

REVISED: April 28, 2022: Check your work to mine! KEY. There is more than one way to solve problems

The **Math-1 EOG test** has 50 questions, and you will have **3 hours** to complete the test.

The exam has two parts: Calculator **Inactive and** (Gridded Bubble Sheet) and Calculator **Active** (Multiple Choice).

Just because you **can use** a calculator, does not mean you have to. **Work Smart**, Use other Strategies.

Look for ways to simplify and reduce problem.

Draw Pictures. Make Data Tables. **Understand what they are asking!** **READ THE PROBLEMS**

Some questions require you to **explain** or write the equations **and not** actually solve it! Look at the answers first!

You can solve problems in many ways using various techniques. (It is OK to GUESS!) but think about the choices.

I have made notes for the question that may not be specific for that problem, but general notes that COULD be used for solving similar formatted problems. **IT IS A STUDY GUIDE.**

The test CAN BE tricky, and you must make sure you read and answer the question they are asking.

These are “**MY**” notes for how I approached the solution. There may be more than one way to work a problem.

I may have made a typing or math mistake. Check your work to mine and to the NC State Answer Key.

**I CANNOT EXPLAIN OR ANSWER ANY QUESTIONS DURING THE TEST! Don't Even Ask!
THERE IS TO BE ZERO TALKING.**

WORK SMART. Notice Question (#41) is really easy! And #50 is simple slope: $\left(\frac{\Delta y}{\Delta x}\right)$!

USE YOUR TIME WISELY. GUESS AND GO ON! COME BACK IF YOU HAVE TIME.

You may have scratch paper and graph paper, but you must turn each page in.

I have tried to explain the process to solve problems in multiple ways.

Question 1: Answer: (A)

Graph of a Function: $y = (4 - x)(x + 2)$ *This is NOT in the normal form $(-x + 4)(x + 2)$*

While this is not a LINEAR GRAPH: $y = mx + b$, it is an equation that can be used.

Make a Data Table and Try Points: When (X) = ZERO, what is (Y)?

When (x) = 0, then: $(4 - 0)(0 + 2) \rightarrow (4)(2) = 8$ Eliminates Answers (B) and (C).

What value of (X) makes (Y) zero? **SOLVE FOR ZERO!**

In this problem, When (x = -2), y = 0 and when (x = 4), y = 0.

If you use **F.O.I.L.** or the **Box** method, you get: $-x^2 + 2x + 8$. The $(-x^2)$ tells you it goes **Downward**: \cap

$-x^2 = \text{SAD SMILE: } \cap$ $+x^2 = \text{HAPPY SMILE: } \cup$

Question 2: Answer: (D)

Which Graph is the Equation of: $2x - y < 4$ *(I know the printed copy quality is not very good)*

The 'Dotted' line means that no values on the line work.

The shaded area satisfies the equation.

When you plug (0, 0) that works: so (C) and (B) are Not the answer!

Every Point in (A) is also included in (D) so are there any other points in (D) that might work?

Try it: (0, 10) $2(0) - 10 < 4$ $-10 < 4$: TRUE

This is in the form of: $Ax - By = C$

$$b = \frac{C}{B} = \frac{4}{-1}$$

$$m = \frac{-A}{B} \rightarrow \frac{-2}{-1} = 2$$

Or $y = mx + b$; so: $-y < -2x - 4$

But, to make (-y) positive, you must switch the inequality:

$y > 2 + 4$ is formed after Dividing everything by (-1).

The only graph with a Positive Slope (m) is D, since (c) was eliminated.

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Question 3: Answer: (B)

| | | | |
|-----------------|--------|-------|---|
| | 3x | -3 | Which expression is equivalent to: $(x + 2)(3x - 3)$ POLYNOMIALS USE: F.O.I.L. or Box. (All answers have a $(3x^2)$ and (-6) so you need the MIDDLE Value: $(x)(3x) + (x)(-3) + 2(3x) + 2(-3)$ $3x^2 + (-3x) + 6x + (-6) \rightarrow 3x^2 + 3x - 6$ |
| x | $3x^2$ | $-3x$ | |
| +2 | $+6x$ | -6 | |
| $-3x + 6x = 3x$ | | | |

Question 4: Gridded Response. (b = 2) A line: $y = mx + b$ passes through the point: $(1, 6)$ and is parallel to $y = 4x + 6$. What is the value of 'b'? (They don't want '6'. They want the Intercept of the NEW LINE!)

PARALLEL LINES have the SAME SLOPE! So, $m = 4$
 PERPENDICUTLAR LINES have NEGATIVE RECIPROCAL slopes: $(4/1 \rightarrow -1/4)$
 So: $m = 4$ $y = mx + b$ $6 = (4)(1) + b \rightarrow$ $6 = 4 + b \rightarrow$ **b = 2**

Question 5: Answer: (6)

Two Functions: $f(x) = \frac{1}{2} * 2^x \rightarrow \frac{2^x}{2}$ and $g(x) = 5x + 2$

What is the **largest INTEGER value** of (x) such that $f(x) \leq g(x)$
 Do not get confused about the name of the function f(x) or g(x).
 It is just another way of naming the function rather than Function A or Function B.

| | | | | | | | |
|-----------------|-------------|-------------|---------------|---------------|---------------|---------------|---------------|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| 2^x | $2^0/2$ | $2^1/2$ | $2^2/2$ | $2^3/2$ | $2^4/2$ | $2^5/2$ | $2^6/2$ |
| $\frac{2^x}{2}$ | $1/2$ | $2/2 = 1$ | $4/2 = 2$ | $8/2 = 4$ | $16/2 = 8$ | $32/2 = 16$ | $64/2 = 32$ |
| $5x + 2$ | $0 + 2 = 2$ | $5 + 2 = 7$ | $10 + 2 = 12$ | $15 + 2 = 17$ | $20 + 2 = 22$ | $25 + 2 = 27$ | $30 + 2 = 32$ |

$\frac{2^x}{2} \leq 5x + 2$ Clear the denominator (multiple both sides by 2)
 $2^x \leq 10x + 4$ Use Power of (2) where 'x' is an integer.

Question 6: Answer: (8)

Using the function: $f(x) = 9x^2 - 54x - 144$, What value of (x) will **solve for zero**?

This is the **Quadratic Formula**: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

You can also Factor Perfect Squares and Solve for Zero:

$9(x^2 - 6x - 16) \rightarrow 9(x - 8)(x + 2)$ What two factors of **-16** add together to get **-6**
 So, **Solving for Zero: x = 8 or x = -2**

Since you cannot have a negative value for the number of **Sales Units, x = 8**

Ax² + Bx + C is the Quadratic Formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

If the Discriminate (Under the Radical) is (+), there are 2 answers.

If it is 0, there is 1 answer and if it is Negative, then there are no solutions (where is y = 0).

a = (1) b = (-6) c = (-16) $\frac{-(-6) \pm \sqrt{6^2 - 4(1)(-16)}}{2(1)} = \frac{6 \pm \sqrt{36 + 64}}{2(1)} = \frac{6 \pm \sqrt{100}}{2(1)} = \frac{6 \pm 10}{2(1)}$
16/2 = 8 Or (-4)/2 = -2

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Question 7: Answer: (A)

Joanna has a total of 50 coins. They are either Nickels or Quarters. The value is **\$7.10**

REMEMBER TO READ THE ANSWERS FIRST. YOU DO NOT SOLVE THIS PROBLEM? Just set it up!

This is a **System Of Equations (SOE)** problem: You need a **COUNT** and a **VALUE** formula!

$$N + Q = 50 \quad \text{and} \quad .05N + .25Q = 7.10 \quad \text{or} \quad (5N + 25Q = 710)$$

Question 8: Answer: (A)

$f(x) = -.25x + 5$ models the height of the candle (x) seconds after it is lit.

WHAT IS THE MEANING OF THE Y intercept? $y = mx + b$ so: $b = 5$ units tall **before it is lit.**

the Slope = $m = -.25$ is how much burns per second.

IF THE QUESTION WAS HOW LONG WOULD THE CANDLE BURN?

$$-5 = -.25X \quad -5 / -.25 = x \quad x = 20 \text{ SECONDS}$$

Question 9: (T = \$280)

The TOTAL COST formula is given by the function: $c(m) = 20m + 40$ where m is the number of months.

What is the cost for **1 year**?

The SLOPE of this problem is '20' and m is the variable (X) for

months).

WATCH THE UNITS: 1 year = 12 Months:

$$20(12) + 40 = T$$

$$240 + 40 = T$$

$$\$280 = T$$

Question 10: Answer: (4.5 Feet)

Water is being pumped into a 10-foot-tall cylindrical tank at a **constant rate**.

The water is increasing linearly! (constant).

At 1:30 the water was 2.4 feet

At 4:00 the water is 3.9 feet

RATE: Rise in Water is: 1.5 feet

Change in Time is: 2.5 hours

$$\text{Rate} = \text{Rise} / \text{Time} \quad 1.5 / 2.5 = .6 \text{ feet per hour}$$

Answer: So, at 5 PM or (in 1 hour) you would add another .6 feet: $3.9 + .6 = 4.5$ Feet!

Multi Step Problem

You do not know what the level was prior to the pumping but it does not matter.

They could have asked, HOW far from the TOP of the Tank is the water?

They could have asked how much water is in the tank if given other information!

They could have made this a VOLUME Formula problem. BASE x height

Question 11: Answer: (B). Convert words into equations: Understanding Math Equalities and Inequalities.

YOU ARE NOT SOLVING A PROBLEM, just writing the four (4) equations for the information:

a) ' x ' is Sally's monthly paycheck and ' y ' is her monthly savings.

b) Sally will save at least \$20 more than $\frac{1}{2}$ of her paycheck each month.

c) She can save at most \$80 more than $\frac{2}{3}$ of her paycheck.

d) Her paycheck each month is at least \$1,200 but no more than \$1,850.

I have not listed all the actual answers from the test! These Equations fit the conditions above!

$$\text{a) } y \geq \frac{1}{2}(x) + 20$$

$$\text{b) } y \leq \frac{2}{3}(x) + 80$$

$$\text{c) } x \geq 1,200$$

$$\text{d) } x \leq 1,850$$

Key words for Inequalities: (At Most: \leq or \leq)

(At Least: \geq or \geq)

x = Paycheck

y = Saving

You can eliminate: (A) since (y) SAVINGS \leq 1,200 and (D) SAVINGS \geq 1,200

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Option (C) is going the wrong way.

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Question 12: Answer: (C) $p = \frac{T-581s}{150}$

A company uses the function: $T = 581s + 150p$ for the total cost of (s) computers and (p) printers.

Which equation can be used to find the number of printers (p) given in terms of T and s?

Use the Rules of equation Operations> Undo and Move.

$$T = 581s + 150p \rightarrow T - 581s = 150p \rightarrow$$

Answer: (C) $p = \frac{T-581s}{150}$ Use rules of equations to UNDO Operations

Another Problems like this is the DISTANCE Formula Problem:

$$\text{Distance} = \text{Rate} * \text{Time} \rightarrow \text{Rate} = \text{Distance} / \text{Time.} \rightarrow \text{Time} = \text{Distance} / \text{Rate}$$

Question 13: Answer: (11)

What is the value of the **Positive Zero** of the function (f), defined by $f(x) = x^2 - 121$

This is a **Polynomial Problem: DIFFERENCE of Perfect Squares!**

Factor: $(x - 11)(x + 11)$ so the Positive Zero Factor is '11'.

Question 14: Answer: (-3)

What is the value of "x" in the System of Equations: (SOE)?

Be Careful! They may have asked for the value of 'y'!

$$5x + 4y = 1 \quad y = 1 - x$$

Since the equations ARE NOT in the same format,

And since one of the equations has a variable with a coefficient of '1' y,

Substitution looks like a good technique. (Solving for ZERO or graphing) does not look good!

| Guess | Graph | Table of Data (Solve for Zero) | Elimination |
|---------------------|--------------|--------------------------------|-------------|
| $5x + 4(1 - x) = 1$ | (Distribute) | | |
| $5x + 4 - 4x = 1$ | (Combine) | | |
| $x + 4 = 1$ | (Move) | | |
| $x = -3$ | Solve | | |

Question 15: Answer: (-2)

What is the smaller zero of the function of? $2x^2 - 8x - 24$

THIS IS A QUADRATIC or a FACTOR of POLYNOMIALS problem.

First, factor out a Common Factor: '2' $2(x^2 - 4x - 12)$

What two factors of (-12) add together to make -4? (-6 * 2)

So: $2(x - 6)(x + 2)$

Answer: $x = \{6, -2\}$. So, the SMALLER ZERO FACTOR is: (-2)

$Ax^2 + Bx + C = 0$ is the Quadratic formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$$a = (1) \quad b = (-4) \quad c = (-12) \quad \frac{-(-4) \pm \sqrt{4^2 - 4(1)(-12)}}{2(1)} = \frac{4 \pm \sqrt{16+48}}{2(1)} = \frac{4 \pm \sqrt{64}}{2(1)} = \frac{4 \pm 8}{2(1)}$$

$$12/2 = 6 \text{ and } (-4)/2 = -2$$

Question 16: Answer: D (8.2, 24.3)

Regression Analysis. Line of Best Fit **CALCULATOR ACTIVE** See Detail Notes for Question #16.

SPECIAL NOTES ON HOW TO USE THE CALCULATOR

Multi-step TI Calculator process.

Enter a table of data. Review results.

Plot data.

Remove a point for a better fit (You might also try to "PLOT" points and visualize the BEST LINE).

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Question 17: Answer: (C). Mean, Median, Mode (See Detail Notes for Question #17) Using the {STAT} function.

Mean is Average

Median: Middle (When In order)

Mode: Most often

Given Data: {8, 11, 12, 10, 9, 7, 5, 3, 9}

What is true if: '45' is added to the data points?

In order: 3, 5, 7, 8, 9, 9, 10, 11, 12

NORMALLY, adding a Larger number will INCREASE the Mean. Small numbers will make it DECREASE.

The **MEDIAN** did not change for **THIS DATA** because the **MIDDLE** points with nine pieces of data is the **VALUE** of '9'. When you add a piece of data (Now ten values),

you 'Average' the two numbers in the middle (and both of these are '9') Tricky question!

Question 18: Answer: (23)

What is the difference between the y intercept of the function: $f(x) = x^2 + 7x = 18$

and the y-intercept of the linear function that passes through the data in the table $g(x)$:

| | | | | |
|--|----|------|--|---|
| | x | g(x) | | $y = mx + b$ |
| | -5 | 2 | | $m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$ |
| | 10 | 11 | | $m = \frac{20 - 11}{25 - 10} = \frac{9}{15} = \frac{3}{5} = .6$ (Could pick any 2 points) |
| | 25 | 20 | | |
| | 60 | 41 | | |

SUBSTITUTE: $11 = .6(10) + b$

Find Intercept: $11 = 6 + b$ $\therefore b = 5$

$f(x) = x^2 + 7x = 18$ $\rightarrow f(x) = x^2 + 7x - 18 = 0$

WHEN 'x' = 0, then $f(x) = -18$

They could have asked about the 'X intercepts'

Factors of -18 that add to: 7 $(x + 9)(x - 2)$

When $x = -9$ or $x = 2$, then, $y = 0$

Compare: difference between -18 and 5 = 23 units

Question 19: Answer: (1)

What is the value of 'x' in the equation shown below? (D.C.M.A.M.)

$$2(x + 8) - 4x = 10x + 4$$

$$2x + 16 - 4x = 10x + 4$$

$$-2x + 16 = 10x + 4$$

$$16 = 12x + 4$$

$$12 = 12x$$

$$x = 1$$

Distribute: $A(B + C) \rightarrow AB + AC$

Combine Like Terms

MOVE: Variables on one side, Numbers on the Other

Question 20: Number of Solutions to an Equation. (ON-LINE TEST ONLY)

Are the equations of the lines in the correct format of either: $Ax + By = C$ or $y = mx + b$

In the format of : $Ax + By = C$, $m = (-A) / B$ and $(b) = C / B$

Remember: Same Slope, Same Intercept = SAME LINE = INFINITE

Same Slope, Different Intercept = PARALLEL = NO Solutions

Different Slope = 1 Solution (If different Slope and SAME intercept: then, $X = 0$)

$$2x + 2y = 16 \quad \& \quad 4x + 3y = 27 \quad (1)$$

$$2x + 2y = 8 \quad \& \quad 4x + 4y = 16 \quad (\text{Infinite})$$

$$2x + 3y = 12 \quad \& \quad 2x + 3y = 18 \quad (\text{None})$$

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Question 21: Answer: (A)

Which equation represents a line that is perpendicular to the graph of $4x + 3y = 9$ and passes through the points $(-2, 3)$?

PLUG ANG CHUG: Try answers and (A) $3x - 4y = -18$ and (D) $3x + 4y = 6$ are POSSIBLE.

Could also try Solving for ZERO.

Parallel Lines Have the SAME Slope.

Perpendicular Lines Negative Reciprocal Slope

Slope of: $4x + 3y = 9$ $m = (-A)/B$ $-4 / 3$ So, Negative Reciprocal is: $\frac{3}{4}$

A) $3x - 4y = -18$ $m = (-A)/B$ $-3 / -4 = \frac{3}{4}$

D) $3x + 4y = 6$ $m = (-A)/B$ $-3 / 4 = \frac{-3}{4}$

Question 22: Answer: (D)

A club begins with 3 members and each month a member brings a new member.

How many members will there be after (X) months? (THIS IS NOT A NUMBER BUT A FORMULA)!

This is an **exponential increase** (Not Linear, so: A and B can probably be eliminated)

Amount * (Rate)² COMPOUNDED RATE.

IT IS USUALLY AN INTEREST RATE: \$100 INVESTED AT 5%

HOW MUCH WOULD YOU HAVE IN 4 YEARS? $100(1 + .05)^4$

| | | | | | |
|---------|---|---|----|----|----|
| Month | 0 | 1 | 2 | 3 | 4 |
| Members | 3 | 6 | 12 | 24 | 48 |

TRY Numbers A) $2x + 3$ $2(0) + 3 = 3$ YES, $2(1) + 3 = 6$ YES, But: $2(2) + 3 \rightarrow 4 + 3 = 7$ NO

B) $3x + 1$ $3(1) + 1 \rightarrow 3 + 1 = 4$ at $x=1$, then $4 \neq 6$ NO

C) $1.5(2)^x$ $1.5(2)^1 \rightarrow 3$ at $x=1$, then $3 \neq 6$ NO

D) $3(2)^x$ $3(2)^1$ $3(2) = 6$ YES, $3(2)^2 \rightarrow (3)(4) = 12$ Yes

Question 23: Answer: (2040)

In 2010, 1,000 people lived in Appleville and 4,000 lived in Bridgetown.

Appleville population DOUBLES (Rate is 2) every 10 years.

Bridgetown population Increases 1,000 every 10 years.

When will Appleville be bigger than Bridgtown?

| | | | | | | | |
|----------------|----------------|---------|---------|---------|------|------|----|
| Every 10 years | 0 (start) 2010 | 10 2020 | 20 2030 | 30 2040 | 40 | 50 | 60 |
| Appleville | 1000 | 2000 | 4000 | 8000 | | | |
| Bridgeville | 4000 | 5000 | 6000 | 7000 | 8000 | 9000 | |

Appleville = Amount (Rate)² = $1000(2)^2$

Bridgetown: $1000 + \text{Year}(1000)$

Question 24: Answer: (7)

Two stores have movies to rent.

(A) \$12.50 per month plus \$1.50 per video.

(B) \$0 Membership and \$3.50 per video.

What is the minimum number of videos a person would need to rent in a month?

for store (A) to be the better deal?

Better Deal means COST LESS.

$Y = mx + b$

$A < B$

$1.50(x) + 12.50 < 3.50(x)$

$12.50 < 2(x)$

$6.25 < x$

$x > 6.25$ Videos. So, you need to rent **7 or More videos for (A) to be the better Deal.**

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Question 25: Answer: (5.6)

Karen has two dogs. The larger dog weighs 1.4 pounds **more than** the smaller.

The combined weight is: 12.6 pounds. What is the weight of the SMALLER Dog?

Converting words to mathematical expressions: Two Dogs: Large (L) and Small (s)

The Larger (L) = s + 1.4

(**more than** means add)

COMBINED (ADD), Total

$$12.6 = L + s$$

$$12.6 = (s + 1.4) + s$$

$$12.6 = 2s + 1.4$$

$$11.2 = 2s$$

$$11.2 / 2$$

$$\therefore 5.6 = s$$

Question 26: Answer: (B)

Which choice could be modeled by a **Linear Function**?

Read the answers and select a situation that could use the MODEL.

A **LINEAR** model is: $Y = mx + b$

A) The amount of money (y) in an account after x years earning 4% Compounded Annually

NO: $Y = \text{Amount} \cdot (1.04)^x$ **Compound Interest formula**

B) The monthly cost (y) of a cell phone for x minutes at a rate of 4 cents per minute

YES: $y = .04(\text{min})$

C) The height (y) of a ball after bouncing x times that reaches $\frac{2}{3}$ the previous height,

NO: Decay problem: Example: Start at 60, $(\frac{2}{3})60 = 40$ (loss of 20), $\frac{2}{3}(40) = 26$ (loss of 16)

D) The amount (y) of radioactive material after years when decay occurs at a rate of 30% each year.

NO: (Another Compound Decay problem: Rate is: $(1-.3)^n$)

Question 27: Answer: (C) Graph analysis. At which interval did the plant grow the fastest.

Qualitative Graph Analysis. Increase, Flat, Decrease

WATCH THE UNITS: Y Units are '1' and the X Units are '2'

Fastest Growth = Steepest Slope. $\frac{\text{RISE}}{\text{Run}} \quad \frac{\Delta y}{\Delta x}$

Answer: (C). Days (8 to 10). $\frac{7-4}{10-8} = \frac{3}{2} = 1.5$

A) Days 4 to 6: $\frac{1}{2} = .5$

B) Days 6 to 8: $\frac{2}{2} = 1$

C) Days 8 to 10: $\frac{3}{2} = 1.5$

D) Days 10 to 12: $\frac{1}{2} = .5$

Question 28: Answer: (4)

The function: $a(n) = 3n - 7$ is the n^{th} term in a sequence. **What is the sum of the 1st and 5th term?**

THIS IS A LINEAR FUNCTION: $y = mx + b$ $y = 3x - 7$

$$A(1) = 3(1) - 7$$

$$A(5) = 3(5) - 7$$

$$3 - 7$$

$$15 - 7$$

$$-4$$

$$8$$

$$-4 + 8 = 4$$

Question 29: Answer: (L = 120)

The width of a rectangle is $\frac{3}{4}$ its length. The perimeter of the rectangle is 420 feet.

What is the length, in feet, of the rectangle? (Watch the units!) **Draw a Picture**

Perimeter = $2(L + W)$ or $2L + 2W$ or $L + L + W + W$

Width = .75(L)

$$2(L + W) = 420$$

$$2(L + .75L) = 420$$

$$2(1.75L) = 420$$

$$3.5L = 420$$

$$L = 420 / 3.5$$

$$\text{so, } L = 120 \text{ Feet}$$

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Question 30: Answer: (B) Where do the **two** functions intersect?

$$f(x) = 3x^2 + 14x - 5$$

$$\text{When: } x = 0, \quad y = -5$$

$$g(x) = 11x + 13$$

$$\text{When } x = 0, \quad y = 13$$

They give you four possible points: **A: (-5, 0)** **B: (-3, -20)** **C: (2, 35)** **D: (6, 79)**

In **g(x)**, you can try each value of (x) and see what works to find (y): (easier with no exponents)!

$$11(-5) + 13$$

$$-55 + 13$$

$$\mathbf{-42 \text{ NO}}$$

$$11(-3) + 13$$

$$-33 + 13$$

$$\mathbf{-20 \text{ YES}}$$

$$11(2) + 13$$

$$22 + 13$$

$$\mathbf{33 \text{ NO}}$$

$$11(6) + 13$$

$$66 + 13$$

$$\mathbf{79 \text{ YES}}$$

BE CAREFUL OF NEGATIVE values and EXPONENTS

(-3, 20) works in **g(x)**, try it in **f(x)**

$$3(-3)^2 + 14(-3) - 5$$

$$3(9) + -42 - 5$$

$$27 - 47$$

$$\mathbf{-20 = -20 \text{ YES}}$$

(6, 29) works in **g(x)**, try in **f(x)**

$$3(6)^2 + 14(6) - 5$$

$$108 + 84 - 5$$

$$192 - 5$$

$$\mathbf{187 \text{ does not equal } 79}$$

Question 31: Answer: (D)

This question uses a table of data and asks what does the slope of the **Line of Best Fit** indicate? You could also use the Ti-84 [STAT] function to find exact values. SEE detail notes for Question #31.

$$\text{Slope is: } \frac{\Delta y}{\Delta x} = \frac{\text{Change in } Y}{\text{Change in } X}$$

Just using the **end-points** of **(10, 62.9)** and **(80, 78.7)** you have approximately: $\frac{80-63}{80-10} \sim \frac{17}{70} \sim .24$

Answers A and B have nothing to do with the meaning of the Slope.

Answer C is a TRUE statement but not about the meaning of the Slope.

Question 32: Answer: (C)

Standard Deviation is a measure of how far the numbers are from the Average.

SEE DETAIL NOTES for Problem #32 on using the TI-84 [STAT] {Calc} and {1:Variable Statistics}.

In 7th grade we learned about the **M.A.D.** or Mean Absolute Deviation (or Difference).

The **Standard Deviation** uses the Average of the SQUARES of the Differences.

The TI-84 can do some amazing statistics, but remembering the steps may be difficult!

In this problem all 4 sets of data have the same Mean (or Average). **(Make W = 10, and see what you get!)**

(W) is a constant value in each problem. **[STAT]. {Edit}. {Calc}. {1Variable Statistics}**

A) W - 2, W - 1, W, W + 1, W + 2 MAD: $| -2 | + | -1 | + | 0 | + | +1 | + | +2 | = 6 / 5 = 1.2$

B) W - 2, W - 2, W, W + 2, W + 2 MAD: $| -2 | + | -2 | + | 0 | + | +2 | + | +2 | = 8 / 5 = 1.6$

C) W - 3, W - 1, W, W + 1, W + 3 MAD: $| -3 | + | -1 | + | 0 | + | +1 | + | +3 | = 8 / 5 = 1.6$

D) W - 3, W, W, W, W + 3 MAD: $| 3 | + | 0 | + | 0 | + | 0 | + | +3 | = 6 / 5 = 1.2$

Question 33: Answer: (A)

Abby scored a: **87, 93, 96 and 89** on her first 4 tests.

What must she make to have an average of **91** on all 5 tests?

Since the Average (91) = **SUM / 5**, the sum of 5 tests must be: **91 * 5 = 455**

$$\text{So, the last test needs to be: } 455 - 87 - 93 - 96 - 89 = \mathbf{90}$$

She needs to make a 90 on her last test to have an Average of 91.

Or **Par Averaging Method**: Compared to **91**: -4, +2, +5, -2 = -1 **91 - 1 = 90**

They give you possible values so you could try each one of them! {90, 94, 98, 100}

REVISED: April 28, 2022: Check your work to mine! KEY. There is more than one way to solve problems

Question 34: Answer: (B)

If the *Perimeter* of a triangle is $8x + 6$ and two sides are: $(x + 1)$ and $(3x - 1)$,

What is the Length of the last side?

This is a **COMBINE LIKE TERMS**: $8x - 6 = A + B + C$ $8x - 6 = (x + 1) + (3x - 1) + C$

$$8x - 6 = 4x + C$$

$$\text{So: } 8x - 4x - 6 = C$$

$$C = 4x - 6$$

Question 35: Answer (D)

What are the solutions to the equation: $4x^2 - 52x + 169 = 121$

Put this into the **Quadratic Formula**: $4x^2 - 52x + 169 - 121 = 0$

$$4x^2 - 52x + 48 = 0$$

$$\text{Factor out a (4)} \rightarrow 4(x^2 - 13x + 12)$$

What two factors **multiply** together to get **+12** and **add** together to get: **-13**?

$$(x - 1)(x - 12) \quad \text{So, } x = 1 \text{ and } x = 12$$

Or TRY SOLUTIONS they give you into the problem! *If '1' works, then '-1' cannot work.*

Or Use the QUADRATIC: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ **a = (1)** **b = (-13)** **c = (12)**

$$\frac{-(-13) \pm \sqrt{13^2 - 4 \cdot 1 \cdot 12}}{2 \cdot 1} = \frac{13 \pm \sqrt{169 - 48}}{2} = \frac{13 \pm \sqrt{121}}{2} = \frac{13 \pm 11}{2}; \quad \frac{13+11}{2} \text{ and } \frac{13-11}{2} \quad \frac{24}{2} = 12 \quad \text{and} \quad \frac{2}{2} = 1$$

Question 36: Answer: (A)

David has a rectangle and a right triangle.

The length of the rectangle is 5 more than the width.

The length of the shorter leg of the triangle is the same as the width of the rectangle.

The length of the longer leg of the triangle is twice the length of the rectangle.

WHAT IS THE **COMBINED ARE** = RECTANGLE + TRIANGLE DRAW A PICTURE

$$\text{Area Rec} = \text{Length} \times \text{Width}$$

$$\text{Length} = (W + 5)$$

$$\text{Area Rec} = (W + 5)(W) = \mathbf{w^2 + 5w}$$

$$\text{Area Tri} = \frac{bh}{2}$$

$$\text{Base} = W, \text{ and Height} = 2(L) \text{ or: } 2(w + 5) \rightarrow 2w + 10;$$

$$\text{so: } \frac{w(2w+10)}{2} = \frac{2w^2 + 10w}{2} = \mathbf{w^2 + 5w}$$

$$\mathbf{(w^2 + 5w) + (w^2 + 5w) = 2w^2 + 10w}$$

Question 37: Answer: (C) Statistics Problem using Line of Best Fit: This really requires that you use the TI-84 calculator to find the slope and intercept.

You could also try to PLOT the points and "Guess" at the Line of Best Fit, but you may be off!

You are asked to compare AMANDA'S SCORE (of a 93) based on her 3.5 hours of Study compared to the Line of Best fit Model: $Y = mx + b$

Answer: (C) Amanda's score is about 2 points lower than what is predicted by the model.

See detail notes for using the TI-84 CALCULATOR STEPS! [STAT] {Edit}. And [STAT] {Calc} and [STAT] {Tests}

Question 38: Answer: (-13)

What is the slope of a line that is *perpendicular* to: $y = -\frac{1}{3}x + 5$ that goes through **(1, -10)**?

Key Information: Parallel Lines have the SAME SLOPE.

Perpendicular Lines have Negative Reciprocal Slope: so: $-\frac{1}{3}$ becomes $+3$

$$\text{Perpendicular: } y = 3x + b$$

$$\text{Given: (1, -10)}$$

$$-10 = 3(1) + b$$

$$b = -13$$

REVISED: April 28, 2022: Check your work to mine! KEY. There is more than one way to solve problems

Question 39: Answer: (C)

Where do the two functions intersect? (System of Equation: Guess, Graph, Substitute, Eliminate)

$$F(x) = 3x + 7$$

$$G(x) = 2x + 12$$

A) -22

B) -5

C) 5

D) 22

Try It: $-59 \neq -30$

$-8 \neq 2$

$22 = 22$

$73 \neq 36$

Or: $3x + 7 = 2x + 12$

$3x - 3x = 12 - 7$

$x = 5$

Work Smart, Not Hard!

Question 40: Answer: (A) Statistics: This is a DEFINITION Question. What is the meaning of (r)?

Marcus measured the height in inches (y) over the course of 3 weeks and the **Correlation Coefficient** between the number of days (x) and the height of the plans is **.85**.

Which could be concluded based on the Correlation Coefficient of the data?

A) Strong: Days increase, Height Increases

B) Strong: Days Increase, Height Decrease

C) Weak: Days Increase Height Increases

D) Weak: Days Increase, Height Decrease

Correlation Coefficient is the variable (r) in statistics;

<https://www.displayr.com/what-is-correlation/>

The *correlation*, or the *correlation coefficient*, or just the letter *r* (written in italics):

A correlation of **1** indicates a perfect positive correlation.

A correlation of **-1** indicates a *perfect negative correlation*.

A correlation of **0** indicates that there is no relationship between the different variables.

Values between -1 and 1 denote the strength of the correlation.

Question 41: Evaluate the function: $g(x) = 19.6 + 1.74x$ (Simple Substitution of x)

What is the value of: $g(30)$?

$$19.6 + 1.74(30) =$$

$$19.6 + 52.2$$

$$\mathbf{71.8}$$

Question 42 Answer: (A) Statistics. A table of data is given.

They ask, if one value (POLAR BEAR: 1000 pounds) Is removed, which statement is TRUE:

There are Eight (8) pieces of Data: **225, 300, 550, 200, 1000, 300, 280, 100**

A) The Mean decreases more than the median because the polar bear is high outlier

B) The Mean decrease less than the median because the polar bear is a high outlier

C) The Mean decrease more than the median because of the high value balances the low

D) The Mean decrease less than the median because the high balances the low

When given data about a MEDIAN, the data must be in order:

{100, 200, 225, 280, 300, 300, 550, 1000}

Since there are and EVEN number of points (8),

the MEDIAN is the average of the 4th (280) and 5th (300) data values OR 290 pounds.

By removing the 1000, there are now 7 points; so, the median is NOW the 4th value: (280).

Removing the 1000 from the data will decrease the average (MEAN).

Answers C and D are strange: High and Low values?

Another statistic is RANGE: (High – Low) would go from: 1000 – 225 to 555 - 225.

REVISED: April 28, 2022: Check your work to mine! KEY. There is more than one way to solve problems

Question 43: The vertices of a rectangle are (1, 2), (5, 0), (2, -6) and (-2, -4); **What is the AREA?**

Notice that the corners ARE NOT Horizontal or Vertical to the x and y axis!

Draw a sketch and use the **Pythagorean Theorem** to find the Length and Width.

$$\text{Width} = (1, 2) \text{ to } (5, 0) \quad a: \Delta x = |5 - 1| \text{ and } b: \Delta y = |0 - 2| \quad \text{so: } 4^2 + 2^2 = c^2 = 16 + 4 = \sqrt{20}$$

$$\text{Length} = (2, -6) \text{ to } (5, 0) \quad a: \Delta x = |5 - 2| \text{ and } b: \Delta y = |0 - -6| \quad \text{so: } 3^2 + 6^2 = c^2 = 9 + 36 = \sqrt{45}$$

$$\text{Area} = \text{Length} \times \text{Width} = \sqrt{20}\sqrt{45} = \sqrt{900} = \mathbf{30 \text{ Square Units}}$$

$$\text{Without a calculator: } \sqrt{20}\sqrt{45} \text{ Could be: } \sqrt{5 \times 4} \sqrt{9 \times 5} = 2 \times 3 \times 5 = 6 \times 5 = \mathbf{30 \text{ Units}^2}$$

Question 44: (ON LINE TEST) Which **Could** be used to model a Linear Function?

- | | |
|--|-----|
| The population of a town decrease by 15% each year | No |
| An airplane descends at a rate of 20 feet per minute | Yes |
| A pizza is \$5.50 plus \$.50 per topping | Yes |
| A cell doubles every two hours | No |

Question 45: What is the distance **between the y intercepts** of the equation:

$$f(x) = 2x^2 - 6x + 3 \text{ and}$$

the linear function represented by the table. $g(x)$: (-5, 15) (-2, 3) (2, -13) (5, -25)

Intercept is when $x = 0$, $f(x)$; So, $y = 3$.

A Linear Equation is: $y = mx + b$: Pick 2 (A and C)

$$\text{points: } \frac{\Delta y}{\Delta x} = \frac{15 - (-13)}{-5 - 2} = \frac{28}{-7} = -4$$

$$3 = -4(-2) + b$$

$$3 = 8 + b$$

$$b = -5$$

$$\text{Answer: (C) 8 Units} \quad |-5| + |3| = 5 + 3 = 8$$

Question 46: Answer (B) Statistics Question. Given a data table of Walking Heart Rate and Running Heart Rate, Use the Linear Best Fit Model to predict the rate of a girl with a walking rate of 100 bpm.

See detail Calculator Notes For Question 46: Finding Regression Line: Option4: $y = ax + b$

Use the Calculator [STAT] function or Plot points and try to guess the Line of Best Fit.

Since all the answers are pretty close, finding the SLOPE may be difficult! (or impossible)!

Enter data into L1 (x) walking and L2 (y) Running)

| | | | | | | | |
|-----------------------|---------|---------|---------|---------|---------|---------|---------|
| 66, 128 | 72, 136 | 74, 134 | 78, 138 | 80, 142 | 84, 146 | 86, 148 | 88, 152 |
| Given Answers: A) 161 | | B) 163 | | C) 165 | | D) 167 | |

Question 47: Statistics Question. ON LINE TEST

SKEWED and NORMAL Data Graphs

Question 48: A rectangle has a perimeter of 64.

Let $x =$ the width. Let $y =$ the Area

What equation could be used to find the Area?

$$\text{Perimeter} = 2(L + W) \quad 64 = 2(X + Y) \quad \rightarrow 64 / 2 = (L + X) \quad 32 = L + X \quad \text{So: } L = 32 - X$$

$$\text{AREA} = \text{Length} \times \text{Width} \quad (32 - x)(x) = -x^2 + 32x \quad \text{Answer: D}$$

Question 49: Answer (C)

Answers: A: (1, 1)

B: (2, 4)

C: (2, 5)

D: (3, 5)

What is the **Midpoint** of the longest side of a triangle with Vertices at (1, 4), (3, 4) and (3, 6)?

Draw a Picture: The hypotenuse goes from (1, 4) to (3, 6).

$$\text{Midpoint: } (1 + 3) / 2 \quad (4 + 6) / 2$$

$$4 / 2 \quad 10 / 2$$

$$2 \quad 5$$

Question 50: Slope of line of Best Fit for points: (50, 1.5)

(200, 6)

(350, 10.5)

(400, 12)

(650, 19.5)

$$\text{SLOPE} = \frac{\Delta y}{\Delta x} = \frac{\text{Change in } Y}{\text{Change in } X} : \frac{12-6}{400-200} \sim \frac{6}{200} \sim \frac{3}{100} \quad \text{Answer (B)}$$