1. Use and Interpret Graphs in Practical Situations (Travel Graphs & Conversion Graphs)

A. Travel Graphs (Distance–Time Graphs)

A **distance-time graph** shows how far an object has travelled over time.

Feature	Meaning
Horizontal line	Object is stationary
Straight sloping line	Constant speed
Steeper line	Faster speed
Downward line	Returning to starting point
Curved line	Acceleration or deceleration

Example 1: Interpreting a Distance–Time Graph

A car travels:

- 0–10 minutes: from 0 km to 10 km
- 10–20 minutes: stays at 10 km
- 20–30 minutes: returns to 0 km

Draw and interpret the graph:

- **0–10 min:** straight sloping line upwards (moving away)
- **10–20 min:** horizontal line (stopped)
- **20–30 min:** sloping line downwards (returning)

Speed = Distance ÷ Time = 10 km ÷ 10 min = 1 km/min

B. Conversion Graphs

Used to **convert units** or currencies, e.g. miles to kilometers, dollars to pounds.

Example 2: Currency Conversion Graph

A graph shows:

- $1 = £0.75
  To convert $20:
- Find $20 on the x-axis, trace up to the graph line, then across to the y-axis → **£15**

2. Draw Graphs from Given Data

Steps:

1. Draw axes and label them with correct units.
2. Choose an appropriate scale.
3. Plot points carefully.
4. Join points with **straight lines** (for travel graphs) or **smooth curves** (if data varies smoothly).

Example 3: Drawing a Distance-Time Graph

Time (min)	Distance (km)
0	0
5	2
10	4
15	4
20	6

- Plot and connect with straight segments.
- Interpret: stopped from 10 to 15 min.

3. Rate of Change – Kinematics (Distance–Time and Speed–Time Graphs)

A. Distance–Time Graphs

- **Gradient = Speed**

Example 4:

From a graph:

- Rise = 10 km, Run = 5 min → Speed = 10 ÷ 5 = **2 km/min**

B. Speed–Time Graphs

- **Gradient** = **Acceleration**
- **Flat line** = Constant speed
- **Sloping up** = Acceleration
- **Sloping down** = Deceleration

Example 5:

Speed increases from 0 to 20 m/s in 5 seconds:

- Acceleration = (20 - 0) ÷ 5 = **4 m/s²**

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4. Calculate Distance from Speed–Time Graphs

> **Distance = Area under the speed–time graph**

Use **geometry**:

- Rectangle → base × height
- Triangle → ½ × base × height
- Trapezium → ½ × (sum of parallel sides) × height

Example 6:

A car accelerates from 0 to 10 m/s in 4 seconds, then travels at 10 m/s for 6 seconds:

- Triangle (acceleration):
  Area = ½ × 4 × 10 = **20 m**
- Rectangle (constant speed):
  Area = 6 × 10 = **60 m**
- **Total distance = 20 + 60 = 80 m**

Extra: Gradient of Tangent (for Curved Distance–Time Graphs)

To estimate **instantaneous speed**, draw a **tangent** to the curve at a point, then:

> **Speed = Gradient = Rise ÷ Run**