

- Introduction to Graphs

Introduction to Graphs

Graphs are visual representations of data collected to show numerical facts quickly, easily, and clearly. They help in understanding trends and comparisons better than tables. A line graph displays data that changes continuously over time.

Concept Explanation

A line graph plots data points on a coordinate grid where the horizontal axis (x-axis) represents the independent variable (often time) and the vertical axis (y-axis) represents the dependent variable (such as temperature, distance, or cost). Points are connected by straight lines to show trends.

Formula Derivation

Graphs do not require formula derivation but understanding coordinates is essential. Each point on the graph is represented as (x, y) , where x is the independent variable and y is the dependent variable.

Worked Illustrations

Example: Temperature recorded at different times of the day:

Time (hours)	6 a.m.	10 a.m.	2 p.m.	6 p.m.
Temperature ($^{\circ}C$)	37	40	38	35

Plotting these points on a graph with time on x-axis and temperature on y-axis, then connecting the points forms a line graph showing temperature changes over the day.

Solved Examples

Example 1: The runs scored by two batsmen A and B in 10 matches are plotted on a line graph. Analyze the graph to answer:

- What do the axes represent?
- Which line corresponds to which batsman?
- In which match did both score the same runs?
- Who is more consistent?

Solution:

- X-axis: Match number (1 to 10)
- Y-axis: Runs scored
- Dotted line: Batsman A; Solid line: Batsman B
- Both scored 60 runs in match 4
- Batsman B is steadier due to fewer fluctuations in runs

Example 2: A car travels from city P to city Q (350 km apart). The distance from P is plotted against time.

- At 7 a.m., distance = 0 km
- From 8 a.m. to 9 a.m., distance increases to 50 km
- From 9 a.m. to 10 a.m., distance increases to 150 km
- From 11 a.m. to 12 noon, distance remains 200 km (car stopped)
- Car reaches city Q at 2 p.m. (350 km)

Speed is calculated as $\text{Speed} = \frac{\text{Change in Distance}}{\text{Change in Time}}$. For example, between 8 a.m. and 9 a.m.,
 $\text{speed} = \frac{50-0}{1} = 50 \text{ km/h}$.

Practice Set

Level 1 – Easy

- Plot the temperature data given in the worked illustration on graph paper.
- Identify the independent and dependent variables in the temperature graph.

Level 2 – Moderate

- Given runs scored by two players in 5 matches, plot a line graph and identify who is more consistent.
- Calculate the speed of the car between 9 a.m. and 10 a.m. from the distance-time graph.

Level 3 – Challenging

- Analyze a given line graph showing monthly sales of two products and determine the month with maximum difference in sales.
- From a distance-time graph, identify intervals where the object was stationary and explain how this is represented graphically.

Answer Key

Level 1

- Plot points at (6,37), (10,40), (14,38), (18,35) and connect them.

- Independent variable: Time; Dependent variable: Temperature

Level 2

- Player with less variation in runs is more consistent.
- Speed between 9 a.m. and 10 a.m. = $\frac{150-50}{1} = 100$ km/h.

Level 3

- Month with maximum sales difference is identified by largest vertical gap between lines.
- Stationary intervals are horizontal line segments where distance does not change with time.

Quick Reference

- Line graph: Connects data points to show trends.
- Coordinates: (x, y) represent points on graph.
- Speed formula: $\text{Speed} = \frac{\text{Distance}}{\text{Time}}$.
- Stationary object: Horizontal line on distance-time graph.

Glossary

- **Independent Variable:** Variable controlled or chosen (e.g., time).
- **Dependent Variable:** Variable that depends on independent variable (e.g., temperature).
- **Line Graph:** Graph connecting data points with lines.
- **Speed:** Rate of change of distance with time.
- **Coordinate:** Pair of values (x, y) locating a point on graph.