



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. A group of 6 people planned to spend \$10.00 each to rent a boat for an outing. At the last minute, 1 person could not go on the outing. The others then paid equally for the boat. How much did each pay?

- A. \$ 8.00
- B. \$ 8.33
- C. \$11.67
- D. \$12.00
- E. \$20.00

2. A calculator has a regular price of \$58.95 before taxes. It goes on sale at 20% below the regular price. Before taxes are added, what is the sale price of the calculator?

- F. \$53.95
- G. \$47.16
- H. \$38.95
- J. \$29.48
- K. \$11.79

3. Melissa knows that 30 miles per hour is equivalent to 44 feet per second. If Melissa drives at a speed of 70 miles per hour, which of the following is closest to her speed in feet per second?

- A. 31
- B. 48
- C. 103
- D. 127
- E. 1,027

4. If $r = 5$, $b = 2$, and $g = -3$, what does $(r + b - g)(b + g)$ equal?

- F. -10
- G. -4
- H. 4
- J. 9
- K. 10

DO YOUR FIGURING HERE.



5. What is the largest value of x for which there exists a real value of y such that $x^2 + y^2 = 256$?

A. 16
 B. 128
 C. 240
 D. 256
 E. 512

DO YOUR FIGURING HERE.

6. At Riverland Amusement Park, if an individual is not more than 4 feet tall, then that individual cannot ride the roller coaster. If Antoine rode the roller coaster at Riverland Amusement Park today, then which of the following may be logically concluded?

F. Antoine is at most 3 feet tall.
 G. Antoine is less than 4 feet tall.
 H. Antoine is exactly 4 feet tall.
 J. Antoine is more than 4 feet tall.
 K. Antoine is at least 5 feet tall.

7. The number, N , of students at Hamlet High School who will catch the flu through Week t of school is modeled by the function $N(t) = \frac{1,200t^2 + 10}{t^2 + 1}$. According to the model, how many students will catch the flu through Week 4?

A. 114
 B. 1,068
 C. 1,130
 D. 1,835
 E. 1,951

8. $3x^5 \cdot 7x^9$ is equivalent to:

F. $10x^4$
 G. $10x^{14}$
 H. $10x^{45}$
 J. $21x^{14}$
 K. $21x^{45}$

9. A bag contains 5 yellow jellybeans, 4 red jellybeans, and 3 green jellybeans, all of the same shape and size. When 1 jellybean is randomly picked from the bag, what is the probability that it is green?

A. $\frac{1}{12}$
 B. $\frac{1}{4}$
 C. $\frac{1}{3}$
 D. $\frac{5}{12}$
 E. $\frac{2}{3}$

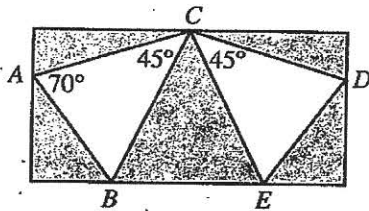
2**2**

10. What is the least common denominator for adding the fractions $\frac{4}{35}$, $\frac{1}{56}$, and $\frac{3}{16}$?

F. 80
 G. 560
 H. 1,960
 J. 4,480
 K. 31,360

DO YOUR FIGURING HERE.

11. Marisa's design for a rectangular stained glass window with 7 triangles is shown below. The 2 white triangles are congruent ($\triangle ABC \cong \triangle DEC$) and will be a different color than the other 5 triangles. The design includes the measures of $\angle CAB$, $\angle ACB$, and $\angle DCE$. What is the measure of $\angle CED$?



A. 45°
 B. 65°
 C. 70°
 D. 115°
 E. 135°

12. The expression $\frac{8 + \frac{1}{7}}{1 + \frac{1}{14}}$ is equal to:

F. $\frac{38}{5}$
 G. $\frac{855}{7}$
 H. 4
 J. 5
 K. 10

13. The sum of the real numbers x and y is 15. Their difference is 9. What is the value of xy ?

A. 12
 B. 15
 C. 24
 D. 36
 E. 135

14. Four points, A , B , C , and D , lie on a circle having a circumference of 17 units. B is 6 units counterclockwise from A . C is 2 units clockwise from A . D is 9 units clockwise from A and 8 units counterclockwise from A . What is the order of the points, starting with A and going clockwise around the circle?

F. A, B, C, D
 G. A, B, D, C
 H. A, C, B, D
 J. A, C, D, B
 K. A, D, C, B



15. To determine a student's overall test score for the semester, Ms. Rainwater deletes the lowest test score and calculates the average of the remaining test scores. Galen took all 5 tests and earned the following test scores in Ms. Rainwater's class this semester: 81, 83, 88, 92, and 99. What overall test score did Galen earn in Ms. Rainwater's class this semester?

DO YOUR FIGURING HERE.

- A. 88.0
- B. 88.6
- C. 90.0
- D. 90.5
- E. 91.0

16. What is the slope-intercept form of $6x - y - 2 = 0$?

- F. $y = -6x + 2$
- G. $y = -6x - 2$
- H. $y = 2x - 6$
- J. $y = 6x + 2$
- K. $y = 6x - 2$

17. What is the sum of the 2 solutions of the equation $x^2 - 3x - 28 = 0$?

- A. 7
- B. 3
- C. 0
- D. -4
- E. -28

18. $|5(-4) + 3(6)| = ?$

- F. -2
- G. 2
- H. 10
- J. 19
- K. 38

19. Tracy is trying to find a wrench to fit a bolt. The $\frac{3}{8}$ -inch wrench is too large, and the $\frac{5}{16}$ -inch wrench is too small. Which of the following could be the size of the wrench that will fit the bolt exactly?

- A. $\frac{1}{4}$ -inch
- B. $\frac{9}{32}$ -inch
- C. $\frac{11}{32}$ -inch
- D. $\frac{25}{64}$ -inch
- E. $\frac{13}{32}$ -inch



20. What is the slope of the line containing the points (3,8) and (-2,10) in the standard (x,y) coordinate plane?

DO YOUR FIGURING HERE.

F. $\frac{1}{18}$

G. $\frac{12}{5}$

H. 18

J. $-\frac{5}{2}$

K. $-\frac{2}{5}$

21. The expression $a + b + c + a + b + c$ is equivalent to:

A. $6abc$

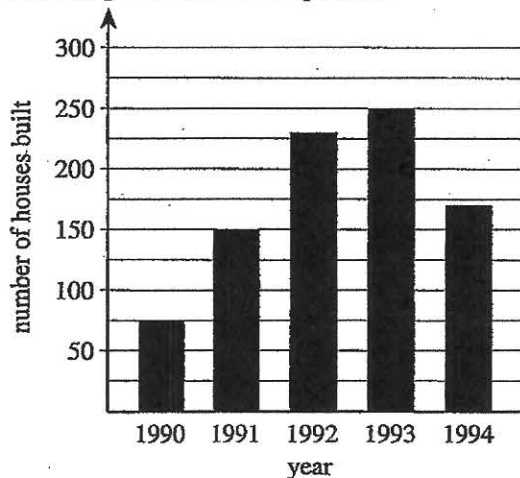
B. $a^2b^2c^2$

C. $6a^2b^2c^2$

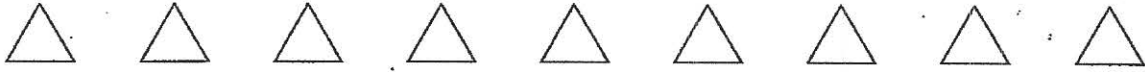
D. $a^2 + b^2 + c^2$

E. $2a + 2b + 2c$

22. During a 5-year period, 875 houses were built in Somerville. The graph below shows how many of these houses were built in each of these 5 years. A certain percent of the 875 houses were built in 1993. Which of the following is closest to that percent?



- F. 20%
 G. 25%
 H. 30%
 J. 35%
 K. 40%



23. How many terms are there between 13 and 37, exclusive of 13 and 37, in the arithmetic sequence below?

4, 7, 10, 13, ..., 37

- A. 0
- B. 7
- C. 8
- D. 28
- E. 36

DO YOUR FIGURING HERE.

24. For $x^2 \neq 49$, $\frac{(x-7)^2}{x^2-49} = ?$

- F. $\frac{x-7}{x+7}$
- G. $\frac{1}{x-7}$
- H. $\frac{1}{x+7}$
- J. $-\frac{1}{7}$
- K. $\frac{1}{7}$

25. The sides of one triangle are 12 inches, 14 inches, and 15 inches long, respectively. 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. 6.4
- B. 9.3
- C. 10.0
- D. 11.0
- E. 14.4

26. Which of the following is equivalent to $(x+2)^0$ whenever $x \neq -2$?

- F. $x+2$
- G. 0
- H. 1
- J. 2
- K. 3

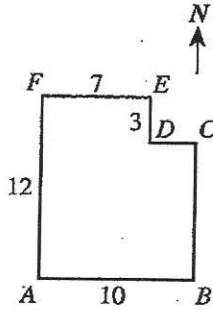
27. A pentagon has 1 side of length z cm, 2 sides of length $(z+2)$ cm each, 1 side of length 5 cm, and 1 side of length $3z$ cm. What is the perimeter, in centimeters, of the pentagon?

- A. $9z+6$
- B. $6z+9$
- C. $6z+4$
- D. $5z+9$
- E. $5z+7$



28. A park has the shape and dimensions in blocks given below. A water fountain is located halfway between B and D . If you are at A , the water fountain is:

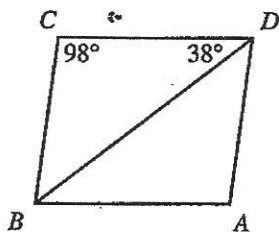
DO YOUR FIGURING HERE.



- F. $4\frac{1}{2}$ blocks north and 5 blocks east.
 G. $4\frac{1}{2}$ blocks north and $8\frac{1}{2}$ blocks east.
 H. 6 blocks north and $3\frac{1}{2}$ blocks east.
 J. 6 blocks north and 5 blocks east.
 K. $7\frac{1}{2}$ blocks north and 9 blocks east.
29. If $a = 2c$ and $b = 6c$, which of the following relationships holds between a and b for each nonzero value of c ?
- A. $a = 3b$
 B. $a = 2b$
 C. $a = b$
 D. $a = \frac{1}{6}b$
 E. $a = \frac{1}{3}b$
30. For a certain plant, the recommended nighttime temperature range in degrees Fahrenheit is $59^\circ \leq F \leq 68^\circ$. Given the formula $C = \frac{5}{9}(F - 32)$, where C is the temperature in degrees Celsius and F is the temperature in degrees Fahrenheit, what is the corresponding nighttime temperature range in degrees Celsius for the plant?
- F. $0^\circ \leq C \leq 5^\circ$
 G. $5^\circ \leq C \leq 10^\circ$
 H. $10^\circ \leq C \leq 15^\circ$
 J. $15^\circ \leq C \leq 20^\circ$
 K. $20^\circ \leq C \leq 25^\circ$



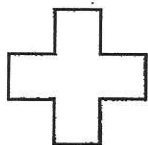
31. In parallelogram $ABCD$ below, the measure of $\angle BCD$ is 98° and the measure of $\angle CDB$ is 38° . What is the measure of $\angle BDA$?



- A. 38°
- B. 41°
- C. 44°
- D. 49°
- E. 52°

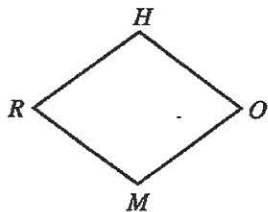
DO YOUR FIGURING HERE.

32. All the adjacent line segments in the figure below intersect in right angles. If each segment is 6 units long, what is the area, in square units, of the entire figure?



- F. 72
- G. 120
- H. 144
- J. 180
- K. 324

33. Rhombus $RHOM$ is shown in the figure below. If $HR = 5$ m and $HM = 6$ m, then what is the length, in meters, of OR ?

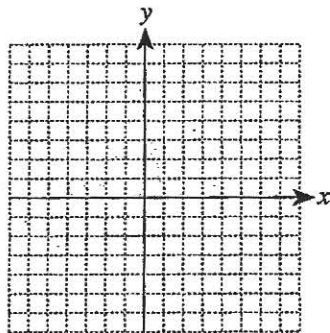


- A. 3
- B. 4
- C. 5
- D. 6
- E. 8



DO YOUR FIGURING HERE.

34. Grid lines are shown at 1-unit intervals in the standard (x,y) coordinate plane below. Some of the 1-by-1 squares are shaded in the grid. What is the least number of additional 1-by-1 squares that must be shaded so the total shaded region will be symmetric about the y -axis?

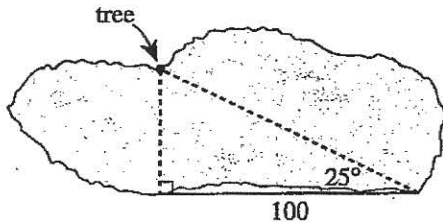


- F. 3
G. 5
H. 7
J. 11
K. 22
35. The ratio of the side lengths of a rectangle with an area of 80 square yards is 4:1. Which of the following is closest to the length, in yards, of the *longer* side of the rectangle?
- A. 10
B. 16
C. 18
D. 32
E. 40
36. Ms. Luciano's Algebra I class is describing the volume of geometric figures in terms of variables. She draws a rectangular prism that has a length of $(x + 2)$ meters, a width of $(x - 2)$ meters, and a height of $(x + 1)$ meters. Which of the following is an expression for the volume, in cubic meters, of the rectangular prism?
- F. $3x - 4$
G. $3x + 1$
H. $x^3 - 4$
J. $x^3 + 2x^2 - 2x - 4$
K. $x^3 + x^2 - 4x - 4$
37. A data set has 15 elements. The 15 elements in a second data set are obtained by multiplying each element in the first data set by 10. The 15 elements in a third data set are obtained by decreasing each element of the second data set by 20. The median of the third data set is 50. What is the median of the first data set?
- A. -20
B. 7
C. 50
D. 70
E. 750



38. Jamal sees a tree on the shore directly across a lake and wonders what the distance is across the lake to the tree. He turns 90° to the right and walks in a straight line for 100 meters. Jamal turns to face the tree and finds the angle between his line of sight and his path measures 25° , as shown below. Which of the following is closest to the distance, in meters, from Jamal's initial position to the tree?

(Note: $\sin 25^\circ \approx 0.42$, $\cos 25^\circ \approx 0.91$, $\tan 25^\circ \approx 0.47$)



- F. 42
G. 47
H. 91
J. 213
K. 238
39. In the standard (x,y) coordinate plane, a right triangle has vertices at $(-3,4)$, $(3,4)$, and $(3,-4)$. What is the length, in coordinate units, of the hypotenuse of this triangle?
- A. 3
B. 4
C. 6
D. 8
E. 10
40. Each edge of a cube is 4 inches long. Each edge of a second cube is triple the length of each edge of the first cube. The volume of the second cube is how many cubic inches bigger than the volume of the first cube?
- F. 128
G. 512
H. 576
J. 1,664
K. 1,728
41. A particular circle in the standard (x,y) coordinate plane has an equation of $(x - 8)^2 + y^2 = 15$. What are the radius of the circle, in coordinate units, and the coordinates of the center of the circle?

	<u>radius</u>	<u>center</u>
A.	7.5	$(-8,0)$
B.	7.5	$(8,0)$
C.	15	$(8,0)$
D.	$\sqrt{15}$	$(-8,0)$
E.	$\sqrt{15}$	$(8,0)$

DO YOUR FIGURING HERE.



Use the following information to answer questions 42–44.

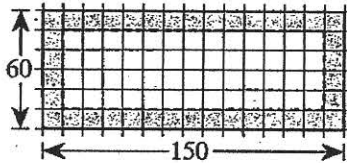
DO YOUR FIGURING HERE.

The Springfield City Council is going to create a park on some unused land the city owns. The park will be a rectangular region 60 feet by 150 feet with an area of 9,000 square feet. There will be a picnic shelter in the park that will cover a square region 30 feet by 30 feet with an area of 900 square feet. The park will be grass, except for the region where the picnic shelter is.

42. The City Council decides to put fencing around the park. What is the perimeter, in feet, of the park?

F. 150
G. 210
H. 270
J. 420
K. 540

43. The picnic shelter must be at least 10 feet from any edge of the park. On graph paper with the distance between grid lines representing 10 feet, a city engineer makes a scale drawing of the park, as shown below. The region where the picnic shelter CANNOT be built is shown shaded. The corners of both the park and the region where the picnic shelter may be built are at the intersections of grid lines. The corners of the picnic shelter must also be at the intersections of grid lines. How many different locations in the park are possible for the placement of the picnic shelter?

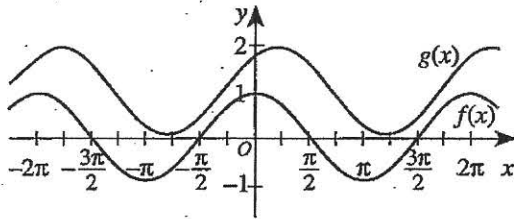


- A. 22
B. 36
C. 52
D. 70
E. 90
44. The City Council's long-term plan for the park involves doubling the area of the park. The length and width of the park will each be extended by d feet. For which of the following equations is $x = d$ a solution?

F. $(x + 60)(x + 150) = 2(9,000)$
G. $(x + 2(60))(x + 2(150)) = 9,000$
H. $(x + 2(60))(x + 2(150)) = 2(9,000)$
J. $(2x + 60)(2x + 150) = 2(9,000)$
K. $2(x + 60)(x + 150) = 9,000$

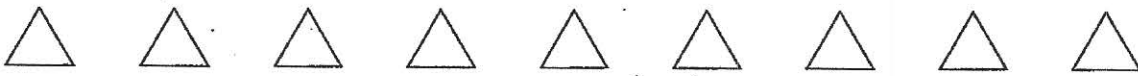


45. The graphs of $f(x) = \cos x$ and $g(x) = \cos\left(x - \frac{\pi}{4}\right) + 1$ are shown in the standard (x,y) coordinate plane below. After one of the following pairs of transformations is applied to the graph of $f(x)$, the image of the graph of $f(x)$ is the graph of $g(x)$. Which pair is it?



DO YOUR FIGURING HERE.

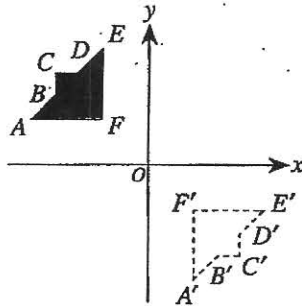
- A. Shift $f(x)$ 1 unit left and $\frac{\pi}{4}$ units down.
- B. Shift $f(x)$ 1 unit left and $\frac{\pi}{4}$ units up.
- C. Shift $f(x)$ 1 unit right and $\frac{\pi}{4}$ units down.
- D. Shift $f(x)$ $\frac{\pi}{4}$ units left and 1 unit up.
- E. Shift $f(x)$ $\frac{\pi}{4}$ units right and 1 unit up.
46. Let p and q be numbers such that $0 < p < q$. Which of the following inequalities *must* be true for all such p and q ?
- F. $p + 1 > q + 1$
- G. $\frac{p}{q} > 1$
- H. $\frac{1}{q} > \frac{1}{p}$
- J. $p^2 > q^2$
- K. $-p > -q$
47. If a is 25% of b , then 135% of b is what percent of a ?
- A. 160%
- B. 210%
- C. 337.5%
- D. 540%
- E. 875%
48. The expression $\sin^2\theta - 4 + \cos^2\theta$ is equivalent to:
- F. -5
- G. -4
- H. -3
- J. 3
- K. 5



49. Figure $ABCDEF$, shown in the standard (x,y) coordinate plane below, has been reflected across a line to figure $A'B'C'D'E'F'$. Which of the following lines of reflection would best describe this transformation?

DO YOUR FIGURING HERE.

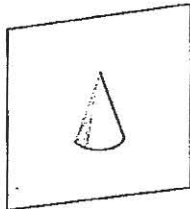
- A. $y = 0$
- B. $y = \frac{1}{2}$
- C. $y = -x$
- D. $x = 0$
- E. $x = y$



50. What is the length, in inches, of a 144° arc of a circle whose circumference is 60 inches?

- F. $\frac{36}{\pi}$
- G. 12π
- H. 24
- J. 36
- K. 12π

51. A solid, right circular cone is sliced perpendicular to its base through its vertex and the center of its base, as shown below. Which of the following best represents the plane section?



- A.
- B.
- C.
- D.
- E.



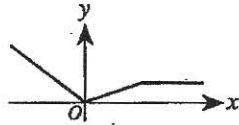
RE.

If b is a positive number such that $\log_b\left(\frac{1}{81}\right) = -4$, then $b = ?$

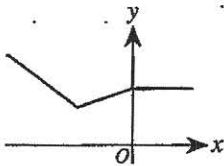
- F. 3
- G. 9
- H. 85
- J. $\frac{1}{3}$
- K. $\frac{1}{9}$

DO YOUR FIGURING HERE.

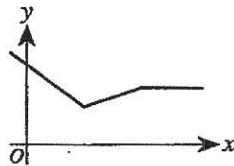
The graph in the standard (x,y) coordinate plane below is the graph of $y = f(x)$. One of the following graphs is the graph of $y = f(x - 3) + 2$. Which one?



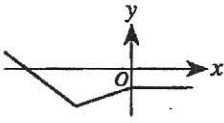
A.



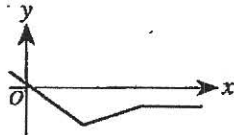
D.



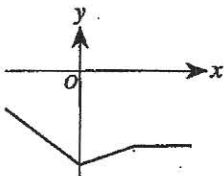
B.



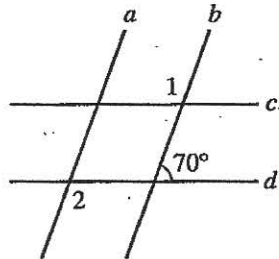
E.



C.



In the figure below, parallel lines a and b intersect parallel lines c and d . If it can be determined, what is the sum of the degree measures of $\angle 1$ and $\angle 2$?



- F. 220°
- G. 180°
- H. 140°
- J. 110°
- K. Cannot be determined from the given information

2



2

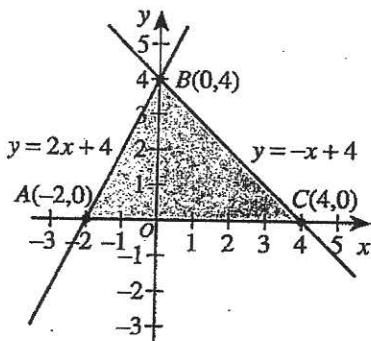
Use the following information to answer questions 55–57.

DO YOUR FIGURING HERE.

Consider the set of all points (x,y) that satisfy all 3 of the conditions below:

$$\begin{aligned} y &\geq 0 \\ y &\leq 2x + 4 \\ y &\leq -x + 4 \end{aligned}$$

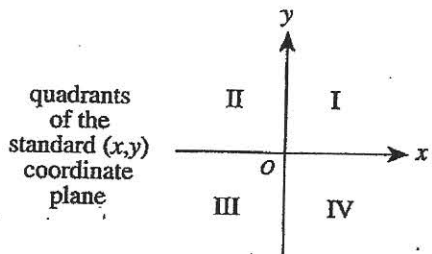
The graph of this set is $\triangle ABC$ and its interior, which is shown shaded in the standard (x,y) coordinate plane below. Let this set be the domain of the function $P(x,y) = 4x + 3y$.



55. What is the maximum value of $P(x,y)$ when x and y satisfy the 3 conditions given?

- A. 4
- B. 8
- C. 12
- D. 16
- E. 28

56. The quadrants of the standard (x,y) coordinate plane are labeled in the figure below. The domain of $P(x,y)$ contains points in which quadrants?



- F. I and II only
- G. I and III only
- H. I and IV only
- J. II and III only
- K. II and IV only

**2****2**

HERE.

 $\tan \angle BCA = ?$

DO YOUR FIGURING HERE.

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

The function $f(x)$ is a cubic polynomial that has the value of 0 when x is 0, 3, and -5 . If $f(1) = -24$, which of the following is an expression for $f(x)$?

- F. $x^3 - 25$
- G. $-2x(x - 3)(x + 5)$
- H. $x(x - 3)(x + 5)$
- J. $2x(x + 3)(x - 5)$
- K. $2x(x - 3)(x + 5)$

Water is considered contaminated when the level of zinc in the water reaches 5 parts of zinc per 1 million parts of water. What is this level of zinc contamination written in scientific notation?

- A. 5.0×10^{-9}
- B. 5.0×10^{-7}
- C. 5.0×10^{-6}
- D. 5.0×10^6
- E. 5.0×10^9

Given $a > b$ and $(a - b) > (a^2 - b^2)$, then $(a + b)$ must be:

- F. less than 1.
- G. greater than 1.
- H. greater than a .
- J. greater than $(a - b)$.
- K. equal to $(a - b)$.

END OF TEST 2**STOP! DO NOT TURN THE PAGE UNTIL TOLD TO DO SO.****DO NOT RETURN TO THE PREVIOUS TEST.**