**Math-8** has questions that are **CALCULATOR Active** and **CALUCLATOR Inactive**.

Once you decide to go on to the ***Calculator Active***, you may not go back to any other parts of the test.

Some of the questions in each section are GRIDED Answers.

(See Extra Notes on how to complete the forms.)

**The Answer Key is at the back of the test. Try the problems. See where you have difficulties.**

**Then, we can compare and make a strategy to approach and solve the problem.**

**R.E.L.A.X:**

**Read** the Question **and** the Answers so you can see what they are asking for! Is the answer in formula, fraction, or decimal form. As you read the questions, consider what answers can be eliminated.

(Example: is slope Positive or Negative?

**Examine** the Math Words: What are the numbers. What are the units? What are they asking?

**Look** and List (Write the formulas needed). What data is given in the problem? What data is given (that is unnecessary), What Information requires prior knowledge or application of a definition: Vertical Angles are Equal, A Right Angle is 900. The sum of the angles of a triangle is 1800. Ratios and Proportions (Cross Products), Right Triangles, Isosceles Triangles, Parallel lines, Perpendicular Lines, Slope, Intercept, Rotations, Pythagorean Theorem (a2 + b2 =c2), Mid-Point, Radicals, Exponents, Scientific Notation, Factoring.

Math Words: Product, Times, Perfect Square, Sum, Total, Average, At least, Deposit, Increasing)

**Answe**r the question that is being asked? Sometimes problems require doing 1 step to find a missing piece of information that is then used or plugged back in to find something else.

**eXamine** your answer? Does it make sense? Number of decimals, Signs, Approximate values, Check your work. What tricks can you use to verify your answer and work.

Since some of the questions are Multiple Choice, it assumes that one of the answers is valid. Sometimes you can try the solutions and work the problems backward.

Some problems are not designed to be answered easily (Question 28). If you don’t see how to quickly approach a solution, skip the problem and concentrate on the problems you do know how to do. Make a note and come back to it.

Some questions ask for the **BEST Answer**, so there could be multiple answers that might work.

Unfortunately, sometimes this is your opinion, and **I cannot help you! DO NOT ASK FOR HELP!**

**VOLUME of a PRISM: BASE x Height (Questions 24 & 30)**

**A Cylinder has a Circle Bottom: A = Pi (r)2 r is the Radius which is (Diameter / 2).**

Volume of a Sphere (**Question 44**) Formula is Given: $\frac{4}{3} πr^{3}$

Sample 1**: C)** 3 x 7 = 21

Sample2: Filled in: p is at **-7**.

Sample 3: Parts of the circle: Fill in: **3/4 or .75**

**Question 1:** Equation of a line: y = mx + b. ‘m’ is the slope: $\frac{Rise}{Run} = \frac{Δy}{Δx}= \frac{Change in Y}{Change in X}$

 ALL LINEAR FUNCTIONS have the same slope (Between any two points)

 The Y Intercept (b) is where the line crosses the y-Axis (when x is Zero)

 Eliminate B and D because the intercept ‘b’ is (-2)

 **Answer: (A)** y = $\frac{2}{3}$(x) -2

**Question 2:** Equation of a line: y = mx + b. ‘m’ is the slope: $\frac{Rise}{Run} = \frac{Δy}{Δx}= \frac{Change in Y}{Change in X}$

 The GIVEN LINE: **y = x - 2** so the slope (m) is (1)

They ask for a line that is ¼ **more than** the current slope: **1 + 1/4** = 5/4)

It is better to keep slope as a fraction and not a decimal of 1.25.

ALL LINEAR FUNCTIONS have the same slope (Between two points)

 The Y Intercept (b) is where the line crosses the y-Axis (when x is Zero)

 Eliminate B and D because the intercept ‘b’ is (-2)

 **Answer: (C)**  A) m = 1 B) m = ½ C) 5/4 D) 1/3

**Question 3:** Scatter plot analysis. Is there a relationship between the data?

 Make sample graphs or sketches. There seems to be a Positive (Except for 7:30 PM) and there are TWO 5:30 (750 and 900) so is it not a FUNCTION but a **relationship**.

 With tables (X) Independent (is on the Right) or TOP and

(Y) is Dependent (on the Left) or BOTTOM!

**SLOPE Is either POSITIVE, NEGATIVE, No Relationship**

**Answer: (D)**

**Question 4:** Which is an IRRATIONAL Numbers:

 NON-TERMINATING and NON-REPEATING:

 The Square Root of any “Non Perfect” square is Irrational.

 PI is irrational. 3.1415….

 Perfect Squares: 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144 (integer2)

 KNOW HOW TO APPRIXIMATE the Square Root of a number.

 KNOW $\sqrt{2} \~ 1.414. \sqrt{10} \~ 3.16$

 Numbers that can be expressed as a fraction that TERMINATE or REPEATE are RATIONAL

 Any Repeating Decimal number can be turned into a Fraction. (Thus Rational)

 The Square Root of a Number is $\sqrt{n}$ The Cubed Root is $\sqrt[3]{n}$

1 = 1 x 1 x 1 8 = 2 x 2 x 2 27 = 3 x 3 x 3 64 = 4 x 4 x 4

 **Answer: (C)**

**Question 5:** Which is a NON-LINEAR Function: NOT: **y = mx + b**. Make Data Tables, Sketch solution

 If (X) is in the Denominator, It is NOT Linear.

 If (X) is raised to a Power X2, X3, etc, it is NOT Linear

LINEAR FUNCTIONS have the same SLOPE: $\frac{Δy}{Δx} or \frac{y2-y1}{X2-x 1}$ for and two points

$\frac{y}{x} is ONLY valid if it goes through the ORIGIN:$ (0, 0)

 **Answer: (D)** (X) is in the denominator

**Question 6:** **Y = 98 -** $\frac{16}{5}x$ INTERPRET this formula. Y = mx + b 🡪 y = - $\frac{16}{5}x+98$

 When (x) = 0, a person would score 98.

 **Answer (D)** is a correct statement 16/5 = 3.2 decrease for each day (x)

 **But** the question ASKS: WHAT IS THE MEANING OF THE Y INTERCEPT?

 **Answer: (A)**

**Question 7:** Which is the Graph of the **function: y = -x**

 You know the intercept is the ORIGIN (0,0). Omit (B) and (D).

 The Slope is (-1) So eliminate (A) Positive slope

 Positive Slope is a “RIGHT ARM” Negative Slope is a “LEFT ARM”

 **Answer: (C)**

 A PARALLEL LINE would have the SAME Slope

 A PERPENDICULARE LINE has a slope that is the NEGATIVE RECIPROCAL:

 In this case: +1

**Question 8:** Which Table is **NON-LINEAR**.

 LINEAR FUNCTIONS HAVE A CONSTANT SLOPE: $\frac{Δy}{Δx} or \frac{y2-y1}{X2-x1}$;

 **Answer: (B)** has a weird data point (4, 13) that does not fit a pattern.

**Question 9:** Which choice is both the square and the cube of an integer.

 (The question is a little confusing since they do not mean the SAME integer)

 The only integer that has the same Square and Cube is (1): 1 x 1 = 1; 1 x 1 x 1 = 1

 121 = 11 x 11, there is no cube root

 100 = 10 x 10, there is no cubed root

 **64 = 8 x 8 and 4 x 4 x 4**

 16 = 4 x 4 and there is no cubed root

 **Answer: (C)**

**Question 10:** Which set of points all lie on the same STRAIGHT Line?

 Make a quick sketch of where the points are.

 Have a graph that identifies the quadrants of the x, y graph.

 Quad I: (+, +) Quad II: (-, +) Quad III (-, -) Quad IV: (+, -)

 **Answer: (D)**

**Question 11:** Calculator Inactive, Gridded Response.

 The area of a square is **49 cm**2, What is the Perimeter?

 $side= \sqrt{49}=7. Perimeter=4\left(s\right) or \left(4\right)\left(7\right)=28$

**Question 12:** **What is the slope** of a line passing through **(2, 3) and (8, 6)**

 Y = mx + b m = $\frac{Δy}{Δx} $= $\frac{y2-y1}{x2-x1}$ = $\frac{6 -3}{8-2}$ = $\frac{3}{6}=\frac{1}{2}$ (or .5)

 Gridded answers DO NOT need to be reduced

**Question 13:** Order the Quantities (LEAST TO GREATEST): (1) $\frac{π^{2}}{4}$ (2) $\frac{Π^{2}}{8}$ (3) $\sqrt{2}$ (4) $\sqrt{3}$

PI ~ 3.14 x 3.14 = 9.856. (Remember the $\sqrt{10} \~ 3.16$

1. $\frac{Π^{2}}{4} \~\frac{10}{4} \~2.5 2) \frac{Π^{2}}{8}=\frac{10}{8} \~1.25. 3) \sqrt{2} \~ 1.414. 4) \sqrt{3}$ < $\sqrt{4} \~<2$

**Answer: 2341**

**Question 14:** What is the value of ‘x’ in the equation: **x3 + 1 = 9?**

 **Answer: X3 = 8 🡪** $\sqrt[3]{8}$ **= 2**

**Question 15:** What positive integer is closest to $\sqrt{240}$

 12 x 12 = 144 13 x 13 = 169 14 x 14 = 196 15 x 15 = 225

 **Answer:** **15**

**Question 16:** Calculator Active

 Using the data in the picture: It is given information it is a Square?

Prior Knowledge: Sides are Parallel, so: Alternate Interior Angles are Equal.

 So: 2x + 15 = 6x – 45 Numbers on one side letters on the other

 **Answer: 15** 60 = 4x 🡪 **x = 15**

**Question 17:** What is the value of ‘x’ in the equation: **.25x + 7 = 4(x -2)**

 Distribute: .25x + 7 = 4x – 8

 Move: .25x = 4x – 15 (Subtract 7) or Add a (-7)

 Move -3.75x = -15 (Subtract 4x) or Add a (-4x)

 Divide x = -15 / - 3.75. (Eliminate the Coefficient)

 Answer: **4** (negative / negative = Positive) LIKE SIGNS = +

**Question 18: What is the** Rate of Change of a linear function that passes through **(2, 9) and (-1, 3)**

Rate of Change = Slope = m = $\frac{Δy}{Δx} or \frac{y2-y1}{X2-x1}$; $\frac{3-9}{-1 -2} or \frac{9-3}{2 --1}= \frac{-6}{-3}= 2 or\frac{6}{3}=2$

**Question 19:** What is the value of ‘x’ in this equation?

 **12(x – 2) + 3x = ½ (x + 6) + 2 (D.C.M.A.M.)**

 Distribute: 12x – 24 + 3x = .5x + 3 + 2

 Combine Like Terms 15x – 24 = .5x + 5

 Move Numbers 15x = .5x + 29

 Move Variables 14.5x = 29

 Divide **x = 2**

**Question 20:** Given two Parallel Lines (P and Q) and a Transversal ( R) and angles:

 A + B = 180

 (2x + 40) + (3x – 85) = 180

 5x – 45 = 180

 5x = 225 🡪 **x = 45**

**Question 21:** A light year is defined as the distance light travels in one year.

One light year is 9.46 x 1012 km. A galaxy is about 150,000 light years wide.

ABOUT how many **kilometers** wide is the galaxy?

 This is a **Scientific Notation** problem. 1012 is a really big number the 9.46 is just approximate. In the normal form for Scientific notation is **N.ddd x10z**

9.46 x 1012 x 1.5 x 105 = 14.19 x 1017 But the form is 1.419 x 10 x 1017 = **1.419 x 1018**

 **Answer: ( C )**

**Question 22:** use the Diagram. Rectangle, Find the length of a side to the **nearest cm.**

 Watch the Units. This is all in ‘**c*entimeters’***!

 Diagonal of a rectangle: **PYTHAGOREAN THEORM**

Also remember: **TRIPLETS:** 3-4-5 and multiples (ARE MOST COMMON)

 **A2 + B2 = C2  or a =** $\sqrt{c^{2}- b^{2}}$ **a =** $\sqrt{13^{2}- 8^{2}}$ **=** $\sqrt{169-64}$ **=** $\sqrt{105}$ **~ 10**

 **Answer: (B)**

**Question 23:** Using the Linear Equation Model: **y = 14,000 – 875x**

What is the meaning of the y intercept?

  **Y = mx + b 🡪 y = - 875x + 14,000 So, WHEN ‘X’ = 0, Y = 14,000**

 Answer ( C )is a correct statement but the question is the what is the Y INTERCEPT.

 INITIAL VALUE of the car.

 **Answer: (A)**

**\*Question 24:** A cylindrical trash can with a diameter of **24 cm** and a height of **42 cm**.

What is the APPROXIMATE VOLUME of the can? **Make sure the units are the same.**

 Formula: **Volume = BASE x Height**

 AREA of the BASE is a **Circle: A = Pi(r)2**

 Since the DIAMETER is 24, the RADIUS is 12.

 3.14 x (12)2 x 42 = 3.14 x 144 x 42 ~ 3.14 x 6,048

 **Answer ( C )** 19,000 cm3  A & B can be easily be eliminated and 3 x 6000 ~ 18,000

**Question 25:** Best Fit Model of Data:

**YOU CANNOT** COUNT BOXES for rise/run since the scales are different.

 Using the Points of (5, 50) and (50, 250) the slope is Slope = m = $\frac{Δy}{Δx} or \frac{y2-y1}{x2-x1}$ = $\frac{250 -50}{50-5}$

 m = $\frac{Δy}{Δx} or \frac{200}{45} \~ \frac{200}{50} \~ 4$: y =mx + b so y = 4x + b.

Drawing a line to connect the points, the Y intercept of 5 seems too small.

 Try Points: 50 = 4(5) + 35 🡪 50 = 20 + 35 = 55

 **Answer: (D)**

**Question 26:** Which is a function of (x)

 Function vs Relationship.

 For a function, the same input must create the same output.

 Eliminate B: Input 2, Output: 0 and 3

 Eliminate C Input 2, Output: 5 and 12

 Eliminate D Input 6, Output: 2 and 8

 Answer: **MUST BE (A)**

**Question 27**: Interpretation of Qualitative Graphs. WHICH IS THE **BEST?**

 Slope: Increasing, Decreasing, Flat or Constant

 Watch the Axis values. They are all the same: y = Distance and x = Time

 She started walking,

 Then she jogged (Can go farther in a shorter time)

 The slowed down to a slower than Jogging

 **Answer (D)**

 **A) Did nothing, Then Ran, then Stopped and did nothing**

 **B) Walked, Stopped, Ran**

 **C) Walked, Stopped, Ran home (faster)**

* ***Question 28***: Using the figure of a Right Triangle. (A 30, 60, 90 Right Triangle has special relationships, just like an Isosceles Triangle is special: l c= n$\sqrt{2}$ )

One Angle is 600. (So, angle ‘K’ must be 300)

In the picture, Segment PQ is parallel to JL.

If PK is ‘4’ and is the Midpoint of JK, Then JK = 8

**Since** it is a **30-60-90** right triangle,

The Hypotenuse is 2x(Short) base that is opposite the 300

so if the Hypotenuse is 8, the base is 4 and the and the Long Leg is $4\sqrt{3}$

So: PQ = 2, the Hypotenuse = 2(2) = 4 and the Long leg = **2**$\sqrt{3}$

Perimeter = 2 + 4 + 2$\sqrt{3} $ ~ 6 + 3.46 ~ 9.5

**Answer: (B) 9.5**

**Question 29:** A car rental company charges $34 per day for a rental and $.50 per mile.

A second car company charges $20 per day and $75 for every mile.

What is the number of miles at which both companies charge the same amount for a 1 DAY?

 A = 34 + .5x B = 20 + .75x

 34 + .5x = 20 + .75x 14 = .25x 56 Miles

 **Answer: (A)**

**Question 30:** A cylindrical barrel has a height of 8 feet and a diameter of 6 feet.

What is the **Approximate** Volume of the barrel?

* + Check the Units. ALL ARE FEET!

VOLUME = **BASE x height.** BASE = Pi(r)2  r = d/2 so r = 6/2 = 3

 Pi(3)2 x 8 3.14 x 9 x 8 3.14 x 72 3 x 70 = 210 cubit feet

 **Answer: (B)**

**Question 31:** Dilation of a shape with a scale factor (r) = ½

 Dilation < 1 : Reduction > 1 : Enlargement = 1 : Copy

 L = (-3, 4) M = (3, 4) N = (3, 1)

NEW: (-1.5, 2) (1.5, 2) (1.5, .5)

It must be (B) or (C) since those are the only answers with a (.5) for y.

**Answer: ( C )**

**Question 32:** What is the meaning of the slope of the Trend Line?

 Slope = m = $\frac{Rise}{Run}=\frac{Δy}{Δx} or \frac{y2-y1}{x2-x1}$ . The scales are the same so you CAN count boxes:

 1/3 or grows 1 inch for every 3 hours of light.

 **Answer: ( D )**

**Question 33**: Compare Rates of Change: (Compare Slopes)

 Jack: For every change in 1 hour, his score goes up 7 points.

 Howie: Score goes up 6 points for every hour.

 **Answer: (A)** Jake’s score goes up 1 more than Howie’s for each hour studied.

**Question 34:** Find the length of a diagonal of a rectangle given the information in the picture.

 The top triangle has two legs of 6 and 8 so the Hypotenuse is 10: (3 – 4 – 5 triangle)

 So, the diagonal is: c = $\sqrt{a^{2}+ b^{2}}$ = $\sqrt{5^{2}+ 10^{2}}$ = $\sqrt{25+ 100}= \sqrt{125} \~ 11+$

 **Answer: (B)**

**Question 35:** Bivariate Data, Using Tables

 16 students = 67% In Math, Not in Literature

 X students = 33% in literature and In Math

 .67 x N $=16 $ so N = 16/.67 = ~ 24

 .33 x 24 ~ 8 (7.92)

 Y students = 78% not in Math and Not in Literature

 4 = 22% In Literature, Not in Math

 .22 x N = 4 N = 4 / .22 ~ 18 (18.18)

 .78 x 18 ~ 14

 X + Y = 8 + 14 = **22**

**Question 36:** Rotation of 180: X (1, 1) Y (3, 5) Z (5, 1)

 Value of point T 180 is swap signs: (-3, -5)

 900 rotation rule: Swap the values of X and Y and change the New X.

**Question 37**: Equation of a Line from a Graph: y = mx + b

 The Y intercept is ‘3’ (but not necessary for this problem)

 It is sloping Downward (Left Arm Rule) so the slope is NEGATIVE

 Eliminate (A) and (B).

 The grid units are ‘1’ so you CAN count the boxes for Slope = m = $\frac{Rise}{Run}=\frac{Δy}{Δx} or \frac{- 1}{4}$

 **Answer: (D)** while not in y = mx + b, it is the correct values for SLOPE

**Question 38:** Given a line passes through the points **(1, 4) and (5, 8)** and a second lines passes through **(2, 10) and (6, 4)** at what points to the two lines intersect?

Is graphing a good way to model this solution?

Line 1 slope = (8-4)/(5-1) = 4/4 = 1 Line 2 Slope = $\frac{y2-y1}{x2-x1}$ = $\frac{10-4}{2-6}= \frac{6}{-4}= -1.5$

Y = mx + b y = mx + b

8 = 1(5) + b 10 = $-1.5\left(2\right)+b$

B = 3 10 = -3 + b

Y1 = x + 3 13 = b

 Y2 = $-1.5\left(x\right)+13$

 Y1 = Y2

 X + 3 = -1.5x + 13 2.5x = 10 x = 4

 Or **PLUG Values** for (X, Y) into both problems and see which one gets the same answer!

 **Answer: (C)**

**Question 39:** Function or Relation?

 **Answer: (A)** Other answers have same (x) different (y).

**Question 40:** A triangle has the vertices of: P(3, -2), Q(10, -2) and R(3, -8)

What is the **approximate** length of side QR.

Draw a Sketch, Count Boxes?

 PQ = 7 (Horizontal line at (-2)

 PR = 6 (Vertical line at x = 3

 QR is the Hypotenuse: $\sqrt{6^{2}+ 7^{2}} $ = $\sqrt{36+ 49 }$ $\sqrt{85}$ ~ 9+

 **Answer: (B)**

**Question 41:** In the expression x and y are positive integers. A = 2 \* 10x. and B = 4 \* 10x + y

B is 20,000 times more than (A): What is the value of y?

 THIS IS A SCIENTIFIC NOTATION PROBLEM!

 20000(A) = B What does the problem say?

20000(2 \* 10x ) = 4 \* 10x + y Substitute

(2\* 104)( 2 \* 10x). = 4 \* 10x + y Expand

 4 \* (10x+4) = 4 \* 10x + y YOU ADD EXPONENTS WHEN YOU MULTIPLY

AND SUBTRACT EXPONENTS WHEN YOU DIVIDE.

**Answer: (B) y = 4**

**Question 42:** Line XY is graphed on the grid with POINT x = (3, -1) and POINT y = (3, 5).

Where could point “Z” be to make a triangle with a Hypotenuse a Length of $\sqrt{45}$?

What POINTS could make this work?

 This is a Right Triangle, Pythagorean Theorem Problem.

 Leg (a) has a length of 6: (-1 – 5)

 Leg (b) = Q

 Leg (c ) = Hypotenuse =$\sqrt{45}$.

 $a^{2}+b^{2}=c^{2}$ 🡪 62 + b2 = 452 🡪 36 + b2 = 452 so b2 = 9, **b = 3**

 **Answer: (C) ( 6, -1) X(3, -1) to (6, -1).** $Δx=3$

**Question 43:** Paula = 3x Julia walked 1 mile per hour faster or (4x)

 JULIA’s Walking distance:

 Pick a Point with a clear (X and Y) intersection:

 When X = 3.5. (4 x 3.5) = 14

 **Answer: (D)**

**Question 44:** The Diameter of a sphere is 6 cm. What is the volume? (NOTE: **v =** $\frac{4}{3} πr^{2}$)

 If D = 6 then r = D/2 = 6/2 = 3 So: v = $\frac{4}{3} π3^{3}$ v = $\frac{4}{3} π27$

 v = $\frac{4}{3} π27. \rightarrow 4π9\rightarrow 36π.$

 **Answer: (B)**

**Question 45:** LINE of Best Fit from Graph.

 They are not asking for the slope or the intercept? The answers are “is this a good model”?

BUT, FYI: Intercept is ‘3’, slope is Slope: m = $\frac{Rise}{Run}=\frac{Δy}{Δx} or \frac{7}{10}$

 **Answer: (D)** Not a good fit since most of the points are above the line

None touch the line,

and 2 are below the line.