ACT - Packet 4

Key

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MATHEMATICS TEST

60 Minutes—60 Questions

Test 4C Problem #34 No answer choice is correct.

DIRECTIONS: Solve each of the problems in the time allowed, then fill in the corresponding bubble on your answer sheet. Do not spend too much time on any one problem; skip the more difficult problems and go back to them later. You may use a calculator on this test. For this test you should assume that figures are NOT necessarily drawn to scale, that all geometric figures lie in a plane, and that the word *line* is used to indicate a straight line.

DO YOUR FIGURING HERE.

1. Shannon walked $1\frac{2}{3}$ miles on Wednesday and $2\frac{3}{5}$ miles on Thursday. What was the total distance, in miles, Shannon walked during those 2 days?

A. $3\frac{5}{8}$

B. $3\frac{2}{5}$

C. $4\frac{4}{15}$

D. $4\frac{1}{3}$

E. $5\frac{1}{3}$

$1\frac{2}{3} = \frac{10}{15}$

$2\frac{3}{5} = \frac{9}{15}$

$3\frac{19}{15} = 4\frac{4}{15}$

2. $4x^3 \times 3xy^2 \times 2xy^2$ is equivalent to:

F. $9x^3y^4$

G. $9x^5y^4$

H. $24x^3y^4$

J. $24x^5y^4$

K. $24x^5y^6$

$24x^5y^4$

3. Mr. Wilk is a high school math teacher whose salary is $33,660 for this school year, which has 180 days. In Mr. Wilk's school district, substitute teachers are paid $85 per day. If Mr. Wilk takes a day off without pay and a substitute teacher is paid to teach his classes, how much less does the school district pay in salary by paying a substitute teacher instead of Mr. Wilk for that day?

A. $57

B. $85

C. $102

D. $114

E. $187

$\frac{33660}{180} = 187$

-85

102

4. A student has earned the following scores on four 100-point tests this marking period: 63, 72, 88, and 91. What score must the student earn on the fifth and final 100-point test of the marking period to earn an average test grade of 80 for the five tests?

F. 79

G. 86

H. 89

J. 94

K. The student cannot earn an average of 80.

$\frac{63+72+88+91+X}{5} = 80$

$314 + X = 400$

$X = 86$

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DO YOUR FIGURING HERE.

5. The oxygen saturation of a lake is found by dividing the amount of dissolved oxygen the lake water currently has per liter by the dissolved oxygen capacity per liter of the water, and then converting that number into a percent. If the lake currently has 6.4 milligrams of dissolved oxygen per liter of water and the dissolved oxygen capacity is 9.5 milligrams per liter, what is the oxygen saturation level of the lake, to the nearest percent?
   - A. 64%
   - B. 67%
   - C. 70%
   - D. 89%
   - E. 95%

Currently / Capacity = 6.4 / 9.5 = .673684 = 67.3%

6. A rectangular lot that measures 125 feet by 185 feet is completely fenced. What is the length, in feet, of the fence?
   - F. 310
   - G. 435
   - H. 620
   - J. 740
   - K. 1,240

(Perimeter) 125 185

2(125+185) = 2(310) = 620

7. The expression $a[(b-c)+d]$ is equivalent to:
   - A. $ab+ac+ad$
   - B. $ab-ac+d$
   - C. $ab-ac+ad$
   - D. $ab-c+d$
   - E. $a-c+d$

$= a[b-c+d]$
$= ab-ac+ad$

8. If $6x-3=-5x+7$, then $x=$?
   - F. $\frac{4}{11}$
   - G. $\frac{10}{11}$
   - H. $\frac{11}{10}$
   - J. $\frac{1}{2}$
   - K. 10

$6x-3=-5x+7$
$+5x \quad +5x$
$11x-3=7$
$11x=10$
$x=10/11$

9. What two numbers should be placed in the blanks below so that the difference between the consecutive numbers is the same?

   13, __, __, 34
   - A. 19, 28
   - B. 20, 27
   - C. 21, 26
   - D. 23, 24
   - E. 24, 29

$13+3x=34$
$3x=21$
$x=7$
13, 20, 27, 34

10. If x is a real number such that $x^3=729$, then $x^2+\sqrt{x}=$?
    - F. 9
    - G. 27
    - H. 30
    - J. 84
    - K. 90

$x=9$

$9^2+\sqrt{9}=81+3=84$

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11. The formula for the volume, V, of a sphere with radius r is $V = \left(\frac{4}{3}\right)\pi r^3$. If the radius of a baseball is $1\frac{1}{3}$ inches, what is the volume to the nearest cubic inch?

A. 6
B. 8
C. 10
D. 14
E. 15

DO YOUR FIGURING HERE.

$V = \frac{4}{3}\pi\left(\frac{4}{3}\right)^3 = 9.9$

12. If a gumball is randomly chosen from a bag that contains exactly 6 yellow gumballs, 5 green gumballs, and 4 red gumballs, what is the probability that the gumball chosen is NOT green?

F. $\frac{2}{3}$
G. $\frac{1}{3}$
H. $\frac{2}{5}$
J. $\frac{3}{5}$
K. $\frac{4}{15}$

$\frac{\text{Not Green}}{\text{total}} = \frac{6+4}{6+5+4} = \frac{10}{15} = \frac{2}{3}$

13. The number of students participating in fall sports at a certain high school can be shown with the following matrix:

Tennis	Soccer	Cross-Country	Football
25	30	50	80

The athletic director estimates the ratio of the number of sports awards that will be earned to the number of students participating with the following matrix:

Tennis	0.2
Soccer	0.5
Cross-Country	0.3
Football	0.4

Given these matrices, what is the athletic director's estimate for the number of sports awards that will be earned for these fall sports?

A. 55
B. 60
C. 65
D. 67
E. 74

$= .2(25) + .5(30) + .3(50) + .4(80)$
$= 5 + 15 + 15 + 32$
$= 67$

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DO YOUR FIGURING HERE.

Use the following information to answer questions 14–15.

The following chart shows the current enrollment in all social studies classes—Geography, US History, World Cultures, and Government—at Iron Mountain High School.

Course title	Section	Period	Enrollment
Geography	A	1	23
	B	2	24
US History	A	2	25
	B	3	29
	C	4	24
World Cultures	A	3	27
Government	A	4	26
	B	6	27

14. What is the average number of students enrolled per section in US History?

F. 25
G. 26
H. 27
J. 29
K. 34

$\frac{25+29+24}{3} = \frac{78}{3} = 26$

15. The school wants to have all of the students enrolled in social studies classes read the same book at the same time so that the author of the book can speak to the students at an assembly. The school originally purchased two classroom sets of 30 books each, but now one set is missing 3 books and the other is missing 5. For which of the following class periods, if any, are there NOT enough books available for each student to have one book?

A. Period 2 only
B. Period 3 only
C. Period 4 only
D. Period 3 and 4 only
E. There are enough books for each class period

27 & 25 books avail

Period 2 24 & 25 OK
3 29 & 27 Not enough
4 24 & 26 OK

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DO YOUR FIGURING HERE.

16. What expression must the center cell of the table below contain so that the sums of each row and each column are equivalent?

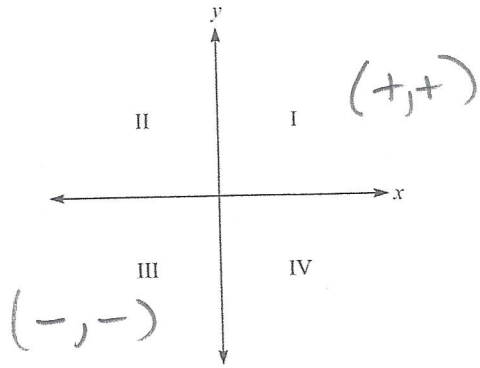
$-4x$	$9x$	$2x$
$7x$		$-3x$
$4x$	$-5x$	$8x$

$= 7x$

$7x$

F. $5x$
G. $3x$
H. 0
J. $-x$
K. $-4x$

17. Point A is to be graphed in a quadrant, not on an axis, of the standard (x, y) coordinate plane below. If the x-coordinate and the y-coordinate of point A are to have the same signs, then point A *must* be located in:



$(+,+)$

$(-,-)$

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

18. Reggie knows how to make 5 different entrees, 4 different side dishes, and 6 different desserts. How many distinct complete meals, each consisting of an entrée, a side dish, and a dessert, can Reggie make?
F. 16
G. 26
H. 72
J. 120
K. 144

$5 \times 4 \times 6 = 120$

19. At a bottling plant, 10,000 liters of carbonated water are needed to produce 3,000 bottles of soda. How many liters of carbonated water are needed to produce 750 bottles of soda?
A. 225
B. 1,500
C. 2,500
D. 4,000
E. 5,000

$\frac{H_2O}{Soda}$ $\quad \frac{10000}{3000} = \frac{X}{750}$

$\frac{10}{3} = \frac{X}{750}$ $\quad 250$

$X = 2500$

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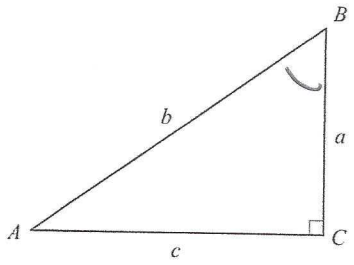
20. If a rectangle measures 20 meters by 48 meters, what is the length, in meters, of the diagonal of the rectangle?
F. 52
G. 68
H. 72
J. 112
K. 2,704

21. For all positive integers a, b, and c, which of the following expressions is equivalent to $\frac{a}{c}$?
A. $\frac{a \times b}{c \times b}$
B. $\frac{a \times a}{c \times c}$
C. $\frac{a \times c}{c \times a}$
D. $\frac{a - b}{c - b}$
E. $\frac{a + b}{c + b}$

22. What is the slope-intercept form of $6x - 2y - 4 = 0$?
F. $y = 6x - 2$
G. $y = 3x + 2$
H. $y = 3x - 2$
J. $y = -3x + 2$
K. $y = -6x - 4$

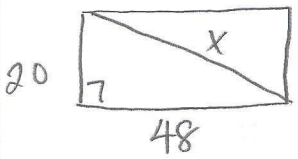
23. Which of the following is a solution to the equation $x^2 + 25x = 0$?
A. 50
B. 25
C. 5
D. -5
E. -25

24. For the right triangle ΔABC shown below, what is $\tan B$?



F. $\frac{a}{b}$
G. $\frac{a}{c}$
H. $\frac{b}{a}$
J. $\frac{c}{a}$
K. $\frac{c}{b}$

DO YOUR FIGURING HERE.



$20^2 + 48^2 = x^2$
$2704 = x^2$
$52 = x$

$-2y = -6x + 4$
$y = 3x - 2$

$x(x+25) = 0$
$x = 0 \quad x + 25 = 0$
$x = -25$

$\tan = \frac{opp}{adj} = \frac{c}{a}$

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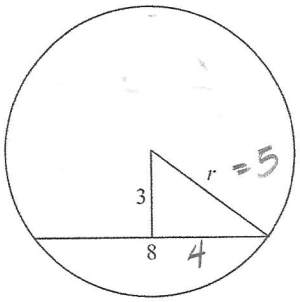
DO YOUR FIGURING HERE.

25. A chord 8 inches long is 3 inches from the center of a circle, as shown below. What is the radius of the circle, to the nearest tenth of an inch?



$3^2+4^2=r^2$
$5=r$

A. 4.0
B. 4.3
C. 5.0
D. 6.9
E. 8.5

26. The length L, in meters, of a spring is given by the equation $L=\left(\frac{2}{3}\right)F+0.05$, where F is the applied force in newtons. Approximately what force, in newtons, must be applied for the spring's length to be 0.23 meters?
F. 0.12
G. 0.18
H. 0.20
J. 0.24
K. 0.27

$0.23=\frac{2}{3}F+0.05$
$.18=\frac{2}{3}F$
$.27=F$

27. After a snowstorm, city workers removed an estimated 12,000 cubic meters of snow from the downtown area. If this snow were spread in an even layer over an empty lot with dimensions 62 meters by 85 meters, about how many meters deep would the layer of snow be?
A. Less than 1
B. Between 1 and 2
C. Between 2 and 3
D. Between 3 and 4
E. More than 4

$V=LWH$
$12000=62(85)X$
$2.3=X$

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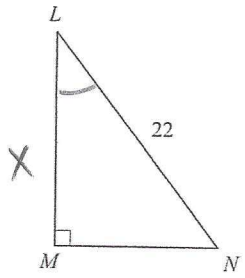
28. The hypotenuse of the right triangle LMN shown below is 22 feet long. The cosine of angle L is $\frac{3}{4}$. How many feet long is the segment LM?



F. 18.4
G. 16.5
H. 11.0
J. 6.7
K. 4.7

DO YOUR FIGURING HERE.

$\cos L = \frac{adj}{hyp} = \frac{x}{22} = \frac{3}{4}$

$4x = 66$

$x =$

29. The table below shows the number of pounds of apples grown last year in 4 cities. (Each whole apple on the graph represents 1,000 pounds of apples.) According to the graph, what fraction of the apples grown in all 4 cities were grown in Appleton?

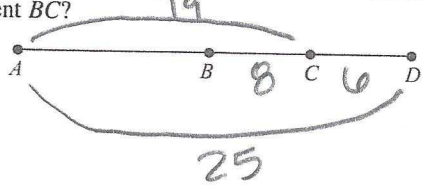
City	Apples grown
Golden Hills	
Red Falls	
Appleton	
Shady Acres	

4500
3000
=2500
2000

A. $\frac{5}{24}$
B. $\frac{1}{4}$
C. $\frac{1}{6}$
D. $\frac{5}{19}$
E. $\frac{3}{16}$

$\frac{\text{Appleton}}{\text{total}} = \frac{2500}{12000} = \frac{5}{24}$

30. Points B and C lie on segment AD as shown below. The length of segment AD is 25 units; the segment AC is 19 units long; and the segment BD is 14 units long. How many units long, if it can be determined, is the segment BC?



F. 5
G. 6
H. 8
J. 11
K. Cannot be determined from the given information.

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DO YOUR FIGURING HERE.

31. What is the x-coordinate of the point in the standard (x, y) coordinate plane at which the two lines $y = -2x + 7$ and $y = 3x - 3$ intersect?

A. 10
B. 5
C. 3
D. 2
E. 1

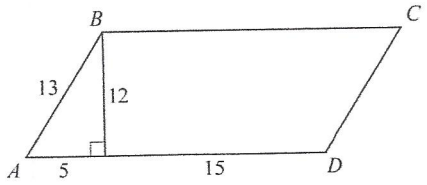
$-2x+7 = 3x-3$
$10 = 5x$
$2 = x$

32. For all pairs of real numbers S and T where $S = 4T - 7$, $T = ?$

F. $\frac{S}{4} - 7$
G. $\frac{S}{4} + 7$
H. $4S + 7$
J. $\frac{S-7}{4}$
K. $\frac{S+7}{4}$

$S = 4T - 7$
$\frac{S+7}{4} = \frac{4T}{4}$
$T = \frac{S+7}{4}$

33. Parallelogram $ABCD$, with dimensions in inches, is shown in the diagram below. What is the area of the parallelogram, in square inches?



A. 60
B. 72
C. 180
D. 240
E. 260

$A = bh$
$= 20(12)$
$= 240$

34. If $b = a + 3$, then $(a - b)^4 = ?$

F. 81
G. 27
H. −3
J. −27
K. −81

$b = a + 3$
$a - b = -3$
$(a-b)^4 = (-3)^4 = 81$

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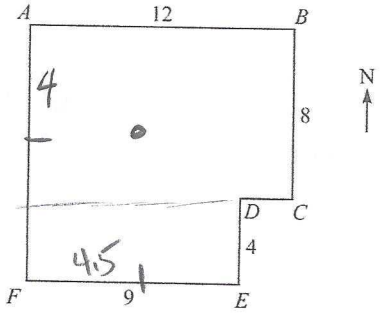
35. A park has the shape and dimensions, in miles, given below. The park office is located halfway between point A and point D. Which of the following is the location of the park office from point A? (Note: The park's borders run east–west or north–south.)



DO YOUR FIGURING HERE.

4 ↓ 4.5 →
S E

A. 3 miles east and $4\frac{1}{2}$ miles north

B. $4\frac{1}{2}$ miles east and 4 miles south

C. 4 miles east and $4\frac{1}{2}$ miles south

D. 6 miles east and 4 miles south

E. 6 miles east and $4\frac{1}{3}$ miles south

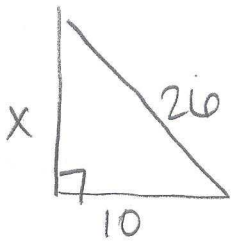
36. The larger of two numbers exceeds three times the smaller number by 4. The sum of twice the larger number and 4 times the smaller number is 58. If x is the smaller number, which equation below determines the correct value of x?

F. $3(2x+4)+4x=58$
G. $3(2x-4)+3x=58$
H. $2(3x+4)+2x=58$
J. $2(3x+4)+4x=58$
K. $2(2x-4)+4x=58$

x = smaller
3x+4 = larger
2(3x+4) + 4x = 58

37. Members of the fire department lean a 26-foot ladder against a building. The side of the building is perpendicular to the level ground so that the base of the ladder is 10 feet away from the base of the building. To the nearest foot, how far up the building does the ladder reach?

A. 12
B. 15
C. 20
D. 22
E. 24



$x^2+10^2=26^2$
$x=24$

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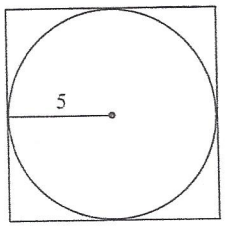
DO YOUR FIGURING HERE.

38. A square is circumscribed about a circle of a 5-foot radius, as shown below. What is the area of the square, in square feet?



10

10

$A = S^2 = 10^2 = 100$

F. 144
G. 100
H. 25π
J. 50
K. 25

39. The ratio of the side lengths for a triangle is exactly 7:11:13. In a second triangle similar to the first, the shortest side is 9 inches long. To the nearest tenth of an inch, what is the length of the longest side of the second triangle?

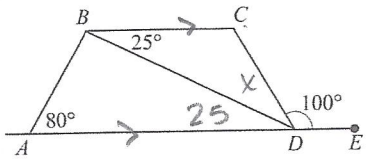
A. 14.1
B. 15
C. 16.7
D. 17.3
E. Cannot be determined from the given information.

$\frac{\text{Short}}{\text{Long}} = \frac{7}{13} = \frac{9}{x}$

$7x = 117$

$x = 16.7$

40. In the figure below, $ABCD$ is a trapezoid. E lies on line AD, and angle measures are as marked. What is the measure of angle CDB?



$100 + 25 + x = 180$

$125 + x = 180$

$x = 55°$

F. 25°
G. 30°
H. 55°
J. 80°
K. 100°

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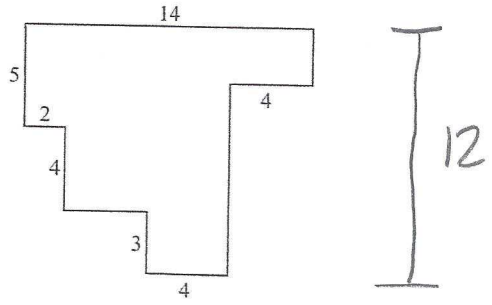
41. In the figure shown below, each pair of intersecting line segments meets at a right angle, and all the lengths are given in inches. What is the perimeter, in inches, of the figure?

DO YOUR FIGURING HERE.



$14+12+14+12=52$

A. 30
B. 36
C. 42
D. 52
E. 62

42. Of the 517 graduating seniors at Brighton High School, approximately $\frac{4}{5}$ will be attending college, and approximately $\frac{1}{2}$ of those going to college will be attending a state college. Which of the following is the closest estimate of the number of graduating seniors who will be attending a state college?

$\frac{1}{2}\left(\frac{4}{5}(517)\right)=206.8$

F. 170
G. 200
H. 260
J. 300
K. 320

43. Let $x \boxdot y = (x-2y)^2$ for all integers x and y. Which of the following is the value of $5 \boxdot (-3)$?

$x \boxdot y = (x-2y)^2$

$5 \boxdot (-3) = (5-2(-3))^2$

$= (5+6)^2 = 11^2 = 121$

A. 121
B. 64
C. 41
D. 1
E. −31

44. If 125% of a number is 425, what is 65% of the number?

$1.25x = 425$

$x = 340$

$.65(340) = 221$

F. 221
G. 276
H. 284
J. 308
K. 340

45. What is the distance in the standard (x, y) coordinate plane between the points (2,3) and (5,5)?

$d = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$= \sqrt{(5-2)^2+(5-3)^2}$

$\sqrt{3^2+2^2} = \sqrt{9+4} = \sqrt{13}$

A. 3
B. 5
C. $\sqrt{11}$
D. $\sqrt{13}$
E. $\sqrt{25}$

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DO YOUR FIGURING HERE.

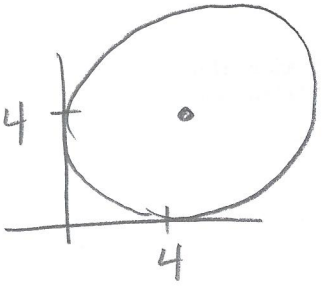
46. The ratio of the radii of two circles is 9:16. What is the ratio of their circumferences?

F. 3:4
G. 9:16
H. 18:32
J. $3:4\pi$
K. $9\pi:16$

Ratio of sides = a/b
Ratio of Circum = a/b

47. A circle in the standard (x, y) coordinate plane is tangent to the x-axis at 4 and tangent to the y-axis at 4. Which of the following is an equation of the circle?

A. $x^2 + y^2 = 4$
B. $x^2 + y^2 = 16$
C. $(x-4)^2 + (y-4)^2 = 4$
D. $(x-4)^2 + (y-4)^2 = 16$
E. $(x+4)^2 + (y+4)^2 = 16$



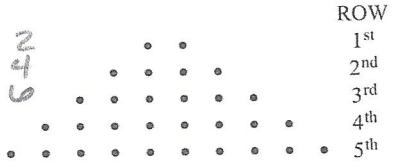
C=(4,4)
r=4
$(x-4)^2+(y-4)^2=16$

48. Using the complex number i, where $i^2 = -1$, $\frac{2}{(1-i)} \times \frac{(1+i)}{(1+i)} = ?$

F. $1+i$
G. $i-1$
H. $1-i$
J. $2(1+i)$
K. $2(1-i)$

$\frac{2+2i}{1-i^2} = \frac{2+2i}{2} = 1+i$

49. Which of the following describes the total number of dots in the first n rows of the triangular arrangement below?



A. 30
B. $2n$
C. n^2
D. $n(n+1)$
E. $2n + 2(n-1)$

n=3 Sum = 2+4+6 = 12

3(3+1)=12

50. After polling a class of 24 students by a show of hands, you find that 9 students play soccer and 21 students play basketball. Given that information, what is the number of students in the class who must play both soccer and basketball?

F. 0
G. 1
H. 3
J. 6
K. 9

$\begin{array}{r} 21 \\ +9 \\ \hline 30 \end{array}$ $\begin{array}{r} 30 \\ -24 \\ \hline 6 \end{array}$

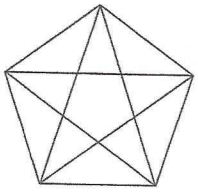
2 △ △ △ △ △ △ △ △ 2

51. Which of the following is the set of all real numbers x such that $x + 2 > x + 5$?
A. The set containing only zero
B. The set containing all nonnegative real numbers
C. The set containing all negative real numbers
D. The set containing all real numbers
E. The empty set

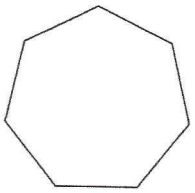
DO YOUR FIGURING HERE.

$x+2 > x+5$
$-x \quad -x$
$2 > 5$ No solution

52. Pentagons have 5 diagonals, as illustrated below. How many diagonals does the heptagon (7 sides) below have?



Pentagon



Heptagon

F. 7
G. 12
H. 14
J. 21
K. 28

$\#\text{ diagonals} = \frac{n(n-3)}{2}$

$\frac{7(7-3)}{2} = \frac{7(4)}{2} = 14$

53. John wants to draw a circle graph showing his friends' favorite ice cream flavors. When he polled his friends asking each their favorite flavor of ice cream, 35% of his friends said chocolate, 20% of his friends said vanilla, 15% of his friends said strawberry, 25% of his friends said mint chocolate chip, and 5% of his friends said flavors other than those previously listed. What will be the degree measure of the vanilla sector of the circle graph?
A. 126°
B. 108°
C. 90°
D. 72°
E. 36°

$\frac{\text{Vanilla}}{\text{total}} \quad \frac{20}{100} = \frac{x}{360}$

$\frac{1}{5} = \frac{x}{360}$

$360 = 5x$
$x = 72$

2 △ △ △ △ △ △ △ △ 2

54. If $\sin\theta = \frac{4}{5}$ and $\frac{\pi}{2} < \theta < \pi$, then $\tan\theta = ?$

DO YOUR FIGURING HERE.

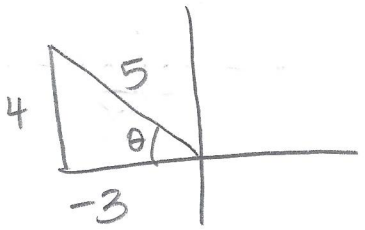
F. $-\frac{5}{4}$

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

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

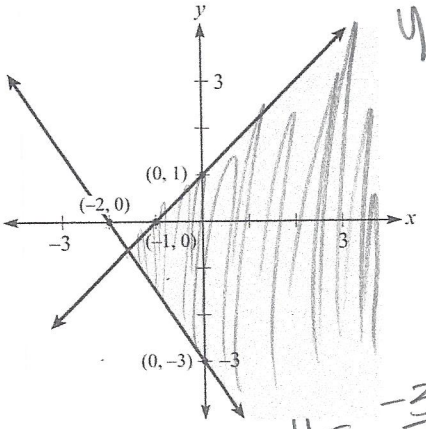
J. $\frac{4}{3}$

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



$\tan\theta = \frac{opp}{adj} = \frac{4}{-3}$

55. Which of the following systems of inequalities is represented by the shaded region of the graph below?



$y = x+1$ shaded below $y \le x+1$

$y = \frac{-3}{2}x - 3$ shaded above $y \ge \frac{-3}{2}x - 3$

A. $y \le x + 1$ or $y \ge x - 3$

B. $y \le x + 1$ and $y \ge x - 3$

C. $y \le x + 1$ or $y \ge \left(-\frac{3}{2}\right)x - 3$

D. $y \le x + 1$ and $y \le \left(-\frac{3}{2}\right)x - 3$

E. $y \le x + 1$ and $y \ge \left(-\frac{3}{2}\right)x - 3$

56. If $f(x) = 2x^2 + 3$, then $f(x + h) = ?$

F. $2x^2 + h^2$

G. $2x^2 + h + 3$

H. $2x^2 + 2h^2 + 3$

J. $x^2 + 2xh + h^2 + 3$

K. $2x^2 + 4xh + 2h^2 + 3$

$f(x) = 2x^2 + 3$

$f(x+h) = 2(x+h)^2 + 3$

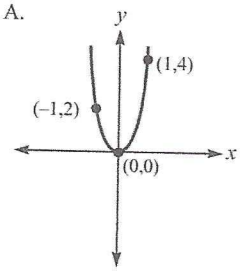
$= 2(x^2 + 2xh + h^2) + 3$

$= 2x^2 + 4xh + 2h^2 + 3$

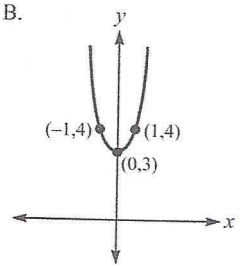
2 △ △ △ △ △ △ △ △ 2

57. Which of the following is the graph, in the standard (x, y) coordinate plane, of $y = \dfrac{x^2 + 3x}{x}$?

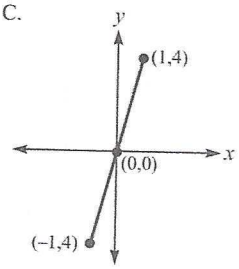
A.



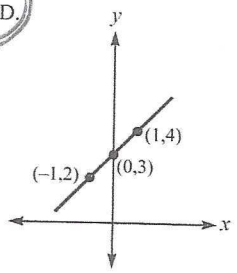
B.



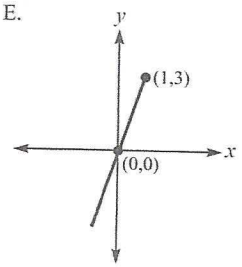
C.



D.



E.



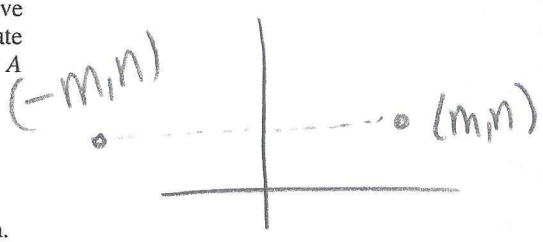
58. A triangle, $\triangle ABD$, is reflected across the y-axis to have the image $\triangle A'B'D'$ in the standard (x, y) coordinate plane: thus A reflects to A'. The coordinates of point A are (m, n). What are the coordinates of point A'?

F. $(-m, n)$
G. $(m, -n)$
H. $(-m, -n)$
J. (n, m)
K. Cannot be determined from the given information.

DO YOUR FIGURING HERE.

$y = \dfrac{x(x+3)}{x} = x+3$

undefined when $x=0$



2 △ △ △ △ △ △ △ △ 2

59. If $x = 3r - 4$ and $y = 3r + 2$, which of the following expresses y in terms of x?

A. $y = x + 2$
B. $y = x + 6$
C. $y = 9r + 14$
D. $y = 6r - 2$
E. $y = 3x + 14$

60. What is $\cos\frac{\pi}{12}$ given that $\frac{\pi}{12} = \frac{\pi}{3} - \frac{\pi}{4}$ and that $\cos(\alpha - \beta) = (\cos\alpha)(\cos\beta) + (\sin\alpha)(\sin\beta)$?

θ	$\sin\theta$	$\cos\theta$
$\frac{\pi}{6}$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$
$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$
$\frac{\pi}{3}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$

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

DO YOUR FIGURING HERE.

$x = 3r - 4$

$x + 4 = 3r$

$r = \frac{x+4}{3}$

$y = 3r + 2$

$y = 3\left(\frac{x+4}{3}\right) + 2$

$y = x + 6$

$\cos\frac{\pi}{12} = \cos\left(\frac{\pi}{3} - \frac{\pi}{4}\right)$

$= \cos\frac{\pi}{3}\cos\frac{\pi}{4} + \sin\frac{\pi}{3}\sin\frac{\pi}{4}$

$= \left(\frac{1}{2}\right)\left(\frac{\sqrt{2}}{2}\right) + \left(\frac{\sqrt{3}}{2}\right)\left(\frac{\sqrt{2}}{2}\right)$

$= \frac{\sqrt{2}}{4} + \frac{\sqrt{6}}{4}$

$= \frac{\sqrt{2}+\sqrt{6}}{4}$

END OF THE MATHEMATICS TEST.

STOP! IF YOU HAVE TIME LEFT OVER, CHECK YOUR WORK ON THIS SECTION ONLY.

Mathematics Test

1. C	21. A	41. D
2. J	22. H	42. G
3. C	23. E	43. A
4. G	24. J	44. F
5. B	25. C	45. D
6. H	26. K	46. G
7. C	27. C	47. D
8. G	28. G	48. F
9. B	29. A	49. D
10. J	30. H	50. J
11. C	31. D	51. E
12. F	32. K	52. H
13. D	33. D	53. D
14. G	34. F	54. G
15. B	35. B	55. E
16. G	36. J	56. K
17. E	37. E	57. D
18. J	38. G	58. F
19. C	39. C	59. B
20. F	40. H	60. H

2 △ △ △ △ △ △ △ △ 2

MATHEMATICS TEST

60 Minutes—60 Questions

DIRECTIONS: Solve each of the problems in the time allowed, then fill in the corresponding bubble on your answer sheet. Do not spend too much time on any one problem; skip the more difficult problems and go back to them later.

You may use a calculator on this test. For this test you should assume that figures are NOT necessarily drawn to scale, that all geometric figures lie in a plane, and that the word *line* is used to indicate a straight line.

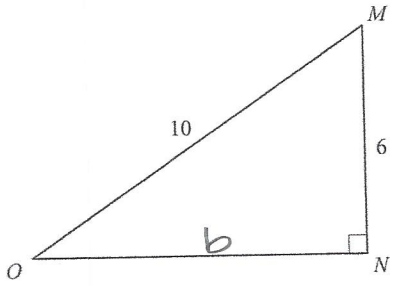
DO YOUR FIGURING HERE.

1. In the standard (x,y) coordinate plane, point X has coordinates $(-4,0)$ and point Y has coordinates $(0,-8)$. What are the coordinates of the midpoint of $\overline{XY}$?
   - A. $(-6,-1)$
   - B. $(-2,-4)$
   - C. $(0,2)$
   - D. $(2,4)$
   - E. $(6,-1)$

midpt $= \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$= \left(\frac{-4+0}{2}, \frac{0+-8}{2}\right) = (-2,-4)$

2. Given right triangle ΔMNO below, how many units long is $\overline{NO}$?



$6^2 + b^2 = 10^2$

$b^2 = 64$

$b = 8$

   - F. $2\sqrt{2}$
   - G. 4
   - H. 6
   - J. $\sqrt{60}$
   - K. 8

3. A distance in meters, M, can be approximated by multiplying a distance in yards, Y, by 1.0936. Which of the following expresses this approximation method? (Note: The symbol $\approx$ means "is approximately equal to.")
   - A. $M \approx \frac{Y}{1.0936}$
   - B. $M \approx \frac{1.0936}{Y}$
   - C. $M \approx Y(1.0936)$
   - D. $M \approx Y + 1.0936$
   - E. $M \approx Y(1.0936Y)$

2 △ △ △ △ △ △ △ △ 2

4. Seth has 4 plaid shirts and 5 solid-colored shirts hanging together in a closet. In his haste to get ready for work, he randomly grabs 1 of these 9 shirts. What is the probability that the shirt Seth grabs is plaid?

F. $\frac{1}{5}$

G. $\frac{1}{4}$

H. $\frac{4}{9}$

J. $\frac{1}{9}$

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

DO YOUR FIGURING HERE.

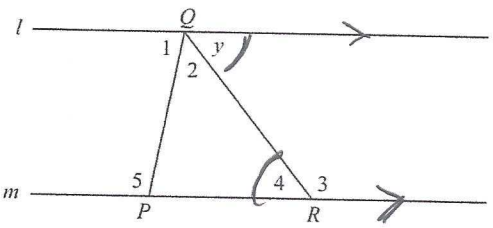
$\frac{\#\text{Plaid}}{\#\text{total}} = \frac{4}{9}$

5. The daily totals of enrollments at Sunnyside Summer Camp last Monday through Saturday were 17, 19, 23, 14, 25, and 28. What was the average number of enrollments per day?

A. 126
B. 28
C. 21
D. 18
E. 14

$\frac{17+19+23+14+25+28}{6} = \frac{126}{6} = 21$

6. In the figure showing ΔPQR below, line l is parallel to line m. Which one of the following angles must be congruent to $\angle y$?



Alt. Int ∠'s

F. $\angle 1$
G. $\angle 2$
H. $\angle 3$
J. $\angle 4$
K. $\angle 5$

7. A carton of paper is priced at $27.00 now. If the paper goes on sale for 25% off the current price, what will be the sale price of the carton?

A. $6.75
B. $20.25
C. $22.00
D. $26.75
E. $33.75

75% of 27 =

.75(27) = $20.25

2 △ △ △ △ △ △ △ △ 2

DO YOUR FIGURING HERE.

8. What is the slope of any line parallel to the line $2x - 3y = 7$?
   F. -3
   G. $-\frac{2}{3}$
   H. $\frac{2}{3}$
   J. 2
   K. 3

$2x-3y=7$
$-2x \quad -2x$
$-3y = -2x + 7$
$\frac{-3y}{-3} = \frac{-2x}{-3} + \frac{7}{-3}$
$y = \frac{2}{3}x - \frac{7}{3}$

Parallel lines = same slope
$m = 2/3$

9. Andrew won a cash prize on a game show. Andrew paid taxes of 30% on the original cash prize and had $28,000 remaining. How much was the original cash prize?
   A. $19,600
   B. $28,300
   C. $36,400
   D. $40,000
   E. $84,000

70% of $x = 28{,}000$
$.7x = 28000$
$x = \$40{,}000$

10. Melissa had 3 fewer apples than Marcia. Then, she gave 2 apples to Marcia. Now how many fewer apples does Melissa have than Marcia?
   F. 0
   G. 2
   H. 3
   J. 5
   K. 7

Mel	Mar
~~7~~	~~10~~
5	12

11. What is the value of $|5 - a|$ if $a = 9$?
   A. -14
   B. -4
   C. 4
   D. 9
   E. 14

$|5-9| = |-4| = 4$

12. For all m and n, $(3m + n)(m^2 - n) = ?$
   F. $3m^3 + 2m^2 - 2n$
   G. $m^3 - 2n^2$
   H. $2m^2 - n - n^2$
   J. $3m^2 + 3mn - 2n^2$
   K. $3m^3 - 3mn + m^2n - n^2$

$3m^3 - 3mn + m^2n - n^2$

13. For all x, $13 - 2(x + 5) = ?$
   A. $-2x + 3$
   B. $11x + 55$
   C. $13 + 10x$
   D. $23 - 2x$
   E. $23 + 2x$

$13 - 2(x+5)$
$= 13 - 2x - 10 = 3 - 2x$

14. $(n^7)^{11}$ is equivalent to:
   F. n^{77}
   G. n^{18}
   H. $11n^4$
   J. $11n^7$
   K. $77n$

n^{77}

$(x^a)^b = x^{ab}$

2 △ △ △ △ △ △ △ △ 2

DO YOUR FIGURING HERE.

15. What is the 217th digit after the decimal point in the repeating decimal $0.\overline{3456}$?
A. 0
B. 3
C. 4
D. 5
E. 6

$4\overline{)217}$ R1 same as 1st #

16. The perimeter of a square is 48 centimeters. What is its area, in square centimeters?
F. 12
G. 96
H. 144
J. 192
K. 2,304

12 | □ | 12 $A = 144$

17. What is the product of the 2 solutions of the equation $x^2 + 3x - 21 = 0$?
A. −63
B. −21
C. −20
D. 20
E. 21

Prod $= \frac{c}{a} = \frac{-21}{1} = -21$

18. Which of the following expressions is a polynomial factor of $a^{16} - 16$?
F. $a^4 - 4$
G. $a^4 + 4$
H. $a^4 + 2$
J. $a + 2$
K. $a - 2$

$a^{16} - 16$
$(a^8 - 4)(a^8 + 4)$
$(a^4 - 2)(a^4 + 2)(a^8 + 4)$

19. When $n = \frac{1}{4}$, what is the value of $\frac{2n - 5}{n}$?
A. 18
B. 9
C. −3
D. −9
E. −18

$\frac{2(\frac{1}{4}) - 5}{1/4} = \frac{1/2 - 5}{1/4} = \frac{-4.5}{1/4} =$
$-4.5(4) = -18$

20. A proofreader can read 40 pages in one hour. How many pages can this proofreader read in 90 minutes?
F. 45
G. 60
H. 150
J. 360
K. 940

$\frac{\text{Pages}}{\text{min}}$ $\frac{40}{60} = \frac{x}{90}$

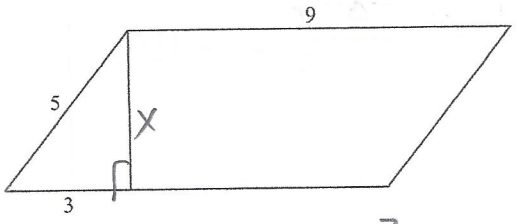
$60x = 3600$

$x = 60$

2 △ △ △ △ △ △ △ △ 2

DO YOUR FIGURING HERE.

21. The area of a parallelogram may be found by multiplying the base by the height. What is the area, in square inches, of the parallelogram below?



$A = bh$
$= 9(4)$
$= 36$

$x^2 + 3^2 = 5^2$
$x = 4$

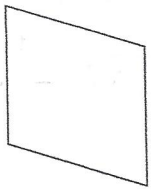
A. 27
B. 36
C. 45
D. 48
E. 81

22. For a certain quadratic equation, $ax^2 + bx + c = 0$, the 2 solutions are $x = \frac{3}{4}$ and $x = -\frac{2}{5}$. Which of the following could be factors of $ax^2 + bx + c$?

F. $(4x - 3)$ AND $(5x + 2)$
G. $(4x - 2)$ AND $(5x + 3)$
H. $(4x + 2)$ AND $(5x - 3)$
J. $(4x + 3)$ AND $(5x - 2)$
K. $(4x + 3)$ AND $(5x + 2)$

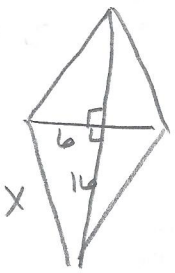
$(4x-3)(5x+2) = 0$
$x = 3/4 \quad x = -2/5$

23. All sides of a rhombus are the same length, as shown below.



If one diagonal is 12 inches long and the other is 32 inches long, how many inches long, to the nearest hundredth of an inch, is a side of the rhombus?

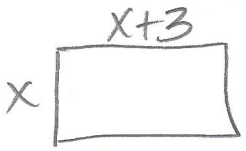
A. 8.54
B. 17.09
C. 34.17
D. 35.78
E. 48.00



$6^2 + 16^2 = x^2$
$292 = x^2$
$17.09 \approx x$

24. A rectangular parking lot that is 3 feet longer than it is wide has an area of 550 square feet. How many feet long is the parking lot?

F. 19
G. 20
H. 22
J. 25
K. 28



$x(x+3) = 550$
$x^2 + 3x - 550 = 0$
$(x+25)(x-22) = 0$
$x = -25, 22$

$\text{length} = x + 3 = 22 + 3$
$= 25$

2 △ △ △ △ △ △ △ △ 2

DO YOUR FIGURING HERE.

25. In the standard (x, y) coordinate plane, what is the slope of the line joining the points (3,7) and (4,−8)?

A. −15

B. −1

C. $-\frac{1}{7}$

D. $\frac{21}{32}$

E. 15

$$\text{Slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-8-7}{4-3} = -15$$

26. Which of the following is the solution set of $x+2>-4$?

F. $\{x: x < -6\}$

G. $\{x: x > -6\}$

H. $\{x: x < -2\}$

J. $\{x: x > 2\}$

K. $\{x: x < 6\}$

$$\begin{array}{r} x+2>-4 \\ -2 \quad -2 \\ \hline x>-6 \end{array}$$

27. What is the center of the circle with equation $(x-3)^2 + (y+3)^2 = 4$ in the standard (x, y) coordinate plane?

A. (3,3)

B. (3,−3)

C. $(\sqrt{3},-\sqrt{3})$

D. (−3,3)

E. $(-\sqrt{3},\sqrt{3})$

$(3,-3)$

$(x-h)^2 + (y-k)^2 = r^2$

center (h,k)

radius r

28. In the standard (x, y) coordinate plane, what is the length of the line segment that has endpoints (−3,4) and (5,−6)?

F. 9

G. $2\sqrt{41}$

H. 18

J. $20\sqrt{2}$

K. 40

$$d = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$$
$$= \sqrt{(5-3)^2 + (-6-4)^2}$$
$$\sqrt{8^2 + (-10)^2} = \sqrt{64+100} = \sqrt{164}$$
$$= 2\sqrt{41}$$

29. A triangle has sides of length 4.7 meters and 9 meters. Which of the following CANNOT be the length of the third side, in meters?

A. 5

B. 7

C. 8

D. 11

E. 14

$$9-4.7 < x < 9+4.7$$
$$4.3 < x < 13.6$$

30. If $\frac{n^x}{n^y} = n^2$ for all $n \neq 0$, which of the following must be true?

F. $x+y=2$

G. $x-y=2$

H. $x \times y = 2$

J. $x \div y = 2$

K. $\sqrt{xy} = 2$

$$\frac{n^x}{n^y} = n^{x-y}$$

$$n^{x-y} = n^2$$

$$x-y=2$$

2 △ △ △ △ △ △ △ △ 2

DO YOUR FIGURING HERE.

31. In the standard (x, y) coordinate plane, what is the y-intercept of the line given by the equation $3x + 5y = 8$?

A. 3

B. $\frac{5}{3}$

C. $\frac{8}{5}$

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

E. -3

$3x+5y=8$
$-3x \quad -3x$
$\frac{5y}{5} = \frac{-3x}{5} + \frac{8}{5}$
$y = \frac{-3}{5}x + \frac{8}{5}$ ← y-int

32. There are 16 ounces in one pound. If 3.4 pounds of beef cost \$4.95, what is the cost per ounce, to the nearest cent?

F. \$0.09
G. \$0.31
H. \$1.05
J. \$1.46
K. \$10.99

$\frac{\$}{OZ} = \frac{4.95}{3.4(16)} = \$0.0909$

33. $\left(\frac{1}{2}\right)^2 + \left(\frac{1}{3}\right)^2 + \left(\frac{1}{4}\right)^2 = ?$

A. $\frac{1}{29}$

B. $\frac{3}{29}$

C. $\frac{61}{144}$

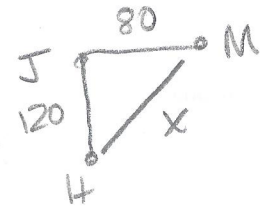
D. $\frac{15}{32}$

E. 9

$\frac{1}{4} + \frac{1}{9} + \frac{1}{16} = \frac{36}{144} + \frac{16}{144} + \frac{9}{144}$
$= \frac{61}{144}$

34. One route along flat terrain from Hermansville to Melville is to drive straight north from Hermansville for 120 miles to Jamestown, then, at Jamestown, to drive straight west for 80 miles to Melville. If a straight, flat road existed between Hermansville and Melville, approximately how many miles long would it be?

F. 200
G. 144
H. 100
J. 98
K. 40



$80^2 + 120^2 = x^2$
$6400 + 14400 = x^2$
$20800 = x^2$
$144.2 = x$

35. In order to clean her aquarium, Stephanie must remove half of the water. The aquarium measures 30 inches long, 16 inches wide, and 12 inches deep. The aquarium is currently completely full. What volume of water, in cubic inches, must Stephanie remove?

A. 1,440
B. 2,880
C. 4,320
D. 5,760
E. 7,200

$V = LWH$
$= (30)(16)(12) = 5760$

$\frac{1}{2}$ of $V = \frac{1}{2}(5760) = 2880$

2 △ △ △ △ △ △ △ △ 2

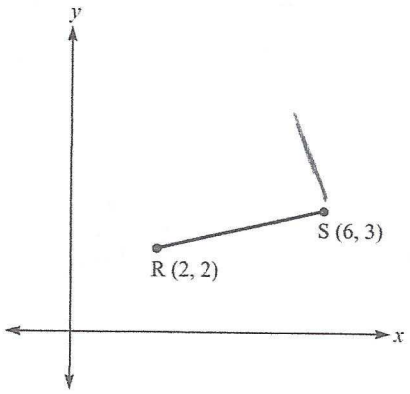
36. The bowling league selects its 4 officers by first selecting the president, then the vice president, then the secretary, then the treasurer. If there are 40 bowlers who are eligible to hold office and no member can hold more than one office, which of the following gives the number of different possible results of the election?

F. 37^4
G. 39^4
H. 40^4
J. $39 \times 38 \times 37 \times 36$
K. $40 \times 39 \times 38 \times 37$

DO YOUR FIGURING HERE.

$\frac{40}{\text{Pres}} \times \frac{39}{\text{VP}} \times \frac{38}{\text{Sec}} \times \frac{37}{\text{Treas}}$

37. The points R (2,2) and S (6,3) in the standard (x,y) coordinate plane below are 2 vertices of triangle RST, which has a right angle at S. Which of the following could be the third vertex, T?



⊥ lines have neg reciprocal slopes

Slope $RS = \frac{3-2}{6-2} = \frac{1}{4}$

Slope $ST = -4$

A) (5,7) (6,3) $\frac{3-7}{6-5} = \frac{-4}{1} = -4$

A. (5,7)
B. (5,−5)
C. (4,6)
D. (4,9)
E. $\left(4, \frac{9}{2}\right)$

38. What value of x will satisfy the equation $0.2(x - 2{,}700) = x$?

F. −675
G. −540
H. 0
J. 540
K. 675

$0.2(x-2700) = x$

$0.2x - 540 = x$

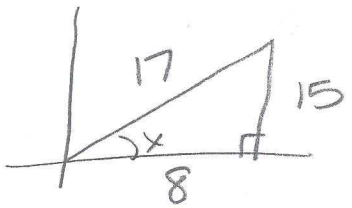
$-0.2x \quad -0.2x$

$\frac{-540}{0.8} = \frac{0.8x}{0.8}$

$-675 = x$

39. If $0° \le x \le 90°$ and $\tan x = \frac{15}{8}$, then $\cos x = ?$

A. $\frac{8}{17}$
B. $\frac{15}{17}$
C. $\frac{17}{8}$
D. $\frac{17}{15}$
E. $\frac{8}{15}$



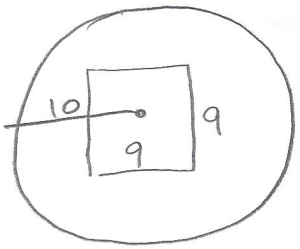
$\cos x = \frac{\text{adj}}{\text{hyp}} = \frac{8}{17}$

2 △ △ △ △ △ △ △ △ 2

40. A square pool with an area of 81 square feet is to be placed entirely within a circular enclosure with a radius of 10 feet. Tiles will be laid within the entire enclosure around the pool (but not under it). What is the approximate area, in square feet, of the enclosure that will be tiled?

F. 81
G. 233
H. 315
J. 396
K. Cannot be determined without knowing the exact placement of the pool.

DO YOUR FIGURING HERE.



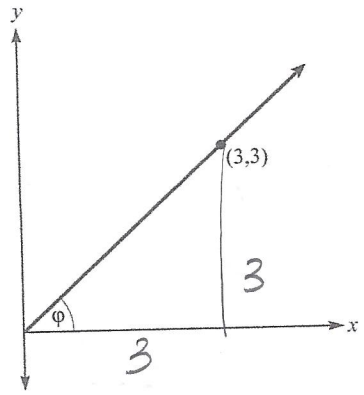
Area of ○ − Area of □
$\pi r^2 - s^2$
$\pi(10)^2 - 9^2$
$100\pi - 81$
233.16

41. In the standard (x,y) coordinate plane, which of the following lines goes through (3,4) and is parallel to $y = 2x + 2$?

A. $y = \frac{1}{2}x + 2$
B. $y = 2x - 2$
C. $y = 2x + 4$
D. $y = 2x + 10$
E. $y = 3x + 2$

$m = 2 \quad (3,4)$
$y = 2x + b$
$4 = 2(3) + b$
$-2 = b$
$y = 2x - 2$

42. In the figure below, $\tan \varphi = ?$



$\tan\varphi = \frac{opp}{adj} = \frac{3}{3} = 1$

F. $\frac{1}{\sqrt{2}}$
G. $\sqrt{2}$
H. 1
J. 3
K. $3\sqrt{2}$

43. Which of the following operations will produce the smallest result when substituted for the blank in the expression: $\frac{2}{3}$ ____ $- 3$?

A. plus
B. minus
C. multiplied by
D. divided by
E. averaged with

(A) $\frac{2}{3} + -3 = -2\frac{1}{3}$
(B) $\frac{2}{3} - -3 = 3\frac{2}{3}$
(C) $\frac{2}{3} \cdot -3 = -2$
(D) $\frac{2}{3} \div -3 = \frac{-2}{9}$
(E) $\frac{2/3 + -3}{2} = \frac{-7}{6}$

2 △ △ △ △ △ △ △ △ 2

DO YOUR FIGURING HERE.

44. The value of b that will make $\frac{b}{3}+2=\frac{1}{4}$ a true statement lies between which of the following numbers?

F. −4 and −6
G. −1 and −3
H. −1 and 1
J. 1 and 3
K. 3 and 5

$\frac{b}{3}+2=\frac{1}{4}$

$\frac{b}{3}=\frac{-7}{4}$ $\quad b=\frac{-21}{4}$

45. What is the solution set of $|3a-2|\leq 7$?

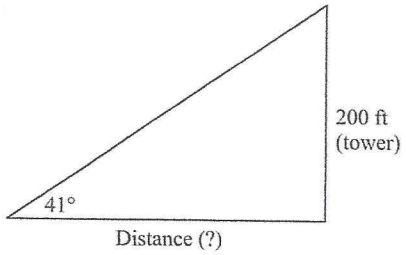
A. $\{a: a \leq 3\}$
B. $\left\{a: -\frac{5}{3} \leq a \leq 3\right\}$
C. $\left\{a: -\frac{5}{3} \geq a \geq 3\right\}$
D. $\left\{a: -\frac{5}{3} \leq a \geq 3\right\}$
E. $\left\{a: -\frac{5}{3} \geq a \leq 3\right\}$

$|3a-2|\leq 7$

$-7 \leq 3a-2 \leq 7$
$+2 \quad +2 \quad +2$
$-5 \leq 3a \leq 9$

$-\frac{5}{3} \leq a \leq 3$

46. When measured from a point on the ground that is a certain distance from the base of a cell phone tower, the angle of elevation to the top of the tower is 41°, as shown below. The height of the cell phone tower is 200 feet. What is the distance, in feet, to the cell phone tower?



opp

adj

$\tan = \frac{opp}{adj}$

$\tan 41 = \frac{200}{x}$

$x \tan 41 = 200$

$x = \frac{200}{\tan 41} = 200 \cot 41$

F. 200 tan 41°
G. 200 sin 41°
H. 200 cos 41°
J. 200 sec 41°
K. 200 cot 41°

47. For the area of a square to triple, the new side lengths must be the length of the old sides multiplied by:

A. $\sqrt{3}$
B. 3
C. 4
D. $2\sqrt{3}$
E. 9

Ratio of sides $= \frac{a}{b}$

Ratio of areas $= \frac{a^2}{b^2}$

$\frac{a^2}{b^2} = \frac{3}{1}$ $\quad \frac{a}{b} = \frac{\sqrt{3}}{1}$

2 △ △ △ △ △ △ △ △ 2

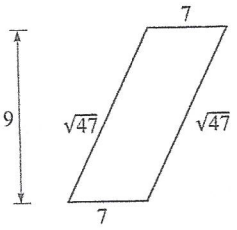
DO YOUR FIGURING HERE.

48. The volume of a cube is given by the formula s^3, where s is the length of a side. If a cube has a volume of 64, and the length of each side is halved, the new cube's volume will be:

F. 3
G. 6
H. 8
J. 16
K. 32

$V = s^3$
$64 = s^3$
$4 = s$
$2 = \frac{1}{2}s$
$V = s^3$
$V = 2^3$
$V = 8$

49. In the parallelogram below, lengths are given in inches. What is the area of the parallelogram, in square inches?



A. $\sqrt{94}$
B. $7\sqrt{47}$
C. 49
D. 63
E. $16\sqrt{47}$

$A = bh$
$= 7(9)$
$= 63$

50. If $8a^6b^3 < 0$, then which of the following CANNOT be true?

F. $b < 0$
G. $b > 0$
H. $a = b$
J. $a < 0$
K. $a > 0$

Neg or pos
$8a^6b^3 < 0$
positive
always positive
$b < 0$

51. If $\log_4 x = 3$, then $x = ?$

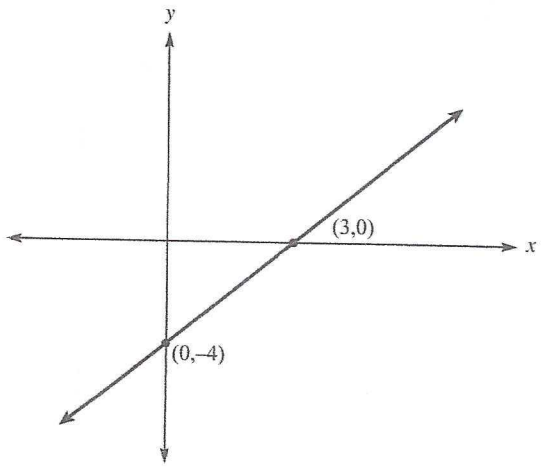
A. $\frac{1}{\log_{12}}$
B. $4\log^3$
C. 12
D. 64
E. 81

$\log_b x = y$ means $b^y = x$
$\log_4 x = 3$ means $4^3 = x$
$64 = x$

2 △ △ △ △ △ △ △ △ 2

52. If a system of 2 linear equations in 2 variables has NO solution, and 1 of the equations is graphed in the (x,y) coordinate plane below, which of the following *could* be the equation of the other line?

DO YOUR FIGURING HERE.



Slope $= \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - -4}{3 - 0} = \frac{4}{3}$

parallel lines so slopes are equal!

F. $y = -2$

G. $y = -\frac{1}{4}x + 2$

H. $y = -2x - 4$

J. $y = \frac{4}{3}x + 2$

K. $y = 4x - 4$

53. In a game, 80 marbles numbered 00 through 79 are placed in a box. A player draws 1 marble at random from the box. Without replacing the first marble, the player draws a second marble at random. If both marbles drawn have the same ones digit (that is, both marbles have a number ending in 0, 1, 2, 3, etc.), the player is a winner. If the first marble drawn is numbered 35, what is the probability that the player will be a winner on the next draw?

$\frac{\#\text{ ones digit 5}}{\#\text{ total}} = \frac{7}{79}$

A. $\frac{1}{79}$

B. $\frac{7}{80}$

C. $\frac{7}{79}$

D. $\frac{1}{10}$

E. $\frac{8}{79}$

2 △ △ △ △ △ △ △ △ 2

DO YOUR FIGURING HERE.

54. In the standard (x,y) coordinate plane, what is the equation of the line that passes through the origin and the point (3,4)?

F. $y = \frac{1}{4}x + \frac{3}{4}$

G. $y = \frac{1}{4}x - \frac{1}{3}$

H. $y = \frac{4}{3}x$

J. $y = \frac{1}{2}x + \frac{3}{4}$

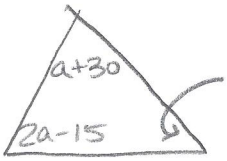
K. $y = \frac{9}{4}x$

(0,0) & (3,4)

Slope $= \frac{4-0}{3-0} = \frac{4}{3}$ $b=0$

55. The measure of the vertex angle of an isosceles triangle is $(a + 30)°$. The base angles each measure $(2a - 15)°$. What is the measure in degrees of one of the base angles?

A. 36°
B. 45°
C. 57°
D. 66°
E. 90°



$a+30+2(2a-15)=180$

$a+30+4a-30=180$

$5a=180$

$a=36$

$2(36)-15$

$=72-15$

$=57$

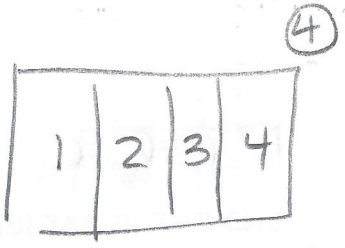
56. What is the smallest possible value for the product of 2 integers that differ by 7?

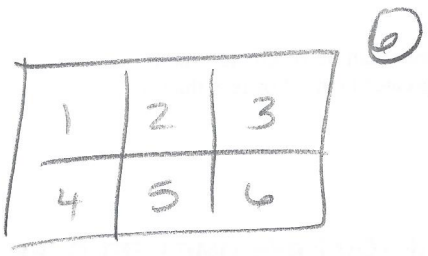
F. 8
G. 0
H. −6
J. −10
K. −12

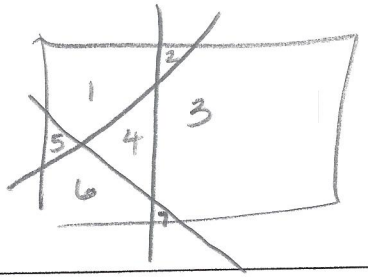
8 1 = 8
7 0 = 0
6 −1 = −6
5 −2 = −10
4 −3 = −12

57. Three distinct lines, all contained within a plane, separate that plane into distinct regions. What are all of the possible numbers of distinct regions of the plane that could be separated by any such three lines?

A. 4, 6, 7
B. 4, 5, 6
C. 3, 5, 7
D. 3, 5, 6
E. 3, 4, 5

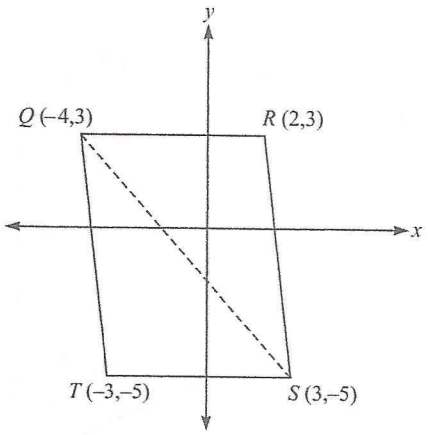






2 △ △ △ △ △ △ △ △ 2

58. Given the vertices of parallelogram $QRST$ in the standard (x, y) coordinate plane below, what is the area of triangle QRS, in square units?



F. 24
G. 28
H. 48
J. 60
K. 80

DO YOUR FIGURING HERE.

$A = \frac{1}{2}bh$
$= \frac{1}{2}(6)(8)$
$= 24$

59. The first and second terms of a geometric sequence are a and ab, in that order. What is the 643rd term of the sequence?

A. $(ab)^{642}$
B. $(ab)^{643}$
C. $a^{642}b$
D. $a^{643}b$
E. ab^{642}

$1^{st} = a$
$2^{nd} = ab$
$3^{rd} = ab^2$
$4^{th} = ab^3$
$643^{rd} = ab^{642}$

60. Points A, B, and C are three distinct points that lie on the same line. If the length of AB is 19 meters and the length of BC is 13 meters, then what are all the possible lengths, in meters, for AC?

F. 6 only
G. 32 only
H. 6 and 32 only
J. Any number less than 32 or greater that 6
K. Any number greater than 32 or less than 6

A 19 B 13 C

$19 + 13 = 32$

19

A C 13 B

$19 - 13 = 6$

END OF THE MATHEMATICS TEST.
STOP! IF YOU HAVE TIME LEFT OVER, CHECK YOUR WORK ON THIS SECTION ONLY.

Mathematics Test

1. B	21. B	41. B
2. K	22. F	42. H
3. C	23. B	43. A
4. H	24. J	44. F
5. C	25. A	45. B
6. J	26. G	46. K
7. B	27. B	47. A
8. H	28. G	48. H
9. D	29. E	49. D
10. K	30. G	50. G
11. C	31. C	51. D
12. K	32. F	52. J
13. A	33. C	53. C
14. F	34. G	54. H
15. B	35. B	55. C
16. H	36. K	56. K
17. B	37. A	57. A
18. H	38. F	58. F
19. E	39. A	59. E
20. G	40. G	60. H

2 △ △ △ △ △ △ △ △ 2

#34 No answer choice is correct.

MATHEMATICS TEST

60 Minutes—60 Questions

DIRECTIONS: Solve each of the problems in the time allowed, then fill in the corresponding bubble on your answer sheet. Do not spend too much time on any one problem; skip the more difficult problems and go back to them later.

You may use a calculator on this test. For this test you should assume that figures are NOT necessarily drawn to scale, that all geometric figures lie in a plane, and that the word *line* is used to indicate a straight line.

DO YOUR FIGURING HERE.

1. The minimum fine for driving in excess of the speed limit is \$25. An additional \$6 is added to the minimum fine for each mile per hour (mph) in excess of the speed limit. Rachel was issued a \$103 fine for speeding in a 55-mph speed limit zone. For driving at what speed, in mph, was Rachel fined?
   A. 48
   B. 52
   C. 62
   D. 68
   E. 78

$25 + 6x = 103$
$6x = 78$
$x = 13$
$55 + 13 = 68$

2. $5x^3 \times 2xy \times 3xy^2$ is equivalent to:
   F. $10x^3y^2$
   G. $10x^5y^3$
   H. $30x^3y^3$
   J. $30x^5y^3$
   K. $30x^5y^2$

$30x^5y^3$

3. What is the fourth term in the arithmetic sequence 13, 10, 7, ...?
   A. 14
   B. 9
   C. 4
   D. 0
   E. −7

13, 10, 7, ?
−3 −3 −3
7 − 3 = 4

4. When written in symbols, "the product of r and s, raised to the fourth power," is represented as:
   F. r^4s^4
   G. $(r+s)^4$
   H. $(rs)^4$
   J. $\frac{r^4}{s^4}$
   K. rs^4

$(rs)^4$

2 △ △ △ △ △ △ △ △ 2

DO YOUR FIGURING HERE.

5. Which of the following numbers has the digit 5 in the thousandths place?
   - A. 5,000.00
   - B. 50.0
   - C. 0.05
   - D. 0.005
   - E. 0.0005

$0.\_\_\_5$ ↑ thousandths Place

6. Mandy and Jordan each bought some of the same notebooks and the same three-ring binder. Mandy paid $5.85 for 3 notebooks and 1 binder. Jordan paid $4.65 for 2 notebooks and 1 binder. What is the price of one of the notebooks?
   - F. $2.70
   - G. $2.25
   - H. $1.80
   - J. $1.20
   - K. $0.75

$3N + B = 5.85$
$-(2N + B = 4.65)$
$N = 1.20$

7. If $mn = k$ and $k = x^2n$, and $nk \neq 0$, which of the following is equal to m?
   - A. 1
   - B. $1/x$
   - C. $\sqrt{x}$
   - D. x
   - E. x^2

$\frac{mn}{n} = \frac{k}{n}$

$m = \frac{k}{n}$ ← $k = x^2n$

$m = \frac{x^2n}{n} = x^2$

8. If $7x + 5 = 2x + 9$, then $x = ?$
   - F. $\frac{4}{5}$
   - G. $1\frac{4}{5}$
   - H. $\frac{4}{9}$
   - J. $1\frac{4}{9}$
   - K. 2

$7x + 5 = 2x + 9$
$-2x \quad -2x$
$5x + 5 = 9$
$5x = 4$
$x = 4/5$

9. What percent of 5 is 7?
   - A. 14%
   - B. 35%
   - C. 71%
   - D. 140%
   - E. 157%

$\frac{\text{is}}{\text{of}} = \frac{\%}{100}$

$\frac{7}{5} = \frac{x}{100}$

$x = 140$

2 △ △ △ △ △ △ △ △ 2

10. If x is a positive real number such that $x^2 = 16$, then $x^3 + \sqrt{x} = ?$

$x=4$

F. 18
G. 20
H. 66
J. 68
K. 74

DO YOUR FIGURING HERE.

$4^3+\sqrt{4} = 64+2=66$

11. $-|-16| - (-16) = ?$

$-16+16$

A. -16
B. 0
C. 4
D. 16
E. 32

12. A partial deck of cards was found sitting out on a table. If the partial deck consists of 6 spades, 3 hearts, and 7 diamonds, what is the probability of randomly selecting a red card from this partial deck? (Note: diamonds and hearts are considered "red," while spades and clubs are considered "black.")

$\frac{\text{Red}}{\text{total}} = \frac{3+7}{16} = \frac{10}{16} = \frac{5}{8}$

F. $\frac{9}{16}$
G. $\frac{13}{16}$
H. $\frac{7}{16}$
J. $\frac{3}{8}$
K. $\frac{5}{8}$

13. Which of the following is a simplified form of $4x - 4y + 3x$?

$7x-4y$

A. $x(7 - 4y)$
B. $x - y + 3x$
C. $-8xy + 3x$
D. $7x - 4y$
E. $-4y - x$

2 △ △ △ △ △ △ △ △ 2

DO YOUR FIGURING HERE.

14. Gary has turtles, cats, and birds for pets. The number of birds he has is 4 more than the number of turtles, and the number of cats is 2 times the number of birds. Of the following, which could be the total number of Gary's pets?
F. 14
G. 18
H. 20
J. 22
K. 26

Turtles = x
Birds = 4 + x
Cats = 2(4 + x)
total = x + 4 + x + 2(4 + x)
= 2x + 4 + 8 + 2x
= 4x + 12
= 4(x + 3)
must be a mult of 4

15. On a map, 1/4 inch represents 12 miles. If a road is 66 miles long, what is its length, in inches, on the map?
A. 5 1/2
B. 5 1/8
C. 1 1/2
D. 1 3/8
E. 7/8

map / actual
1/4 / 12 = x / 66
12x = 16.5
x = 1.375 = 1 3/8

16. If $b = a - 4$, then $(a - b)^3 = ?$
F. 64
G. 16
H. −4
J. −16
K. −64

b = a − 4
a − b = 4
(a − b)³ = (4)³ = 64

17. If g is an integer, which of the following could NOT equal g^2 ?
A. 0
B. 1
C. 4
D. 8
E. 9

18. Justin owns 6 different dress shirts, 3 different pairs of pants, and 5 different ties. How many distinct outfits, each consisting of a shirt, a pair of pants, and a tie, can Justin make?
F. 14
G. 42
H. 90
J. 120
K. 144

6 shirt × 3 pant × 5 tie

19. An oil refinery produces gasoline from crude oil. For every 10,000 barrels of crude oil supplied, the refinery can produce 6,500 barrels of gasoline. How many barrels of gasoline can be produced from 3,500 barrels of crude oil?
A. 1,265
B. 1,750
C. 2,125
D. 2,275
E. 5,385

oil / gas
10000 / 6500 = 3500 / x
10000x = 22750000
x = 2275

2 △ △ △ △ △ △ △ △ 2

(0,0)

20. What is the slope of a line that passes through the origin and the point $(-6, 2)$?
F. 3
G. 1/3
H. −1/3
J. −3
K. −6

DO YOUR FIGURING HERE.

(0,0) (−6,2) $m = \frac{y_2 - y_1}{x_2 - x_1}$

$m = \frac{2-0}{-6-0} = \frac{-2}{6} = -\frac{1}{3}$

21. If $n^x \cdot n^8 = n^{24}$ and $(n^6)^y = n^{18}$, what is the value of $x + y$?
A. 7
B. 9
C. 12
D. 19
E. 27

$n^x \cdot n^8 = n^{24}$

$n^{x+8} = n^{24}$

$x + 8 = 24$

$x = 16$

$(n^6)^y = n^{18}$

$n^{6y} = n^{18}$

$6y = 18$

$y = 3$

$x + y = 16 + 3 = 19$

22. What is the slope-intercept form of $9x + 3y - 6 = 0$?
F. $y = 9x - 6$
G. $y = 3x + 2$
H. $y = 3x - 2$
J. $y = -3x + 2$
K. $y = -9x + 6$

$9x + 3y - 6 = 0$

$3y = -9x + 6$

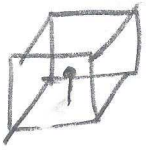
$y = -3x + 2$

23. If the volume of a cube is 64, what is the shortest distance from the center of the cube to the base of the cube?
A. 2
B. 4
C. $2\sqrt{4}$
D. $\sqrt{32}$
E. 16

$V = s^3$

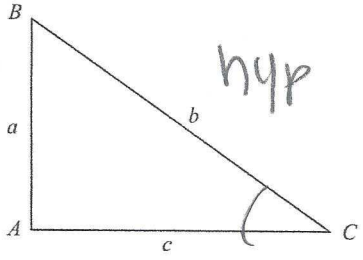
$64 = s^3$

$s = 4$



$\frac{1}{2}s = 2$

24. For the right triangle ΔABC shown below, what is $\sin C$?



opp hyp adj

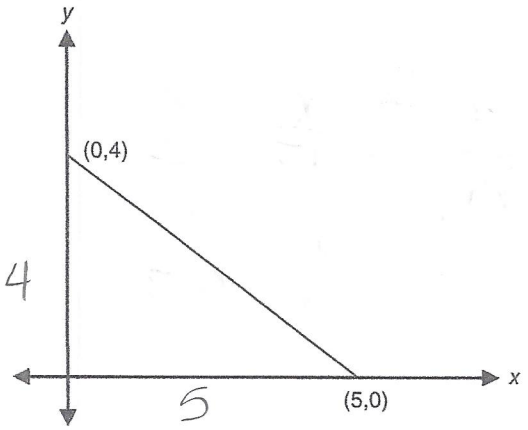
$\sin = \frac{opp}{hyp} = \frac{a}{b}$

F. $\frac{a}{b}$
G. $\frac{a}{c}$
H. $\frac{b}{a}$
J. $\frac{c}{b}$
K. $\frac{c}{a}$

2 △ △ △ △ △ △ △ △ 2

DO YOUR FIGURING HERE.

25. What is the area, in coordinate units, of the triangle in the figure below?



A. 4.5
B. 9.0
C. 10.0
D. 12.5
E. 20.0

$A = \frac{1}{2}(5)(4)$
$= \frac{1}{2}(20) = 10$

26. A shoe store charges $39 for a certain type of sneaker. This price is 30% more than the amount it costs the shoe store to buy one pair of these sneakers. At an end-of-the-year sale, sales associates can purchase any remaining sneakers at 20% off the shoe store's cost. How much would it cost an employee to purchase a pair of sneakers of this type during the sale (excluding sales tax)?

F. $31.20
G. $25.00
H. $24.00
J. $21.84
K. $19.50

130% of cost = 39
$1.3x = 39$
$x = 30$
80% of 30 = .8(30) = 24

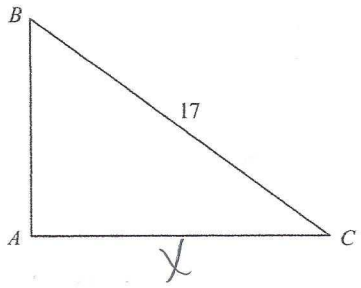
27. After excavating a lot, workers removed an estimated 7,000 cubic yards of dirt from the area. If this dirt were spread in an even layer over an empty lot with dimensions 30 yards by 64 yards, about how deep, in yards, would the layer of dirt be?

A. Less than 1
B. Between 1 and 2
C. Between 2 and 3
D. Between 3 and 4
E. More than 4

$V = LWH$
$7{,}000 = 30(64)H$
$3.65 = H$

2 △ △ △ △ △ △ △ △ 2

28. The hypotenuse of the right triangle $\triangle ABC$ shown below is 17 feet long. The cosine of angle C is $\frac{3}{5}$. How many feet long is the segment AC?



F. 6
G. 10.2
H. 12
J. 15
K. 28.3

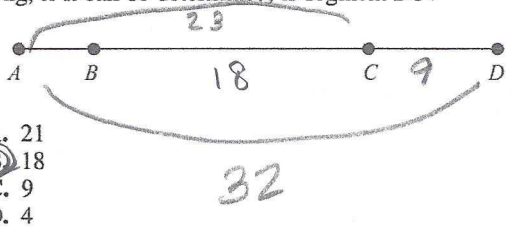
29. When the choir is arranged in rows of 5 people each, the last row is one person short. When the choir is arranged in rows of 6 people each, the last row is still one person short. What is the least possible number of people in the choir?

A. 29
B. 30
C. 56
D. 60
E. 99

30. What is the y-coordinate of the point in the standard (x,y) coordinate plane at which the 2 lines $y = \frac{x}{2} + 3$ and $y = 3x - 2$ intersect?

F. 5
G. 4
H. 3
J. 2
K. 1

31. Points B and C lie on segment AD as shown below. Segment AD is 32 units long, segment AC is 23 units long, and segment BD is 27 units long. How many units long, if it can be determined, is segment BC?



A. 21
B. 18
C. 9
D. 4
E. Cannot be determined from the given information.

DO YOUR FIGURING HERE.

$\cos = \frac{adj}{hyp} = \frac{x}{17} = \frac{3}{5}$

$5x = 51$

$x = 10.2$

LCM of 5 & 6 minus one

$30 - 1$

$y = \frac{x}{2} + 3$ $\quad y = 3x - 2$

$2\left(3x - 2 = \frac{x}{2} + 3\right)$

$6x - 4 = x + 6$

$5x = 10$

$x = 2$

$3(2) - 2$

4

2 △ △ △ △ △ △ △ △ 2

DO YOUR FIGURING HERE.

32. For all pairs of real numbers M and N where $M = 6N + 5$, $N = ?$

F. $\frac{M}{6} - 5$

G. $\frac{M}{5} + 6$

H. $6M + 5$

J. $\frac{M-5}{6}$

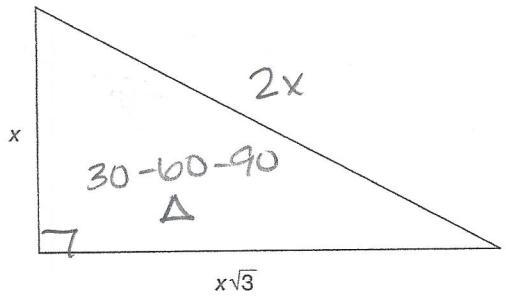
K. $\frac{M+5}{6}$

$M = 6N + 5$

$M - 5 = 6N$

$\frac{M-5}{6} = N$

33. In the figure below, the perimeter of the triangle is $12 + 4\sqrt{3}$ inches. What is the value of x, in inches?



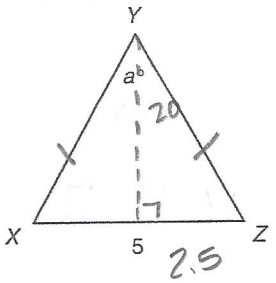
$x + 2x + x\sqrt{3} = 12 + 4\sqrt{3}$

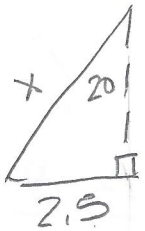
$3x + x\sqrt{3} = 12 + 4\sqrt{3}$

$x = 4$

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

34. In the figure below, $\overline{XY} = \overline{YZ}$. If $a = 40°$, than $\overline{XY} = ?$





$\sin = \frac{opp}{hyp}$

$\sin 20 = \frac{2.5}{x}$

$x \sin 20 = 2.5$

$x = \frac{2.5}{\sin 20} = 7.3$

F. 9.50
G. 8.75
H. 7.75
J. 6.25
K. 5.50

L. 7.3

2 △ △ △ △ △ △ △ △ 2

DO YOUR FIGURING HERE.

35. In the (x, y) coordinate plane, what is the y-intercept of the line $-9x - 3y = 15$?

A. -9
B. -5
C. -3
D. 3
E. 15

$-9x - 3y = 15$
$-3y = 9x + 15$
$y = -3x - 5$

36. The product of two integers is between 137 and 149. Which of the following CANNOT be one of the integers?

F. 15
G. 13
H. 11
J. 10
K. 7

$11 \times 13 = 143$
$14 \times 10 = 140$
$7 \times 20 = 140$
$15 \times 9 = 135$
$15 \times 10 = 150$

37. When x is divided by 7, the remainder is 4. What is the remainder when $2x$ is divided by 7?

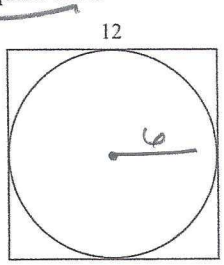
A. 1
B. 4
C. 5
D. 7
E. 8

$\frac{x}{7}$ R $= 4$

$\frac{2x}{7}$ R $= 8$

$7\overline{)8}$ R 1

38. A circle is circumscribed within a square with sides of 12 feet, as shown below. What is the area of the circle, to the nearest square foot?



F. 144
G. 113
H. 72
J. 12π
K. 3π

$A = \pi r^2$
$= \pi(6)^2 = 36\pi$
$= 36(3.14) = 113$

39. The average of 7 consecutive numbers is 16. What is the sum of the least and greatest of the 7 integers?

A. 13
B. 14
C. 16
D. 19
E. 32

13 14 15 16 17 18 19

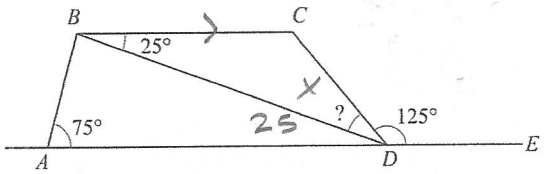
↑ Ave of odd # of consecutive #'s = the median of those #'s.

$13 + 19 = 32$

2 △ △ △ △ △ △ △ △ 2

DO YOUR FIGURING HERE.

40. In the figure below, $ABCD$ is a trapezoid. Point E lies on line AD, and angle measures are as marked. What is the measure of angle BDC?



$25+x+125=180$
$x+150=180$
$x=30$

F. 25°
G. 30°
H. 45°
J. 55°
K. 100°

41. For which of the following functions is $f(-5) > f(5)$?

A. $f(x) = 6x^2$ $f(-5)=150$ $f(5)=150$
B. $f(x) = 6$ $f(-5)=6$ $f(5)=6$
C. $f(x) = 6/x$ $f(-5)=-6/5$ $f(5)=6/5$
D. $f(x) = 6 - x^3$ $f(-5)=131$ $f(5)=-121$
E. $f(x) = x^6 + 6$ $f(-5)=f(5)$

42. For what value of n would the following system of equations have an infinite number of solutions?

$$3a + b = 12$$
$$12a + 4b = 3n$$

$\frac{3}{12} = \frac{1}{4} = \frac{12}{3a}$
$3a=48$
$a=16$

F. 4
G. 9
H. 16
J. 36
K. 48

43. If x and y are positive integers such that the greatest common factor of x^2y^2 and xy^3 is 27, then which of the following could y equal?

A. 81
B. 27
C. 18
D. 9
E. 3

GCF $x^2y^2 \& xy^3 = xy^2$

$xy^2 = 27$
1
3 9
3 3

$xy^2 = 3 \times 3^2$ $x=3$ $y=3$

2 △ △ △ △ △ △ △ △ 2

44. What is the smallest possible integer for which 15% of that integer is greater than 2.3?

F. 3
G. 12
H. 15
J. 16
K. 18

45. What is the distance in the standard (x,y) coordinate plane between the points (0,1) and (4,4)?

A. $\sqrt{7}$
B. 3
C. 4
D. 5
E. $\sqrt{27}$

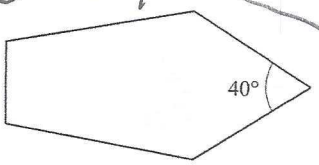
$x_1 y_1 \quad x_2 y_2$

46. The sides of a triangle are 9, 12, and 15 centimeters long. What is the angle between the 2 shortest sides?

F. 180°
G. 90°
H. 60°
J. 45°
K. 30°

$9^2+12^2=15^2$
Right Δ

47. In the pentagon, shown below, one interior angle measures 40°. What is the total measure of the other 4 interior angles?



A. 120°
B. 160°
C. 320°
D. 500°
E. 680°

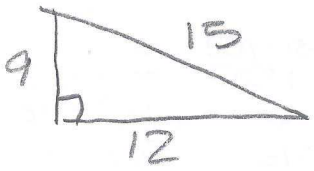
48. For real numbers r and s, when is the equation $|r-s| = |r+s|$ true?

F. Always
G. Only when $r = s$
H. Only when $r = 0$ or $s = 0$
J. Only when $r > 0$ and $s < 0$
K. Never

DO YOUR FIGURING HERE.

15% of # > 2.3
$.15x > 2.3$
$x > 15.\overline{3}$

$d = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$
$= \sqrt{(4-0)^2+(4-1)^2}$
$\sqrt{4^2+3^2} = \sqrt{25} = 5$



$=4$

Sum $= (n-2)180$
$= (5-2)180$
$= 3(180) = 540$

$y+40 = 540$
$y = 500$

2 △ △ △ △ △ △ △ △ 2

DO YOUR FIGURING HERE.

49. What is the value of $\log_4 64$?

A. 3
B. 4
C. 8
D. 10
E. 16

$\log_b x = y \iff b^y = x$

$\log_4 64 = y \Rightarrow 4^y = 64$

$y = 3$

50. How many different positive three-digit integers can be formed if the three digits 3, 4, and 5 must be used in each of the integers?

F. 6
G. 8
H. 12
J. 15
K. 24

$3 \times 2 \times 1 = 6$

51. Which of the following is the set of all real numbers x such that $x - 3 < x - 5$?

A. The empty set
B. The set containing only zero
C. The set containing all nonnegative real numbers
D. The set containing all negative real numbers
E. The set containing all real numbers

$x - 3 < x - 5$

$-x \quad\quad -x$

$-3 < -5$ False

No solution

52. What is the slope of a line that is perpendicular to the line determined by the equation $7x + 4y = 11$?

F. -4
G. $-\frac{7}{4}$
H. $\frac{11}{4}$
J. 4
K. $\frac{4}{7}$

$7x + 4y = 11$

$y = -\frac{7}{4}x + \frac{11}{4}$

slope $= -\frac{7}{4}$

$\perp$ slope = Neg Reciprocal $= \frac{4}{7}$

53. If each element in a data set is multiplied by 3, and each resulting product is then reduced by 4, which of the following expressions gives the mean of the resulting data set in terms of x?

A. x
B. $3x - 4$
C. $x + \frac{4}{3}$
D. $\frac{x}{3} + 4$
E. $x + \frac{4}{3}$

what happes to each term happens to the mean.

$3x - 4$

2 △ △ △ △ △ △ △ △ 2

54. If $\cos\theta = -\frac{3}{5}$ and $\frac{\pi}{2} < \theta < \pi$, then $\tan\theta = ?$

QII

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

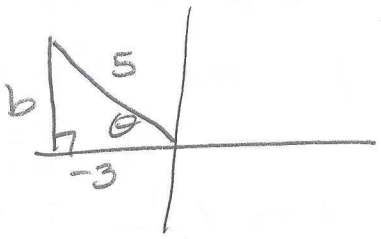
G. $-\frac{4}{3}$

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

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

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

DO YOUR FIGURING HERE.



$\cos = \frac{adj}{hyp} = \frac{-3}{5}$

$(-3)^2 + b^2 = 5^2$

$b = 4$

$\tan\theta = \frac{opp}{adj} = \frac{4}{-3}$

55. The City Council has approved the construction of a circular pool in front of City Hall. The area available for the pool is a rectangular region 12 feet by 18 feet, surrounded by a brick wall. If the pool is to be as large as possible within the walled area, and edge of the pool must be at least 2 feet from the wall all around, how many feet long should the radius of the pool be?

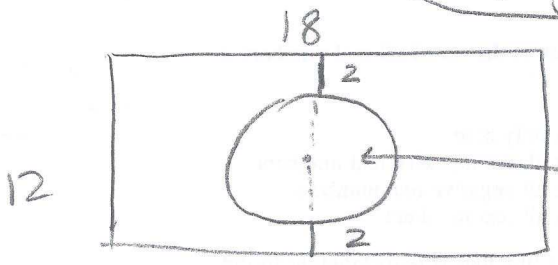
A. 14

B. 10

C. 7

D. 5

E. 4



$12 - 4 = 8$

$r = 4$

56. Kate rode her bicycle to visit her grandmother. The trip to Kate's grandmother's house was mostly uphill, and took m minutes. On the way home, Kate rode mostly downhill and was able to travel at an average speed twice that of her trip to her grandmother's house. Which of the following expresses the total number of minutes that Kate bicycled on her entire trip?

F. $3m$

G. $2m$

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

J. $\frac{3m}{2}$

K. $\frac{m}{2}$

uphill = m

downhill = $\frac{m}{2}$ (twice the Rate = 1/2 the time)

total = $\frac{3m}{2}$

57. Let n equal $3a + 2b - 7$. What happens to the value of n if the value of a increases by 2 and the value of b decreases by 1?

A. It is unchanged.

B. It decreases by 1.

C. It increases by 4.

D. It decreases by 4.

E. It decreases by 2.

$n = 3a + 2b - 7$

$n = 3(a+2) + 2(b-1) - 7$

$= 3a + 6 + 2b - 2 - 7$

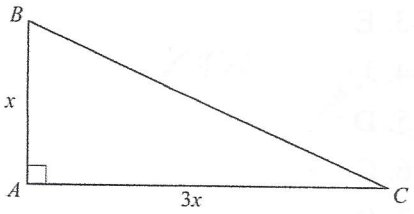
$n = (3a + 2b - 7) + 4$

add +4

2 △ △ △ △ △ △ △ △ 2

58. In the figure below, $\triangle ABC$ is a right triangle with legs that measure x and $3x$ inches, respectively. What is the length, in inches, of the hypotenuse?

DO YOUR FIGURING HERE.



$x^2+(3x)^2=c^2$
$x^2+9x^2=c^2$
$10x^2=c^2$
$x\sqrt{10}=c$

F. $\sqrt{10x}$
G. $\sqrt{3x}$
H. $\sqrt{2x}$
J. $2x$
K. $4x$

59. If the edges of a cube are tripled in length to produce a new, larger cube, then the larger cube's surface area is how many times larger than the smaller cube's surface area?

A. 3
B. 9
C. 18
D. 27
E. 54

Ratio of sides $=\frac{a}{b}=\frac{1}{3}$
Ratio of Areas $=\frac{a^2}{b^2}=\frac{1}{9}$
$=$ 9 times the Area

60. Considering all values of a and b for which $a+b$ is at most 9, a is at least 2, and b is at least -2, what is the minimum value of $b-a$?

F. 0
G. -7
H. -11
J. -13
K. -15

$a+b\leq 9$ $\quad a\geq 2$ $\quad b\geq -2$

if $a=2$ $\quad 2+b\leq 9$
$b\leq 7$

if $b=-2$ $\quad a+-2\leq 9$
$a\leq 11$

END OF THE MATHEMATICS TEST.
STOP! IF YOU HAVE TIME LEFT OVER, CHECK YOUR WORK ON THIS SECTION ONLY.

$b-a$ if $a=2$ & $b=7$
$7-2=5$

if $a=11$ & $b=-2$
$-2-11=-13$

Mathematics Test

1. D	21. D	41. D
2. J	22. J	42. H
3. C	23. A	43. E
4. H	24. F	44. J
5. D	25. C	45. D
6. J	26. H	46. G
7. E	27. D	47. D
8. F	28. G	48. H
9. D	29. A	49. A
10. H	30. G	50. F
11. B	31. B	51. A
12. K	32. J	52. K
13. D	33. B	53. B
14. H	34. G	54. G
15. D	35. B	55. E
16. F	36. F	56. J
17. D	37. A	57. C
18. H	38. G	58. F
19. D	39. E	59. B
20. H	40. G	60. J