AMI:

Day 1: #1-12

Day 2: #13-24

Day 3: #25-36

Day 4: #37-48

Day 5: #49-60

2

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. Kalino earned 85, 95, 93, and 80 points on the 4 tests, each worth 100 points, given so far this term. How many points must he earn on his fifth test, also worth 100 points, to average 90 points for the 5 tests given this term?

   A. 87
   B. 88
   C. 90
   D. 92
   E. 97

2. What is the value of the expression $g \cdot (g + 1)^2$ for $g = 2$?

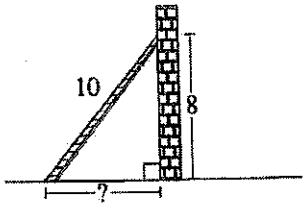
   F. 10
   G. 12
   H. 18
   J. 20
   K. 36

3. Company A sells 60 pens for \$15.00, while Company B sells the same type of pens 40 for \$8.00. Which company's price per pen is cheaper, and what is that price?

   A. Company A, at \$0.20
   B. Company A, at \$0.23
   C. Company A, at \$0.25
   D. Company B, at \$0.20
   E. Company B, at \$0.25

4. A ladder is 10 ft long and reaches 8 ft up a wall, as shown below. How many feet is the bottom of the ladder from the base of the wall?

   F. 2
   G. 3
   H. 6
   J. $\sqrt{2}$
   K. $\sqrt{164}$



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DO YOUR FIGURING HERE.

5. Consider the 3 statements below to be true.

   All insects that are attracted to honey are ants.
   Insect I is not an ant.
   Insect J is attracted to honey.

   Which of the following statements is necessarily true?

   A. Insect I is an ant not attracted to honey.
   B. Insect I is an ant attracted to honey.
   C. Insect I is attracted to honey.
   D. Insect J is not attracted to honey.
   E. Insect J is an ant.

6. A city utility department charges residential customers \$2.50 per 1,000 gallons of water and \$16.00 per month for trash pickup. Which of the following expressions gives a residential customer's total monthly charges, in dollars, for use of g thousand gallons of water and trash pickup?

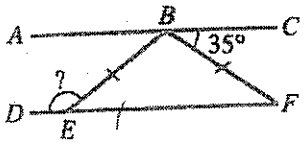
   F. $2.50g + 16.00$
   G. $2.50g + 1{,}016.00$
   H. $16.00g + 2.50$
   J. $18.50g$
   K. $2{,}500.00g + 16.00$

7. What is the value of x that satisfies the equation $2(x + 4) = 5x - 7$?

   A. -1
   B. $\frac{1}{3}$
   C. $\frac{11}{3}$
   D. 5
   E. $\frac{43}{3}$

8. In the figure below, B is on $\overline{AC}$, E is on $\overline{DF}$, $\overline{AC}$ is parallel to $\overline{DF}$, and $\overline{BE}$ is congruent to $\overline{BF}$. What is the measure of $\angle DEB$?

   F. 35°
   G. 135°
   H. 145°
   J. 155°
   K. 215°



9. What is the least common denominator when adding the fractions $\frac{a}{2}$, $\frac{b}{3}$, $\frac{c}{9}$, and $\frac{d}{15}$?

   A. 45
   B. 90
   C. 135
   D. 270
   E. 810

DO YOUR FIGURING HERE.

10. Which of the following expressions is equivalent to $3x(x^2y + 2xy^2)$?

F. $3x^2y + 6xy^2$
G. $3x^3y + 2xy^2$
H. $3x^3y + 6x^2y^2$
J. $5x^4y^3$
K. $9x^4y^3$

11. A certain type of notebook costs $2.50 before sales tax is added. When you buy 9 of these notebooks you receive 1 additional notebook free. What is the average cost per notebook for the 10 notebooks before sales tax is added?

A. $2.78
B. $2.50
C. $2.30
D. $2.25
E. $2.15

12. For all x, $(3x + 1)^2 = ?$

F. $6x + 2$
G. $6x^2 + 2$
H. $9x^2 + 1$
J. $9x^2 + 3x + 1$
K. $9x^2 + 6x + 1$

13. Mark and Juanita own a sandwich shop. They offer 3 kinds of bread, 5 kinds of meat, and 3 kinds of cheese. Each type of sandwich has a combination of exactly 3 ingredients: 1 bread, 1 meat, and 1 cheese. How many types of sandwiches are possible?

A. 11
B. 15
C. 30
D. 45
E. 120

14. If $a^2 = 49$ and $b^2 = 64$, which of the following CANNOT be a value of $a + b$?

F. -15
G. -1
H. 1
J. 15
K. 113

GO ON TO THE NEXT PAGE

DO YOUR FIGURING HERE.

15. On the real number line, what is the midpoint of –5 and 17 ?

A. –11
B. 6
C. 11
D. 12
E. 22

16. If $3\frac{3}{5} = x + 2\frac{2}{3}$, then $x = ?$

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

G. $\frac{14}{15}$

H. $1\frac{1}{2}$

J. $1\frac{6}{15}$

K. $6\frac{4}{15}$

17. A system of linear equations is shown below.

$$3y = -2x + 8$$
$$3y = 2x + 8$$

Which of the following describes the graph of this system of linear equations in the standard (x,y) coordinate plane?

A. Two distinct intersecting lines
B. Two parallel lines with positive slope
C. Two parallel lines with negative slope
D. A single line with positive slope
E. A single line with negative slope

18. Which real number satisfies $(2^x)(4) = 8^3$?

F. 2
G. 3
H. 4
J. 4.5
K. 7

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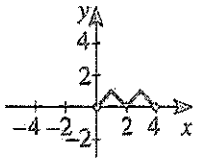
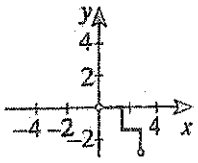
DO YOUR FIGURING HERE.

19. The graph shown in the standard (x,y) coordinate plane below is to be rotated in the plane 180° about the origin.

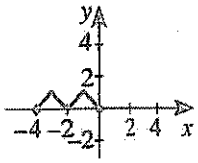


One of the following graphs is the result of this rotation. Which one is it?

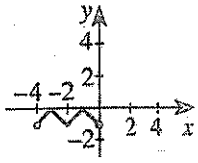
A.



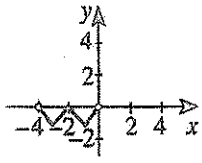
B.



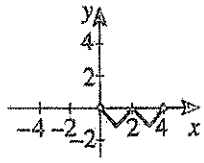
C.



D.



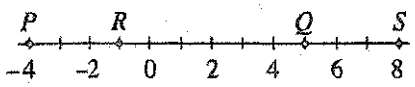
E.



20. What are the values for x that satisfy the equation $(x + a)(x + b) = 0$?

F. $-a$ and $-b$
G. $-a$ and b
H. $-ab$
J. a and $-b$
K. a and b

21. On the real number line below, with coordinates as labeled, an object moves according to the following set of instructions: From point P the object moves right to Q, then left to R, then right to S, and finally left until it returns to its original position at P. What is the closest estimate of the total length, in coordinate units, of the movements this object makes?



A. 0
B. 4
C. 12
D. 22
E. 36

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22. By definition, the determinant $\begin{vmatrix} a & b \\ c & d \end{vmatrix}$ equals $ad - bc$.

What is the value of $\begin{vmatrix} 2x & 3y \\ 5x & 4y \end{vmatrix}$ when $x = -3$ and $y = 2$?

F. -138
G. -42
H. 12
J. 42
K. 138

DO YOUR FIGURING HERE.

23. When Angela was cleaning her refrigerator, she found 2 bottles of catsup. Looking at the labels, she noticed that the capacity of the larger bottle was twice the capacity of the smaller bottle. She estimated that the smaller bottle was about $\frac{1}{3}$ full of catsup and the larger bottle was about $\frac{2}{3}$ full of catsup. She poured all the catsup from the smaller bottle into the larger bottle. Then, about how full was the larger bottle?

A. $\frac{2}{9}$ full
B. $\frac{1}{2}$ full
C. $\frac{5}{6}$ full
D. Completely full
E. Overflowing

24. When Jeff starts a math assignment, he spends 5 minutes getting out his book and a sheet of paper, sharpening his pencil, looking up the assignment in his assignment notebook, and turning to the correct page in his book. The equation $t = 10p + 5$ models the time, t minutes, Jeff budgets for a math assignment with p problems. Which of the following statements is necessarily true according to Jeff's model?

F. He budgets 15 minutes per problem.
G. He budgets 10 minutes per problem.
H. He budgets 5 minutes per problem.
J. He budgets 10 minutes per problem for the hard problems and 5 minutes per problem for the easy problems.
K. He budgets a 5-minute break after each problem.

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

25. Kaya drove 200 miles in 5 hours of actual driving time. By driving an average of 10 miles per hour faster, Kaya could have saved how many hours of actual driving time?

A. $\frac{1}{6}$

B. $\frac{2}{3}$

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

D. 1

E. 4

26. What number can you add to the numerator and denominator of $\frac{7}{9}$ to get $\frac{1}{2}$?

F. -11

G. -5

H. $-2\frac{1}{2}$

J. $-1\frac{2}{3}$

K. 5

27. If the inequality $|a| > |b|$ is true, then which of the following *must* be true?

A. $a = b$
B. $a \neq b$
C. $a < b$
D. $a > b$
E. $a > 0$

28. What is the slope of the line given by the equation $14x - 11y + 16 = 0$?

F. -11

G. $-\frac{14}{11}$

H. $-\frac{11}{14}$

J. $\frac{14}{11}$

K. 14

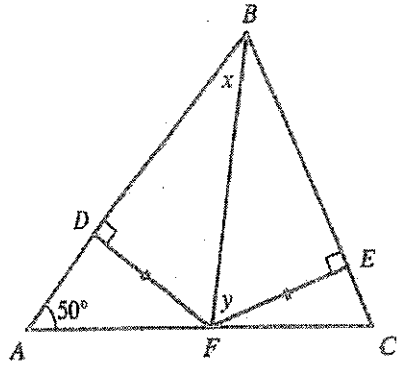
29. Which of the following is a value of x that satisfies $\log_x 36 = 2$?

A. 4
B. 6
C. 8
D. 16
E. 18

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

30. In $\triangle ABC$ below, D, E, and F are points on $\overline{AB}$, $\overline{BC}$, and $\overline{AC}$, respectively, and $\overline{DF}$ is congruent to $\overline{EF}$. What is the *sum* of the measures of the angles marked x and y?



F. 40°
G. 80°
H. 90°
J. 100°
K. 130°

31. Which of the following expressions is equivalent to $(-2x^5y^2)^4$?

A. $-16x^{20}y^8$
B. $-8x^{20}y^8$
C. $-8x^9y^6$
D. $16x^9y^6$
E. $16x^{20}y^8$

32. A line contains the points A, B, C, and D. Point B is between points A and C. Point D is between points C and B. Which of the following inequalities *must* be true about the lengths of these segments?

F. $BC < AB$
G. $BD < AB$
H. $BD < CD$
J. $CD < AB$
K. $CD < BC$

33. Which of the following inequalities defines the solution set for the inequality $16 - 5x \leq 8$?

A. $x \geq \frac{8}{5}$
B. $x \geq \frac{5}{8}$
C. $x \geq -\frac{8}{5}$
D. $x \leq -\frac{5}{8}$
E. $x \leq -\frac{8}{5}$

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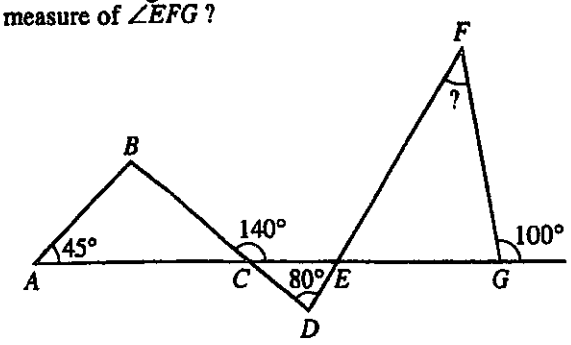
DO YOUR FIGURING HERE.

34. The electrical resistance, r ohms, of 1,000 ft of solid copper wire at 77°F can be approximated by the model $r = \frac{10{,}770}{d^2} - 0.37$ for any wire diameter, d mils (1 mil = 0.001 inch), such that $5 \leq d \leq 100$. What is the approximate resistance, in ohms, for such a wire with a diameter of 50 mils ?

F. 1
G. 4
H. 17
J. 215
K. 430

35. In the figure below, points A, C, E, and G are collinear; B, C, and D are collinear; and D, E, and F are collinear. Angle measures are as marked. What is the measure of $\angle EFG$?



A. 40°
B. 45°
C. 60°
D. 80°
E. Cannot be determined from the given information

36. The solution set of $\sqrt{x-1} > 5$ is the set of all real numbers x such that:

F. $x > 4$
G. $x > 6$
H. $x > 24$
J. $x > 25$
K. $x > 26$

37. The measure of each interior angle of a regular polygon with n sides is $\left[\frac{(n-2)180}{n}\right]$ degrees. What is the measure of each interior angle of a regular polygon with n sides, in *radians* ?

A. $\frac{(n-2)\pi}{4n}$
B. $\frac{(n-2)\pi}{2n}$
C. $\frac{(n-2)\pi}{n}$
D. $\frac{(n-2)2\pi}{n}$
E. $\frac{(n-2)4\pi}{n}$

GO ON TO THE NEXT PAGE.

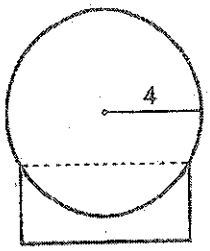
DO YOUR FIGURING HERE.

38. What is the distance, in coordinate units, between the points (–3,5) and (4,–1) in the standard (x,y) coordinate plane?

F. $\sqrt{13}$
G. $\sqrt{17}$
H. $\sqrt{85}$
J. 13
K. 85

Use the following information to answer questions 39–41.

The end-on view of a cylindrical milk tank on its support is shown in the figure below. The interior radius of the tank's circular end is 4 feet. The interior length of the tank is 25 feet.



39. Which of the following is closest to the tank's volume, in cubic feet?

A. 310
B. 630
C. 1,300
D. 2,500
E. 5,000

40. The tank currently holds 5,000 gallons of milk. Each gallon of milk weighs about 8 pounds. About how many pounds does this milk weigh?

F. 625
G. 4,000
H. 4,992
J. 5,008
K. 40,000

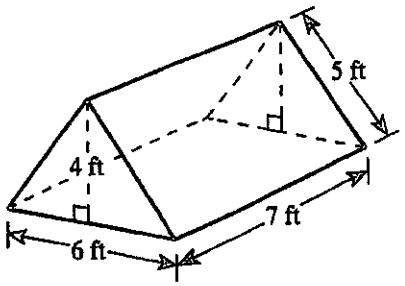
41. The center of the circular end of the tank is 2 feet above the top level of the support. What is the width, in feet, of the support?

A. $2\sqrt{3}$
B. $4\sqrt{3}$
C. $4\sqrt{5}$
D. 12
E. 24

DO YOUR FIGURING HERE.

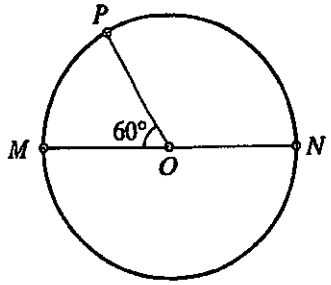
42. The tent illustrated below is in the shape of a right triangular prism and is made of nylon. How many square feet of nylon is required for the front, rear, and 2 sides of the tent?

(Note: Please ignore the extra nylon for seams.)



F. 47
G. 59
H. 82
J. 94
K. 118

43. Points M and N are the endpoints of the diameter of a circle with center at O, as shown below. Point P is on the circle, and $\angle MOP$ measures 60°. The shortest distance along the circle from M to P is what percent of the distance along the circle from M to N?



A. 75%
B. 60%
C. 50%
D. $33\frac{1}{3}\%$
E. $16\frac{2}{3}\%$

44. Traveling at approximately 186,000 miles per second, about how many miles does a beam of light travel in 2 hours?

F. 3.72×10^5
G. 2.23×10^6
H. 2.68×10^7
J. 6.70×10^8
K. 1.34×10^9

45. Barb is going to cover a rectangular area 8 feet by 10 feet with rectangular paving blocks that are 4 inches by 8 inches by 2 inches to make a flat patio. What is the minimum number of paving blocks she will need if all the paving blocks will face the same direction?

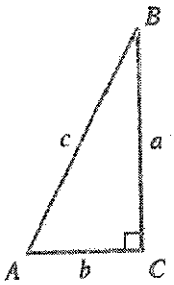
(Note: Barb will not cut any of the paving blocks.)

A. 80
B. 360
C. 601
D. 960
E. 1,213

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

46. A right triangle that has its sides measured in the same unit of length is shown below. For any such triangle, $(\tan A)(\sin B)$ is equivalent to:



F. $\frac{a}{c}$

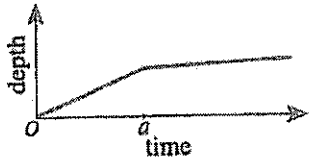
G. $\frac{ab}{c^2}$

H. $\frac{a^2}{bc}$

J. $\frac{b^2}{ac}$

K. $\frac{c}{a}$

47. A swimming pool of uniform depth is being filled. When the pool started filling, its drain was closed. The graph below shows the depth of the water in the pool as a function of the length of time that water has been flowing into the pool.



Exactly 1 event occurred at time a that changed the rate at which the depth was increasing. Which of the following could have been that event?

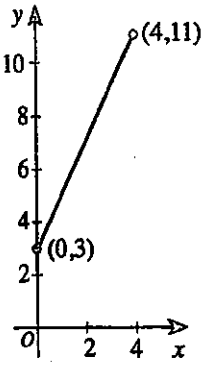
I. The flow of water into the pool was increased.
II. The flow of water into the pool was decreased.
III. The drain was opened.

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

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

48. Shown below is the graph of the equation $y = 2x + 3$ for values of x such that $0 \leq x \leq 4$.



Which of the following statements is(are) true?

I. The graph has constant slope 2.
II. The range of the graph consists of all values of y such that $3 \leq y \leq 11$.
III. The polynomial $2x + 3$ has a zero of $x = 3$.

F. I only
G. I and II only
H. I and III only
J. I, II, and III
K. None of the statements is true.

49. If $\tan A = \frac{a}{b}$, $a > 0$, $b > 0$, and $0 < A < \frac{\pi}{2}$, then what is $\cos A$?

A. $\frac{a}{b}$

B. $\frac{b}{a}$

C. $\frac{a}{\sqrt{a^2 + b^2}}$

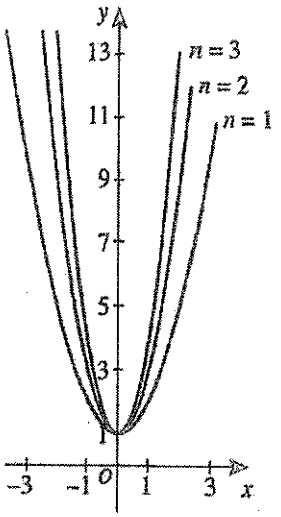
D. $\frac{b}{\sqrt{a^2 + b^2}}$

E. $\frac{\sqrt{a^2 + b^2}}{b}$

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

50. The 3 parabolas graphed in the standard (x,y) coordinate plane below are from a family of parabolas. A general equation that defines this family of parabolas contains the variable n in addition to x and y. For one of the parabolas shown, $n = 1$; for another, $n = 2$; and for the third, $n = 3$. Which of the following could be a general equation that defines this family of parabolas for all $n \geq 1$?



F. $y = nx^2 + 1$

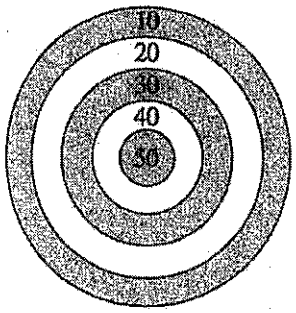
G. $y = \frac{1}{n}x^2 + 1$

H. $y = x^2 + n$

J. $y = -nx^2 + 1$

K. $y = -\frac{1}{n}x^2 + 1$

51. Thomas and Jonelle are playing darts in their garage using the board with the point values for each region shown below. The radius of the outside circle is 10 inches, and each of the other circles has a radius 2 inches smaller than the next larger circle. All of the circles have the same center. Thomas has only 1 dart left to throw and needs at least 30 points to win the game. Assuming that his last dart hits at a random point within a single region on the board, what is the percent chance that Thomas will win the game?



A. 36%

B. 30%

C. 16%

D. 9%

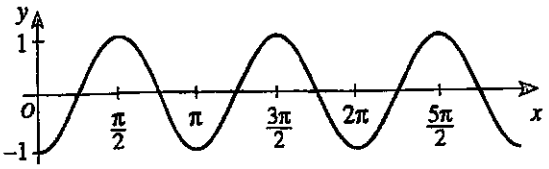
E. $1\frac{1}{2}\%$

52. The ratio of a to b is 3 to 4, and the ratio of c to b is 1 to 2. What is the ratio of a to c ?

F. 1 to 1
G. 3 to 1
H. 3 to 2
J. 3 to 8
K. 6 to 1

DO YOUR FIGURING HERE.

53. For the function graphed below, the x-axis can be partitioned into intervals, each of length p radians, and the curve over any one interval is a repetition of the curve over each of the other intervals. What is the least possible value for p, the period of the function?



A. $\frac{\pi}{2}$

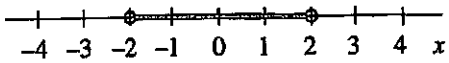
B. π

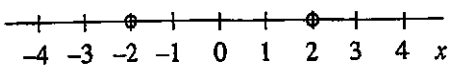
C. $\frac{3\pi}{2}$

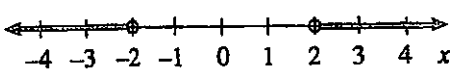
D. 2π

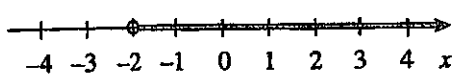
E. 3π

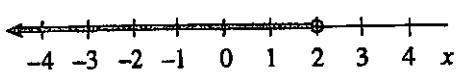
54. Which of the following graphs represents the solution set of the inequality $|x| < 2$ on the real number line?

F. 

G. 

H. 

J. 

K. 

55. If $(x - 7)$ is a factor of $2x^2 - 11x + k$, what is the value of k?

A. –21
B. –17
C. –7
D. 7
E. 28

56. Let a equal $2b + 3c - 5$. What happens to the value of a if the value of b decreases by 1 and the value of c increases by 2?

F. It increases by 4.
G. It increases by 2.
H. It increases by 1.
J. It is unchanged.
K. It decreases by 2.

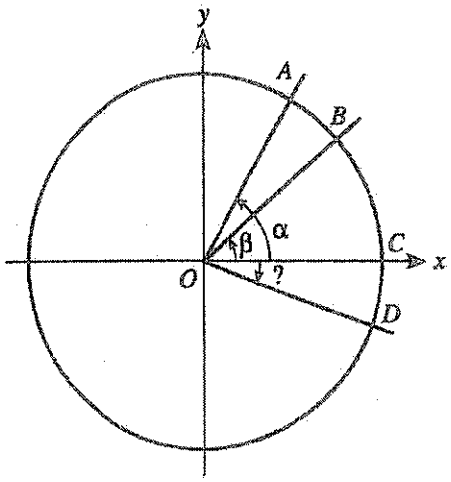
GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

57. A large cube has edges that are twice as long as those of a small cube. The volume of the large cube is how many times the volume of the small cube?

A. 2
B. 4
C. 6
D. 8
E. 16

58. The center of the unit circle shown below is O. Points A, B, C, and D are points on the circle. When $\angle COA$ is measured in the direction of the arrow shown, its measure is α. Similarly, when $\angle COB$ is measured in the direction of the arrow shown, its measure is β. Both α and β are positive. The length of $\overset{\frown}{BA}$ is the same as the length of $\overset{\frown}{DC}$. What is the measure of $\angle COD$ measured in the direction of the arrow shown?



F. $-\beta$
G. $-\beta - \alpha$
H. $\beta - \alpha$
J. $-\alpha$
K. Cannot be determined from the given information

59. In a town of 500 people, the 300 males have an average age of 45 and the 200 females have an average age of 35. To the nearest year, what is the average age of the town's entire population?

A. 40
B. 41
C. 42
D. 43
E. 44

60. On September 1, a dress was priced at \$90. On October 1, the price was reduced by 20%. On November 1, the price was further reduced by 25% of the October 1 price and marked FINAL. What percent of the original price was the FINAL price?

F. 40%
G. 45%
H. 55%
J. 60%
K. 77.5%

END OF TEST 2

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

DO NOT RETURN TO THE PREVIOUS TEST.