

Units and Units Conversions

The title is centered on the page. It is surrounded by five light purple circles. Two circles are positioned above the text, and three are positioned below it. The circles are of varying sizes and are arranged in a way that they partially overlap the text and each other.



Note:

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

Principle Units

<u>Quantity</u>	<u>Unit</u>	<u>Symbol</u>
● 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

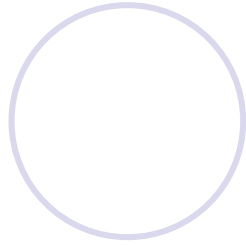
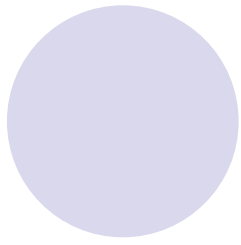
Common Derived Units

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

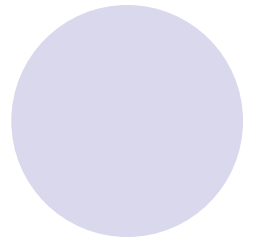
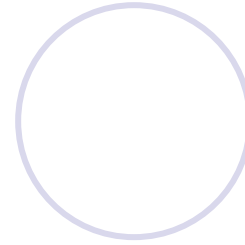
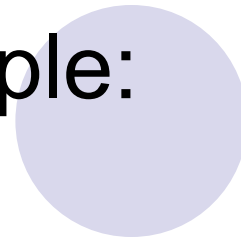


Prefixes for units

<u><i>Factor</i></u>	<u><i>Prefix</i></u>	<u><i>Symbol</i></u>
● 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:



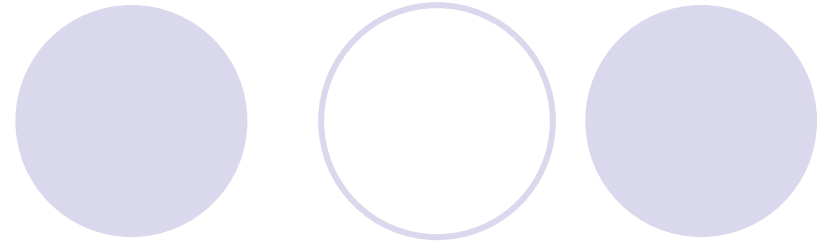
- 256,000,000 bytes $\sim 256 \times 10^6$ bytes
 ~ 256 MB
- Ka-band frequency:
 - **25 Ghz $\sim 25 \times 10^9$ hz $\sim 25,000,000,000$ /s**



Remarks:

- The prefix must precede the unit to indicate the factor. Otherwise it could infer another units.
- Ex: 2 microns = $2\ \mu\text{m} = 2 \times 10^{-6}\ \text{m}$
7 nanoseconds = $7\ \text{ns} = 7 \times 10^{-9}\ \text{s}$

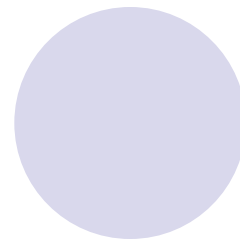
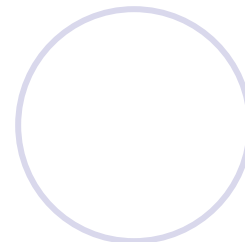
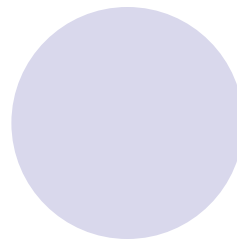
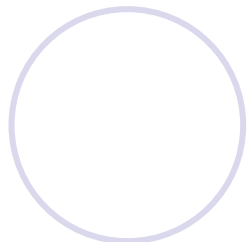
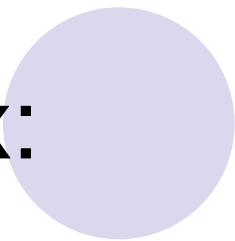
Unit Conversions



- 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 ₣(French Francs)40/gallons



Homework (1-5 unit handouts)

Milk density $\sim 1000 \text{ kg/m}^3$

Petroleum density $\sim 777 \text{ kg/m}^3$

100p ~ 1 sterling pound