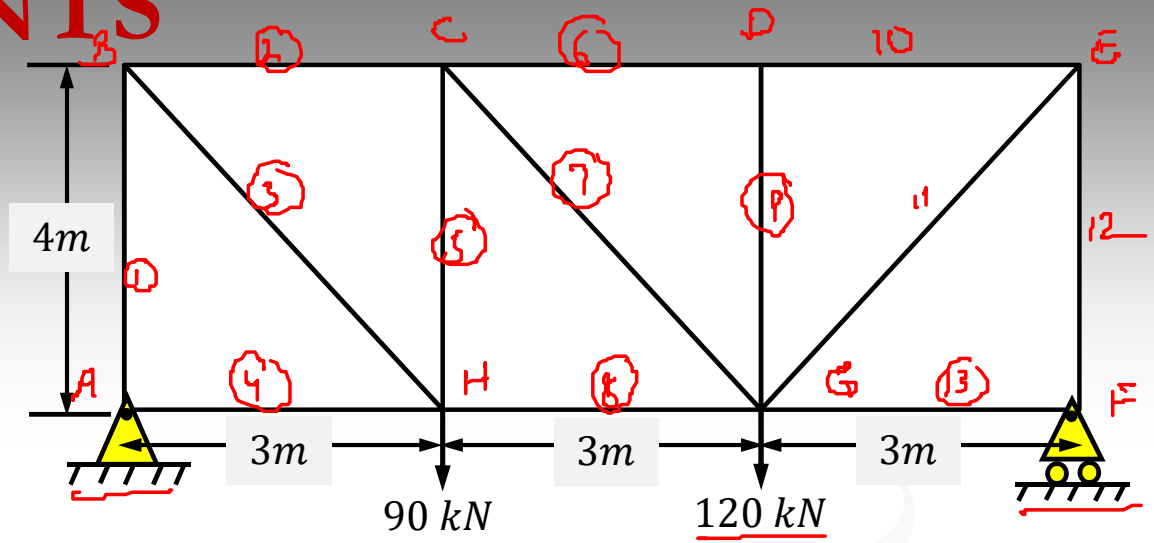
METHOD OF JOINTS

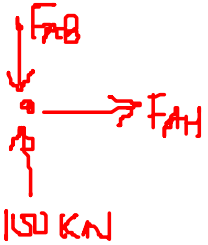
Example: Determine magnitude and nature of the forces in the truss loaded and supported as shown in the figure.



$\Sigma F_x = 0, \quad H_A = 0, \quad \Sigma F_y = 0 \quad V_A + V_F = 210\ kN$

$\Sigma M_A = 0 \quad 90 \times 3 + 120 \times 6 = 9V_F \Rightarrow V_F = 110\ kN$

FBD of joint 'A'



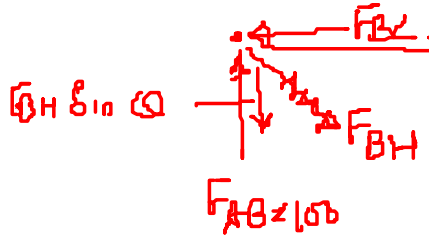
$\Sigma F_y = 0$

$F_{AB} = 150\ kN\ (comp)$

$\Sigma F_x = 0$

$F_{AH} = 0$

FBD of joint 'B'



$\Sigma F_y = 0$

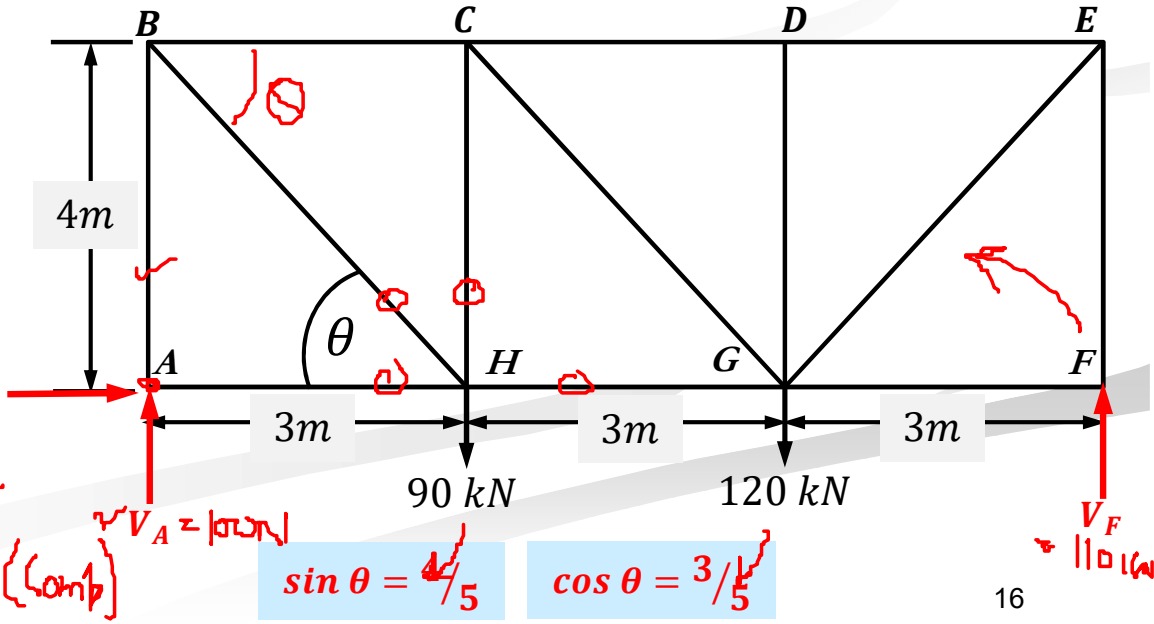
$F_{BH} \times \frac{4}{5} = 150$

$F_{BH} = 125\ kN\ (T)$

$\Sigma F_x = 0$

$H_A = F_{BC} = 125 \times \frac{3}{5}$

$= 75\ kN\ (comp)$



$\sin\theta = 4/5$ $\quad \cos\theta = 3/5$

METHOD OF JOINTS

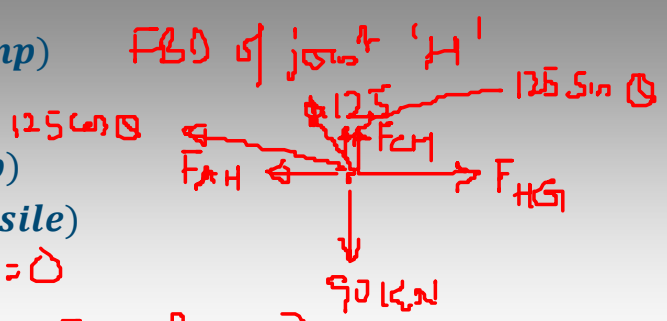
$F_{AB} = 100\ kN\ (Comp)$

$F_{AH} = 0$

$F_{BC} = 75\ kN\ (Comp)$

$F_{BH} = 125\ kN\ (Tensile)$

FBD of joint 'H'



$\Sigma F_y = 0$

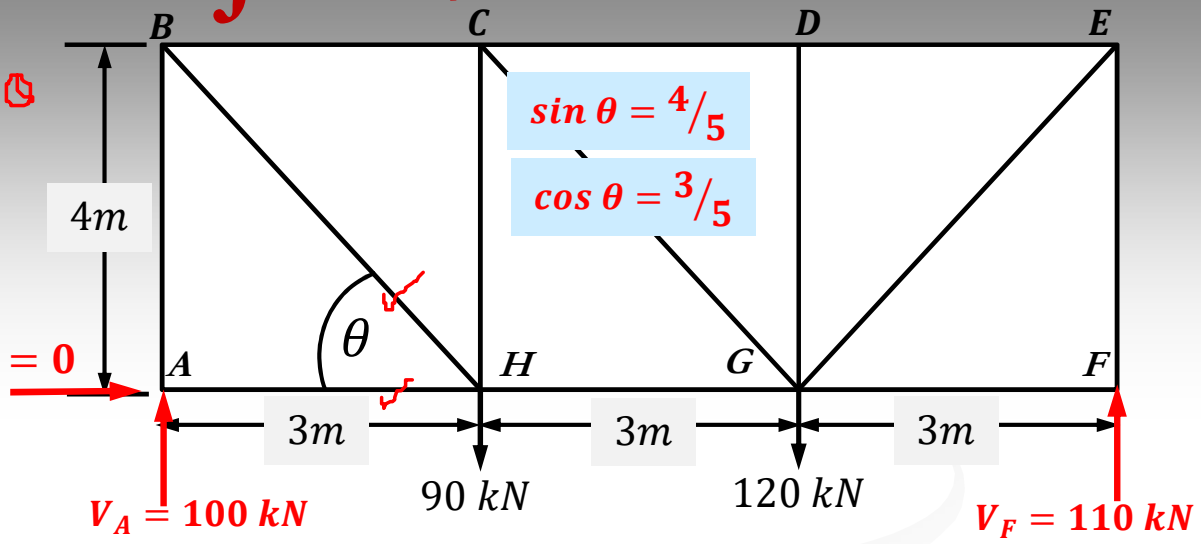
$125 \times \frac{4}{5} + F_{CH} - 90 = 0$

$F_{CH} = 90 - 100 = -10\ kN$

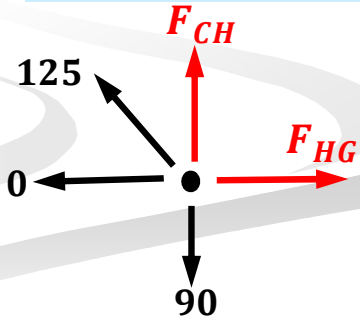
$F_{CH} = 10\ kN\ (Comp)$

$\Sigma F_x = 0$

$0 - F_{AH} + 125 \times \frac{3}{5} = F_{HG} = 75\ kN\ (T)$



FBD of joint H



METHOD OF JOINTS

$F_{AB} = 100\ kN\ (Comp)$

$F_{AH} = 0$

$F_{BC} = 75\ kN\ (Comp)$

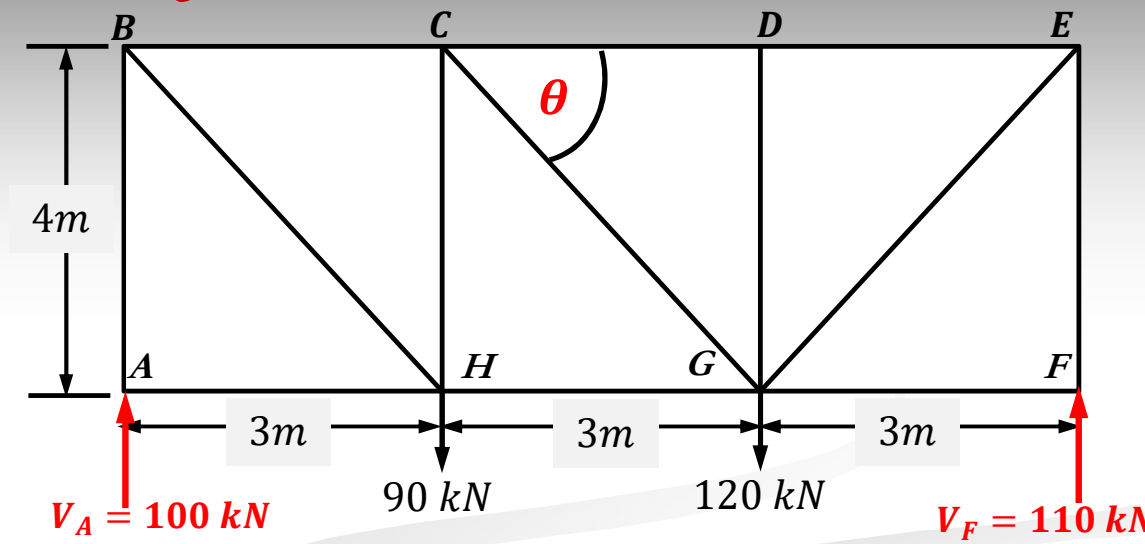
$F_{BH} = 125\ kN\ (Tensile)$

$F_{CH} = 10\ kN\ (Comp)$

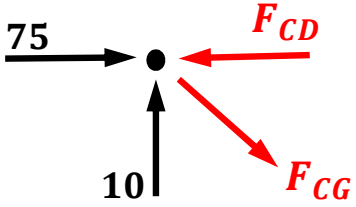
$F_{HG} = 75\ kN\ (Tensile)$

$\sin\theta = {}^{4}/_{5}$

$\cos\theta = {}^{3}/_{5}$



FBD of joint C



METHOD OF JOINTS

$F_{AB} = 100\ kN\ (Comp)$

$F_{AH} = 0$

$F_{BC} = 75\ kN\ (Comp)$

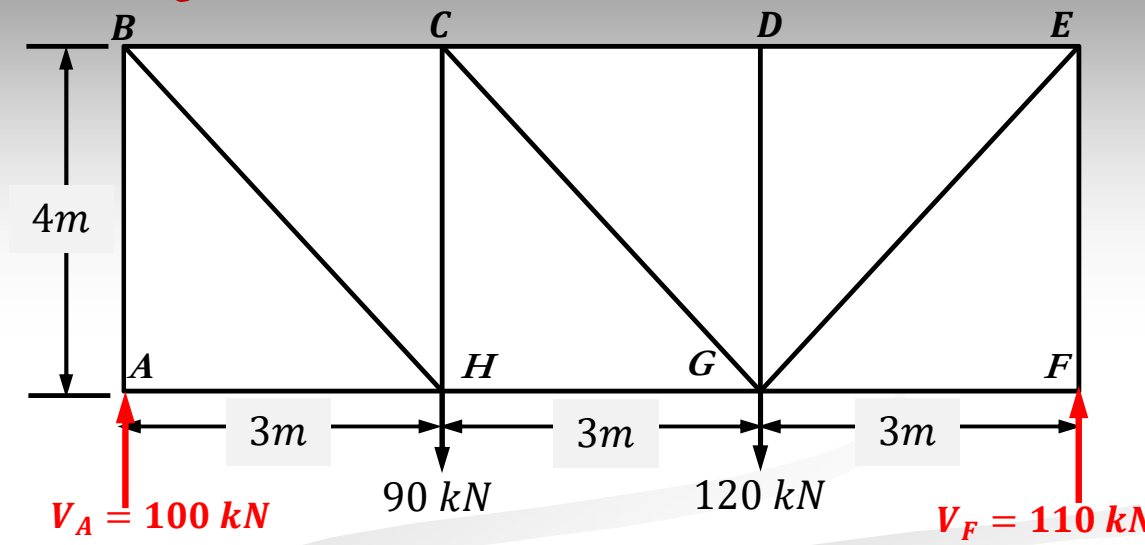
$F_{BH} = 125\ kN\ (Tensile)$

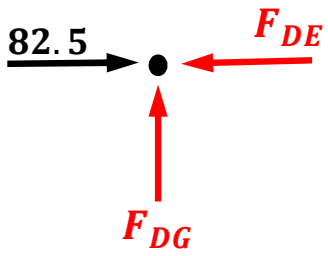
$F_{CH} = 10\ kN\ (Comp)$

$F_{HG} = 75\ kN\ (Tensile)$

$F_{CG} = 12.5\ kN\ (Tensile)$

$F_{CD} = 82.5\ kN\ (Comp)$





FBD of joint D

METHOD OF JOINTS

$F_{AB} = 100\ kN\ (Comp)$

$F_{AH} = 0$

$F_{BC} = 75\ kN\ (Comp)$

$F_{BH} = 125\ kN\ (Tensile)$

$F_{CH} = 10\ kN\ (Comp)$

$F_{HG} = 75\ kN\ (Tensile)$

$F_{CG} = 12.5\ kN\ (Tensile)$

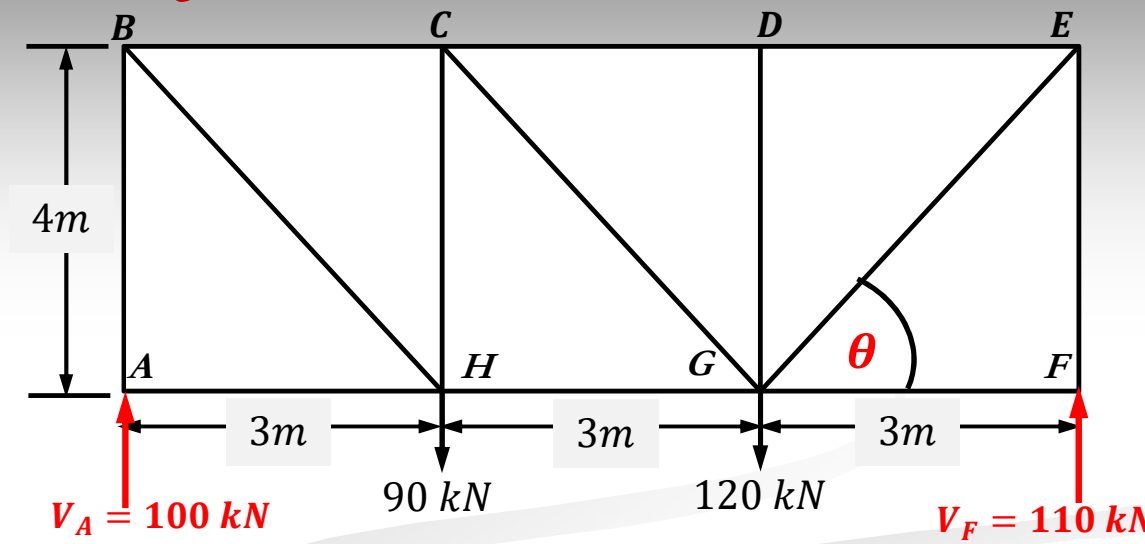
$F_{CD} = 82.5\ kN\ (Comp)$

$F_{DE} = 82.5\ kN\ (Comp)$

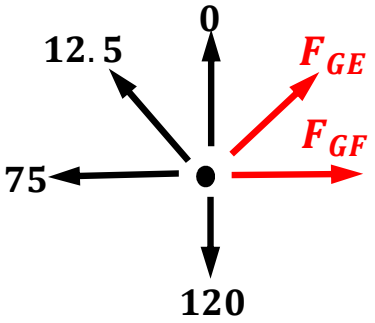
$F_{DG} = 0$

$\sin\theta = {}^{4}/_{5}$

$\cos\theta = {}^{3}/_{5}$



FBD of joint G



METHOD OF JOINTS

$F_{AB} = 100\ kN\ (Comp)$

$F_{AH} = 0$

$F_{BC} = 75\ kN\ (Comp)$

$F_{BH} = 125\ kN\ (Tensile)$

$F_{CH} = 10\ kN\ (Comp)$

$F_{HG} = 75\ kN\ (Tensile)$

$F_{CG} = 12.5\ kN\ (Tensile)$

$F_{CD} = 82.5\ kN\ (Comp)$

$F_{DE} = 82.5\ kN\ (Comp)$

$F_{DG} = 0$

$F_{GE} = 137.5\ kN\ (T)$

$F_{GF} = 0$