

MATHEMATICS TEST

60 Minutes—60 Questions

DIRECTIONS: Solve each problem, choose the correct answer, and then fill in the corresponding oval on your answer document.

Do not linger over problems that take too much time. Solve as many as you can; then return to the others in the time you have left for this test.

You are permitted to use a calculator on this test. You may use your calculator for any problems you choose,

but some of the problems may best be done without using a calculator.

Note: Unless otherwise stated, all of the following should be assumed.

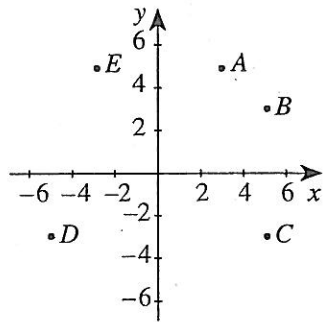
1. Illustrative figures are NOT necessarily drawn to scale.
2. Geometric figures lie in a plane.
3. The word *line* indicates a straight line.
4. The word *average* indicates arithmetic mean.

1. Which point in the standard (x,y) coordinate plane below has the coordinates (-3,5)?

DO YOUR FIGURING HERE.

x must be left of origin
y must be above x-axis
E is the only one

E



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

→

2. A bag contains 4 red jelly beans, 5 green jelly beans, and 3 white jelly beans. If a jelly bean is selected at random from the bag, what is the probability that the jelly bean selected is green?

Very simple probability

$$\frac{\text{What u want}}{\text{TOTAL possible}} = \frac{5}{4+5+3} = \frac{5}{12}$$

J

- F. $\frac{1}{12}$
- G. $\frac{1}{5}$
- H. $\frac{5}{23}$
- J. $\frac{5}{12}$
- K. $\frac{5}{7}$

→

3. The balance in Joan's savings account tripled during the year. Joan then withdrew \$500, and the resulting balance was \$100. What was the balance in the account before it tripled?

Translate English to Math

$$\begin{aligned} 3(x) - 500 &= 100 \\ 3x &= 600 \\ x &= 200 \end{aligned}$$

A

- A. \$200
- B. \$300
- C. \$400
- D. \$500
- E. \$600

→



4. For what value of x is the equation $2(x - 6) + x = 18$ true?

Simple Algebra

DO YOUR FIGURING HERE.

- F. 15
- G. 10
- H. 8
- J. 4
- K. 2

$$2x - 12 + x = 18$$

$$3x = 30$$

$$x = 10$$

5. An earring manufacturing company has fixed costs of \$10,000 per month and production costs of \$0.60 for each pair of earrings it makes. If the company produces x pairs of earrings in a month, which of the following expressions represents the total of the company's monthly costs?

Fixed Costs + Variable Cost

- A. $\$10,000x$
- B. $\$10,000 + x$
- C. $\$10,000x + \0.60
- D. $\$10,000 + \$0.60x$
- E. $(\$10,000 + \$0.60)x$

$$\$10,000 + \$0.60x$$

fixed

Variable \rightarrow depends on how many made

TAXES, RENT, etc

6. Anton went to Mexico during summer vacation with his Spanish class. He recorded the number of pesos he spent each day in a table, as shown below. What was the mean number of pesos he spent per day?

$$AV = \frac{\text{SUM OF ENTRIES}}{\text{TOTAL \# OF ENTRIES}}$$

July	1	2	3	4	5
Pesos spent	250	100	150	100	400

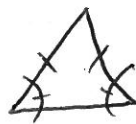
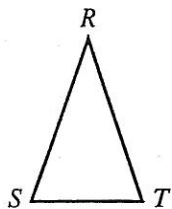
$$AV = \frac{250 + 100 + 150 + 100 + 400}{5}$$

$$AV = \frac{1000}{5} = 200$$

- F. 100
- G. 150
- H. 200
- J. 220
- K. 300

7. In $\triangle RST$, shown below, $\overline{RS} \cong \overline{RT}$, and the measure of $\angle R$ is 40° . What is the measure of $\angle S$?

Isosoles Triangle



If Vertex Angle is 40° , then base Angles get split evenly

with remainder of $180 - 40 = 140$

$$140 \div 2 = 70$$

- A. 20°
- B. 40°
- C. 50°
- D. 70°
- E. Cannot be determined from the given information

8. In the formula $d = rt$, d represents distance in miles, r represents average speed in miles per hour, and t represents time in hours. What is an automobile's average speed, in miles per hour, if it travels 60 miles in $1\frac{1}{2}$ hours?

Plug and chug

$$D = R \cdot T$$

$$60 = R \cdot 1\frac{1}{2} \text{ or } 60 = \frac{3}{2}r$$

- F. 30
- G. 40
- H. 60
- J. 90
- K. 120

$$\frac{2}{3} \cdot 60 = \frac{3}{2}r \cdot \frac{2}{3}$$

$$2 \cdot 20 = 40 = r$$

calculator $\Rightarrow 60 \div 1.5 = 40$

9. $|3-2| - |1-4| = ?$

Absolute Value DO YOUR FIGURING HERE.

- B → A. -4
B. -2
C. 2
D. 4
E. 10

TREAT Absolute Values like parentheses.
Do them first, then do operation. $|3-2| = 1$
 $|1-4| = 3$
 $1-3 = -2$

10. If c , d , and f are nonzero real numbers and $cd = f$, which of the following equations for c must always be true?

- H → E. $c = df$
G. $c = \frac{d}{f}$
→ H. $c = \frac{f}{d}$
J. $c = f - d$
K. $c = \sqrt{df}$

Solving for ONE Variable in terms of another Variable
If $cd = f$, then $c = \frac{f}{d}$

11. A cookie recipe calls for $\frac{2}{3}$ cup sugar to make 24 two-inch cookies. According to this recipe, how many cups of sugar should be used to make 60 two-inch cookies?

Ratio And Proportion

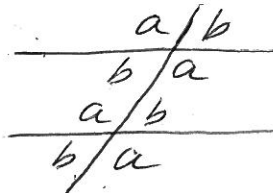
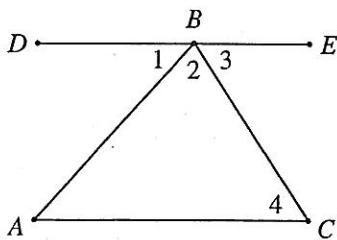
- D → A. $\frac{5}{9}$
B. 1
C. $1\frac{1}{5}$
→ D. $1\frac{2}{3}$
E. $3\frac{1}{6}$

$\frac{\frac{2}{3}}{24} = \frac{x}{60}$ $\frac{2}{3} \text{ of } 60 = 40$
 $\frac{40}{24} = \frac{\frac{2}{3} \cdot 60}{24} = x = \frac{40 \div 8}{24 \div 8} = \frac{5}{3} = 1\frac{2}{3}$

12. In the figure below, B is on \overline{DE} and $\overline{DE} \parallel \overline{AC}$. Which of the following angle congruences must hold?

Parallel lines and Transversals

- K → F. $\angle 1 \cong \angle 2$
G. $\angle 1 \cong \angle 4$
H. $\angle 2 \cong \angle 3$
J. $\angle 2 \cong \angle 4$
- K. $\angle 3 \cong \angle 4$



USE EXTENSIONS LINES

13. For what value of a is $x = 3$ a solution to the equation $x + 3 = ax + 9$?

- C → A. 1.5
B. 1
→ C. -1
D. -1.5
E. -3

MAKE $x \rightarrow 3$

$3 + 3 = a \cdot 3 + 9$
 $6 - 9 = 3a$
 $-3 = 3a$
 $-1 = a$

2



2

x $\xrightarrow{\text{left}}$ -2

y $\xrightarrow{\text{down}}$ -1

14. Quadrilateral $ABCD$ has vertices $(-2, -1)$, $(4, -3)$, $(5, 2)$, and $(-1, 3)$ in the standard (x, y) coordinate plane. Suppose $ABCD$ is translated 2 units to the left and 1 unit down, forming quadrilateral $A'B'C'D'$. Which of the following shows the coordinates of the vertices of $A'B'C'D'$?

DO YOUR FIGURING HERE.

Coordinate Graphing
- Translation

F

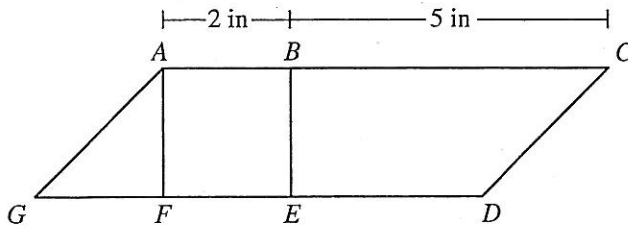
- F. $(-4, -2)$, $(2, -4)$, $(3, 1)$, $(-3, 2)$
- G. $(-3, -3)$, $(3, -5)$, $(4, 0)$, $(-2, 1)$
- H. $(-2, -2)$, $(4, -4)$, $(5, 1)$, $(-1, 2)$
- J. $(0, 0)$, $(6, -2)$, $(7, 3)$, $(1, 4)$
- K. $(4, 2)$, $(-8, 6)$, $(-10, -4)$, $(2, -6)$

EASIER than it appears.
Simply add two NEGATIVE units to x and ONE NEGATIVE unit for y.

15. In the figure below, F and E are points on \overline{GD} . What is the ratio of the area of square $ABEF$ to the area of parallelogram $ACDG$?

AREA of Square and Parallelogram combined with Ratio. Good example of how ACT combined two MATH TOPICS

E



- A. 1:14
- B. 1:7
- C. 7:1
- D. 7:2
- E. 2:7

$$\frac{\text{Area of Square}}{\text{Area of } \square} = \frac{2^2}{2 \times 7} = \frac{2 \cdot 2}{2 \cdot 7} = \frac{2}{7}$$

16. When $a = b$ and $c = d$, which of the following equations must be true?

AXIOMS - Identity and transitive Property

G

- F. $a + b = c + d$
- G. $a + d = b + c$
- H. $a + c = a + b$
- J. $a - c = d - b$
- K. $ad = cd$

$3 + 3 \neq 4 + 4$
 $3 + 4 \neq 3 + 3$
 $3 - 4 \neq 4 - 3$
 $3 \times 4 \neq 4 \times 4$

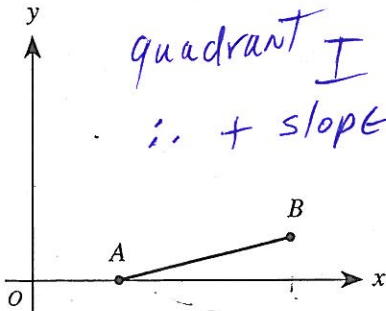
USE EASY NUMBERS and PROCESS of ELIMINATION

17. The scales on both axes of the standard (x, y) coordinate plane below are the same. Of the following, which is the best estimate for the slope of \overline{AB} ?

Slope and coordinate graphing system

Big Δ in y
Small Δ in x

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



quadrant I
 \therefore + slope

$$\text{Slope} = \frac{\Delta y}{\Delta x} \begin{matrix} \text{change of} \\ y \\ \text{change of} \\ x \end{matrix}$$

Going from A to B, there's much more change in x than in y

Can't be

18. A road map is drawn to scale so that 1.5 inches represents 90 miles. How many miles does 1.6 inches represent?

- G → F. 91
G. 96
H. 99
J. 100
K. 106

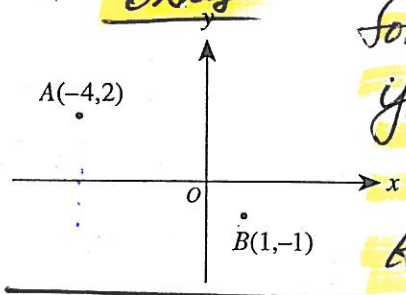
Ratio and proportion

$$\frac{1.5}{90} = \frac{1.6}{x} \Rightarrow x = \frac{90 \times 1.6}{1.5} = 96$$

DO YOUR FIGURING HERE.

19. In the standard (x,y) coordinate plane shown below, what is the distance in the x direction, in units, from point A to point B?

- A → A. 5
B. 4
C. 3
D. -3
E. -5



This is Not a distance formula question. Make sure you work on the question asked and not what you assume. $(-4 - 1) = -5$ or units

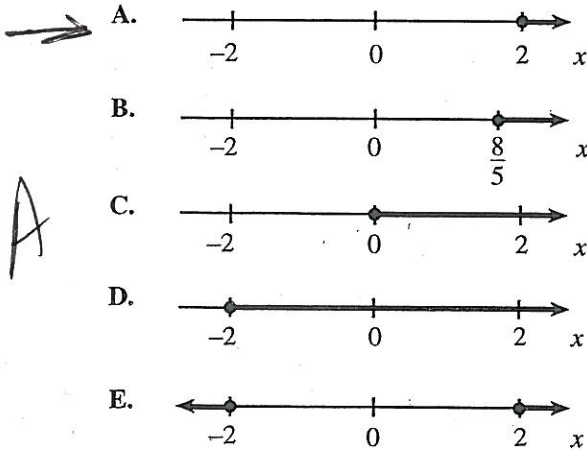
20. Which of the following is NOT a solution of $(x-3)(x-1)(x+3)(x+7) = 0$?

- K → F. -7
G. -3
H. 1
J. 3
K. 7
- x can be these values

$x \Rightarrow 3, 1, -3, -7$

Zero Product Property
If $ab=0$, then either a or b must be 0 or both.

21. Which of the following shows the solution set for the inequality $5x - 1 \geq 9$?



Inequalities

Solve the inequality 1st

$$5x - 1 \geq 9$$

$$5x \geq 10$$

$$x \geq 2$$

where are x 's greater than 2

22. If $a = 10$, then which of the following represents 8,003?

- J → F. $8a + 3$
G. $80a + 3$
H. $8a^2 + 3$
J. $8a^3 + 3$
K. $8a^4 + 3$

$10^3, 10^2, 10^1, 10^0, 10^{-1}, 10^{-2}, 10^{-3}$

If $a = 10$, then 8,003 must be $8 \times 10^3 + 3$

Place Value



SYSTEMS OF EQUATIONS
DO YOUR FIGURING HERE.

23. What is the value of b in the solution to the system of equations below?

$$\begin{aligned} 3a - 2b &= 21 \\ a + 3b &= -4 \end{aligned}$$

If you need to find b ,
Eliminate a

$$\begin{array}{r} 3a - 2b = 21 \\ -3(a + 3b = -4) \\ \hline -11b = 33 \\ b = -3 \end{array}$$

- D
- A. 17
 - B. 9
 - C. 5
 - D. -3
 - E. -5

24. Which of the following is an equivalent form of $x + x(x + x)$?

DISTRIBUTE PROPERTY +
PEMDAS

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

- H
- F. $4x$
 - G. $x^2 + 2x$
 - H. $2x^2 + x$
 - J. $4x^2$
 - K. x^4

25. To check the slope of a ramp, a building inspector places an overlay of the standard (x,y) coordinate plane on the construction blueprint so that the x -axis aligns with the horizontal on the blueprint. The line segment representing the side view of the ramp goes through the points $(1,-3)$ and $(14,2)$. What is the slope of the planned ramp?

Figuring Slope given
TWO POINTS

$$\text{Slope} = \frac{\Delta y}{\Delta x} = \frac{2 - (-3)}{14 - 1} = \frac{5}{13}$$

- D
- A. $-\frac{1}{15}$
 - B. $-\frac{1}{13}$
 - C. $-\frac{1}{6}$
 - D. $\frac{5}{13}$
 - E. $\frac{13}{5}$

You don't even need to find Δx .
the only answer with 5 in the
Numerator is D

26. Due to inflation, a car that formerly sold for \$15,000 now sells for 10% more. Which of the following calculations gives the current cost, in dollars, of the car?

PERCENT INCREASE

The ORIGINAL COST of car
Plus 10% MORE of 15K

- H
- F. $15,000 + 10$
 - G. $15,000 + 15,000(0.01)$
 - H. $15,000 + 15,000(0.10)$
 - J. $15,000 + 15,000(10)$
 - K. $15,000(0.10)$

27. In 3-dimensional space, the set of all points 12 units from the origin is:

Definition of Sphere

Set of all points equidistant
from a fixed center point.

- B
- A. a circle.
 - B. a sphere.
 - C. a line.
 - D. a cylinder.
 - E. 2 parallel planes.

A circle is defined as
a set of points equidistant from
a fixed center point

2



2

$(n-2) \cdot 180 = \frac{4 \cdot 180}{2} = 120$

$\frac{120}{2} = 60$

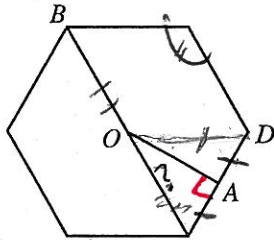
28. In the regular hexagon below, vertices B, C, and D are labeled; \overline{OA} is perpendicular to \overline{CD} ; A is the midpoint of \overline{CD} ; and O is the midpoint of \overline{BC} . What is the degree measure of $\angle AOC$?

DO YOUR FIGURING HERE.

Angle Measure of Regular Polygon

$\frac{(n-2)180}{n} = \text{each angle in regular polygon}$

OA \perp CD
If OA bisects CD



$\triangle OCA$ is a 30, 60, 90 right triangle

- F. 15°
- G. 20°
- H. 30°
- J. 45°
- K. 60°

29. The number 0.005 is 100 times as large as which of the following numbers?

Multiplying w/ Decimals

$0.005 \times 100 = 0.00005$
Find which one has four zeros

- A. 0.5
- B. 0.05
- C. 0.0005
- D. 0.00005
- E. 0.000005

30. The volume, V, of a sphere is determined by the formula $V = \frac{4\pi r^3}{3}$, where r is the radius of the sphere.

Plugging Numbers into Formula

What is the volume, in cubic centimeters, of a sphere with a diameter 6 centimeters long?

$D = 2r$
 $6 = 2r$
 $3 = r$

- F. 36π
- G. 72π
- H. 108π
- J. 144π
- K. 288π

You can do 36π this in your head = $\frac{4\pi \cdot 3 \cdot 3 \cdot 3}{3}$

31. Which of the following is equal to $\frac{\frac{1}{2} - \frac{1}{3}}{\frac{1}{2} + \frac{1}{3}}$?

Adding/subtraction/Division of Fractions

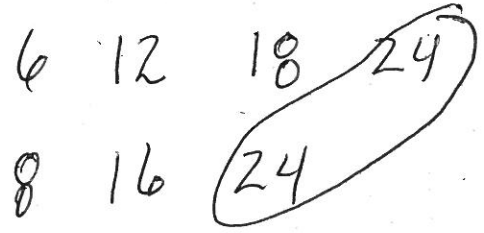
- A. $-\frac{5}{1}$
- B. $-\frac{1}{5}$
- C. $\frac{1}{2}$
- D. $\frac{1}{5}$
- E. $\frac{1}{6}$

$\frac{\frac{3}{6} - \frac{2}{6}}{\frac{3}{6} + \frac{2}{6}} = \frac{\frac{1}{6}}{\frac{5}{6}} = \frac{6}{30} = \frac{1}{5}$

32. One neon sign flashes every 6 seconds. Another neon sign flashes every 8 seconds. If they flash together and you begin counting seconds, how many seconds after they flash together will they next flash together?

Least Common Multiple

- F. 48
- G. 24
- H. 14
- J. 7
- K. 2



Prime factorization
6 unique factors
8 unique factors
2³ to highest degree
 $3 \times 2^3 = 24$

SAME

2



2

$\sqrt{2x} - 5 = 1$

Looking at this, you see that $\sqrt{2x}$ must = 6

33. If $\sqrt{2x} - 5 = 1$, then $x = ?$

DO YOUR FIGURING HERE.

- A. -8
- B. 8
- C. 9
- D. 12
- E. 18

You can do in your head

Solving for x

$$(\sqrt{2x})^2 = (6)^2$$

$$2x = 36$$

$$x = 18$$

34. A truck sprang a leak at the bottom of its radiator, which held 480 ounces of fluid when it started to leak, and started losing radiator fluid at a constant rate of 4 ounces per minute. Suppose that the radiator continued to leak at this constant rate and that the truck, traveling at 35 miles per hour, could continue traveling at this rate until its radiator was completely empty. In how many miles would the radiator be empty?

RATE PROBLEM COMBO

- F. 13.7
- G. 17.5
- H. 35.0
- J. 70.0
- K. 120.0

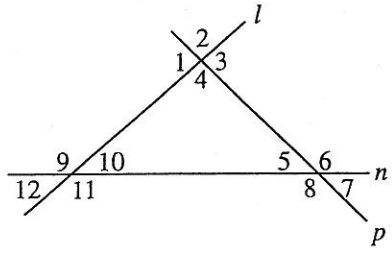
$$\frac{480 \text{ oz}}{4 \text{ oz/min}} = 120 \text{ min} = 2 \text{ hours}$$

$$35 \text{ mph} \times 2 \text{ hours} = 70 \text{ miles}$$

35. Each of 3 lines crosses the other 2 lines, as shown below. Which of the following relationships, involving angle measures (in degrees), must be true?

VERTICAL ANGLES and TOTAL NUMBER OF DEGREES IN a TRIANGLE.

E



- I. $m\angle 4 + m\angle 5 + m\angle 10 = 180^\circ$
- II. $m\angle 2 + m\angle 7 + m\angle 12 = 180^\circ$
- III. $m\angle 2 + m\angle 7 + m\angle 10 = 180^\circ$

- A. I only
- B. II only
- C. III only
- D. I and II only
- E. I, II, and III

WATCH OUT - EASY QUESTION but somewhat TIME CONSUMING in the way its set-up

36. How many ordered pairs (x,y) of real numbers will satisfy the equation $2x - 5y = 6$?

LINEAR Algebra

- F. 0
- G. 1
- H. 2
- J. 3
- K. Infinitely many

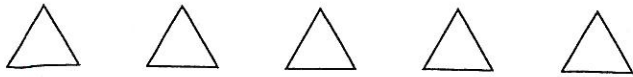
A LINE is INFINITE

$2x - 5y = 6$ is a line in a plane and HAS INFINITELY MANY SOLUTIONS

arrows POINT to infinity



2



$\frac{4-2}{1} = \frac{2}{1} = 2$

37. If Mark works steadily he can complete a task in x hours. What portion of the task remains if he works steadily for y hours, where y is any value less than x?

DO YOUR FIGURING HERE.

- A. $\frac{(x+y)}{x}$
- B. $\frac{(y-x)}{x}$
- C. $\frac{(x-y)}{(x+y)}$
- D. $\frac{(x-y)}{y}$
- E. $\frac{(x-y)}{x}$

E

Expressing changes Algebraically
The remaining portion will be expressed in terms of decimal or percent

38. If $a^2 - b^2 = 81$ and $a - b = 9$, then $a = ?$

- F. 12
- G. 9
- H. 3
- J. -3
- K. -9

X
G

Difference of 2 squares
 $a^2 - b^2 = (a+b)(a-b)$ If $a-b=9$, then $(a+b)9=81$
b must be $a+b=9$
use systems of equations $a-b=9$
 $a+b=9$
 $2a=18$
 $a=9$

39. For $y \neq 0$, $\frac{y^8}{y^2}$ is equivalent to:

- A. 1
- B. 4
- C. y^3
- D. y^4
- E. y^6

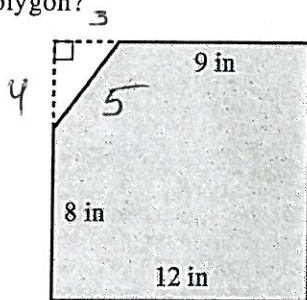
E

$\frac{y^8}{y^2} = y^{8-2} = y^6$

Application of Rules of Exponents

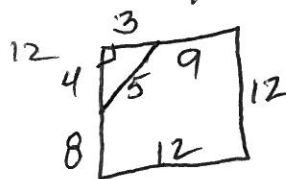
40. The polygon below was a square with 12-inch sides before a triangle was cut off. What is the perimeter, in inches, of this polygon?

H



- F. 41
- G. 43
- H. 46
- J. 48
- K. 53

Perimeter and Pythagorean triple



$5 + 9 + 12 + 12 + 8 = 46$

41. A circle in the standard (x,y) coordinate plane has center (2,-3) and radius 4 units. Which of the following equations represents this circle?

- A. $(x-2)^2 + (y+3)^2 = 4$
- B. $(x+2)^2 - (y-3)^2 = 4$
- C. $(x+2)^2 + (y-3)^2 = 4$
- D. $(x-2)^2 + (y+3)^2 = 16$
- E. $(x+2)^2 - (y-3)^2 = 16$

eliminate $r^2=16$

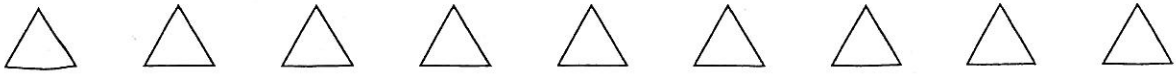
Equation of circle

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

(h,k) -> center coordinates

r = radius

center 2, -3 r=4
 $(x-2)^2 + (y-(-3))^2 = 4^2$



G

42. In the figure below, a square is circumscribed about a circle with a 30-inch diameter. Points A, B, C, and D are the midpoints of the square's sides. What is the total area, in square inches, of the shaded regions?

DO YOUR FIGURING HERE.

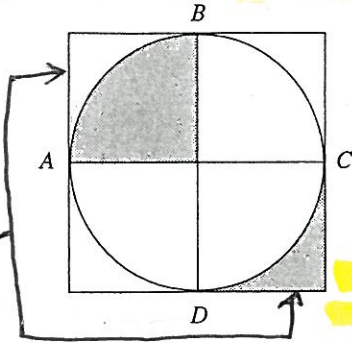
AREA of Squares + Circles

$$\frac{(30)^2 - \pi(15)^2}{4} + \frac{(15)^2 \pi}{4} =$$

1/4 of SQUARE $\rightarrow \frac{30^2}{4} = 225$

- F. 450
- G. 225
- H. 177
- J. 94
- K. 47

Now shaded AREA is 1/4 of SQUARE



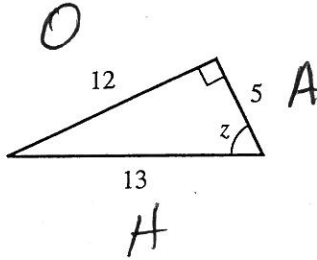
43. For the triangle shown below, what is the value of $\tan z$?

EASY Trig

TAN = opposite / adjacent

TAN z = 12 / 5

- A. 5/12
- B. 12/5
- C. 5/13
- D. 13/5
- E. 12/13



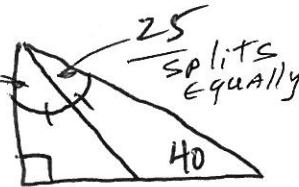
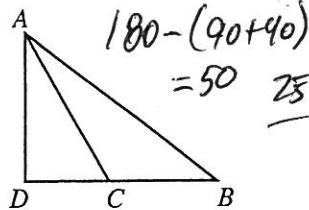
44. In $\triangle ABD$ below, points D, C, and B are collinear, \overline{AD} is perpendicular to \overline{DB} , and \overline{AC} bisects $\angle DAB$. If the measure of $\angle CBA$ is 40° , what is the measure of $\angle ACB$?

TRIANGLE Angle Measurement

$180 - (40 + 25) =$

115

- F. 115°
- G. 112.5°
- H. 110°
- J. 107.5°
- K. 105°



45. You have enough material to build a fence 40 meters long. If you use it all to enclose a square region, how many square meters will you enclose?

PERIMETER AND AREA of SQUARES

$10 \times 10 = 100$

- A. 160
- B. 100
- C. 80
- D. 40
- E. 20

$40 \div 4 = 10$
Each side is 10

46. For what nonzero whole number k does the quadratic equation $x^2 + kx + 2k = 0$ have exactly 1 real solution for x ?

Quadratic Equations

If you can't find away to quickly

ANSWER, plug in answers and see

what works, only one that works is H

- F. -4
- G. -2
- H. 2
- J. 4
- K. 8

2



$$\frac{a-b}{b-a} = -1$$



2

47. For all $x > 3$, $\frac{3x-x^2}{x^2+3x-18} = ?$

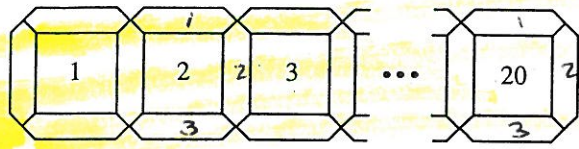
Simplifying Algebraic expressions
DO YOUR FIGURING HERE.

- A. $\frac{-x}{x+6}$
- B. $\frac{x}{x-6}$
- C. $\frac{1}{x+6}$
- D. $-\frac{1}{18}$
- E. $\frac{1}{18}$

$$\frac{x(3-x)}{(x+6)(x-3)} = \frac{x}{x+6} \cdot \frac{3-x}{x-3} = \frac{x}{x+6} \cdot -1$$

$$\frac{3-x}{x-3} = -1 \text{ because } = \frac{3-x}{-1(3-x)} \text{ or } \frac{-1(x-3)}{(x-3)}$$

48. The pattern shown in abbreviated form below is composed of squares that are arranged horizontally and surrounded by 4 hexagons. All the squares are congruent, and all the hexagons are congruent. How many of these congruent hexagons will there be if the pattern is repeated until there are 20 squares?



- F. 44
- G. 61
- H. 70
- J. 79
- K. 80

$a-b = \# \text{ of spaces between } a \text{ and } b$
 $(a-b)+1 = \# \text{ of things including } a \text{ and } b$

Subtracting including end points.

2 thru 20 have 3
 $20-2=18$ add 4
 to include 2 and 20 $\rightarrow 19$
 $19 \times 3 = 57$
 Figure 1 has 4
 $57 + 4 = 61$

49. If the circumference of a circle is $\frac{5}{2}\pi$ inches, how many inches long is its radius?

- A. $\frac{2}{5}$
- B. $\frac{4}{5}$
- C. $\frac{5}{4}$
- D. $\frac{\sqrt{5}}{2}$
- E. $\sqrt{\frac{5}{2}}$

$$C = 2\pi r$$

$$\frac{5\pi}{2} = 2\pi r$$

$$\frac{5\pi}{2\pi} = \frac{2\pi r}{2\pi}$$

$$\frac{5}{4} = r$$

Circumference and Radius of Circle

$$\frac{5\pi}{2} = 2\pi r$$

$$\frac{5\pi}{2\pi} = \frac{4\pi r}{4\pi} = \frac{5}{4}$$

$$\frac{5\pi}{2} = 2\pi r$$

$$5\pi = 4\pi r$$

$$\frac{5}{4} = r$$

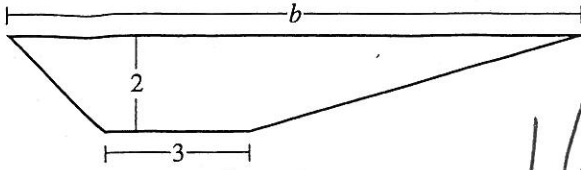
50. If the function f satisfies the equation $f(x+y) = f(x) + f(y)$ for every pair of real numbers x and y , what is(are) the possible value(s) of $f(0)$?

FUNCTIONS

- F. Any real number
- G. Any positive real number
- H. 0 and 1 only
- J. 1 only
- K. 0 only

$f(x+y) \neq f(x) + f(y)$
 only if they are both 0
 GO ON TO THE NEXT PAGE.

51. The area of the trapezoid below is 16 square inches, the altitude is 2 inches, and the length of one base is 3 inches. What is the length, b , of the other base, in inches?



DO YOUR FIGURING HERE.

Trapezoid area formula

$$16 = \frac{(b_1 + 3) \cdot 2}{2}$$

$$16 = b_1 + 3 \quad b_1 = 13$$

- D
- A. $2\frac{2}{3}$
 - B. 5
 - C. 11
 - D. 13
 - E. 15

$$A = \left(\frac{b_1 + b_2}{2} \right) \cdot h$$

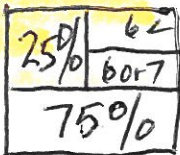
52. This year, 75% of the graduating class of Harriet Tubman High School had taken at least 8 math courses. Of the remaining class members, 60% had taken 6 or 7 math courses. What percent of the graduating class had taken fewer than 6 math courses?

PERCENT

$$100\% - 75\% = 25\%$$

$$100\% - 60\% = 40\% \quad (40\% \text{ of } 25\% = 10\%)$$

- G
- F. 0%
 - G. 10%
 - H. 15%
 - J. 30%
 - K. 45%



53. Which of the following shaded regions is the graph in the standard (x,y) coordinate plane of the points that satisfy the inequality $|y| \leq 10$?

Absolute Value and graphing inequalities

$$|y| \leq 10$$

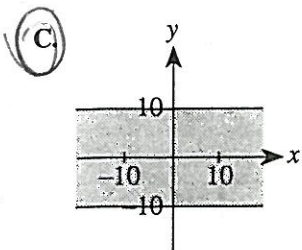
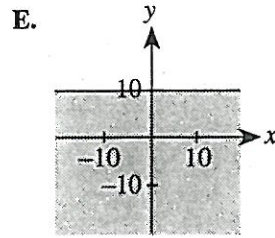
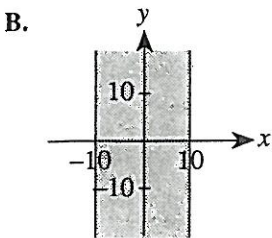
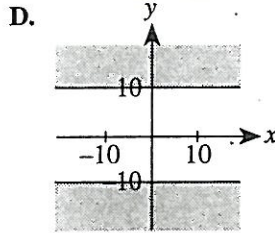
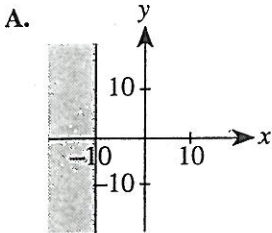
split

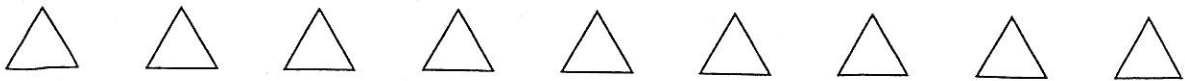
$$-y \leq 10$$

$$y \geq -10$$

$y \leq 10$
y values are less than 10

y values are greater than negative ten





54. A standard sheet of paper ($8\frac{1}{2}$ inches wide by 11 inches long) is rolled up so that the 2 shorter edges just meet, forming a circular tube (cylinder) $8\frac{1}{2}$ inches high. How many inches in circumference is the tube?

DO YOUR FIGURING HERE.

Tubes and Circumference

The Circumference is the length of the longer side which is 11 inches

- F. 11
- G. $\frac{11}{2\pi}$
- H. 22π
- J. $\frac{289}{4}\pi$
- K. 121π

55. A baseball team played its first 20 games and won 12 of them. Then, the team went on a losing streak and lost its next 4 games. How many consecutive additional victories does the baseball team need in order to bring its winning percentage back to at least what it was just before this 4-game losing streak?

AVERAGES $x =$ Additional Number of Wins

$$\frac{12 + x}{24 + x} \geq 60\%$$

Solve for $x \geq 6$

See Revert

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

games won / games played = Winning Percentage

24 because they lost 4 games

56. Lines p and q intersect at point $(1,3)$ in the standard (x,y) coordinate plane. Lines p and r intersect at $(2,5)$. Which of the following is an equation for line p ?

Equation of lines if line p goes thru both points to find equation

Only one that works

- F. $y = 2x + 1$
- G. $y = 2x + 2$
- H. $y = 2x + 3$
- J. $y = 2x + 5$
- K. Cannot be determined from the given information

plug $(1,3)$ and $(2,5)$

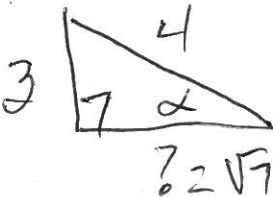
Since all choices have slope 2 \rightarrow plug in one point and find line $3 = 2(1) + b$
 $1 = b$

57. If $\sin \alpha = \frac{3}{4}$, and α is the measure of an acute angle, then $\cos \alpha = ?$

EASY TRIG

(Note: An acute angle has a degree measure from 0° to 90° .)

- A. $\frac{1}{4}$
- B. $\frac{4}{3}$
- C. $\frac{\sqrt{3}}{2}$
- D. $\frac{\sqrt{7}}{4}$



$$(\text{?})^2 + 3^2 = 4^2$$

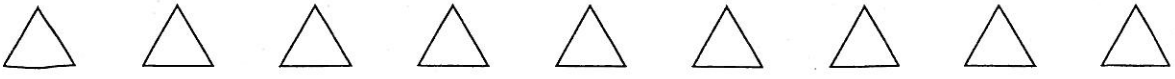
$$(\text{?})^2 = 16 - 9 = 7$$

$$\text{?} = \sqrt{7}$$

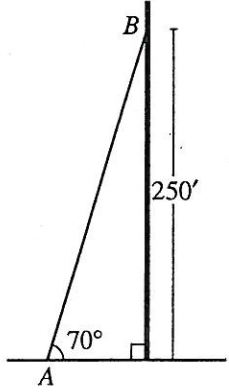
D is the only answer with 4 @ hypotenuse

E. Cannot be determined from the given information

$$\cos \alpha = \frac{A}{H} = \frac{\sqrt{7}}{4}$$



58. The radio station WEST is erecting a new transmitting tower that is 280 feet tall. A support wire will be attached to the ground at point A and to the tower 250 feet up at point B, as shown below. The wire must be at least as long as \overline{AB} . Which of the following expresses the length of \overline{AB} , in feet?



- F. $250 \cos 70^\circ$
- G. $250 \sin 70^\circ$
- H. $250 \tan 70^\circ$
- J. $\frac{250}{\cos 70^\circ}$
- K. $\frac{250}{\sin 70^\circ}$

DO YOUR FIGURING HERE.

TRIG

$$\sin 70^\circ = \frac{250}{AB}$$

Solve for AB

$$AB \sin 70^\circ = \frac{250}{AB} \cdot AB$$

$$AB = \frac{250}{\sin 70^\circ}$$

59. In an arithmetic series, the terms of the series are equally spread out. For example, in $1 + 5 + 9 + 13 + 17$, consecutive terms are 4 apart. If the first term in an arithmetic series is 3, the last term is 136, and the sum is 1,390, what are the first 3 terms?

- A. 3, 10, 17
- B. 3, 23, 43
- C. 3, $36\frac{1}{3}$, 70
- D. 3, $69\frac{1}{2}$, 136
- E. 3, 139, 1,251

You don't know the number of terms

$$1390 = \left(\frac{3 + 136}{2}\right)n$$

20 = n = # of terms

Arithmetic Series Formula

a_1 1st Term

a_n Last Term

N = # of Terms

$136 + 3 = 139$

Exclusive

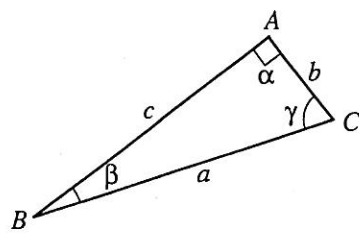
3 and 136 Need to add 1

20 | 140

7 is common Difference

60. Right triangle $\triangle ABC$ has angle measures α , β , and γ degrees and side lengths a , b , and c inches, as illustrated below. Which of the following is true about the value of the product $\tan \beta \tan \gamma$?

- F. The value is 1.
- G. The value is $\frac{b^2}{c^2}$.
- H. The value is $\frac{b^2 c^2}{a^4}$.
- J. The value is undefined.
- K. The value cannot be determined from the given information.



TRIG

$$\tan \beta = \frac{b}{c}$$

$$\tan \gamma = \frac{c}{b}$$

$$\frac{b}{c} \cdot \frac{c}{b} = 1$$

END OF TEST 2

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

$$\frac{bc}{cb} = \frac{bc}{bc} = 1$$

Test 2: Mathematics—Scoring Key

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

Number Correct (Raw Score) for:	
Pre-Alg./Elem. Alg. (EA) Subscore Area	_____ (24)
Inter. Alg./Coord. Geo. (AG) Subscore Area	_____ (18)
Plane Geo./Trig. (GT) Subscore Area	_____ (18)
Total Number Correct for Math Test (EA + AG + GT)	_____ (60)

* EA = Pre-Algebra/Elementary Algebra
 AG = Intermediate Algebra/Coordinate Geometry
 GT = Plane Geometry/Trigonometry

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