Exercise – 16A

1. Find the distance between the points

(i) $A(9,3)$ and $B(15,11)$

(ii) $A(7,-4)$ and $B(-5,1)$

(iii) $A(-6,-4)$ and $B(9,-12)$

(iv) $A(1,-3)$ *and* $B(4,-6)$

(v) $P(a+b,a-b)$ *and* $Q(a-b,a+b)$

(vi) $P(a\sin\alpha, a\cos\alpha)$ *and* $Q(a\cos\alpha, -a\sin\alpha)$

Sol:

(i) $A(9,3)$ and $B(15,11)$

The given points are $A(9,3)$ and $B(15,11)$.

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

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

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

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

$=\sqrt{(6)^2+(8)^2}$

$=\sqrt{36+64}$

$=\sqrt{100}$

$=10\,units$

(ii) $A(7,-4)$ and $B(-5,1)$

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

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

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

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

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

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

$=\sqrt{144+25}$

$=\sqrt{169}$

$= 13\ units$

$= \sqrt{144 + 25}$

$= \sqrt{169}$

$= 13\ units$

(iii) $A(-6, -4)$ and $B(9, -12)$

The given points are $A(-6, -4)\ and\ B(9, -12)$

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

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

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

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

$= \sqrt{(15)^2 + (-8)^2}$

$= \sqrt{225 + 64}$

$= \sqrt{289}$

$= 17\ units$

(iv) $A(1, -3)\ and\ B(4, -6)$

The given points are $A(1, -3)\ and\ B(4, -6)$

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

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

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

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

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

$= \sqrt{9 + 9}$

$= \sqrt{18}$

$= \sqrt{9 \times 2}$

$= 3\sqrt{2}\ units$

(v) $P(a + b, a - b)\ and\ Q(a - b, a + b)$

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

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

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

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

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

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

$=\sqrt{4b^2+4b^2}$

$=\sqrt{8b^2}$

$=\sqrt{4\times 2b^2}$

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

(vi) $P(a\sin\alpha, a\cos\alpha)\ and\ Q(a\cos\alpha, -a\sin\alpha)$

The given points are $P(a\sin\alpha, a\cos\alpha)$ and $Q(a\cos a, -a\sin\alpha)$

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

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

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

$=\sqrt{\begin{array}{l}(a^2\cos^2\alpha+a^2\sin^2\alpha-2a^2\cos\alpha\times\sin\alpha)\\+(a^2\sin^2\alpha+a^2\cos^2\alpha+2a^2\cos\alpha\times\sin\alpha)\end{array}}$

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

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

$=\sqrt{2a^2(1)}$ (From the identity $\cos^2\alpha+\sin^2\alpha=1$)

$=\sqrt{2a^2}$

$=\sqrt{2}a\ units$

2. Find the distance of each of the following points from the origin:

(i) $A(5,-12)$ (ii) $B(-5,5)$ (iii) $C(-4,-6)$

Sol:

(i) $A(5,-12)$

Let $O(0,0)$ be the origin

$OA=\sqrt{(5-0)^2+(-12-0)^2}$

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

$=\sqrt{25+144}$

$=\sqrt{169}$

$=13\ units$

(ii) $B(-5,5)$

Let $O(0,0)$ be the origin.

$OB=\sqrt{(-5-0)^2+(5-0)^2}$

$=\sqrt{(-5)^2+(5)^2}$

$=\sqrt{25+25}$

$=\sqrt{50}$

$=\sqrt{25\times 2}$

$=5\sqrt{2}\ units$

(iii) $C(-4,-6)$

Let $O(0,0)$ be the origin

$OC=\sqrt{(-4-0)^2+(-6-0)^2}$

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

$=\sqrt{16+36}$

$=\sqrt{52}$

$=\sqrt{4\times 13}$

$=2\sqrt{13}\ units$

3. Find all possible values of x for which the distance between the points $A(x,-1)$ and $B(5,3)$ is 5 units.

Sol:

Given $AB=5\ units$

Therefore, $(AB)^2=25\ units$

$\Rightarrow (5-a)^2+\{3-(-1)\}^2=25$

$\Rightarrow (5-a)^2+(3+1)^2=25$

$\Rightarrow (5-a)^2+(4)^2=25$

$\Rightarrow (5-a)^2 + 16 = 25$

$\Rightarrow (5-a)^2 = 25 - 16$

$\Rightarrow (5-a)^2 = 9$

$\Rightarrow (5-a) = \pm\sqrt{9}$

$\Rightarrow 5-a = \pm 3$

$\Rightarrow 5-a = 3 \ or \ 5-a = -3$

$\Rightarrow a = 2 \ or \ 8$

Therefore, $a = 2 \ or \ 8$.

4. Find all possible values of y for which distance between the points $A(2,-3)$ and $B(10,y)$ is 10 units.

Sol:

The given points are $A(2,-3)$ and $B(10,y)$

$\therefore AB = \sqrt{(2-10)^2 + (-3-y)^2}$

$= \sqrt{(-8)^2 + (-3-y)^2}$

$= \sqrt{64 + 9 + y^2 + 6y}$

$\because AB = 10$

$\therefore \sqrt{64 + 9 + y^2 + 6y} = 10$

$\Rightarrow 73 + y^2 + 6y = 100$ (Squaring both sides)

$\Rightarrow y^2 + 6y - 27 = 0$

$\Rightarrow y^2 + 9y - 3y - 27 = 0$

$\Rightarrow y(y+9) - 3(y+9) = 0$

$\Rightarrow (y+9)(y-3) = 0$

$\Rightarrow y + 9 = 0 \ or \ y - 3 = 0$

$\Rightarrow y = -9 \ or \ y = 3$

Hence, the possible values of y are -9 and 3.

5. Find value of x for which the distance between the points $P(x,4)$ and $Q(9,10)$ is 10 units.

Sol:

The given points are $P(x,4) \ and \ Q(9,10)$.

$\therefore PQ = \sqrt{(x-9)^2 + (4-10)^2}$

$= \sqrt{(x-9)^2 + (-6)^2}$

$= \sqrt{x^2 - 18x + 81 + 36}$

$= \sqrt{x^2 - 18x + 117}$

$\because PQ = 10$

$\therefore \sqrt{x^2 - 18x + 117} = 10$

$\Rightarrow x^2 - 18x + 117 = 100$ (Squaring both sides)

$\Rightarrow x^2 - 18x + 17 =$

$\Rightarrow x^2 - 17x - x + 17 = 0$

$\Rightarrow x(x-17) - 1(x-17) = 0$

$\Rightarrow (x-17)(x-1) = 0$

$\Rightarrow x - 17 = 0 \ or \ x - 1 = 0$

$\Rightarrow x = 17 \ or \ x = 1$

Hence, the values of x are 1 and 17.

6. If the point $A(x, 2)$ is equidistant form the points $B(8, -2)$ and $C(2, -2)$, find the value of x. Also, find the value of x. Also, find the length of AB.

Sol:

As per the question

$AB = AC$

$\Rightarrow \sqrt{(x-8)^2 + (2+2)^2} = \sqrt{(x-2)^2 + (2+2)^2}$

Squaring both sides, we get

$(x-8)^2 + 4^2 = (x-2)^2 + 4^2$

$\Rightarrow x^2 - 16x + 64 + 16 = x^2 + 4 - 4x + 16$

$\Rightarrow 16x - 4x = 64 - 4$

$\Rightarrow x = \frac{60}{12} = 5$

Now,

$AB = \sqrt{(x-8)^2 + (2+2)^2}$

$= \sqrt{(5-8)^2 + (2+2)^2}$ $(\because x = 2)$

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

$= \sqrt{9+16} = \sqrt{25} = 5$

Hence, $x = 5$ and $AB = 5 \ units$.

7. If the point $A(0,2)$ is equidistant form the points $B(3,p)$ and $C(p,5)$ find the value of p. Also, find the length of AB.

Sol:

As per the question

$AB = AC$

$\Rightarrow \sqrt{(0-3)^2+(2-p)^2} = \sqrt{(0-p)^2+(2-5)^2}$

$\Rightarrow \sqrt{(-3)^2+(2-p)^2} = \sqrt{(-p)^2+(-3)^2}$

Squaring both sides, we get

$(-3)^2+(2-p)^2 = (-p)^2+(-3)^2$

$\Rightarrow 9+4+p^2-4p = p^2+9$

$\Rightarrow 4p = 4$

$\Rightarrow p = 1$

Now,

$AB = \sqrt{(0-3)^2+(2-p)^2}$

$= \sqrt{(-3)^2+(2-1)^2}$ $\qquad (\because p=1)$

$= \sqrt{9+1}$

$= \sqrt{10}$ *units*

Hence, $p = 1$ *and* $AB = \sqrt{10}$ *units*

8. Find the point on the a-axis which is equidistant from the points (2, -5) and (-2, 9).

Sol:

Let (x, 0) be the point on the *x* axis. Then as per the question, we have

$\sqrt{(x-2)^2+(0+5)^2} = \sqrt{(x+2)^2+(0-9)^2}$

$\Rightarrow \sqrt{(x-2)^2+(5)^2} = \sqrt{(x+2)^2+(-9)^2}$

$\Rightarrow (x-2)^2+(5)^2 = (x+2)^2+(-9)^2$ $\qquad$ (Squaring both sides)

$\Rightarrow x^2-4x+4+25 = x^2+4x+4+81$

$\Rightarrow 8x = 25-81$

$\Rightarrow x = -\frac{56}{8} = -7$

Hence, the point on the *x*-axis is $(-7,0)$.

9. Find the points on the x-axis, each of which is at a distance of 10 units from the point A(11, -8).

Sol:

Let $P(x, 0)$ be the point on the x-axis. Then as per the question we have

$AP = 10$

$\Rightarrow \sqrt{(x-11)^2 + (0+8)^2} = 10$

$\Rightarrow (x-11)^2 + 8^2 = 100$ (Squaring both sides)

$\Rightarrow (x-11)^2 = 100 - 64 = 36$

$\Rightarrow x - 11 = \pm 6$

$\Rightarrow x = 11 \pm 6$

$\Rightarrow x = 11-6, 11+6$

$\Rightarrow x = 5, 17$

Hence, the points on the x-axis are $(5,0)$ and $(17,0)$.

10. Find the points on the y-axis which is equidistant form the points $A(6,5)$ and $B(-4,3)$

Sol:

Let P $(0, y)$ be a point on the y-axis. Then as per the question, we have

$AP = BP$

$\Rightarrow \sqrt{(0-6)^2 + (y-5)^2} = \sqrt{(0+4)^2 + (y-3)^2}$

$\Rightarrow \sqrt{(6)^2 + (y-5)^2} = \sqrt{(4)^2 + (y-3)^2}$

$\Rightarrow (6)^2 + (y-5)^2 = (4)^2 + (y-3)^2$ (Squaring both sides)

$\Rightarrow 36 + y^2 - 10y + 25 = 16 + y^2 - 6y + 9$

$\Rightarrow 4y = 36$

$\Rightarrow y = 9$

Hence, the point on the y-axis is $(0,9)$.

11. If the points $P(x, y)$ is point equidistant from the points $A(5,1)$ and $B(-1,5)$, Prove that 3x=2y. **Sol:**

As per the question, we have

$AP = BP$

$\Rightarrow \sqrt{(x-5)^2 + (y-1)^2} = \sqrt{(x+1)^2 + (y-5)^2}$

$\Rightarrow (x-5)^2 + (y-1)^2 = (x+1)^2 + (y-5)^2$ (Squaring both sides)

$\Rightarrow x^2 - 10x + 25 + y^2 - 2y + 1 = x^2 + 2x + 1 + y^2 - 10y + 25$

$\Rightarrow -10x - 2y = 2x - 10y$

$\Rightarrow 8y = 12x$

$\Rightarrow 3x = 2y$

Hence, $3x = 2y$

12. If $p(x, y)$ is point equidistant from the points $A(6, -1)$ and $B(2, 3)$, show that x – y = 3

Sol:

The given points are $A(6, -1)$ and $B(2, 3)$. The point $P(x, y)$ equidistant from the points A and B So, $PA = PB$

Also, $(PA)^2 = (PB)^2$

$\Rightarrow (6-x)^2 + (-1-y)^2 = (2-x)^2 + (3-y)^2$

$\Rightarrow x^2 - 12x + 36 + y^2 + 2y + 1 = x^2 - 4x + 4 + y^2 - 6y + 9$

$\Rightarrow x^2 + y^2 - 12x + 2y + 37 = x^2 + y^2 - 4x - 6y + 13$

$\Rightarrow x^2 + y^2 - 12x + 2y - x^2 - y^2 + 4x + 6y = 13 - 37$

$\Rightarrow -8x + 8y = -24$

$\Rightarrow -8(x - y) = -24$

$\Rightarrow x - y = \frac{-24}{-8}$

$\Rightarrow x - y = 3$

Hence proved.

13. Find the co-ordinates of the point equidistant from three given points $A(5, 3), B(5, -5)$ and $C(1, -5)$

Sol:

Let the required point be $P(x, y)$. Then $AP = BP = CP$

That is, $(AP)^2 = (BP)^2 = (CP)^2$

This means $(AP)^2 = (BP)^2$

$\Rightarrow (x-5)^2 + (y-3)^2 = (x-5)^2 + (y+5)^2$

$\Rightarrow x^2 - 10x + 25 + y^2 - 6y + 9 = x^2 - 10x + 25 + y^2 + 10y + 25$

$\Rightarrow x^2 - 10x + y^2 - 6y + 34 = x^2 - 10x + y^2 + 10y + 50$

$\Rightarrow x^2 - 10x + y^2 - 6y - x^2 + 10x - y^2 - 10y = 50 - 34$

$\Rightarrow -16y = 16$

$\Rightarrow y = -\frac{16}{16} = -1$

And $(BP)^2 = (CP)^2$

$\Rightarrow (x-5)^2 + (y+5)^2 = (x-1)^2 + (y+5)^2$

$\Rightarrow x^2 - 10x + 25 + y^2 + 10y + 25 = x^2 - 2x + 1 + y^2 + 10y + 25$

$\Rightarrow x^2 - 10x + y^2 + 10y + 50 = x^2 - 2x + y^2 + 10y + 26$

$\Rightarrow x^2 - 10x + y^2 + 10y - x^2 + 2x - y^2 - 10y = 26 - 50$

$\Rightarrow -8x = -24$

$\Rightarrow x = \frac{-24}{-8} = 3$

Hence, the required point is $(3, -1)$.

14. If the points $A(4,3)$ and $B(x,5)$ lies on a circle with the centre $O(2,3)$. Find the value of x.

Sol:

Given, the points $A(4,3)$ and $B(x,5)$ lie on a circle with center $O(2,3)$.

Then $OA = OB$

Also $(OA)^2 = (OB)^2$

$\Rightarrow (4-2)^2 + (3-3)^2 = (x-2)^2 + (5-3)^2$

$\Rightarrow (2)^2 + (0)^2 = (x-2)^2 + (2)^2$

$\Rightarrow 4 = (x-2)^2 + 4$

$\Rightarrow (x-2)^2 = 0$

$\Rightarrow x - 2 = 0$

$\Rightarrow x = 2$

Therefore, $x = 2$

15. If the point $C(-2,3)$ is equidistant form the points $A(3,-1)$ and $B(x,8)$, find the value of x. Also, find the distance between BC

Sol:

As per the question, we have

$AC = BC$

$\Rightarrow \sqrt{(-2-3)^2 + (3+1)^2} = \sqrt{(-2-x)^2 + (3-8)^2}$

$\Rightarrow \sqrt{(5)^2 + (4)^2} = \sqrt{(x+2)^2 + (-5)^2}$

$\Rightarrow 25 + 16 = (x+2)^2 + 25$ (Squaring both sides)

$\Rightarrow 25 + 16 = (x+2)^2 + 25$

$\Rightarrow (x+2)^2 = 16$

$\Rightarrow x+2 = \pm 4$

$\Rightarrow x = -2 \pm 4 = -2-4, -2+4 = -6, 2$

Now

$BC = \sqrt{(-2-x)^2 + (3-8)^2}$

$= \sqrt{(-2-2)^2 + (-5)}$

$= \sqrt{16+25} = \sqrt{41}\ units$

Hence, $x = 2$ or -6 and $BC = \sqrt{41}\ units$

16. If the point $P(2,2)$ is equidistant from the points $A(-2,k)$ and $B(-2k,-3)$, find k. Also, find the length of AP.

Sol:

As per the question, we have

$AP = BP$

$\Rightarrow \sqrt{(2+2)^2 + (2+k)^2} = \sqrt{(2+2k)^2 + (2+3)^2}$

$\Rightarrow \sqrt{(4)^2 + (2-k)^2} = \sqrt{(2+2k)^2 + (5)^2}$

$\Rightarrow 16 + 4 + k^2 - 4k = 4 + 4k^2 + 8k + 25$ (Squaring both sides)

$\Rightarrow k^2 + 4k + 3 = 0$

$\Rightarrow (k+1)(k+3) = 0$

$\Rightarrow k = -3, -1$

Now for $k = -1$

$AP = \sqrt{(2+2)^2 + (2-k)^2}$

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

$= \sqrt{16+9} = 5\ units$

For $k = -3$

$AP = \sqrt{(2+2)^2 + (2-k)^2}$

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

$= \sqrt{16+25} = \sqrt{41}\ units$

Hence, $k = -1, -3; AP = 5\ units\ \ for\ k = -1\ and\ AP = \sqrt{41}\ units\ \ for\ k = -3.$

17. If the point (x, y) is equidistant form the points $(a+b, b-a)$ and $(a-b, a+b)$, prove that bx = ay.

Sol:

As per the question, we have

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

$$\Rightarrow (x-a-b)^2+(y-b+a)^2=(x-a+b)^2+(y-a-b)^2 \qquad \text{(Squaring both sides)}$$

$$\Rightarrow x^2+(a+b)^2-2x(a+b)+y^2+(a-b)^2-2y(a-b)=x^2+(a-b)^2-2x(a-b)+y^2$$
$$+(a+b)^2-2y(a+b)$$

$$\Rightarrow -x(a+b)-y(a-b)=-x(a-b)-y(a+b)$$

$$\Rightarrow -xa-xb-ay+by=-xa+bx-ya-by$$

$$\Rightarrow by=bx$$

Hence, $bx=ay$.

18. Using the distance formula, show that the given points are collinear:

(i) (1, -1), (5, 2) and (9, 5) (ii) (6, 9), (0, 1) and (-6, -7)

(iii) (-1, -1), (2, 3) and (8, 11) (iv) (-2, 5), (0,1) and (2, -3)

Sol:

(i) Let $A(1,-1), B(5,2)$ and $C(9,5)$ be the give points. Then

$$AB=\sqrt{(5-1)^2+(2+1)^2}=\sqrt{4^2+3^2}=\sqrt{25}=5 \text{ units}$$

$$BC=\sqrt{(9-5)^2+(5-2)^2}=\sqrt{4^2+3^2}=\sqrt{25}=5 \text{ units}$$

$$AC=\sqrt{(9-1)^2+(5+1)^2}=\sqrt{8^2+6^2}=\sqrt{100}=10 \text{ units}$$

$$\therefore AB+BC=(5+5)\text{units}=10 \text{ units}=AC$$

Hence, the given points are collinear

(ii) Let $A(6,9), B(0,1)$ and $C(-6,-7)$ be the give points. Then

$$AB=\sqrt{(0-6)^2+(1-9)^2}=\sqrt{(-6)^2+(-8)^2}=\sqrt{100}=10 \text{ units}$$

$$BC=\sqrt{(-6-0)^2+(-7-1)^2}=\sqrt{(-6)^2+(-8)^2}=\sqrt{100}=10 \text{ units}$$

$$AC=\sqrt{(-6-6)^2+(-7-9)^2}=\sqrt{(-12)^2+(16)^2}=\sqrt{400}=20 \text{ units}$$

$$\therefore AB+BC=(10+10)\text{units}=20 \text{ units}=AC$$

Hence, the given points are collinear

(iii) Let $A(-1,-1), B(2,3)$ and $C(8,11)$ be the give points. Then

$AB = \sqrt{(2+1)^2 + (3+1)^2} = \sqrt{(3)^2 + (4)^2} = \sqrt{25} = 5 \ units$

$BC = \sqrt{(8-2)^2 + (11-3)^2} = \sqrt{(6)^2 + (8)^2} = \sqrt{100} = 10 \ units$

$AC = \sqrt{(8+1)^2 + (11+1)^2} = \sqrt{(9)^2 + (12)^2} = \sqrt{225} = 15 \ units$

$\therefore AB + BC = (5+10) units = 15 \ units = AC$

Hence, the given points are collinear

(iv) Let $A(-2,5), B(0,1)$ and $C(2,-3)$ be the give points. Then

$AB = \sqrt{(0+2)^2 + (1-5)^2} = \sqrt{(2)^2 + (-4)^2} = \sqrt{20} = 2\sqrt{5} \ units$

$BC = \sqrt{(2-0)^2 + (-3-1)^2} = \sqrt{(2)^2 + (-4)^2} = \sqrt{20} = 2\sqrt{5} \ units$

$AC = \sqrt{(2+2)^2 + (-3-5)^2} = \sqrt{(4)^2 + (-8)^2} = \sqrt{80} = 4\sqrt{5} \ units$

$\therefore AB + BC = \left(2\sqrt{5} + 2\sqrt{5}\right) units = 4\sqrt{5} \ units = AC$

Hence, the given points are collinear

19. Show that the points A (7, 10), B(-2, 5) and C(3, -4) are the vertices of an isosceles right triangle.

Sol:

The given points are $A(7,10), B(-2,5) \ and \ C(3,-4)$.

$AB = \sqrt{(-2-7)^2 + (5-10)^2} = \sqrt{(-9)^2 + (-5)^2} = \sqrt{81+25} = \sqrt{106}$

$BC = \sqrt{(3-(-2))^2 + (-4-5)^2} = \sqrt{(5)^2 + (-9)^2} = \sqrt{25+81} = \sqrt{106}$

$AC = \sqrt{(3-7)^2 + (-4-10)^2} = \sqrt{(-4)^2 + (-14)^2} = \sqrt{16+196} = \sqrt{212}$

Since, AB and BC are equal, they form the vertices of an isosceles triangle

Also, $(AB)^2 + (BC)^2 = \left(\sqrt{106}\right)^2 + \left(\sqrt{106}\right)^2 = 212$

and $(AC)^2 = \left(\sqrt{212}\right)^2 = 212.$

Thus, $(AB)^2 + (BC)^2 = (AC)^2$

This show that ΔABC is right- angled at B.

Therefore, the points $A(7,10), B(-2,5) \ and \ C(3,-4)$ are the vertices of an isosceles right-angled triangle.

20. Show that the points A (3, 0), B(6, 4) and C(-1, 3) are the vertices of an isosceles right triangle.

Sol:

The given points are $A(3,0), B(6,4)$ and $C(-1,3)$. Now,

$$AB = \sqrt{(3-6)^2 + (0-4)^2} = \sqrt{(-3)^2 + (-4)^2}$$
$$= \sqrt{9+16} = \sqrt{25} = 5$$
$$BC = \sqrt{(6+1)^2 + (4-3)^2} = \sqrt{(7)^2 + (1)^2}$$
$$= \sqrt{49+1} = \sqrt{50} = 5\sqrt{2}$$
$$AC = \sqrt{(3+1)^2 + (0-3)^2} = \sqrt{(4)^2 + (-3)^2}$$
$$= \sqrt{16+9} = \sqrt{25} = 5$$
$$\because AB = AC \text{ and } AB^2 + AC^2 = BC^2$$

Therefore, $A(3,0), B(6,4)$ and $C(-1,3)$ are die vertices of an isosceles right triangle

21. If A(5,2), B(2, -2) and C(-2, t) are the vertices of a right triangle with $\angle B=90°$, then find the value of t.

Sol:

$$\because \angle B = 90°$$
$$\therefore AC^2 = AB^2 + BC^2$$
$$\Rightarrow (5+2)^2 + (2-t)^2 = (5-2)^2 + (2+2)^2 + (2+2)^2 + (-2-t)^2$$
$$\Rightarrow (7)^2 + (t-2)^2 = (3)^2 + (4)^2 + (4)^2 + (t+2)^2$$
$$\Rightarrow 49 + t^2 - 4t + 4 = 9 + 16 + 16 + t^2 + 4t + 4$$
$$\Rightarrow 8 - 4t = 4t$$
$$\Rightarrow 8t = 8$$
$$\Rightarrow t = 1$$

Hence, $t = 1$.

22. Prove that the points A(2, 4), b(2, 6) and $C(2+\sqrt{3},5)$ are the vertices of an equilateral triangle.

Sol:

The given points are $A(2,4), B(2,6)$ *and* $C\left(2+\sqrt{3},5\right)$. *Now*

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

$BC=\sqrt{\left(2-2-\sqrt{3}\right)^2+\left(6-5\right)^2}=\sqrt{\left(-\sqrt{3}\right)^2+\left(1\right)^2}$

$=\sqrt{3+1}=2$

$AC=\sqrt{\left(2-2-\sqrt{3}\right)^2+\left(4-5\right)^2}=\sqrt{\left(-\sqrt{3}\right)^2+\left(-1\right)^2}$

$=\sqrt{3+1}=2$

Hence, the points $A(2,4), B(2,6)$ and $C\left(2+\sqrt{3},5\right)$ are the vertices of an equilateral triangle.

23. Show that the points (-3, -3),(3,3) and $C\left(-3\sqrt{3},3\sqrt{3}\right)$ are the vertices of an equilateral triangle.

Sol:

Let the given points be $A(-3,-3), B(3,3)$ *and* $C\left(-3\sqrt{3},3\sqrt{3}\right)$. Now

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

$=\sqrt{36+36}=\sqrt{72}=6\sqrt{2}$

$BC=\sqrt{\left(3+3\sqrt{3}\right)^2+\left(3-3\sqrt{3}\right)^2}$

$=\sqrt{9+27+18\sqrt{3}+9+27-18\sqrt{3}}=\sqrt{72}=6\sqrt{2}$

$AC=\sqrt{\left(-3+3\sqrt{3}\right)^2+\left(-3-3\sqrt{3}\right)^2}=\sqrt{\left(3-3\sqrt{3}\right)^2+\left(3+3\sqrt{3}\right)^2}$

$=\sqrt{9+27-18\sqrt{3}+9+27+18\sqrt{3}}$

$=\sqrt{72}=6\sqrt{2}$

Hence, the given points are the vertices of an equilateral triangle.

24. Show that the points A(-5,6), B(3,0) and C(9,8) are the vertices of an isosceles right-angled triangle. Calculate its area.

Sol:

Let the given points be $A(-5,6)B(3,0)$ *and* $C(9,8)$.

$AB=\sqrt{\left(3-(-5)\right)^2+(0-6)^2}=\sqrt{(8)^2+(-6)^2}=\sqrt{64+36}=\sqrt{100}=10\ units$

$BC=\sqrt{(9-3)^2+(8-0)^2}=\sqrt{(6)^2+(8)^2}=\sqrt{36+64}=\sqrt{100}=10\ units$

$AC=\sqrt{\left(9-(-5)\right)^2+(8-6)^2}=\sqrt{(14)^2+(2)^2}=\sqrt{196+4}=\sqrt{200}=10\sqrt{2}\ units$

Therefore, $AB=BC=10\ units$

Also, $(AB)^2+(BC)^2=(10)^2+(10)^2=200$

and $(AC)^2=(10\sqrt{2})^2=200$

Thus, $(AB)^2+(BC)^2=(AC)^2$

This show that ΔABC is right angled at B.

Therefore, the points $A(-5,6)B(3,0)$ *and* $C(9,8)$ are the vertices of an isosceles right-angled triangle

Also, area of a triangle $=\frac{1}{2}\times base\times height$

If AB is the height and BC is the base,

Area $=\frac{1}{2}\times 10\times 10$

= 50 square units

25. Show that the points O(0,0), $A(3,\sqrt{3})$ and $B(3,-\sqrt{3})$ are the vertices of an equilateral triangle. Find the area of this triangle.

Sol:

The given points are $O(0,0)A(3,\sqrt{3})$ *and* $B(3,-\sqrt{3})$.

$$OA=\sqrt{(3-0)^2+\{(\sqrt{3})-0\}^2}=\sqrt{(3)^2+(\sqrt{3})^2}=\sqrt{9+3}=\sqrt{12}=2\sqrt{3}\ units$$

$$AB=\sqrt{(3-3)^2+(-\sqrt{3}-\sqrt{3})^2}=\sqrt{(0)+(2\sqrt{3})^2}=\sqrt{4(3)}=\sqrt{12}=2\sqrt{3}\ units$$

$$OB=\sqrt{(3-0)^2+(-\sqrt{3}-0)^2}=\sqrt{(3)^2+(\sqrt{3})^2}=\sqrt{9+3}=\sqrt{12}=2\sqrt{3}\ units$$

Therefore, $OA=AB=OB=2\sqrt{3}\ units$

Thus, the points $O(0,0)$ $A(3,\sqrt{3})$ and $B(3,-\sqrt{3})$ are the vertices of an equilateral triangle

Also, the area of the triangle $OAB=\frac{\sqrt{3}}{4}\times(side)^2$

$=\frac{\sqrt{3}}{4}\times(2\sqrt{3})^2$

$=\frac{\sqrt{3}}{4}\times 12$

$=3\sqrt{3}$ square units.

26. Show that the following points are the vertices of a square:

(i) A (3,2), B(0,5), C(-3,2) and D(0,-1)

(ii) A (6,2), B(2,1), C(1,5) and D(5,6)

(iii) A (0,-2), B(3,1), C(0,4) and D(-3,1)

Sol:

(i) The given points are $A(3,2), B(0,5), C(-3,2)$ and $D(0,-1)$.

$AB=\sqrt{(0-3)^2+(5-2)^2}=\sqrt{(-3)^2+(3)^2}=\sqrt{9+9}=\sqrt{18}=3\sqrt{2}\ units$

$BC=\sqrt{(-3-0)^2+(2-5)^2}=\sqrt{(-3)^2+(-3)^2}=\sqrt{9+9}=\sqrt{18}=3\sqrt{2}\ units$

$CD=\sqrt{(0+3)^2+(-1-2)^2}=\sqrt{(3)^2+(-3)^2}=\sqrt{9+9}=\sqrt{18}=3\sqrt{2}\ units$

$DA=\sqrt{(0-3)^2+(-1-2)^2}=\sqrt{(-3)^2+(-3)^2}=\sqrt{9+9}=\sqrt{18}=3\sqrt{2}\ units$

Therefore, $AB=BC=CD=DA=3\sqrt{2}\ units$

Also, $AC=\sqrt{(-3-3)^2+(2-2)^2}=\sqrt{(-6)^2+(0)^2}=\sqrt{36}=6\ units$

$BD=\sqrt{(0-0)^2+(-1-5)^2}=\sqrt{(0)^2+(-6)^2}=\sqrt{36}=6\ units$

Thus, diagonal $AC=$ diagonal BD

Therefore, the given points from a square.

(ii) The given points are $A(6,2), B(2,1), C(1,5)\ and\ D(5,6)$

$AB=\sqrt{(2-6)^2+(1-2)^2}=\sqrt{(-4)^2+(-1)^2}=\sqrt{16+1}=\sqrt{17}\ units$

$BC=\sqrt{(1-2)^2+(5-1)^2}=\sqrt{(-1)^2+(-4)^2}=\sqrt{1+16}=\sqrt{17}\ units$

$CD=\sqrt{(5-1)^2+(6-5)^2}=\sqrt{(4)^2+(1)^2}=\sqrt{16+1}=\sqrt{17}\ units$

$DA=\sqrt{(5-6)^2+(6-2)^2}=\sqrt{(1)^2+(4)^2}=\sqrt{1+16}=\sqrt{17}\ units$

Therefore, $AB=BC=CD=DA=17\ units$

Also, $AC=\sqrt{(1-6)^2+(5-2)^2}=\sqrt{(-5)^2+(3)^2}=\sqrt{25+9}=\sqrt{34}\ units$

$BD=\sqrt{(5-2)^2+(6-1)^2}=\sqrt{(3)^2+(5)^2}=\sqrt{9+25}=\sqrt{34}\ units$

Thus, diagonal $AC=$ diagonal BD

Therefore, the given points from a square.

(iii) The given points are $P(0,-2), Q(3,1), R(0,4)\ and\ S(-3,1)$

$PQ=\sqrt{(3-0)^2+(1+2)^2}=\sqrt{(3)^2+(3)^2}=\sqrt{9+9}=\sqrt{18}=3\sqrt{2}\ units$

$QR=\sqrt{(0-3)^2+(4-1)^2}=\sqrt{(-3)^2+(3)^2}=\sqrt{9+9}=\sqrt{18}=3\sqrt{2}\ units$

$RS=\sqrt{(-3-0)^2+(1-4)^2}=\sqrt{(-3)^2+(-3)^2}=\sqrt{9+9}=\sqrt{18}=3\sqrt{2}\ units$

$SP=\sqrt{(-3-0)^2+(1+2)^2}=\sqrt{(-3)^2+(3)^2}=\sqrt{9+9}=\sqrt{18}=3\sqrt{2}\ units$

Therefore, $PQ=QS=RS=SP=3\sqrt{2}\ units$

Also, $PR=\sqrt{(0-0)^2+(4+2)^2}=\sqrt{(0)^2+(6)^2}=\sqrt{36}=6\ units$

$QS=\sqrt{(-3-3)^2+(1-1)^2}=\sqrt{(-6)^2+(0)^2}=\sqrt{36}=6\ units$

Thus, diagonal $PR=$diagonal QS

Therefore, the given points from a square.

27. Show that the points $A(-3,2),B(-5,-5),C(2,-3)\ and\ D(4,4)$. are the vertices of a rhombus. Find the area of this rhombus

Sol:

The given points are $A(-3,2),B(-5,-5),C(2,-3)\ and\ D(4,4)$.

$AB=\sqrt{(-5+3)^2+(-5-2)^2}=\sqrt{(-2)^2+(-7)^2}=\sqrt{4+49}=\sqrt{53}\ units$

$BC=\sqrt{(2+5)^2+(-3+5)^2}=\sqrt{(7)^2+(2)^2}=\sqrt{49+4}=\sqrt{53}\ units$

$CD=\sqrt{(4-2)^2+(4+3)^2}=\sqrt{(2)^2+(7)^2}=\sqrt{4+49}=\sqrt{53}\ units$

$DA=\sqrt{(4+3)^2+(4-2)^2}=\sqrt{(7)^2+(2)^2}=\sqrt{49+4}=\sqrt{53}\ units$

Therefore, $AB=BC=CD=DA=\sqrt{53}\ units$

Also, $AC=\sqrt{(2+3)^2+(-3-2)^2}=\sqrt{(5)^2+(-5)^2}=\sqrt{25+25}=\sqrt{50}=\sqrt{25\times 2}=5\sqrt{2}\ units$

$BD=\sqrt{(4+5)^2+(4+5)^2}=\sqrt{(9)^2+(9)^2}=\sqrt{81+81}=\sqrt{162}=\sqrt{81\times 2}=9\sqrt{2}\ units$

Thus, diagonal AC is not equal to diagonal BD.

Therefore ABCD is a quadrilateral with equal sides and unequal diagonals

Hence, ABCD a rhombus

Area of a rhombus $=\frac{1}{2}\times$ (product of diagonals)

$=\frac{1}{2}\times\left(5\sqrt{2}\right)\times\left(9\sqrt{2}\right)$

$=\frac{45(2)}{2}$

$=45$ square units.

28. Show that the points A(3,0), B(4,5), C(-1,4) and D(-2,-1) are the vertices of a rhombus. Find its area.

Sol:

The given points are $A(3,0), B(4,5), C(-1,4)$ and $D(-2,-1)$

$AB=\sqrt{(3-4)^2+(0-5)^2}=\sqrt{(-1)^2+(-5)^2}$

$=\sqrt{1+25}=\sqrt{26}$

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

$=\sqrt{25+1}=\sqrt{26}$

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

$=\sqrt{1+25}=\sqrt{26}$

$AD=\sqrt{(3+2)^2+(0+1)^2}=\sqrt{(5)^2+(1)^2}$

$=\sqrt{25+1}=\sqrt{26}$

$AC=\sqrt{(3+1)^2+(0-4)^2}=\sqrt{(4)^2+(-4)^2}$

$=\sqrt{16+16}=4\sqrt{2}$

$BD=\sqrt{(4+2)^2+(5+1)^2}=\sqrt{(6)^2+(6)^2}$

$=\sqrt{36+36}=6\sqrt{2}$

$\because AB=BC=CD=AD=6\sqrt{2}\ and\ AC\neq BD$

Therefore, the given points are the vertices of a rhombus

Area $(\Delta ABCD)=\frac{1}{2}\times AC\times BD$

$=\frac{1}{2}\times 4\sqrt{2}\times 6\sqrt{2}=24\,sq.\ units$

Hence, the area of the rhombus is 24 sq. units.

29. Show that the points A(6,1), B(8,2), C(9,4) and D(7,3) are the vertices of a rhombus. Find its area.

Sol:

The given points are $A(6,1), B(8,2), C(9,4)$ and $D(7,3)$.

$AB=\sqrt{(6-8)^2+(1-2)^2}=\sqrt{(-2)^2+(-1)^2}$

$=\sqrt{4+1}=\sqrt{5}$

$BC=\sqrt{(8-9)^2+(2-4)^2}=\sqrt{(-1)^2+(-2)^2}$

$= \sqrt{1+4} = \sqrt{5}$

$CD = \sqrt{(9-7)^2 + (4-3)^2} = \sqrt{(2)^2 + (1)^2}$

$= \sqrt{4+1} = \sqrt{5}$

$AD = \sqrt{(7-6)^2 + (3-1)^2} = \sqrt{(1)^2 + (2)^2}$

$= \sqrt{1+4} = \sqrt{5}$

$AC = \sqrt{(6-9)^2 + (1-4)^2} = \sqrt{(-3)^2 + (-3)^2}$

$= \sqrt{9+9} = 3\sqrt{2}$

$BD = \sqrt{(8-7)^2 + (2-3)^2} = \sqrt{(1)^2 + (-1)^2}$

$= \sqrt{1+1} = \sqrt{2}$

$\because AB = BC = CD = AD = \sqrt{5}$ *and* $AC \neq BD$

Therefore, the given points are the vertices of a rhombus. Now

Area $(\Delta ABCD) = \frac{1}{2} \times AC \times BD$

$= \frac{1}{2} \times 3\sqrt{2} \times \sqrt{2} = 3\,sq.\ units$

Hence, the area of the rhombus is 3 sq. units.

30. Show that the points A(2,1), B(5,2), C(6,4) and D(3,3) are the angular points of a parallelogram. Is this figure a rectangle?

Sol:

The given points are $A(2,1), B(5,2), C(6,4)$ *and* $D(3,3)$

$AB = \sqrt{(5-2)^2 + (2-1)^2} = \sqrt{(3)^2 + (1)^2} = \sqrt{9+1} = \sqrt{10}\ units$

$BC = \sqrt{(6-5)^2 + (4-2)^2} = \sqrt{(1)^2 + (2)^2} = \sqrt{1+4} = \sqrt{5}\ units$

$CD = \sqrt{(3-6)^2 + (3-4)^2} = \sqrt{(-3)^2 + (-1)^2} = \sqrt{9+1} = \sqrt{10}\ units$

$AD = \sqrt{(3-2)^2 + (3-1)^2} = \sqrt{(1)^2 + (2)^2} = \sqrt{1+4} = \sqrt{5}\ units$

Thus, $AB = CD = \sqrt{10}$ units and $BC = AD = \sqrt{5}$ units

So, quadrilateral *ABCD* is a parallelogram

Also, $AC = \sqrt{(6-2)^2 + (4-1)^2} = \sqrt{(4)^2 + (3)^2} = \sqrt{16+9} = \sqrt{25} = 5\ units$

$BD = \sqrt{(3-5)^2 + (3-2)^2} = \sqrt{(-2)^2 + (1)^2} = \sqrt{4+1} = \sqrt{5}\ units$

But diagonal AC is not equal to diagonal BD.

Hence, the given points do not form a rectangle.

31. Show hat A(1,2), B(4,3),C(6,6) and D(3,5) are the vertices of a parallelogram. Show that ABCD is not rectangle.

Sol:

The given vertices are $A(1,2), B(4,3), C(6,6)$ and $D(3,5)$.

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

$= \sqrt{9+1} = \sqrt{10}$

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

$= \sqrt{4+9} = \sqrt{13}$

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

$= \sqrt{9+1} = \sqrt{10}$

$AD = \sqrt{(1-3)^2 + (2-5)^2} = \sqrt{(-2)^2 + (-3)^2}$

$= \sqrt{4+9} = \sqrt{13}$

$\because AB = CD = \sqrt{10}\ units\ and\ BC = AD = \sqrt{13}\ units$

Therefore, *ABCD* is a parallelogram

$AC = \sqrt{(1-6)^2 + (2-6)^2} = \sqrt{(-5)^2 + (-4)^2}$

$= \sqrt{25+16} = \sqrt{41}$

$BD = \sqrt{(4-3)^2 + (3-5)^2} = \sqrt{(1)^2 + (-2)^2}$

$= \sqrt{1+4} = \sqrt{5}$

Thus, the diagonal *AC* and *BD* are not equal and hence *ABCD* is not a rectangle

32. Show that the following points are the vertices of a rectangle.

(i) A (-4,-1), B(-2,-4), C(4,0) and D(2,3)

(ii) A (2, -2), B(14,10), C(11,13) and D(-1,1)

(iii) A (0,-4), B(6,2), C(3,5) and D(-3,-1)

Sol:

(i) The given points are $A(-4,-1), B(-2,-4) C(4,0)\ and\ D(2,3)$

$AB = \sqrt{\{-2-(-4)\}^2 + \{-4-(-1)\}^2} = \sqrt{(2)^2 + (-3)^2} = \sqrt{4+9} = \sqrt{13}\ units$

$BC = \sqrt{\{4-(-2)\}^2 + \{0-(-4)\}^2} = \sqrt{(6)^2 + (4)^2} = \sqrt{36+16} = \sqrt{52} = 2\sqrt{13}\ units$

$CD = \sqrt{(2-4)^2 + (3-0)^2} = \sqrt{(-2)^2 + (3)^2} = \sqrt{4+9} = \sqrt{13}\ units$

$AD = \sqrt{\{2-(-4)\}^2 + \{3-(-1)\}^2} = \sqrt{(6)^2 + (4)^2} = \sqrt{36+16} = \sqrt{52} = 2\sqrt{13}\ units$

Thus, $AB = CD = \sqrt{13}\ units\ and\ BC = AD = 2\sqrt{13}\ units$

Also, $AC = \sqrt{\{4-(-4)\}^2 + \{0-(-1)\}^2} = \sqrt{(8)^2 + (1)^2} = \sqrt{64+1} = \sqrt{65}\ units$

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

Also, diagonal AC = diagonal BD

Hence, the given points form a rectangle

(ii) The given points are $A(2,-2), B(14,10) C(11,13)\ and\ D(-1,1)$

$AB = \sqrt{(14-2)^2 + \{10-(-2)\}^2} = \sqrt{(12)^2 + (12)^2} = \sqrt{144+144} = \sqrt{288} = 12\sqrt{2}\ units$

$BC = \sqrt{(11-14)^2 + (13-10)^2} = \sqrt{(-3)^2 + (3)^2} = \sqrt{9+9} = \sqrt{18} = 3\sqrt{2}\ units$

$CD = \sqrt{(-1-11)^2 + (1-13)^2} = \sqrt{(-12)^2 + (-12)^2} = \sqrt{144+144} = \sqrt{288} = 12\sqrt{2}\ units$

$AD = \sqrt{(-1-2)^2 + \{1-(-2)\}^2} = \sqrt{(-3)^2 + (3)^2} = \sqrt{9+9} = \sqrt{18} = 3\sqrt{2}\ units$

Thus, $AB = CD = 12\sqrt{2}\ units\ and\ BC = AD = 3\sqrt{2}\ units$

Also,

$AC = \sqrt{(11-2)^2 + \{13-(-2)\}^2} = \sqrt{(9)^2 + (15)^2} = \sqrt{81+225} = \sqrt{306} = 3\sqrt{34}\ units$

$BD = \sqrt{(-1-14)^2 + (1-10)^2} = \sqrt{(-15)^2 + (-9)^2} = \sqrt{81+225} = \sqrt{306} = 3\sqrt{34}\ units$

Also, diagonal AC = diagonal BD

Hence, the given points from a rectangle

(iii) The given points are $A(0,-4), B(6,2) C(3,5)\ and\ D(-3,-1)$.

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

$BC = \sqrt{(3-6)^2 + (5-2)^2} = \sqrt{(-3)^2 + (3)^2} = \sqrt{9+9} = \sqrt{18} = 3\sqrt{2}\ units$

$CD = \sqrt{(-3-3)^2 + (-1-5)^2} = \sqrt{(-6)^2 + (-6)^2} = \sqrt{36+36} = \sqrt{72} = 6\sqrt{2}\ units$

$AD = \sqrt{(-3-0)^2 + \{-1-(-4)\}^2} = \sqrt{(-3)^2 + (3)^2} = \sqrt{9+9} = \sqrt{18} = 3\sqrt{2}\ units$

Thus, AB = CD = $\sqrt{10}$ units and BC = AD = $\sqrt{5}$ units

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

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

Also, diagonal AC = diagonal BD

Hence, the given points from a rectangle