📘 IGCSE Math – Rates (Detailed Notes with Examples)

✅ 1. Use Common Measures of Rate

◆ What is a Rate?

A **rate** compares two quantities of different units. It tells us how much of one quantity changes with respect to another.

◆ Common Measures of Rate:

Type of Rate	Unit Example	Meaning	
Speed	km/h or m/s	Distance per unit of time	
Heartbeat	beats per minute (bpm)	Number of heartbeats per minute	
Flow Rate (e.g., Water)	liters per second (L/s)	Amount of liquid flowing per second	
Fuel Consumption	liters per 100 km	Fuel used per 100 km of distance	

◆ Example 1:

A tap fills 15 liters of water in 5 minutes. What is the flow rate?

Solution:

$$\text{Rate} = \frac{\text{Total volume}}{\text{Total time}} = \frac{15\ \text{L}}{5\ \text{min}} = 3\ \text{L/min}$$

✅ 2. Apply Other Measures of Rate

This refers to applying rates in real-world contexts, including unit conversions.

◆ Example 2: Currency Exchange

If 1 USD = 1.35 SGD, how many Singapore Dollars will you get for 200 USD?

Solution:

$$200 \text{ USD} \times 1.35 = 270 \text{ SGD}$$

◆ Example 3: Fuel Consumption

A car uses 8 liters of petrol to travel 100 km. What is the fuel consumption per km?

Solution:

$$\text{Fuel consumption} = \frac{8 \text{ L}}{100 \text{ km}} = 0.08 \text{ L/km}$$

You can also express it per 10 km or per 1 km as needed.

◆ Example 4: Cost per Item

A pack of 5 pens costs $7.50. What is the cost per pen?

Solution:

$$\frac{7.50}{5} = 1.50 \text{ per pen}$$

✅ 3. Solve Problems Involving Average Speed

◆ **Formula for Average Speed:**

$$\text{Average Speed} = \frac{\text{Total Distance}}{\text{Total Time}}$$

Make sure distance and time are in compatible units!

◆ **Example 5:**

A cyclist travels 30 km in 2 hours. What is the average speed?

Solution:

$$\frac{30 \text{ km}}{2 \text{ h}} = 15 \text{ km/h}$$

◆ **Example 6 (Involving Multiple Parts):**

A car travels:

- 60 km at 60 km/h,

- then 40 km at 80 km/h.

What is the average speed for the entire journey?

Step 1: Find time for each part:

$$\text{Time 1} = \frac{60}{60} = 1 \text{ hour}$$

$$\text{Time 2} = \frac{40}{80} = 0.5 \text{ hour}$$

Step 2: Total Distance = 100 km, Total Time = 1.5 h

$$\text{Average Speed} = \frac{100}{1.5} = 66.\overline{6} \text{ km/h}$$

⟳ Unit Conversion Tip

Convert minutes to hours by dividing by 60:

$$30 \text{ min} = \frac{30}{60} = 0.5 \text{ hr}$$

Convert seconds to minutes:

$$90 \text{ sec} = \frac{90}{60} = 1.5 \text{ min}$$