Unit 9
Introduction to Coordinate Geometry

EXERCISE 9.1

Q1. Find the distance between the following pairs of points.

(a) $A(9,2),\ B(7,2)$

Solution:

$$\text{Distance formula} = d = \pm\sqrt{|x_2 - x_1|^2 + |y_2 - y_1|^2}$$

$$|AB| = \sqrt{(7-9)^2 + (2-2)^2}$$

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

$$= \sqrt{4+0} = \sqrt{4} = 2$$

(b) $A(2,-6),\ B(3,-6)$

Solution:

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

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

(c) $A(-8,1),\ B(6,1)$

Solution:

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

$$= \sqrt{(14)^2 + (0)^2} = 14$$

(d) $A(-4,\sqrt{2}),\ B(-4,-3)$

Solution:

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

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

$$= \sqrt{(0)^2 4(-3-\sqrt{2})^2} = |-3-\sqrt{2}|$$

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

(e) $A(3,11),\quad B(3,4)$

Solution:

$$|AB| = \sqrt{(3-3)^2 + [-4-(-11)]^2}$$
$$= \sqrt{(0)^2 + (7)^2} = 7$$

(f) $A(0,0),\quad B(0,5)$

Solution:

$$|AB| = \sqrt{(0-0)^2 + (-5-0)^2}$$
$$= \sqrt{(0)^2 + (-5)^2} = \sqrt{0+25}$$
$$= \sqrt{25} = 5$$

Q2. Let P be the point on x-axis with x-coordinate a and Q be the point on y-axis with y-coordinate b as given below. Find the distance between P and Q.

(i) $a = 9,\quad b = 7$

Solution:

$$\therefore \quad P \text{ is } (9,0) \text{ and } Q \text{ is } (0,7)$$
$$|PQ| = \sqrt{(0-9)^2 + (7-0)^2}$$
$$= \sqrt{81+49} = \sqrt{130}$$

(ii) $a = 2,\quad b = 3$

Solution:

$$\therefore \quad P \text{ is } (2,0) \text{ and } Q \text{ is } (0,3)$$
$$|AB| = \sqrt{(0-2)^2 + (3-0)^2}$$
$$= \sqrt{4+9} = \sqrt{13}$$

(iii) $a = -8,\quad b = 6$

Solution:

$$|PQ| = \sqrt{[0-(-8)]^2 + (6-0)^2}$$
$$= \sqrt{(8) + (6)} = \sqrt{64+36}$$
$$= \sqrt{100} = 10$$

(iv) $a = -2,\quad b = -3$

Solution:

$$\therefore \quad P \text{ is } (-2,0) \text{ and } Q \text{ is } (0,3)$$
$$|PQ| = \sqrt{[0-(-2)]^2 + (-3-0)^2}$$
$$= \sqrt{(2)^2 + (-3)^2} = \sqrt{9+4} = \sqrt{13}$$

(v) $\boldsymbol{a = \sqrt{2}}, \quad \boldsymbol{b = 1}$

Solution:

$$\therefore \quad P \text{ is } (\sqrt{2}, 0) \text{ and } Q \text{ is } (0,1)$$

$$|PQ| = \sqrt{\left(0 - \sqrt{2}\right)^2 + (1-0)^2}$$

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

(v) $\boldsymbol{a = -9 \quad and \quad b = -4}$

Solution:

$$\therefore \quad P \text{ is } (-9,0) \text{ and } Q \text{ is } (0,4)$$

$$|PQ| = \sqrt{[0-(-9)]^2 + [-4-0]^2}$$

$$= \sqrt{(9)^2 + (-4)^2} \qquad = \sqrt{81+16}$$

$$= \sqrt{97}$$

EXERCISE 9.2

Q1. Show whether the points with vertices $(5,2)$, $(5,4)$ and $(4,-1)$ are vertices of an equilateral triangle or an isosceles triangle?

Solution:

Let the points be A(5,2), B(5,4) and C(-4,1).

$$|AB| = \sqrt{(5-5)^2 + (4+2)^2}$$

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

$$= \sqrt{0+36} = 6$$

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

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

$$= \sqrt{81+9} = \sqrt{90} = \sqrt{9 \times 10} = 3\sqrt{10}$$

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

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

$$= \sqrt{81+9} = \sqrt{90} = \sqrt{9 \times 10} = 3\sqrt{10}$$

$$As \qquad |BC| = |CA| = 3\sqrt{10}$$

Since two sides are equal therefore the triangle is formed is an issosceles triangle.

Q2. Show whether or not the points with vertices $(-1,1)$, $(5,4)$, $(2,-2)$ and $(-4,1)$ from a square.

Solution:

Let the points be A(-1,1), B(5,4), C(2,2) and D (-4,1)

$$|AB| = \sqrt{(5+1)^2 + (4-1)}^2$$
$$= \sqrt{36+9} = \sqrt{45} = \sqrt{9\times 5} = 3\sqrt{5}$$
$$|BC| = \sqrt{(5-2)^2 + (4+2)^2} = \sqrt{3^2+6^2}$$
$$= \sqrt{9+36} = \sqrt{45} = 3\sqrt{5}$$
$$|CD| = \sqrt{(2+4)^2 + (-2-1)^2} = \sqrt{6^2 + (-3)^2}$$
$$= \sqrt{36+9} = \sqrt{45} = 3\sqrt{5}$$
$$|\mathrm{DA}| = \sqrt{(-1+4)^2 + (1-1)^2} = \sqrt{(3)^2+0^2} = 3$$
$$|AB| = |BC| = |CD| = 3\sqrt{5} \quad but\ |AD| = 3$$

Since all sides are not equal therefore the given points did not form a square.

Q3. Show whether or not the points coordinates $(1,3)$, $(4,2)$ and $(-2,6)$ are vertices of a right triangle.

Solution:

Let the given points be $A\,(1{,}3), B(4{,}2)$ and $C(-2{,}6)$.

$$|AB| = \sqrt{(4-1)^2 + (2-3)^2} = \sqrt{(3)^2 + (-1)^2}$$
$$= \sqrt{9+1} = \sqrt{10}$$
$$|BC| = \sqrt{(4+2)^2 + (2-6)^2} = \sqrt{(6)^2 + (-4)^2}$$
$$= \sqrt{36+16} = \sqrt{52}$$
$$|CA| = \sqrt{(1+2)^2 + (3-6)^2} = \sqrt{(6)^2 + (-4)^2}$$
$$= \sqrt{9+9} = \sqrt{18}$$
$$|BC|^2 = 52$$
$$|AB|^2 + |CA|^2 = 10 + 18 = 28 \neq |BC|^2$$

Since given points does not obey the Pythagoras theorem therefore the coordinates are not the vertices of right angle triangle.

Q4. Use the distance formula to prove whether or not the points $(1,1), (-2,-8)$ and $(4,10)$ lie on a straight line?

Solution:

Let the given points be $A(1{,}1), B(-2{,}8)$ and $(4{,}10)$.

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

$$= \sqrt{(3)^2 + (9)^2} = \sqrt{9+81} = \sqrt{90} = \sqrt{9 \times 10}$$
$$= 3\sqrt{10}$$
$$|BC| = \sqrt{(4+2)^2 + (10+8)^2} = \sqrt{(6)^2 + (18)^2}$$
$$= \sqrt{36+324} = \sqrt{360} = 6\sqrt{10}$$
$$|AC| = \sqrt{(4-1)^2 + (10-1)^2} = \sqrt{(3)^2 + (9)^2}$$
$$= \sqrt{9+81} = \sqrt{90} = 3\sqrt{10}$$

By applying the condition of collinear points

As $|AB| + |AC| = 3\sqrt{10} + 3\sqrt{10} = 6\sqrt{10} = |BC|$

So the points A, B, C are on the same straight line.

OR the given points are collinear.

Q5. Find k, given that the point $(2, k)$ is equidistant from $(3, 7)$ and $(9, 1)$.

Solution:

Let the given points be $P(2, k)$ and $A(3,\ 7)$, $B(9,\ 1)$.

As the points P is equidistant from A and B.

$\therefore \quad |PA| = |PB|$

i.e. $\sqrt{(2-3)^2 + (k-7)^2} = \sqrt{(2-9) + (k-1)}$

Squaring both sides we have

$$(-1) + (5-7)^2 = (-7)^2 + (k-1)^2$$
$$1 + k^2 - 14k + 49 = 49 + k^2 - 2k + 1$$
$$50 + k^2 - 14k = 50 + k^2 - 2k$$
$$-14 + 2k = 0$$
$$-12k = 0$$
$$\Rightarrow \quad k = 0$$

Q6. Use distance formula to verify that the points $A(0, 7), B(3, -5), C(-2, 15)$ are collinear.

Solution:

Let the points be A(0,7), B(3,5) and C(-2,15).

$$|AB| = \sqrt{(0-3)^2 + (7+5)^2}$$
$$= \sqrt{(-3)^2 + (12)^2} = \sqrt{9+144}$$
$$= \sqrt{153} = \sqrt{9 \times 17} = 3\sqrt{17}$$
$$|BC| = \sqrt{(-2-3)^2 + (15+5)^2}$$
$$= \sqrt{(-5)^2 + (20)^2} = \sqrt{25+400}$$
$$= \sqrt{425} = \sqrt{25 \times 17} = 5\sqrt{17}$$
$$|CA| = \sqrt{(0+2)^2 + (7-15)^2} = \sqrt{(2)^2 + (-8)^2}$$
$$= \sqrt{4+64} = \sqrt{68} = 2\sqrt{17}$$

By applying the condition of collinear points

$$|AB| + |CA| = 3\sqrt{17} + 2\sqrt{17} = (3+2)\sqrt{17}$$
$$= (3+2)\sqrt{17} = 5\sqrt{17} = |BC|$$

$\therefore$ the given points are collinear.

Q7. Verify whether or not the points O (0,0), $A(\sqrt{3},1)$ are the vertices of an equilateral triangle.

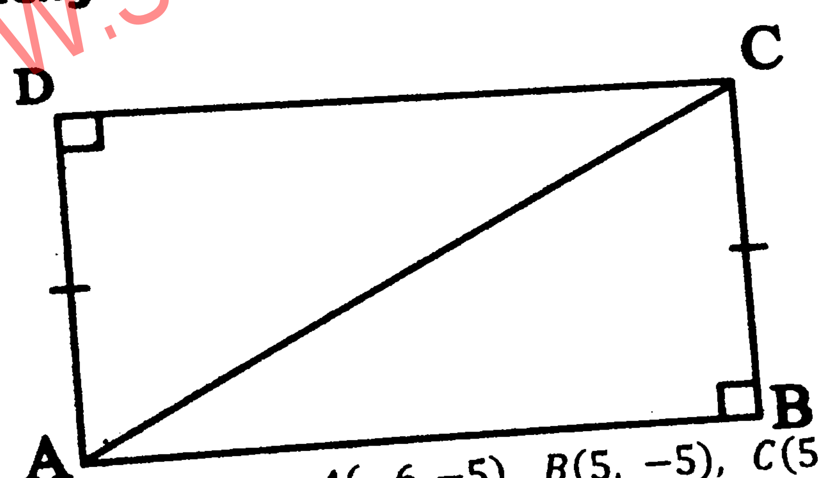
Solution:

$$|OA| = \sqrt{(\sqrt{3}-0)^2 + (1-0)^2} = \sqrt{(\sqrt{3})^2 + (-1)^2}$$
$$= \sqrt{3+1} = \sqrt{4} = 2$$
$$|OB| = \sqrt{(\sqrt{3}-0)^2 + (-1-0)^2} = \sqrt{(\sqrt{3})^2 + (-1)^2}$$
$$= \sqrt{3+1} = \sqrt{4} = 2$$
$$|AB| = \sqrt{\left(\sqrt{3}-\sqrt{3}\right)^2 + (-1-1)^2}$$
$$= \sqrt{(0)^2 + (-2)^2} = \sqrt{0+4} = 2$$

Since $|OA| = |OB| = |AB|$ therefore ABO are vertices of an equilateral triangle.

Q8. Show that the points $A(-6,-5)$, $B(5,-5)$, $C(5,-8)$ and $D(-6,-8)$ are vertices of a rectangle. Find the lengths of its diagonals. Are they equal?

Solution:



The points are $A(-6,-5)$, $B(5,-5)$, $C(5,-8)$ and $D(-6,-8)$

$$|AB| = \sqrt{(-6-5)^2 + (-5+5)^2} = \sqrt{(-11) + (0)^2}$$
$$= \sqrt{121} = 11$$
$$|DC| = \sqrt{(5+6)^2 + (-8+8)^2} = \sqrt{(11)^2 + (0)^2}$$
$$= \sqrt{121} = 11$$

$$|AD| = \sqrt{(-6+6)^2 + (-5+8)^2}$$
$$= \sqrt{9} = 3$$
$$|BC| = \sqrt{(5-5)^2 + (-8+5)^2}$$
$$= \sqrt{0+9} = 3$$
$$|AC| = \sqrt{(-6-5)^2 + (-5+8)^2} = \sqrt{(11)^2 + (3)^2}$$
$$= \sqrt{121+9} = \sqrt{130}$$

Now by applying Pythagoras theorem

$$|AB|^2 + |BC|^2 = (11)^2 + (3)^2 = 121 + 9 = 130 = |AC|^2$$
$$\therefore \angle ABC = 90^o$$
$$and\ |AB| = |DC|\ and\ |AD| = |BC|$$

Hence ABCD is a rectangle

For **diagonals**

$$|AC| = \sqrt{(-6-5)^2 + (-5+8)^2} = \sqrt{(11)^2 + (3)^2}$$
$$= \sqrt{121+9} = \sqrt{130}$$

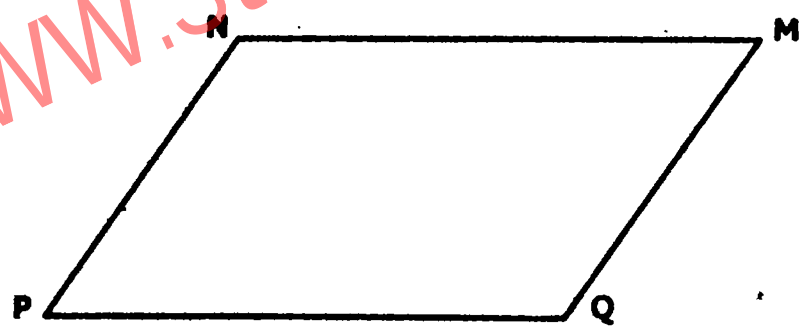
Also $|BD| = \sqrt{(-6-5)^2 + (-8+5)^2}$

$$= \sqrt{(-11)^2 + (-3)^2} = \sqrt{121+9} = \sqrt{130}$$

$\therefore$ the two diagonals are equal in length.

Q9. Show that the points $M(-1,4), N(-5,3), P(1,-3)$ and $Q(5,-2)$ are the vertices of a parallelogram.

Solution:



Points are $M(-1,4), N(-5,3), P(1,-3)$ and $Q(5,-2)$

$$|MN| = \sqrt{(-1+5)^2 + (4-3)^2} = \sqrt{(4)^2 + (1)^2}$$
$$= \sqrt{16+1} = \sqrt{17}$$
$$|PQ| = \sqrt{(5-1)^2 + (4-3)^2} = \sqrt{(4)^2 + (1)^2}$$
$$= \sqrt{16+1} = \sqrt{17}$$
$$|NP| = \sqrt{(1+5)^2 + (-3-3)^2} = \sqrt{(6)^2 + (-6)^2}$$
$$= \sqrt{36+36} = \sqrt{72} = 6\sqrt{2}$$
$$|MQ| = \sqrt{(5+1)^2 + (-2-4)^2} = \sqrt{(6)^2 + (-6)^2}$$
$$= \sqrt{36+36} = 6\sqrt{2}$$

$$|QN| = \sqrt{(5+5)^2 + (-2-3)^2} = \sqrt{(10)^2 + (-5)^2}$$
$$= \sqrt{100+25} = \sqrt{125} = 5\sqrt{5}$$
$$|NP|^2 + |PQ|^2 = 72 + 17 = 89 \neq 125 = |QN|^2$$

But $|MN| = |PQ| = |NQ| = |MQ|$

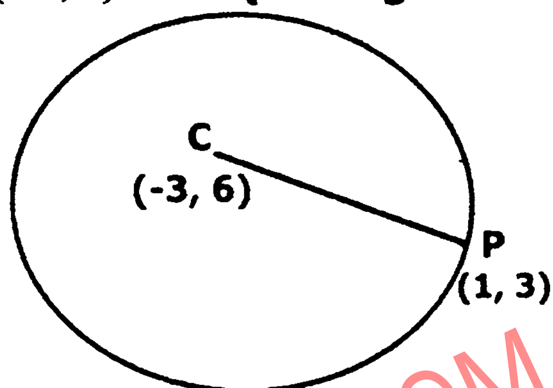
Hence the given points from a parallelogram.

Q10. Find the length of the diameter of the circle having centre at $C(-3,6)$ and passing through $P(1,3)$.

Solution:

Centre C(-3, 6) and the circle is passing through the point P(1,3)

$\therefore$ $radius = m|PC|$



$$= \sqrt{(-3-1)^2 + (6-3)^2}$$
$$= \sqrt{(-4)^2 + (3)^2} = \sqrt{16+9} = \sqrt{25} = 5$$
$$diameter = 2 \times radius$$
$$= 2 \times 5 = 10$$

EXERCISE 9.3

Q1. Find the mid-point of the line segment joining each of the following pairs of points.

(a) A(9,2), B(7,2)

Solution:

Mid point M is $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$\left(\frac{9+7}{2}, \frac{2+2}{2}\right)$

Or $\left(\frac{16}{2}, \frac{4}{2}\right)$

Or $(8, 2)$

(b) A(2,6), B(3,-6)

Solution:

Mid point M is $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$\left(\frac{2+3}{2}, \frac{-6-6}{2}\right)$

Or $\left(\frac{5}{2}, \frac{-12}{2}\right)$

Or $\left(\frac{5}{2}, -6\right)$

or $(2.5, -6)$

(c) A(3,-11),B (3,-4)

Solution:

Mid point M is $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$\left(\frac{-8+6}{2}, \frac{1+1}{2}\right)$

Or $\left(\frac{-2}{2}, \frac{2}{2}\right)$

Or $(-1, 1)$

(d) A(-4,9), B(-4,-3)

Solution:

Mid point M is $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$\left(\frac{-4-4}{2}, \frac{9-3}{2}\right)$

Or $\left(\frac{-8}{2}, \frac{6}{2}\right)$

Or $(-4, 3)$

(e) A(3,-11), B(3,4)

Solution:

Mid point M is $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$\left(\frac{3+3}{2}, \frac{-11-4}{2}\right) = \left(\frac{6}{2}, -\frac{15}{2}\right)$

Or $(3, -7.5)$

(f) A(0,0), B(0,-5)

Solution:

Mid point M is $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$\left(\frac{0+0}{2}, \frac{0-5}{2}\right)$

or $\left(\frac{0}{2}, \frac{-5}{2}\right)$

$(0, -2.5)$

Q2. The end point of a line segment PQ is $(-3, 6)$ and its mid-point is $(5, 8)$. Find the coordinates of the end point Q.

Solution:

Let Q be the point (x, y), $M(5,8)$ is the mid point of PQ by mind point formula we have

$$x = \frac{x_1+x_2}{2}$$

$5 = \frac{-3+x}{2}$

$10 = -3 + x$

$10 + 3 = x$

$x = 13$

Now $y = \frac{y_1+y_2}{2}$

$8 = \frac{6+y}{2}$

$16 = 6 + y$

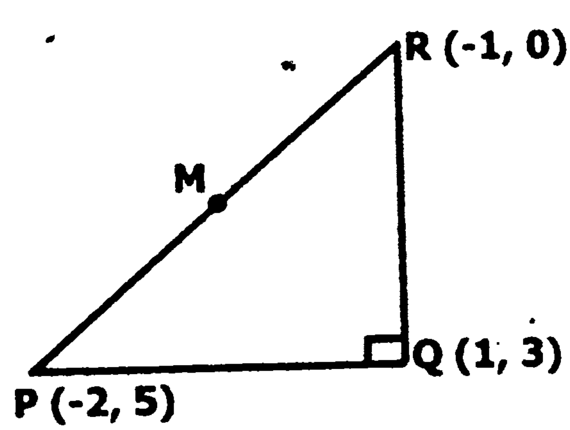
$16 - 6 = y$

$y = 10$

Hence point Q is (13, 10)

Q3. Prove that mid-point of the hypotenuse of a right triangle is equidistant from its three vertices $P(-2, 5)$, $Q(1, 3)$ and $R(-1.0)$.

Solution:



$P(-2,5), Q(1,3), R(-1,0)$

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

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

$$|QR| = \sqrt{(1+1)^2 + (3-0)^2} == \sqrt{(-2)^2 + (3)^2}$$
$$= \sqrt{4+9} = \sqrt{13}$$
$$|PR| = \sqrt{(-2+1)^2 + (5-0)^2}$$
$$= \sqrt{(-1)^2 + (5)^2} = \sqrt{1+25} = \sqrt{26}$$
$$|PR|^2 = 26 = |PQ|^2 + |QR|^2$$

$\therefore \overline{PR}$ is hypotenuse

Mid point of hypotenuse PR is $M\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$$M\left(\frac{-2-1}{2}, \frac{5+0}{2}\right)$$

Or $\quad M\left(-\frac{3}{2}, \frac{5}{2}\right)$

$$|MP|^2 = |MR|^2$$
$$= \sqrt{\left(-\frac{3}{2}+1\right)^2 + \left(\frac{5}{2}-0\right)^2}$$
$$= \sqrt{\left(-\frac{1}{2}\right)^2 + \left(\frac{5}{2}\right)^2}$$
$$= \sqrt{\frac{1}{4} + \frac{25}{4}} = \frac{\sqrt{26}}{2}$$

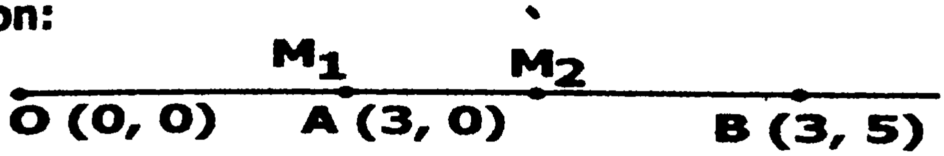
Now $\quad |MQ| = \sqrt{\left(-\frac{3}{2}-1\right)^2 + \left(\frac{5}{2}-3\right)^2}$

$$= \sqrt{\left(-\frac{5}{2}\right)^2 + \left(-\frac{1}{2}\right)^2}$$
$$= \sqrt{\frac{25}{4} + \frac{1}{4}} = \sqrt{\frac{26}{4}} = \frac{\sqrt{26}}{2} = |MP| = |MR|$$

Hence M the mid point of hypotenuse is equidistant from the three vertices of the angle PQR.

Q4. If O(0, 0), A(3, 0) and B(3, 5) are three points in the plane, find M_1 and M_2 as mid-points of the line segments AB and OB respectively. Find $|M_1M_2|$.

Solution:



$0(0,0),\ A(3,0),\ B(3,5)$

Mid point of AB is $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$M_1\left(\frac{3+3}{2},\frac{0+5}{2}\right)$ or $M_1\left(3,\frac{5}{2}\right)$

M_2 the mid point of OB is $M_2\left(\frac{x_1+x_2}{2},\frac{y_1+y_2}{2}\right)$

$\left(\frac{0+3}{2},\frac{0+5}{2}\right)$ or $M_2\left(\frac{3}{2},\frac{5}{2}\right)$

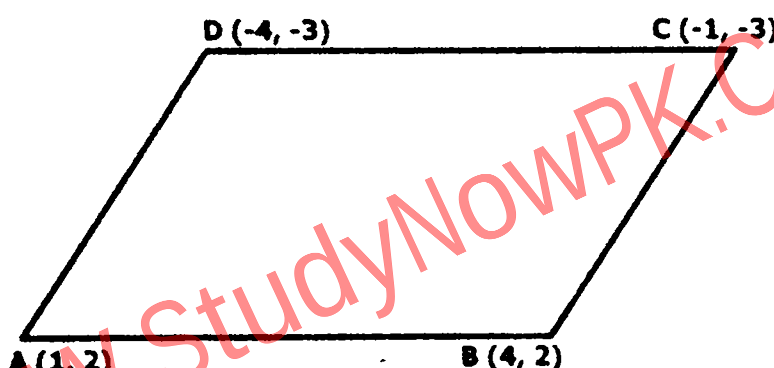
Now $|M_1M_2| = \sqrt{\left(3-\frac{3}{2}\right)^2+\left(\frac{5}{2}-\frac{5}{2}\right)^2}$

$$= \sqrt{\left(\frac{3}{2}\right)^2+(0)^2} = \sqrt{\frac{9}{4}+0} = \frac{3}{2}$$

Q5. Show that the diagonals of the parallelogram having vertices $A(1,2)$, $B(4,2)$, $C(-1,-3)$ and $D(-4,-3)$ bisect each other.

[Hint: The mid-points of the diagonals coincide]

Solution:



M_1 mid point of AC is $\left(\frac{x_1+x_2}{2},\frac{y_1+y_2}{2}\right)$

$\left(\frac{1-1}{2},\frac{2-3}{2}\right)$

Or $\left(\frac{0}{2},\frac{-1}{2}\right)$

Or $M_1\left(0,-\frac{1}{2}\right)$

M_2 mid point of BD is $\left(\frac{x_1+x_2}{2},\frac{y_1+y_2}{2}\right)$

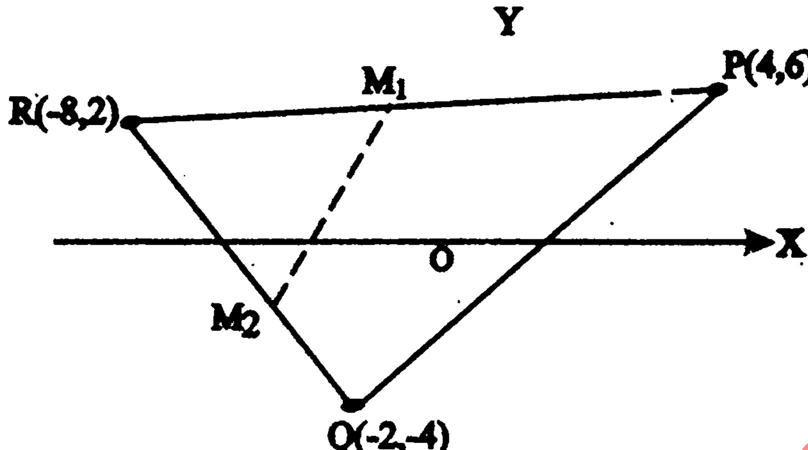
$\left(\frac{-4+4}{2},\frac{-3+2}{2}\right)$ or $\left(\frac{0}{2},-\frac{1}{2}\right)$

Or $M_1\left(0,-\frac{1}{2}\right)$

Since both the diagonals have same mid point therefore they bisect each other.

Q6. The vertices of a triangle are $P(4,6), Q(-2,-4)$ and $R(-8,2)$. Show that the length of the line segment joining the mid-points of the line segments PR, QR is $\frac{1}{2}PQ$.

Solution:



M_1 the mid point of QR is $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$\left(\frac{-2-8}{2}, \frac{-4+2}{2}\right)$

or $\left(\frac{-10}{2}, \frac{-2}{2}\right)$

or $M_1(-5,-1)$

M_2 the mid point of PR is $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$\left(\frac{4-8}{2}, \frac{6+2}{2}\right)$ or $\left(\frac{-4}{2}, \frac{8}{2}\right)$

or $M_2(-2,4)$

$|M_1M_2| = \sqrt{(-5+2)^2+(4+1)^2} = \sqrt{(-3)^2+(5)^2}$

$= \sqrt{9+25} = \sqrt{34}$ .... (i)

Now $|PQ| = \sqrt{(4+2)^2+(6+4)^2} = \sqrt{(6)^2+(10)^2}$

$= \sqrt{36+100} = \sqrt{136}$

$= \sqrt{4\times 34} = 2\sqrt{34}$

$\frac{1}{2}|PQ| = \sqrt{34}$ .... (ii)

From (i) and (ii), we get

$|M_1M_2| = \frac{1}{2}|PQ|$

REVIEW EXERCISE 9

Q1. Choose the correct answer.

(i) Distance between points (0, 0) and (1, 1) is

(a) 0 (b) 1 (c) 2 (d) $\sqrt{2}$

(ii) Distance between the points (1, 0) and (0, 1) is

(a) 0 (b) 1 (c) $\sqrt{2}$ (d) 2

(iii) Mid-point of the points (2, 2) and (0, 0) is

(a) (1, 1) (b) (1, 0)
(c) (0, 1) (d) (-1, -1)

(iv) Mid-point of the points (2, -2) and (-2. 2) is

(a) (2, 2) (b) (-2, -2)
(c) (0, 0) (d) (1, 1)

(v) A triangle having all sides equal is called

(a) Isosceles (b) Scalene
(c) Equilateral (d) None of these

(vi) A triangle having all sides different is called

(a) Isosceles (b) Scalene
(c) Equilateral (d) None of these

Answers:

(i) d	(ii) c	(iii) a	(iv) c	(v) c	(vi) b

Q2. Answer the following, which is true and which is false.

(i) A line has two end points.
(ii) A line segment has one end point.
(iii) A triangle is formed by three collinear points.
(iv) Each side of a triangle has two collinear vertices.
(v) The end points of each side of a rectangle are collinear.
(vi) All the points that lie on the x-axis are collinear.
(vii) Origin is the only point collinear with the points of both the axes separately.

Answers:

(i) F	(ii) F	(iii) F	(iv) T	(v) T
(vi) T	(vii) T			

Q3. Find the distance between the following pairs of points.

(i) A(6,3), B(3,-3)

Solution:

$$|AB| = \sqrt{(3-6)^2 + (-3-3)^2}$$
$$= \sqrt{(-3)^2 + (-6)^2} = \sqrt{9+36} = \sqrt{45}$$

(ii) A(7,5), B(1,-1)

Solution:

$$|AB| = \sqrt{(7-1)^2 + (5-1)^2}$$
$$= \sqrt{(6) + (6)} = \sqrt{36+36} = \sqrt{72} = 6\sqrt{2}$$

(iii) A(0,0), B(-4,-3)

Solution:

$$|AB| = \sqrt{(0+4)^2 + (0+3)^2}$$
$$= \sqrt{(4)^2 + (3)^2} = \sqrt{16+9} = \sqrt{25} = 5$$

Q4. Find the mid-point between following pairs of points.

(i) (6, 6), B(-4,-3)

Solution:

Mid point M $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$\left(\frac{6+4}{2}, \frac{6-2}{2}\right)$

or $\left(\frac{10}{2}, \frac{4}{2}\right)$

or (5, 2)

(ii) (-5, -7), (-7, -5)

Solution:

Mid point M $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$\left(\frac{-5-7}{2}, \frac{-7-5}{2}\right)$

or $\left(\frac{-12}{2}, \frac{-12}{2}\right)$

or $(-6, -6)$

(iii) (8, 0), (0, -12)

Solution:

Mid point M $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$\left(\frac{8+0}{2}, \frac{0-12}{2}\right)$

or $\left(\frac{8}{2}, \frac{-12}{2}\right)$

or $(-4, -6)$

Q5. Define the following:

(i) Coordinate geometry:

Coordinate geometry is the study of geometrical shapes the Cartesian plane (or coordinate plane)

(ii) Collinear:

Two or more than two points which lie on the same straight line are called collinear points with respect to that line.

(iii) Non-collinear:

The points which do not on the same straight line are called Non-collinear.

(iv) Equilateral triangle:

If the length of all three sides of a triangle is same, then the triangle is called an equilateral triangle.

(v) Scalene Triangle:

A triangle is called scalene triangle if measure of all the three sides are different.

(vi) Isosceles Triangle:

An isosceles triangle is a triangle which has two of its sides with equal length while the third side has different length.

(vii) Right Triangle:

A triangle in which one of the angles has measure equal to 90° is called right triangle.

(viii) Square:

A square is a closed figure formed by four non-collinear points such that lengths of all sides are equal and measure of each angle is 90°