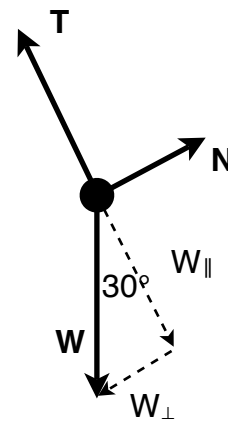


## Box on a slope

A box is held in position by a cable along a smooth slope, as shown. If  $\theta=60^\circ$  and  $m=50$  kg, find the tension in the cable and the normal force exerted by the slope.

**Solution:** Draw the free-body diagram:



Resolve the forces into directions along the slope and perpendicular to the slope.

$$W_{\perp} = W \sin 30^\circ = mg \times \sin 30^\circ = 9.8 \times 50 \times 0.5 = 245 \text{ N}$$

$$W_{\parallel} = W \cos 30^\circ = mg \times \cos 30^\circ = 9.8 \times 50 \times 0.866 = 424 \text{ N}$$

The box is stationary so the net force is zero.

(a) Along the slope: choose up to be positive

$$T - W_{\parallel} = 0$$

so

$$T = W_{\parallel} = 424 \text{ N}$$

(b) Perpendicular to the slope: choose away from the slope to be positive

$$N - W_{\perp} = 0$$

so

$$N = W_{\perp} = 245 \text{ N}$$