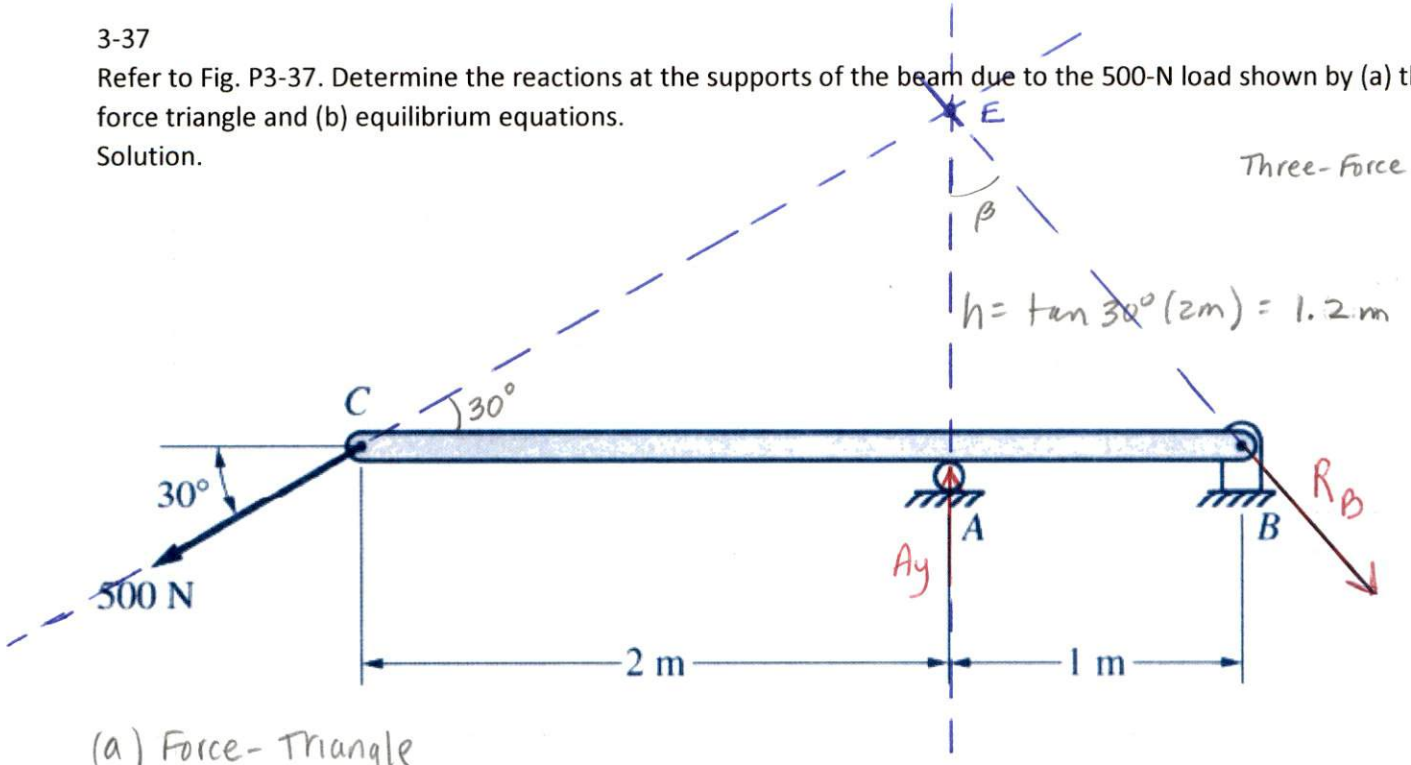
3-37

Refer to Fig. P3-37. Determine the reactions at the supports of the beam due to the 500-N load shown by (a) the force triangle and (b) equilibrium equations.

Solution.



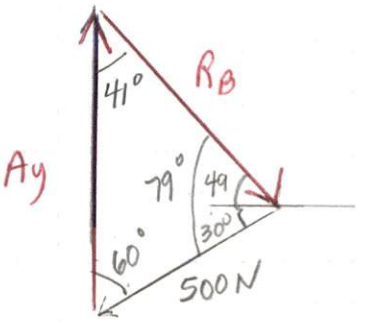
Three-Force Body

$h = \tan 30°\,(2\text{m}) = 1.2\text{m}$

(a) Force-Triangle

FBD

$\beta = \tan^{-1}\frac{1\text{m}}{1.2\text{m}} = 41°$



Force-Triangle

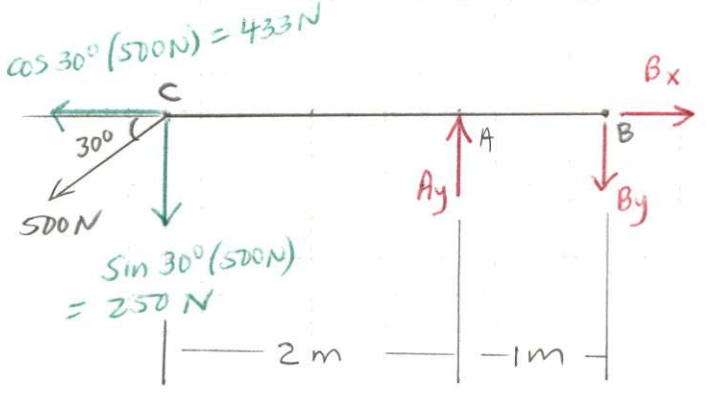
$$\frac{Ay}{\sin 79°} = \frac{R_B}{\sin 60°} = \frac{500\text{ N}}{\sin 41°}$$

$$Ay = \frac{\sin 79°\,(500\text{N})}{\sin 41°} = 748\text{ N} \uparrow$$

$$R_B = \frac{\sin 60°\,(500\text{N})}{\sin 41°} = 660\text{ N} \measuredangle 311°$$

(b) Equilibrium Equations

ccw +M ↺
cw −M ↻



FBD

$[\Sigma M_A = 0]$ $250\text{N}(2\text{m}) - By(1\text{m}) = 0$

$By = 500\text{ N} \downarrow$

$[\Sigma F_x = 0]$ $-433\text{N} + Bx = 0$

$Bx = 433\text{ N} \rightarrow$

$[\Sigma F_y = 0]$ $-250\text{N} + Ay - By = 0$

$Ay = 250\text{N} + 500\text{N}$

$= 750\text{ N} \uparrow$