STD 9 Maths [Manjari]
Coordinate Geometry

*** Choose the right answer from the given options. [1 Marks Each]** **[40]**

1. Which of the following points does not lie in any quadrant?
   (A) (1, 2) (B) (4, 4) (C) (-2,-1) (D) (0, 5)

   Ans. : (0, 5)

2. The coordinates of two points A and B are (5, 7) and (5,5). The length of the line segment AB is 7 -(-5) units. This statement is:
   (A) true (B) false (C) can't say (D) none of these

   Ans. : false

3. The coordinates of a point are (2, 8). Its distance from x-axis is:
   (A) 2 units (B) 8 units (C) (2 + 8) units (D) $\sqrt{2^2+8^2}$ units

   Ans. : 8 units

4. Abscissa of all the points on the x-axis is:
   (A) 0 (B) 1 (C) 2 (D) any number

   Ans. : any number

5. The point at which the two coordinate axes meet is called the:
   (A) Abscissa (B) Ordinate (C) Origin (D) Quadrant

   Ans. : Origin

6. A point both of whose co-ordinates are negative will lie in:
   (A) I quadrant (B) II quadrant (C) III quadrant (D) IV quadrant

   Ans. : III quadrant

7. The points (-5, 2) and (2, -5) lie in the:
   (A) Same quadrant (B) II and III quadrants respectively
   (C) II and IV quadrants respectively (D) IV and II quadrants respectively

   Ans. : II and IV quadrants respectively

8. The point whose ordinate is 4 and which lies on y-axis is:
   (A) (4, 0) (B) (0, 4) (C) (1, 4) (D) (4, 2)

   Ans. : (0, 4)

9. Which of the points P(0, 3), Q(1, 0), R(0, -1), S(-5, 0), T(1, 2) do not lie on the x-axis?
   (A) P and R only (B) Q and S only (C) P, R and T (D) Q, S and T

Ans. : P, R and T

10. The point which lies on y-axis at a distance of 5 units in the negative direction of y-axis is:

    (A) (0, 5) (B) (5, 0) (C) (0, -5) (D) (-5, 0)

    Ans. : (0, -5)

11. If the co-ordinates of a point are (-5, 6), the perpendicular distance of the point from x-axis is:

    (A) 5 units (B) 6 units (C) 7 units (D) 7.5 units

    Ans. : 5 units

12. The co-ordinates of the point whose ordinate is -4 and which lies at y-axis are:

    (A) (0, -4) (B) (4, 0) (C) (-4, 0) (D) (0, 4)

    Ans. : (0, -4)

13. If the distance between the points (2, -2) and (-1, x) is 5, one of the value of x is:

    (A) -2 (B) 2 (C) -1 (D) 1

    Ans. : 2

14. The mid-point of the line segment joining the points A(-2, 8) and B(-6, -4) is:

    (A) (-4, -6) (B) (2, 6) (C) (-4, 2) (D) (4, 2)

    Ans. : (4, 2)

15. The distance between the points A(0, 6) and B(0, -2) is:

    (A) 6 (B) 8 (C) 4 (D) 2

    Ans. : 8

16. The distance of the point P(-6,8) from the origin is:

    (A) 8 (B) $2\sqrt{7}$ (C) 10 (D) 6

    Ans. : 10

17. The centre of a circle is at (2, 0). if one end of a diameter is at (6, 0), then the other end is at:

    (A) (0,0) (B) (4, 0) (C) (-2, 0) (D) (-6, 0)

    Ans. : (4, 0)

18. The points (-4, 0), (4, 0) and (3, 0) are the vertices of a/an:

    (A) Right triangle (B) Isosceles triangle

    (C) Equilateral triangle (D) Scalene triangle

    Ans. : Isosceles triangle

19. Abscissa of all the points on the x-axis is :

    (B) 1 (C) 2 (D) any number

Ans. : (D) any number

20. A point both of whose co-ordinates are negative will lie in :

(A) I quadrant (B) II quadrant (C) III quadrant (D) IV quadrant

Ans. : (C) III quadrant

21. If the co-ordinates of a point are $(-5,6)$, the perpendicular distance of the point from x-axis is :

(A) 5 units (B) 6 units (C) 7 units (D) 7.5 units

Ans. : (B) 6 units

22. If the distance between the points $(2,-2)$ and $(-1,x)$ is 5, one of the value of x is:

(A) -2 (B) 2 (C) -1 (D) 1

Ans. : (B) 2

23. The centre of a circle is at $(2,0)$. If one end of a diameter is at $(6,0)$, then the other end is at:

(A) $(0,0)$ (B) $(4,0)$ (C) $(-2,0)$ (D) $(-6,0)$

Ans. : (C) $(-2,0)$

24. The coordinates of a point are $(2,8)$. Its distance from x-axis is:

(A) 2 units (B) 8 units (C) $(2+8)$ units (D) $\sqrt{2^2+8^2}$ units

Ans. : (B) 8 units

25. The co-ordinates of the point whose ordinate is -4 and which lies at y-axis are :

(A) $(0,-4)$ (B) $(4,0)$ (C) $(-4,0)$ (D) $(0,4)$

Ans.: (A) $(0,-4)$

26. The coordinates of two points A and B are $(5,7)$ and $(5,-5)$. The length of the line segment AB is $7-(-5)$ units. This statement is :

(A) 1 (C) can't say (D) none of these

Ans.: (A) 1

27. The distance between the points $A(0,6)$ and $B(0,-2)$ is:

(A) 6 (B) 8 (C) 4 (D) 2

Ans. : (B) 8

28. The distance of the point $P(-6,8)$ from the origin is:

(A) 8 (B) $2\sqrt{7}$ (C) 10 (D) 6

Ans. : (C) 10

29. The mid-point of the line segment joining the points $A(-2,8)$ and $B(-6,-4)$ is:

(A) $(-4,-6)$ (B) $(2,6)$ (C) $(-4,2)$ (D) $(4,2)$

Ans. : (C) $(-4,2)$

30. The point at which the two coordinate axes meet is called the :

(A) Abscissa (B) Ordinate (C) Origin (D) Quadrant

Ans. : (C) Origin

31. The points $(-4,0),(4,0)$ and $(3,0)$ are the vertices of a/an:

(A) Right triangle (B) Isosceles triangle

(C) Equilateral triangle (D) Scalene triangle

Ans. : (D) Scalene triangle

32. The points $(-5,2)$ and $(2,-5)$ lie in the :

(A) Same quadrant

(B) II and III quadrants respectively

(C) II and IV quadrants respectively

(D) IV and II quadrants respectively

Ans. : (C) II and IV quadrants respectively

33. The point which lies on y-axis at a distance of 5 units in the negative direction of y-axis is :

(A) $(0,5)$ (B) $(5,0)$ (C) $(0,-5)$ (D) $(-5,0)$

Ans. : (C) $(0,-5)$

34. The point whose ordinate is 4 and which lies on y-axis is:

(A) $(4,0)$ (B) $(0,4)$ (C) $(1,4)$ (D) $(4,2)$

Ans. : (B) $(0,4)$

35. Which of the following points does not lie in any quadrant?

(A) $(1,2)$ (B) $(4,4)$ (C) $(-2,-1)$ (D) $(0,5)$

Ans. : (D) $(0,5)$

36. Which of the points $P(0,3), Q(1,0), R(0,-1), S(-5,0), T(1,2)$ do not lie on the x-axis?

(A) P and R only (B) Q and S only (C) P, R and T (D) Q, S and T

Ans. : (C) P, R and T

37. Point $(-1,-1)$ lies in

(A) 1st quadrant (B) 2nd quadrant (C) 3rd quadrant (D) 4th quadrant

Ans. : (C) 3rd quadrant

38. Point $(0,-6)$ lies

(A) on the-ve side of y-axis (B) on x-axis

(C) in 1st quadrant (D) in 2nd quadrant

Ans.: (A) on the-ve side of y-axis

39. The perpendicular distance of the point $(4,5)$ from the y-axis is

    (A) 5 (B) 4 (C) 4.5 (D) 1

    Ans. : (B) 4

40. The coordinates of the point which lies on y-axis at a distance of 4 units in negative direction of y-axis

    (A) $(-4,0)$ (B) $(4,0)$ (C) $(0,-4)$ (D) $(0,4)$

    Ans. : (C) $(0,-4)$

*** A statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.** **[18]**

Directions: In each question below, there are two statements labelled as Assertion (A) and Reason (R). Choose the correct answer as per the options given below:
(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

41. Assertion (A): (-3, 4) lies to the left of the y-axis.
    Reason (R): Abscissa is negative to the right of y-axis.

    Ans. : (A) is true but (R) is false.

42. Assertion (A): (-11, -13) lies in IV quadrant.
    Reason (R): Abscissa and ordinate are negative in III quadrant.

    Ans. : (A) is false but (R) is true.(A) is false but (R) is true.

43. Assertion (A): The abscissa is 9 and ordinate is -6, the coordinates of the point is (9, -6).
    Reason (R): The point (2,3) lies in II quadrant.

    Ans. : (A) is true but (R) is false

44. Assertion (A): The ordinate of point (-6, 4) is 4.
    Reason (R): The perpendicular distance of a point from x-axis is called its ordinate.

    Ans. : Both (A) and (R) are true and (R) is the correct explanation of (A)

45. Assertion (A): If $a \neq b$ then $(a,b) \neq (b,a)$.
    Reason (R): (-1,-2) lies in quadrant III.

    Ans. : Both (A) and (R) are true but (R) is not the correct explanation of (A)

46. Assertion (A): Points (1, 5), (2, 3) and (-2, -11) are collinear.
    Reason (R): Three points are said to be collinear, when they all lie of the same

line.

Ans. : (A) is false but (R) is true

47. The coordinates of the midpoint P of the join of the points $A(x_1, y_1)$ and $B(x_2, y_2)$ is $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$.
Reason (R): The mid-point of a line segment divides the line segment in the ratio 1: 1.

Ans. : Both (A) and (R) are true and (R) is the correct explanation of (A)

48. Assertion (A) : $(-11, -13)$ lies in IV quadrant.
Reason (R) : Abscissa and ordinate are negative in III quadrant.

Ans. : D

49. Assertion (A) : $(-3, 4)$ lies to the left of the y-axis.
Reason (R) : Abscissa is negative to the right of y-axis.

Ans. : C

50. Assertion (A) : If $a \neq b$, then $(a, b) \neq (b, a)$.
Reason (R) : $(-1, -2)$ lies in quadrant III.

Ans. : B

51. Assertion (A) : Points $(1, 5), (2, 3)$ and $(-2, -11)$ are collinear.
Reason (R) : Three points are said to be collinear, when they all lie of the same line.

Ans. : D

52. Assertion (A) : The abscissa is 9 and ordinate is -6, the coordinates of the point is $(9, -6)$.
Reason (R) : The point $(2, 3)$ lies in II quadrant.

Ans. : C

53. Assertion (A) : The coordinates of the midpoint P of the join of the points $A(x_1, y_1)$ and $B(x_2, y_2)$ is $(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2})$.
Reason (R) : The mid-point of a line segment divides the line segment in the ratio $1 : 1$.

Ans. : A

54. Assertion (A) : The ordinate of point $(-6, 4)$ is 4.
Reason (R) : The perpendicular distance of a point from x-axis is called its ordinate.

Ans. : A

55. Assertion (A): Point $A(-2, -6)$ lies in III quadrant.
Reason (R): A point both of whose coordinates are negative lies in III quadrant.

(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.

Ans.: (A) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

56. Assertion (A): The abscissa of a point $(4,3)$ is 4.
Reason (R): The perpendicular distance of a point from y-axis is called its abscissa.

(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.

Ans.: (A) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

57. Assertion (A): The point $(7,0)$ lies on y-axis.
Reason (R): The y co-ordinate of the point on x-axis is zero.

(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.

Ans. : (D) Assertion (A) is false but reason (R) is true.

58. Assertion (A): Point $(5,-3)$ lies in IV quadrant.
Reason (R): The perpendicular distance of a point from y-axis is called its abscissa.

(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.

Ans. : (B) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

*** Answer the following questions. [3 Marks Each]** **[90]**

59. Point W has x-coordinate equal to –5. Can you predict the coordinates of point H which is on the line through W parallel to the y-axis? Which quadrants can H lie in?

Ans. : If point W has x-coordinate –5, then any point on the line through W parallel to the y-axis will also have x-coordinate –5.
Therefore, the coordinates of H will be of the form:
H = (–5, y), where y can be any real number.
Now, depending on the value of y:
If y > 0, then H lies in Quadrant II.
If y < 0, then H lies in Quadrant III.
If y = 0, then H lies on the x-axis.
So, H can lie in:
Quadrant II
Quadrant III
or on the x-axis

60. Are the points M (–3, –4), A (0, 0) and G (6, 8) on the same straight line? Suggest a method to check this without plotting and joining the points.

Ans. : To check whether the points M (–3, –4), A (0, 0), and G (6, 8) lie on the same straight line using the Distance formula:

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

$MA = \sqrt{\left[(0+3)^2 + (0+4)^2\right]}$

$= \sqrt{\left(3^2 + 4^2\right)}$

$= \sqrt{(9+16)} = \sqrt{25} = 5$

$AG = \sqrt{\left[(6-0)^2 + (8-0)^2\right]}$

$= \sqrt{(36+64)}$

$= \sqrt{100} = 10$

$MG = \sqrt{\left[(6+3)^2 + (8+4)^2\right]}$

$= \sqrt{\left(9^2 + 12^2\right)}$

$= \sqrt{(81+144)}$

$= \sqrt{225} = 15$

Now checking: MA + AG = 5 + 10 = 15 = MG
Since the sum of two distances equals the third, the points M, A and G lie on the same straight line.

61. Use your method (from Problem 6) to check if the points R (–5, –1), B (–2, –5) and C (4, –12) are on the same straight line.

Ans. : To check whether the points R (–5, –1), B (–2, –5) and C (4, –12) lie on the same straight line using the distance formula: $d = \sqrt{\left[(x_2 - x_1)^2 + (y_2 - y_1)^2\right]}$

$RB = \sqrt{\left[(-2+5)^2 + (-5+1)^2\right]}$

$= \sqrt{\left(3^2 + (-4)^2\right)}$

$= \sqrt{(9+16)} = \sqrt{25} = 5$

$BC = \sqrt{\left[(4+2)^2 + (-12+5)^2\right]}$

$= \sqrt{\left(6^2 + (-7)^2\right)}$

$= \sqrt{(36+49)} = \sqrt{85}$

$RC = \sqrt{\left[(4+5)^2 + (-12+1)^2\right]}$

$= \sqrt{\left(9^2 + (-11)^2\right)}$

$= \sqrt{(81+121)} = \sqrt{202}$

Now: RB + BC = $5 + \sqrt{85} \neq \sqrt{202}$

Since the sum of two distances is not equal to the third, the points R, B and C do not lie on the same straight line.

62. A computer graphics program displays images on a rectangular screen whose coordinate system has the origin at the bottom-left corner.
The screen is 800 pixels wide and 600 pixels high. A circular icon of radius 80 pixels is drawn with its centre at the point A (100, 150). Another circular icon of radius 100 pixels is drawn with its centre at the point B (250, 230). Determine:
(i) whether any part of either circle lies outside the screen.
(ii) whether the two circles intersect each other.

Ans. : (i) No. Each of the two circles lies inside the screen.

(ii) Yes. The two circles intersect each other as shown in the picture.

Distance between centers A $(100, 150)$ $B(250, 230)$ is

$AB = \sqrt{(250-100)^2 + (230-150)^2}$

$= \sqrt{150^2 + 80^2}$

$= \sqrt{22500 + 6400}$

$= \sqrt{28900}$

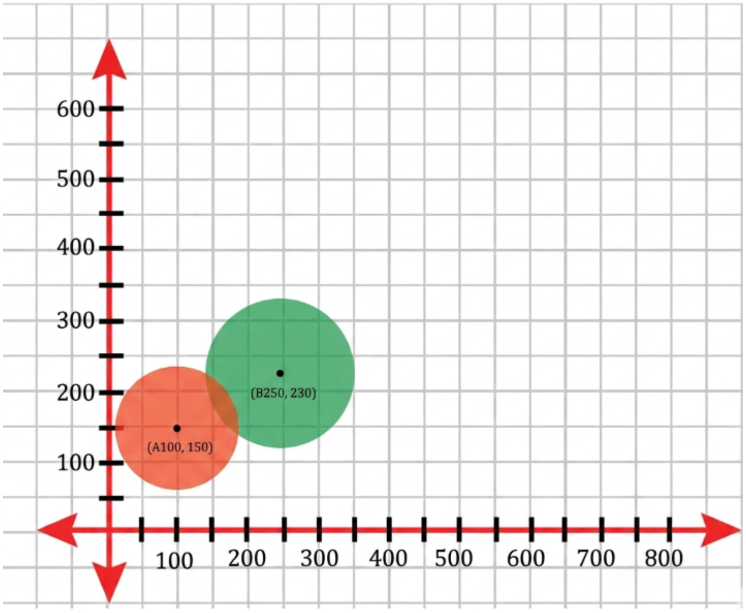
$= \sqrt{289 \times 100}$

$= \sqrt{17^2 \times 10^2}$

$= 17 \times 10$

$= 170$

$\therefore$ Sum of radii $= 80 + 100 = 800$



63. Find the point on the x-axis which is equidistant from $A(2,-5)$ and $B(-2,9)$.

Ans. : Let $P(x,0)$ be a point which is equidistant from points $A(2,-5)$ and $B(-2,9)$.

Now, $AP = \sqrt{(x-2)^2 + (0+5)^2} = \sqrt{x^2 + 4 - 4x + 25} = \sqrt{x^2 - 4x + 29}$

And $BP = \sqrt{(x+2)^2 + (0-9)^2} = \sqrt{x^2 + 4 + 4x + 81} = \sqrt{x^2 + 4x + 85}$

We have, $AP = BP \Rightarrow \sqrt{x^2 - 4x + 29} = \sqrt{x^2 + 4x + 85}$

Squaring both sides we get, $x^2 - 4x + 29 = x^2 + 4x + 85 \Rightarrow -8x = 56 \Rightarrow x = -7$

Hence, the required point is $(-7,0)$.

64. Determine if the points $(1,5),(2,3)$ and $(-2,-11)$ are collinear.

Ans. : Let the given points be $A(1,5), B(2,3)$ and $C(-2,-11)$.

Now, $AB = \sqrt{(2-1)^2 + (3-5)^2} = \sqrt{1+4} = \sqrt{5}$

$AC = \sqrt{(-2-1)^2 + (-11-5)^2} = \sqrt{9+256} = \sqrt{265}$

And, $BC = \sqrt{(-2-2)^2 + (-11-3)^2} = \sqrt{16+196} = \sqrt{212}$

Clearly, $AB + AC \neq BC, AB + CB \neq AC$ and, $AC + BC \neq AB$

$\therefore$ So, the given points are not collinear.

65. Find the distance between the following pairs of points :

(i) $(2,3),(4,1)$ (ii) $(-5,7),(-1,3)$ (iii) $(a,b),(-a,-b)$

Ans. : (i) Let the given points be $A(2,3)$ and $B(4,1)$.

$\therefore \quad AB = \sqrt{(4-2)^2 + (1-3)^2} = \sqrt{2^2 + (-2)^2} = \sqrt{4+4} = \sqrt{8} = 2\sqrt{2}$

(ii) Let the given points be $A(-5,7)$ and $B(-1,3)$.

$\therefore \quad AB = \sqrt{(-1+5)^2 + (3-7)^2} = \sqrt{4^2 + (-4)^2} = \sqrt{16+16} = \sqrt{32}$

$= 4\sqrt{2}$

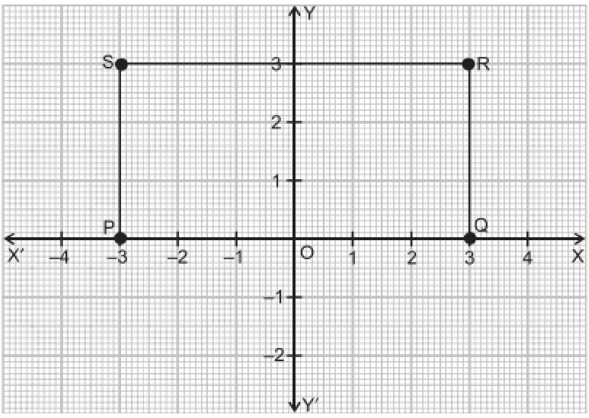
(iii) Let the given points be $A(a,b)$ and $B(-a,-b)$.

$$\therefore \quad AB = \sqrt{(-a-a)^2+(-b-b)^2} = \sqrt{(-2a)^2+(-2b)^2} = \sqrt{4a^2+4b^2}$$
$$= \sqrt{4\left(a^2+b^2\right)} = 2\sqrt{a^2+b^2}$$

66. On which axes do the following point lie?
(i) $P(0,-5)$ (ii) $Q(4,0)$ (iii) $C(-3,0)$

Ans. : (i) Point $P(0,-5)$ has the abscissa $=0$. So, it lies on the y-axis.
(ii) Point $Q(4,0)$ has the ordinate $=0$. So, it lies on the x-axis.
(iii) Point $C(-3,0)$ has the ordinate $=0$. So, it lies on the x-axis.

67. In the figure, PQRS is a rectangle with length 6 cm and breadth 3 cm. O is the mid-point of PQ. Find the co-ordinates of P, Q, R and S.



Ans. : Co-ordinates of P are $(-3,0)$;
Co-ordinates of Q are $(3,0)$
Co-ordinates of R are $(3,3)$;
Co-ordinates of S are $(-3,3)$.

68. If $A(-2,1), B(a,0), C(4,b)$ and $D(1,2)$ are the vertices of a parallelogram ABCD, find the values of a and b. Hence find the length of its sides.

Ans. : $a=1, b=1$, each side $=\sqrt{10}$ units

69. Prove that the points $(3,0),(6,4)$ and $(-1,3)$ are vertices of a right-angled isosceles triangle.

Ans. : The points $(3,0),(6,4)$, and $(-1,3)$ form a right-angled isosceles triangle because two sides are equal (5 units each) and the squared side lengths $(5^2+5^2=(\sqrt{50})^2$) satisfy the Pythagorean theorem.

70. Show that the points $(-2,5),(3,-4)$ and $(7,10)$ are the vertices of a right angled isosceles triangle.

Ans. : The points $(-2,5),(3,-4)$, and $(7,10)$ are the vertices of a right-angled isosceles triangle because $AB=AC$ and $AB^2+AC^2=BC^2$.

71. Prove that, the points $(2,-2),(-2,1)$ and $(5,2)$ are the vertices of a right triangle. Also, find the area of this triangle.

Ans. : 12.5 sq. units

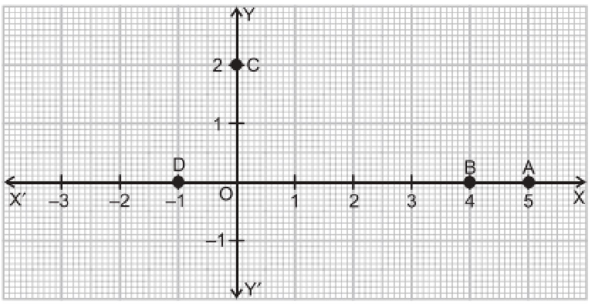
72. Write the co-ordinates of the point:
(i) whose ordinate is -5 and which lies on y-axis.
(ii) which lies on x and y axes both.
(iii) whose abscissa is -3 and which lies on x-axis.

Ans. : (i) $(0,-5)$, (ii) $(0,0)$, (iii) $(-3,0)$

73. Write the co-ordinates of the vertices of a rectangle whose length and breadth are 4 units and 3 units respectively, has one vertex at the origin, the longer side is on the x-axis and one of the vertices lies in the IVth quadrant. Also, find its area.

Ans. : $(0,0),(4,0),(4,-3),(0,-3)$; 12 sq. units

74. Write the coordinates of the points A, B, C, D, marked on the coordinate axes, in the given figure.



Ans. : $A(5,0),B(4,0),C(0,2),D(-1,0)$

75. **Triangular Field Measurement:** A farmer marks his field corners at A (1, 1), B (5, 9) and C (9, 1).He wants to install a water pipeline along the hypotenuse if the field is right-angled. Verify whether the field forms a right-angled triangle.

Ans. : $AB^2=(5-1)^2+(9-1)^2=16+64=80$

$BC^2=(9-5)^2+(1-9)^2=16+64=80$

$AC^2=(9-1)^2+(1-1)^2=64+0=64$

$AB^2+BC^2=80+80=160\neq AC^2$

$AB^2+AC^2=80+64=144\neq BC^2$

$BC^2+AC^2=80+64=144\neq AB^2$

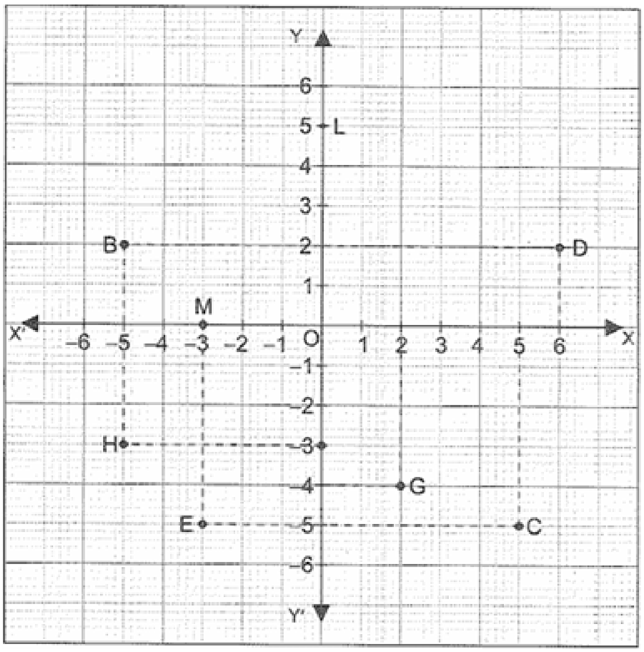
76. Write the answer of each of the following questions:
(i) What are the names of horizontal and vertical lines drawn to determine the position of any point in the Cartesian plane?
(ii) What is the name of each part of the plane formed by these two lines?
(iii) Write the name of the point where these two lines intersect.

Ans. : (i) The names of horizontal and vertical lines drawn to determine the position of any point in the cartesian plane are x-axis and y-axis, respectively.

(ii) The axes divide the plane into four regions called quadrants. Hence, the name of each part of the plane is quadrant.

(iii) The horizontal axis called the x-axis and vertical axis called the y-axis intersect at a point called the origin.

77. See fig. and write the following:



(i) The coordinates of B.

(ii) The coordinates of C.

(iii) The point identified by the coordinates (-3, -5).

(iv) The point identified by the coordinates (2, -4).

(v) The abscissa of the point D.

(vi) The ordinate of the point H.

(vii) The coordinates of the point L.

(viii) The coordinates of the point M.

Ans. : (i) The point B is 5 units to the left of the y-axis and 2 units above the x-axis. Therefore, the coordinates of the point B are (-5, 2).

(ii) The point C is 5 units to the right of the y-axis and 5 units below the x-axis. Therefore, the coordinates of the point Care (5,-5).

(iii) The point identified by the coordinates (-3,-5) is E.

(iv) The point identified by the coordinates (2,-4) is G.

(v) The abscissa of the point D is 6.

(vi) The ordinate of the point H is - 3.

(vii) The point L lies on y-axis and it is 5 units above the x-axis. Therefore, the coordinates of the point L are (0, 5).

(vii) The point M lies on x-axis and it is 3 units to the left of the y-axis. Therefore, the coordinates of the point M are (-3, 0).

78. Plot the points $A(-5,-2), B(1,-2), C(6,4)$ and $D(0,4)$. Join the points to get AB, BC, CD Name the so obtained.

Ans. : Figure so obtained is a parallelogram

79. The length of perpendiculars PM and PN drawn from a point P, on x-axis and y-axis are of 3 and 2 units, respectively. Find the coordinates of the points P, M and N.

Ans. : $\mathrm{P}(2,3), \mathrm{M}(2,0)$ and $\mathrm{N}(0,3)$

80. The perpendicular distance of a point from the x-axis is 4 units and the perpendicular distance from the y-axis is 5 units. Write the co-ordinates of such a point if it lies in the
(i) 1st quadrant, (ii) 2nd quadrant
(iii) 3rd quadrant, (iv) 4th quadrant

Ans. : (i) $(5,4)(ii)(-5,4)(iii)(-5,-4)(iv)(5,-4)$

81. Coordinates of A and B are $(-3,a)$ and $(1,a+4)$. The mid-point of AB is $(-1,1)$. Find the value of a.

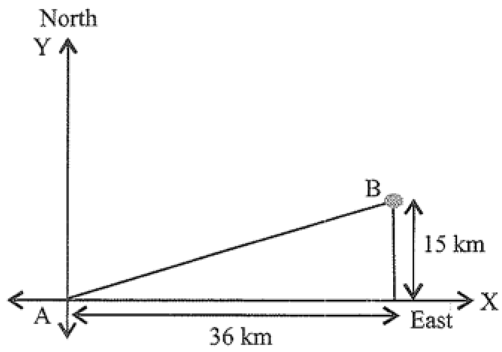
Ans. : Let P be the mid-point of AB. Coordinates of A, P and B are $(-3,a)$, $(-1,1)$ and $(1,a+4)$.
By mid-point formula.
Mid-point of $\mathrm{AB} = \left(\frac{-3+1}{2}, \frac{a+a+4}{2}\right) = (-1, a+2)$
But mid-point of AB is $\mathrm{P}(-1,1)$
$a+2=1 \Rightarrow a=1-2=-1$.

82. Points $P(-5,x), Q(y,7)$ and $R(1,-3)$ are collinear such that PQ = QR. Calculate the values of x and y.

Ans. : $\mathrm{P}(-5,x), \mathrm{Q}(y,7)$ and $\mathrm{R}(1,-3)$ are collinear and $\mathrm{PQ}=\mathrm{QR}$
$\therefore \mathrm{Q}(y,7)$ is the mid-point of PR
Now by mid-point formula $y=\frac{-5+1}{2}=\frac{-4}{2}=-2$
and
$7=\frac{x-3}{2} \Rightarrow x-3=14 \Rightarrow x=14+3=17$
Hence, $x=17$ and $y=-2$.

83. (i) Find the distance between the points $(0,0)$ and $(36,15)$.
(ii) A town B is located 36 km east and 15 km north of the town A, which is densely populated. How would you find the distance from town A to town B without actually measuring it.

Let us see. This situation can be represented graphically as shown in fig.



Ans. : (i) The distance between the points $(0,0)$ and $(36,15)$ is

$$d=\sqrt{(36-0)^2+(15-0)^2}=\sqrt{(36)^2+(15)^2}$$
$$=\sqrt{1296+225}=\sqrt{1521}=39 \text{ km}$$

(ii) The coordinates of point A are $(0,0)$ and the coordinates of the point B are $(36,15)$. We can find the distance of town B from town A by using the distance formula.

$$\therefore \text{ Required distance }=\sqrt{(36-0)^2+(15-0)^2}$$
$$=\sqrt{(36)^2+(15)^2}=\sqrt{1296+225}=\sqrt{1521}=39 \text{ km.}$$

84. Find the perimeter of the $\triangle PQR$ where coordinates of vertices are $P(3,1), Q(7,4)$ and $R(11,1)$.

Ans. : Perimeter of $\triangle \mathrm{PQR}=\mathrm{PQ}+\mathrm{QR}+\mathrm{RP}$

$PQ=\sqrt{(7-3)^2+(4-1)^2}=\sqrt{16+9}=\sqrt{25}=5$

$\mathrm{QR}=\sqrt{(11-7)^2+(1-4)^2}=\sqrt{16+9}=\sqrt{25}=5$

$RP=\sqrt{(3-11)^2+(1-1)^2}=\sqrt{64+0}=\sqrt{64}=8$

Perimeter of $\triangle \mathrm{PQR}=5+5+8=18$.

85. Find the point on the x-axis which is equidistant from $(2,-5)$ and $(-2,9)$.

Ans. : Let the points $(2,-5)$ and $(-2,9)$ be denoted by A and B respectively. Let $\mathrm{P}(x,0)$ on the x-axis be the point which is equidistant from $\mathrm{A}(2,-5)$ and $\mathrm{B}(-3,4)$.Then,

$\mathrm{PA}=\mathrm{PB} \quad \Rightarrow \mathrm{PA}^2=\mathrm{PB}^2$

$\Rightarrow (x-2)^2+(0+5)^2=(x+2)^2+(0-9)^2$

$\Rightarrow x^2-4x+4+25=x^2+4x+4+18$

$\Rightarrow \quad -8x=56 \quad \Rightarrow x=-7$

Hence, the required point on the x-axis is (-7, 0).

86. Find the value of k, if the point $P(0,2)$ is equidistant from $(3,k)$ and $(k,5)$.

Ans. : Let the points $(3,k)$ and $(k,5)$ be denoted by A and B respectively.

Since $\mathrm{P}(0,2)$ is equidistant from $\mathrm{A}(3,k)$ and $\mathrm{B}(k,5)$

PA = PB

$\Rightarrow \sqrt{(3-0)^2+(k-2)^2} = \sqrt{(k-0)^2+(5-2)^2}$

Squaring both sides, we get

$\Rightarrow (3-0)^2+(k-2)^2 = (k-0)^2+(5-2)^2$

$\Rightarrow 9+k^2-4k+4 = k^2+9$

$\Rightarrow -4k+4 = 0$

$\Rightarrow k = 1$

87. Find the coordinates of a point whose abscissa is equal to its ordinate and which is equidistant from $A(5,0)$ and $B(0,3)$.

Ans. : Since the abscissa, i.e., x-coordinate of a point is equal to its ordinate i.e., y-coordinate, therefore let the point be $\mathrm{P}(h,h)$.

As $\mathrm{P}(h,h)$ is equidistant from $\mathrm{A}(5,0)$ and $\mathrm{B}(0,3)$

So, PA = PB $\Rightarrow \sqrt{(h-5)^2+h^2} = \sqrt{h^2+(h-3)^2}$

Squaring both sides, we get

$\Rightarrow (h-5)^2+h^2 = h^2+(h-3)^2$

$\Rightarrow h^2-10h+25+h^2 = h^2+h^2-6h+9$

$\Rightarrow -4h = -16$

$\Rightarrow h = 4$

Hence the coordinates of point P are $(4,4)$.

88. Find the point on the y-axis which is equidistant from $(-5,-2)$ and $(3,2)$

Ans. : Let the points $(-5,-2)$ and $(3,2)$ be denoted by A and B respectively. Let $\mathrm{P}(0,y)$ on the y-axis be the point which is equidistant from $\mathrm{A}(-5,-2)$ and $\mathrm{B}(3,2)$ respectively.

Ther PA = PB $\Rightarrow \mathrm{PA}^2 = \mathrm{PB}^2$

$\Rightarrow (0+5)^2+(y+2)^2 = (0-3)^2+(y-2)^2$

$\Rightarrow 25+y^2+4y+4 = 9+y^2-4y+4$

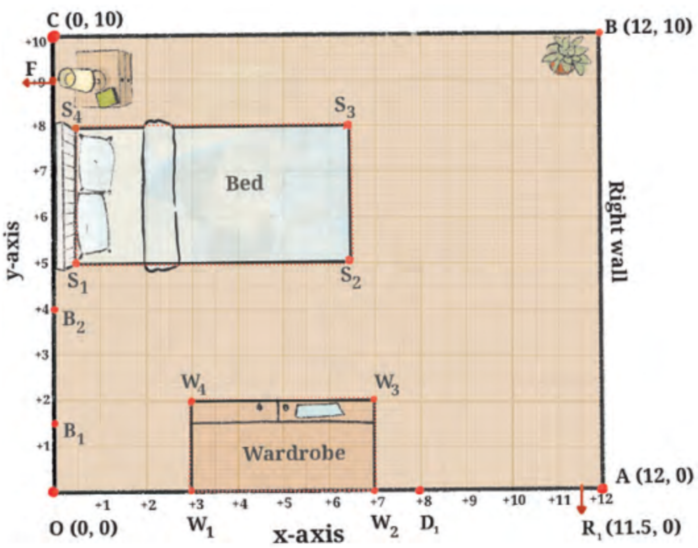
$\Rightarrow 8y = -16$

$\Rightarrow y = -2$

Hence, the required point on the y-axis is $(0,-2)$.

*** Questions with calculation. [4 Marks Each]** **[120]**

89. Fig. shows Reiaan’s room with points OABC marking its corners. The x- and y-axes are marked in the figure. Point O is the origin.



(i) If D_1R_1 represents the door to Reiaan's room, how far is the door from the left wall (the y-axis) of the room? How far is the door from the x-axis?

(ii) What are the coordinates of D_1 ?

(iii) If R_1 is the point (11.5,0), how wide is the door? Do you think this is a comfortable width for the room door? If a person in a wheelchair wants to enter the room, will she/he be able to do so easily?

(iv) If B_1 (0, 1.5) and B_2 (0, 4) represent the ends of the bathroom door, is the bathroom door narrower or wider than the room door?

Ans. : (i) The room door lies on the x-axis, so its distance from the x-axis = 0 units.
From the figure,
D_1 = (8, 0) and R_1 = (11.5, 0).
So the door begins 8 units from the y-axis.
(ii) The coordinates of D_1 are (8, 0).
(iii) Coordinates of D_1 = (8, 0) and $R_1 = (11.5, 0)$.
So, the width of the door
= distance between D_1 and R_1
= 11.5 – 8
= 3.5 units
- If the unit represents feet, then 3.5 $ft \approx 42$ inches, which is quite comfortable for a room door.
- Standard residential doors are usually 30–36 inches wide, so this is actually slightly wider than average, which is good.

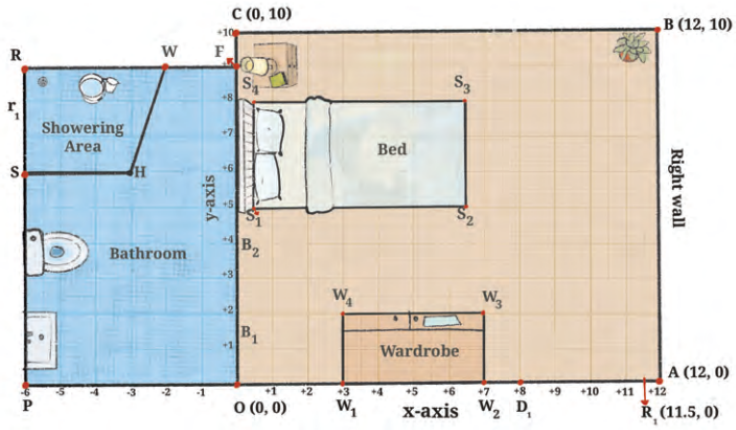
For wheelchair accessibility:
A wheelchair typically needs at least 32 inches (~2.7 ft) clear width.
Since 3.5 ft > 2.7 ft, the door is wide enough.
So, we can say yes, this door width is comfortable and a person using a wheelchair should be able to enter easily without difficulty.
(iv) Coordinates of $B_1 = (0, 1.5)$ and $B_2 = (0, 4)$.
So, the width of the bathroom door

= distance between B_1 and B_2

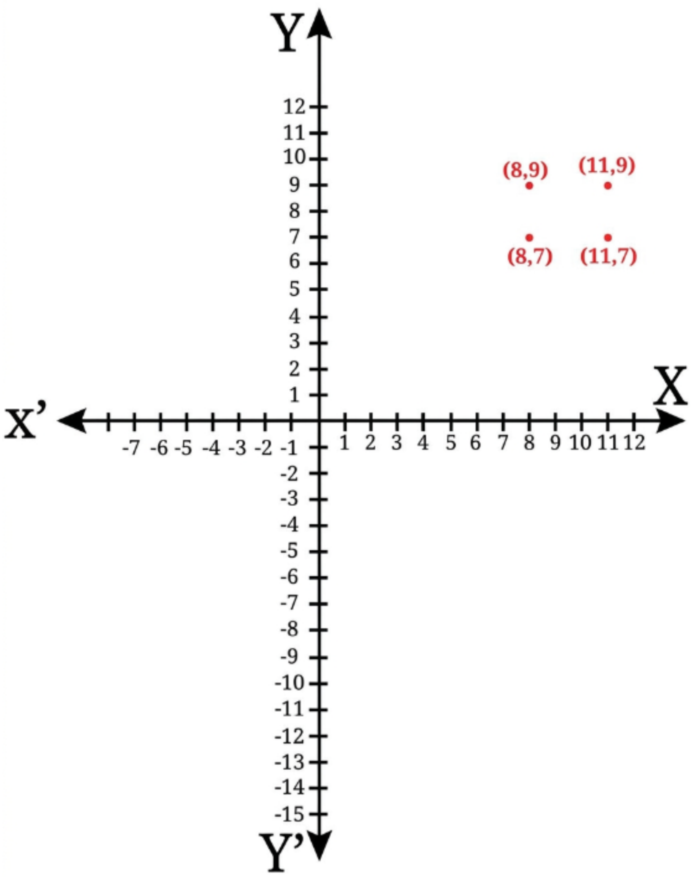
= 4 – 1.5 = 2.5 units

Since 2.5 < 3.5, the bathroom door is narrower than the room door.

90. On a graph sheet, mark the x-axis and y-axis and the origin O. Mark points from (-7, 0) to (13, 0) on the x-axis and from (0, – 15) to (0, 12) on the y-axis. (Use the scale 1 cm = 1 unit.) Using Fig. answer the given questions.



1. Place Reiaan’s rectangular study table with three of its feet at the points (8, 9), (11, 9) and (11, 7).



(i) Where will the fourth foot of the table be?

(ii) Is this a good spot for the table?

(iii) What is the width of the table? The length? Can you make out the height of the table?

2. If the bathroom door has a hinge at B_1 and opens into the bedroom, will it hit

the wardrobe? Are there any changes you would suggest if the door is made wider?

3. Look at Reiaan's bathroom.

(i) What are the coordinates of the four corners O, F, R, and P of the bathroom?

(ii) What is the shape of the showering area SHWR in Reiaan's bathroom? Write the coordinates of the four corners.

(iii) Mark off a 3 ft × 2 ft space for the washbasin and a 2 ft × 3 ft space for the toilet. Write the coordinates of the corners of these spaces.

4. Other rooms in the house:

(i) Reiaan's room door leads from the dining room which has length 18 ft and width 15 ft. The length of the dining room extends from point P to point A. Sketch the dining room and mark the coordinates of its corners.

(ii) Place a rectangular 5 ft × 3 ft dining table precisely in the centre of the dining room. Write down the coordinates of the feet of the table.

Ans. : (i) The given three points form three corners of a rectangle:

A = (8, 9)

B = (11, 9)

C = (11, 7)

To complete the rectangle, the fourth point must have:

– same x-coordinate as A → 8

– same y-coordinate as C → 7

Therefore, the fourth foot is at: (8, 7)

(ii) Yes, this is a good spot because:

- The table is placed neatly inside the room.
- It does not block doors or pathways.
- It is positioned near the wall, which is practical for study.

(iii) Width:

Distance between (8, 9) and (11, 9)

= 11 − 8 = 3 units

Length:

Distance between (11, 9) and (11, 7)

= 9 − 7 = 2 units

Height:

The height of the table cannot be determined from the given diagram because the figure represents only a top view (2D), not vertical dimensions.

2. From Fig

$-B_1 = (0, 1.5)$

$-B_2 = (0, 4)$

So, the bathroom door has width:

= 4 – 1.5

= 2.5 units

If the door is hinged at B_1 and opens into the bedroom, it will sweep an arc of radius 2.5 units from B_1.
Now the wardrobe begins at:
$W_1 = (3, 0)$
$W_4 = (3, 2)$
The nearest point of the wardrobe from $B_1(0, 1.5)$ is around x = 3, which is farther than the door width 2.5 units.
Therefore, the bathroom door will not hit the wardrobe.
Suggestion if the door is made wider:
- If the door becomes much wider, it may come close to or hit the wardrobe.
- In that case, the door could be made to open inward into the bathroom, or
- the wardrobe could be shifted slightly to the right or
- the door width could be kept limited for comfortable movement.

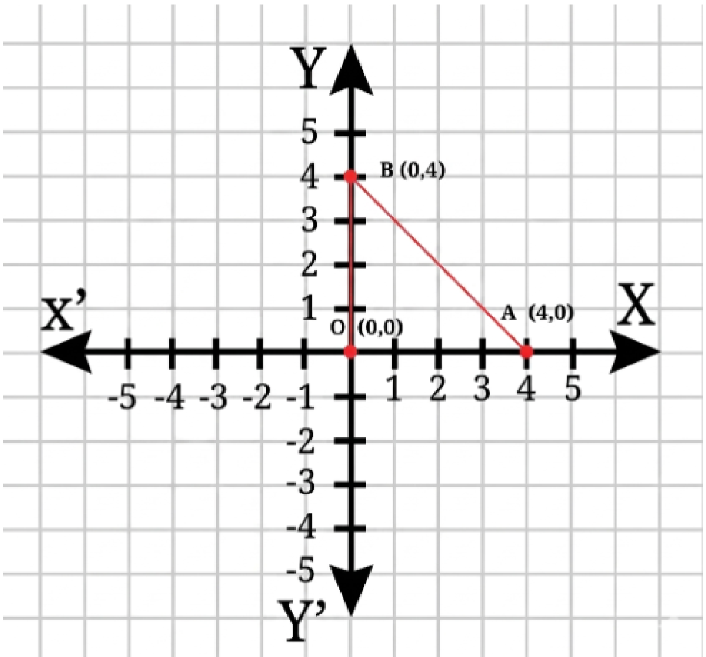
3.
(i) From Fig.
The coordinates of the four corners O, F, R, and P of the bathroom are:
O = (0, 0)
F = (0, 9)
R = (-6, 9)
P = (-6, 0)
(ii)
From the figure:
S = (-6, 5)
H = (-3, 5)
W = (-2, 9)
R = (-6, 9)
Since one pair of opposite sides is parallel, SHWR is a trapezium.
Shape of SHWR = Trapezium
Coordinates of the corners:
S = (-6, 5)
H = (-3, 5)
W = (-2, 9)
R = (-6, 9)
(iii) Washbasin space (3 ft × 2 ft):
Take the rectangle at the bottom-left corner of the bathroom.
Coordinates of Corners:
(-6, 0), (-3, 0), (-3, 2) and (-6, 2)
Toilet space (2 ft × 3 ft):
Take a rectangle above the washbasin.
Coordinates of Corners:
(-6, 2), (-4, 2), (-4, 5) and (-6, 5)

Coordinates of Washbasin corners:
(-6, 0), (-3, 0), (-3, 2) and (-6, 2)
Coordinates of Toilet corners:
(-6, 2), (-4, 2), (-4, 5) and (-6, 5)
4.
(i) From Fig.
Coordinates of P = (-6, 0)
Coordinates of A = (12, 0)
So, the length of PA = 12 – (-6) = 18 ft, which matches the given length.
If the dining room is 15 ft wide and lies below PA, then its upper side is PA and it extends downward 15 units.
Hence the coordinates of four corners are:
P = (-6, 0)
A = (12, 0)
Q = (12, -15)
S = (-6, -15)
The coordinates of the dining room corners are:
(-6, 0), (12, 0), (12, -15), (-6, -15)
(ii) The dining room extends:
From x = -6 to x = 12
From y = 0 to y = -15
Centre of the dining room:
x-coordinate of centre = (-6 + 12)/2 = 3
y-coordinate of centre = (0 + (-15))/2 = -7.5
Now place a 5 ft × 3 ft table at the centre.
Taking length = 5 units along the x-axis and width = 3 units along the y-axis:
Half-length = 2.5
Half-width = 1.5
So the coordinates of corners (feet) of the table are:
(3 – 2.5, -7.5 – 1.5) = (0.5, -9)
(3 + 2.5, -7.5 – 1.5) = (5.5, -9)
(3 + 2.5, -7.5 + 1.5) = (5.5, -6)
(3 – 2.5, -7.5 + 1.5) = (0.5, -6)
The coordinates of the four feet of the dining table are:
(0.5, -9), (5.5, -9), (5.5, -6), (0.5, -6)

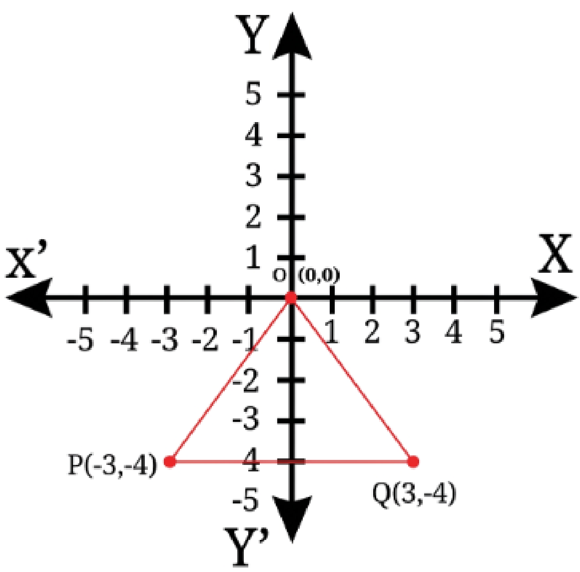
91. Using the origin as one vertex, plot the vertices of:
(i) A right-angled isosceles triangle.
(ii) An isosceles triangle with one vertex in Quadrant III and the other in Quadrant IV.

Ans. : (i) One possible set of vertices of triangle OAB is:
O = (0, 0)

A = (4, 0)
B = (0, 4)
Because:
OA = 4 units
OB = 4 units
OA is perpendicular to OB
So triangle OAB is a right-angled isosceles triangle.



(ii) One possible set of vertices is:
O = (0, 0), P = (−3, −4), Q = (3, −4)
Explanation:
P lies in Quadrant III
Q lies in Quadrant IV
OP = OQ = 5 units
So triangle OPQ is an isosceles triangle.



92. Do the points $(3,2),(-2,-3)$ and $(2,3)$ form a triangle ? If, so name the type of triangle formed.

Ans. : Let the given points be $\mathrm{A}(3,2),\mathrm{B}(-2,-3)$ and $\mathrm{C}(2,3)$.

$$AB=\sqrt{(-2-3)^2+(-3-2)^2}=\sqrt{(-5)^2(-5)^2}=\sqrt{25+25}=\sqrt{50}$$

Now,
$$=5\sqrt{2}$$
$$BC=\sqrt{(2+2)^2(3+3)^2}=\sqrt{4^2+6^2}=\sqrt{16+36}=\sqrt{52}=2\sqrt{13}$$

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

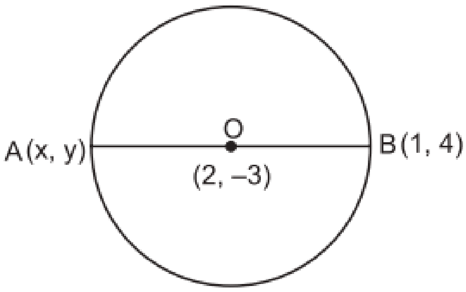
Here, $AB+BC>AC, AB+AC>BC$ and $AC+BC>AB$. So, the points form a triangle.

Also, $AB^2+AC^2=50+2=52=BC^2$.

So, $\triangle ABC$ is a right-angled triangle right angled at A .

93. Find the co-ordinates of a point A, where AB is the diameter of a circle whose centre is $(2,-3)$ and $B(1,4)$.

Ans. :



Let the co-ordinates of A be (x,y). Then O is the mid-point of AB .

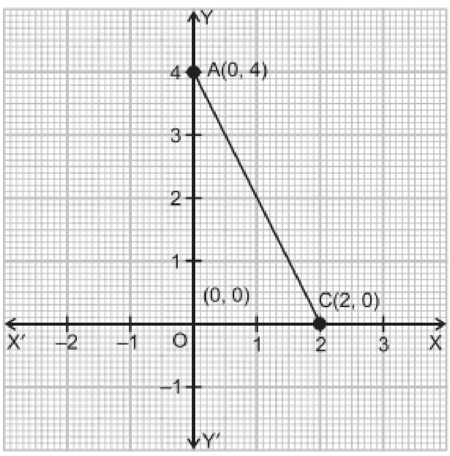
So, $\frac{x+1}{2}=2 \Rightarrow x+1=4 \Rightarrow x=3$

And, $\frac{y+4}{2}=-3 \Rightarrow y+4=-6 \Rightarrow y=-10$

Hence, the required co-ordinates of point A are $A(3,-10)$.

94. Find the area of the triangle whose vertices are $(0,4),(0,0)$ and $(2,0)$ by plotting these points on a graph paper.

Ans. :



Let $X'OX$ and YOY' be the coordinate axes. Points $A(0,4), O(0,0)$ and $C(2,0)$ have been plotted. Joining AC we get a right triangle OAC .

Area of $\triangle AOC = \frac{1}{2} \times OA \times OC = \frac{1}{2} \times 4 \times 2 = 4$ sq. units.

95. In which quadrant will the point lie if its:

(i) the ordinate is 8 and the abscissa is -4.

(ii) the abscissa is -6 and the ordinate is -3.

(iii) the ordinate is 4 and the abscissa is 5.

(iv) the ordinate is 4 and the abscissa -4.

Ans. : (i) Coordinates of the point whose ordinate is 8 and abscissa is -4 are $(-4,8)$. Here abscissa is negative and ordinate is positive.

$\therefore$ The point $(-4,8)$ lies in the II^{nd} quadrant.

(ii) Coordinates of the point whose abscissa is -6 and ordinate is -3 are $(-6,-3)$. Here both abscissa and ordinate are negative.

$\therefore$ The point $(-6,-3)$ lies in the III^{rd} quadrant.

(iii) Coordinates of the point whose ordinate is 4 and abscissa 5 are $(5,4)$.

Here both abscissa and ordinate are positive.

$\therefore$ The point $(5,4)$ lies in the I^{st} quadrant.

(iv) Coordinates of the point whose ordinate is 4 and the abscissa is -4 are $(-4,4)$

Here abscissa is negative and ordinate is positive.

$\therefore$ The point $(-4,4)$ lies in the II^{nd} quadrant.

96. Find the length of the median AD of ΔABC having vertices $A(0,-1), B(2,1)$ and $C(0,3)$.

Ans. : $(-4,-15)$

97. Find the coordinates of the mid-point of the line segment whose endpoints are:

(i) $A(4,3)$ and $B(-6,5)$ (ii) $P(0,-8)$ and $Q(10,8)$ (iii) $L(-7,-9)$ and $M(-3,3)$ (iv) $R(-3a,4b)$ and $S(a,-3b)$

Ans. : (i) $(-1,4)$

(ii) $(5,0)$

(iii) $(-5,-3)$

(iv) $\left(-a,\frac{b}{2}\right)$

98. Show that the points $A(5,6), B(1,5), C(2,1)$ and $D(6,2)$ are the vertices of a square.

Ans. : The points $A(5,6), B(1,5), C(2,1)$, and $D(6,2)$ are the vertices of a square because all four sides are equal to $\sqrt{17}$ and both diagonals are equal to $\sqrt{34}$.

99. If the point $P(x,y)$ is equidistant from the points $A(3,6)$ and $B(-3,4)$, prove that $3x+y-5=0$.

Ans. : Since $P(x,y)$ is equidistant from $A(3,6)$ and $B(-3,4)$,

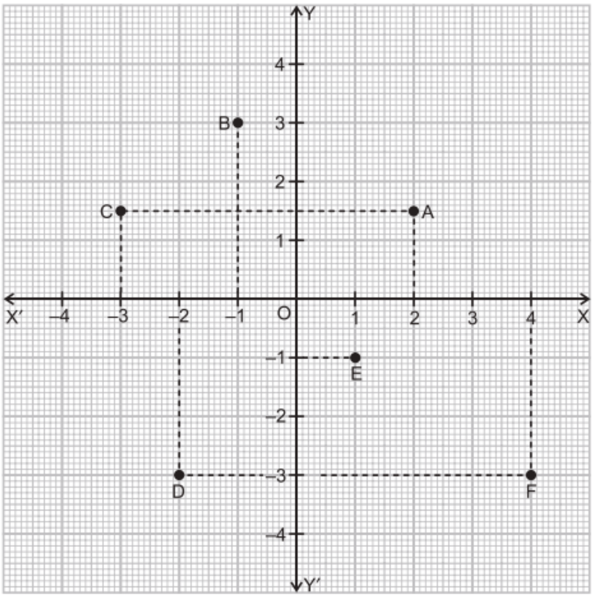
$\sqrt{(x-3)^2+(y-6)^2} = \sqrt{(x+3)^2+(y-4)^2}$

$(x-3)^2+(y-6)^2 = (x+3)^2+(y-4)^2$

$x^2-6x+9+y^2-12y+36 = x^2+6x+9+y^2-8y+16 \quad -12x-4y+20=0$

$3x+y-5=0$

100. Write down the coordinates of the points A, B, C, D, E and F, as shown in figure given below



Ans. : $A(2,1.5), B(-1,3), C(-3,1.5), D(-2,-3), E(1,-1), F(4,-3)$

101. In which quadrant will the point lie, if its

(i) ordinate is 2 and the abscissa is -3?

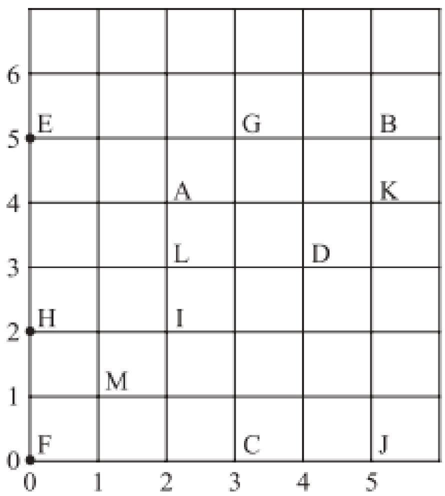
(ii) abscissa is -4 and the ordinate is -2?

(iii) ordinate is 3 and the abscissa is 4 ?

(iv) ordinate is 3 and the abscissa is -2?

Ans. : (i) IInd, (ii) IIIrd, (iii) Is,t (iv) IInd

102.

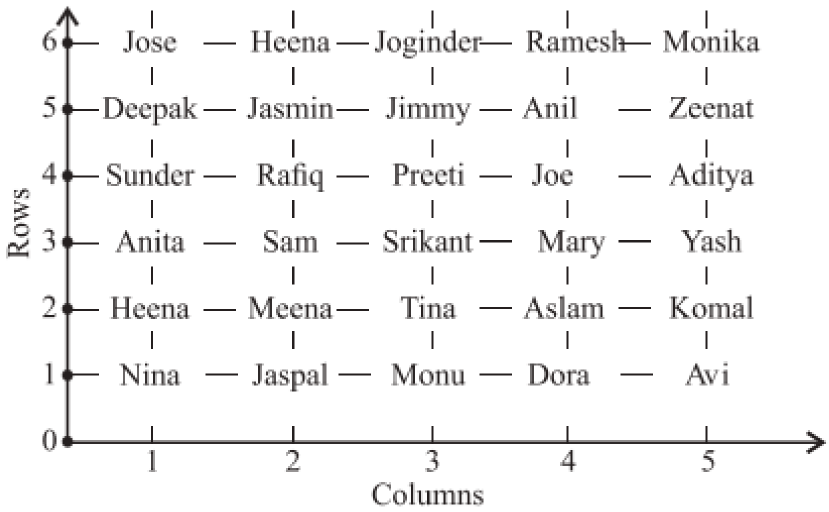


Use figure to write the ordered pairs to locate the position of each of the

following points.
(i) M, (ii) G, (iii) E, (iv) J, (v) F, (vi) I, (vii) K, (viii) H, (ix) D, (x) L

Ans. : (i) $(1,1)$ (ii) $(3,5)$ (iii) $(10,5)$ (iv) $(5,0)$ (v) $(10,0)$ (vi) $(2,2)$ (vii) $(5,4)$ (viii) $(0,2)$ (ix) $(4,3)$ (x) $(2,3)$

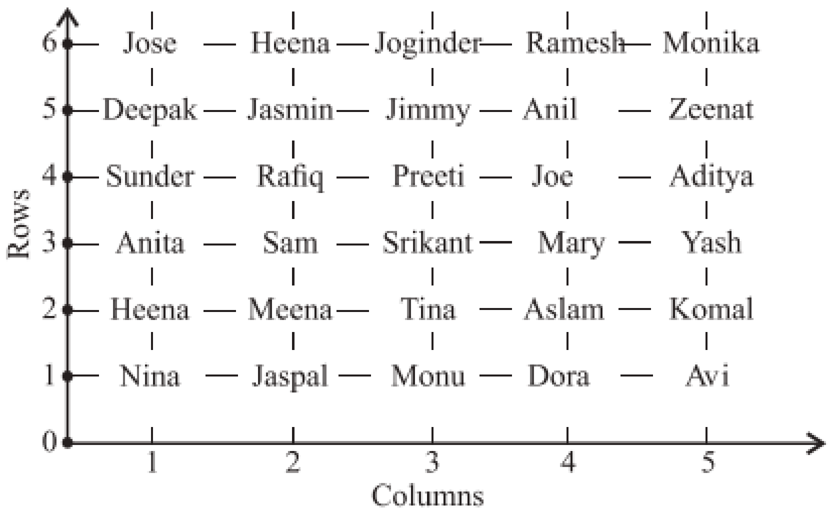
103.



Write the names and number pairs for the locations of all the students who are sitting in the sixth row (in figure).

Ans. : Jose $(1,6)$; Heena $(2,6)$; Joginder $(3,6)$; Ramesh $(4,6)$; Monika $(5,6)$

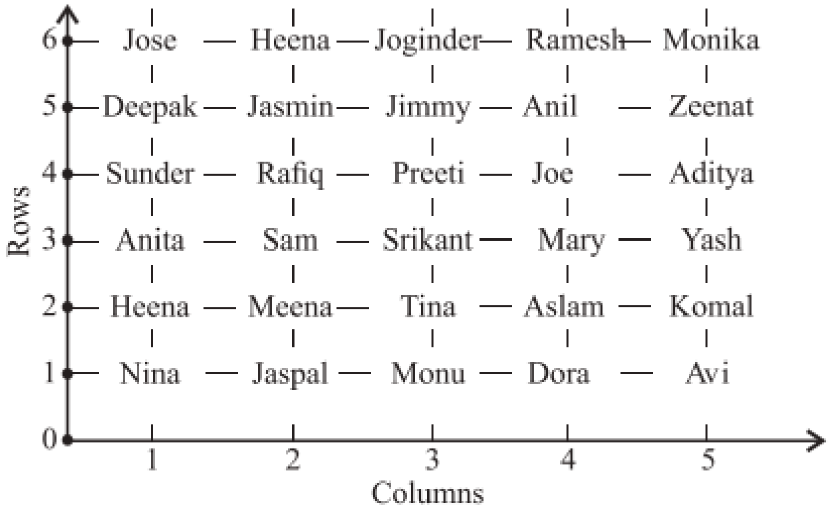
104.



Write the names and number pairs for the locations of all the students who are seated in the second column (in figure).

Ans. : Jaspal (2, 1); Meena (2, 2); Sam (2, 3); Rafiq (2, 4); Jasmin (2, 5); Heena (2, 6)

105.

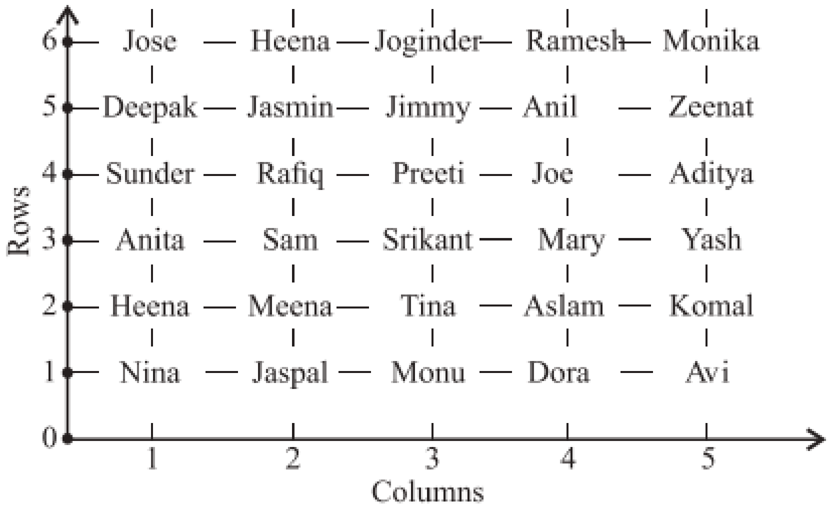


Name the students whose position is located by each of the following number pairs (in figure).

(i) $(3,1)$, (ii) $(1,3)$, (iii) $(1,1)$, (iv) $(5,5)$, (v) $(4,6)$, (vi) $(1,6)$, (vii) $(4,2)$, (viii) $(5,3)$

Ans. : (i) Monu, (ii) Anita, (iii) Nina, (iv) Zeenat, (v) Ramesh, (vi) Jose, (vii) Aslam, (viii) Yash

106.



Using figure locate the positions of the following students by using number pairs.

(i) Tina, (ii) Yash, (iii) Anita, (iv) Rafiq, (v) Joginder, (vi) Srikant, (vii) Komal, (viii) Sam

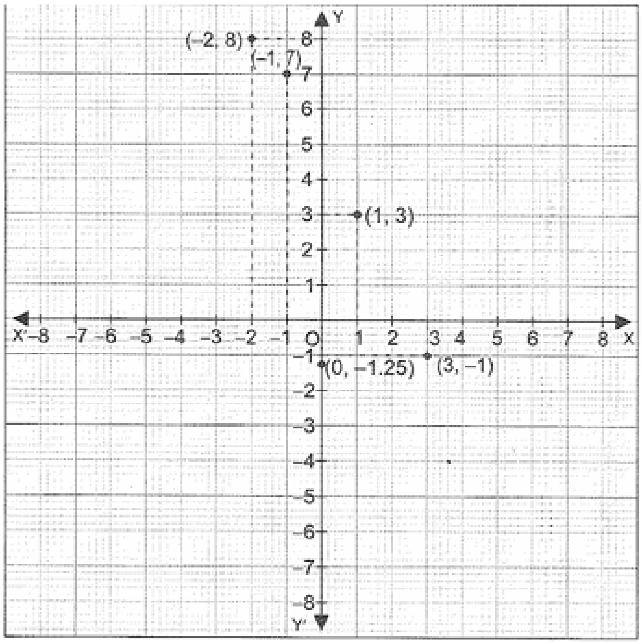
Ans. : (i) $(3,2)$, (ii) $(5,3)$, (iii) $(1,3)$, (iv) $(2,4)$, (v) $(3,6)$, (vi) $(3,3)$, (vii) $(5,2)$, (viii) $(2,3)$,

107. Plot the points (x,y) given in the following table on the plane, choosing suitable units of distance on the axes.

x	-2	-1	0	1	3
y	8	7	-1.25	3	-1

Ans. : The pairs of numbers given in the table can be represented by the points $(-2,8),(-1,7),(0,-1.25),(1,3)$ and $(3,-1)$

The location of points are shown by dots in Fig.



108. (i) Plot a point A on the graph paper whose abscissa is 4 and ordinate is 3.

(ii) Plot a point B on the graph paper whose abscissa is -2 and ordinate is 4.

(iii)Plot a point C on the graph paper whose abscissa is -3 and ordinate is 3.5.

(iv) Plot a point D on the graph paper whose abscissa is zero and ordinate is 4.

Ans. : (i) Point $\mathrm{A}=(4,3)$

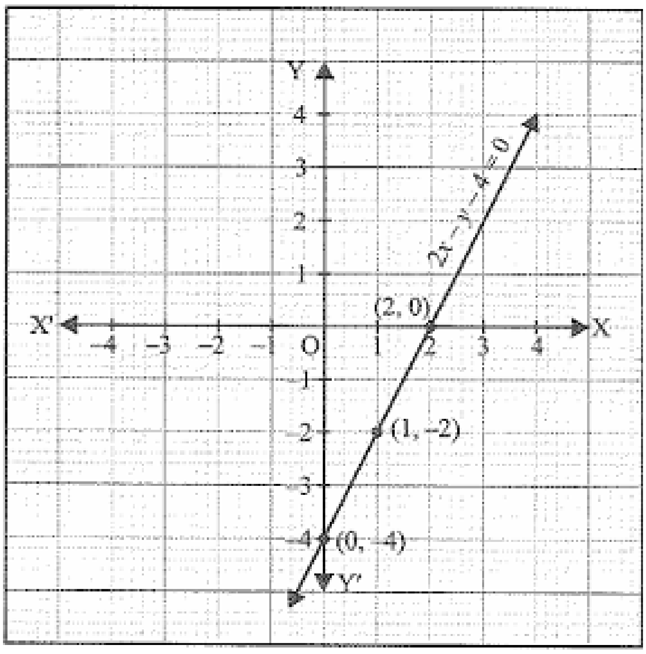
(ii) Point $\mathrm{B}=(-2,4)$

(iii) Point $\mathrm{C}=(-3,3.5)$

(iv) Point $\mathrm{D}=(0,4)$

109. Let $\mathrm{A}=(-5,3),\mathrm{B}=(6,0)$ and $\mathrm{C}(5,5)$. Plot the points A, B and C and draw the triangle ABC.

Ans. : Mark the points $A(-5,3),B(6,0)$ and $C(5,5)$ on the Cartesian plane. Then join AB, BC, and CA to form triangle ABC.



110. Plot the points $A(0,4), B(-3,0), C(0,-4)$ and $D(3,0)$. Name the figure obtained by joining the points A, B, C, D. Also, name the quadrant in which the sides AB and AD lie.

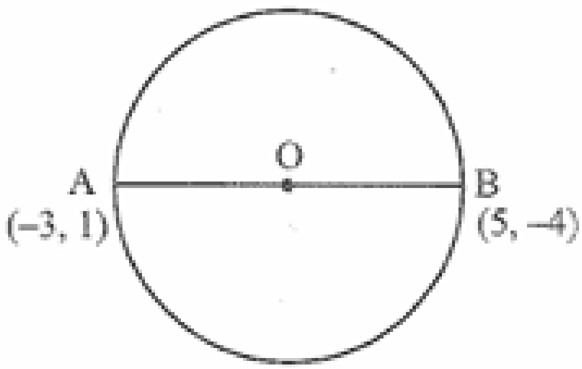
Ans. : Figure ABCD is a rhombus. Side AB lies in II quadrant and AD lies in I quadrant.

111. The line segment joining $A(-3,1)$ and $B(5,-4)$ is a diameter of a circle whose centre is O. Find the coordinates of centre O.

Ans. : We know that if $\mathrm{P}(x_1, y_1)$ and $\mathrm{Q}(x_2, y_2)$, are two given points then the coordinates of the mid-point $\mathrm{R}(x, y)$ of PQ are $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

Here AB is the diameter of circle whose end points are $A(-3,1)$ and $B(5,-4)$. As O is the centre of the circle, so O is the mid-point of diameter AB.

Therefore, the coordinates of O are $\left(\frac{-3+5}{2}, \frac{1-4}{2}\right) = \left(1, -\frac{3}{2}\right)$.



112. Find the coordinates of point A, where AB is the diameter of a circle whose centre is $(2,-3)$ and B is $(1,4)$.

Ans. : The coordinates of one end B of diameter AB are $(1,4)$. Let the coordinates of other end A of diameter AB be (α, β).

The coordinates of centre $O=\left(\frac{\alpha+1}{2},\frac{\beta+4}{2}\right)$

But the coordinate of centre O of diameter AB are $(2,-3)$.

$\frac{\alpha+1}{2}=2$ and $\frac{\beta+4}{2}=-3$

⇒ $\alpha+1=4$ and $\beta+4=-6$

⇒ $\alpha=3$ and $\beta=-10$

Hence, the coordinates of the other end A are $(3,-10)$.

113. Points $P(-5,x),Q(y,7)$ and $R(1,-3)$ are collinear such that PQ = QR. Calculate the values of x and y.

Ans. : Points $P(-5,x),Q(y,7)$ and $R(1,-3)$ are collinear and PQ = QR.

$\mathrm{Q}(y,7)$ is the mid-point of PR

Using the mid-point formula, the coordinates of Q which is the mid-point of line joining $\mathrm{P}(-5,x)$ and $\mathrm{R}(1,-3)$ are $\left(\frac{-5+1}{2},\frac{-3+x}{2}\right)$.

Also the coordinates of Q are (y, 7)

$y=\frac{-5+1}{2}=\frac{-4}{2}=-2$ and $\frac{-3+x}{2}=7$

⇒ $-3+x=14 \Rightarrow x=14+3=17$

Hence x = 17 and y = 2.

114. The coordinates of the mid-point of the line joining the points ($2p+1,4)$ and $(5,q-1)$ are $(2p,q)$. Find the values of p and q.

Ans. : Let $\mathrm{A}(2p+1,4)$ and $\mathrm{B}(5,q-1)$ be the given points.

Coordinates of the mid-point of the line joining the points A and B are $\left(\frac{2p+1+5}{2},\frac{4+q-1}{2}\right)=\left(\frac{2p+6}{2},\frac{3+q}{2}\right)=\left(p+3,\frac{3+q}{2}\right)$

But the given coordinates of the mid-point of the line joining the points A and B are $(2p,q)$.

⇒ $2p=p+3 \Rightarrow 2p-p=3 \Rightarrow p=3$

and

$q=\frac{3+q}{2} \Rightarrow 2q=3+q$

⇒ $2q-q=3 \Rightarrow q=3$

Hence $p=3,q=3$.

115. Using distance formula, show that the points, $(-3,2),(1,-2)$ and $(9,-10)$ are collinear.

Ans. : Let the given points $(-3,2),(1,-2)$ and $(9,-10)$ be denoted by A, B and C, respectively. These points will be collinear, if the sum of the lengths of two line segments is equal to the third.

Using the distance formula, we have

$\mathrm{AB}=\sqrt{(1+3)^2+(-2-2)^2}=\sqrt{16+16}=\sqrt{32}=4\sqrt{2}$

$\mathrm{BC}=\sqrt{(9-1)^2+(-10+2)^2}$

$=\sqrt{64+64}=\sqrt{128}=8\sqrt{2}$

$AC = \sqrt{(9+3)^2 + (-10-2)^2}$

$= \sqrt{144+144} = \sqrt{288} = 12\sqrt{2}$.

Now $AB + BC = 4\sqrt{2} + 8\sqrt{2} = 12\sqrt{2} = AC$

$\therefore$ The points A, B and C are collinear.

116. Find the values of y for which the distance between the points $P(2,-3)$ and $Q(10,y)$ is 10 units.

Ans. : Using the distance formula,

$PQ = \sqrt{(10-2)^2 + (y+3)^2}$

Also $PQ = 10$ units (Given)

$\therefore \sqrt{(10-2)^2 + (y+3)^2} = 10$

⇒ $(10-2)^2 + (y+3)^2 = 100$ ⇒ $64 + y^2 + 6y + 9 = 100$

⇒ $y^2 + 6y + 73 - 100 = 0$ ⇒ $y^2 + 6y - 27 = 0$

⇒ $y^2 + 9y - 3y - 27 = 0$ ⇒ $y(y+9) - 3(y+9) = 0$

⇒ $(y+9)(y-3) = 0$ ⇒ $y+9 = 0$ or $y-3 = 0$

Hence, y = - 9, 3 .

117. Find a relation between x and y such that the point (x,y) is equidistant from the points $(3,6)$ and $(-3,4)$.

Ans. : Let the points $(3,6)$ and $(-3,4)$ be denoted by A and B respectively and the point (x, y) be denoted by P.

Since the point $P(x,y)$ is equidistant from the points $A(3,6)$ and $B(-3,4)$,

PA = PB

⇒ $\sqrt{(x-3)^2 + (y-6)^2} = \sqrt{(x+3)^2 + (y-4)^2}$

Squaring both sides, we get

$x^2 - 6x + 9 + y^2 - 12y + 36 = x^2 + 6x + 9 + y^2 - 8y + 16$

⇒ $-12x - 4y = -20$

⇒ $3x + y = 5$ or $3x + y - 5 = 0$

which is the required relation between x and y.

118. Since the point $P(x,y)$ is equidistant from the points $A(a+b, b-a)$ and $B(a-b, a+b)$, prove that $bx = ay$.

Ans. : Since the point $P(x,y)$ is equidistant from the points $A(a+b, b-a)$ and $B(a-b, a+b)$

$therefore\ PA = PB \Rightarrow PA^2 = PB^2$

⇒ $\{x-(a+b)\}^2 + \{y-(b-a)\}^2 = \{x-(a-b)\}^2 + \{y-(a+b)\}^2$

⇒ $x^2 - 2x(a+b) + (a+b)^2 + y^2 - 2y(b-a) + (b-a)^2$

$= x^2 - 2x(a-b) + (a-b)^2 + y^2 - 2y(a+b) + (a+b)^2$.

⇒ $-2x(a+b) - 2y(b-a) = -2x(a-b) - 2y(a+b)$ $\left[\because (b-a)^2 = (a-b)^2\right]$

⇒ $-2xa - 2xb - 2yb + 2ya = -2xa + 2xb - 2ya - 2yb$

⇒ $-2xb + 2ya = 2xb - 2ya$

⇒ $-4bx = -4ya$
⇒ $bx = ay$ [dividing by -4]

*** Answer the following questions. [5 Marks Each]** **[150]**

119. Consider the points R (3, 0), A (0, –2), M (–5, –2) and P (–5, 2). If they are joined in the same order, predict:
(i) Two sides of RAMP that are perpendicular to each other.
(ii) One side of RAMP that is parallel to one of the axes.
(iii) Two points that are mirror images of each other in one axis. Which axis will this be?

Ans. : (i) Let us observe:
AM joins A(0, –2) to M(–5, –2), so it is horizontal.
MP joins M(–5, –2) to P(–5, 2), so it is vertical.
A horizontal line and a vertical line are perpendicular.
Therefore:
– AM ⊥ MP
The two perpendicular sides are AM and MP.
(ii) AM is parallel to the x-axis because both points A and M have the same y-coordinate (–2).
MP is parallel to the y-axis because both points M and P have the same x-coordinate (–5).
One side parallel to an axis is:
AM, which is parallel to the x-axis or MP, which is parallel to the y-axis
(iii) Compare M(–5, –2) and P(–5, 2):
They have the same x-coordinate.
Their y-coordinates are equal in magnitude but opposite in sign.
So, they are mirror images of each other in the x-axis.
The points M and P are mirror images of each other.
The axis is the x-axis.

120. Plot point Z (5, –6) on the Cartesian plane. Construct a right-angled triangle IZN and find the lengths of the three sides.

Ans. : Point Z is (5, –6).
To form a right-angled triangle easily, take:
I = (5, 0) on the x-axis
N = (0, –6) on the y-axis
Then triangle IZN is right-angled at Z? Let's check:
IZ is vertical
ZN is horizontal
So, triangle IZN is right-angled at Z.
Coordinates of the points:
I = (5, 0)

Z = (5, –6)
N = (0, –6)
Now find the lengths of the sides:
1. IZ:
Distance between (5, 0) and (5, –6)
= 0 – (–6) = 6 units
2. ZN:
Distance between (5, –6) and (0, –6)
= 5 – 0 = 5 units
3. IN:
Using distance formula:
$IN = \sqrt{\left[(5-0)^2 + (0-(-6))^2\right]}$
$= \sqrt{\left(5^2 + 6^2\right)}$
$= \sqrt{(25+36)}$
$= \sqrt{61}$ units
Therefore, one possible right-angled triangle is formed by:
I = (5, 0)
Z = (5, –6)
N = (0, –6)
Lengths of the sides:
IZ = 6 units
ZN = 5 units
$IN = \sqrt{61}$ units

121. Let P, Q be points of trisection of AB, with P closer to A, and Q closer to B.

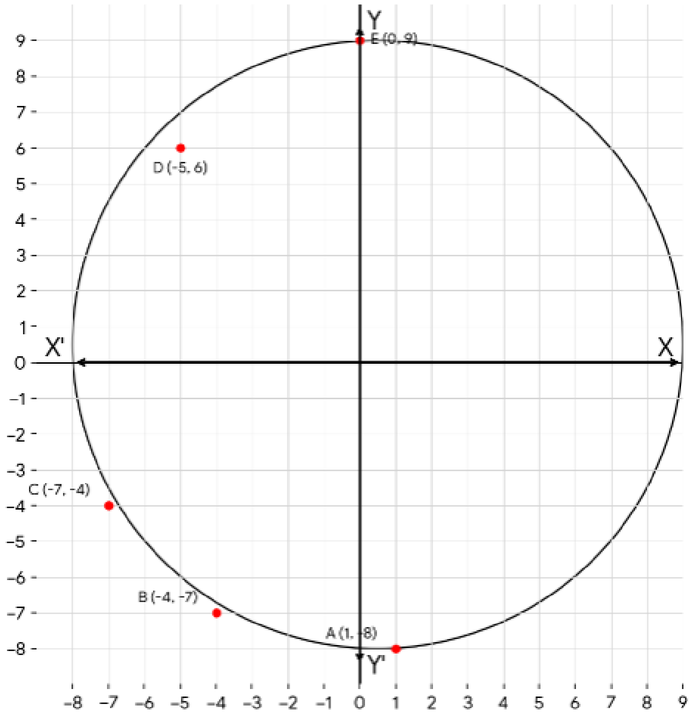
Ans. : To trisect AB, P and Q divides the segment into 3 equal parts.
Given: A (4, 7), B (16, –2)
Let P (x_1, y_1) and $Q\,(x_2, y_2)$

Here, P is midpoint of A and Q, so
$X_1 = (4 + X_2)/2$ ...(1)
$y_1 = (7 + y_2)/2$ ...(2)
So, Q is midpoint of P and B, so
$x_2 = (x_1 + 16)/2$ ...(3)
$y_2 = (y_1 - 2)/2$ ...(4)
Solving for x-coordinates, from (1):
$X_1 = (4 + X_2)/2$ and
From (3): $x_2 = (x_1 + 16)/2$
Substituting (1) into (3), we get
$x_2 = ((4 + x_2)/2 + 16)/2$

$= (4 + x_2 + 32)/4$
$= (x_2 + 36)/4$
So, $4x_2 = x_2 + 36$
$\Rightarrow 3x_2 = 36$
$\Rightarrow x_2 = 12$
Then from (1): $x_1 = (4 + 12)/2 = 8$
Solving for y-coordinates, from (2):
$y_1 = (7 + y_2)/2$ and
From (4): $y_2 = (y_1 - 2)/2$
Substituting (2) into (4):
$y_2 = ((7 + y_2)/2 - 2)/2$
$= (7 + y_2 - 4)/4$
$= (y_2 + 3)/4$
So, $4y_2 = y_2 + 3$
$\Rightarrow 3y_2 = 3$
$\Rightarrow y_2 = 1$
Then from (2): $y_1 = (7 + 1)/2 = 4$
Therefore, P = (8, 4) and Q = (12, 1).

122. (i) Given the points A (1, –8), B (–4, 7) and C (–7, –4), show that they lie on a circle K whose center is the origin O (0, 0). What is the radius of circle K?
(ii) Given the points D (–5, 6) and E (0, 9), check whether D and E lie within the circle, on the circle, or outside the circle K.

Ans. : (i) Distance OD:
$= \sqrt{}\left(1^2 + (-8)^2\right)$
$= \sqrt{}(1 + 64)$
$= \sqrt{}65$
Distance OB:
$= \sqrt{}\left((-4)^2 + 7^2\right)$
$= \sqrt{}(16 + 49)$
$= \sqrt{}65$
Distance OC:
$= \sqrt{}\left((-7)^2 + (-4)^2\right)$
$= \sqrt{}(49 + 16)$
$= \sqrt{}65$
Since all three points are at the same distance from origin, they lie on a circle centred at (0, 0).
Radius $= \sqrt{}65$
Points A, B and C lie on circle K with center (0, 0) and radius √65



(ii)

Distance OD:

$= \sqrt{\left((-5)^2 + 6^2\right)}$

$= \sqrt{(25 + 36)}$

$= \sqrt{61}$

Distance OE:

$= \sqrt{\left(0^2 + 9^2\right)}$

=9

Compare with radius √65 ≈ 8.06

– √61 ≈ 7.81 < √65 → D lies inside the circle – 9 > √65 → E lies outside the circle

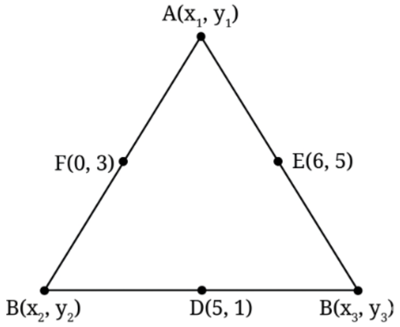
D lies inside the circle.

E lies outside the circle.

123. The midpoints of the sides of triangle ABC are the points D, E, and F. Given that the coordinates of D, E, and F are (5, 1), (6, 5), and (0, 3), respectively, find the coordinates of A, B and C.

Ans. : Let the vertices of triangle ABC be $A(x_1, y_1), B(x_2, y_2)$, and $C(x_3, y_3)$.

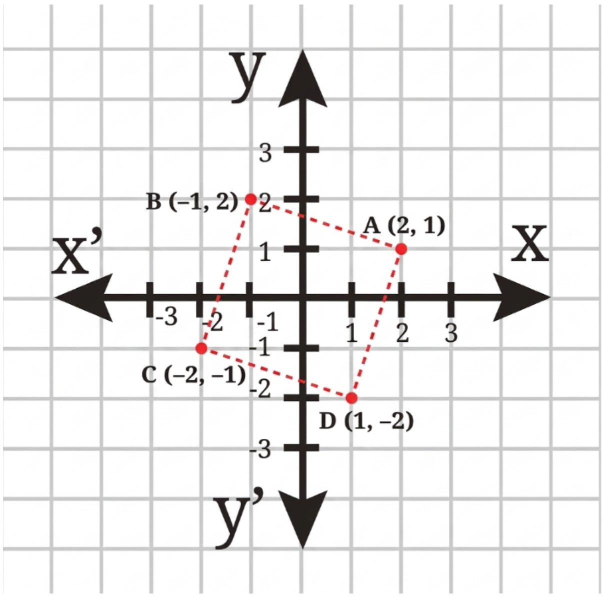
Given midpoints: D(5, 1), E(6, 5), F(0, 3)



D is midpoint of BC, so using midpoint formula:
$x_2 + x_3 = 10$ ...(1)
$y_2 + y_3 = 2$ ...(2)
E is midpoint of CA, therefore:
$x_3 + x_1 = 12$ ...(3)
$y_3 + y_1 = 10$ ...(4)
F is midpoint of AB, therefore:
$X_1 + X_2 = 0$ ...(5)
$y_1 + y_2 = 6$ ...(6)
Solving for x-coordinates, from (5):
$X_2 = -X_1$
Substitute into (1): $-x_1 + x_3 = 10$
$\Rightarrow x_3 = 10 + x_1$ ...(7)
Substituting into (3): $(10 + X_1) + X_1 = 12$
$\Rightarrow 2x_1 + 10 = 12$
$\Rightarrow 2x_1 = 2$
$\Rightarrow x_1 = 1$
Then: $x_2 = -1$
$\Rightarrow x_3 = 10 + 1 = 11$
Solving y-coordinates, from (6):
$y_2 = 6 - y_1$
Substituting into (2): $(6 - y_1) + y_3 = 2$
$\Rightarrow y_3 = y_1 - 4$ ...(8)
Substituting into (4): $(y_1 - 4) + y_1 = 10$
$\Rightarrow 2y_1 - 4 = 10$
$\Rightarrow 2y_1 = 14$
$\Rightarrow y_1 = 7$
Then: $y_2 = 6 - 7 = -1$
$\Rightarrow y_3 = 7 - 4 = 3$
Therefore, the coordinates of the points are A (1, 7), B (–1, –1) and C (11, 3).

124. Plot the points A (2, 1), B (–1, 2), C (–2, –1), and D (1, –2) in the coordinate plane. Is ABCD a square? Can you explain why? What is the area of this square?

Ans. : Yes, ABCD is a square.



We can check it finding the lengths of sides and diagonals.

Finding the lengths of all sides:

$AB = \sqrt{[(-1-2)^2 + (2-1)^2]}$

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

$= \sqrt{(9+1)}$

$= \sqrt{10}$

$BC = \sqrt{[(-2-(-1))^2 + (-1-2)^2]}$

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

$= \sqrt{(1+9)}$

$= \sqrt{10}$

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

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

$= \sqrt{(9+1)}$

$= \sqrt{10}$

$DA = \sqrt{[(2-1)^2 + (1-(-2))^2]}$

$= \sqrt{[1^2 + 3^2]}$

$= \sqrt{(1+9)}$

$= \sqrt{10}$

All four sides are equal.

Now finding diagonals:

$AC = \sqrt{[(-2-2)^2 + (-1-1)^2]}$

$= \sqrt{[(-4)^2 + (-2)^2]}$

$= \sqrt{(16+4)}$

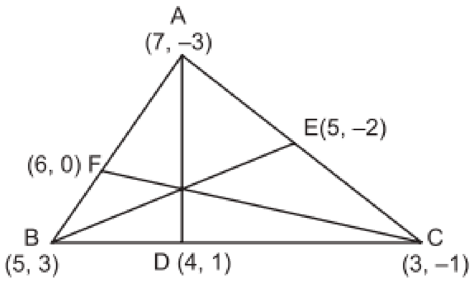
$= \sqrt{20}$

$BD = \sqrt{[(1-(-1))^2 + (-2-2)^2]}$

$= \sqrt{\left[2^2 + (-4)^2\right]}$
$= \sqrt{(4+16)}$
$= \sqrt{20}$
Diagonals are equal.
All sides are equal and diagonals are equal, so ABCD is a square.
Area of ABCD = = $(\text{ side })^2$
$= (\sqrt{10})^2$
= 10 square units.

125. Find the lengths of the medians of a ΔABC whose vertices are $A(7,-3), B(5,3)$ and $C(3,-1)$.

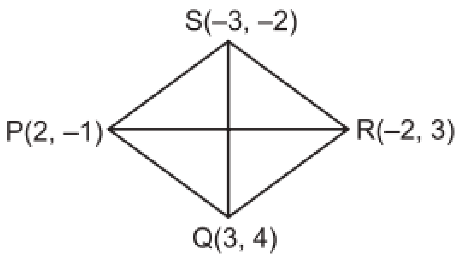
Ans. :



Let D, E, F, be the mid-points of the sides BC, CA and AB respectively. Then,
Co-ordinates of D are $\left(\frac{5+3}{2}, \frac{3-1}{2}\right)$, i.e., $(4,1)$
Co-ordinates of E are $\left(\frac{3+7}{2}, \frac{-1-3}{2}\right)$, i.e., $(5,-2)$
Co-ordinates of F are $\left(\frac{7+5}{2}, \frac{-3+3}{2}\right)$, i.e., $(6,0)$
Also, $AD = \sqrt{(7-4)^2 + (-3-1)^2} = \sqrt{9+16} = \sqrt{25} = 5$ units
$\Rightarrow \quad BE = \sqrt{(5-5)^2 + (-2-3)^2} = \sqrt{0+25} = 5$ units
And, $CF = \sqrt{(6-3)^2 + (0+1)^2} = \sqrt{9+1} = \sqrt{10}$ units

126. If $P(2,-1), Q(3,4), R(-2,3)$ and $S(-3,-2)$ be four points in a plane, show that PQRS is a rhombus but not a square.

Ans. :



The given points are $P(2,-1), Q(3,4)$, $R(-2,3)$ and $S(-3,-2)$.
We have,
$PQ = \sqrt{(3-2)^2 + (4+1)^2} = \sqrt{1^2 + 5^2} = \sqrt{26}$

$QR=\sqrt{(-2-3)^2+(3-4)^2}=\sqrt{25+1}=\sqrt{26}$

$RS=\sqrt{(-3+2)^2+(-2-3)^2}=\sqrt{1+25}=\sqrt{26}$

$SP=\sqrt{(-3-2)^2+(-2+1)^2}=\sqrt{25+1}=\sqrt{26}$

$PR=\sqrt{(-2-2)^2+(3+1)^2}=\sqrt{16+16}=4\sqrt{2}$

and, $QS=\sqrt{(-3-3)^2+(-2-4)^2}=\sqrt{36+36}=6\sqrt{2}$

$\therefore \quad PQ=QR=RS=SP=\sqrt{26}$

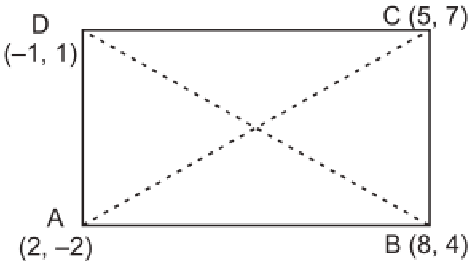
and, $PR \neq QS$

$\because$ PQRS is a quadrilateral whose sides are equal but diagonals are not equal.

Hence, PQRS is a rhombus but not a square. Proved.

127. Show that the point $A(2,-2), B(8,4), C(5,7)$ and $D(-1,1)$ are the vertices of a rectangle ABCD.

Ans. :



We have, $AB=\sqrt{(8-2)^2+(4+2)^2}=\sqrt{36+36}=\sqrt{72}$

$BC=\sqrt{(5-8)^2+(7-4)^2}=\sqrt{9+9}=\sqrt{18}$

$CD=\sqrt{(-1-5)^2+(1-7)^2}=\sqrt{36+36}=\sqrt{72}$

and $\quad AD=\sqrt{(-1-2)^2+(1+2)^2}=\sqrt{9+9}=\sqrt{18}$

Also, $AC=\sqrt{(5-2)^2+(7+2)^2}=\sqrt{9+81}=\sqrt{90}$

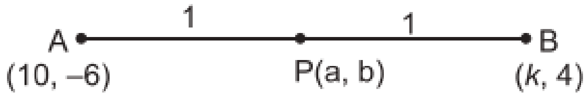
and $BD=\sqrt{(8+1)^2+(4-1)^2}=\sqrt{81+9}=\sqrt{90}$

Here, $AB=CD$ and $BC=AD \Rightarrow$ Opposite sides of quadrilateral ABCD are equal. Also, $AC=BD \Rightarrow$ Its diagonals are equal.

$\therefore \quad$ The given quadrilateral ABCD is a rectangle.

128. If (a,b) is the mid-point of the line segment joining the points $A(10,-6)$ and $B(k,4)$ and $a-2b=18$, find the value of k and the distance AB.

Ans. :



Let $P(a,b)$ be the mid-point of the line segment joining the points $A(10,-6)$ and $B(k,4)$. Then

$\frac{x_2+x_1}{2}=a$ and, $\frac{y_2+y_1}{2}=b$

$\Rightarrow \quad \frac{k+10}{2}=a$ and, $\frac{4-6}{2}=b$

$\Rightarrow k+10=2a$ ....(i)

and, $-1=b \quad \Rightarrow \quad b=-1$ ....(ii)

Also, $\quad a-2b=18$

$\Rightarrow \quad a-2(-1)=18$

$\Rightarrow \quad a+2=18 \Rightarrow a=16$.

Putting the value of $a=16$ in (i), we get

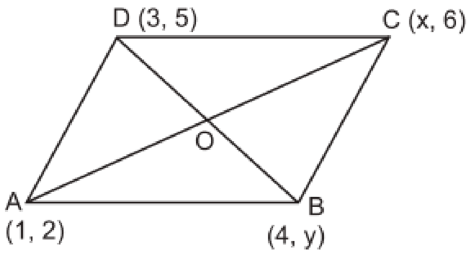
$k+10=2a \Rightarrow k+10=2(16) \Rightarrow k=32-10=22$

And, $\quad AB=\sqrt{(22-10)^2+(4+6)^2}=\sqrt{12^2+10^2}$

$=\sqrt{144+100}=\sqrt{244}=\sqrt{4\times 61}=2\sqrt{61}$ units.

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

Ans. :



Let the given points be $A(1,2),B(4,y),C(x,6)$ and $D(3,5)$.

We know that diagonals of a parallelogram bisect each other.

∴ Co-ordinates of mid-point of AC

= Co-ordinates of mid-point of BD

$\Rightarrow \quad \left(\frac{x+1}{2},\frac{6+2}{2}\right)=\left(\frac{3+4}{2},\frac{5+y}{2}\right)$

$\Rightarrow \quad \left(\frac{x+1}{2},4\right)=\left(\frac{7}{2},\frac{5+y}{2}\right)$

$\Rightarrow \quad \frac{x+1}{2}=\frac{7}{2}$ and $\frac{5+y}{2}=4$

$\Rightarrow \quad x+1=7$ and $5+y=8$

$\Rightarrow \quad x=7-1=6$ and $y=8-5=3$

Hence, $x=6$ and $y=3$.

130. Write whether the following statements are true or false. Justify your answer.

(i) Point $(3,0)$ lies in the first quadrant.

(ii) Points $(1,-1)$ and $(-1,1)$ lie in the same quadrant.

(iii) The coordinates of a point whose ordinate is $-\frac{1}{2}$ and abscissa is 1 are $(-\frac{1}{2},1)$.

(iv) A point lies on y-axis at a distance of 2 units from the x-axis, its coordinates are $(2,0)$.

(v) $(-1,7)$ is a point in the II quadrant.

Ans. : (i) False, because ordinate of the point is zero. So, the point lies on x-axis.

(ii) False, since $(1,-1)$ lies in fourth quadrant and $(-1,1)$ lies in second quadrant.

(iii) False, because to write the co-ordinates of a point abscissa comes first and then ordinate.

(iv) False, because $(2, 0)$ lies on x-axis.

(v) True, because its abscissa is negative and ordinate is positive.

131. ABCD is a quadrilateral formed by the points $A(-1,-1), B(-1,6), C(3,6)$ and $D(3,-1)$ P, Q, R and S are midpoints of sides AB, BC, CD and DA respectively. Show that diagonals of quadrilateral bisect each other.

Ans. : $\sqrt{10}$ units

132. Show that the points $A(2,-2), B(14,10), C(11,13)$ and $D(-1,1)$ are the vertices of a rectangle.

Ans. : $AB = \frac{10-(-2)}{14-2} = \frac{12}{12} = 1$

$BC = \frac{13-10}{11-14} = \frac{3}{-3} = -1$

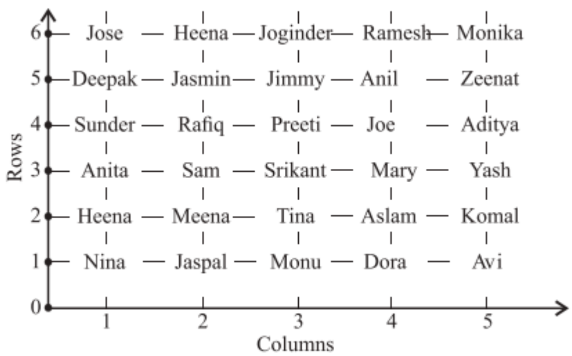
Since $AB \perp BC$ (product $= -1$), angle at B is 90°.

$CD = \frac{1-13}{-1-11} = \frac{-12}{-12} = 1$

$AD = \frac{1-(-2)}{-1-2} = \frac{3}{-3} = -1$

Thus, $AB \| CD$ and $BC \| AD$.

133. Make a seating plan of your class (as shown in fig).



(i) Write the roll number and name of the student as it appears in the class register and assign the ordered pair denoting his/her seat in the class. You may draw a table similar to the following :

Roll No.	Name	Location as an ordered pair
1.	Aditya	$(5,4)$
2.	...	...
3.	...	...
...	...	...

(ii) Write the name and location of all the students in your class whose first letter of the name is the same as that of yours.

Ans. : (i)

Roll No.	Name	Location (Column, Row)
1.	Aditya	(5, 4)
2.	Anil	(4, 5)
3.	Anita	(1, 3)
4.	Aslam	(4, 2)
5.	Avi	(5, 1)
6.	Deepak	(1, 5)
7.	Dora	(4, 1)
8.	Heena	(1, 2) *or* (2, 6)
9.	Jaspal	(2, 1)
10.	Jasmin	(2, 5)
11.	Jimmy	(3, 5)
12.	Joe	(4, 4)
13.	Joginder	(3, 6)
14.	Jose	(1, 6)
15.	Komal	(5, 2)
16.	Mary	(4, 3)
17.	Meena	(2, 2)
18.	Monika	(5, 6)
19.	Monu	(3, 1)
20.	Nina	(1, 1)
21.	Preeti	(3, 4)
22.	Rafiq	(2, 4)
23.	Ramesh	(4, 6)
24.	Sam	(2, 3)
25.	Srikant	(3, 3)
26.	Sunder	(1, 4)

27.	Tina	(3, 2)
28.	Yash	(5, 3)
29.	Zeenat	(5, 5)

(ii) Students in my class whose names start with the same first letter as mine are: Rahul (Ahmedabad), Riya (Surat), and Ramesh (Vadodara).

134. Plot the following points on the graph paper and indicate in which quadrant or on which coordinate axis these points lie:
(i) $(-2,0)$, (ii) $(0,5)$, (iii) $(0,0)$
(iv) $(3,-2)$, (v) $(-5,-1)$, (vi) $(0,-3/2)$

Ans. : (i) On the -ve side of x-axis.
(ii) On the y-axis.
(iii) On both the x-axis and y-axis called origin.
(iv) $(3,-2)$ lies in quadrant IV.
(v) $(-5,-1)$ lies in quadrant III.
(vi) $\left(0,\frac{-3}{2}\right)$ lies on the -ve side of y-axis.

135. PIot the points $\mathrm{A}(0,0), \mathrm{B}(4,-2), \mathrm{C}(8,0)$ and $\mathrm{D}(4,2)$. Join these points in the given order. Show that BD is the perpendicular bisector of AC. What type of quadrilateral is ABCD?

Ans. : Rhombus

136. Plot the points $\mathrm{M}(5,-3)$ and $\mathrm{N}(-3,-3)$.

Ans. : Point M $(5,-3)$ lies 5 units to the right and 3 units down.
Point N $(-3,-3)$ lies 3 units to the left and 3 units down.
Both points lie on the line:
y = −3
These are the required points on the coordinate plane.

137. What is the length of MN?

Ans. : 8 units

138. Find the coordinates of the points A, B and C lying on MN such that $\mathrm{MA}=\mathrm{AB}=\mathrm{BC}=\mathrm{CN}$.

Ans. : $\mathrm{A}(3,-3), \mathrm{B}(1,-3)$ and $\mathrm{C}(-1,-3)$

139. Show that points A, B and C are collinear by plotting the points in a certain plane $A(-1,2), B(2,-1)$ and $C(4,-3)$.
[Hint: Plot these points and show that they lie on the same straight line]

Ans. : Plot the points: $A(-1,2), B(2,-1), C(4,-3)$
After plotting, join the points. All three points lie on the same straight line.

Therefore, A, B, and C are collinear points.

140. $A(10,5), B(6,-3)$ and $C(2,1)$ are the vertices of a triangle ABC. L is the mid-point of AB and M is the midpoint of AC. Write down the coordinates of L and M. Show that $LM = \frac{1}{2}BC$.

Ans. : L is the mid-point of AB.

The coordinates of A are $(10,5)$ and the coordinates of B are $(6,-3)$.

$\therefore$ The coordinates of L are $\left(\frac{10+6}{2}, \frac{5-3}{2}\right) = \left(\frac{16}{2}, \frac{2}{2}\right) = (8,1)$

M is the mid-point of AC. The coordinates of A are $(10,5)$ and the coordinates of C are $(2,1)$.

$\therefore$ The coordinates of M are

$\left(\frac{10+2}{2}, \frac{5+1}{2}\right) = \left(\frac{12}{2}, \frac{6}{2}\right) = (6,3)$

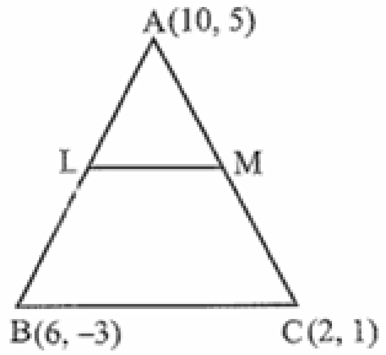
Using the distance formula, we get

$\mathrm{BC} = \sqrt{(2-6)^2 + (1+3)^2} = \sqrt{16+16} = 4\sqrt{2}$

$\therefore LM = \sqrt{(6-8)^2 + (3-1)^2} = \sqrt{4+4} = 2\sqrt{2}$

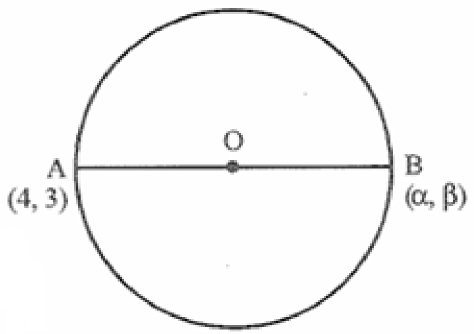
$\mathrm{LM} = 2\sqrt{2} = \frac{1}{2} \times 4\sqrt{2} = \frac{1}{2}\mathrm{BC}$.

Hence, the result.



141. The coordinates of one end point of a diameter AB are $(4,3)$ and the coordinates of centre are $(1,1)$. Find the coordinates of other end of diameter.

Ans. :



Let the coordinates of one end A of diameter be $(4,3)$ and the other end B be (α, β).

$\because$ O is the centre of the circle.

$\therefore$ O is the mid-point of diameter AB.

The coordinates of centre O are $\left(\frac{4+\alpha}{2}, \frac{3+\beta}{2}\right)$

But the coordinates of centre are $(1,1)$

$\therefore \frac{\alpha+4}{2}=1$ and $\frac{\beta+3}{2}=1$

⇒ $\alpha+4=2$ and $\beta+3=2$

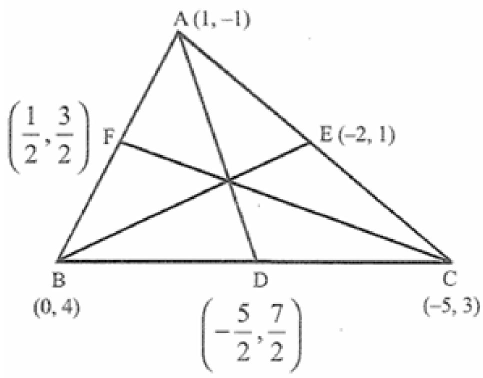
⇒ $\alpha=-2$ and $\beta=-1$

Hence the coordinates of the other end B are $(-2,-1)$

142. Find the lengths of the medians of the triangle whose vertices are $(1,-1),(0,4)$ and $(-5,3)$.

Ans. : Let the vertices of the triangle $(1,-1),(0,4)$ and $(-5,3)$ be denoted by A, B and C respectively.

Median is a line-segment joining a vertex of a triangle to the mid-point of the opposite side. In figure, D, E and F are the mid-points of the sides BC, CA and AB respectively of a $\triangle \mathrm{ABC}$ and AD, BE and CF are three medians.



$\therefore$ Coordinates of D are $\left(\frac{0-5}{2}, \frac{4+3}{2}\right)=\left(-\frac{5}{2}, \frac{7}{2}\right)$

Coordinates of E are $\left(\frac{-5+1}{2}, \frac{3-1}{2}\right)=(-2,1)$

and coordinates of F are $\left(\frac{1+0}{2}, \frac{-1+4}{2}\right)=\left(\frac{1}{2}, \frac{3}{2}\right)$.

Now, by distance formula

Length of median AD = Distance between the points

$\mathrm{A}(1,-1)$ and $\mathrm{D}\left(-\frac{5}{2}, \frac{7}{2}\right)=\sqrt{\left(-\frac{5}{2}-1\right)^2+\left(\frac{7}{2}+1\right)^2}=\sqrt{\frac{49}{4}+\frac{81}{4}}=\frac{\sqrt{130}}{2}$

Length of median $\mathrm{BE}=$ distance between the points $\mathrm{B}(0,4)$ and $\mathrm{E}(-2,1)$

$=\sqrt{(-2-0)^2+(1-4)^2}=\sqrt{4+9}=\sqrt{13}$

Length of median $\mathrm{CF}=$ distance between the points $\mathrm{C}(-5,3)$ and $\mathrm{F}\left(\frac{1}{2}, \frac{3}{2}\right)$

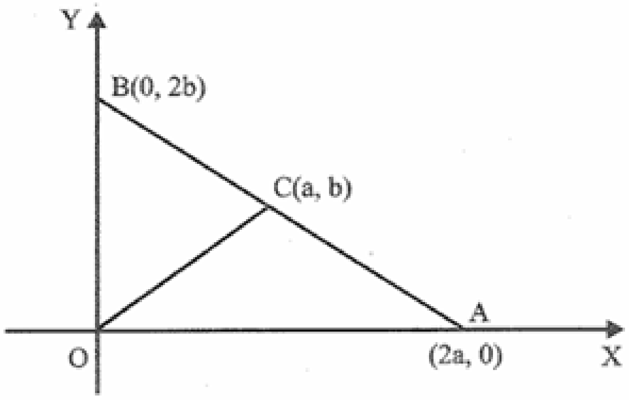
$=\sqrt{\left(\frac{1}{2}+5\right)^2+\left(\frac{3}{2}-3\right)^2}=\sqrt{\left(\frac{11}{2}\right)^2+\left(-\frac{3}{2}\right)^2}$

$=\sqrt{\frac{121+9}{4}}=\frac{\sqrt{130}}{2}$

143. In the given figure, a right triangle BOA is given and C is the mid-point of the hypotenuse AB. Show that C is equidistant from the vertices O, A and B.

Ans. : C is the mid-point of hypotenuse AB.

Coordinates of A and B are ($2a,0$) and ($0,2b$) respectively.



$\therefore$ Coordinates of C are $\left(\frac{2a+0}{2}, \frac{0+2b}{2}\right) = (a,b)$

$\mathrm{OC} = \sqrt{(a-0)^2+(b-0)^2} = \sqrt{a^2+b^2}$

$\mathrm{AC} = \sqrt{(a-2a)^2+(b-0)^2} = \sqrt{a^2+b^2}$

and $\mathrm{BC} = \sqrt{(a-0)^2+(b-2b)^2} = \sqrt{a^2+b^2}$

$\therefore$ OC = AC = BC $\left[\because \text{Each} = \sqrt{a^2+b^2}\right]$

⇒ C is equidistant from the vertices O, A and B.

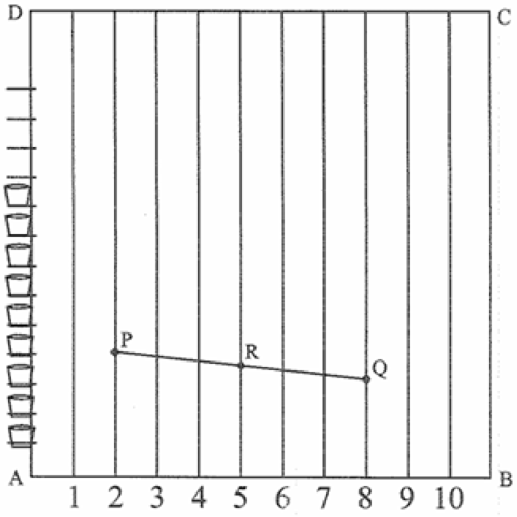
144. To conduct Sports Day activities, in your rectangular shaped school ground ABCD, lines have been drawn with chalk powder at a distance of 1m each. 100 flower pots have been placed at a distance of 1m from each other along AD, as shown in figure given below Niharika runs $\frac{1}{4}th$ the distance AD on the 2nd line and posts a green flag. Preet runs $\frac{1}{5}th$ the distance AD on the eighth line and posts a red flag. What is the distance between both the flags? If Rashmi has to post a blue flag exactly halfway the two flags, where should she post her flag?

Ans. : Let A be the origin, AB along the x-axis and AD along the y-axis.

Since 100 flower pots have been placed at a distance of 1 m from each other along AD,

$\therefore$ AD = 100 m

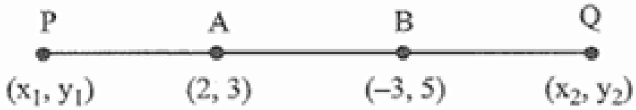
Since Niharika runs $\frac{1}{4}th$ the distance AD on the second line



$\therefore$ Distance which Niharika runs $= \frac{1}{4} \times 100 = 25 \text{ m}$
Let she posts green flag at the point P.
$\therefore$ The coordinates of point P are $(2, 25)$.
Again, Preet runs $\frac{1}{5}$ th of the distance AD on the 8th line.
$\therefore$ Distance which Preet runs $= \frac{1}{5} \times 100 = 20 \text{ m}$
Let she posts red flag at the point Q.
Distance between green and red flags
$= \sqrt{(8-2)^2 + (20-25)^2} = \sqrt{36+25} = \sqrt{61} \text{ m}$
The coordinates of the mid-point of PQ are $\left(\frac{2+8}{2}, \frac{25+20}{2}\right) = (5, 22.5)$
Rashmi should post her blue flag at the point R on the 5th line at a distance of 22.5 m.

145. The line segment joining $A(2,3)$ and $B(-3,5)$ is extended through each end and by a length equal to its original length. Find the coordinates of the new ends.

Ans. : Let the line segment joining $A(2,3)$ and $B(-3,5)$ is extended through each end by a length equal to its original length AB as shown in the figure.
Let $\mathrm{P}(x_1, y_1)$ and $\mathrm{Q}(x_2, y_2)$ be the new end points.
Now PA = AB = BQ
$\therefore \mathrm{A}$ is the mid-point of PB .
⇒ $2 = \frac{x_1 + (-3)}{2}$ and $3 = \frac{y_1 + 5}{2}$
⇒ $4 = x_1 - 3$ and $6 = y_1 + 5$
which gives $x_1 = 7$ and $y_1 = 1$



Hence, the coordinates of the point P are $(7, 1)$.
Again B is the mid-point of AQ
$\therefore \quad \frac{2+x_2}{2} = -3$ and $\frac{3+y_2}{2} = 5$
⇒ $2 + x_2 = -6$ and $3 + y_2 = -10$

$\Rightarrow x_2 = -8$ and $y_2 = 7$

$\therefore$ The coordinates of Q are $(-8,7)$.

Hence, the coordinates of the new ends are $(7,1)$ and $(-8,7)$.

146. If $Q(0,1)$ is equidistant from $P(5,-3)$ and $R(x,6)$, find the value of x. Also, find the distance QR and PR.

Ans. : Since $\mathrm{Q}(0,1)$ is equidistant from $\mathrm{P}(5,-3)$ and $\mathrm{R}(x,6)$, then $\mathrm{QP} = \mathrm{QR}$.

$\Rightarrow \sqrt{(5-0)^2 + (-3-1)^2} = \sqrt{(x-0)^2 + (6-1)^2}$

Squaring both sides, we get

$25 + 16 = x^2 + 25 \qquad x^2 = 16 \Rightarrow x = \pm 4$

When x = 4 R is (4, 6)

$$\therefore \begin{array}{l} \mathrm{QR} = \sqrt{(4-0)^2 + (6-1)^2} = \sqrt{16+25} = \sqrt{41} \\ \mathrm{PR} = \sqrt{(4-5)^2 + (6+3)^2} = \sqrt{1+81} = \sqrt{82} \end{array}$$

Again when $x = -4, \mathrm{R}$ is $(-4,6)$.

$\mathrm{QR} = \sqrt{(-4-0)^2 + (6-1)^2} = \sqrt{16+25} = \sqrt{41}$

and

$\mathrm{PR} = \sqrt{(-4-5)^2 + (6+3)^2} = \sqrt{81+81}$

$= \sqrt{162} = \sqrt{81 \times 2} = 9\sqrt{2}$

Hence, $x = \pm 4, \mathrm{QR} = \sqrt{41}, \mathrm{PR} = 9\sqrt{2}$.

147. (i) If 'a' is the length of one of the sides of an equilateral triangle ABC, base BC lies on x-axis and vertex B is at the origin, find the coordinates of the vertices of the triangle ABC.

(ii) Find the coordinates of the point equidistant from three given points $A(5,3), B(5,-5)$ and $C(1,-5)$.

Ans. : (i) Base BC of $\triangle\mathrm{ABC}$ lies on x-axis and vertex B is at the origin.

$\mathrm{BC} = a \quad$ [Given]

$\therefore$ Coordinates of C are $(a,0)$.

Draw $\mathrm{AD} \perp \mathrm{BC}$

Since $\triangle\mathrm{ABC}$ is equilateral

$\therefore \mathrm{AD}$ bisects BC

$\therefore \mathrm{BD} = \mathrm{DC} = \frac{\mathrm{BC}}{2} = \frac{a}{2}$

In rt. $\angle d \triangle \mathrm{ADB}$, we get

$\mathrm{AB}^2 = \mathrm{AD}^2 + \mathrm{BD}^2 \quad$ [By the Pythagoras theorem]

$\Rightarrow \mathrm{AD}^2 = \mathrm{AB}^2 - \mathrm{BD}^2 - a^2 - \left(\frac{a}{2}\right)^2 = \frac{3a^2}{4}$

$\Rightarrow \mathrm{AD} = \frac{a\sqrt{3}}{2}$

Hence, the coordinates of A, B and C are

$\mathrm{A}\left(\frac{a}{2}, \frac{a\sqrt{3}}{2}\right), \mathrm{B}(0,0)$ and $\mathrm{C}(a,0)$

(ii) Let $\mathrm{P}(x,y)$ be the circumcentre of triangle ABC, then P is equidistant from vertices A, B and C respectively.

$\therefore$ PA = PB = PC

Now $\mathrm{PA} = \mathrm{PB} \Rightarrow \mathrm{PA}^2 = \mathrm{PB}^2$

⇒ $(x-5)^2 + (y-3)^2 = (x-5)^2 + (y+5)^2$

⇒ $x^2 - 10x + 25 + y^2 - 6y + 9 = x^2 - 10x + 25 + y^2 + 10y + 25$

⇒ $-6y + 34 = 10y + 50$

⇒ $-16y = 16$

⇒ $y = -1$

Again $\mathrm{PB} = \mathrm{PC} \Rightarrow \mathrm{PB}^2 = \mathrm{PC}^2$

⇒ $(x-5)^2 + (y+5)^2 = (x-1)^2 + (y+5)^2$

⇒ $x^2 - 10x + 25 + y^2 + 10y + 25 = x^2 - 2x + 1 + y^2 + 10y + 25$

⇒ $-10x + 50 = -2x + 26 \Rightarrow -8x = -24 \Rightarrow x = 3$

Hence, the coordinates of the point P are $(3,-1)$.

148. The opposite angular points of a square are $(5,4)$ and $(-1,6)$. Find the coordinates of the remaining two vertices.

Ans. : Let $A(5,4)$ and $C(-1,6)$ be the given opposite vertices of a square ABCD. Let the coordinates of $\mathrm{B}($ or D$)$ be (x,y)

Since ABCD is a square,

$\therefore$ $\mathrm{AB} = \mathrm{BC}$ or $\mathrm{AB}^2 = \mathrm{BC}^2$

⇒ $(x-5)^2 + (y-4)^2 = (x+1)^2 + (y-6)^2$

⇒ $-10x + 25 - 8y + 16 = 2x + 1 - 12y + 36$

⇒ $-12x + 4y + 4 = 0$

⇒ $3x - y - 1 = 0$ or $y = 3x - 1$ ...(1)

Also $\mathrm{AB}^2 + \mathrm{BC}^2 = \mathrm{AC}^2$

$\therefore$ $(x-5)^2 + (y-4)^2 + (x+1)^2 + (y-6)^2 = (-1-5)^2 + (6-4)^2$

⇒ $2x^2 + 2y^2 - 8x - 20y + 38 = 0$

⇒ $x^2 + y^2 - 4x - 10y + 19 = 0$ ...(2)

Substituting $y = 3x - 1$ in (2), we get

⇒ $x^2 + (3x-1)^2 - 4x - 10(3x-1) + 19 = 0$

⇒ $10x^2 - 40x + 30 = 0 \Rightarrow x^2 - 4x + 3 = 0$

⇒ $(x-1)(x-3) = 0 \Rightarrow x = 1,3$

When $x = 1$, from (1), $y = 3(1) - 1 = 2$

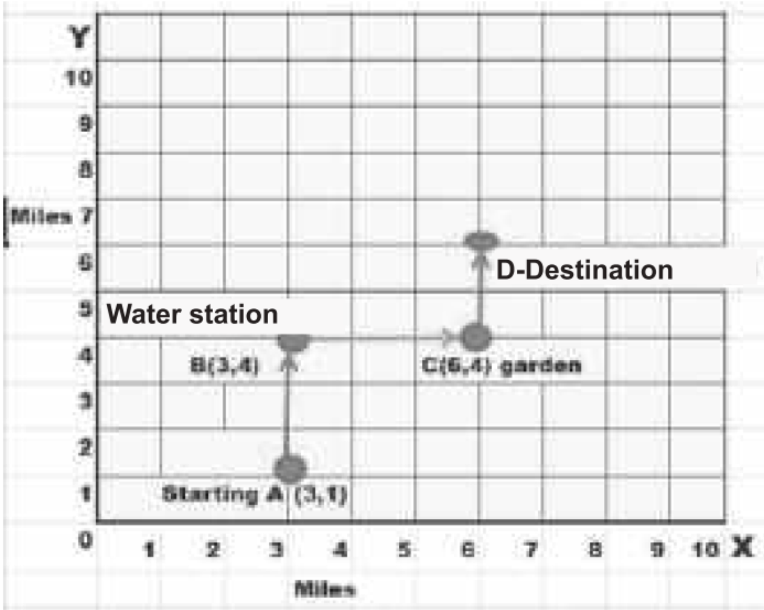
When $x = 3$, from (1), $y = 3(3) - 1 = 8$

Hence, the coordinates of the remaining two vertices are $(1,2)$ and $(3,8)$.

*** Case study based questions.** **[24]**

Arun is participating in an 8 miles walk. The organizers used a square coordinate grid to plot the course. The starting point is at A (3, 1). At B (3, 4), there's a water station to make sure the walkers stay hydrated.

From water station, the walkway turns right and at C(6, 4), a garden is situated to keep walkers fresh. From the garden, the walkway turns left and finally, Arun reaches at destination D to complete 8 miles.



Based on the above information, answer the following questions:

149. How far is the water station B from the starting point A?
150. How far is the water station B from garden C?
151. What is the abscissa of destination point D?
152. What are the coordinates of destination point D?

Ans. : 1. 3 miles

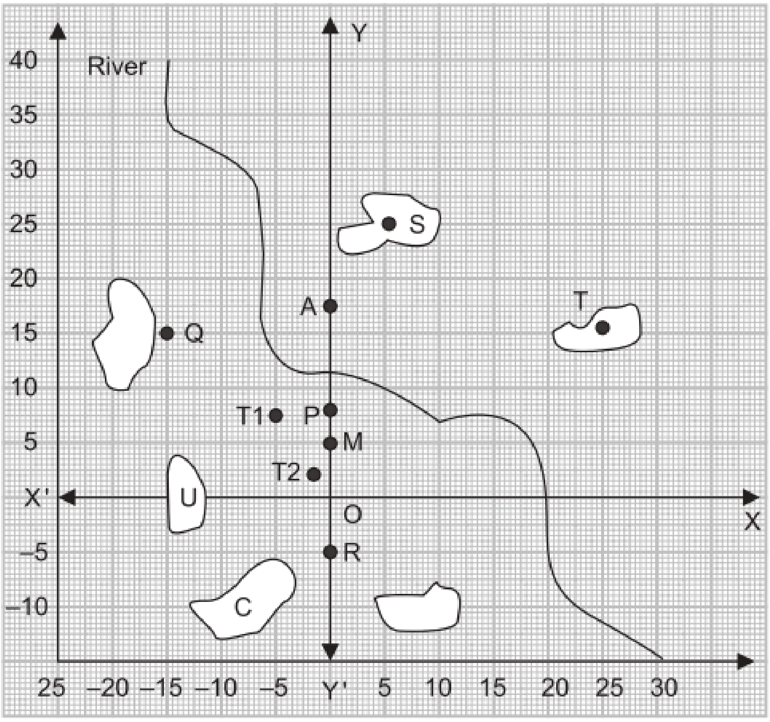
2. 3 miles

3. 6

4. (6, 6)

National Park: A national park is an area set aside by the government to preserve and protect natural environment.

The graph below shows a map of the National Park. The shaded areas indicate woods. The plain areas indicate meadows and fields without trees. Point O on the graph represents the location of the park's supervisor's office, and points P and Q are the ranger's towers.



153. Find the distance between the towers P(0,7.5) and Q(- 15, 15)

154. Find the distance of the point S(5, 25) from x-axis.

155. Find the point on x-axis (other than O) equidistant from the points R(0, - 5) and M(0, 5).

156. There are two trees $T_1(-5,7)$ and $T_2(-1,3)$ in the park.

Find the coordinates of the mid-point of the line segment joining both the trees.

Ans. : 1. To find the distance d, we use the distance formula:

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

$d=\sqrt{(-15-0)^2+(15-7.5)^2}$

$d=\sqrt{(-15)^2+(7.5)^2}$

$d=\sqrt{225+56.25}=\sqrt{281.25}$

$\sqrt{281.25}$ units

2. For point $S(5,25)$, the y-coordinate is 25. 25 units

3. U

4. We use the midpoint formula: $\left(\frac{x_1+x_2}{2},\frac{y_1+y_2}{2}\right)$

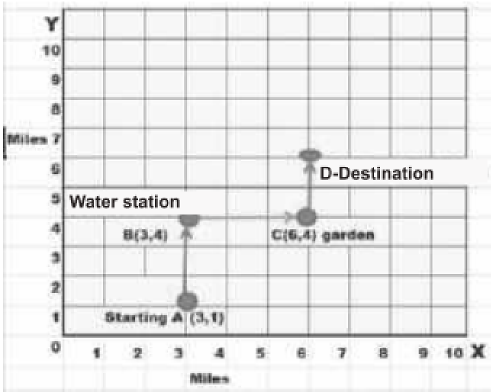
$x_{\text{mid}}=\frac{-5+(-1)}{2}=\frac{-6}{2}=-3$

$y_{\text{mid}}=\frac{7+3}{2}=\frac{10}{2}=5$

(-3, 5)

157. Arun is participating in an 8 miles walk. The organizers used a square coordinate grid to plot the course. The starting point is at $A(3,1)$. At $B(3,4)$, there's a water station to make sure the walkers stay hydrated.

From water station, the walkway turns right and at $C(6,4)$, a garden is situated to keep walkers fresh. From the garden, the walkway turns left and finally, Arun reaches at destination D to complete 8 miles.



Based on the above information, answer the following questions :

(i) How far is the water station B from the starting point A?

(ii) How far is the water station B from garden C?

(iii) What is the abscissa of destination point D?

(iv) What are the coordinates of destination point D?

Ans. : (i) 3 miles

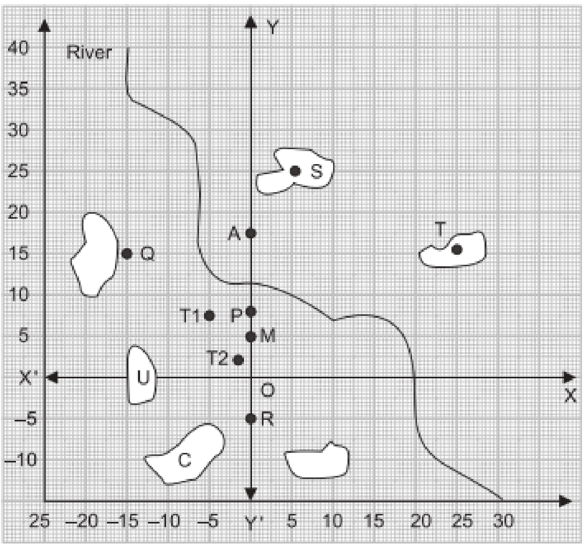
(ii) 3 miles

(iii) 6

(iv) $(6,6)$

158. **National Park :** A national park is an area set aside by the government to preserve and protect natural environment.

The graph below shows a map of the National Park. The shaded areas indicate woods. The plain areas indicate meadows and fields without trees. Point O on the graph represents the location of the park's supervisor's office, and points P and Q are the ranger's towers.



(i) Find the distance between the towers $P(0,7.5)$ and $Q(-15,15)$.

(ii) Find the distance of the point $S(5,25)$ from x-axis.

(iii) Find the point on x-axis (other than O) equidistant from the points $R(0,-5)$ and $M(0,5)$.

(iv) There are two trees $T_1(-5,7)$ and $T_2(-1,3)$ in the park. Find the coordinates of the mid-point of the line segment joining both the tree

Ans. : (i) $\sqrt{281.25}$ units

(ii) 25 units

(iii) U

(iv) $(-3,5)$

159. The class IX was divided into two groups for discussion on the topic of Coordinate Geometry. Both the groups had prepared lots of questions and their answers. Some parts of the questions are shown here. So you are required to answer them.

1. The coordinates of the point which lies on x-axis at a distance of 4 units in the negative direction of x-axis is

(i) $(0,4)$ (ii) $(4,0)$ (iii) $(-4,0)$ (iv) $(0,-4)$

2. The quadrants in which abscissa and ordinate are equal are

(i) I and II quadrants (ii) II and III quadrants

(iii) I and III quadrants (iv) III and IV quadrants

3. Which one of the following is the sign of abscissa and ordinate of a point in the third quadrant respectively?

4. On plotting the points $O(0,0), A(4,0), B(4,4), C(0,4)$, and joining OA, AB, BC and CO which of the following figures is obtained?

Ans. : 1. (iii)

2. (iii)

3. -,-

4. square

160. On Parents-Teacher (PT) meeting day, maths teacher made a complain against Rahul to his parents that Rahul is not fair in mathematics particularly on the topics Coordinate Geometry. Rahul could not object his teacher. He simply smiled and requested his teacher to give him a test paper to solve in front of his parents. The teacher gave a test paper to Rahul and asked him to solve it quickly and return him. The questions in the test paper are as follows:

1. A point lies on x-axis at a distance of 6 units from the y-axis. It coordinates are

(i) $(0,6)$ (ii) $(6,0)$ (iii) $(-6,0)$ (iv) $(0,-6)$

2. The name of the figure obtained by joining the points $P(-6,2), Q(-6,0)$, $R(0,0)$ and $S(0,2)$ is

(i) Rectangle (ii) Rhombus (iii) Square (iv) Trapezium

3. Find the coordinates of a point whose ordinate is -5 and which lie on y-axis.

4. Find the coordinates of a point whose abscissa is -6 and which lie on x-axis.

Ans. : 1. (ii)

2. (i)

3. $(0, -5)$
4. $(-6, 0)$

----- Maths By Shailendra Gangwar I 9988117385 -----