



1. CHAPTER OVERVIEW & QUESTION IDENTIFICATION SYSTEM

Co-ordinate Geometry connects algebra with geometry using ordered pairs of real numbers. In the Class 10 CBSE examination, this chapter carries approximately **6 Marks** and is one of the highest scoring chapters if you follow systematic calculation steps.



ONEPATH HACK: QUESTION IDENTIFICATION MATRIX

Apply: "QUESTION DEKHO → TYPE PEHCHANO → METHOD CHUNO"

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If Question Mentions...	Identify Concept	Formula / Approach to Apply
"Distance between two points", "Equidistant from...", "Check if vertices form a triangle/square/rect"	Distance Formula	$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
"Find point on x-axis" / "y-axis"	Axes Coordinates	On x-axis: take point as $P(x, 0)$ On y-axis: take point as $Q(0, y)$
"Divides line segment in ratio m:n" / "Find ratio"	Section Formula	Use $P(x, y) = ((mx_2 + nx_1)/(m+n), (my_2 + ny_1)/(m+n))$. If ratio is unknown, assume $k : 1$!
"Mid-point", "Bisection", "Diagonals of parallelogram"	Mid-point Formula	$M = ((x_1 + x_2)/2, (y_1 + y_2)/2)$ Diagonals of parallelogram bisect each other!
"Points of Trisection"	Trisection	Divide line into 3 equal parts using ratios $1:2$ and $2:1$.

2. DISTANCE FORMULA & APPLICATIONS

① WHAT?

The Distance Formula calculates the straight-line distance between any two points in a Cartesian plane given by coordinates $A(x_1, y_1)$ and $B(x_2, y_2)$.

② WHY?

It is derived directly from the **Pythagoras Theorem** in a right-angled triangle formed by the horizontal displacement $|x_2 - x_1|$ and vertical displacement $|y_2 - y_1|$.

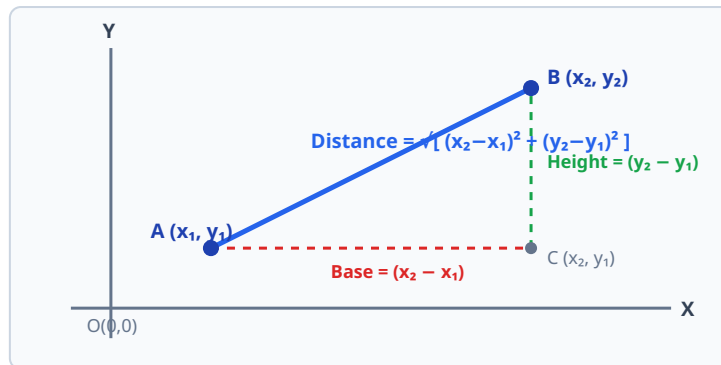
③ HOW & FORMULA

● DISTANCE FORMULA

$$AB = \sqrt{[(x_2 - x_1)^2 + (y_2 - y_1)^2]}$$

Distance of a point $P(x, y)$ from Origin $O(0, 0)$: $OP = \sqrt{(x^2 + y^2)}$

④ VISUAL DIAGRAM



🔥 TINKU SIR TRICK: "DIFFERENCE SQUARED & ADD"

Never worry about sign order inside the bracket! Since $(x_2 - x_1)^2 = (x_1 - x_2)^2$, sign flip doesn't matter after squaring.

Trick Steps: Step 1: Subtract x-coords → Step 2: Subtract y-coords → Step 3: Square both → Step 4: Add them → Step 5: Take Square Root!

● COMMON MISTAKE TO AVOID

Wrong: $\sqrt{[(x_2 - x_1)^2 + (y_2 - y_1)^2]} = (x_2 - x_1) + (y_2 - y_1)$ ❌ (Square roots CANNOT be split over addition!)

Correct: Solve the addition inside the root completely BEFORE taking the root. ✅

⑤ SOLVED EXAMPLES & GEOMETRICAL APPLICATIONS

EXAMPLE 1 (Equidistant Point on Axis): Find a point on the x-axis which is equidistant from $A(2, -5)$ and $B(-2, 9)$.

Solution:

1. Let the required point on x-axis be $P(x, 0)$ since y-coordinate on x-axis is always 0.
2. Given $PA = PB \Rightarrow PA^2 = PB^2$ (Squaring removes roots!)
3. $PA^2 = (x - 2)^2 + (0 - (-5))^2 = (x - 2)^2 + 25 = x^2 - 4x + 4 + 25 = x^2 - 4x + 29$
4. $PB^2 = (x - (-2))^2 + (0 - 9)^2 = (x + 2)^2 + 81 = x^2 + 4x + 4 + 81 = x^2 + 4x + 85$
5. Equating $PA^2 = PB^2$:

$$x^2 - 4x + 29 = x^2 + 4x + 85$$

$$-4x - 4x = 85 - 29 \Rightarrow -8x = 56 \Rightarrow x = -7$$

Final Answer: The required point is $P(-7, 0)$.

⑥ GEOMETRICAL SHAPE TESTING RULES

To prove what shape is formed by given points, calculate the required side lengths and diagonal lengths using Distance Formula:

Geometric Figure	Conditions to Prove
Equilateral Triangle	All 3 sides equal ($AB = BC = CA$)
Isosceles Triangle	Any 2 sides equal ($AB = AC \neq BC$)
Right Triangle	Pythagoras holds ($AB^2 + BC^2 = AC^2$)
Parallelogram	Opposite sides equal ($AB = CD$ and $BC = DA$). Diagonals NOT equal ($AC \neq BD$).
Rectangle	Opposite sides equal AND Diagonals equal ($AB = CD, BC = DA$ AND $AC = BD$).
Rhombus	All 4 sides equal ($AB = BC = CD = DA$). Diagonals NOT equal ($AC \neq BD$).
Square	All 4 sides equal AND Diagonals equal ($AB = BC = CD = DA$ AND $AC = BD$).
Collinear Points (A, B, C)	Sum of two distances equals third ($AB + BC = AC$).

3. ✂ SECTION FORMULA & MID-POINT THEOREM

① WHAT?

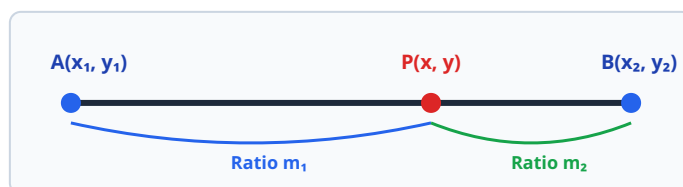
The Section Formula determines the coordinates of a point $P(x, y)$ which divides a line segment joining $A(x_1, y_1)$ and $B(x_2, y_2)$ internally in a given ratio $m_1 : m_2$.

② FORMULA & STRUCTURE

● SECTION FORMULA (INTERNAL DIVISION)

$$P(x, y) = \left(\frac{m_1x_2 + m_2x_1}{m_1 + m_2}, \frac{m_1y_2 + m_2y_1}{m_1 + m_2} \right)$$

③ VISUAL REPRESENTATION



🔥 TINKU SIR TRICK: "CRISS-CROSS MULTIPLICATION"

To write the section formula easily without confusion:

Multiply the **LEFT ratio** (m_1) with the **RIGHT coordinate** (x_2 or y_2).

Multiply the **RIGHT ratio** (m_2) with the **LEFT coordinate** (x_1 or y_1).

$$x = \frac{m_1 \cdot x_2 + m_2 \cdot x_1}{m_1 + m_2}$$

ONEPATH HACK: FINDING UNKNOWN RATIO WITH K : 1

Whenever you are asked to "Find the ratio in which point P divides AB", ALWAYS assume the ratio is $k : 1$ (where $k = m_1/m_2$).

Coordinates using $k : 1$:

$$P(x, y) = ((kx_2 + x_1)/(k + 1), (ky_2 + y_1)/(k + 1))$$

- If division is by **x-axis**: Set y-coordinate = 0 $\Rightarrow (ky_2 + y_1)/(k + 1) = 0 \Rightarrow k = -y_1 / y_2$
- If division is by **y-axis**: Set x-coordinate = 0 $\Rightarrow (kx_2 + x_1)/(k + 1) = 0 \Rightarrow k = -x_1 / x_2$

④ SPECIAL CASES: MID-POINT & TRISECTION

MID-POINT FORMULA (1 : 1 RATIO)

When $m_1 = m_2 = 1$, the mid-point $M(x, y)$ of segment joining $A(x_1, y_1)$ and $B(x_2, y_2)$ is:

$$M(x, y) = ((x_1 + x_2)/2, (y_1 + y_2)/2)$$

POINTS OF TRISECTION

Points P and Q trisect segment AB if they divide it into three equal lengths ($AP = PQ = QB$).

- Point P divides AB internally in ratio $1 : 2$.
- Point Q divides AB internally in ratio $2 : 1$ (or Q is mid-point of PB !).

⑤ SOLVED EXAMPLES

EXAMPLE 2 (Finding Ratio): Find the ratio in which the line segment joining $A(1, -5)$ and $B(-4, 5)$ is divided by the x-axis. Also find the coordinates of the point of division.

Solution:

1. Let point on x-axis be $P(x, 0)$ dividing AB in ratio $k : 1$.
2. Using Section Formula for y-coordinate:

$$y = (k(5) + 1(-5)) / (k + 1)$$

3. Since P lies on x-axis, $y = 0$:

$$0 = (5k - 5) / (k + 1) \Rightarrow 5k - 5 = 0 \Rightarrow 5k = 5 \Rightarrow k = 1$$

4. Therefore, required ratio is $1 : 1$ (Mid-point!).

5. Now find x-coordinate using $k = 1$:

$$x = (1(-4) + 1(1)) / (1 + 1) = (-4 + 1)/2 = -3/2$$

Final Answer: Ratio = $1 : 1$, Point of division = $P(-3/2, 0)$.

4. ▲ CENTROID OF A TRIANGLE

① WHAT IS CENTROID?

The **Centroid** of a triangle is the point of intersection of its three medians. It divides each median in the ratio **2 : 1** (measured from vertex to base).

● CENTROID FORMULA

For a triangle with vertices $A(x_1, y_1)$, $B(x_2, y_2)$, and $C(x_3, y_3)$, Centroid $G(x, y)$ is:

$$G(x, y) = ((x_1 + x_2 + x_3)/3, (y_1 + y_2 + y_3)/3)$$

EXAMPLE 3: If two vertices of $\triangle ABC$ are $A(3, -5)$, $B(-7, 4)$ and its centroid is $G(2, -1)$, find coordinates of third vertex C .

Solution:

Let third vertex be $C(x_3, y_3)$.

By Centroid Formula:

$$(x_1 + x_2 + x_3)/3 = 2 \Rightarrow (3 - 7 + x_3)/3 = 2 \Rightarrow -4 + x_3 = 6 \Rightarrow x_3 = 10$$

$$(y_1 + y_2 + y_3)/3 = -1 \Rightarrow (-5 + 4 + y_3)/3 = -1 \Rightarrow -1 + y_3 = -3 \Rightarrow y_3 = -2$$

Final Answer: Third vertex C is $(10, -2)$.

5. 📖 VERIFIED CBSE BOARD PYQS & BOARD PATTERNS (2023–2026)

● VERIFIED CBSE 2023 [2 MARKS]

Question: Find the ratio in which the point $P(-1, 6)$ divides the line segment joining the points $A(-3, 10)$ and $B(6, -8)$.

Detailed Board Solution:

1. Let $P(-1, 6)$ divide AB in ratio $k : 1$.

2. Using x-coordinate of Section Formula:

$$-1 = (k(6) + 1(-3)) / (k + 1)$$

$$-1(k + 1) = 6k - 3 \Rightarrow -k - 1 = 6k - 3$$

$$-k - 6k = -3 + 1 \Rightarrow -7k = -2 \Rightarrow k = 2/7$$

3. Thus, the ratio $k : 1 = 2/7 : 1 = 2 : 7$.

Verification: Check y-coordinate with $k = 2/7$: $y = (2/7(-8) + 10)/(2/7 + 1) = (-16 + 70)/9 = 54/9 = 6$. (Matches!)

Final Answer: Ratio is $2 : 7$.

 VERIFIED CBSE 2024 [3 MARKS]

Question: If $A(1, 2)$, $B(4, y)$, $C(x, 6)$ and $D(3, 5)$ are vertices of a parallelogram taken in order, find x and y .

CBSE Approach & Solution:

Key Property: Diagonals of a parallelogram bisect each other! So, Mid-point of diagonal AC = Mid-point of diagonal BD .

- Mid-point of $AC = ((1 + x)/2, (2 + 6)/2) = ((1 + x)/2, 4)$
- Mid-point of $BD = ((4 + 3)/2, (y + 5)/2) = (7/2, (y + 5)/2)$

Equating corresponding coordinates:

$$(1 + x)/2 = 7/2 \Rightarrow 1 + x = 7 \Rightarrow x = 6$$

$$(y + 5)/2 = 4 \Rightarrow y + 5 = 8 \Rightarrow y = 3$$

Final Answer: $x = 6, y = 3$.

 CBSE-STYLE / COMPETENCY PATTERN 2025–2026 [4 MARKS CASE STUDY]

Scenario: Three students set up tents at points $A(1, 4)$, $B(5, 1)$, and $C(1, 1)$ on a playground.

(i) Find distance between A and B.

$$AB = \sqrt{[(5 - 1)^2 + (1 - 4)^2]} = \sqrt{[16 + 9]} = \sqrt{25} = 5 \text{ units.}$$

(ii) Find coordinates of tent D such that ABCD forms a rectangle.

In rectangle $ABCD$, mid-point of AC = mid-point of BD .

$$\text{Mid-point of } AC = ((1 + 1)/2, (4 + 1)/2) = (1, 2.5).$$

$$\text{Let } D = (x, y). \text{ Mid-point of } BD = ((5 + x)/2, (1 + y)/2).$$

$$(5 + x)/2 = 1 \Rightarrow 5 + x = 2 \Rightarrow x = -3; \quad (1 + y)/2 = 2.5 \Rightarrow 1 + y = 5 \Rightarrow y = 4.$$

Coordinates of $D = (5, 4)$ (if taken in cyclic order $A-B-C-D$).

6. STUDENTS OFTEN MAKE THESE MISTAKES

Common Error	 Wrong Approach	 Correct Approach	 How to Avoid
Squaring inside square root	$\sqrt{(x^2 + y^2)} = x + y$	$\sqrt{(3^2 + 4^2)} = \sqrt{(9 + 16)} = \sqrt{25} = 5$	Never split square root over + or – signs!
Flipping Ratio Terms	Using m_1 with x_1 in Section Formula	Use cross rule: m_1 multiplies with x_2 !	Draw line segment and arrows showing cross-multiplication.
Points on Axis	Taking point on x-axis as $(0, x)$	Point on x-axis is ALWAYS $(x, 0)$!	Remember: "On X-axis, Y is Zero; On Y-axis, X is Zero".
Parallelogram Order	Joining points randomly in any order	Follow cyclic order: $A \rightarrow B \rightarrow C \rightarrow D$	Draw a quick rough figure to mark vertices in order.

7. 🌐 COMPLETE CHAPTER MIND MAP

CO-ORDINATE GEOMETRY (CLASS 10) | — 📌 1. DISTANCE FORMULA | — Formula: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ | — From Origin: $d = \sqrt{x^2 + y^2}$ | — Applications: Collinearity ($AB + BC = AC$), Shape proving (Square, Rectangle, etc.) | — Tinku Sir Trick: Difference² + Difference² → Sum → Square Root! | — 📌 2. SECTION FORMULA | — Internal Division: $P(x, y) = ((m_1x_2 + m_2x_1)/(m_1+m_2), (m_1y_2 + m_2y_1)/(m_1+m_2))$ | — Unknown Ratio Trick: Assume $k : 1$ ratio! | — Division by x-axis: Set $y = 0 \Rightarrow k = -y_1 / y_2$ | — Division by y-axis: Set $x = 0 \Rightarrow k = -x_1 / x_2$ | — 📌 3. MID-POINT & TRISECTION | — Mid-point Formula: $M = ((x_1 + x_2)/2, (y_1 + y_2)/2)$ | — Parallelogram Property: Mid-point of Diagonal 1 = Mid-point of Diagonal 2 | — Trisection Points: Divide in 1:2 and 2:1 ratios | — 📌 4. CENTROID OF TRIANGLE | — Formula: $G(x, y) = ((x_1 + x_2 + x_3)/3, (y_1 + y_2 + y_3)/3)$

8. 🚀 ONEPATH ONE-PAGE REVISION SHEET

🏆 LAST-MINUTE BOARD REVISION CHEAT SHEET

1. Distance Formula: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
2. Point from Origin: $OP = \sqrt{x^2 + y^2}$
3. Section Formula: $P(x, y) = ((m_1x_2 + m_2x_1)/(m_1+m_2), (m_1y_2 + m_2y_1)/(m_1+m_2))$
4. Mid-Point Formula: $M(x, y) = ((x_1 + x_2)/2, (y_1 + y_2)/2)$
5. Centroid Formula: $G(x, y) = ((x_1 + x_2 + x_3)/3, (y_1 + y_2 + y_3)/3)$
6. Parallelogram Shortcut: If $ABCD$ is parallelogram, $x_A + x_C = x_B + x_D$ and $y_A + y_C = y_B + y_D$.
7. Trisection Ratios: First point = $1 : 2$, Second point = $2 : 1$.

9. TOP 10 PRACTICE QUESTIONS FOR BOARD EXAM

- 1. BASIC** Find distance between points $A(a \sin \theta, 0)$ and $B(0, a \cos \theta)$. (Ans: a)
- 2. BASIC** Find the perimeter of a triangle with vertices $(0, 4)$, $(0, 0)$ and $(3, 0)$. (Ans: 12 units)
- 3. MODERATE** Find a relation between x and y such that $P(x, y)$ is equidistant from $(7, 1)$ and $(3, 5)$. (Ans: $x - y = 2$)
- 4. MODERATE** Show that the points $(1, 7)$, $(4, 2)$, $(-1, -1)$ and $(-4, 4)$ are vertices of a square.
- 5. MODERATE** Find the coordinates of the points of trisection of the line segment joining $(4, -1)$ and $(-2, -3)$. (Ans: $(2, -5/3)$ and $(0, -7/3)$)
- 6. ADVANCED** In what ratio does the line $2x + y - 4 = 0$ divide the line segment joining $A(2, -2)$ and $B(3, 7)$? (Ans: $2 : 9$)
- 7. ADVANCED** If $P(9a - 2, -b)$ divides the segment joining $A(3a + 1, -3)$ and $B(8a, 5)$ in ratio $3:1$, find a and b . (Ans: $a = 1, b = -3$)
- 8. HOTS** If the mid-point of line segment joining $A(3, 4)$ and $B(k, 6)$ is $P(x, y)$ and $x + y - 10 = 0$, find k . (Ans: $k = 7$)
- 9. HOTS** Find the center of a circle passing through points $(6, -6)$, $(3, -7)$ and $(3, 3)$. (Ans: $(3, -2)$)
- 10. BOARD SPECIAL** Find the ratio in which the y -axis divides the line segment joining $(5, -6)$ and $(-1, -4)$. Also find point of intersection. (Ans: $5 : 1, (0, -13/3)$)

10. FINAL CHAPTER MASTERY CHECKLIST

Topic / Skill	Status
Distance formula calculation & origin distance rule	☐ Completed
Equidistant points on X-axis and Y-axis	☐ Completed
Proving geometric figures (Square, Rectangle, Parallelogram, Rhombus)	☐ Completed
Section formula internal division & $k:1$ assumption trick	☐ Completed
Points of trisection calculation	☐ Completed
Mid-point theorem and diagonal property of parallelogram	☐ Completed
Centroid of triangle calculation	☐ Completed
Solved past 4 years verified CBSE PYQs (2023–2026)	☐ Completed