



COORDINATE GEOMETRY

- SECTION FORMULA

1 CHAPTER SNAPSHOT

This chapter covers:

- ✓ Section Formula
- ✓ Internal Division
- ✓ Midpoint Formula
- ✓ Ratio $m_1:m_2$
- ✓ Centroid Formula (optional but listed to fill, if needed)

Section formula determines the coordinates of a point P dividing a line segment AB in a given ratio.

2 KEY CONCEPTS

- ★ Points $A(x_1, y_1)$ & $B(x_2, y_2)$
- ★ Point $P(x, y)$ divides AB
- ★ Ratio $m_1:m_2$ ($m_1 > 0, m_2 > 0$)
- ★ Internal Division

Example points $A(x_1, y_1)$ & Point(2,1), 2:3 in Q1, Q(-1,4) divides AB, Q1, Q(-14,21), R(-2,-2)

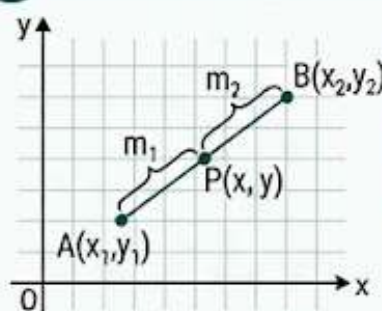
3 FORMULA BOX

$$P(x, y) = \left(\frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}, \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2} \right)$$

x-coordinate
y-coordinate
points A
Cross-multiplication
points B

$$\text{Midpoint} = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

4 VISUAL MEMORY AID



Pythagorean
 $d^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$

5 BOARD EXAM FOCUS & HOTSPOTS

Common Question Types

- ✓ Find division point coordinates
- ✓ Find the ratio given points
- ✓ Check point P divides AB
- ✓ Collinearity problems

Example:

Find coordinates of point P which divides $A(-1, 3)$ and $B(4, -2)$ in the ratio 2:3.

$$P(1, 1) = \frac{-1 \cdot 3 + 4 \cdot 2}{2 + 3}$$

$$P(1, 1) = \frac{-3 + 8}{5} = \frac{5}{5} = 1$$

Bottom Logic:

If distance between $(x, 2)$ and $(3, 4)$ is $\sqrt{2}$, find x. Show simple logic.

6 APPLICATIONS OF SECTION FORMULA

- Map work & path planning
- Engineering (structural division)
- Civil planning (intermediate stations)
- Game development

8 COMMON MISTAKES

- ⚠ Swapping ratios with points
- ⚠ Incorrect cross-multiplication order
- ⚠ Confusing internal/external division
- ⚠ Denominator error ($m_1 - m_2$)

7 QUICK FORMULA MAP

To Find	Formula
Point $P(x, y)$	$(m_1 x_2 + m_2 x_1, m_1 y_2 + m_2 y_1)$
Ratio $m_1:m_2$	$\frac{m_1}{m_2}$ (given P)
Midpoint	$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$

9 30-SECOND RAPID REVISION

- Section formula for weighted averages
- Cross-multiplication is key
- m_1 goes with point B
- Denominator is $m_1 + m_2$

10 KEY TAKEAWAY



The distance formula is the fundamental tool for converting geometric distance into algebra, unlocking analysis for countless positions and shapes.

★ **Remember:** The formula is derived from the Pythagorean theorem. Always cross-multiply ratio m_1 with point B and m_2 with point A!