LECTURE 1

- what is physics ?

  Aristotle (384-322 BC) → Galileo (1564-1642) → NEWTON

- 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 eq^{n} represents.

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

($[\lambda]$: 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 $[t] = T$.

Sol²: the output and input of cosine are dimensionless.
Thus $[A] = L$ whereas $[\omega t] = [\omega][t] = 1 \therefore [\omega] = \frac{1}{T}$

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).)

E3 To add $1.000\,m^2$ to $1.000\,ft^2$ we simply convert both summands to some common unit, conversion of units is accomplished by multiplication by aptly chosen 1 (4-significant figures.)

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

$$= 0.092894\ m^2$$

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

Thus,

$$1.000\,m^2 + 1.000\,ft^2 -$$
$$1.000\,m^2 + 1.000\,ft^2 = 1.000\,m^2 + 0.092\underline{894}\,m^2$$
$$= \boxed{1.093\,m^2}$$

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.