

A 160-kg load is supported by a rope and pulley system.

For an angle  $\alpha = 40^\circ$ , what force  $P$  is req'd. to maintain equilibrium?

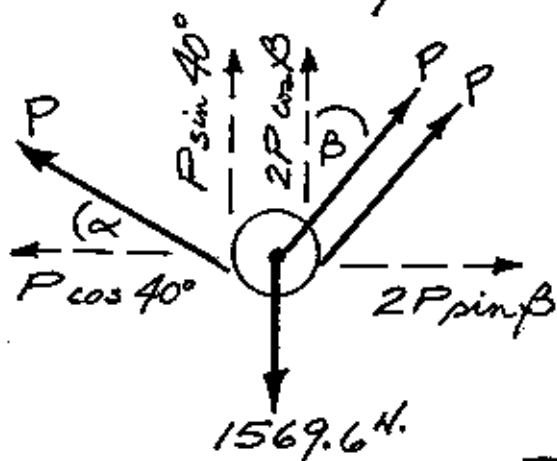
What position for  $\beta$ ?

[Assume frictionless pulleys]

$$W = mg = 160 \text{ kg} (9.81 \frac{\text{m}}{\text{s}^2}) = 1569.6 \text{ N.}$$

NOTE: Due to frictionless pulleys, the cable tension will be the same throughout the entire length of the rope.

F.B.D. Since the load is applied at A, consider all the forces acting at pt. A for equilibrium.



$$\sum F_x = 0 = -P \cos 40^\circ + 2P \sin \beta$$

$$.766 = 2 \sin \beta$$

$$\beta = \sin^{-1} \left[ \frac{.766}{2} \right] = 22.5^\circ$$

$$\sum F_y = 0 = P \sin 40^\circ + 2P \cos \beta - 1569.6$$

$$P \cdot 643 P + 1.848 P = 1569.6$$

$$2.491 P = 1569.6$$

$$P = 630.2 \text{ N}$$

$$\beta = 22.5^\circ$$