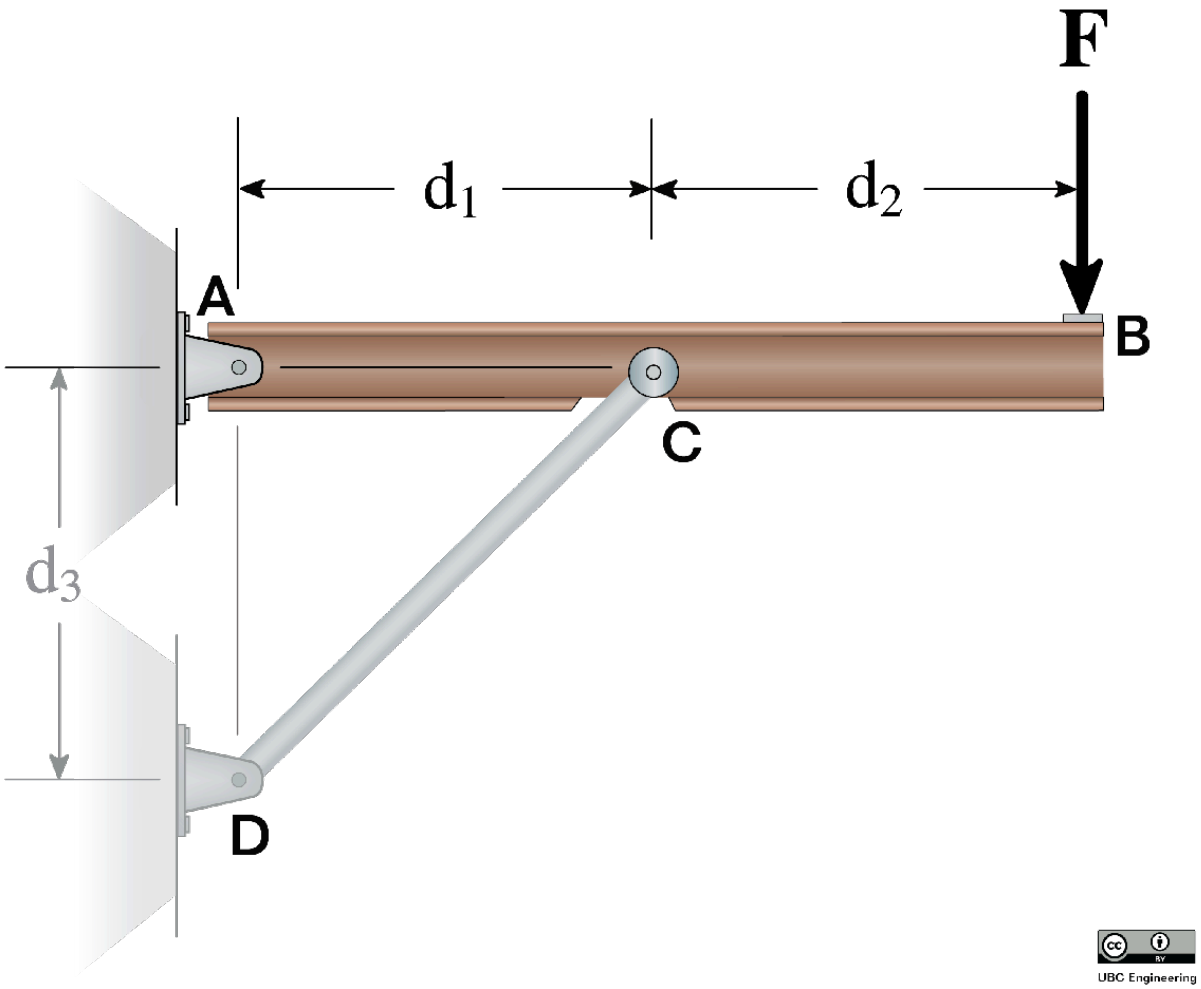

A uniform member AB has total mass $m\,\mathrm{kg}$ and supports a force $F\,\mathrm{N}$ at point B. If the member is held in equilbrium by a pin at point A and by another member attached to pins at point C and D, find the reaction components at A and the force exerted by member CD. Assume $g = 9.81\,\mathrm{N/kg}$. Let forces be positive if pointing upwards or to the right and moments be positive if rotating counterclockwise.

Draw a FBD for the CD member and find the smallest angle (in DEGREES) between the CD member and the horizontal line and between the force exerted by the CD member on AB and the horizontal line. Assume the member has negligible mass.

$\theta_{CD} = \arctan\left(\frac{d_3}{d_1}\right)$

$\theta_F = \arctan\left(\frac{C_y}{C_x}\right)$

$$\Sigma M_D = 0 \rightarrow d_3 C_x - d_1 C_y = 0 \rightarrow \frac{C_y}{C_x} = \frac{d_3}{d_1}$$

$$\theta_F = \arctan\left(\frac{d_3}{d_1}\right)$$

Find the angle between the CD member and the force it exerts on the AB member.

$$\Delta\theta = 0$$

Find the reaction components at point A and the magnitude of the force exerted by member CD.

$$\Sigma M_A = 0 \rightarrow d_1 \cdot F_{CD}\sin(\theta_F) - \left(\frac{d_1 + d_2}{2}\right) \cdot mg - (d_1 + d_2) \cdot F = 0 \rightarrow F_{CD} = \frac{\left(\frac{d_1 + d_2}{2}\right) \cdot mg + (d_1 + d_2) \cdot F}{d_1 \sin(\theta_F)}$$

$$\Sigma F_x = 0 \rightarrow A_x + F_{CD}\cos(\theta_F) = 0 \rightarrow A_x = -F_{CD}\cos(\theta_F)$$

$$\Sigma F_y = 0 \rightarrow A_y + F_{CD}\sin(\theta_F) - F - mg = 0 \rightarrow A_y = F + mg - F_{CD}\sin(\theta_F)$$