

Bell Work, Jan 19 – 23, 2015

IB Physics: Scientific thinking,
5% rule, precision, accuracy, qualitative,
quantitative, linearization, relationships,
proportionality, extrapolation, interpolation,
period, amplitude

Physics Bell Work, Monday, Jan 19

1. Which ruler gives better measurements? Why

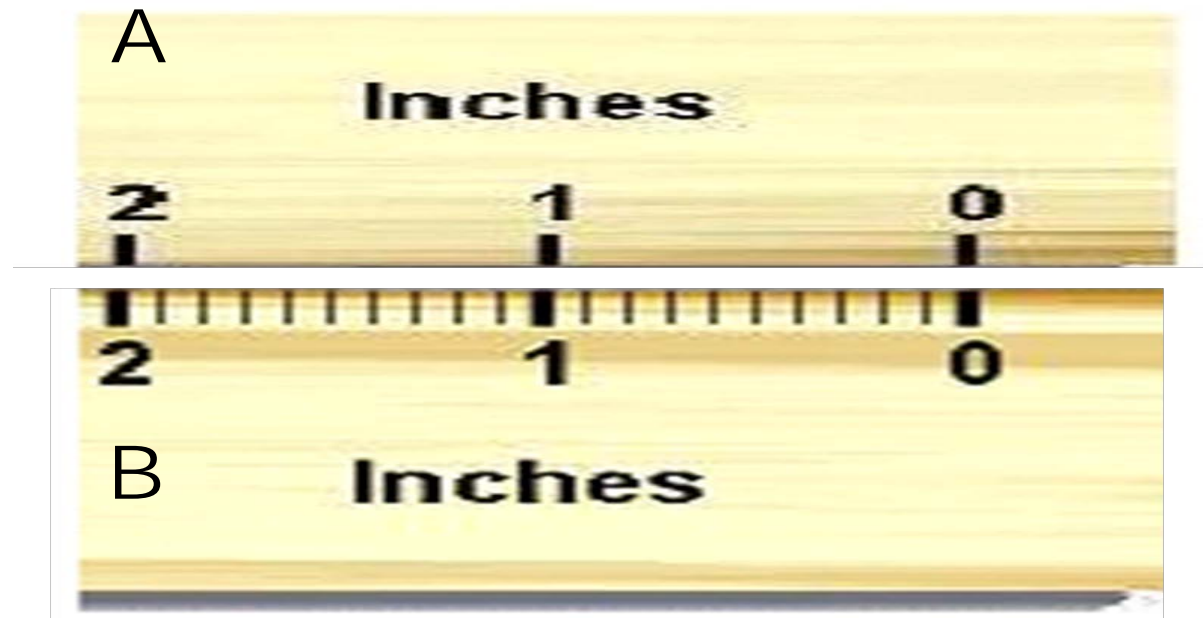
All measurements are uncertain. Ruler B's measurements are more certain than ruler A because ruler B has 1/10 inch marks.

2. Explain precision of measuring tools.

Precision is the lack of uncertainty.

More decimal places give us more precision and less uncertainty.

Sketch
the
rulers.



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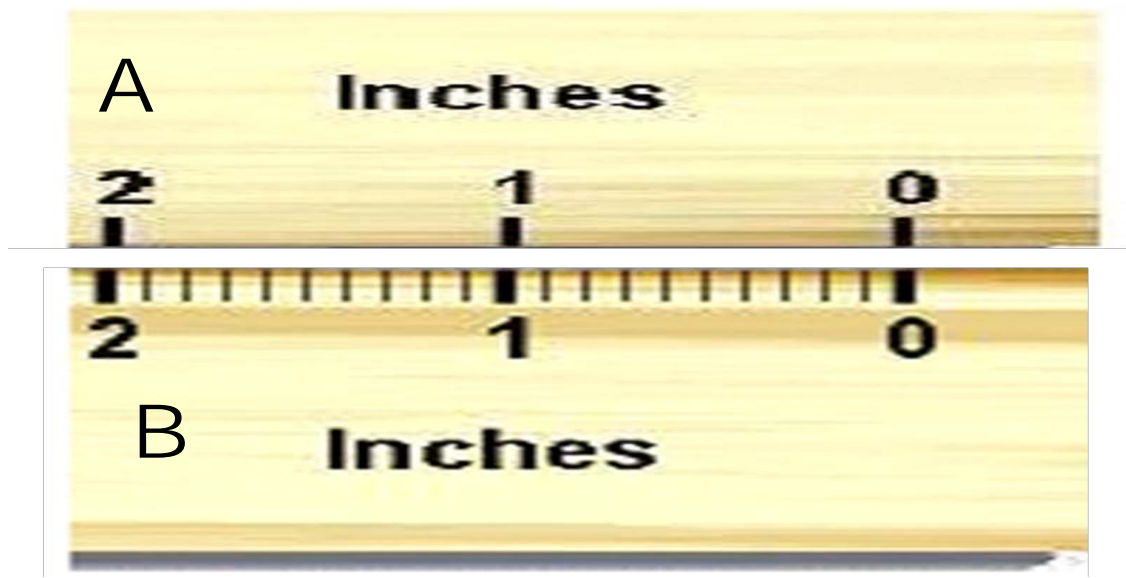
3. Which ruler is more precise? Why

Ruler B , it more decimal places.

4. Compare and contrast accuracy and precision in measurements.

Accuracy is correctness or close to a true value.

Precision of measurements implies that the values are close to each other. Example: measurements of 1.1, 1.2 1.1 & 1.0 are close together thus are precise measurements.



Physics Bell Work, Tuesday, Jan 20

1. Contrast quantitative and qualitative.

Qualitative = Conceptually correct, but not numerically accurate.

Quantitative = Numerically Accurate

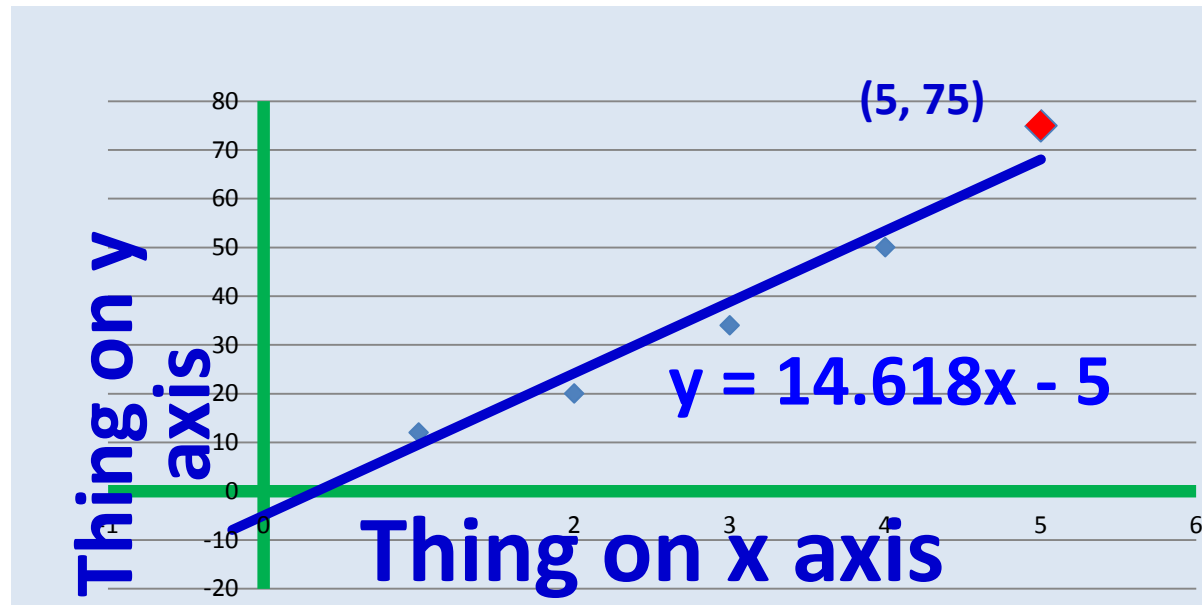
2. What does negligible mean?

A negligible quantity can be ignored and /or set to a value of zero.

Negligible means insignificant or does not matter.

3. Is the y-intercept of this graph insignificant (negligible) or significant? Why or why not? Sketch the graph & copy the data

x	y
1	12
2	15
3	34
4	64
5	75



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3. Is the y-intercept insignificant? Why or why not?

If $b \leq 5\%$ of y_{\max} then b is insignificant and b can be $= 0$

If $b > 5\%$ of y_{\max} then b is significant and b can not be $= 0$

$Y_{\max} =$
greatest
measured
value of y
in the table

x	y
1	12
2	15
3	34
4	64
5	75

$$y_{\max} = 75$$

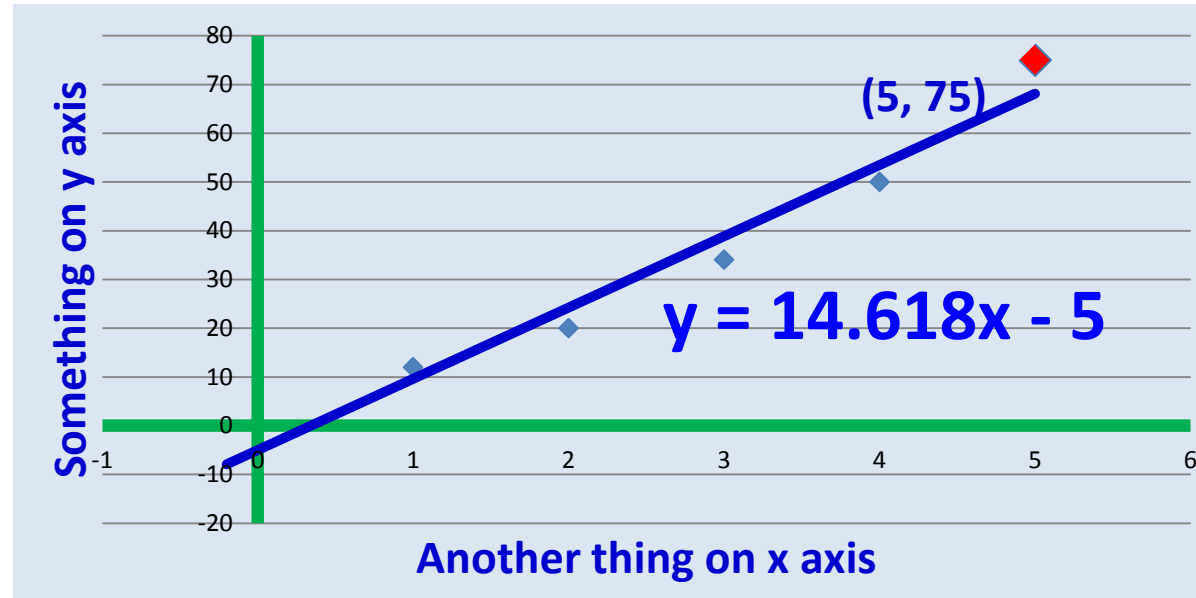
$$5\% y_{\max} = 3.75$$

$b = -5$, use the absolute value

$$b = |-5| = 5$$

$$5 > 3.75$$

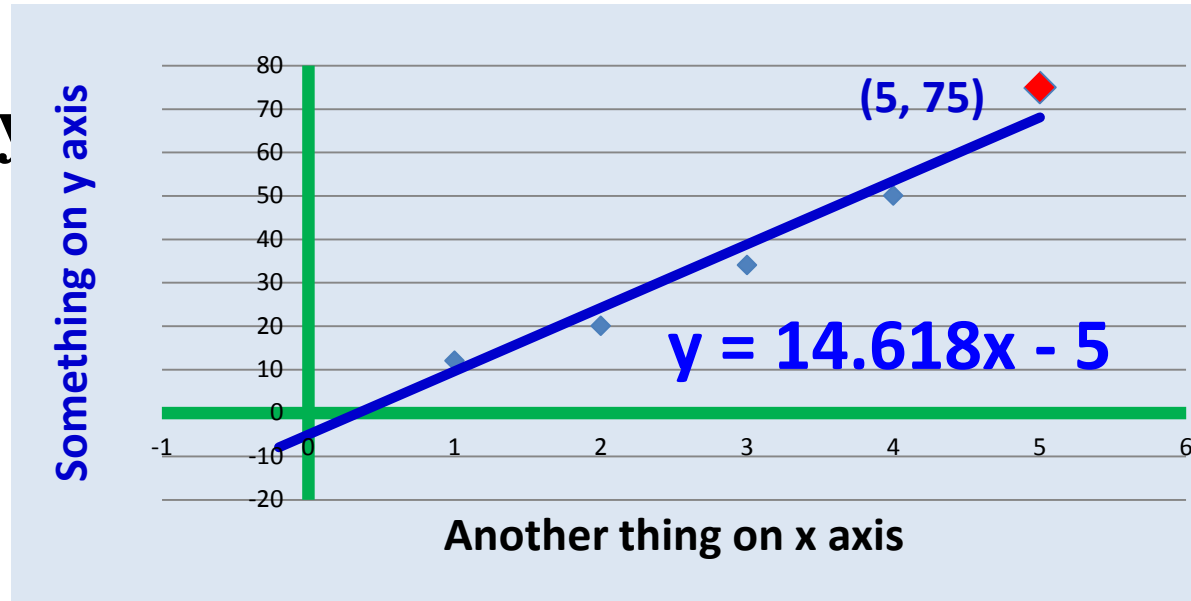
$b > 5\% y_{\max}$ b is significant



So b can not be set to 0,
 b is not negligible

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3. Is the y-intercept insignificant? Why or why not?



$$y_{\max} = 75$$

Use the absolute value of b

$$b = |-5| = 5$$

$$b/y_{\max} \times 100 \leq 5\%$$

Then b is insignificant (= 0)

$$b/y_{\max} \times 100 > 5\%$$

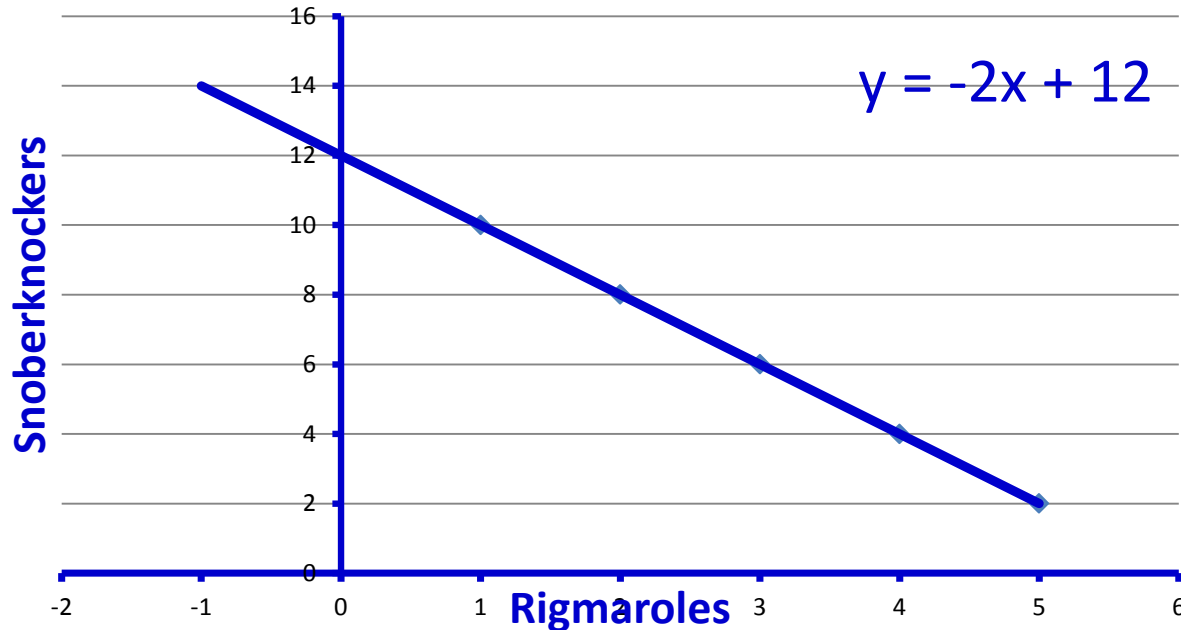
b is significant (cannot be zero)

$$5/75 \cdot 100 = 6.66\%$$

$$b/y_{\max} \times 100 > 5\%$$

b is significant, so b can not be set to 0

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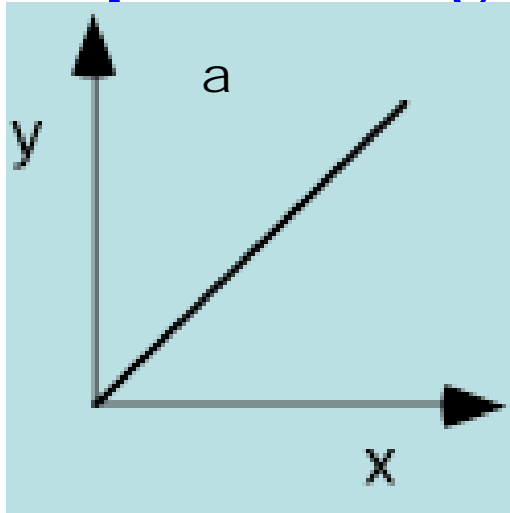


4. Is the y-intercept of this line significant? Why?

Yes the y intercept is significant. Y-intercepts of lines with negative slopes are almost always significant..

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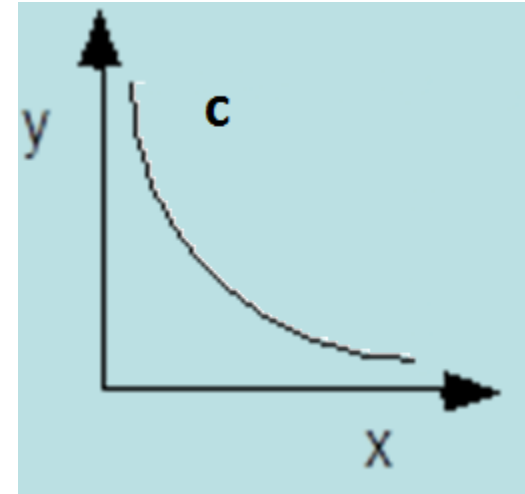
1. Sketch each graph. Describe the relationship between the variables x & y for each graph. Write an equation that will express each graph in linear form.



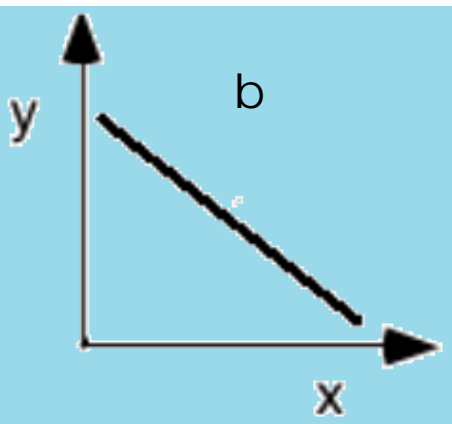
a. Y is directly proportional to x, linear

$x \propto y$, (x bigger, y bigger),

$$y = mx + b$$



c. Y is inversely proportional to x.



b. Y is indirectly proportional to x, linear.

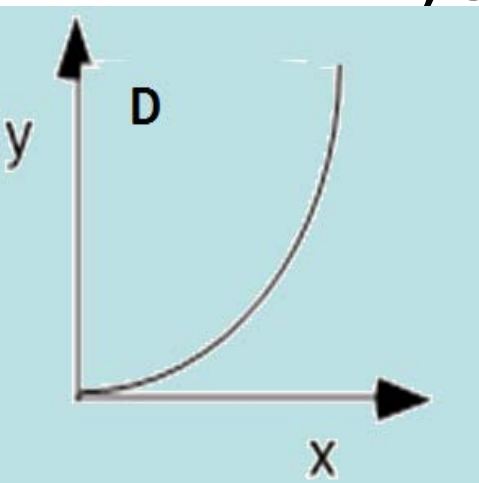
$x \propto y$ (x bigger, y smaller),

$$y = -mx + b$$

$y \propto \frac{1}{x}$ x bigger, y smaller

$$y = m \left(\frac{1}{x} \right) + b$$

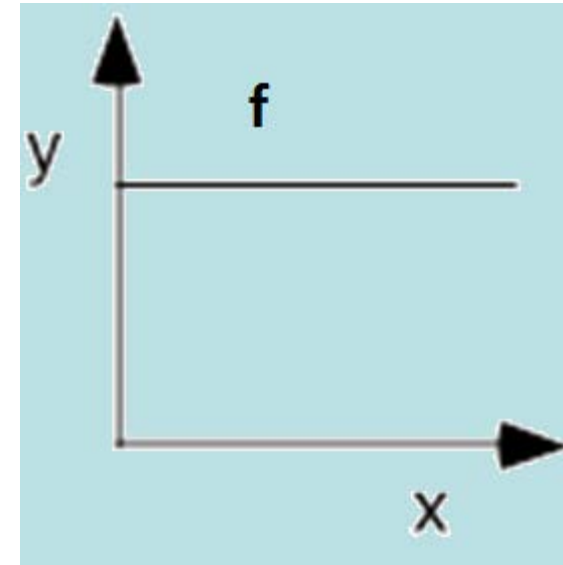
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d. Y is proportional to the square of x.

$$y \propto x^2$$

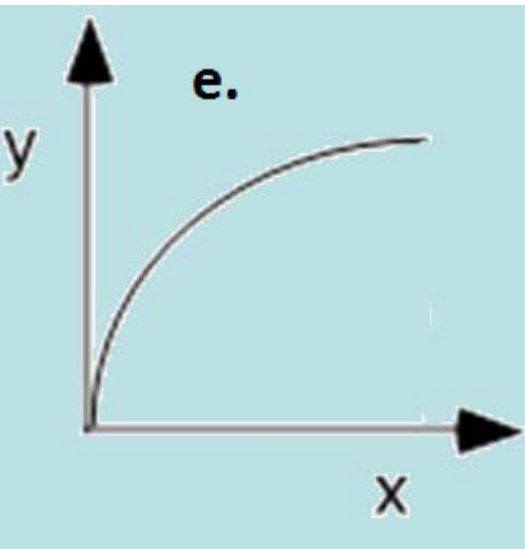
$$y = mx^2 + b$$



f. As x increases, y remains the same. There is no relationship between the variables.

$$y = b$$

Or y is constant

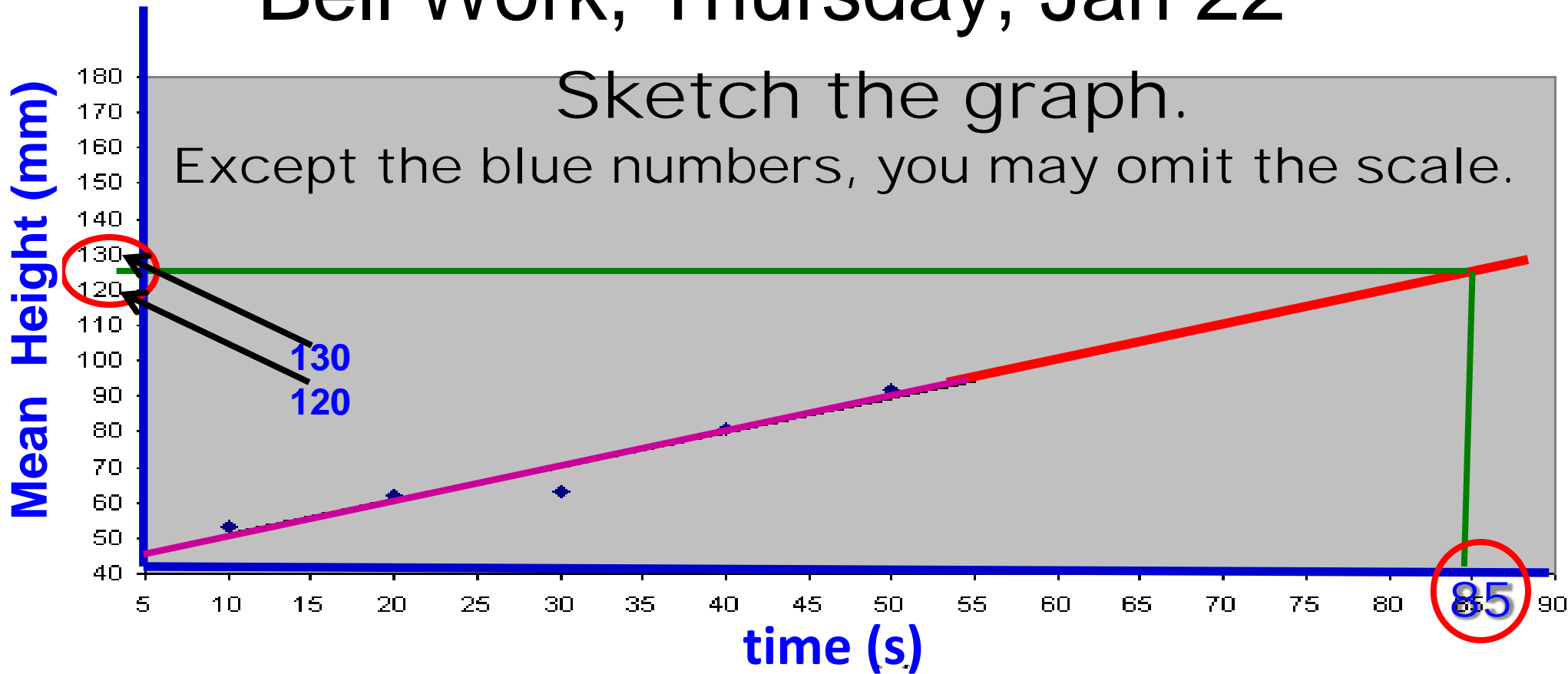


e. The square of y is proportional to x.

$$y^2 \propto x$$

$$y^2 = mx + b$$

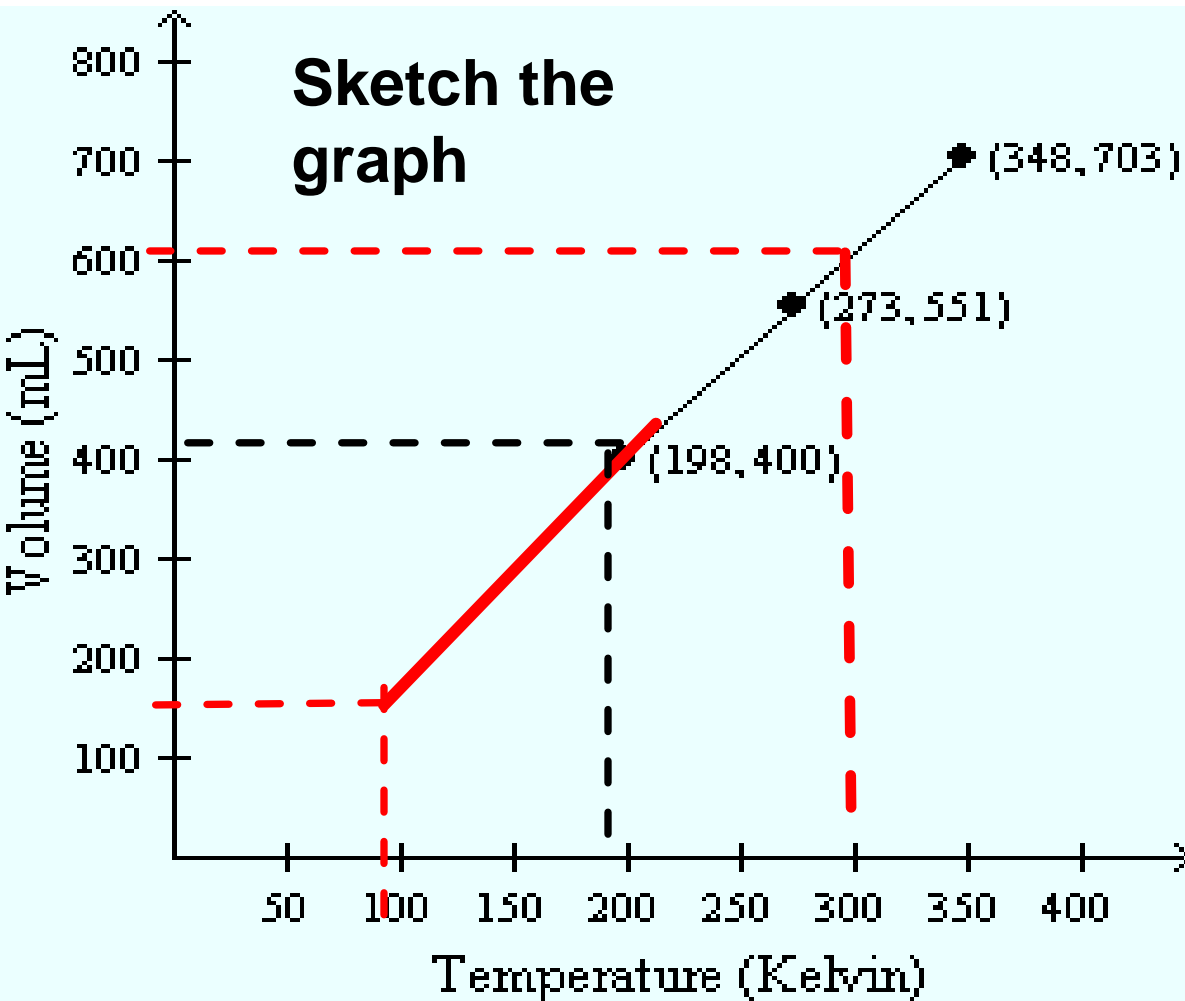
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1. To predict the mean height (y axis) when the time (x axis) is 85 seconds one would **extrapolate (extend) the trend line.**
2. What is the mean height at 85 s?
Approximately 125 mm

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3. A researcher who wants to learn about the behavior of a particular gas examines the relationship between temperature and gas volume when the gas is held at a constant pressure. The graph below shows the data collected. **What would the data show if the temperature were decreased to 100°K ?**



The volume would decrease to about 150 mL.

4. What is interpolation? Interpolate the value of Volume when temperature = 300°K

Interpolation is used to find values in between data points.

At 300°K , the volume = 600mL

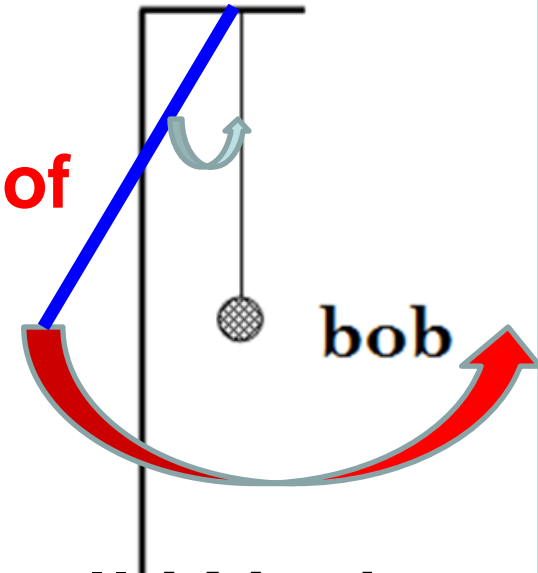
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5. For a swinging pendulum, what is amplitude (A)?

It is a measure as an angle or a distance from the rest point of the swing bob.

6. What is the period of a pendulum?

The period of a pendulum (T) is the amount of time in seconds it takes the pendulum to make a complete swing back and forth.



If you are out of room on your Bell Work sheet, write this on your study guide.