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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.

1. Which point in the standard (x,y) coordinate plane below has the coordinates $(2,-5)$?
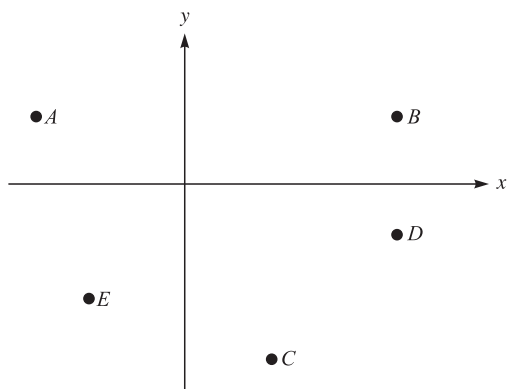
  A. *A*
  B. *B*
  C. *C*
  D. *D*
  E. *E*

2. Assume that the statements in the box below are true.

> All students who attend Tarrytown High School have a student ID.
> Amelia does not attend Tarrytown High School.
> Carrie has a student ID.
> Traci has a student ID.
> Joseph attends Grayson High School.
> Michael is a high school student who attends Tarrytown High School.

Considering only the statements in the box, which of the following statements must be true?
  F. Michael has a student ID.
  G. Amelia is not a high school student.
  H. Carrie attends Tarrytown High School.
 **J.** Traci attends Tarrytown High School.
  K. Joseph does not have a student ID.

DO YOUR FIGURING HERE.

GO ON TO THE NEXT PAGE.

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3. The balance of Juan's savings account quadrupled during the year. At the end of the year, Juan withdrew $300, and the resulting balance was $400. What was the balance in the account before it quadrupled?
   A. $100
   B. $175
   C. $300
   D. $350
   E. $700

4. For what value of a is the equation $3(a + 5) - a = 23$ true?
   F. 9
   G. 8
   H. 5
   J. 4
   K. 2

5. On the real number line below, numbers decrease in value from right to left, and Y is positive. The value of X must be:

left   X   Y   right
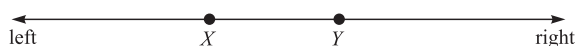
   A. positive.
   B. negative.
   C. greater than Y.
   D. less than Y.
   E. between 0 and Y.

6. In $\triangle ABC$ below, $AB \cong BC$, and the measure of $\angle B$ is $55°$. What is the measure of $\angle C$?
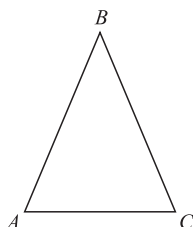
   F. 27.5°
   G. 55°
   H. 62.5°
   J. 125°
   K. Cannot be determined from the given information

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

DO YOUR FIGURING HERE.

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8. Which of the following is a factor of the polynomial $x^2 + 3x - 18$?

F. $x - 6$
G. $x - 12$
H. $x - 18$
J. $x + 3$
K. $x + 6$

9. A line in the standard (x, y) coordinate plane is parallel to the x-axis and 5 units below it. Which of the following is an equation of this line?

A. $y = -5$
B. $x = -5$
C. $y = -5x$
D. $y = x - 5$
E. $x = y - 5$

10. $\dfrac{2r}{3} + \dfrac{4s}{5}$ is equivalent to:

F. $\dfrac{2r + 4s}{8}$
G. $\dfrac{2r + 4s}{15}$
H. $\dfrac{2(r + 2s)}{15}$
J. $\dfrac{(10r + 12s)}{15}$
K. $\dfrac{2(10r + 12s)}{15}$

11. A pie recipe calls for $\dfrac{1}{3}$ cup sugar to make one 9-inch pie. According to this recipe, how many cups of sugar should be used to make three 9-inch pies?

A. $\dfrac{1}{9}$
B. $\dfrac{2}{3}$
C. 1
D. $1\dfrac{1}{9}$
E. 3

12. $|5 - 3| - |2 - 6| = ?$

F. -4
G. -2
H. 2
J. 4
K. 6

DO YOUR FIGURING HERE.

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13. If Ryan traveled 20 miles in 4 hours and Jeff traveled twice as far in half the time, what was Jeff's average speed, in miles per hour?
A. 80
B. 40
C. 20
D. 10
E. 5

14. If $x = -5$, what is the value of $2x^2 + 6x$?
F. -80
G. -20
H. 5
J. 20
K. 50

15. For what value of a is $b = 4$ a solution to the equation $b - 2 = ab + 16$?
A. -3.5
B. -1.5
C. 0
D. 3.5
E. 7

16. In the figure below, S and T are points on RU. What is the ratio of the area of square $STVX$ to the area of parallelogram $RUVY$?
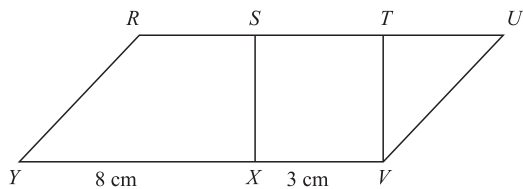
F. 3:8
G. 1:11
H. 3:11
J. 9:11
K. 3:24

DO YOUR FIGURING HERE.

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17. If $f(x) = 2x^2 - 6x + 7$, then $f(-3) =$?

   A. 7

   B. 18

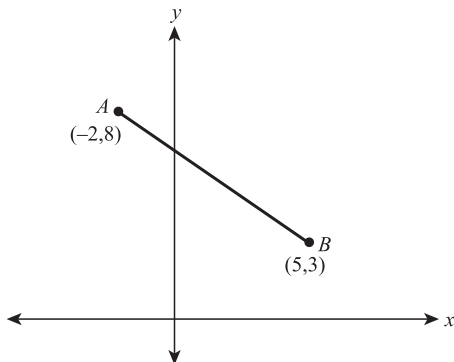   **C.** 25

   D. 36

   E. 43

18. A map is drawn so that 1.2 inches represents 50 miles. About how many miles do 1.4 inches represent?

   F. 54

   G. 58

   H. 65

   J. 70

   K. 100

19. $(5x^3 + 3xz^2 - 17z) - (4xz^2 + 5z - 2x^3) = $?

   A. $7x^3 - xz^2 - 22z$

   B. $7x^3 - xz^2 - 12z$

   C. $3x^3 - xz^2 - 12z$

   D. $3x^3 + 7xz^2 - 22z$

   E. $3x^3 + 7xz^2 - 12z$

20. In the standard (x,y) coordinate plane shown below, what is the distance on the y-axis, in units, from point A to point B?

   F. -3

   G. -5

   H. 3

   J. 5

   K. 11

21. Which of the following is NOT a solution of $(x - 5)(x - 3)(x + 3)(x + 9) = 0$?

   A. 5

   B. 3

   C. -3

   D. -5

   E. -9

22. If $0 < pr < 1$, then which of the following CANNOT be true?

   F. $p < 0$ and $r < 0$

   G. $p < -1$ and $r < 0$

   H. $p < -1$ and $r < -1$

   J. $p < 1$ and $r < 1$

   K. $p < 1$ and $r > 0$

DO YOUR FIGURING HERE.

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23. If $n = 10$, then which of the following represents 552?
A. $5n + 2$
B. $5n^2 + 2$
C. $5n^2 + 5n + 2$
D. $5n^3 + 5n + 2$
E. $5n^4 + 5n + 2$

24. What is the value of b in the solution to the system of equations below?
$$3a - b = 18$$
$$a + 3b = -4$$
F. -10
G. -3
H. 3
J. 6
K. cannot be determined with the given information

25. Which of the following is an equivalent form of $x + x(x + x + x)$?
A. $5x$
B. $x^2 + 3x$
C. $3x^2 + x$
D. $5x^2$
E. $x^3 + x$

26. Due to inflation, a refrigerator that formerly sold for $450 now sells for 7% more. Which of the following calculations gives the current cost, in dollars, of the refrigerator?
F. $450 + 7$
G. $450 + 450(0.07)$
H. $450 + 450(0.7)$
J. $450 + 450(7)$
K. $450(0.07)$

27. In a 3-dimensional (x, y, z) space, the set of all points 5 units from the x-axis is:
A. a line.
B. 2 parallel lines.
C. a circle.
D. a sphere.
E. a cylinder.

28. An overlay of an accessibility ramp of a building is placed on the standard (x, y) coordinate plane so that the x-axis aligns with the horizontal. The line segment representing the side view of the ramp goes through the points $(-2, -1)$ and $(16, 2)$. What is the slope of the accessibility ramp?
F. -3
G. $-\dfrac{1}{3}$
H. $-\dfrac{1}{6}$
J. $\dfrac{1}{6}$
K. $\dfrac{1}{14}$

DO YOUR FIGURING HERE.

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29. The number 0.002 is 100 times as large as which of the following numbers?
A. 0.000002
B. 0.00002
C. 0.0002
D. 0.02
E. 0.2

DO YOUR FIGURING HERE.

30. The volume, V, of a sphere is determined by the formula $V = \dfrac{4\pi r^3}{3}$, where r is the radius of the sphere. What is the volume, in cubic inches, of a sphere with a diameter 12 inches long?
F. 48π
G. 72π
H. 288π
J. 864π
K. 2304π

31. Which of the following is equal to $\dfrac{\left(\dfrac{1}{3} - \dfrac{1}{4}\right)}{\left(\dfrac{1}{3} + \dfrac{1}{4}\right)}$?

A. $-\dfrac{1}{7}$

B. $\dfrac{1}{7}$

C. $\dfrac{1}{12}$

D. $\dfrac{7}{12}$

E. $\dfrac{12}{7}$

32. One traffic light flashes every 6 seconds. Another traffic light flashes every 9 seconds. If they flash together and you begin counting seconds, how many seconds after they flash together will they next flash together?
F. 6
G. 9
H. 18
J. 36
K. 54
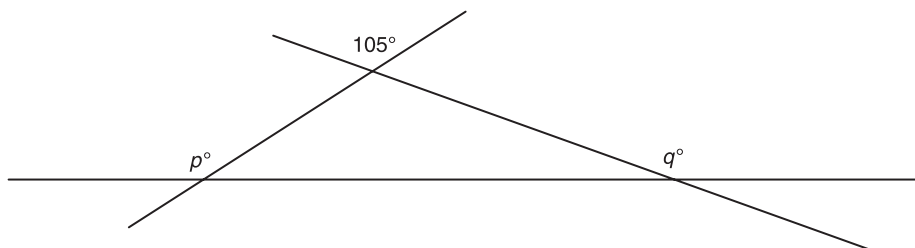
33. If $\sqrt{2x} + 5 = 9$, then $x = $?
A. -4
B. 2
C. 4
D. 8
E. 16

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34. In the figure below, what is the sum of p and q?

DO YOUR FIGURING HERE.

105°

$p°$

$q°$

  F. 75°
  G. 150°
  H. 180°
  J. 285°
  K. 360°

35. How many ordered pairs (x, y) of real numbers will satisfy the equation $5x - 7y = 13$?
  A. 0
  B. 1
  C. 2
  D. 3
  E. Infinitely many

36. How many different positive 3-digit integers can be formed if the three digits 3, 4, and 5 must be used in each of the integers?
  F. 6
  G. 7
  H. 8
  J. 9
  K. 12
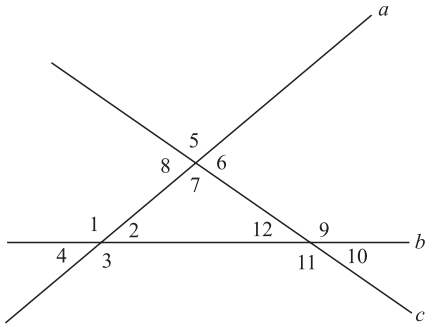
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37. Each of the 3 lines crosses the other 2 lines as shown below. Which of the following relationships, involving angle measures (in degrees) *must* be true?

    I. $m\angle 2 + m\angle 7 + m\angle 12 = 180°$
   II. $m\angle 4 + m\angle 5 + m\angle 10 = 180°$
  III. $m\angle 3 + m\angle 8 + m\angle 11 = 180°$

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

38. If $x^2 - y^2 = 49$ and $x - y = 7$, then $x =$?
  F. 14
  G. 7
  H. 4
  J. -4
  K. -7

39. For $a \neq 0$, $\dfrac{a^9}{a^3}$ is equivalent to:
  A. 1
  B. 3
  C. a^3
  D. a^4
  E. a^6

DO YOUR FIGURING HERE.

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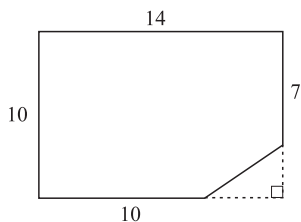**40.** The polygon below was once a rectangle with sides 10 and 14 before a triangle was cut off. What is the perimeter, in inches, of this polygon?

F. 54
G. 48
H. 46
J. 41
K. 36

41. A circle in the standard (x, y) coordinate plane has center $(-4, 5)$ and radius 5 units. Which of the following equations represents this circle?
A. $(x - 4)^2 - (y + 5)^2 = 5$
B. $(x - 4)^2 + (y + 5)^2 = 5$
C. $(x - 4)^2 - (y + 5)^2 = 25$
D. $(x + 4)^2 + (y - 5)^2 = 25$
E. $(x + 4)^2 - (y - 5)^2 = 25$

42. For the triangle shown below, what is the value of $\tan x$?
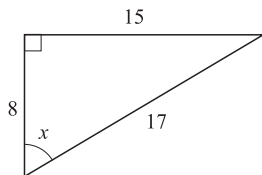
F. $\dfrac{8}{15}$

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

H. $\dfrac{15}{8}$

J. $\dfrac{15}{17}$

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

43. You have enough material to build a fence 120-feet long. If you use it all to enclose a square region, how many square feet will you enclose?
A. 900
B. 480
C. 240
D. 120
E. 60

DO YOUR FIGURING HERE.

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44. For what nonzero whole number k does the quadratic equation $y^2+2ky+4k = 0$ have exactly one real solution for y?

  F. 8
  G. 4
  H. 2
  J. -4
  K. -8

45. In $\triangle ABC$ below, points B, D, and C are collinear. Segment AB is perpendicular to segment BC, and segment AD bisects angle BAC. If the measure of angle DCA is 60°, what is the measure of angle ADB?
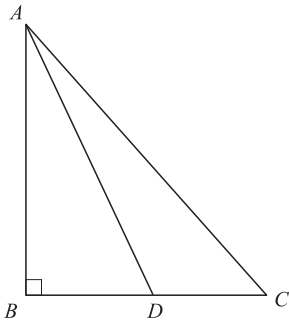
  A. 15°
  B. 45°
  C. 60°
  D. 75°
  E. 105°

46. For all $x > 4$, $\dfrac{4x - x^2}{x^2 - 2x - 8} = ?$

  F. $-\dfrac{x}{x + 2}$

  G. $\dfrac{x}{x - 2}$

  H. $\dfrac{1}{x + 2}$

  J. $-\dfrac{1}{8}$

  K. $\dfrac{1}{8}$

DO YOUR FIGURING HERE.

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47. If the circumference of a circle is $\frac{4}{3}\pi$ inches, how many inches long is its radius?

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

   B. $\frac{3}{2}$

   C. $\frac{2}{3}$

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

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

48. If the function f satisfies the equation $f(x+y) = f(x) + f(y)$ for every pair of real numbers x and y, what is (are) the possible value(s) of $f(1)$?
   F. Any real number
   G. Any positive real number
   H. 0 and 1 only
   J. 0 only
   K. 1 only

49. The area of the trapezoid below is 24 square inches, the altitude is 3 inches, and the length of one base is 5 inches. What is the length, b, of the other base, in inches?
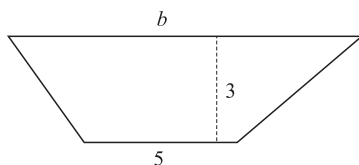
   A. 3
   B. 8
   C. 11
   D. 13
   E. 16

50. If a, b, and c are consecutive positive integers and $2^a \times 2^b \times 2^c = 512$, then $2^a + 2^b + 2^c =$?
   F. 6
   G. 9
   H. 14
   J. 16
   K. 28

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51. If 30% of x equals 60% of y, which of the following expresses y in terms of x ?
A. $y = 33\%$ of x
B. $y = 50\%$ of x
C. $y = 66\%$ of x
D. $y = 150\%$ of x
E. $y = 200\%$ of x

52. For which values of x will $3(x + 4) \geq 9(4 + x)$?
F. $x \leq -4$
G. $x \geq -4$
H. $x \geq -16$
J. $x \leq 4$
K. $x \leq -16$

53. If $x = 6a + 3$ and $y = 9 + a$, which of the following expresses y in terms of x?
A. $y = x + 51$
B. $y = 7x + 12$
C. $y = 9 + x$
D. $y = \dfrac{57 + x}{6}$
E. $y = \dfrac{51 + x}{6}$

54. ABCD is a trapezoid that is bisected by line PQ, which is parallel to lines AB and DC. If the length of line DP is 8 units, the length of line PA is 12 units, and the length of line AB is 36 units, what is the length of PQ?
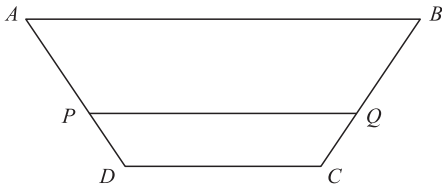
F. 8
G. 9
H. 12
J. 16
K. 24

55. The total weekly profit p, in dollars, from producing and selling x units of a certain product is given by the function $p(x) = 225x - (165x + c)$, where c is a constant. If 75 units were produced and sold last week for a profit of $3,365, what is the value of c?
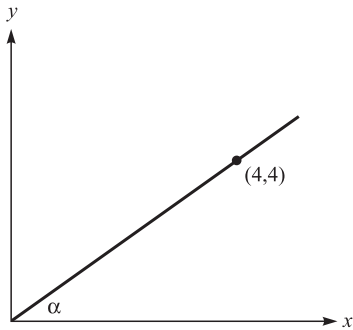A. $-1{,}135$
B. -745
C. $1{,}135$
D. $4{,}500$
E. $9{,}010$

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56. In the figure below, sin α =?   **DO YOUR FIGURING HERE.**

F. $\dfrac{1}{2}$

G. $\dfrac{\sqrt{3}}{2}$

H. 1

J. $\dfrac{\sqrt{2}}{2}$

K. $\dfrac{\sqrt{2}}{4}$

57. For all real integers, which of the following is *always* an even number?

I. $x^3 + 4$
II. $2x + 4$
III. $2x^2 + 4$

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

2 △ △ △ △ △ △ △ △ 2

58. Carol has an empty container and puts in 6 red chips. She now wants to put in enough white chips so that the probability of drawing a red chip at random from the container is $\frac{3}{8}$. How many white chips should she put in?

  F. 3
  G. 6
  H. 8
  J. 10
  K. 16

59. A wheel 27 inches in diameter rolls along a line. How many inches does the wheel roll along the line in 32 revolutions?

  A. 27π
  B. 32π
  C. 432π
  D. 864π
  E. $1{,}728\pi$

60. For any real number a, the equation $|x - 2a| = 5$. On a number line, how far apart are the 2 solutions for x?

  F. $2a$
  G. $5 + 2a$
  H. $10a$
  J. 5
  K. 10

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