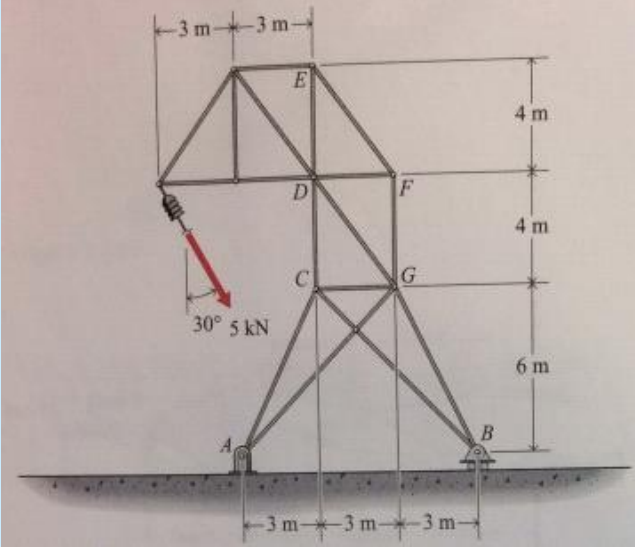


1-20* A transmission line truss supports a 5-kN load, as shown in Fig. P1-20. Determine the forces in members FG and CD.



Support Reactions

$\Sigma M_A = 0$

$B_y(9) - 5 \cos(30^\circ)(3) + 5 \sin(30^\circ)(10) = 0$

$B_y = 1.334$

$\Sigma M_B = 0$

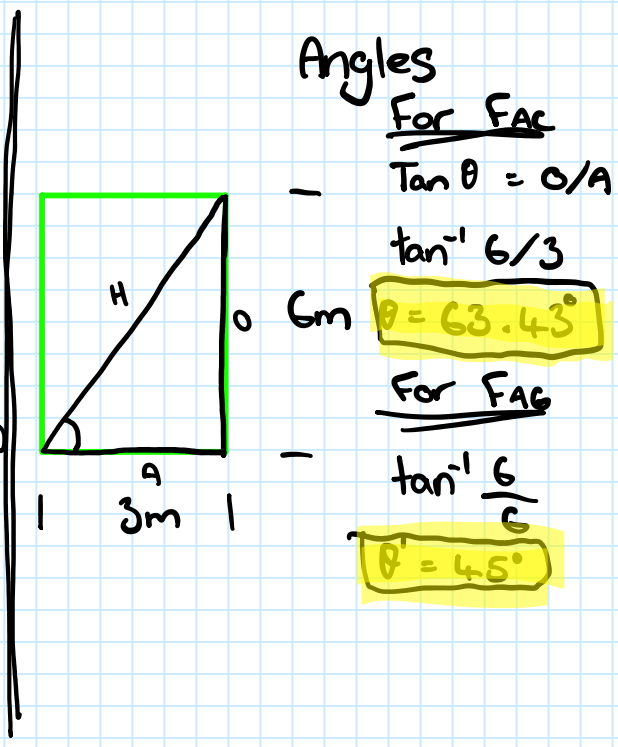
$A_y(9) - 5 \cos(30^\circ)(12) + 5 \sin(30^\circ)(10) = 0$

$A_y = 2.995$

$\Sigma F_x = 0$

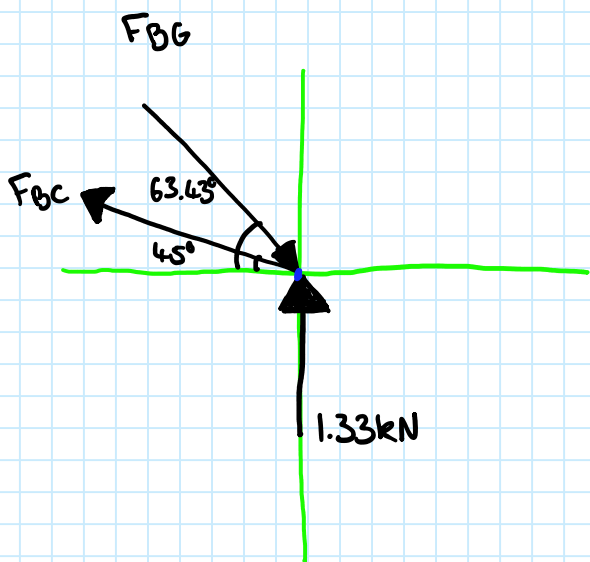
$A_x + 5 \sin(30^\circ) = 0$

$A_x = 2.5 \text{ kN}$



Angles
 For F_{AC}
 $\tan \theta = O/A$
 $\tan^{-1} 6/3$
 $\theta = 63.43^\circ$
 For F_{AG}
 $\tan^{-1} 6/6$
 $\theta = 45^\circ$

Joint B



$\Sigma F_x = 0$ (1)

$F_{BG} \cos(63.43^\circ) + F_{BC} \cos(45^\circ) = 0$

$\Sigma F_y = 0$ (2)

$1.334 - F_{BG} \sin(63.43^\circ) + F_{BC} \sin(45^\circ) = 0$

$F_{BC} = F_{BG} \frac{\cos(63.43^\circ)}{\cos(45^\circ)} = 0.632 F_{BG}$

From Eq 2.

$-1.334 - F_{BG} \sin(63.43^\circ) + F_{BG}(0.632) \sin(45^\circ) = 0$

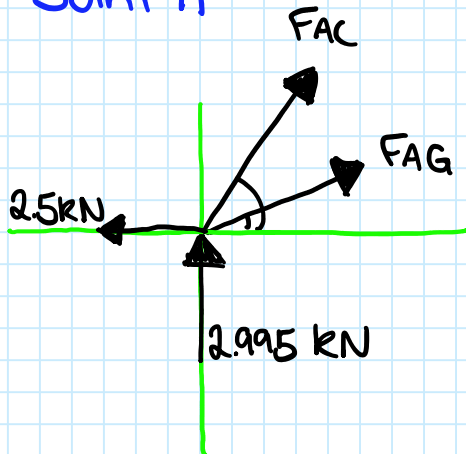
$F_{BG} = 2.98 \text{ kN (C)}$

Eq 1

$-2.98 \cos(63.43^\circ) + F_{BC} \cos(45^\circ) = 0$

$F_{BC} = 1.88 \text{ (T)}$

Joint A



$\Sigma F_x = 0$ (1)

$-2.5 + F_{AC} \cos(63.43^\circ) + F_{AG} \cos(45^\circ) = 0$

$\Sigma F_y = 0$ (2)

$2.995 + F_{AC} \sin(63.43^\circ) + F_{AG} \sin(45^\circ) = 0$

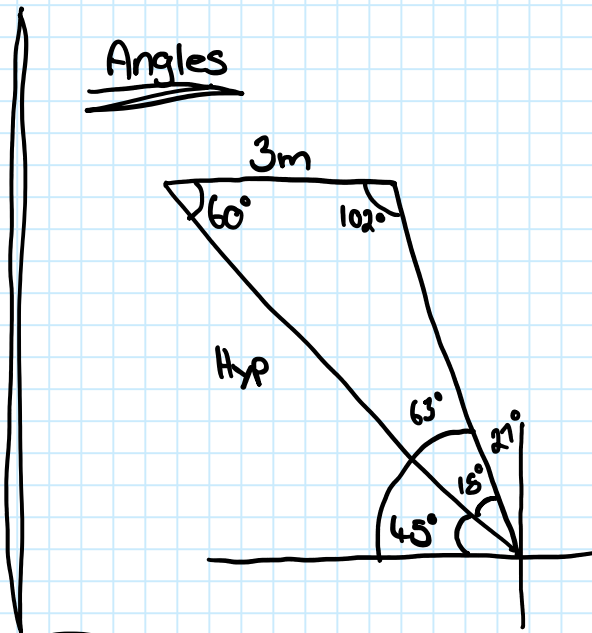
$2.995 = F_{AC} \sin(63.43^\circ) + 0.707 F_{AC} \sin(45^\circ)$

$F_{ACy} = 2.06$

$-2.5 = F_{AC} \cos(63.43^\circ) + 0.632 F_{AC} \cos 45^\circ$

$F_{ACx} = -2.8$

Angles



$63 - 90 = 27^\circ$
 $90 - 27 - 45 = 18^\circ$

$F_{AG} = F_{AC} \times \frac{\cos 63.43^\circ}{\cos 45^\circ} = 0.632 F_{AC}$

$F_{AGy} = F_{AC} \frac{\sin(45^\circ)}{\sin(63.43^\circ)} = 0.791$