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Example 1: Do the points $(3, 2)$, $(-2, -3)$ and $(2, 3)$ form a triangle? If so, name the type of triangle formed.

Solution: Let us apply the distance formula to find the distances PQ, QR, and PR, where $P(3, 2)$, $Q(-2, -3)$ and $R(2, 3)$ are the given points. We have

$$PQ = \sqrt{(3+2)^2 + (2+3)^2} = \sqrt{5^2 + 5^2} = \sqrt{50} = 7.07 \text{ (approx.)}$$

$$QR = \sqrt{(-2-2)^2 + (-3-3)^2} = \sqrt{(-4)^2 + (-6)^2} = \sqrt{52} = 7.21 \text{ (approx.)}$$

$$PR = \sqrt{(3-2)^2 + (2-3)^2} = \sqrt{1^2 + (-1)^2} = \sqrt{2} = 1.41 \text{ (approx.)}$$

Since the sum of any two of these distances is greater than the third distance, the points P, Q, and R form a triangle.
Also, $PQ^2 + PR^2 = QR^2$. By the converse of Pythagoras' theorem, we have $\angle P = 90°$. Therefore, $\triangle PQR$ is a right triangle.

Example 3 : Fig. 7.6 shows the arrangement of desks in a classroom. Ashima, Bharti and Camella are seated at $A(3, 1)$, $B(6, 4)$, and $C(8, 6)$ respectively. Do you think they are seated in a line? Give reasons for your answer.

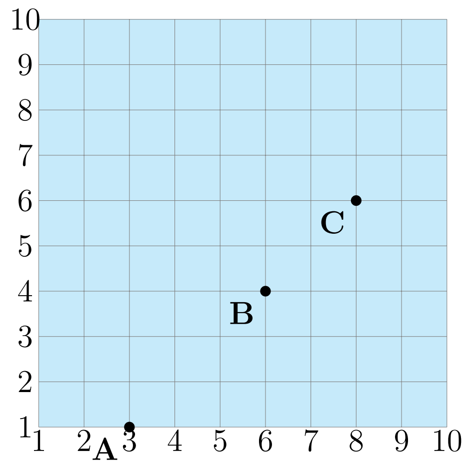

Fig. 7.6

Solution : Using the distance formula, we have

$$AB = \sqrt{(6-3)^2 + (4-1)^2} = \sqrt{9+9} = \sqrt{18} = 3\sqrt{2}$$
$$BC = \sqrt{(8-6)^2 + (6-4)^2} = \sqrt{4+4} = \sqrt{8} = 2\sqrt{2}$$
$$AC = \sqrt{(8-3)^2 + (6-1)^2} = \sqrt{25+25} = \sqrt{50} = 5\sqrt{2}$$

Since $AB + BC = 3\sqrt{2} + 2\sqrt{2} = 5\sqrt{2} = AC$, we can say that the points A, B and C are collinear. Therefore, they are seated in a line.