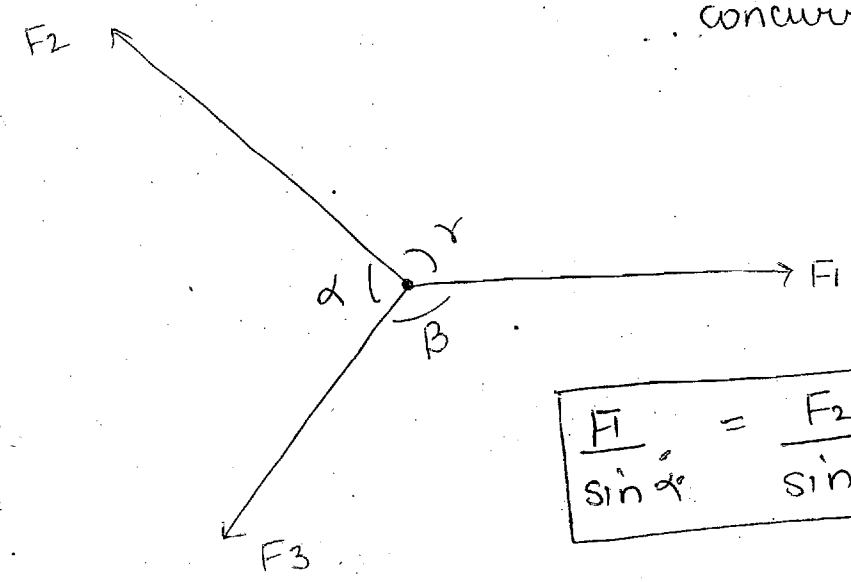
Lami's Theorem

concurrent Forces



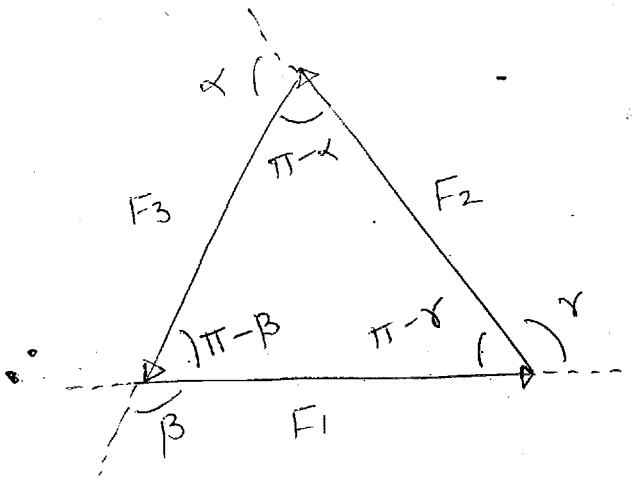
$$\frac{F_1}{\sin\alpha} = \frac{F_2}{\sin\beta} = \frac{F_3}{\sin\gamma}$$

1) $F_1 + F_2 + F_3 = 0$

Equilibrium state

2) 3-Forces system

3) SINE-RULE



Equilibrium Forces

$F_1 \propto \sin(\pi-\alpha)$

$F_1 = K \sin\alpha$

$\frac{F_1}{\sin\alpha} = K$ (constant)

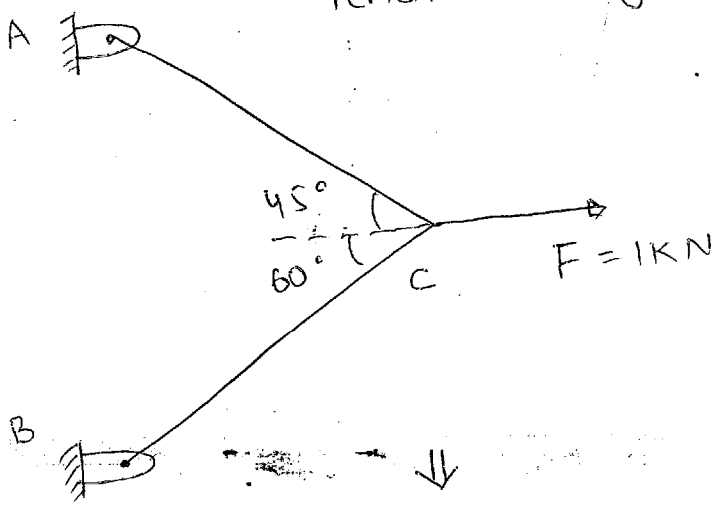
→ If three concurrent forces are acting on a body of point kept in equilibrium then each forces is directly proportional to the Sine of angle between the other 2 forces.

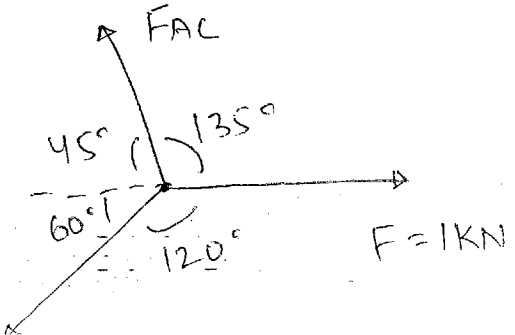
Ques- Two steel truss member AC and BC each is having cross.-sectional area of 100 mm^2 are subjected to horizontal force F as shown in figure below :-

All joints are hinged (moment resist) if F = 1 KN then determine the magnitude of the vertical reaction and the point B in ~~KN-m~~ KN-m ?

NOTE :- Truss is in static equilibrium

Tensile loading due to force $\vec{F}$





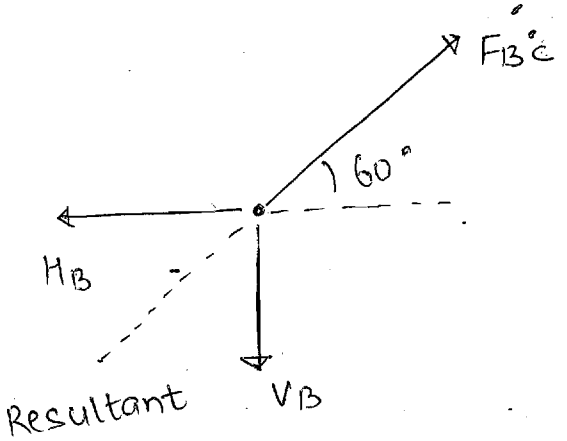
$$\frac{F_{AC}}{\sin 120^\circ} = \frac{F_{BC}}{\sin 135^\circ} = \frac{1}{\sin 105^\circ}$$

* $F_{AC} = 0.896$ KN — Highest force

$F_{BC} = 0.732$ KN

JOINT B

$\Sigma F_x = 0$



$\Sigma F_y = 0$

$F_{BC} \sin 60^\circ = V_B$

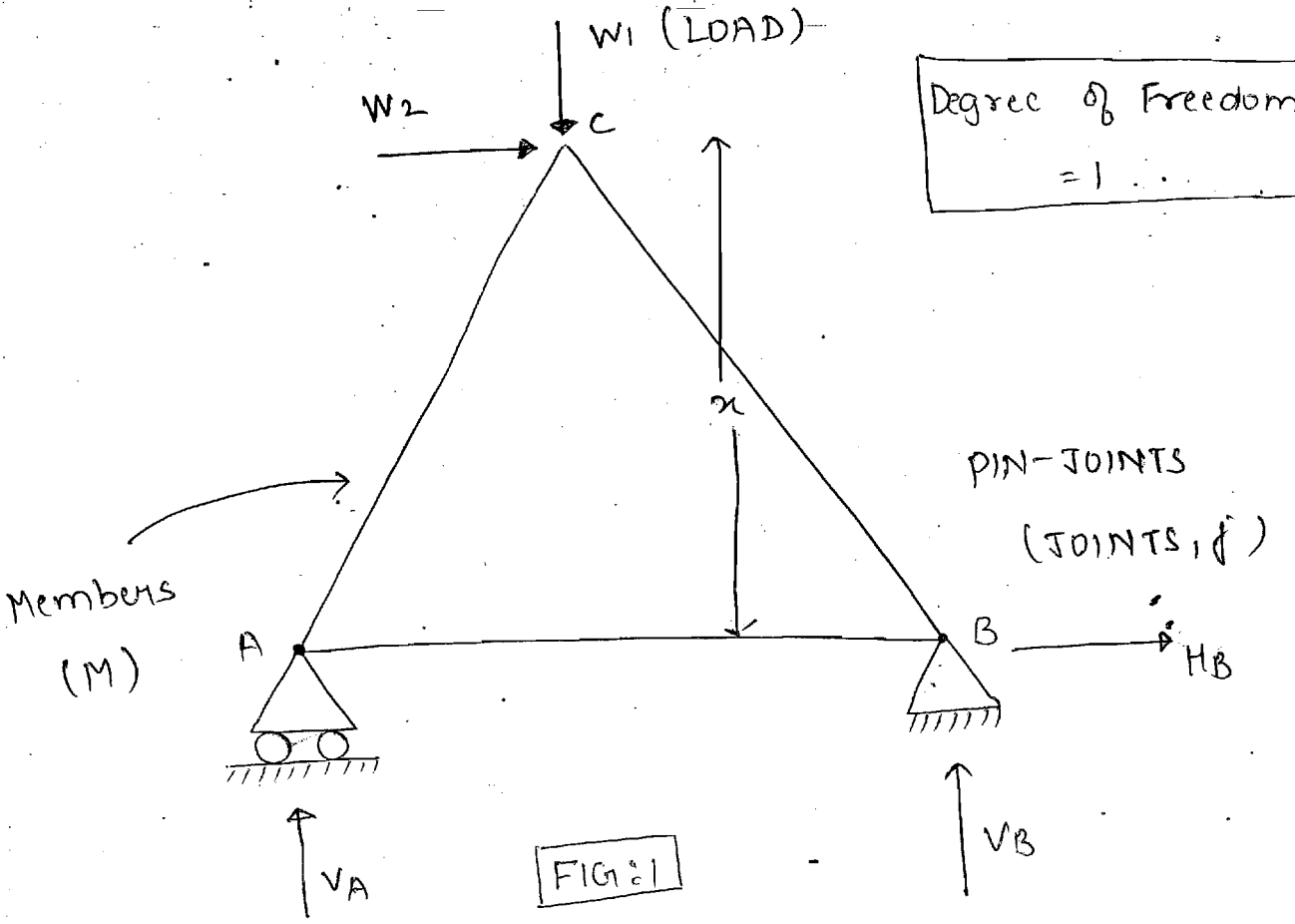
$V_B = 0.634$ KN

→ TRUSS OR RIGID STRUCTURE

RIGID – Forces will be only on joints

Members will be rigid.

Truss is a rigid structure in which the members are subjected to either tensile or compressive forces under applied loading condition



Degree of Freedom
= 1

PIN-JOINTS
(JOINTS, j)

FIG: 1

Static equilibrium

on Truss reaction at supports

$\Sigma F_x = 0$

$H_B + W_2 = 0 \Rightarrow H_B = -W_2 \quad -(1)$

$\Sigma F_y = 0$

$V_A + V_B = W_1 \quad -(2)$

$V_A \times (ab) + W_2(n) = W_1 \left(\frac{ab}{2}\right) \quad -(3)$

SIGN CONV.

Members ⟶ 'TENSILE'

∴ Away from the