

8th EOG

Expanded Control
2019

1) linear equations (equations that form a line)

$$y = mx + b$$

For any point on the line represented by x and y , the slope of the line is m and the point the line hits the y axis is b .

$b = -2$ because the line crosses the y axis at -2 . In order to get to the next point from -2 , we move up 2 (rise) and over 3 (run) $\frac{2}{3}$

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

② The slope is the same as the rate of change = $\frac{\text{change } y}{\text{change } x} = \frac{\text{rise}}{\text{run}} = m$

$$y = x - 2$$

↑
slope = 1

$$y = mx + b$$

↑ ↑
slope y-intercept

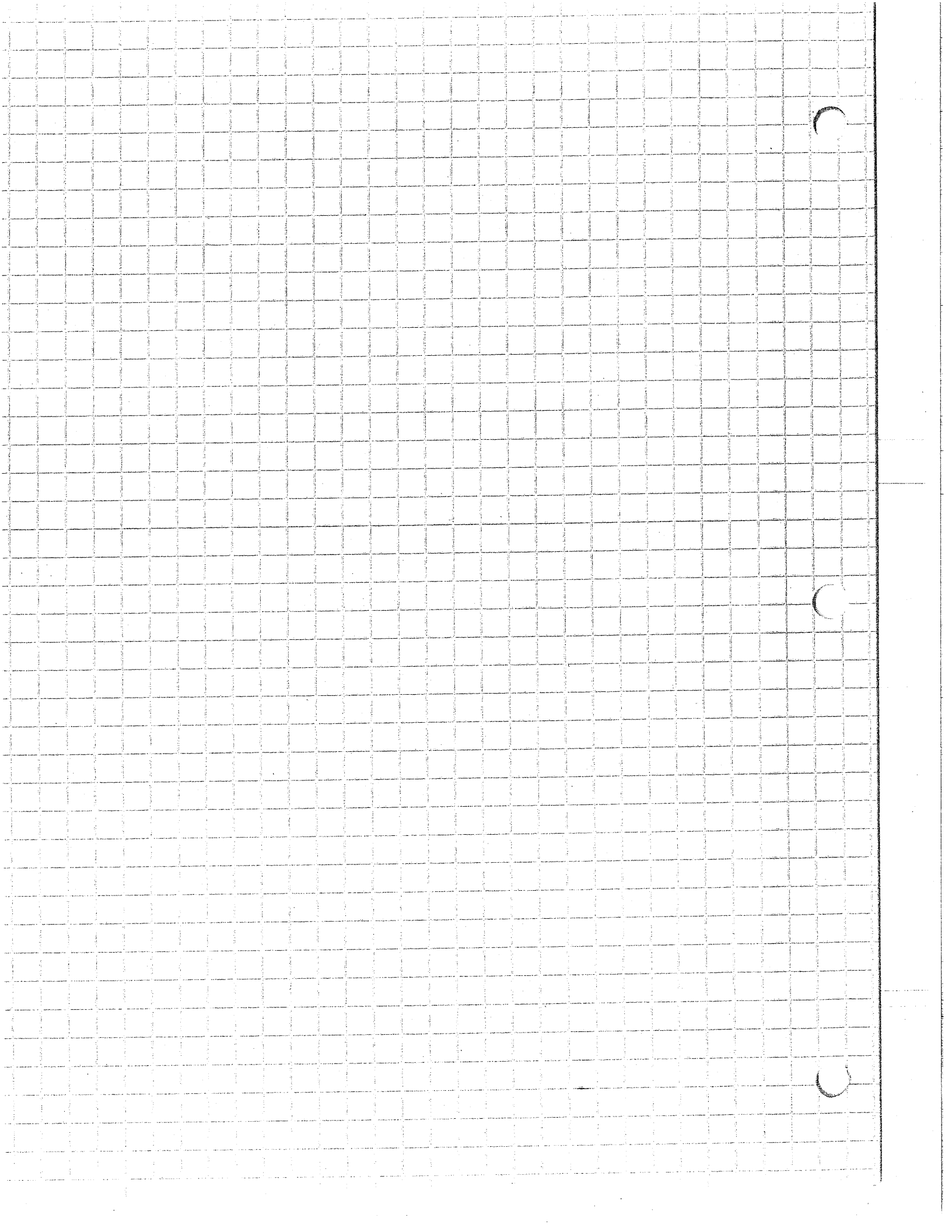
Find the slope of each graph and compare.

③ → has a slope $\frac{5}{4} = 1\frac{1}{4}$

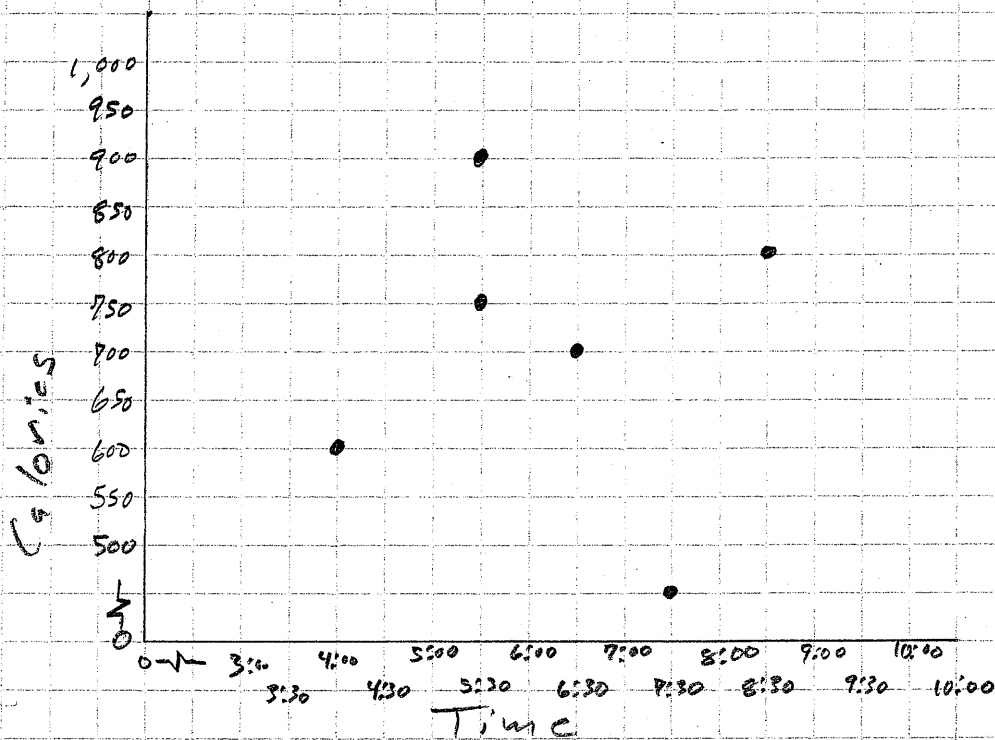
A → $\frac{3}{4}$

B → $\frac{1}{2}$

D → $\frac{2}{7}$?



3)



I cannot draw a line to connect or even group these points. The best answer is that they have almost no relation to each other. Definitely not a function because we have two y values for the same x (5:30).

- 4)
- A) $\frac{4\pi}{\pi} = 4$ because the π cancel. 4 is a counting number, definitely rational.
 - B) $\sqrt{6^2} = 6$ because the $\sqrt{\quad}$ cancels the 2 leaving 6. 6 is rational.
 - C) $\sqrt{18}$ → there is no number that can be squared to equal 18.
 - D) 21.989 is rational

A rational number is any number that can be written as a fraction.

5) linear function can be written as $y = mx + b$

$$A) y = \frac{x}{4} + 5 \rightarrow y = \frac{1}{4}x + 5 \checkmark$$

$$B) y = 10 + x \rightarrow y = x + 10 \checkmark$$

$$C) y = \frac{x+3}{4} - 2x$$

$$4y = x + 3 - 8x$$

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

$$y = -\frac{7}{4}x + \frac{3}{4} \checkmark$$

$$D) y = \frac{2}{x+3} - 5$$

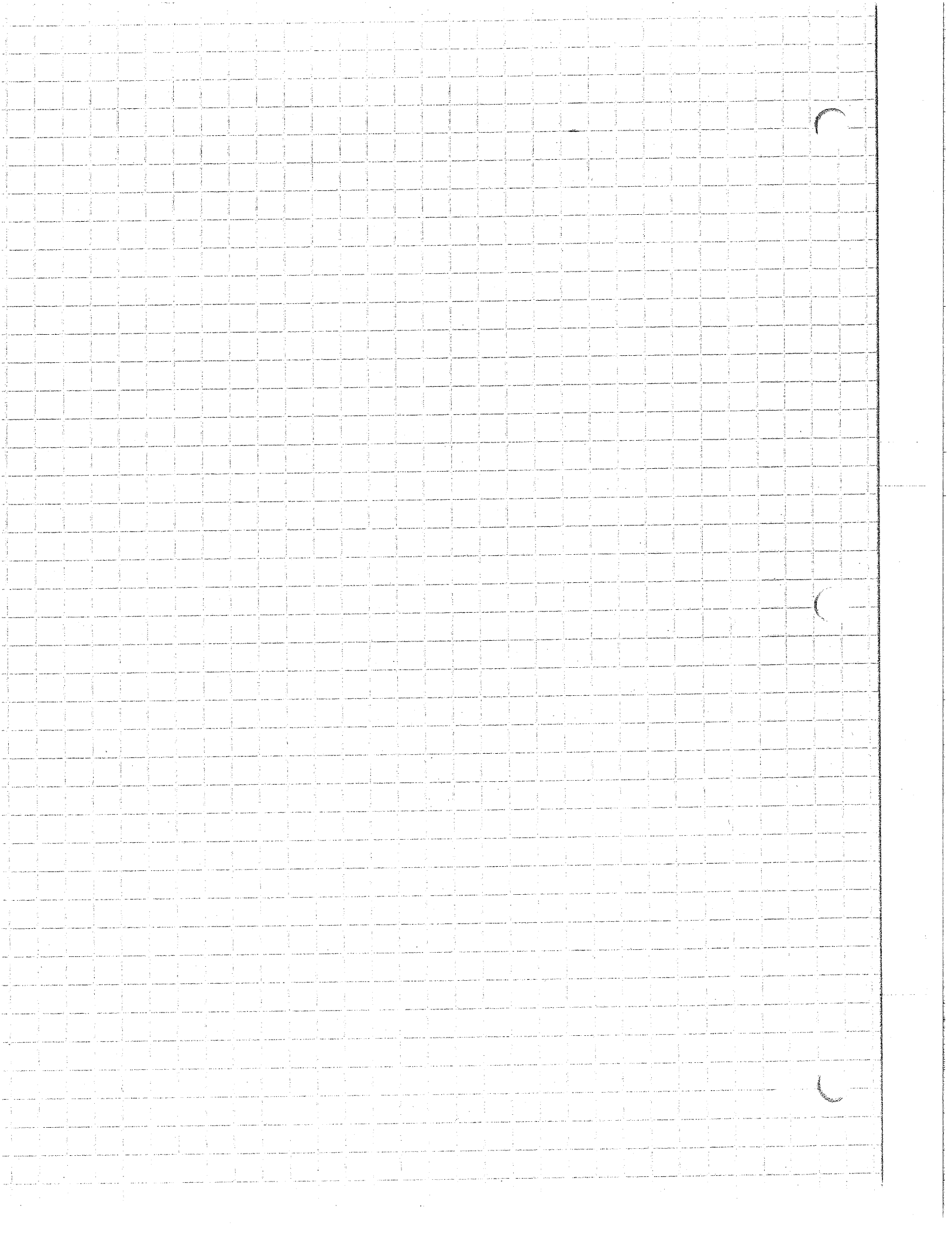
$$y(x+3) = 2 - 5(x+3)$$

$$xy + 3y = -3$$

cannot combine or divide \times

6) the y -intercept is the starting point for a function. If I put 0 in for x I would get $y = 98$ so if a student misses no days, we expect they will get a 98. \rightarrow A

7) Since b is not in the equation, b must equal zero. I also know that since it is a negative x , the slope is negative (declining as we go left-to-right).
The slope can be written $-x = \frac{-1}{1}x$
graph C shows this.



8)

		+2	+2	+2	+2
X	0	2	4	6	8
Y	24	18	12	6	0
		-6	-6	-6	-6

 slope is a constant $\frac{-6}{2} = -3$

9)

		+2	+2	+2	+2
X	0	2	4	6	8
Y	24	18	13	9	6
		-6	-5	-4	-3

 slope is NOT constant,
this is NOT linear

9) A) 121 is 11^2 but nothing cubed

B) 100 is 10^2 but nothing cubed

C) 64 is 8^2 AND 4^3

D) 16 is only 4^2

10) A)

0, 1, 2
-1, 1, 3
+2, 1, 3

 X

B)

4, 2, -1
-2, 2, 1, -2
+2, 4, -2

 X

C)

0, 0, +0
+8, 0, +8
-8, 0, +8
0, 8

 X

D)

1, 2, +2
+1, 2, 4, +4
+2, 4, 8

slope is only a constant $\frac{y_2 - y_1}{x_2 - x_1}$ for D

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

11) The area of the square is 49 cm^2 , then
the sides must be 7 because
 $7^2 = 49$. The perimeter is 4 times
the side. $4 \times 7 = 28$

12) slope = $m = \frac{y_2 - y_1}{x_2 - x_1}$

$(2, 3)^1$
 $(8, 6)^2$

$$\frac{6 - 3}{8 - 2} = \frac{3}{6} = \frac{1}{2}$$

$$13) \frac{\pi^2}{4} \approx \frac{3.14^2}{4} \approx \frac{9}{4} = 2\frac{1}{4} = 2.25$$

$$\frac{\pi^2}{8} \approx \frac{3.14^2}{8} \approx \frac{9}{8} = 1\frac{1}{8} = 1.125$$

$$\sqrt{2} \approx 1.4$$

$$\sqrt{3} \approx 1.7$$

	1.3	
	1.3	
	3 9	
	1 3	
	2 1.6 9	
1.4	1.5	4 7
1.4	1.5	1.7
5 6	1.5	1.7
1 4	1.5	
1.9 6	1.5	
	2 7 5	
	1 5	11 9
	2.2 5	17
		2.8 9
		1.125
		8 1.0
		8
		20
		16
		40
		40
		0

least

greatest



1.125, 1.4, 1.7, 2.25

$\frac{\pi^2}{8}$, $\sqrt{2}$, $\sqrt{3}$, $\frac{\pi^2}{4}$

2 3 4 1

$$\begin{aligned}
 14) \quad & x^3 + 1 = 9 \\
 & -1 \quad -1 \\
 & \hline
 & x^3 = 8 \\
 & x \cdot x \cdot x = 8 \\
 & 2 \cdot 2 \cdot 2 = 8
 \end{aligned}$$

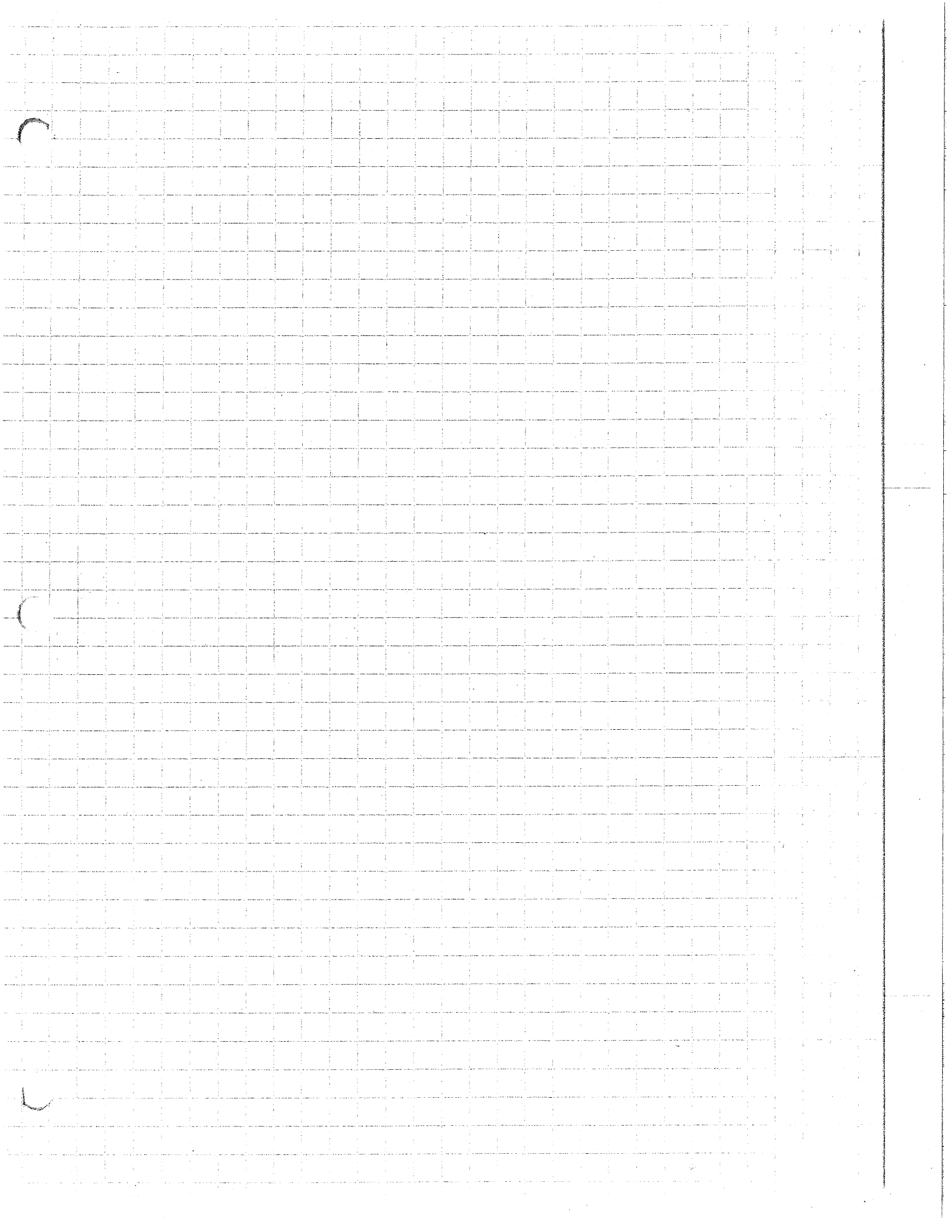
$$\begin{aligned}
 15) \quad & \sqrt{230} \rightarrow x \cdot x = 230 \quad 10 \cdot 10 = 100 \\
 & \quad \quad \quad \quad \quad \quad \quad 12 \cdot 12 = 144 \\
 & \quad \quad \quad \quad \quad \quad \quad 13 \cdot 13 =
 \end{aligned}$$

$$\begin{array}{r}
 3 \\
 16 \\
 16 \\
 \hline
 196 \\
 16 \\
 \hline
 256
 \end{array}$$

$$\begin{array}{r}
 13 \\
 13 \\
 \hline
 37 \\
 13 \\
 \hline
 169
 \end{array}$$

$$\begin{array}{r}
 1 \\
 14 \\
 \hline
 56 \\
 14 \\
 \hline
 196
 \end{array}
 \quad
 \begin{array}{r}
 2 \\
 15 \\
 \hline
 175 \\
 15 \\
 \hline
 225
 \end{array}$$

15^2 is closer than 16^2 so **15**



16) Because it is a square I know the sides are parallel. That makes the two angles alternate interior angles and alt. interior angles are equal.

$$2x + 15 = 6x - 45 \quad \leftarrow -2x \text{ from both sides}$$

$$15 = 4x - 45$$

$$60 = 4x \quad \leftarrow +45 \text{ to both sides}$$

$$15 = x \quad \leftarrow \text{divide both sides by 4}$$

$$17) .25x + 7 = 4(x - 2)$$

$$.25x + 7 = 4x - 8 \quad \leftarrow - .25x \text{ from both sides}$$

$$7 = 3.75x - 8 \quad \leftarrow + 8 \text{ to both sides}$$

$$15 = 3.75x \quad \leftarrow \text{divide both sides by } 3.75$$

$$\boxed{4 = x}$$

18) Rate of change is the slope

$$\frac{y_2 - y_1}{x_2 - x_1} \rightarrow \frac{3 - 9}{-1 - 2} = \frac{-6}{-3} = 2$$

negative divided by
a negative is a positive

$$19) 12(x-2) + 3x = \frac{1}{2}(x+6) + 2$$

$$12x - 24 + 3x = \frac{1}{2}x + 3 + 2$$

$$15x - 24 = \frac{1}{2}x + 5$$

$-\frac{1}{2}x \quad -\frac{1}{2}x$

$$14\frac{1}{2}x - 24 = 5$$

$+24 \quad +24$

$$14\frac{1}{2}x = 29$$

$\frac{14\frac{1}{2}}{14\frac{1}{2}} \quad \frac{29}{14\frac{1}{2}}$

$$x = 2$$

20) Because the two angles are on parallel lines they are supplementary angles (They add up to 180°)

$$2x + 40 + 3x - 85 = 180$$

Combine the x values

$$5x + 40 - 85 = 180$$

Combine the constants

$$5x - 45 = 180$$

add 45 to both sides

$$5x = 225$$

divide both sides by 5

$$x = 45$$

21) In order to perform any math operations, first I need both numbers to be in the same form. To make the math easier, I'll put them both into scientific notation.

$$9.46 \times 10^{12} \text{ Kilometers}$$

$$150,000 = 1.5 \times 10^5 \text{ light years}$$

$$9.46 \times 10^{12} \times 1.5 \times 10^5$$

simplify \rightarrow

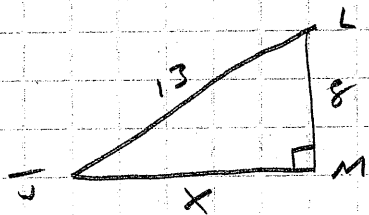
$$14.19 \times 10^{17}$$

$$1.419 \times 10^{18}$$

When you multiply with exponents, first you multiply the coefficients, then add exponents.

Be sure the coefficients are greater than one and less than ten.

22) Rectangles have 90° corners so I know $\angle JML = 90^\circ$



$$a^2 + b^2 = c^2$$

$$8^2 + x^2 = 13^2$$

$$64 + x^2 = 169$$

$$-64 \quad -64$$

$$\sqrt{x^2} = \sqrt{105}$$

\leftarrow To cancel the exponent, w/ take the root of both sides.

$$x = 10.24$$

23) The y-intercept of a function shows the starting point. Since the slope is negative, I know the starting point is the greatest value for the car.

24) Volume of any prism is the area of the base times the height.

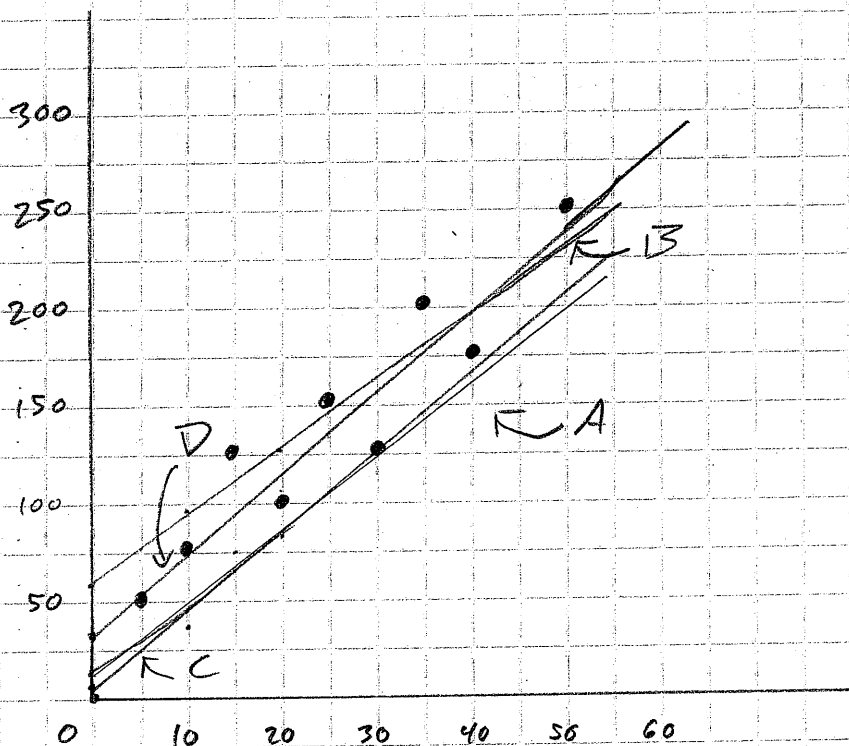
base area is a circle $A = \pi r^2$

$$452.16 \times \text{height} (42) \quad \pi r^2 = 452.16$$

18,990.72

C is the closest.

25)



When I graph the 4 equations, I can tell equation D goes through at least one point and goes through the middle of the scatter plot (it has roughly the same number of dots above the line as below the line).

26) For it to be a function, the x values cannot repeat. The y values can, but not the x's.

A is the only data set where the x's do not repeat.

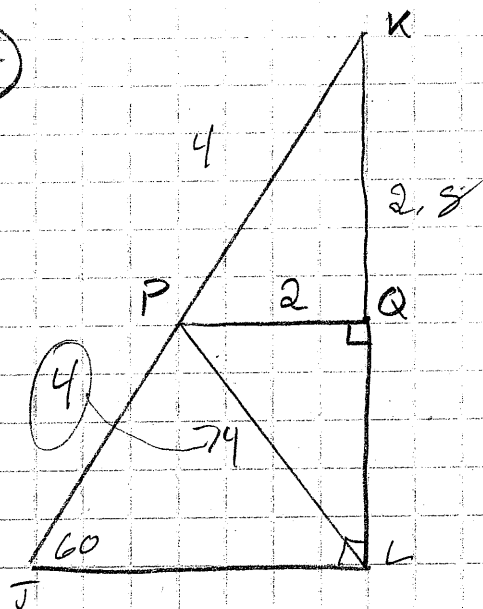
2) When she walks, both distance and time change.

• When she jogs, she will increase the distance faster than the time increases.

• Then, when she slows down, her distance will change more slowly, but it will not stay the same because she never stops. Flat lines show time increasing but distance staying the same so we know we don't want any flat lines.

Dis is the best answer.

28)



$$a^2 + b^2 = c^2$$

$$2^2 + x^2 = 4^2$$

$$2^2 + x^2 = 4^2$$

$$4 + x^2 = 16$$

$$4 + x^2 = 16$$

$$x^2 = 12$$

$$x^2 = 8$$

$$x \approx 3.46$$

$$x \approx 2.8$$

$$2 + 4 + 3.46 = 9.46$$

B is closest

How do I know that is isosceles?

29) A company $\rightarrow y = .5x + 35$ per day
 B company $\rightarrow y = .75x + 20$ per day
 At what point are they equal?

$$.5x + 35 = .75x + 20$$

$-.5x$ from both sides

$$35 = .25x + 20$$

-20 from both sides

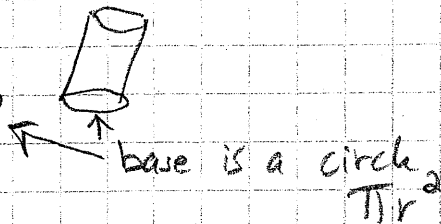
$$15 = .25x$$

divide both sides by $.25$

$$60 = x$$

30) Volume of a cylinder

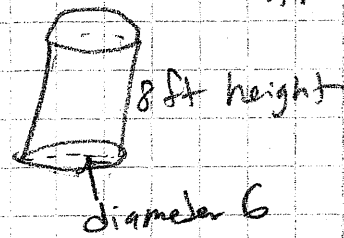
Area of the base
times the height



$$\text{Volume}_{\text{cylinder}} = \pi r^2 \cdot h$$

radius is half the diameter

$$\frac{6}{2} = 3 \quad \text{radius} = 3$$



$$\pi \approx 3.14$$

$$3.14 \cdot 3^2 \cdot 8$$

$$3.14 \cdot 9 \cdot 8 = 226.08$$

226
cubic
feet

31) Dilation can enlarge or shrink an object making a new object that is proportional to the original object.

1st Find the coordinates of the object

$$L(-3, 4) \quad M(3, 4) \quad N(3, 1)$$

2nd multiply each by the scale factor

$$L \rightarrow -3 \cdot \frac{1}{2} = -1.5 \quad 4 \cdot \frac{1}{2} = 2 \quad M \rightarrow 3 \cdot \frac{1}{2} = 1.5$$

$$L'(-1.5, 2) \quad M'(1.5, 2) \quad 4 \cdot \frac{1}{2} = 2$$

$$N'(1.5, 0.5)$$

$$N \rightarrow 3 \cdot \frac{1}{2} = 1.5$$

$$1 \cdot \frac{1}{2} = 0.5$$

(3d) trend line is a line that best represents the data.

or "rise or change"

$$\text{Slope} = \frac{\text{rise}}{\text{run}} = \frac{\text{change } y}{\text{change } x} = \frac{y-y}{x-x}$$

*Notice that "Plant growth (inches)" is the y-axis and "hours of sunlight" is on the x-axis.

The line passes (0,0) so you can find another point. (3,1) is

Close.

$$\frac{\text{rise}}{\text{run}} = \frac{1}{3} \text{ or } \frac{1-0}{3-0} = \frac{1}{3}$$

← inches
← hours

1 inch every 3 hours of sunlight

(33) rate of change = Slope = $\frac{\text{change } y}{\text{change } x} = \frac{y_2 - y_1}{x_2 - x_1}$

- Find Jake's rate of change.
- Pick two points

$(1, 84)$ $(2, 91)$

$$\frac{91 - 84}{2 - 1} = \frac{7}{1} = 7 \text{ points per hour studied}$$

- Howie $\frac{6}{1} = 6$ points each hour

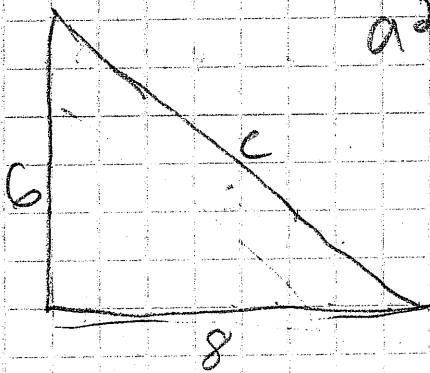
Jake's score is 1 point greater than Howie.

(A)

39

We need to find the length of the rectangle. In order to do that we first use the pythagorean theorem with the triangle

$$a^2 + b^2 = c^2$$



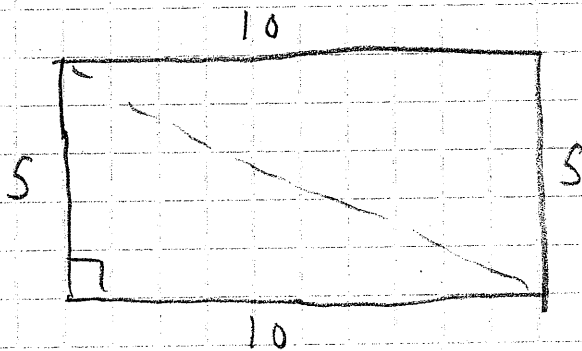
$$6^2 + 8^2 = c^2$$

$$36 + 64 = c^2$$

$$100 = c^2$$

$$\sqrt{100} = \sqrt{c^2}$$

$$10 = c$$



$$a^2 + b^2 = c^2$$

$$10^2 + 5^2 = c^2$$

$$100 + 25 = c^2$$

$$125 = c^2$$

$$\sqrt{125} = \sqrt{c^2}$$
$$11.1 = c$$

30) $V = \text{base area} \times \text{height}$
 The base of a cylinder is a circle

$$A = \pi r^2$$

$$A = 3.14 \cdot 3^2$$

$$A = 28.26 = 3.14 \cdot 9$$

$$V = A \cdot \text{height}$$

$$V = 28.26 \cdot 8$$

$$V = 226.08$$

B is the closest

31) To dilate from the origin, you multiply each x and y coordinates by the scale factor.

original x factor dilated

$$L(-3, 4) \quad \frac{1}{2} \quad (-1.5, 2)$$

$$M(3, 4) \quad \frac{1}{2} \quad (1.5, 2)$$

$$N(3, 1) \quad \frac{1}{2} \quad (1.5, .5)$$

(C)

32) Of the three choices, only (D) comes close to the given trend line.

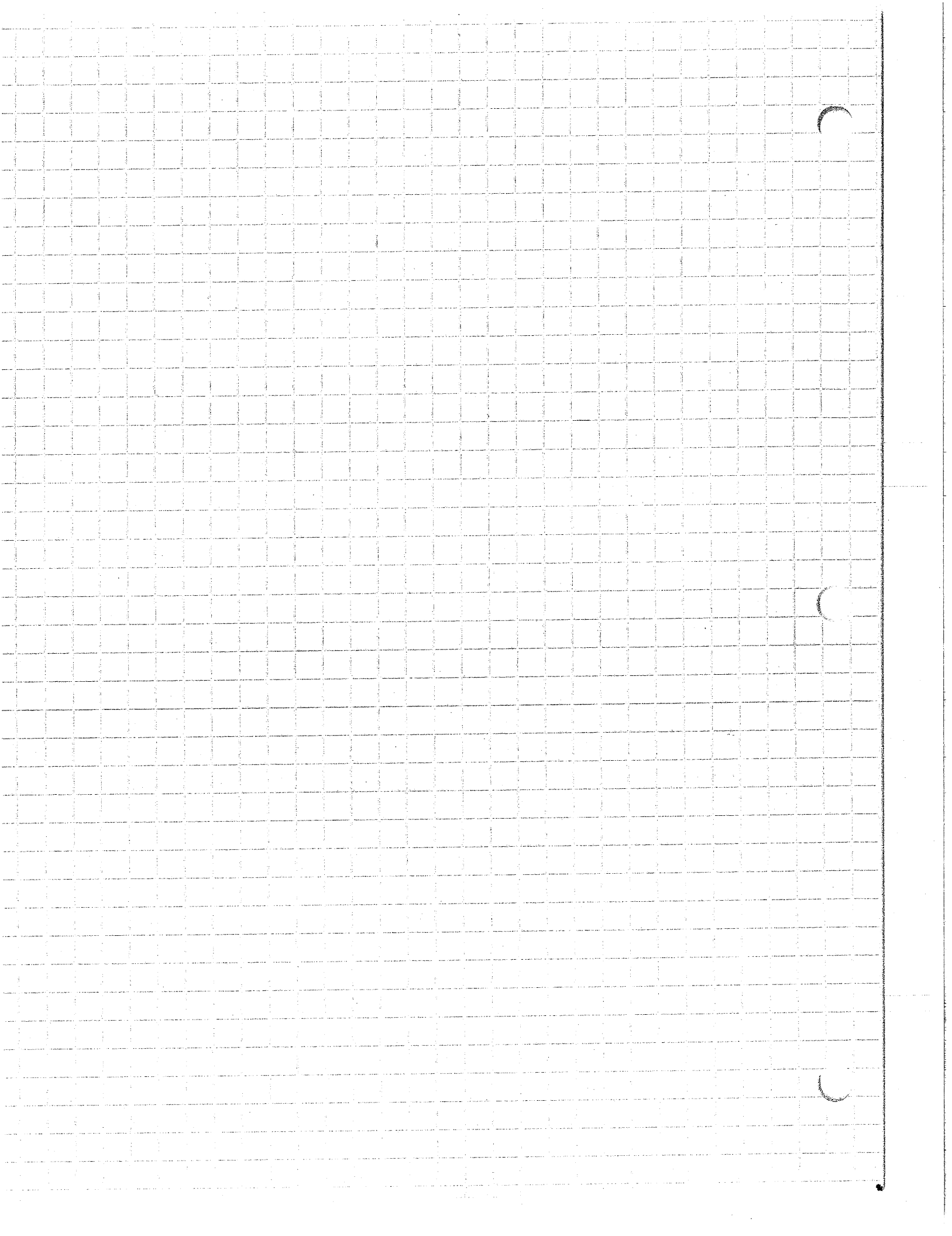
33) Rate of change is the slope of a formula

$$\text{slope} = m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\text{Jake's } m = \frac{91 - 84}{2 - 1} = \frac{7}{1} = 7$$

Hawie's m is given as 6

(A)



34) I can use pythagoras to help me find the hypotenuse of the top triangle. The hypotenuse is also the side of the rectangle. That will give me the two sides I need to use pythagoras to answer the question.

$$a^2 + b^2 = c^2 \text{ where } c \text{ is always the hypotenuse}$$

Top triangle

$$6^2 + 8^2 = c^2$$

$$36 + 64 = c^2$$

$$100 = c^2$$

$$\sqrt{100} = \sqrt{c^2}$$

$$10 = c$$

Rectangle

$$5^2 + 10^2 = c^2$$

$$25 + 100 = c^2$$

$$125 = c^2$$

$$\sqrt{125} = \sqrt{c^2}$$

$$11.18 = c$$

11 is the closest at 11 inches

35) The first bullet point shows that 67% of the students are not in Lit. Club. The table says that is 16 students. I can set up a ratio to solve this

$$\frac{\text{part}}{\text{whole}} \rightarrow \frac{67}{100} = \frac{16}{x}$$

$$1600 = 67x$$

$$23.88 = x \approx 24$$

24 In math and
-16 Lit. club
8

The second bullet point is tricky. It gives us the percent of the y value, not the constant.

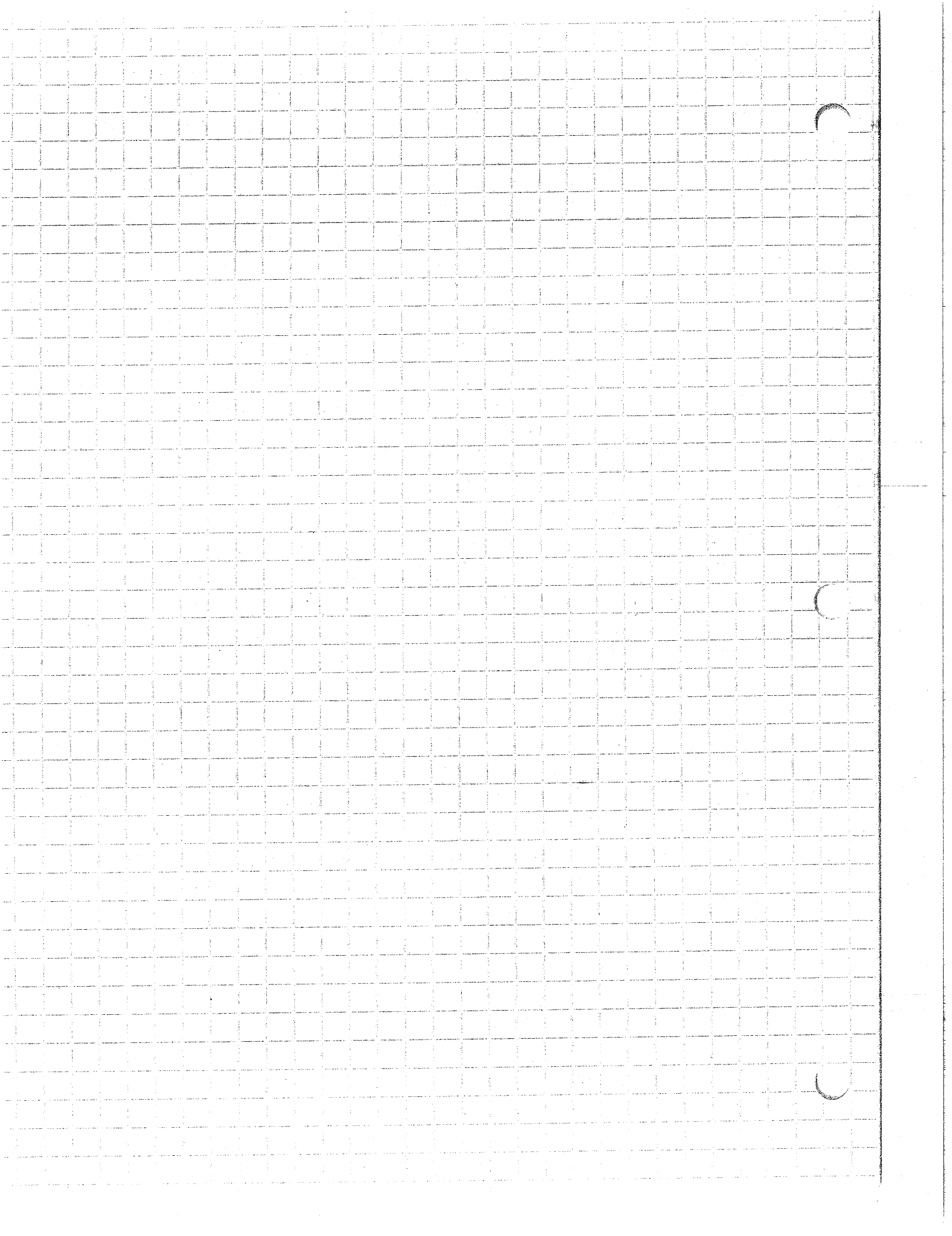
$$100\% - 78\% = 22\%$$

$$\frac{p}{w} \rightarrow \frac{22}{100} = \frac{4}{x}$$

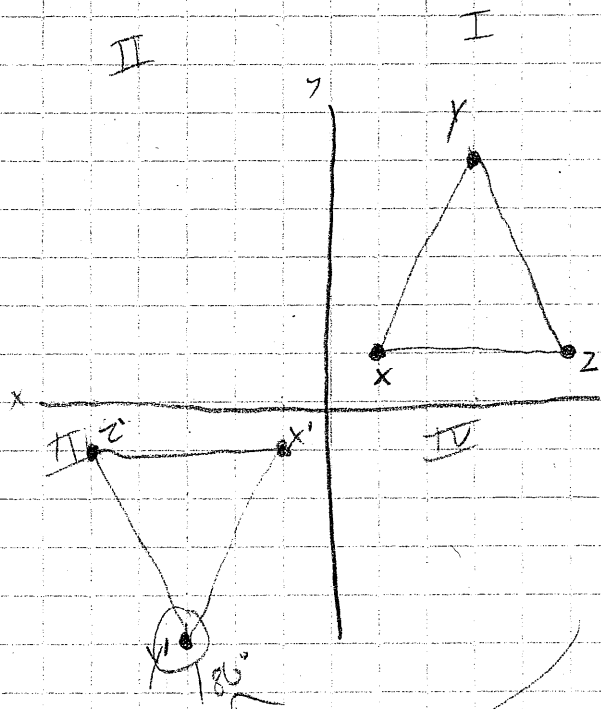
19 Not in math or
-4 Lit. club
15

$$400 = 22x$$

$$18.18 = x \approx 19 \text{ total}$$



36



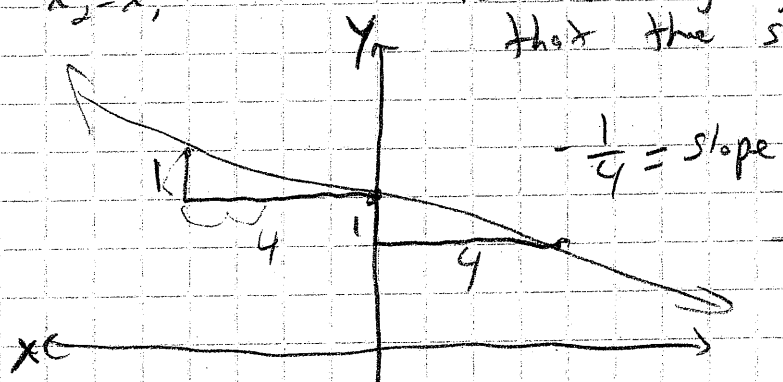
* rotate your paper
Once for 90°
twice for 180°

$(-3, -5)$ (B)

(37) Slope = rate of change = $\frac{\text{rise}}{\text{run}} = m = \frac{\text{change in } y}{\text{change in } x}$

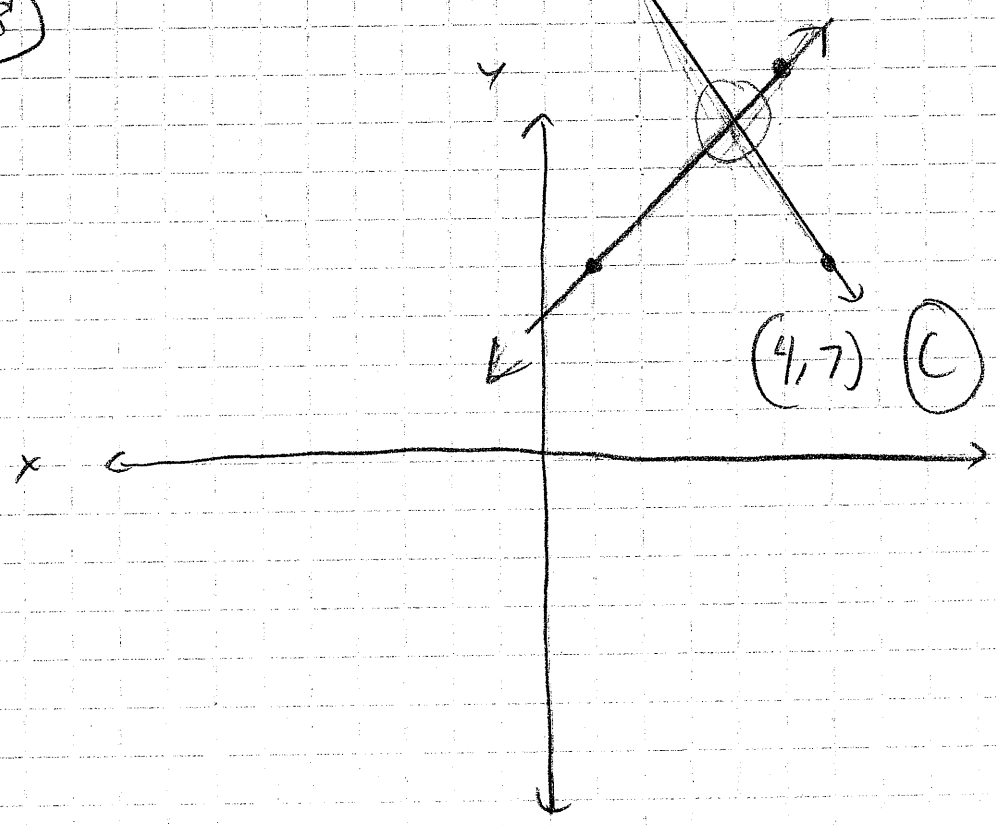
$$\frac{y_2 - y_1}{x_2 - x_1}$$

Reading the graph from left to right, we notice that the slope is negative

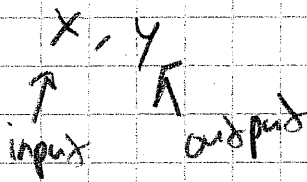


(D) $y = 2 - \frac{1}{4}x$
because you can rewrite it
as $y = -\frac{1}{4}x + 2$

(38)



39) Every input needs exactly one output



B, C, and D

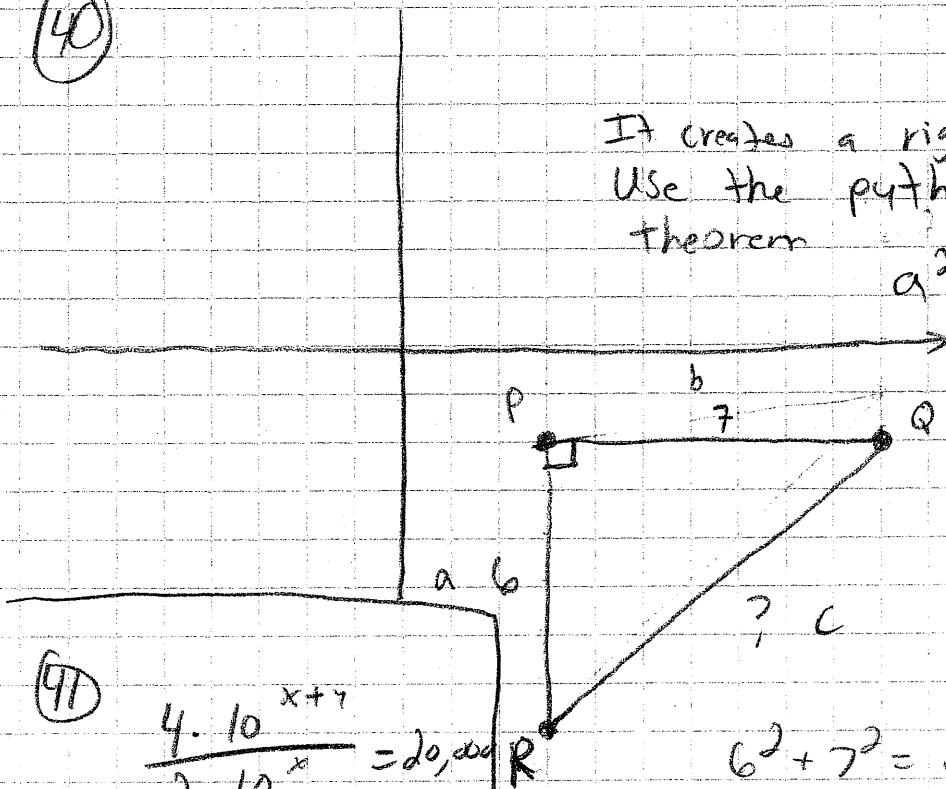
has multiple outputs for some input.

(A) would be best choice.
Every input (x-value) has one output (y-value)

40

It creates a right triangle. Use the pythagorean theorem

$$a^2 + b^2 = c^2$$



41

$$\frac{4 \cdot 10^{x+7}}{2 \cdot 10^x} = 20,000$$

$$2 \cdot \frac{10^{x+7}}{10^x} = 20,000$$

$$2 \cdot 10^{x+7-x} = 20,000$$

$$\frac{2 \cdot 10^7}{2} = \frac{20,000}{2}$$

(B)

$$6^2 + 7^2 = c^2$$

$$36 + 49 = c^2$$

$$\sqrt{85} = \sqrt{c^2}$$

$$9.2 = c$$

$$9 \cdot 9 = 81$$

$$10 \cdot 10 = 100$$

$$10^1 = 10$$

$$10^2 = 100$$

$$10^3 = 1,000$$

$$10^4 = 10,000$$

$$10^y = 10,000$$

$$(y = 4)$$

It has to be a right triangle.

$$\textcircled{4} \quad a^2 + b^2 = c^2$$

↑ ↑ ↖ hypotenuse
side side

$$y \Leftrightarrow x = 6 \text{ units} \quad \sqrt{45} \approx 6.7$$

$$6^2 + b^2 = 6.7^2$$

$$36 + b^2 = 6.7^2$$

$$\begin{array}{r} 36 + b^2 = 44.89 \\ -36 \quad \quad -36 \end{array}$$

$$\sqrt{b^2} = \sqrt{8.89}$$

$$b \approx 2.9 \text{ or } 3$$

3 would be the other side.

Answer C is the only one close to our answer.

You can also plot all answers and see which one makes sense.

(43)

$$y = 3x$$

3 would be the slope or m , $\frac{\text{rise}}{\text{run}}$
for Paula.

You need to add 1 to Julia
which would be 4

See the graph that has a slope
of 4

(D)

(44)

$$\text{radius} = \frac{\text{diameter}}{2}$$

$$r = \frac{6}{2} = 3$$

$$V = \frac{4}{3} \pi \cdot 3^3$$

$$V = \frac{4}{3} \cdot 3^3 \cdot \pi$$

$$= \frac{4}{3} \cdot 27 \cdot \pi$$

$$= 36 \pi \text{ cm}^3$$

(B)

(45) When placing a line of best fit or using linear model to estimate data, it is best to go through most points or have the same number of points on top and same number of points on the bottom of your line.

In this case most points are above

(D)

