Unit and Dimension

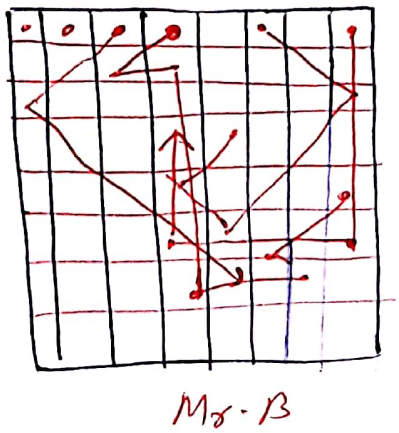
What is physics?

Physics is the branch of science in which we study about laws of Nature.

It is basically study of Nature and its laws.

Nature

what is laws.



Mr. C (servant)

* Camel chal diagnolly any kadam
* Hathi travels in a straight line. any kadam
*

→ Event — Game of chess
→ observation (Mr. C)
→ Experiments.
→ Laws.

} Combination of all these are Physics.

Math is basically a language of physics

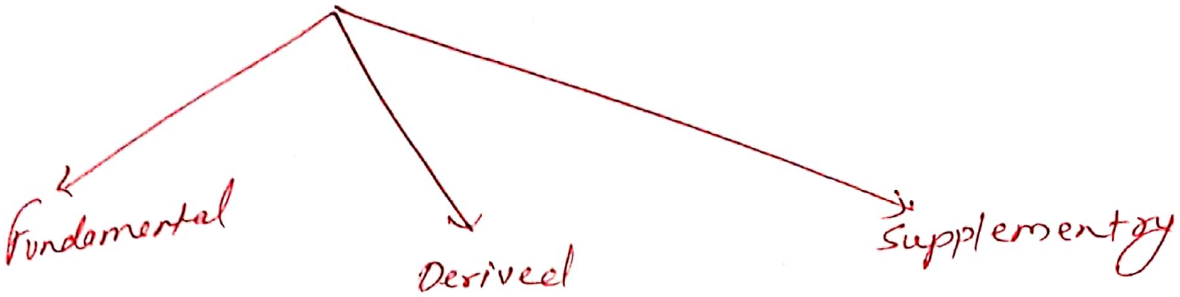
Physics is depends on nature.

Defination of Physics:-

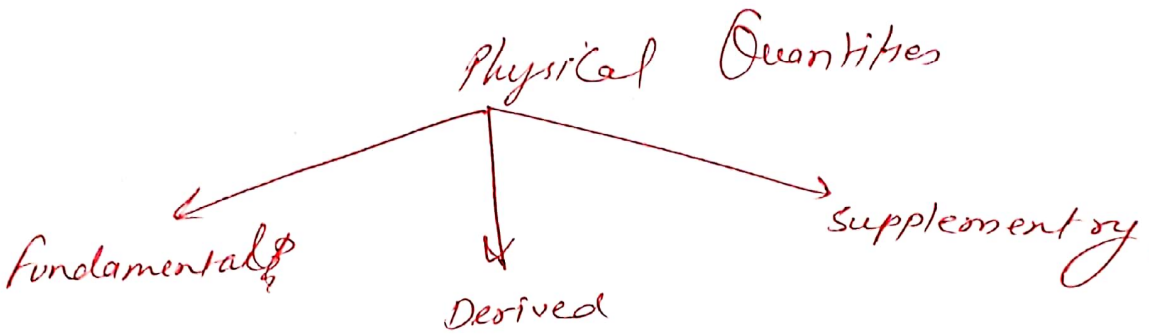
Physics is the study of Nature and its laws.

Units

Physical Quantities



Physical Quantities:- Physical Quantities express and help us to define the laws of physics.



(1) Fundamental Physical Quantities

The quantities which solely define physics and are independent of other physical quantities are known as fundamental physical quantities.

1) mass (kg)
2) length (m)
3) Time (sec)
4) Temp. (k)
5) Electric Current (Amp)
6) mass of substance (mole)
7) Luminous Intensity. (Candella)

Unit is the standard measure of a physical Quantity

Units

- FPS
- S.I → System of International units
  - It is makes for common unit.
  - It define fundamental P.Q.
- MKS
- CGS

Qualities of units

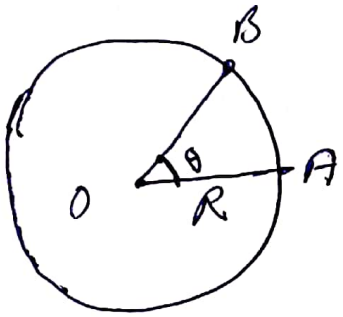
* A unit shoulbe such that
  - It is acepted world wide.
  - It should be user friendly and not bulky.
  - It should remain unaffected by natural phenomena.

(11) Supplementary PQ :-

It is add-on of fundamental PQ,

1. Plane Angle
2. Solid Angle

(1) Plane Angle :-



$$\theta = \frac{\text{Arc}}{\text{radius}}$$

$$\theta = \frac{\text{length of AB}}{R}$$

$$\theta = \frac{AB}{R} \quad \begin{matrix} m \\ m \end{matrix}$$

Unit of θ = radian

radian to degree.

$\frac{\pi}{2}$ rad = 90°

π rad = 180

1 rad = $\frac{180}{\pi}$.

$$x\text{-radian} = \frac{180}{\pi} \times x$$

$180^\circ = \pi$

$1^\circ = \frac{\pi}{180}$.

Solid Angle

3D-angle as in a ice cream Cone.

Unit — Steradian

⇒ **Derived PQ:-** The Quantities which are formed by the combination of 2- or more than 2- F-PQ are known as d-PQ.

① Speed = $\frac{\text{Distance}}{\text{time}}$ = m/s.

② Acceleration = $\frac{\text{Change in velocity}}{\text{time}} = \frac{\Delta v}{\Delta T} = \frac{(m/s)}{s} = m/sec^2$

③ momentum = mass × velocity = kg − m/s

④ force = ma = kg m/sec²

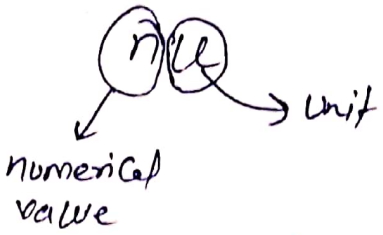
⑤ K.E = $\frac{1}{2}mv^2$ = kg − m²/sec²

⑥ P.E = mgh = kg m²/sec²

⑦ Pressure = $\frac{F}{\text{Area}} = \frac{kg\ m/sec^2}{m^2}$

$= kg/msec^2$

⇒ **Measurement :-**



This combination is known as magnitude of the quantity.

nu = Constant

$n \propto \frac{1}{u}$

500 kg ⇒ 500 × 1000 g

$n \propto \frac{1}{u}$

⇒ nu = Constant

$n_1 u_1 = n_2 u_2$

n_1 → Numerical value in I st System

n_2 → " " " 2nd System.

u_1 ⇒ units in I st System.

u_2 → units in 2nd System.

Convert 1 N in Dynes.

[S.I] (CGS)

$$n_1 u_1 = n_2 u_2$$

$$1 \cdot kg\text{-}m/sec^2 = 1 \cdot Dyne.$$

~~$1 \cdot [kg\text{-}m/sec^2] =$~~

$$1 \cdot [kg][m][s]^{-2} = n_2 \cdot [g][cm][sec]^{-2}$$

$$n_2 = \left[\frac{kg}{g}\right] \cdot \left[\frac{m}{cm}\right] \cdot \left[\frac{s}{s}\right]^2 \cdot$$

$$= \left(\frac{1000\,g}{g}\right) \cdot \left(\frac{100\,cm}{cm}\right) \cdot$$

$$n_2 = 10^5$$

$$1\,N = 10^5 \cdot Dyne.$$