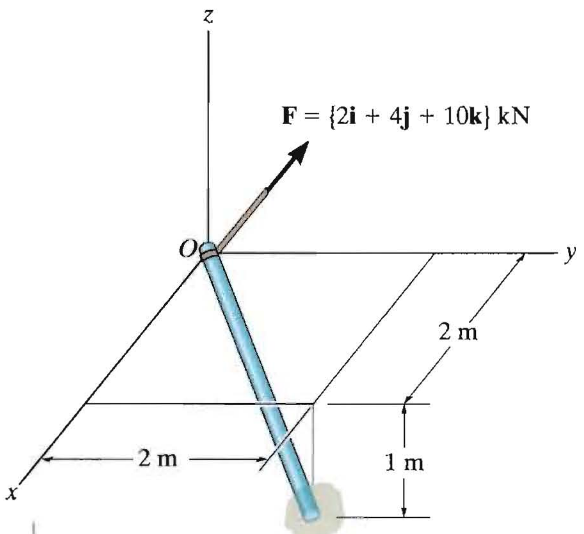
Solution

1. Determine the projection of the force **F** along the pole. *(5 points)*



Projection $F = \mathbf{F} \cdot \hat{u}$

$\hat{u}$ - unit vector along the pole

$$\hat{u} = \frac{\text{Pole}}{|\text{Pole}|} = \frac{2\hat{i} + 2\hat{j} - \hat{k}}{\sqrt{2^2 + 2^2 + (-1)^2}}$$

$$\hat{u} = \frac{2}{3}\hat{i} + \frac{2}{3}\hat{j} - \frac{1}{3}\hat{k}$$

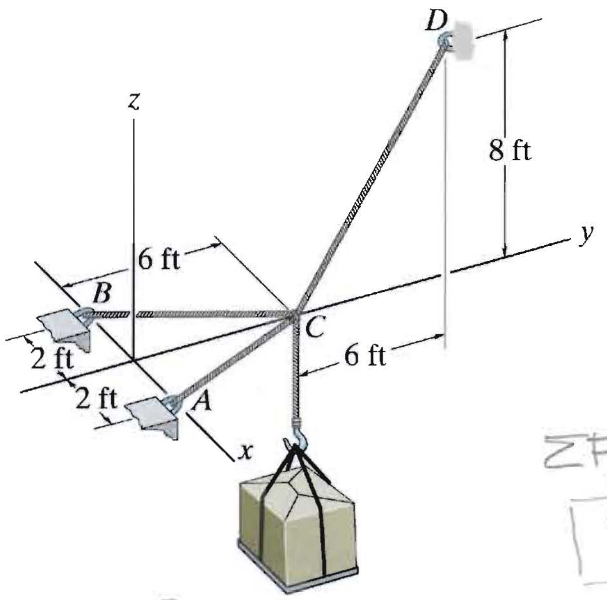
$$F = (2\hat{i} + 4\hat{j} + 10\hat{k}) \cdot \left(\frac{2}{3}\hat{i} + \frac{2}{3}\hat{j} - \frac{1}{3}\hat{k}\right)$$

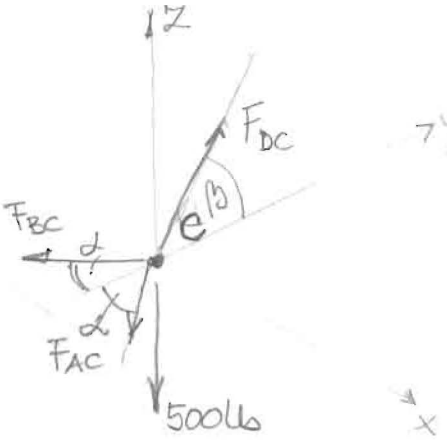
$$\boxed{F = 0.667 \text{ kN}}$$

magnitude of the projection of the force F along the pole

* Projection of the force F along the pole vector expression : $F_p = 0.667\,\hat{u}$

2. 500-lb load is supported by cables AC, BC and DC. Draw the FBD to find the forces in the cables. Write the equilibrium equations needed to determine the forces in the cables. Do not solve them. *(5 points)*





$$\sin\alpha = \frac{2}{\sqrt{2^2+6^2}} = \frac{2}{\sqrt{40}}$$

$$\cos\alpha = \frac{6}{\sqrt{40}}$$

$$\sin\beta = \frac{8}{\sqrt{8^2+6^2}} = \frac{8}{10}$$

$$\cos\beta = \frac{6}{10}$$

$\Sigma F_x = 0$

$$\boxed{F_{AC}\sin\alpha - F_{BC}\sin\alpha = 0}$$

$\Sigma F_y = 0$

$$\boxed{-F_{CA}\cos\alpha - F_{BC}\cos\alpha + F_{DC}\cos\beta = 0}$$

$\Sigma F_z = 0$

$$\boxed{-500 + F_{DC}\sin\beta = 0}$$

* When solved $F_{CD} = 625$ lb ; $F_{AC} = F_{BC} = 197.6$ lb