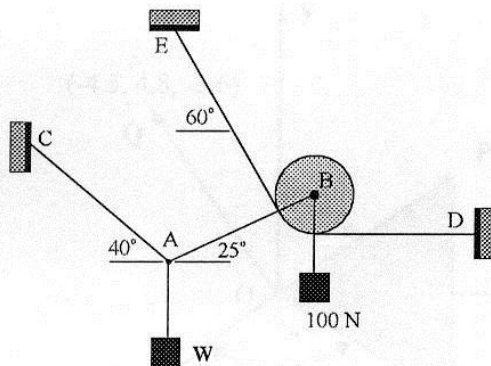


PLEASE INCLUDE THIS SHEET WITH YOUR SUBMISSION

A 100 N weight is attached to a pulley at B. The pulley can roll on the cable which is attached to supports at E and D. Two cables AC and AB tied at A support a weight, W.

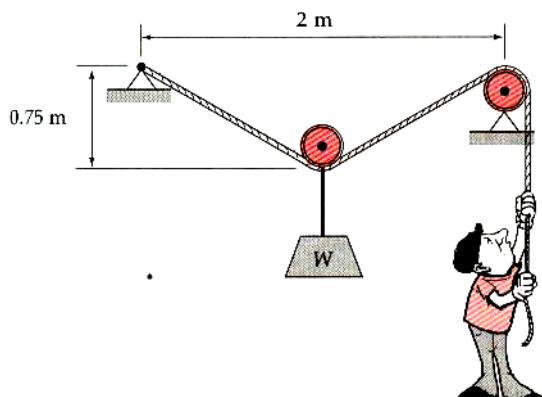
The system is in equilibrium in the configuration shown. Determine the magnitude of the weight W.



$$\begin{aligned}
 &[\sum F_x = 0] \quad F_{AB} \cos 25^\circ - F_{AC} \cos 40^\circ = 0 \\
 &F_{AC} = 1.183 F_{AB} = 103.1 \text{ N} \\
 &[\sum F_y = 0] \quad F_{AB} \sin 25^\circ + F_{AC} \sin 40^\circ - W = 0 \\
 &87.17 \sin 25^\circ + 103.1 \sin 40^\circ - W = 0 \\
 &W = 103.1 \text{ N}
 \end{aligned}$$

$$\begin{aligned}
 &[\sum F_x = 0] \quad F_{BD} - F_{BE} \cos 25^\circ - F_{BE} \cos 60^\circ = 0 \\
 &[\sum F_y = 0] \quad F_{BE} \sin 60^\circ - F_{BA} \sin 25^\circ - 100 = 0 \\
 &F_{BD} = F_{BE} = T \\
 &\text{From ①} \quad T - 0.9063 F_{BA} - 0.5T = 0 \\
 &\text{From ②} \quad 0.8660 T - 0.4226 F_{BA} - 100 = 0 \\
 &T = 1.8126 F_{BA} \\
 &0.8660 [1.8126 F_{BA}] - 0.4226 F_{BA} = 100 \\
 &F_{BA} = 87.17 \text{ N}
 \end{aligned}$$

2. The 460 N man is holding the 360 N weight W in equilibrium, as shown.
- What is the tension in the rope?
 - How much higher can he raise the weight?



(a) Equilibrium at the position gives

$$\begin{aligned}
 &\theta = \tan^{-1} \left(\frac{0.75}{1} \right) = 36.87^\circ \\
 &(\sum F_y = 0) \quad 2T \sin \theta - 360 = 0 \\
 &2T \sin (36.87^\circ) - 360 = 0 \\
 &T = 30 \text{ N}
 \end{aligned}$$

(b) Equilibrium at the lifted position

$$\begin{aligned}
 &\text{Maximum force that can be applied is equal to the weight of the man} \\
 &\therefore T = 460 \text{ N} \\
 &(\sum F_y = 0) \quad 2T \sin \alpha - 360 = 0 \\
 &2(460) \sin \alpha - 360 = 0 \\
 &\alpha = 23^\circ \\
 &\tan \alpha = \frac{h}{1} \quad \therefore h = 0.42 \text{ m} \\
 &\therefore \text{difference} = 0.75 - 0.42 = 0.33 \text{ m}
 \end{aligned}$$