

CHAPTER 7

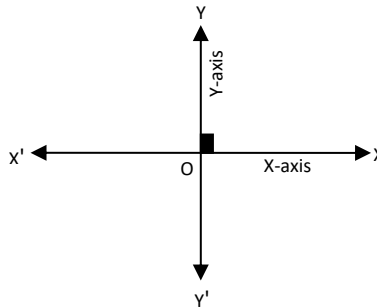
COORDINATE GEOMETRY

- *The Cartesian Co-ordinates System*

Two perpendicular lines $X'OX$ and $Y'OY$ in a plane constitute the cartesian co-ordinate system.

$X'OX$ is called the axis of X (or X -axis) $Y'OY$ is called the axis of Y (or Y -axis)

The intersection point O is called the origin.



- *Co-ordinates of a Point*

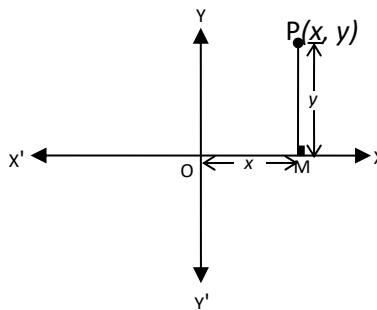
Let P be any point in the plane of the rectangular axis. From P draw $PM \perp X'OX$.

Then

OM is called x -co-ordinate (or abscissa) of P .

MP is called y -co-ordinate (or ordinate) of P .

\therefore Cartesian co-ordinates of P are (x, y) .



REMARKS

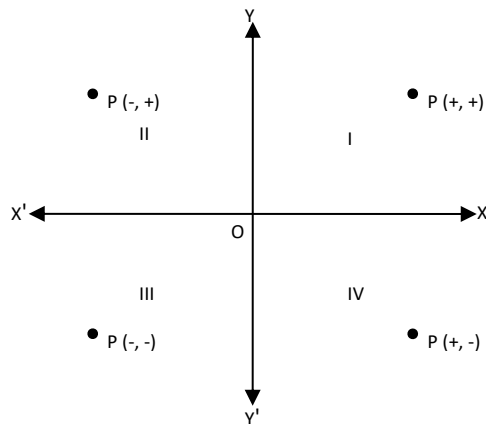
The co-ordinates of origin O are $(0, 0)$.

The co-ordinates of any point on X -axis is $(x, 0)$,

The coordinates of any point on Y -axis is $(0, y)$.

- *Signs of the Co-ordinates*

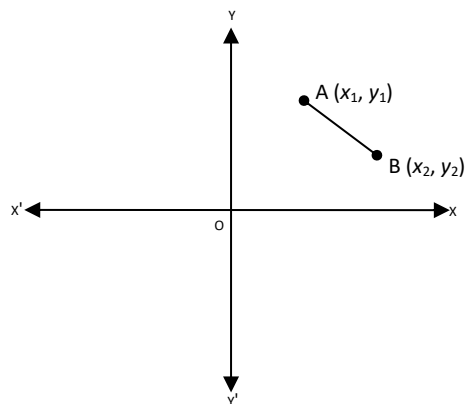
- If the point P is on the right of the origin, then x -co-ordinate of P is positive.
- If the point P is on the left of the origin, then its x -co-ordinate is negative.
- If the point P is above X-axis, then its y -co-ordinate is positive.
- If the point P is below X-axis, then its y -co-ordinate is negative.



- *Quadrants:*
 - In fig. XOY is called first quadrant.
 - YOX' is called second quadrant.
 - X'OY' is called third quadrant.
 - Y'OX is called fourth quadrant.
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- *Distance formula:*
 - If A(x_1, y_1) and B(x_2, y_2) be two points, then

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

i. e., The distance between two points
 $= \sqrt{(\text{difference of abscissae})^2 + (\text{difference of ordinates})^2}$



REMARKS

To prove that a quadrilateral is a

- i. parallelogram, show that both the pairs of opposite sides are equal (or) diagonals bisect each other.
- ii. rhombus, show that all sides are equal.
- iii. rectangle, show that both the pairs of opposite sides are equal and diagonals are also equal.
- iv. square, show that all sides are equal and diagonals are also equal.

▪ Section formula:

The point which divides the join of two distinct points A(x_1, y_1) and B(x_2, y_2) in the ratio $m_1: m_2$ has the co-ordinates.

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

$$m_1 \neq 0, m_2 \neq 0, m_1 + m_2 \neq 0$$

In particular, the mid-point of the segment joining A(x_1, y_1) and B (x_2, y_2) has the co-ordinates

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








▪ Centroid of a Triangle :







If A (x_1, y_1), B(x_2, y_2) and C(x_3, y_3) be the vertices of a triangle then its centroid is given by:



$$\left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3} \right)$$






- The area of the triangle formed by the points (x_1, y_1), (x_2, y_2) and (x_3, y_3) is the numerical value of









$$\frac{1}{2} [(x_1, y_2 - x_2, y_1) + (x_2, y_3 - x_3, y_2) + (x_3, y_1 - x_1, y_3)]$$








A.		MCQ (1 Mark)	Level
1		<p>Three points A, B and C are said to be collinear if</p> <p>a) They lie on the same straight line</p> <p>b) They don't lie on the same straight line</p> <p>c) They lie on three different straight lines</p> <p>d) None of the above</p>	C
2		<p>The points A(0 , -2), B(3 , 1), C(0 , 4), D(-3 , 1) are the vertices of a</p> <p>a)Parallelogram b) Rectangle c) Square d) Rhombus</p>	C
3		<p>A is a point on the y-axis at a distance of 4 units from the x-axis lying below the x-axis</p> <p>a) (4 , 0) b) (0 , 4) c) (-4 , 0) d) (0 , -4)</p>	U
4		<p>The distance between the points $P(a \cos 25^\circ, 0)$ and $Q(0, a \cos 65^\circ)$ is</p> <p>a) a b) $2a$ c) a^2 d) 1</p>	U
5		<p>The distance between the points $P(0, y)$ and $Q(x, 0)$ is</p> <p>a) $x^2 + y^2$ b) $\sqrt{x^2 - y^2}$ c) $\sqrt{x^2 + y^2}$ d) \sqrt{xy}</p>	
6		<p>1. The area of ΔABC if area of the Δ formed by joining the midpoints of the sides is 2 sq.units is</p> <p>a) 2sq.units b) 8sq.units c) 4sq.units d) 0sq.units</p>	C
7		<p>If the points $P(2, 3)$, $Q(5, k)$, $R(6, 7)$ are collinear, the value of k is</p>	U

		a) 4 b) 6 c) $\frac{-3}{2}$ d) $\frac{1}{4}$	
8		If the centriod of the Δ formed by the points (a, b) , (b, c) and (c, a) is at the origin, then $a^3 + b^3 + c^3$ is a) abc b) $a + b + c$ c) 0 d) $3abc$	U
9		Two vertices of ΔPQR are $P(-1, 4)$ and $Q(5, 2)$ and its centriod is $(0, -3)$. The coordinates of R are: a) $(-4, -15)$ b) $(4, 3)$ c) $(4, 15)$ d) $(-15, -4)$	HOT
10		The point $M(1, 2)$ divides the join of $P(-2, 1)$ and $Q(7, 4)$ in the ratio a) $2 : 1$ b) $3 : 2$ c) $1 : 2$ d) $2 : 3$	C
11		All the points on the y-axis is of the form a) $(0, y)$ b) $(y, 0)$ c) $(0, 0)$ d) $(x, 0)$	C
12		The coordinates of the point which divides the join of $(-1, 7)$ and $(4, -3)$ in the ratio $2 : 3$ is a) $(3, 1)$ b) $(1, 3)$ c) $(3, 0)$ d) $(0, 3)$	U
13		111121The midpoint of the line joining $(-3, -6)$ and $(1, -2)$ is a) $(-2, -8)$ b) $(0, -4)$ c) $(-1, -4)$ d) $(1, 4)$	MD

14		If the area of a triangle is 0, then the vertices of the triangle are, a) Non-collinear b) Zero c) (0 , 0) d) Collinear	U
15		If the points $(x, -1)$, $(2, 1)$ and $(4, 5)$ are collinear, then x is a) 0 b) 1 c) -1 d) 2	U

A.		Very Short Answer Questions (VSA) (1 Mark)	Level
16		In what ratio is the line segment joining the points $(-2, -3)$ and $(3, 7)$ divided by y -axis?	C
17		If the distance of $P(x, y)$ from $A(5, 1)$ and $B(-1, 5)$ are equal, then	C
18		The distance of the point $P(2, 3)$ from x -axis is	U
19		The positive value of y for which the distance between the points $P(2, -3)$ and $Q(10, y)$ is 10cm, is	U
20		A point on the x -axis which is equidistant from $A(5, 4)$ and $B(-2, 3)$ is	U
B.		Short Answer Questions (SA) (2 marks)	

21`		.Find the ratio in which y-axis divides the join of (5 , -6) and (-1 , -4).	C
22		Show that the points (1 , 5), (2 , 3) and (-2 , 11) are collinear.	U
23		Find the coordinates of a point on x-axis which is equidistant from (2 , -5) and (-2 , 9)	U
24		Find the points on y-axis, each of which is at a distance of 13 units from the point (-5 , 7)	HOT
25		.Find the centroid of ΔABC , whose vertices are A(-3 , 0), B(5 , -2), C(-8 , 5)	U
C.		Long Answer Questions (LA) (3 Marks)	
26		Show that the points A(2 , -2), B(14 , 10), C(11 , 13) & D(-1 , 1) are the vertices of a rectangle.	C
27		If $(a , 0)$, $(0 , b)$ & $(1 , 1)$ are collinear, then prove that $\frac{1}{a} + \frac{1}{b} = 1$	C
28		The midpoint of the line segment joining A(2a , 4) and B(-2 , 3b) is M(1 , 2a + 1). Then find a & b.	HOT

29		Find the coordinates of the point which is $\frac{2}{3}$ rd of the way from P(0 , 1) to Q(1 , 0)	the MD
D.		V Long Answer Questions (VLA) (4 Marks)	
30		Find the coordinates of points which trisect the line joining (1 , -2) & (-3 , 4).	U
31		Prove that A(3 , 0), B(4 , 5), C(-1 , 4) & D(-2 , -1) are the vertices of a rhombus and .Find the area of ABCD	U
32		. A(8 , -6), B(-4 , 6) & C(-10 , -8) are the vertices of ΔABC and P, Q & R are the midpoints of sides AB, BC & CA respectively. Show that $\Delta PQR = \frac{1}{4} \text{ar}(\Delta ABC)$	U
33		Show that the points A(a , a), B(-a , -a) & C(- $\sqrt{3}a$, $\sqrt{3}a$) are the vertices of an equilateral Δ Also find its area	U
34		Find the centroid of the Δ whose vertices are (-2 , -3), (-1 , 0) & (7 , -6).	U
35		Determine the ratio in which the line $2x + y = 4$ divides the line segment joining the points A(2 , - 2) & B(3 , 7).	HOT

ANSWERS

1) a 2) c 3) d 4) a 5) c 6) b 7) b 8) d 9) a 10) c

11) a 12) b 13) c 14) d 15) b 16) 2 : 3 17) $3x = 2y$ 18) 3 19) 3 20)) (2 , 0)

21) $5 : 1$ 23) $(-7, 0)$ 24) $(0, 19)$ & $(0, -5)$ 25) $(-2, 1)$

$$28) a = 2, b = 2 \quad 29) \left(\frac{2}{3}, \frac{1}{3}\right) \quad 30) \left(\frac{-1}{3}, 0\right) \& \left(\frac{-5}{3}, 2\right) \quad 31) 24 \text{sq. units}$$

33) $AB = 2\sqrt{2}a$; Area = $2\sqrt{3}a^2$ sq.units 34) (3 , -3) 35) 2 : 9

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