Units and Units Conversions

Note:

- Variables, parameters, and constants represent quantities with *associated units*.
- There are 2 widely used unit systems
  - British system ~ “ft & lb”
  - SI “Systeme International d’Unites” ~ “m & kg”
  - Due mainly to worldwide popularity
  - SI units used in most of scientific work

Principle Units

Quantity	*Unit*	*Symbol*
Length	meter	m
Mass	gram	g
Time	second	s
Computer Storage Capacity	Byte	B
Electrical current	Ampere	A
Temperature	Kelvin	K
Luminous intensity (brightness)	Candela	cd
Amount of substance	mole	mol

Common Derived Units

Quantity	*Derived Unit*	*Symbol & Unit*
Velocity	$\frac{\text{distance}}{\text{time}}$	$\frac{m}{s}$
Force	Newton	N ~ $\frac{kg.m}{s^2}$
Energy	Joule	J ~ $\frac{kg.m^2}{s^2}$
Power	Watt	W ~ $\frac{kg.m^2}{s^3}$
Frequency	Hertz	hz ~ $\frac{1}{s}$
Pressure	Pascal	Pa ~ $\frac{N}{m^2}$

Prefixes for units

Factor	*Prefix*	*Symbol*
10^{12}	Tera	T
10^{9}	Giga	G
10^{6}	Mega	M
10^{3}	Kilo	K
10^{1}	deca	D
10^{-1}	deci	d
10^{-3}	mili	m
10^{-6}	micro	μ
10^{-9}	nano	η
10^{-12}	pico	p

Example:

- 256,000,000 bytes ~ 256 x 10^6 bytes
  ~ 256 MB
- Ka-band frequency:
  - **25 Ghz ~ 25 x 10^9 hz ~ 25,000,000,000 /s**

Remarks:

- The prefix must precede the unit to indicate the factor. Otherwise it could infer another units.
- Ex: 2 microns = 2 μm = 2 x 10^{-6} m

  7 nanoseconds = 7 ηs = 7 x 10^{-9} s

Unit Conversions

- Ex: a) Convert 345m into miles:

b) Convert 5lbs into grams:

Ex:

Determine which of the following is heavier:

a) £1.5 sterling pound of rice that costs $10/25 lbs
b) ¥2000 of petroleum that costs ћ(French Francs)40/gallons

Homework (1-5 unit handouts)

Milk density ~ 1000 kg/m/m/m
Petroleum density ~ 777 kg/m/m/m
100p ~ 1 sterling pound