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.

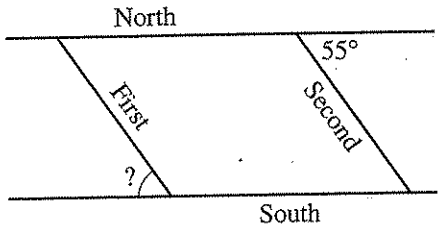
You are permitted to use a calculator on this test. You may use your calculator for any problems you choose, but some of the problems may best be done without using a calculator.

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. On the map below, 2 parallel streets, North and South, intersect 2 other parallel streets, First and Second. The acute angle at which Second Street intersects North Street measures 55°. What is the measure of the acute angle at which First Street intersects South Street?



A. 35°
B. 55°
C. 62.5°
D. 65°
E. 70°

2. Which of the following is a simplified form of the expression $4(2 + 5x) + 9 - 2x$?

F. $3x + 17$
G. $7x + 15$
H. $18x + 17$
J. $26x + 9$
K. $35x$

3. A point at $(-2,8)$ in the standard (x,y) coordinate plane is shifted right 8 units and down 2 units. What are the new coordinates of the point?

A. $(-10,10)$
B. $(0, 0)$
C. $(6, 6)$
D. $(6,10)$
E. $(10,10)$

DO YOUR FIGURING HERE.

4. To attend an annual banquet, members pay $17 per ticket while nonmembers pay $20 per ticket. What is the total amount, in dollars, from the sale of 70 member tickets and n nonmember tickets?

   F. $n + 70$
   G. $(20 + 17)n$
   H. $20(n + 17)$
   J. $20(n + 70)$
   K. $20n + 17(70)$

5. A coat originally priced at $80 is discounted to $60. What is the percent of discount on this coat?

   A. 13%
   B. 20%
   C. 25%
   D. 30%
   E. $33\frac{1}{3}\%$

6. In $\triangle ABC$, $\angle A$ and $\angle C$ are congruent, and the measure of $\angle B$ is 114°. What is the measure of $\angle A$?

   F. 33°
   G. 57°
   H. 60°
   J. 66°
   K. 114°

7. Bella will pick 1 jelly bean at random out of a bag containing 28 jelly beans that are in the colors and quantities shown in the table below. Each of the jelly beans is 1 color only.

Color	Quantity
Green	6
Black	3
Red	5
Orange	2
Yellow	4
Blue	8

   What is the probability that Bella will pick a blue or yellow jelly bean?

   A. $\frac{1}{3}$
   B. $\frac{3}{4}$
   C. $\frac{1}{7}$
   D. $\frac{2}{7}$
   E. $\frac{3}{7}$

DO YOUR FIGURING HERE.

8. What is an automobile's average speed, in miles per hour, if it travels 60 miles in $1\frac{1}{2}$ hours?

F. 30
G. 40
H. 60
J. 90
K. 120

9. To determine a student's overall test score for the semester, Ms. Ackerman deletes the lowest test score and calculates the average of the remaining test scores. Niels took all 5 tests and earned the following test scores in Ms. Ackerman's class this semester: 62, 78, 83, 86, and 93. What overall test score did Niels earn in Ms. Ackerman's class this semester?

A. 77.5
B. 80.4
C. 83.0
D. 85.0
E. 85.5

10. For the equation $5y + n = m$, which of the following expressions gives y in terms of m and n ?

F. $\frac{m-n}{5}$

G. $\frac{m-5}{n}$

H. $\frac{m+n}{5}$

J. $\frac{n-m}{5}$

K. $m - n - 5$

11. If $5 + 2x = 19$, then $3x =$?

A. 7
B. 12
C. 15
D. 21
E. 36

12. The perimeter of a square is 24 feet. What is the area of the square, in square feet?

F. 6
G. 12
H. 36
J. 72
K. 576

13. What is 7% of 4.58×10^6 ?

A. 32,060,000
B. 3,206,000
C. 320,600
D. 763.33
E. 76.33

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

14. Which of the following expressions is a factor of the expression $x^2 - 6x + 8$?

F. $x - 3$
G. $x - 4$
H. $x - 5$
J. $x - 6$
K. $x - 8$

15. Given real numbers a, b, c, d, and e such that $c < d$, $e < c$, $e > b$, and $b > a$, which of these numbers is the greatest?

A. a
B. b
C. c
D. d
E. e

16. A new operation, ♦, is defined on pairs of ordered pairs of integers as follows: $(a,b) \diamond (c,d) = \frac{ac + bd}{ab - cd}$. What is the value of $(2,1) \diamond (4,6)$?

F. $-\frac{7}{11}$
G. $-\frac{7}{4}$
H. $\frac{7}{4}$
J. 7
K. 14

17. A high school band needs to make 3 sizes of flags—small, medium, and large—for an upcoming halftime show. The 3 sizes of flags are made by combining 1-foot squares of material that come in 2 colors. Four band members have agreed to make the flags. The information they will need is given to them in the tables below. The table with colors tells how many 1-foot squares of each color are needed for each size flag, and the table with names tells how many flags of each size that each person is to make.

	red	blue
small	2	2
medium	5	3
large	10	5

	small	medium	large
Jalinda	0	6	2
Lance	0	3	3
Hamako	2	6	0
Dakota	8	0	0

How many 1-foot squares of blue material does Lance need to make his flags?

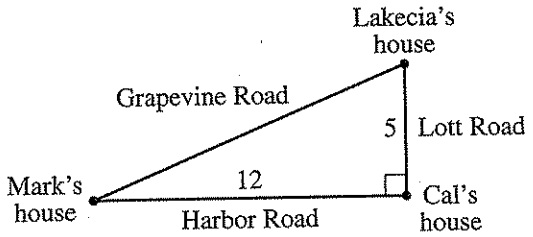
A. 42
B. 24
C. 20
D. 15
E. 14

DO YOUR FIGURING HERE.

18. What is the least common multiple of 80, 70, and 30 ?

F. 60
G. 168
H. 180
J. 1,680
K. 168,000

19. The figure below shows Mark's, Cal's, and Lakecia's houses at the 3 vertices of the right triangle formed by 3 roads. The distances given in the figure are in miles. Mark and Lakecia each make a trip from Mark's house to Lakecia's house. Mark takes Grapevine Road. Lakecia takes Harbor Road to pick up Cal, and then takes Lott Road. How many miles shorter is Mark's trip than Lakecia's trip?



A. 1
B. 4
C. 5
D. 7
E. 8

20. Which of the following is equivalent to $(a^8)^{24}$?

F. $192a$
G. $32a$
H. $8a^{24}$
J. a^{32}
K. a^{192}

21. For the function $h(x) = 4x^2 - 3x$, what is the value of $h(-3)$?

A. −99
B. −15
C. 27
D. 45
E. 153

22. The Carousel Clothes Shop is advertising a sale featuring 30% off the marked price on any item. Which of the following gives the sale price, in dollars, of an item with a marked price of p dollars?

F. $0.3p$
G. $p - 30p$
H. $p - 0.3$
J. $p + 0.3p$
K. $p - 0.3p$

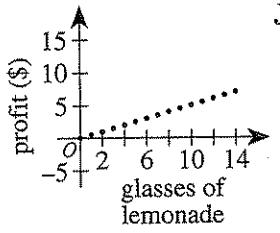
DO YOUR FIGURING HERE.

23. A store advertises packs of chewing gum at 5 for $1.29. At this advertised price, how much would the store charge for 2 packs of gum?

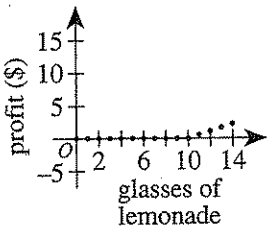
A. $0.65
B. $0.52
C. $0.50
D. $0.26
E. $0.25

24. Johnny is selling lemonade. He paid $5.00 for his supplies and charges $0.50 per glass of lemonade. Johnny's profit is found by subtracting his expenses from his income. Which of the following graphs represents his profit as a function of the number of glasses of lemonade he sells?

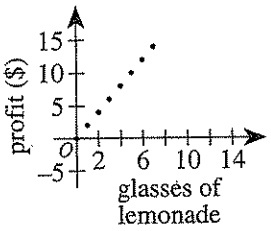
F.



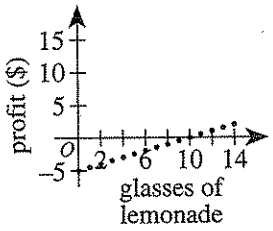
J.



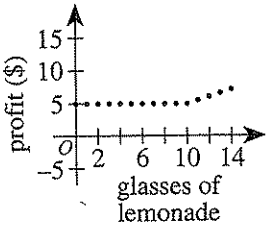
G.



K.



H.



25. The positive integer $n!$ is defined as the product of all the positive integers less than or equal to n. For example, $3! = 1(2)(3) = 6$. What is the value of the expression $\frac{6!}{3!2!}$?

A. 1
B. 3
C. 6
D. 60
E. 120

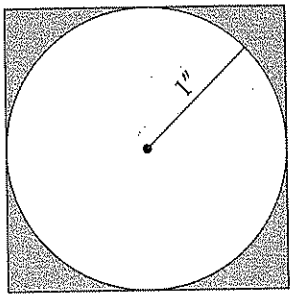
GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

26. Ms. Johnson purchased 1,000 prizes for the school carnival for \$90. Each prize costs either \$0.05 or \$0.25. How many of the less expensive prizes did she buy?

F. 200
G. 360
H. 500
J. 640
K. 800

27. A circle with a radius of 1 inch is inscribed in a square as shown below.



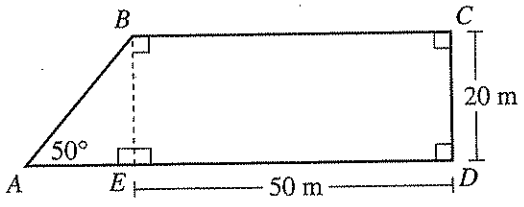
What is the area of the shaded region, in square inches?

A. π
B. $8 - \pi$
C. $4 - \pi$
D. $2 - \pi$
E. $1 - \pi$

28. The lengths of the corresponding sides of 2 similar right triangles are in the ratio of 4:7. The hypotenuse of the smaller triangle is 20 inches long. How many inches long is the hypotenuse of the larger triangle?

F. 11
G. 23
H. 28
J. 31
K. 35

29. For the polygon below, which of the following represents the length, in meters, of $\overline{AE}$?



A. 20

B. 30

C. $\frac{20}{\tan 50°}$

D. $\frac{30}{\tan 50°}$

E. $\tan 50°$

DO YOUR FIGURING HERE.

30. The perimeter of a parallelogram is 76 inches, and 1 side measures 14 inches. If it can be determined, what are the lengths, in inches, of the other 3 sides?

F. 14, 14, 34
G. 14, 17, 17
H. 14, 24, 24
J. 14, 31, 31
K. Cannot be determined from the given information

31. Which of the following is a solution statement for the inequality $3x - 7 < 5 + 9x$?

A. $-2 < x$
B. $-\frac{1}{3} < x$
C. $-2 > x$
D. $1 > x$
E. $2 > x$

32. The pep squad plans to make a circular sign in the shape of a basketball to hang on a wall for the game. The circle will have a radius of 4 feet. Which of the following is closest to the perimeter, in feet, of the circle?

F. 8
G. 13
H. 25
J. 50
K. 200

33. $-5\left|-8+9\right| = ?$

A. −85
B. −5
C. −4
D. 5
E. 85

34. In a large high school, some teachers teach only 1 subject, and some teachers teach more than 1 subject. Using the information given in the table below about the math, science, and gym teachers in the school, how many teachers teach math only?

Number of teachers	Subject(s) taught
12	at least 1 class of math
10	at least 1 class of gym
20	at least 1 class of science
6	both gym and science but not math
5	both math and science but not gym
2	gym only
1	math, gym, and science

F. 1
G. 2
H. 5
J. 16
K. 28

DO YOUR FIGURING HERE.

Use the following information to answer questions 35–37.

The Environmental Club at Forrest Hills High School grows plants in the school's greenhouse. The members of the club sell the plants to raise money for the school, and Sami and Jacque are taking an inventory of the plants. The table below gives the numbers of packs of plants. For example, there are 60 packs of sunflowers with 1 plant per pack, 25 packs of petunias with 4 plants per pack, and 15 packs of tomatoes with 6 plants per pack. All of the packs have been counted except for the 6-plant packs of marigolds.

Plants	Number of 1-plant packs	Number of 4-plant packs	Number of 6-plant packs
Tomatoes	30	0	15
Marigolds	60	40	?
Petunias	0	25	100
Sunflowers	60	0	0

35. Jacque completes the inventory and later tells Sami that the number of marigold plants is the same as the number of petunia plants. How many 6-plant packs of marigolds are in the greenhouse?

A. 20
B. 25
C. 70
D. 80
E. 480

36. Mr. Mai bought $\frac{1}{10}$ of the sunflower plants for $15.00. What was the price of 1 sunflower plant?

F. $0.25
G. $0.40
H. $1.50
J. $2.00
K. $2.50

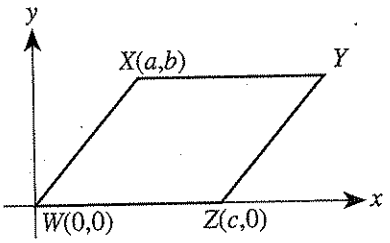
37. Helen takes all of the tomato plants in 1-plant packs and puts them together to make as many 4-plant packs as she can. How many whole 4-plant packs of tomato plants can Helen make?

A. 5
B. 7
C. 8
D. 15
E. 30

DO YOUR FIGURING HERE.

Use the following information to answer questions 38–40.

Parallelogram $WXYZ$ is shown in the standard (x,y) coordinate plane below. The coordinates for 3 of its vertices are $W(0,0)$, $X(a,b)$, and $Z(c,0)$.



38. What are the coordinates of Y ?

F. (a,c)
G. (b,c)
H. (c,b)
J. $(a+b, c)$
K. $(a+c, b)$

39. The measure of $\angle Y$ is 50°. What is the measure of the angle between $\overline{WX}$ and the y-axis?

A. 35°
B. 40°
C. 45°
D. 50°
E. 55°

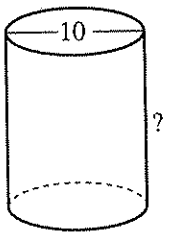
40. Parallelogram $WXYZ$ is rotated clockwise ($\circlearrowright$) by 90° about the origin. At what ordered pair is the image of Z located?

F. $(0,-c)$
G. $(-c, 0)$
H. $(0, 0)$
J. $(0, c)$
K. (a, b)

DO YOUR FIGURING HERE.

41. A liter is 1,000 cubic centimeters. Which of the following is closest to the height, in centimeters, of a cylindrical container, shown below, with diameter 10 cm and capacity 1 liter?

(Note: The volume of a cylinder with radius r and height h is $\pi r^2 h$.)



A. 4
B. 8
C. 10
D. 13
E. 16

42. For World Literature class, Lenka must read *Anna Karenina* in 8 days. She reads $\frac{1}{12}$ of the book each of the first 3 days. For the remaining 5 days, what fraction of the book, on average, must Lenka read per day?

F. $\frac{1}{8}$
G. $\frac{1}{12}$
H. $\frac{1}{20}$
J. $\frac{3}{20}$
K. $\frac{3}{25}$

43. Which of the following equations shows a correct use of the quadratic formula to solve $x^2 - 5x + 3 = 0$?

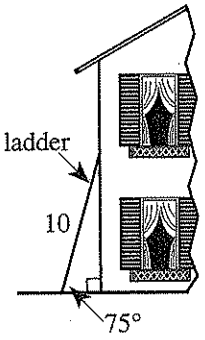
A. $x = \frac{5 \pm \sqrt{25 - 4(1)(3)}}{2(1)}$
B. $x = \frac{5 \pm \sqrt{25 + 4(1)(3)}}{2(1)}$
C. $x = \frac{-5 \pm \sqrt{25 - 4(1)(-3)}}{2(1)}$
D. $x = \frac{-5 \pm \sqrt{25 - 4(1)(3)}}{2(1)}$
E. $x = \frac{-5 \pm \sqrt{25 + 4(1)(3)}}{2(1)}$

DO YOUR FIGURING HERE.

44. In the standard (x,y) coordinate plane, the point $(1,-6)$ is the midpoint of the line segment with endpoints $(9,-13)$ and (a,b). What is (a,b) ?

F. $(-7,1)$
G. $(-7,-25)$
H. $(7,-1)$
J. $(4,-3.5)$
K. $(5,-9.5)$

45. A straight 10-foot-tall ladder is leaning against a house at an angle of 75°, as shown in the figure below. Which of the following expressions gives the distance, in feet, the base of the ladder is from the house along the level ground?



A. $10 \sin 75°$

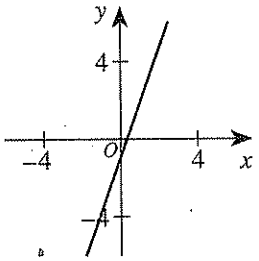
B. $10 \cos 75°$

C. $10 \tan 75°$

D. $\frac{10}{\cos 75°}$

E. $\frac{10}{\tan 75°}$

46. One of the following equations is graphed in the standard (x,y) coordinate plane below. Which one?



F. $y = -\frac{1}{3}x - 2$

G. $y = \frac{1}{3}x - 1$

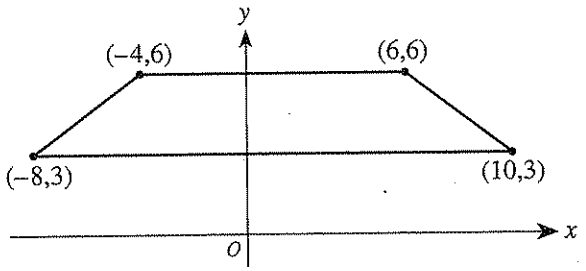
H. $y = -x + 1$

J. $y = -3x + 2$

K. $y = 3x - 1$

DO YOUR FIGURING HERE.

47. The vertices of a trapezoid have the (x,y) coordinates indicated in the figure below. What is the area, in square coordinate units, of the trapezoid?



A. 20
B. 36
C. 38
D. 42
E. 70

48. Mr. Cleary's algebra class is discussing slopes of lines. The class is to graph the total cost, C, of buying h hamburgers that cost 99¢ each. Mr. Cleary asks the class to describe the slope between any 2 points (h,C) on the graph. Devon gives a correct response that the slope between any 2 points on this graph is always:

F. zero.
G. the same positive value.
H. the same negative value.
J. a positive value, but the value varies.
K. a negative value, but the value varies.

49. The first 3 terms of a geometric sequence are 4, 10, and 25. What is the next term in the sequence?

A. 35
B. 40
C. 55
D. 62.5
E. 70

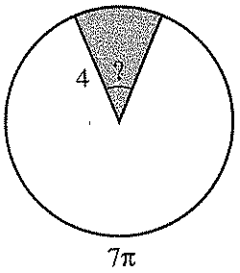
50. The volume of a cube is 64 cubic centimeters. What is the total surface area, in square centimeters, of the cube?

F. 16
G. 24
H. 64
J. 96
K. 384

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

51. In the figure below, a sector is shown shaded in a circle with radius 4 decimeters. The length of the arc of the unshaded sector is 7π decimeters. What is the measure of the central angle of the shaded sector?



A. 35°
B. 40°
C. 45°
D. 50°
E. 55°

52. In the standard (x,y) coordinate plane, the graph of which of the following equations is a circle with center $(4,-2)$ and radius 3 coordinate units?

F. $(x+4)^2+(y-2)^2=3$
G. $(x-4)^2+(y+2)^2=3$
H. $(x+4)^2+(y+2)^2=9$
J. $(x+4)^2+(y-2)^2=9$
K. $(x-4)^2+(y+2)^2=9$

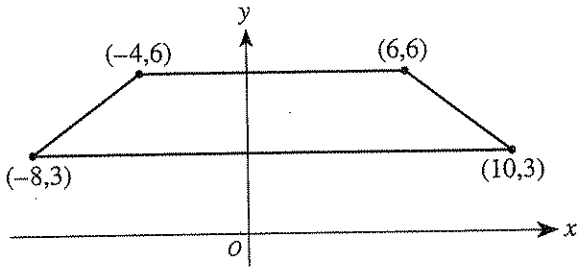
53. In $\triangle ABC$, the measure of $\angle A$ is 47°, the measure of $\angle B$ is 76°, and the length of $\overline{BC}$ is 18 centimeters. Which of the following is an expression for the length, in centimeters, of $\overline{AC}$?

(Note: The law of sines states that for any triangle, the ratios of the lengths of the sides to the sines of the angles opposite those sides are equal.)

A. $\frac{\sin 47°}{18 \sin 76°}$
B. $\frac{\sin 76°}{18 \sin 47°}$
C. $\frac{18 \sin 47°}{\sin 76°}$
D. $\frac{18 \sin 76°}{\sin 47°}$
E. $\frac{(\sin 47°)(\sin 76°)}{18}$

DO YOUR FIGURING HERE.

47. The vertices of a trapezoid have the (x,y) coordinates indicated in the figure below. What is the area, in square coordinate units, of the trapezoid?



A. 20
B. 36
C. 38
D. 42
E. 70

48. Mr. Cleary's algebra class is discussing slopes of lines. The class is to graph the total cost, C, of buying h hamburgers that cost 99¢ each. Mr. Cleary asks the class to describe the slope between any 2 points (h,C) on the graph. Devon gives a correct response that the slope between any 2 points on this graph is always:

F. zero.
G. the same positive value.
H. the same negative value.
J. a positive value, but the value varies.
K. a negative value, but the value varies.

49. The first 3 terms of a geometric sequence are 4, 10, and 25. What is the next term in the sequence?

A. 35
B. 40
C. 55
D. 62.5
E. 70

50. The volume of a cube is 64 cubic centimeters. What is the total surface area, in square centimeters, of the cube?

F. 16
G. 24
H. 64
J. 96
K. 384

DO YOUR FIGURING HERE.

54. The side of a square is l meters longer than the side of a second square. How many meters longer is the diagonal of the first square than the diagonal of the second square?

F. $\sqrt{2}l$
G. $2l$
H. $4l$
J. l
K. l^2

55. If $x \leq 2$, then $|x-2| = ?$

A. 0
B. $x+2$
C. $x-2$
D. $-x-2$
E. $-x+2$

56. There are 25 buildings on Elm Street. Of these 25 buildings, 10 have fewer than 6 rooms, 10 have more than 7 rooms, and 4 have more than 8 rooms. What is the total number of buildings on Elm Street that have 6, 7, or 8 rooms?

F. 5
G. 9
H. 11
J. 14
K. 15

57. If $\cos x = -\frac{1}{3}$, what is the value of $\cos 2x$?

$\left(\text{Note: } (\cos x)^2 = \frac{1+\cos 2x}{2}\right)$

A. $-\frac{8}{9}$
B. $-\frac{7}{9}$
C. $-\frac{1}{6}$
D. $\frac{1}{9}$
E. $\frac{1}{6}$

58. Let $f(x) = \sqrt{x}$ and $g(x) = 10x + b$. In the standard (x,y) coordinate plane, $y = f(g(x))$ passes through $(4,6)$. What is the value of b ?

F. -4
G. -14
H. -36
J. -37
K. -38

DO YOUR FIGURING HERE.

59. A plane contains 11 horizontal lines and 11 vertical lines. These lines divide the plane into disjoint regions. How many of these disjoint regions have a finite, nonzero area?

A. 100
B. 110
C. 144
D. 156
E. 169

60. When a, b, and c are real numbers and $ab^2c^4 > 0$, which of the following *must* be greater than 0 ?

F. ac^2
G. ac
H. ab
J. abc
K. bc

END OF TEST 2

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

DO NOT RETURN TO THE PREVIOUS TEST.