Chapter-Coordinate Geometry

1. Distance Formula

The distance between two points (x_1, y_1) and (x_2, y_2) is given by:

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

Example 1:

Find the distance between the points (3, 4) and (-2, 7).

Solution:

$$d = \sqrt{[(-2 - 3)^2 + (7 - 4)^2]}$$
$$= \sqrt{[(-5)^2 + 3^2]}$$
$$= \sqrt{(25 + 9)}$$
$$= \sqrt{34} \approx 5.83 \text{ units}$$

Example 2:

Determine if the points (1, 5), (4, 6), and (6, 3) form a right-angled triangle.

Solution:

Calculate the distances:

$$AB = \sqrt{[(4 - 1)^2 + (6 - 5)^2]} = \sqrt{10}$$
$$BC = \sqrt{[(6 - 4)^2 + (3 - 6)^2]} = \sqrt{13}$$
$$AC = \sqrt{[(6 - 1)^2 + (3 - 5)^2]} = 5$$

Check if $AB^2 + BC^2 = AC^2$:

$10 + 13 = 23$ and $5^2 = 25$

Since $23 \neq 25$, the triangle is not right-angled.

2. Section Formula

The coordinates of the point P(x, y) that divides the line segment joining $A(x_1, y_1)$ and $B(x_2, y_2)$ in the ratio m:n are:

$x = (mx_2 + nx_1) / (m + n)$

$y = (my_2 + ny_1) / (m + n)$

Example 1:

Find the coordinates of the point that divides the line segment joining (2, -3) and (5, 6) in the ratio 2:3.

Solution:

Here, m = 2, n = 3, $(x_1, y_1) = (2, -3)$, and $(x_2, y_2) = (5, 6)$

$x = (2(5) + 3(2)) / (2 + 3) = 16/5 = 3.2$

$y = (2(6) + 3(-3)) / (2 + 3) = 3/5 = 0.6$

The point is (3.2, 0.6)

Example 2:

Find the midpoint of the line segment joining (-3, 7) and (2, -4).
Solution:
Midpoint divides the line segment in the ratio 1:1
x = (1(2) + 1(-3)) / (1 + 1) = -1/2 = -0.5
y = (1(-4) + 1(7)) / (1 + 1) = 3/2 = 1.5
The midpoint is (-0.5, 1.5)