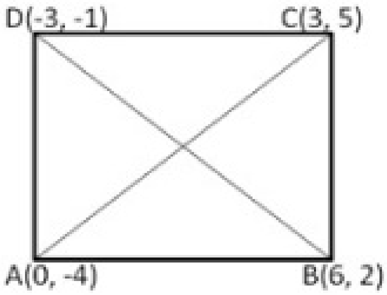
Exercise 16A

Question 20:
(i) Let A(0, -4), B(6,2), C(3,5) and D(-3,-1) are the vertices of quad. ABCD. Then



$$AB = \sqrt{(6-0)^2+(2+4)^2} = \sqrt{(6)^2+(6)^2} = \sqrt{36+36} = \sqrt{72} = 6\sqrt{2} \text{ units}$$

$$BC = \sqrt{(3-6)^2+(5-2)^2} = \sqrt{(-3)^2+(3)^2} = \sqrt{18} = 3\sqrt{2} \text{ units}$$

$$DC = \sqrt{(-3-3)^2+(-1-5)^2} = \sqrt{(-6)^2+(-6)^2} = 6\sqrt{2} \text{ units}$$

$$AD = \sqrt{(-3-0)^2+(-1+4)^2} = \sqrt{(-3)^2+(3)^2} = \sqrt{18} = 3\sqrt{2} \text{ units}$$

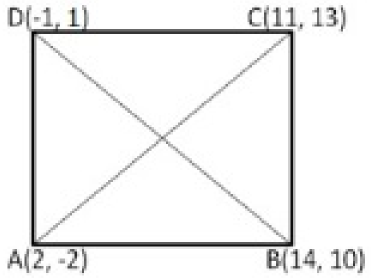
Thus, $AB = DC$ and $AD = BC$

$$\text{Diag.} AC = \sqrt{(3-0)^2+(5+4)^2} = \sqrt{(3)^2+(9)^2} = \sqrt{9+81} = \sqrt{90}$$
$$= 3\sqrt{10} \text{ units}$$

$$\text{Diag.} BD = \sqrt{(-3-6)^2+(-1-2)^2} = \sqrt{(-9)^2+(-3)^2} = \sqrt{81+9} = \sqrt{90}$$
$$= 3\sqrt{10} \text{ units}$$

$\therefore$ Diag. AC = Diag. BD

Thus, ABCD is a quadrilateral whose opposite sides are equal and the diagonals are equal.
Hence, quad. ABCD is a rectangle.
(ii) Let A(2, -2), B(14, 10), C(11, 13) and D(-1, 1) be the angular points of quad. ABCD, then



$AB = \sqrt{(14-2)^2 + (10+2)^2} = \sqrt{(12)^2 + (12)^2} = \sqrt{288} = 12\sqrt{2}$ units

$BC = \sqrt{(11-14)^2 + (13-10)^2} = \sqrt{(-3)^2 + (3)^2} = \sqrt{18} = 3\sqrt{2}$ units

$DC = \sqrt{(-1-11)^2 + (1-13)^2} = \sqrt{(-12)^2 + (-12)^2} = \sqrt{288} = 12\sqrt{2}$ unit

$AD = \sqrt{(-1-2)^2 + (1+2)^2} = \sqrt{(-3)^2 + (3)^2} = \sqrt{18} = 3\sqrt{2}$ units

thus, $AB = DC$ and $AD = BC$

Diag. $AC = \sqrt{(11-2)^2 + (13+2)^2} = \sqrt{(9)^2 + (15)^2} = \sqrt{306}$

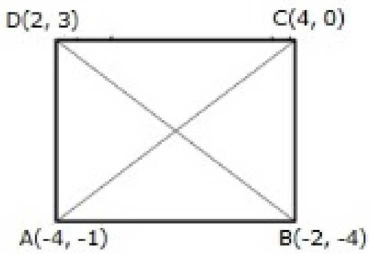
$= 3\sqrt{34}$ units

Diag. $BD = \sqrt{(-1-14)^2 + (1-10)^2} = \sqrt{(-15)^2 + (-9)^2}$

$= \sqrt{225+81} = \sqrt{306} = 3\sqrt{34}$ units

$\therefore$ Diag. AC = Diag. BD

Thus, ABCD is a quadrilateral whose opposite sides are equal and diagonals are equal.
Hence, quad. ABCD is rectangle.
(iii) Let A(-4, -1), B(-2, -4), C(4, 0) and D(2, 3) are the vertices of quad. ABCD. Then



$AB = \sqrt{(-2+4)^2 + (-4+1)^2} = \sqrt{(2)^2 + (-3)^2} = \sqrt{4+9} = \sqrt{15}$ units

$BC = \sqrt{(4+2)^2 + (0-4)^2} = \sqrt{(6)^2 + (-4)^2} = \sqrt{36+16} = \sqrt{52} = 7\sqrt{3}$ units

$DC = \sqrt{(2-4)^2 + (3-0)^2} = \sqrt{(-2)^2 + (3)^2} = \sqrt{4+9} = \sqrt{15}$ units

$AD = \sqrt{(-4-2)^2 + (-1-3)^2} = \sqrt{(-6)^2 + (-4)^2} = \sqrt{36+16} = \sqrt{52} = 7\sqrt{3}$ units

Thus, $AB = DC$ and $AD = BC$

Diag. $AC = \sqrt{(4+4)^2 + (0+1)^2} = \sqrt{(8)^2 + (1)^2} = \sqrt{64+1} = \sqrt{65}$ units

Diag. $BD = \sqrt{(2+2)^2 + (3+4)^2} = \sqrt{(4)^2 + (7)^2} = \sqrt{16+49} = \sqrt{65}$ units

$\therefore$ Diag AC = Diag. BD

Thus, ABCD is a quadrilateral whose opposite sides are equal and the diagonals are equal
Hence, quad. ABCD is a rectangle.

*********** END **********