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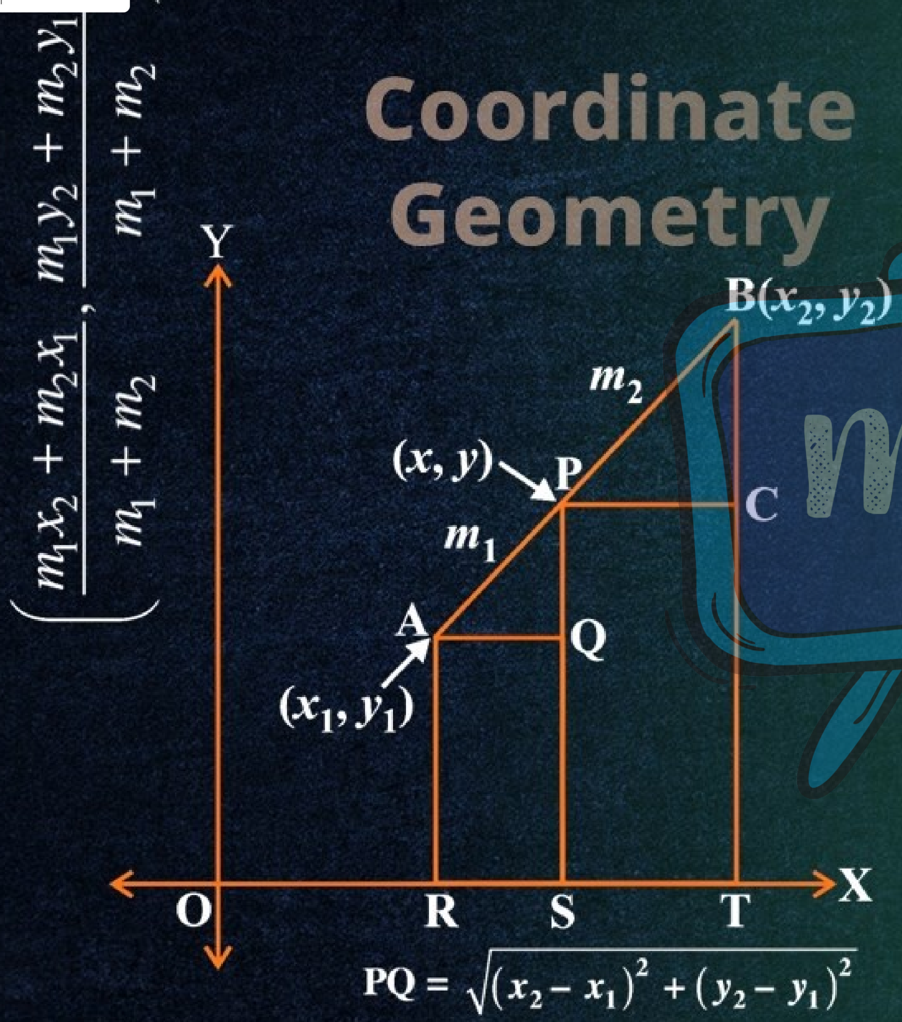
Coordinate Geometry



CLASS – 10

MATHEMATICS

Chapter – 7

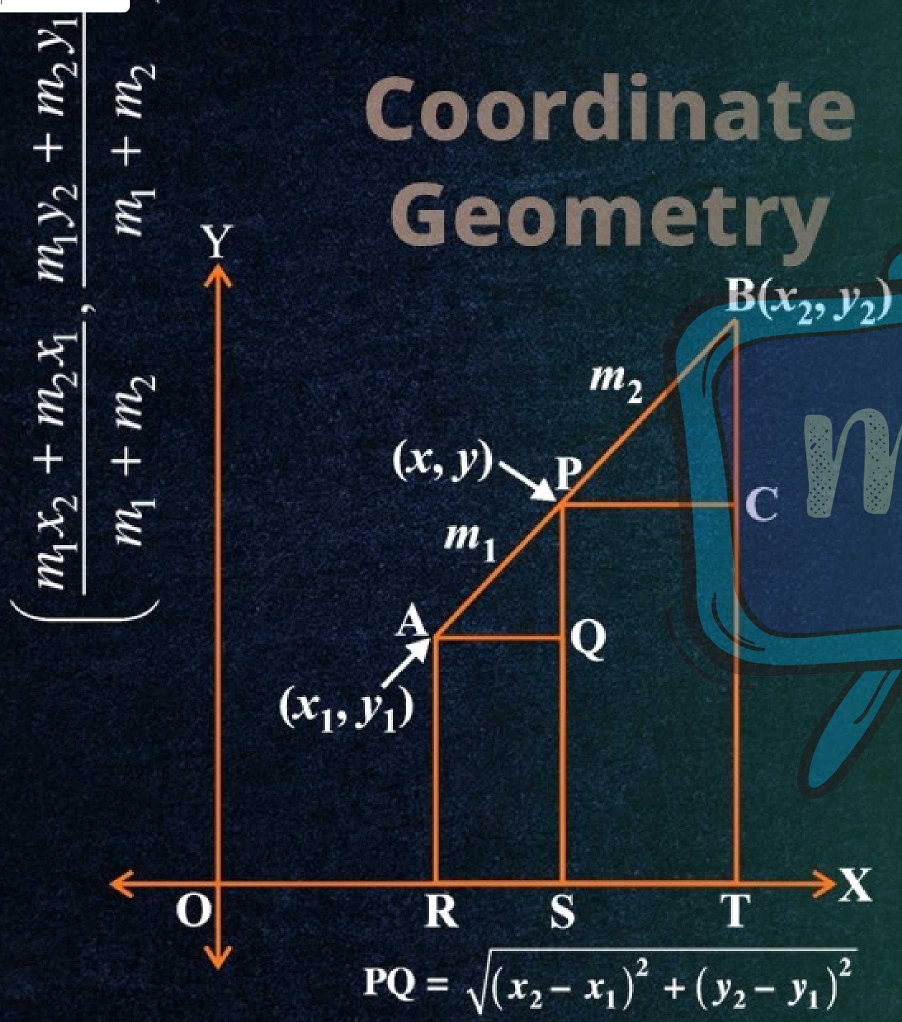
Coordinate Geometry

Part – 3

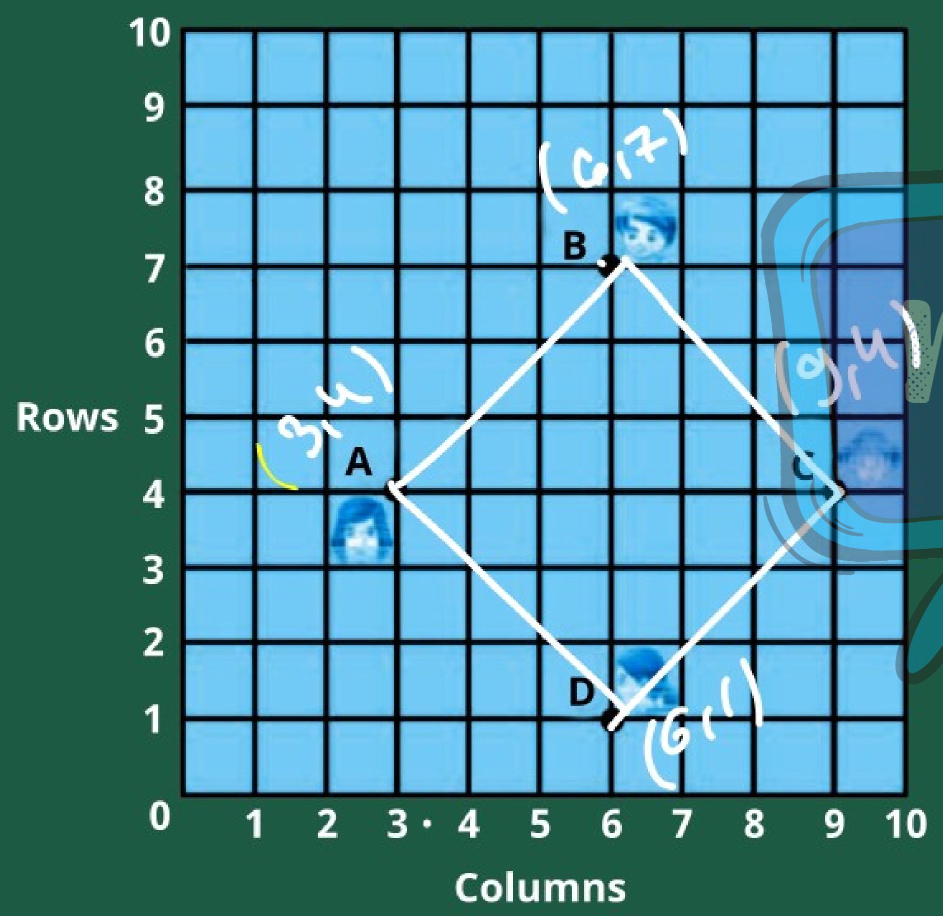
Exercise 7.1 (Q.5–7)

Shubham Tiwari

Coordinate Geometry



EXERCISE 7.1



5. In a classroom, 4 friends are seated at the points A, B, C and D as shown in Fig. 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.

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

To check that ABCD is a square
Let's apply distance formula

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

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

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

$$\boxed{AB = 3\sqrt{2} \text{ unit}}$$

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

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

$$BC = \sqrt{9+9} = \sqrt{18} = 3\sqrt{2} \text{ unit}$$

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

$$= \sqrt{3^2 + 3^2} = 3\sqrt{2} \text{ unit}$$

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

$$\sqrt{3^2 + (-3)^2} = \sqrt{18} = 3\sqrt{2} \text{ unit}$$

$$AC = \sqrt{(9-3)^2 + (4-4)^2}$$

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

$AC = 6$ unit

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

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

$$BD = \sqrt{0 + 6^2} = \sqrt{6^2} = 6 \text{ unit}$$

As we have observed that in □ ABCD all the sides and diagonals are equal

Hence it is a square

6. Name the type of quadrilateral formed, if any, by the following points, and give reasons for your answer :

i. $\underbrace{(-1, -2)}_{A}, \underbrace{(1, 0)}_{B}, \underbrace{(-1, 2)}_{C}, \underbrace{(-3, 0)}_{D}$

Soln

By applying distance formula

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

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

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

$$AB = \sqrt{4+4} = \sqrt{8} = 2\sqrt{2} \text{ unit}$$

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

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

$$BC = \sqrt{2^2 + 2^2} = \sqrt{4+4} = \sqrt{8} = 2\sqrt{2} \text{ unit}$$

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

$(-1, 2)$ C

$(-3, 0)$ D

$(-1, -2)$ A

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

$$CD = \sqrt{2^2 + 2^2} = \sqrt{8} = 2\sqrt{2} \text{ unit}$$

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

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

$$= \sqrt{2^2 + 2^2} = \sqrt{8} = 2\sqrt{2} \text{ units}$$

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

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

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

$$= \sqrt{16}$$

$$\boxed{AC = 4 \text{ unit}}$$

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

B(1,0)

D(-3,0)

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

$$= \sqrt{4^2 + 0^2}$$

$$BD = \sqrt{16+0} = 4 \text{ unit}$$

as all sides are equal and diagonal are also equal, this is a square

ii. (−3, 5), (3, 1), (0, 3), (−1, −4)

A B C D

By the distance formula

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

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

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

$= \sqrt{6^2 + 4^2} = \sqrt{36 + 16}$

$AB = \sqrt{52} = \sqrt{4 \times 13} = 2\sqrt{13}$ unit

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$$BC = \sqrt{(3-0)^2 + (1-3)^2}$$
$$= \sqrt{3^2 + (-2)^2}$$
$$BC = \sqrt{9+4} = \sqrt{13} \text{ unit}$$

$$CD = \sqrt{[0-(-1)]^2 + [3-(-4)]^2}$$
$$= \sqrt{(0+1)^2 + (3+4)^2}$$
$$CD = \sqrt{1^2 + 7^2} = \sqrt{1+49} = \sqrt{50} \text{ unit}$$

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

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$$AD = \sqrt{(-2)^2 + 9^2}$$

$$= \sqrt{4+81}$$

$$\boxed{AD = \sqrt{85} \text{ unit}}$$

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

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

$$\underline{AC} = \sqrt{9+4} = \sqrt{13} \text{ unit}$$

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

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

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$$BD = \sqrt{4^2 + 5^2}$$

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

$$BD = \sqrt{41} \text{ unit}$$

are we can see that

$AB = 2\sqrt{13}$

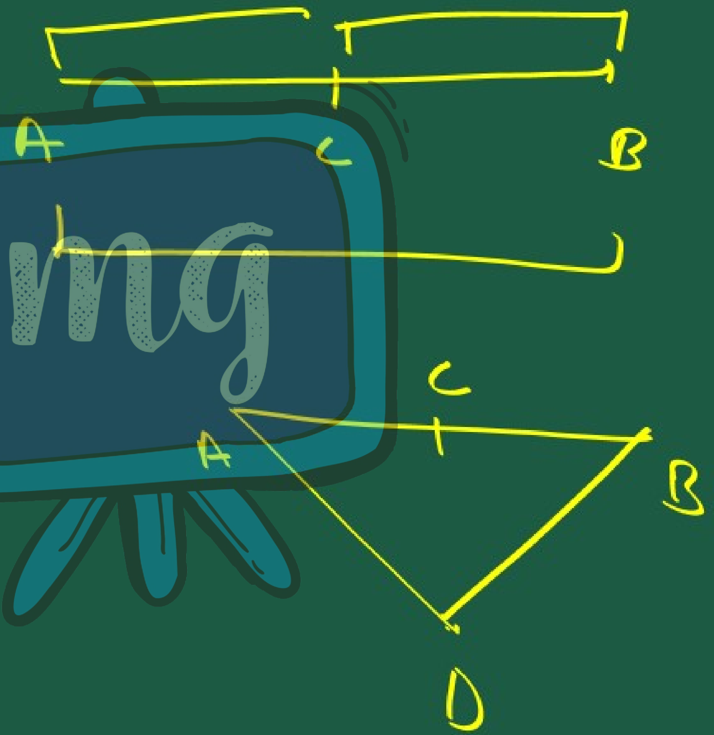
$BC = \sqrt{13}$

$AC = \sqrt{13}$

$AB = AC + BC$

$2\sqrt{13} = \sqrt{13} + \sqrt{13}$

$2\sqrt{13} = 2\sqrt{13}$


A
C
B
C
A
B
D

iii. $\underbrace{(4, 5)}_{A}, \underbrace{(7, 6)}_{B}, \underbrace{(4, 3)}_{C}, \underbrace{(1, 2)}_{D}$

Soln. By the distance formula

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

$= \sqrt{(7-4)^2 + (6-5)^2}$

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

$= \sqrt{9+1} = \sqrt{10}$ unit

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

$BC = \sqrt{3^2 + 3^2} = 3\sqrt{2}$ unit

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

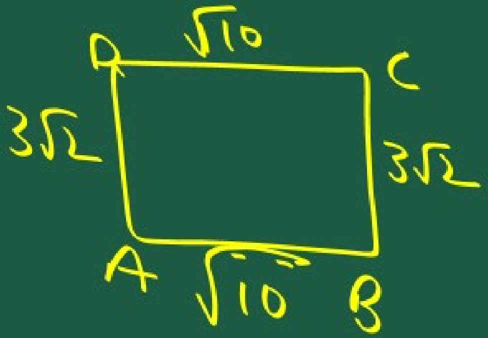
$$= \sqrt{3^2 + (1)^2}$$

$$CD = \sqrt{9+1} = \sqrt{10} \text{ unit}$$

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

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

$$AD = 3\sqrt{2} \text{ unit}$$



$$AC = \sqrt{(4-4)^2 + (5-3)^2}$$

$$= \sqrt{0^2 + 2^2}$$

$$= \sqrt{0 + 2^2}$$

$$AC = \sqrt{2^2} = 2 \text{ unit}$$

$(7,6)$

$(1,2)$

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

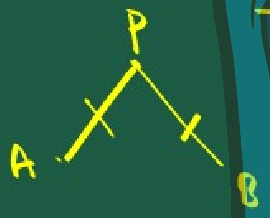
$$= \sqrt{6^2 + 4^2}$$

$$= \sqrt{36+16} = \sqrt{52} \text{ unit}$$

Hence ABCD is a $\parallel$gm.

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

Soln.



let P be the coordinate as $P(a, 0)$

as P is equidistant from $(2,-5)$ and $(-2,9)$

let $A(2,-5)$ and $B(-2,9)$

$PA = PB$

$$PA = PB$$

$$PA^2 = PB^2$$

by the distance formula

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

$$PA^2 = PB^2$$

$$(a-2)^2+(0+5)^2 = (a-(-2))^2+(0-9)^2$$

$$(a-2)^2+5^2 = (a+2)^2+(-9)^2$$

$$(a-2)^2-(a+2)^2 = 9^2-5^2$$

$$a^2+4-4a-(a^2+4+4a) = 81-25$$

$$\cancel{a^2}+\cancel{4}-4a-\cancel{a^2}-\cancel{4}-4a = 56$$

$$-8a = 56$$

$$\underline{a = -7}$$

Hence the coordinate $P(a,0)$ will be

$P(-7,0)$