EXAMPLE:

A moving object could be described in terms of its;

(i) Mass

(ii) Length

(iii) Area

(iv) Volume

(v) Velocity

(vi) Acceleration

- It's Temperature or electrical properties, density, viscosity of the medium through which it moves would also be of importance, since they would affect its motion.
- These MEASURABLE properties used to describe PHYSICAL STATE of the body or systems are known as its DIMENSIONS.

UNITS: To complete the description of the physical situation, it is also necessary to know the MAGNITUDE of each dimension. Length=(meter).

- The distinction between units and dimensions is that dimensions are properties that can be measured and units are standard elements in terms of which these dimensions can be described quantitatively and assigned numerical values.

DIMENSIONAL REASONING:

Analyzing any physical situation it is necessary to decide what factors are involved;

- Then try to determine a quantitative relationship between them.
- The factors involved can be assessed from OBSERVATION, EXPERIMENT or INTUITION.

- 1+3=4 numerically correct but in physical terms it may be untrue, for example 1elephant + 3 aero planes =4 days is untrue.
- An equation describing a physical situation will only be true if all the terms are of the same kind and have the same dimensions.
- Area = LxL=L^2 area has the dimension of L^2 . The corresponding unit of area will be the unit of length squared m^2 in SI units.
- $$V = \frac{L}{T} = LT^{-1}$$
  $$a = \frac{V}{T} = \frac{LT^{-1}}{T} = LT^{-2}$$

In practice for any given system of units, the constant of proportionality is made UNITY.

Force α Mass x Acceleration

Force = Mass x Acceleration

$$F = ma$$
$$F = MLT^{-2}$$
$$\text{Pr}essure = \frac{Force}{Area} = \frac{F}{L^2} = FL^{-2}$$
$$Density = \frac{Mass}{Volume} = \frac{M}{L^3} = ML^{-3}$$
$$M = FT^2L^{-1}$$
$$\therefore Density = ML^{-3} = FT^2L^{-4}$$

SEE PAGE 669 DOUGLAS FOR DIMENSIONS OF QUANTITIES COMMONLY OCCURING IN MECHANICS TABLE 24.1.

- The SI system is a rationalized system of metric units in which the units for all physical quantities can be derived from SIX basic arbitrarily defined units which are:

(i) Length meter

(ii) Mass kilogram

(iii) Time second

(iv) Electric current ampere

(v) Absolute temperature kelvin

(vi) Luminous Intensity candela

Details of the basic and derived SI units are given in Table 24.3 page 673 (Douglas)