49. (a) The initial potential energy is

$$U_i = mgy_i = (520\,\text{kg})\left(9.8\,\text{m/s}^2\right)(300\,\text{m}) = 1.53 \times 10^6\ \text{J}$$

where $+y$ is upward and $y = 0$ at the bottom (so that $U_f = 0$).

(b) Since $f_k = \mu_k N = \mu_k mg\cos\theta$ we have

$$\Delta E_{\text{th}} = f_k d = \mu_k mgd\cos\theta$$

from Eq. 8-29. Now, the hillside surface (of length $d = 500$ m) is treated as an hypotenuse of a 3-4-5 triangle, so $\cos\theta = x/d$ where $x = 400$ m. Therefore,

$$\Delta E_{\text{th}} = \mu_k mgd\frac{x}{d} = \mu_k mgx = (0.25)(520)(9.8)(400) = 5.1 \times 10^5\ \text{J}\ .$$

(c) Using Eq. 8-31 (with $W = 0$) we find

$$\begin{aligned} K_f &= K_i + U_i - U_f - \Delta E_{\text{th}} \\ &= 0 + 1.53 \times 10^6 - 0 - 5.1 \times 10^5 \\ &= 0 + 1.02 \times 10^6\ \text{J}\ . \end{aligned}$$

(d) From $K_f = \frac{1}{2}mv^2$ we obtain $v = 62.6$ m/s.