Affiliated to CBSE, New Delhi (Affiliation No. 1030642)

GNPS

GOMTI NANDAN PUBLIC SCHOOL

Gandhi Ward, Bina (M.P.) 470113. | 9165 609 333. | info@mygnps.com | www.mygnps.com

CLASS X · MATHEMATICS BASIC (241) · CBSE BOARD EXAMINATION 2027

CHAPTER 7 BASIC

Coordinate Geometry

Chapter Practice Booklet · Questions only · Answers in the separate Answer Booklet

6 guided method questions | 31 practice questions | 3 case studies | Basic (430 series) board question index

INSIDE THIS BOOKLET

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STUDENT DETAILS

NAME _____

CLASS & SECTION _____

ROLL NO. _____

BOOKLET STARTED ON _____

CHAPTER TEST SCORE ____ / 20

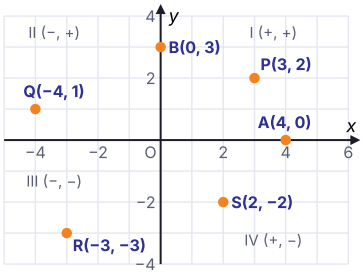
1

READ THIS FIRST · MATHEMATICS BASIC

Chapter Notes

The whole chapter in short-note form: every definition, formula, method and model answer. Revise from here – you should not need the textbook again.

1 The coordinate plane



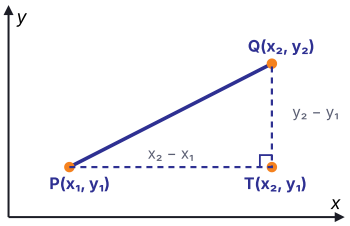
A point is fixed by an ordered pair $(x,\ y)$. x is the **abscissa** (distance from the y-axis) and y is the **ordinate** (distance from the x-axis).

- Signs: Quadrant I $(+,+)$, II $(-,+)$, III $(-,-)$, IV $(+,-)$.
- A point on the x-axis is $(a,\ 0)$; a point on the y-axis is $(0,\ b)$; the origin is $O(0,\ 0)$.
- The distance of $(x,\ y)$ from the x-axis is $|y|$ and from the y-axis is $|x|$.

EXAMPLE

$(-3,\ 5)$: abscissa -3, ordinate 5, Quadrant II, 5 units from the x-axis and 3 units from the y-axis.

2 Distance formula



In right $\triangle PTQ$: $PT = x_2 - x_1$ and $QT = y_2 - y_1$. By Pythagoras, $PQ^2 = PT^2 + QT^2$.

The distance between $P(x_1,\ y_1)$ and $Q(x_2,\ y_2)$ is

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

- The order of the points does not matter, because the differences are squared.
- From the origin: $OP = \sqrt{x^2 + y^2}$.
- On the same horizontal line ($y_1 = y_2$) the distance is just $|x_2 - x_1|$.

EXAMPLE

$A(-1,\ 3)$, $B(5,\ -5)$: $AB = \sqrt{6^2 + (-8)^2} = \sqrt{100} = 10$ units.

3 Using distances: collinear points and types of figures

- **Collinear:** three points lie on one line if the two smaller distances add up to the largest.
- **Triangle:** two sides equal: isosceles · three equal: equilateral · (longest side)² = sum of squares of the other two: right-angled.

Square	4 equal sides and equal diagonals
Rhombus	4 equal sides, diagonals not equal
Rectangle	opposite sides equal and equal diagonals
Parallelogram	opposite sides equal, diagonals not equal

EXAMPLE

$A(1,-1)$, $B(3,\ 3)$, $C(-1,-5)$: $AB = \sqrt{4+16} = 2\sqrt{5}$, $AC = \sqrt{4+16} = 2\sqrt{5}$, $BC = \sqrt{16+64} = 4\sqrt{5}$. $AB + AC = BC$, so the points are collinear.

4 Equidistant points and unknown coordinates

If P is equidistant from A and B, write $PA = PB$ and square both sides: $PA^2 = PB^2$. For a point on the x-axis take $(x,\ 0)$; on the y-axis take $(0,\ y)$.

EXAMPLE

Point on the x-axis equidistant from $A(5,\ -2)$ and $B(-1,\ 4)$: $(x-5)^2+4 = (x+1)^2+16 \to -10x+29 = 2x+17 \to x = 1$. The point is $(1,\ 0)$. Check: both distances are $\sqrt{20}$ ✓

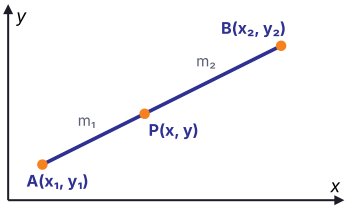
When a distance is given and a coordinate is unknown, square both sides. A square root then gives **two** values ($\pm$): keep both unless the question rules one out.

5 Model answer: unknown coordinate (2 marks)

Find y if the distance between $P(2,\ -3)$ and $Q(10,\ y)$ is 10 units.

1. $\sqrt{(10-2)^2+(y+3)^2} = 10 \to 64+(y+3)^2 = 100$ **1**
2. $(y+3)^2 = 36 \to y+3 = \pm 6 \to y = 3$ or $y = -9$ **1**

6 Section formula (internal division)



The point P that divides the join of $A(x_1,\ y_1)$ and $B(x_2,\ y_2)$ internally in the ratio $m_1 : m_2$ (so $AP : PB = m_1 : m_2$) is

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

- Cross over: m_1 multiplies the coordinates of B, and m_2 those of A.
- It comes from two similar right triangles with vertical and horizontal sides through A, P and B.

EXAMPLE

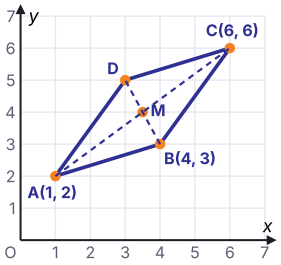
Divide $A(-4,\ 6)$ and $B(6,\ -4)$ in the ratio $3 : 2$: $x = \dfrac{3(6)+2(-4)}{5} = 2$, $y = \dfrac{3(-4)+2(6)}{5} = 0$. The point is $(2,\ 0)$.

7 Midpoint, trisection, centroid and parallelograms

Midpoint of AB (ratio $1 : 1$):

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

- **Points of trisection:** use the ratios $1 : 2$ and $2 : 1$.
- **Centroid** of a triangle (where the medians meet, dividing each in $2 : 1$): $G\left(\dfrac{x_1+x_2+x_3}{3},\ \dfrac{y_1+y_2+y_3}{3}\right)$.
- **Parallelogram:** the diagonals bisect each other, so the midpoint of AC = the midpoint of BD. The fourth vertex is $D = A + C - B$ (coordinate by coordinate).



EXAMPLE

$A(1,\ 2)$, $B(4,\ 3)$, $C(6,\ 6)$: midpoint of AC is $M(3.5,\ 4)$, so $D = (1+6-4,\ 2+6-3) = (3,\ 5)$.

8 Finding the ratio: the k : 1 method

If the ratio is unknown, take it as $k : 1$. Then $P = \left(\dfrac{kx_2+x_1}{k+1},\ \dfrac{ky_2+y_1}{k+1}\right)$. Put in the coordinate you know and solve for k.

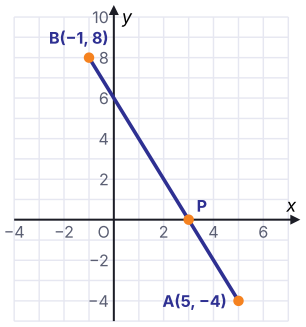
- Divided by the **x-axis**: the point has $y = 0$. Divided by the **y-axis**: the point has $x = 0$.
- Write the answer as a ratio ($k = \frac{1}{2}$ gives $1 : 2$), then find the point if asked.
- Check with the other coordinate. A negative k means the point is not between A and B.

EXAMPLE

Ratio in which $P(1,\ 3)$ divides $A(-2,\ 6)$ and $B(7,\ -3)$: $\dfrac{7k-2}{k+1} = 1 \to 6k = 3 \to k = \frac{1}{2}$, so $1 : 2$.

Check y: $\dfrac{-3(\frac{1}{2})+6}{\frac{3}{2}} = 3$ ✓

9 Model answer: ratio in which an axis divides (3 marks)



Find the ratio in which the x-axis divides the join of $A(5,\ -4)$ and $B(-1,\ 8)$. Also find the point of division.

1. Let the ratio be $k : 1$. The point is $P\left(\frac{-k+5}{k+1},\ \frac{8k-4}{k+1}\right)$. 1
2. P is on the x-axis, so $\frac{8k-4}{k+1} = 0 \rightarrow k = \frac{1}{2}$. The ratio is $1 : 2$. 1
3. $x = \frac{1(-1)+2(5)}{3} = 3$, so the point is $(3,\ 0)$. 1

10 Checks that save marks

- Square **each** difference separately: $(x_2 - x_1)^2 + (y_2 - y_1)^2$, then take the root.
- In the section formula, m_1 goes with the second point B.
- Divided by the x-axis means $y = 0$, not $x = 0$.
- Keep both signs after a square root, unless the question rules one out.
- Four equal sides alone do not make a square: check the diagonals too.
- Leave surds simplified: $\sqrt{50} = 5\sqrt{2}$, $\sqrt{45} = 3\sqrt{5}$.

Exam snapshot

What the board asks, and how to prepare

SYLLABUS 2026–27

- Concepts of coordinate geometry and graphs of linear equations.
- **Distance formula.**
- **Section formula** (internal division).

Not asked: the area of a triangle from its vertices (deleted).

BOARD WEIGHTAGE

6 / 80

Unit III is this chapter alone, 6 marks. Basic papers ask 1-mark questions on distance and the section formula, a 2-mark midpoint or equidistant-point question, and a 3-mark section-formula question or a 4-mark case study.

MOST ASKED IN BASIC BOARD PAPERS + SAMPLE PAPER 2026–27 (3 PAPERS CHECKED)

How often	Question type	Marks	Papers
★★☆	Section formula: a point, an unknown coordinate or the ratio	1–3	2 of 3
★★☆	Distance formula: a length or an equidistant point	1–2	2 of 3
★☆☆	Midpoint: fourth vertex of a parallelogram	2	1 of 3
★☆☆	Case study on a grid map	4	1 of 3

MISTAKES THAT COST MARKS

- Subtracting the wrong way and then forgetting to square: $(x_2 - x_1)^2$ is always positive.
- Adding the coordinates in the midpoint but not dividing by 2.
- Using $\dfrac{m_1x_1 + m_2x_2}{m_1 + m_2}$: the multipliers must cross over.
- Taking $(0,\ x)$ for a point on the x-axis. It is $(x,\ 0)$.
- Sign slips with negatives: $(-3 - 5)^2 = 64$, not 4.
- Not simplifying surds: $\sqrt{72} = 6\sqrt{2}$.

HOW TO USE THIS BOOKLET

1. **Day 1:** Notes, then Part A (guided methods) – fill every blank.
2. **Day 2:** Part B (NCERT practice). Do every MUST DO question first.
3. **Day 3:** Part C (board pattern), Part D (case studies) and the real board questions in Part E.
4. **Sun 27 Dec: Sunday chapter test – 20 marks in 40 minutes, without the booklet.**
5. Check every answer in the Answer Booklet. Write each mistake on the My Mistakes page.

RULES AT A GLANCE

Distance	$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
From origin	$\sqrt{x^2 + y^2}$
Section $m_1 : m_2$	$\left(\dfrac{m_1x_2 + m_2x_1}{m_1 + m_2},\ \dfrac{m_1y_2 + m_2y_1}{m_1 + m_2}\right)$
Midpoint	$\left(\dfrac{x_1 + x_2}{2},\ \dfrac{y_1 + y_2}{2}\right)$
Unknown ratio	take $k : 1$; x-axis $y = 0$, y-axis $x = 0$
Centroid	$\left(\dfrac{x_1 + x_2 + x_3}{3},\ \dfrac{y_1 + y_2 + y_3}{3}\right)$
Parallelogram	diagonals have the same midpoint

A

PART A · LEARN THE METHODS

Guided Practice

Fill in the blanks to learn each board method step by step. Then use the same steps on your own in Part B.

Distance and midpoint

A1. Complete the steps to find the distance between $A(2,\ -1)$ and $B(5,\ 3)$. MUST DO [2]

$x_2 - x_1 = 5 - 2 =$ ___, $y_2 - y_1 = 3 - (-1) =$ ___

$AB = \sqrt{(\ \ )^2 + (\ \ )^2} = \sqrt{\ \ +\ \ } =$ ___ units

A2. Complete the steps to find the midpoint of $P(-3,\ 4)$ and $Q(7,\ -2)$. MUST DO [2]

$x = \dfrac{x_1 + x_2}{2} = \dfrac{-3+}{2} =$ ___, $y = \dfrac{y_1 + y_2}{2} = \dfrac{4 + (\ \ )}{2} =$ ___. Midpoint = (__, __)

Section formula

A3. Complete the steps to find the point dividing the join of $A(1,\ 2)$ and $B(6,\ 7)$ in the ratio $2 : 3$. [2] MUST DO

$m_1 = __,\ m_2 = __.\quad x = \dfrac{m_1x_2 + m_2x_1}{m_1 + m_2} = \dfrac{2(\ \ ) + 3(\ \ )}{5} = ___$

$y = \dfrac{m_1y_2 + m_2y_1}{m_1 + m_2} = \dfrac{2(\ \ ) + 3(\ \ )}{5} = ___$. The point is $(__, __)$

A4. Complete the steps to find the ratio in which the x-axis divides the join of $A(2,\ -4)$ and $B(5,\ 2)$, and the point of division. [3]

Let the ratio be $k : 1$. $y = \dfrac{k(\ \ ) + 1(\ \ )}{k + 1}$. On the x-axis, $y = __$

So $2k - 4 = 0 \to k = __$. Ratio $= ___$. $x = \dfrac{2(5) + 1(2)}{3} = __$. Point $= (__, __)$

Equidistant point and diameter

A5. Complete the steps to find the point on the x-axis equidistant from $A(2,\ 3)$ and $B(6,\ 1)$. [3] MUST DO

Take $P(x, __)$. $PA^2 = PB^2$: $(x - 2)^2 + (\ \ )^2 = (x - 6)^2 + (\ \ )^2$

$x^2 - 4x + 4 + 9 = x^2 - 12x + 36 + 1 \to 8x = ___ \to x = __$. Point $= (__, __)$

A6. The centre of a circle is $O(1,\ 2)$ and one end of a diameter is $A(-2,\ 5)$. Complete the steps to find the other end B. [2]

O is the _____ of AB. $\dfrac{-2 + x}{2} = 1 \to x = __$, $\dfrac{5 + y}{2} = 2 \to y = __$. $B = (__, __)$

B

PART B · NCERT PRACTICE

NCERT Practice

The same skills as the NCERT examples and exercises, with new numbers. Basic papers are built on NCERT, so finish every question.

Distance formula

B1. The distance of the point $(-6,\ 8)$ from the origin is: MUST DO [1]

(a) 14 (b) 2 (c) 10 (d) $2\sqrt{7}$

B2. Find the distance between the points: MUST DO [2]

(i) $(3,\ 4)$ and $(-5,\ -2)$ (ii) $(a,\ b)$ and $(-a,\ -b)$

B3. Check whether the points $A(1,\ 5)$, $B(2,\ 3)$ and $C(-2,\ 11)$ are collinear. [2]

B4. Show that $A(2,\ 1)$, $B(5,\ 3)$, $C(3,\ 6)$ and $D(0,\ 4)$ are the vertices of a square. MUST DO [3]

B5. Find the values of x for which the distance between $P(x,\ 3)$ and $Q(4,\ -1)$ is 5 units. MUST DO [2]

B6. Find the point on the y-axis which is equidistant from $A(5,\ -2)$ and $B(-3,\ 2)$. MUST DO [3]

B7. Find a relation between x and y such that the point $(x,\ y)$ is equidistant from $(1,\ 3)$ and $(5,\ 1)$ [2]

.

B8. Name the type of quadrilateral formed by $A(-2,\ 0)$, $B(2,\ 3)$, $C(6,\ 0)$ and $D(2,\ -3)$. Give reasons. [3]

B9. Show that $A(3,\ 0)$, $B(6,\ 4)$ and $C(-1,\ 3)$ are the vertices of a right-angled isosceles triangle. [3]

Section formula

B10. The midpoint of the segment joining $(-2,\ 7)$ and $(6,\ -3)$ is: [1]

(a) $(4,\ 4)$ (b) $(2,\ 2)$ (c) $(2,\ 5)$ (d) $(-4,\ 5)$

B11. Find the coordinates of the point which divides the join of $(-2,\ 3)$ and $(8,\ -7)$ in the ratio $3 : 2$. MUST DO [2]

B12. Find the points of trisection of the segment joining $A(-3,\ 4)$ and $B(6,\ -2)$. MUST DO [3]

B13. In what ratio does the point $P(2,\ 1)$ divide the join of $A(-4,\ 5)$ and $B(5,\ -1)$? [3]

B14. Find the ratio in which the y-axis divides the join of $(6,\ -2)$ and $(-3,\ 7)$. Also find the point of division. MUST DO [3]

B15. The points $A(2,\ 3)$, $B(5,\ 4)$, $C(x,\ 6)$ and $D(1,\ y)$, taken in order, are the vertices of a parallelogram. Find x and y. [2]

B16. $A(-1,\ 2)$ and $B(5,\ -6)$ are the ends of a diameter of a circle. Find its centre and radius. [2]

B17. Find the coordinates of the points which divide the join of $A(-4,\ 0)$ and $B(0,\ 8)$ into four equal parts. [3]

C

PART C · BOARD PATTERN (BASIC)

Board Pattern Practice

Question types from real Mathematics Basic papers (430 series) and the 2026–27 Sample Paper. ★★★ = asked in all 3 papers checked · ★★ = 2 papers · ★ = 1 paper.

ASSERTION–REASON: HOW TO ANSWER

(a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, but R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

Distance formula: unknowns, circles, equidistant points

★★☆ 2 of 3 papers · 1–2 marks

C1. The distance between $(0,\ 5)$ and $(-5,\ 0)$ is: MUST DO [1]

(a) 5 (b) $5\sqrt{2}$ (c) 10 (d) $2\sqrt{5}$

C2. The distance of the point $(4,\ -3)$ from the x-axis is: [1]

(a) 4 (b) 5 (c) 7 (d) 3

C3. If the distance between $(2,\ -3)$ and $(k,\ 5)$ is 10 units, then k is: [1]

(a) -8 or 4 (b) 8 only (c) 6 or -6 (d) 8 or -4

C4. Find the point on the x-axis which is equidistant from $A(7,\ 6)$ and $B(-3,\ 4)$. MUST DO [2]

C5. Show that $A(-1,\ 0)$, $B(3,\ 0)$ and $C(1,\ 2\sqrt{3})$ are the vertices of an equilateral triangle. [2]

Section formula: ratio and point of division

★★☆ 2 of 3 papers · 1–3 marks

C6. The point $P(-2,\ 3)$ divides the join of $A(-6,\ 5)$ and $B(6,\ -1)$ in the ratio: MUST DO [1]

(a) $2:1$ (b) $1:2$ (c) $1:3$ (d) $3:1$

C7. The x-axis divides the join of $(1,\ -2)$ and $(4,\ 6)$ in the ratio: [1]

(a) $1:3$ (b) $3:1$ (c) $2:3$ (d) $3:2$

C8. $P(1,\ 2)$ divides AB in the ratio $3:1$, where A is $(-2,\ 5)$. Then B is: [1]

(a) $(1,\ 2)$ (b) $(4,\ -1)$ (c) $(2,\ 1)$ (d) $(2,\ -1)$

C9. ASSERTION–REASON [1]

Assertion (A): The midpoint of the segment joining $(-3,\ 7)$ and $(3,\ -7)$ is the origin.

Reason (R): The midpoint of the join of $(x_1,\ y_1)$ and $(x_2,\ y_2)$ is $\left(\dfrac{x_1+x_2}{2},\ \dfrac{y_1+y_2}{2}\right)$.

C10. Find the ratio in which the y-axis divides the segment joining $(-4,\ 7)$ and $(8,\ -5)$. Also find the point of intersection. MUST DO [3]

C11. Find the ratio in which the x-axis divides the join of $A(4,\ -6)$ and $B(-1,\ 4)$. Also find the point of division. [3]

Midpoint: median, diameter, parallelogram

★☆☆ 1 of 3 papers · 2 marks

C12. The midpoint of the segment joining $(-3,\ 4)$ and $(3,\ 6)$ lies on: MUST DO [1]

(a) the x -axis (b) the y -axis (c) the origin (d) neither axis

C13. One end of a diameter of a circle with centre $(3,\ -1)$ is $(7,\ 2)$. The other end is: [1]

(a) $(11,\ 5)$ (b) $(5,\ 0.5)$ (c) $(4,\ 3)$ (d) $(-1,\ -4)$

C14. $ABCD$ is a parallelogram with $A(-1,\ 3)$, $B(4,\ 5)$ and $D(1,\ -2)$. Find the vertex C. MUST DO [2]

D

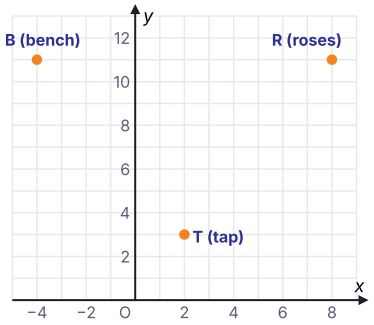
PART D · SECTION E STYLE

Case-Based Questions

Each case carries 4 marks (1 + 1 + 2), as in Section E of the board paper. Underline the numbers in the passage before you start.

D1. Case Study · School Garden [4]

The school garden is drawn on a grid in which 1 unit = 1 m. The tap is at $T(2,\ 3)$, the rose bed at $R(8,\ 11)$ and the bench at $B(-4,\ 11)$.



(i) How far is the rose bed from the tap? [1]

(ii) A lamp is to be fixed midway between the rose bed and the bench. Where is it? [1]

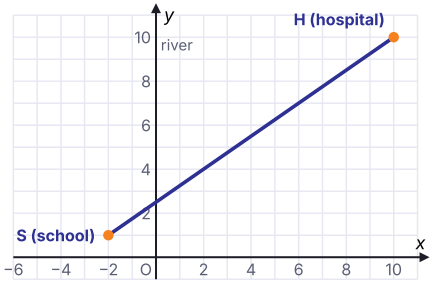
(iii) A sprinkler S is placed on TR so that $TS : SR = 1 : 3$. Find its position. [2]

OR

(iii) Show that T, R and B form an isosceles triangle. [2]

D2. Case Study · Town Map [4]

On a town map (1 unit = 1 km), the school is at $S(-2,\ 1)$ and the hospital at $H(10,\ 10)$. A straight road joins them. A river runs along the y-axis.



(i) Find the length of the road SH. [1]

(ii) A bus stop is built at the midpoint of SH. Find its position. [1]

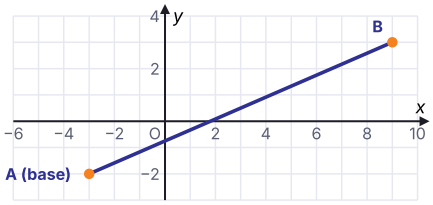
(iii) A metro station M on SH is twice as far from S as from H. Find M. [2]

OR

(iii) The road crosses the river at P. In what ratio does P divide SH? Find P. [2]

D3. Case Study · Drone Delivery [4]

A drone flies in a straight line from its base $A(-3,\ -2)$ to a village $B(9,\ 3)$. On the map, 1 unit = 100 m, and the x-axis is a highway.



(i) How far does the drone fly from A to B? [1]

(ii) It drops a parcel at the midpoint of AB. Where is the parcel dropped? [1]

(iii) The drone crosses the highway at Q. Find the ratio $AQ : QB$ and the point Q. [2]

OR

(iii) Find the point on AB that is one quarter of the way from A to B. [2]

E

PART E · REAL BOARD QUESTIONS

Board PYQ Index (Basic)

Real questions from the Mathematics Basic (430 series) papers and the 2026–27 Sample Paper, by type. Open the official paper and solve the listed questions.

Frequency	Question type	Marks	Where asked (year: paper code, question number)	Practise here
★★☆	**Section formula: a point, an unknown coordinate or the ratio**	1–3	**2025:** 430/1/1 Q6 · **SQP 2026–27:** Q8, Q28	A3–A4, B10–B17, C6–C11, D2–D3
★★☆	**Distance formula: a length or an equidistant point**	1–2	**2026:** 430/1/2 Q3 · **SQP 2026–27:** Q25(B)	A1, A5, B1–B9, C1–C5, D1
★☆☆	**Midpoint: fourth vertex of a parallelogram**	2	**SQP 2026–27:** Q25(A)	A2, A6, B10, B15–B16, C12–C14
★☆☆	**Case study on a grid map (park gates)**	4	**2025:** 430/1/1 Q38	A1, A3–A5, B1–B17, C1–C11, D1–D3
★☆☆	**Abscissa and ordinate**	1	**2025:** 430/1/1 Q5	A1, A5, B1–B9, C1–C5, D1

Papers checked (3): 2026 – 430/1/2 (Section A only could be read online) · 2025 – 430/1/1 · CBSE Sample Paper 2026–27 (Mathematics Basic). Sets of one code family share most questions, so they count as one paper. Download the official papers from cbse.gov.in → Previous Year Question Papers → Mathematics Basic.

F

PART F · YOUR RECORD

My Mistakes

Write down each mistake from this chapter, including the chapter test.

Every wrong answer is a free lesson. Write it here, find the rule you missed, and redo the question after three days. Bring this page to class before the next test.

Date	Part & Q No.	What went wrong	Correct rule or method	Redone ✓