

58. (a) Comparing the $t = 2.0$ s photo with the $t = 0$ photo, we see that the distance traveled by the box is

$$d = \sqrt{4.0^2 + 2.0^2} = 4.5 \text{ m} .$$

Thus (from Table 2-1, with *downhill* positive) $d = v_0 t + \frac{1}{2} a t^2$, we obtain $a = 2.2 \text{ m/s}^2$; note that the boxes are assumed to start from rest.

- (b) For the axis along the incline surface, we have

$$mg \sin \theta - f_k = ma .$$

We compute mass m from the weight $m = 240/9.8 = 24 \text{ kg}$, and θ is figured from the absolute value of the slope of the graph: $\theta = \tan^{-1} 2.5/5.0 = 27^\circ$. Therefore, we find $f_k = 53 \text{ N}$.