



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. What is the value of x when $\frac{3x}{2} + 16 = 10$?

- A. -9
- B. -4
- C. 4
- D. 9
- E. 39

DO YOUR FIGURING HERE.

2. A bowl contains 100 jelly beans, of which 42 are red, 36 are blue, and 22 are green. What is the probability that a jelly bean picked at random from the bowl will NOT be red?

- F. $\frac{11}{50}$
- G. $\frac{9}{25}$
- H. $\frac{21}{50}$
- J. $\frac{29}{50}$
- K. $\frac{39}{50}$

3. For what value of x is the equation $3.6x + 7.99 = 1.03 - 2.4x$ true?

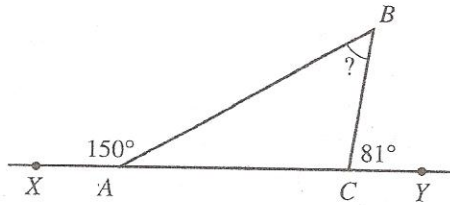
- A. -58
- B. -5.8
- C. -1.16
- D. 1.16
- E. 5.8



4. In the figure below, the measure of $\angle XAB$ is 150° ; the measure of $\angle YCB$ is 81° ; and X , A , C , and Y are collinear. What is the measure of $\angle B$?

DO YOUR FIGURING HERE.

- F. 30°
 G. 51°
 H. 60°
 J. 69°
 K. 77°



5. Which of the following numbers is a solution to $x^2 - 16 = 6x$?
- A. -8
 B. 2
 C. 4
 D. $4 + \sqrt{6}$
 E. 8
6. $|6 - 4| - |3 - 7| = ?$
- F. -6
 G. -2
 H. 2
 J. 6
 K. 20
7. Dakota bought a pair of shoes that had an original price of \$70.00. The store offered a 20% discount on the original price of the shoes, and Dakota paid 6% sales tax on the discounted price of the shoes. How much did Dakota pay for the shoes, including tax?
- A. \$51.80
 B. \$52.64
 C. \$59.36
 D. \$60.20
 E. \$79.80
8. What is the value of $x^2y^3 - xy^2 + x$ when $x = -3$ and $y = 2$?
- F. -63
 G. -57
 H. 57
 J. 63
 K. 81
9. A toy car travels at a constant rate of 11 inches every 5 seconds. At this rate, which of the following is closest to the number of feet the car travels in 2 minutes?
- A. 5
 B. 13
 C. 22
 D. 24
 E. 28



10. Dalia is taking inventory of cases of soda cans. There are 24 cans in a full case, and Dalia has 4 partially filled cases: 1 case is $\frac{1}{2}$ full, 1 case is $\frac{2}{3}$ full, and 2 cases are each $\frac{5}{6}$ full. How many soda cans are in the 4 partially filled cases?

F. 48
G. 64
H. 68
J. 80
K. 96

DO YOUR FIGURING HERE.

11. Each side of a square is 3 cm long. One vertex of the square is at (6,4) on a square coordinate grid marked in centimeter units. Which of the following points on the grid could be another vertex of the square?

A. (9, 4)
B. (6, 3)
C. (4, 5)
D. (1,-5)
E. (-3, 4)

12. Eduardo is making a cake with frosting. The recipe calls for $\frac{1}{8}$ teaspoon of vanilla extract for the cake and $\frac{3}{4}$ teaspoon of vanilla extract for the frosting. To make 2 cakes with frosting by doubling this recipe, how many teaspoons of vanilla extract does Eduardo need?

F. $\frac{2}{3}$
G. $\frac{7}{8}$
H. $\frac{7}{16}$
J. $1\frac{1}{2}$
K. $1\frac{3}{4}$

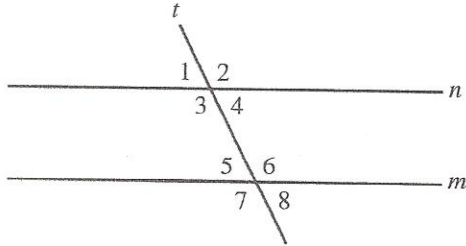
13. In the standard (x,y) coordinate plane, what is the midpoint of the line segment with endpoints (1,9) and (7,-3)?

A. (-3,-6)
B. (-1, 8)
C. (4, 3)
D. (5, 2)
E. (8, 6)

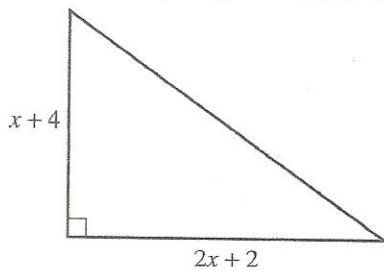


14. In the plane shown in the figure below, lines m and n are cut by transversal line t . The 8 angles at the intersections of these lines are labeled. Which of the following statements, when it is true, CANNOT always be used to prove that lines m and n are parallel?

DO YOUR FIGURING HERE.



- F. $\angle 1 \cong \angle 5$
 G. $\angle 1 \cong \angle 7$
 H. $\angle 1 \cong \angle 8$
 J. $\angle 2 \cong \angle 7$
 K. $\angle 4 \cong \angle 5$
15. The dimensions of the right triangle shown below are in feet. What is the area, in square feet, of the triangle?



- A. $x^2 + 4$
 B. $x^2 + 8$
 C. $x^2 + 5x + 4$
 D. $2x^2 + 8$
 E. $8x^2$
16. If $f(x) = x^2 - x + 1$, what is $f(-3)$?
- F. -11
 G. -5
 H. 7
 J. 10
 K. 13

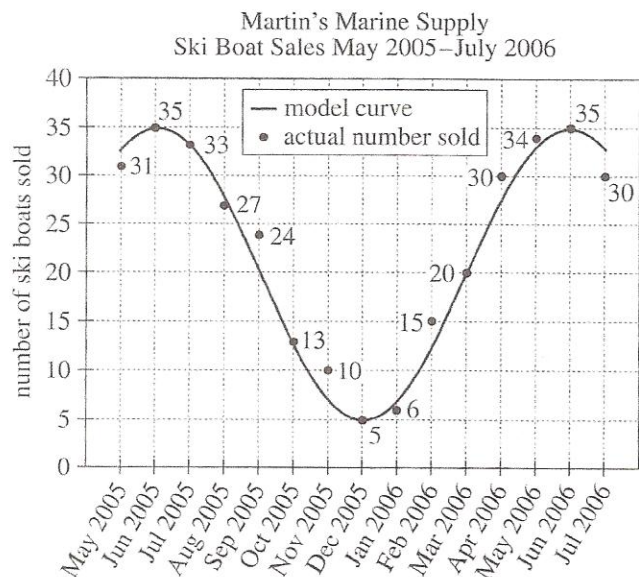
17. What is the length, in feet, of the side of a square whose area, in square feet, is equal to the area of a 25-foot-by-16-foot rectangle?
- A. $\sqrt{41}$
 B. $2\sqrt{10}$
 C. 9
 D. 20
 E. 400



Use the following information to answer questions 18–20.

DO YOUR FIGURING HERE.

The graph below shows the number of ski boats sold each month by Martin's Marine Supply. The number near each point is the actual number of ski boats sold for the month corresponding with the point. The curve represents a model equation that comes close to fitting the actual numbers sold by month.



18. One of the following is the value for September 2005 on the model curve. Which one?

F. 5
G. 20
H. 24
J. 27
K. 35

19. What is the average number of ski boats actually sold per month between and including the months of January 2006 and April 2006?

A. $13\frac{2}{3}$
B. $15\frac{1}{4}$
C. $16\frac{3}{4}$
D. $17\frac{3}{4}$
E. $21\frac{2}{3}$



20. During the period shown in the graph, each ski boat sold for exactly \$30,000 before sales tax. On January 1, 2006, the sales tax was increased from 6% to 7%. How much more was the total sales tax on the actual number of ski boats sold in July 2006 than on the actual number sold in July 2005 ?

F. \$3,600
 G. \$5,400
 H. \$6,300
 J. \$9,000
 K. \$9,900

DO YOUR FIGURING HERE.

21. For nonzero real numbers a , b , and c , the expression

$$\frac{a^3b^3c^4}{5a^2b^7c}$$

is equivalent to:

A. $\frac{a^3c^3}{5b^4}$

B. $\frac{a^3c^4}{5b^4}$

C. $\frac{a^3bc^4}{5ab^4c}$

D. $\frac{(abc)^{12}}{(5abc)^9}$

E. $5a^7b^{10}c^5$

22. Akiko's average heart rate is 70 beats per minute. In scientific notation, how many times would her heart beat in 24 hours?

F. 1.44×10^3

G. 1.68×10^3

H. 4.2×10^3

J. 1.008×10^4

K. 1.008×10^5

23. The lengths of the 3 sides of a triangle are in the ratio 5:6:9. The perimeter of the triangle is 100 inches. What is the length, in inches, of the longest side of the triangle?

A. 10
 B. 25
 C. 30
 D. 45
 E. 50



24. Given that $\sin A = \frac{20}{25}$, which of the following values could $\tan A$ equal?

DO YOUR FIGURING HERE.

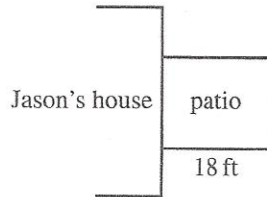
- F. $\frac{5}{20}$
- G. $\frac{15}{20}$
- H. $\frac{20}{15}$
- J. 4
- K. 5
25. Which of the following sets of 3 numbers could be the side lengths, in meters, of a right triangle?
- A. 1, 1, 1
- B. 2, 3, 5
- C. 3, 4, 7
- D. 4, 9, 13
- E. 6, 8, 10
26. When graphed in the standard (x,y) coordinate plane, the line $2x + 3y - 1 = 0$ has a slope of:
- F. -2
- G. $-\frac{2}{3}$
- H. $\frac{2}{3}$
- J. $\frac{3}{2}$
- K. 2
27. Which of the following expressions is equivalent to $(2x^2 + x + 3) + (2x + 1) + (3x - 1) - (2x + 2x + 2x)$?
- A. $2x^2 + 8x + 3$
- B. $2x^2 + 2x + 3$
- C. $2x^2 + 3$
- D. $8x + 3$
- E. $2x + 3$



Use the following information to answer questions 28–30.

DO YOUR FIGURING HERE.

Jason will have a rectangular concrete patio constructed beside his house, as shown below. The patio will have a length of 18 feet, and the top surface of the patio will have an area of 270 square feet. The patio will be constructed so that one side of the patio is against a side of Jason's house.

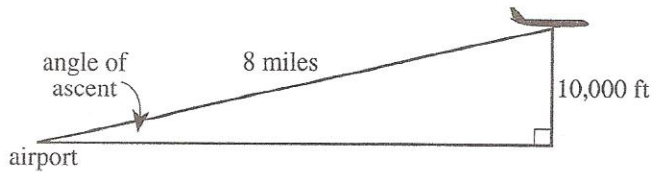


28. The patio will have a thickness of 6 inches. The patio will consist of how many cubic feet of concrete?
- F. 45
G. 90
H. 108
J. 117
K. 135
29. Jason chooses Tully's Concrete Finishing to seal his patio. Tully's Concrete Finishing uses the formula $C = 3.5A + 120$ to calculate the charge, C dollars, to seal a patio, where A square feet is the area of the top surface of the patio. What will be the charge for sealing Jason's patio?
- A. \$ 483
B. \$ 945
C. \$1,065
D. \$1,128
E. \$1,365
30. Jason will plant shrubs along the portion of the perimeter of the patio that is NOT against his house. What is the length, in feet, of that portion?
- F. 33
G. 43.5
H. 48
J. 51
K. 66



31. An airplane taking off from an airport climbs at a constant angle of ascent so that it will reach an altitude of 10,000 feet when the airplane has flown 8 miles, as illustrated in the figure below. Which of the following expressions gives the angle of ascent?

(Note: 1 mile = 5,280 feet)



DO YOUR FIGURING HERE.

- A. $\text{Arcsin}\left(\frac{8}{10,000}\right)$
- B. $\text{Arctan}\left(\frac{10,000}{8(5,280)}\right)$
- C. $\text{Arcsin}\left(\frac{10,000}{8(5,280)}\right)$
- D. $\text{Arccos}\left(\frac{10,000}{8(5,280)}\right)$
- E. $\text{Arctan}\left(\frac{8(5,280)}{10,000}\right)$
32. Which of the following inequalities orders the 4 numbers $\sqrt{3}$, $1\frac{5}{6}$, 1.6, and $\frac{5}{3}$ from largest to smallest?
- F. $1\frac{5}{6} > \sqrt{3} > \frac{5}{3} > 1.6$
- G. $1\frac{5}{6} > \frac{5}{3} > 1.6 > \sqrt{3}$
- H. $1\frac{5}{6} > \sqrt{3} > 1.6 > \frac{5}{3}$
- J. $\frac{5}{3} > 1\frac{5}{6} > \sqrt{3} > 1.6$
- K. $\sqrt{3} > 1\frac{5}{6} > \frac{5}{3} > 1.6$
33. What is the 7th term of the geometric sequence 1, -2, 4, -8, ... ?
- A. -32
- B. -10
- C. 16
- D. 56
- E. 64
34. The hypotenuse of $\triangle POM$ is \overline{PM} . Which of the following statements could be true about $\triangle POM$?
- F. $\overline{MO} \cong \overline{OP}$
- G. $\overline{MP} \cong \overline{OP}$
- H. $\angle M$ is a right angle.
- J. The 3 sides of $\triangle POM$ are congruent.
- K. The 3 interior angles of $\triangle POM$ are congruent.



35. Let $\triangle ABC$ and $\triangle DEF$ be similar triangles such that the scale factor of $\triangle ABC$ to $\triangle DEF$ is $\frac{2}{3}$. The perimeter of $\triangle ABC$ is 20 inches. What is the perimeter of $\triangle DEF$, in inches?

DO YOUR FIGURING HERE.

- A. 13
 B. 25
 C. 30
 D. 40
 E. 45
36. Planter's Greenhouse estimates its profit by subtracting its overhead costs from 40% of its net sales. Which of the following equations represents this relationship between estimated profit (P), net sales (S), and overhead costs (C) of Planter's Greenhouse?

F. $P = \frac{40}{100}C - S$

G. $P = \frac{40}{100}S - C$

H. $P = S - \frac{40}{100}C$

J. $P = 40C - S$

K. $P = 40S - C$

37. In right triangle $\triangle PQR$ shown below, \overline{QR} is 450 feet long and the measure of $\angle R$ is 35° . What is the length, in feet, of \overline{PQ} ?

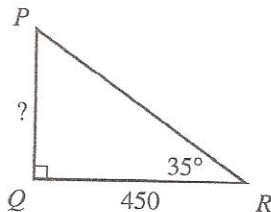
A. $450 \sin 35^\circ$

B. $450 \tan 35^\circ$

C. $\frac{450}{\sin 35^\circ}$

D. $\frac{450}{\cos 35^\circ}$

E. $\frac{450}{\tan 35^\circ}$



38. Which of the following is equivalent to $\frac{5+3x}{2} - 3 > 0$?

F. $x > 0$

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

H. $x > 1$

J. $x > 3$

K. $x > 6$



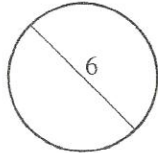
39. Sofia and Lance are contributing a total of \$2,500 per year to help their nephew pay for college. Each year, Lance contributes $1\frac{1}{2}$ times the amount Sofia contributes. What is the amount, in dollars, Lance will contribute over a period of 4 years?
- A. \$1,250
 B. \$1,875
 C. \$4,000
 D. \$5,000
 E. \$6,000

DO YOUR FIGURING HERE.

40. Which of the following is the least common denominator for $\frac{1}{x^2-4} + \frac{1}{4x-8}$?
- F. $(x-2)$
 G. $4(x+2)$
 H. $(x-2)(x+2)$
 J. $4(x-2)(x+2)$
 K. $4(x-2)^2(x+2)$

41. The circle shown below has a diameter of 6 cm. What is the area, in square centimeters, of the circle?

- A. 3π
 B. 6π
 C. 9π
 D. 12π
 E. 36π



42. Which of the following is an equation of the line that passes through $(10,-2)$ and $(-2,-5)$ in the standard (x,y) coordinate plane?

- F. $y = \frac{1}{4}x - \frac{9}{2}$
 G. $y = \frac{1}{4}x - \frac{1}{2}$
 H. $y = \frac{1}{4}x - 2$
 J. $y = -\frac{1}{4}x - \frac{1}{2}$
 K. $y = -\frac{1}{4}x + \frac{9}{2}$

43. A health club surveyed 175 members about which types of equipment they had used in the past month. Of the 175 members, 117 had used treadmills, 89 had used stationary bikes, and 53 had used both types of equipment. Some members had used neither type of equipment. Of the 175 members, how many had used treadmills, stationary bikes, or both?
- A. 53
 B. 81
 C. 122
 D. 134
 E. 153



44. What is the largest 2-digit integer that is divisible by 7 and is a multiple of 3?

F. 21
 G. 42
 H. 84
 J. 98
 K. 105

DO YOUR FIGURING HERE.

45. In the standard (x,y) coordinate plane, the line

$$y = \frac{1}{4}x + 6$$

is perpendicular to the line:

A. $y = -4x + 6$

B. $y = 4x + 6$

C. $y = -\frac{1}{4}x + 6$

D. $y = \frac{1}{4}x - 6$

E. $y = \frac{1}{4}x$

46. An emergency helicopter is located 2 miles north and 4 miles east of City Center. There is an emergency 22 miles south and 6 miles west of City Center. Which of the following is the distance, in miles, between the helicopter and the emergency?

F. 20
 G. 22
 H. 24
 J. 26
 K. 34

47. The 3 statements given below are all true about certain positive integers x , y , and z .

1. x is an even prime number
2. $6 < y < 9$
3. z is a perfect square such that $10 < z < 20$

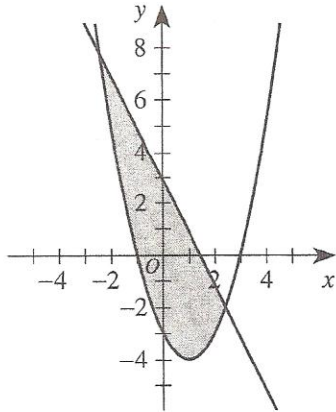
Which of the following integers could be the value of $\frac{yz}{x}$?

A. 4
 B. 32
 C. 48
 D. 56
 E. 72



48. The shaded region in the standard (x,y) coordinate plane below is bounded by a parabola and a line. The shaded region and its boundary is the solution set of which of the following systems of inequalities?

DO YOUR FIGURING HERE.



- F. $\begin{cases} y \geq -2x + 3 \\ y \leq x^2 - 2x - 3 \end{cases}$
- G. $\begin{cases} y \leq -2x + 3 \\ y \geq x^2 - 2x - 3 \end{cases}$
- H. $\begin{cases} y \leq -2x + 3 \\ y \leq x^2 - 2x - 3 \end{cases}$
- J. $\begin{cases} y \geq -2x - 3 \\ y \leq x^2 - 2x + 3 \end{cases}$
- K. $\begin{cases} y \leq -2x - 3 \\ y \geq x^2 - 2x + 3 \end{cases}$

49. What is the value of y in the solution of the system of equations below?

$$\begin{aligned} x + y &= -a \\ x - y &= b \end{aligned}$$

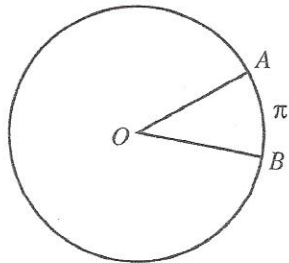
- A. $-\left(\frac{a+b}{2}\right)$
- B. $b - a$
- C. $\frac{b-a}{2}$
- D. $a + b$
- E. $\frac{a-b}{2}$



50. In the circle shown below, central angle $\angle AOB$ measures 45° , and arc \widehat{AB} is π centimeters long. How many centimeters long is the circle's radius?

DO YOUR FIGURING HERE.

- F. 2
G. 4
H. 8
J. 16
K. $4\sqrt{2}$



51. The solution to $ax = b$ is $x = 3$. The solution to $ax - 2 = b$ is $x = 8$. What is the value of a ?

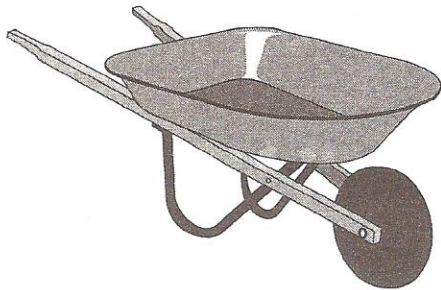
- A. $\frac{2}{5}$
B. $\frac{2}{7}$
C. $\frac{3}{8}$
D. $\frac{8}{3}$
E. $\frac{8}{5}$

52. Consider the equation $x^2 - 6x + k = 0$. When solved for x , this equation will have exactly one real solution for which of the following values of k ?

- F. -9
G. -3
H. 6
J. 9
K. 36

53. In the distance that Molly pushed the wheelbarrow shown below, the wheel rotated $\frac{3\pi}{2}$ radians. The distance that Molly pushed the wheelbarrow is what fraction of the circumference of the wheel?

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



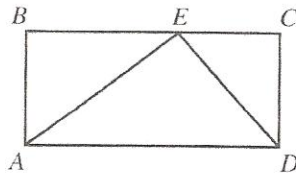


54. The domain of the function $f(x) = \frac{1}{100 - |x|}$ contains all real values of x EXCEPT:

DO YOUR FIGURING HERE.

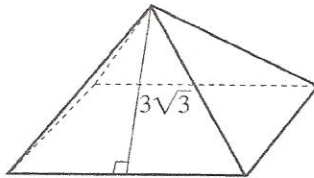
- F. 0
 G. 0 and 100
 H. 0 and $\frac{1}{100}$
 J. $-\frac{1}{100}$ and $\frac{1}{100}$
 K. -100 and 100
55. In the figure below, E lies $\frac{3}{5}$ of the way from B to C on rectangle $ABCD$. The area of $\triangle AED$ is what fraction of the area of rectangle $ABCD$?

- A. $\frac{1}{2}$
 B. $\frac{2}{3}$
 C. $\frac{2}{5}$
 D. $\frac{3}{5}$
 E. $\frac{3}{10}$



56. A right square pyramid with equilateral triangular faces is shown in the figure below. The slant height of the pyramid is $3\sqrt{3}$ inches. What is the total length, in inches, of all 8 edges of the pyramid?

- F. 12
 G. 21
 H. 24
 J. 36
 K. 48



57. A circle in the standard (x,y) coordinate plane intersects the x -axis at $(-7,0)$ and $(1,0)$. The radius of the circle is 5 coordinate units. Which of the following could be the center of the circle?

- I. $(-3,-3)$
 II. $(-3, 0)$
 III. $(-3, 3)$
- A. I only
 B. II only
 C. III only
 D. I and III only
 E. I, II, and III

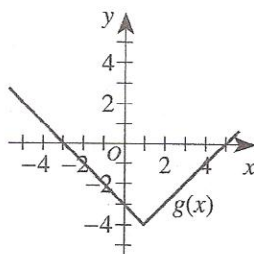
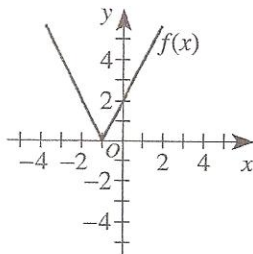


58. What percent of the *even* numbers from 2 to 50, inclusive, have a units digit that is twice the tens digit?

F. 4%
 G. 5%
 H. 8%
 J. 16%
 K. 20%

DO YOUR FIGURING HERE.

59. The graphs of $f(x)$ and $g(x)$ are shown in the standard (x,y) coordinate planes below. One of the following expressions represents $g(x)$ in terms of $f(x)$. Which one?



- A. $\frac{1}{2}f(x-2) - 4$
 B. $\frac{1}{2}f(x-2) + 4$
 C. $\frac{1}{2}f(x+2) + 4$
 D. $f(x-2) - 4$
 E. $f(x+2) - 4$
60. A news anchor made the true statement below.
 If it is raining, then the parade is canceled.
 Which of the following statements is logically equivalent to the news anchor's statement?
- F. If it is not raining, then the parade is not canceled.
 G. The parade is canceled if and only if it is raining.
 H. If it is not raining, then the parade is canceled.
 J. If the parade is canceled, then it is raining.
 K. If the parade is not canceled, then it is not raining.

END OF TEST 2

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

DO NOT RETURN TO THE PREVIOUS TEST.