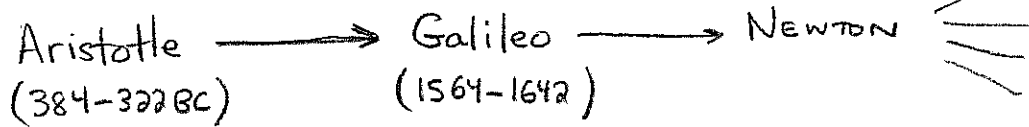


LECTURE 1

①

- what is physics?



- what is a unit?

a unit is a object or phenomenon which sets a particular scale for a dimension such as mass, length, time, etc...

- what is a dimension (in this context!)

a dimension is a basic variable in physics. At the present time there are 7 fundamental quantities. (we'll see more later)

DIMENSION	NOTATION	SI unit
TIME	T	second = s
LENGTH	L	meter = m
MASS	M	mass = kg

The dimension of a physical quantity tells us what the eqⁿ represents.

E1 If $[\lambda] = L^2$ then λ is an area.
(or has to do with area)

↑
dimension of λ is

We cannot add variables with different dimensions however, we can add variables with different units.

(by conversion techniques)

E2 Suppose $x = A \cos(\omega t + \phi)$ is an equation where $[x] = L$. What must we conclude about the dimension (or units if we have chosen a system) of A , ω and ϕ . Assume $[t] = T$.

Solⁿ: the output and input of cosine are dimensionless.

Thus $[A] = L$ whereas $[\omega t] = [\omega][t] = 1 \therefore \underline{[\omega] = \frac{1}{T}}$

and $[\phi] = 1$ (ϕ is dimensionless)

(Remark: later we call A the amplitude, ω the angular frequency and ϕ is a phase angle (in radians).)

4-significant figures.

E3 To add 1.000m^2 to 1.000ft^2 we simply convert both summands to some common unit, conversion of units is accomplished by multiplication by aptly chosen 1

$$1(\text{ft})^2 = 1(\text{ft})^2 \left(\frac{1\text{ m}}{3.281\text{ ft}} \right)^2$$

$$= 0.092894\text{ m}^2$$

Thus,
 "guard" digit, one beyond the # of significant figs. to be safe. (little over-cautious here)

$$1.000\text{m}^2 + 1.000\text{ft}^2 -$$

$$1.000\text{m}^2 + 1.000\text{ft}^2 = 1.000\text{m}^2 + 0.092894\text{m}^2$$

$$= \boxed{1.093\text{m}^2}$$

not significant to final answer.

• Read §1.1 → 1.5 for much more interesting examples on units and conversions ... we go to §1.6 now.

