Exercise 9.1

Q1 Find the distance between the following pairs of points.

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

Solution:

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

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

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

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

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

Solution:

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

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

(C) A (-8, 1), B (6, 1)

Solution:

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

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

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

Solution:

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

$= \sqrt{(0)^2 + \left(-3-\sqrt{2}\right)^2} = |-3 - \sqrt{2}| = 3 + \sqrt{2}$

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

Solution:

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

$= \sqrt{(0)^2 + (7)^2} = 7$

(f) A (0, 0), 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) $a = 9, b = 7$

Solution:

P is (9,0) and Q is (0,7)

$|PQ| = \sqrt{(0-9)^2 + (7-0)^2}$

$= \sqrt{81 + 49} = \sqrt{130}$

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

Solution:

P is (2,0) and Q is (0,3)

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

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

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

Solution:

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

$= \sqrt{64+36} = \sqrt{100} = 10$

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

Solution:

$\therefore P$ is (-2,0) and Q is (0,3)

$|PQ| = \sqrt{[0-(-2)]^2 + (-3-0)^2}$

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

$= \sqrt{13}$

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

Solution:

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

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

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

(vi) $a = -9$ and $b = -4$

Solution: [redacted]

$\therefore P$ is (-9,0) and Q is (0,4)

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

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

$= \sqrt{97}$

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

Since two sides are equal therefore the triangle is formed is an isosceles 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)

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

$= \sqrt{(36+9)} = \sqrt{45} = \sqrt{9\times 5} = 3\sqrt{5}$

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

$= \sqrt{(9+36)} = \sqrt{45} = \sqrt{9\times 5} = 3\sqrt{5}$

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

$= \sqrt{(36+9)} = \sqrt{45} = 3\sqrt{5}$

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

$|AB| = |BC| = |CD| = 3\sqrt{5}$ 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 coordinate (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).

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

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

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

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

$= \sqrt{(36+16)} = \sqrt{52}$

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

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

$= \sqrt{(9+9)} = \sqrt{18}$

$|BC|^2 = 52$

$|AB|^2 + |CA|^2 = 10 + 18 = 28 \neq |IBCI|^2$

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:

A (1, 1), B(-2, 8) and C(4, 10)

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

$= \sqrt{(3)^2 + (9)^2} = \sqrt{(3)^2 + (9)^2} = \sqrt{9+81} = \sqrt{90} = \sqrt{(9\times 10)} = 3\sqrt{10}$

$|BC| = \sqrt{(4+2)^2 + (10+8)^2} = \sqrt{(6)^2 + (18)^2} = \sqrt{36+324} = \sqrt{360} = 6\sqrt{10}$

$|AC| = \sqrt{(4-1)^2 + (10-1)^2} = \sqrt{(3)^2 + (9)^2} = \sqrt{(9+81)} = \sqrt{90} = 3\sqrt{10}$

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 collinea..

Solution:

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

$|AB| = \sqrt{(0-3)^2 + (7+5)^2}$

$= \sqrt{(-3)^2 + (1^2)^2} = \sqrt{(9+144} = \sqrt{(153} = \sqrt{(9 \times 17} = 3\sqrt{17}$

$|BC| = \sqrt{(-2-3)^2 + (15+5)^2}$

$= \sqrt{(-5)^2 + (20)^2} = \sqrt{5+400} = \sqrt{425} = \sqrt{25\times 17} = \sqrt{17}$

$|CA| = \sqrt{(0+2)^2 + (7-15)^2} = \sqrt{(2)^2 + (-8)^2} = \sqrt{4+64} = \sqrt{68} = 2\sqrt{17}$

By applying the condition of collinear points

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

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

The given points are collinear.

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

Solution:

$|OA| = \sqrt{(\sqrt{3}-0)^2 + (1-0)^2} = \sqrt{(3)^2 + (-1)^2}$

$= \sqrt{3+1} = \sqrt{4} = 2$

$|OB| = \sqrt{(\sqrt{3}-0)^2 + (-1-0)^2} = \sqrt{(3)^2 + (-1)^2}$

$= \sqrt{3+1} = \sqrt{4} =$

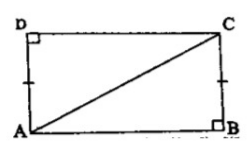
$|AB| = \sqrt{(\sqrt{3}-\sqrt{3})^2 + (-1-1)^2} = \sqrt{(0)^2 + (-2)^2}$

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

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)

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

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

$|AD| = \sqrt{(-6+6)^2 + (-5+8)^2} = \sqrt{9} = 3$

$|BC| = \sqrt{(5-5)^2 + (-8+5)^2} = \sqrt{0+9} = 3$

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

Now by applying Pythagoras theorem

$|AB|^2 + |BC|^2 = (11)^2 + (3)^2 = 121 + 9 = 130 = |AC|^2$

$\therefore \angle ABC = 90°$

and $|AB| = |DC|$ and $|AD| = |AC|$

Hence ABCD is a rectangle

For diagonals

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

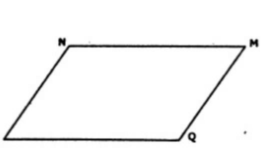
Also $|BD| = \sqrt{(-6-5)^2 + (-8+5)^2}$

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

The two diagonals are equal in length.

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

Solution:



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

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

$= \sqrt{16+1} = \sqrt{17}$

$|PQ| = \sqrt{(5-1)^2 + (4-3)^2} = \sqrt{(4)^2 + (1)^2} = \sqrt{16+1} = \sqrt{17}$

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

$|QN| = \sqrt{(5+1)^2 + (-2-4)^2} = \sqrt{(6)^2 + (-6)^2} = \sqrt{36+36} = 6\sqrt{2}$

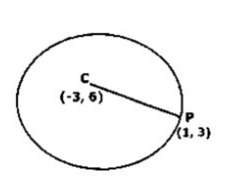
$|NP|^2 + |PQ|^2 = 7^2 + 17 = 89 \neq 125 = |QN|^2$

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

Hence the given points from a parallelogram.

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

Solution:



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

$\therefore \quad$ 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
$= 2\times 5 = 10$cm

Exercise 9.3

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

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

Solution:

Midpoint 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)

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

or $(2.5, -6)$

(c) A(−8, 1), B(6, 1)

Midpoint 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)

Midpoint 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)

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

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

or $\left(\frac{6}{2}, -\frac{15}{2}\right)$

or $(3, -7.5)$

(f) A(0, 0), B(0, −5)

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

or $(0, -2.5)$.

2. The end point P 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 midpoint 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 $y = \frac{y_1+y_2}{2}$

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

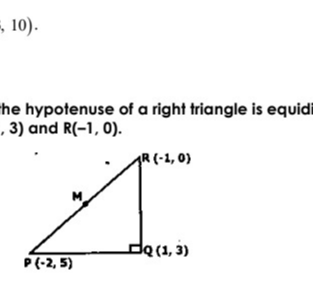
$16 = 16+y$

$16-6 = y$

$y = 10$

Hence point Q is $(13, 10)$.

3. 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).



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

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

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

$|QR| = \sqrt{(1+1)^2+(3-0)^2} = \sqrt{(-2)^2+(3)^2}$

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

$|PR| = \sqrt{(-2+1)^2+(5-0)^2} = \sqrt{(-1)^2+(5)^2}$

$= \sqrt{1+25} = \sqrt{26} = 2$

$\therefore$ PR is hypotenuse

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

$|MP|^2 = |MR|^2$

$= \sqrt{\left(-\frac{3}{2}+1\right)^2+\left(\frac{5}{2}-0\right)^2}$

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

$= \sqrt{\left(\frac{1}{4}\right)+\left(\frac{25}{4}\right)} = \frac{\sqrt{26}}{2}$

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

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

$= \sqrt{\left(\frac{25}{4}\right)+\left(\frac{1}{4}\right)} = \sqrt{\frac{26}{4}} = \frac{\sqrt{26}}{2}$

$|MP| = |MR|$

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

4. 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:

O(0, 0), A(3, 0) and B(3, 5)

Midpoint 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 $M_2\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

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

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

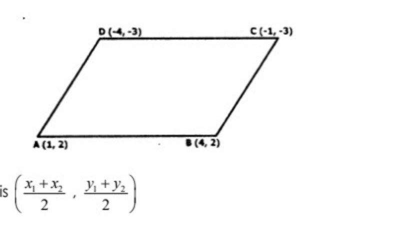
$= \sqrt{\left(\frac{3}{2}\right)^2+(0)^2}$

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

5. 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 midpoint 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 $\left(0, \frac{-1}{2}\right)$

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

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

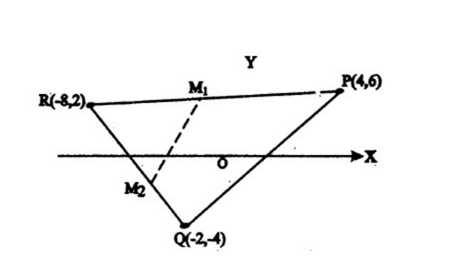
or $\left(\frac{0}{2}, \frac{-1}{2}\right)$

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

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:



Midpoint of QR is $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$M_1\left(\frac{-2-8}{2}, \frac{-4+2}{2}\right)$

or $\left(\frac{-10}{2}, \frac{-2}{2}\right)$ or $M_1(-5, -1)$

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

$M_2\left(\frac{4-8}{2}, \frac{6+2}{2}\right)$ or $M_2\left(\frac{-4}{2}, \frac{8}{2}\right)$

or $M_2(-2, -4)$

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

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

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

Solution:

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

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

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

$= \sqrt{9+36} = \sqrt{45}$

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

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

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

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

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

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

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

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

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

(i) (6, 6), (4, -2)

Solution:

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

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

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

or $(5, 2)$.

(ii) (-5, −7), (-7, −5)

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

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

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

or $(-6, -6)$.

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

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

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

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°