

Section Formula — Class 10 Coordinate Geometry

The point that divides a line segment in a given ratio — and the midpoint as its special case.

$$P(x, y) = \left(\frac{(m_1x_2 + m_2x_1)}{(m_1 + m_2)}, \frac{(m_1y_2 + m_2y_1)}{(m_1 + m_2)} \right) \cdot \text{where } m_1 : m_2 = PA : PB, \text{ and } P \text{ lies between A and B}$$

Every symbol — and the cross-over that decides the marks

Symbol	What it is	The trap
$A(x_1, y_1)$	The first point — where you start measuring the ratio.	Its coordinate is multiplied by m_2 , not m_1 .
$B(x_2, y_2)$	The second point, at the far end.	Its coordinate is multiplied by m_1 .
$m_1 : m_2$	The ratio $PA : PB$ — m_1 sits beside A, m_2 beside B.	Swapping to $m_2 : m_1$ gives a different, wrong point.
$m_1 + m_2$	The number of equal parts the segment is cut into.	Forgetting it turns a coordinate into a raw total.

The whole trick in one line: each ratio part multiplies the **far** coordinate. Write $m_1x_1 + m_2x_2$ and every mark after it is gone.

One rule, three forms

Form	Looks like	Reach for it when...
General	$P = \left(\frac{(m_1x_2 + m_2x_1)}{(m_1 + m_2)}, \frac{(m_1y_2 + m_2y_1)}{(m_1 + m_2)} \right)$	the ratio is given — substitute and divide.
$k : 1$	$P = \left(\frac{(kx_2 + x_1)}{(k + 1)}, \frac{(ky_2 + y_1)}{(k + 1)} \right)$	the ratio is unknown — one unknown, one equation.
Midpoint $1 : 1$	$M = \left(\frac{(x_1 + x_2)}{2}, \frac{(y_1 + y_2)}{2} \right)$	the point is halfway — a plain average, no weighting.

Reading the ratio out of the words. “Points of trisection” means two points, at **1 : 2** and **2 : 1**. “Centre of a circle” from a diameter, or “the midpoint”, means **1 : 1**. “Twice as far from B as from A” means **1 : 2**. On an axis question, use **$y = 0$** for the x-axis and **$x = 0$** for the y-axis.

Where this sits in NCERT and CBSE

Question	The verified answer
Which section?	Chapter 7 runs 7.1 Introduction · 7.2 Distance Formula · 7.3 Section Formula . This page is 7.3.
Which exercise?	§7.1 carries no exercise, so every exercise sits one number behind its section: §7.2 → Ex 7.1 , §7.3 → Ex 7.2 . Two exercises, ten questions each .
What was removed?	§7.4 Area of a Triangle , its exercise and the old optional exercise. So area-based collinearity (“find k so the points are collinear”) is out ; the distance version, $AB + BC = AC$, survives in Ex 7.1.
What does CBSE examine?	<i>“Review: Concepts of coordinate geometry. Distance formula. Section formula (internal division).”</i>

Unit III Coordinate Geometry = 6 of 80. The seven units run $6 + 20 + 6 + 15 + 12 + 10 + 11 = 80$. CBSE sets marks **by unit, never by chapter** — chapter-wise percentage tables online are unofficial estimates. And **“(internal division)” is the whole scope limit**: if P appears to sit outside the segment, re-read the question.

Key takeaways

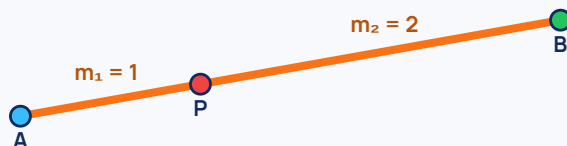
- Each ratio part multiplies the **far** coordinate — m_1 goes with x_2 , m_2 with x_1 .
- $m_1 : m_2$ is $PA : PB$** . Match m_1 to the point you measure from, or you land on a different point.
- Unknown ratio? Write it **$k : 1$** , use the easier coordinate, solve one equation, answer as $k : 1$.
- The **midpoint is just the 1 : 1 case** — average, do not weight.
- Trisection = 1 : 2 and 2 : 1**. Check the second point: it is the midpoint of the first point and B.
- At Class 10 the division is always **internal** — P lies between A and B. External division comes later.

One rule, four board questions

Straight from Exercise 7.2 — the same formula in four different disguises.

EX 7.2 Q2 · POINTS OF TRISECTION

Find the points of trisection of the segment joining $A(4, -1)$ and $B(-2, -3)$.



Drawn to scale at $m_1 : m_2 = 1 : 2$ — P sits a third of the way along, not halfway.

Step 1 — the ratios. $AP = PQ = QB$, so **P is 1 : 2** and **Q is 2 : 1**.

Step 2 — P at 1 : 2. $x = (1 \cdot (-2) + 2 \cdot 4)/3 = 6/3 = 2$; $y = (1 \cdot (-3) + 2 \cdot (-1))/3 = -5/3$. **P(2, -5/3)**

Step 3 — Q at 2 : 1. $x = (2 \cdot (-2) + 1 \cdot 4)/3 = 0/3 = 0$; $y = (2 \cdot (-3) + 1 \cdot (-1))/3 = -7/3$. **Q(0, -7/3)**

Check: Q is the midpoint of P and B $\rightarrow ((2 - 2)/2, (-5/3 - 3)/2) = (0, -7/3)$ ✓ Fractions are normal — do **not** round.

EX 7.2 Q5 · IN WHAT RATIO DOES THE x-AXIS DIVIDE IT?

In what ratio does the x-axis divide the segment joining $A(1, -5)$ and $B(-4, 5)$? Also find the point.

Step 1 — the axis as a number. Every point on the x-axis has $y = 0$.

Step 2 — k : 1 on the y-coordinate. $(k \cdot 5 + 1 \cdot (-5))/(k + 1) = 0 \Rightarrow 5k - 5 = 0 \Rightarrow k = 1$, so the ratio is **1 : 1**.

Step 3 — the point. $x = (1 \cdot (-4) + 1 \cdot 1)/2 = -3/2$, giving **$(-3/2, 0)$** .

Check: the ratio came out 1 : 1, so the crossing point must be the midpoint of AB $\rightarrow ((1 - 4)/2, (-5 + 5)/2) = (-3/2, 0)$ ✓

EX 7.2 Q7 · THE MIDPOINT, RUN BACKWARDS

The centre of a circle is $(2, -3)$ and one end of a diameter is $B(1, 4)$. Find the other end A.

The centre is the midpoint of the diameter, so $((x + 1)/2, (y + 4)/2) = (2, -3)$. Equate each coordinate: $x + 1 = 4 \Rightarrow x = 3$; $y + 4 = -6 \Rightarrow y = -10$. **A(3, -10)**

Check: midpoint of $(3, -10)$ and $(1, 4) = (2, -3)$ ✓ Note the sign: $(y + 4)/2 = -3$ gives -6 , not $+6$ — multiply the **whole** right-hand side by 2.

WHERE THE MARKS ACTUALLY GO

Cross-over	Writing $m_1x_1 + m_2x_2$ — wrong from that line on, no follow-through.
Ratio order	Reading it from the wrong end. Say which point you measured from.
Rounding	Turning $-5/3$ into -1.67 . Leave exact fractions — the board wants them.
No check line	One substitution back catches almost every sign slip.

NOW TRY THESE TWO

1 (Ex 7.2 Q4). In what ratio does $(-1, 6)$ divide the segment joining $(-3, 10)$ and $(6, -8)$?

2 (Ex 7.2 Q6). If $(1, 2)$, $(4, y)$, $(x, 6)$ and $(3, 5)$ are the vertices of a parallelogram taken in order, find x and y .

Answers: 1 $\rightarrow$ **2 : 7** (check with the y-coordinate: it gives 6 ✓). 2 $\rightarrow$ **$x = 6$, $y = 3$** , because the diagonals of a parallelogram bisect each other, so both diagonals share the midpoint $(7/2, 4)$ ✓

Make the section formula automatic

- **Start free with Chapter 1** — the whole chapter, no card needed.
- **Mistake identification** — see whether you lost the mark to the cross-over, the ratio order or a sign.
- **Anytime tests** — drill section formula and midpoint in ten minutes.
- **Weekly tests** — keep Coordinate Geometry warm as you move on.
- **Mock tests before the exam** — full papers, marked the CBSE way.

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