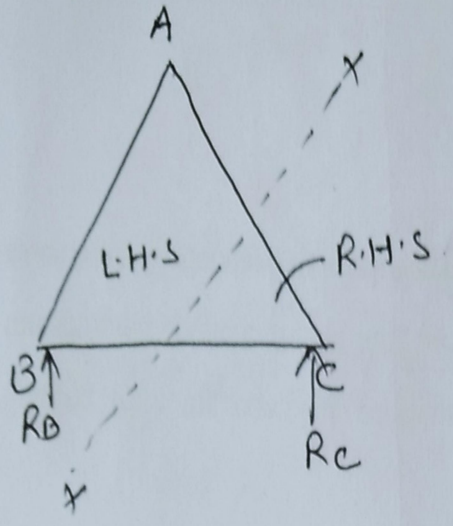
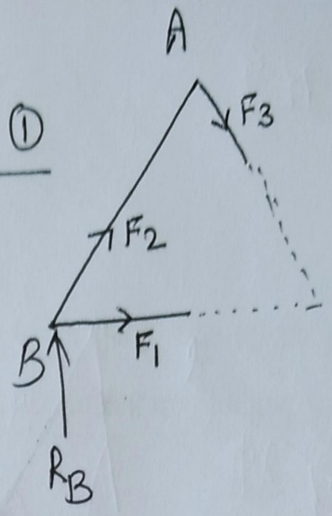
Trusses

Section Method :→



Step ①



Step ②

Give the direction of Force in each member.

Step ③

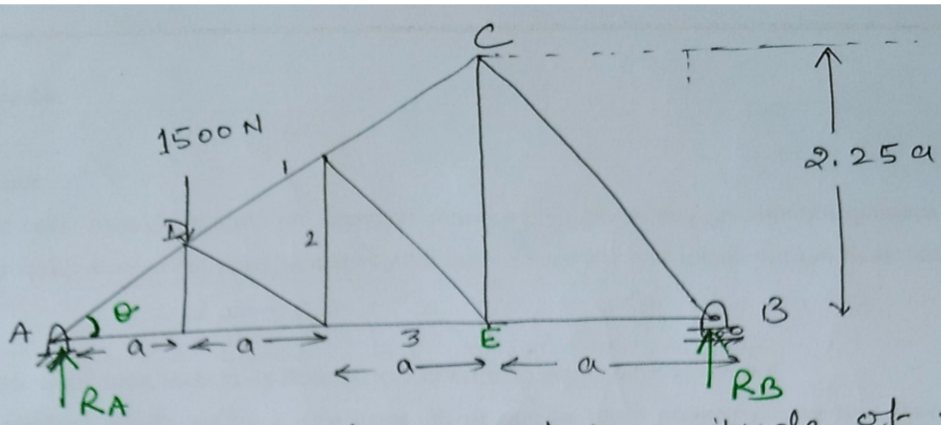
Apply the condition of Equilibrium in the selected part.

$$\Sigma H = 0$$

$$\Sigma V = 0$$

& $$\Sigma M = 0$$

Q.



Determine the nature and magnitude of the forces in the member 1, 2 & 3.

Sol^{n}. First of all find the Reaction R_A & R_B

Apply the cond^{n} of Equilibrium for ABC truss.

$$\Sigma H = 0$$

$$\Sigma V = 0$$

$$\therefore R_A + R_B = 1500 \quad \text{——— (1)}$$

$$\Sigma M_A = 0$$

$$1500 \times a = R_B \times 4a$$

$$\boxed{R_B = 375\ N}$$

So, $R_A = 1500 - 375$

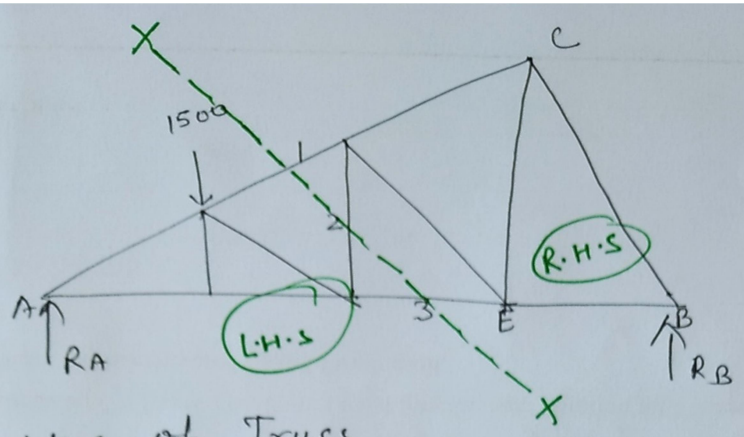
$$\boxed{R_A = 1125\ N}$$

For calculating angle θ take ΔABC

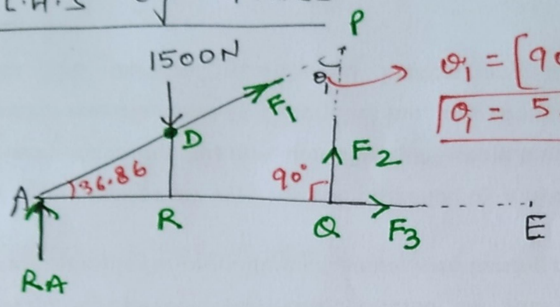
$$\tan\theta = \frac{CE}{AE} = \frac{2.25a}{3a}$$

$$\boxed{\tan\theta = 0.75}$$

$$\boxed{\theta = 36.86}$$



Take L.H.S of Truss



$\theta_1 = [90 - 36.86]$

$\theta_1 = 53.131$

Apply cond^n of Equilibrium

$\Sigma H = 0$

$F_1 \sin\theta_1 + F_3 = 0$ ------ (2)

ΔAPQ
$\sin\theta_1 = 0.800$
$\cos\theta_1 = 0.599$

$\Sigma V = 0$

$R_A + F_2 + F_1 \cos\theta_1 - 1500 = 0$

$1125 + F_2 + F_1 \cos(53.131) - 1500 = 0$

$F_1 \times (0.599) + F_2 = 375$ ——— (3)

Now

$\Sigma M_A = 0$

R_A, F_1 & F_3 will be Zero.

So,

$F_2 \times AQ = 1500 \times AR$

$F_2 \times 2\alpha = 1500 \times \alpha$

$F_2 = 750\ N$ (Tension)

Put this in eq^n (3)

$F_1 = \frac{375 - 750}{0.599} = -626\ N$

$F_1 = 626\ N$ (compressive)

Similarly.

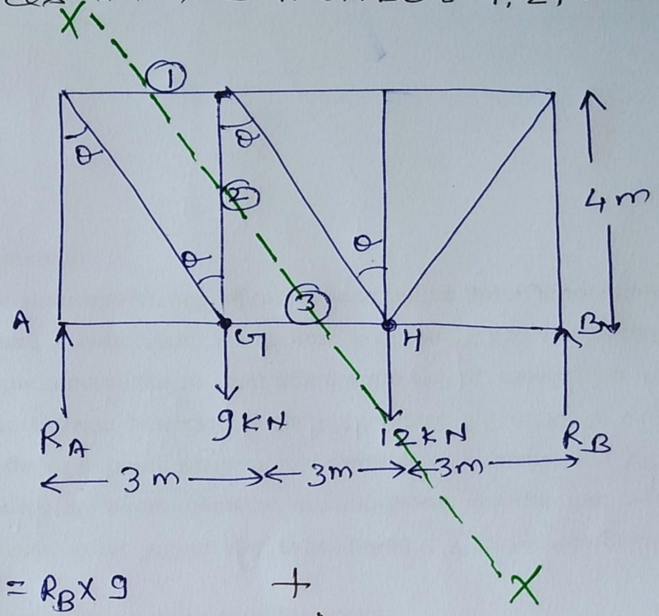
$F_3 = -F_1 \sin\theta_1$

$= 626 \times 0.8$

$F_3 = 500.8\ N$

Tension

Q. A truss of span 9m is loaded in Fig. Find the reaction and forces in the member 1, 2, & 3.



Sol^n

Apply cond^n of Equilibrium to whole truss.

$\Sigma V = 0$

$R_A + R_B = 9 + 12$

$R_A + R_B = 21$ ——— (1)

$\Sigma H = 0$ X

$\Sigma M_A = 0$

$9 \times AG + 12 \times AH = R_B \times 9$

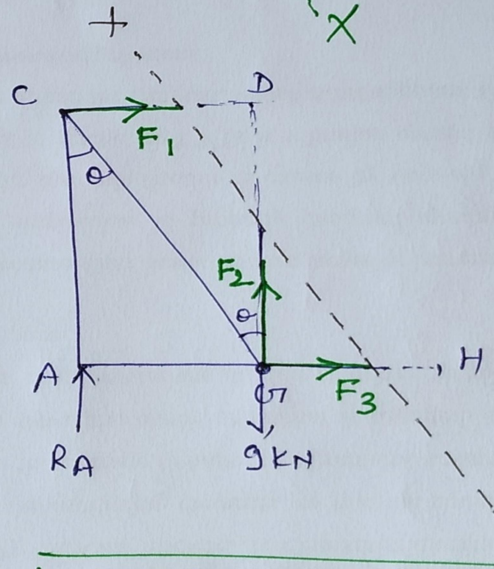
$9R_B = 9 \times 3 + 12 \times 6$

$R_B = \frac{99}{9} = 11\ KN$

$\boxed{R_B = 11\ KN}$

and $R_A = 21 - 11 = 10\ KN$

$\boxed{R_A = 10\ KN}$



In Fig (2) Again Apply eq^n equation.

$\Sigma H = 0$

$F_1 + F_3 = 0$ ——— (2)

$\Sigma V = 0$

$R_A + F_2 = 9$

$F_2 = 9 - 10$

$\boxed{F_2 = -1\ KN}$

$\boxed{F_2 = 1\ KN}$ (Compressive)

Moment about G.

$\Sigma M_G = 0$

$R_A \times AG + F_1 \times DG = 0$

$10 \times 3 + F_1 \times 4 = 0$

$F_1 = -\frac{30}{4} = -7.5\ KN$

$\boxed{F_1 = 7.5\ KN}$ Compressive nature.

From eq^n (2)

$F_3 = -F_1$

$F_3 = -(-7.5) = 7.5\ KN$ (Tensile)

Ans