the speed limit is \$25. An additional \$6 is added to the minimum fine for each mile per hour (mph) in excess of the speed limit. Rachel was issued a \$103 fine for speeding in a 55-mph speed limit zone. For driving at what speed, in mph, was Rachel fined?

A. 48  
B. 52  
C. 62  
D. 68  
E. 78

2.  $5x^3 \times 2xy \times 3xy^2$  is equivalent to:

F.  $10x^3y^2$   
G.  $10x^5y^3$   
H.  $30x^3y^3$   
J.  $30x^5y^3$   
K.  $30x^5y^2$

3. What is the fourth term in the arithmetic sequence 13, 10, 7, ...?

A. 14  
B. 9  
C. 4  
D. 0  
E. -7

4. When written in symbols, "the product of  $r$  and  $s$ , raised to the fourth power," is represented as:

F.  $r^4s^4$   
G.  $(r + s)^4$   
H.  $(rs)^4$   
J.  $\frac{r^4}{s^4}$   
K.  $rs^4$

**DO YOUR FIGURING HERE.**

**GO ON TO THE NEXT PAGE.**



5. Which of the following numbers has the digit 5 in the thousandths place?

A. 5,000.00  
B. 50.0  
C. 0.05  
D. 0.005  
E. 0.0005

**DO YOUR FIGURING HERE.**

6. Mandy and Jordan each bought some of the same notebooks and the same three-ring binder. Mandy paid \$5.85 for 3 notebooks and 1 binder. Jordan paid \$4.65 for 2 notebooks and 1 binder. What is the price of one of the notebooks?

F. \$2.70  
G. \$2.25  
H. \$1.80  
J. \$1.20  
K. \$0.75

7. If  $mn = k$  and  $k = x^2n$ , and  $nk \neq 0$ , which of the following is equal to  $m$ ?

A. 1  
B.  $1/x$   
C.  $\sqrt{x}$   
D.  $x$   
E.  $x^2$

8. If  $7x + 5 = 2x + 9$ , then  $x = ?$

F.  $\frac{4}{5}$   
G.  $1\frac{4}{5}$   
H.  $\frac{4}{9}$   
J.  $1\frac{4}{9}$   
K. 2

9. What percent of 5 is 7?

A. 14%  
B. 35%  
C. 71%  
D. 140%  
E. 157%

**GO ON TO THE NEXT PAGE.**



10. If  $x$  is a positive real number such that  $x^2 = 16$ , then  $x^3 + \sqrt{x} = ?$

F. 18  
G. 20  
H. 66  
J. 68  
K. 74

DO YOUR FIGURING HERE.

11.  $-|-16| - (-16) = ?$

A. -16  
B. 0  
C. 4  
D. 16  
E. 32

12. A partial deck of cards was found sitting out on a table. If the partial deck consists of 6 spades, 3 hearts, and 7 diamonds, what is the probability of randomly selecting a red card from this partial deck? (Note: diamonds and hearts are considered "red," while spades and clubs are considered "black.")

F.  $\frac{9}{16}$   
G.  $\frac{13}{16}$   
H.  $\frac{7}{16}$   
J.  $\frac{3}{8}$   
K.  $\frac{5}{8}$

13. Which of the following is a simplified form of  $4x - 4y + 3x$ ?

A.  $x(7 - 4y)$   
B.  $x - y + 3x$   
C.  $-8xy + 3x$   
D.  $7x - 4y$   
E.  $-4y - x$

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DO YOUR FIGURING HERE.

14. Gary has turtles, cats, and birds for pets. The number of birds he has is 4 more than the number of turtles, and the number of cats is 2 times the number of birds. Of the following, which could be the total number of Gary's pets?
- F. 14
  - G. 18
  - H. 20
  - J. 22
  - K. 26
15. On a map,  $\frac{1}{4}$  inch represents 12 miles. If a road is 66 miles long, what is its length, in inches, on the map?
- A.  $5 \frac{1}{2}$
  - B.  $5 \frac{1}{8}$
  - C.  $1 \frac{1}{2}$
  - D.  $1 \frac{3}{8}$
  - E.  $\frac{7}{8}$
16. If  $b = a - 4$ , then  $(a - b)^3 = ?$
- F. 64
  - G. 16
  - H. -4
  - J. -16
  - K. -64
17. If  $g$  is an integer, which of the following could NOT equal  $g^2$ ?
- A. 0
  - B. 1
  - C. 4
  - D. 8
  - E. 9
18. Justin owns 6 different dress shirts, 3 different pairs of pants, and 5 different ties. How many distinct outfits, each consisting of a shirt, a pair of pants, and a tie, can Justin make?
- F. 14
  - G. 42
  - H. 90
  - J. 120
  - K. 144
19. An oil refinery produces gasoline from crude oil. For every 10,000 barrels of crude oil supplied, the refinery can produce 6,500 barrels of gasoline. How many barrels of gasoline can be produced from 3,500 barrels of crude oil?
- A. 1,265
  - B. 1,750
  - C. 2,125
  - D. 2,275
  - E. 5,385

GO ON TO THE NEXT PAGE.

2



2

20. What is the slope of a line that passes through the origin and the point  $(-6, 2)$ ?

F. 3  
 G.  $1/3$   
 H.  $-1/3$   
 J.  $-3$   
 K.  $-6$

DO YOUR FIGURING HERE.

21. If  $n^x \cdot n^8 = n^{24}$  and  $(n^6)^y = n^{18}$ , what is the value of  $x + y$ ?

A. 7  
 B. 9  
 C. 12  
 D. 19  
 E. 27

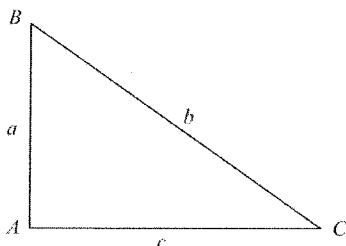
22. What is the slope-intercept form of  $9x + 3y - 6 = 0$ ?

F.  $y = 9x - 6$   
 G.  $y = 3x + 2$   
 H.  $y = 3x - 2$   
 J.  $y = -3x + 2$   
 K.  $y = -9x + 6$

23. 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

24. For the right triangle  $\triangle ABC$  shown below, what is  $\sin C$ ?

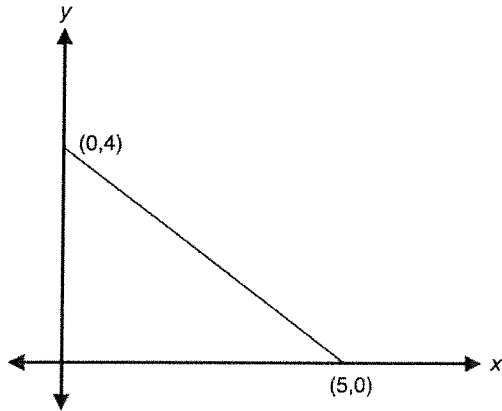


F.  $\frac{a}{b}$   
 G.  $\frac{a}{c}$   
 H.  $\frac{b}{a}$   
 J.  $\frac{c}{b}$   
 K.  $\frac{c}{a}$

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**2****2**

25. What is the area, in coordinate units, of the triangle in the figure below?

**DO YOUR FIGURING HERE.**

- A. 4.5  
B. 9.0  
C. 10.0  
D. 12.5  
E. 20.0
26. A shoe store charges \$39 for a certain type of sneaker. This price is 30% more than the amount it costs the shoe store to buy one pair of these sneakers. At an end-of-the-year sale, sales associates can purchase any remaining sneakers at 20% off the shoe store's cost. How much would it cost an employee to purchase a pair of sneakers of this type during the sale (excluding sales tax)?  
F. \$31.20  
G. \$25.00  
H. \$24.00  
J. \$21.84  
K. \$19.50
27. After excavating a lot, workers removed an estimated 7,000 cubic yards of dirt from the area. If this dirt were spread in an even layer over an empty lot with dimensions 30 yards by 64 yards, about how deep, in yards, would the layer of dirt be?  
A. Less than 1  
B. Between 1 and 2  
C. Between 2 and 3  
D. Between 3 and 4  
E. More than 4

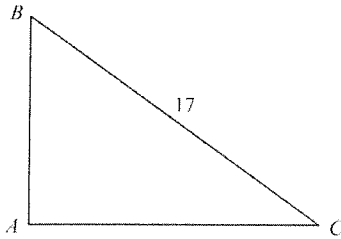
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28. The hypotenuse of the right triangle  $\triangle ABC$  shown below is 17 feet long. The cosine of angle  $C$  is  $\frac{3}{5}$ . How many feet long is the segment  $AC$ ?



DO YOUR FIGURING HERE.

- F. 6  
G. 10.2  
H. 12  
J. 15  
K. 28.3
29. When the choir is arranged in rows of 5 people each, the last row is one person short. When the choir is arranged in rows of 6 people each, the last row is still one person short. What is the least possible number of people in the choir?
- A. 29  
B. 30  
C. 56  
D. 60  
E. 99
30. What is the  $y$ -coordinate of the point in the standard  $(x,y)$  coordinate plane at which the 2 lines  $y = \frac{x}{2} + 3$  and  $y = 3x - 2$  intersect?
- F. 5  
G. 4  
H. 3  
J. 2  
K. 1
31. Points  $B$  and  $C$  lie on segment  $AD$  as shown below. Segment  $AD$  is 32 units long, segment  $AC$  is 23 units long, and segment  $BD$  is 27 units long. How many units long, if it can be determined, is segment  $BC$ ?



- A. 21  
B. 18  
C. 9  
D. 4  
E. Cannot be determined from the given information.

GO ON TO THE NEXT PAGE.



32. For all pairs of real numbers  $M$  and  $N$  where  $M = 6N + 5$ ,  $N = ?$

DO YOUR FIGURING HERE.

F.  $\frac{M}{6} - 5$

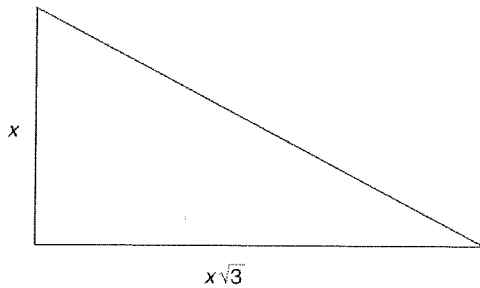
G.  $\frac{M}{5} + 6$

H.  $6M + 5$

J.  $\frac{M - 5}{6}$

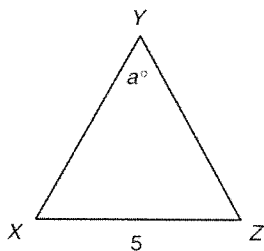
K.  $\frac{M + 5}{6}$

33. In the figure below, the perimeter of the triangle is  $12 + 4\sqrt{3}$  inches. What is the value of  $x$ , in inches?



- A. 2
- B. 4
- C. 6
- D. 8
- E. 12

34. In the figure below,  $\overline{XY} = \overline{YZ}$ . If  $a = 40^\circ$ , then  $\overline{XY} = ?$



- F. 9.50
- G. 8.75
- H. 7.75
- J. 6.25
- K. 5.50



**2****2**

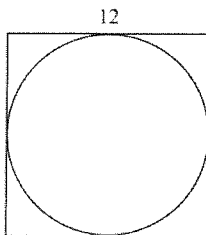
35. In the  $(x, y)$  coordinate plane, what is the  $y$ -intercept of the line  $-9x - 3y = 15$ ?
- A.  $-9$
  - B.  $-5$
  - C.  $-3$
  - D.  $3$
  - E.  $15$

**DO YOUR FIGURING HERE.**

36. The product of two integers is between 137 and 149. Which of the following CANNOT be one of the integers?
- F.  $15$
  - G.  $13$
  - H.  $11$
  - J.  $10$
  - K.  $7$

37. When  $x$  is divided by 7, the remainder is 4. What is the remainder when  $2x$  is divided by 7?
- A.  $1$
  - B.  $4$
  - C.  $5$
  - D.  $7$
  - E.  $8$

38. A circle is circumscribed within a square with sides of 12 feet, as shown below. What is the area of the circle, to the nearest square foot?



- F.  $144$
  - G.  $113$
  - H.  $72$
  - J.  $12\pi$
  - K.  $3\pi$
39. The average of 7 consecutive numbers is 16. What is the sum of the least and greatest of the 7 integers?
- A.  $13$
  - B.  $14$
  - C.  $16$
  - D.  $19$
  - E.  $32$

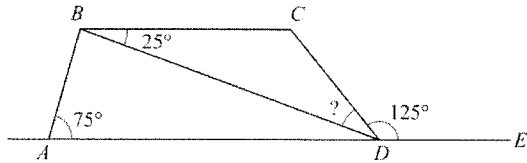
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40. In the figure below,  $ABCD$  is a trapezoid. Point  $E$  lies on line  $AD$ , and angle measures are as marked. What is the measure of angle  $BDC$ ?



DO YOUR FIGURING HERE.

- F.  $25^\circ$   
 G.  $30^\circ$   
 H.  $45^\circ$   
 J.  $55^\circ$   
 K.  $100^\circ$
41. For which of the following functions is  $f(-5) > f(5)$ ?
- A.  $f(x) = 6x^2$   
 B.  $f(x) = 6$   
 C.  $f(x) = 6/x$   
 D.  $f(x) = 6 - x^3$   
 E.  $f(x) = x^6 + 6$
42. For what value of  $n$  would the following system of equations have an infinite number of solutions?
- $$3a + b = 12$$
- $$12a + 4b = 3n$$
- F. 4  
 G. 9  
 H. 16  
 J. 36  
 K. 48
43. If  $x$  and  $y$  are positive integers such that the greatest common factor of  $x^2y^2$  and  $xy^3$  is 27, then which of the following could  $y$  equal?
- A. 81  
 B. 27  
 C. 18  
 D. 9  
 E. 3

GO ON TO THE NEXT PAGE.



44. What is the smallest possible integer for which 15% of that integer is greater than 2.3?

F. 3  
G. 12  
H. 15  
J. 16  
K. 18

**DO YOUR FIGURING HERE.**

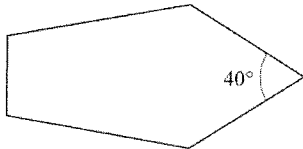
45. What is the distance in the standard  $(x,y)$  coordinate plane between the points  $(0,1)$  and  $(4,4)$ ?

A.  $\sqrt{7}$   
B. 3  
C. 4  
D. 5  
E.  $\sqrt{27}$

46. The sides of a triangle are 9, 12, and 15 centimeters long. What is the angle between the 2 shortest sides?

F.  $180^\circ$   
G.  $90^\circ$   
H.  $60^\circ$   
J.  $45^\circ$   
K.  $30^\circ$

47. In the pentagon, shown below, one interior angle measures  $40^\circ$ . What is the total measure of the other 4 interior angles?



- A.  $120^\circ$   
B.  $160^\circ$   
C.  $320^\circ$   
D.  $500^\circ$   
E.  $680^\circ$
48. For real numbers  $r$  and  $s$ , when is the equation  $|r - s| = |r + s|$  true?
- F. Always  
G. Only when  $r = s$   
H. Only when  $r = 0$  or  $s = 0$   
J. Only when  $r > 0$  and  $s < 0$   
K. Never

**GO ON TO THE NEXT PAGE.**



49. What is the value of  $\log_4 64$ ?

- A. 3
- B. 4
- C. 8
- D. 10
- E. 16

**DO YOUR FIGURING HERE.**

50. How many different positive three-digit integers can be formed if the three digits 3, 4, and 5 must be used in each of the integers?

- F. 6
- G. 8
- H. 12
- J. 15
- K. 24

51. Which of the following is the set of all real numbers  $x$  such that  $x - 3 < x - 5$ ?

- A. The empty set
- B. The set containing only zero
- C. The set containing all nonnegative real numbers
- D. The set containing all negative real numbers
- E. The set containing all real numbers

52. What is the slope of a line that is perpendicular to the line determined by the equation  $7x + 4y = 11$ ?

- F.  $-4$
- G.  $-\frac{7}{4}$
- H.  $\frac{11}{4}$
- J.  $4$
- K.  $\frac{4}{7}$

53. If each element in a data set is multiplied by 3, and each resulting product is then reduced by 4, which of the following expressions gives the mean of the resulting data set in terms of  $x$ ?

- A.  $x$
- B.  $3x - 4$
- C.  $x + \frac{4}{3}$
- D.  $\frac{x}{3} + 4$
- E.  $x + \frac{4}{3}$

**2****2**

54. If  $\cos \theta = -\frac{3}{5}$  and  $\frac{\pi}{2} < \theta < \pi$ , then  $\tan \theta = ?$

F.  $-\frac{5}{4}$

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

H.  $-\frac{3}{5}$

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

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

**DO YOUR FIGURING HERE.**

55. The City Council has approved the construction of a circular pool in front of City Hall. The area available for the pool is a rectangular region 12 feet by 18 feet, surrounded by a brick wall. If the pool is to be as large as possible within the walled area, and edge of the pool must be at least 2 feet from the wall all around, how many feet long should the radius of the pool be?

A. 14

B. 10

C. 7

D. 5

E. 4

56. Kate rode her bicycle to visit her grandmother. The trip to Kate's grandmother's house was mostly uphill, and took  $m$  minutes. On the way home, Kate rode mostly downhill and was able to travel at an average speed twice that of her trip to her grandmother's house. Which of the following expresses the total number of minutes that Kate bicycled on her entire trip?

F.  $3m$

G.  $2m$

H.  $m + \frac{1}{2}$

J.  $\frac{3m}{2}$

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

57. Let  $n$  equal  $3a + 2b - 7$ . What happens to the value of  $n$  if the value of  $a$  increases by 2 and the value of  $b$  decreases by 1?

A. It is unchanged.

B. It decreases by 1.

C. It increases by 4.

D. It decreases by 4.

E. It decreases by 2.

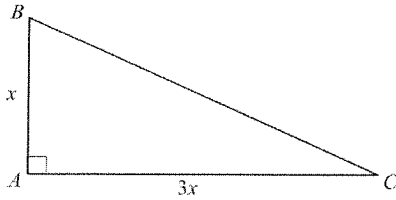
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58. In the figure below,  $\triangle ABC$  is a right triangle with legs that measure  $x$  and  $3x$  inches, respectively. What is the length, in inches, of the hypotenuse?

**DO YOUR FIGURING HERE.**

- F.  $\sqrt{10}x$   
G.  $\sqrt{3}x$   
H.  $\sqrt{2}x$   
J.  $2x$   
K.  $4x$
59. If the edges of a cube are tripled in length to produce a new, larger cube, then the larger cube's surface area is how many times larger than the smaller cube's surface area?  
A. 3  
B. 9  
C. 18  
D. 27  
E. 54
60. Considering all values of  $a$  and  $b$  for which  $a + b$  is at most 9,  $a$  is at least 2, and  $b$  is at least  $-2$ , what is the minimum value of  $b - a$ ?  
F. 0  
G.  $-7$   
H.  $-11$   
J.  $-13$   
K.  $-15$

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