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. If $\frac{3x}{2} + 12 = 4$, then $x = ?$

   A. -8

   B. $-\frac{16}{3}$

   C. $\frac{4}{3}$

   D. $\frac{16}{3}$

   E. $\frac{32}{3}$

2. $2x^4 \cdot 5x^7$ is equivalent to:

   F. $7x^3$
   G. $7x^{11}$
   H. $10x^{11}$
   J. $7x^{28}$
   K. $10x^{28}$

3. Let $f(x) = \frac{x^2 + 12}{x - 6}$. What is the value of $f(10)$?

   A. 112
   B. 28
   C. 12
   D. 10
   E. 8

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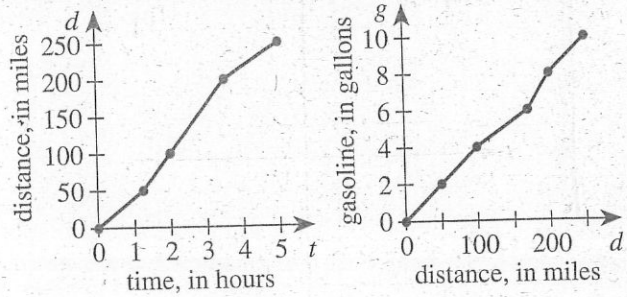
DO YOUR FIGURING HERE.

4. The 2 graphs shown below represent a car trip. The graph on the left shows the total distance as a function of time. The graph on the right shows the total number of gallons of gasoline used as a function of the total distance. Approximately how many gallons of gasoline were used during the first 2 hours of the trip?



F. 2
G. 4
H. 8
J. 25
K. 100

5. What is the value of 442 + 325 + 287, rounded to the nearest hundred?

A. 700
B. 800
C. 900
D. 1,000
E. 1,100

6. A bus company always keeps 3 tires in stock for every bus it owns, plus an additional 30 tires in stock for emergencies. According to this policy, the bus company needs to have a total of 120 tires in stock. How many buses does the company own?

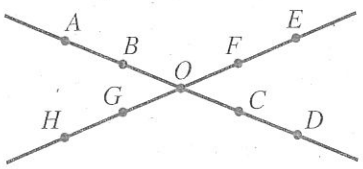
F. 30
G. 35
H. 40
J. 45
K. 50

7. For what value of x is the equation $2(x - 6) + x = 36$ true?

A. 24
B. 16
C. 14
D. 10
E. 8

DO YOUR FIGURING HERE.

8. Five points are shown on each of the 2 lines in the figure below. Point O is the intersection point of the 2 lines. Which of the following rays does NOT contain point O ?



F. $\overrightarrow{AB}$
G. $\overrightarrow{BD}$
H. $\overrightarrow{CD}$
J. $\overrightarrow{EF}$
K. $\overrightarrow{EG}$

9. Let r, s, and t be positive integers such that $rs = 24$, $st = 36$, and $t = 3$. What is the value of r ?

A. 2
B. 4
C. 6
D. 8
E. 12

10. Mele earned scores of 75, 70, 92, 95, and 97 points (a total of 429 points) on the first 5 tests in Economics II. Solving which of the following equations for s gives the score he needs to earn on the 6th test to average exactly 85 points for all 6 tests?

F. $\frac{429}{5} + s = 85$
G. $\frac{429}{6} + s = 85$
H. $\frac{s+429}{5} = 85$
J. $\frac{s+429}{6} = 85$
K. $\frac{s+429}{6} = \frac{85}{100}$

11. For how many whole numbers from 44 through 55 is the ones digit greater than the tens digit?

A. 3
B. 4
C. 5
D. 11
E. 12

12. The weight of a circular rod of a certain type is proportional to its length. A 15-foot circular rod of this type weighs 35 pounds. What is the weight, in pounds, of a 21-foot circular rod of this type?

F. 41
G. 44
H. 47
J. 49
K. 56

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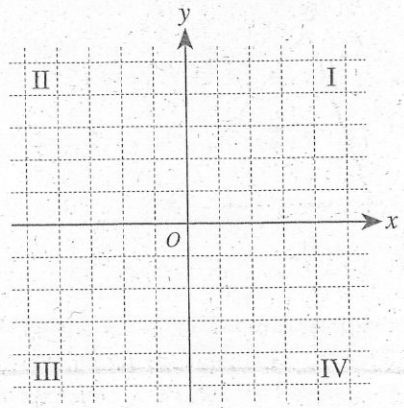
DO YOUR FIGURING HERE.

13. The vertices of a rectangle are (–1,–2), (4,–2), (4,3), and (–1,3). When the rectangle is graphed in the standard (x,y) coordinate plane below, what percent of the total area of the rectangle lies in Quadrant III ?



A. 8%
B. 12%
C. 12.5%
D. 32%
E. 48%

14. Which of the following expressions is equivalent to the one given below?

$$\frac{3+7(x-6)}{3(x-6)+10}$$

F. $\frac{10}{13}$
G. $\frac{7}{10}$
H. $\frac{39}{8}$
J. $\frac{7x-39}{3x-8}$
K. $\frac{10x-42}{13x-18}$

15. In the standard (x,y) coordinate plane, an equation of a circle is $x^2 + y^2 = 81$. At what points does the circle intersect the y-axis?

A. (0, 1) and (0, –1)
B. (0, 9) and (0, –9)
C. (0,18) and (0,–18)
D. (0,27) and (0,–27)
E. (0,81) and (0,–81)

16. Four points, A, B, C, and D, lie on a circle having a circumference of 17 units. B is 5 units counterclockwise from A. C is 3 units clockwise from A. D is 11 units clockwise from A and 6 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

DO YOUR FIGURING HERE.

17. In 1985, the cost of clothing for a certain family was \$620. In 1995, 10 years later, the cost of clothing for this family was \$1,000. Assuming the cost increased linearly, what was the cost of this family's clothing in 1991 ?

A. \$908
B. \$848
C. \$812
D. \$810
E. \$772

18. For a math homework assignment, Karla found the area and perimeter of a room of her house. She reported that the area of her rectangular living room is 180 square feet and that the perimeter is 54 feet. When drawing a sketch of her living room the next day, she realized that she had forgotten to write down the dimensions of the room. What are the dimensions of Karla's living room, in feet?

F. 9 by 20
G. 10 by 18
H. 12 by 15
J. 14 by 13
K. 16 by 11

19. If $1.056 \cdot 10^n = 0.0001056$, what is the value of n ?

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

20. The value of m is directly proportional to the value of p. When $m = 2$, $p = 6$. What is m when $p = 9$?

F. $\frac{1}{3}$
G. $\frac{4}{3}$
H. 3
J. 5
K. 27

21. To park a car at a short-term parking lot costs \$1.75 for the 1st hour or any part thereof, \$1.50 for the 2nd hour or any part thereof, and \$0.75 for each additional hour or any part thereof after the 2nd hour. Your ticket shows that you parked your car in this lot from 10:47 a.m. to 4:35 p.m. on the same day. What is the cost of parking your car, according to this ticket?

(Note: Prices include all applicable sales tax.)

A. \$4.75
B. \$5.50
C. \$5.86
D. \$6.10
E. \$6.25

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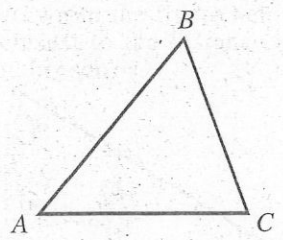
DO YOUR FIGURING HERE.

2. The degree measures of the interior angles of $\triangle ABC$, shown below, form an arithmetic sequence with common difference 10°. What is the first term of the sequence?



F. 80°
G. 60°
H. 50°
J. 40°
K. 30°

3. Point B lies on $\overline{AC}$ between A and C. Point D is a point not on $\overline{AC}$ such that the measure of $\angle ABD$ is 38°. What is the measure of $\angle CBD$?

A. 38°
B. 52°
C. 76°
D. 128°
E. 142°

4. Let $2x + 3y = 4$ and $5x + 6y = 7$. What is the value of $8x + 9y$?

F. −10
G. −1
H. 2
J. 7
K. 10

5. Which of the following is the equation $3(x - y) = 5$ solved for y ?

A. $y = x - \frac{5}{3}$

B. $y = \frac{5}{3} - x$

C. $y = 15 - x$

D. $y = x - 15$

E. $y = \frac{5}{3}x$

6. Which of the following statements is true about odd and/or even numbers?

F. The sum of any 2 even numbers is odd.
G. The sum of any 2 odd numbers is odd.
H. The quotient of any 2 even numbers is odd.
J. The quotient of any 2 even numbers is even.
K. The product of any 2 odd numbers is odd.

DO YOUR FIGURING HERE.

27. A deck of cards for a children's game contains 10 red cards, 10 blue cards, and 10 yellow cards. The players take turns, each drawing a card at random from the deck and placing the card on the table. When it is the fourth player's turn, there are 3 yellow cards on the table. What is the probability that the fourth player will draw a yellow card?

A. $\frac{7}{30}$

B. $\frac{7}{27}$

C. $\frac{1}{3}$

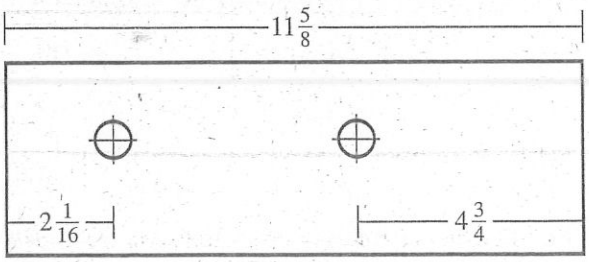
D. $\frac{4}{10}$

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

28. To win the student council election, a candidate must receive over 50% of the votes cast. There were 750 votes cast. Which of the following expressions is true about x, the minimum number of votes that a candidate must have received to win the election?

F. $x < 375$
G. $x = 375$
H. $x > 375$
J. $x < 376$
K. $x > 376$

29. A machine part is diagrammed in the figure below with the dimensions given in inches. If the centers of the circles lie on the same line parallel to the bottom of the part, what is the distance, in inches, between the centers of the 2 holes in the machine part?



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A. $5\frac{3}{16}$

B. $5\frac{1}{16}$

C. 5

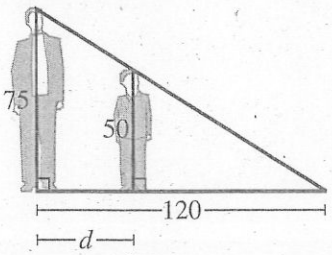
D. $4\frac{13}{16}$

E. $4\frac{3}{16}$

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

30. A father and his son are standing near to each other on level ground late one afternoon so that their shadows end at the same place. The father is 75 inches tall, the son is 50 inches tall, and the father's shadow is 120 inches long, as shown in the figure below. Which of the following is closest to the distance, d inches, between the father and his son?



F. 25
G. 40
H. 60
J. 70
K. 80

31. In the standard (x,y) coordinate plane, what is the distance, in coordinate units, between $(-3,-2)$ and $(5,5)$?

A. $\sqrt{13}$
B. $\sqrt{15}$
C. $\sqrt{113}$
D. 5
E. 15

32. Chayton decides to save money in a savings account for a vacation. He deposits \$10 in his savings account the 1st month. Each month thereafter, the amount he deposits is \$10 more than the amount he deposited the previous month. Thus, Chayton's deposit is \$20 the 2nd month, \$30 the 3rd month, and so on. He makes his final deposit of \$360 the 36th month. What is the total amount of Chayton's 36 deposits?

F. \$ 710
G. \$1,850
H. \$6,300
J. \$6,480
K. \$6,660

33. One side of a triangle is 15 cm long, and another side is 28 cm long. Which of the following is a possible length, in centimeters, for the third side?

A. 2
B. 12
C. 31
D. 44
E. 52

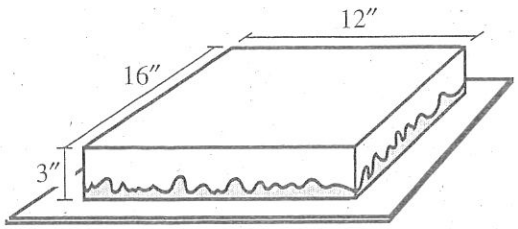
34. The expression $\frac{2x+3}{12x^2}$ is equivalent to:

F. $\frac{1}{3}$
G. $\frac{1}{x}$
H. $\frac{1}{2x}$
J. $\frac{x+1}{2x^2}$
K. $\frac{1}{6x}+\frac{1}{4x^2}$

DO YOUR FIGURING HERE.

Use the following information to answer questions 35–37.

Ken baked, frosted, and decorated a rectangular cake for the last Math Club meeting. The cake was 3 inches high, 12 inches wide, and 16 inches long. He centered the cake on a piece of cardboard whose rectangular top surface had been covered with aluminum foil, as shown in the figure below.



35. Ken used a piece of cardboard large enough to allow the cardboard to extend 2 inches beyond the cake on all sides. What is the area, in square inches, of the aluminum foil that is exposed on the top surface of the cardboard?

A. 60
B. 64
C. 88
D. 96
E. 128

36. At the Math Club meeting, Principal Gonzales cut the entire cake into pieces. Each piece is 2 inches wide, 2 inches long, and 3 inches high. What is the number of pieces Principal Gonzales cut the cake into?

F. 16
G. 20
H. 28
J. 48
K. 96

37. The Math Club will pay Ken $5.00 for preparing the cake and will also pay him for the cost of the cake mix at $1.73, the frosting mix at $2.67, and the sales tax of 5% on these 2 items. What is the total amount the Math Club will pay Ken?

A. $4.67
B. $9.40
C. $9.45
D. $9.62
E. $9.87

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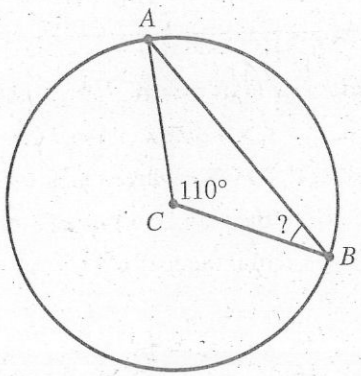
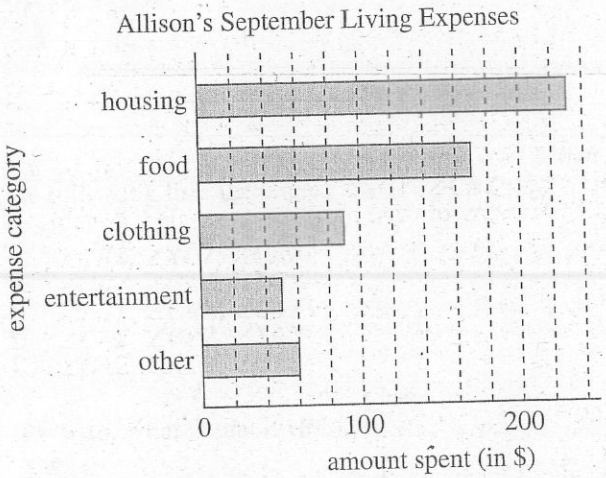
DO YOUR FIGURING HERE.

38. Points A and B lie on the circle below, where central angle $\angle ACB$ measures 110°. What is the measure of $\angle ABC$?



F. 35°
G. 40°
H. 45°
J. 55°
K. Cannot be determined from the given information

39. The graph below shows Allison's living expenses, which totaled $600, during September of her freshman year in college.



Trying to limit her spending, Allison decides that in October she could spend $60 less for food and $40 less for clothing. If she can accomplish this and the rest of her expenses are the same as they were in September, approximately what percent of Allison's October expenses will be for entertainment?

A. 5%
B. 8%
C. 10%
D. 17%
E. 20%

DO YOUR FIGURING HERE.

40. Nadia works exactly 40 hours each week and earns a minimum of $1,200 every 4 weeks. Her hourly rate of pay is determined by the job she is assigned and may vary. If x is Nadia's average hourly pay for a 4-week period, which of the following inequalities best describes x ?

F. $x \leq \$ \ 7.50$
G. $x \geq \$ \ 7.50$
H. $x \leq \$ \ 30.00$
J. $x \geq \$ \ 30.00$
K. $x \geq \$120.00$

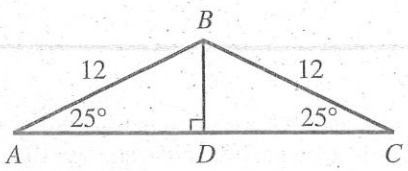
41. If x is any positive integer, then the sum of $8x$ and $13x$ is *always* divisible by which of the following?

A. 5
B. 8
C. 13
D. 21
E. 104

42. The coordinates of the endpoints of $\overline{MN}$ in the standard (x,y) coordinate plane are $(-13,-4)$ and $(5,4)$. What is the x-coordinate of the midpoint of $\overline{MN}$?

F. -8
G. -4
H. 0
J. 4
K. 9

43. The diagram of the roof for a new storage shed is shown below. Some lengths are given in meters, but the length of the vertical support, $\overline{BD}$, has been left off. Which of the following expressions gives the length, in meters, of $\overline{BD}$?



A. 12 sin 25°

B. 12 tan 25°

C. 12 cos 25°

D. $\frac{12}{\cos 25°}$

E. $\frac{12}{\sin 25°}$

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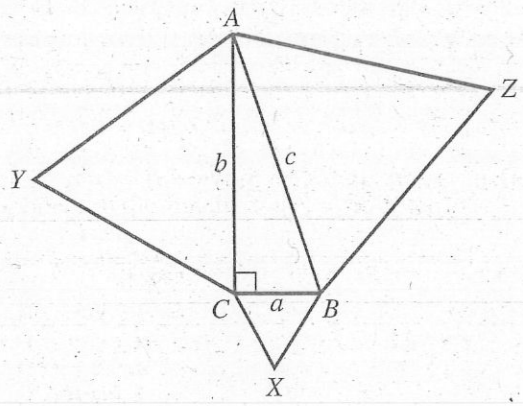
DO YOUR FIGURING HERE.

Use the following information to answer questions 44–46.

In the figure below, $\triangle ACB$ is a right triangle with legs of length a units and b units, where $0 < a < b$, and hypotenuse of length c units. The triangles $\triangle YCA$, $\triangle ZBA$, and $\triangle XCB$ are equilateral. The area of an equilateral triangle with sides x units long is $\frac{\sqrt{3}}{4}x^2$ square units.



44. What is the perimeter of pentagon $AZBCY$, in units?

F. $a + b + 2c$
G. $a + 2b + 2c$
H. $a + 3b + 3c$
J. $2a + 2b + 2c$
K. $3a + 3b + 3c$

45. For all values of a and b such that $0 < a < b$, which of the following lists the angles $\angle XCY$, $\angle CAZ$, and $\angle CBZ$ in order of their measures from *least* to *greatest* ?

A. $\angle CBZ$, $\angle XCY$, $\angle CAZ$
B. $\angle CBZ$, $\angle CAZ$, $\angle XCY$
C. $\angle XCY$, $\angle CAZ$, $\angle CBZ$
D. $\angle CAZ$, $\angle CBZ$, $\angle XCY$
E. $\angle CAZ$, $\angle XCY$, $\angle CBZ$

46. If $b = 2a$, what is $\tan(\angle ABC)$?

F. 2
G. $\frac{1}{2}$
H. $\frac{1}{\sqrt{5}}$
J. $\frac{2}{\sqrt{5}}$
K. $\sqrt{5}$

DO YOUR FIGURING HERE.

47. The sum of 3 consecutive odd integers is k. In terms of k, what is the sum of the 2 smaller of these integers?

A. $\frac{2k}{3} - 2$

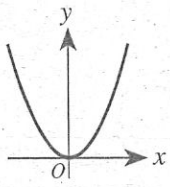
B. $\frac{2k}{3}$

C. $\frac{2k}{3} + 2$

D. $k - 2$

E. $k - 3$

48. The graph of $y = x^2$ is shown in the standard (x,y) coordinate plane below. For which of the following equations is the graph of the parabola shifted 3 units to the right and 2 units down?



F. $y = (x + 3)^2 + 2$

G. $y = (x + 3)^2 - 2$

H. $y = (x - 2)^2 + 3$

J. $y = (x - 3)^2 + 2$

K. $y = (x - 3)^2 - 2$

49. Lucky found \$8.25 in pennies, nickels, dimes, and quarters while walking home from school one week. When she deposited this money in the bank, she noticed that she had twice as many nickels as pennies, 1 fewer dime than nickels, and 1 more quarter than nickels. How many quarters did Lucky find that week?

A. 3
B. 9
C. 16
D. 21
E. 26

50. The mean of 4 numbers is 32. The smallest of the 4 numbers is 5. What is the mean of the other 3 numbers?

F. $30\frac{3}{4}$

G. 32

H. 36

J. 41

K. $42\frac{2}{3}$

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

51. If the statement "If a cat is tricolor, then it is a female" were true, which of the following statements would also have to be true?

A. "If a cat is a female, then it is tricolor."
B. "If a cat is not a female, then it is tricolor."
C. "If a cat is not a female, then it is not tricolor."
D. "If a cat is not tricolor, then it is a female."
E. "If a cat is not tricolor, then it is not a female."

52. What is the set of all the values of b that satisfy the equation $(x^3)^{4-b^2} = 1$ for all nonzero values of x ?

F. $\{0\}$
G. $\{2\}$
H. $\{4\}$
J. $\{-\sqrt{7}, \sqrt{7}\}$
K. $\{-2, 2\}$

53. Which of the following trigonometric functions is equivalent to the function $g(x) = \sin x \sec x$?

(Note: $\sec x = \frac{1}{\cos x}$)

A. $f(x) = \cos x$
B. $f(x) = \cot x$
C. $f(x) = \csc x$
D. $f(x) = \sin x$
E. $f(x) = \tan x$

54. The table below gives some (x,y) pairs that satisfy a linear relationship. What does z equal?

x	y
-2	-7
2	5
0	-1
-3	z

F. -10
G. -8
H. -7
J. -2
K. 0

55. The volume of a right circular cylinder with a height of 6 cm is 150π cubic centimeters. What is the lateral surface area, in square centimeters, of this cylinder?

(Note: For a right circular cylinder with radius r and height h, the lateral surface area is $2\pi rh$ and the volume is $\pi r^2 h$.)

A. 25π
B. 36π
C. 50π
D. 60π
E. 110π

56. Whenever w is an integer greater than 1, $\log_w \frac{w^2}{w^6} = ?$

DO YOUR FIGURING HERE.

F. -4

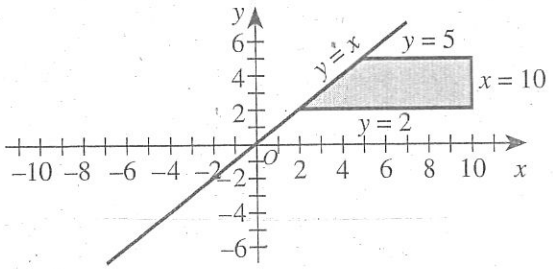
G. -3

H. $-\frac{1}{3}$

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

K. 3

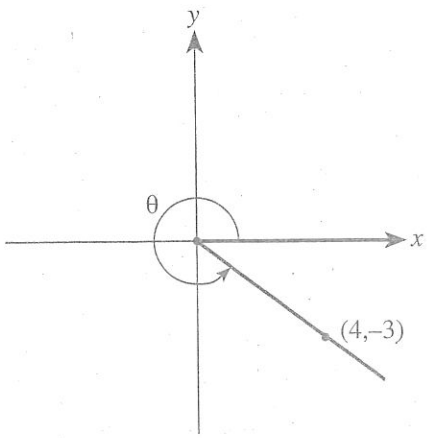
57. Amal's teacher assigned each student in class to draw a trapezoid using a segment of the line $y = x$ as one side. The interior of Amal's trapezoid is shown shaded in the standard (x,y) coordinate plane below. The equations of the lines that intersect to form the trapezoid are also shown.



The next part of the assignment was to reflect the trapezoid across the x-axis and write a set of inequalities defining the reflected trapezoid and its interior. Which of the following sets of inequalities should Amal have written?

A. $x \leq 10,\ 2 \leq y \leq 5,\ y \leq x$
B. $x \leq 10,\ -5 \leq y \leq -2,\ y \geq -x$
C. $x \leq 10,\ -5 \leq y \leq -2,\ y \leq -x$
D. $x \leq -10,\ 2 \leq y \leq 5,\ y \leq -x$
E. $x \leq -10,\ -5 \leq y \leq -2,\ y \geq x$

58. In the standard (x,y) coordinate plane below, an angle is shown whose vertex is the origin. One side of this angle with measure θ passes through $(4,-3)$, and the other side includes the positive x-axis. What is the cosine of θ ?



F. $-\frac{4}{3}$

G. $-\frac{3}{4}$

H. $-\frac{3}{5}$

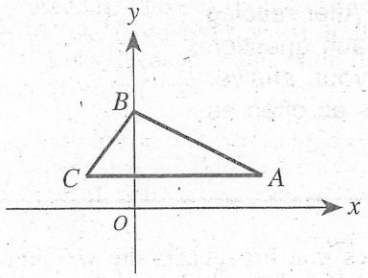
J. $\frac{4}{5}$

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

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

59. Triangle $\triangle ABC$ has vertices $A(8,2)$, $B(0,6)$, and $C(-3,2)$. Point C can be moved along a certain line, with points A and B remaining stationary, and the area of $\triangle ABC$ will not change. What is the slope of that line?



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

B. $-\frac{3}{4}$

C. 0

D. $\frac{4}{3}$

E. 2

60. Let the function $f(a,b)$ be defined as $f(a,b) = b^2 - a$. For all x and y, $f((x^2 + y^2),(x - y)) = ?$

F. $2y^2$

G. 0

H. $-2y^2$

J. $-2xy + 2y^2$

K. $-2xy$

END OF TEST 2

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

DO NOT RETURN TO THE PREVIOUS TEST.