## EXERCISE 7.1

**Q.1 Describe the location in the plane of the point $P(x,y)$, for which**

**(i)** $x>0$

**Ans:** Right half plane

**(ii)** $x>0$ and $y>0$

**Ans:** $1^{st}$ quadrant

**(iii)** $x=0$

**Ans:** The equation of $y$-axis

**(iv)** $y=0$

**Ans:** The equation of $x$-axis

**(v)** $x>0$ and $y\le 0$

**Ans:** $4^{th}$ quadrant and negative $y$-axis

**(vi)** $y=0, x=0$

**Ans:** Origin

**(vii)** $x=y$

**Ans:** It is line bisecting $1^{st}$ and $3^{rd}$ quadrant

**(viii)**

**Ans:** It is a line bisecting $1^{st}$ and $3^{rd}$ quadrant

**(ix)**

**Ans:** The set of points lying above $x$-axis

**(x)** **and $y$ have opposite signs**

**Ans:** The set of points in $2^{nd}$ and $4^{th}$ quadrants

**Q.2 Find the distance between the points:**

**(i)** $A(6,7), B(0,-2)$

**Ans:**

$$x_1=6, y_1=7, x_2=0, y_2=-2$$
$$d=\sqrt{|x_2-x_1|^2+|y_2-y_1|^2}$$
$$|AB|=\sqrt{|0-6|^2+|-2-7|^2}$$
$$|AB|=\sqrt{|1-6|^2+|-9|^2}$$
$$|AB|=\sqrt{36+81}$$
$$|AB|=\sqrt{117}$$
$$|AB|=\sqrt{9\times 13}$$
$$|AB|=3\sqrt{13}$$

**(ii)** $C(-5,-2), D(3,2)$

**Ans:**

$$x_1=-5, y_1=-2, x_2=3, y_2=2$$
$$d=\sqrt{|x_2-x_1|^2+|y_2-y_1|^2}$$

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

$|CD| = \sqrt{|3+5|^2 + |2+2|^2} = \sqrt{|8|^2 + |4|^2}$

$|CD| = \sqrt{64+16} = \sqrt{80} = \sqrt{16\times 5}$

$|CD| = 4\sqrt{5}$

**(iii)** $L(0,3), M(-2,-4)$

**Ans:**

$x_1 = 0, y_1 = 3, x_2 = -2, y_2 = -4$

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

$|LM| = \sqrt{|-2-0|^2 + |-4-3|^2}$

$|LM| = \sqrt{|-2|^2 + |-7|^2}$

$|LM| = \sqrt{4+49} = \sqrt{53}$

**(iv)** $P(-8,-7), Q(0,0)$

**Ans:**

$x_1 = -8, y_1 = -7, x_2 = 0, y_2 = 0$

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

$|PQ| = \sqrt{|0-(-8)|^2 + |0-(-7)|^2}$

$|PQ| = \sqrt{|8|^2 + |7|^2} = \sqrt{64+49}$

$|PQ| = \sqrt{113}$

**Q.3 Find in each of the following**

**(i) The distance between the two given points**

**(ii) Midpoint of the line segment joining the two points:**

**(a)** $A(3,1), B(-2,-4)$

**Ans:**

$x_1 = 3, y_1 = 1, x_2 = -2, y_2 = -4$

Midpoint of $(x,y) = \left[\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right]$

$M[A,B] = \left[\frac{3-2}{2}, \frac{-4+1}{2}\right] = \left[\frac{1}{2}, \frac{-3}{2}\right]$

**(b)** $A(-8,3), B(2,-1)$

**Ans:**

$x_1 = -8, y_1 = 3, x_2 = 2, y_2 = -1$

Midpoint of $(x,y) = \left[\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right]$

$M[A,B] = \left[\frac{-8+2}{2}, \frac{3-1}{2}\right] = \left[\frac{-6}{2}, \frac{2}{2}\right]$

$= [3,1]$

**(c)** $A\left(-\sqrt{5}, -\frac{1}{3}\right), B\left(-3\sqrt{5}, 5\right)$

**Ans:**

$x_1 = \sqrt{5}, y = \frac{1}{3}, x_2 = -3\sqrt{5}, y_2 = 5$

Midpoint of $(x,y) = \left[\frac{\sqrt{5}-3\sqrt{5}}{2}, \frac{5-\frac{1}{3}}{2}\right]$

$= \left[\frac{-4\sqrt{5}}{2}, \frac{15-1}{3} \div 2\right]$

$= \left[\frac{-4\sqrt{5}}{2}, \frac{4}{3}\times\frac{1}{2}\right] = \left[\frac{-4\sqrt{5}}{2}, \frac{7}{2}\right]$

**Q.4 Which of the following points are at a distance of 15 units from the origin?**

**(i)** $\left(\sqrt{176}, 7\right)$

**Ans:**

$= \sqrt{|176-0|^2 + |7-0|^2}$

$= \sqrt{176+49} = \sqrt{225}$

$= \sqrt{15^2} = 15$

**(ii)** $(10,-10)$

**Ans:**

$= \sqrt{|10-0|^2 + |-10-0|}$

$= \sqrt{|10|^2 + |-10|^2} = \sqrt{100+100}$

$= \sqrt{200} = \sqrt{200\times 2} = 10\sqrt{2}$

**(iii)** $(1,15)$

**Ans:**

$= \sqrt{|1-0|^2 + |15-0|^2} = \sqrt{(1)^2 + (15)^2}$

$= \sqrt{1+225} = \sqrt{226}$

Only in part (i) we see that the point $\left(\sqrt{176}, 1\right)$ is at distance of 15 units from origin

**Q.5 Show that:**

**(i)**

**he points** $A(0,2), B(\sqrt{3},1)$ **and** $C(0,-2)$ **are vertices of a right triangle.**

**Ans:**

$A(0,2), B(\sqrt{3},1)$

$x_1 = 0, y_1 = 2, x_2 = \sqrt{3}, y_2 = 1$

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

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

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

$|AB| = \pm 2$

$|AB| = 2$

$B(\sqrt{3},1), C(0,-2)$

$x_1 = \sqrt{3}, y_1 = 1, x_2 = 0, y_2 = -3$

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

$|BC| = \sqrt{|0 - \sqrt{3}|^2 + |-2 - 1|^2} = \sqrt{|-\sqrt{3}|^2 + |-3|^2}$

$|BC| = \sqrt{3+9} = \sqrt{12} = \sqrt{4 \times 3}$

$|BC| = 2\sqrt{3}$

$C(0,-2), A(0,2)$

$x_1 = 0, y_1 = -2, x_2 = 0, y_2 = 2$

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

$|CA| = \sqrt{4} = 2$

By pathagorous theorem.

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

$4 \times 3 = 4 + 4$

$12\ S$

Are not the length of right angled triangle.

**(ii)**

**he points** $A(3,1), B(-2,-3)$ **and** $C(2,2)$ **are vertices of an isosceles triangle.**

**Ans:** T

$A(3,1), B(-2,-3)$

$x_1 = 3, y_1 = 1, x_2 = -2, y_2 = -3$

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

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

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

$B(-2,-3), C(2,2)$

$x_1 = -2, y_1 = -3, x_2 = 2, y_2 = 2$

$|BC| = \sqrt{|2-(-2)|^2 + |2-(-3)|^2} = \sqrt{16+25}$

$|BC| = \sqrt{41}$

$C(2,2), A(3,1)$

$x_1 = 2, y_1 = 2, x_2 = 3, y_2 = 1$

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

$|CA| = \sqrt{2}$

These are the sides of the isosceles triangle.

**(iii)**

**he points** $A(5,2), B(-2,3), C(-3,-4)$ **and** $D(4,-5)$ **are vertices of a parallelogram.**

**Ans:**

$A(5,2), B(-2,-3)$

$x_1 = 5, y_1 = 2, x_2 = -2, y_2 = 3$

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

$|AB| = \sqrt{|-2-5|^2 + |3-2|^2} = \sqrt{49+1} = \sqrt{50}$

$B(-2,-3), C(-3,-4)$

$x_1 = -2, y_1 = 3, x_2 = -3, y_2 = -4$

$|BC| = \sqrt{|-3-(-2)|^2 + |-4-3|^2} = \sqrt{1+49} = \sqrt{50}$

$C(-3,-4), D(4,-5)$

$x_1 = -3, y_1 = -4, x_2 = 4, y_2 = -5$

$|CD| = \sqrt{|4-(-3)|^2 + |-5-(4)|^2} = \sqrt{49+1}$ T

$|CD| = \sqrt{50}$

$A(5,2), D(4,-5)$

$x_1=5, y_1=2, x_2=4, y_2=-5$

$|AD|=\sqrt{|4-5|^2+|-5-2|^2}=\sqrt{1+49}=\sqrt{50}$

$A(5,2), C(-3,-4)$

$|AC|=\sqrt{|-3-5|^2+|-4-2|^2}=\sqrt{64+36}$

$|AC|=\sqrt{100}=10$

By pythagoraus

$(10)^2=(\sqrt{50})^2+(\sqrt{50})^2$

$100=50+50$

$100=100$

Since pythagoraus theorem is satisfied so $ABCD$ is a square

Are not the length of parallelogram.

**Q.6 Find $h$ such that the points $A(\sqrt{3},-1), B(0,2)$ and $C(h,-2)$ are vertices of a right triangle with right angle at the vertex $A$.**

**Ans:**

$A(\sqrt{3},-1), C(h,-2)$

$x_1=\sqrt{3}, y_1=-1, x_2=h, y_2=-2$

$|AC|=\sqrt{|h-\sqrt{3}|^2+|-2-(-1)|^2}$

$|AC|=\sqrt{h^2+(\sqrt{3})^2-2h\sqrt{3}+(-1)^2}$

$|AC|=\sqrt{h^2+3-2h\sqrt{3}+1}$

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

$A(\sqrt{3},-1), B(0,2)$

$x_1=\sqrt{3}, y_1=-1, x_2=0, y_2=2$

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

$=\sqrt{|-\sqrt{3}|^2+|2+1|^2}$

$|AB|=\sqrt{3+9}$

$|AB|=\sqrt{12}$

$B(0,2), C(h,-2)$

$x_1=0, y_1=2, x_2=h, y_2=-2$

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

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

$|BC|=\sqrt{h^2+16}$

$(\text{Hyp})^2=(\text{Prep})^2+(\text{base})^2$

$\left(\sqrt{h^2+16}\right)^2=\left(\sqrt{12}\right)^2+\left(\sqrt{h^2-2h\sqrt{3}+4}\right)^2$

$h^2+16=12+h^2-2h\sqrt{3}+4$

$h^2+2h\sqrt{3}-h^2=16-16$

$2h\sqrt{3}=0$

$h=\dfrac{0}{2\sqrt{3}}$

$h=0$

**Q.7 Find $h$ such that $A(-1,h), B(3,2)$ and $C(7,3)$ are collinear.**

**Ans:**

$M=\dfrac{y_2-y_1}{x_2-y_1}$

$A(-1,h), B(3,2)$

$M=\dfrac{2-7}{3-1}=\dfrac{2-h}{4}$

$BC$

$B(3,2), C(7,3)$

$M=\dfrac{2-3}{3-7}=\dfrac{-1}{-4}=\dfrac{1}{4}$

$M=M$

$AB=BC$

$\dfrac{2-h}{4}=\dfrac{1}{4}$

$2-h=\dfrac{4}{4}$

$2-h=1$

$-h=1-2$

$-h=-1$

$h=1$

**Q.8 The points $A(-5,-2)$ and $B(5,-4)$ are ends of a diameter of a circle. Fid the centre and radius of the circle.**

**Ans:**

$A(-5,-2), B(5,-4)$

$x_1=-5,\ y_1=-2,\ x_2=5,\ y_2=-4$

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

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

$|AB|=\sqrt{(10)^2+(-2)^2}$

$|AB|=\sqrt{100+4}=\sqrt{104}$

$|AB|=2\sqrt{26}$

2 radius = diameter

=Radius $=\dfrac{\text{diameter}}{2}$

Radius $=\dfrac{2\sqrt{2}}{2}$

Radius $=\sqrt{26}$

Centre of circle $=\left[\dfrac{x_1+x}{2},\dfrac{y_1+y_2}{2}\right]$

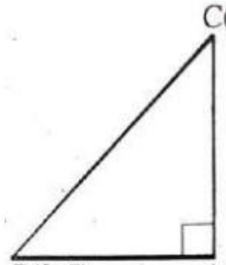
$=\left[\dfrac{-5+5}{2},\dfrac{-2-4}{2}\right]$

$=\left[\dfrac{0}{2},-\dfrac{6}{2}\right]$

$=(0,-3)$ is the centre of circle

**Q.9 Find $h$ such that the points $A(h,1),B(2,7)$ and $C(-6,-7)$ are vertices of a right triangle with right angle at the vertex $A$.**

**Ans:**




$B(2,7),C(-6,-7)$

$|BC|=\sqrt{|-6-2|^2+|-7-7|^2}$

$|BC|=\sqrt{|-8|^2+|-14|^2}$

$|BC|=\sqrt{64+196}$

$|BC|=\sqrt{260}$

$A(h,1),B(2,7)$

$|AB|=\sqrt{|2-h|^2+|7-1|^2}$

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

$|AB|=\sqrt{h^2-4h+4+36}$

$|AB|=\sqrt{h^2-4h+40}$

$A(h,1),C(-6,-7)$

$|AC|=\sqrt{|h+6|^2+|1+7|^2}$

$|AC|=\sqrt{h^2+12h+36+64}$

$|AC|=\sqrt{h^2-12h+100}$

By pathagorous theorem

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

$\left(\sqrt{260}\right)^2=\left(\sqrt{h^2+12h+100}\right)^2+\left(\sqrt{h^1-4h+40}\right)^2$

$260=h^2+12h+100+h^2-4h+140$

$2h^2+8h+140-260=0$

$2h^2+8h-120=0$

$2\left(h^2+4h-60\right)=0$

$h^2+10h-6h-60=\dfrac{0}{2}$

$h(h+10)-6(h+10)=0$

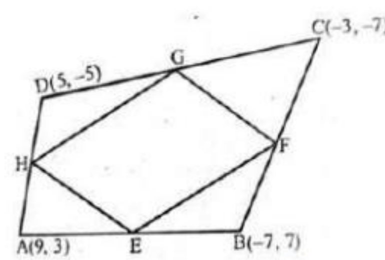
$(h+10)(h-6)=0$

$h+10=0 \qquad h-10=0$

$h=-10 \qquad h=6$

**Q.10 A quadrilateral has the points $A(9,3),B(-7,7),C(-3,-7)$ and $D(5,-5)$ as its vertices. Find the midpoints of its sides. Show that the figure formed by joining the midpoints consecutively is a parallelogram.**

**Ans:**




Midpoint E of $\overline{AB}=\left[\dfrac{9-7}{2},\dfrac{3+7}{2}\right]$

$E=\left[\dfrac{2}{2},\dfrac{10}{2}\right]=(1,5)$

Midpoint o F of $\overline{BC} = \left[\frac{-3-7}{2}, \frac{-7+7}{2}\right]$

$F = \left[\frac{-10}{2}, \frac{0}{2}\right] = (-5,0)$

Midpoint G of $\overline{CD} = \left[\frac{5-3}{2}, \frac{-5-7}{2}\right]$

$G = \left[\frac{2}{2}, \frac{-12}{2}\right] = (1,-6)$

Midpoint H of $\overline{AD} = \left[\frac{5+9}{2}, \frac{-5+3}{2}\right]$

$H = \left[\frac{14}{2}, \frac{-2}{2}\right] = (7,-1)$

$\overline{EF} = \sqrt{|-5-1|^2 + |0-5|^2}$

$\overline{EF} = \sqrt{|-6|^2 + |-5|^2} = \sqrt{36+25}$

$\overline{EF} = \sqrt{61}$

$\overline{FG} = \sqrt{|1+5|^2 + |-6-0|^2}$

$\overline{FG} = \sqrt{|6|^2 + |-6|^2}$

$\overline{FG} = \sqrt{36+36} = \sqrt{72}$

$\overline{GH} = \sqrt{|7-1|^2 + |-1-5|^2}$

$\overline{GH} = \sqrt{36+36} = \sqrt{72}$

$\overline{EF} = \overline{GH} = \sqrt{61}$

$|FG| = |HE| = \sqrt{72}$