📘 **Subject: Physics**

👩🏾‍🏫 **Class: SS1**

🗓️ **Term: First Term**

📚 **Week 1**

🧲 **Topic: Fundamental and Derived Quantities**

🔭 **Sub-theme: Interaction of Matter, Space, and Time**

🎯 **Topic Focus**

- Fundamental & Derived Quantities and Units
- Distance vs. Displacement

✅ **Lesson Content**

🔹 **1. Physical Quantities**

A **physical quantity** is anything that can be measured and expressed with a number and a unit.
Examples:

- A bag weighs **15 kilograms** → *Mass*
- A journey takes **2 hours** → *Time*
- A footballer runs at **8 meters per second** → *Speed*

🔹 **2. Fundamental Quantities**

These are the **basic quantities** in physics that cannot be broken down further. All other quantities are derived from them.

Quantity	Symbol	SI Unit	Unit Symbol
Length	L	metre	m
Mass	m	kilogram	kg

Quantity	Symbol	SI Unit	Unit Symbol
Time	t	second	s
Electric current	I	ampere	A
Temperature	T	kelvin	K
Amount of substance	n	mole	mol
Luminous intensity	Iv	candela	cd

Real-Life Applications:

- **Length:** Distance between buildings or football pitch length
- **Mass:** Weighing items at home or hospital
- **Time:** Stopwatch timing or cooking time
- **Current:** Charging a phone
- **Temperature:** Using a thermometer
- **Amount of substance:** Measuring chemicals in lab
- **Luminous intensity:** Measuring brightness of light bulbs

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🔹 3. Derived Quantities

These are obtained by combining **two or more fundamental quantities** through mathematical operations.

Derived Quantity	Formula	SI Unit	Derived From
Speed	Distance ÷ Time	m/s	m and s
Area	Length × Breadth	m^2	m × m
Volume	L × B × H	m^3	m × m × m
Force	Mass × Acceleration	newton (N)	$kg \cdot m/s^2$
Pressure	Force ÷ Area	pascal (Pa)	N/m^2

Derived Quantity	Formula	SI Unit	Derived From
Density	Mass ÷ Volume	kg/m^3	$kg \div m^3$

Real-Life Applications:

- **Speed:** Car speedometers
- **Area:** Calculating land/floor size
- **Volume:** Measuring liquids in bottles
- **Force:** Pushing heavy objects
- **Pressure:** Pumping a balloon
- **Density:** Whether objects float or sink in water

🔹 4. Distance vs. Displacement

Feature	Distance	Displacement
Meaning	Total path covered	Shortest path from start to end
Quantity Type	Scalar (no direction)	Vector (has direction)
Can be Zero?	Never zero if movement occurs	Can be zero (if start = end)
Unit	metre (m)	metre (m)

Real-Life Examples:

Example 1 (Distance vs Displacement):
Tunde walks **4 meters forward**, then **4 meters back**.

- Distance = 4 + 4 = **8 m**
- Displacement = **0 m** (He returned to the starting point)

Example 2 (Displacement):
A cyclist moves **10 meters east**, then **5 meters west**.

- Distance = 10 + 5 = **15 m**
- Displacement = **5 m east** (10 − 5)

Why It's Important:

- **Drivers** need distance to calculate fuel usage
- **Pilots** and **sailors** use displacement for navigation
- **Athletes** may return to start point: displacement = 0 but distance ≠ 0

📝 Summary

- Physics studies **measurable quantities**.
- **Fundamental quantities** are the basis of all measurements.
- **Derived quantities** come from combining fundamental ones.
- **Distance** is the total path covered.
- **Displacement** is how far out of place an object is—and includes direction.