Exercise 16A

Question 1:
(i) The given points are A(9,3) and B(15,11).

Then, $(x_1 = 9, \ y_1 = 3)$ and $(x_2 = 15$ and $y_2 = 11)$

$\therefore AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$= \sqrt{(15 - 9)^2 + (11 - 3)^2} = \sqrt{6^2 + 8^2}$

$= \sqrt{34 + 64} = \sqrt{100} = 10$ units

(ii) The given points are A(7,4) and B(-5,1).

Then, $(x_1 = 7, \ y_1 = -4)$ and $(x_2 = -5, y_2 = 1)$

$\therefore AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$= \sqrt{(-5 - 7)^2 + (1 + 4)^2} = \sqrt{(-12)^2 + (5)^2}$

$= \sqrt{144 + 25} = \sqrt{169} = 13$ units

(iii) The given points are A(-6, -4) and B(9,-12).

Then, $(x_1 = -6, \ y_1 = -4)$ and $(x_2 = 9, y_2 = -12)$

$\therefore AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$= \sqrt{(6 + 9)^2 + (-12 + 4)^2} = \sqrt{(15)^2 + (-8)^2}$

$= \sqrt{225 + 64} = \sqrt{289} = 17$ units

(iv) The given points are A(1, -3) and B(4, -6).

Then, $(x_1 = 1, \ y_1 = -3)$ and $(x_2 = 4, y_2 = -6)$

$\therefore AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$= \sqrt{(4 - 1)^2 + (-6 + 3)^2} = \sqrt{(3)^2 + (-3)^2}$

$= \sqrt{18} = 3\sqrt{2}$ units

(v) The given points are P(a + b, a - b) and Q(a - b, a + b).

Then, $[x_1 = (a + b), y_1 = (a - b)]$ and $[x_2 = (a - b), \ y_2 = (a + b)]$

$\therefore PQ = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$= \sqrt{(a - b - a - b)^2 + (a + b - a + b)^2}$

$= \sqrt{(-2b)^2 + (2b)^2} = \sqrt{4b^2 + 4b^2}$

$= \sqrt{8b^2} = 2\sqrt{2}b$ units

(vi) The given points are P(a sin a, a cos a) and Q(a cos a, - a sina).

$(x_1 = a\sin\alpha,\ y_1 = a\cos\alpha)$ and $(x_2 = a\cos\alpha,\ y_2 = -a\sin\alpha)$

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

$$= \sqrt{(a\cos\alpha - a\sin\alpha)^2 + (-a\sin\alpha - a\cos\alpha)^2}$$

$$= \sqrt{a^2\cos^2\alpha + a^2\sin^2\alpha - 2a^2\cos\alpha\sin\alpha + a^2\cos^2\alpha + a^2\sin^2\alpha + 2a^2\cos\alpha\sin\alpha}$$

$$= \sqrt{a^2\cos^2\alpha + a^2\sin^2\alpha + a^2\cos^2\alpha + a^2\sin^2\alpha}$$

$$= \sqrt{a^2(\cos^2\alpha + \sin^2\alpha) + a^2(\cos^2\alpha + \sin^2\alpha)}$$

$$= \sqrt{a^2 + a^2} = \sqrt{2a^2} = \sqrt{2}\,a \text{ units}$$

Question 2:

(i) The given point is A(5, -12) and let O(0,0) be the origin.

$$\text{Then, } AO = \sqrt{(5-0)^2 + (-12-0)^2}$$

$$= \sqrt{5^2 + (-12)^2} = \sqrt{25 + 144} = \sqrt{169}$$

$$= 13 \text{ units}$$

(ii) The given point is B(-5, 5) and let O(0,0) be the origin.

$$\text{Then, } BO = \sqrt{(-5-0)^2 + (5-0)^2}$$

$$= \sqrt{25 + 25} = \sqrt{50} = 5\sqrt{2} \text{ units}$$

(iii) The given point is C(-4, -6) and let O(0,0) be the origin.

$$\text{Then, } CO = \sqrt{(-4-0)^2 + (-6-0)^2}$$

$$= \sqrt{16 + 36} = \sqrt{52} = 2\sqrt{13} \text{ units}$$

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