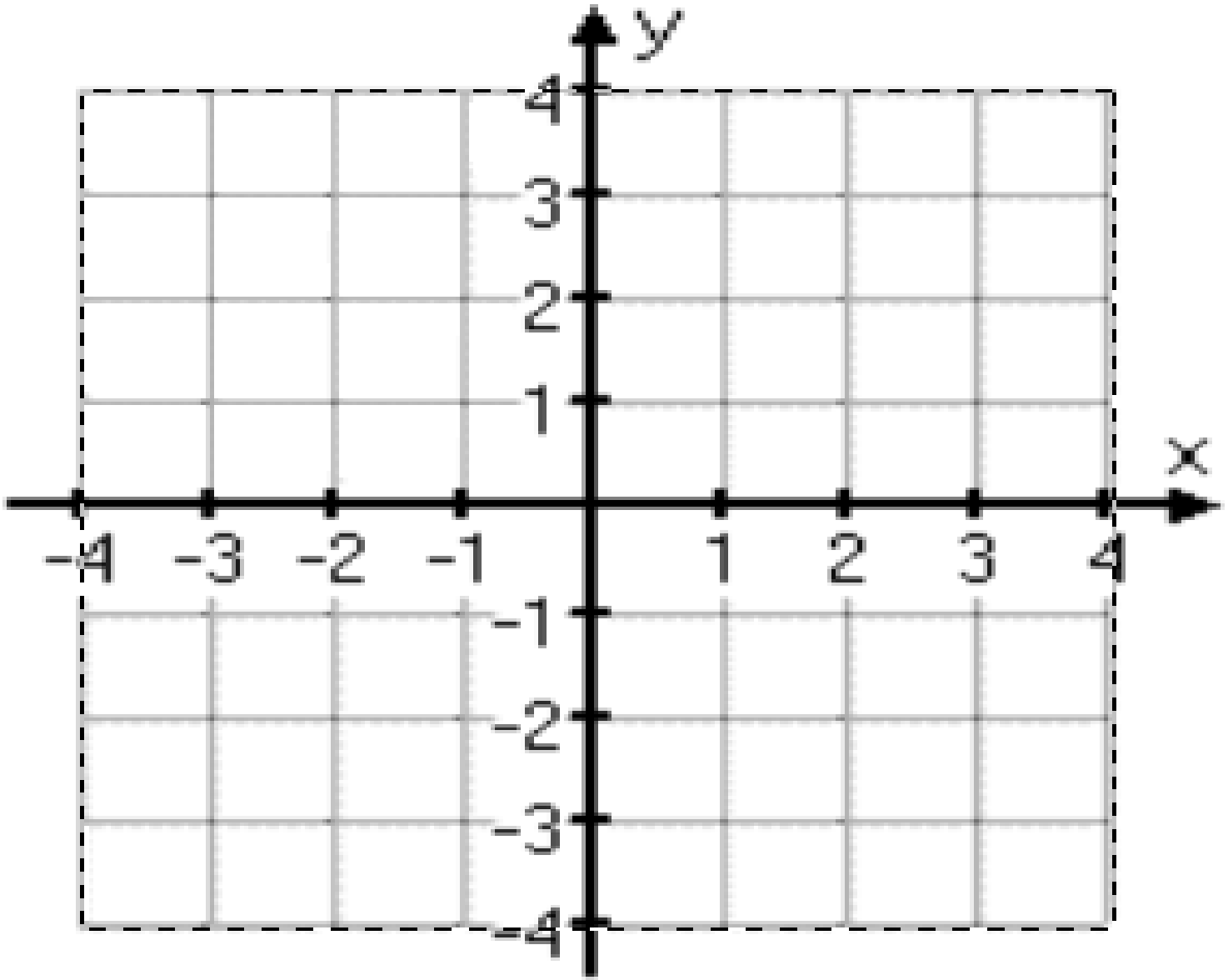
Coordinate Geometry



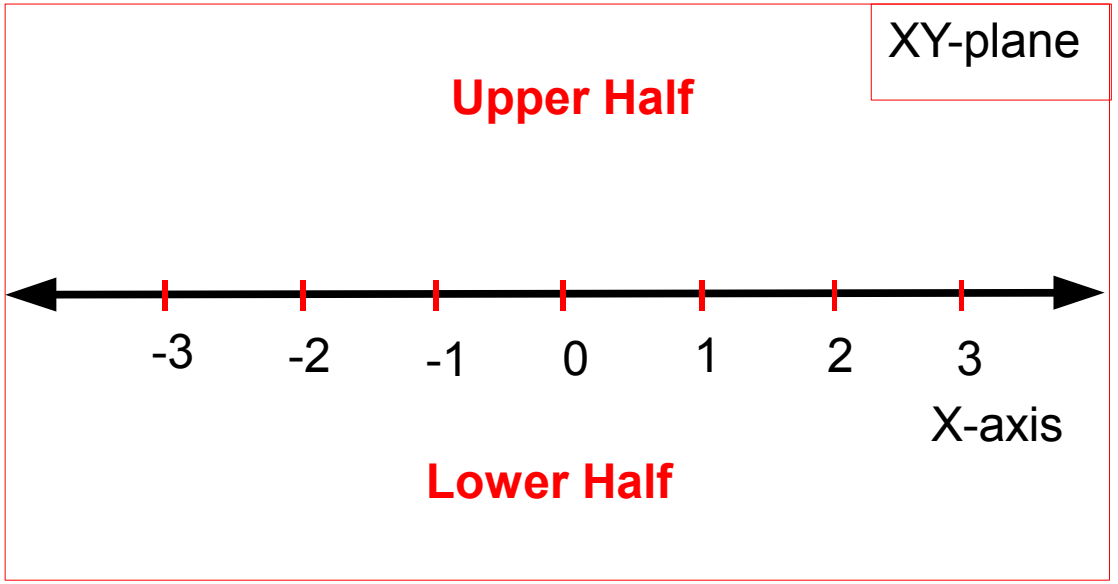
X-Y Plane

A Cartesian coordinate system in two dimensions is defined by two axes, X axis and a Y axis, where

- The horizontal axis is normally labeled X
- The vertical axis is normally labeled Y.

The two axis meet each other at right angles
They form a plane referred to as the XY-plane.

X-Axis



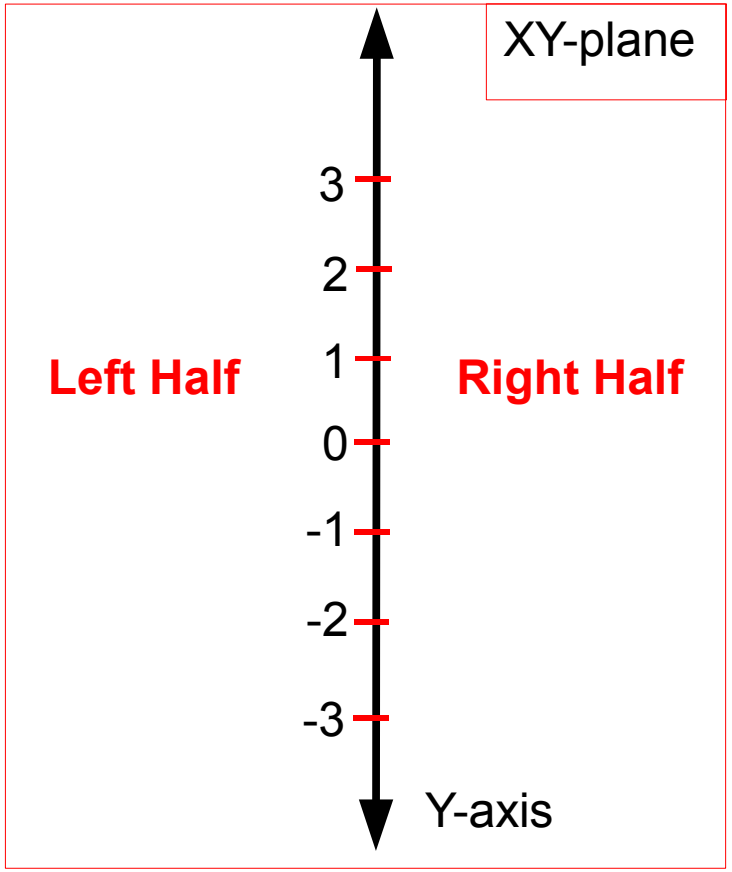
X axis is a horizontal number line.
0 is at the center of the X axis.
The left side of 0 contains negative numbers.
Whereas right side of 0 is occupied by positive numbers.

Note : X axis divides the XY-plane into upper half and lower half.

Y-Axis

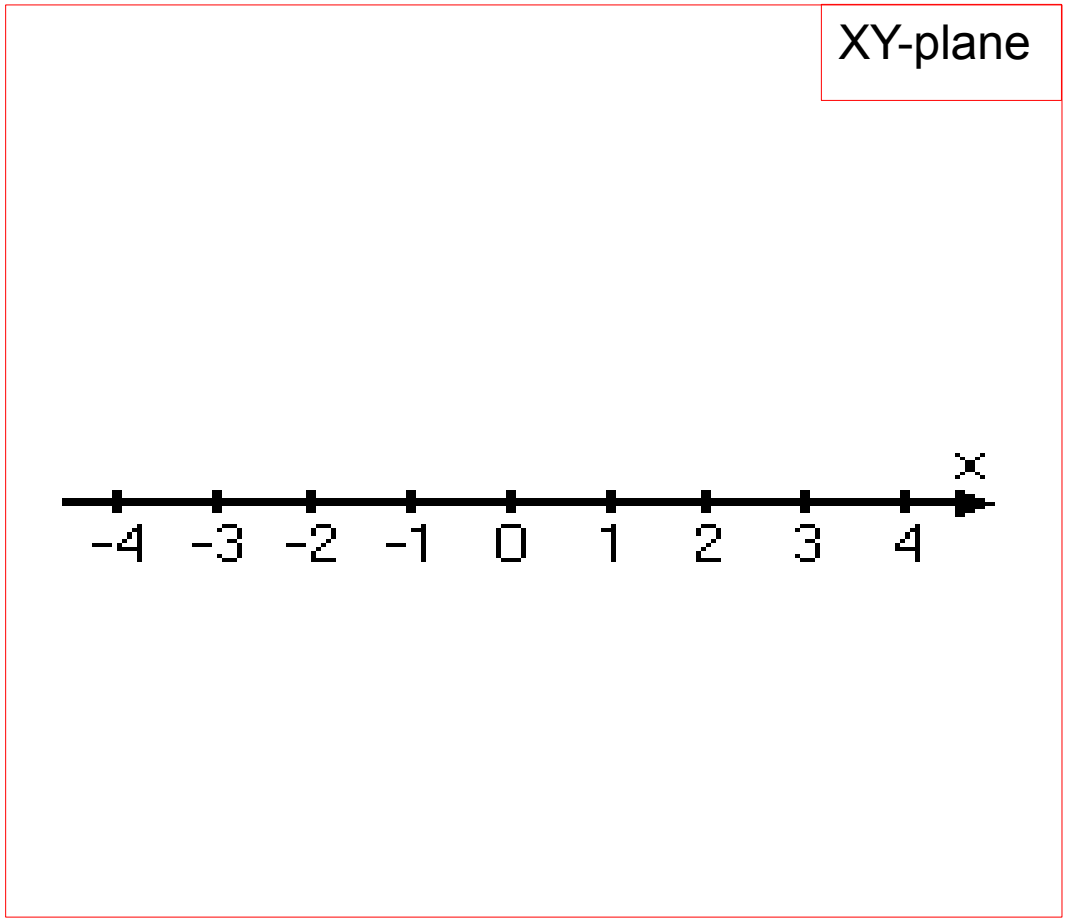
Y axis is a vertical number line.
0 is at the center of the Y axis.
Positive numbers are placed above 0 whereas negative number are placed below 0.

Note: Y axis divides the XY-plane in to left half and right half.



XY-Plane

When X axis and Y axis intersect each other at their centers at right angle, we get the XY- plane.
The point of intersection is a known as origin.
The co-ordinate of this point are (0,0)

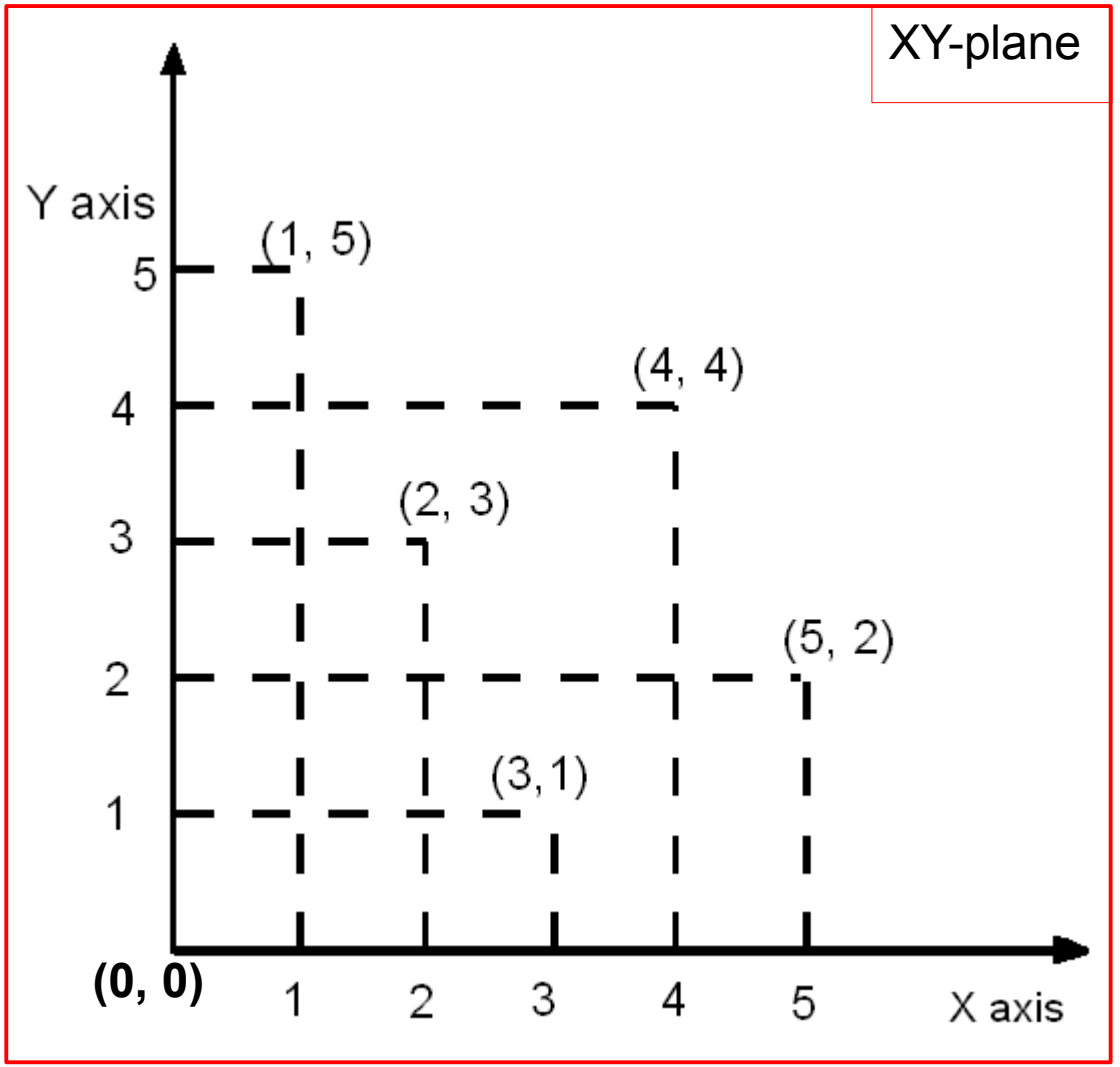


XY-Plane

Any point in the XY-plane is denoted as ordered pair (x,y) where (x, y) is reached by moving x units along the x-axis from the origin and then moving y units vertically

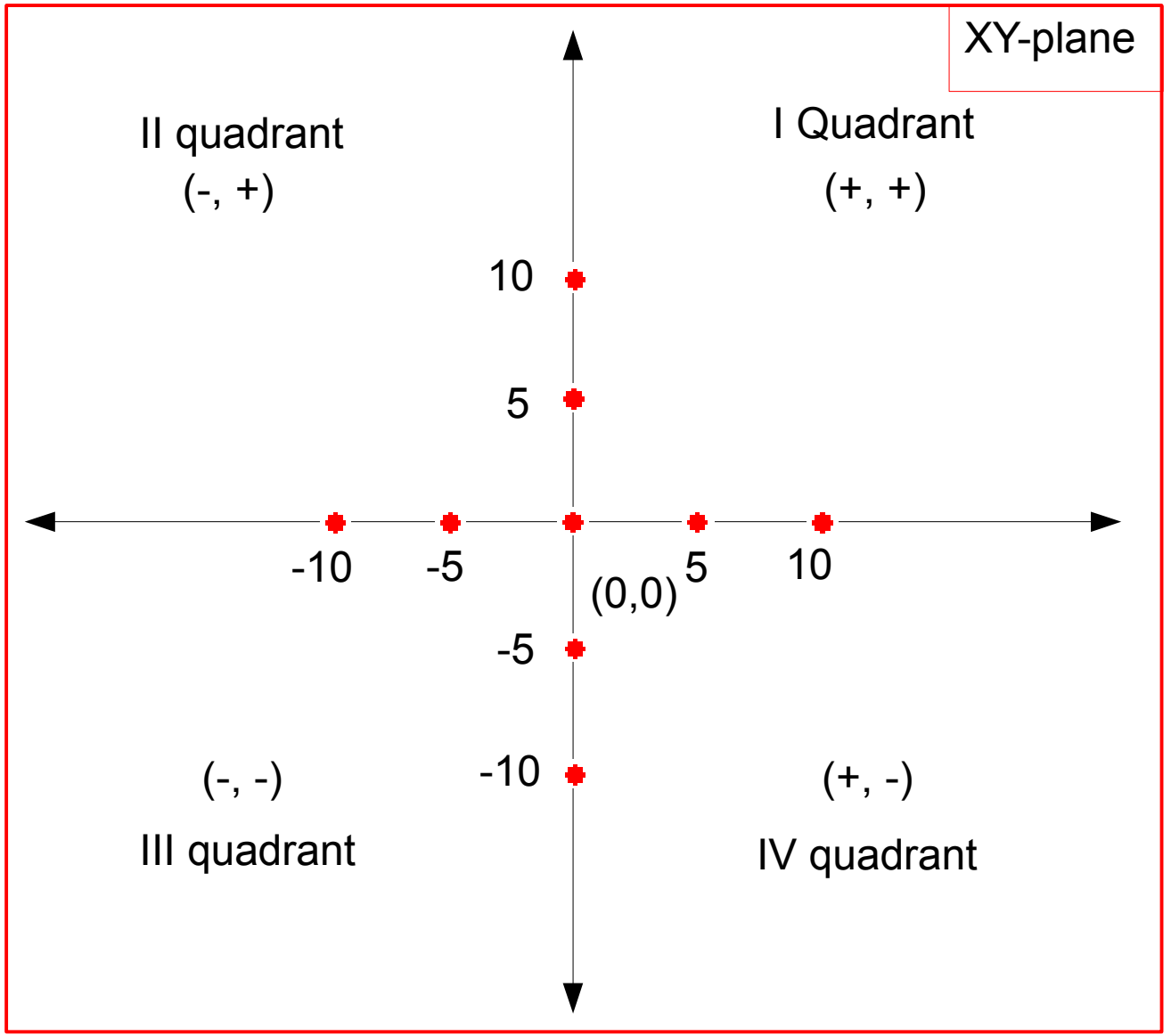
In the figure, observe the points (1, 5), (2, 3), (3, 1), (4, 4), (5, 2) plotted in the XY plane.

Note: (x,y) ≠ (y,x), if x ≠ y.



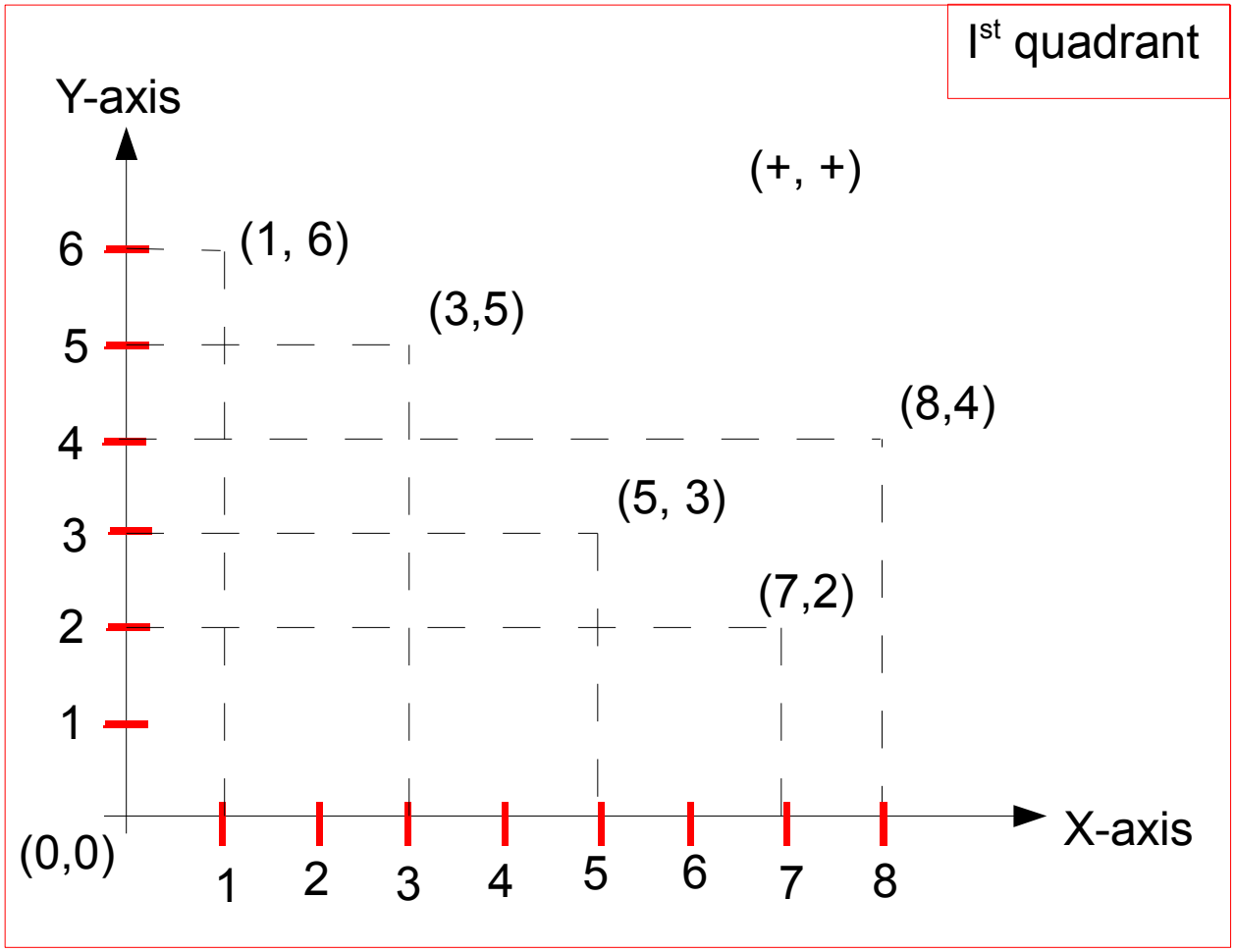
Quadrants

XY-plane is divided into four quadrants.



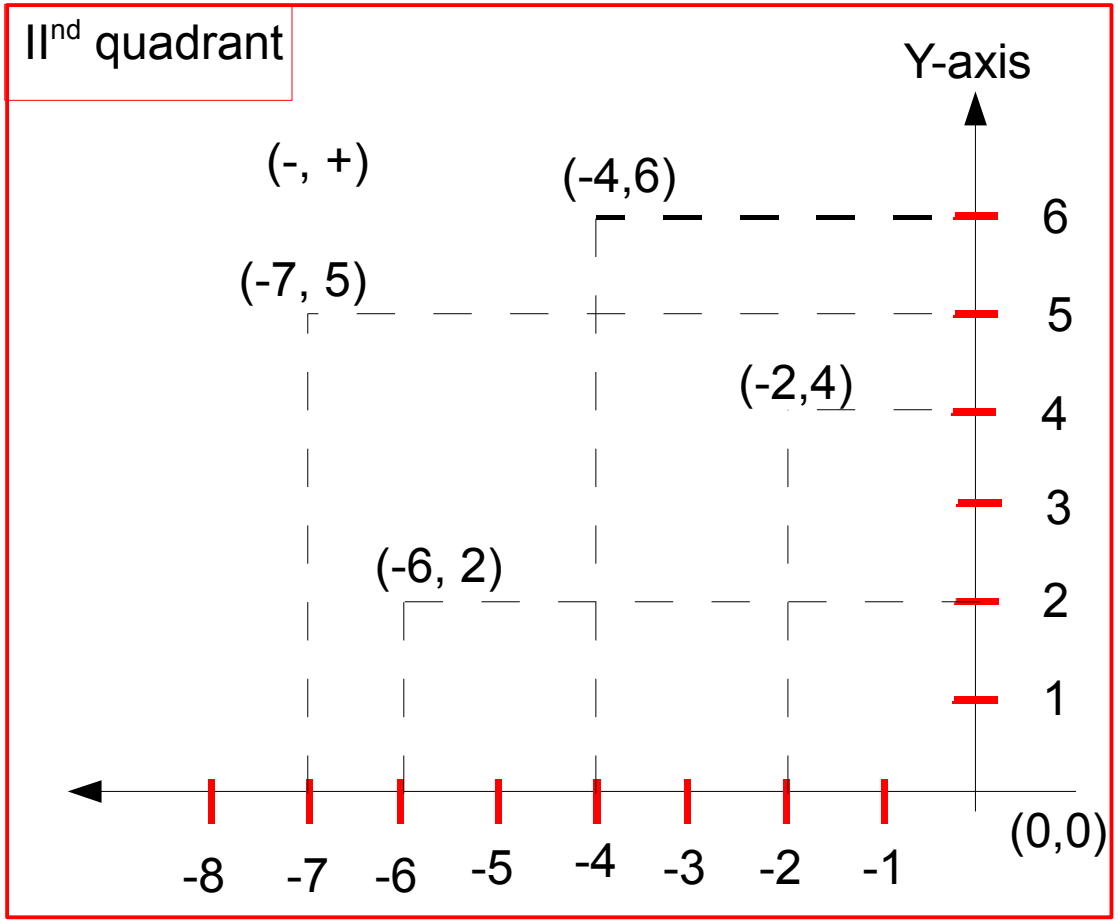
Quadrants

Ist quadrant : Any point in Ist quadrant will be of the form (x, y), where x denotes the x-coordinate and y denote the y-coordinate. Here both x-coordinate and y-coordinate are positive.



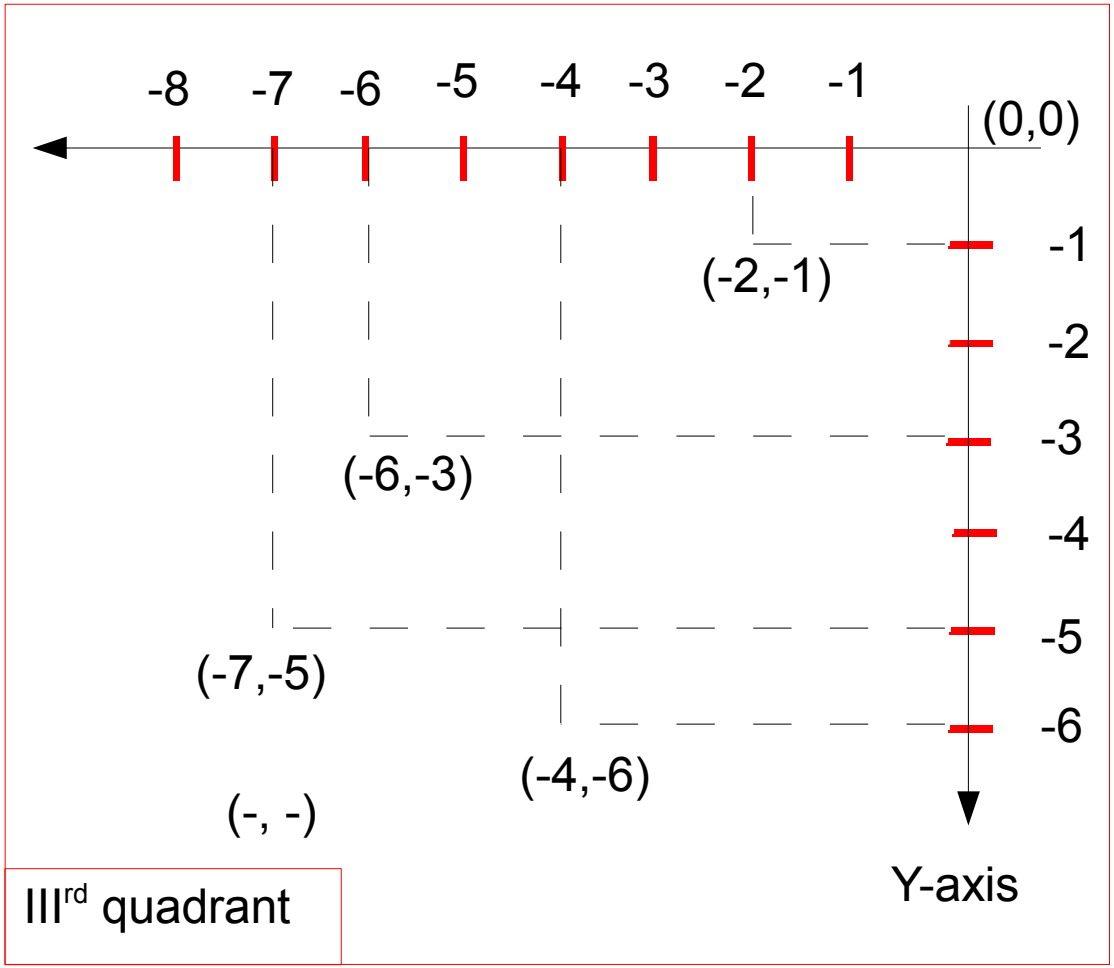
Quadrants

IInd quadrant : Any point in IInd quadrant will be of the form (-x, y), where x denotes the x-coordinate and y denote the y-coordinate. Here x-coordinate is negative but y-coordinate is positive.



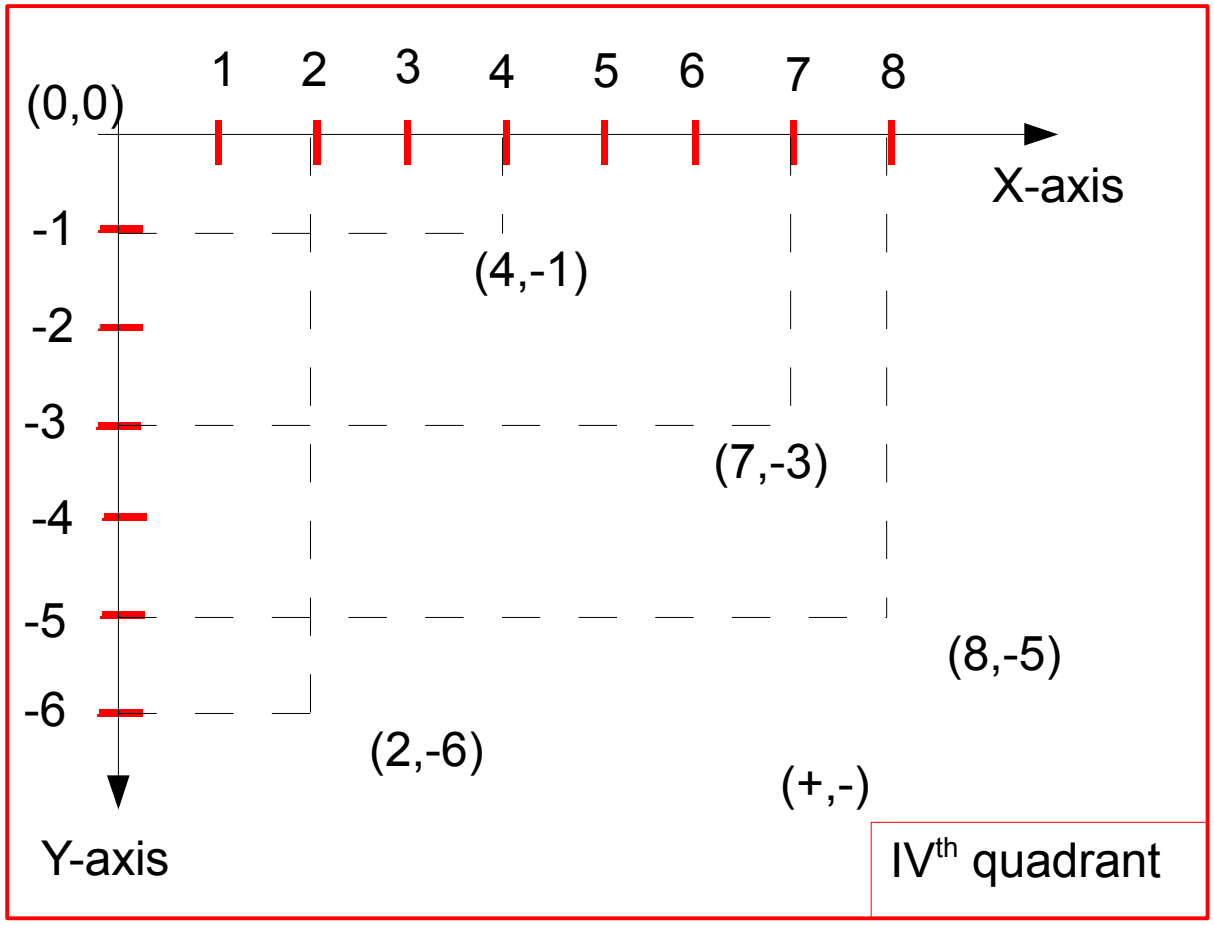
Quadrants

IIIrd quadrant : Any point in IIIrd quadrant will be of the form (-x,-y), where x denotes the x-coordinate and y denote the y-coordinate. Here both x-coordinate and y-coordinate are negative.

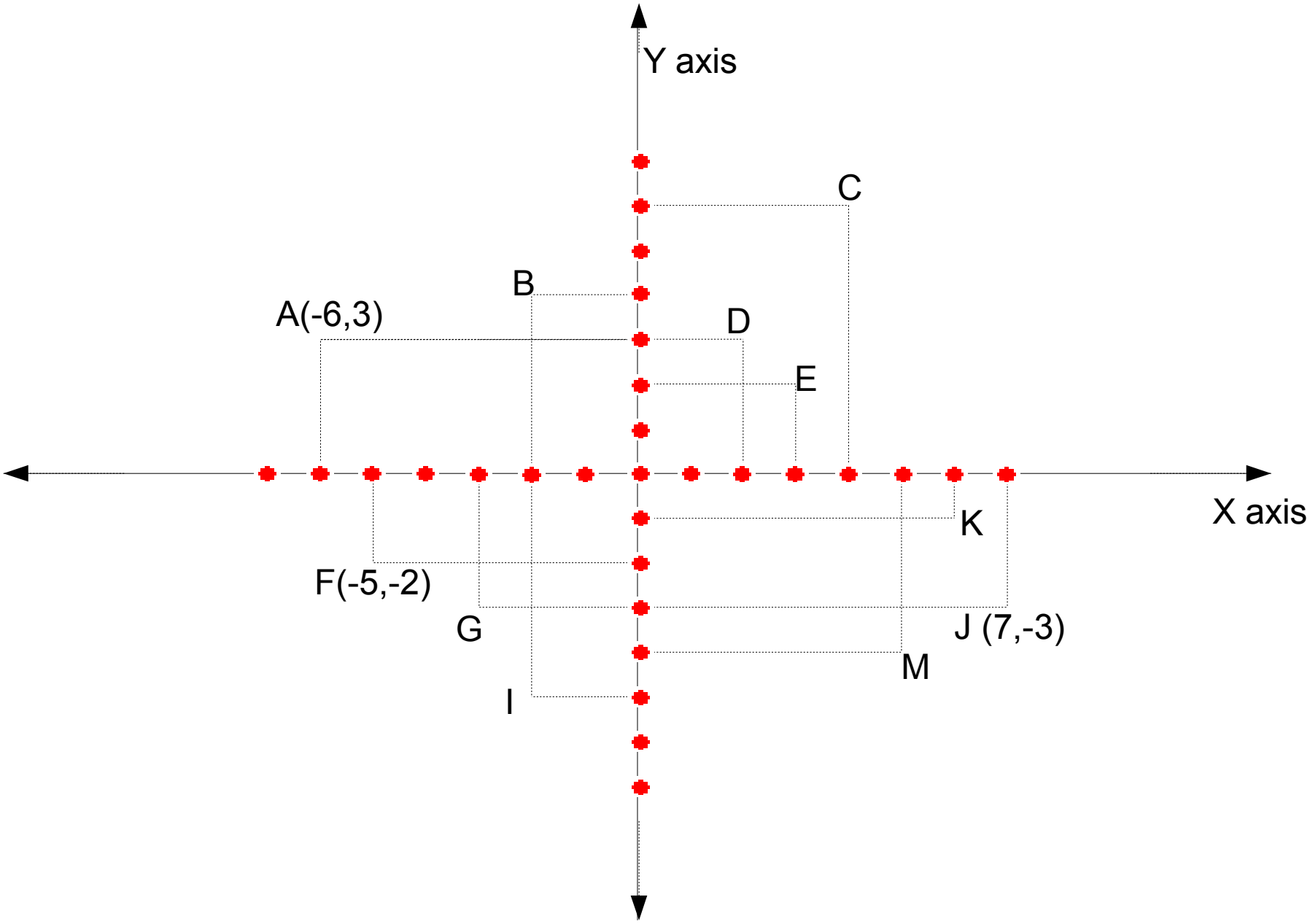


Quadrants

IVth quadrant : Any point in IVth quadrant will be of the form (x,-y), where x denotes the x-coordinate and y denote the y-coordinate. Here x-coordinate is positive but y-coordinate is negative.



Quiz:



Quiz:

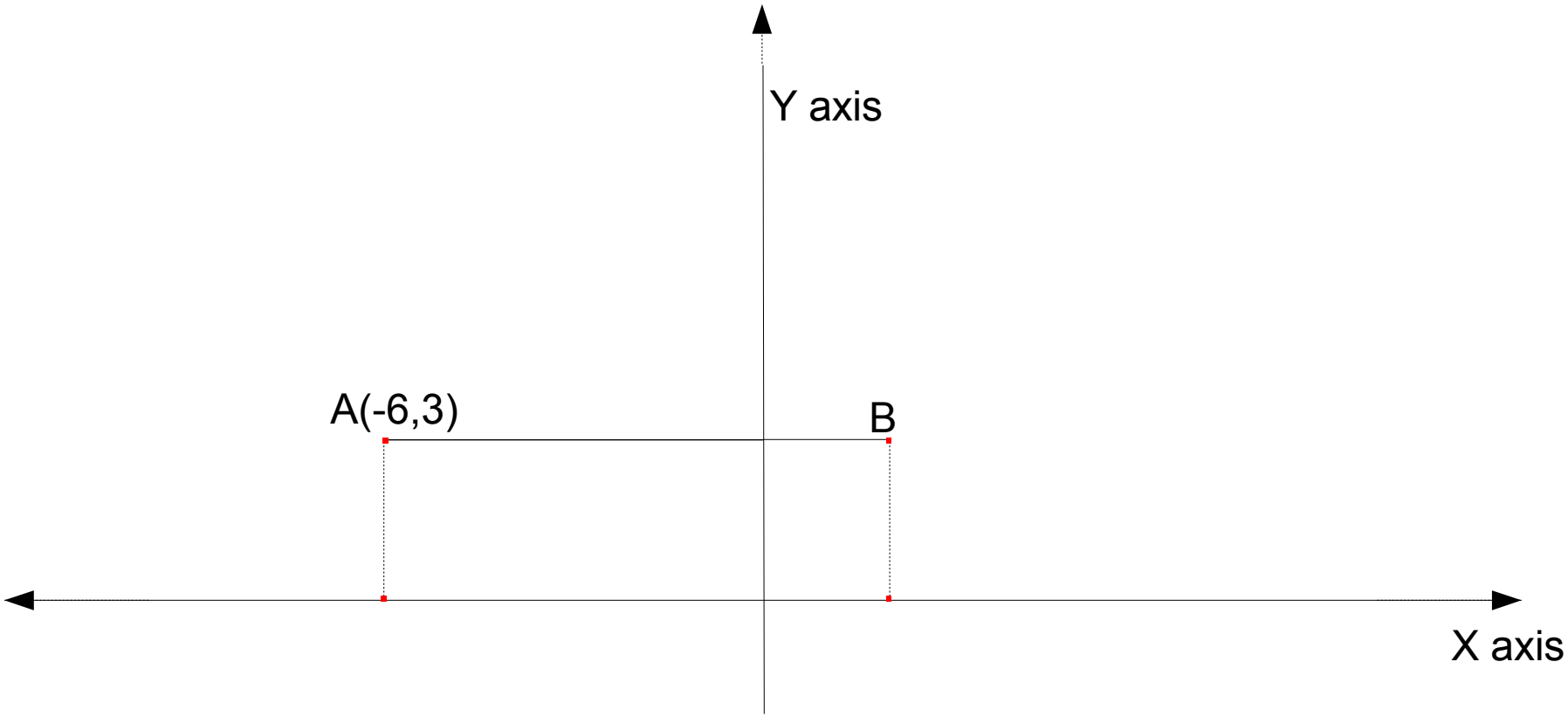
(Send your solutions to support@greedge.com)

1. In the figure on the previous page, identify the co-ordinates of the following points:

- B
- C
- D
- E
- G
- I
- K
- M

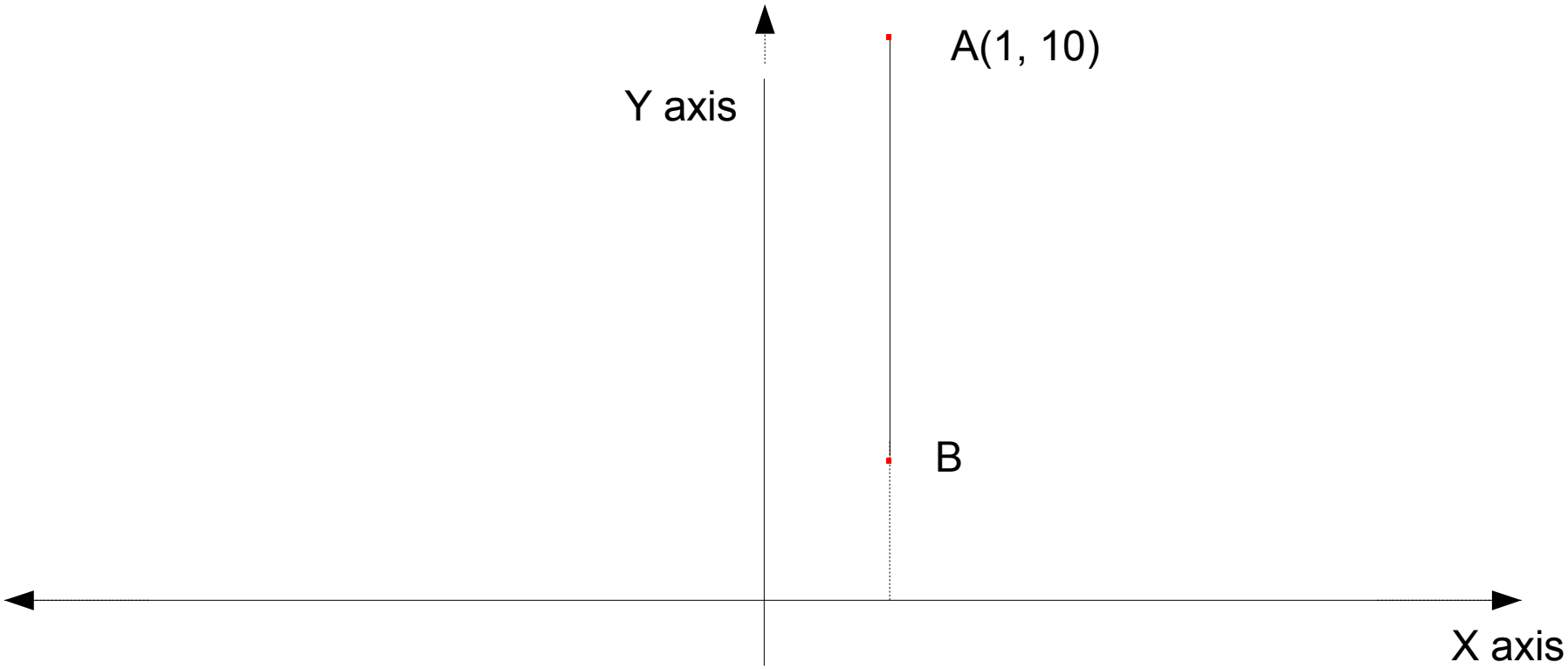
Quiz:

2. In the figure below, length of AB = 8. AB is parallel to X axis. Identify the co-ordinates of point B.



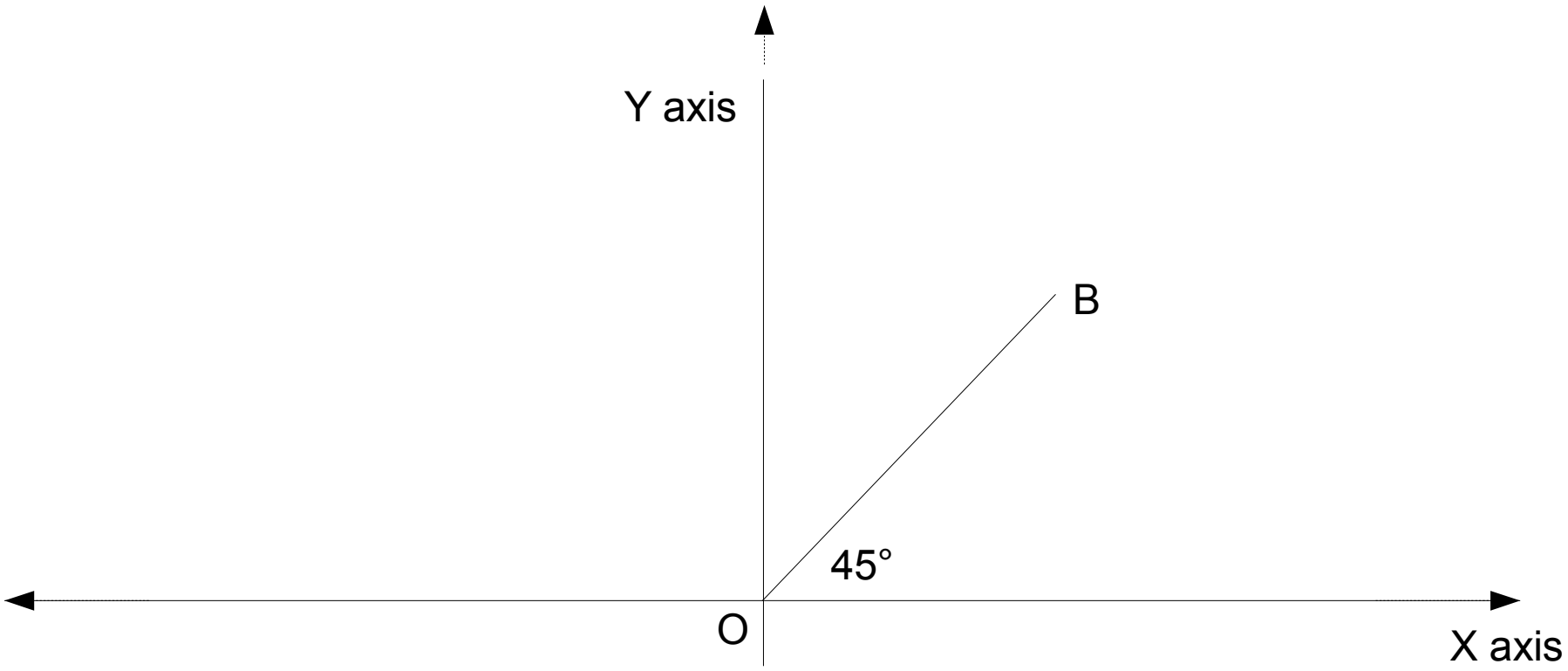
Quiz:

3. In the figure below, length of AB = 8. AB is parallel to Y axis. Identify the co-ordinates of point B.



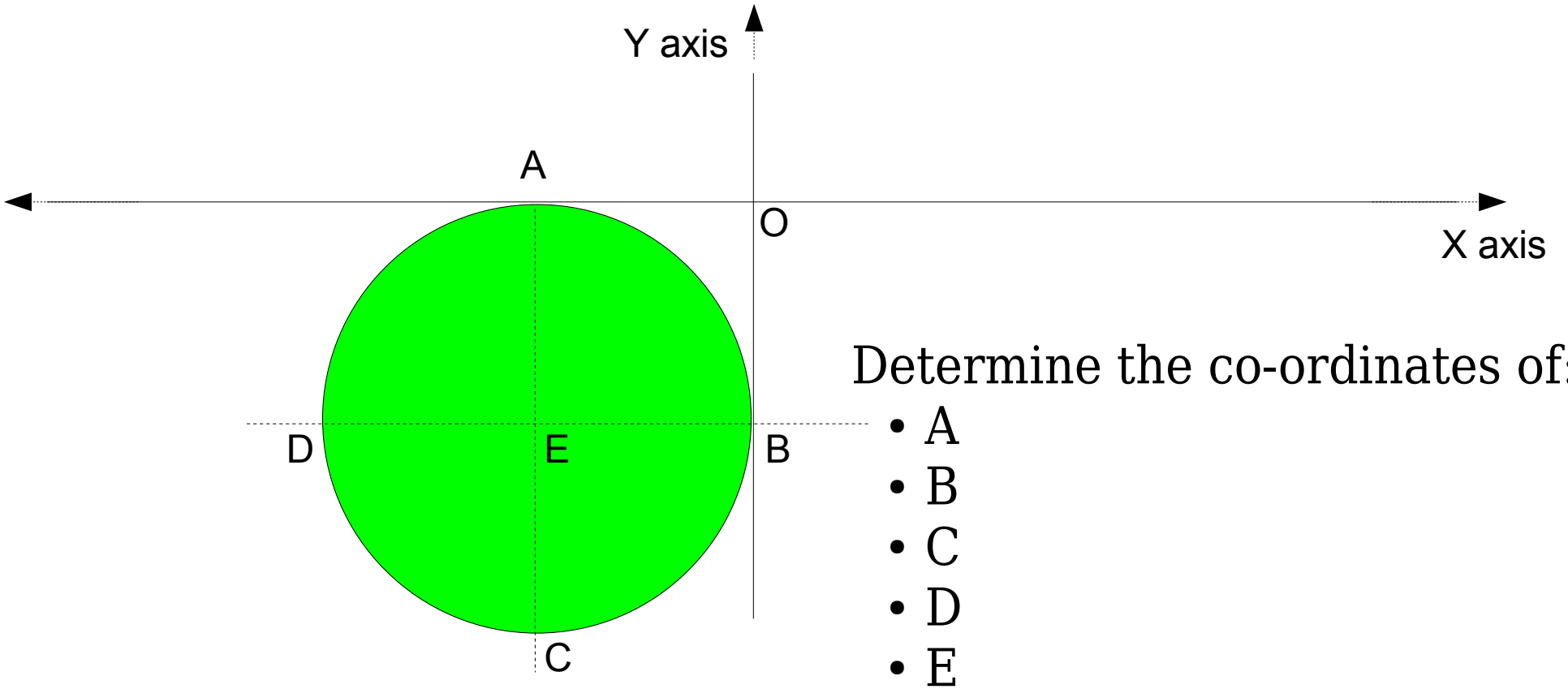
Quiz:

4. In the figure below, length of OB = 8. OB makes an angle of 45° with the X axis. Identify the co-ordinates of point B.



Quiz:

5. In the figure below, radius of the circle is 8. E is the center and AC and BD are diameters



Determine the co-ordinates of:

- A
- B
- C
- D
- E

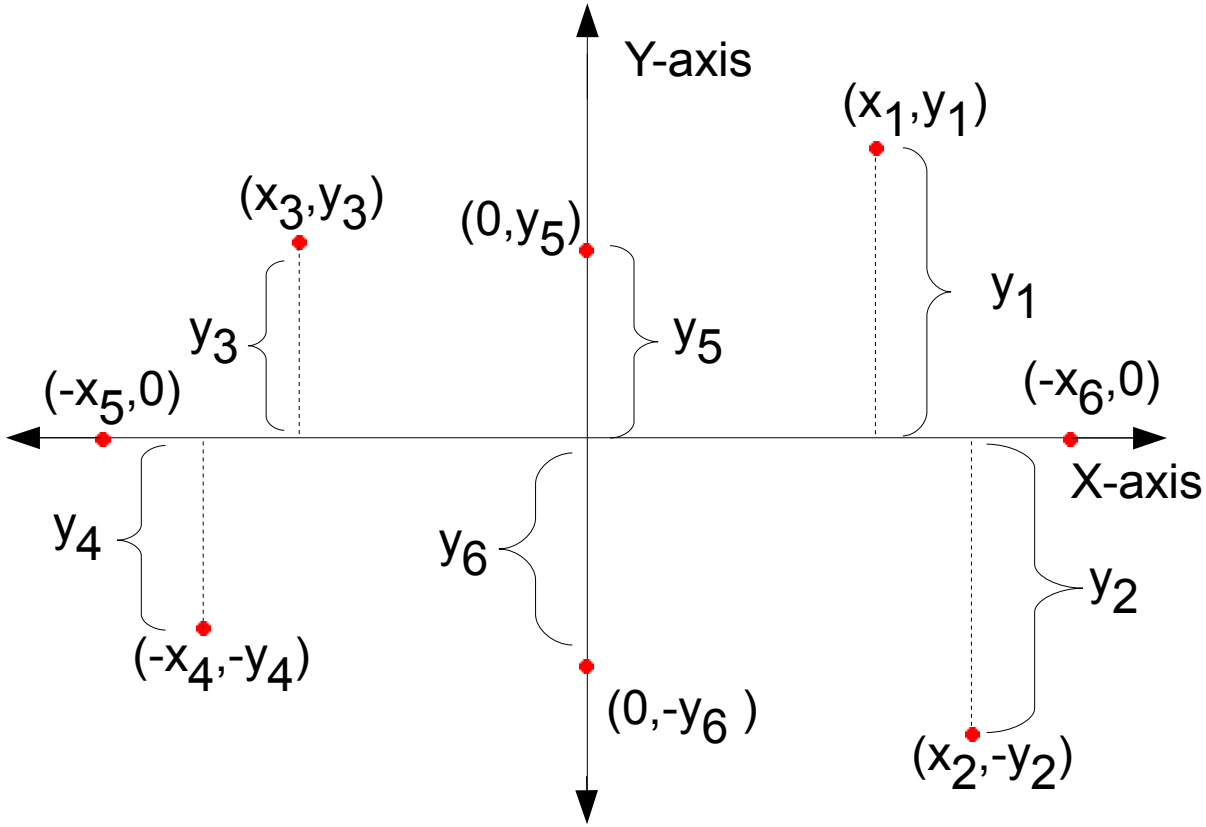
Part II: Distance between points

Distance from X-Axis

How to find the distance of a point from the X-axis?

Let (x, y) be any point in the plane. The distance between the point (x,y) and X-axis = |y| units

Note that: Distance is always positive .



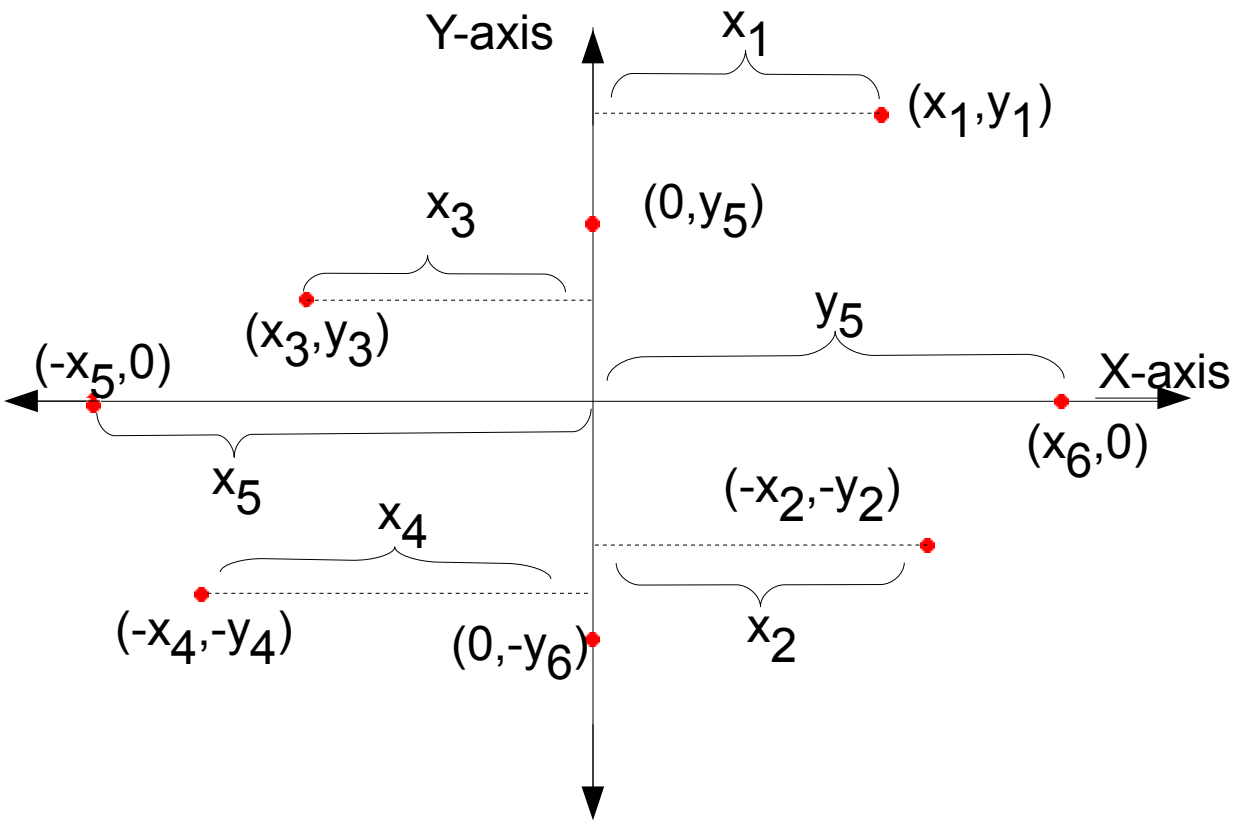
Guess : 1) What is the distance of a point that lies on the X-axis from the X-axis itself ?

2) What is the distance between a point (x,y) and Y-axis?

Distance from Y-axis

How to find distance from a point to Y-axis?

Let (x, y) be any point in the plane. The distance between the point (x,y) and Y-axis will be |x| units along the X-axis.



Distance between two points

Distance between two points. Given the points (x, y) and (x', y') then distance between these two points is given by

$\sqrt{\{(x - x')^2 + (y - y')^2\}}$

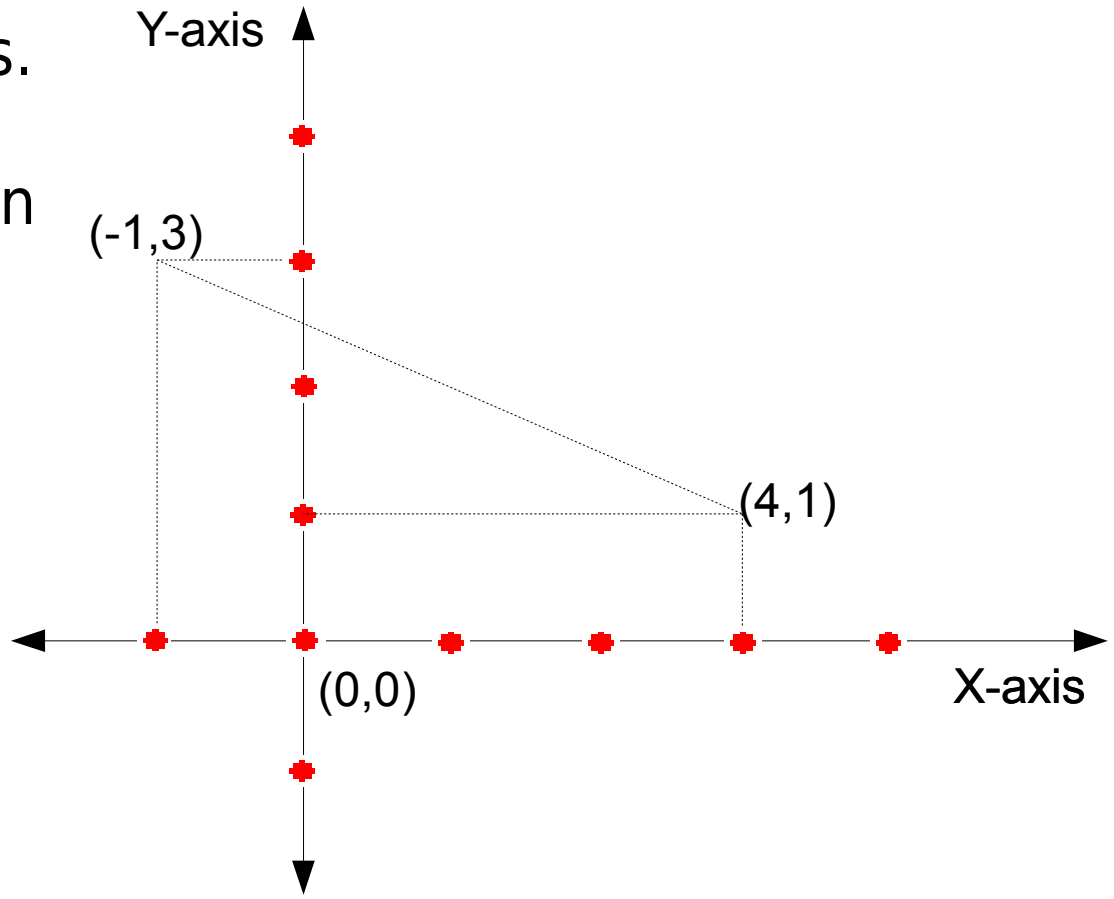
For eg: Let us find distance between (-1, 3) and (4, 1) is

$= \sqrt{[(-1 - 4)^2 + (3 - 1)^2]}$

$= \sqrt{[(-5)^2 + (2)^2]}$

$= \sqrt{[25 + 4]}$

$= \sqrt{29}$



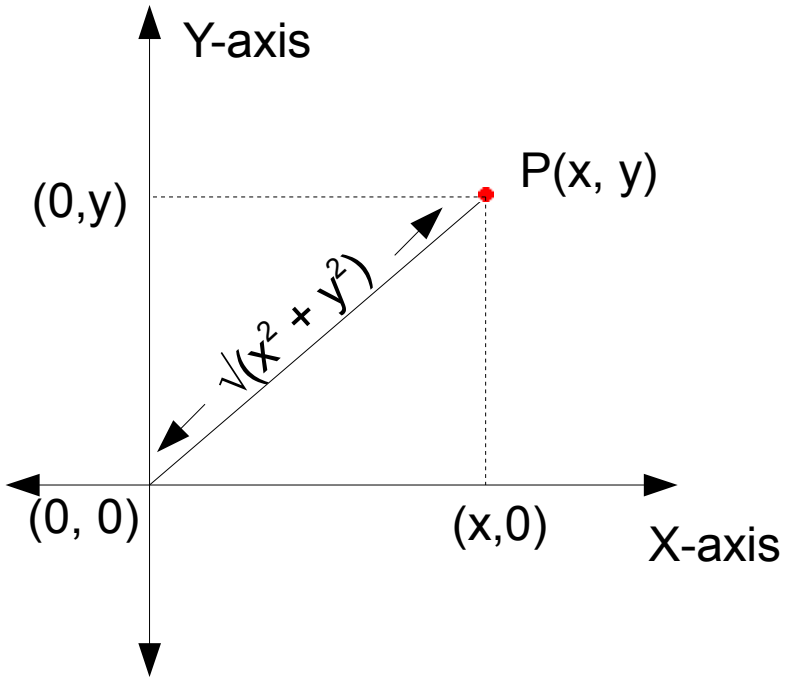
Guess: What is the distance between the point (x,0) and the point (0,y)?

Distance from Origin(O,O)

Let us find the distance from the point to the origin. Let P=(x,y) be any point in the plane, then the distance between the point P and the origin is given by $\sqrt{(x^2 + y^2)}$

Let us find the distance between the point (-4, -5) and the origin.
(By applying distance formula)

$= \sqrt{\{(-4 + 0)^2 + (-5 + 0)^2\}}$
$= \sqrt{\{(-4)^2 + (-5)^2\}}$
$= \sqrt{\{(-4)^2 + (-5)^2\}}$
$= \sqrt{(16+25)}$
$= \sqrt{41}$



Guess: Let P be any point in the plane. If you join all the points which are at equal distance say 'd' from the point P, then which shape will you obtain?

Midpoint Formula

Let P = (x, y) and Q = (x', y') be any points in the XY-plane.
Then the midpoint M between the points P and Q is given by

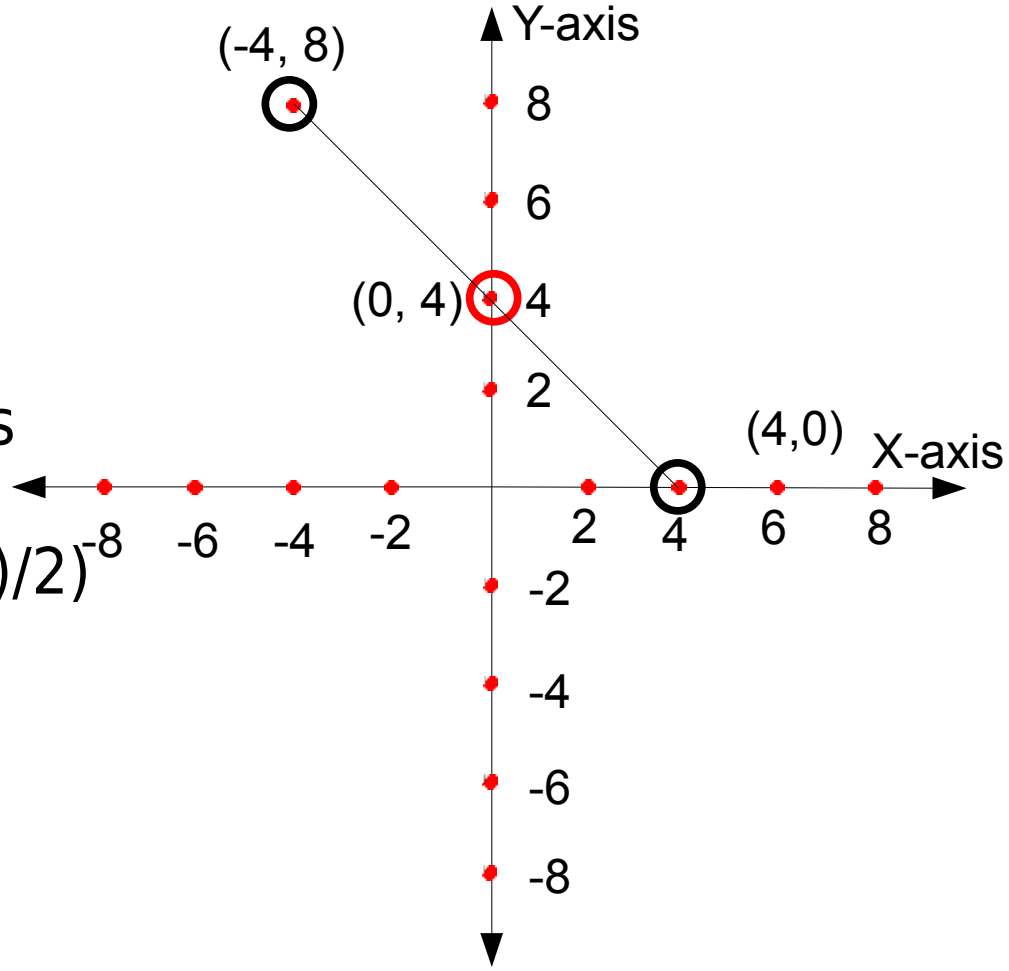
$$M = \left(\frac{x + x'}{2}, \frac{y + y'}{2} \right)$$

Find the midpoint of the points (4,0) and (-4,8).

Let M be midpoint of the points (4,0) and (-4,8)

M = ((4 + (- 4))/2 , (0 + 8)/2)

= (0, 4)



Quiz

(Send your solutions to support@greedge.com)

1)Find the distance of each of the following points from the X-axis

a) (1,2)
b) (3,-10)
c)(-11,0)
d)(-8,-5)
e)(0,8)

2) Find the distance of each of the following points from the Y-axis.

a) (3,9)
b)(-8,2)
c)(7,0)
d)(0,0)
e) (0,-12)

Quiz

3)Compare the following :

Col A = Distance of a point on the X-axis from the X-axis.

Col B = Distance of a point on the Y-axis from the X-axis.

4) Find the distance between the following points

a) (5,1) and (5,-8)

b) (6,7) and origin

c) (7,4) and (-4,2)

d) origin and (-5 ,5)

5) Let P(x, y) and Q(y, x) be two points in the XY plane.

Col A: Distance between the point P and origin.

Col B: Distance between the point Q and origin.

Compare Col A and Col B

Quiz

6) If P=(2,6) and Q = (-3,4) and let M be the midpoint of the segment PQ , then find the following
   a) Distance between the points P and Q.
   b) Distance of point M from the X -axis
   c) Distance of point M from the Y-axis
   d) Distance between the point M and origin.

7) Find the perimeter of the triangle formed by the points (1,3), (2,6) and (-1,-1) .

8) The two vertices of a right angle triangle are (1, 1) and (4,1) and the length of the hypotenuse is 5. The 3rd vertex of the triangle lies in the 1st Quadrant. What are the possible coordinates of this point ?

Quiz

9) If (1,1) , (4, 1) and (1,-1) are the vertices of the rectangle then find the following:

a)fourth vertex of the rectangle

b) perimeter of the rectangle

c)the diagonal of the rectangle.

10)Find the area of the triangle formed by the three points A(-1,-1), B(-1,5) and C(7,-1).