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.

1. For each of 3 years, the table below gives the number of games a football team played, the number of running plays they ran, and the total number of yards the team gained on running plays.

Year	Games	Running plays	Total yards gained on running plays
1997	11	397	1,028
1998	11	394	1,417
1999	9	378	1,920

To the nearest tenth of a yard, what is the average number of yards gained per running play in 1998 ?

A. 2.6
B. 2.7
C. 3.6
D. 4.9
E. 5.1

DO YOUR FIGURING HERE.

2. For the polygon below, the lengths of 2 sides are not given. Each angle between adjacent sides measures 90°. What is the polygon's perimeter, in feet?
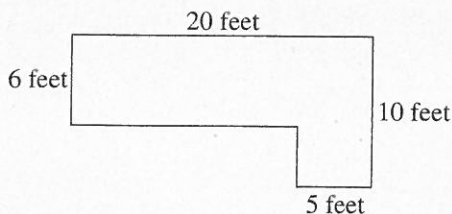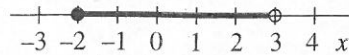

F. 41
G. 52
H. 60
J. 140
K. 200

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3. Which of the following inequalities represents the graph shown below on the real number line?

$$-3 \ -2 \ -1 \ \ 0 \ \ 1 \ \ 2 \ \ 3 \ \ 4 \ \ x$$

- **A.** $-2 \leq x \leq 2$
- **B.** $-2 \leq x < 3$
- **C.** $0 \leq x < 3$
- **D.** $2 \leq x \leq 3$
- **E.** $3 < x \leq -2$

4. What is the value of $3 \cdot 2^{x+y}$ when $x = 4$ and $y = -1$?

- **F.** 216
- **G.** 96
- **H.** 47
- **J.** 24
- **K.** 18

5. For integers a and b such that $ab = 8$, which of the following is NOT a possible value of a ?

- **A.** 2
- **B.** 1
- **C.** −4
- **D.** −6
- **E.** −8

6. What is the volume, in cubic centimeters, of a cube whose edges each measure 4 centimeters in length?

- **F.** 12
- **G.** 16
- **H.** 24
- **J.** 64
- **K.** 96

7. A community center sponsored a 1-day craft show. The center offered 2 sizes of display tables for rent and charged $40 to rent one of the 70 large tables and $25 to rent one of the 50 small tables. Which of the following expressions gives the total amount of money, in dollars, collected from renting all of the small tables and L of the large tables?

- **A.** $L + 50$
- **B.** $40L + 1,250$
- **C.** $40L + 2,000$
- **D.** $65L$
- **E.** $4,050L$

DO YOUR FIGURING HERE.

8. In the figure below, A, B, and C are collinear, the measure of $\angle ABD$ is $7x°$, and the measure of $\angle CBD$ is $3x°$. What is the measure of $\angle ABD$?

F. 252°
G. 126°
H. 108°
J. 54°
K. 18°
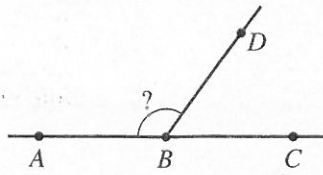
9. Which of the following is NOT a possible value for a probability?

A. 0.001

B. 0.5

C. $\frac{6}{10}$

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

E. $\frac{34}{31}$

10. For the first several months after the Fiery Red Scooter arrived in toy stores, the rate of sales increased slowly. As this new scooter caught on, however, the rate of sales increased rapidly. After several more months, many people owned a Fiery Red Scooter, and the rate of sales decreased. Which of the following graphs could represent the total number of Fiery Red Scooters sold as a function of time, in months, after the scooter arrived in toy stores?

F.

G.

H.

J.

K.
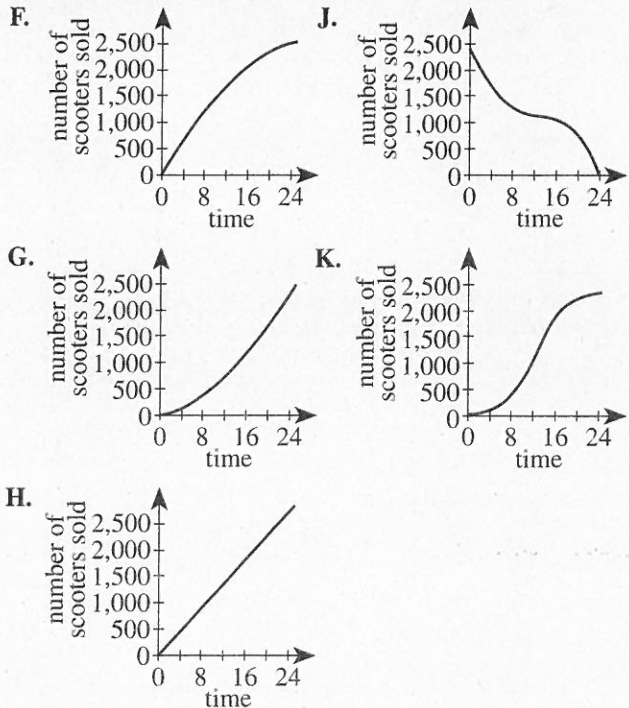
11. For a community service project, members of the junior class at San Carlos High School are going to varnish the rectangular dining room floor of a local nursing home. The floor is 60 feet wide and 80 feet long. Under the assumption that 1 can of varnish covers exactly 250 square feet, what is the minimum number of cans of varnish they will need in order to put 1 coat of varnish on this floor?

A. 1
B. 9
C. 10
D. 19
E. 20

DO YOUR FIGURING HERE.

12. Carl is making a scale drawing of his rectangular bedroom floor. The floor is 12 feet wide by 14 feet long. He is using a scale of $\frac{1}{4}$ inch = 1 foot for the scale drawing of the floor. What will be the dimensions, in inches, of Carl's bedroom floor in the scale drawing?

F. 3 by $3\frac{1}{2}$

G. 4 by $4\frac{2}{3}$

H. 6 by 7

J. 36 by 42

K. 48 by 56

13. According to a recent survey of students about the juice they each preferred, 20% of the students preferred cranberry juice, 40% preferred orange juice, 20% preferred grapefruit juice, and the remaining students preferred tomato juice. If each student preferred only 1 juice and 250 students preferred tomato juice, how many students were surveyed?

A. 330
B. 500
C. 625
D. 1,000
E. 1,250

14. The circumference of each tire on a bicycle is 50 inches. About how many revolutions does one of these bicycle tires make traveling 300 feet (3,600 inches) without slipping?

F. 6
G. 18
H. 72
J. 300
K. 864

15. $(4x^2 - 3x + 7) - (-1 + 5x + 2x^2)$ is equivalent to:

A. $2x^2 - 8x + 8$
B. $2x^2 + 2x + 8$
C. $2x^4 + 2x^2 + 6$
D. $6x^2 - 8x + 6$
E. $6x^4 - 8x^2 + 6$

DO YOUR FIGURING HERE.

16. A ticket for a movie at the Hazelnut Cinema costs $5.00. Latoya treats her younger brother to a movie at the Hazelnut Cinema. She gives him $\frac{1}{2}$ the money she brought with her, for his ticket and a snack. When he asks to play a video game, she gives him $1.00. That leaves Latoya exactly enough money to buy her own ticket. How much money did Latoya bring with her?

F. $10.00
G. $11.00
H. $12.00
J. $13.00
K. $14.00

17. Mr. Gomez gave his class a test on 20 spelling words. Only one of the following percents is possible as the percent of the 20 words a student spelled correctly. Which one is it?
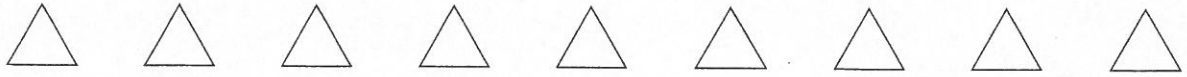
A. 77%
B. 85%
C. 88%
D. 96%
E. 99%

18. The first 5 terms of a geometric sequence are 0.375, −1.5, 6, −24, and 96. What is the 6th term?

F. −384
G. −126
H. −66
J. 126
K. 384

19. $(2x - 3y)^2$ is equivalent to:

A. $4x^2 - 12xy + 9y^2$
B. $4x^2 - 10xy + 9y^2$
C. $4x^2 - 9y^2$
D. $4x^2 + 9y^2$
E. $4x - 6y$

GO ON TO THE NEXT PAGE.

20. As shown in the figure below, Mr. Thompson, who is standing at point A, needs to determine the distance from point C on the ground to point E at the top of one of the second-story windows of his house. He places a mirror on the ground at point B so that when he looks in the mirror, he can see the top of the window. Mr. Thompson's eye level, at point D, is 6 ft above the ground. He notes that $AB = 4$ ft and $BC = 14$ ft. Approximately how many feet above the ground is the top of the second-story window?

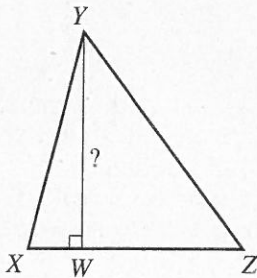(Note: In $\triangle ABD$ and $\triangle CBE$, $\angle ABD$ is congruent to $\angle CBE$.)
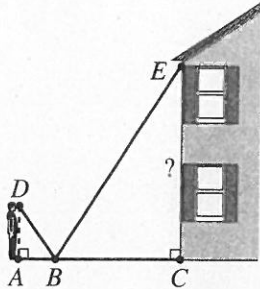
F. 2
G. 10
H. 16
J. 21
K. 24

21. What is the solution to the equation $7x - (x - 3) = 6$?

A. $-\dfrac{3}{2}$

B. -2

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

D. $\dfrac{3}{2}$

E. 2

22. The area of $\triangle XYZ$ below is 32 square inches. If $\overline{XZ}$ is 8 inches long, how long is altitude $\overline{YW}$, in inches?

F. 10
G. 8
H. 6
J. 4
K. 2

DO YOUR FIGURING HERE.

23. Given $f(x) = 2x^2 - 5x + 7$, what is the value of $f(-10)$?

   A. −243
   B. −143
   C. 157
   D. 257
   E. 457

24. The cheerleading squad wants to purchase new uniforms to wear at the regional championship competition. They decide to sell candy bars for $1.00 each. The squad will receive $0.40 for each of the first 200 candy bars sold. For each of the next 300 sold, the squad will receive $0.50. For each additional candy bar sold, the squad will receive $0.60. How many candy bars must the squad sell to reach their goal of raising $350.00 ?

   F. 350
   G. 584
   H. 667
   J. 700
   K. 875

25. The table below shows the age distribution of the student body at Memorial High School.

Age, in years	14	15	16	17	18
Percent of students	6%	28%	26%	31%	9%

   What percent of the students are at least 16 years old?

   A. 34%
   B. 40%
   C. 50%
   D. 60%
   E. 66%

26. What percent of $\frac{2}{3}$ is $\frac{1}{3}$?

   F. 22%
   G. 33%
   H. 50%
   J. 67%
   K. 200%

27. The sign below advertises a sale on coats. What is the sale price of a coat with a regular price of $84.00 ?

```
SALE   SALE   SALE
      All Coats
3/4 off the regular price!
SALE   SALE   SALE
```

   A. $ 9.00
   B. $21.00
   C. $42.00
   D. $63.00
   E. $83.25

DO YOUR FIGURING HERE.

28. The ratio of a side of square A to the length of rectangle B is 2:3. The ratio of a side of square A to the width of rectangle B is 2:1. What is the ratio of the area of square A to the area of rectangle B ?

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

29. In Intermediate Algebra class, Ms. Schimmack makes the statement "y varies directly as the product of w^2 and x, and inversely as z^3" and asks her students to translate it into an equation. Which of the following equations, with k as the constant of proportionality, is a correct translation of Ms. Schimmack's statement?

A. $y = \dfrac{kw^2x}{z^3}$

B. $y = \dfrac{kz^3}{w^2x}$

C. $y = \dfrac{w^2xz^3}{k}$

D. $y = \dfrac{z^3}{kw^2x}$

E. $y = kw^2xz^3$

30. In a certain isosceles triangle, the measure of each of the base angles is twice the measure of the vertex angle. What is the measure, in degrees, of each of the base angles?

F. 36°
G. 60°
H. 72°
J. 120°
K. 144°

31. For a single production run, when n items are made and sold, a company's profit, P dollars, can be modeled by $P = n^2 - 300n - 100,000$. What is the smallest number of items that must be made and sold in order for the company not to lose money on the production run?

A. 150
B. 200
C. 300
D. 350
E. 500

Use the following information to answer questions 32–34.

Mousepads Galore is a company that produces computer mousepads. *Cost* is the total money spent to produce and sell the mousepads, and *revenue* is the total income generated by the sale of the mousepads. The graph below depicts projections for the linear cost function, $C(x)$, and the linear revenue function, $R(x)$.

number of mousepads
produced/sold
(in thousands)
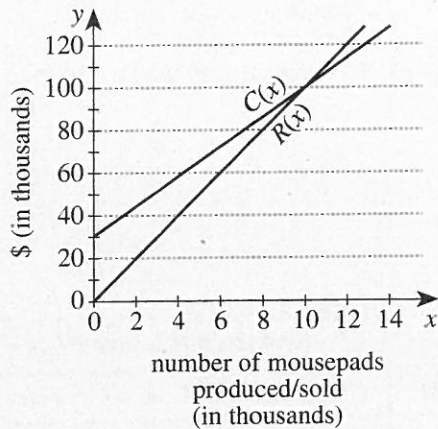
32. During the month of April, Mousepads Galore broke even (did not gain or lose any money) when x mousepads were produced and sold. How many mousepads did the company produce and sell during the month of April?

F.   10,000
G.   12,000
H.   14,000
J.   15,000
K.   30,000

33. The cost function shown in the graph for Mousepads Galore has 2 components: a fixed cost, plus a constant production cost per mousepad. Which of the following is the fixed cost?

A. $ 0
B. $ 1,000
C. $ 10,000
D. $ 30,000
E. $100,000

34. Mousepads Galore sells each mousepad at the same price, which is an integer number of dollars. According to the revenue function, what is the price of each of these mousepads?

F. $ 3
G. $ 7
H. $10
J. $12
K.   Cannot be determined from the given information

DO YOUR FIGURING HERE.

35. Which of the following is a *complete* factorization of the expression $2x + 2xy + 6x^2y$?

    A. $2x(y + 3xy)$
    B. $2x + 2xy(1 + 3x)$
    C. $2x(1 + y + 4xy)$
    D. $1 + y + 3xy$
    E. $2x(1 + y + 3xy)$

36. Which of the following is an equation of the line that passes through the points $(1,3)$ and $(-3,-13)$ in the standard (x,y) coordinate plane?

    F. $x + y = 4$
    G. $4x - y = 1$
    H. $5x - y = 2$
    J. $6x - 2y = 8$
    K. $7x - 2y = 5$

37. A square has sides that are the same length as the radius of a circle. If the circle has an area of 36π square units, how many units long is the perimeter of the square?

    A. 18
    B. 24
    C. 36
    D. 72
    E. 324

38. If the following system has a solution, what is the x-coordinate of the solution?

    $$3x + 6y = 52$$
 $$x + 6y = 24$$

    F. 19
    G. 14
    H. 6
    J. 0
    K. The system has no solution.

23

GO ON TO THE NEXT PAGE.

Use the following information to answer
questions 39–41.

In the figure below, B and C are on $\overline{HD}$ and G and F are on
$\overline{HE}$. The measurements given are in inches. Both $BGFC$
and $CFED$ are trapezoids. The area, A, of a trapezoid is
given by $A = \frac{1}{2}h(b_1 + b_2)$, where h is the height and b_1 and
b_2 are the lengths of the 2 parallel sides.
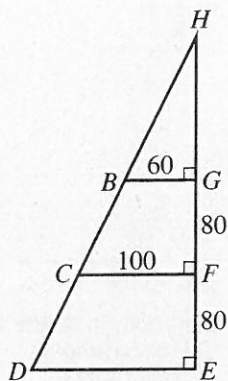
39. What is the area of $BGFC$, in square inches?
    A. 2,500
    B. 5,400
    C. 6,400
    D. 7,000
    E. 12,800

40. What is the length of $\overline{BC}$, in inches?
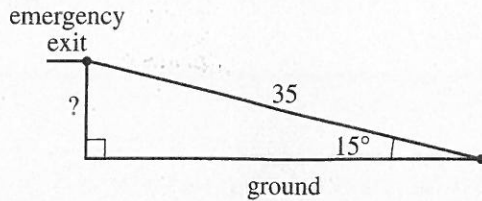   F. 90
    G. 100
    H. $\sqrt{4,800}$
    J. $\sqrt{8,000}$
    K. $\sqrt{16,400}$

41. What is the radius, in inches, of the largest circle that
    can be drawn so that no point of the circle is outside
    $CFED$?
    A. 40
    B. 50
    C. 60
    D. 70
    E. 80

42. As shown in the figure below, an escape ramp leading from an emergency exit of an airplane is 35 feet long when fully extended and forms a 15° angle with the level ground.

emergency
exit

ground

Given the trigonometric approximations in the table below, what is the height above the ground of the emergency exit, rounded to the nearest 0.1 foot?

cos 15°	0.966
sin 15°	0.259
tan 15°	0.268

F. 2.8
G. 7.4
H. 7.7
J. 9.1
K. 9.4

43. There are 10 equally spaced dots marked on a circle. Kim chooses an integer, n, that is greater than 1. Beginning at a randomly chosen dot, Kim goes around the circle clockwise and colors in every nth dot. He continues going around and around the circle coloring in every nth dot, counting each dot whether it is colored in or not, until he has colored in every dot. Which of the following could have been Kim's integer n ?

A. 2
B. 3
C. 4
D. 5
E. 6

44. Consider the exponential equation $y = Ca^t$, where C and a are positive real constants and t is a positive real number. The value of y decreases as the value of t increases if and only if which of the following statements about a is true?

F. $-1 < a$
G. $0 < a$
H. $0 < a < 1$
J. $1 < a < 2$
K. $1 < a$

45. What is the distance, in coordinate units, between the points $P(-2,-1)$ and $Q(1,3)$ in the standard (x,y) coordinate plane?

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

DO YOUR FIGURING HERE.

46. During their morning jog in the park, Jean stops at a drinking fountain. Sula continues to jog and gets 10 meters ahead of Jean. Sula is jogging at a constant rate of 2 meters per second, and Jean starts jogging at a constant rate of 2.4 meters per second to catch up to Sula. Which of the following equations, when solved for t, gives the number of seconds Jean will take to catch up to Sula?

  F. $2t + 10 = 2.4t$

  G. $2t - 10 = 2.4t$

  H. $\dfrac{10 + 2.4t}{2.4} = 2t$

  J. $2t = 10$

  K. $2.4t = 10$

47. Which of the following defines the solution set for the system of inequalities below?

$$x \leq 6$$
$$4 + 2x \geq 0$$

  A. $x \geq -2$
  B. $x \leq 6$
  C. $-8 \leq x \leq 6$
  D. $-2 \leq x \leq 6$
  E. $2 \leq x \leq 6$

48. At Brookfield High School, 55 seniors are enrolled in the sociology class and 40 seniors are enrolled in the drawing class. Of these seniors, 20 are enrolled in both the sociology class and the drawing class. How many of the 120 seniors enrolled at Brookfield High School are NOT enrolled in either the sociology class or the drawing class?

  F. 5
  G. 15
  H. 20
  J. 35
  K. 45

49. If two lines in the standard (x,y) coordinate plane are perpendicular and the slope of one of the lines is 3, what is the slope of the other line?

  A. -3

  B. -1

  C. $-\dfrac{1}{3}$

  D. $\dfrac{1}{3}$

  E. 3

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50. In the standard (x,y) coordinate plane, $(12,3)$ is half-way between $(2a, a + 3)$ and $(4a, a - 5)$. What is the value of a ?
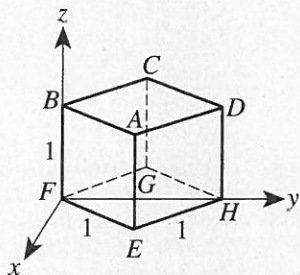
   F. 0
   G. 2
   H. 3
   J. 4
   K. 6

51. How many 3-letter orderings, where no letter is repeated, can be made using the letters of the word GATORS ?

   A.   3
   B.   6
   C.   27
   D. 120
   E. 216

52. As shown in the (x,y,z) coordinate space below, the cube with vertices A through H has edges that are 1 coordinate unit long. The coordinates of F are $(0,0,0)$, and H is on the positive y-axis. What are the coordinates of D ?

   F. $(0,1,1)$
   G. $(0,\sqrt{2},0)$
   H. $(0,\sqrt{2},1)$
   J. $(0,\sqrt{2},\sqrt{3})$
   K. $(1,1,1)$

53. Whenever x, y, and z are positive real numbers, which of the following expressions is equivalent to $2 \log_3 x + \frac{1}{2} \log_6 y - \log_3 z$?

   A. $\log_3\left(\dfrac{x^2 y}{z}\right)$

   B. $\log_3\left(\dfrac{x^2}{z}\right) + \log_6\left(\sqrt{y}\right)$

   C. $\log_3\left(\dfrac{z}{x^2}\right) + \log_6\left(\dfrac{y}{2}\right)$

   D. $\log_3(x - z) + \log_6\left(\sqrt{y}\right)$

   E. $2 \log_3(x - z) + \log_6\left(\dfrac{y}{2}\right)$

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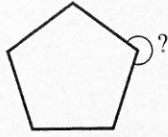
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54. If $2 \leq x \leq 5$ and $-4 \leq y \leq -3$, what is the maximum value of $|y - 2x|$?

   F. 20
   G. 14
   H. 13
   J. 8
   K. 7

55. The measure of each interior angle of a regular n-sided polygon is $\frac{(n-2)180°}{n}$. A regular pentagon is shown below. What is the measure of the designated angle?


   A. 108°
   B. 144°
   C. 198°
   D. 252°
   E. 288°

56. Which of the following trigonometric functions has an amplitude of 2 ?

   (Note: The *amplitude* of a trigonometric function is $\frac{1}{2}$ the nonnegative difference between the maximum and minimum values of the function.)

   F. $f(x) = 2 \sin x$

   G. $f(x) = 2 \tan x$

   H. $f(x) = \sin\left(\frac{1}{2}x\right)$

   J. $f(x) = \cos 2x$

   K. $f(x) = \frac{1}{2}\cos x$

57. Which of the following is an equivalent expression for r in terms of S and t whenever r, S, and t are all distinct and $S = \frac{rt - 3}{r - t}$?

   A. $\frac{St - 3}{S - t}$

   B. $\frac{S - 3}{S - 1}$

   C. $\frac{S - t}{S - 3}$
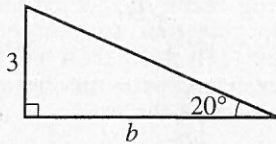
   D. $\frac{St - 3}{S + t}$

   E. $\frac{3}{t - S}$

58. In the figure below, lines *l* and *m* are parallel and angle measures are as marked. If it can be determined, what is the value of *x* ?
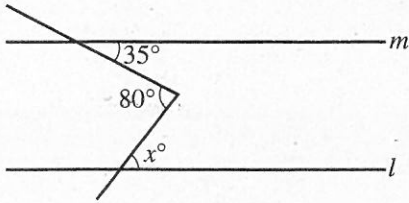
F. 35
G. 45
H. 65
J. 80
K. Cannot be determined from the given information

59. In the triangle below, where the 2 given side lengths are expressed in feet, what is the value of *b* ?

A. $3 \cos 20°$
B. $3 \sin 20°$
C. $3 \tan 20°$
D. $3 \sin 70°$
E. $3 \tan 70°$

60. An angle in standard position in the standard (x,y) coordinate plane has its vertex at the origin and its initial side on the positive *x*-axis. If the measure of an angle in standard position is 1,573°, it has the same terminal side as an angle of each of the following measures EXCEPT:

F. −587°
G. −227°
H. 133°
J. 493°
K. 573°

END OF TEST 2

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

DO NOT RETURN TO THE PREVIOUS TEST.