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. Illustrative figures 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.

DO YOUR FIGURING HERE.

1. Kaya ran $1\frac{2}{5}$ miles on Monday and $2\frac{1}{3}$ miles on Tuesday. What was the total distance, in miles, Kaya ran during those 2 days?

   A. $3\frac{2}{15}$

   B. $3\frac{3}{8}$

   C. $3\frac{2}{5}$

   D. $3\frac{7}{15}$

   E. $3\frac{11}{15}$

2. $3x^3 \cdot 2x^2y \cdot 4x^2y$ is equivalent to:

   F. $9x^7y^2$

   G. $9x^{12}y^2$

   H. $24x^7y^2$

   J. $24x^{12}y$

   K. $24x^{12}y^2$

3. Mr. Dietz is a teacher whose salary is $22,570 for this school year, which has 185 days. In Mr. Dietz's school district, substitute teachers are paid $80 per day. If Mr. Dietz takes a day off without pay and a substitute teacher is paid to teach Mr. Dietz's classes, how much less does the school district pay in salary by paying a substitute teacher instead of paying Mr. Dietz for that day?

   A. $ 42
   B. $ 80
   C. $ 97
   D. $105
   E. $122

4. So far, a student has earned the following scores on four 100-point tests this grading period: 65, 73, 81, and 82. What score must the student earn on the fifth and last 100-point test of the grading period to earn an average test grade of 80 for the 5 tests?

   F. 75
   G. 76
   H. 78
   J. 99
   K. The student cannot earn an average of 80.

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5. The oxygen saturation level of a river is found by dividing the amount of dissolved oxygen the river water currently has per liter by the dissolved oxygen capacity per liter of the water and then converting to a percent. If the river currently has 7.3 milligrams of dissolved oxygen per liter of water and the dissolved oxygen capacity is 9.8 milligrams per liter, what is the oxygen saturation level, to the nearest percent?

A. 34%
B. 70%
C. 73%
D. 74%
E. 98%

6. A rectangular lot that measures 150 ft by 200 ft is completely fenced. What is the approximate length, in feet, of the fence?

F. 300
G. 350
H. 400
J. 700
K. 1,400

7. The expression $a[b + (c - d)]$ is equivalent to:
A. $ab + ac - ad$
B. $ab + ac + ad$
C. $ab + ac - d$
D. $ab + c + d$
E. $ab + c - d$

8. If $4x + 3 = 9x - 4$, then $x = ?$

F. $\frac{7}{5}$

G. $\frac{5}{7}$

H. $\frac{7}{13}$

J. $\frac{1}{5}$

K. $-\frac{1}{5}$

9. What 2 numbers should be placed in the blanks below so that the difference between consecutive numbers is the same?

$$17, \underline{\quad}, \underline{\quad}, 41$$

A. 23, 29
B. 24, 34
C. 25, 33
D. 26, 35
E. 27, 31

Practice ACT Tests

DO YOUR FIGURING HERE.

10. If x is a real number such that $x^3 = 64$, then $x^2 + \sqrt{x} = $?

   F.   4
   G.   10
   H.   18
   J.   20
   K.   47

11. A formula for the volume V of a sphere with radius r is

   $V = \frac{4}{3}\pi r^3$. If the radius of a spherical rubber ball is

   $1\frac{1}{4}$ inches, what is its volume to the nearest cubic

   inch?

   A.   5
   B.   7
   C.   8
   D.   16
   E.   65

12. If a marble is randomly chosen from a bag that contains exactly 8 red marbles, 6 blue marbles, and 6 white marbles, what is the probability that the marble will NOT be white?

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

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

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

   J. $\frac{3}{10}$

   K. $\frac{7}{10}$

13. The number of students participating in fall sports at a certain high school can be shown by the following matrix.

   Tennis   Soccer   Cross-Country   Football
   [40   60   80   80]

   The athletic director estimates the ratio of the number of sports awards that will be earned to the number of students participating with the following matrix.

Tennis	0.3
Soccer	0.4
Cross-Country	0.2
Football	0.5

   Given these matrices, what is the athletic director's estimate for the number of sports awards that will be earned for these fall sports?

   A.   80
   B.   88
   C.   91
   D.   92
   E.   99

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

Use the following information to answer
questions 14–15.

The following chart shows the current enrollment in all the
mathematics classes offered by Eastside High School.

Course title	Section	Period	Enrollment
Pre-Algebra	A	3	23
Algebra I	A	2	24
	B	3	25
	C	4	29
Geometry	A	1	21
	B	2	22
Algebra II	A	4	28
Pre-Calculus	A	6	19

14. What is the average number of students enrolled per
section in Algebra I ?

F. 24
G. 25
H. 26
J. 27
K. 29

15. The school owns 2 classroom sets of 30 calculators
each, which students are required to have during their
mathematics class. There are 2 calculators from one set
and 6 calculators from the other set that are not avail-
able for use by the students because these calculators
are being repaired. For which of the following class
periods, if any, are there NOT enough calculators
available for each student to use a school-owned calcu-
lator without having to share?

A. Period 2 only
B. Period 3 only
C. Period 4 only
D. Periods 3 and 4 only
E. There are enough calculators for each class period.

16. What expression must the center cell of the table
below contain so that the sums of each row, each
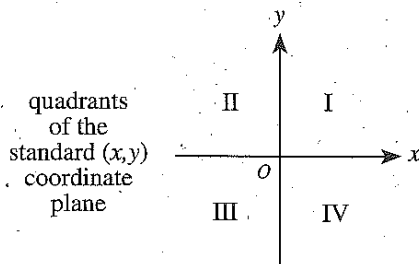column, and each diagonal are equivalent?

x	$8x$	$-3x$
$-2x$	?	$6x$
$7x$	$-4x$	$3x$

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

Practice ACT Tests

17. Point A is to be graphed in a quadrant, not on an axis, of the standard (x,y) coordinate plane below.

If the x-coordinate and the y-coordinate of point A are to have opposite signs, then point A *must* be located in:

A. Quadrant II only.
B. Quadrant IV only.
C. Quadrant I or III only.
D. Quadrant I or IV only.
E. Quadrant II or IV only.

18. Kareem has 4 sweaters, 6 shirts, and 3 pairs of slacks. How many distinct outfits, each consisting of a sweater, a shirt, and a pair of slacks, can Kareem select?

F. 13
G. 36
H. 42
J. 72
K. 216

19. At a refinery, 100,000 tons of sand are required to produce each 60,000 barrels of a tarry material. How many tons of sand are required to produce 3,000 barrels of this tarry material?

A. 5,000
B. 18,000
C. 20,000
D. 40,000
E. 50,000

20. If a rectangle measures 54 meters by 72 meters, what is the length, in meters, of the diagonal of the rectangle?

F. 48
G. 63
H. 90
J. 126
K. 252

21. For all positive integers x, y, and z, which of the following expressions is equivalent to $\frac{x}{y}$?

   A. $\frac{x \cdot z}{y \cdot z}$

   B. $\frac{x \cdot x}{y \cdot y}$

   C. $\frac{y \cdot x}{x \cdot y}$

   D. $\frac{x - z}{y - z}$

   E. $\frac{x + z}{y + z}$

DO YOUR FIGURING HERE.

22. What is the slope-intercept form of $8x - y - 6 = 0$?
   F. $y = -8x - 6$
   G. $y = -8x + 6$
   H. $y = 8x - 6$
   J. $y = 8x + 6$
   K. $y = 6x - 8$

23. Which of the following is a solution to the equation $x^2 - 36x = 0$?
   A. 72
   B. 36
   C. 18
   D. 6
   E. −6

24. For right triangle $\triangle RST$ shown below, what is $\tan R$?

   F. $\frac{r}{s}$

   G. $\frac{r}{t}$

   H. $\frac{t}{r}$

   J. $\frac{t}{s}$

   K. $\frac{s}{t}$
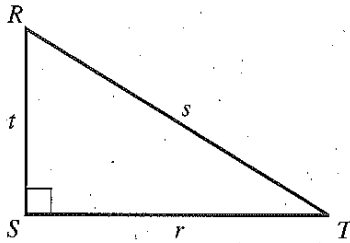
25. A chord 24 inches long is 5 inches from the center of a circle, as shown below. What is the radius of the circle, to the nearest tenth of an inch?

   A. 29.0
   B. 24.5
   C. 16.9
   D. 13.0
   E. 10.9
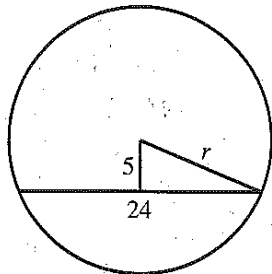
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26. The length L, in meters, of a spring is given by the equation $L = \frac{2}{3}F + 0.03$, where F is the applied force in newtons. What force, in newtons, must be applied for the spring's length to be 0.18 meters?

F. 0.13
G. 0.15
H. 0.225
J. 0.255
K. 0.27

27. After a snowstorm, city workers removed an estimated 10,000 cubic yards of snow from the downtown area. If this snow were spread in an even layer over the entire rectangular football field shown below, about how many yards deep would the layer of snow be?
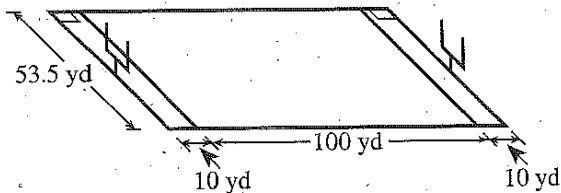
A. Less than 1
B. Between 1 and 2
C. Between 2 and 3
D. Between 3 and 4
E. More than 4

28. The hypotenuse of the right triangle $\triangle PQR$ shown below is 16 feet long. The sine of $\angle P$ is $\frac{3}{5}$. About how many feet long is $\overline{QR}$?
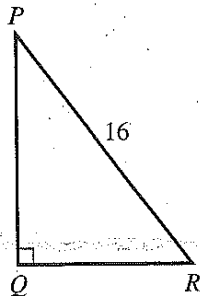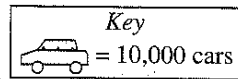

F.   8.0
G.   9.6
H. 12.4
J. 14.3
K. 15.4

29. The graph below shows the number of cars assembled last year in 4 cities, to the nearest 5,000 cars. According to the graph, what fraction of the cars assembled in all 4 cities were assembled in Coupeville?

Key
🚗 = 10,000 cars

City	Cars assembled
Car Town	🚗 🚗 🚗 🚗
Coupeville	🚗 🚗 🚗
Truck City	🚗 🚗
Sedan Falls	🚗 🚗
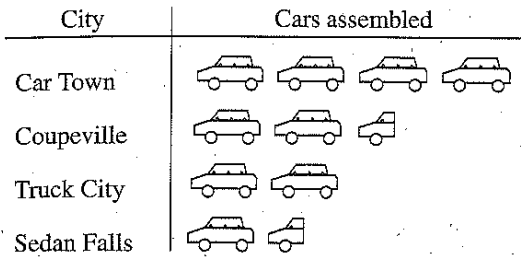
A. $\frac{1}{5}$

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

C. $\frac{3}{11}$

D. $\frac{3}{10}$

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

30. Points B and C lie on $\overline{AD}$ as shown below. The length of $\overline{AD}$ is 30 units; $\overline{AC}$ is 16 units long; and $\overline{BD}$ is 20 units long. How many units long, if it can be determined, is $\overline{BC}$?

A   B   C   D

F. 4
G. 6
H. 10
J. 14
K. Cannot be determined from the given information

31. What is the x-coordinate of the point in the standard (x,y) coordinate plane at which the 2 lines $y = 2x + 6$ and $y = 3x + 4$ intersect?

A. 1
B. 2
C. 4
D. 6
E. 10

32. For all pairs of real numbers M and V where $M = 3V + 6$, $V = ?$
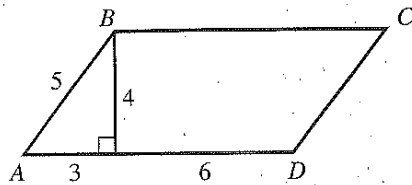
F. $\frac{M}{3} - 6$

G. $\frac{M}{3} + 6$

H. $3M - 6$

J. $\frac{M - 6}{3}$

K. $\frac{M + 6}{3}$

33. Parallelogram $ABCD$, with dimensions in inches, is shown in the diagram below. What is the area of the parallelogram, in square inches?
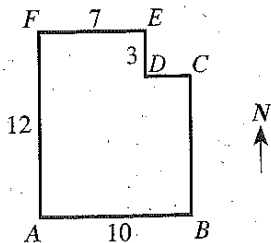
A. 18
B. 36
C. 39
D. 45
E. 72

34. If $a = b + 2$, then $(b - a)^4 = ?$

F. -16
G. -8
H. 1
J. 8
K. 16

35. A park has the shape and dimensions in blocks given below. A water fountain is located halfway between point B and point D. Which of the following is the location of the water fountain from point A?

(Note: The park's borders run east-west or north-south.)

A. $3\frac{1}{2}$ blocks east and 6 blocks north

B. 5 blocks east and $4\frac{1}{2}$ blocks north

C. 5 blocks east and 6 blocks north

D. $8\frac{1}{2}$ blocks east and $4\frac{1}{2}$ blocks north

E. 9 blocks east and $7\frac{1}{2}$ blocks north

36. The larger of two numbers exceeds twice the smaller number by 8. The sum of twice the larger and 3 times the smaller number is 65. If x is the smaller number, which equation below determines the correct value of x ?

F. $3(2x + 8) + 2x = 65$
G. $3(2x - 8) + 2x = 65$
H. $(4x + 8) + 3x = 65$
J. $2(2x + 8) + 3x = 65$
K. $2(2x - 8) + 3x = 65$

37. Members of the fire department lean a 30-foot ladder against a building. The side of the building is perpendicular to the level ground so that the base of the ladder is 10 feet away from the base of the building. To the nearest foot, how far up the building does the ladder reach?

A. 10
B. 20
C. 28
D. 31
E. 40

38. A square is circumscribed about a circle of 7-foot radius, as shown below. What is the area of the square, in square feet?

F. 49
G. 56
H. 98
J. 49π
K. 196
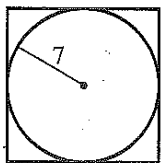
39. The ratio of the side lengths for a triangle is exactly 12:14:15. In a second triangle similar to the first, the shortest side is 8 inches long. To the nearest tenth of an inch, what is the length of the longest side of the second triangle?

A. 11.0
B. 10.0
C. 9.3
D. 6.4
E. Cannot be determined from the given information

40. In the figure below, $ABCD$ is a trapezoid, E lies on $\overleftrightarrow{AD}$, and angle measures are as marked. What is the measure of $\angle BDC$?
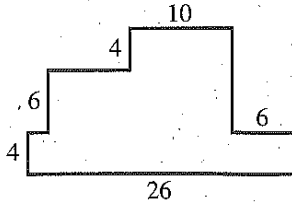
F. 15°
G. 25°
H. 30°
J. 35°
K. 45°
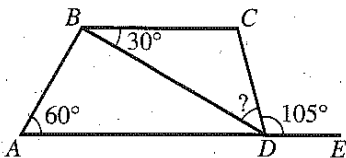
41. In the figure shown below, each pair of intersecting line segments meets at a right angle, and all the lengths given are in inches. What is the perimeter, in inches, of the figure?

A. 40
B. 52
C. 56
D. 66
E. 80

42. Of the 804 graduating seniors in a certain high school, approximately $\frac{2}{5}$ are going to college and approximately $\frac{1}{4}$ of those going to college are going to a state university. Which of the following is the closest estimate for how many of the graduating seniors are going to a state university?

F. 80
G. 90
H. 160
J. 200
K. 320

43. If x and y are positive integers such that the greatest common factor of x^2y^2 and xy^3 is 45, then which of the following could y equal?

A. 45
B. 15
C. 9
D. 5
E. 3

44. If 115% of a number is 460, what is 75% of the number?

F. 280
G. 300
H. 320
J. 345
K. 400

45. What is the distance in the standard (x,y) coordinate plane between the points $(1,0)$ and $(0,5)$?

A. 4
B. 6
C. 16
D. 36
E. $\sqrt{26}$

DO YOUR FIGURING HERE.

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46. The ratio of the radii of two circles is 4:9. What is the ratio of their circumferences?

   F.   2:3
   G.   4:9
   H.   16:81
   J. $4:8\pi$
   K. $9:18\pi$

47. A circle in the standard (x,y) coordinate plane is tangent to the x-axis at 5 and tangent to the y-axis at 5. Which of the following is an equation of the circle?

   A. $x^2 + y^2 = 5$
   B. $x^2 + y^2 = 25$
   C. $(x - 5)^2 + (y - 5)^2 = 5$
   D. $(x - 5)^2 + (y - 5)^2 = 25$
   E. $(x + 5)^2 + (y + 5)^2 = 25$

48. In the complex numbers, where $i^2 = -1$,
    $$\frac{1}{1+i} \cdot \frac{1-i}{1-i} = ?$$

   F. $i - 1$

   G. $1 + i$

   H. $1 - i$

   J. $\frac{1-i}{2}$

   K. $\frac{1+i}{2}$

49. Which of the following statements describes the total number of dots in the first n rows of the triangular arrangement illustrated below?

          •   1st row
        • • •   2nd row
      • • • • •   3rd row
    • • • • • • • 4th row
   • • • • • • • • • 5th row
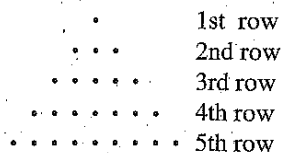
   A.   This total is always equal to 25 regardless of the number of rows.
   B.   This total is equal to twice the number of rows.
   C.   This total is equal to 5 times the number of rows.
   D.   This total is equal to the square of the number of rows.
   E.   There is no consistent relationship between this total and the number of rows.

GO ON TO THE NEXT PAGE.

50. After polling a class of 20 music students by a show of hands, you find that 8 students play the guitar and 9 students play the piano. Given that information, what is the minimum number of students in this music class who play both the guitar and the piano?
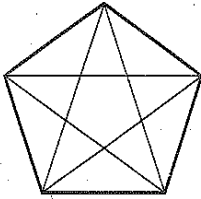
F. 0
G. 1
H. 8
J. 9
K. 17

DO YOUR FIGURING HERE.

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 all real numbers
C. The set containing all negative real numbers
D. The set containing all nonnegative real numbers
E. The set containing only zero

52. Pentagons have 5 diagonals, as illustrated below.

How many diagonals does the octagon below have?
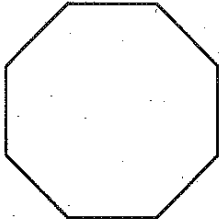
F. 8
G. 16
H. 20
J. 30
K. 40

53. Douglas wants to draw a circle graph showing the favorite colors of his friends. When he polled his friends asking each their favorite color, 25% of his friends said red; 30% of his friends said blue; 20% of his friends said green; 10% of his friends said purple; and the remaining friends said colors other than red, blue, green, and purple. The colors other than red, blue, green, and purple will be grouped together in an Other sector. What will be the degree measure of the Other sector?

A. 108°
B. 54°
C. 27°
D. 15°
E. 10°

54. If $\sin \theta = -\frac{3}{5}$ and $\pi < \theta < \frac{3\pi}{2}$, then $\tan \theta = ?$
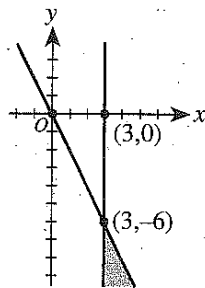
F. $-\frac{5}{4}$

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

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

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

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

55. Which of the following systems of inequalities is represented by the shaded region of the graph below?

A. $y \leq -2x$ and $x \geq 3$
B. $y \leq -2x$ or $x \geq 3$
C. $y \geq -2x$ and $x \geq 3$
D. $y \geq -2x$ or $x \geq 3$
E. $y \geq -2x$ and $x \leq 3$

56. If $f(x) = x^2 - 2$, then $f(x + h) = ?$

F. $x^2 + h^2$

G. $x^2 - 2 + h$

H. $x^2 + h^2 - 2$

J. $x^2 + 2xh + h^2$

K. $x^2 + 2xh + h^2 - 2$

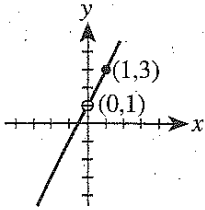**57.** Which of the following is the graph, in the standard (x,y) coordinate plane, of $y = \dfrac{2x^2 + x}{x}$?
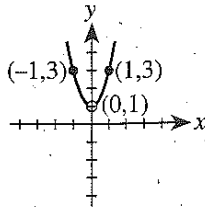
A.

$(1,3)$
$(0,1)$

D.

$(-1,3)$ $(1,3)$
$(0,1)$
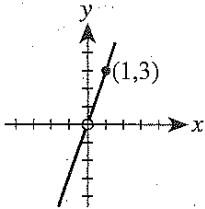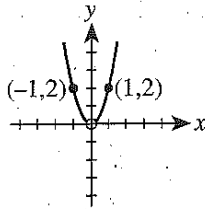
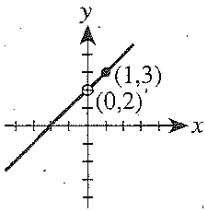B.

$(1,3)$

E.

$(-1,2)$ $(1,2)$

C.

$(1,3)$
$(0,2)$

58. A triangle, $\triangle ABC$, is reflected across the x-axis to have the image $\triangle A'B'C'$ in the standard (x,y) coordinate plane; thus, A reflects to A'. The coordinates of point A are (c,d). What are the coordinates of point A' ?

F. $(c,-d)$
G. $(-c, d)$
H. $(-c,-d)$
J. (d, c)
K. Cannot be determined from the given information

59. If $x = 2t - 9$ and $y = 5 - t$, which of the following expresses y in terms of x ?

A. $y = \dfrac{1 - x}{2}$

B. $y = \dfrac{19 - x}{2}$

C. $y = 14 - 2x$

D. $y = 5 - x$

E. $y = 1 - x$