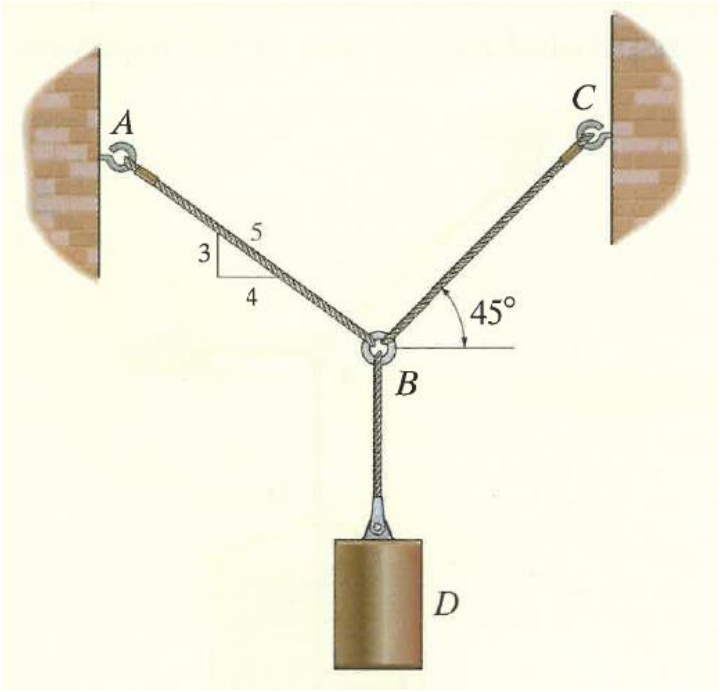
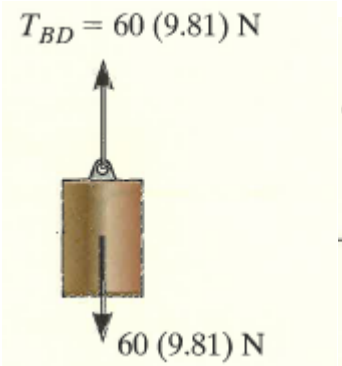
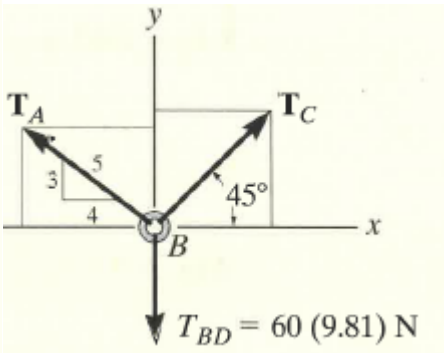
3.2

Déterminer la tension dans les câbles BA et BC nécessaire pour supporter le cylindre de 60 kg..







Equations of Equilibrium. Applying the equations of equilibrium along the x and y axes, we have

$$\stackrel{+}{\rightarrow} \Sigma F_x = 0; \qquad T_C \cos 45° - \left(\tfrac{4}{5}\right) T_A = 0 \qquad (1)$$

$$+\uparrow \Sigma F_y = 0; \quad T_C \sin 45° + \left(\tfrac{3}{5}\right) T_A - 60(9.81)\ \text{N} = 0 \qquad (2)$$

Equation (1) can be written as $T_A = 0.8839 T_C$. Substituting this into Eq. (2) yields

$$T_C \sin 45° + \left(\tfrac{3}{5}\right)(0.8839 T_C) - 60(9.81)\ \text{N} = 0$$

So that

$$T_C = 475.66\ \text{N} = 476\ \text{N} \qquad \textit{Ans.}$$

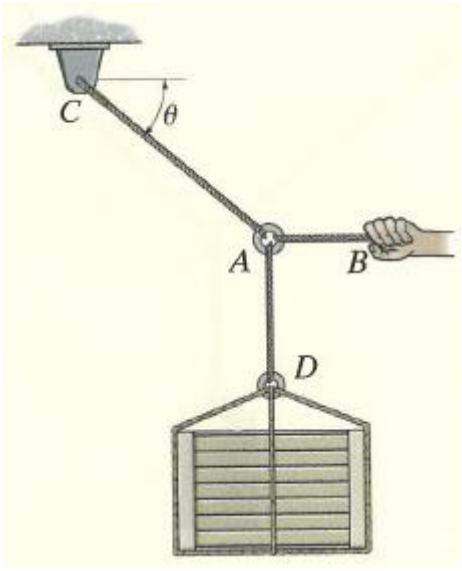
Substituting this result into either Eq. (1) or Eq. (2), we get

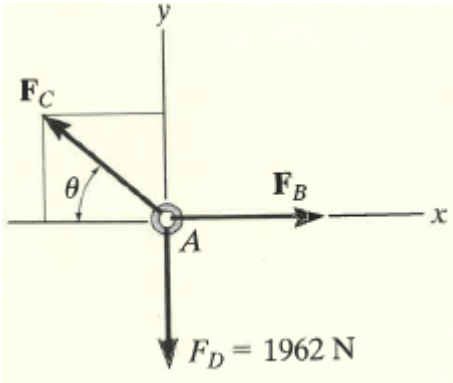
$$T_A = 420\ \text{N} \qquad \textit{Ans.}$$

Source: Engineering Mechanics - Statics, R.C. Hibbeler, Pearson, 12th Edition

3.3

La caisse de 200 kg est suspendue comme montré ci-dessous.
Chacune des cordes AB et AC peut supporter une charge maximale de 10 kN avant de rompre.
Si AB reste horizontale, déterminer l'angle θ minimum.





Equations of Equilibrium. Applying the equations of equilibrium along the x and y axes,

$$\stackrel{+}{\rightarrow} \Sigma F_x = 0; \quad -F_C \cos\theta + F_B = 0; \quad F_C = \frac{F_B}{\cos\theta} \qquad (1)$$

$$+\uparrow \Sigma F_y = 0; \quad F_C \sin\theta - 1962\ \text{N} = 0 \qquad (2)$$

From Eq. (1), F_C is always greater than F_B since $\cos\theta \leq 1$. Therefore, rope AC will reach the maximum tensile force of 10 kN *before* rope AB. Substituting $F_C = 10$ kN into Eq. (2), we get

$$[10(10^3)\,\text{N}]\sin\theta - 1962\ \text{N} = 0$$

$$\theta = \sin^{-1}(0.1962) = 11.31^\circ \qquad \textit{Ans.}$$

The force developed in rope AB can be obtained by substituting the values for θ and F_C into Eq. (1).

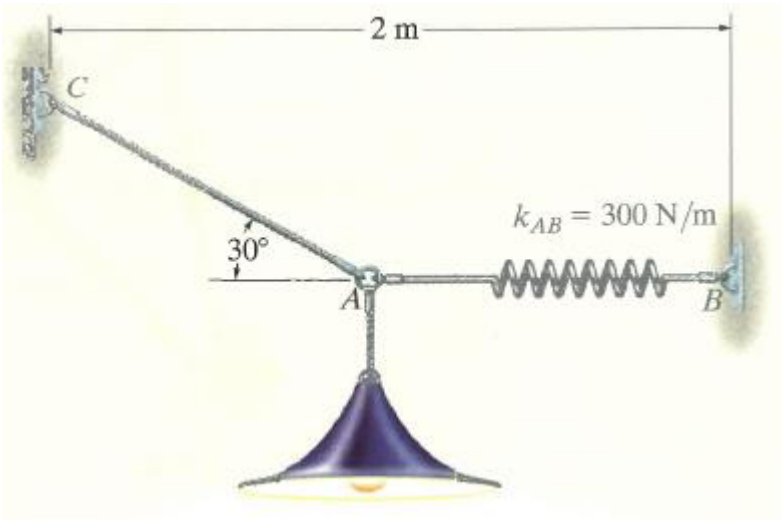
$$10(10^3)\ \text{N} = \frac{F_B}{\cos 11.31^\circ}$$

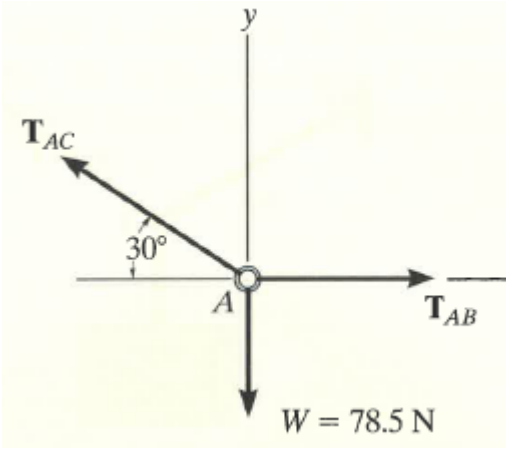
$$F_B = 9.81\ \text{kN}$$

Source: Engineering Mechanics - Statics, R.C. Hibbeler, Pearson, 12th Edition

3.4

Déterminer la longueur AC nécessaire afin que la lampe de 8 kg soit positionnée comme montré (AB horizontal).
La longueur au repos du ressort est de 0.4 m et sa rigidité de 300 N/m.





Equations of Equilibrium. Using the x, y axes,

$\stackrel{+}{\rightarrow} \Sigma F_x = 0;$ $\quad T_{AB} - T_{AC}\cos 30° = 0$

$+\uparrow \Sigma F_y = 0;$ $\quad T_{AC}\sin 30° - 78.5\text{ N} = 0$

Solving, we obtain

$$T_{AC} = 157.0\text{ N}$$

$$T_{AB} = 135.9\text{ N}$$

The stretch of spring AB is therefore

$T_{AB} = k_{AB}s_{AB};$ $\quad 135.9\text{ N} = 300\text{ N/m}(s_{AB})$

$$s_{AB} = 0.453\text{ m}$$

so the stretched length is

$$l_{AB} = l'_{AB} + s_{AB}$$

$$l_{AB} = 0.4\text{ m} + 0.453\text{ m} = 0.853\text{ m}$$

The horizontal distance from C to B, Fig. 3–8a, requires

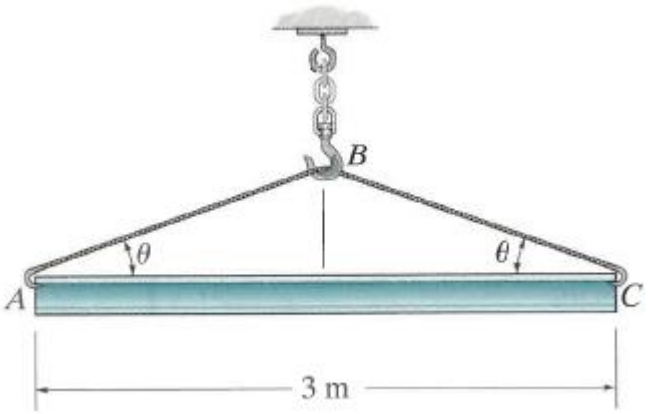
$$2\text{ m} = l_{AC}\cos 30° + 0.853\text{ m}$$

$$l_{AC} = 1.32\text{ m}$$

Source: Engineering Mechanics - Statics, R.C. Hibbeler, Pearson, 12th Edition

F3-2

La poutre pèse 3.5 kN. Déterminer la longueur du câble ABC la plus courte si ce câble supporte une charge maximale de 7.5 kN.



F3–2. $+\uparrow \Sigma F_y = 0;\ -2(7.5)\sin\theta + 3.5 = 0$

$$\theta = 13.5°$$

$$L_{ABC} - 2\left(\frac{1.5\text{ m}}{\cos 13.5°}\right) = 3.09\text{ m} \qquad \textit{Ans.}$$

Source: Engineering Mechanics - Statics, R.C. Hibbeler, Pearson, 12th Edition