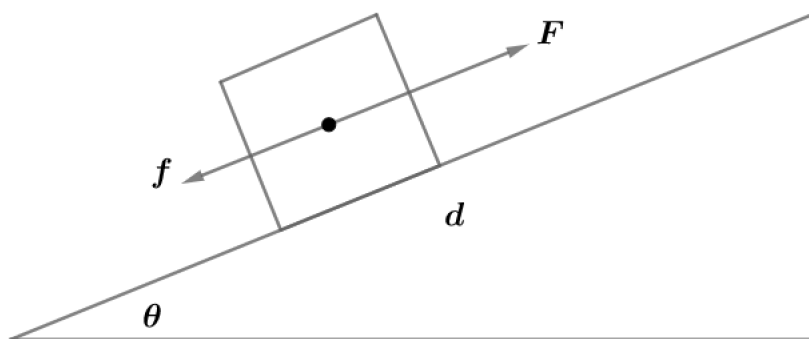# 2018A F=ma Exam: Problem 6

Kevin S. Huang

We can use conservation of energy. The work done by the applied force goes into increasing the mechanical energy of the crate as well as dissipation by the friction force.

$$W = U + K + E_d$$

$$Fd = mgd\sin\theta + \frac{1}{2}mv^2 + fd$$

Thus,

$$(F - f - mg\sin\theta)d = \frac{1}{2}mv^2$$

$$v = \sqrt{\frac{2(F - f - mg\sin\theta)d}{m}} = \sqrt{\frac{2(1000 - 400 - (115)(10)(\sin 20°))(5)}{115}} = 4.24\,\mathrm{m/s}$$

so the answer is $\boxed{A}$.