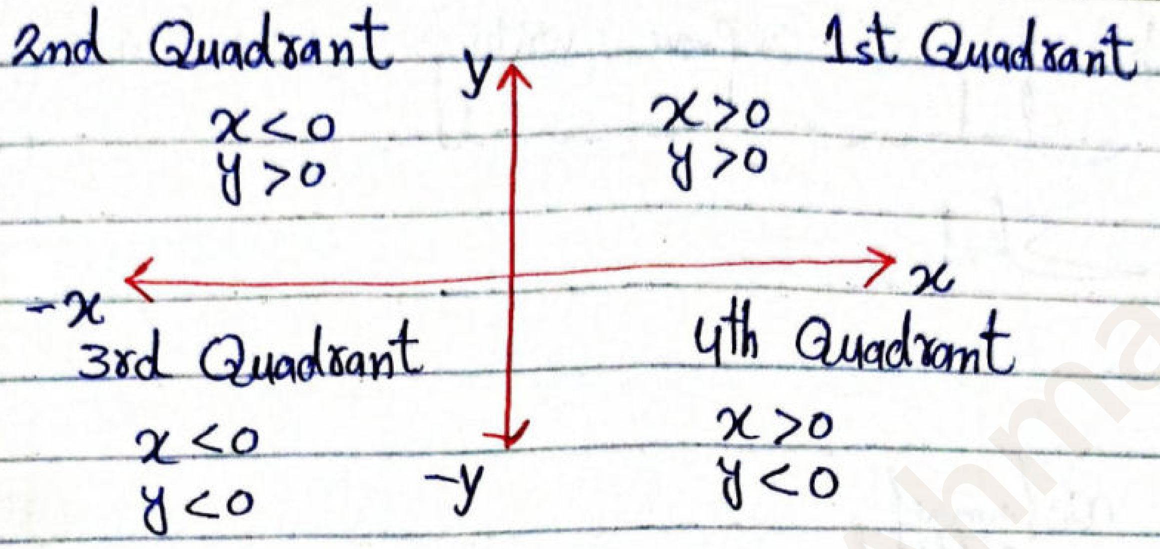
Ex#7.1



<u>Remember:</u> ① At x-axis ; $y=0$
② At y-axis ; $x=0$

if a Point $P(x,y)$
abscissa ↙ ↘ ordinate

<u>Q#1</u> Describe the Location in the Plane of Point $P(x,y)$, for which

(i) $x>0$; Right Half Plane

(ii) $x>0$ and $y>0$; 1st Quadrant

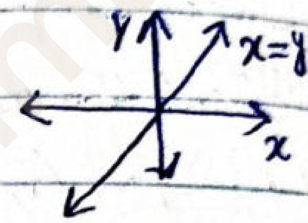
(iii) $x=0$; at y-axis.

(iv) $y=0$; at x-axis.

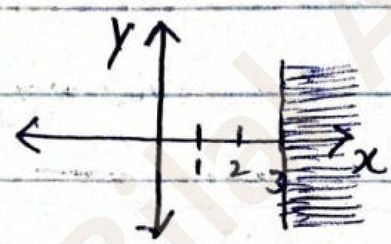
(V) $x > 0$ and $y \leq 0$; 4th Quadrant and negative x-axis.

(Vi) $y = 0$, $x = 0$; at origin $O(0,0)$

(Vii) $x = y$; Line bisecting 1st and 3rd Quadrant.



(Viii) $x \geq 3$



Set of Points Lying on and right Side of Line $x = 3$.

(ix) $y > 0$; Set of Points above x-axis OR upper Half plane.

(X) x and y have opposite signs

2nd and 4th Quadrant.

Note: Distance Formula:

$A(x_1, y_1)$ .... $B(x_2, y_2)$

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

Q#2 Find distance b/w Points

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

$\Rightarrow x_1 = 6, y_1 = 7$ $x_2 = 0, y_2 = -2$

As,

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

$$d = \sqrt{(0-6)^2 + (-2-7)^2}$$

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

$$d = \sqrt{36 + 81}$$

$$d = \sqrt{117}$$

3	117
3	39
13	13
	1

$$d = \sqrt{\cancel{3^2} \times 13}$$

$$d = 3\sqrt{13}$$ Ans.

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

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

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

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

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

$$d = \sqrt{((8)^2 + (4)^2}$$

$$\cancel{d = \sqrt{225 + 16}}$$

$$d = \sqrt{64 + 16}$$

$$d = \sqrt{80}$$

$$d = \sqrt{16 \times 5}$$

$$d = 4\sqrt{5}$$

$$\begin{array}{r|l} 2 & 80 \\ \hline 2 & 40 \\ \hline 2 & 20 \\ \hline 2 & 10 \\ \hline 5 & 5 \\ \hline & 1 \end{array}$$

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

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

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

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

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

$$d = \sqrt{4 + 49}$$

$$d = \sqrt{53}$$

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

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

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

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

$$d=\sqrt{(8)^2+(7)^2}$$

$$d=\sqrt{64+49}$$

$$d=\sqrt{113}$$

Note: Mid-Point Formula

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

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

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

(i) Distance

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

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

$$d=\sqrt{(-5)^2+(-5)^2}=\sqrt{25+25}$$

$$d = \sqrt{50} = \sqrt{25 \times 2}$$

$$d = 5\sqrt{2}$$

(ii) Mid-Point

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

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

$$M = \left(\frac{3-2}{2}, \frac{1-4}{2} \right)$$

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

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

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

(i) Distance

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

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

$$d = \sqrt{(2+8)^2 + (-4)^2} = \sqrt{(10)^2 + 16}$$

$$d = \sqrt{100 + 16}$$

$$d = \sqrt{116}$$

$$d = \sqrt{4 \times 29}$$

$$d = 2\sqrt{29}$$

2	116
2	58
29	29
	1

(ii) Mid-Point

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

$$M = \left(\frac{-8+2}{2}, \frac{3+(-1)}{2}\right)$$

$$M = \left(\frac{-6}{2}, \frac{3-1}{2}\right)$$

$$M = \left(-\frac{\cancel{6}^{3}}{\cancel{2}}, \frac{\cancel{2}}{\cancel{2}}\right)$$

$$M = (-3, 1)$$

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

$x_1 = -\sqrt{5}$, $y_1 = -\frac{1}{3}$ $\quad$ $x_2 = -3\sqrt{5}$, $y_2 = 5$

(i) Distance

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

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

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

$$d = \sqrt{\left(-2\sqrt{5}\right)^2 + \left(\frac{15+1}{3}\right)^2}$$

$$d = \sqrt{4(5) + \left(\frac{16}{3}\right)^2}$$

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

$$d = \sqrt{20 + \frac{256}{9}}$$

$$d = \sqrt{\frac{180+256}{9}}$$

2	436
2	218
	109

$$d = \sqrt{\frac{436}{9}}$$

$$d = \sqrt{\frac{4 \times 109}{9}}$$

$$d = \frac{2\sqrt{109}}{3}$$

(ii) Mid-Point

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

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

$$M = \left(\frac{-\sqrt{5} - 3\sqrt{5}}{2} , \frac{\frac{-1+15}{3}}{2} \right)$$

$$M = \left(\frac{-\cancel{4}^{2}\sqrt{5}}{\cancel{2}_{1}} , \frac{\cancel{14}^{7}}{3 \times \cancel{2}} \right)$$

$$M = \left(-2\sqrt{5} , \frac{7}{3} \right)$$

Q#4 Which of following Points are at distance of 15 units from origin?

(i) $(\sqrt{176}, 7)$

Origin $O(0,0)$, $(\sqrt{176}, 7)$

here; $x_1 = 0, y_1 = 0$ $\quad x_2 = \sqrt{176} ; y_2 = 7$

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

$$d = \sqrt{(\sqrt{176} - 0)^2 + (7 - 0)^2}$$

$$d = \sqrt{(\sqrt{176})^2 + (7)^2}$$

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

$$d = \sqrt{225}$$

$$d = 15$$

So, $(\sqrt{176}, 7)$ is at 15 units from origin.

(ii) $(10, -10)$

Origin $(0,0)$ $(10,-10)$

here; $x_1 = 0$, $y_1 = 0$ $x_2 = 10$, $y_2 = -10$

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

$$d = \sqrt{(10-0)^2 + (-10-0)^2} = \sqrt{(10)^2 + (-10)^2}$$

$$d = \sqrt{100 + 100}$$

$$d = \sqrt{200} = \sqrt{100 \times 2}$$

$$d = 10\sqrt{2}$$

So, $(10, -10)$ is not at 15 units from origin.

(iii) $(1, 15)$

origin $(0,0)$ $(1,15)$

here; $x_1 = 0$, $y_1 = 0$ $x_2 = 1$, $y_2 = 15$

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

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

$$d = \sqrt{(1)^2 + (15)^2} = \sqrt{1 + 225}$$

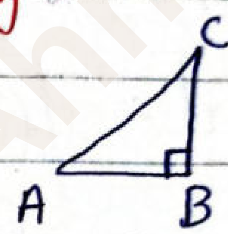
$$d = \sqrt{226}$$

So, $(1,15)$ is not at 15 units from origin.

Q#5 Show that

(i) the Points $A(0,2)$, $B(\sqrt{3},1)$ and $C(0,-2)$ are vertices of right triangle.

we will find $|AB|$, $|BC|$ and $|AC|$.



For $|AB|$

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

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

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

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

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

$$|AB| = \sqrt{4}$$

$$\boxed{AB = 2}$$

For $|BC|$

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

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

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

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

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

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

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

For $|AC|$

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

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

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

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

$$|AC| = \sqrt{(0)^2+(-4)^2} = \sqrt{16}$$

$$\boxed{|AC| = 4}$$

for right triangle, Pythagoras Theorem,

$$|AC|^2 = |AB|^2+|BC|^2$$

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

$$16 = 4+4(3)$$

$$16 = 4+12$$

$$16 = 16$$

hence, $A(0,2)$, $B(\sqrt{3},1)$ and $C(0,-2)$ are Vertices of a right triangle.

(ii) The Points $A(3,1)$, $B(-2,-3)$ and $C(2,2)$ are vertices of isosceles triangle.

We will find $|AB|$, $|BC|$, $|AC|$.

Note that, an isosceles triangle has two equal sides out of three.

For $|AB|$

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

here, $x_1 = 3$, $y_1 = 1$ $\quad\quad$ $x_2 = -2$, $y_2 = -3$

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

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

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

$$\boxed{|AB| = 41}$$

For $|BC|$

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

here, $x_1 = -2$, $y_1 = -3$ $\quad\quad$ $x_2 = 2$, $y_2 = 2$

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

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

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

$$|BC| = \sqrt{(4)^2 + (5)^2} = \sqrt{16+25}$$

$$\boxed{|BC| = \sqrt{41}}$$

For $|AC|$

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

here, $x_1 = 3,\ y_1 = 1$ $\qquad$ $x_2 = 2,\ y_2 = 2$

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

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

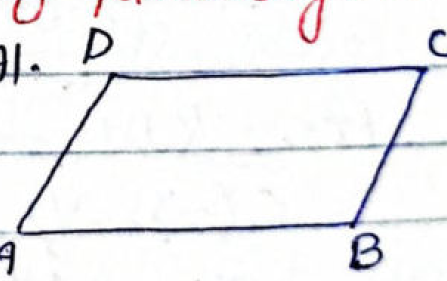
$$|AC| = \sqrt{(-1)^2+(1)^2} = \sqrt{1+1}$$

$$\boxed{|AC| = \sqrt{2}}$$

Since, $|AB| = |BC|$, So, $A(3,1), B(-2,-3)$ and $C(2,2)$ are vertices of isosceles triangle.

(iii) the Points $A(5,2), B(-2,3), C(-3,-4)$ and $D(4,-5)$ are vertices of Parallelogram.

we will find $|AB|, |BC|, |CD|, |DA|$.



For $|AB|$

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

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

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

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

$$|AB| = \sqrt{(-7)^2+(1)^2} = \sqrt{49+1}$$

$$|AB| = \sqrt{50} = \sqrt{25\times 2}$$

$$\boxed{|AB| = 5\sqrt{2}}$$

For $|BC|$

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

here, $x_1 = -2,\ y_1 = 3$ $\qquad$ $x_2 = -3,\ y_2 = -4$

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

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

$$|BC| = \sqrt{(-3+2)^2 + (-7)^2} = \sqrt{(-1)^2 + 49}$$

$$|BC| = \sqrt{1+49} = \sqrt{50}$$

$$|BC| = \sqrt{25\times 2}$$

$$\boxed{|BC| = 5\sqrt{2}}$$

For $|CD|$

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

here; $x_1 = -3,\ y_1 = -4$ $\qquad$ $x_2 = 4,\ y_2 = -5$

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

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

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

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

$$|CD| = \sqrt{49+1} = \sqrt{50} = \sqrt{25\times 2}$$

$$\boxed{|CD| = 5\sqrt{2}}$$

For $|DA|$

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

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

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

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

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

$$|DA| = \sqrt{1+49} = \sqrt{50} = \sqrt{25\times 2}$$

$$\boxed{|DA| = 5\sqrt{2}}$$

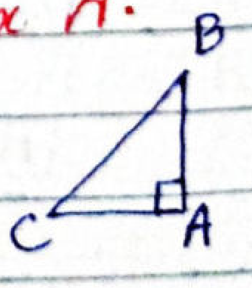
Since,

$|AB| = |CD|$ and $|BC| = |DA|$, So,

A, B, C and D are Vertices of Parallelogram

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

we will find $|AB|$, $|BC|$, $|AC|$.



For $|AB|$

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

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

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

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

$$|AB| = \sqrt{3+9} = \sqrt{12}$$

$$\boxed{|AB| = \sqrt{12}}$$

For $|BC|$

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

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

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

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

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

For $|AC|$

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

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

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

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

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

$\because (a-b)^2 = a^2+b^2-2ab$

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

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

Now; for right triangle,
By Pythagoras Theorem,

$$|BC|^2 = |AB|^2 + |AC|^2$$

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

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

$$\Rightarrow \cancel{h^2} - \cancel{h^2} + 2\sqrt{3}h + 16 - 12 - 4 = 0$$

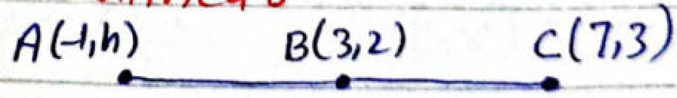
$$\Rightarrow 2\sqrt{3}h + \cancel{16} - \cancel{16} = 0$$

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

$$\Rightarrow h = \frac{0}{2\sqrt{3}}$$

$$\Rightarrow \boxed{h = 0} \text{ Ans.}$$

Q#7/ Find h, that $A(-1,h)$, $B(3,2)$ and $C(7,3)$ are Collinear.



Since, A, B, C Lies on Same Line, We consider that B is mid-point of A and B.
So,

$$B(3,2) = \text{Mid-Point of } AB$$

$$\Rightarrow (3,2) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

$$(3,2) = \left(\frac{-1+7}{2}, \frac{h+3}{2}\right)$$

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

Comparing ordinate from both sides,

$$\Rightarrow \quad 2 = \frac{h+3}{2}$$

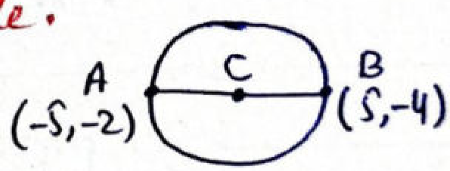
$$\Rightarrow \quad 2 \times 2 = h+3$$

$$4 = h+3$$

$$4-3 = h$$

$$\Rightarrow \quad \boxed{1 = h} \text{ Ans.}$$

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



Let C be the centre of circle. Also, C is the mid-point of ~~Circle~~ A and B.

So,

$$C(x,y) = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$$

$$C(x,y) = \left(\frac{-5+5}{2}, \frac{-2+(-4)}{2}\right)$$

$$C(x,y) = \left(\frac{0}{2}, \frac{-2-4}{2}\right)$$

$$C(x,y) = \left(0, -\frac{\cancel{6}^{\,3}}{\cancel{2}_{\,1}}\right)$$

$$C(x,y) = (0,-3)$$

So, $C(0,-3)$ is centre of circle.

Now: from figure,

$r = |CB|$, $\underset{x_1, y_1}{C(0,-3)}$, $\underset{x_2, y_2}{B(5,-4)}$

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

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

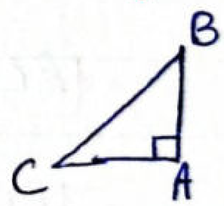
$$r = \sqrt{(5)^2+(-4+3)^2} = \sqrt{25+(-1)^2}$$

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

$$r = \sqrt{26}$$

So, radius of Circle is $\sqrt{26}$ units.

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



we will find $|AB|$, $|BC|$ and $|AC|$.

For $|AB|$,

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

$x_1 = h$, $y_1 = 1$ $\quad$ $x_2 = 2$, $y_2 = 7$

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

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

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

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

For $|BC|$,

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

$x_1 = 2$, $y_1 = 7$ $\quad$ $x_2 = -6$, $y_2 = -7$

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

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

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

$$|BC| = \sqrt{260}$$

Now; For $|AC|$

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

$x_1=h,\ y_1=1$ $\quad x_2=-6,\ y_2=-7$

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

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

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

$$|AC| = \sqrt{(6+h)^2+64}$$

$$|AC| = \sqrt{(6)^2+(h)^2+2(6)(h)+64}$$

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

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

for right triangle, Pythagoras Theorem,

$$|BC|^2 = |AB|^2+|AC|^2$$

$$\Rightarrow (\cancel{\sqrt{260}})^{\cancel{2}} = (\cancel{\sqrt{h^2-4h+40}})^{\cancel{2}} + (\cancel{\sqrt{h^2+12h+100}})^{\cancel{2}}$$

$$260 = h^2 - 4h + 40 + h^2 + 12h + 100$$

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

$$\Rightarrow \quad 2h^2 + 8h + 140 - 260 = 0$$

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

$$\Rightarrow \quad 2(h^2 + 4h - 60) = 0$$

$$\Rightarrow \quad h^2 + 4h - 60 = 0$$

$$h^2 + 10h - 6h - 60 = 0$$

$$\boxed{\begin{array}{l} 10 - 6 = 4 \\ 10 \times -6 = -60 \end{array}}$$

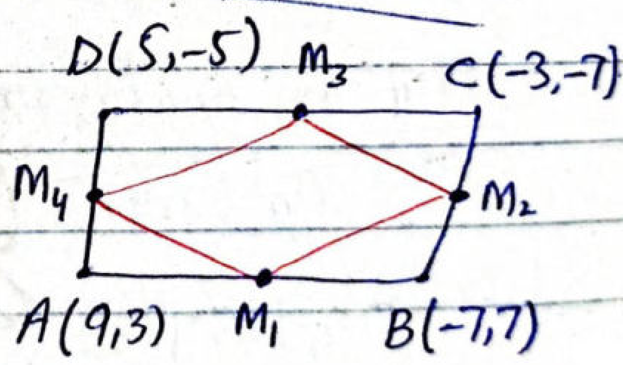
$$h(h+10) - 6(h+10) = 0$$

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

$$\Rightarrow \quad h + 10 = 0 \qquad h - 6 = 0$$

$$\boxed{h = -10} \quad \text{or} \quad \boxed{h = 6}$$

Q#10 A q.



M_1 is mid-point of AB.

$$M_1(x,y) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

$$M_1(x,y) = \left(\frac{9-7}{2}, \frac{3+7}{2}\right)$$

$$M_1(x,y) = \left(\frac{2}{2}, \frac{10}{2}\right)$$

$$M_1(x,y) = (1, 5)$$

M_2 is mid-Point of BC.

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

$$M_2(x,y) = \left(\frac{-7-3}{2}, \frac{7-7}{2}\right)$$

$$= \left(\frac{-10}{2}, \frac{0}{2}\right)$$

$$M_2(x,y) = (-5,0)$$

M_3 is mid-point of CD.

$$M_3(x,y) = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$$

$$M_3(x,y) = \left(\frac{-3+5}{2}, \frac{-7-5}{2}\right)$$

$$M_3(x,y) = \left(\frac{2}{2}, \frac{-12}{2}\right)$$

$$M_3(x,y) = (1,-6)$$

M_4 is mid-Point of DA.

$$M_4(x,y) = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$$

$$M_4(x,y) = \left(\frac{5+9}{2}, \frac{-5+3}{2}\right)$$

$$M_4(x,y) = \left(\frac{14}{2}, \frac{-2}{2}\right)$$

$$M_4(x,y) = (7,-1)$$

Now;

$$|M_1M_2| = \sqrt{(-5-1)^2+(0-5)^2}$$

$$|M_1M_2| = \sqrt{(-6)^2+(-5)^2} = \sqrt{36+25}$$

$$|M_1M_2| = \sqrt{61}$$

and;

$$|M_2M_3| = \sqrt{(1+5)^2+(-6-0)^2}$$

$$|M_2M_3| = \sqrt{(6)^2+(-6)^2} = \sqrt{36+36}$$

$$|M_2M_3| = \sqrt{72}$$

and;

$$|M_3M_4| = \sqrt{(7-1)^2+(-1+6)^2}$$

$$|M_3M_4| = \sqrt{(6)^2+(5)^2} = \sqrt{36+25}$$

$$|M_3M_4| = \sqrt{61}$$

also;

$$|M_1M_4| = \sqrt{(7-1)^2+(-1-5)^2} = \sqrt{(6)^2+(-6)^2}$$

$$|M_1M_4| = \sqrt{36+36}$$

$$|M_1M_4| = \sqrt{72}$$

Since, opposite sides, $|M_1M_2| = |M_3M_4|$ and $|M_2M_3| = |M_1M_4|$. So, M_1, M_2, M_3 and M_4 form a Parallelogram.

{The End}