



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. The lowest temperature on a winter morning was -8°F . Later that same day the temperature reached a high of 24°F . By how many degrees Fahrenheit did the temperature increase?

DO YOUR FIGURING HERE.

Integers

To find difference subtract end points
 $24 - (-8) = 24 + 8 = 32$

- E
 A. 3°
 B. 8°
 C. 16°
 D. 24°
 E. 32°

2. Disregarding sales tax, how much will you save when you buy an \$11 compact disc that is on sale for 25% off?

Percent

You save 25% of full price when you get 25% off.
 $\$11 \times 25\% =$
 $\$11 \times 0.25 = \2.75

- H
 F. \$0.28
 G. \$0.44
 H. \$2.75
 J. \$3.00
 K. \$8.25

3. As part of a school project, Akio wants to find the average cost of renting a newly released videotape from video rental stores in his neighborhood. He surveys 4 stores and finds the cost of renting a newly released videotape from the 4 stores to be \$3.50, \$3.40, \$3.50, and \$3.00, respectively. Using this data, what is the average cost of renting a newly released videotape from these 4 stores?

Average formula

$$AV = \frac{\text{sum of entries}}{\text{Number of entries}}$$

$$\frac{\$3.50 + \$3.40 + 3.50 + 3.00}{4} = \$3.35$$

- C
 A. \$3.25
 B. \$3.30
 C. \$3.35
 D. \$3.45
 E. \$3.50

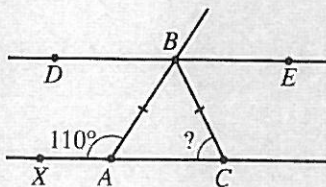
4. In the figure below, \overline{AC} is parallel to \overline{DE} with X on \overline{AC} and B on \overline{DE} . Also $\overline{AB} \cong \overline{BC}$, and the measure of $\angle XAB$ is 110° . What is the measure of $\angle ACB$?

Supplemental angles and isosceles triangles

$$\angle BAC \cong \angle BCA$$

$$180^{\circ} = 110^{\circ} + \angle BAC$$

$$70^{\circ} = \angle BAC = \angle BCA$$



- J
 F. 35°
 G. 40°
 H. 55°
 J. 70°
 K. 110°

You can do ALL of this in your head



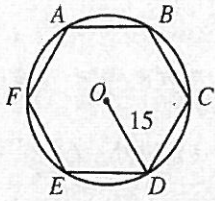
5. Regular hexagon $ABCDEF$ is inscribed in a circle, as shown below. If the length of radius \overline{OD} is 15 centimeters, how long is \overline{AB} , in centimeters?

DO YOUR FIGURING HERE.

Hexagons

The diagonals of hexagon break a regular hexagon into equilateral triangles

- A. 15
- B. 18
- C. 30
- D. 5π
- E. $\frac{225\pi}{6}$



6. The price of a pumpkin is directly proportional to its weight. If a pumpkin that weighs 15.0 pounds costs \$3.25, how much will an 11.4-pound pumpkin cost?

Proportions

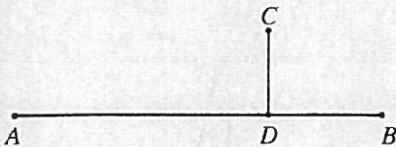
15#'s = 11.4 Direct Proportion ? = $\frac{\$3.25 \times 11.4}{15}$
 $\$3.25 = \$?$ use calculator to solve

7. In the figure below, D is a point on \overline{AB} , and \overline{CD} is perpendicular to \overline{AB} . Based on this information, which of the following is the best conclusion?

Perpendicular lines

This is one of those ridiculous easy questions
 All 90° angles are equal

- A. $\angle CDA \cong \angle CDB$.
- B. $\angle CDA$ is larger than $\angle CDB$.
- C. \overline{AB} bisects \overline{CD} .
- D. \overline{CD} and \overline{DB} are equal in length.
- E. Point C is equidistant from A and B .



8. If $3x - 7 = 4x - 16$, then $x = ?$

Solving for variable

$3x - 7 = 4x - 16$
 $-3x + 16 = -3x + 16$

 $9 = x$

- F. -23
- G. -9
- H. $-\frac{23}{7}$
- J. $\frac{23}{7}$
- K. 9

9. Which of the following is always equal to $a(5 - a) - 6(a + 4)$?

Simplifying Algebraic Expressions and Distributive Property

- A. $-2a - 24$
- B. $-2a + 4$
- C. $-a^2 - a - 24$
- D. $-a^2 - a + 4$
- E. $-2a^3 - 24$

$5a - a^2 - 6a - 24$
 $-a^2 - a - 24$

10. One marble is drawn at random from a bag containing 3 red, 2 blue, and 4 green marbles. What is the probability that the marble drawn is NOT blue?

DO YOUR FIGURING HERE.

Probability =
$$\frac{\text{Desired outcome}}{\text{ALL possible outcomes}}$$

Not Blue =
$$\frac{7}{9}$$

H

- F. $\frac{1}{2}$
 - G. $\frac{2}{9}$
 - H. $\frac{7}{9}$
 - J. $\frac{7}{24}$
 - K. $\frac{12}{81}$
- What you want
Plus what you
don't want EQUALS
TOTAL POSSIBLE

11. Wanda programs her calculator to perform a linear function, but she doesn't tell you what that function is. When $n = 6$, the value of the function is 2. When $n = 12$, the value is 4. Which of the following expressions explains what the calculator will display when any number, n , is entered?

FUNCTIONS

A

- A. $\frac{n}{3}$
- B. $n - 4$
- C. $n - 8$
- D. $2n - 10$
- E. $2n - 20$

input	output
6	2
12	4

What is the pattern?
The input is being divided by 3

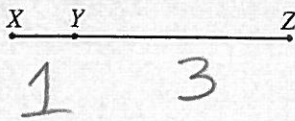
This ALL can be done in your head

12. On the line segment below, the ratio of lengths XY to YZ is 1:3. What is the ratio of XY to XZ?

PROPORTIONS and RATIOS

F

- F. 1:4
- G. 1:2
- H. 3:1
- J. 4:1
- K. Cannot be determined from the given information



Label with info

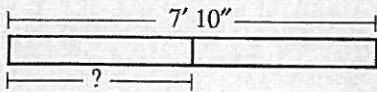
$xz = 1 + 3$
so $\frac{xy}{xz} = \frac{1}{1+3} = \frac{1}{4}$

13. If a board 7 feet 10 inches long is cut into 2 equal parts, as shown below, what will be the length, to the nearest inch, of each part?

MEASUREMENT

C

- A. 3' 5"
- B. 3' 9"
- C. 3' 11"
- D. 4' 2"
- E. 4' 5"



Very basic question
 $\frac{1}{2}$ of 7 feet = 3 feet six inches
 $\frac{1}{2}$ of 10 inches = five inches
3 feet 11 inches

14. The speed of one train exceeds twice the speed of another by 30 mph. If r mph is the speed of the slower train, which of the following expresses the speed, in miles per hour, of the faster train?

SPEED and RATES

K

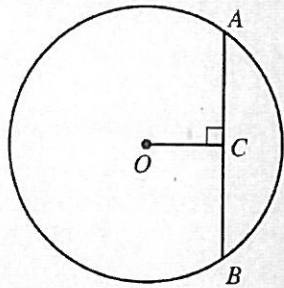
- F. $r + 15$
- G. $r - 30$
- H. $r + 30$
- J. $2r - 30$
- K. $2r + 30$

$R = \text{slower train}$
 $S = \text{faster train}$

Combined with translation from English to Math

$S = 2R + 30$

15. The circle shown below has a radius of 10 meters, and the length of chord \overline{AB} is 16 meters. If O marks the center of the circle, what is the length of \overline{OC} ?



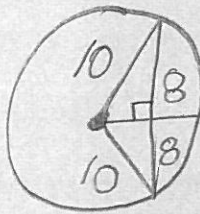
- A. $2\sqrt{3}$
 B. 6
 C. 12
 D. $4\sqrt{21}$
 E. 36

B

DO YOUR FIGURING HERE.

Circles

If radius intersects chord at 90° , then its a perpendicular bisector of the chord



Use Pythagorean triplet to find \overline{OC}

16. What is the value of the expression $x^3 - 2x^2 + 4x + 4$ for $x = -2$?

- F. 12
 G. -2
 H. -4
 J. -8
 K. -20

Wherever you see x , substitute in -2

Evaluating Expressions

$$(-2)^3 - 2(-2)^2 + 4(-2) + 4$$

$$-8 - 2(4) - 8 + 4 = 3(-8) + 4 = -20$$

K

17. What is the next term after $-\frac{1}{4}$ in the geometric sequence $16, -4, 1, -\frac{1}{4}, \dots$?

- A. $-\frac{1}{8}$
 B. 0
 C. $\frac{1}{16}$
 D. $\frac{1}{8}$
 E. $\frac{1}{2}$

Geometric Sequence has a common ratio

The sequence is changed by \times or \div using the same number each time
 To find common ratio divide second term over first $CR = \frac{-4}{16} = -\frac{1}{4}$
 $-\frac{1}{4} \div (-4) = \frac{1}{16}$

C

18. On the blueprint for Betty's house, $\frac{1}{4}$ inch represents an actual length of 1 foot. What is the area, in square feet, of Betty's rectangular bedroom, which is $2\frac{1}{2}$ inches by 3 inches on the blueprint?

- F. 30
 G. 44
 H. 60
 J. 120
 K. 244

$$\frac{0.25}{1.00} = \frac{2.5}{L}$$

$$\frac{0.25}{1} = \frac{3.0}{W}$$

$$L = \frac{2.5}{0.25} = 10 \quad W = \frac{3.0}{0.25} = 12 \quad 10 \times 12 = 120$$

Proportions and area
 Need to find length and width individually before finding area

J

19. If $a > 0$ and $b < 0$, then the sum of a and b :

- A. is always positive.
 B. is always negative.
 C. is always zero.
 D. cannot be zero, but can be any other real number.
 E. can be any real number.

Axioms of real numbers

If you add any positive number and any negative number, you can get any

Real number result

E

20. If $x + \frac{3}{4} = \frac{1}{28}$, then $x = ?$

DO YOUR FIGURING HERE.

Solving Algebraic equations

K

- F. 21
- G. $\frac{11}{14}$
- H. $\frac{1}{21}$
- J. $-\frac{1}{16}$
- K. $-\frac{5}{7}$

$$x + \frac{21}{28} = \frac{1}{28}$$

$$x = \frac{1}{28} - \frac{21}{28} = \frac{-20}{28} = \frac{-5}{7}$$

because both 20 and 28 are divisible by 4

21. What is the slope of the line given by the equation $3x + 5y = -15$?

C

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

Slope/intercept

$$y = mx + b$$

$m = \text{slope}$

$b = y\text{-intercept}$

Slope

$3x + 5y = -15$ is same as

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

$$m = -\frac{3}{5} = \text{slope}$$

22. The length of a side of a square is represented as $(2x - 3)$ inches. Which of the following general expressions represents the area of the square, in square inches?

F

- F. $4x^2 - 12x + 9$
- G. $4x^2 - 12x + 6$
- H. $4x^2 - 6x + 9$
- J. $4x^2 - 9$
- K. $8x - 12$

$$(2x-3)(2x-3) = 4x^2 - 12x + 9$$

$$(a-b)(a-b) = a^2 - 2ab + b^2$$

Area of square = s^2
Multiplying binomials

23. Which of the following is a polynomial factor of $x^2 - 2x - 15$?

C

- A. $15 - x$
- B. $5 + x$
- C. $3 + x$
- D. $2 - x$
- E. x

$$x^2 - 2x - 15 = (x - 5)(x + 3)$$

$x + 3$ is the same thing as $3 + x$

Factoring Trinomials

24. In the equation $m = \frac{3}{1+q}$, q represents a positive integer. As q gets larger and larger without bound, the value of m :

F

- F. gets closer and closer to 0.
- G. gets closer and closer to 1.
- H. gets closer and closer to 3.
- J. remains constant.
- K. gets larger and larger.

↳ without end

Limits

as q gets larger and larger the entire fraction gets smaller and smaller.

25. The book *Fahrenheit 451* by Ray Bradbury is about a society in which all books are banned and burned. The title of the book gives the approximate temperature at which paper starts to burn. Since Fahrenheit, F , and Celsius, C , temperatures are related by the formula $C = \frac{5}{9}(F - 32)$, which of the following would make an equivalent title for the book?

DO YOUR FIGURING HERE.

Manipulating Formulas

$$C = \frac{5}{9}(451 - 32)$$

$$(0.55)(419) = 232.77$$

$$\approx 233$$

- B
- A. Celsius 219
 - B. Celsius 233
 - C. Celsius 268
 - D. Celsius 754
 - E. Celsius 844

26. The length of a rectangle is 6 inches longer than the width. If the perimeter of the rectangle is 48 inches, what is the width, in inches?

Algebra and Perimeter Formula

- G
- F. 8
 - G. 9
 - H. 15
 - J. 21
 - K. 27

Translate

$$L = 6 + W$$

$$W = W$$

Perimeter of Rectangle = $2W + 2L$

$$48 = 2W + 2(6 + W)$$

$$36 = 4W$$

$$9 = W$$

27. What are all the solutions for x if $2x^2 - 3x - 20 = 0$?

- A. $x = -20$ only
- B. $x = -5$ or $x = 2$
- C. $x = -4$ or $x = \frac{5}{2}$
- D. $x = -\frac{5}{2}$ or $x = 4$
- E. $x = -2$ or $x = 5$

Factoring Trinomials

$$2x^2 - 3x - 20 = (2x + 5)(x - 4) = 0$$

If $ab = 0$, then a or b must be 0

$$2x + 5 = 0 \text{ or } x - 4 = 0$$

$$x = -\frac{5}{2} \text{ or } x = 4$$

28. In Terrell's history class, all tests count equally. So far, Terrell has taken 2 of the 3 tests in history and earned scores of 93% and 82%, respectively. What is the minimum percent Terrell needs on the third test to have a test average of at least 85%?

Average Formula

$$85 = \frac{93 + 82 + x}{3}$$

- K
- F. 89%
 - G. 88%
 - H. 87%
 - J. 83%
 - K. 80%
- To have average of 85 for three tests, he needs 85×3 or 255 points. He has $93 + 82$ now

$$255 - 93 - 82 = 80$$

29. If a , b , and c are positive integers such that $a^b = x$ and $c^b = y$, then $xy = ?$

Substituting Variables and Rules of Exponents

- C
- A. ac^b
 - B. ac^{2b}
 - C. $(ac)^b$
 - D. $(ac)^{2b}$
 - E. $(ac)^{b^2}$

$$x = a^b \quad y = c^b$$

$$xy = a^b c^b = (ac)^b$$



30. What is the area, in square inches, of a circle with a diameter equal to 10 inches?

- J
 F. 100
 G. 25
 H. 10π
 J. 25π
 K. 100π

$$D = 2r$$

$$10 = 2r$$

$$\frac{10}{2} = r = 5$$

DO YOUR FIGURING HERE.

Area of circle = πr^2
 Area = $\pi (5)^2 = 25\pi$

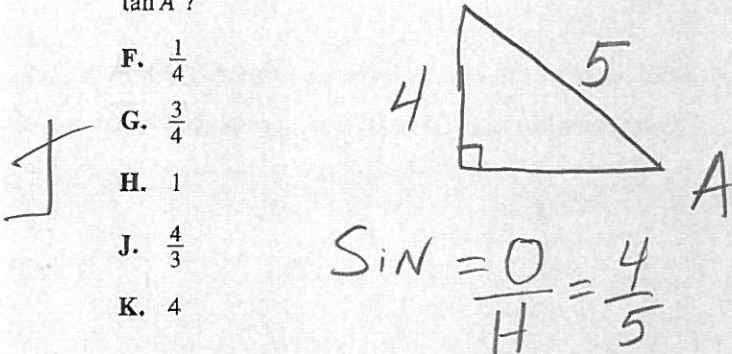
31. To get a driver's license, an applicant must pass a written test and a driving test. Past records show that 80% of the applicants pass the written test and 60% of those who have passed the written test pass the driving test. Based on these figures, how many applicants in a random group of 1,000 applicants would you expect to get driver's licenses?

- B
 A. 200
 B. 480
 C. 600
 D. 750
 E. 800

Percents

80% of 1,000 = 800
 60% of 800 = 480

32. If $\sin A = \frac{4}{5}$, then which of the following could be $\tan A$?



SOH CAH TOA

Since Tangent is $\frac{O}{A}$, then $O = 4$. The only choice that has 4 as numerator is J

33. If x is any number other than 4 and 5, then $\frac{(4-x)(x-5)}{(x-4)(x-5)} = ?$

- B
 A. -20
 B. -1
 C. 0
 D. 1
 E. 20

The (x-5)'s cancel out

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

Simplifying Algebraic Expressions

because $\frac{x-y}{y-x} = \frac{-y+x}{y-x} = \frac{-1(y-x)}{(y-x)}$

34. $\sqrt{50} + \sqrt{128} = ?$

Simplifying Radicals

- F
 F. $13\sqrt{2}$
 G. $14\sqrt{2}$
 H. $2\sqrt{5} + 2\sqrt{8}$
 J. $89\sqrt{2}$
 K. $\sqrt{178}$

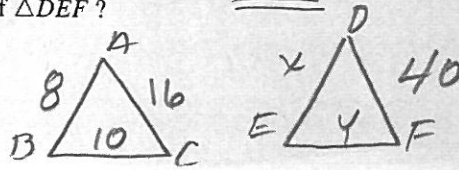
$$\sqrt{25 \cdot 2} + \sqrt{64 \cdot 2} =$$

$$5\sqrt{2} + 8\sqrt{2} = 13\sqrt{2}$$

35. Triangle $\triangle ABC$ is similar to $\triangle DEF$. \overline{AB} is 8 inches long, \overline{BC} is 10 inches long, and \overline{AC} is 16 inches long. If the longest side of $\triangle DEF$ is 40 inches long, what is the perimeter, in inches, of $\triangle DEF$?

B

- A. 74
- B. 85
- C. 90
- D. 136
- E. 170



DO YOUR FIGURING HERE.

Similar Triangles

$$\frac{16}{40} = \frac{2}{5} = \frac{8}{x} \quad x = 20$$

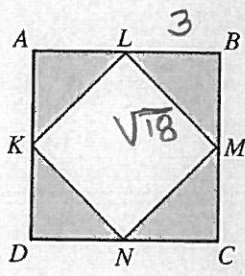
$$\frac{2}{5} = \frac{10}{y} \quad y = 25$$

Perimeter = $40 + 20 + 25 = 85$

36. Sides AB , BC , CD , and DA of square $ABCD$ have midpoints L , M , N , and K , as shown below. If \overline{AB} is 6 inches long, what is the area, in square inches, of the shaded region?

K

- F. $4\frac{1}{2}$
- G. $6\sqrt{2}$
- H. 9
- J. $12\sqrt{2}$
- K. 18



Area of Squares

$$A = s^2 = 6^2 = 36$$

Unshaded region area = 18

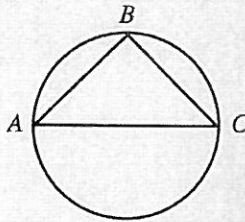
TOTAL - UNSHADED = SHADED

$$36 - 18 = 18$$

$\sqrt{18}$ by Pythagorean

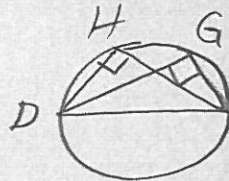
37. In the figure below, \overline{AC} is a diameter of the circle, B is a point on the circle, and $\overline{AB} \cong \overline{BC}$. What is the degree measure of $\angle ABC$?

D



- A. 45°
- B. 60°
- C. 75°
- D. 90°
- E. Cannot be determined from the given information

Angle inscribed in Semicircle is Always 90°



If DE is Diameter, then any angle formed in semicircle is 90°

38. In the standard (x,y) coordinate plane, what are the coordinates of the midpoint of a line segment with endpoints $(-1,3)$ and $(2,7)$?

F

- F. $(\frac{1}{2}, 5)$
- G. $(1, \frac{9}{2})$
- H. $(\frac{3}{2}, 2)$
- J. $(1, 4)$
- K. $(3, 4)$

Mid-Point Formula

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

$$\frac{-1 + 2}{2}, \frac{3 + 7}{2}$$

$$\left(\frac{1}{2}, 5 \right)$$

GO ON TO THE NEXT PAGE.

39. In a downhill ski race, Margo posted a time of 2 minutes and 24 seconds for a course 1.2 miles long. About how many miles per hour did she average for the race?

- B
A. 60
B. 30
C. 20
D. 3
E. 2

2 minutes = 120 sec
Hour is $60 \times 60 = 3600$ seconds
 $\frac{120 + 24}{3600} = 0.04$ hour

DO YOUR FIGURING HERE.

DISTANCE = RATE \times TIME
CONVERTING MEASUREMENTS

$1.2 = \text{Rate} \times 0.04$
 $\frac{1.2}{0.04} = \text{Rate} = 30$

40. For the 2 functions $f(x)$ and $g(x)$, tables of values are shown below. What is the value of $g(f(3))$?

G

x	f(x)	x	g(x)
-5	7	-2	3
-2	-5	1	-1
1	3	2	-3
3	2	3	-5

- F. -5
G. -3
H. -1
J. 2
K. 7

Composite Functions

When $x = 3$, $f(3) = 2$

Substitute $f(3)$ and 2 in $g(f(3)) \rightarrow$ because $g(2)$

When $x = 2$, then $g(2)$ becomes -3

41. For positive real numbers x , y , and z , which of the following expressions is equivalent to $x^{\frac{1}{2}}y^{\frac{2}{3}}z^{\frac{5}{6}}$?

choices give clue D

- A. $\sqrt[3]{xy^2z^3}$
B. $\sqrt[6]{xy^2z^5}$
C. $\sqrt[6]{x^3y^2z^5}$
D. $\sqrt[6]{x^3y^4z^5}$
E. $\sqrt[11]{xy^2z^5}$

Remember $\sqrt{x} = x^{\frac{1}{2}}$

EXponents + Radicals

Need to have common denominator in exponents
 $x^{\frac{3}{6}} y^{\frac{4}{6}} z^{\frac{5}{6}} = \sqrt[6]{x^3 y^4 z^5}$

42. A formula for the area of a rhombus is $A = \frac{1}{2}d_1d_2$, where d_1 and d_2 are the lengths of the diagonals. Which of the following is an expression for d_2 ?

F

- F. $\frac{2A}{d_1}$
G. $\frac{A}{2d_1}$
H. $\frac{Ad_1}{2}$
J. $2(A - d_1)$
K. $A - \frac{d_1}{2}$

Variables in terms of other variables

Solve for d_2 . $A = \frac{d_1 d_2}{2} \cdot 2$
 $2A = d_1 d_2$
 $\frac{2A}{d_1} = \frac{d_1 d_2}{d_1}$



43. The line graphed below shows the predicted gasoline use for a certain car. Which of the following is the closest estimate of this car's predicted rate of gasoline use, in miles per gallon?

DO YOUR FIGURING HERE.

Slope = $\frac{\Delta y}{\Delta x}$

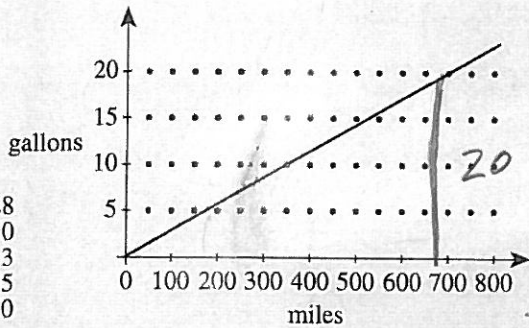
slope is rate of change

$\frac{\text{gallons}}{\text{miles}} = \frac{20 \div 20}{700 \div 20} = \frac{1}{35}$

1 gallon to 35 is the same thing as 35 miles per gallon

D

- A. 28
B. 30
C. 33
D. 35
E. 40



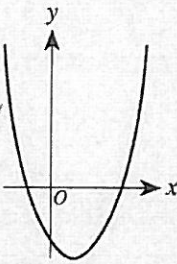
44. The graph of y = ax^2 + bx + c in the standard (x,y) coordinate plane is shown below.

Interpreting graphs

y = ax^2 + bx + c is the general form for quadratic equations. Solutions look like y = (x-d)(x-e)

When y=0, solutions are x=d and x=e

Imaginary Solutions occur when graph does not cross x-axis.



When y = 0, which of the following best describes the solution set for x?

- F. 2 real solutions
G. 1 double real solution only
H. 1 real and 1 imaginary solution
J. 1 double imaginary solution only
K. 2 imaginary solutions

45. If |y| = y + 6, then y = ?

Solutions to Absolute Value Equations

- A. -12
B. -6
C. -3
D. 0
E. 6

|y| = y + 6 splits

-y = y + 6 and y = y + 6

-2y = 6 y = -3

illogical

46. What fraction lies exactly halfway between 2/3 and 3/4?

Finding Half Way point between two numbers

- F. 3/5
G. 5/6
H. 7/12
J. 9/16
K. 17/24

Not really the Mid-Point Formula because it's not an x-y coordinate plane, but you can use it.

(2/3 + 3/4) / 2 = (8/12 + 9/12) / 2 = 17/12 / 2 = 17/24

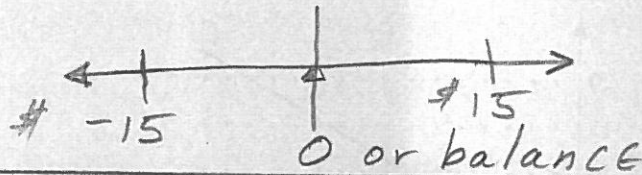
17/24

47. Elliott writes a check for \$15. He records the check in his check register, which up to this time has shown the correct balance. When figuring his new balance, he accidentally adds \$15 instead of subtracting. The balance in his check register now shows:

- E
→
- A. \$30 less than it should.
 - B. \$15 less than it should.
 - C. the correct amount.
 - D. \$15 more than it should.
 - E. \$30 more than it should.

DO YOUR FIGURING HERE.

INTEGERS



\$30
Difference

48. Six plants, each of a different plant type, are to be arranged on a display shelf's 6 spots. If each spot must have a plant, in how many different arrangements can the plants be placed?

- K
- F. 6
 - G. 21
 - H. 30
 - J. 36
 - K. 720

Permutations are Arrangements in a certain order

$$6! = 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 720$$

49. In the standard (x,y) coordinate plane, what is the distance between the points (3,-4) and (-5,2)?

- D
- A. 4
 - B. 6
 - C. 8
 - D. 10
 - E. 14

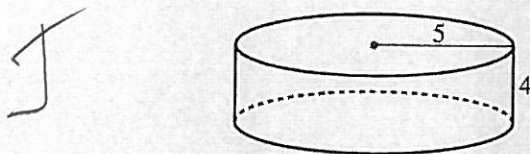
DISTANCE Formula

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

$$D = \sqrt{(-5 - 3)^2 + (2 - (-4))^2} = \sqrt{64 + 36} = 10$$

50. A formula for the volume, V , of a right circular cylinder is $V = \pi r^2 h$, where r is the radius and h is the height. The cylindrical tank shown below has radius 5 meters and height 4 meters and is filled with water.

Formula and Application of information



$$V = \pi (5)^2 \times 4 = 100\pi \approx 300$$

If 1 cubic meter of water weighs approximately 2,205 pounds, then the weight, in pounds, of the water in the tank is:

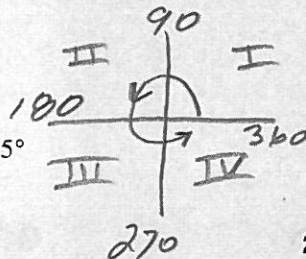
$$300 \times 2205 = 661,500$$

-
- F. less than 200,000.
 - G. between 200,000 and 400,000.
 - H. between 400,000 and 600,000.
 - J. between 600,000 and 800,000.
 - K. more than 800,000.

51. What are the values of θ , between 0° and 360° , when $\tan \theta = -1$?

Trig and reference angles

- B
- A. 225° and 315° only
 - B. 135° and 315° only
 - C. 135° and 225° only
 - D. 45° and 135° only
 - E. 45° , 135° , 225° , and 315°



TANGENTS are Negative in Quadrants II and IV.
When $\tan \theta = 1$, $\theta = 45^\circ$

24

GO ON TO THE NEXT PAGE.

$$90 + 45 = 135$$

$$270 + 45 = 315$$



52. Which of the following is an equation of a circle with its center at (3,4) and tangent to the x-axis in the standard (x,y) coordinate plane?

F

- F. $(x-3)^2 + (y-4)^2 = 16$
- G. $(x-4)^2 + (y-3)^2 = 16$
- H. $(x-4)^2 + (y-3)^2 = 9$
- J. $(x-3)^2 + (y-4)^2 = 9$
- K. $(x+4)^2 + (y+3)^2 = 16$



Area of circle
DO YOUR FIGURING HERE.

Formula = $(x-h)^2 + (y-k)^2 = r^2$
 (h,k) center coordinates (3,4)
 r = Radius = 4
 Tangent lines to circles are perpendicular to radius

53. Which of the following best represents the graph of $y \leq ax + b$ for some positive a and negative b?

C

- A. NO
- B. NO
- C. YES
- D. NO
- E. NO

Y values are greater than all the y values are less than the line $y \leq ax + b$

Inequalities and slope intercept form
 a = slope b = y-Intercept
 Since slope is positive, eliminate B and D.
 Since b is negative eliminate choice A. Choose C because all the y values are less than the line $y \leq ax + b$

54. One of the graphs below is that of $y = A \sin \theta$ for θ between 0 and 6.28 radians, where A is a constant. Which graph?

54

- F. YES
- G. NO
- H. NO
- J. NO
- K. NO

Advanced Trigonometry

Need to have studied trigonometry to fully understand how to interpret Trig graphs

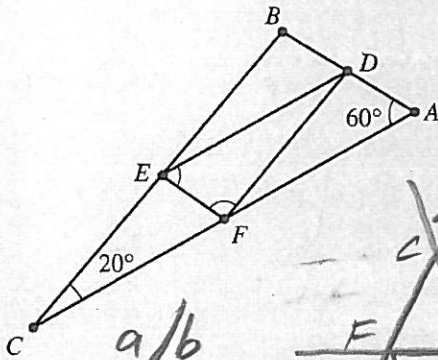
Since there's nothing adding to $A \sin \theta$, there's no y-axis shift. Since $\sin 0^\circ = 0$, graph will go thru origin. Eliminate G, J and K.

Choice H is wrong because there's no multiple of θ . $A \sin \theta$ means period equals ONE



55. In the figure below, D , E , and F are the midpoints of the sides \overline{AB} , \overline{BC} , and \overline{AC} , respectively. If the measure of $\angle BCA$ is 20° , and the measure of $\angle BAC$ is 60° , what is the sum of the measures of $\angle DFE$ and $\angle FED$?

- A. 60°
- B. 80°
- C. 100°
- D. 120°
- E. 160°



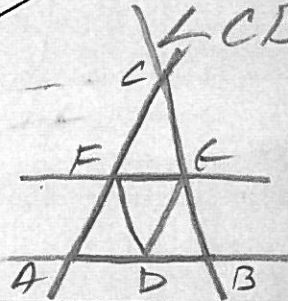
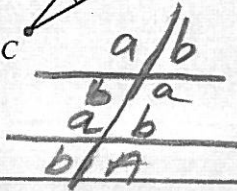
DO YOUR FIGURING HERE.

Triangles Similarity
 $\triangle CEF \sim \triangle CBA$ because
 E and F midpoints
 $EF \parallel BA$, $FD \parallel CB$ and $ED \parallel CA$

$\angle CBA = 180^\circ - (60 + 20) = 100^\circ$

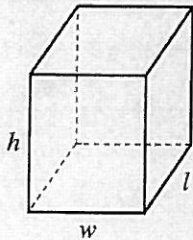
Extend all the parallel lines and fill in the missing amounts.

E



56. A formula for the surface area (A) of the rectangular solid shown below is $A = 2lw + 2lh + 2wh$ where l represents length; w , width; and h , height. By doubling each of the dimensions (l , w , and h), the surface area will be multiplied by what factor?

- F. 2
- G. 4
- H. 6
- J. 8
- K. 12



Surface Area of Rectangular Solids

$A = 2(2l)(2w) + 2(2l)(2h) + 2(2w)(2h)$

$A = 8lw + 8lh + 8wh$

$A = 4(2lw) + 4(2lh) + 4(wh)$

$4A = 4(2lw + 2lh + 2wh)$

G

SOHCAHTOA

57. If $\sin x = \frac{\sqrt{3}}{2}$ and $\cos x = -\frac{1}{2}$, then $\sec x = ?$

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

$\sec = \frac{1}{\cos}$

$\sec x = \frac{1}{-\frac{1}{2}} = \frac{1}{-\frac{1}{2}} = \frac{2}{-1} = -2$

A



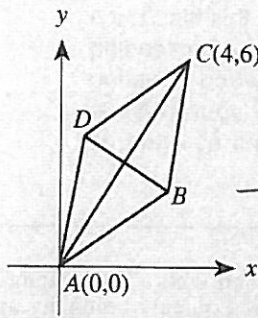
58. In a rhombus, all 4 sides are the same length. Rhombus ABCD below has vertices at A(0,0) and C(4,6). What is the slope of diagonal \overline{BD} ?

DO YOUR FIGURING HERE.

Rhombus and slope

Diagonals meet at 90° in Rhombi and squares
 \perp lines have opposite reciprocal slopes

$$\text{slope} = \frac{6-0}{4-0} = \frac{3}{2} \quad \perp = -\frac{2}{3}$$



- F. $-\frac{3}{2}$
- G. $-\frac{2}{3}$
- H. $\frac{2}{3}$
- J. $\frac{3}{2}$

G

K. Cannot be determined from the given information

59. Yvette earned a score of 56 on a recent 25-question multiple-choice exam. The scoring for the exam was +6 for each correct answer, -2 for each incorrect answer, and 0 for each unanswered question. What is the maximum number of questions Yvette could have answered correctly?

Work from choices

START WITH MAXIMUM

- A. 9
- B. 10
- C. 11
- D. 13
- E. 14

$$14 \times 6 = 84$$

$$11 \times -2 = -22$$

62 too high

$$13 \times 6 = 78$$

$$12 \times -2 = -24$$

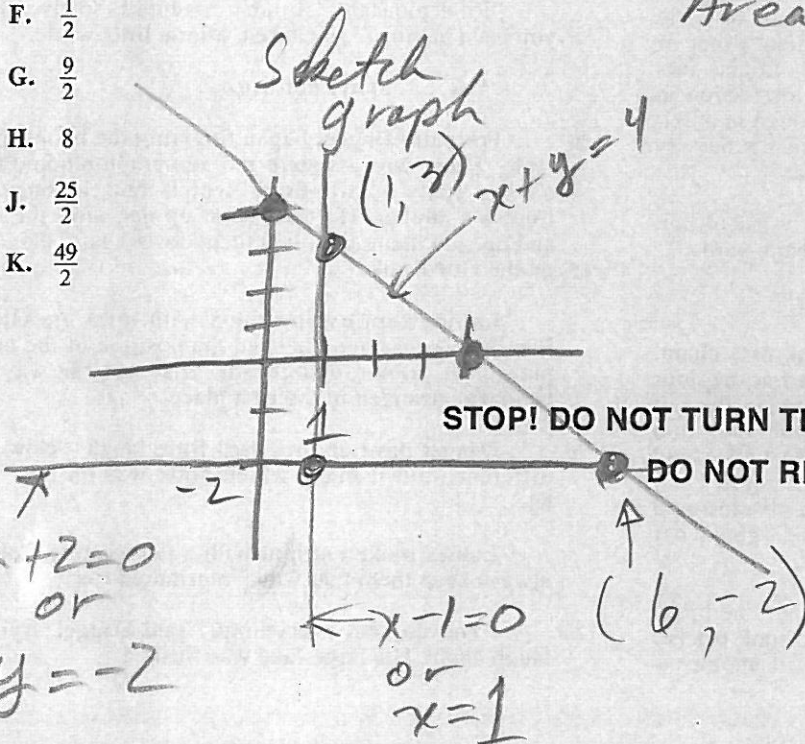
54 MAY HAVE left one blank

D

60. In the standard (x,y) coordinate plane, the graphs of the 3 equations $x - 1 = 0$, $y + 2 = 0$, and $x + y = 4$ form the boundary of a triangle. What is the area of this triangle, expressed in square coordinate units?

Graphing lines and Area of triangle

- F. $\frac{1}{2}$
- G. $\frac{9}{2}$
- H. 8
- J. $\frac{25}{2}$
- K. $\frac{49}{2}$



$$A = \frac{5 \times 5}{2}$$

$$= \frac{25}{2}$$

END OF TEST 2

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

DO NOT RETURN TO THE PREVIOUS TEST.

base = $6 - 1 = 5$

Height = $3 - (-2) = 5$