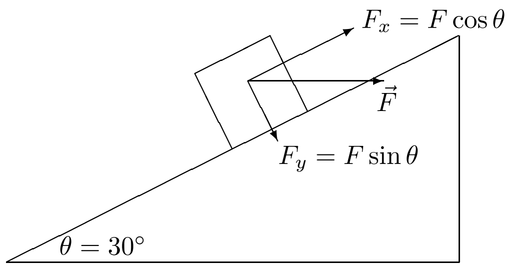
86. (Fourth problem in **Cluster 1**)

The coordinate system we wish to use is shown in Fig. 5-18 in the textbook, so we resolve this horizontal force into appropriate components.



(a) We apply Newton's second law to the x axis:

$$F_x - mg\sin\theta = ma$$

This yields $a = -1.44\,\text{m/s}^2$, which is interpreted as an acceleration of $1.44\,\text{m/s}^2$ downhill.

(b) Applying Newton's second law to the y axis (where there is no acceleration), we have

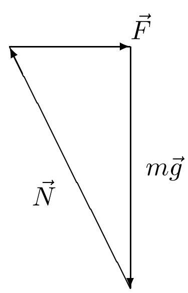
$$N - F_y - mg\cos\theta = 0 \ .$$

This yields the normal force $N = 105$ N.

(c) When we set $a = 0$ in the part (a) equation, we obtain

$$F\cos 30° = mg\sin 30° \ .$$

Therefore, $F = 56.6$ N. Alternatively, we can use a "vector triangle" approach, referred to in the previous problem solution. We form a closed triangle.



We note that the angle between the weight vector and the normal force is θ. Thus, we see $mg\tan\theta = F$, which gives $F = 56.6$ N.