Chapter 22

Coordinates and simple graphs

Learn the ideas below, follow each worked example, then attempt the practice before checking the answers.

22.1 The coordinate plane

Two perpendicular axes meet at the origin (0, 0). The horizontal axis is x and the vertical axis is y. An ordered pair (x, y) gives horizontal position first and vertical position second. Choose a clear scale on each axis and keep intervals equal along an axis.

Worked example To plot (−3, 2), move 3 units left from the origin, then 2 units up. The point (2, −3) is different because the coordinates have changed order.

22.2 Quadrants and points on axes

The first quadrant has positive x and y. The second has negative x and positive y. The third has both negative and the fourth has positive x and negative y. A point on an axis is not in any quadrant. On the x axis y = 0, and on the y axis x = 0.

Worked example (4, 5) lies in quadrant I, (−4, 5) in II, (−4, −5) in III and (4, −5) in IV. The point (0, −6) lies on the y axis.

22.3 Horizontal vertical and simple linear graphs

A horizontal line has equation y = constant and a vertical line has equation x = constant. To graph y = mx + c, choose x values, calculate y, plot the pairs and draw the straight line. The value c is the y intercept and m is the gradient.

Worked example For y = 2x + 1, x values −1, 0, 1 and 2 give y values −1, 1, 3 and 5. The points lie on one line, which crosses the y axis at (0, 1).

22.4 Gradient and intercepts

Gradient is vertical change divided by horizontal change. Use two points on the line and subtract coordinates consistently. A positive gradient rises from left to right and a negative one falls. To find an x intercept, set y = 0; for a y intercept, set x = 0.

Worked example Through (1, 3) and (4, 9), gradient = $\frac{9-3}{4-1} = \frac{6}{3}$ = 2. For y = 2x − 6, the intercepts are (0, −6) and (3, 0).

22.5 Reading graphs in context

Read axis labels, units and scales before interpreting a graph. A point represents a pair of related values. Interpolate within the displayed data range with care; extrapolation beyond it may be unreliable. In a distance time graph, gradient gives speed and a horizontal section means the distance is unchanged.

Worked example A distance time graph rises from (0 h, 0 km) to (2 h, 90 km), giving speed 90 ÷ 2 = 45 km/h. A horizontal section from 2 h to 2.5 h represents a 30 minute stop.

Chapter 22 practice

Work in your notebook. Show your method and include units where needed.

1. In which quadrant is (−5, −2)?
2. Give the equation of the horizontal line through (3, −4).
3. Find y when x = −2 in y = 3x + 5.
4. Find the gradient through (0, 2) and (3, 11).
5. A graph shows 120 km travelled in 3 hours at constant speed. Find the speed.

Answers with methods

1. Quadrant III because both coordinates are negative.

2. y = −4.

3. y = 3(−2) + 5 = −1.

4. $\frac{11 - 2}{3 - 0} = \frac{9}{3} = 3$.

5. 120 ÷ 3 = 40 km/h.

Common mistake to avoid

Coordinates are ordered. Plotting y first swaps the axes and usually gives the wrong point. Label axes and units before plotting.