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PRACTICE PAPER 06 (2024-25)

CHAPTER 07 COORDINATE GEOMETRY

(ANSWERS)

SUBJECT: MATHEMATICS **MAX. MARKS : 40**

CLASS : X **DURATION : 1½ hrs**

General Instructions:

(i). **All** questions are compulsory.

(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.

(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.

(iv). There is no overall choice.

(v). Use of Calculators is not permitted

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. Three vertices of a parallelogram ABCD are A(1, 4), B(–2, 3) and C(5, 8). The ordinate of the fourth vertex D is

(a) 8 (b) 9 (c) 7 (d) 6

Ans: (b) 9

2. Points A(–1, y) and B(5, 7) lie on a circle with centre O(2, –3y). The values of y are

(a) 1, –7 (b) –1, 7 (c) 2, 7 (d) –2, –7

Ans: (b) –1, 7

3. If A(4, –2), B(7, –2) and C(7, 9) are the vertices of a ΔABC, then ΔABC is

(a) equilateral triangle (b) isosceles triangle

(c) right angled triangle (d) isosceles right angled triangle

Ans: (c) right angled triangle

4. If (a, b) is the mid point of the line segment joining the points A (10, –6) and B (k, 4) and a – 2b = 18, the values of k is

(a) 30 (b) 22 (c) 4 (d) 40

Ans: (b) 22

5. The coordinate of point P on X-axis equidistant from the points A (–1, 0) and B (5, 0) is

(a) (2, 0) (b) (0, 2) (c) (3, 0) (d) (2, 2)

Ans: (a) (2, 0)

6. A circle drawn with origin as the centre passes through $\left(\frac{13}{2}, 0\right)$. The point which does not lie in the interior of the circle is

(a) $\left(-\frac{3}{4}, 1\right)$ (b) $\left(2, \frac{7}{3}\right)$ (c) $\left(5, -\frac{1}{2}\right)$ (d) $\left(-6, \frac{5}{2}\right)$

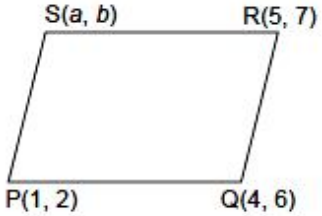
Ans: (d) $\left(-6, \frac{5}{2}\right)$

Distance of $\left(-6, \frac{5}{2}\right)$ from centre of the circle *i.e.*, (0, 0)

$$= \sqrt{(0+6)^2 + \left(0-\frac{5}{2}\right)^2} = \sqrt{36+\frac{25}{4}}$$

$$= \sqrt{\frac{144+25}{4}} = \frac{13}{2} = \text{radius of circle.}$$

7. If P(1, 2), Q(4, 6), R(5, 7) and S(a, b) are the vertices of a parallelogram PQRS, then
(a) a = 2, b = 4 (b) a = 3, b = 4(c) a = 2, b = 3 (d) a = 3, b = 5
Ans: (c) a = 2, b = 3



Mid-point of PR $= \left(\frac{1+5}{2}, \frac{2+7}{2}\right) = \left(3, \frac{9}{2}\right)$

Mid-points of SQ $= \left(\frac{4+a}{2}, \frac{6+b}{2}\right)$

Diagonals of parallelogram bisect each other.

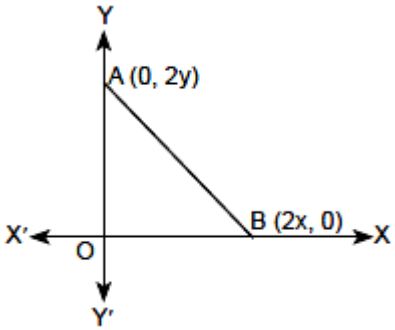
$$\therefore \quad \left(3, \frac{9}{2}\right) = \left(\frac{4+a}{2}, \frac{6+b}{2}\right)$$

$$\Rightarrow \quad 3 = \frac{4+a}{2}, \ \frac{9}{2} = \frac{6+b}{2}$$

$$\Rightarrow \quad a = 2, \quad b = 3.$$

8. The coordinates of the point which is equidistant from the three vertices of the ΔAOB as shown in the figure is

(a) (x, y) (b) (y, x) (c) $\left(\frac{x}{2}, \frac{y}{2}\right)$ (d) $\left(\frac{y}{2}, \frac{x}{2}\right)$



Ans: (a) (x, y)
∵ AOB is a right triangle.
∴ Mid-point of AB is equidistant from A, O and B.

Mid-point of AB $= \left(\frac{0+2x}{2}, \frac{2y+0}{2}\right) = (x, y)$

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

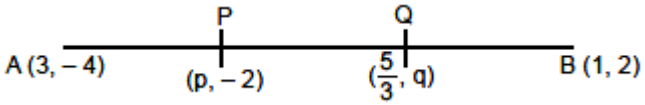
9. **Assertion (A):** Mid-point of a line segment divides line in the ratio 1 : 1.
Reason (R): The ratio in which the point (–3, k) divides the line segment joining the points (–5, 4) and (–2, 3) is 1 : 2.
Ans. (c) Assertion (A) is true but reason (R) is false.

10. **Assertion (A):** The origin is the only point equidistant from (2, 3) and (-2, -3).
Reason (R): The origin is the mid-point of the line joining (2, 3) and (-2, -3).
Ans. (d) Assertion (A) is false but reason (R) is true.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. The line segment AB joining the points A(3, –4) and B(1, 2) is trisected at the points P(p, –2) and Q(5/3, q). Find the values of p and q.
Ans: Now AP : PB = 1 : 2



$\therefore\ p = \dfrac{1\times1+2\times3}{1+2} \Rightarrow p = \dfrac{7}{3}$

Also AQ : QB = 2 : 1 $\Rightarrow q = \dfrac{2\times2+1\times(-4)}{1+2} = 0$

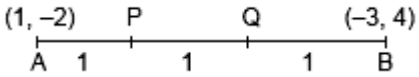
12. Find the point on x-axis which is equidistant from the points (2, – 5) and (–2, 9).
Ans: Let point on x-axis be P(a, 0) and given that A(2, –5) and B(–2, 9) are equidistant.
$\therefore$ PA = PB
$\Rightarrow \sqrt{(a-2)^2+25} = \sqrt{(a+2)^2+81}$
Squaring both sides, we get
$a^2 + 4 - 4a + 25 = a^2 + 4 + 4a + 81$
$\Rightarrow -8a = 56 \Rightarrow a = -7$
Hence the required point is (–7, 0)

13. Find the value of x such that PQ = QR where the coordinates of P, Q and R are (6, –1), (1, 3) and (x, 8) respectively.
Ans: Here, P (6, – 1), Q (1, 3) and R (x, 8)
Given PQ = QR
$\Rightarrow \sqrt{(6-1)^2+(-1-3)^2} = \sqrt{(1-x)^2+(3-8)^2}$
$\Rightarrow \sqrt{5^2+(-4)^2} = \sqrt{1^2+x^2-2x+(-5)^2}$
$\Rightarrow \sqrt{25+16} = \sqrt{1+x^2-2x+25}$
$\Rightarrow \sqrt{41} = \sqrt{x^2-2x+26}$
Squaring both sides, we get
$41 = x^2 - 2x + 26 \Rightarrow x^2 - 2x + 26 - 41 = 0 \Rightarrow x^2 - 2x - 15 = 0$
$\Rightarrow x^2 - 5x + 3x - 15 = 0 \Rightarrow x(x-5) + 3(x-5) = 0$
$\Rightarrow (x-5)(x+3) = 0$
either $x - 5 = 0$ or $x + 3 = 0$
$x = 5$ or $x = -3$
So $x = 5$ or -3

14. Find the coordinates of the point of trisection of the line segment joining (1, –2) and (–3, 4).

Ans: Let the points P and Q trisect AB.

$\Rightarrow$ AP : PB = 1 : 2 and AQ : QB = 2 : 1



Using section formula coordinates of P are

$x = \frac{1\times(-3)+2\times1}{1+2} = \frac{-3+2}{3} = \frac{-1}{3}$ and $y = \frac{1\times4+2\times(-2)}{1+2} = \frac{4+(-4)}{3} = \frac{0}{3} = 0$

Thus, P is $\left(\frac{-1}{3}, 0\right)$,

Coordinates of Q are $x = \frac{2\times(-3)+1\times1}{1+2} = \frac{-6+2}{3} = \frac{-5}{3}$

$y = \frac{2\times4+1\times(-2)}{1+2} = \frac{8+(-2)}{3} = \frac{6}{3} = 2$

Thus, Q is $\left(\frac{-5}{3}, 2\right)$

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Show that the points A(3, 5), B(6, 0), C(1, – 3) and D(–2, 2) are the vertices of a square ABCD.

Ans:

$AB = \sqrt{(6-3)^2+(0-5)^2}$

$= \sqrt{9+25} = \sqrt{34}$

$BC = \sqrt{(6-1)^2+(0+3)^2}$

$= \sqrt{25+9} = \sqrt{34}$

$CD = \sqrt{(1+2)^2+(-3-2)^2}$

$= \sqrt{9+25} = \sqrt{34}$

$DA = \sqrt{(-2-3)^2+(2-5)^2}$

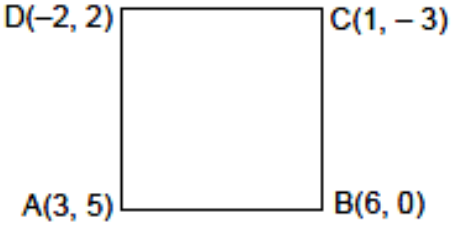
$= \sqrt{25+9} = \sqrt{34}$

$AC = \sqrt{(1-3)^2+(-3-5)^2}$

$= \sqrt{4+64} = \sqrt{68}$

$BD = \sqrt{(6+2)^2+(0-2)^2}$

$= \sqrt{64+4} = \sqrt{68}$



AB = BC = CD = DA = $\sqrt{34}$

Diagonal AC = diagonal BD = $\sqrt{68}$

Hence A, B, C and D are vertices of a square.

16. In what ratio does the line $x – y – 2 = 0$ divide the line segment joining (3, –1) and (8, 9)?

Ans: Let the line $x – y – 2 = 0$, divides the line segment joining (3, – 1) and (8, 9) in the ratio k : 1 and let the coordinates of the required point be (x_1, y_1).

Then $x_1 = \frac{8k+3}{k+1}$

and $y_1 = \frac{9\times k+1\times(-1)}{k+1} = \frac{9k-1}{k+1}$

This point (x_1, y_1) lies on the line whose equation is $x – y – 2 = 0$.

$\therefore$ It must satisfy the equation of the given line

$\Rightarrow \frac{8k+3}{k+1} - \frac{9k-1}{k+1} - 2 = 0$

$\Rightarrow 8k + 3 – (9k – 1) – 2(k + 1) = 0$

$\Rightarrow 8k + 3 – 9k + 1 – 2k – 2 = 0$

$\Rightarrow -3k + 2 = 0 \Rightarrow k = \frac{2}{3}$

Therefore, the required ratio is $k : 1 = \frac{2}{3} : 1$ or 2 : 3.

17. Show that points A(7, 5), B(2, 3) and C(6, – 7) are the vertices of a right triangle. Also find its area.

Ans:

$$AB = \sqrt{(2-7)^2+(3-5)^2} = \sqrt{25+4} = \sqrt{29}$$

$$BC = \sqrt{(6-2)^2+(-7-3)^2} = \sqrt{16+100} = \sqrt{116}$$

$$CA = \sqrt{(7-6)^2+(5+7)^2} = \sqrt{1+144} = \sqrt{145}$$

Since $AB^2 + BC^2 = 29 + 116 = 145 = CA^2$.

$\therefore$ ΔABC is right angled at B.

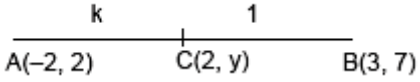
Area =

$$\frac{1}{2}AB \times BC = \frac{1}{2}\sqrt{29}.\sqrt{116} = \frac{1}{2}\sqrt{29}.2.\sqrt{29} = 29.$$

OR

Find the ratio in which the point (2, *y*) divides the line segment joining the points A(–2, 2) and B(3, 7). Also find the value of *y*.

Ans: Let C divides AB in the ratio *k* : 1



$\therefore$ *x* coordinate of C = $\frac{k \times 3 + 1 \times (-2)}{k+1}$

$\Rightarrow 2 = \frac{3k-2}{k+1} \Rightarrow 2k + 2 = 3k - 2 \Rightarrow k = 4$

$\therefore$ C divides AB in the ratio 4 : 1

Now *y* coordinate of C = $\frac{4 \times 7 + 1 \times 2}{4+1}$ [$\because k = 4$]

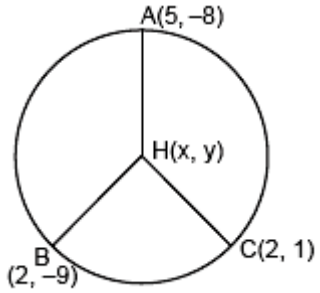
$\Rightarrow y = \frac{28+2}{5} = \frac{30}{5} = 6$

SECTION – D

Questions 18 carry 5 marks.

18. Find the centre of a circle passing through (5, – 8), (2, – 9) and (2, 1).

Ans: Let H(*x*, *y*) is centre of circle passing through A, B and C. Since AH, BH and CH are radius of circle.



$\therefore$ AH = BH and BH = CH

Also $AH^2 = BH^2$ and $BH^2 = CH^2$

$AH^2 = (x-5)^2 + (y+8)^2 = x^2 + 25 - 10x + y^2 + 64 + 16y$

$BH^2 = (x-2)^2 + (y+9)^2 = x^2 + 4 - 4x + y^2 + 81 + 18y$

$CH^2 = (x-2)^2 + (y-1)^2 = x^2 + 4 - 4x + y^2 + 1 - 2y$

$\because$ $AH^2 = BH^2$ [Radii of a circle]

$\therefore$ $x^2 + 25 - 10x + y^2 + 64 + 16y = x^2 + 4 - 4x + y^2 + 81 + 18y$

$\Rightarrow -10x + 4x + 16y - 18y = -4$

$\Rightarrow -6x - 2y = -4 \Rightarrow 3x + y = 2$ ...(i)

Also $BH^2 = CH^2$

$\therefore$ $x^2 + 4 - 4x + y^2 + 81 + 18y = x^2 + 4 - 4x + y^2 + 1 - 2y$

$\Rightarrow 18y + 2y = 1 - 81$

$\Rightarrow 20y = -80 \Rightarrow y = -4$

Putting value of y in (i), we get

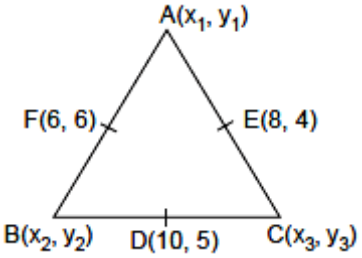
$3x + (-4) = 2 \Rightarrow 3x = 2 + 4 \Rightarrow 3x = 6 \Rightarrow x = 2$

$\therefore$ Coordinates of centre are (2, –4).

OR

If the points (10, 5), (8, 4) and (6, 6) are the mid-points of the sides of a triangle, find its vertices.

Ans: Let $A(x_1, y_1)$, $B(x_2, y_2)$ and $C(x_3, y_3)$ be the vertices of a triangle D(10, 5), E(8, 4) and F(6,6) are mid-points of sides BC, CA and AB respectively.



Therefore, $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) = (6, 6)$

$\Rightarrow x_1 + x_2 = 12$ ...(i)

and $y_1 + y_2 = 12$ ...(ii)

$\left(\frac{x_2 + x_3}{2}, \frac{y_2 + y_3}{2}\right) = (10, 5)$

$x_2 + x_3 = 20$ ...(iii)

and $y_2 + y_3 = 10$ ...(iv)

and $\left(\frac{x_1 + x_3}{2}, \frac{y_1 + y_3}{2}\right) = (8, 4)$

$\Rightarrow x_1 + x_3 = 16$ ...(v)

and $y_1 + y_3 = 8$ ...(vi)

Adding (i), (iii) and (v), we get $2(x_1 + x_2 + x_3) = 48$ ...(vii)

$\Rightarrow x_1 + x_2 + x_3 = 24$

From (i), (iii), (v) and (vii), we get $x_1 = 4$, $x_2 = 8$, $x_3 = 12$ ...(viii)

Adding (ii), (iv) and (vi), we get $2(y_1 + y_2 + y_3) = 30$

$y_1 + y_2 + y_3 = 15$ ...(ix)

From (ii), (iv), (vi) and (ix), we get $y_1 = 5$, $y_2 = 7$, $y_3 = 3$ ...(x)

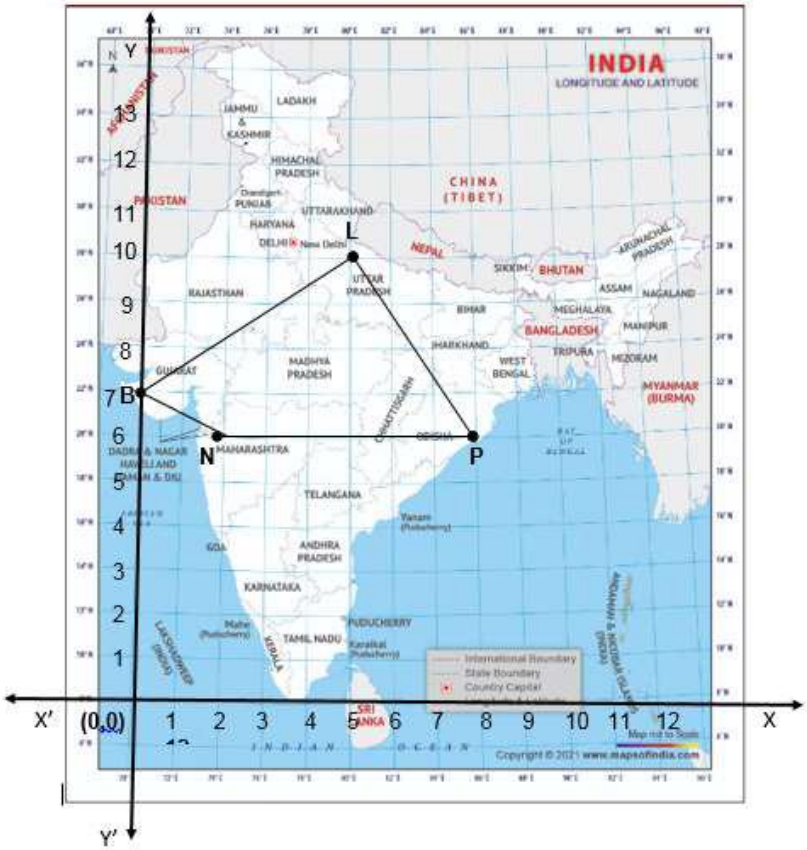
From (viii) and (x), we get

Coordinates of vertices are A (4, 5), B (8, 7) and C (12, 3).

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. In a GPS, The lines that run east-west are known as lines of latitude, and the lines running north-south are known as lines of longitude. The latitude and the longitude of a place are its coordinates and the distance formula is used to find the distance between two places. The distance between two parallel lines is approximately 150 km. A family from Uttar Pradesh planned a round trip from Lucknow (L) to Puri (P) via Bhuj (B) and Nashik (N) as shown in the given figure below.



Based on the above information answer the following questions using the coordinate geometry.

(i) Find the distance between Lucknow (L) to Bhuj(B).

(ii) If Kota (K), internally divide the line segment joining Lucknow (L) to Bhuj (B) into 3 : 2 then find the coordinate of Kota (K).

(iii) Name the type of triangle formed by the places Lucknow (L), Nashik (N) and Puri (P)

OR

Find a place (point) on the longitude (y-axis) which is equidistant from the points Lucknow (L) and Puri (P).

(i)

$LB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \Rightarrow LB = \sqrt{(0 - 5)^2 + (7 - 10)^2}$

$LB = \sqrt{(5)^2 + (3)^2} \Rightarrow LB = \sqrt{25 + 9}$ $LB = \sqrt{34}$

(ii) Coordinates of Kota (K)= $\left(\frac{3\times0+2\times5}{3+2}, \frac{3\times7+2\times10}{3+2}\right) = \left(\frac{10}{5}, \frac{41}{5}\right) = \left(2, \frac{41}{5}\right)$

(iii)

L(5, 10), N(2,6), P(8,6)

$LN = \sqrt{(2 - 5)^2 + (6 - 10)^2} = \sqrt{(3)^2 + (4)^2} = \sqrt{9 + 16} = \sqrt{25} = 5$

$NP = \sqrt{(8 - 2)^2 + (6 - 6)^2} = \sqrt{(4)^2 + (0)^2} = 4$

$PL = \sqrt{(8 - 5)^2 + (6 - 10)^2} = \sqrt{(3)^2 + (4)^2} \Rightarrow LB = \sqrt{9 + 16} = \sqrt{25} = 5$

as LN = PL ≠ NP, so Δ LNP is an isosceles triangle.

OR

Let A (0, b) be a point on the y – axis then AL = AP

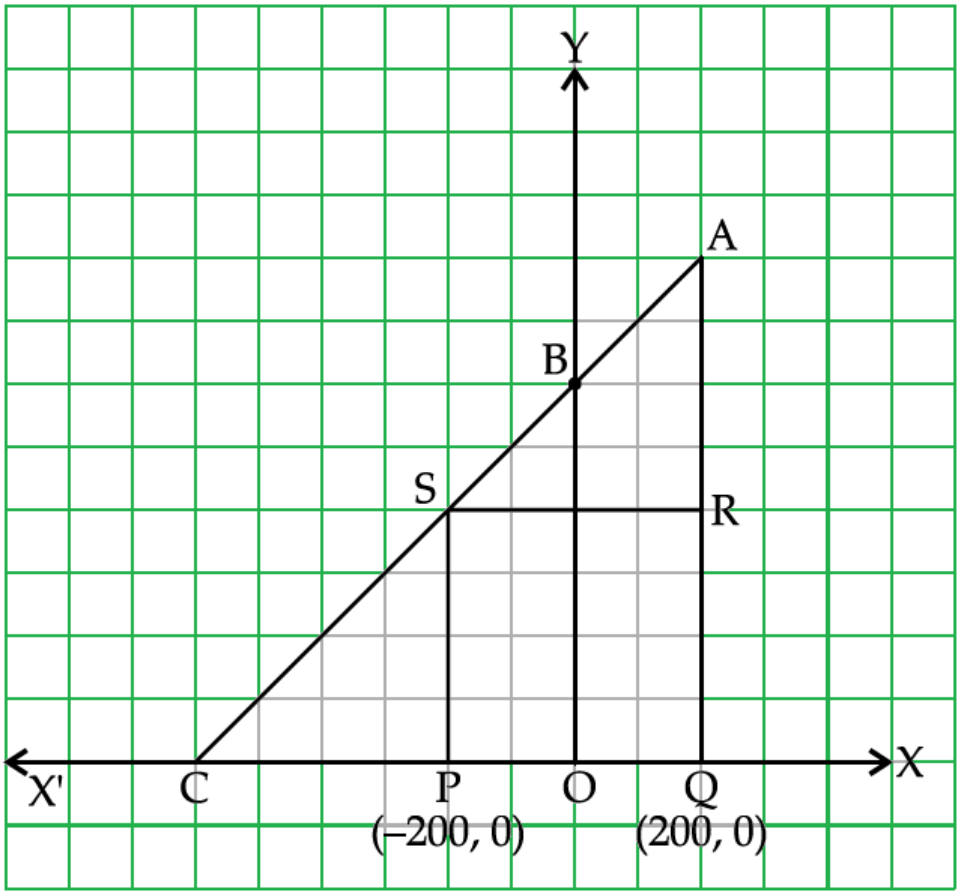
$\Rightarrow \sqrt{(5 - 0)^2 + (10 - b)^2} = \sqrt{(8 - 0)^2 + (6 - b)^2}$

$\Rightarrow (5)^2 + (10 - b)^2 = (8)^2 + (6 - b)^2$

$\Rightarrow 25 + 100 - 20b + b^2 = 64 + 36 - 12b + b^2 \Rightarrow 8b = 25 \Rightarrow b = \frac{25}{8}$

So, the coordinate on y axis is $\left(0, \frac{25}{8}\right)$

20. Jagdhish has a field which is in the shape of a right angled triangle AQC. He wants to leave a space in the form of a square PQRS inside the field from growing wheat and the remaining for growing vegetables (as shown in the figure). In the field, there is a pole marked as O.



Based on the above information, answer the following questions:

(i) Taking O as origin, coordinates of P are (–200, 0) and of Q are (200, 0). PQRS being a square, what are the coordinates of R and S?

(ii) (a) What is the area of square PQRS ?

OR

(b) What is the length of diagonal PR in square PQRS?

(iii) If S divides CA in the ratio K : 1, what is the value of K, where point A is (200, 800) ?

Ans: (i) Coordinates of R = (200, 400)

Coordinates of S = (– 200, 400)

(ii) Since, side of square PQRS = 400

Thus, area of square PQRS = $(\text{side})^2$

= $(400)^2$ = 160000 unit^2

OR

We know that, diagonal of square = 2 × side

∴ Diagonal PR of square PQRS = 2 × 400

= 400 √2 units

(iii) Let the ratio be k : 1.

Using section formula, $-200 = \dfrac{200k + 1 \times (-600)}{k + 1}$

⇒ – 200 k – 200 = 200 k – 600

⇒ – 400 k = – 400

⇒ k = 1