COORDINATE GEOMETRY

PPT-8

SUBJECT : MATHEMATICS
CHAPTER NUMBER: 07
CHAPTER NAME : COORDINATE GEOMETRY

CHANGING YOUR TOMORROW

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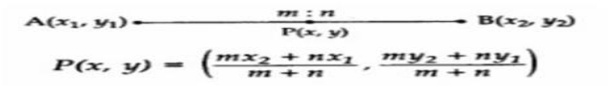
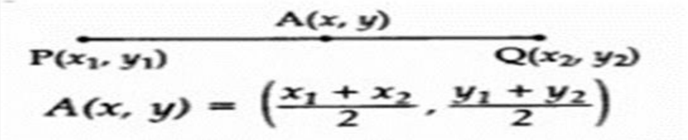
PREVIOUS KNOWLEDGE TEST

1. The coordinates of the point which divides the line segment joiningthe points A(x_1, y_1) and B(x_2, y_2) internally in the ratio m : n are:



2.The mid-point of the line segment joining the points P (x_1, y_1) and Q ((x_2, y_2)



. Collinearity Condition

If three points A, B and C are collinear and B lies between A and C, then,

1.AB + BC = AC. AB, BC, and AC can be calculated using the distance formula.

2.The ratio in which B divides AC, calculated using section formula for both the x and y coordinates separately will be equal.

3.Area of a triangle formed by three collinear points is zero.

LEARNING OUTCOME

1. Students will be able to apply distance formula to find the distance between two points.
2. Students will be able to apply distance formula to know whether three points are collinear or not.
3. Students will be able to apply distance formula to solve on problems based on geometrical figure.
4. Students will be able to apply section formula to solve on problems based on finding section ratio and section point.
5. Students will be able to apply section formula to solve on problems based on finding points of trisection.
6. Students will be able to find the area of triangle when the coordinates of its vertices are given.
7. Students will be able to find the area of a quadrilateral when the coordinates of its vertices are given..

Revision ;

. https://youtu.be/kpvfS_e-hrA (7.20)

1. If the points A(x, 2), B(-3, 4) and C(7, -5) are collinear

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When the points are collinear.

Area of the triangle formed by the three points is 0.

$x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2) = 0$

$x(-4 - (-5)) + (-3)(-5 - 2) + 7(2 - (-4)) = 0$

$x(1) + 21 + 42 = 0$

$x + 63 = 0 \therefore x = -63$

2.Find a relation between x and y such that the point P(x, y) is equidistant from the points A (2, 5) and B (-3, 7)

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Let P (x, y) be equidistant from the points A (2, 5) and B (-3, 7).

∴ AP = BP ...[Given]

$AP^2 = BP^2$ ...[Squaring both sides]

$(x-2)^2 + (y-5)^2 = (x+3)^2 + (y-7)^2$

$\Rightarrow x^2 - 4x + 4 + y^2 - 10y + 25 = x^2 + 6x + 9 + y^2 - 14y + 49$

$\Rightarrow -4x - 10y - 6x + 14y = 9 + 49 - 4 - 25$

$\Rightarrow -10x + 4y = 29$

∴ $10x + 29 = 4y$ is the required relation.

3. Find the ratio in which y-axis divides the line segment joining the points A(5, -6), and B(-1, -4). Also find the coordinates of the point of division.

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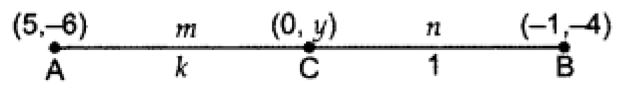
Let AC: CB = m : n = k : 1



Coordinates of C $= \left(\dfrac{mx_2 + nx_1}{m+n}, \dfrac{my_2 + ny_1}{m+n}\right)$

$$= \left(\frac{-k+5}{k+1}, \frac{-4k-6}{k+1}\right) \quad \ldots(i)$$

Point C lies on y-axis $\therefore \dfrac{-m+5}{m+1} = 0$

$\Rightarrow$ $-k + 5 = 0$ or $k = 5$

$\therefore$ **Required ratio** $= k : 1 =$ **5 : 1**

From (i), required point C,

$$\Rightarrow \left(\frac{-5+5}{5+1}, \frac{-20-6}{5+1}\right) = \left(0, \frac{-26}{6}\right) = \left(\mathbf{0}, \frac{\mathbf{-13}}{\mathbf{3}}\right)$$

4. Three vertices of a parallelogram taken in order are (-1, 0), (3, 1) and (2, 2) respectively. Find the coordinates of fourth vertex

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Let A(-1, 0), B(3, 1), C(2, 2) and D(x, y) be the vertices of a parallelogram ABCD taken in order. Since, the diagonals of a parallelogram bisect each other.

∴ Coordinates of the mid-point of AC = Coordinates of the mid-point of BD

$$\Rightarrow \left(\frac{-1+2}{2}, \frac{0+2}{2}\right) = \left(\frac{3+x}{2}, \frac{1+y}{2}\right)$$

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

$$\Rightarrow \frac{3+x}{2} + \frac{1}{2} \qquad \Big| \qquad \frac{y+1}{2} = 1$$

$$\Rightarrow 3 + x = 1 \qquad \Big| \qquad \Rightarrow y + 1 = 2$$

$$\Rightarrow x = 1 - 3 \qquad \Big| \qquad \Rightarrow y = 2 - 1$$

$$\Rightarrow x = -2 \qquad \Big| \qquad \Rightarrow y = 1$$

The coordinate of the fourth vertex, D(-2, 1)

5. Prove that the points A(0, -1), B(-2, 3), C(6, 7) and D(8, 3) are the vertices of a rectangle ABCD.

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$$AB = \sqrt{(-2-0)^2 + (3+1)^2}$$
$$= \sqrt{4+16} = \sqrt{20} = 2\sqrt{5}$$
$$BC = \sqrt{(6+2)^2 + (7-3)^2}$$
$$= \sqrt{64+16} = \sqrt{80} = 4\sqrt{5}$$
$$CD = \sqrt{(8-6)^2 + (3-7)^2}$$
$$= \sqrt{4+16} = \sqrt{20} = 2\sqrt{5}$$
$$AD = \sqrt{(8-0)^2 + (3+1)^2}$$
$$= \sqrt{64+16} = \sqrt{80} = 4\sqrt{5}$$
$$\text{Diagonal } AC = \sqrt{(6-0)^2 + (7+1)^2}$$
$$= \sqrt{36+64} = \sqrt{100} = 10$$
$$\text{Diagonal } BD = \sqrt{(8+2)^2 + (3-3)^2} = \sqrt{10^2} = 10$$

Opposite sides AB = CD = $2\sqrt{5}$

Opposite sides BC = AD = $4\sqrt{5}$

Diagonal AC = Diagonal BD = 10

∴ ABCD is a rectangle.

6. Find the ratio in which point P(-1, y) lying on the line segment joining points A(-3, 10) and B(6, -8) divides it. Also find the value of y.

Let PA : PB = k : 1

Coordinates of P = Coordinates of P

$$\left(\frac{6k-3}{k+1}, \frac{-8k+10}{k+1}\right) = (-1, y)$$

$$\frac{6k-3}{k+1} = \frac{-1}{1}$$

$$6k - 3 = -k - 1$$

$$6k + k = -1 + 3$$

$$7k = 2$$

$$k = \frac{2}{7} \quad \text{...}(i)$$

$$y = \frac{-8k+10}{k+1}$$

$$y = \frac{-8\left(\frac{2}{7}\right)+10}{\frac{2}{7}+1} \quad \text{...[From } (i)]$$

$$y = \frac{\frac{-16+70}{7}}{\frac{2+7}{7}}$$

$$y = \frac{54}{7} \times \frac{7}{9} = 6$$

$\therefore$ **Required ratio** = k : 1 = $\frac{2}{7}$: 1 = **2 : 7 and** y = **6.**

HOME ASSIGNMENT CH-. 7.

THANKING YOU

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