Notes

Power the rate at which work is done / energy is transferred

$$P = \frac{W}{\Delta t} = \frac{FD}{\Delta t} = Fv$$

($\frac{D}{\Delta t}$ → speed)

S.I. units: Watts W

$$1\,W = 1\,\frac{J}{s} = 1\,N \cdot \frac{m}{s}$$

horsepower (hp)

$$1\,hp = 745.7\,W$$

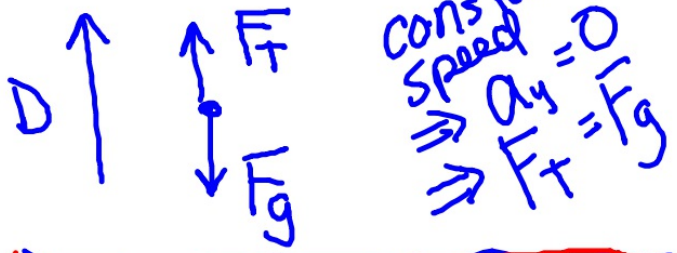
(1)

$m = 60\,kg$

$D = 9.42\,m$

$\Delta t = 5.10\,s$

$\mathbb{P}$ = rate at which work is done by rope



$\Sigma F_y = ma_y$ $0\ \frac{m}{s^2}$

$F_T - F_g = 0$

$F_T = F_g$

don't need to show

$$\mathbb{P} = \frac{W_T}{\Delta t} = \frac{F_T D}{\Delta t}$$

$$\mathbb{P} = \frac{(mg)D}{\Delta t}$$

$$\mathbb{P} = \frac{(60\,kg)(9.8\,\frac{m}{s^2})(9.42\,m)}{5.10\,s}$$

$$\mathbb{P} = 1,086\,W$$

(2)

Assume Constant Velocity

$F_N = F_g = mg$

Harry: $P = \frac{W}{\Delta t}$

$= \frac{F_N D}{\Delta t}$

$= \frac{mgD}{\Delta t}$

$= \frac{(100kg)(9.8\frac{m}{s^2})(2.5m)}{3.13s}$

$\approx 783\,W$

Bob:

$= 511\,W$

(3)

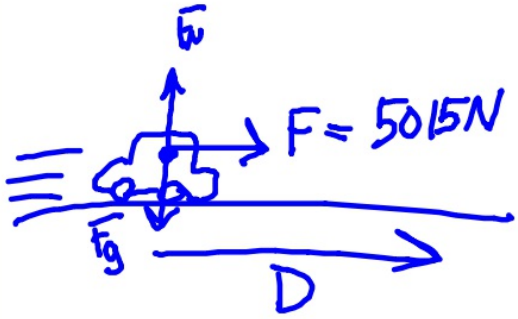
$m = 1000\ kg$

$V_i = 0 \frac{m}{s}$

$V_f = 30 \frac{m}{s}$

Assume car accelerates from rest

$F = 5015\ N$



$W = K_f - K_i$

$W = \frac{1}{2}(1000kg)(30\frac{m}{s})^2 - 0$

$W = 450{,}000\ J$

$W = FD$

$450{,}000\ J = (5015\ N)D$

$\boxed{D = 89.7\ m}$