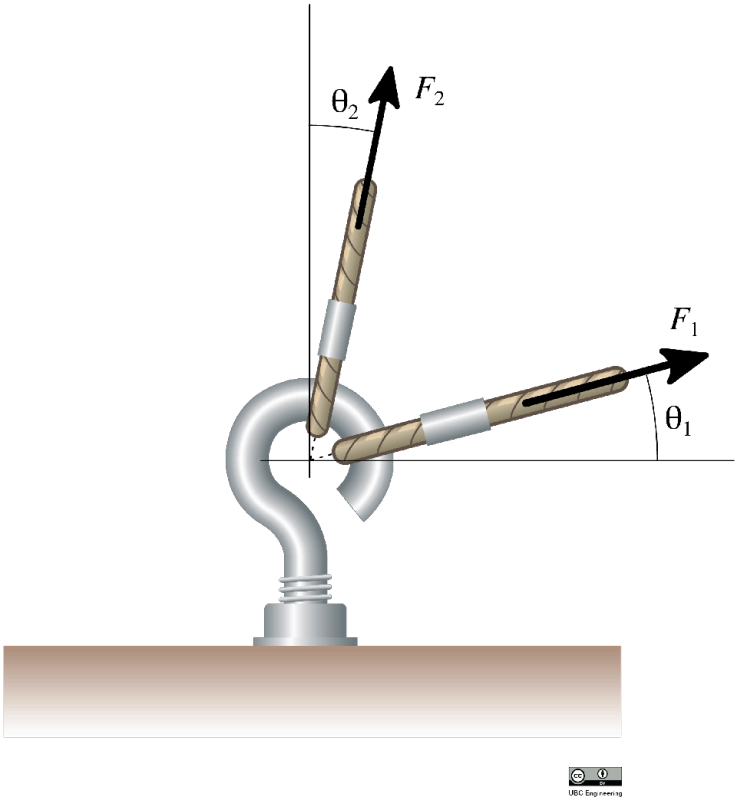
21-S-2.3-RP-01

A hook screwed onto a surface is pulled by two ropes, which exert forces F_1 and F_2 at specified angles. Calculate the magnitude of the resultant force and its angle ϕ from horizontal (in DEGREES).



$$\overrightarrow{F_R} = \overrightarrow{F_1} + \overrightarrow{F_2}$$

$$F_{Rx} = F_1 \cos(\theta_1) + F_2 \sin(\theta_2)$$

$$F_{Ry} = F_1 \sin(\theta_1) + F_2 \cos(\theta_2)$$

$$||\overrightarrow{F_R}|| = \sqrt{{F_{Rx}}^2 + {F_{Ry}}^2}$$

$$= \sqrt{{F_1}^2 + {F_2}^2 + 2F_1F_2(\cos(\theta_1)\sin(\theta_2) + \sin(\theta_1)\cos(\theta_2))}$$

$$\phi = \arctan\left(\frac{F_{Ry}}{F_{Rx}}\right)$$