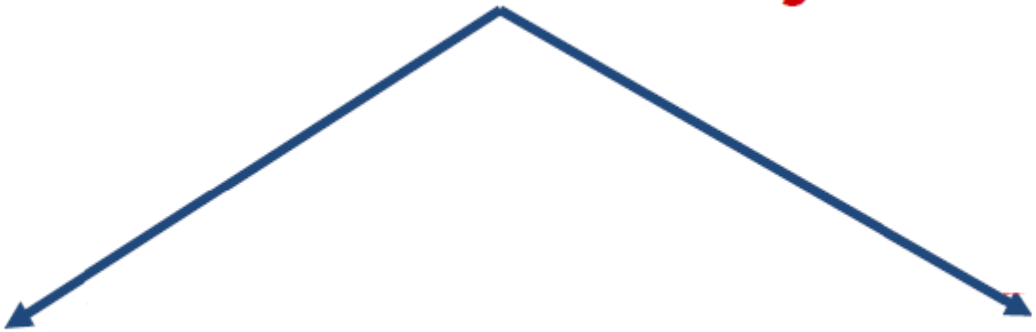
Units & Dimensions 1

How is **Dimensional Analysis** used?



Principle of Homogeneity

Conversion FACTOR

Principle of Homogeneity

⇒ Two or more quantities in addition or subtraction should have same dimension.

⇒ Quantities on either side of an expression (equation) should have the same dimension

⇒ Using this principle we can check the correctness of the physical equation

Question

Let us perform dimensional analysis on equation to check it's correctness

Equation : v = u + at

	L.H.S.	R.H.S.
Step-1	Dimension of 'v'	Dimension of 'u +at'
Step-2	$[M^0L^1T^{-1}]$	$[M^0L^1T^{-1}] + [M^0L^1T^{-2}]$ $[M^0L^0T^1]$
Step-3	$[M^0L^1T^{-1}]$	$[M^0L^1T^{-1}] + [M^0L^1T^{-1}]$

∴ **The given physical equation is dimensionally correct**

Question

Let us perform dimensional analysis on equation to check it's correctness

Equation : $v^2 = u^2 + 2as$

L.H.S.

Dimensions of Velocity (v) = $[M^0 L^1 T^{-1}]$

$\therefore$ Dimensions of v^2 = $[M^0 L^1 T^{-1}]$ $[M^0 L^1 T^{-1}]$

= $[M^0 L^2 T^{-2}]$

R.H.S.

Dimensions of u^2 = $[M^0 L^2 T^{-2}]$

Dimensions of $a \times s$ = $[M^0 L^1 T^{-2}]$ $[M^0 L^1 T^0]$

= $[M^0 L^2 T^{-2}]$

$\therefore$ The given physical equation is dimensionally correct

Question

The relation between velocity and time of a particle is given

$$v = A + \frac{B}{t} + \frac{Ct}{2}$$

The units of A, B and C will be

Solution:

b) By the principle of homogeneity unit of A, $\frac{B}{t}$ and ct^2 must be of v.

$v = A$ i.e $A = m/s$

$v = \frac{B}{t} \Rightarrow B = m$

$v = Ct^2 \Rightarrow C = m/s^3$