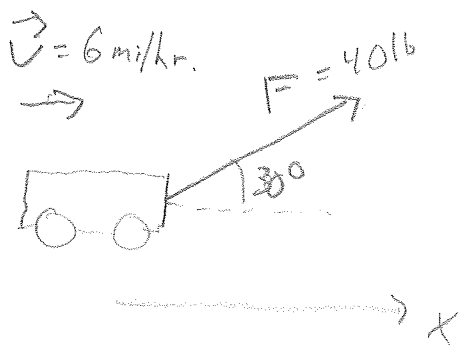
7-55



a) How much work does the force do over 10 min?

$W = \vec{F} \cdot \vec{d}$

$\vec{d} = 10\,\text{min} \cdot 6\,\text{mi/hr} = 10\,\text{min} \cdot \frac{1\,\text{hr}}{60\,\text{min}} \cdot 6\,\text{mi/hr} = 1\,\text{mile} = 5280\,\text{ft.}$

$(v_0 \cdot t)$

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

or $1\,\text{ft} \cdot \text{lb} = 1.356\,\text{J}$, so $= 2.4 \times 10^5\ \text{J}$

b) What's the average power expended to do this?

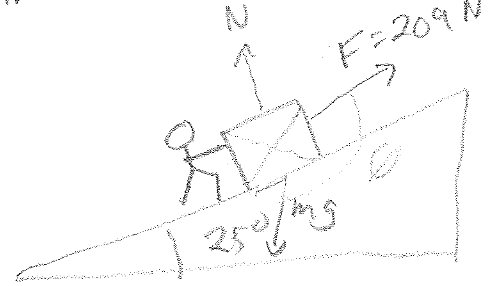
$P = W/\Delta t = \frac{1.8 \times 10^5\ \text{ft lbs}}{600\,\text{s}} = 305\ \text{ft lb/s}$

$1\,\text{hp} = 550\ \text{ft lb/s}$ so $P = 0.55\ \text{hp}$

7-63 | Push box up frictionless incline, $F = 209\ N$

$m = 25.0\ kg$

After crate slides 1.50 m,



a) how much work done by guy pushing?

$W = \vec{F} \cdot \vec{d}$

$\vec{F}, \vec{d}$ in same direction (up slope), so $W = \vec{F} \cdot \vec{d} = Fd\cos 0$

$W = 209\ N \cdot 1.50\ m = 314\ J$

b) work done by gravity?

again $W = \vec{F} \cdot \vec{d}$, here the angle between $m\vec{g}$ and $\vec{F}$

is $\theta = 90° + 25° = 115$

so $W = |\vec{F}||\vec{d}|\cos 115 = (25.0\ kg)(9.8\ m/s^2)(1.50\ m)\cos 115$

$= -155\ J$

"–" sign means gravity isn't doing work, but is taking work from elsewhere + storing it up.

c) Normal force?

$\vec{N}$ is $\perp$ to $\vec{d}$, so $\cos 90° = 0$, $W = 0$

d) Total work? Sum up work done by all forces,

$W_{TOT} = (314 - 155 + 0)\ J = 158\ J$

Speed at this point? $K = W = 158\ J$, $K = \frac{1}{2}mv^2$, $v = \sqrt{\frac{2K}{m}} = 3.56\ m/s$