

56. (a) The component of the weight along the incline (with downhill understood as the positive direction) is $mg \sin \theta$ where $m = 630$ kg and $\theta = 10.2^\circ$. With $f = 62.0$ N, Newton's second law leads to

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

which yields $a = 1.64$ m/s². Using Eq. 2-15, we have

$$80.0 \text{ m} = \left(6.20 \frac{\text{m}}{\text{s}}\right)t + \frac{1}{2} \left(1.64 \frac{\text{m}}{\text{s}^2}\right)t^2 .$$

This is solved using the quadratic formula. The positive root is $t = 6.80$ s.

- (b) Running through the calculation of part (a) with $f = 42.0$ N instead of $f = 62$ N results in $t = 6.76$ s.