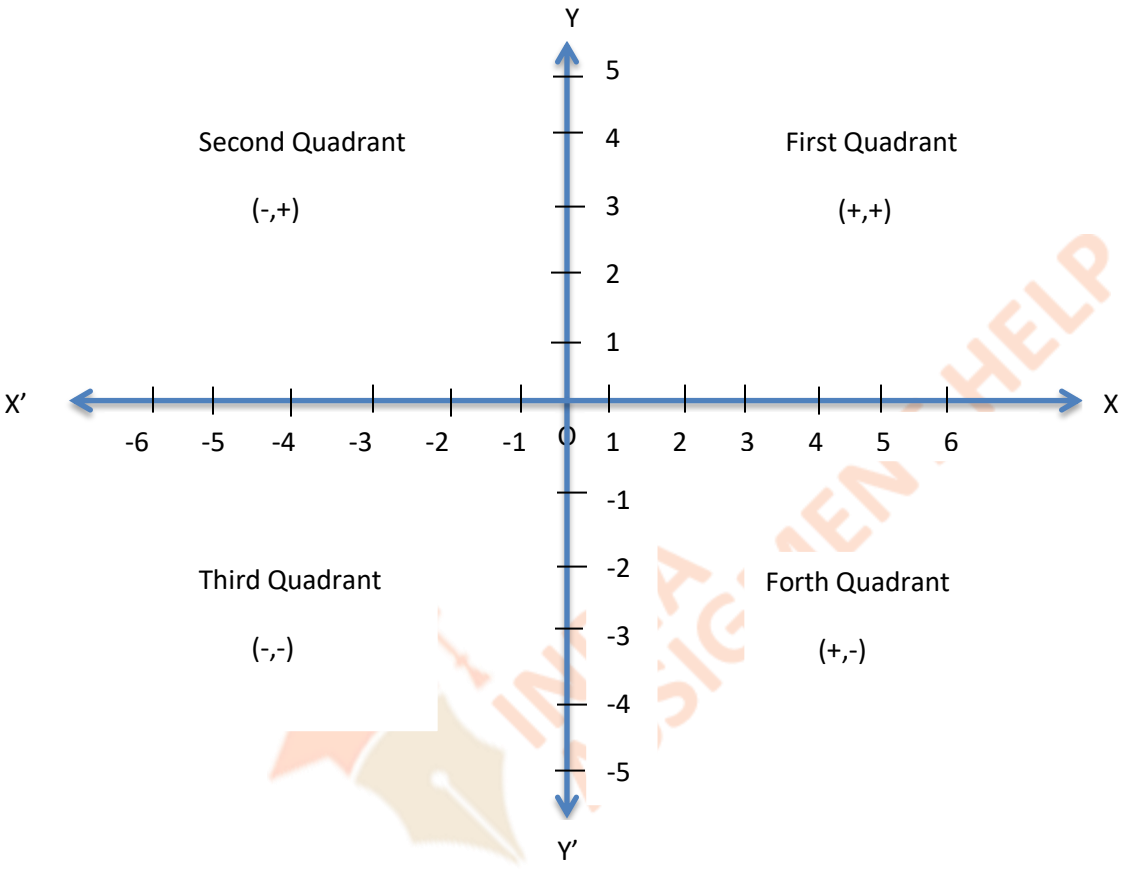
Introduction

Coordinate geometry is an interesting topic for the students.

Coordinate geometry is also known as analytic geometry. With the help of this concept, position of a point can be determined using the coordinates. It is geometry in two dimensions.



The above figure is a Cartesian plane in which there are two lines XOX' and YOY' perpendicular to each other. These lines are known as coordinate axis

Origin: The point at which both the axes intersect each other

XOX': It is the X axis of Cartesian plane. It is the horizontal axis.

YOY': It is the Y axis of Cartesian plane. It is the vertical axis.

There are four quadrants in the Cartesian plane which are as follows:

Quadrant 1: XOY with sign (+, +)

Quadrant 2: YOX' with sign (-, +)

Quadrant 3: X'OY' with sign (-, -)

Quadrant 4: Y'OX with sign (+, -)

Order pair: Any of the point in the Cartesian plane can be represented in the form of (a, b) which is known as ordered pair, where a is the x-coordinate known as abscissa of the point and b is the y-coordinate known as ordinate of the point

Note: Every point on the x-axis is of the form (x, 0) which means that on the x axis, y-coordinate is zero. Likewise, every point on y-axis is of the form (0, y) which means that on the y axis, x-coordinate is zero.

Examples:

Example 1 - Plot each of the following points on a graph paper:

(i) A(5,2)
(ii) B(-2,4)
(iii) C(-4,-6)
(iv) D(4,-3)

Solution – Here, Let XOX' and YOY' be the coordinate axes.

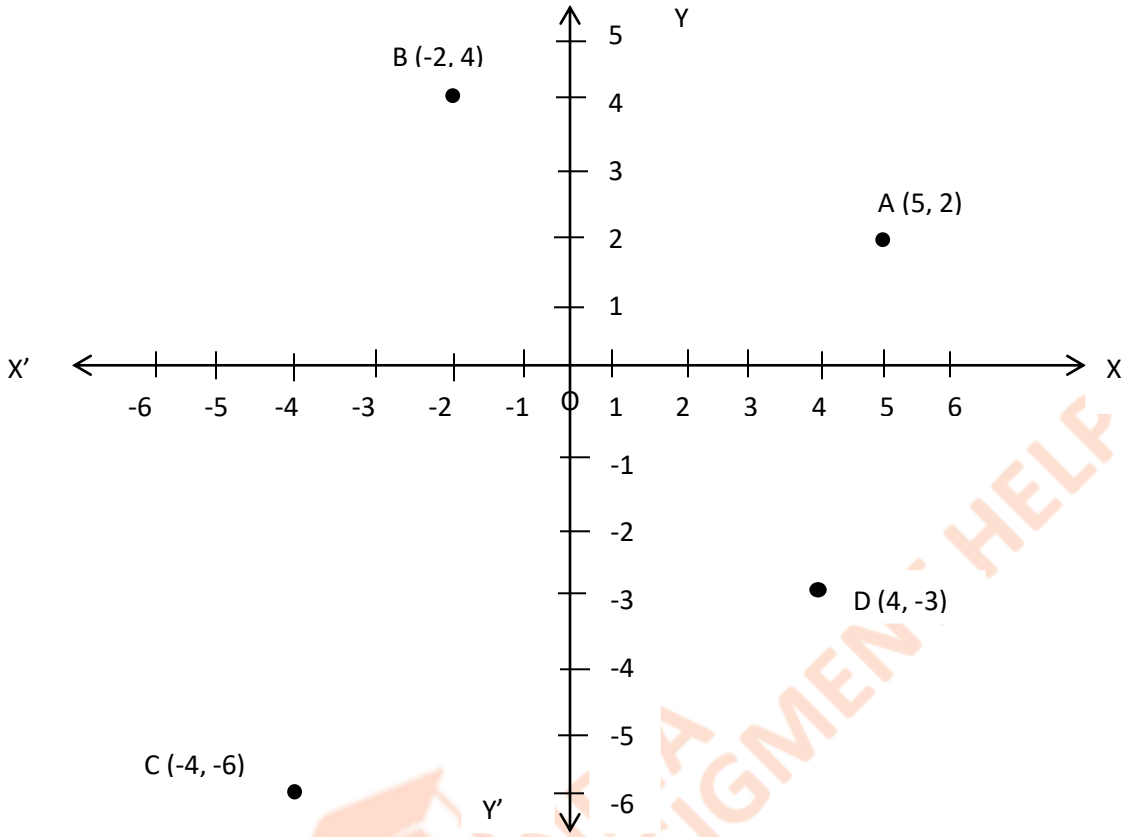
(i) On the x axis, if we take 5 units to the right of y axis and on the y axis, 2 units above the x axis then we get point A (5, 2).

(ii) On the x axis, if we take 2 units to the left of y axis and on the y axis, 4 units above the x axis then we get point A (-2, 4).

(iii) On the x axis, if we take 4 units to the left of y axis and on the y axis, 6 units below the x axis then we get point A (-4, -6).

(iv) On the x axis, if we take 4 units to the right of y axis and on the y axis, 3 units below the x axis then we get point A (4, -3).

We will plot these 4 points on a graph as follows:



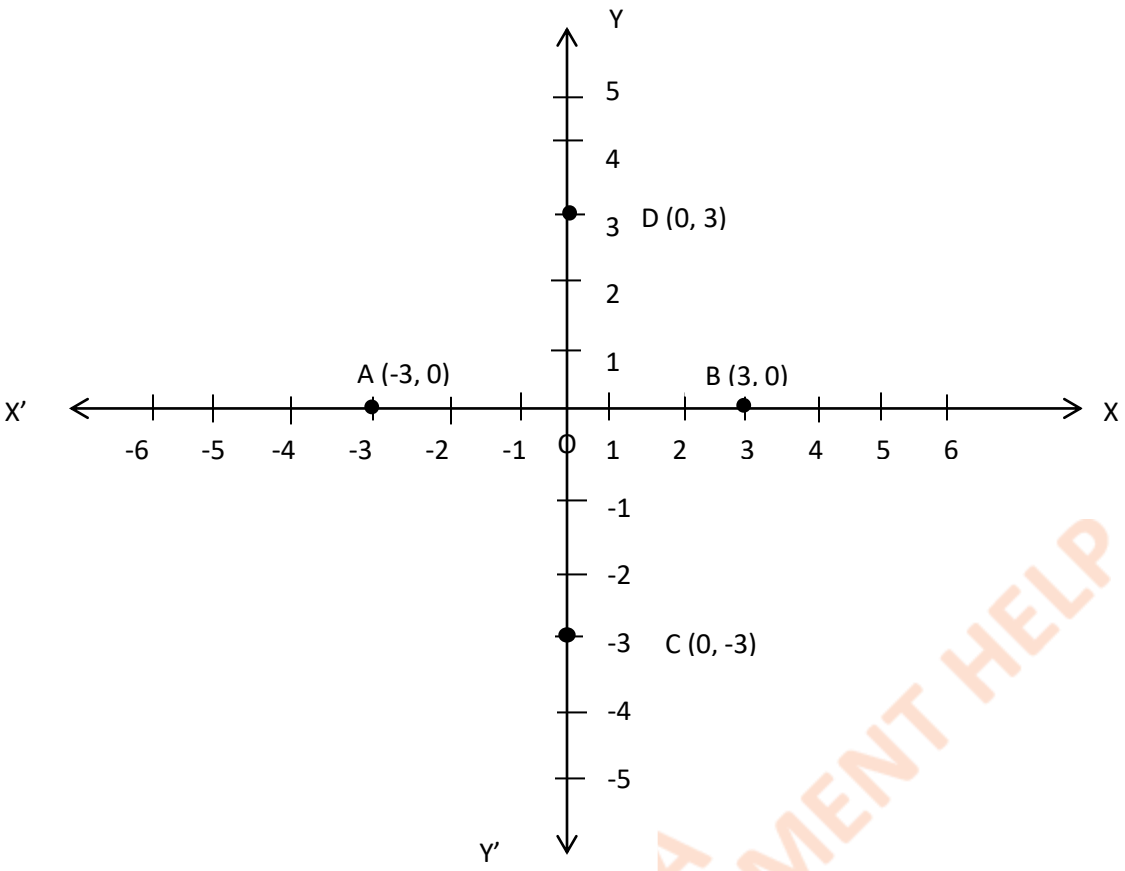
Example 2 – Plot each of the following points on a graph paper:

(i) (-3,0)
(ii) (3,0)
(iii) (0,-3)
(iv) (0,3)

Solution – Let XOX' and YOY' be the coordinate axes.

Now, we know that when point is of the form (x, 0) then it will lie on the x-axis and if the point is of the form (0, y) then it will lie on the y axis.

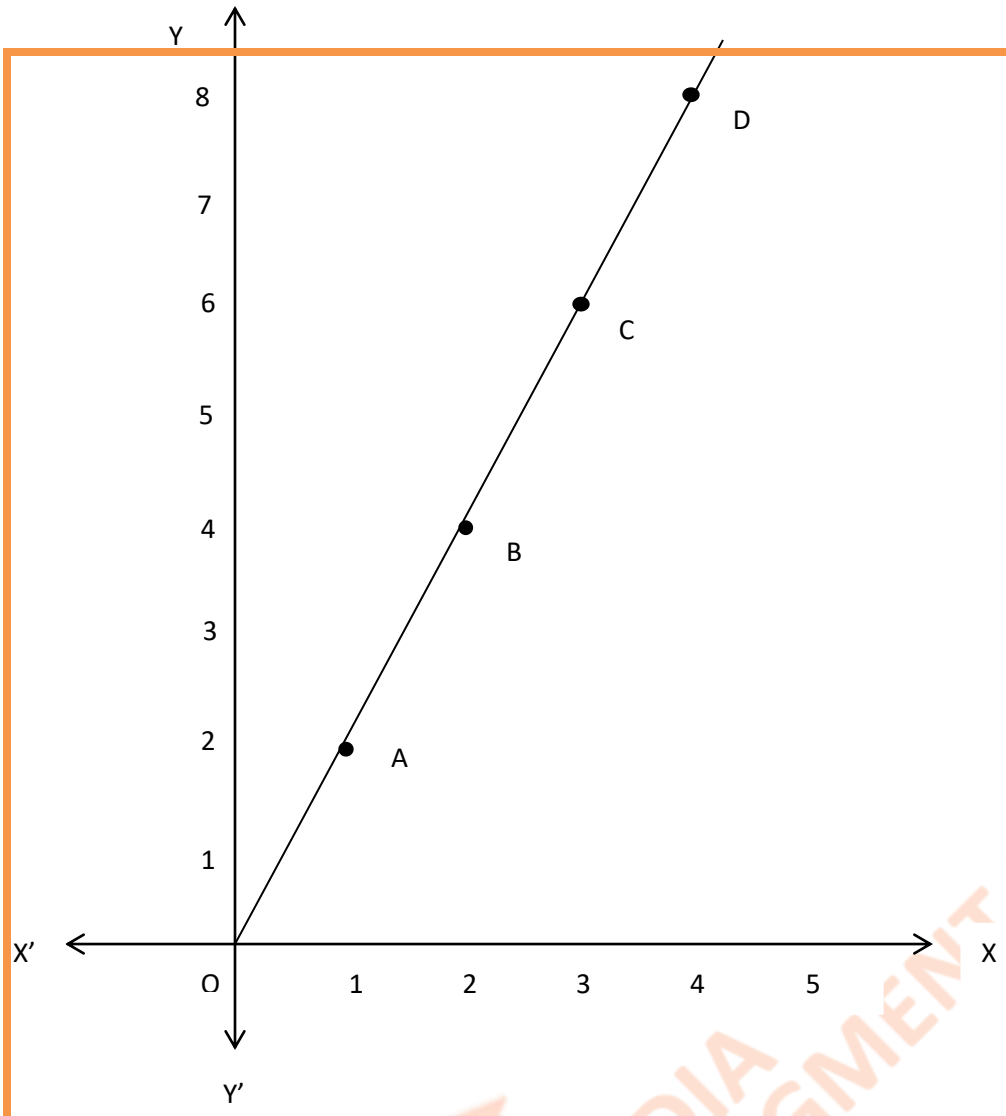
Thus, the given points are shown on the graph as follows:



Example 3 – Plot the points A (1, 2), B (2, 4), C (3, 6) and D (4, 8) on a graph paper. Check if the given points lie on a straight line. Produce BA downwards. Does it pass through the origin?

Solution - Let XOX' and YOY' be the coordinate axes.

The given points are shown as follows on a graph paper:



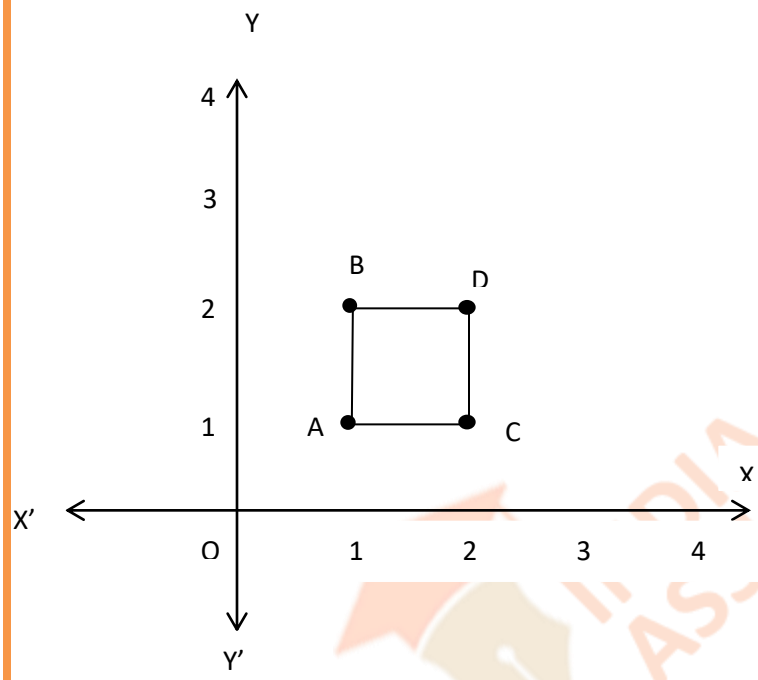
We can see from the above graph that all the given points lie on a straight line.

When we produce BA downwards then we see that it passes through the origin (0, 0)

Example 4 – On a graph paper, plot the points A (1, 1), B (1, 2), C (2, 1) and d (2, 2). Show that ACDB is a square.

Solution - Let XOX' and YOY' be the coordinate axes.

The given points are shown as follows on a graph paper



From the figure, we can see that all the sides are equal.

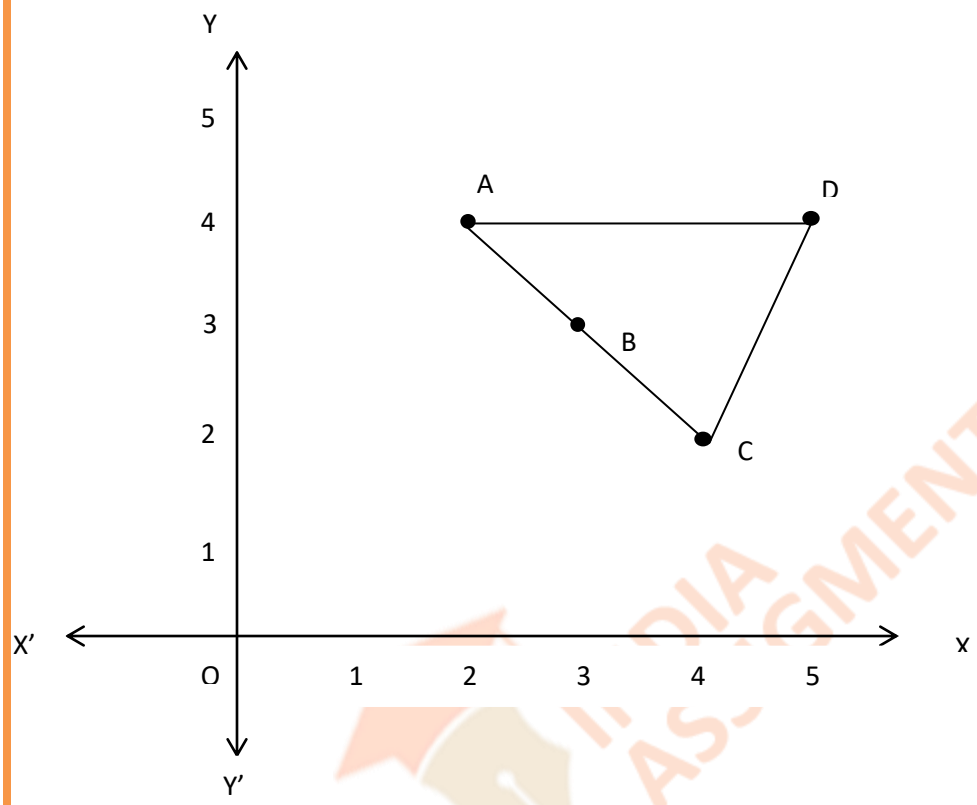
AB = BC = CD = AD = 1 unit, also AB is perpendicular on AC.

Therefore, ACDB is a square.

Example 5 – On a graph paper, plot the points A (2, 4), B (3, 3), C (4, 2) and D (5, 4). Show that ABC is a straight line and ACD is a triangle.

Solution - Solution - Let XOX' and YOY' are the coordinate axes.

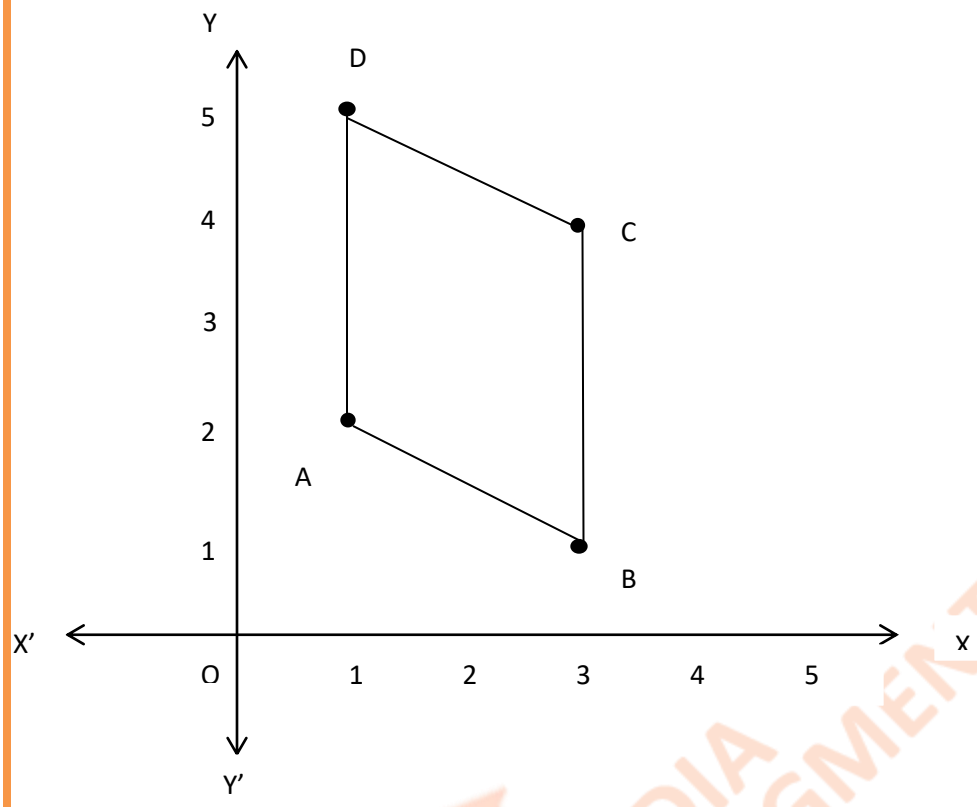
The given points are shown as follows on a graph paper



From the figure, we can see that on joining the points A, B and C, we get a straight line. So, ABC is a straight line.

Now, on joining AD and CD, we get a triangle ACD. Thus, ACD is a triangle.

Example 6 – Write the coordinates of the vertices of the adjoining figure.



Solution – From the given figure we can see that the coordinates of the parallelogram ABCD are A (1, 2), B (3. 1), C (3, 4) and D (1, 5)

Exercise 22A

Question 1 – Write the abscissa of each of the following points:

(a) (0, 5)

Solution – Since we know that abscissa means the x-coordinate of a point.

Thus, abscissa of (0, 5) is 0

(b) (3, 7)

Solution - Abscissa of (3, 7) is 3

(c) (-2, 4)

Solution - Abscissa of (-2, 4) is -2

(d) (6, -3)

Solution - Abscissa of (6, -3) is 6

Question 2 – Write the ordinate of each of the following points:

(a) (4, 0)

Solution - Since we know that ordinate means the y-coordinate of a point.

Thus, ordinate of (4, 0) is 0

(b) (5, 2)

Solution – The ordinate of (5, 2) is 2

(c) (1, -4)

Solution – The ordinate of (1, -4) is -4

(d) (-10, -7)

Solution – The ordinate of (-10, -7) is -7

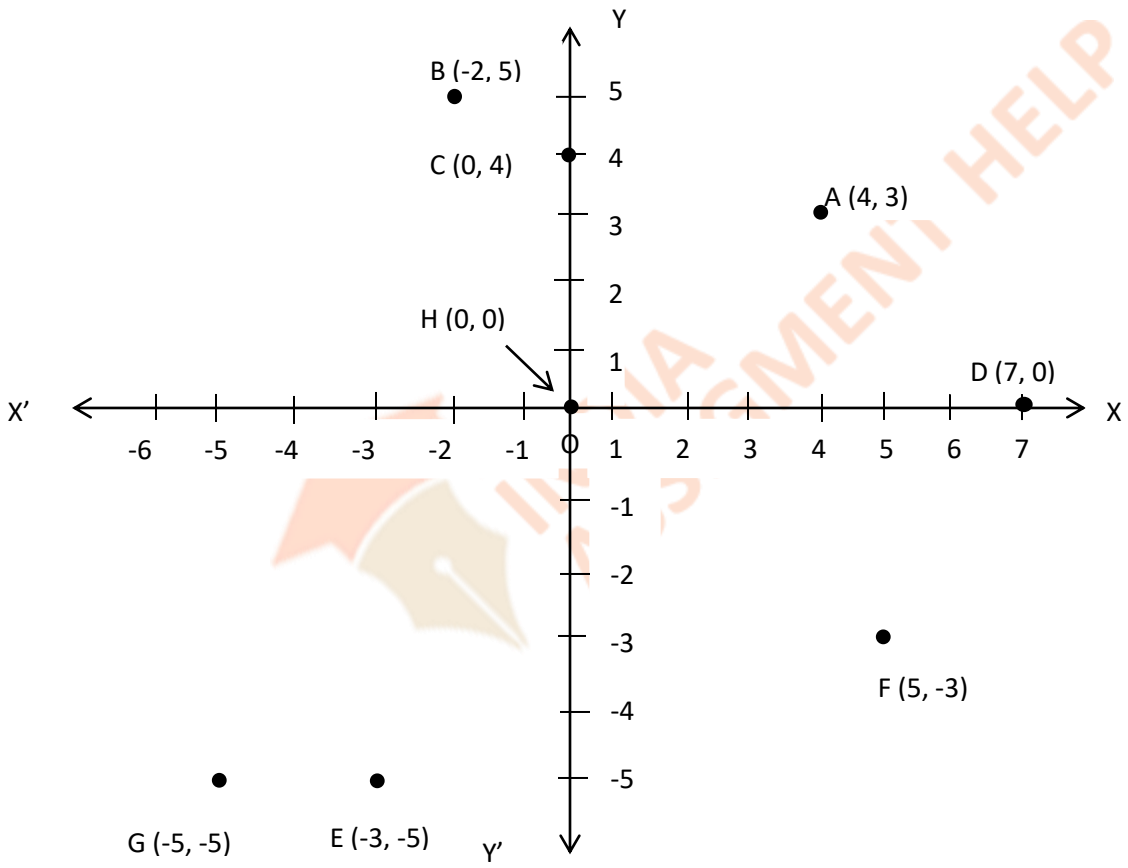
Question 3 – On a graph paper, plot each of the following points:

(a) A (4, 3)
(b) B (-2, 5)
(c) C (0, 4)
(d) D (7, 0)
(e) E (-3, -5)

(f) F (5, -3)
(g) G (-5, -5)
(h) H (0, 0)

Solution – Let XOX' and YOY' are the coordinate axes.

Thus, the given points are shown on the graph as follows:

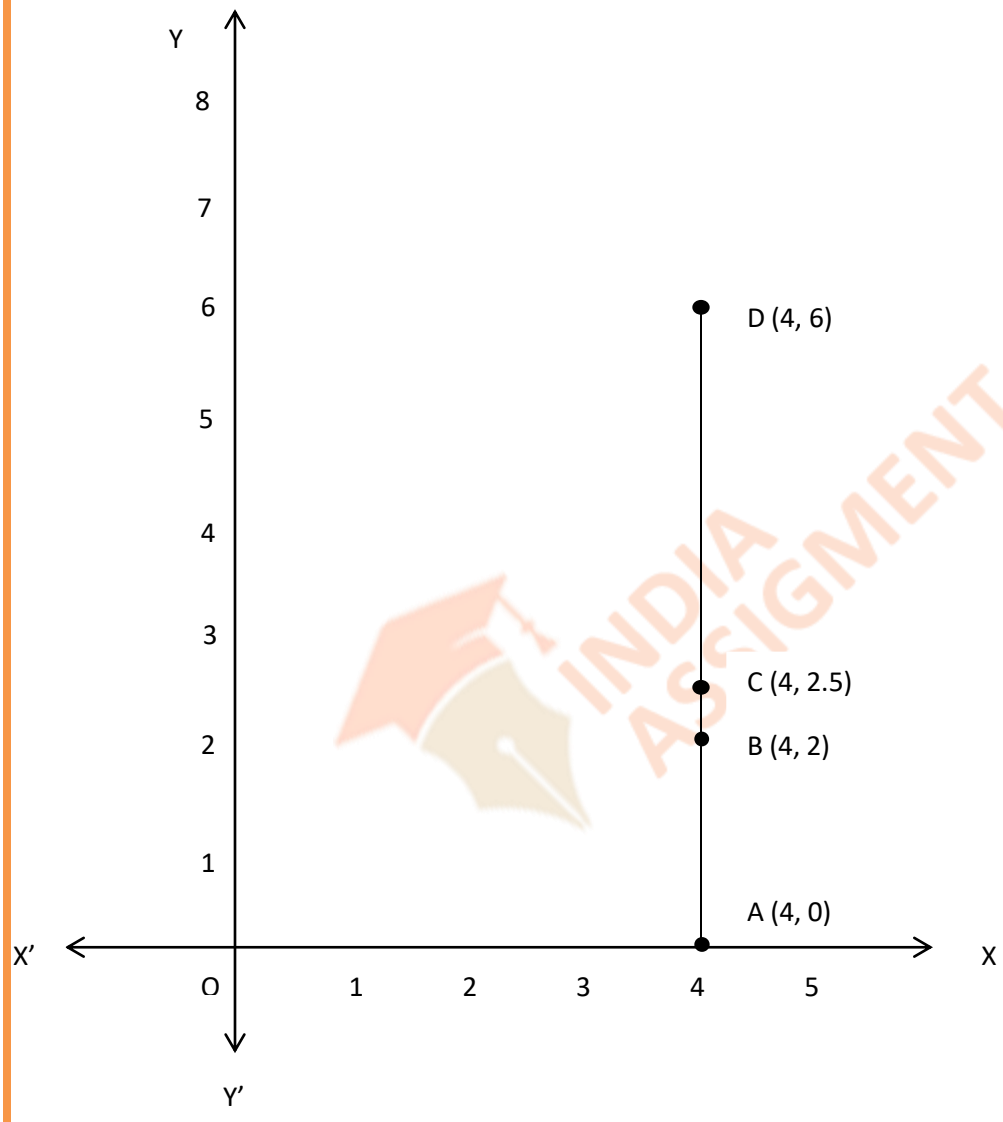


Question 4 – Plot each of the following points on a graph sheet. Verify that they lie on a line.

(a) A (4, 0), B (4, 2), C (4, 2.5) and D (4, 6)

Solution - Let XOX' and YOY' are the coordinate axes.

The given points are shown as follows on a graph paper:

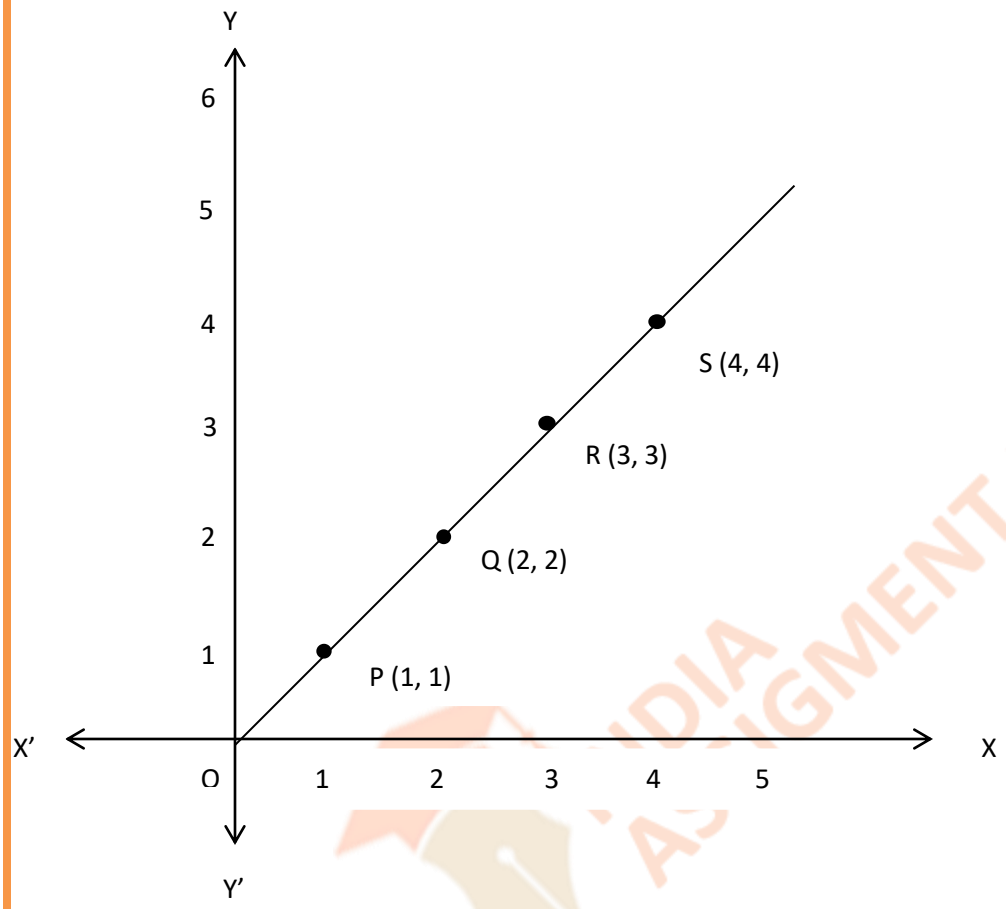


When we join all these points, we see that they all lie on a same line.

(b) P (1, 1), Q (2, 2), R (3, 3) and S (4, 4)

Solution - Let XOX' and YOY' are the coordinate axes.

The given points are shown as follows on a graph paper:

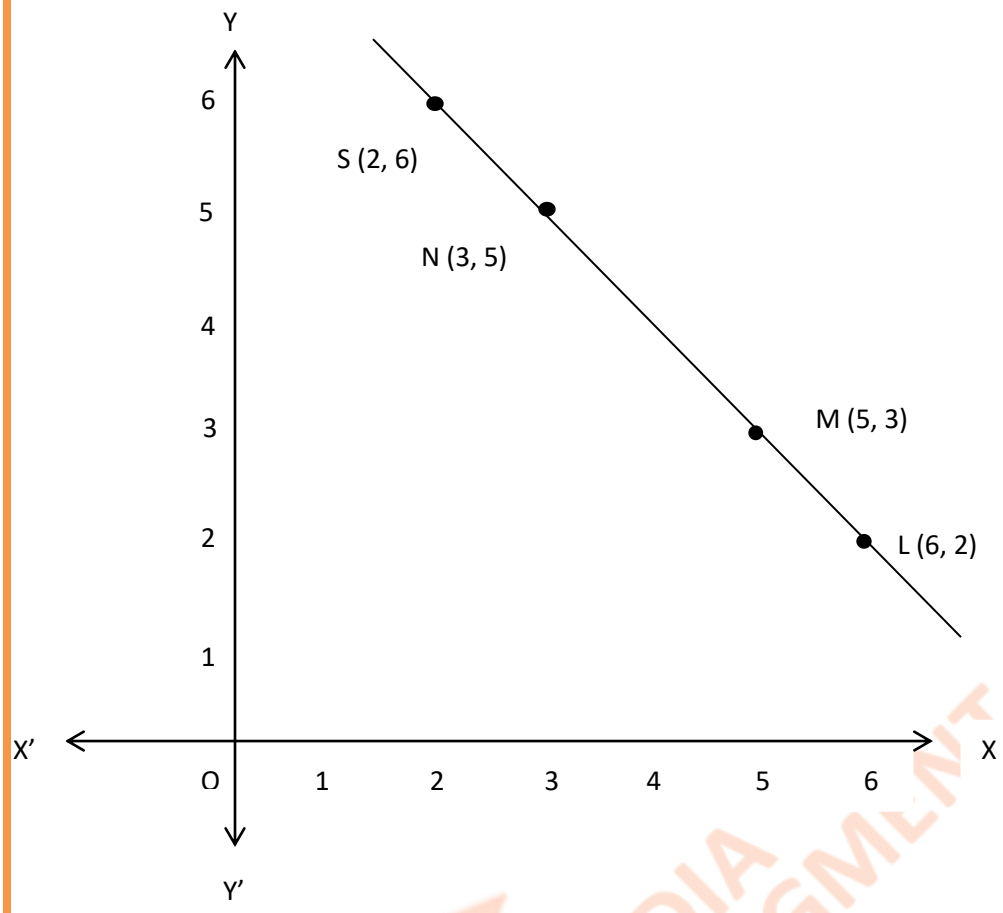


When we join all these points, we see that they all lie on a same line.

(c) L (6, 2), M (5, 3), N (3, 5) and O (2, 6)

Solution - Let XOX' and YOY' are the coordinate axes.

The given points are shown as follows on a graph paper:



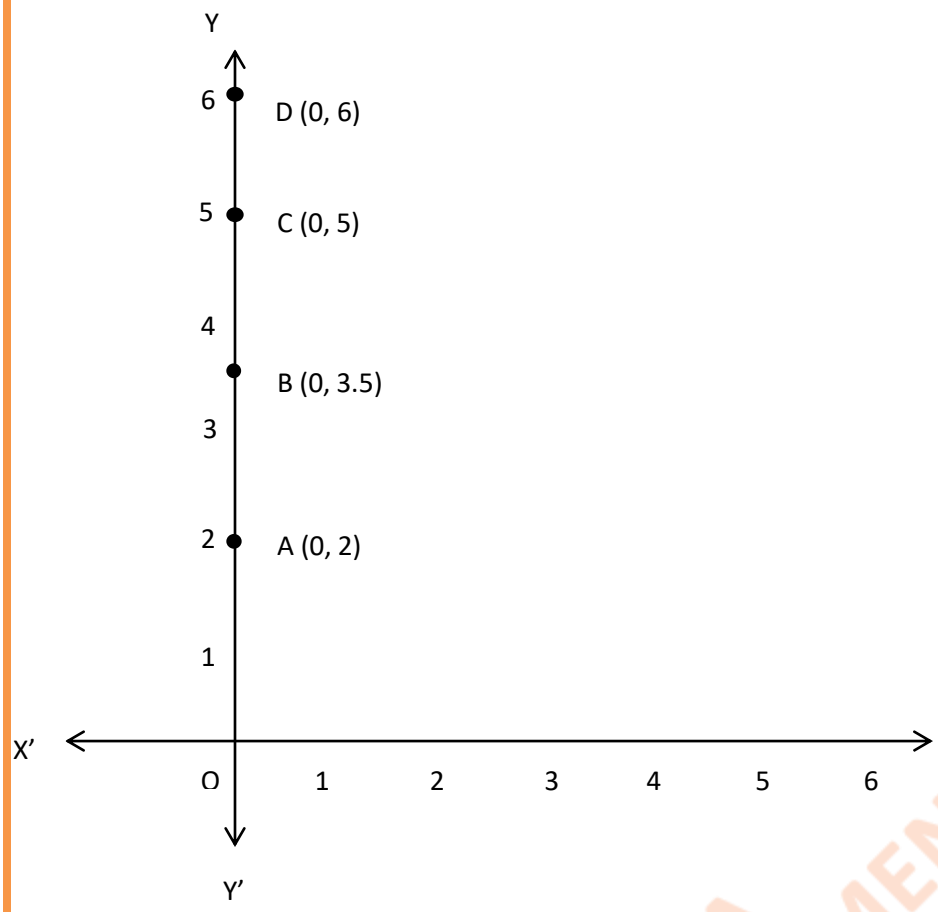
When we join all these points, we see that they all lie on a same line.

Question 5 – Plot the given points on a graph sheet and check if they lie on a straight line. If not, name the shape they form when joined in the given order.

(a) A (0, 2), B (0, 3.5), C (0, 5) and D (0, 6)

Solution - Let XOX' and YOY' are the coordinate axes.

The given points are shown as follows on a graph paper:

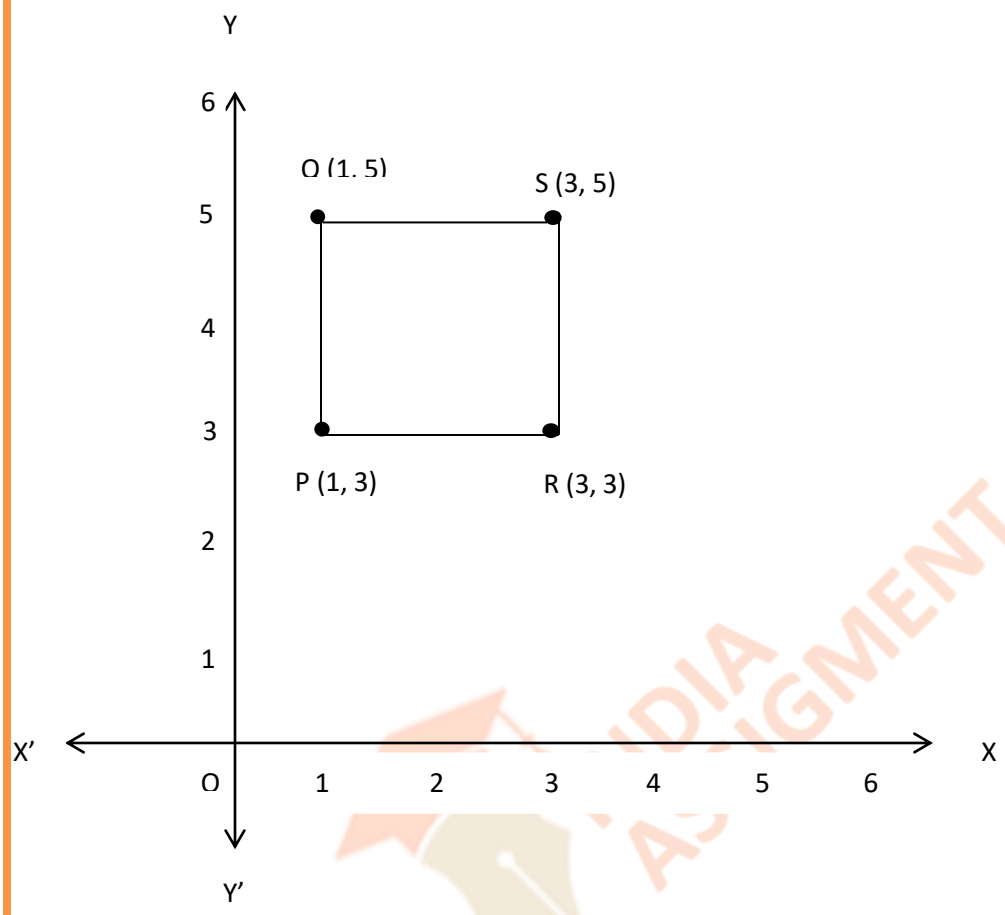


When we join all these points, we see that they all lie on a same line and we get a straight line.

(b) P (1, 3), Q (1, 5), R (3, 3) and S (3, 5)

Solution - Let XOX' and YOY' are the coordinate axes.

The given points are shown as follows on a graph paper



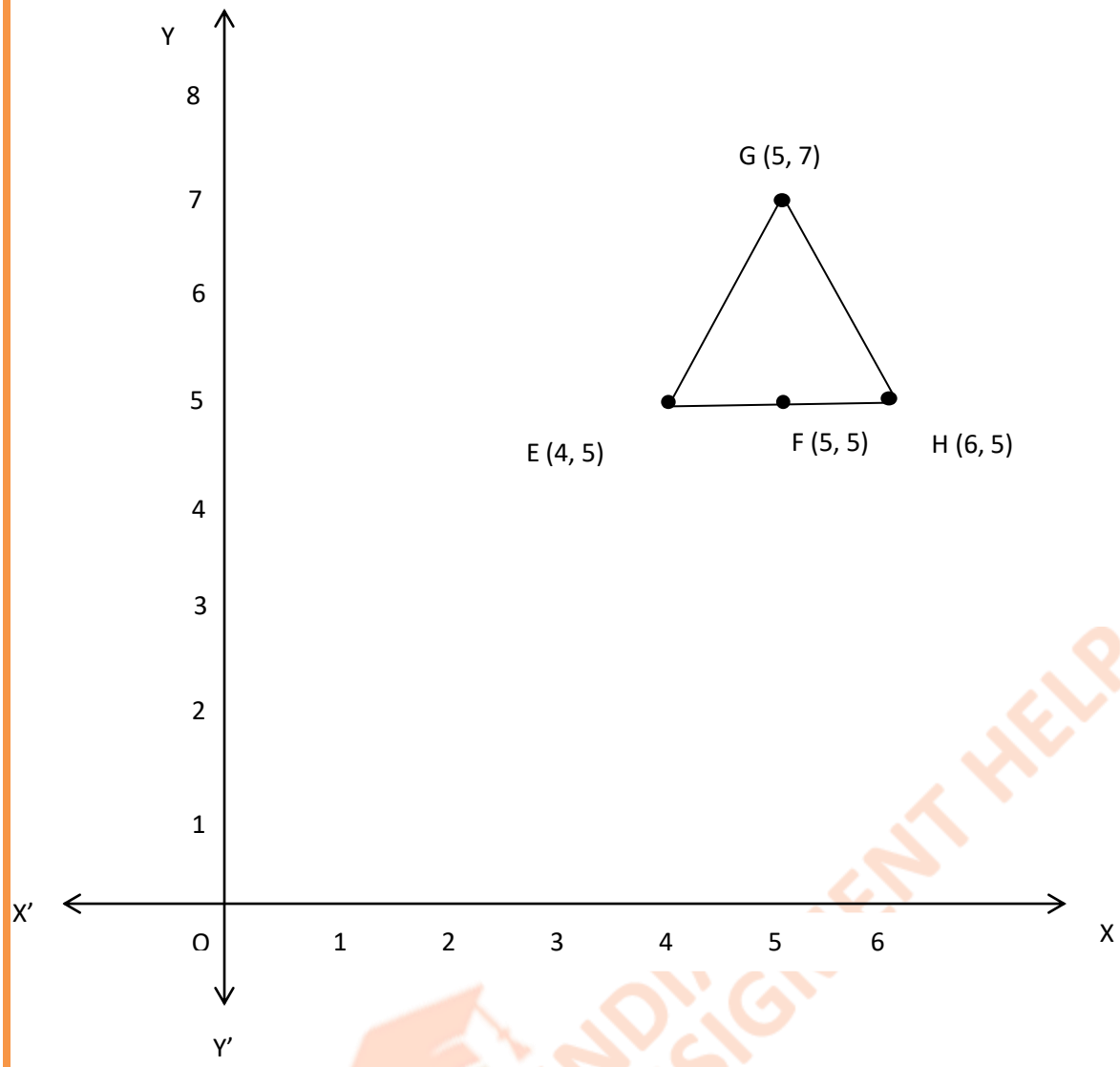
When we join all these points, we see that they do not lie on a same line.

The shape formed by joining all these point is square.

(c) E (4, 5), F (5, 5), G (5, 7) and H (6, 5)

Solution - Let XOX' and YOY' are the coordinate axes.

The given points are shown as follows on a graph paper:



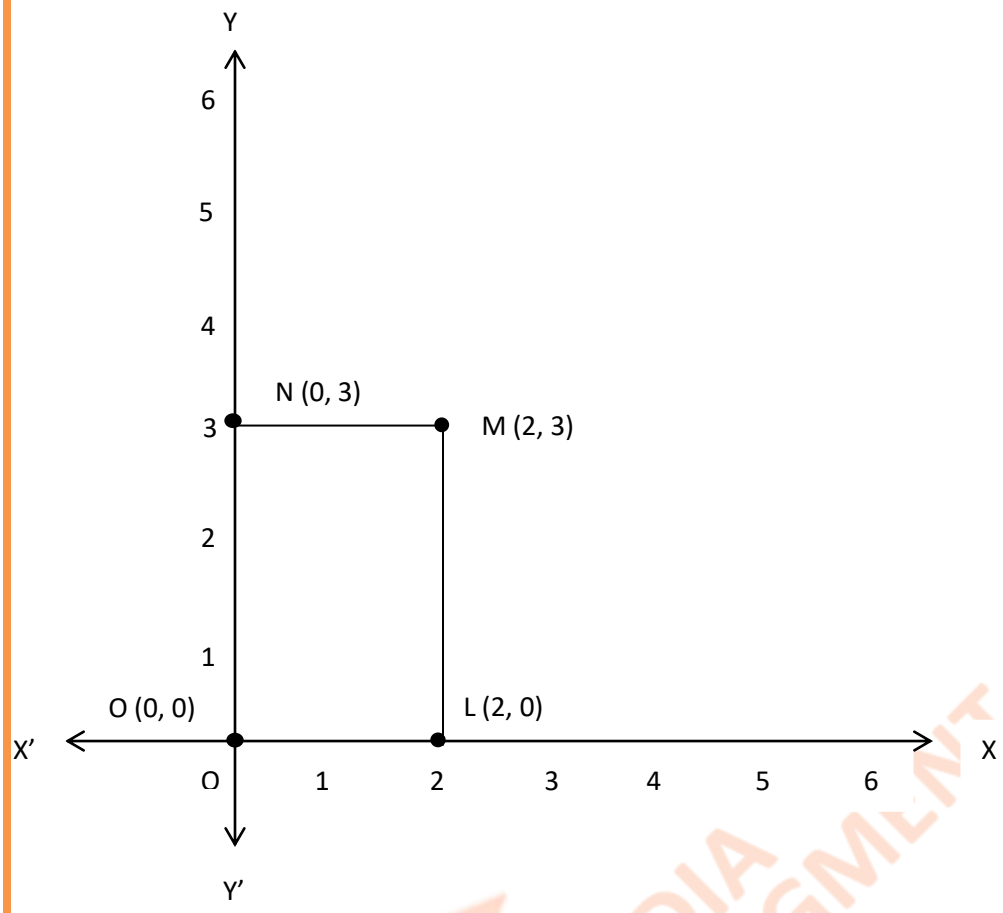
When we join all these points, we see that they do not lie on a same line.

The shape formed by joining all these points is triangle.

(d) L (2, 0), M (2, 3), N (0, 3) and O (0, 0)

Solution - Let XOX' and YOY' are the coordinate axes.

The given points are shown as follows on a graph paper:



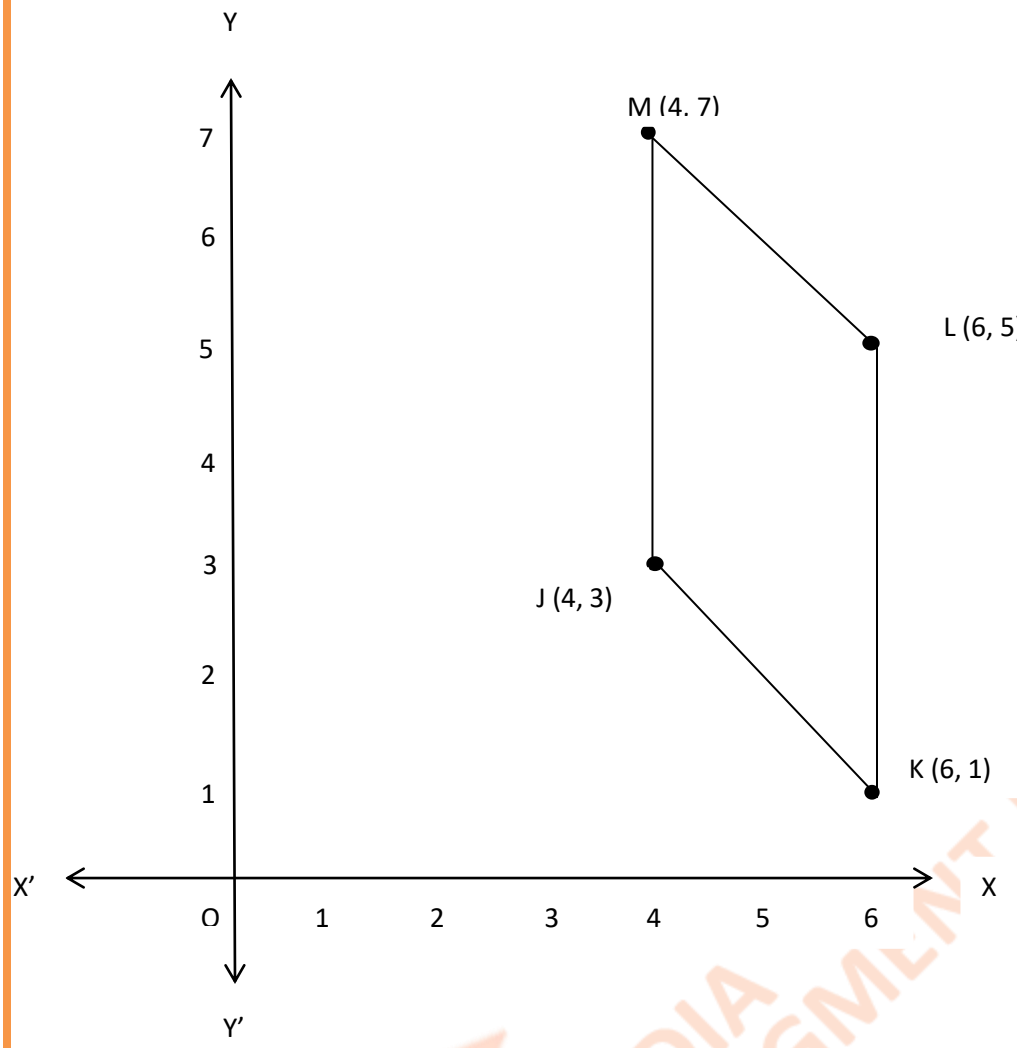
When we join all these points, we see that they do not lie on a same line.

The shape formed by joining all these points is rectangle.

(e) J (4, 3), K (6, 1), L (6, 5) and M (4, 7)

Solution Let XOX' and YOY' are the coordinate axes.

The given points are shown as follows on a graph paper:



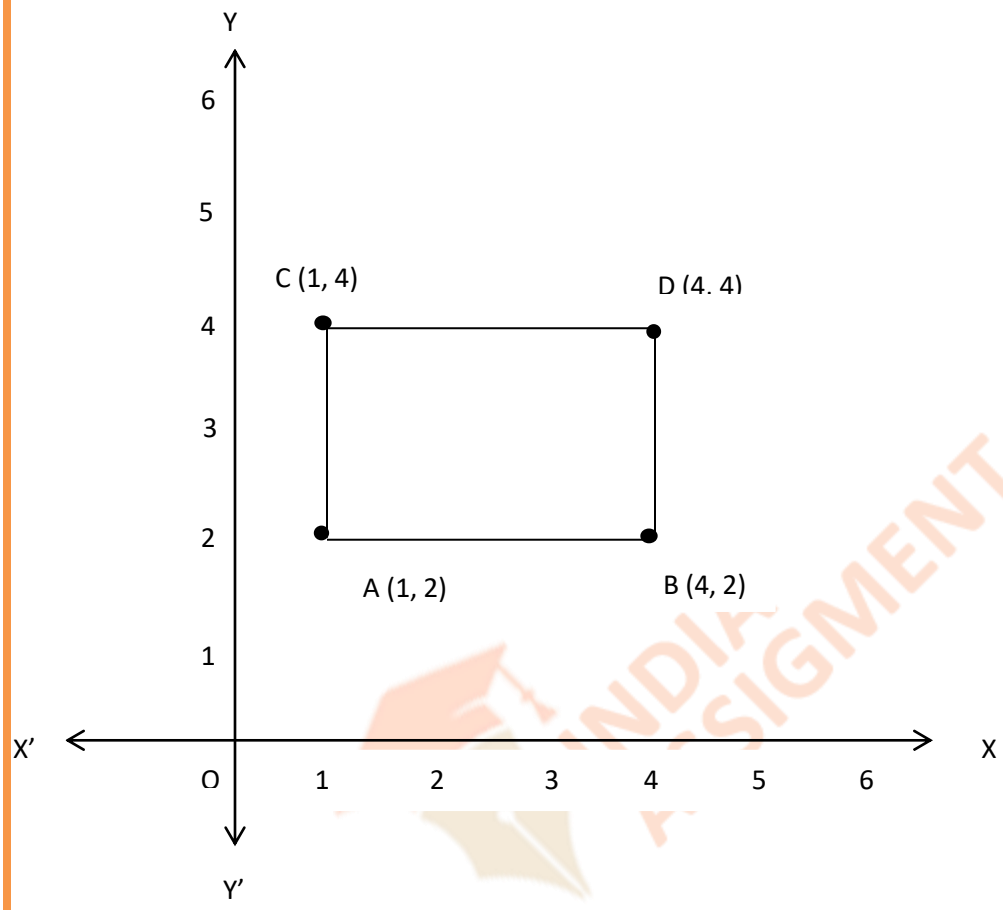
When we join all these points, we see that they do not lie on a same line.

The shape formed by joining all these point is parallelogram.

Question 6 – Locate the points A (1, 2), B (4, 2) and C (1, 4) on a graph sheet taking suitable axes. Write the coordinates of the fourth point D in order to complete the rectangle ABCD

Solution - Let XOX' and YOY' are the coordinate axes.

The given points are shown as follows on a graph paper:

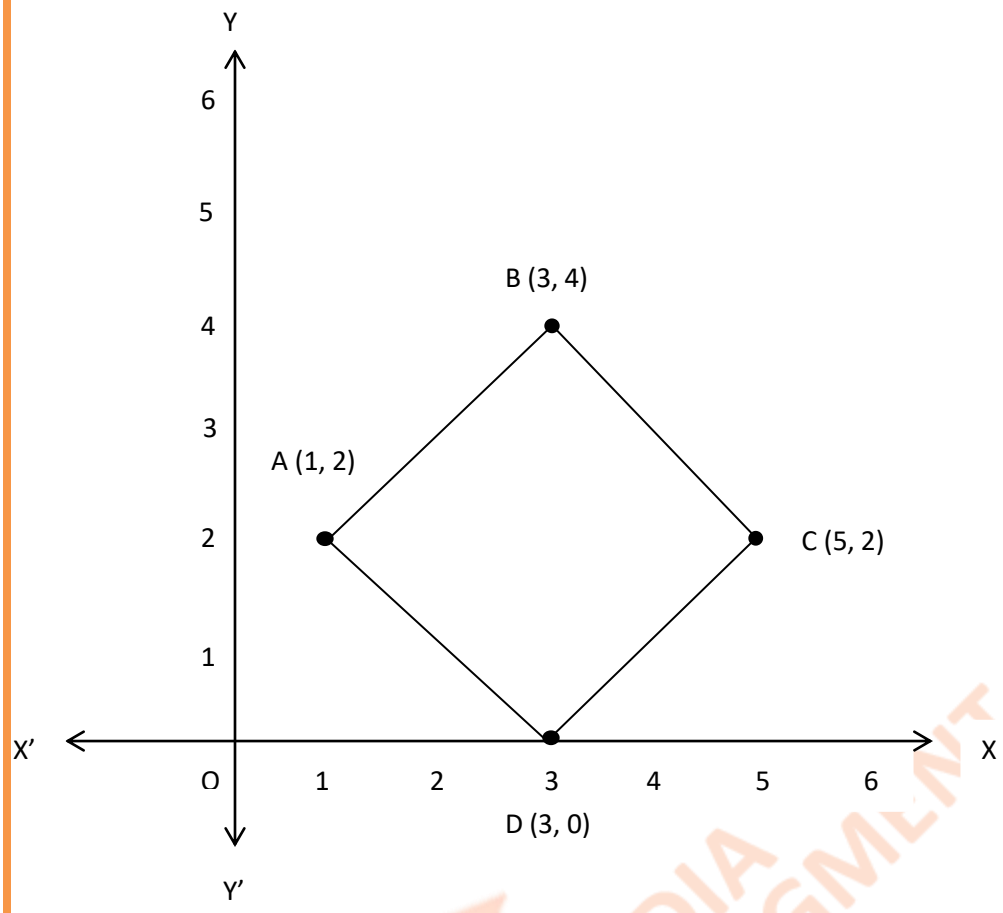


From the above graph, we see that in order to complete the rectangle ABCD, the coordinates of Fourth point D must be (4, 4)

Question 7 – Locate the points A (1, 2), B (3, 4) and C (5, 2) on a graph sheet taking suitable axes. Write the coordinates of the fourth point D in order to complete the rhombus ABCD. Measure the diagonals of this rhombus and check whether they are equal or not.

Solution - Let XOX' and YOY' are the coordinate axes.

The given points are shown as follows on a graph paper:



From the above graph, we see that in order to complete the rhombus ABCD, the coordinates of Fourth point D must be (3, 0).

There are two diagonals namely AC and BD

Length of diagonal AC = 4 units

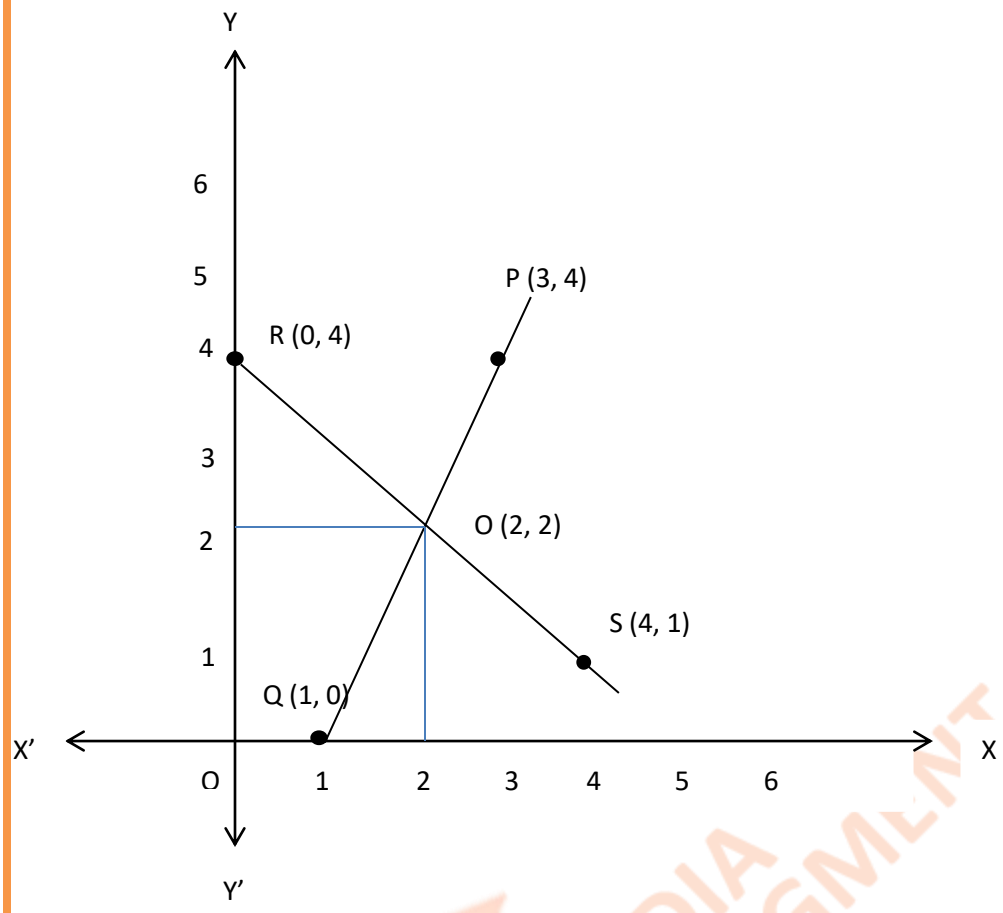
Length of diagonal BD = 4 units

Therefore, length of both diagonals is equal.

Question 8 – Locate the points P (3, 4), Q (1, 0), R (0, 4) and S (4, 1) on a graph sheet and write the coordinates of the point of intersection of line segments PQ and RS.

Solution - Let XOX' and YOY' are the coordinate axes.

The given points are shown as follows on a graph paper:

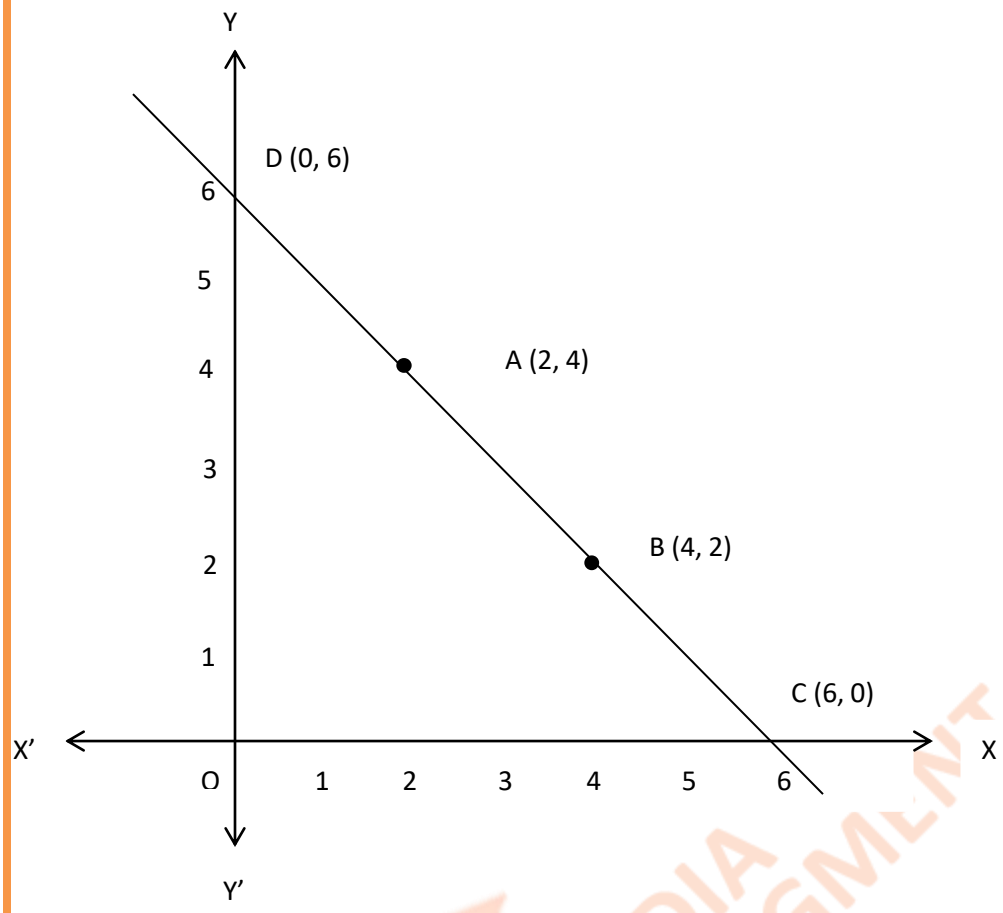


From the above graph, we see that the point of intersection of line segments PQ and RS is O and the coordinates of point O is (2, 2)

Question 9 – Plot the points A (2, 4) and B (4, 2) on a graph sheet and draw a line passing through these two points. Extend the line on both sides to meet the coordinate axes. What are the coordinates of the points where this line meets the x-axis and the y-axis?

Solution - Let XOX' and YOY' are the coordinate axes.

The given points are shown as follows on a graph paper:

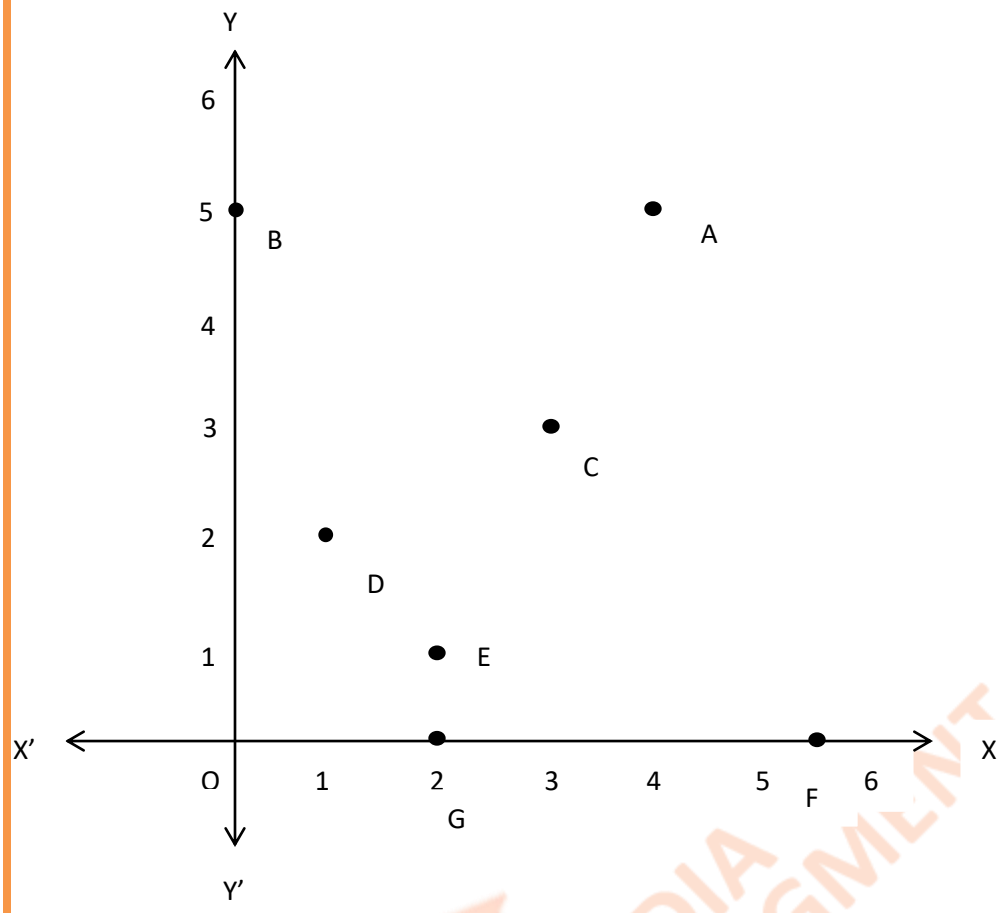


From the above graph, we see that when we extend the line segment joining A and B on both the sides, the coordinates of the point on x-axis is C (6, 0) and the coordinate of the point on y-axis is D (0, 6)

Question 10 – From the given figure, choose the letters that indicate the location of the following points:

(a) (2, 1)
(b) (0, 5)
(c) (2, 0)

Also, mention the coordinates of the points A and F.



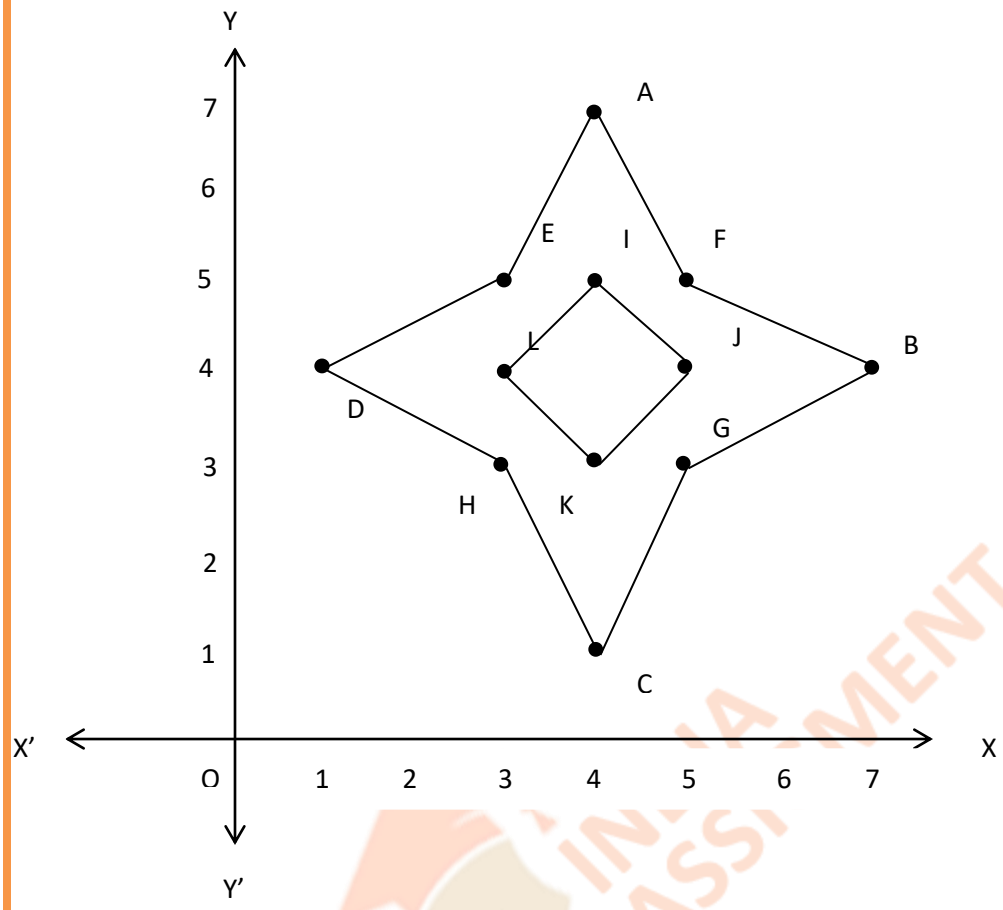
Solution - (a) (2, 1) is indicated by the point E

(b) (0, 5) is indicated by the point B

(c) (2, 0) is indicated by the point G

From the given graph, we can see that coordinates of the point A is (4, 5) and coordinates of the point F is (5.5, 0)

Q11 Write the coordinates of all the points in the graph given below:



Solution – Coordinates of all the points are as follows:

Coordinates of A is (4, 7)

Coordinates of B is (7, 4)

Coordinates of C is (4, 1)

Coordinates of D is (1, 4)

Coordinates of E is (3, 5)

Coordinates of F is (5, 5)

Coordinates of G is (5, 3)

Coordinates of H is (3, 3)

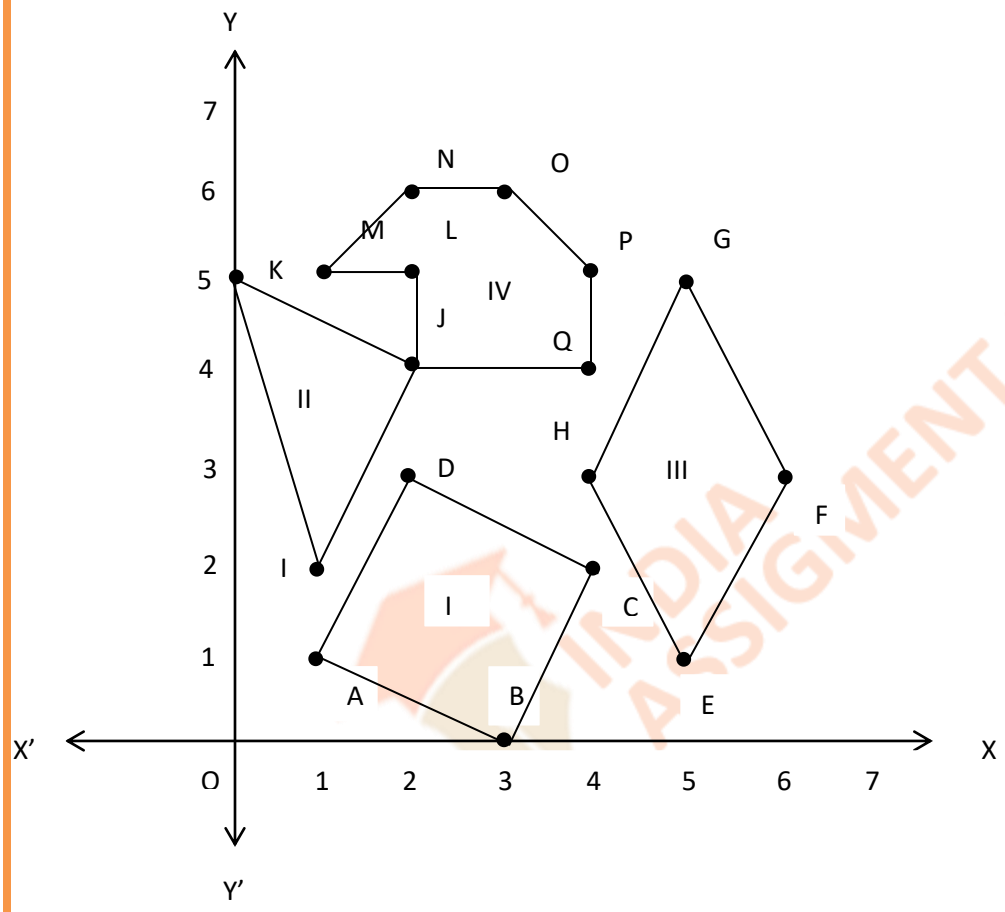
Coordinates of I is (4, 5)

Coordinates of J is (5, 4)

Coordinates of K is (4, 3)

Coordinates of L is (3, 4)

Question 12 Write the coordinates of the vertices of each of the figures given below:



Solution – From the graph, we can find out all the coordinates of vertices of each figure:

In figure I, coordinates of A is (1, 1)

Coordinates of B is (3, 0)

Coordinates of C is (4, 2)

Coordinates of D is (2, 3)

In figure II, coordinates of I is (1, 2)

Coordinates of J is (2, 4)

Coordinates of K is (0, 5)

In figure III, coordinates of E is (5, 1)

Coordinates of F is (6, 3)

Coordinates of G is (5, 5)

Coordinates of H is (4, 3)

In figure IV, coordinates of L is (2, 5)

Coordinates of M is (1, 5)

Coordinates of N is (2, 6)

Coordinates of O is (3, 6)

Coordinates of P is (4, 5)

Coordinates of Q is (4, 4)

Coordinates of J is (2, 4)

Question 13 – Fill in the blanks to make the given statements true.

(a) A point in which the x-coordinate is 0 and y-coordinate is 5 will lie on ……

Ans. Y-axis

(b) All points with y-coordinate as 0 lie on …..

Ans. X-axis

(c) The x-coordinate of any point lying on the y-axis is always ….

Ans. 0

(d) The point where the two axes intersect is called the …..

Ans. Origin

(e) For the point (5, 2), the distance from the x-axis is ….units

Ans. 2 units

(f) The distance of any point from the y-axis is the ….coordinate.

Ans. X-coordinate

(g) The coordinates of the origin are …

Ans. (0, 0)

Exercise 22B

Question 1 – In which of the following quadrants does the point P (3, 6) lie?

Solution – Since the point P (3, 6) is of the form (+, +), thus it will lie in the first quadrant.

Question 2 – In which of the following quadrants does the point (-7, -1) lie?

Solution – Since the point (-7, -1) is of the form (-, -), thus it will lie in the third quadrant.

Question 3 – In which of the following quadrants does the point A (2, -3) lie?

Solution - Since the point A (2, -3) is of the form (+, -), thus it will lie in the fourth quadrant.

Question 4 – In which of the following quadrants does the point Q (-4, 1) lie?

Solution - Since the point Q (-4, 1) is of the form (-, +), thus it will lie in the second quadrant.

Question 5 – The abscissa of a point is its distance from the …..

Solution – y-axis

Question 6 – The graph of y = a is …

Solution – a line parallel to x-axis

Question 7 – The equation representing the y-axis is ….

Solution – x = 0