MODULE - 1

COORDINATE GEOMETRY

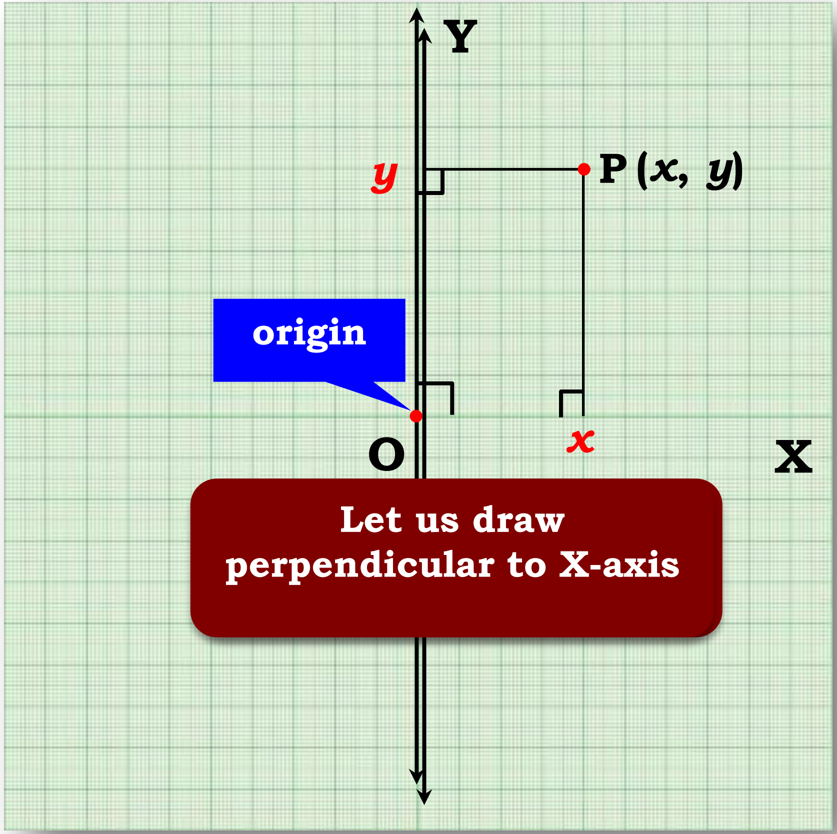
- Introduction
- Distance formula

What is Coordinate Geometry ?

- **Coordinate Geometry is an algebraic approach to geometry.**

- **It is a branch of mathematics which shows symbolic relationship between algebra and geometry.**

In Class IX, you have studied that to locate the position of a point in a plane, we require a pair of coordinate axes.



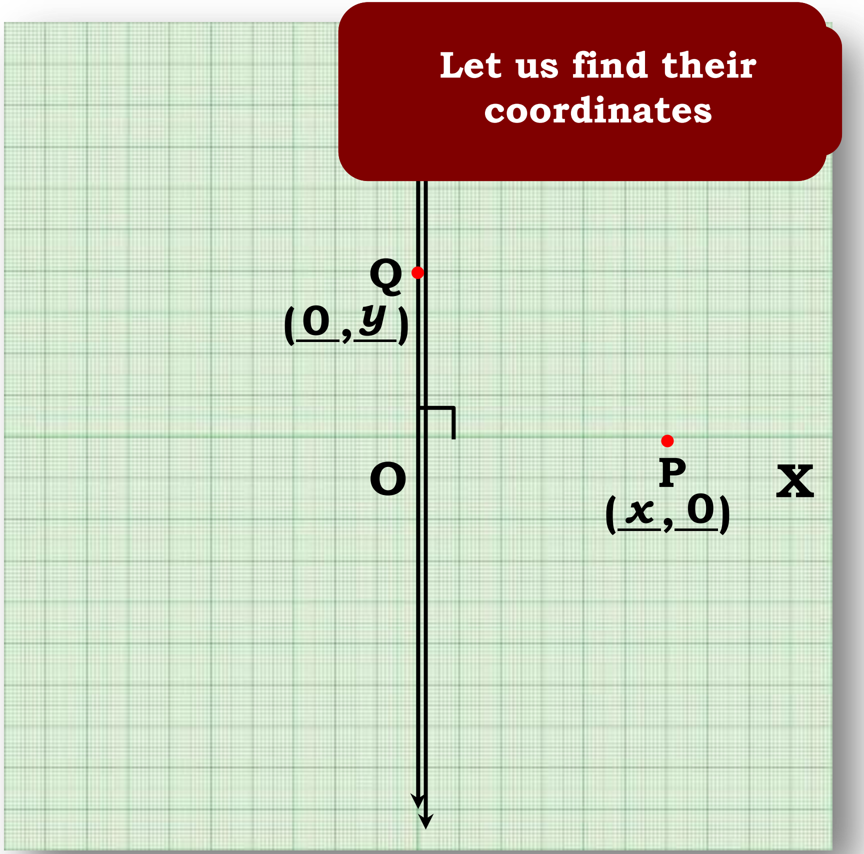
The horizontal axis is called x-axis and the vertical axis is called y-axis.

The intersection point of both the axes is … an… angle.

Now, let us understand its X-coordinate and Y-coordinate

The number associated on the foot of the perpendicular on X-axis is called X-coordinate or abscissa.

The number associated on the foot of the perpendicular on Y-axis is called Y-coordinate or ordinate.



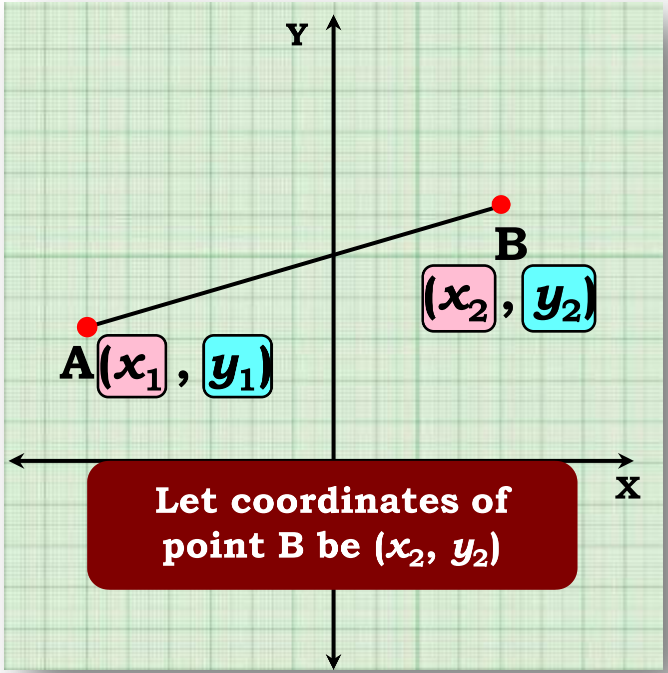
The coordinates of a point on the X-axis are of the form $(x, 0)$,

and of a point on the Y-axis are of the form $(0, y)$.

Let us learn how to find the distance between the two points whose coordinates are given,

DISTANCE FORMULA

Distance formula is used to find the distance between two points in a co-ordinate plane.



The distance between two points A(x_1, y_1) and B(x_2, y_2) in a rectangular coordinate system is given by

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

Q. Find the distance between the following pair of points :

(i) A (2, 3), B (4, 1)

Sol. $x_1 = 2$, $y_1 = 3$, $x_2 = 4$, $y_2 = 1$

By distance formula,

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

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

$$\therefore \quad AB = \sqrt{(2)^2 + (-2)^2}$$

$$\therefore \quad AB = \sqrt{4 + 4}$$

$$\therefore \quad AB = \sqrt{8}$$

$$\therefore \quad \boxed{AB = 2\sqrt{2} \text{ units}}$$

Let us substitute the values.

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

Let the coordinates of A be (x_1, y_1).

MODULE - 2

COORDINATE GEOMETRY

- **Sums based on Distance formula**

Q. Find the distance between the following pair of points :

(ii) A (–5, 7), B (–1, 3)

Sol. $x_1 = -5$, $y_1 = 7$, $x_2 = -1$, $y_2 = 3$

By distance formula,

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

$$\therefore \quad AB = \sqrt{[-1 - (-5)]^2 + (3 - 7)^2}$$

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

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

$$\therefore \quad AB = \sqrt{16 + 16}$$

$$\therefore \quad AB = \sqrt{32} = \sqrt{16 \times 2}$$

$$\therefore \quad \boxed{AB = 4\sqrt{2} \text{ units}}$$

Let us substitute the values.

What is the formula to find distance between two points ?

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

Q. Find the distance between the following pair of points :

(iii) A (a, b), B $(-a, -b)$

] Let us substitute the ... be values.

What is the formula to find distance between two points ?

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

Sol. $x_1 = a,\ y_1 = b,\ x_2 = -a,\ y_2 = -b$

By distance formula,

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

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

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

$$\therefore AB = \sqrt{4a^2 + 4b^2}$$

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

$$\therefore \boxed{AB = 2\sqrt{a^2 + b^2}}$$

Q. Find the distance between the points (0,0) and (36,15).

Can you find distance between the two towns A and B

Sol. For A (0,0) and B (36,15)

$x_1 = 0$, $y_1 = 0$, $x_2 = 36$, $y_2 = 15$

By distance formula

Let the coordinates of A be (x_1, y_1).

AB

∴ AB

What is the formula to find distance between two points ?

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

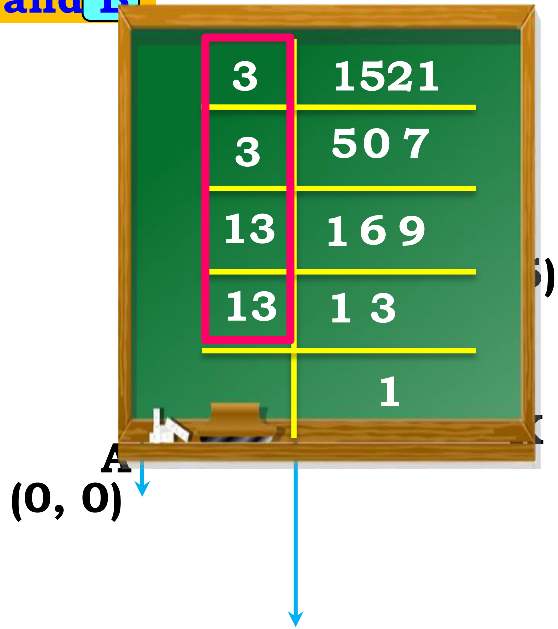
∴ AB

∴ AB = $\sqrt{1296 + 225}$

∴ AB = $\sqrt{1521} = \sqrt{\underline{3 \times 3} \times \underline{13 \times 13}}$

∴ AB = $3 \times 13 = 39$

∴ Distance between the two town A and B is 39 km



Q. Check whether (5, –2), (6, 4) and (7, –2) are the vertices of an isosceles triangle.

$x_2 = 7$, $y_2 = -2$

Sol. Let three points be A (5, –2), B (6, 4), C (7, –2) respectively.

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

x_1

A triangle is isosceles if any two sides are equal

Let us find AC

$\ldots)^2 + [-2-(-2)]^2$

$x_1 = 5$, $x_1 = 6$, $y_1 = 4$, $x_2 = 7$, $y_2 = -2$

$\therefore AB = \sqrt{(1)^2 + (6)^2}$

AC =

What is the formula to find distance between two points?

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

What is the formula to find distance between two points ?

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

$BC = \sqrt{(7-6)^2 + (-2-4)^2}$

AC =

AC

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

= 2

$\therefore BC = \sqrt{1 + 36}$

$\therefore \boxed{BC = \sqrt{37}}$

As AB = BC,
points A, B and C are the vertices of an isosceles triangle.

MODULE - 3

COORDINATE GEOMETRY

- Sum based on Distance formula

Q. In a classroom, 4 friends are seated

Champa and Chameli walk into the c ... utes

Champa asks Chameli , "Don't you th ... agrees.

Using distance formula, find which o

What is the formula to find distance between two points ?

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

$x_1 = 3$, $y_1 = 4$ $x_2 = 6$, $y_2 = 7$

Sol. The co-ordinates of point

A (3, 4) , B (6, 7) , C (9, 4) , D (6, 1)

Let us find AB

Let the coordinates of A be (x_1, y_1).

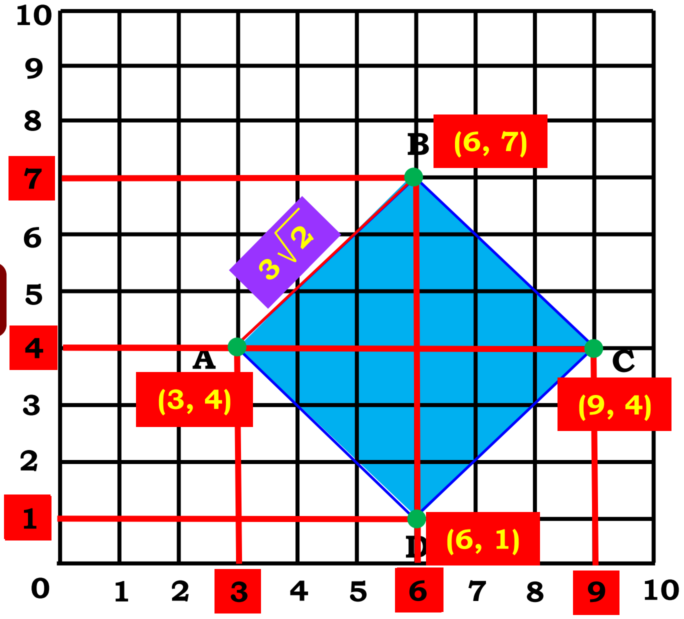
$\therefore$ AB = $\sqrt{(6-3)^2 + (7-4)^2}$

$\therefore$ AB = $\sqrt{(3)^2 + (3)^2}$

$\therefore$ AB = $\sqrt{18}$

$\therefore$ AB = $\sqrt{9 \times 2}$

$\therefore$ AB = $3\sqrt{2}$ ...(i)



Q. In a classroom, 4 friends are sea[...]wn Champa and Chameli walk into t[...]minutes Champa asks Chameli , "Don't y[...]isagrees. Using distance formula, find which of them is correct.

What is the formula to find distance between two points ?

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

$x_1 = 6$, $y_1 = 7$

$x_2 = 9$, $y_2 = 4$

Sol. The co-ordinat[...] of poi[...]

A (3, 4) , B (6, 7) , C (9, 4) , D (6, 1)

Let us find BC

Let the coordinates of B be (x_1, y_1).

$\therefore$ BC $= \sqrt{(9-6)^2 + (4-7)^2}$

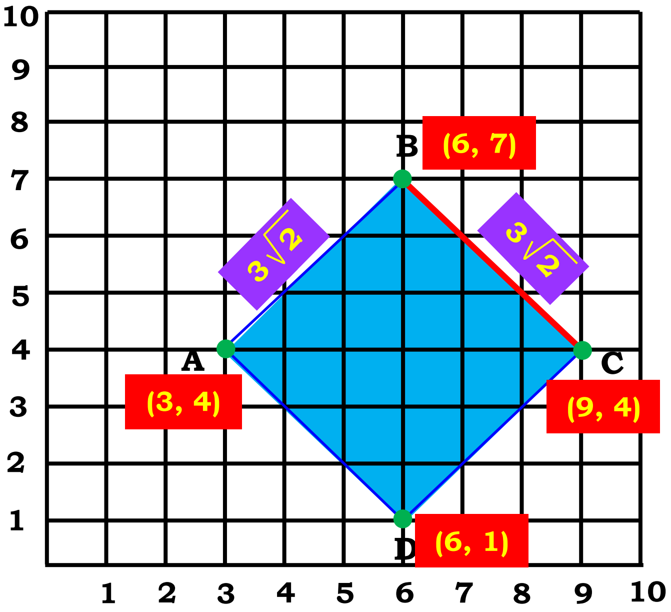
$\therefore$ BC $= \sqrt{3^2 + (-3)^2}$

$\therefore$ BC $=$

$\therefore$ BC $=$

$\therefore$ BC $= \sqrt{9 \times 2}$

$\therefore$ BC $= 3\sqrt{2}$ ...(ii)



Q. In a classroom, 4 friends are seate ... n
Champa and Chameli walk into the ... inutes
Champa asks Chameli , "Don't you ... sagrees.
Using distance formula, find which of them is correct.

What is the formula to find distance between two points ?

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

$x_1 = 9,\ y_1 = 4$ $\quad x_2 = 6,\ y_2 = 1$

Sol. The co–ordinates of point

A (3, 4) , B (6, 7) , C (9, 4) , D (6, 1)

$\therefore$ CD = $\sqrt{(6-9)^2 + (1-4)^2}$

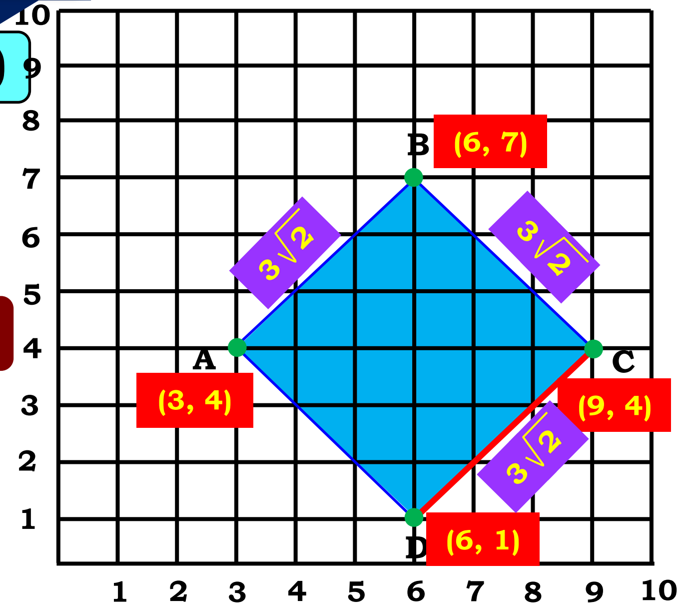
Let the coordinates of C be (x_1, y_1).

Let us find CD

$\therefore$ CD = $\sqrt{9 + 9}$

$\therefore$ CD = $\sqrt{18}$

$\therefore$ CD = $3\sqrt{2}$ ...(iii)



Q. In a classroom, 4 friends a... s shown
Champa and Chameli walk ... a few minutes
Champa asks Chameli, "Do ... ameli disagrees.
Using distance formula, find which of them is correct.

What is the formula to find distance between two points ?

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

$x_1 = 3$, $y_1 = 4$ $x_2 = 6$, $y_2 = 1$

Sol. ... ates of poi...

A (3, 4), B (6, 7), C (9, 4), D (6, 1)

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

$\therefore$ AD

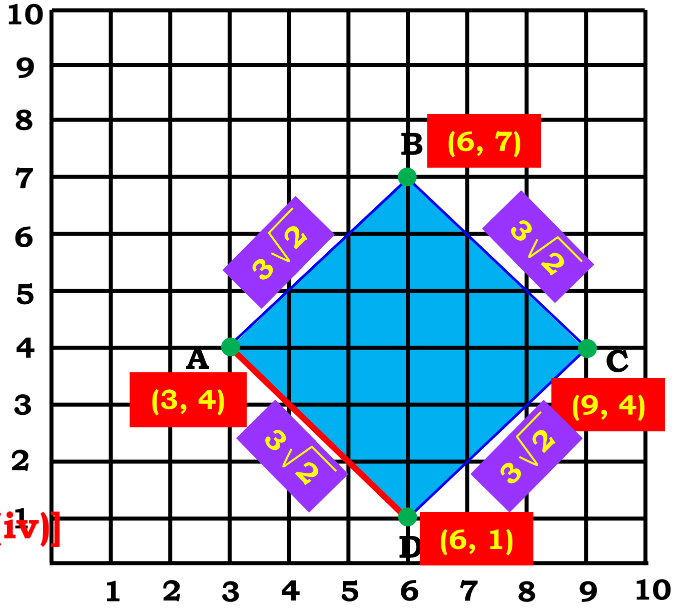
Let the coordinates of A be (x_1, y_1).

$\therefore$ AD $= \sqrt{9 + 9} = \sqrt{18}$

$\therefore$ AD $= 3\sqrt{2}$ ...(iv)

$\therefore$ AB = BC = CD = AD [from (i), (ii), (iii), (iv)]

$\therefore$ □ABCD is rhombus [by definition]



Q. In a classroom, 4 friends a … D as shown Champa and Chameli walk … or a few minutes Champa asks Chameli , "D … Chameli disagrees. Using distance formula, find which of them …

What is the formula to find distance between two points ?

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

$x_1 = 3$, $y_1 = 4$ | $x_1 = 6$, $y_1 = 7$ | $x_2 = 9$, $y_2 = 4$ | $x_2 = 6$, $y_2 = 1$

Sol. The co-ordinates of points …

A (3, 4), B (6, 7), C (9, 4), D (6, 1)

Let the coordinates of D be (x_2, y_2).

… + $(4 - 4)^2$

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

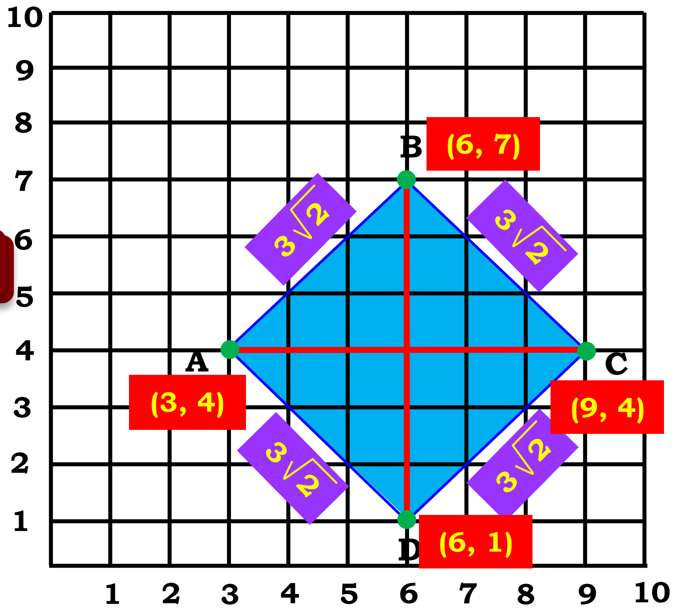
Let us find diag BD

Let the coordinates of A be (x_1, y_1).

… $7)^2$

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

$= \sqrt{36} = 6$



Q. In a classroom, 4 friends are seated at the points A, B, C and D as shown Champa and Chameli walk into the class and after observing for a few minutes Champa asks Chameli , "Don't you think ABCD is a square?" Chameli disagrees. Using distance formula, find which of them is correct.

Sol. The co–ordinates of point

A (3, 4) , B (6, 7) , C (9, 4) , D (6, 1)

AB = BC = CD = DA and

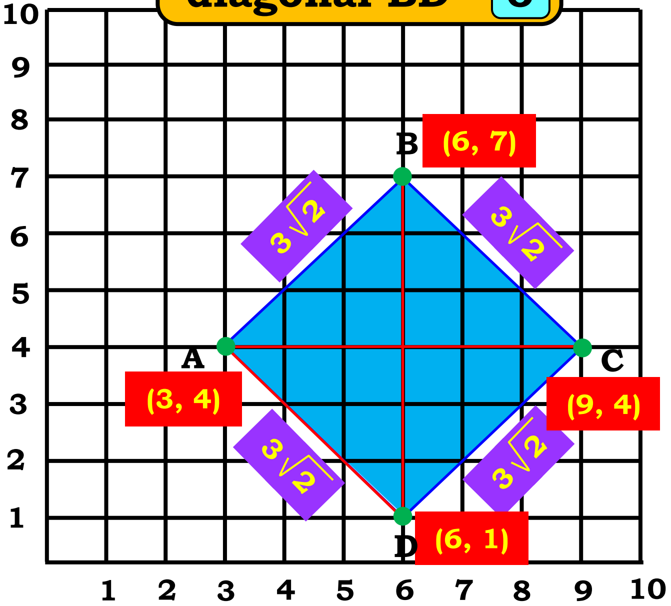
Diagonal AC = Diagonal BD

∴ □ ABCD is a square

Hence, Champa is correct

diagonal AC = 6

diagonal BD = 6



MODULE - 4

COORDINATE GEOMETRY

- Sum based on Distance formula

$x_1 = 1$, $y_1 =$ $x_1 = -1$, $y_1 = -2$, $x_2 = 1$, $y_2 = 0$ $_1 = -1$, $y_1 = 2$, $x_2 = -3$, $y_2 = 0$

(i) (–1, –2) , (1, 0) , (–3, 0)

Sol. Let A (–1, –2), B (1, 0) , C (–1, 2), D (–3, 0)

What is the formula to find distance between two points ?

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

$\therefore$ AB $= \sqrt{[1 - (-1)]^2 + [0 - (-2)]^2}$

$\therefore$ AB $= \sqrt{8}$

$\therefore$ AB $= \boxed{2\sqrt{2}}$ ...(i)

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

$\therefore$ BC $= \sqrt{(-2)^2 + (2)^2}$

$\therefore$ BC $= \sqrt{4 + 4}$

Let us find CD

What is the formula to find distance between two points ?

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

$\therefore$ CD $= \sqrt{[-3 - (-1)]^2 + (0 - 2)^2}$

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

$\therefore$ CD $= \sqrt{4 + 4}$

$\therefore$ CD $= \sqrt{8}$

$\therefore$ CD $= \boxed{2\sqrt{2}}$ ...(iii)

Q. $x_1 = -1, y_1 = -2$ of quadrilateral f $x_2 = -3, y_2 = 0$ by the

s, and give reaso wer.

Sol. A (–1, –2), B (1, 0) , C (–1, 2), D (–3, 0)

$AB = 2\sqrt{2}$ ...(i)

$BC = 2\sqrt{2}$ ...(ii)

$AC = 2\sqrt{2}$ ...(iii)

Let the coordinates of D be (x_2, y_2)

What is the formula to find distance between two points ?

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

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

$\therefore$ AD $= \sqrt{4 + 4}$

$\therefore$ AD $= \sqrt{8}$

$\therefore$ $\boxed{AD = 2\sqrt{2}}$ ...(iv)

AB = BC = AC = AD [From (i), (ii), (iii) and (iv)]

$\therefore$ □ABCD is a Rhombus.

$x_1 = -1, y_1$ | $x_1 = 1, y_1 = 0$ | $= -1, y_2 = 2$ | $x_2 = -3, y_2 = 0$

the

r.

AB = BC = AC = AD

Sol. A (–1, –2), B (1, 0), C (–1, 2), D (–3, 0)

□ABCD is a Rhombus.

What is the formula to find distance between two points ?

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

$\therefore$ AC = $\sqrt{0 + (4)^2}$

$\therefore$ AC = $\sqrt{16}$

$\therefore$ **AC = 4**

What is the formula to find distance between two points ?

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

BD =

$\therefore$ BD = $\sqrt{16}$

$\therefore$ **BD = 4**

BD =

In □ ABCD,

AB = BC = CD = AD and

Diagonal AC = Diagonal BD

Hence, □ ABCD is a square

MODULE -5

COORDINATE GEOMETRY

- **Sum based on Distance formula**

Q. Name the type of quadrilateral formed, if any, by the following points, and give reasons for your Answer.

$x_1 = 4,\ y$ $x_1 = 7,\ y_1 = 6$ x_2 $x_1 = 4,\ y_1 = 3$ $4,\ y_2 = 3$

Sol. Let A (4, 5), B (7, 6), C (4, 3), D (1, 2)

$x_2 = 1,\ y_2 = 2$

What is the formula to find distance between two points ?

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

$\therefore$ AB = $\sqrt{(7 - \ldots}$

AB = $\sqrt{3^2 + 1^2}$

What is the formula to find distance between two points ?

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

BC = $\sqrt{(4 - 7)^2 + (3 - 6)^2}$

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

$\therefore$ BC = $\sqrt{9 + 9}$

$\therefore$ BC = $\sqrt{18}$

$\therefore$ BC = $3\sqrt{2}$

CD = $\ldots 3)^2$

$\therefore$ CD = $\sqrt{9 + 1}$

$\therefore$ CD = $\sqrt{10}$

Q. Name the type of quadrilateral formed, if any, by the following points, and give reasons for your Answer.

(iii) (4, 5) , (7 $x_1 = 4$, $y_1 = 5$ 2)

$x_2 = 1$, $y_2 = 2$

AB = $\sqrt{10}$

BC = $3\sqrt{2}$

Soln. A (4, 5), B (7, 6), C (4, 3), D (1, 2)

$x_1 = 4$, $y_1 = 5$ (1 – 4) $x_2 = 4$, $y_2 = 3$,

What is the formula to find distance between two points ?

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

Let the coordinates of C be (x_2, y_2).

What is the formula to find distance between two points ?

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

$\therefore$ AD = $3\sqrt{2}$

$\therefore$ AC = $\sqrt{0^2 + (-2)^2}$

$\therefore$ AC = $\sqrt{4}$

$\therefore$ AC = 2

Q. Name the type of quadrilateral formed, if any, by the following poin[…] so[…]wer.

$x_1 = 7,$ $y_1 = 6$

$x_2 = 1,$ $y_2 = 2$

(iii) (4, 5) , (7, 6) , […] , (1, 2)

Soln. A (4, 5), B (7, 6), C (4, 3), D (1, 2)

AB	=	$\sqrt{10}$
BC	=	$3\sqrt{2}$
CD	=	$\sqrt{10}$
AD	=	$3\sqrt{2}$

Let the coordinates of D be (x_2, y_2).

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

What is the formula to find distance between two points ?

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

BD =

$\therefore$ $\sqrt{52}$

BD =

$\therefore$ $2\sqrt{13}$

BD =

As AB = CD and BC = AD and

diag AC ≠ diag BD

$\therefore$ □ ABCD is a parallelogram.

MODULE - 6

COORDINATE GEOMETRY

- Sum based on determining collinear points

Points A, B and C are collinear

$\therefore$ **AB + BC = AC**

Conversely,

IF sum of lengths of two smaller segments is equal to length of greater segment, Then Points are collinear.

Q. Dete $x_1 = -6$, $y_1 = -2$, $x_2 = 2$, $y_2 = 3$ whether the points (-6, -2), (2, ... nd (10, 8) are c...

What is the formula to find length of AB?

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

...ent then the points ...OLLINEAR.

Let A (– 6 , – 2)
B (2 , 3)
C (10 , 8)

Sol. A (–6, –2) | B (2, 3) | C

By distance formula,

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

Let the coordinates of B be (x_2, y_2).

$$= \sqrt{(2+6)^2 + (3+2)^2}$$

$$= \sqrt{(8)^2 + (5)^2}$$

$$= \sqrt{64 + 25}$$

$$\therefore \quad AB = \sqrt{89} \text{ units} \quad \ldots(i)$$

Q. **Determine, by d**

$x_1 = 2,$ $y_1 = 3,$ $x_2 = 10,$ $y_2 = 8$

points

(-6, -2), (2, 3) and (10, ... collinear.

$AB = \sqrt{89}$ units ...(i)

Sol. A (–6, –2) | B (2, 3) | C (10, 8)

What is the formula to find length of ... ?

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

By distance formula,

$$BC = \sqrt{(10 - 2)^2 + (8 - 3)^2}$$

$\therefore$ BC = ...

Let the coordinates of B be (x_1, y_1).

$\therefore$ ...

$\therefore$ $BC = \sqrt{89}$ units ...(ii)

Q. **Determin** $x_1 = -6,\ y_1 = -2$ **formula, whether the points (-6, -2), (2, 3) and (10, 8) are collinear.**

Sol.

A $(-6, -2)$

B $(2, 3)$

C $(10, 8)$ $x_2 = 10,\ y_2 = 8$

By distance formula,

Let the coordinates of C be

Let the coordinates of A be (x_1, y_1).

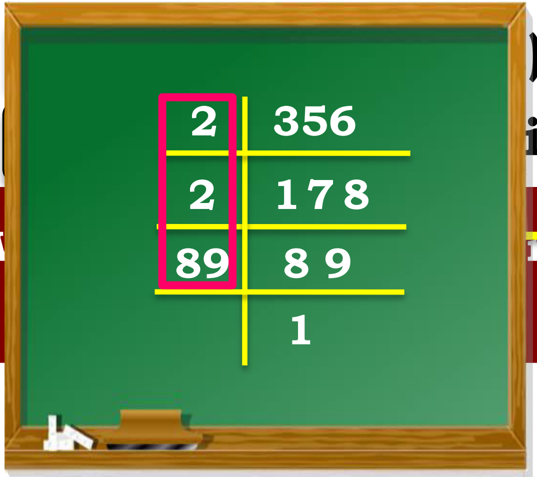
$\therefore \quad AC = \sqrt{(16)^2 + (10)^2}$

$\therefore \quad AC = \sqrt{256 + 100}$

$\therefore \quad AC = \sqrt{356}$

$\therefore \quad AC = \sqrt{4 \times 89}$

$\therefore \quad AC = 2\sqrt{89}$ units ...(iii)



Q. Determine, by distance formula, whether the points $(-6, -2)$, $(2, 3)$ and $(10, 8)$ are collinear.

Sol

$AB = \sqrt{89}$ units ...(i)

$BC = \sqrt{89}$ units ...(ii)

$AC = 2\sqrt{89}$ units ...(iii)

Let us add equation (i) and (ii).

So, L.H.S. and R.H.S. are equal.

Adding (i) and (ii), we get

$AB + BC = \sqrt{89} + \sqrt{89}$

$AB + BC = 2\sqrt{89}$ units ...(iv)

From (iii) and (iv),

$AB + BC = AC$

$\therefore$ Points A, B and C are collinear.

MODULE - 7

COORDINATE GEOMETRY

- Sum based on determining collinear points

Q. Determine whether the points (1, 5), (2, 3) and (–2 , –11) are collinear.

Sol. Let three points be A (1,5), B (2,3), C (–2,–11) respectively.

$x_1 = 1$, $y_1 = 5$

$x_2 = -2$, $y_2 = -11$

$y_1 = 3$, $x_2 = -2$, $y_2 = -11$

$= 2$, $y_2 = 3$

Let us find AB

What is the formula to find distance between two points ?

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

AB $= \sqrt{\quad 5)^2}$

$\therefore$ AB $= \sqrt{(1)^2 \quad}$

$\therefore$ AB $= \sqrt{1 + 4}$

$\therefore$

BC $= \sqrt{(-2 - 2)^2 + (-11 - 3)^2}$

$\therefore$ BC $= \sqrt{(-4)^2 + (-14)^2}$

$\therefore$ BC $= \sqrt{16 + 196}$

$\therefore$ BC $= \sqrt{212} = \sqrt{4 \times 53}$

$\therefore$ BC $= 2\sqrt{53}$

$)^2 + \quad (-11\ 5)^2$

What is the formula to find distance between two points ?

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

$\therefore \quad \sqrt{9 + 256}$

AC $=$

$\therefore \quad \sqrt{265}$

AC $=$

Since, AB + BC $\neq$ AC

$\therefore$ **Points A,B,C are not collinear.**

Thank You

MODULE - 8

COORDINATE GEOMETRY

- **Sum based on determining the type of Quadrilateral**

Q. Name the type of quadrilateral formed, if any, by the ... answer.

$x_1 = 3, y_1 = 1, x_2$ ...

$x_1 = 0, y_1 = 3, x_2 = -1, y_2 = -4$

(ii) ...

Sol. Let A (–3, 5), B (3, 1), C (0, 3), D (–1, –4)

Let th...

What is the formula to find distance between two points ?

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

What is the formula to find distance between two points ?

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

$\therefore \quad AB = \sqrt{[3 - (-3)]^2 + (1 - 5)^2}$

$\therefore \quad AB = \sqrt{52}$

$\therefore \quad \boxed{AB = 2\sqrt{13}}$

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

$\therefore \quad BC = \sqrt{(-3)^2 + (2)^2}$

$\therefore \quad BC = \sqrt{9 + 4}$

$\therefore \quad \boxed{BC = \sqrt{13}}$

$\therefore \quad CD = \sqrt{1 + 49}$

$\therefore \quad CD = \sqrt{50}$

$\therefore \quad \boxed{CD = 5\sqrt{2}}$

Q. Name the type of quadrilateral formed, if any, by the following points, and give reasons for your Answer.

(ii) (–3, 5), (3, 1), (0, 3), (–1, –4)

$x_1 = -3,\ y_1 = 5$

Sol. A (–3, 5), B (3, 1), C (0, 3), D (–1, –4)

$x_1 = -3,\ y_1 = 5$

$x_2 = 0,\ y_2 = 3$

$x_2 = -1,\ y_2 = -4$

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

$$\therefore\ AD = \sqrt{(-1+3)^2 + (-4-5)^2}$$

Let the coordinates of C be $(x_2,\ y_2)$.

What is the formula to find distance between two points ?

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

$\therefore$ AD $= \sqrt{85}$

Diag AC $= \sqrt{[0-(-3)]^2 + (3-5)^2}$

$\therefore$ AC $= \sqrt{(0+3)^2 + (3-5)^2}$

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

$\therefore$ AC $= \sqrt{9 + 4}$

$\therefore$ $\boxed{AC = \sqrt{13}}$

AB $= 2\sqrt{13}$

BC $= \sqrt{13}$

CD $= 5\sqrt{2}$

$\therefore$ any quadrilateral

MODULE - 9

COORDINATE GEOMETRY

- **Sums based on Distance formula**

Q. ...he **distance** between the ... **10 units.**

$x_1 = 2,\ y_1 = -3$ $\qquad x_2 = 10,\ y_2 = y$

Soln. P(2, –3), Q(10, y)

Now $PQ = 10$

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

$$\sqrt{(10-2)^2 + [y - (-3)]^2}$$

$$\sqrt{8^2 + (y+3)^2}$$

Let the coordinates of P be (x_1, y_1).

What is the formula to find distance between two points ?

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

$... + (y+3)^2$ **[Squaring throughout]**

$...^2 + 6y + 9$

$\therefore \quad y^2 + 6y + 9 - 36 = 0$

$\therefore \quad y^2 + 6y - 27 = 0$

$\therefore \quad y^2 + 9y - 3y - 27 = 0$

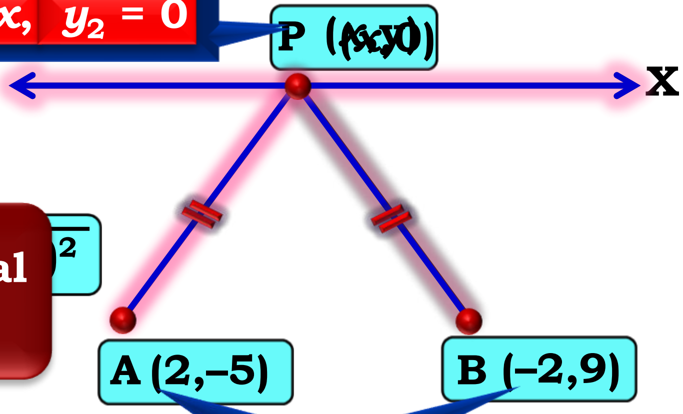
$\therefore \quad y(y+9) - 3(y+9) = 0$

$\therefore \quad (y+9)(y-3) = 0$

$\therefore \quad y = -9 \quad \text{or} \quad y = 3$

Q. Find the point on the x– axis which is equidistant from (2, –5) and (–2, 9).

$x_2 = x, \; y_2 = 0$



$x_1 = -2, \; y_1 = 9$

Sol. Let, A (2, –5) B (–2, 9)

AP = BP

$\therefore$ AP = BP

By distance formula,

$\sqrt{(x - 2)^2 + [(\ldots}$ ... $)^2$

EQUIDISTANT means 'Equal Distance'.

$\therefore \quad (x - 2 \ldots$

$\therefore \quad \cancel{x^2} - 4x + 4 + 25 = \cancel{x^2} + 4x + 4 + 81$

Which is the formula to find length of AP and BP?

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

$\therefore$

$\therefore$

$\therefore \quad -8x = 56$

$\therefore \quad x = \frac{\cancel{56}^{\,7}}{\cancel{-8}} = -7$

$\therefore$ The coordinates of P are (–7,0) .

MODULE - 10

COORDINATE GEOMETRY

- **Sums based on Distance formula**

Q. If Q (0,1) is equidistant from P (5,–3) and R(x,6), find the values of x, Also find the distances QR and PR.

Sol. Q (0, 1), P(5, –3) R (x, 6)

$\therefore$ QP = QR

Squaring

Let the coordinates of Q be

Which is the formula to find length of QR?

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

Which is the formula to find

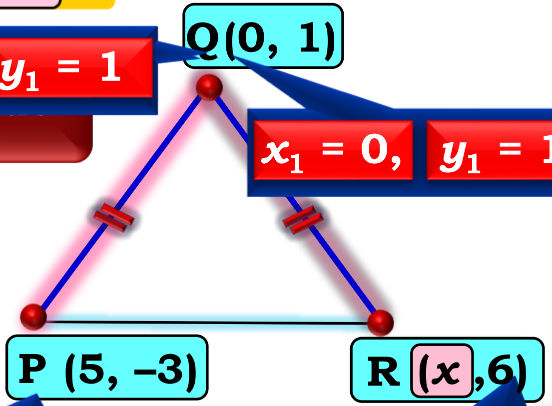
Let the coordinates of R be

$x_1 = 0,\ y_1 = 1$

$x_1 = 0,\ y_1 = 1$

$x_2 = 5,\ y_2 = -3$

$x_2 = x,\ y_2 = 6$



$0)^2 + (6 - 1)^2$

5^2

$\cancel{25}$

$x^2 = 16$

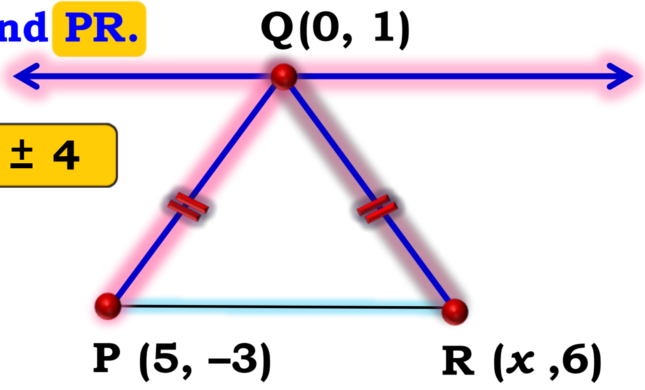
$\therefore$ QR = ... $+ (6-1)^2$

$$QR = \sqrt{x^2 + 5^2}$$

$$QR = \sqrt{16 + 25} \quad (\because x^2 = 16)$$

$$\boxed{QR = \sqrt{41}}$$

Q. If Q $x_1 = 5$, $y_1 = -3$ a $x_2 = 4$, $y_2 = 6$ and R(x,6), find the values of x. Also find the distances QR and PR.



$x = \pm 4$

When $x = 4$, P = (5, –3), R = (4, 6)

$\therefore$ PR $= \sqrt{(4-5)^2 + [6-(-3)]^2}$

Which is the formula to find length of PR?

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

$x_1 = 5$, $y_1 = -3$ $x_2 = -4$, $y_2 = 6$

Let the coordinates of P be

When $x = -4$, P = (5, –3), R = (–4,6)

$\therefore$ PR $= \sqrt{(-4-5)^2 + [6-(-3)]^2}$

Let the coordinates of P be (x_1, y_1)

$\therefore$ PR $= \sqrt{81 + 81}$

$\therefore$ $\boxed{\text{PR} = 9\sqrt{2}}$

MODULE - 11

COORDINATE GEOMETRY

- **Sum based on Distance formula**

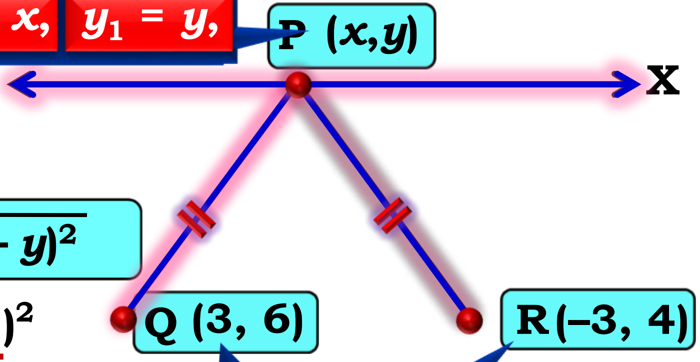
Q. Find a relation between x and y such that the point (x, y) is equidistant from the point (3, 6) and (–3, 4)

$x_1 = x$, $y_1 = y$,

Sol. Let, Q (3, 6) R (–3, 4)

PQ = PR

$\therefore$ PQ = PR



By distance formula,

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

Let the coordinates of P be (x_1, y_1)

$\therefore$ ... $x)^2 + (4 - y)^2$

$\therefore$ ... $^2 = \cancel{9} + 6x + \cancel{x^2} + 16 - ... + \cancel{y^2}$

$x_2 = -3$, $y_2 = 4$

$\therefore$ ... $= 0$

i.e PQ = PR

Which is ... to find length of PQ and PR?

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

$\therefore$ ... $= 0$

$\therefore$ $-4(3x + y - 5) = 0$

$\therefore$ $3x + y - 5 = 0$

MODULE - 12

COORDINATE GEOMETRY

- **Section formula for Internal Division**

SECTION FORMULA FOR INTERNAL DIVISION

A (x_1, y_1) P (x, y) B (x_2, y_2)

AP : PB = $m_1 : m_2$

…in the ratio AP : PB.

Section formula for internal division is used to find coordinates of point of internal division

…ternal division'.

$$x = \frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}$$

$$y = \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2}$$

SECTION FORMULA FOR INTERNAL DIVISION

A (x_1, y_1) P (x, y) B (x_2, y_2)

AP : PB = $m_1 : m_2$

Let us understand, how to remember the formula

$$x = \frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}$$

$$y = \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2}$$

Q. Find $x_1 = -5$, $y_1 = 8$ es $x_2 = 4$, $y_2 = -4$ which divides line segment QR int ally in the ra $m_1 : m_2$.

(i) Q (–5, 8) and R (4, –4) and $m_1 : m_2 = 2:1$

Sol. By section formula for internal division,

Let us substitute the values

Which formula is used to find co-ordinates of P?

Section formula for Internal Division

$$x = \frac{m_1x_2 + m_2x_1}{m_1 + m_2}, \quad y = \frac{m_1y_2 + m_2y_1}{m_1 + m_2}$$

8 – 5 $\quad$ 3 1

Let the co-ordinates of R be (x_2, y_2)

$$y = \frac{m_1y_2 + m_2y_1}{m_1 + m_2}$$

$$= \frac{2(-4) + 1(8)}{2 + 1} = \frac{-8 + 8}{3}$$

$$\therefore y = 0$$

$$\therefore \boxed{P\ (1, 0)}$$

MODULE - 13

COORDINATE GEOMETRY

- Sums based on section formula

$x_1 = -1$, $y_1 = 7$ $x_2 = 4$, $y_2 = -3$ points which divides the join of

(–1, 7) ... (4, –3) ... the ratio 2:3.

A (–1,7) P (x, y) B (4, –3)

Sol. A (–1, 7), B (4, –3) $m_1 : m_2 = 2 : 3$

By using section formula, we get

Let the co-ordinates of B be (x_2, y_2)

Which formula is used to find co-ordinates of P?

$$x = \frac{m_1x_2 + m_2x_1}{m_1 + m_2}, \quad y = \frac{m_1y_2 + m_2y_1}{m_1 + m_2}$$

$$= \frac{8 + (-3)}{5} = \frac{\cancel{5}}{\cancel{5}}$$

$\therefore \quad x = 1$

$$y = \frac{m_1y_2 + m_2y_1}{m_1 + m_2}$$

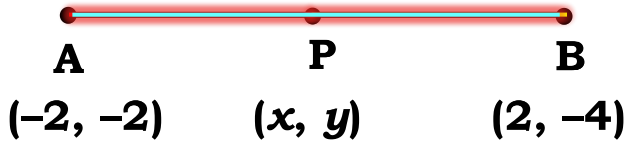
$$= \frac{2\,(-3) + 3\,(7)}{2 + 3}$$

$$= \frac{-6 + 21}{5} = \frac{\cancel{15}^{\,3}}{\cancel{5}}$$

$\therefore \quad y = 3$

$\therefore$ P (1, 3)

Q. If A and B are (–2, –2) and (2, –4) respectively, find the coordinates of P such that $AP = \frac{3}{7}AB$ and P lies on the line segment AB.



Sol. $\boxed{AP} + PB = AB$

$\therefore \quad \frac{3AB}{7} + PB = AB$

$\therefore \quad PB = AB - \frac{3AB}{7}$

$\therefore \quad PB = \frac{7AB - 3AB}{7}$

$\therefore \quad \boxed{PB = \frac{4}{7}AB}$

$\boxed{AP = \frac{3}{7}AB}$

$\therefore \quad AP : PB = 3 : 4$

... e (− ... 4) respectively, find the coordinates
... t A ... ies on the line segment AB.

$x_1 = -2, y_1 = -2$

$x_2 = 2, y_2 = -4$

Sol. A (−2, −2), B (2, −4) $\quad m_1 : m_2 = 3 : 4$

A	P	B
(−2, −2)	(x, y)	(2, −4)

By using section formula, we get

Let the co-ordinates of A be (x_1, y_1)

$$y = \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2}$$

Let us substitute the values

$$= \frac{3\,(2) + 4\,(-2)}{3 + 4}$$

Which formula is used to find co-ordinates of P?

$$x = \frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}, \quad y = \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2}$$

$$\therefore \quad x = \frac{-2}{7}$$

$$\therefore \quad y = \frac{-20}{7}$$

$$P = \left(\frac{-2}{7}, \frac{-20}{7} \right)$$

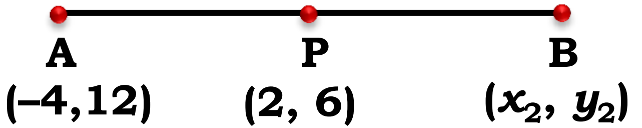
MODULE - 14

COORDINATE GEOMETRY

- **Sums based on section formula**

$x_1 = -1$, $y_1 = 7$ $x = 2$, $y = 6$

... 3. If A(– 4, 12), P(2, 6), then find the coordinates of point B.



Sol. A (–4, 12), P (2, 6) $m_1 : m_2 = 2 : 3$

By using section formula, we get

Which formula is used to find co-ordinates of B?

$$x = \frac{m_1x_2 + m_2x_1}{m_1 + m_2}, \quad y = \frac{m_1y_2 + m_2y_1}{m_1 + m_2}$$

We have co-ordinates of two points and the ratio

$$x = \frac{m_1x_2 + m_2x_1}{m_1 + m_2}$$

$$10 + 12 = 2x_2$$

$$22 = 2x_2$$

$$\therefore \quad x_2 = 11$$

$$y = \frac{m_1y_2 + m_2y_1}{m_1 + m_2}$$

$$6 = \frac{2\,y_2 + 3(12)}{2 + 3}$$

$$6 = \frac{2y_2 + 36}{5}$$

$$30 = 2y_2 + 36$$

$$30 - 36 = 2y_2$$

$$-6 = 2y_2$$

$$\therefore \quad y_2 = -3$$

$\therefore$ B (11, –3)

Q. In wh $x_1 = 3$, $y_1 = 6$ he point (1, 3) divide the line segment joining the points (3, and (–5, –6) internally ?

To find : $m_1 : m_2$

$m_1 : m_2$

Sol. Let A (3, 6)

$x_2 = -5$, $y_2 = -6$

B(–5, –6)

Let P divides seg $x = 1$, $y = 3$ in the ratio $m : n$

P(1, 3)

By section formula for internal division,

Let the co-ordinates of P be (x, y)

Let, P (1,3) divides seg AB internally in the ratio $m_1 : m_2$.

$\therefore$

$n_2 y_1$

n_2

$\therefore\ m_1 + m_2 = -5m_1 + 3m_2$

$\therefore\quad m_1 + 5m_1 = 3m_2 - m_2$

$\therefore\quad 6m_1 = 2m_2$

$$\frac{m_1}{m_2} = \frac{\cancel{2}\,1}{\cancel{6}\,3} = \frac{1}{3}$$

$\therefore\ m_1 : m_2 = 1 : 3$

MODULE - 15

COORDINATE GEOMETRY

- **Sums based on Section formula**

Q $x_1 = -3,\ y_1 = 10$ in $x_2 = 6,\ y_2 = -8$ s $x = -1,\ y = 6$ the points (–3, 10) and (6, –8) is divided by (–1, 6).

To find : $m_1 : m_2$

Sol. A (–3, 10), B (6, –8), P(–1, 6)

A (–3, 10) P (–1, 6) B (6, –8)

By section formula for internal division,

$$x = \frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}$$

Let the co-ordinates of P be (x, y)

Which formula should we apply here ?

Section formula for Internal Division

$$x = \frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}, \quad y = \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2}$$

$\therefore \quad 2m_2 = 7m_1$

$\therefore \quad \frac{2}{7} = \frac{m_1}{m_2}$

$\frac{m_1}{m_2} = \frac{2}{7}$

$m_1 : m_2 = 2 : 7$

Q. **Find the ratio** in which the line **segment joining A (1, –5) and B (–4, 5)** is **divided by the X–axis.** Also find the coordinates of the point of division.

Sol. P lies on X-axis,

To find - $m_1 : m_2$

$x_1 = 1,\ y_1 = -5$ $x_2 = -4,\ y_2 = 5$ $x = x,\ y = 0$

A (1, –5), B (–4, 5) P(x, 0)

$\therefore$ By using section Formula,

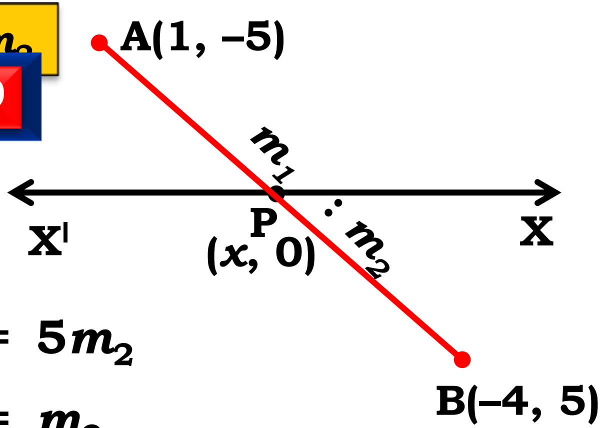
Let the co-ordinates of P be (x, y)

Which formula shall we apply?

Section formula for Internal Division

$$x = \frac{m_1x_2 + m_2x_1}{m_1 + m_2},\quad y = \frac{m_1y_2 + m_2y_1}{m_1 + m_2}$$

$\therefore$ $0 = 5m_1 - 5m_2$



$\therefore\ 5m_1 = 5m_2$

$\therefore\ m_1 = m_2$

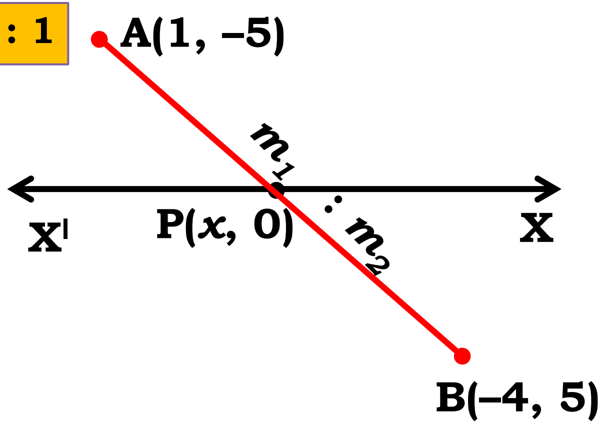
$$\frac{m_1}{m_2} = \frac{1}{1}$$

$m_1 : m_2 = 1 : 1$

Q. ... A (1, –5) and B (–4, 5) is ... of the point of division.

$x_1 = 1,\ \ y_1 = -5$ $\quad x_2 = -4,\ \ y_2 = 5$ $\quad x = x,\ \ y = 0$

Sol. A (1, –5), B (–4, 5) P(x, 0) $\quad m_1 : m_2 = 1 : 1$



$\therefore$ X– axis divides AB in the ratio 1 : 1

$$\boxed{x} = \frac{m_1 \boxed{x_2} + m_2 \boxed{x_1}}{m_1 + m_2}$$

$$\therefore \quad x = \frac{1(-4) + 1(1)}{1 + 1}$$

$$\therefore \quad x = \frac{-4 + 1}{2}$$

$$\therefore \quad x = \frac{-3}{2} = -1.5$$

$$\therefore \quad \boxed{P\,(-1.5,\ 0)}$$

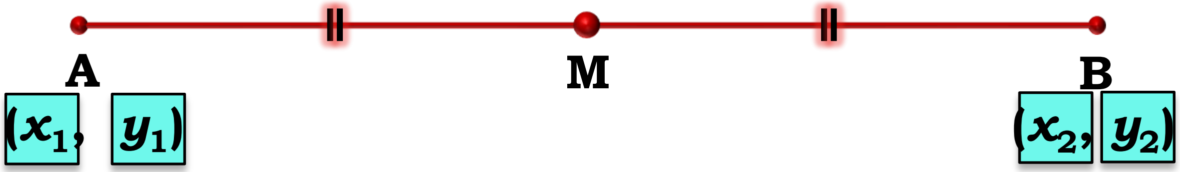
Thank You

MODULE - 16

COORDINATE GEOMETRY

- Midpoint Formula

MIDPOINT FORMULA



Point M is m

Nov
the
coo

Let B (x_2, y_2)

B

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

Q. Find the coordinates of the midpoint of segment KR,
if K ...

$x_1 = 2.5$, $y_1 = -4.3$ $x_2 = -1.5$, $y_2 = 2.7$

Sol. Let K(2.5, –4.3) | R(–1.5, 2.7)

Let P be the midpoint of ...

By midpoint formula,

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

Which is the formula used to find co-ordinates of P?

Mid-Point Formula

$$x = \frac{x_1 + x_2}{2}, \quad y = \frac{y_1 + y_2}{2}$$

$\therefore$ ... 2.7

Let us substitute the values.

$$\therefore \quad P = \left(\frac{2.5 - 1.5}{2}, \frac{-4.3 + 2.7}{2} \right) = \left(\frac{1}{2}, \frac{-1.6}{2} \right)$$

$\therefore$ $\boxed{P = (0.5, -0.8)}$

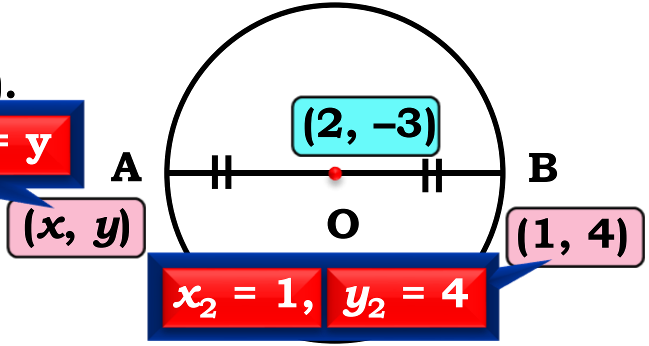
Q. Find the coordinates of a points A, where AB is the diameter of a circle whose centre is (2, –3) and B is (1, 4).

Sol. Let the coordinates of points A be (x, y).

The centre of the circle, i.e

the midpoint of AB

$x_1 = x, \quad y_1 = y$



$x_2 = 1, \quad y_2 = 4$

$\therefore$ By Midpoint Formula

$$(2, -3) = \left(\frac{x + 1}{2}, \frac{y + 4}{2}\right)$$

Mid-Point Formula

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

ed to

of

ent

$$-3 = \frac{4 + y}{2}$$

$$-6 = 4 + y$$

$$\therefore \quad y = -10$$

Let the co-ordinates of B be (x_2, y_2)

are (3, –10)

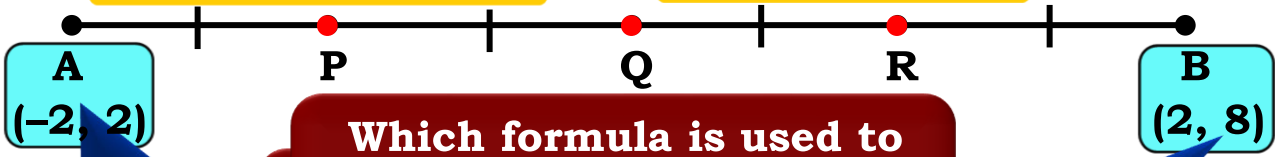
MODULE - 17

COORDINATE GEOMETRY

- Sums based on Midpoint Formula

Q. Find the coordinates of the points which divide the line segment joining A (–2, 2) and B (2, 8) into four equal parts.

Sol.



$x_1 = -2$, $y_1 = 2$

Which formula is used to

Let the co-ordinates of B be (x_2, y_2)

$x_2 = 2$, $y_2 = 8$

Q is the mid... between A and B

$\therefore$ By Midpoint Formula

$$Q = \left(\frac{-2+2}{2}, \frac{2+8}{2}\right)$$

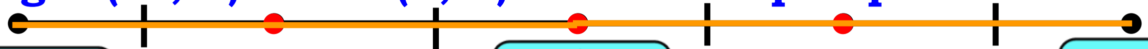
$$\therefore \boxed{Q = (0, 5)}$$

Mid-Point Formula

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

Q. Find the coordinates of the points which divide the line segment joining A (–2, 2) and B (2, 8) into four equal parts.

Sol.



A $(-2, 2)$ P $\left(-1, \frac{7}{2}\right)$ Q $(0, 5)$ R $\left(1, \frac{13}{2}\right)$ B $(2, 8)$

$x_1 = -2$, $y_1 = 2$

$x_2 =$ $x_1 = 0$, $y_1 = 5$

$x_2 = 2$, $y_2 = 8$

Let the co-ordinates of B be (x_2, y_2)

AQ

∴

$$P = \left(\frac{-2 + 0}{2}, \frac{2 + 5}{2}\right)$$

$$\therefore \quad \boxed{P = \left(-1, \frac{7}{2}\right)}$$

R is the midpoint of seg QB

∴ By Midpoint Formula

Mid-Point Formula

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

...d to ...f ...nt

$$R = \left(\frac{0 + 2}{2}, \frac{5 + 8}{2}\right)$$

$$\therefore \quad \boxed{R = \left(1, \frac{13}{2}\right)}$$

MODULE - 18

COORDINATE GEOMETRY

- **Sum based on Section Formula and Midpoint Formula**

$x_1 = 4$ $y_1 = -1$ $x_2 = -2$, $y_2 = -3$

...oints of trisection of the line

...ided in three equal parts

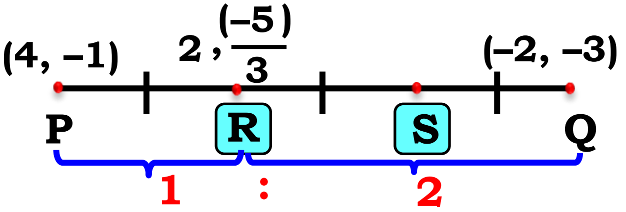
Sol. P (4, –...

Let the poi...

of trisectio...

Now, point ... io 1 : 2 , $m_1 : m_2 = 1 : 2$

We have co-ordinates of two points and the ratio



By using section formula, we get

Which formula is used to find co-ordinates of R?

$$x = \frac{m_1x_2 + m_2x_1}{m_1 + m_2}, \quad y = \frac{m_1y_2 + m_2y_1}{m_1 + m_2}$$

Let us substitute the values

$$x = \frac{m_1x_2 + m_2x_1}{m_1 + m_2}$$

$$= \frac{1(-2) + 2(4)}{\ldots}$$

$$\therefore \quad x = 2$$

$$y = \frac{m_1y_2 + m_2y_1}{m_1 + m_2}$$

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

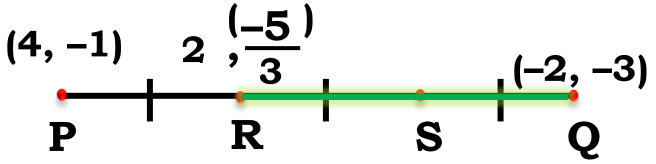
$$= \frac{-3 - 2}{3}$$

$$\therefore \quad y = \frac{-5}{3}$$

$$\therefore \quad R = \left(2, \frac{-5}{3}\right)$$

$x_1 = 2,$ $y_1 = \frac{-5}{3}$ $x_2 = -2,$ $y_2 = -3$

Q. ... ts of trisection of the line seg... joining ... 3).



Sol. R $\left(2, \frac{-5}{3}\right)$, Q (–2, –3)

Now, point S is the midpoint of seg RQ

$\therefore$ By Midpoint Formula

Let the co-ordinates of R be (x_1, y_1)

Which formula is used to find co-ordinates of midpoint of a segment

$\therefore \quad S = \left(0, \frac{-7}{3}\right)$

MODULE - 19

COORDINATE GEOMETRY

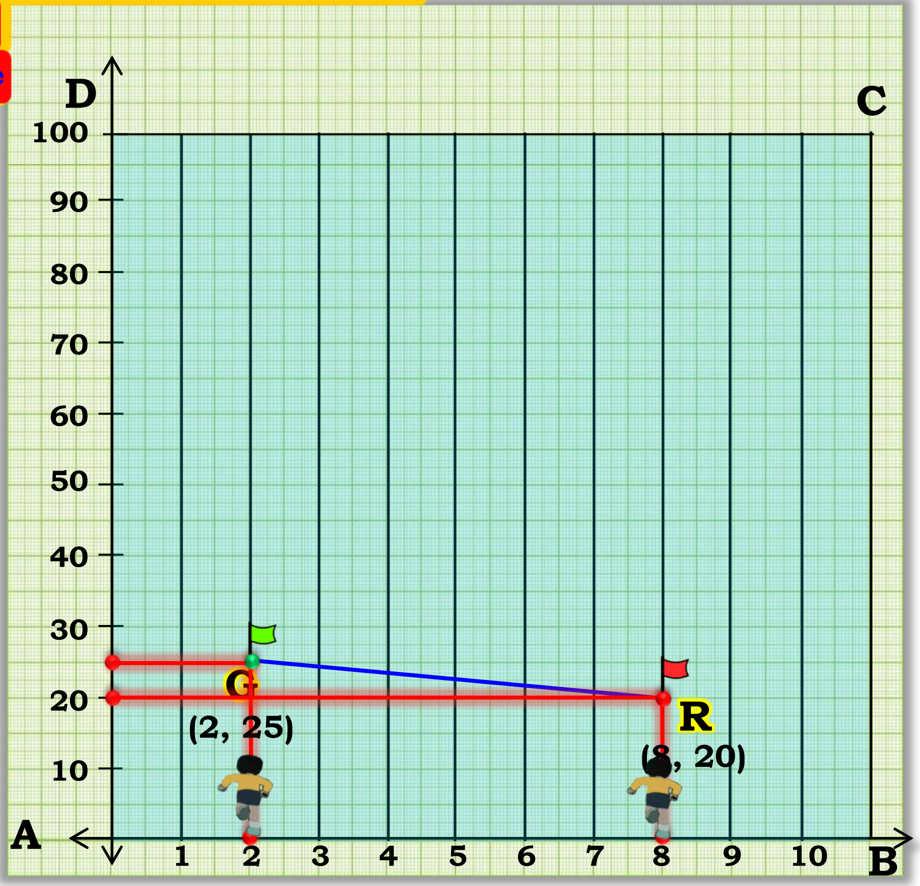
- **Sums based on Midpoint Formula**

Q. 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.

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 between the line segment joining the two flags, where should she post her flag ?



Sol. $AD = 100 \times 1 = 100$

$$\frac{1}{4}^{\text{th}} \text{ the distance AD} = \frac{1}{4} \times 100 = 25$$

$$\frac{1}{5}^{\text{th}} \text{ the distance AD} = \frac{1}{5} \times 100 = 20$$

Q. 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.
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 ... gm... s, ... ost

$x_1 = 2$, $y_1 = 25$ $x_2 = 8$, $y_2 = 20$

Sol. G =(2, 25), R = (8, 20)

$\therefore$ GR $= \sqrt{(8-2)^2 + (20-25)^2}$

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

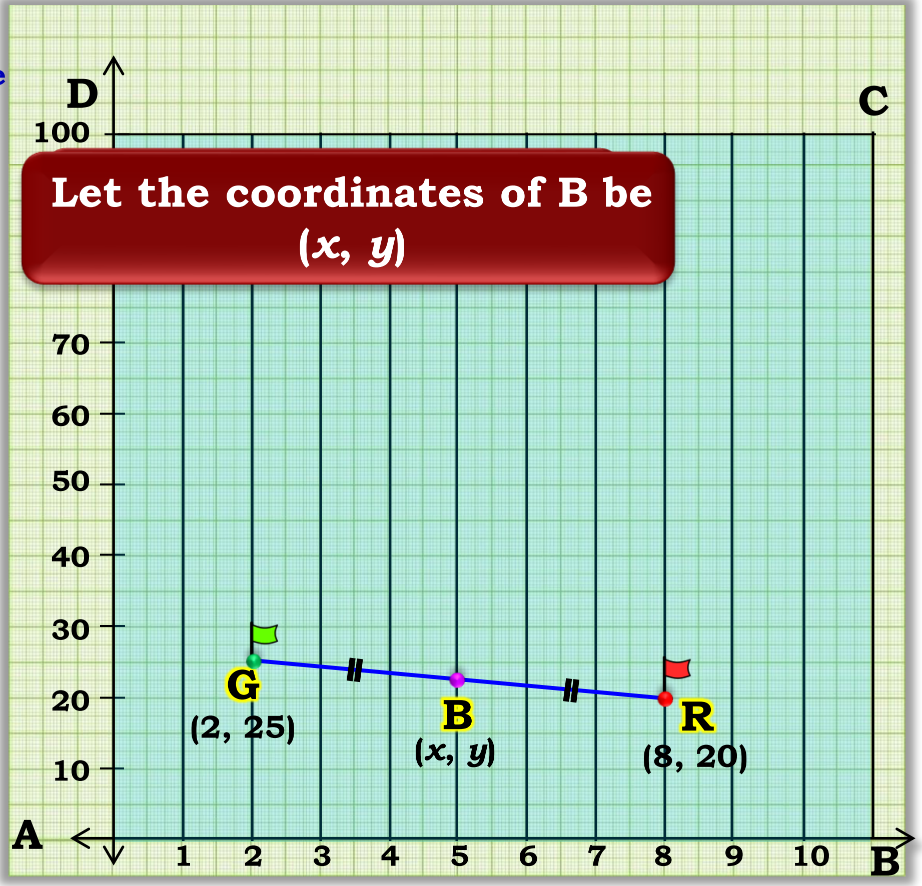
Which is the formula to find length of GR?

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

Point B is the midpoint of G (2, 25) and R (8, 20)

Let Coordinates of B = (x, y)

Let the coordinates of B be (x, y)



Q. To conduct sports day activities, in your rectangular shaped school ground ABCD, lines have been drawn with chalk powder at a dist... flower pots have been placed at a distance of 1m from each other ... Niharika runs $\frac{1}{4}$ th the distance AD on the 2nd lin... and posts a green flag. Preet runs $\frac{1}{5}$ th the distan... AD on the eighth line and posts a red flag. What is the distance between both the flags ? ...

$x_1 = 2,\ y_1 = 25$ $\quad$ $x_2 = 8,\ y_2 = 20$

Mid-Point Formula

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

Sol. G(2, 25) $\quad$ R(8, 20)

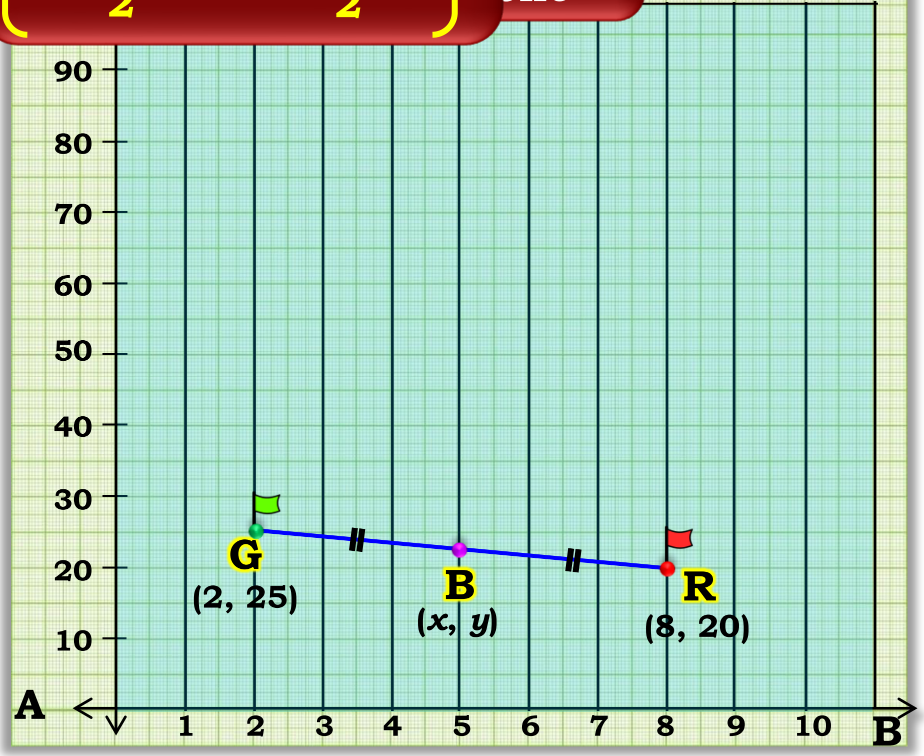
By Midpoint Formula,

$$x = \frac{\boxed{x_1} + \boxed{x_2}}{2}$$

$$\therefore \quad x = \left(\frac{2 + 8}{2}\right)$$

$$\therefore \quad x = \frac{\cancel{10}^{\,5}}{\cancel{2}}$$

$$\therefore \quad x = 5$$



Q. 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.
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 ?

$x_1 = 2$, $y_1 = 25$ $\quad$ $x_2 = 8$, $y_2 = 20$

Sol. G(2, 25) $\quad$ R(8, 20)

$$\therefore \quad y = \frac{\boxed{y_1} + \boxed{y_2}}{2}$$

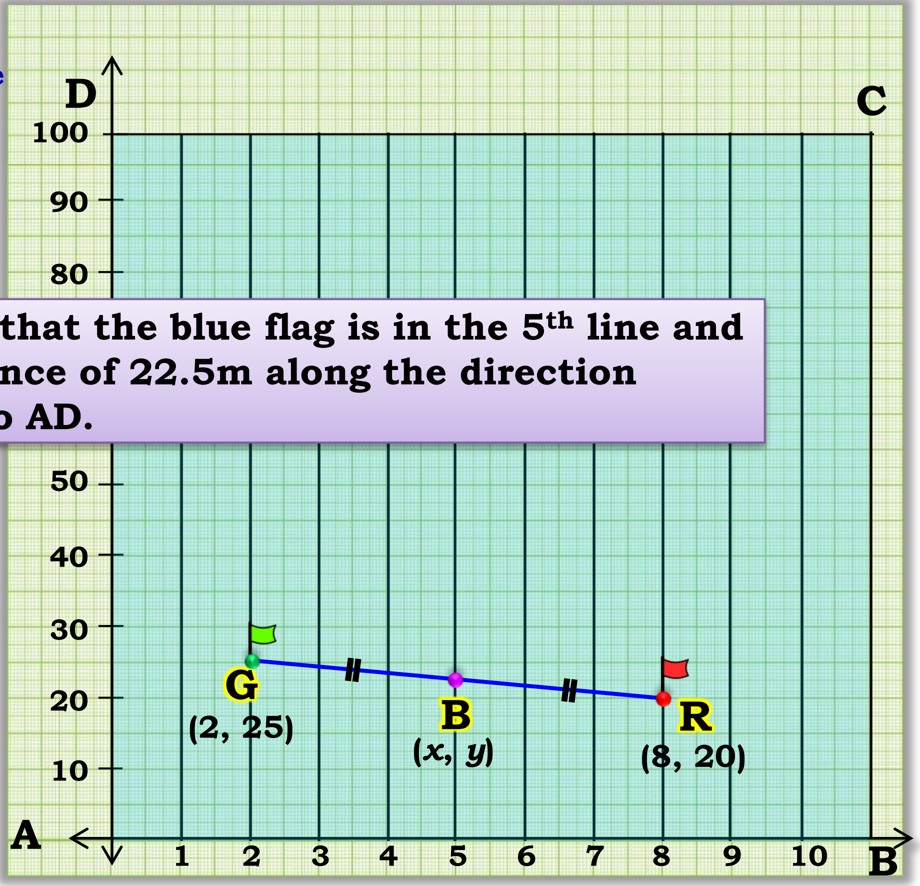
$$\therefore \quad y = \left(\frac{25 + 20}{2}\right)$$

$$\therefore \quad y = \frac{45}{2}$$

$$\therefore \quad y = 22.5$$

$$\therefore \quad \boxed{B = (5, 22.5)}$$

It means that the blue flag is in the 5th line and at a distance of 22.5m along the direction parallel to AD.

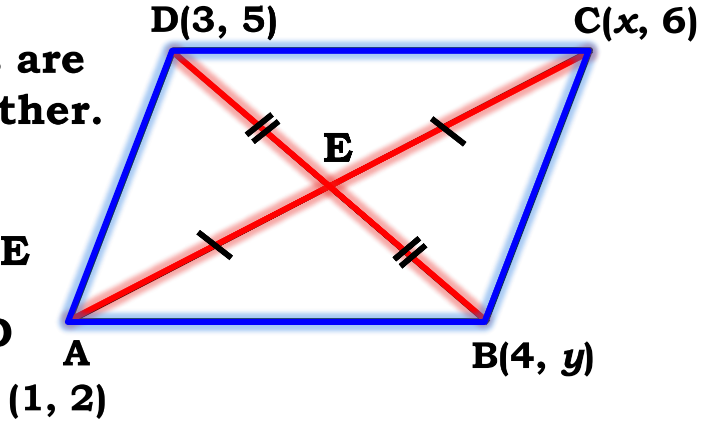


MODULE - 20

COORDINATE GEOMETRY

- Sums based on Midpoint Formula

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



Sol. In a parallelogram, the opposite sides are equal and the diagonals bisect each other.

□ABCD is a parallelogram

$\therefore$ Diagonals bisect each other at point E

$\therefore$ E is the mid point of diag. AC and BD

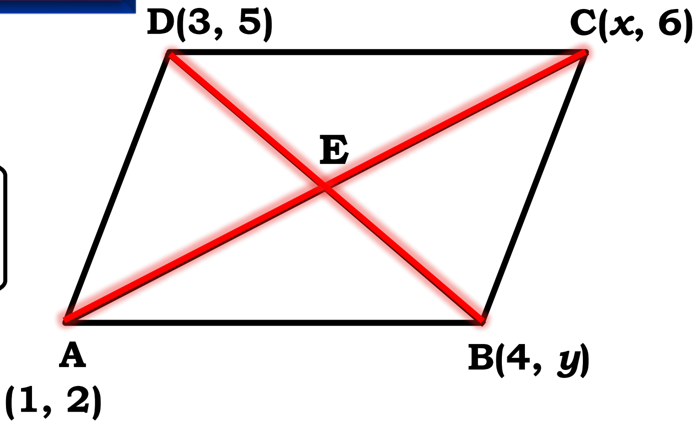
Let E = (x, y)

E is midpoint of diagonal AC as well as diagonal BD

Q. ... of a parallelogram

$x_1 = 1$, y_1 | $x_1 = 4$, $y_1 = y$ | $y_2 = 6$ | $x_2 = 3$, $y_2 = 5$,

Sol. A(1, 2) B(4, y) C(x, 6) D(3, 5)



Which formula is used to

n

Mid-Point Formula

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

$$\ldots, \frac{2 + 6}{2}\Big]$$

$$\ldots 1, 4\Big] \ldots \text{(i)}$$

Also,

Mid-Point Formula

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

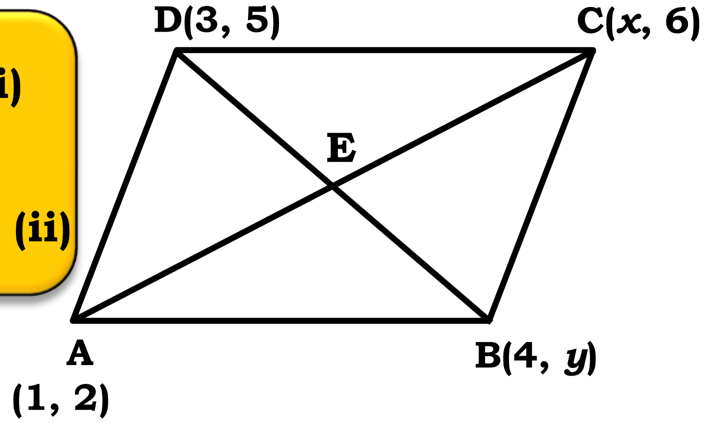
$$\ldots, \frac{y + 5}{2}\Big]$$

$$= \left(\frac{7}{2}, \frac{y + 5}{2}\right) \ldots \text{(ii)}$$

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

$$\left(\frac{x+1}{2}, 4\right) \quad \ldots \text{(i)}$$

$$\left(\frac{7}{2}, \frac{y+5}{2}\right) \quad \ldots \text{(ii)}$$



Sol. $\therefore$ From (i) and (ii)

$$\frac{x+1}{2} = \frac{7}{2}$$

$$\therefore \quad 2x + 2 = 14$$

$$2x = 12$$

$$x = 6$$

$$\text{Also } 4 = \frac{y+5}{2}$$

$$8 = y + 5$$

$$\therefore \quad y = 3$$

$\therefore$ **Coordinates of E = (6, 3)**

MODULE - 21

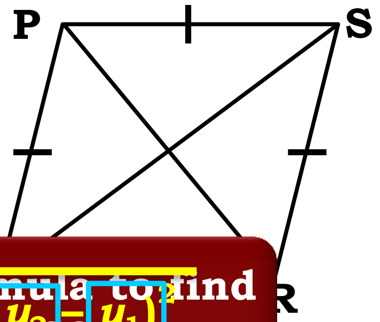
COORDINATE GEOMETRY

- Sum based on Distance formula

Q. Find the area of a rhombus if its vertices are

$x_1 = 3,\; y_1 =$ ($x_1 = 4,\; y_1 = 5$ $x_2 = -1, y_2 = 4$ $x_2 = -2, y_2 = -1$

[Hint : Area of rhombus ... product of ... diagonals)]



Sol. P = (3, 0), Q = (4, 5), R = (−1, 4), S = (−2, −1)

$\therefore$ Diagonal PR $= \sqrt{(-1-3)^2 + (4-0)^2}$

Let the coordinates of S be (x_2, y_2)

$\therefore$

$\therefore$

$\therefore \quad d_1 = \sqrt{32}$

$\therefore \quad \boxed{d_1 = 4\sqrt{2}}$

$\therefore$ Diagonal QS $= \sqrt{(-2-4)^2 + (-1-5)^2}$

$\therefore \quad d_2 = \sqrt{(-6)^2 + (-6)^2}$

Which is the formula to find length of QS?

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

Which is the formula to find length of PR?

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

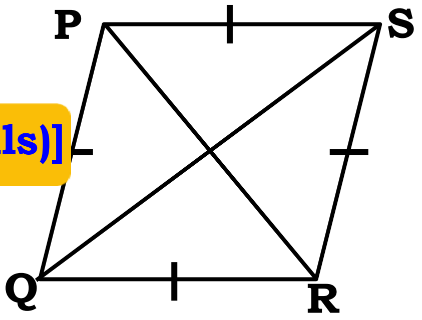
$\therefore \quad d_2 = \sqrt{36 + 36}$

$\therefore \quad d_2 = \sqrt{72}$

$\therefore \quad \boxed{d_2 = 6\sqrt{2}}$

10. Find the area of a rhombus if its vertices are (3, 0) , (4, 5) (–1 ,4) and (–2 , –1) taken in order.

[Hint : Area of a rhombus = $\frac{1}{2}$(product of its diagonals)]



Sol. P = (3, 0), Q = (4, 5), R = (–1, 4), S = (–2, –1)

$\therefore$ Area of rhombus ABCD $= \frac{1}{2} \times \boxed{d_1} \times \boxed{d_2}$

$d_1 = 4\sqrt{2}$

$d_2 = 6\sqrt{2}$

$= \frac{1}{\cancel{2}} \times \overset{2}{\cancel{4}}\sqrt{2} \times 6\sqrt{2}$

$= 2 \times 2 \times 6$

$= 24$

$\therefore$ **Area of rhombus PQRS is 24 sq. units**

MODULE - 22

COORDINATE GEOMETRY

- Sum based on Finding Area of a triangle

AREA OF A TRIANGLE

Now, let us understand how to find the area of triangle whose coordinates of all 3 vertices are given

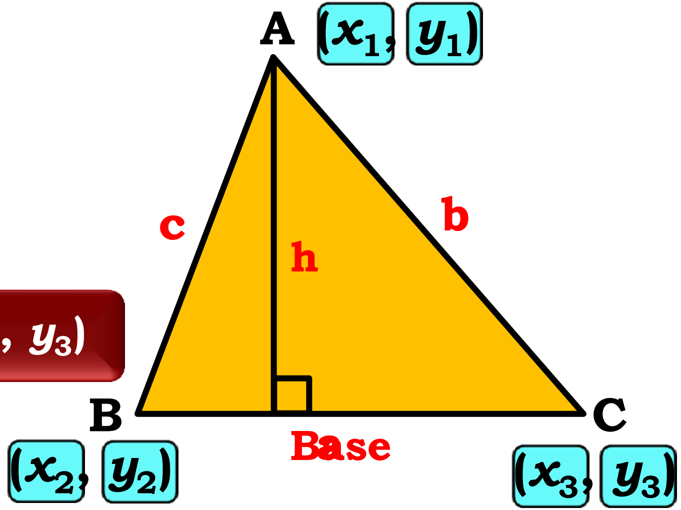
Area of ΔABC =

$$\frac{1}{2}\left[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)\right]$$

Formula :

$$\sqrt{s(s-a)(s-b)(s-c)}$$

Let C (x_3, y_3)



Q. Find the area of the triangle whose vertices are :

$x_1 = -5,\ y_1 = -1$ -5 $x_2 = 3,\ y_2 = -5$ $x_3 = 5,\ y_3 = 2$

Sol. Given : A $(-5, -1)$, B $(3, -5)$, C $(5, 2)$

Let the co-ordinates of

Consider ΔABC

Which formula is used to find area of triangle?

$$\frac{1}{2}[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$$

$$\therefore \text{ar}(\Delta ABC) = \frac{1}{2}[-5(-5-2) + 3(2-(-1)) + 5(-1-(-5))]$$

$$+3 \times 3 + 5 \times 4)$$

$$= \frac{1}{\cancel{2}} \times \overset{32}{\cancel{64}}$$

$$= 32$$

$\therefore$ **ar (Δ ABC) = 32 sq. units**

MODULE - 23

COORDINATE GEOMETRY

- **Sum based on Finding Area of a triangle**

Q. ... of th... se ...

$x_1 = 2$, $y_1 = 3$

$x_2 = -1$, $y_2 = 0$

$x_3 = 2$, $y_3 = -4$

Sol. Given : A (2, 3) , B (–1, 0) , C (2, –4)

$\therefore$ ... $= \frac{1}{2}$ [2 (0 – (–4)) + (–1) (–4 – 3) + 2 (3 – 0)]

Let the co-ordinates of C be (x_3, y_3)

$= \frac{1}{2}$ [(2 × 4) + (–1) (–7) + 2 × (3)]

Which formula is used to find area of triangle?

$$\frac{1}{2}[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$$

$$= \frac{1}{\cancel{2}} \times \overset{10.5}{\cancel{21}}$$

$\therefore$ ar (ΔABC) = 10.5

$\therefore$ **ar (Δ ABC) is 10.5 sq. units**

Q. In each of the following find the value of 'k', for which the ... lin...

... 1) , (3 ...

$x_1 = 7$, $y_1 = -2$ $x_2 = 5$, $y_2 = 1$ $x_3 = 3$, $y_3 = k$

Sol. Let A (7, –2), B (5, 1), C (3, k)

Since the points are collinear ,

$\therefore$ Area of triangle formed is Zero.

Let the co-ordinates of A be (x_1, y_1)

...) + 5 (k + 2) + 3 (–2 – 1)]

Which formula is used to find area of triangle?

$\frac{1}{2}[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$

... 6 – 3)

$\therefore$ $-2k + 8 = 0$

$\therefore$ $-2k = -8$

$\therefore$ $\boxed{k = 4}$

Q. In each of the following find the value of 'k', for which the points are collin...

$x_1 = 8$, $y_1 = 1$ 1) $x_2 = k$, $y_2 = -4$ $x_3 = 2$, $y_3 = -5$

Sol. Let A (8, 1), B (k, –4), C (2, –5)

Let the co-ordinates of B be (x_2, y_2)

... collinear ,

...ned is Zero.

$$\text{area} = \frac{1}{2}\,[8(-4+5) + k(-5-1) + 2(1+4)]$$

Which formula is used to find area of triangle?

$$\frac{1}{2}\,[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$$

$\therefore\ 18 - 6k = 0$

$\therefore\ 6k = 18$

$\therefore\ \boxed{k = 3}$

Thank You

MODULE - 24

COORDINATE GEOMETRY

- **Sum based on Finding Area of a triangle**

Q. Find the area of the triangle formed by joining the mi… triangle whose vertices are (0, –1), (2, …
Fin… area of the g…

Sol. P, Q … int of AB , BC and AC

∴ By midpoint formula

Mid-Point Formula

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

Let the co-ordinates of C be (x_1, y_1)

$$\ldots, \frac{-1+1}{2}\Bigg)$$

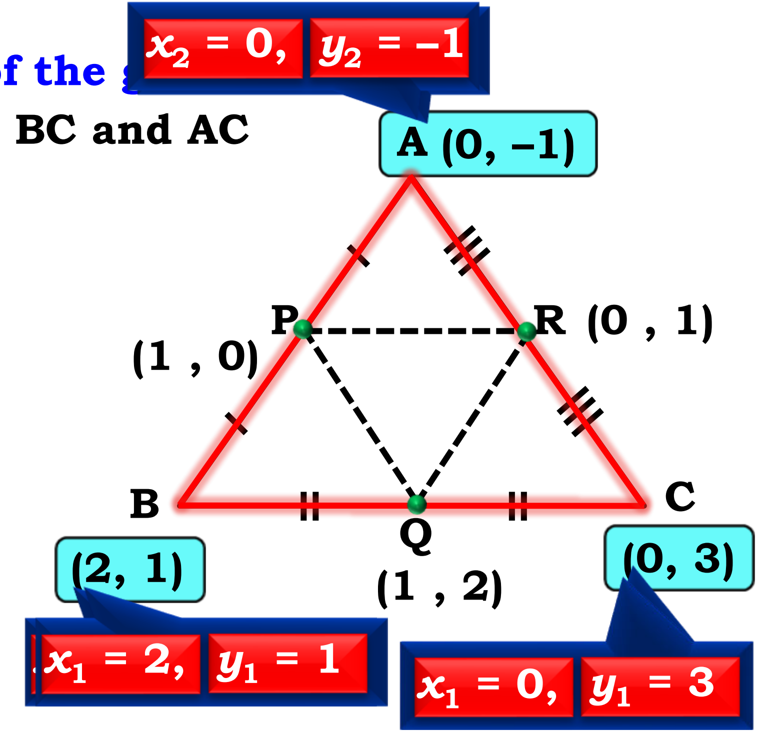
$$= (1, 0)$$

$$\text{Coordinate of Q} = \left(\frac{2+0}{2}, \frac{1+3}{2}\right)$$

$$= (1, 2)$$

$$\text{Coordinate of R} = \left(\frac{0+0}{2}, \frac{3-1}{2}\right)$$

$$= (0, 1)$$



Q. Find the area of the triangle formed by joining the mid–po angle whose vertices are (0, –1), (2, 1) ar

L s of

Consider ΔPQR

Find the area of the given triangle.

Sol

Which formula is used to find area of triangle?

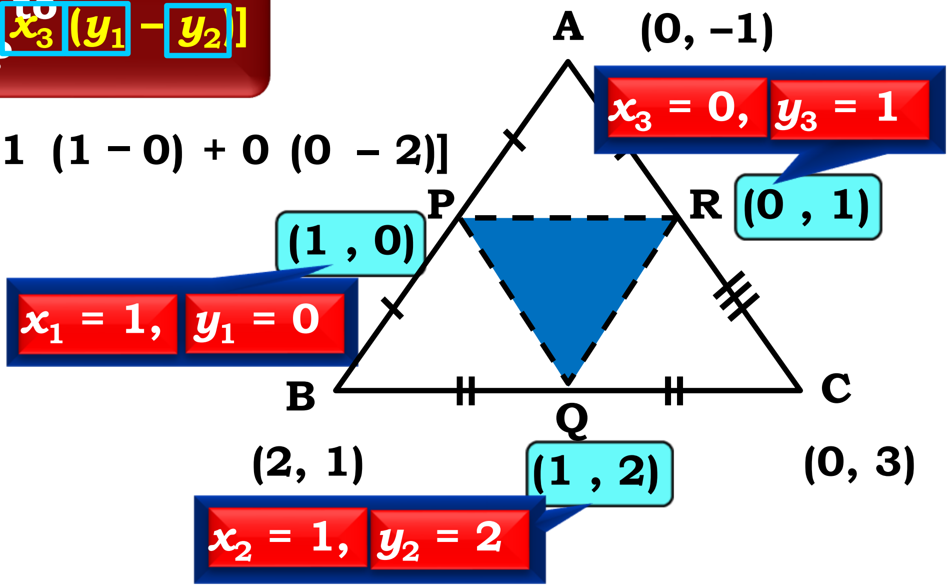
$$\frac{1}{2}\left[\boxed{x_1}\boxed{(y_2}-\boxed{y_3)}+\boxed{x_2}\boxed{(y_3}-\boxed{y_1)}+\boxed{x_3}\boxed{(y_1}-\boxed{y_2)}\right]$$

$$\therefore \quad ar(\Delta PQR) = \frac{1}{2}\left[1\,(2-1) + 1\,(1-0) + 0\,(0-2)\right]$$

$$= \frac{1}{2}(1 + 1 + 0)$$

$$= \frac{1}{\cancel{2}} \times \cancel{2}$$

$$\therefore \quad \boxed{ar(\Delta PQR) = 1 \text{ sq.unit}}$$



Q. Find the area of the triangle formed by joining the mid–points of the triangle whose vertices are (0, –1), (2, 1) an[d (0, 3).]

Find th[e ratio of this area to the] area of the given [triangle.]

i.e ar(ΔPQR)

Le[t]

Consider ΔABC

i.e ar(ΔABC)

$x_1 = 0,\ y_1 = -1$

Sol.

ar (ΔPQR) = 1 sq.unit

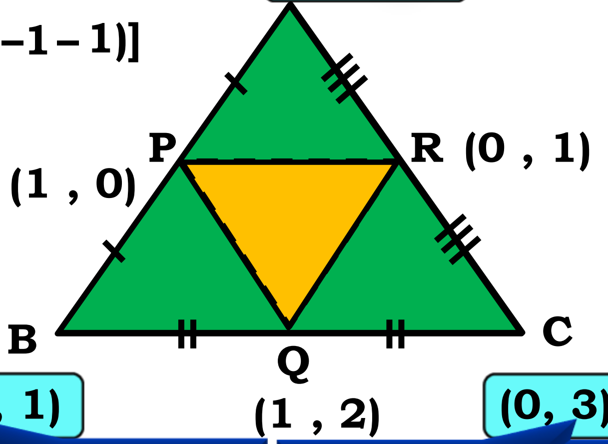
A (0, –1)

$\therefore$ ar (ΔABC) $= \dfrac{1}{2}\,[0\,(1 - 3) + 2\,(3 + 1) + 0\,(-1 - 1)]$

$= \dfrac{1}{2}\,(0 + 8 + 0)$

Which formula is used to find area of triangle?

$\dfrac{1}{2}\,[\boxed{x_1}\,(\boxed{y_2} - \boxed{y_3}) + \boxed{x_2}\,(\boxed{y_3} - \boxed{y_1}) + \boxed{x_3}\,(\boxed{y_1} - \boxed{y_2})]$



$\therefore$ ar (ΔABC) = 4 sq.units

(2, 1)

(0, 3)

$x_2 = 2,\ y_2 = 1$

$x_3 = 0,\ y_3 = 3$

$\dfrac{\text{area (ΔPQR)}}{\text{area (ΔABC)}} = \dfrac{1}{4}$ or 1 : 4

MODULE - 25

COORDINATE GEOMETRY

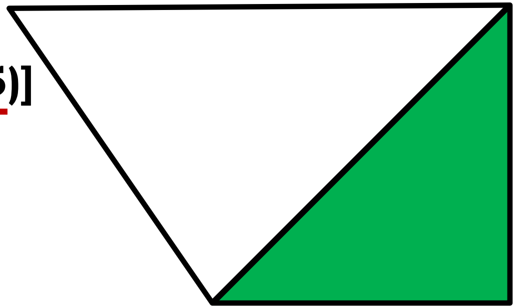
- **Sum based on Finding Area of a triangle**

Q. Find the ar… ose vertices taken in or… –2) and (2, 3)

Let the co-ordinates of R be (x_3, y_3)

$x_3 = 3$, $y_3 = -2$

Sol. Let the c… S be (–4, –2) ,… and (2, 3) respectively.



$$\therefore \text{ ar } (\Delta PQR) = \frac{1}{2}\left[-4(-5+2) + (-3)(-2+2) + 3(-2+5)\right]$$

Which formula is used to find area of triangle?

$$\frac{1}{2}\left[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)\right]$$

$$= \frac{1}{2}(12 - 0 + 9)$$

$$= \frac{1}{2} \times 21$$

$$= 10.5 \text{ Sq. units}$$

$x_1 = -4$, $y_1 = -2$

$x_2 = -3$, $y_2 = -5$

Q. Find the are... ose vertices taken in ord... –2) and (2, 3)

Let the co-ordinates of S be (x_3, y_3)

Sol.

$$\text{ar}(\Delta PRS) = \frac{1}{2}[-4(-2-3) + 3(3+2) + 2(-2+2)]$$

$$= \frac{1}{2}[\ \ ]$$

Which formula is used to find area of triangle?

$$\frac{1}{2}[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$$

$$= \frac{35}{2} = 17.5\ \text{cm}^2$$

Also ar (□PQRS) = A (ΔPQR) + A (ΔPRS)

= 10.5 + 17.5

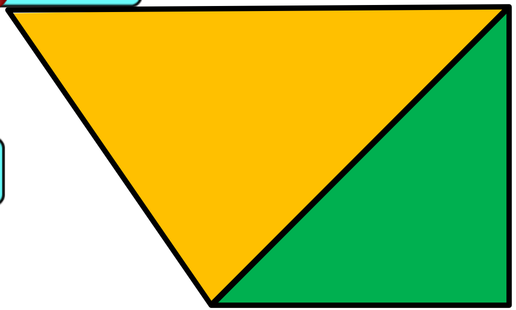
= 28 sq.units

∴ ar (□PQRS) = 28 sq.units

A (ΔPQR) = 10.5

$x_2 = 3$, $y_2 = -2$

$x_3 = 2$, $y_3 = 3$



$x_1 = -4$, $y_1 = -2$

MODULE - 26

COORDINATE GEOMETRY

- **Sum based on Finding Area of a triangle**

Q. You have studied in class IX, (Chapter 9, Example 3),
that ... equal areas.
Veri... (3, –2) and
C (5, 2).

Let the co-ordinates of C be (x_2, y_2)

Mid-Point Formula

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

Sol. D is the mid-point of BC.

$\therefore$ By Midpoint formula,

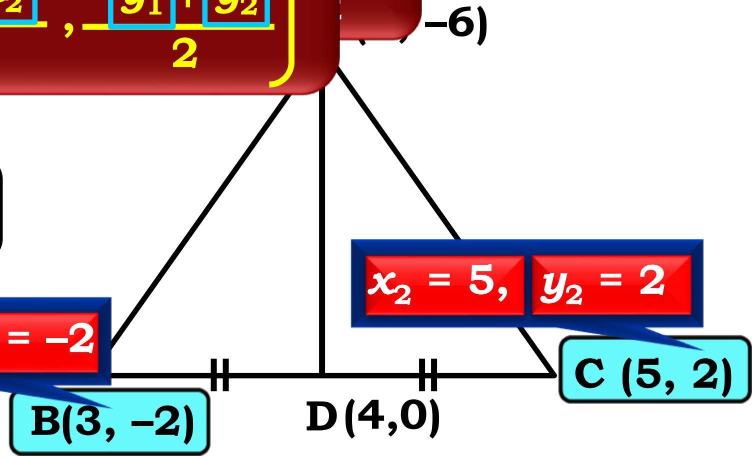
$$\therefore \text{Coordinates of D} = \left(\frac{3+5}{2}, \frac{-2+2}{2}\right)$$

$$D = \left(\frac{8}{2}, 0\right)$$

$$D = (4, 0)$$

$x_1 = 3$, $y_1 = -2$

$x_2 = 5$, $y_2 = 2$



Q. You have studied in ... mple 3),
that a median of a tr... triangles of equal areas.
Verify this result for ... A (4, –6 ...
C (5, 2).

Let ... of

Consider ΔABD

$x_1 = 4$, $y_1 = -6$

Sol. For ΔABD, the co-ordinates of A,B,D

Given : A (4, –6) , B (3, –2), D (4, 0)

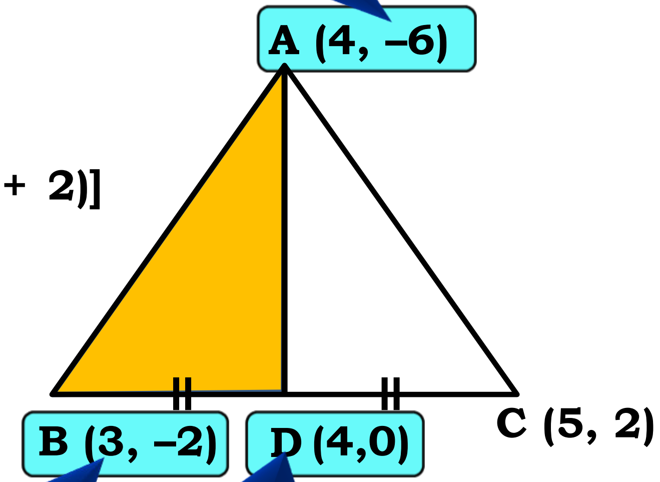
$$\text{ar}(\Delta ABD) = \frac{1}{2}\left[4(-2-0) + 3(0+6) + 4(-6+2)\right]$$

Which formula is used to find area of triangle?

$$\frac{1}{2}\left[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)\right]$$

-3

$$= \frac{1}{\cancel{2}} \times \cancel{(-6)} = -3$$



$x_2 = 3$, $y_2 = -2$ $x_3 = 4$, $y_3 = 0$

Area of triangle cannot be negativ...

∴ ar (ΔABD) = 3 sq. units

Q. You have studied in class IX, (Chapter 9, Example 3), that a median o … two triangles of equal areas. Verify this resul … are A (4, –6) ,B (3, –2) and C (5, 2).

Consider ΔADC

Sol. For ΔADC, the co-ordinates of A,D,C

Given : A (4, –6), D (4, 0), C (5, 2)

$$\text{ar}(\Delta ADC) = \frac{1}{2}[4(0-2) + 4(2+6) + 5(-6-0)]$$

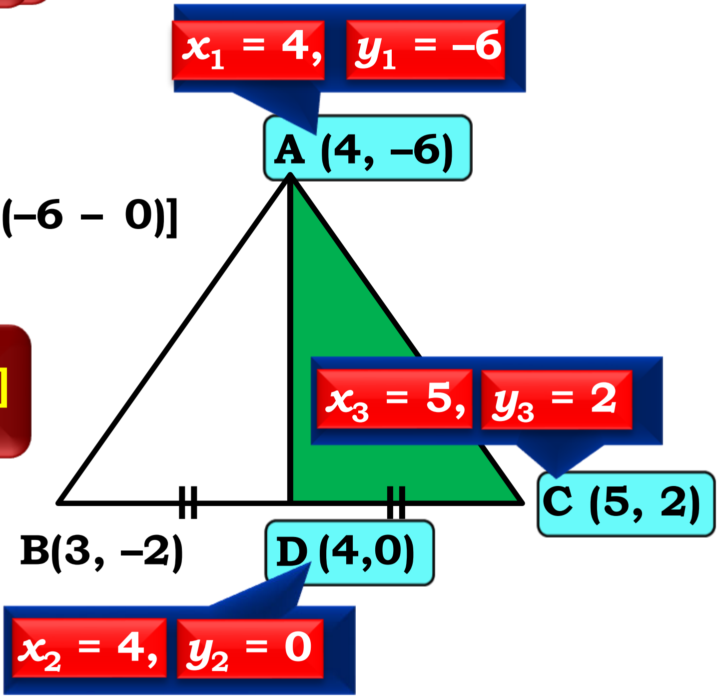
Which formula is used to find area of triangle?

$$\frac{1}{2}[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$$

Area of triangle cannot be negative.

∴ ar (ΔADC) = 3 sq. units

∴ ar (ΔABD) = ar (ΔADC)



MODULE - 27

COORDINATE GEOMETRY

- Sum based on Section Formula

Q. Point P divides the line segment joining the points A (2, 1) and B (5, −8) respectively. $\frac{AP}{AB} = \frac{1}{3}$. If P lies on the line $2x - y + k = 0$, find the value of k.

Sol.

$$\frac{AP}{\boxed{AB}} = \frac{1}{3}$$

$$\therefore \quad \frac{AP}{AP + BP} = \frac{1}{3}$$

$$\therefore \quad 3AP = AP + BP$$

$$\therefore \quad 3AP - AP = BP$$

$$\therefore \quad 2AP = BP$$

$$\therefore \quad \frac{AP}{BP} = \frac{1}{2}$$

Q. Point P divides the line segment joining the points A (2, 1) and B (5, –8) in the ratio 1 : 2. If P lies on the line $2x - y + k = 0$, find the value of k.

$x_1 = 2$, $y_1 = 1$ $x_2 = 5$, $y_2 = -8$

Sol. A (2, 1), B (5, –8) $m_1 : m_2 = 1 : 2$

A P B

(2, 1) (x, y) (5, –8)

By using section formula, we get

$$x = \frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}$$

$$y = \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2}$$

$$= \frac{1(-8) + 2(1)}{1 + 2}$$

$$= \frac{-8 + 2}{3}$$

$$\therefore \quad y = \frac{-6}{3} = -2$$

Let the co-ordinates of A be (x_1, y_1)

Which formula will help to find the coordinates of P?

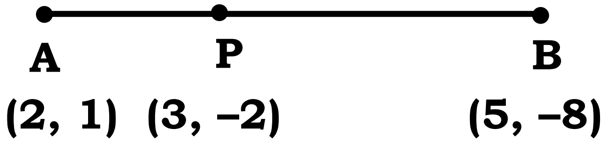
Section formula for internal division

$$x = \frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}, \quad y = \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2}$$

$\therefore x = \dfrac{\ }{3}$

$$P = (3, -2)$$

Q. Point P divides the line segment joining the points A (2, 1) and B (5, –8) respectively. $\frac{AP}{AB} = \frac{1}{3}$. If P lies on the line $2x - y + k = 0$, find the value of k.



Sol. P lies on the line $2x - y + k = 0$

$\therefore$ Coordinates of point P satisfy the given equation $2x - y + k = 0$

$\therefore$ We substitute $x = 3$, $y = -2$

$$2(3) - (-2) + k = 0$$

$$\therefore \quad 6 + 2 + k = 0$$

$$\therefore \quad 8 + k = 0$$

$$\therefore \quad \boxed{k = -8}$$

MODULE - 28

COORDINATE GEOMETRY

- **Sum based on Finding Radius of a circle**

Q. Find the co-ordinates of the centre of a circle passing through the points A (3, 5), B (–1, 1) and C (3, –3). Also, find the radius of the circle.

Sol.

Let, O (a, b)

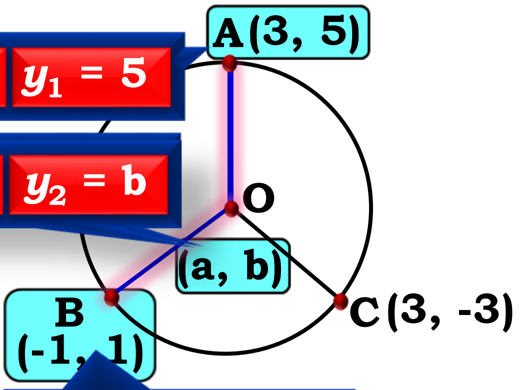
OA = OB = O

Let the co-ordinates of B be (x_1, y_1)

$x_1 = 3$, $y_1 = 5$

$x_2 = a$, $y_2 = b$

OA = OB



$$\sqrt{(a-3)^2+(b-5)^2} = \sqrt{[a-(-1)]^2+(b-1)^2}$$

$\therefore$ $(a-3)^2 + (b-5)^2 = (a+1)^2 + (b-1)^2$

$\therefore$ $\cancel{a^2} - 6a + 9 + \cancel{b^2} - 10b + 25 = \cancel{a^2} + 2a + 1 + \cancel{b^2}$ ...

$x_1 = -1$, $y_1 = 1$

Which is the formula to find length of OA and OB?

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

... 34 = 2a – 2b + 2

... 2b = 2 – 34

$\therefore$ –8a – 8b = –32

$\therefore$ a + b = 4 ...(i)

Q. **Find the co-ordinates of the centre of a circle passing through the points A (3, 5), B (–1, 1) and C (3, –3). Also, find the radius of the circle.**

Sol. Let, O (a, b)

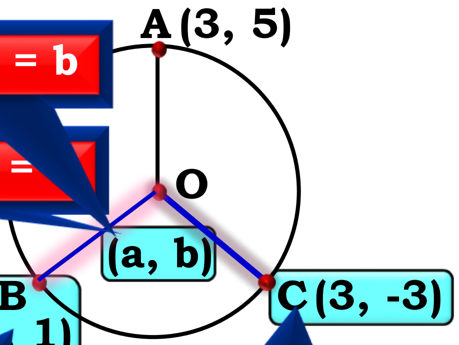
$a + b = 4 \quad \ldots(i)$

$x_2 = a, \; y_2 = b$

$x_2 = a, \; y_2 =$

OA = OB = OC (radii of the same circle)

OB = OC



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

$\therefore \quad (a + 1)^2 + (b - 1)^2 = (a - 3)^2 + (b + 3)^2$

$x_1 = -1 \qquad x_1 = 3, \; y_1 = -3$

Which is the formula to find length of OB and OC?

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

$\therefore \quad \ldots = \cancel{a^2} - 6a + 9 + \cancel{b^2} + 6b + 9$

$\therefore \quad \ldots = -6a + 6b + 18$

$\therefore \quad 2a + 6a - 2b - 6b = 18 - 2$

$\therefore \quad \ldots = 16$

$\therefore \quad \ldots = 2 \quad \ldots(ii)$

Let the co-ordinates of C be (x_1, y_1)

MODULE - 29

COORDINATE GEOMETRY

- **Sum based on Finding Radius of a circle**

Q. **Find the co-ordinates of the centre of a circle passing through the points A (3, 5), B (–1, 1) and C (3, –3). Also, find the radius of the circle.**

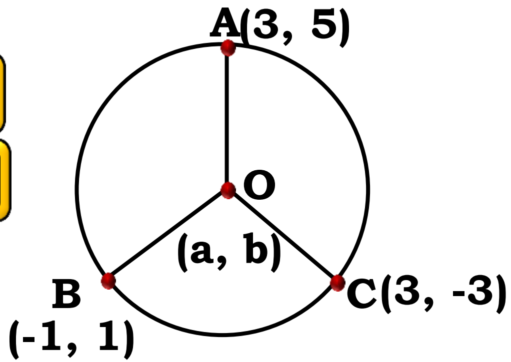
Sol.

Adding (i) and (ii)

$$\begin{aligned} a + \cancel{b} &= 4 \\ a - \cancel{b} &= 2 \\ \hline 2a &= 6 \\ a &= 3 \end{aligned}$$

$a + b = 4 \quad \ldots(i)$

$a - b = 2 \quad \ldots(ii)$



Substituting value of a in (i),

$$3 + b = 4$$

$$\therefore \quad b = 4 - 3$$

$$\therefore \quad b = 1$$

$$\therefore \quad \boxed{O = (3, 1)}$$

Q. Find the co-ordinates of the centre of a circle pass... points A (... . Also, find the ... circle.

Let the co-ordinates of A be (x_1, y_1)

$x_1 = 3$, $y_1 = 5$

Sol. By distan...

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

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

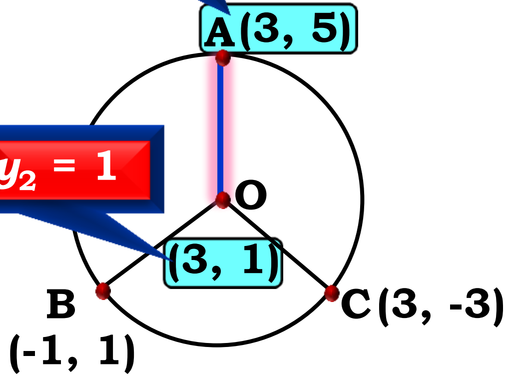
$x_2 = 3$, $y_2 = 1$

Which is the formula to find length of AO?

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

$\therefore$ $AO = \sqrt{16} = 4$

$\therefore$ $\boxed{\text{Radius = 4 units}}$



Thank You

MODULE - 30

COORDINATE GEOMETRY

- **Sum based on Finding Medians of a triangle**

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

Sol. Let AP, BQ and CR be the medians of

Which formula is used to find co-ordinates of P?

Mid-Point Formula

$$\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}$$

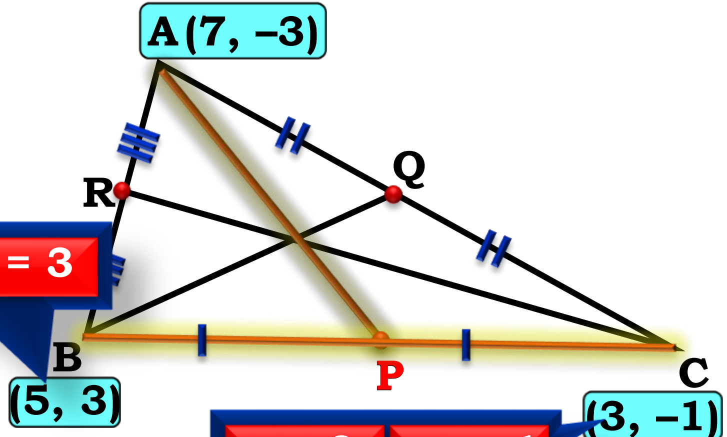
$x_1 = 5$, $y_1 = 3$

Let the co-ordinates of C be (x_2, y_2)

$x_2 = 3$, $y_2 = -1$

For using distance formula, we require the co-ordinates of A and P.

✓ ?



Q. ... ΔABC whose vertices are

$x_1 = 7$, $y_1 = -3$ | $x_2 = 4$, $y_2 = 1$

Sol. A $(7, -3)$ P $(4, 1)$

By distance formula,

Let the co-ordinates of P be (x_2, y_2)

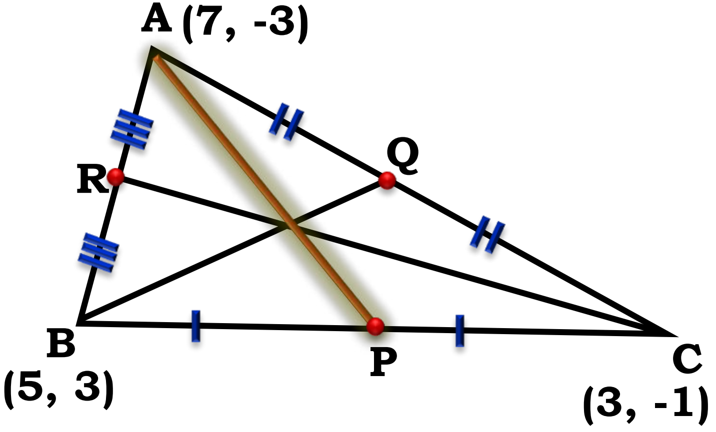
$= \sqrt{[4-7]^2 + [1-(-3)]^2}$

Which formula is used to find length of AP?

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

$= \sqrt{9 + 16} = \sqrt{25}$

$\therefore$ AP = 5 units



MODULE - 31

COORDINATE GEOMETRY

- Sum based on Finding Medians of a triangle

Q. Find the lengths of the medians of ΔABC whos... A (7, -3), B (5, 3) and C (3, –1).

Sol ... Let AP, BQ and CR be the medians of

Which formula is used to find co-ordinates of Q?

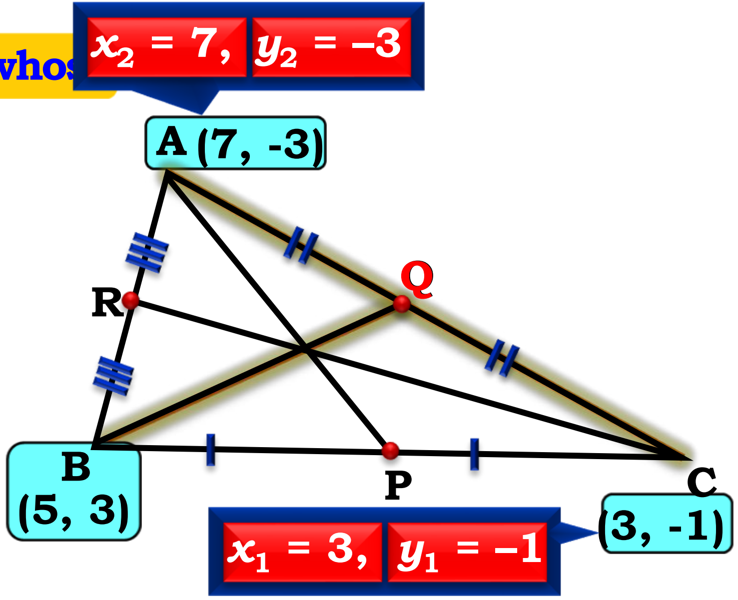
Mid-Point Formula

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

Let the co-ordinates of C be (x_1, y_1)

For using distance formula, we require the co-ordinates of B and Q.

∴ Q = (5, –2)



Q. ΔABC whose vertices are

$x_1 = 5$, $y_1 = 3$

$x_2 = 5$, $y_2 = -2$

Sol. B (5, 3) Q(5, −2)

By distance formula,

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

$3\ ]^2$

Let the co-ordinates of Q be (x_2, y_2)

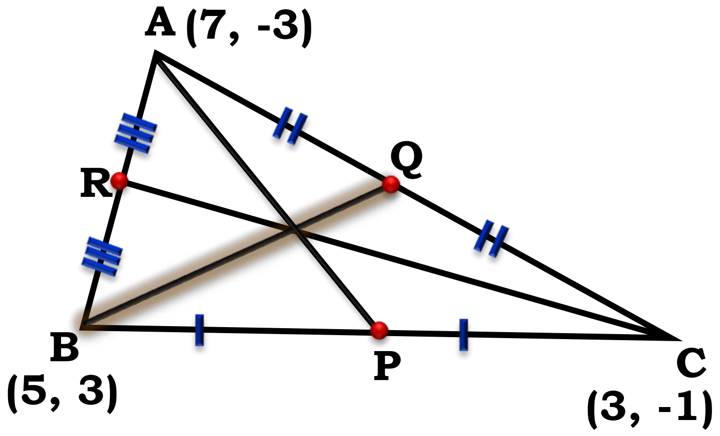
$$= \sqrt{(0)^2 + (-5)^2}$$

Which formula is used to find length of BQ?

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

$$= \sqrt{25}$$

$\therefore$ BQ = 5 units



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

Sol ... medians of

Which formula is used to find co-ordinates of R?

Mid-Point Formula

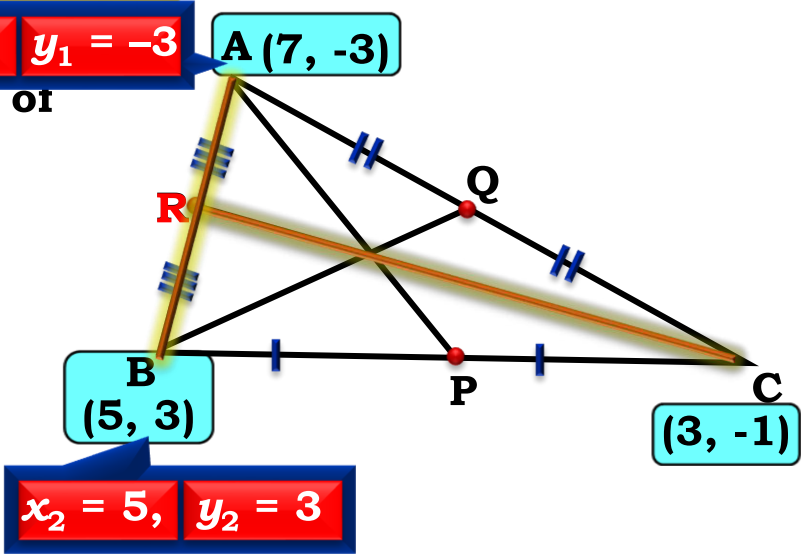
$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

Let the co-ordinates of A be (x_1, y_1)

For using distance formula, we require the co-ordinates of C and R.

✓ ?

$\therefore$ R = (6, 0)



Q ... ns ... f ΔABC whose vertices are ... 3), B (5, 3) an ... (3, –1).

$x_1 = 3,\ y_1 = -1$ $x_2 = 6,\ y_2 = 0$

Sol. C (3, –1) R (6, 0)

By distance formula,

Let the co-ordinates of R be (x_2, y_2)

C ... $y_1)^2$

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

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

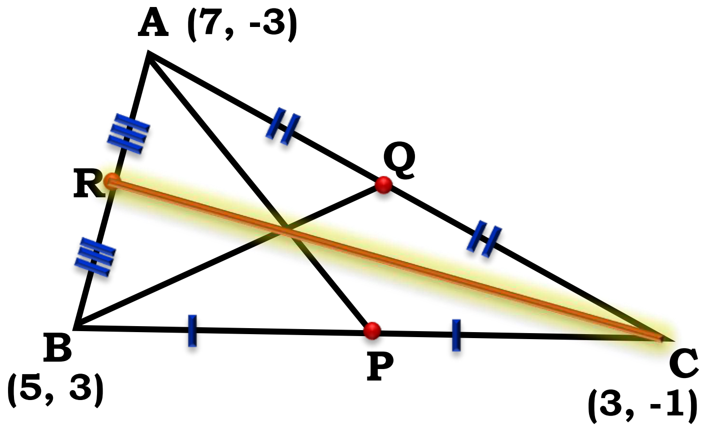
Which formula is used to find length of CR?

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

$= \sqrt{9 + 1}$

$= \sqrt{10}$

$\therefore$ $\boxed{CR = \sqrt{10} \text{ units}}$



MODULE - 32

COORDINATE GEOMETRY

- **Sum based on Centroid of a Triangle**

Point of concurrence of medians

ula

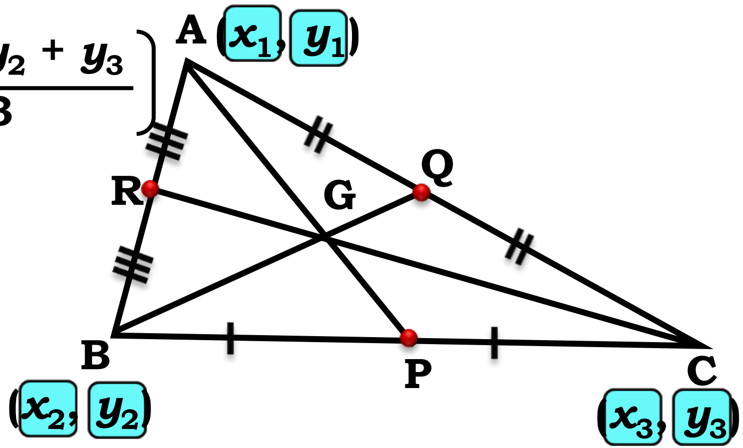
Segment joining vertex and midpoint of opposite side

Consider ΔABC

C (x_3, y_3)

Let us draw medians AP, BQ and CR

$$\therefore \text{Coordinates of G are} = \left(\frac{x_1 + x_2 + x_3}{3} , \frac{y_1 + y_2 + y_3}{3} \right)$$



Q. A(3, 2) and B(–2, 1) are two vertices of a triangle ABC
wh ... dinates $\left(\frac{5}{3}, -\frac{1}{3}\right)$.
F ... rd vertex C of the triangle.

Centroid Formula

$$\left(\frac{\boxed{x_1}+\boxed{x_2}+\boxed{x_3}}{3}, \frac{\boxed{y_1}+\boxed{y_2}+\boxed{y_3}}{3}\right)$$

Sol.

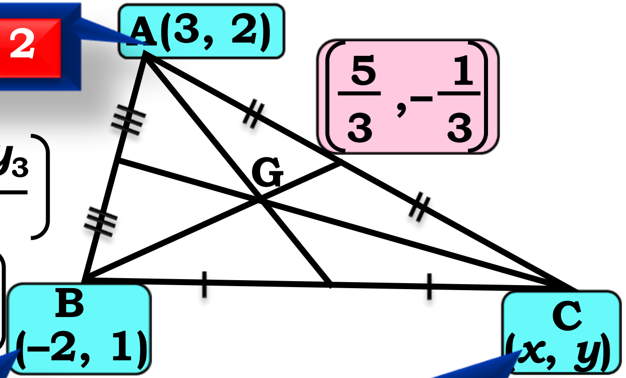
Let coordinates of C are (x, y)

$x_1 = 3$, $y_1 = 2$

$\therefore$ By ...

$\therefore$ Coo ... x_3, $\frac{y_1 + y_2 + y_3}{3}\Big)$

Let the co-ordinates of C be (x_3, y_3)



$$\left(\frac{5}{3}, -\frac{1}{3}\right) = \left(\frac{3 - 2 + x}{3}, \frac{2 + 1 + y}{3}\right)$$

$$\left(\frac{5}{3}, -\frac{1}{3}\right) = \left(\frac{1 + x}{3}, \frac{3 + y}{3}\right)$$

$x_2 = -2$, $y_2 = 1$ $x_3 = x$, $y_3 = y$

$$\therefore \frac{5}{3} = \frac{1 + x}{3} \qquad \therefore \frac{-1}{3} = \frac{3 + y}{3}$$

Q. **A(3, 2) and B(–2, 1) are two vertices of a triangle ABC whose centroid G has the coordinates $\left(\frac{5}{3}, -\frac{1}{3}\right)$.**
Find the coordinates of the third vertex C of the triangle.

Sol.

$$\therefore \quad \frac{5}{3} = \frac{1 + x}{3}$$

$$\therefore \quad 5 = 1 + x$$

$$\therefore \quad 5 - 1 = x$$

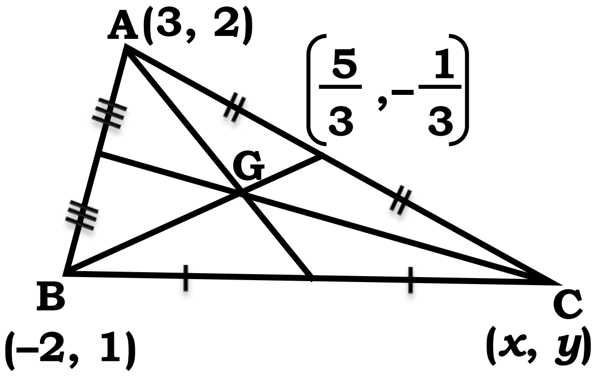
$$\therefore \quad x = 4$$

$$\therefore \quad \frac{-1}{3} = \frac{3 + y}{3}$$

$$\therefore \quad -1 = 3 + y$$

$$\therefore \quad -1 - 3 = y$$

$$\therefore \quad y = -4$$



$\therefore$ $\boxed{\text{The coordinates of C are } (4, -4)}$

MODULE - 33

COORDINATE GEOMETRY

- Sum based on Area of triangle

Q. Find k so that the point P(–4, 6) lies on the line segment joining A(k, 10) and B(3, –8).

$x_1 = -4$, $y_1 = 6$ | $x_2 = k$, $y_2 = 10$ | $x_3 = 3$, $y_3 = -8$

P B

(k, 10) (–4, 6) (3, –8)

Sol. Given : P (–4, 6), A (k, 10), B (3, –8)

If P(–4, 6) lies on the line segment joining A(k, 10) and B(3, –8), then P, A and B are collinear.

Area of triangle $= \frac{1}{2}[(x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2))]$

Let the co-ordinates of P be (x_1, y_1)

$\ldots 10 + 8) + k(-8 - 6) + 3(6 - 10)]$

$\therefore \quad 0 \times 2 = [-4(18) + k(-14) + 3(-4)]$

Which formula is used to find area of triangle?

$\frac{1}{2}[(\boxed{x_1}\boxed{(y_2} - \boxed{y_3)} + \boxed{x_2}\boxed{(y_3} - \boxed{y_1)} + \boxed{x_3}\boxed{(y_1} - \boxed{y_2)}]$

$\therefore \quad 84 = -14k$

$\therefore \quad k = \frac{-84}{14}$

$\therefore \quad \boxed{k = -6}$

Q. Find k so that the point P(–4, 6) lies on the line segment

$x_1 = -6, y_1 = -10$ $x_2 = 3,$ $y_2 = -8$ $x = -4,$ $y = 6$

P B

(–6, 10) (–4, 6) (3, –8)

Sol. A (–6, 10), B (3, –8), P (–4, 6) $m_1 : m_2 = ?$

P divides segment AB in the ratio $m_1 : m_2$

By using section formula, we get

Let the co-ordinates of P be (x, y)

To find the ratio let us apply section formula

$$x = \frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}, \quad y = \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2}$$

$$\therefore \quad -4 = \left(\frac{m_1(3) + m_2(-6)}{m_1 + m_2}\right)$$

$$\therefore \quad -4(m_1 + m_2) = 3m_1 - 6m_2$$

$$\therefore \quad -4m_1 - 4m_2 = 3m_1 - 6m_2$$

$$\therefore \quad -4m_1 - 3m_1 = -6m_2 + 4m_2$$

$$\therefore \quad \cancel{-}7m_1 = \cancel{-}2m_2$$

$$\therefore \quad \frac{m_1}{m_2} = \frac{2}{7}$$

$\therefore$ **P divides AB in the ratio 2 : 7**

MODULE - 34

COORDINATE GEOMETRY

- **Sum based on Area of triangle and parallelogram**

Q. If the points A(1, –2), B(2, 3), C(–3, 2) and D(–4, –3) are the vertices of parallelogram ABCD, then taking AB a
the base, find the height of the parallelogram.

$x_3 = -4$, $y_3 = -3$

Sol. The coordinates of vertices of ΔABD are A(1, –2), B(2, 3) and D(–4, –3)

Let the co-ordinates of D be (x_3, y_3)

ar ($(-3 - (-2)) + (-4)(-2 - 3)]$

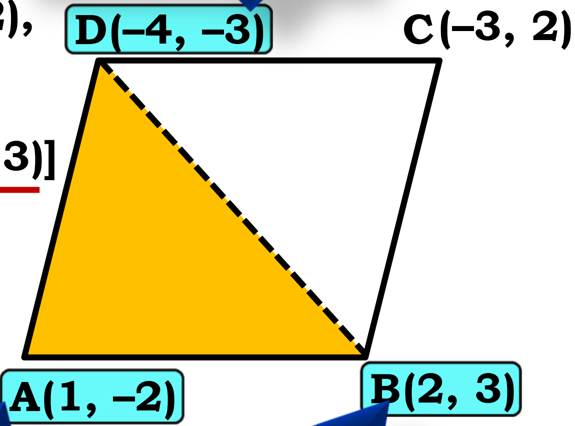
$= \frac{1}{2}\,[1\,(6) + 2\,(-1) + (-4)\,(-5)]$

Which formula is used to find area of triangle?

$\frac{1}{2}\,[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$

$= \frac{1}{\cancel{2}} \times \cancel{24}^{\,12}$

∴ ar (ΔABD) = 12 Sq.units



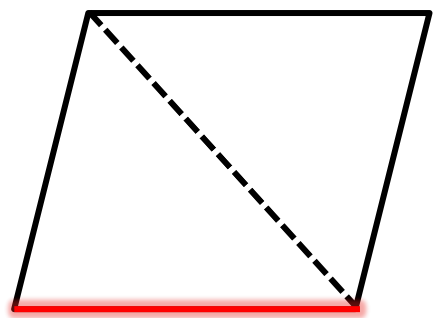
$x_1 = 1$, $y_1 = -2$

$x_2 = 2$, $y_2 = 3$

Q. If the points A(1, –2), B(2, 3), C(–3, 2) and D(–4, –3) are the ... D, then taking **AB as** ... he parallelogram.

$x_1 = 1$, $y_1 = -2$ $x_2 = 2$, $y_2 = 3$

Sol. A (1, –2) B (2, 3)



By distance formula,

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

Let the co-ordinates of B be (x_2, y_2)

Which formula is used to find length of AB?

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

$$= \sqrt{26}$$

$\therefore$ $AB = \sqrt{26}$ units

Q. If the points A(1, –2), B(2, 3), C(–3, 2) and D(–4, –3) are the vertices of parallelogram ABCD, then taking AB as the base, find the height of the parallelogram.

Sol. Let DM = h be the height of parallelogram ABCD when AB is taken as the base.

$$\text{Area of } \Delta ABD = \frac{1}{2}\,(\text{Base} \times \text{Height})$$

$$\text{Area of } \Delta ABD = \frac{1}{2}\,(AB \times DM)$$

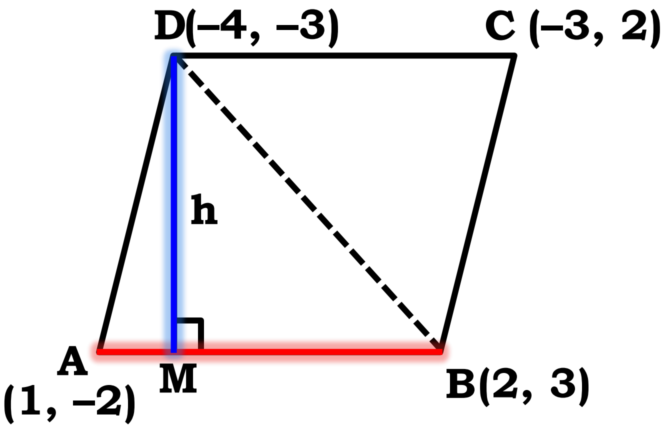
What is the formula to find Area of a triangle ?

½ × base × height

$$\therefore \quad h = \frac{2\,(\text{Area of } \Delta ABD)}{AB}$$

$$\therefore \quad h = \frac{2 \times 12}{\sqrt{26}}$$

$$\therefore \quad \boxed{h = \frac{24}{\sqrt{26}} \text{ units}}$$



(ΔABD) = 12 Sq.units

$AB = \sqrt{26}$ units

Thank You