MODULE 4
ACCELERATION INTUITION

INTRODUCTION

Many students think acceleration means "moving fast." Others think it means "speeding up." Both ideas are close, but not complete. In Physics, acceleration does not describe how fast you are moving; it describes *how quickly your velocity changes*.

To feel acceleration, you do not need a laboratory. You only need a daladala.

When the daladala is moving at a steady speed, your body feels normal. But when it suddenly starts, you feel pushed backward. When it suddenly stops, you feel pushed forward. That feeling is not speed, it is **acceleration**.

What Acceleration Really Means?

Acceleration is the *rate of change of velocity with time*.

This means acceleration happens when:

- velocity increases (speeding up)
- velocity decreases (slowing down)
- direction changes (even at constant speed!)

So, an object can have acceleration even if its speed stays the same as long as its direction is changing.

Acceleration is given by:

$$a = \frac{\Delta v}{\Delta t}$$

Where:

a = acceleration (m/s^2)

Δv = change in velocity (m/s)

Δt = time taken (s)

For now, take a short breath and set theory aside, let us warm up with some carefully chosen worked examples.

BINDER Example 7

A car increases its velocity from 5m/s to 25m/s in 4s. Find its acceleration.

Solution

$$a = \frac{v - u}{t}$$

$$a = \frac{(25 - 5)\text{m/s}}{4\text{s}} = 5\text{m/s}^2$$

Therefore, the acceleration is 5m/s^2.

Making Sense of the Answer: *The car's velocity increases by 5m/s every second.*

Think Like a Physicist: *Acceleration tells you "how much velocity changes per second," not how fast the object is moving.*

REAL Example 8

Mr. Akilikubwa asks **Kipute** and **Kipanga** to observe a boda-boda leaving the school gate. At first the boda-boda moves slowly, then within a few seconds it becomes very fast. What does the change in the boda-boda's motion tell you about its acceleration?

Solution

Since the boda-boda's velocity is **increasing with time**, its acceleration is **positive**.

Making Sense of the Answer: *The boda-boda is not only moving; it is **changing its velocity**, and that is what acceleration means.*

Think Like a Physicist: *If velocity increases with time, acceleration is positive; if velocity decreases, acceleration is negative.*

HOT Example 9

A bus is moving at 18m/s. The driver applies brakes and the bus comes to rest in 6s. Find the acceleration.

Solution

Given: $\mathrm{u} = 18\mathrm{m/s}, \mathrm{v} = 0\mathrm{m/s}\ (\text{at rest}), \mathrm{t} = 6\mathrm{s}$

$$\mathrm{a} = \frac{\mathrm{v} - \mathrm{u}}{\mathrm{t}}$$

$$\mathrm{a} = \frac{(0 - 18)\mathrm{m/s}}{6\mathrm{s}} = -3\mathrm{m/s^2}$$

Therefore, the acceleration is $-3\mathrm{m/s^2}$.

Making Sense of the Answer: *The negative sign shows the bus is slowing down. Its velocity decreases by 3m/s every second.*

Think Like a Physicist: *A negative acceleration does not mean "bad acceleration." It simply means the acceleration is opposite to the direction of motion.*

It is important for you to understand that:

In real life, acceleration can change every moment. A driver may press the accelerator gently, then strongly, then release it. But in many Physics problems, we

simplify motion by assuming the acceleration is **constant**. This is called **uniform acceleration**.

Uniform acceleration does not mean the object is moving at a constant speed. It means *the acceleration is constant, so the velocity changes by the same amount every second.*

That brings our worked examples to a satisfying close. The example meal has been enjoyed; now let us prepare our taste buds, because the next subtopic is about to serve its own delicious ideas.