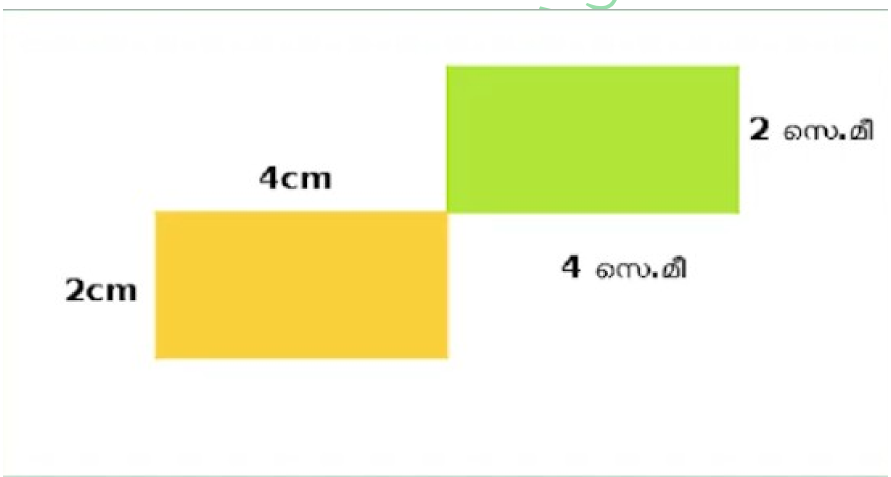
Assignment on 26-11-2020

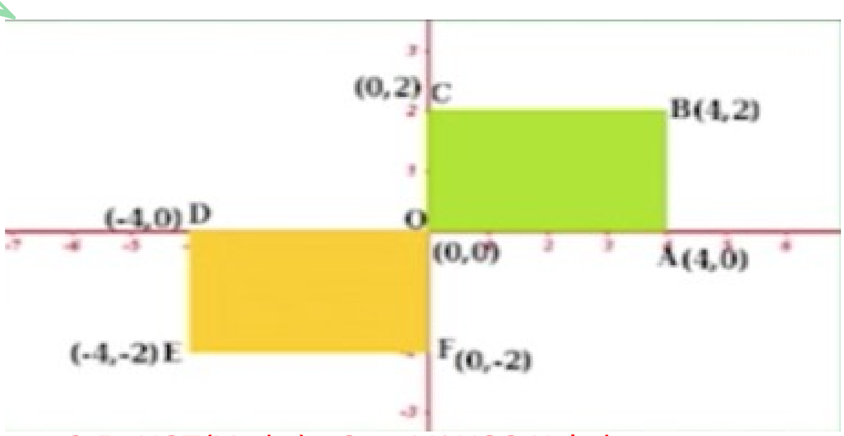
Draw the coordinate axes and find the coordinates of the corners of the two rectangles.



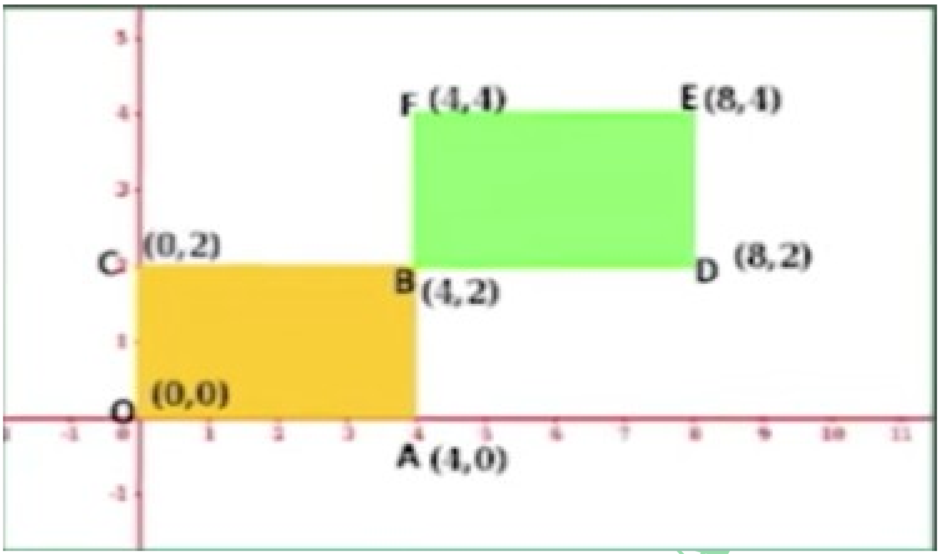
Answer

We can draw axes anywhere on a plane to find the coordinates of a point. As the position of axes changes, the coordinates of the point also changes. But the shape of the picture does not change.

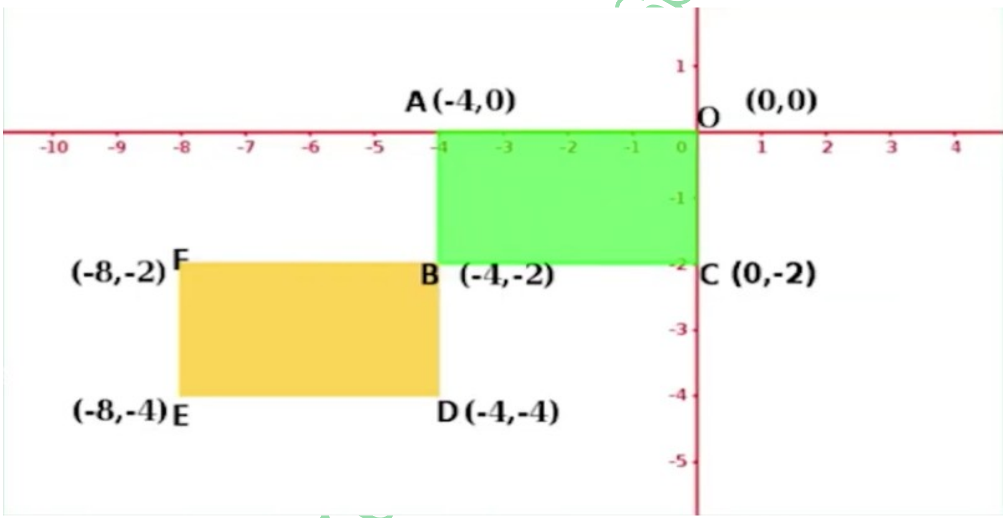
Method-1



Method-2



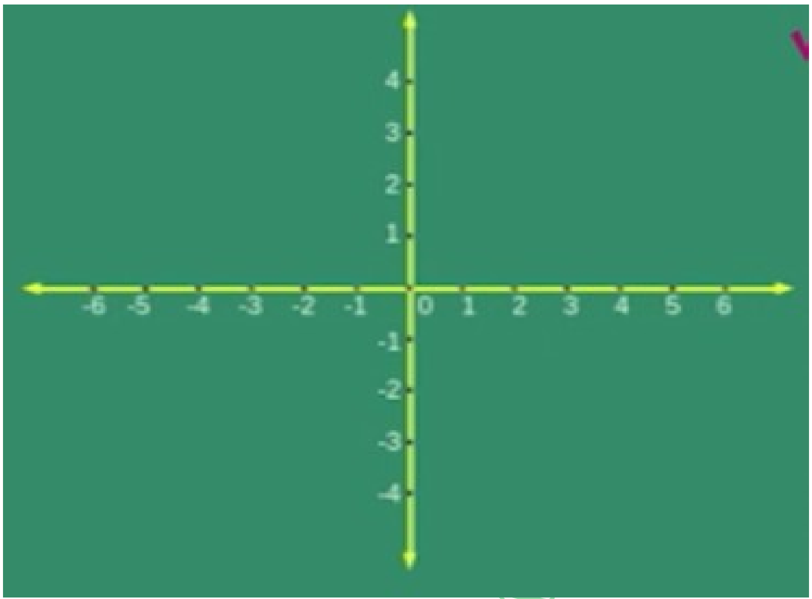
Method-3



Note:

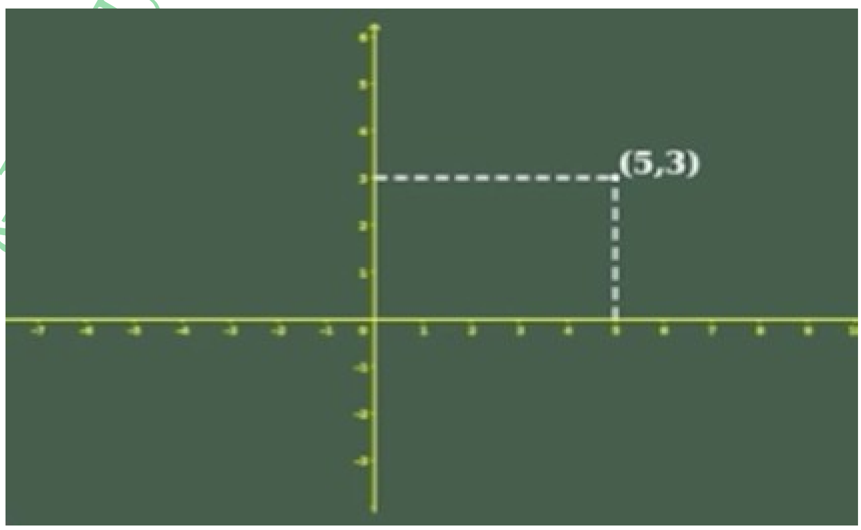
When we mark numbers on the axes we can take any distance as 1 unit (eg. 1 cm, ½ cm, 2 cm, etc). As the distance of 1 unit changes, the coordinates of points also changes. But the position of points does not change.

How can we mark the position of a point, if its coordinates are given. For this, first draw the axes mutually perpendicular. The intersecting point of the axes is marked as zero. Taking a convenient distance as 1 unit, mark the numbers. Right and top of the intersecting point positive numbers; left and bottom of the intersecting point negative numbers.



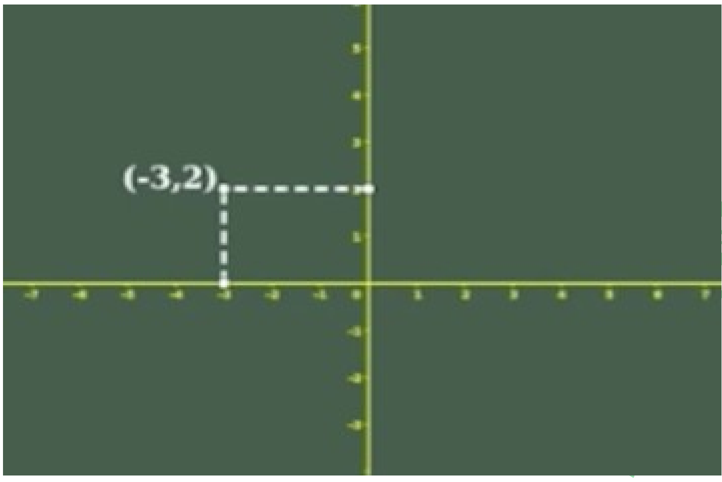
Example-1: Mark (5,3) on the plane.

Here both numbers in the pair are positive. Therefore, this point is on the right top. Draw perpendiculars from 5 on x-axis and 3 on y-axis. The intersecting point of these two perpendiculars is the point (5,3).



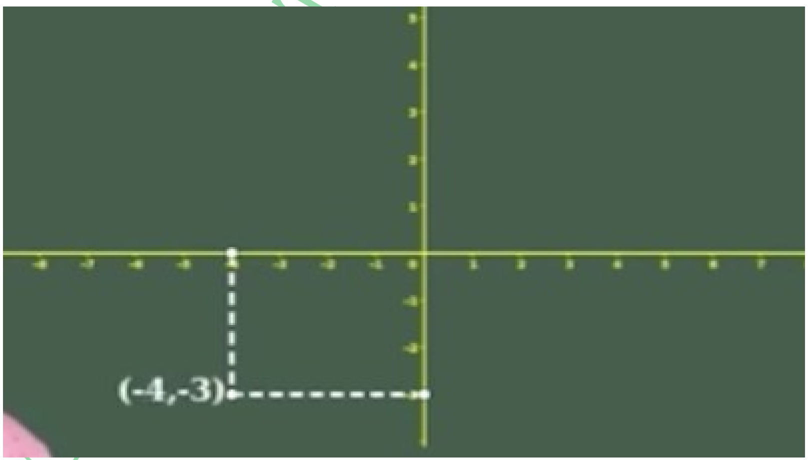
Example-2: Mark (-3,2) on the plane.

Here first number in the pair is negative and second number is positive. Therefore, this point is on the left top. Draw perpendiculars from -3 on x-axis and 2 on y-axis. The intersecting point of these two perpendiculars is the point (-3,2).



Example-3: Mark (-4,-3) on the plane.

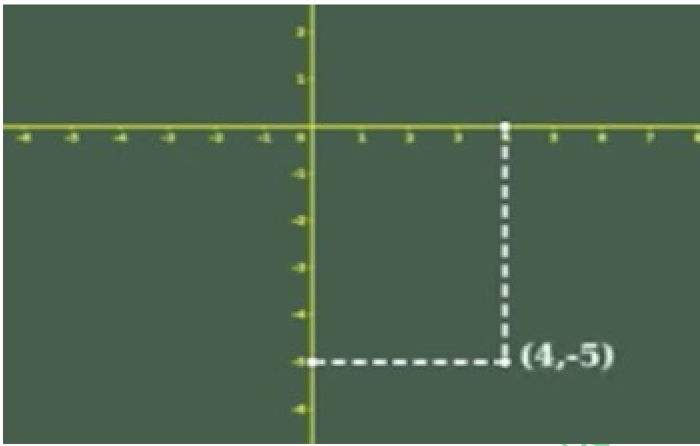
Here both numbers in the pair are negative. Therefore, this point is on the left bottom. Draw perpendiculars from -4 on x-axis and -3 on y-axis. The intersecting point of these two perpendiculars is the point (-4,-3).



Example-4: Mark (4,-5) on the plane.

Here first number in the pair is positive and second number is negative. Therefore, this point is on the right bottom. Draw

perpendiculars from 4 on x-axis and -5 on y-axis. The intersecting point of these two perpendiculars is the point (4,-5).



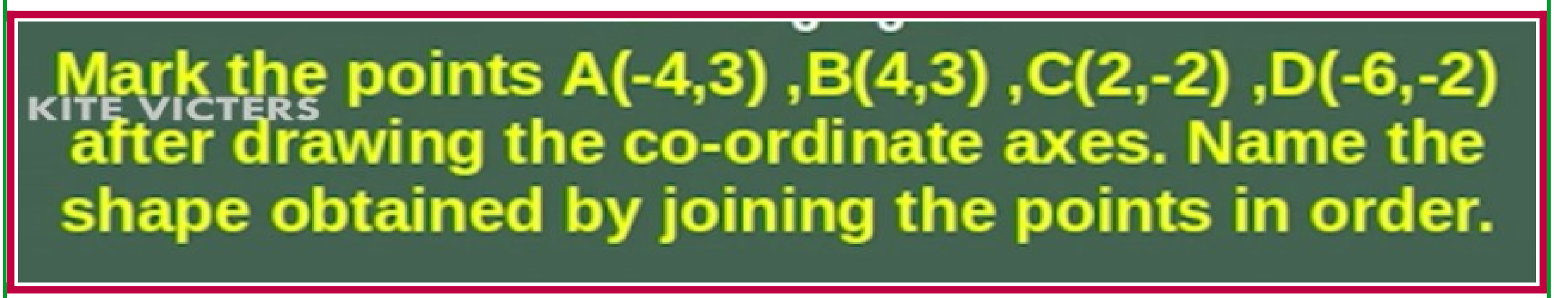
Activity

Write the coordinates of A from the figure.

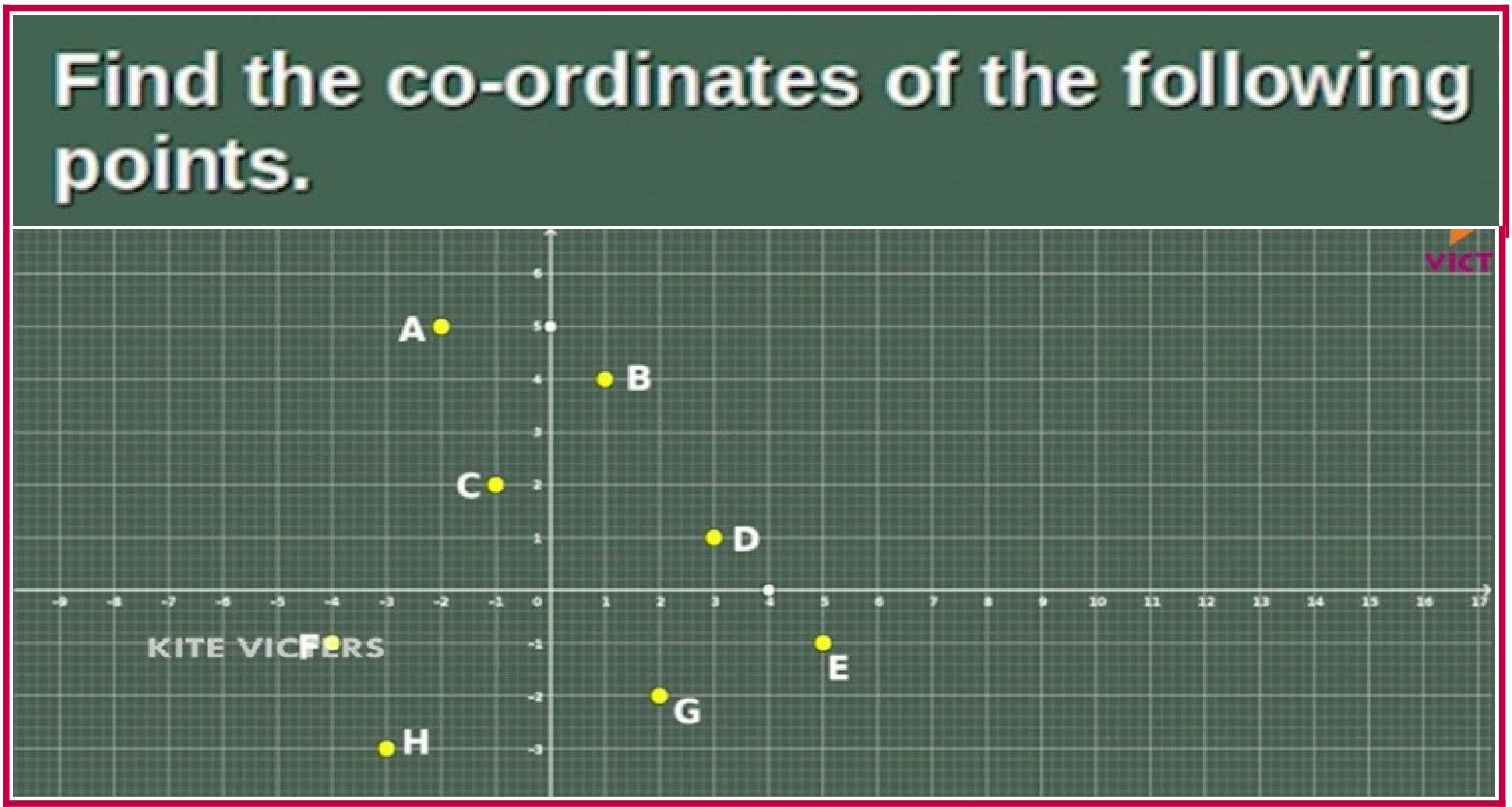
Draw perpendiculars from A to both x and y axes. The perpendiculars meet x-axis at 4 and y-axis at 5.

Therefore, coordinates of A is (4,5)

Assignment-1



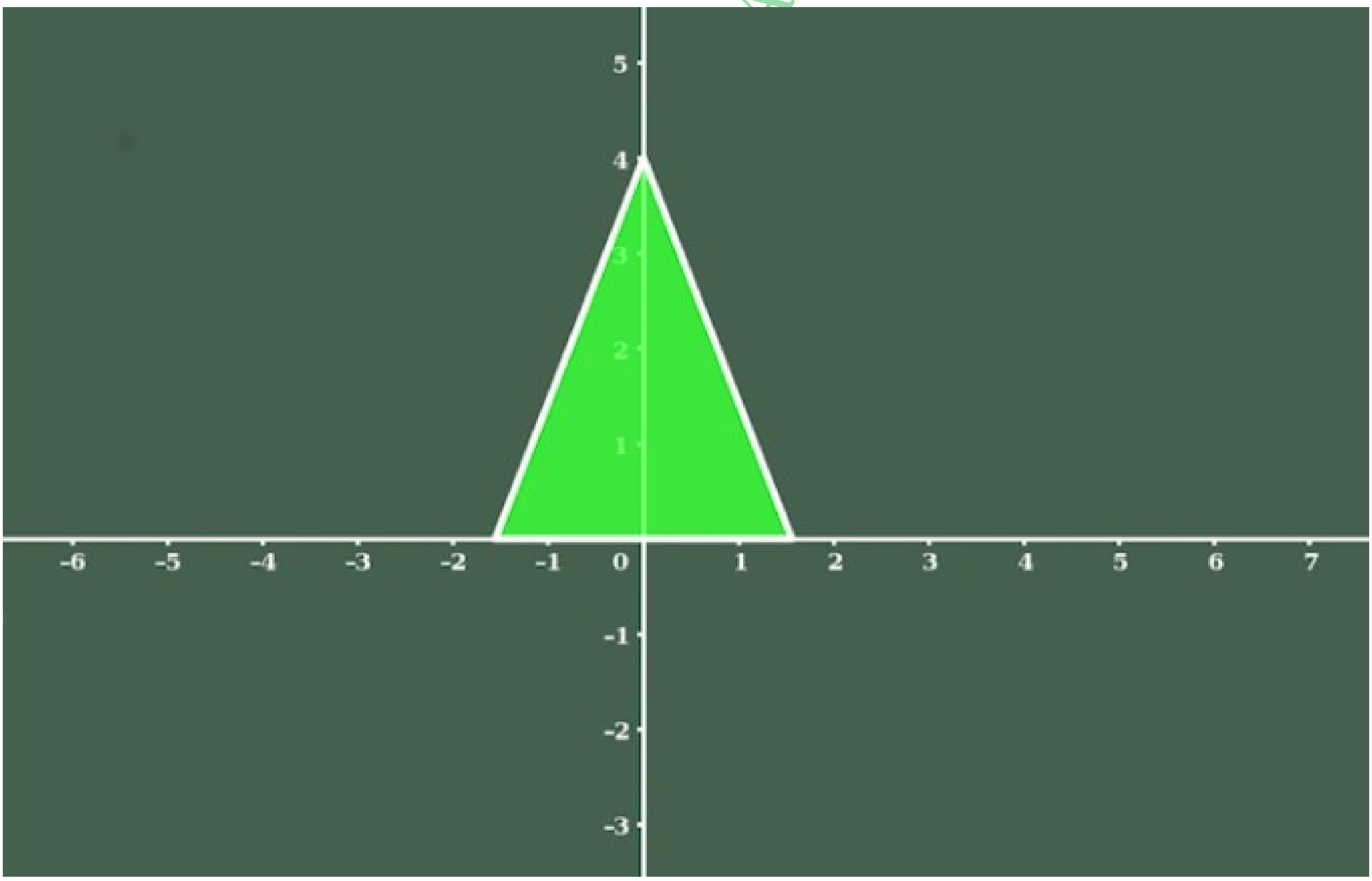
Assignment-2



Prepared by Jaisingh Jose G R ;HST(Maths) Govt.V&HSS Kulathoor

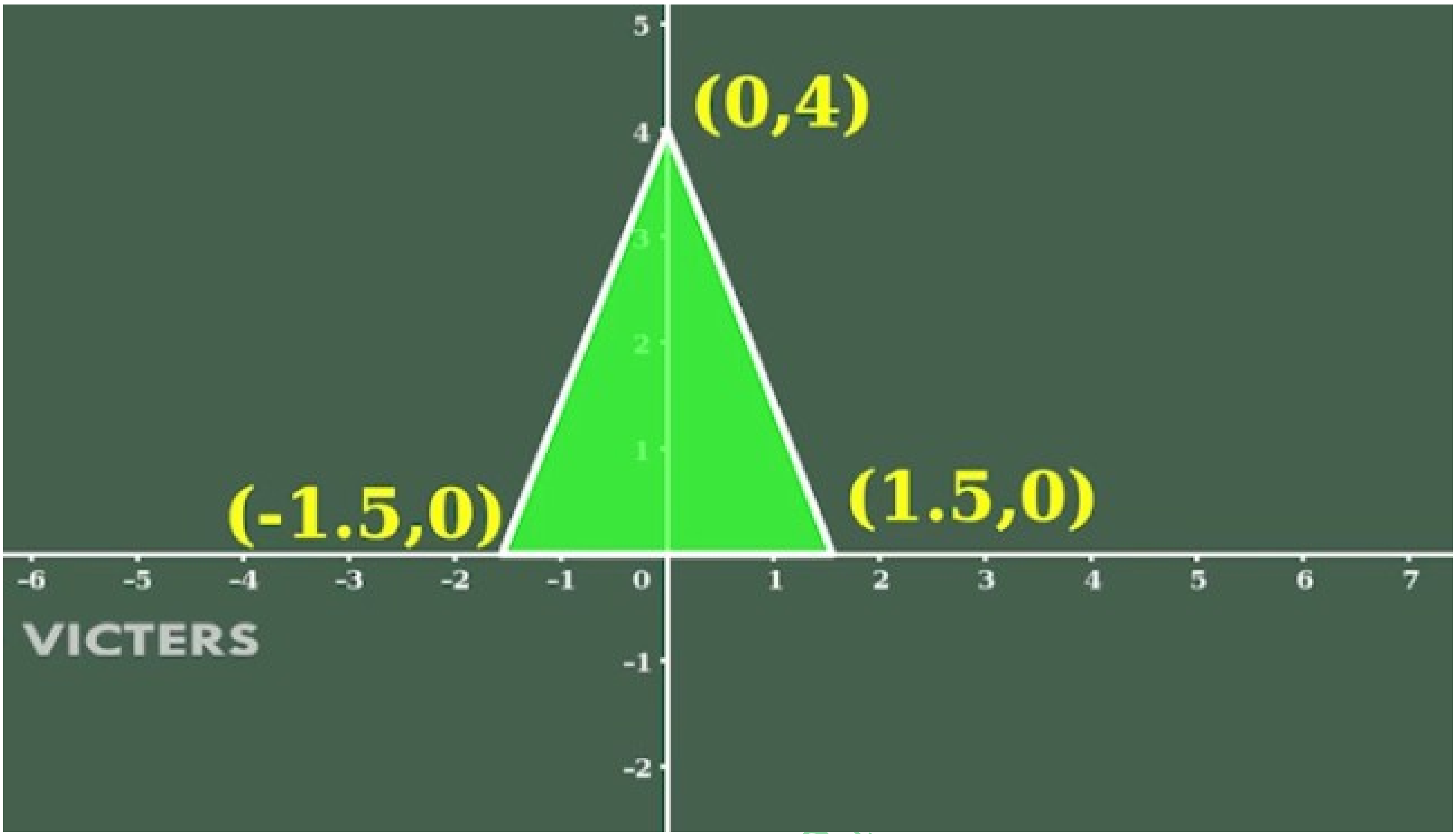
Activity

In the figure, an isosceles triangle of base 3 cm and height 4 cm drawn. The axes are drawn through the midpoint of the base. Find the coordinates of the vertices of the triangle.



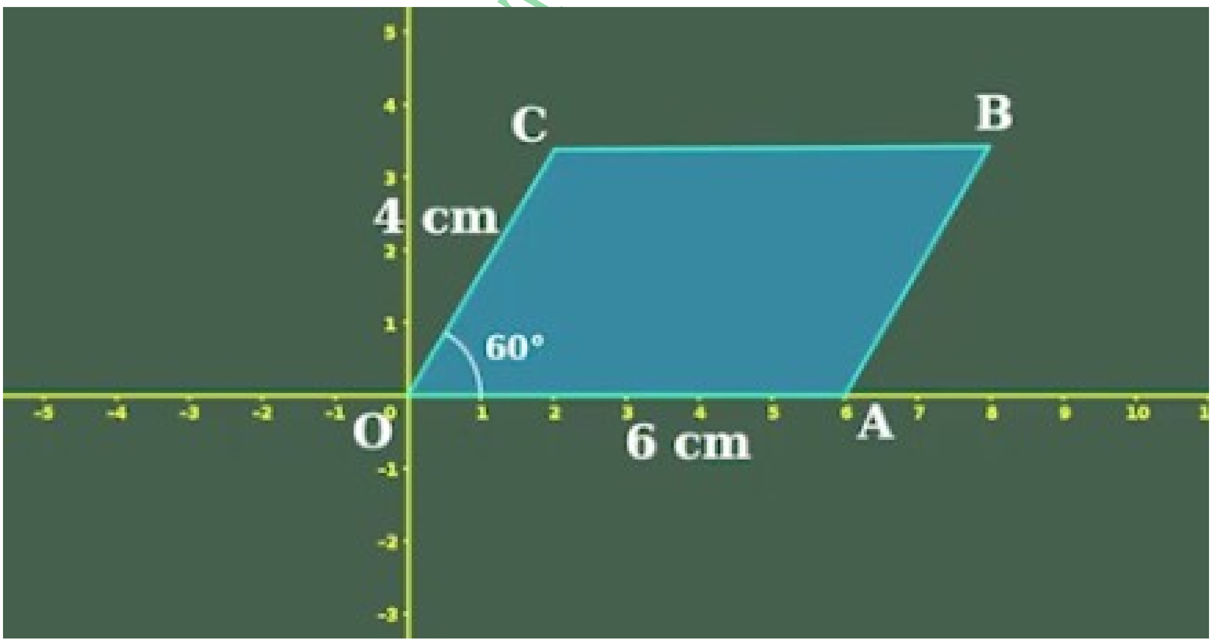
Answer

The coordinates of vertices are (-1.5,0), (1.5,0), (0,4)



Activity

In the figure, OABC is a parallelogram. OA = 6 cm, OC = 4 cm, ∟AOC = 60°. Find the coordinates of O, A, B and C.



Answer

Draw CD and BE perpendicular to the x-axis. ∟OCD = 30°,

∟COD = 60°, OC = 4 cm, OA = 6 cm

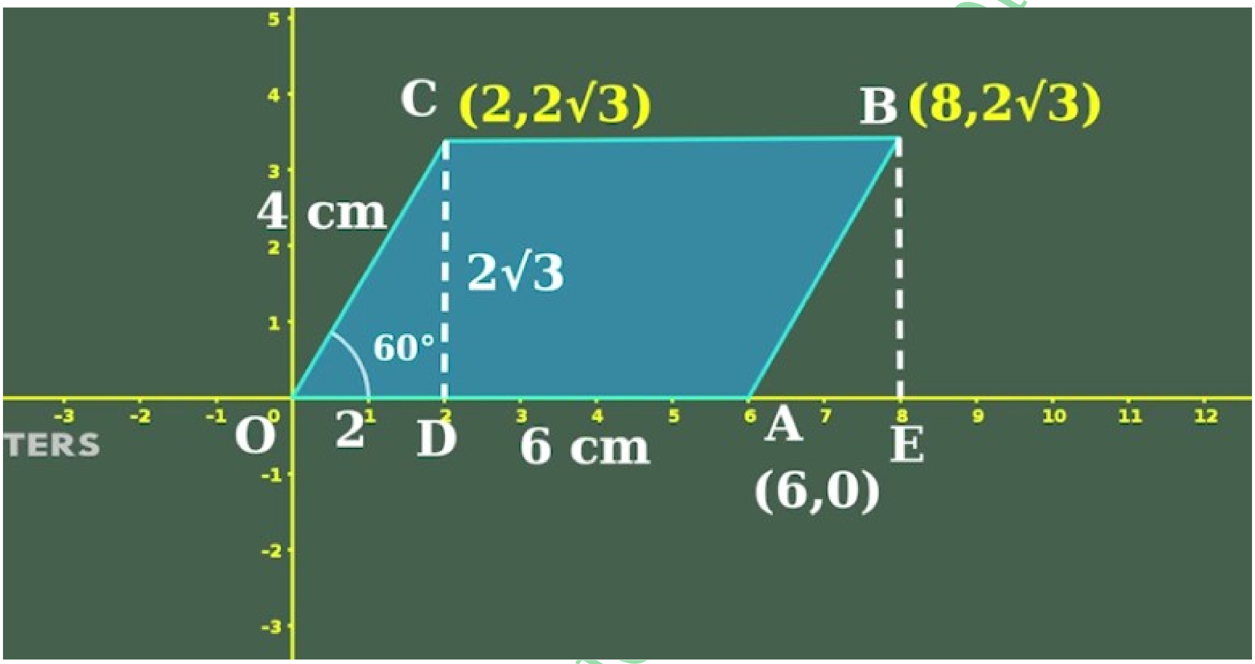
ΔCOD is a triangle of angles 30°, 60°, 90°

Its sides are in the ratio 1 : √3 : 2

Therefore, OD = 2 cm, CD = 2√3 cm

Also, ΔCOD and ΔBAE are equal triangles.

Therefore, OD = AE = 2 cm, CD = BE = 2√3 cm



Therefore,

Coordinates of O = (0,0)

Coordinates of A = (6,0)

Coordinates of B = (2,2√3)

Coordinates of C = (6+2,2√3) = (8,2√3)

Note :

When we draw axes,

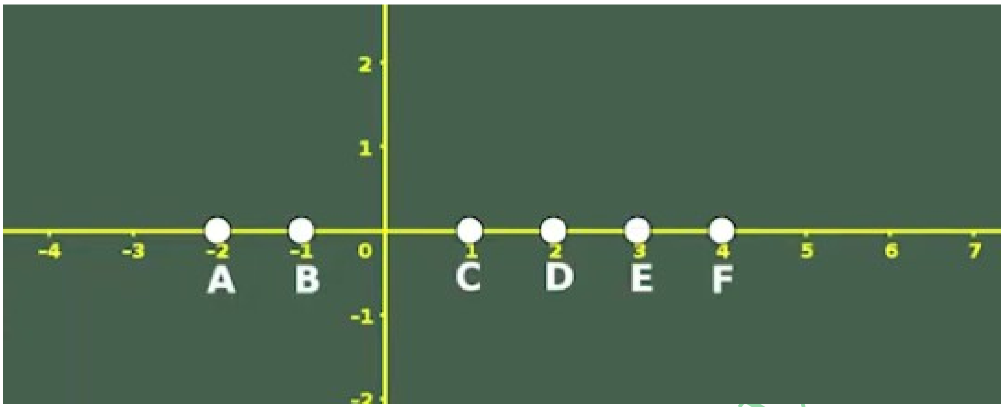
x-axis is labelled as X'X (XdashX) from left to right.

y-axis is labelled as YY' (YYdash) from top to bottom.

Intersecting point of both axes is denoted by "O". It is called the origin.

Activity

In the figure, write the coordinates of points A, B, C, D, E and F.



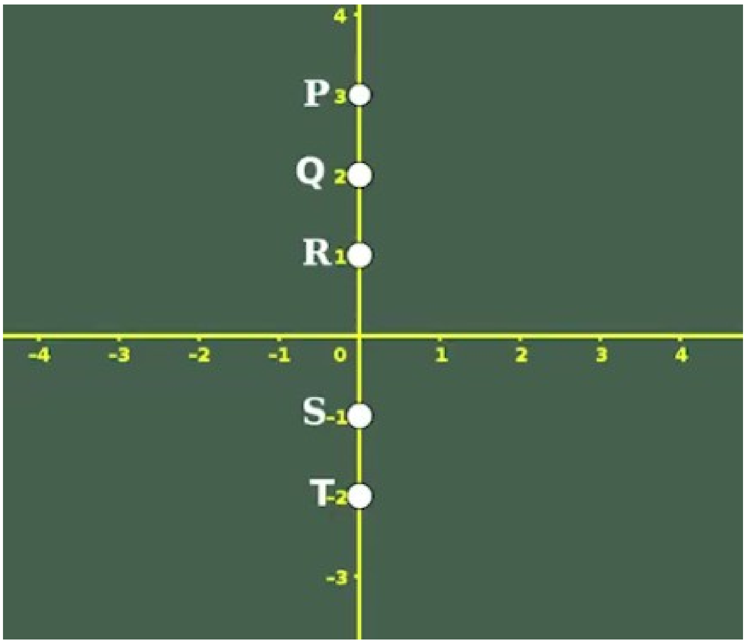
Answer

Coordinates of A = (-2,0)
Coordinates of B = (-1,0)
Coordinates of C = (1,0)
Coordinates of D = (2,0)
Coordinates of E = (3,0)
Coordinates of F = (4,0)

These points A, B, C, D, E, F are points on the x-axis. The second coordinate or y coordinate of these points are zero.

That is, The y coordinate of any point on the x axis is 0.

Activity



In the figure, write the coordinates of points P, Q, R, S and T.

Answer

Coordinates of P = (0,3)

Coordinates of Q = (0,2)

Coordinates of R = (0,1)

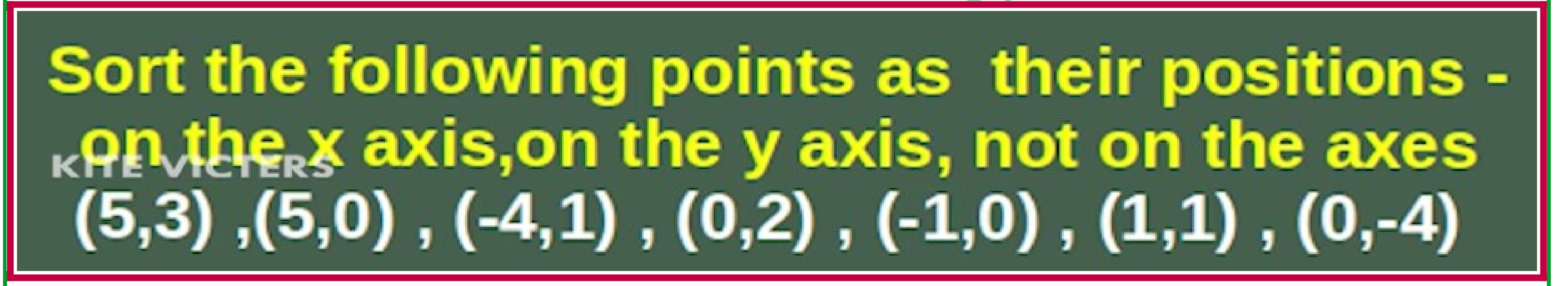
Coordinates of S = (0,-1)

Coordinates of T = (0,-2)

These points P, Q, R, S, T are points on the x-axis. The first coordinate or x coordinate of these points are zero.

That is, The x coordinate of any point on the y axis is 0.

Activity



Answer

The y coordinate of any point on the x axis is 0.

The x coordinate of any point on the y axis is 0.

Therefore,

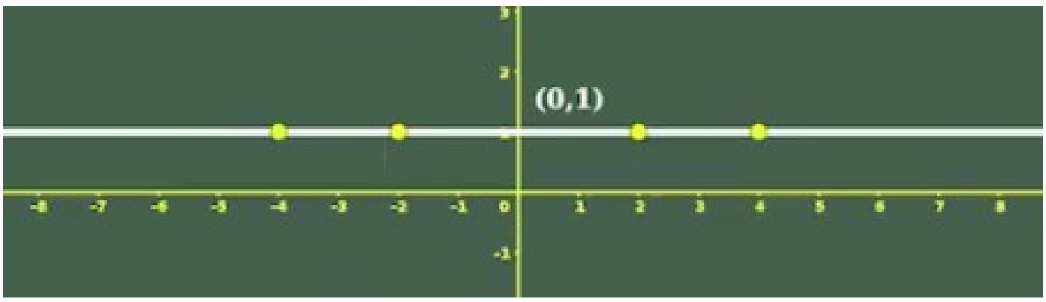
Points on the x axis are (5,0), (-1,0)

Points on the y axis are (0,2), (0,-4)

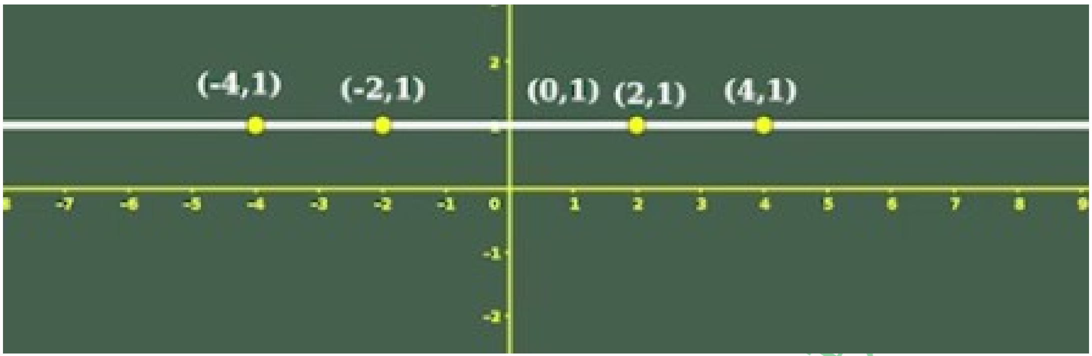
Points not on the axes are (5,3), (-4,1), (1,1)

Activity

Draw the axes. Mark the point (0,1). Draw a line parallel to x axis through this point. Write the coordinates of points marked on that line.



Answer

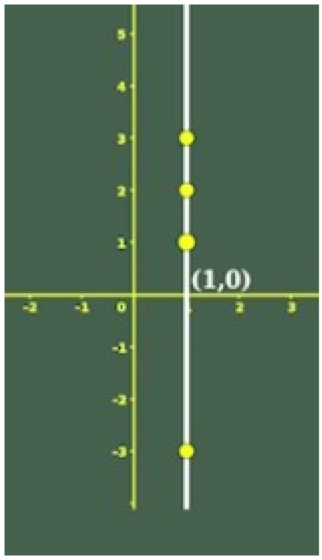


The coordinates of the points are (-4,1), (-2,1), (2,1) and (4,1)

That is,

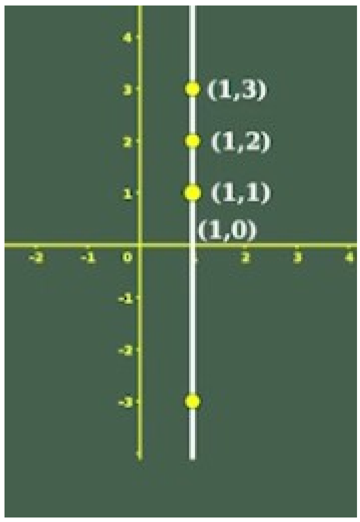
The y coordinates of any point in a line parallel to x axis are equal.

Activity



Draw the axes. Mark the point (1,0). Draw a line parallel to y axis through this point. Write the coordinates of points marked on that line.

Answer



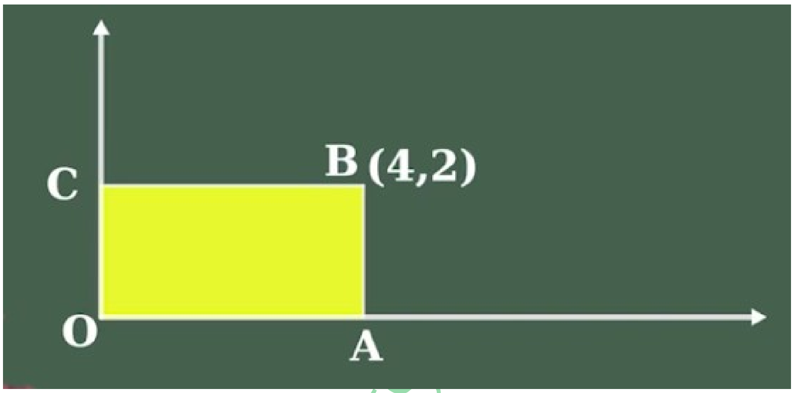
The coordinates of the points are (1,3), (1,2), (1,1) and (1,-3)

That is,

The x coordinates of any point in a line parallel to y axis are equal.

Activity

In the figure, OABC is a rectangle. Coordinates of B is (4,2). Write the coordinates of O, A and C



Answer

O is the origin.

Therefore, Coordinates of O = (0,0)

AB is parallel to the y axis.

Therefore, x coordinate of A is 4.

Also A is a point on the x axis.

Therefore, its y coordinate is 0.

Therefore, Coordinates of A = (4,0)

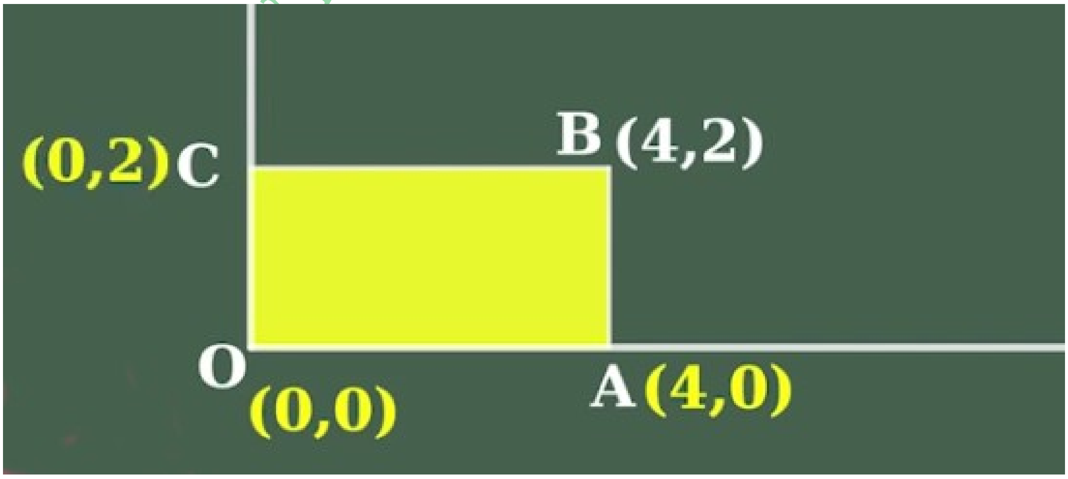
CB is parallel to the x axis.

Therefore, y coordinate of C is 2.

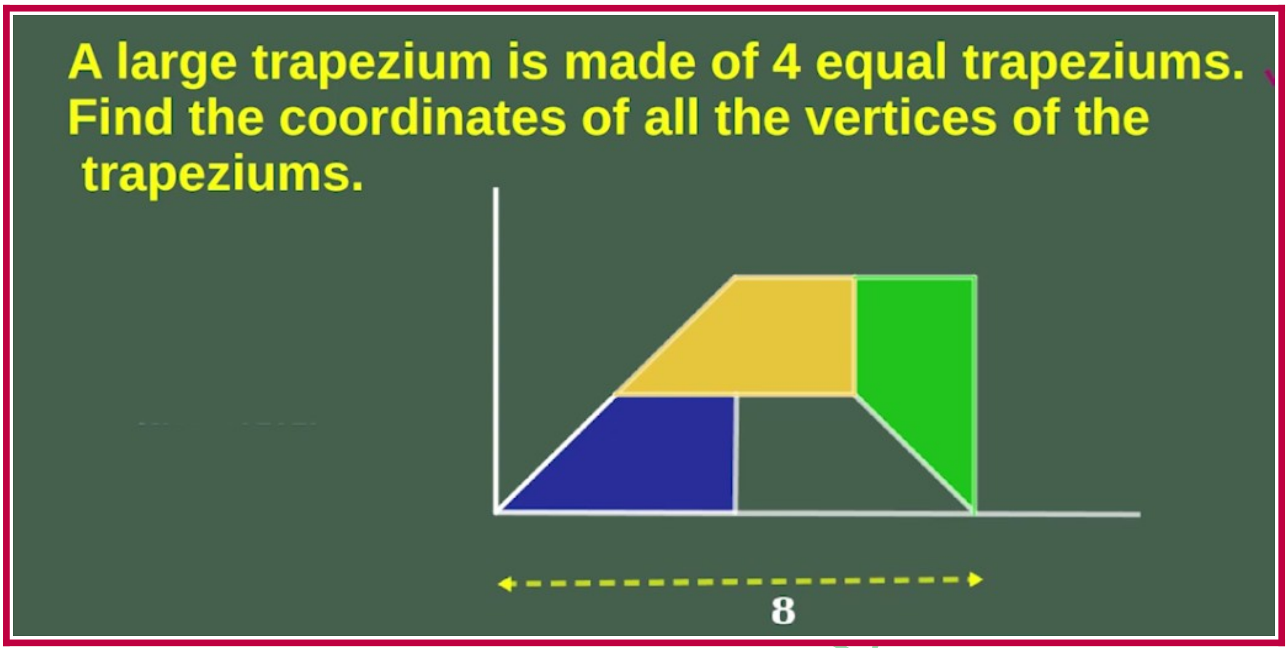
Also C is a point on the y axis.

Therefore, its x coordinate is 0.

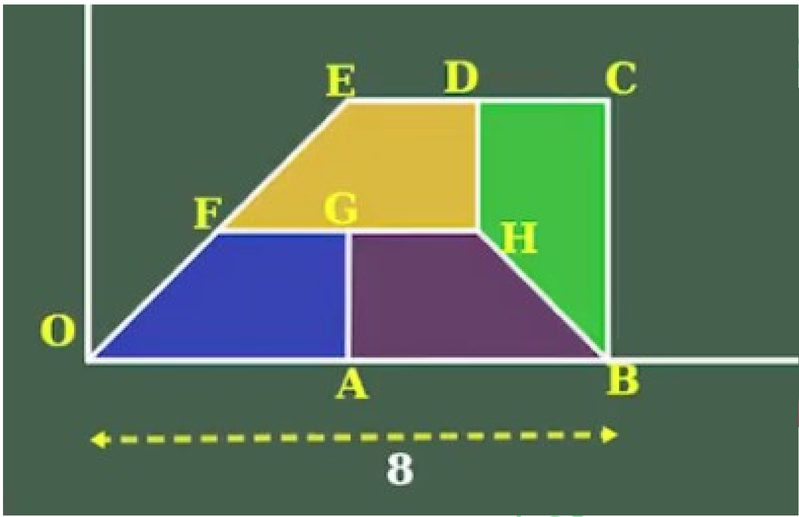
Therefore, Coordinates of C = (0,2)

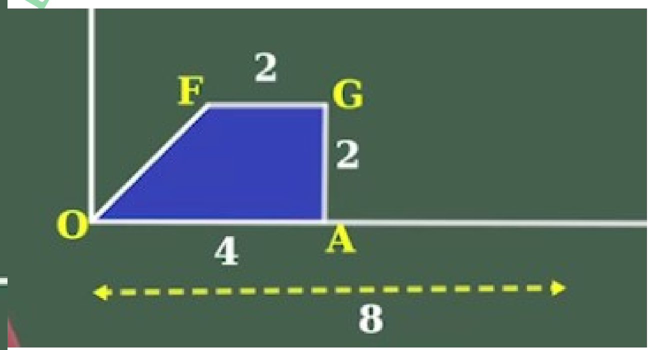


Activity



Answer





Consider the small trapezium OAGF.

OB = 8

Therefore, OA = 4, AG = 2, GF = 2

We can write the coordinates of all points using this.

Coordinates of O = (0,0)

Coordinates of A = (4,0)

Coordinates of B = (8,0)

OA = 4, AG = 2. Therefore, Coordinates of G = (4,2)

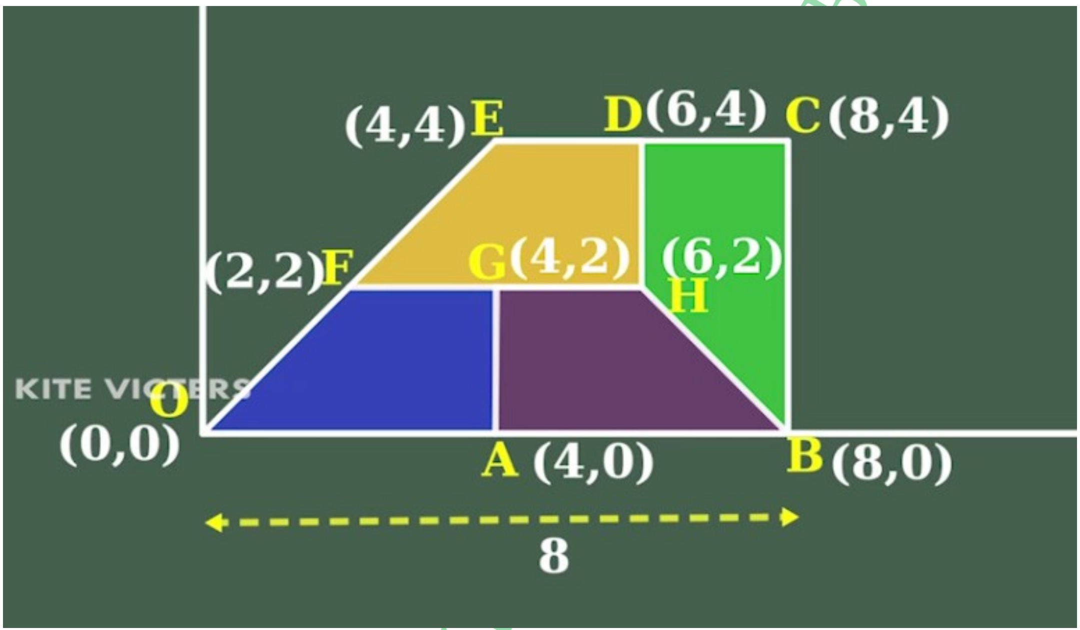
GF = 2. Therefore, Coordinates of F = (4-2,2) = (2,2)

Coordinates of H = (4+2,2) = (6,2)

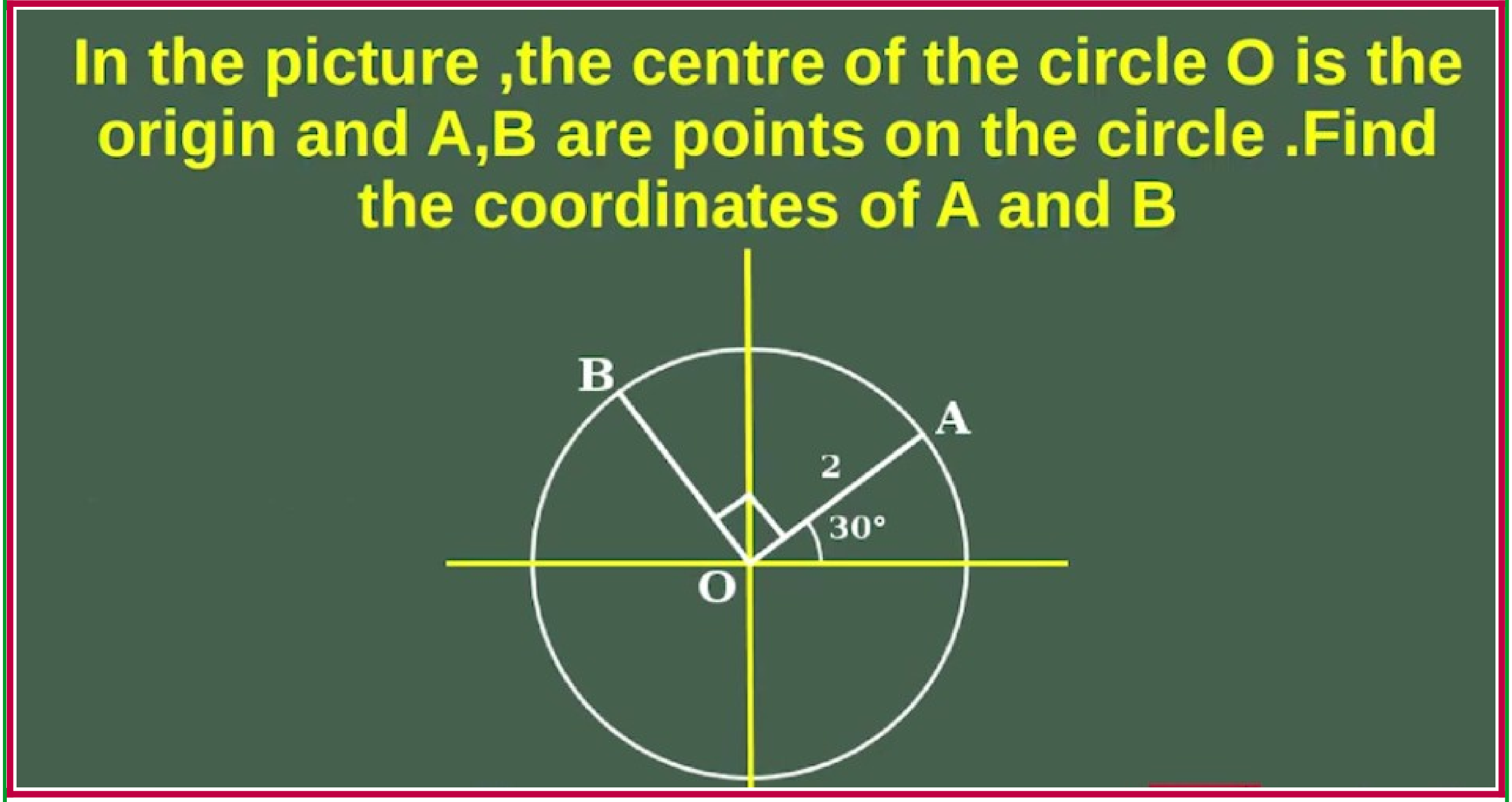
OB = 8, BC = 4. Therefore, Coordinates of C = (8,4)

CD = 2. Therefore, Coordinates of D = (8-2,4) = (6,4)

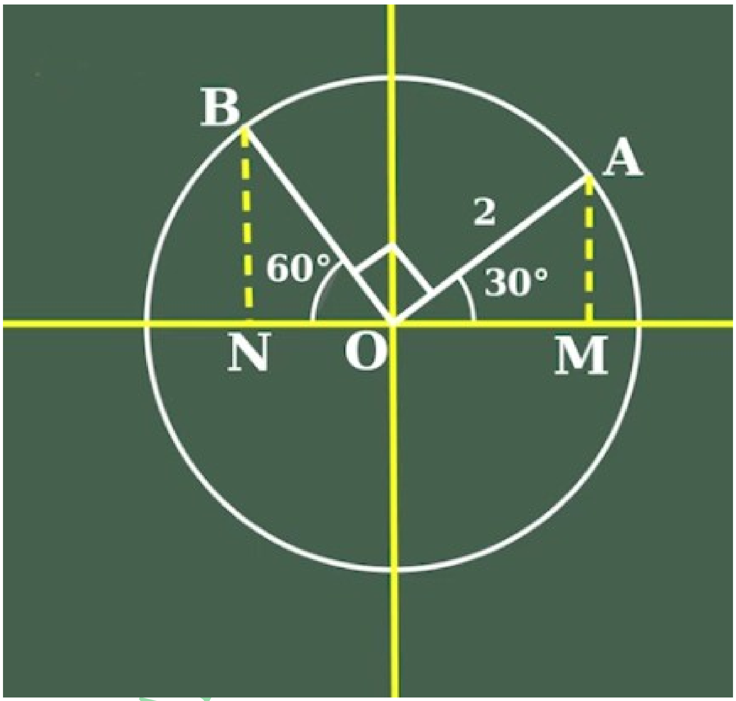
ED = 2. Therefore, Coordinates of E = (6-2,4) = (4,4)



Activity



Answer



$\angle AOB = 90^\circ$

$OA = OB = 2$ (radii of circle)

Draw AM and BN perpendicular to x axis.

$\angle AOM = 30^\circ$

ΔAOM is a triangle of angles 30°, 60°, 90°. Its sides are in the ratio $1 : \sqrt{3} : 2$

Therefore, $AM = 1$ and $OM = \sqrt{3}$

Therefore, Coordinates of A = $(\sqrt{3}, 1)$

$\angle BON = 180 - (90^\circ + 30^\circ) = 180 - 120^\circ = 60^\circ$

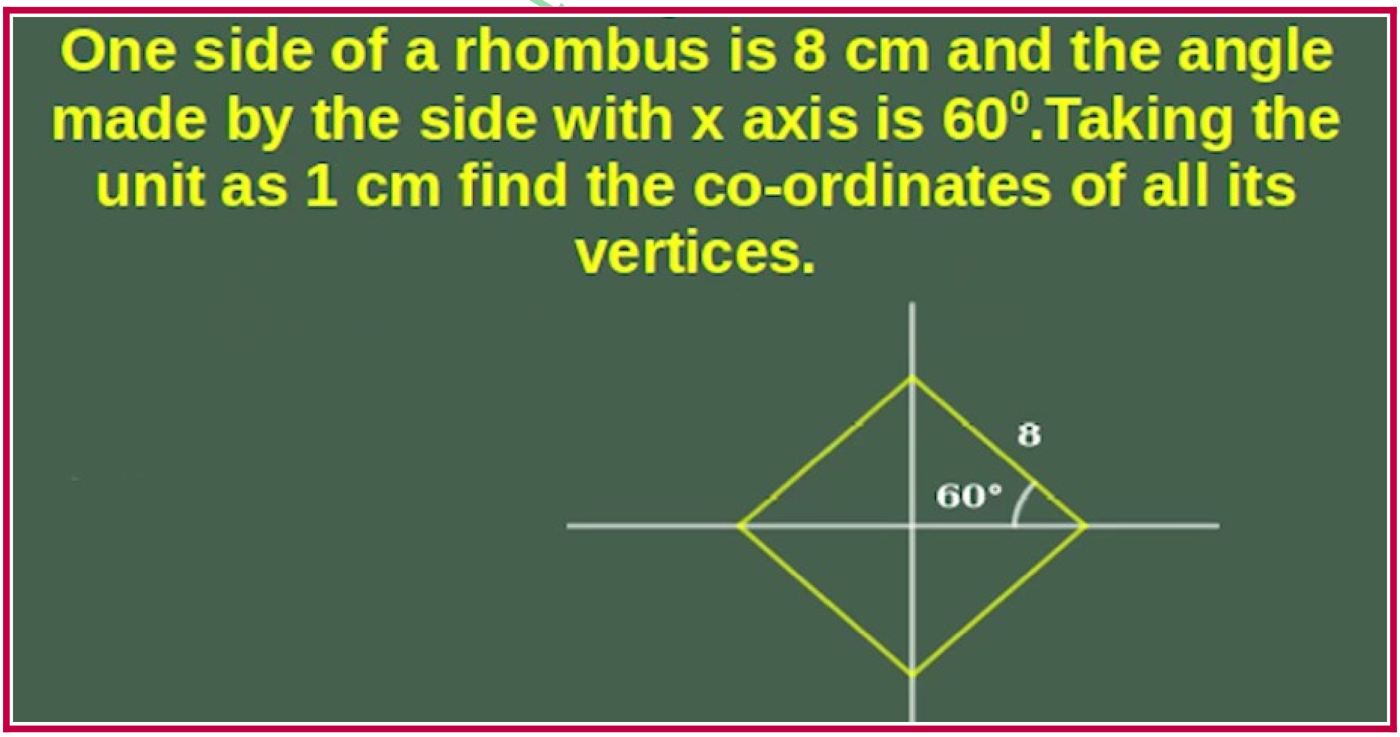
$\angle OBN = 30^\circ$

ΔAOM and ΔOBN are equal triangles.

Therefore, $ON = 1$, $BN = \sqrt{3}$

Therefore, Coordinates of B = $(-1, \sqrt{3})$

Assignment



Discussed in the previous class

1. Coordinates of origin is (0,0)

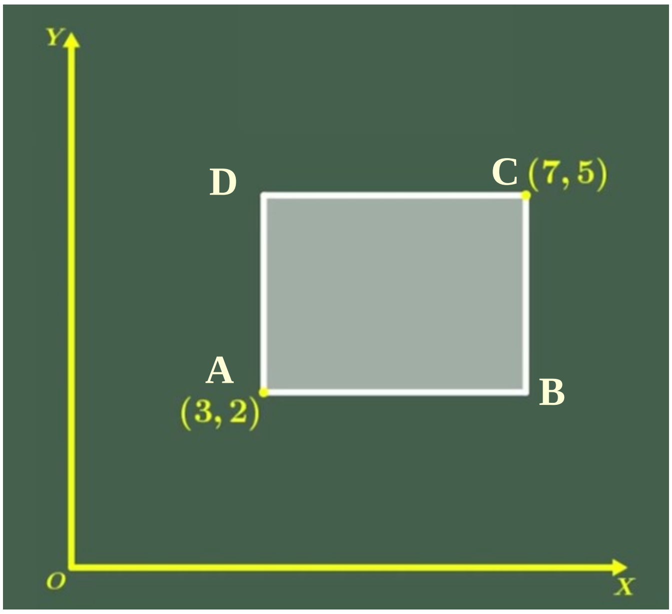
2. The y coordinate of any point on the x axis is 0.

3. The x coordinate of any point on the y axis is 0.

4. The y coordinates of any point in a line parallel to x axis are equal.

5. The x coordinates of any point in a line parallel to y axis are equal.

Activity



In the figure, (3,2) and (7,5) are coordinates of one pair of opposite vertices of a rectangle. Find the coordinates of the other two vertices.

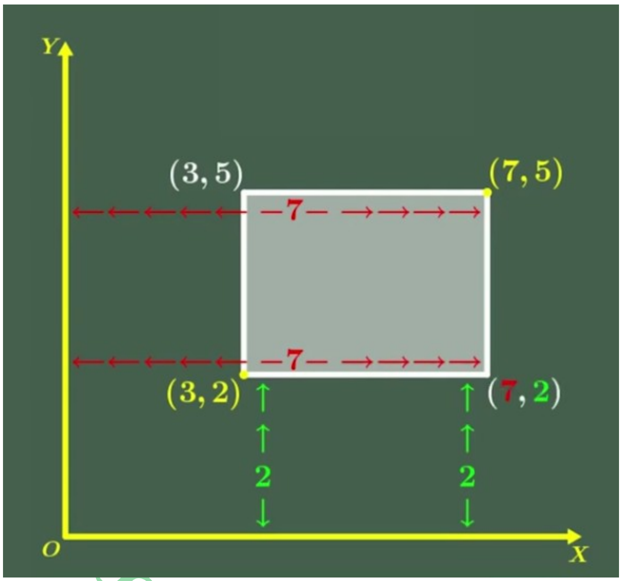
Answer

In the figure, ABCD is a rectangle.
Coordinates of A = (3,2)
Coordinates of C = (7,5)
The y coordinates of any point in a line parallel to x axis are equal.

Therefore, y coordinate of B is 2

y coordinate of D is 5

The x coordinates of any point in a line parallel to y axis are equal.



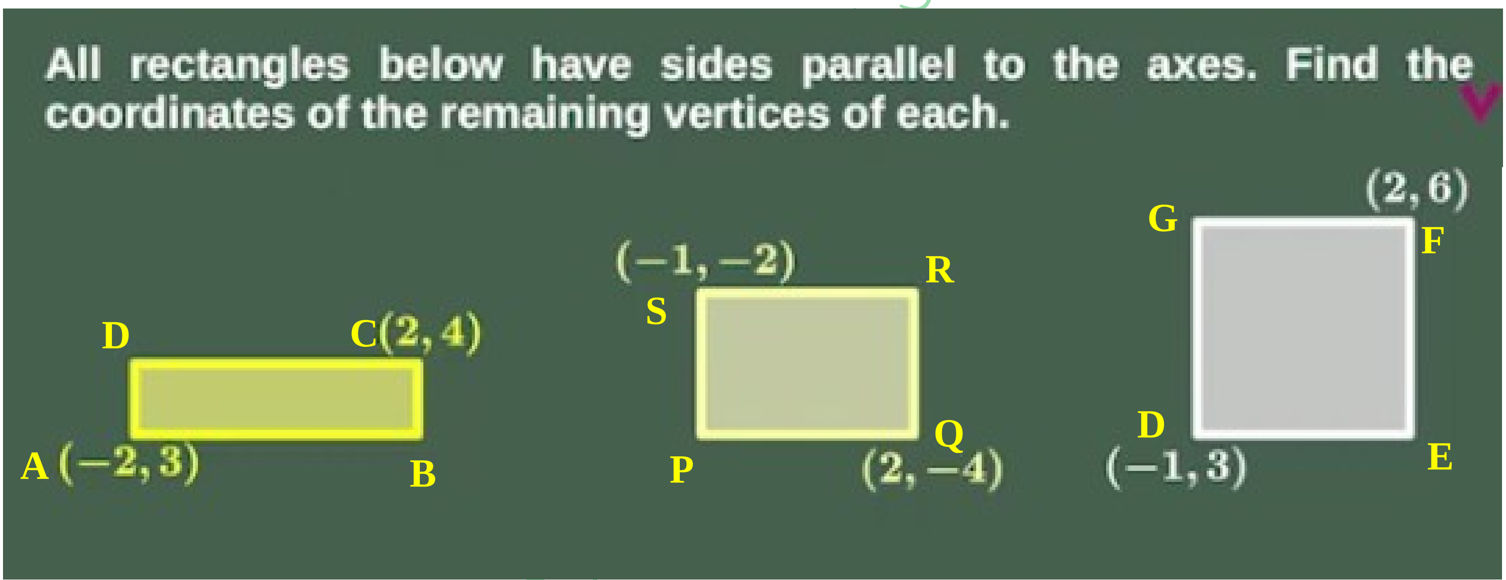
Therefore, x coordinate of B is 7

x coordinate of D is 3

Therefore, Coordinates of B = (7,2)

Coordinates of D = (3,5)

Activity



Answer

The y coordinates of any point in a line parallel to x axis are equal.

The x coordinates of any point in a line parallel to y axis are equal.

Therefore, Coordinates of B = (2,3)

Coordinates of D = (-2,4)

Coordinates of P = (-1,-4)

Coordinates of R = (2,-2)

Coordinates of E = (2,3)
Coordinates of G = (-1,6)

Activity

Without drawing coordinate axes, mark each pair of points below with left- right, top-bottom position correct. Find the other coordinates of the rectangles drawn with these as opposite vertices and sides parallel to the axes.

(i) (3, 5), (7, 8) (ii) (6, 2), (5, 4)

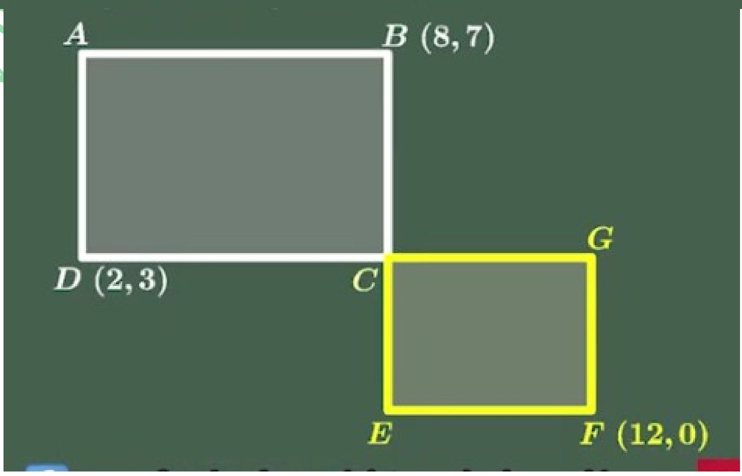
(iii) (-3, 5), (-7, 1) (iv) (-1, -2), (-5, -4)

Answer

(i) (3,5) is at left bottom and (7,8) is at top right.
The coordinates of the other two vertices are (3,8) and (7,5).
(ii) (6,2) is at right bottom and (5,4) is at left top.
The coordinates of the other two vertices are (6,4) and (5,2).
(iii) (-3,5) is at right top and (-7,1) is at left bottom.
The coordinates of the other two vertices are (-3,1) and (-7,5).
(iv) (-1,-2) is at right top and (-5,-4) is at left bottom.
The coordinates of the other two vertices are (-1,-4) and (-5,-2).

Assignment

In the figure, the sides of the rectangles ABCD and CEFG are parallel to axes. Find the coordinates of the vertices A, C, E, G.

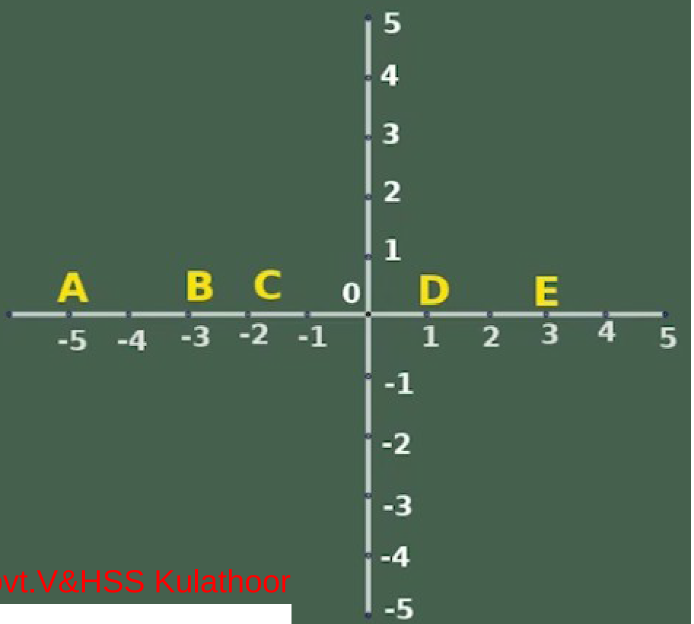


Distances

Activity

In the figure, find the coordinates of A, B, C, D and E. Find the distance between; A and B(AB), A and D(AD), C and D(CD), A and C(AC). Also find $|x_1 - x_2|$ and complete the table.

Name	$(x_1,y_1),(x_2,y_2)$	Distance	$\lvert x_1 - x_2\rvert$



Answer

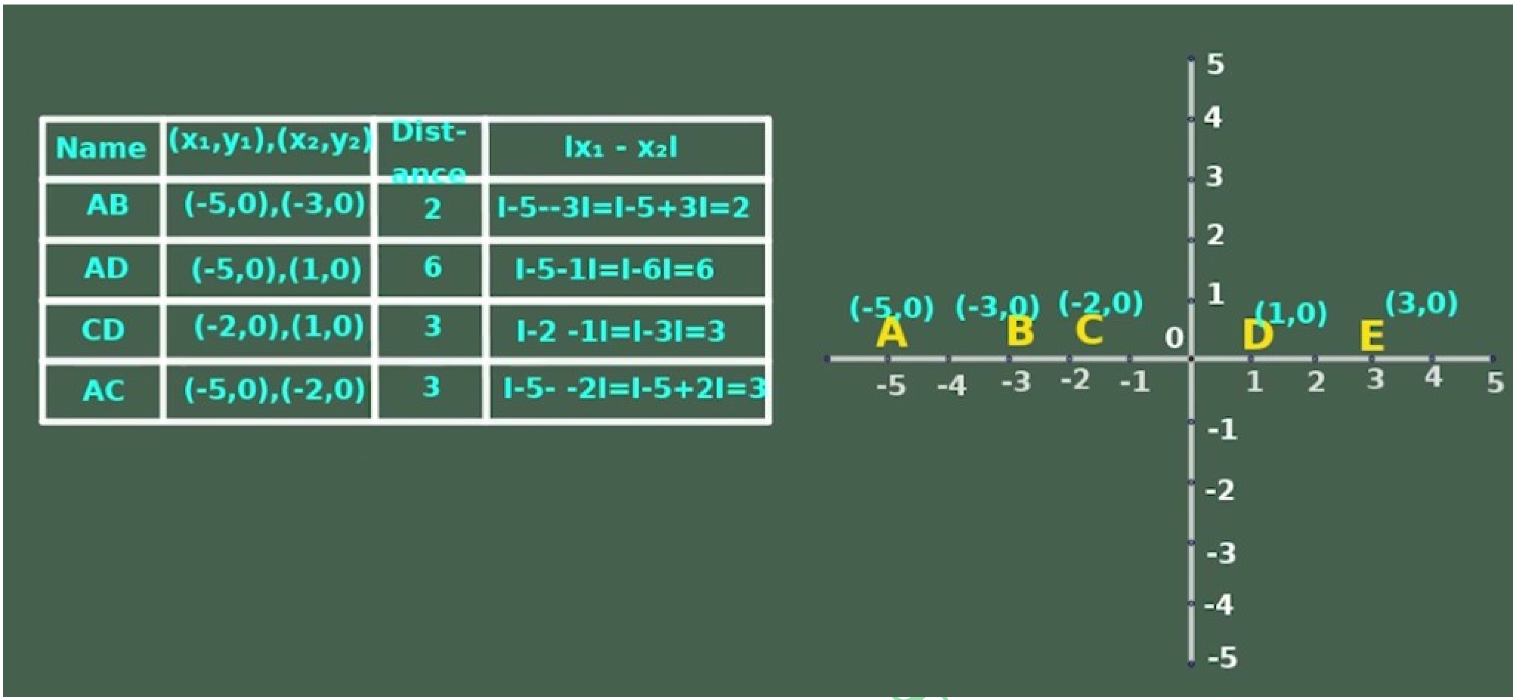
Coordinates of A = (-5,0)

Coordinates of B = (-3,0)

Coordinates of C = (-2,0)

Coordinates of D = (1,0)

Coordinates of E = (3,0)



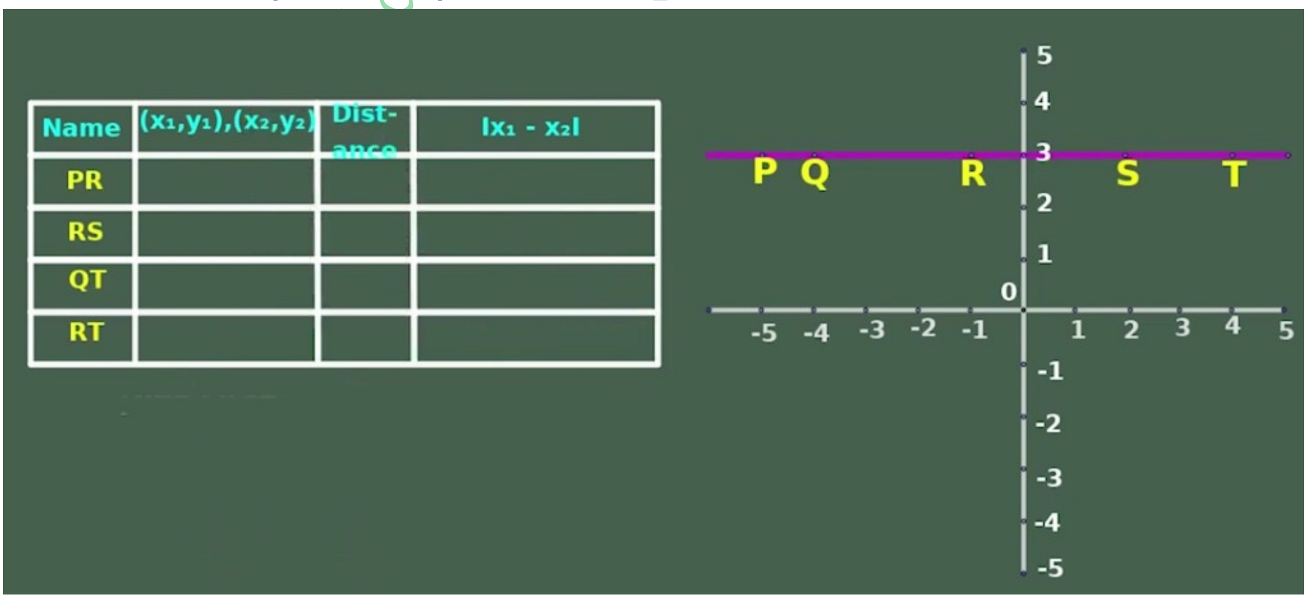
Name	$(x_1,y_1),(x_2,y_2)$	Dist-ance	$\lvert x_1 - x_2 \rvert$
AB	(-5,0),(-3,0)	2	$\lvert -5--3 \rvert = \lvert -5+3 \rvert = 2$
AD	(-5,0),(1,0)	6	$\lvert -5-1 \rvert = \lvert -6 \rvert = 6$
CD	(-2,0),(1,0)	3	$\lvert -2-1 \rvert = \lvert -3 \rvert = 3$
AC	(-5,0),(-2,0)	3	$\lvert -5- -2 \rvert = \lvert -5+2 \rvert = 3$

Note: The y coordinate of any point on the x axis is 0. Therefore, any point on the x axis can be written as (x,0). Eg. $(x_1,0)$, $(x_2,0)$, $(x_3,0)$, . . .

If $(x_1,0)$, $(x_2,0)$ are two points on the x axis, then the distance between these two points = $| x_1 - x_2 |$

Activity

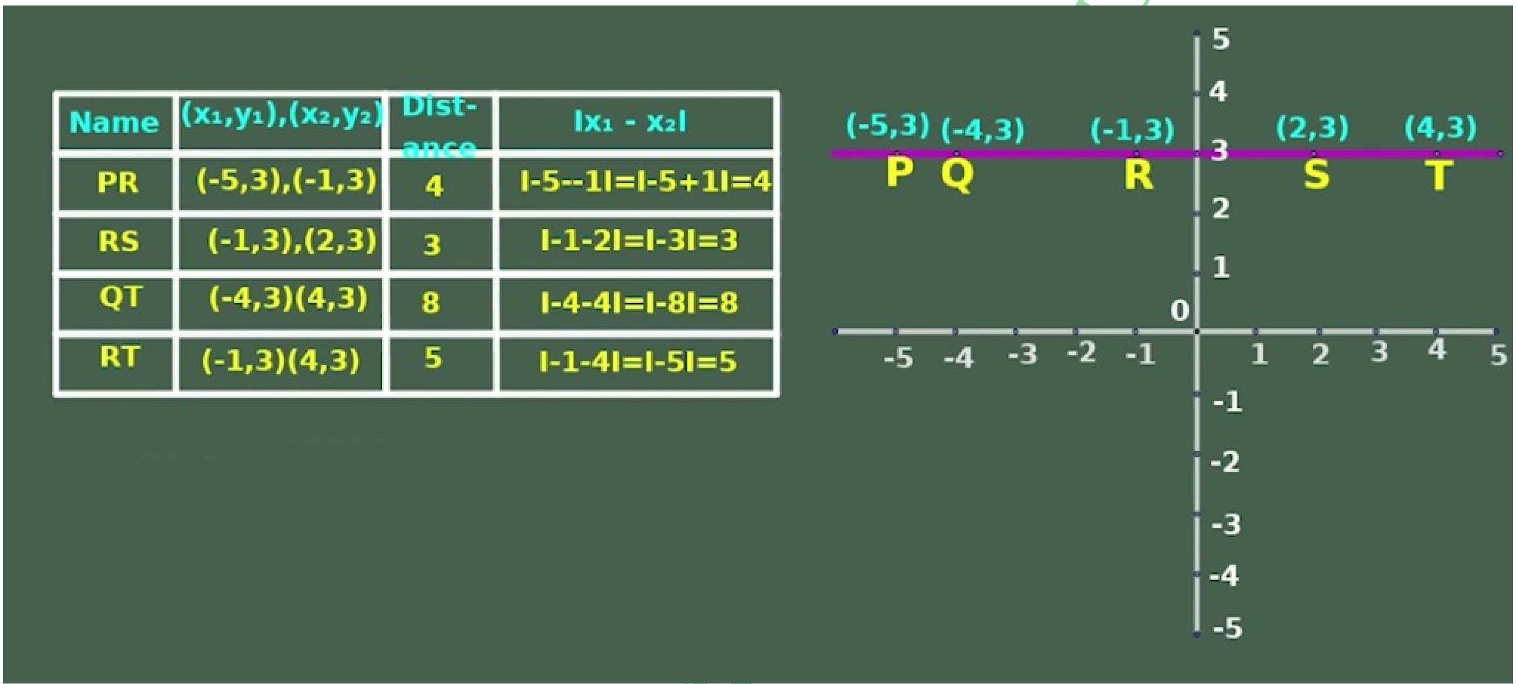
In the figure, find the coordinates of P, Q, R, S and T. Find the distance between; P and Q(PQ), R and S(RS), Q and T(QT), R and T(RT). Also find $| x_1 - x_2 |$ and complete the table.



Name	$(x_1,y_1),(x_2,y_2)$	Dist-ance	$\lvert x_1 - x_2 \rvert$
PR			
RS			
QT			
RT			

Answer

Coordinates of P = (-5,3)
Coordinates of Q = (-4,3)
Coordinates of R = (-1,3)
Coordinates of S = (2,3)
Coordinates of T = (4,3)



Note:

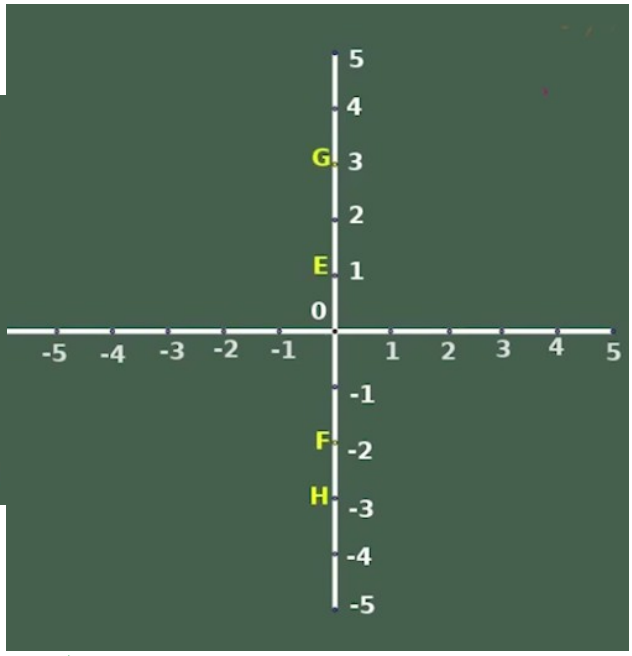
The y coordinates of any point on a line parallel to x axis are equal. Therefore, any point on a line parallel to the x axis can be written as (x,k). Eg. (x_1,k), (x_2,k), (x_3,k), . . .

If (x_1,k), (x_2,k) are two points on a line parallel to x axis, then the distance between these two points = $|x_1 - x_2|$

Activity

In the figure, find the coordinates of E, F, G and H. Find the distance between; G and E(GE), G and F(GF), E and H(EH), G and H(GH). Also find $|y_1 - y_2|$ and complete the table.

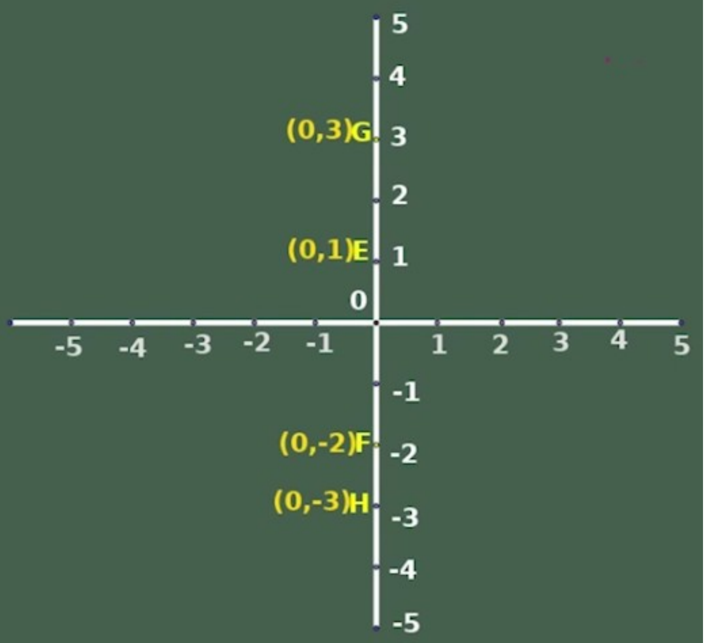
Name	$(x_1,y_1),(x_2,y_2)$	Dist-ance	$\lvert y_1-y_2 \rvert$



Answer

Coordinates of E = (0,1)
Coordinates of F = (0,-2)
Coordinates of G = (0,3)
Coordinates of H = (0,-3)

Name	$(x_1,y_1),(x_2,y_2)$	Dist-ance	$\lvert y_1-y_2 \rvert$
GE	(0,3),(0,1)	2	$\lvert 3-1 \rvert = \lvert 2 \rvert = 2$
GF	(0,3),(0,-2)	5	$\lvert 3- -2 \rvert = \lvert 3+2 \rvert = 5$
EH	(0,1),(0,-3)	4	$\lvert 1- -3 \rvert = \lvert 1+3 \rvert = 4$
GH	(0,3),(0,-3)	6	$\lvert 3- -3 \rvert = \lvert 3+3 \rvert = 6$



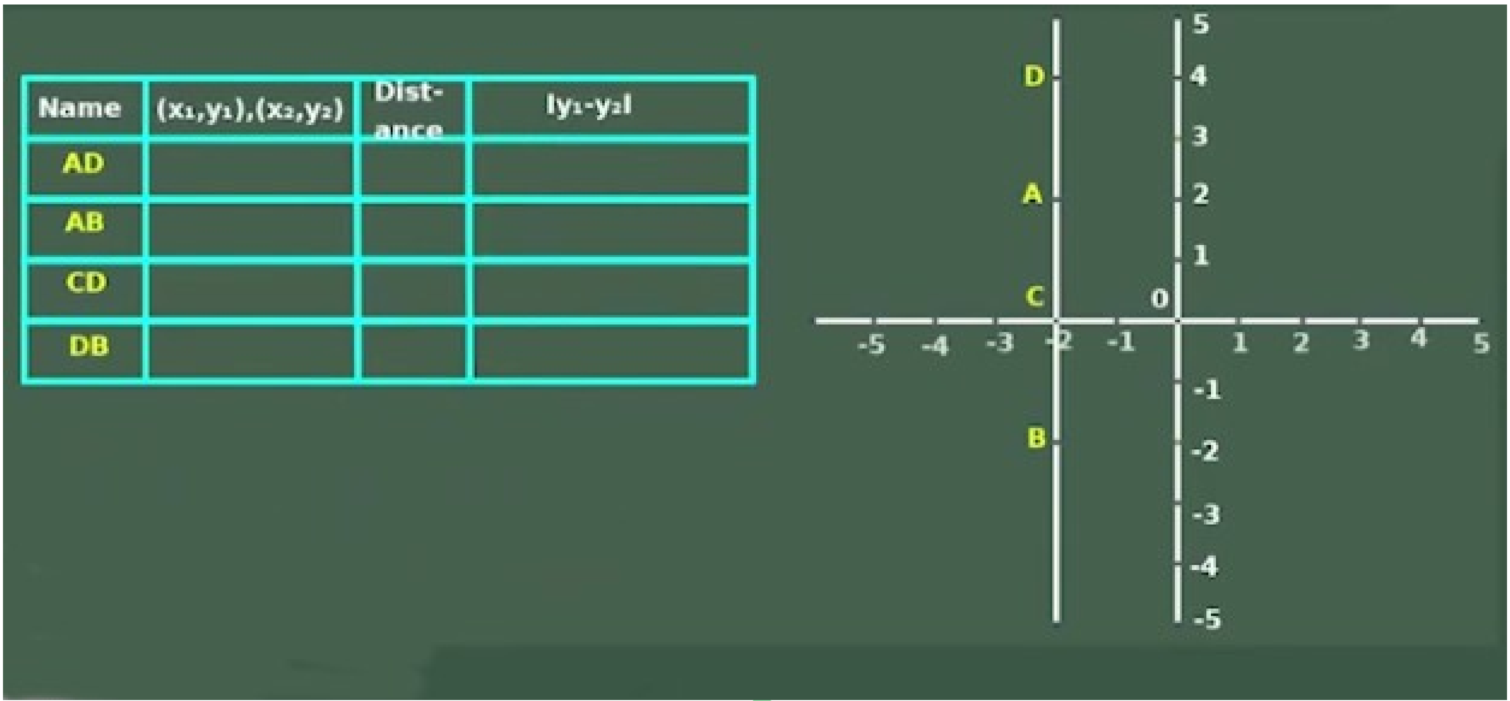
Note:

The x coordinates of any point on the y axis is 0. Therefore, any point on the y axis can be written as (0,y). Eg. $(0,y_1)$, $(0,y_2)$,$(0,y_3)$, . . .

If $(0,y_1)$, $(0,y_2)$ are two points on the y axis, then the distance between these two points = $\lvert y_1 - y_2 \rvert$

Activity

In the figure, find the coordinates of A, B, C and D. Find the distance between; A and D(AD), A and B(AB), C and D(CD), D and B(DB). Also find $|y_1 - y_2|$ and complete the table.



Name	$(x_1,y_1),(x_2,y_2)$	Dist-ance	$\lvert y_1-y_2\rvert$
AD			
AB			
CD			
DB			

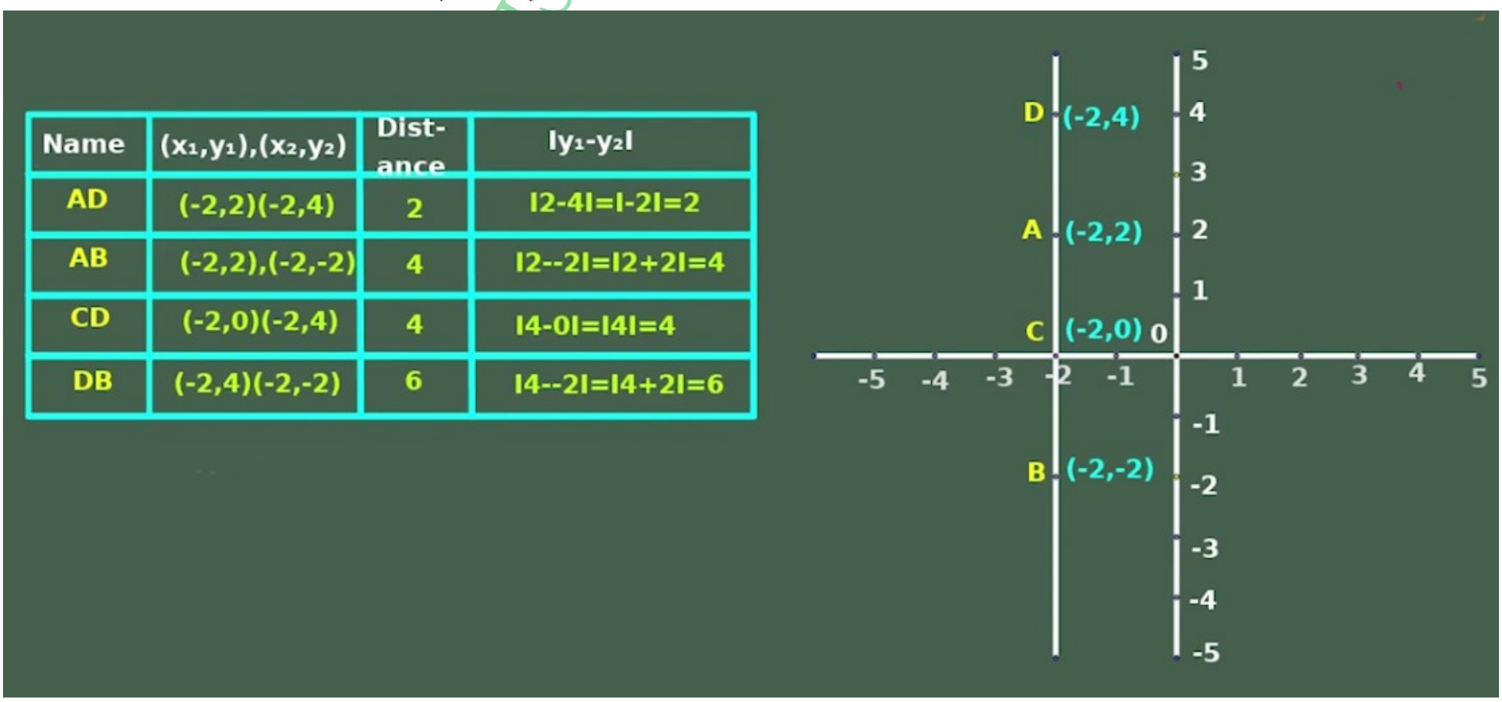
Answer

Coordinates of A = (-2,2)

Coordinates of B = (-2,-2)

Coordinates of C = (-2,0)

Coordinates of D = (-2,4)



Name	$(x_1,y_1),(x_2,y_2)$	Dist-ance	$\lvert y_1-y_2\rvert$
AD	(-2,2)(-2,4)	2	I2-4I=I-2I=2
AB	(-2,2),(-2,-2)	4	I2--2I=I2+2I=4
CD	(-2,0)(-2,4)	4	I4-0I=I4I=4
DB	(-2,4)(-2,-2)	6	I4--2I=I4+2I=6

Note:

The x coordinates of points on a line parallel to the y axis are equal. Therefore, any point on a line parallel to the y axis can be written as (k,y). Eg. (k,y_1), (k,y_2),(k,y_3), . . .

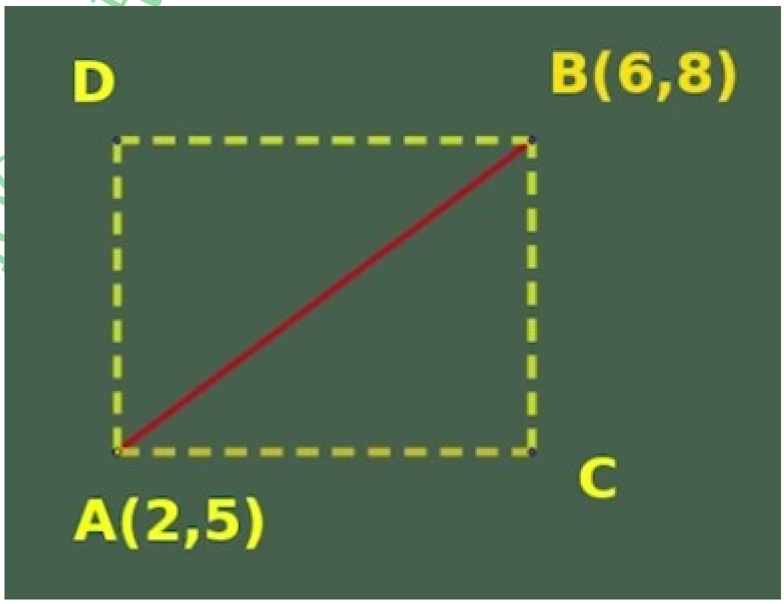
If (k,y_1), (k,y_2) are two points on a line parallel to the y axis, then the distance between these two points = $|y_1 - y_2|$

Distance between two points not parallel to the axes

Activity

Find the distance between A(2,5) and B(6,8).

Answer



To find the distance between A and B, draw lines parallel to both axes through A and B.

Coordinates of C = (6,5)

AC = | 6 - 2 | = 4

BC = | 8 - 5 | = 3

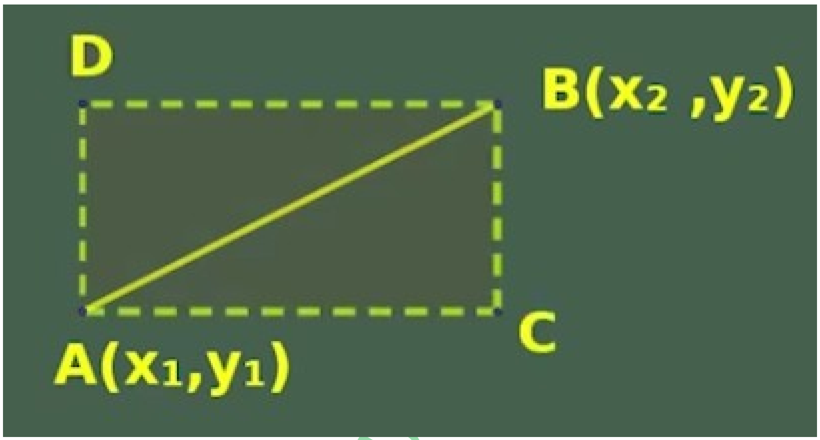
In the right triangle AB is the hypotenuse

$$AB = \sqrt{AC^2+BC^2} = \sqrt{4^2+3^2} = \sqrt{16+9}$$

$$= \sqrt{25} = 5$$

Activity

If $A(x_1,y_1)$, $B(x_2,y_2)$ be any two points on a line. What is the length of AB



Answer

To find the distance between A and B, draw lines parallel to both axes through A and B.

Coordinates of C = (x_2,y_1)

$AC = |x_1-x_2|$

$BC = |y_1-y_2|$

In the right triangle AB is the hypotenuse

$$AB = \sqrt{AC^2+BC^2}$$

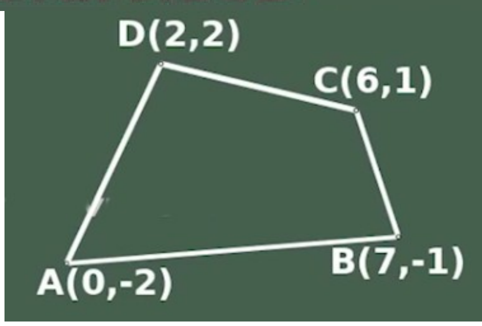
$$AB = \sqrt{(|x_1-x_2|)^2+(|y_1-y_2|)^2}$$

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

If $A(x_1,y_1)$,$B(x_2,y_2)$ be any two points on a plane, then distance $AB = \sqrt{(x_1-x_2)^2+(y_1-y_2)^2}$

Activity

Calculate the lengths of the sides and diagonals of the quadrilateral ABCD



Answer

We have to find the length of AB, BC, CD, AD, AC and BD.

$$AB = \sqrt{(0-7)^2+(-2--1)^2} = \sqrt{(-7)^2+(-2+1)^2}$$

$$= \sqrt{(-7)^2+(-1)^2} = \sqrt{49+1}$$

$$= \sqrt{50} = 5\sqrt{2}$$

$$BC = \sqrt{(6-7)^2+(1--1)^2} = \sqrt{(-1)^2+(2)^2}$$

$$= \sqrt{1+4} = \sqrt{5}$$

$$CD = \sqrt{(2-6)^2+(2-1)^2} = \sqrt{(-4)^2+(1)^2}$$

$$= \sqrt{16+1} = \sqrt{17}$$

$$AD = \sqrt{(2-0)^2+(2--2)^2} = \sqrt{(2)^2+(4)^2}$$

$$= \sqrt{4+16} = \sqrt{20}$$

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

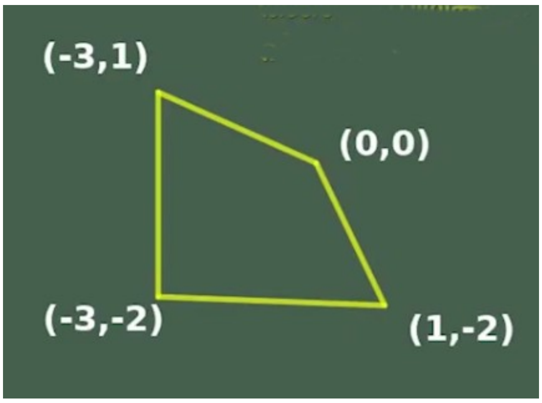
$$= \sqrt{36+9} = \sqrt{45}$$

$$BD = \sqrt{(7-2)^2+(-1-2)^2} = \sqrt{(5)^2+(-3)^2}$$

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

Assignment

Calculate the lengths of sides and diagonals of the given quadrilateral.



Activity

Find the distance of the following points from the origin.

a) (3,4) b) (-6,8) c) (-4,-1) d) (a,b) e) (x,y)

Answer

The coordinates of origin is (0,0)

a) The distance of (3,4) from (0,0) $= \sqrt{(3-0)^2+(4-0)^2}$

$= \sqrt{3^2+4^2}$

$= \sqrt{9+16}$

$= \sqrt{25} = \mathbf{5}$

b) The distance of (-6,8) from (0,0) $= \sqrt{(-6-0)^2+(8-0)^2}$

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

$= \sqrt{36+64}$

$= \sqrt{100} = \mathbf{10}$

c) The distance of (-4,-1) from (0,0) $= \sqrt{(-4-0)^2+(-1-0)^2}$

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

$= \sqrt{16+1}$

$= \sqrt{17}$

d) The distance of (a,b) from (0,0) = $\sqrt{(a-0)^2+(b-0)^2}$

$= \sqrt{a^2+b^2}$

e) The distance of (x,y) from (0,0) = $\sqrt{(x-0)^2+(y-0)^2}$

$= \sqrt{x^2+y^2}$

Note:

Distance of any point (x,y) from the origin = $\sqrt{x^2+y^2}$

Activity

A circle of radius 10 cm is drawn with the origin as centre. a) Check whether each of the points with coordinates (6,9),(5,9),(6,8),(-6,7) is inside ,outside or on the circle
b) Write coordinatess of 8 points on this circle

Answer

a) Radius of the circle = 10 unit

Centre is origin (0,0)

If the distance from the centre is 10, it is a point on the circle.

If the distance from the centre is more than 10, it is a point outside the circle.

If the distance from the centre is less than 10, it is a point outside the circle.

The distance of (6,9) from (0,0) $= \sqrt{6^2+9^2}$

$= \sqrt{36+81}$

$= \sqrt{117} > 10$

Therefore, (6,9) is a point outside the circle.

The distance of (5,9) from (0,0) $= \sqrt{5^2+9^2}$

$= \sqrt{25+81}$

$= \sqrt{106} > 10$

Therefore, (5,9) is a point outside the circle.

The distance of (6,8) from (0,0) $= \sqrt{6^2+8^2}$

$= \sqrt{36+64}$

$= \sqrt{100} = 10$

Therefore, (6,8) is a point on the circle.

The distance of (-6,7) from (0,0) $= \sqrt{(-6)^2+7^2}$

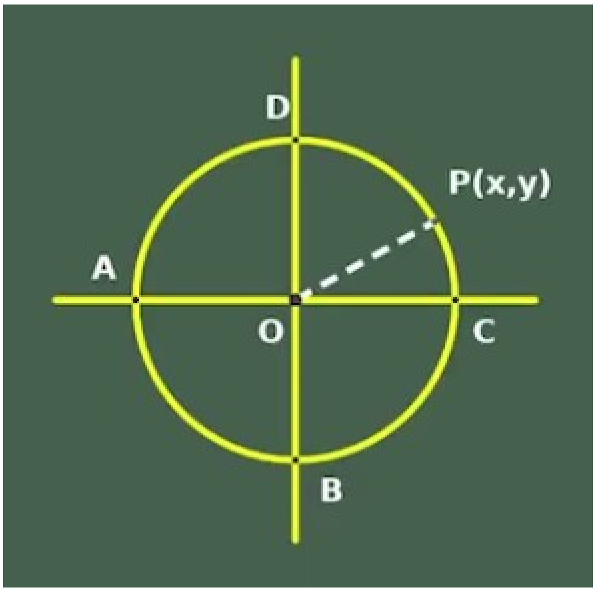
$= \sqrt{36+49}$

$= \sqrt{85} < 10$

Therefore, (-6,7) is a point inside the circle.

b) Radius of the circle = 10

Therefore, OA = OB = OC = OD = 10



The y coordinate of any point on the x axis is 0.

The x coordinate of any point on the y axis is 0.

Therefore, Coordinates of A = (-10,0)

Coordinates of B = (0,-10)

Coordinates of C = (10,0)

Coordinates of D = (0,10)

Let P(x,y) is a point on the circle.

Then $x^2 + y^2 = 10^2$

$x^2 + y^2 = 100$

$64 + 36 = 100$

That is, $8^2 + 6^2 = 100$

$x = 8, \quad y = 6$

Now we can write four points on the circle.

They are (8,6), (-8,6), (-8,-6), (8,-6)

Also, $36 + 84 = 100$

That is, $6^2 + 8^2 = 100$

$x = 6, \quad y = 8$

Now we can write another four points on the circle.

They are (6,8), (-6,8), (-6,-8), (6,-8).

Note:

Similarly we can find so many points on the circle.

Eg: $1 + 99 = 100$

That is, $1^2 + (\sqrt{99})^2 = 100$

Here we can take, $x = 1, \; y = \sqrt{99}$ or $x = \sqrt{99}, \; y = 1$

Using this we can write another 8 points on the circle.

Also, $2 + 98 = 100$

That is, $(\sqrt{2})^2 + (\sqrt{98})^2 = 100$

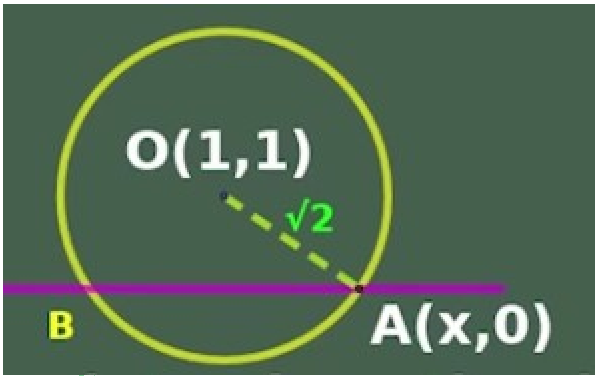
Here we can take, $x = \sqrt{2}, \; y = \sqrt{98}$ or $x = \sqrt{98}, \; y = \sqrt{2}$

Using this we can write another 8 points on the circle.

Activity

Find the coordinates of the points where a circle of radius √2, centred on the point with coordinates (1,1) cuts the axes.

Answer



Radius of the circle = √2

O(0,1) is the centre of the circle.

Let A(x,0) is the point where the circle cuts the x axis.

$OA = \sqrt{2}$

$OA^2 = (\sqrt{2})^2 = 2$

That is, $(x-1)^2 + (0-1)^2 = 2$

$(x-1)^2 + (-1)^2 = 2$

$(x-1)^2 + 1 = 2$

$(x-1)^2 = 2 - 1 = 1$

Therefore, $x - 1 = \pm 1$

$x = 1 \pm 1 = 1 + 1$ or $1-1$

$= 2, 0$

If x = 2, the point is (2,0)

If x = 0, the point is (0,0)

Therefore, the circle cut the x axis at (0,0) and (2,0)

Let A(0,y) is the point where the circle cuts the y axis.

$OA = \sqrt{2}$

$OA^2 = (\sqrt{2})^2 = 2$

That is, $(0-1)^2 + (y-1)^2 = 2$

$(-1)^2 + (y-1)^2 = 2$

$1 + (y-1)^2 = 2$

$(y-1)^2 = 2 - 1 = 1$

Therefore, $y - 1 = \pm 1$

$y = 1 \pm 1 = 1 + 1 \text{ or } 1-1$

$= 2, 0$

If $y = 2$, the point is $(0,2)$

If $y = 0$, the point is $(0,0)$

Therefore, the circle cut the y axis at $(0,0)$ and $(0,2)$

Assignment

Find the points on the x-axis which are at a distance of 5units from (3,4)

(Based on the online class on 04-12-2020)

Assignment on 03-12-2020

Find the points on the x-axis which are at a distance of 5units from (3,4)

Answer

Let the coordinates of the point at 5 unit distance from (3,4) on the x axis is (x,0).

Therefore, $(x-3)^2 + (0-4)^2 = 5^2$

$(x-3)^2 + (-4)^2 = 25$

$(x-3)^2 + 16 = 25$

$(x-3)^2 = 25 - 16 = 9$

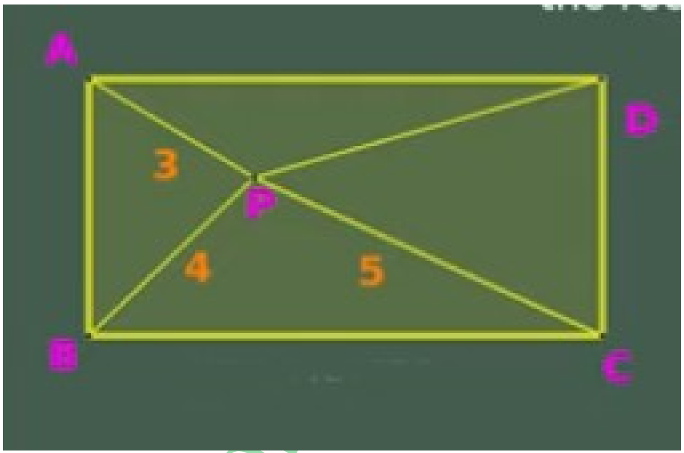
$x - 3 = \pm 3$

Therefore, $x = 3 \pm 3 = 3 + 3 \text{ or } 3 - 3$

$= 6, 0$

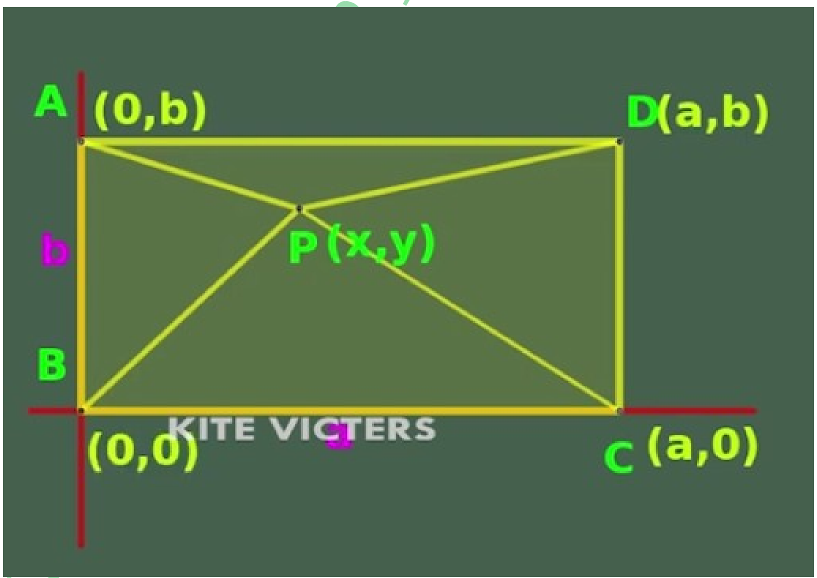
Therefore, The coordinates of the point at 5 unit distance from (3,4) on the x axis are (0,0) and (6,0)

Activity



Consider the rectangle ABCD. P is a point inside the rectangle. PA = 3 cm, PB = 4 cm, PC = 5 cm. Find PD.

Answer



Consider a rectangle of length a unit and breadth b unit. Let, P(x,y) is a point inside the rectangle. Draw the axes through B, with BC on the x axis and BA on the y axis. Therefore,

Coordinates of B = (0,0)
Coordinates of C = (a,0)
Coordinates of A = (0,b)
Coordinates of D = (a,b)

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

$PA^2 = (x - 0)^2 + (y - b)^2$
$= x^2 + (y - b)^2$
$PC^2 = (x - a)^2 + (y - 0)^2$
$= (x - a)^2 + y^2$
$PA^2 + PC^2 = x^2 + (y - b)^2 + (x - a)^2 + y^2$
$= x^2 + y^2 + (x - a)^2 + (y - b)^2$

So, $PA^2 + PC^2 = PB^2 + PD^2$

Sum of the squares of distance from any point inside a rectangle to each pair of opposite corners are equal.

Now we can find the distance PD

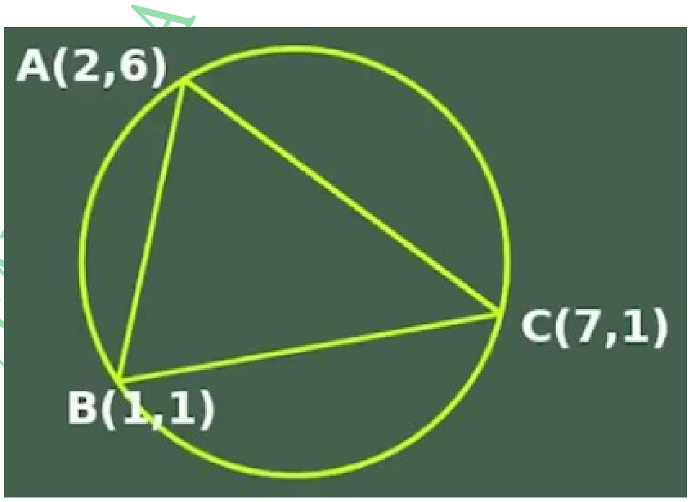
$4^2 + PD^2 = 3^2 + 5^2$

$16 + PD^2 = 9 + 25$

$PD^2 = 9 + 25 – 16 = 34 – 16 = 18$

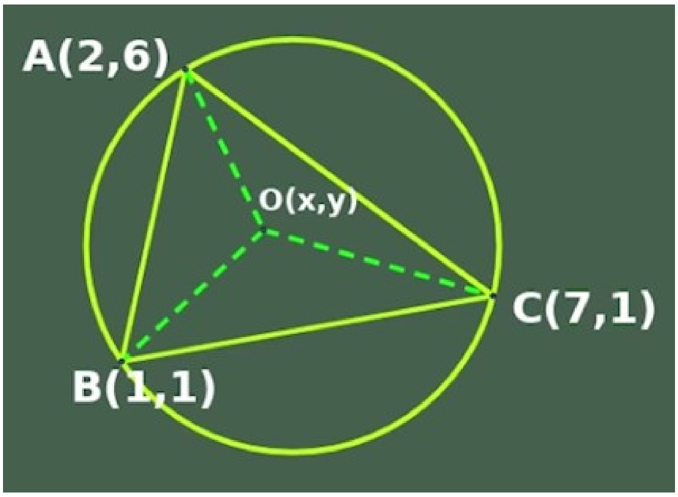
Therefore, $PD = \sqrt{18} = 3\sqrt{2}$

Activity



The coordinates of the vertices of a triangle are (2,6), (1,1), (7,1). Find the coordinates of the centre of its circumcircle and the circumradius.

Answer



Let O(x,y) be the centre of the circumcircle.

Therefore, OA = OB = OC

$OA^2 = (x - 2)^2 + (y - 6)^2$

$= x^2 - 2\times x\times 2 + 2^2 + y^2 - 2\times y\times 6 + 6^2$

$= x^2 - 4x + 4 + y^2 - 12y + 36$

$= x^2 + y^2 - 4x – 12y + 40$

$OB^2 = (x - 1)^2 + (y - 1)^2$

$= x^2 - 2x + 1^2 + y^2 - 2y + 1^2$

$= x^2 - 2x + 1 + y^2 - 2y + 1$

$= x^2 + y^2 - 2x – 2y + 2$

$$OC^2 = (x - 7)^2 + (y - 1)^2$$
$$= x^2 - 14x + 7^2 + y^2 - 2y + 1^2$$
$$= x^2 - 14x + 49 + y^2 - 2y + 1$$
$$= x^2 + y^2 - 14x - 2y + 50$$

$$OA^2 = x^2 + y^2 - 4x - 12y + 40$$
$$OB^2 = x^2 + y^2 - 2x - 2y + 2$$
$$OC^2 = x^2 + y^2 - 14x - 2y + 50$$

$$OA^2 = OB^2$$

Therefore,

$$x^2 + y^2 - 4x - 12y + 40 = x^2 + y^2 - 2x - 2y + 2$$
$$x^2 - x^2 + y^2 - y^2 - 4x + 2x - 12y + 2y + 40 - 2 = 0$$
$$-4x + 2x - 12y + 2y + 40 - 2 = 0$$
$$-2x - 10y + 38 = 0$$
$$2x + 10y = 38$$
$$x + 5y = 19 \text{ .... } 1$$

$$OA^2 = OB^2$$
$$x^2 + y^2 - 2x - 2y + 2 = x^2 + y^2 - 14x - 2y + 50$$
$$x^2 - x^2 + y^2 - y^2 - 2x + 14x - 2y + 2y + 2 - 50 = 0$$
$$-2x + 14x - 2y + 2y + 2 - 50 = 0$$
$$12x - 48 = 0$$
$$12x = 48$$
$$x = \frac{48}{12} = 4$$

Substituting x = 4 in first equation, we get

$$4 + 5y = 19$$
$$5y = 19 - 4 = 15$$
$$y = \frac{15}{5} = 3$$

Therefore, Coordinates of the circumcentre = (4,3)

$$OA^2 = (4 - 2)^2 + (3 - 6)^2 = (2)^2 + (-3)^2$$

$$= 4 + 9 = 13$$

Circumradius = $\sqrt{13}$

Assignment

The coordinates of the vertices of a triangle are (1,2), (2,3), (3,1). Find the coordinates of the centre of its circumcircle and the circumradius.

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