SI UNITS
(Le System International d’unites)

- Standard System of measurement used by scientific community.
- Based on universal values
- Not really the metric system but close.

There are two types of nations in this world; those that use the metric system, and those who have walked on the moon.

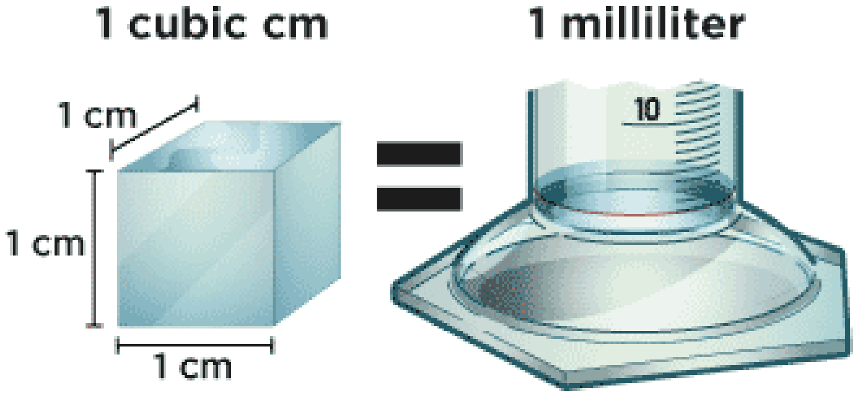
SI Units
LENGTH

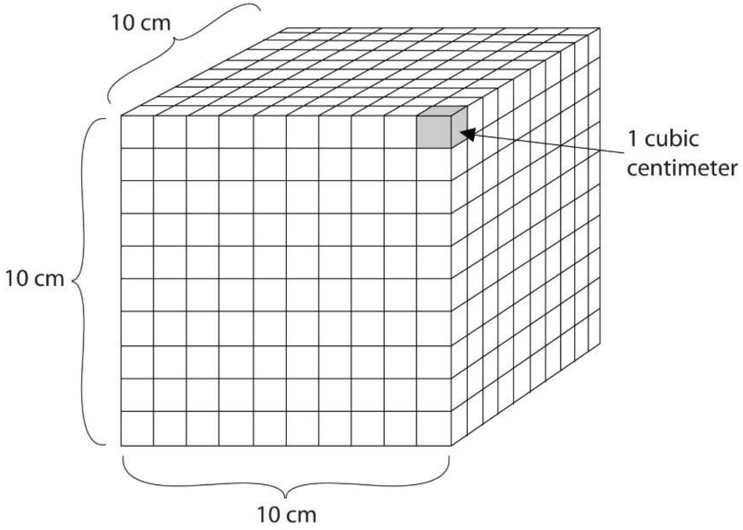
METER

- 1 meter = 1/10, 000, 000 the distance from North Pole to equator
- Distance Light Travels in 1/299,792,458 of a second
- 1 m = 100 centimeter
- 1 kilometer = 1000 m = 10^3 m
- 1 mile = 1612 m = 1.612km
- 1 inch = 0.0254m = 2.54 cm

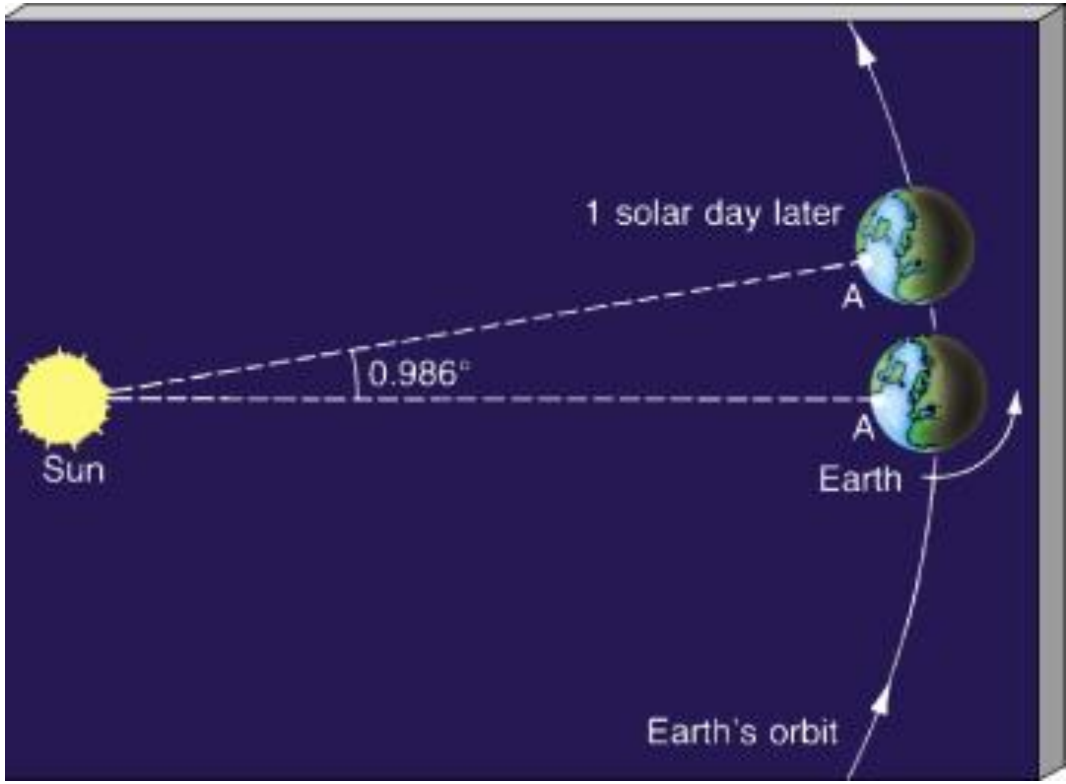
SI Units
Mass

- **KILOGRAM**
- 1 kg = 1000g
- 1 g = 1 cm^3 of water
- 1000 cm^3 = 1 liter
- 1 liter of H_2O = 1 kg
- 1 kg = 2.2 lbs
- 1 lb = 0.45kg
- Kg = mass, lb = Force
- Slug = mass, 1 slug = 32 lbs





SI Units
TIME



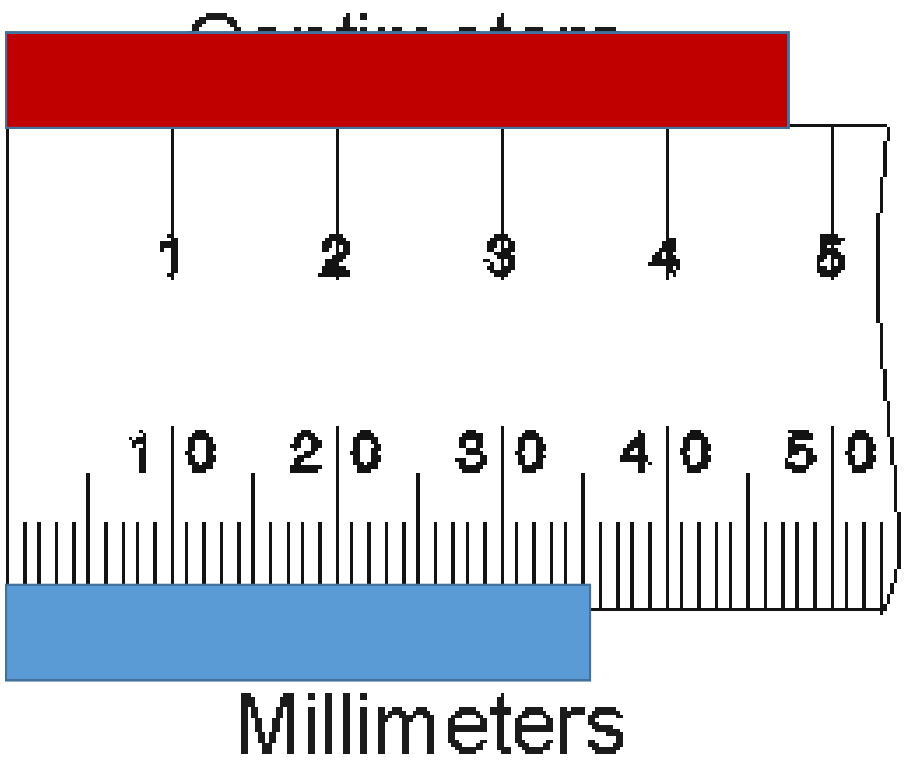
- **SECOND**
- 1 second = 1/86, 400 of a mean solar day
- 1 second = 0.0000157 days = $1.57*10^{-5}$ days
- Time it takes:
  - To say: 1 chimpanzee
  - A snail to travel 1 cm
  - The international space station travels 7700m
  - The time a Cesium atom vibrates 9,192,631,770 times (1967, General Conference of Weights and Measures)

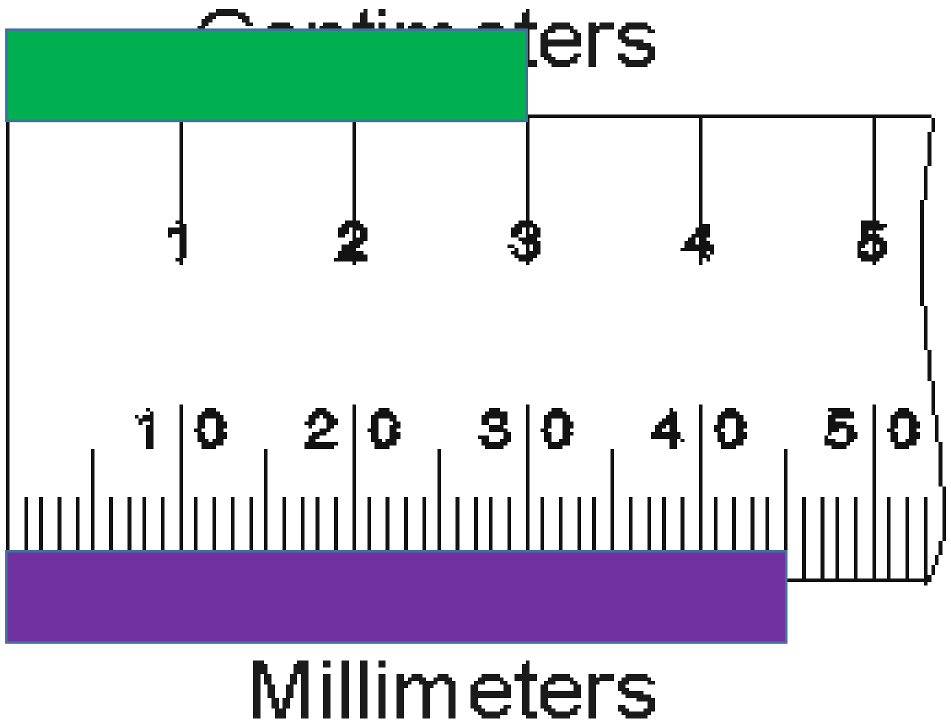
SI UNITS
Temperature

- Kelvin (assigned in 1954)
- Based on Celsius
- 0 K = absolute zero = -273.15 ^{o}C = -459.67 ^{o}F
- 273.15 K = Freezing Point of Water = 0 ^{o}C = 32^{o}F
- 373.15 K = Boiling Point of Water = 100^{o}C = 212^{o}F
- Other Important Temps:

Measurements & Significant Digits

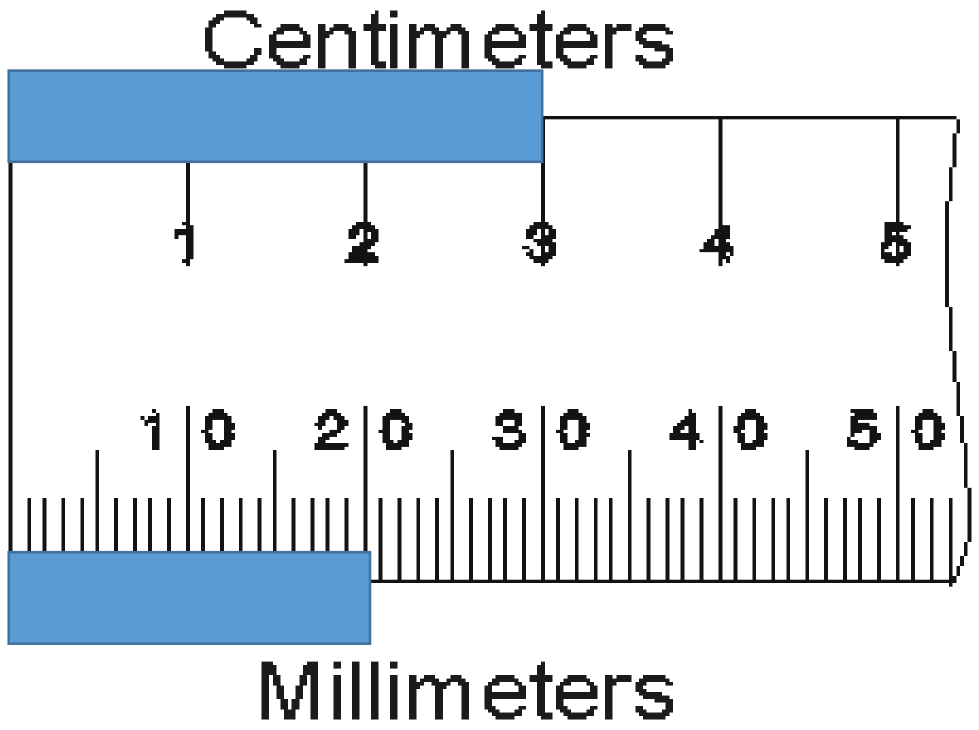
- Significant Digits are determined by the final digit of a measurement
- Final digit of a measurement is estimated
- Measure to the smallest unit on the scale, then estimate the final digit





Significant Digits
RULES FOR ZEROS

- All non-zero numbers are significant
- All Final Zeros after a decimal are significant (ex. 3.0 cm)
- Zeros between of Sig. Digits are significant (ex. 20.05 mm)
- Zeros use only as as place holders are NOT significant (ex. 0.030 m, or 0.0205 m)



Using Significant Digits
Addition and Subtraction

- Round final calculation to the least accurate measurement.

  Ex.: 12.26m + 3.5m = 15.76m = ______________

- Measurements must be in the same units:

  Ex.: 12.2m + 3.21 cm = _________________

  Ex.: $5.21 \times 10^5 + 8.62 \times 10^3$ cm = _______________

Using Significant Digits
Multiplication & Division

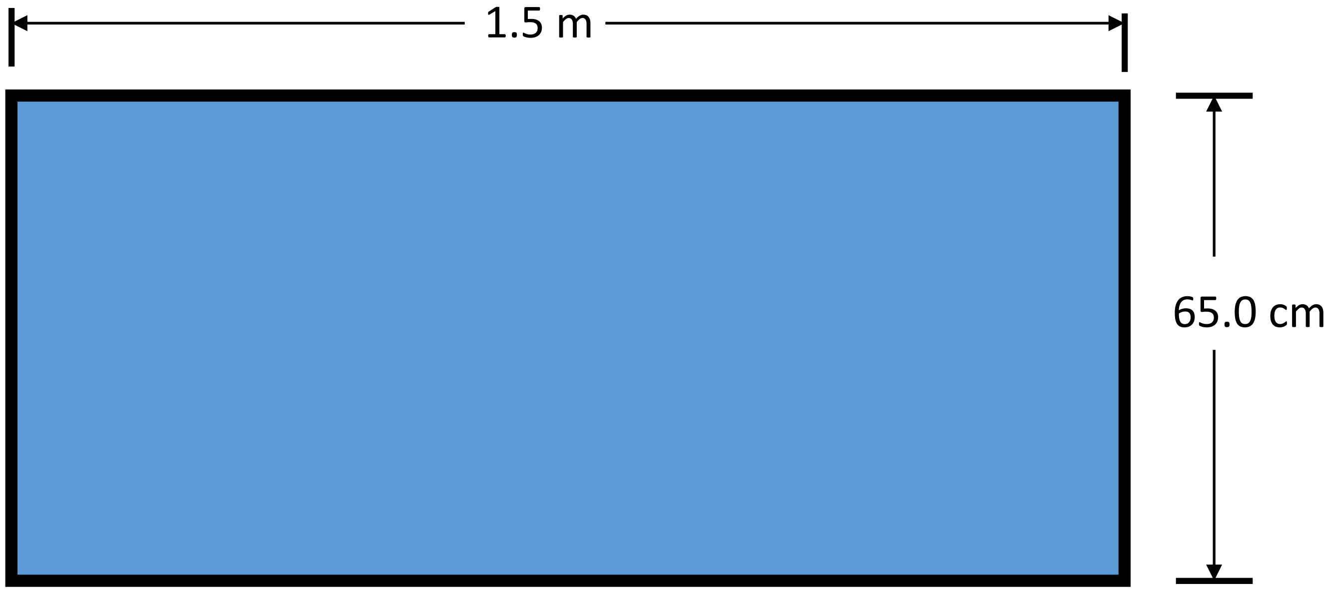
Round to the fewest significant digits

- Ex. (12.0kg * 0.050 m/s) =

- Ex. (15.21m / 2.1 s) =

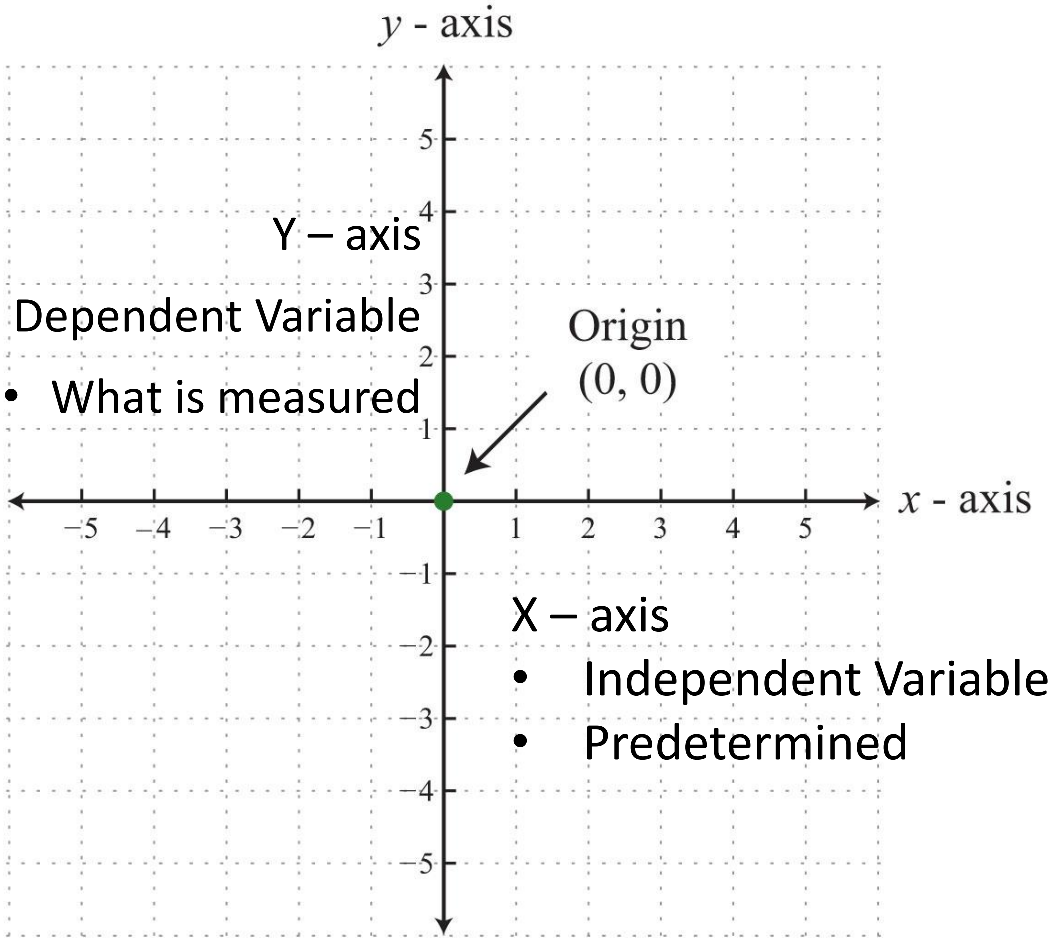
- Ex: 5.21×10^5 m* 8×10^3 m = ________________

Calculate perimeter and area of the object below with the appropriate significant figures



HW: Worksheet

GRAPHING RELATIONSHIPS



Y – axis
- Dependent Variable
  - What is measured

X – axis
- Independent Variable
- Predetermined

Lab Example:

The temperature of a balloon is increased from 20°C in 10 degree increments.

The diameter of the balloon is measured and recorded as the temperature increases.

Independent Variable:
Temperature

Dependent Variable:
Diameter

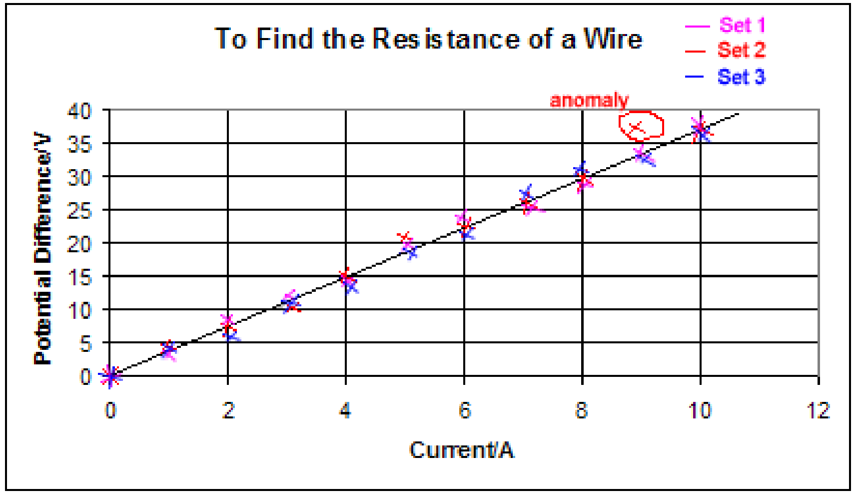
20°C 5.0 cm

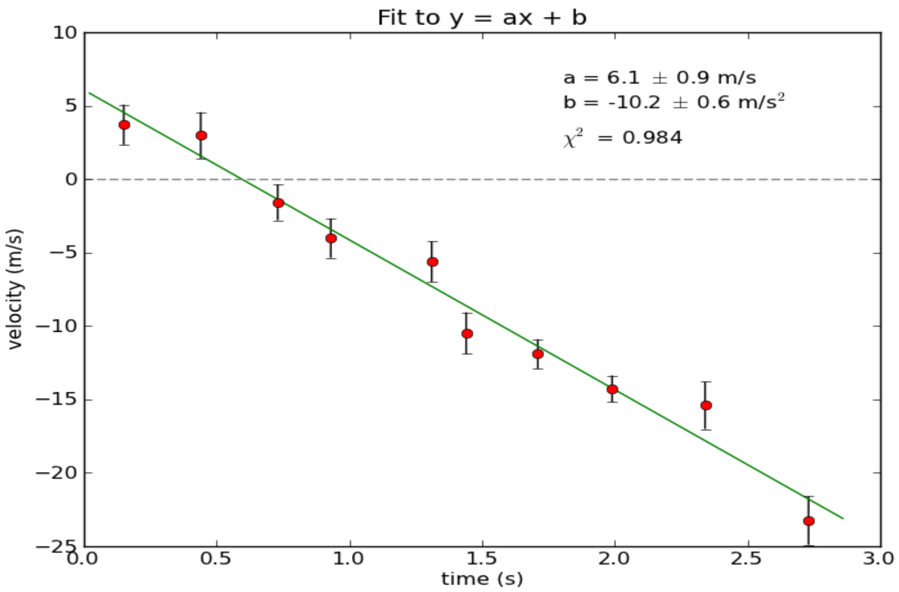
30°C 11.0 cm

40°C 20.0 cm

50°C 31.0 cm

Types of Relationships: **Direct Relationship**





- Straight Line
- Δy constant as x changes
- **EASY TO MAKE PREDICTIONS**

- $y = mx + b$
- m = slope = $\frac{\Delta y}{\Delta x}$
- b = y-intercept = starting point

Describing Relationship

- Y is DIRECTLY related to X

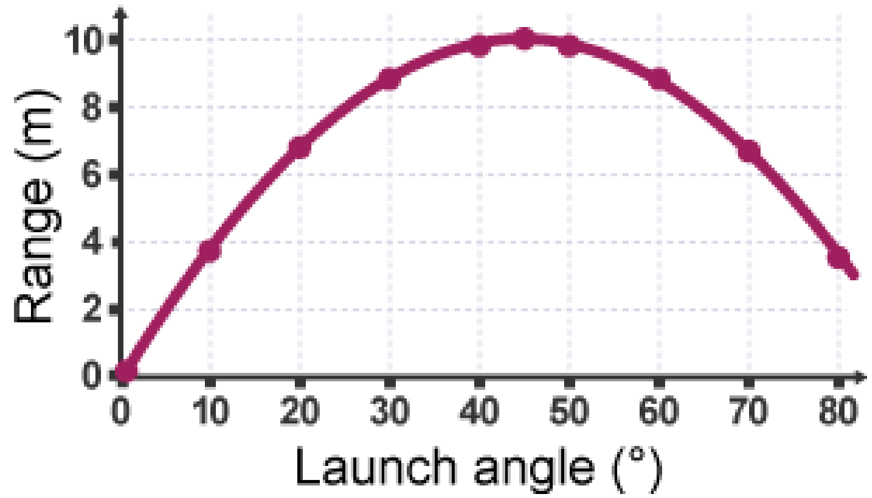
Types of Relationships: Exponential Relationship

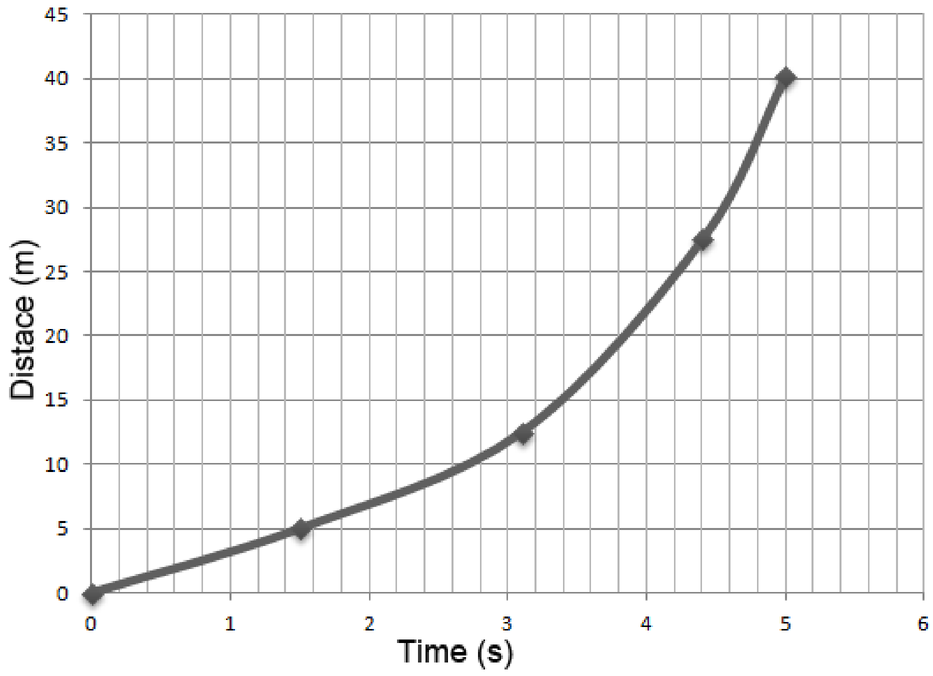
- Parabola
- Δy will increase and decrease as x changes.

- $y = Ax^2 + Bx + C$

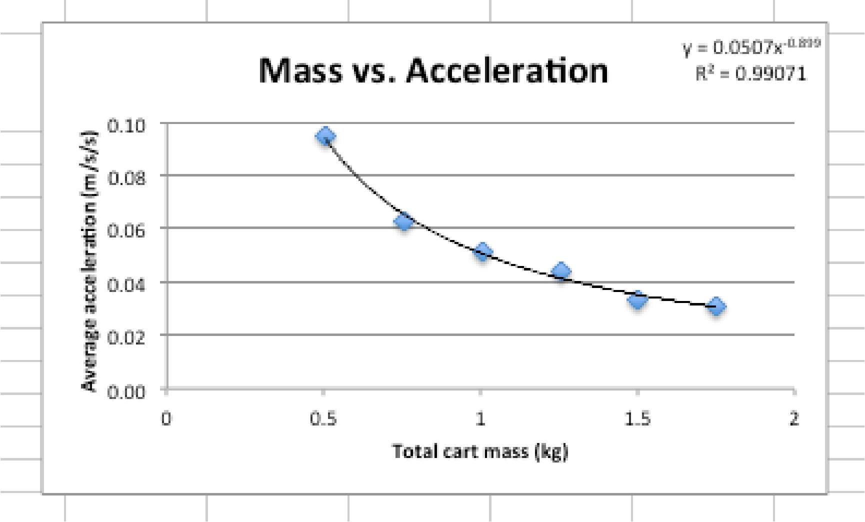
How to describe relationship:

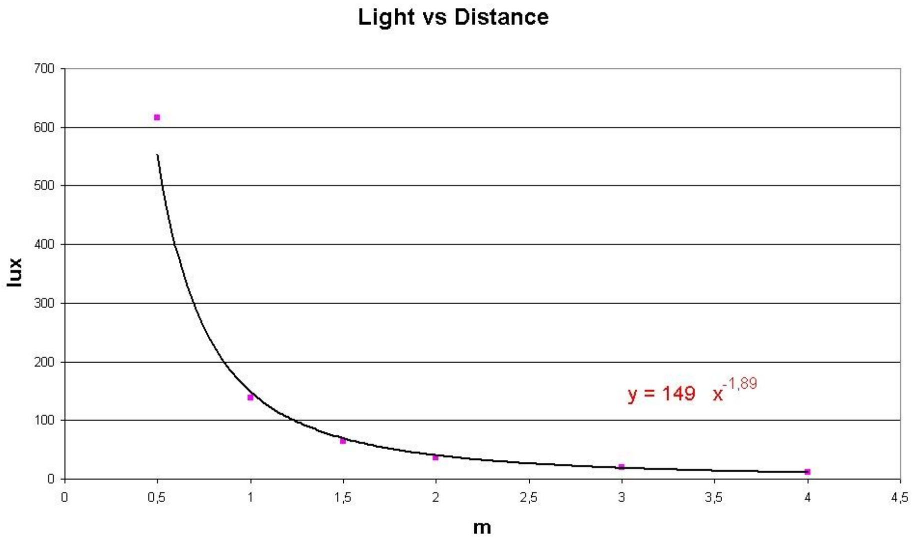
- y exponentially related to x
- y directly related to x^2





Types of Relationships: **Inverse Relationship**





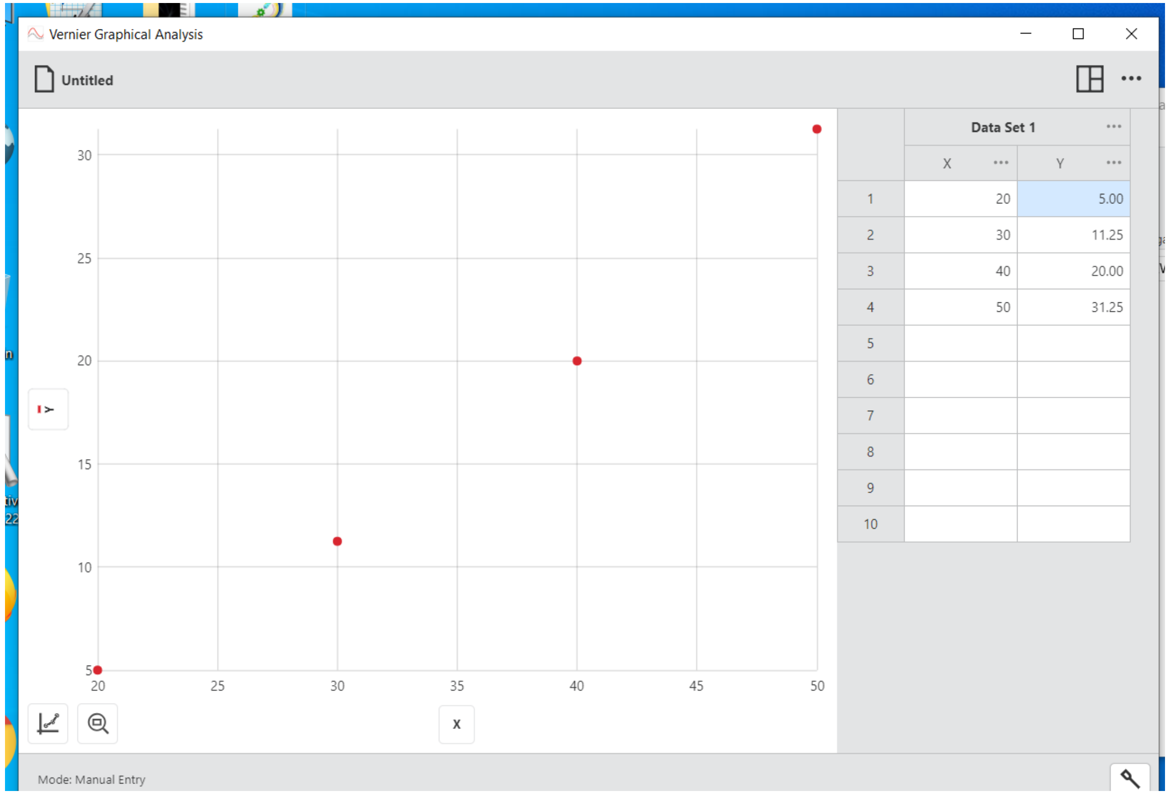
- Hyperbola
- Δy will decrease as x changes.
- Never reaches zero (asymptote)

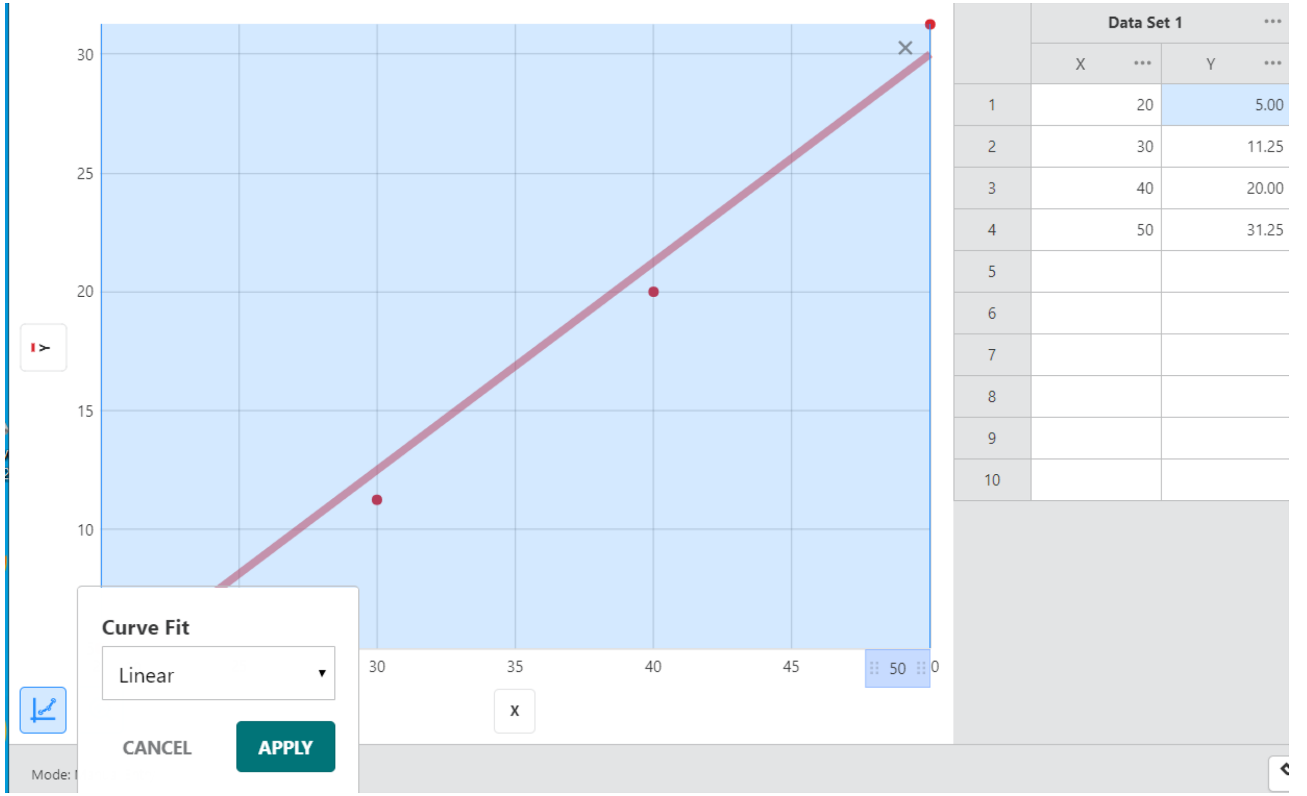
- $y = \frac{n}{x} = n\frac{1}{x} = nx^{-k}$

- y inversely related to x
- y directly related to the inverse of x

Graphing Software

- TI N-spire (Hopefully you remember from last year)
- Vernier Graphical Analysis -4 (See Link on Notes page)





Graphing Software

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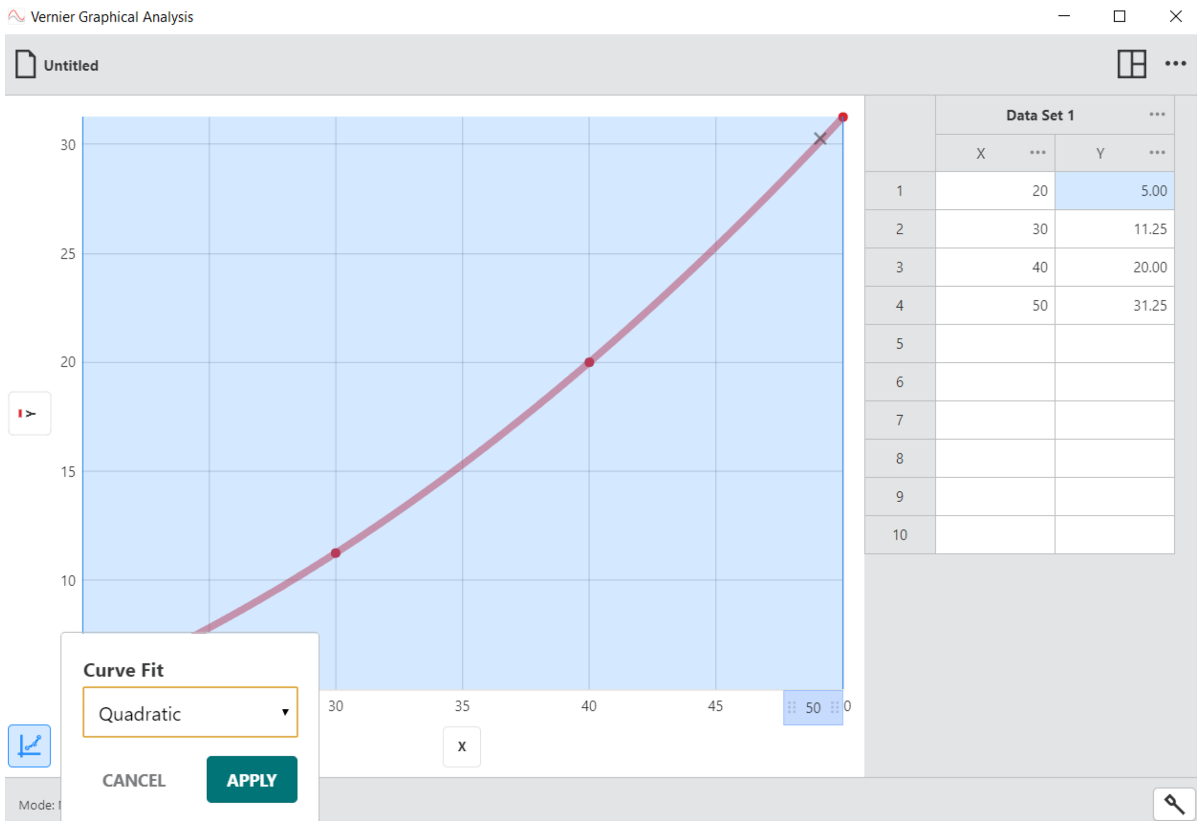


Sample 1: Balloon Lab:

Lab Example:

The temperature of a balloon is increased from $20^{o}C$ in 10 degree increments.

The diameter of the balloon is measured and recorded as the temperature increases.

Graph the data and describe the relationship

X-Axis
Independent Variable:
Temperature

Y-axis
Dependent Variable:
Diameter

$20^{o}C$ 5.0 cm

$30^{o}C$ 11.0 cm

$40^{o}C$ 20.0 cm

$50^{o}C$ 35.0 cm

Sample 2:

The acceleration of a cart is measured when the mass is added to a cart pulled along a frictionless track.

Use the data below to determine the Force on the cart.

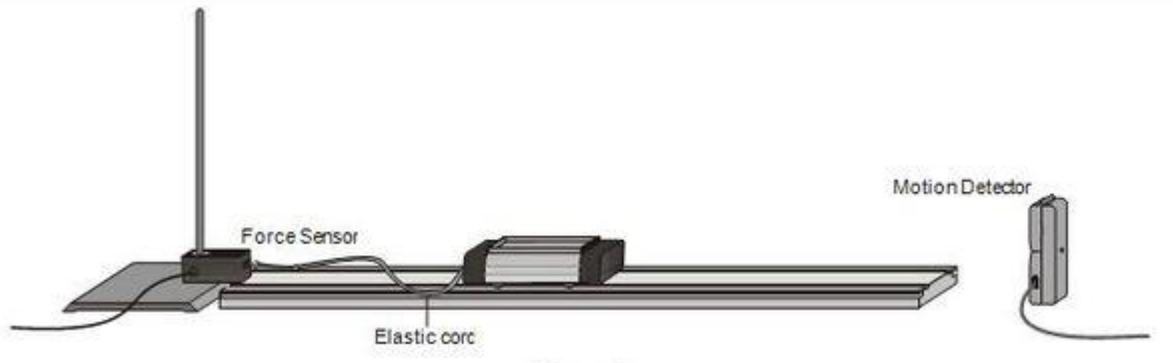


Figure 1

mass (kg):	Acceleration (m/s^2)
5	3.9
8	2.6
15	1.3
18	1.1
22	0.91

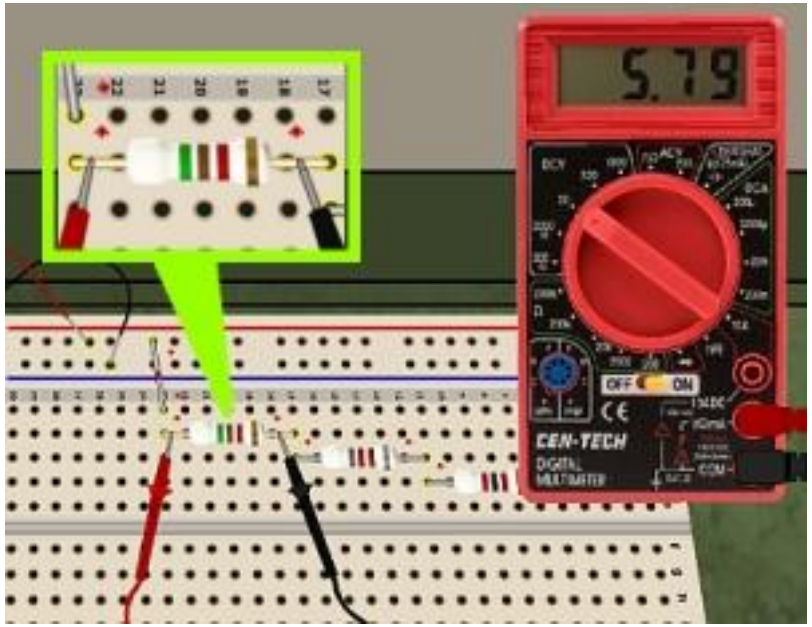
Analyze w/
Vernier Software

Graph the data and describe the relationship

Sample 3:

The current (I) in a simple circuits is increased in 2 Amp increments.
The potential difference (V) across a resistor measured (Volts)
This Data is used to determine the Resistance.

CURRENT (amps):	POTENTIAL DIFFERENCE (volts)
2	3.1
4	5.9
6	9.1
8	11.9
10	15.1



Graph the data and describe the relationship

The slope of the line represents the Resistance of the Circuit.

Determine the Resistance

Determining Absolute Zero

(HOMEWORK)

TEMPERATURE (ºC)	PRESSURE (AP)