

أوقات الدرس



ساعتين أسبوعيًا

الجمعة السبت

10:00



11:00 AM



OL Academy

Phycs101

Chapter 1

مدرس المقرر



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Physics & Measurements



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1.1 Standards of length, mass, and time

Physics based on experimental observation and quantities measurement.

In 1960 the set of standards for the fundamental quantities of science was established. It is called SI.

Base Quantity	Si Unit	CGS
Length	meter	centimeter
Mass	Kilogram	gram
Time	seconds	seconds

What is the meaning of the Si & CGS?

Si	System International
CGS	Centimeter - gram - second

1.2 Quantities and their unit:

	Quantity	Si Unit	Symbol
Distance	Distance	meter	m
Area	Area	meter	m
Circumference	Circumference	meter	m
	Speed	meter per sec	m/s
	Momentum	kg.meter per sec	kg.m/s

length 7

length

1000000000

1.3 Some Prefixes for SI units:

Some Prefixes for Powers of Ten

Power	Prefix	Abbreviation	Power	Prefix	Abbreviation
10^{-24}	yocto	y	10^1	deka	da
10^{-21}	zepto	z	10^2	hecto	h
10^{-18}	atto	a	10^3	kilo	k
10^{-15}	femto	f	10^6	mega	M
10^{-12}	pico	p	10^9	giga	G
10^{-9}	nano	n	10^{12}	tera	T
10^{-6}	micro	μ	10^{15}	peta	P
10^{-3}	milli	m	10^{18}	exa	E
10^{-2}	centi	c	10^{21}	zetta	Z
10^{-1}	deci	d	10^{24}	yotta	Y

mega length 10×10^6

Example: Introduced the following quantities using a suitable prefixes:

1) **0.03 m =** $0.03\text{ m} = 3 \times 10^{-2} \text{ cm}$ $\text{m} \rightarrow \text{cm} \rightarrow \text{mm}$

0.03 m

2) **0.005 m =** $0.005\text{ m} \rightarrow 5 \times 10^{-3} \text{ mm}$

10^{-3}	milli
10^{-2}	cm
10^3	km

3) **20000 g =** $20000\text{ g} = 20 \times 10^3 \text{ kg}$

decimal $\rightarrow 10^{-1}$

many zeros $\rightarrow 10^0$

4) **7100000 ohms =** $7100000\ \Omega = 7.1 \times 10^6 \text{ M}\Omega$

1 kg
 1000 g

1.4 Conversation of units

Examples:

1- Convert 15 inch into cm knowing that 1 in = 2.54 cm.

$$15 \cancel{\text{in}} \times \frac{2.54 \text{ cm}}{1 \cancel{\text{in}}} = 38.1 \text{ cm}$$

2- Convert 127 cm into inch knowing that 1 in = 2.54 cm.

$$127 \cancel{\text{cm}} \times \frac{1 \text{ in}}{2.54 \cancel{\text{cm}}} = 50 \text{ in}$$

3- Convert 1228 km/h into m/s.

$$1228 \cancel{\text{km}} \times \frac{1 \cancel{\text{h}}}{3600 \text{ s}} \times \frac{1000 \text{ m}}{1 \cancel{\text{km}}} = 341 \text{ m/s}$$

Convert the
① hr $\xrightarrow{\times 60}$ min
1 min $\xrightarrow{\times 60}$ sec
60 $\times 60 = 3600$ s

Exercise:

1- A car travelled 380 m. How many km that the car travelled ?

$$380 \text{ m} \times \frac{1 \text{ km}}{1000 \text{ m}} = 0.38 \text{ km}$$

2- A train travelled 2.64 Km. how many meters did it travelled?

$$2.64 \text{ km} \times \frac{1000 \text{ m}}{1 \text{ km}} = 2640 \text{ m}$$

3- Area of a small rug is 0.5 m², find the rug area in mm². prefix

$$0.5 \text{ m}^2 \times (10^{-3})^2 = 0.5 \times 1000000$$
$$= 500000 \text{ mm}^2$$

Additional questions for unit Conversion:

1- 867000 cm to m.

2- 125.3 m/s to km/h.

3- On an interstate in a rural region of Wyoming, a car is traveling at a speed of 38.0 m/s. Is the driver exceeding the speed limit of 75.0 mi/h?

Conservation of time units:

1 year	365 days
1 day	24 hours
1 hour	60 minutes
1 minute	60 seconds

Exercise:

1- How many seconds in 2 days?

$$2 \text{ days} \times \frac{24 \text{ hr}}{1 \text{ day}} \times \frac{60 \text{ min}}{1 \text{ hr}} \times \frac{60 \text{ sec}}{1 \text{ min}} = 172800 \text{ sec}$$

2- A car moving with a speed of 25 m/s. Find the speed of the car in:

a. Km/h

90 Km/h

b. cm/min

1500000 cm/min

Some important mathematical skills!

Differentiation:

$$\boxed{\frac{d}{dx}} 10 = \text{zero}$$

$$\frac{d}{dx} 5x^2$$

Let a and c be a constant, then $\frac{d}{dx}(a) = 0$, $\frac{d}{dx}(ax^n) = na(x^{n-1})$

Examples:

Find the differentiation for the following examples:

$$3x^2 = 6x$$

$$5 = 0$$

$$100x = 100$$

$$5x \quad 2 = 1$$

$$5 \cdot 2 x'$$

$$\frac{d}{dx} 10x = 10$$

Integration:

$$\int ax^n dx = a \frac{x^{n+1}}{n+1} + C$$

$$\int \frac{5x^{3+1}}{3+1}$$

$$\frac{5x^4}{4} = \frac{5}{4}x^4$$

Find the Integration for the following examples:

$$\int 3x^2 dx = \int \frac{3x^{2+1}}{2+1} = \frac{3}{3}x^3 = x^3$$

$$\int 5 dx = 5x$$

$$\int 100x dx = \frac{100}{2}x^2 = 50x^2$$

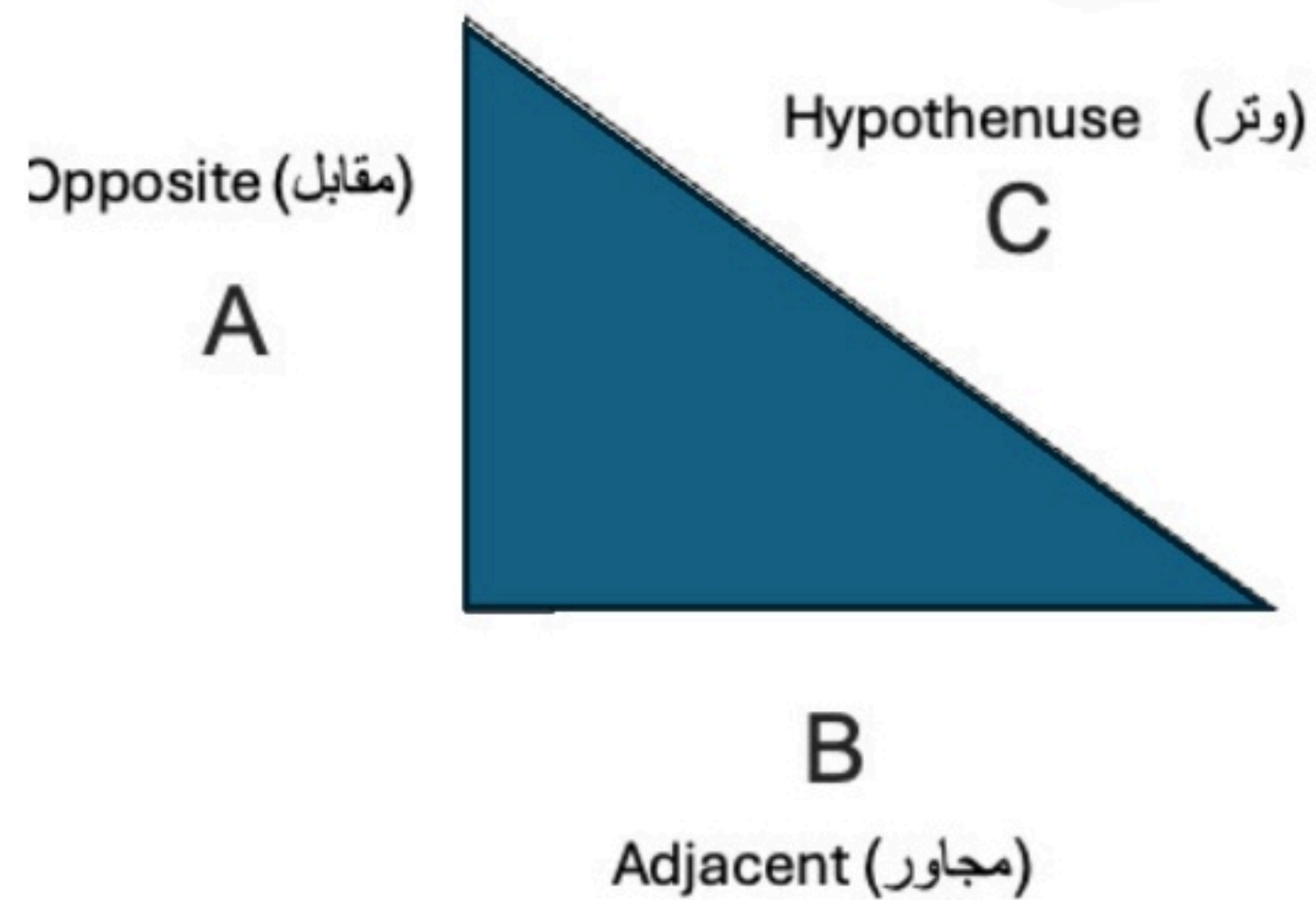
$$\int 7 = 7x$$

Quadratic equation:

$$ax^2 + bx + c = 0$$

To solve it we use $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ or using the calculator!

Geometric:



$$C^2 = A^2 + B^2$$

$$\cos \theta = \frac{\text{مجاور } A}{\text{وتر } C}$$

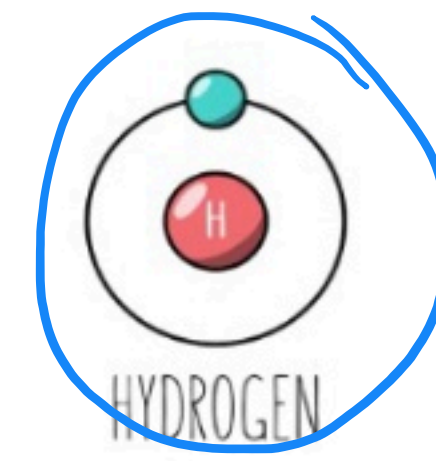
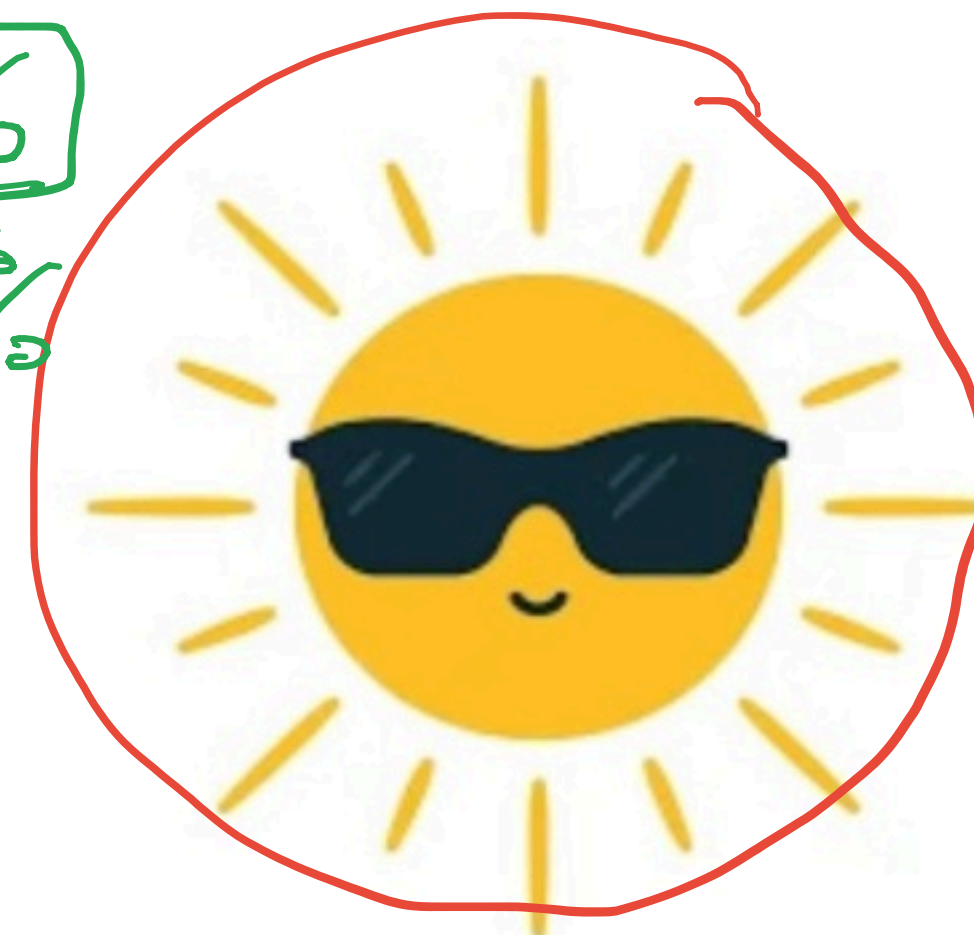
$$\sin \theta = \frac{\text{مقابل } B}{\text{وتر } C}$$

$$\tan \theta = \frac{\text{مقابل } B}{\text{مجاور } A}$$

$$\theta = \tan^{-1} \left(\frac{\text{مقابل } B}{\text{مجاور } A} \right)$$

Additional questions:

H 73%
He 25%
elements 2%



1- How many The mass of the sun is $1.99 \times 10^{30} kg$ and the mass of the Hydrogen atom is $1.66 \times 10^{-27} kg$. How many atoms are in the sun?

$$1.99 \times 10^{30} \times 0.73 = \underline{1.4527 \times 10^{30}}$$

30 كلة هيدروجين
H 73%

$$\frac{1.4527 \times 10^{30}}{1.66 \times 10^{-27}} = 0.875 \times 10^{57}$$

2- The volume of wallet is $8.5 in^2$. Convert to cm^3 . Hint (1 in = 2.54 cm).

3- One gallon of paint (volume = $3.78 \times 10^{-3} \text{ m}^3$). Convert the area of 25 m^2 . What is the thickness of paint on the wall?