77. (a) In 10 min the cart moves

$$d = \left(6.0\ \frac{\text{mi}}{\text{h}}\right)\left(\frac{5280\ \text{ft/mi}}{60\ \text{min/h}}\right)(10\ \text{min}) = 5280\ \text{ft}$$

so that Eq. 7-7 yields

$$W = F\,d\cos\phi = (40\ \text{lb})\,(5280\ \text{ft})\cos 30^\circ = 1.8 \times 10^5\ \text{ft}\cdot\text{lb}.$$

(b) The average power is given by Eq. 7-42, and the conversion to horsepower (hp) can be found on the inside back cover. We note that 10 min is equivalent to 600 s.

$$P_{\text{avg}} = \frac{1.8 \times 10^5\ \text{ft}\cdot\text{lb}}{600\ \text{s}} = 305\ \text{ft}\cdot\text{lb/s}$$

which (upon dividing by 550) converts to $P_{\text{avg}} = 0.55$ hp.