

# How to round numbers off

In this course, when we calculate a numerical value, we only will care about three or four digits

– Rounding to four digits

- Look at the leftmost non-zero digit, and take it and the next three digits to the right as your result, keeping any zeros on the left
- If the next digit on the right is 5 or greater, add one to the rightmost digit of your result

– Example: 0.003452889

- First four non-zero digits, and keeping the zeroes on the left are 0.003452, the next digit is 8, so the result becomes 0.003453.

# Scientific Notation

Speed of light: 300,000,000 m/sec

Mass of a dust particle: 0.000 000 000 753 kg

Is there a better method to describe these long numbers?

Yes! – Scientific notation

$$1200 = \boxed{1.2} \times 10^3$$

↑  
1 ≤ coefficient < 10

power

base

1.2 times 10 to the power of 3

300,000,000 =  $3 \times 10^8$  8: how many places after the first number

0.000 000 000 753 =  $7.53 \times 10^{-10}$  10: how many 0s before first num.

1200 =  $1.2 \times 10^3 = 1.2e3$  (used in LON-CAPA)

# Fundamental Units

**Physical quantity** = **Number** + **Unit**

e.g., **Height** = **6** **feet**      Need to standardize units  
                  = **1.8** **meters**

SI Units (**S**ysteme **I**nternationale) – metric

Fundamental quantity	Fundamental unit (SI)	Symbol (SI)
distance	meter	[m]
time	second	[s]
mass	kilogram	[kg]

British units: distance – mile, yard, foot, inch  
                  mass – pound, ounce

Complex units in CAPA:  $m/s^2$

## Prefix of a Unit

1 **kilometer** [km] = 1000 m =  $10^3$  m

1 **centimeter** [cm] = (1/100) m =  $10^{-2}$  m

1 **millimeter** [mm] = (1/1000) m =  $10^{-3}$  m

Useful prefixes to denote multiples of ten:

Giga (G):  $10^9$

Mega (M):  $10^6$

**Kilo (k):  $10^3$**

**Centi (c):  $10^{-2}$**

**Milli (m):  $10^{-3}$**

Micro ( $\mu$ ):  $10^{-6}$

Nano (n):  $10^{-9}$



Hard disk size: **gigabytes**

# Unit Conversion

How many miles are equal to 2.5 km?

(1 mile = 1.61 km)

## **Tips for unit conversion:**

- Multiply the quantity by the ratio of the two units, with the unit you want to keep on top:

$$\begin{aligned} 2.5 \text{ km} \times \frac{1 \text{ mile}}{1.61 \text{ km}} &= \frac{2.5 \text{ km}}{1} \times \frac{1 \text{ mile}}{1.61 \text{ km}} \\ &= \frac{2.5 \text{ km} \times 1 \text{ mile}}{1.61 \text{ km}} \\ &= \frac{2.5}{1.61} \text{ mile} \\ &= 1.553 \text{ mile} \end{aligned}$$