



Exercise 16C

Question 3:

(i) Let A(0, 1), B(1, 2) and C(-2, -1) be the given points. Then,

$$(x_1 = 0, y_1 = 1)(x_2 = 1, y_2 = 2), (x_3 = -2, y_3 = -1)$$

$$\begin{aligned}\therefore \text{Area of } \triangle ABC &= \frac{1}{2} [x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)] \\ &= \frac{1}{2} [0 \times (2 - (-1)) + 1 \times (-1 - 1) + (-2) \times (1 - 2)] \\ &= \frac{1}{2} (0 - 2 + 2) = 0\end{aligned}$$

Hence the given points are collinear

(ii) Let A(-5, 1), B(5, 5) and C(10, 7) be the given points.

$$\therefore \text{Then, } (x_1 = -5, y_1 = 1)(x_2 = 5, y_2 = 5)(x_3 = 10, y_3 = 7)$$

$$\begin{aligned}\therefore \text{Area of } \triangle ABC &= \frac{1}{2} [x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)] \\ &= \frac{1}{2} [(-5)(5 - 7) + 5(7 - 1) + 10(1 - 5)] \\ &= \frac{1}{2} [10 + 30 - 40] = 0\end{aligned}$$

Hence the given points are collinear

(iii) Let P(a, b + c), Q(b, c + a) and R(c, a + B) be the given points.

$$\text{Then, } (x_1 = a, y_1 = b + c), (x_2 = b, y_2 = c + a), (x_3 = c, y_3 = a + b)$$

$$\begin{aligned}\therefore \text{Area of } \triangle PQR &= \frac{1}{2} [x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)] \\ &= \frac{1}{2} a(c + a - a - b) + b(a + b - b - c) + c(b + c - c - a) \\ &= \frac{1}{2} [a(c - b) + b(a - c) + c(b - a)] = 0\end{aligned}$$

Hence the given points are collinear

Question 4:

(i) The given points are A(-1, 3), B(2, p) and C(5, -1)

$$\therefore (x_1 = -1, y_1 = 3)(x_2 = 2, y_2 = p)(x_3 = 5, y_3 = -1)$$

The given point A, B, C are collinear if

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

$$\Rightarrow (-1)(p + 1) + 2(-1 - 3) + 5(3 - p) = 0$$

$$\Rightarrow -p - 1 - 8 + 15 - 5p = 0$$

$$\Rightarrow -6p + 6 = 0 \Rightarrow -6p = -6$$

$$p = \frac{6}{6} = 1$$

Hence, $p = 1$

(ii) The given points are A(3, 2), B(4, p) and C(5, 3)

$(x_1 = 3, y_1 = 2), (x_2 = 4, y_2 = p)$ and $(x_3 = 5, y_3 = 3)$

The given points A, B, C are collinear if

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

$$\Rightarrow 3(p - 3) + 4(3 - 2) + 5(2 - p) = 0$$

$$3p - 9 + 4 + 10 - 5p = 0$$

$$-2p = -5 \Rightarrow p = \frac{5}{2}$$

Hence, $p = \frac{5}{2}$

(iii) The three points are A(-3, 9), B(2, p), C(4, -5)

Let $x_1 = -3, y_1 = 9; x_2 = 2, y_2 = p; x_3 = 4, y_3 = -5$

Three points $(x_1, y_1), (x_2, y_2)$ and (x_3, y_3) are collinear if

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

$$\Rightarrow -3(p + 5) + 2(-5 - 9) + 4(9 - p) = 0$$

$$\Rightarrow -3p - 15 - 28 + 36 - 4p = 0 \text{ or } -7p - 7 = 0$$

$$\therefore 7p = -7$$

$$p = \frac{-7}{7} = -1$$

***** END *****