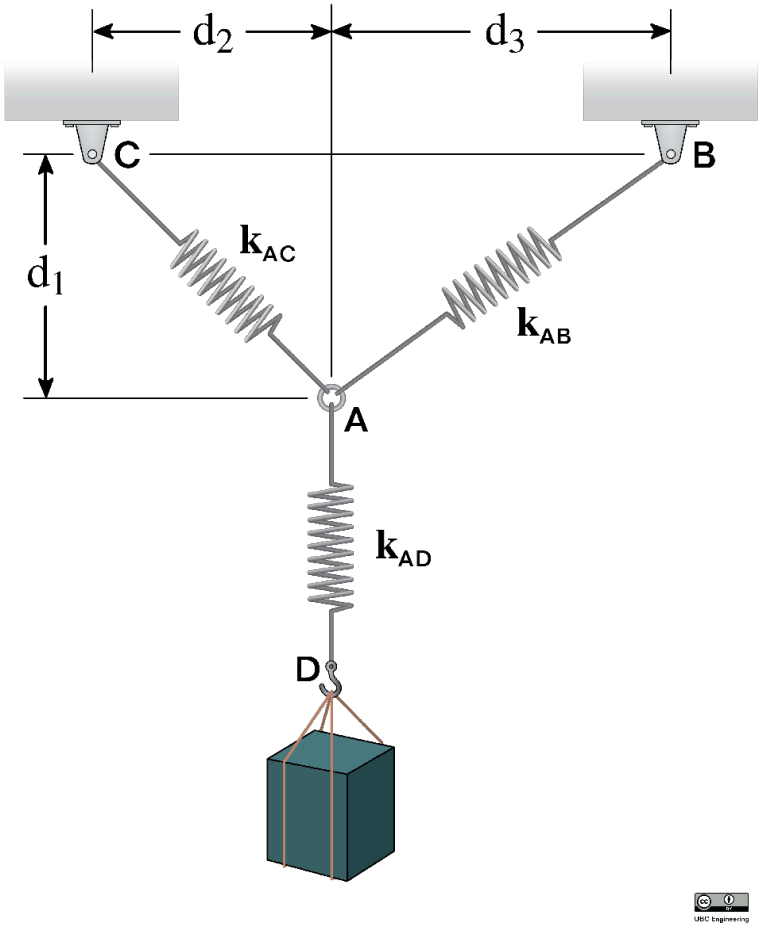
21-S-3.3-RP-01



In the 2D system above, the springs are stretched and are in static equilibrium. Find the stretch in each spring.

Find the elastic tension in each spring.

$|AB| = \sqrt{{d_1}^2 + {d_3}^2}$

$|AC| = \sqrt{{d_1}^2 + {d_2}^2}$

$\Sigma F_x = 0 \rightarrow \frac{d_3}{|AB|} T_{AB} - \frac{d_2}{|AC|} T_{AC} \rightarrow T_{AB} = \frac{d_2 |AB|}{d_3 |AC|} T_{AC}$

$\Sigma F_y = 0 \rightarrow \frac{d_1}{|AB|} T_{AB} + \frac{d_1}{|AC|} T_{AC} - T_{AD} = 0$

$\rightarrow T_{AD} = \frac{d_1 (d_2 + d_3)}{d_3 |AC|} T_{AC} \rightarrow T_{AC} = \frac{d_3 |AC|}{d_1 (d_2 + d_3)} T_{AD}$

$T_{AD} = m_D * g$

$$T_{AC} = \frac{d_3|AC|}{d_1(d_2+d_3)} T_{AD}$$

$$T_{AB} = \frac{d_2|AB|}{d_3|AC|} T_{AC} = \frac{d_2|AB|}{d_1(d_2+d_3)} T_{AD}$$

Finally, determine the stretch in each spring.

$$\Delta x_{AB} = \frac{T_{AB}}{k_{AB}}$$

$$\Delta x_{AC} = \frac{T_{AC}}{k_{AC}}$$

$$\Delta x_{AD} = \frac{T_{AD}}{k_{AD}}$$