MATHEMATICS TEST

60 Minutes—60 Questions

DIRECTIONS: Solve each problem, choose the correct answer, and then fill in the corresponding oval on your answer document.

Do not linger over problems that take too much time. Solve as many as you can; then return to the others in the time you have left for this test.

You are permitted to use a calculator on this test. You may use your calculator for any problems you choose, but some of the problems may best be done without using a calculator.

Note: Unless otherwise stated, all of the following should be assumed.

1. Illustrations are NOT necessarily drawn to scale.
2. Geometric figures lie in a plane.
3. The word *line* indicates a straight line.
4. The word *average* indicates arithmetic mean.

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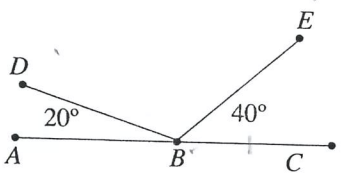
1. Ten students are receiving honors credit for taking Mr. Friedman's class. This number is exactly 20% of the total number of students in the class. How many students are in Mr. Friedman's class?

A. 12
B. 15
C. 18
D. 20
E. 50

DO YOUR FIGURING HERE.

2. In the figure below, points A, B, and C are on a straight line. What is the measure of angle DBE?



F. 60°
G. 80°
H. 100°
J. 120°
K. 140°

A

3. What is the fifth term of the arithmetic sequence 7, 4, 1, ... ?

   A. $^{-}5$
   B $^{-}2$
   C. 1
   D. 4
   E. 14

DO YOUR FIGURING HERE.

4. Which of the following values of c is the solution to the proportion $\frac{20}{8} = \frac{c}{10}$?

   F. 4
   G. 16
   H. 18
   J. 22
   K. 25

5. If G, H, and K lie on the same line, and $\overline{GK} \approx \overline{HK}$, then which of the following must be true?

   A. G is the midpoint of $\overline{HK}$.
   B. H is the midpoint of $\overline{GK}$.
   C. K is the midpoint of $\overline{GH}$.
   D. G is the midpoint of $\overline{KH}$.
   E. K is the midpoint of $\overline{KG}$.

A

6. Four pieces of yarn, each 1.2 meters long, were cut from the end of a ball of yarn that was 50 meters long before the four pieces were cut. How many meters of yarn are left?

   F. 45.2
   G. 45.8
   H. 46.8
   J. 47.2
   K. 47.8

GO ON TO THE NEXT PAGE.

7. If $x = {}^{-}2$, then $14 - 3(x + 3) = ?$

   A. $^{-}1$
   B. 11
   C. 14
   D. 17
   E. 29

DO YOUR FIGURING HERE.

8. $^{-}|^{-}6| - (^{-}6) = ?$

   F. $^{-}36$
   G. $^{-}12$
   H. 0
   J. 12
   K. 36

9. A car dealership expects an increase of 15% in its current annual sales of 3,200 cars. What will be its new annual sales?

   A. 3,215
   B. 3,248
   C. 3,680
   D. 4,700
   E. 4,800

10. If $x^4 = 90$ and x is a real number, then x lies between which two consecutive integers?

    F. 2 and 3
    G. 3 and 4
    H. 4 and 5
    J. 5 and 6
    K. 6 and 7

A

11. If $47 - x = 188$, then $x = ?$

A. $^{-}235$
B. $^{-}141$
C. 4
D. 141
E. 235

DO YOUR FIGURING HERE.

12. Group A needs 8 more hours than Group B in order to paint a wall. Group B needs twice as long as Group C to complete the same task. If Group C took h hours to paint a wall in Katy's house, how many hours would the task have taken Group A?

F. $10h$
G. $16h$
H. $10 + h$
J. $2(8 + h)$
K. $8 + 2h$

13. In the standard (x, y) coordinate plane, three corners of a rectangle are located at $(2, ^{-}2)$, $(^{-}5, ^{-}2)$, and $(2, ^{-}5)$. What is the location of the rectangle's fourth corner?

A. $(2, 5)$
B. $(^{-}2, 5)$
C. $(^{-}2, 2)$
D. $(^{-}2, ^{-}5)$
E. $(^{-}5, ^{-}5)$

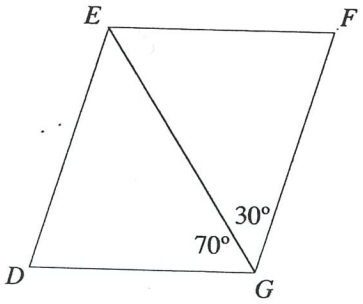
A

14. Which of the following is another way to write $5a - 5b + 3a$?

F. $5(a - b + 3)$
G. $(a - b)(5 + 3a)$
H. $a(8 - 5b)$
J. $8a - 5b$
K. $2a - 5b$

15. What is the measure of angle *FEG* in the parallelogram below?

DO YOUR FIGURING HERE.



A. 30°
B. 40°
C. 50°
D. 60°
E. 70°

16. What is the slope of any line parallel to the line $4x + 3y = 9$?

F. -4
G. $-\frac{4}{3}$
H. $\frac{4}{9}$
J. 4
K. 9

17. If $x > 0$ and $3x^2 - 7x - 20 = 0$, then $x = ?$

A. $\frac{5}{3}$
B. 3
C. 4
D. 7
E. 20

A

GO ON TO THE NEXT PAGE.

18. The lengths of the sides of a triangle are 2, 5, and 8 centimeters. How many centimeters long is the shortest side of a similar triangle that has a perimeter of 30 centimeters?

F. 4
G. 7
H. 10
J. 15
K. 16

DO YOUR FIGURING HERE.

19. A shirt that normally sells for $24.60 is on sale for 15% off. How much does it cost during the sale, to the nearest dollar?

A. $ 4
B. $10
C. $20
D. $21
E. $29

20. Which of the following is a factored form of $3xy^4 + 3x^4y$?

F. $3x^4y^4(y + x)$
G. $3xy(y^3 + x^3)$
H. $6xy(y^3 + x^3)$
J. $3x^4y^4$
K. $6x^5y^5$

A

21. If $x - 2y = 0$ and $3x + y = 7$, what is the value of x?

A. $^{-}1$
B. 0
C. 1
D. 2
E. 3

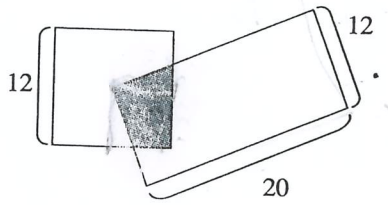
GO ON TO THE NEXT PAGE.

22. There are three feet in a yard. If 2.5 yards of fabric at Fabric World cost $4.50, what is the fabric's price per foot?

F. $ 0.60
G. $ 0.90
H. $ 1.50
J. $ 1.80
K. $11.25

DO YOUR FIGURING HERE.

23. The figure below shows a square overlapping a rectangle. One vertex of the rectangle is in the center of the square. What is the area, in square units, of the shaded region?

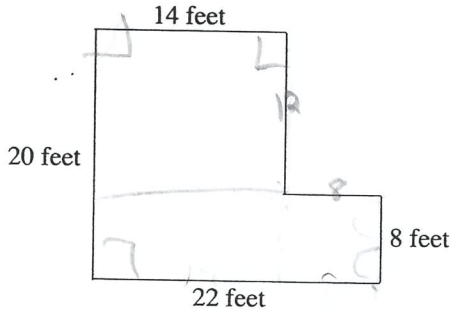


A. 9
B. 18
C. 36
D. 72
E. 144

A

24. Caleb's floor has the dimensions shown below. How many square feet of tile will Caleb need in order to cover his entire floor? (Note: All angles are right angles.)

DO YOUR FIGURING HERE.

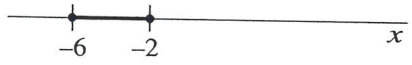


F. 64
G. 96
H. 160
J. 344
K. 484

25. Which of the following is the graph of the inequality $x - 2 \leq -4$?

A.


B.


C.


D.


E.


A

26. Betty sells jewelry. She earns $7h + 0.04s$ dollars, where h is the number of hours worked, and s is the total price of the jewelry sold. What would she earn for working 15 hours and selling $120.50 worth of jewelry?

F. $109.82
G. $153.20
H. $226.10
J. $231.50
K. $848.32

DO YOUR FIGURING HERE.

27. Which of the following is less than $\frac{3}{5}$?

A. $\frac{4}{6}$
B. $\frac{8}{13}$
C. $\frac{6}{10}$
D. $\frac{7}{11}$
E. $\frac{4}{7}$

28. What is the area, in square feet, of a right triangle with sides of lengths 7 feet, 24 feet, and 25 feet?

F. 56
G. 84
H. $87\frac{1}{2}$
J. 168
K. 300

A

DO YOUR FIGURING HERE.

29. When Mike's graduating class is arranged in rows of 6 people each, the last row is one person short. When it is arranged in rows of 7, the last row is still one person short. When the class is arranged in rows of 8, the last row is *still* one person short. What is the fewest possible number of people in Mike's graduating class?

A. 23
B. 41
C. 71
D. 167
E. 335

30. The lengths of two sides of a triangle are 3.5 inches and 6 inches. Which of the following CANNOT be the length, in inches, of the third side?

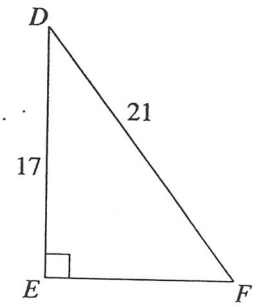
F. 2
G. 3
H. 4
J. 5
K. 6

31. For all $b > 0$, $\frac{4}{5} + \frac{1}{b} = ?$

A. $\frac{4}{5b}$
B. $\frac{5}{5b}$
C. $4b + \frac{5}{5b}$
D. $\frac{5}{5}$
E. $\frac{4b+5}{5b}$

A

32. How long is side $\overline{EF}$ in the right triangle below?



F. $\sqrt{21^2 - 17^2}$
G. $\sqrt{21^2 + 17^2}$
H. $21^2 - 17^2$
J. $21^2 + 17^2$
K. $\sqrt{21 - 17}$

DO YOUR FIGURING HERE.

33. The measure of each side of square $JKLM$ is b inches. If its length is increased by 2 inches and its width is increased by 3 inches, a rectangle will be formed. What will be the area, in square inches, of the new rectangle?

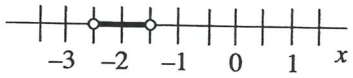
A. $2b + 5$
B. $4b + 10$
C. $b^2 + 6$
D. $b^2 + 5b + 5$
E. $b^2 + 5b + 6$

34. If $\sin \beta = \frac{8}{17}$, and $\cos \beta = \frac{15}{17}$, what is the value of $\tan \beta$?

F. $\frac{7}{17}$
G. $\frac{8}{15}$
H. $\frac{23}{17}$
J. $\frac{15}{8}$
K. $\frac{120}{17}$

A

35. Which of the following best describes the graph on the number line below?



A. $^{-}|x| = {}^{-}2$
B. $^{-}|x| < 0.5$
C. $^{-}3 < x < {}^{-}1$
D. $^{-}1.5 < x < {}^{-}2.5$
E. $^{-}1.5 > x > {}^{-}2.5$

DO YOUR FIGURING HERE.

36. Carolyn's basketball team made 1-point, 2-point, and 3-point shots during their last game. Twenty percent of their baskets were worth 1 point, 70% of their baskets were worth 2 points, and 10% of their baskets were worth 3 points. To the nearest tenth of a point, what was the average point value of the shots made by Carolyn's basketball team?

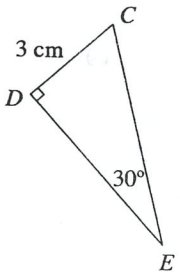
F. 1.4
G. 1.7
H. 1.8
J. 1.9
K. 2.0

37. What is the largest possible product of two odd integers whose sum is 42?

A. 117
B. 185
C. 259
D. 377
E. 441

38. In the triangle below, if $\overline{CD}$ is 3 centimeters long, what is the length of $\overline{CE}$?

DO YOUR FIGURING HERE.

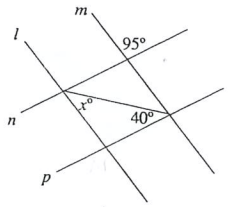


F. 3 cm
G. $3\sqrt{2}$ cm
H. $3\sqrt{3}$ cm
J. 6 cm
K. 9 cm

39. In the (x, y) coordinate plane, what is the y-intercept of the line $12x - 3y = 12$?

A. $^{-}4$
B. $^{-}3$
C. 0
D. 4
E. 12

40. In the figure below, lines l and m are parallel, and lines n and p are parallel. What is the value of x?



F. 40
G. 45
H. 50
J. 70
K. 85

A

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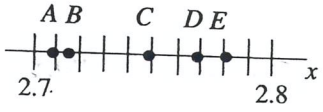
41. Which of the points graphed on the number line below is closest to the value of e?
(Note: $e \approx 2.718281828$)



A. A
B. B
C. C
D. D
E. E

DO YOUR FIGURING HERE.

42. For which value of a does the following system of equations have no solution?

$$-x + 6y = 7$$
$$-5x + 10ay = 32$$

F. $\frac{5}{3}$
G. 3
H. 6
J. 30
K. 60

43. The expression $(360 - x)°$ is the measure of a nonzero obtuse angle if and only if:

A. $0 < x < 90$
B. $0 < x < 180$
C. $180 < x < 270$
D. $180 < x < 360$
E. $270 < x < 360$

44. If $p - q = -4$ and $p + q = -3$, then $p^2 - q^2 = ?$

F. -12
G. -7
H. 7
J. 12
K. 25

DO YOUR FIGURING HERE.

45. The lengths of the sides of a triangle are 6 meters, 8 meters, and 10 meters. What is the angle formed by the intersection of the two shortest sides?

A. $30°$
B. $45°$
C. $60°$
D. $90°$
E. $135°$

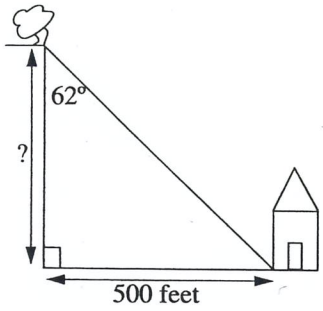
46. In the standard (x, y) coordinate plane, if the x-coordinate of each point on a line is 9 more than three times the y-coordinate, the slope of the line is:

F. -9
G. -3
H. $\frac{1}{3}$
J. 3
K. 9

A

47. A tree is growing at the edge of a cliff, as shown below. From the tree, the angle between the base of the cliff and the base of a nearby house is 62°. If the distance between the base of the cliff and the base of the house is 500 feet, how many feet tall is the cliff?

DO YOUR FIGURING HERE.



A. $500 \cos 62°$

B. $500 \tan 62°$

C. $\frac{500}{\sin 62°}$

D. $\frac{500}{\cos 62°}$

E. $\frac{500}{\tan 62°}$

48. Two numbers have a greatest common factor of 9 and a least common multiple of 54. Which of the following is the pair of numbers?

F. 9 and 18

G. 9 and 27

H. 18 and 27

J. 18 and 54

K. 27 and 54

49. Five functions are listed below. If k is a real number less than 1, and $a(x) = 5^x$, which of these functions yields the greatest value of $a(b(x))$ for all $x > 2$?

A. $b(x) = \frac{k}{x}$

B. $b(x) = \frac{x}{k}$

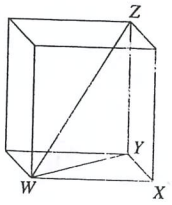
C. $b(x) = kx$

D. $b(x) = x^k$

E. $b(x) = \sqrt[k]{x}$

DO YOUR FIGURING HERE.

50. Line segments $\overline{WX}$, $\overline{XY}$, and $\overline{YZ}$ form the rectangular box shown below, and have lengths of 12 centimeters, 5 centimeters, and 13 centimeters, respectively. What is the cosine of $\angle ZWY$?



F. $\frac{5}{13}$

G. $\frac{\sqrt{2}}{2}$

H. $\frac{12}{13}$

J. 1

K. $\frac{13\sqrt{2}}{12}$

A

51. A certain circle has an area of 4π square centimeters. What is the length, in centimeters, of its radius?

A. $\frac{1}{4}$

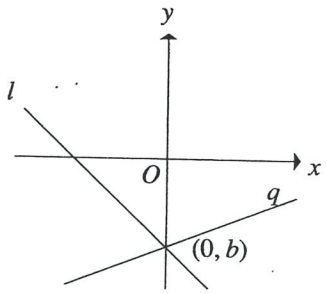
B. 2

C. 4

D. 2π

E. 4π

52. The equation of line l below is $y = mx + b$. Which of the following could be the equation of line q?



F. $y = \frac{1}{2}mx$

G. $y = \frac{1}{2}mx - b$

H. $y = \frac{1}{2}mx + b$

J. $y = -\frac{1}{2}mx - b$

K. $y = -\frac{1}{2}mx + b$

53. The equation $x^2 - 6x + k = 0$ has exactly one solution for x. What is the value of k?

A. 0

B. 3

C. 6

D. 9

E. 12

54. What is the slope of the line that passes through the origin and $(\frac{1}{3}, \frac{3}{4})$?

F. $\frac{1}{4}$

G. $\frac{1}{3}$

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

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

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

DO YOUR FIGURING HERE.

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55. If R, S, and T are real numbers, and $RST = 2$, which of the following *must* be true?

A. $RT = \frac{2}{S}$

B. R, S, and T are all positive.

C. $R = 2$, $S = 2$, or $T = 2$

D. $R = 0$, $S = 0$, or $T = 0$

E. $R > 2$, $S > 2$, or $T > 2$

DO YOUR FIGURING HERE.

56. A square has sides of length $(w + 5)$ units. If a rectangle with a length of $(w + 2)$ units and a width of $(w - 3)$ units is removed from the interior of the square, which of the following is the remaining area of the square?

F. 31 square units

G. $9w + 19$ square units

H. $11w + 31$ square units

J. $w^2 + 10w + 25$ square units

K. $2w^2 + 9w + 19$ square units

57. What is the smallest positive value for θ where $\sin 2\theta$ reaches its minimum value?

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

B. $\frac{\pi}{2}$

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

D. π

E. $\frac{3\pi}{2}$

A

58. In the standard (x, y) coordinate plane, if the distance between the points $(r, 6)$ and $(10, r)$ is 4 units, which of the following is the value of r?

F. 3
G. 4
H. 7
J. 8
K. 10

59. Calleigh put 5 nickels into an empty hat. She wants to add enough pennies so that the probability of drawing a nickel at random from the hat is $\frac{1}{6}$. How many pennies should she put into the hat?

A. 1
B. 5
C. 10
D. 25
E. 30

60. How many different integer values of x satisfy the inequality $\frac{1}{5} < \frac{3}{x} < \frac{1}{3}$?

F. 1
G. 2
H. 3
J. 4
K. 5

DO YOUR FIGURING HERE.

A

END OF TEST.

STOP! DO NOT TURN THE PAGE UNTIL TOLD TO DO SO.