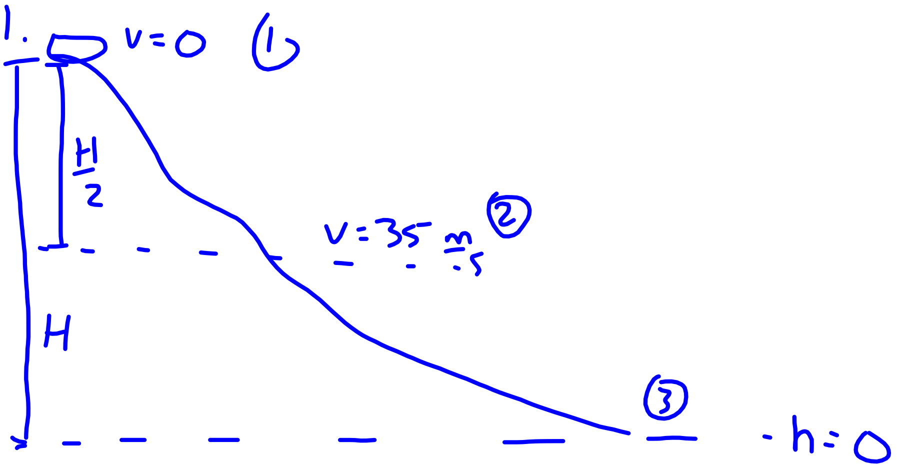
1.



a) $E_1 = E_2$

$\cancel{m}gh_1 + 0 = \cancel{m}gh_2 + \frac{1}{2}\cancel{m}v_2^2$

$(9.8)H = (9.8)\left(\frac{H}{2}\right) + \frac{1}{2}(35)^2$

$4.9H = 612.5$

$H = 125\text{ m}$

b) $E_1 = E_3$ (or $E_2 = E_3$)

$0 + \cancel{m}gh_1 = \frac{1}{2}\cancel{m}v_3^2 + 0$

$(9.8)(125) = \frac{1}{2}v_3^2$

$v_3 = 49.5\ \frac{m}{s}$

2. $P = \frac{\Delta E}{t}$

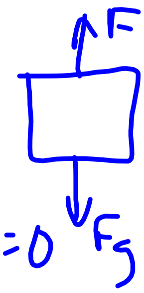
$= \frac{W}{t}$

$= \frac{Fd}{t}$

$= F\left(\frac{d}{t}\right)$

$= FV$

3. Using formula derived in #2...



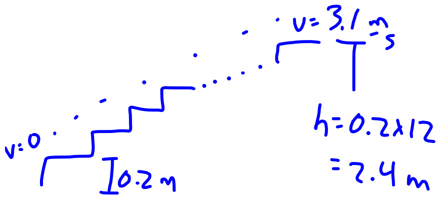
If $\vec{v}$ is constant, then $\vec{a} = 0$, so $F_{NET} = 0$

$\therefore F = mg$

$P = Fv$

$v = \frac{P}{F} = \frac{950}{(613)(9.8)}$

$= 0.16\ \frac{m}{s}$



$\Delta E_{out} = \Delta E_k + \Delta E_g$
$= (E_{k_f} - E_{k_i}) + (E_{g_f} - E_{g_i})$
$= (\frac{1}{2} m v_f^2) + (m g h_f)$
$= \frac{1}{2}(65)(3.1)^2 + (65)(9.8)(2.4)$
$= 312.3 + 1528.8$
$= 1841\ J$

$Eff = \frac{E_{out}}{E_{in}}$

$0.25 = \frac{1841}{E_{in}}$

$E_{in} = 7364\ J$

$P_{in} = \frac{E_{in}}{t}$
$= \frac{7364}{2.8}$
$\boxed{P = 2630\ W}$

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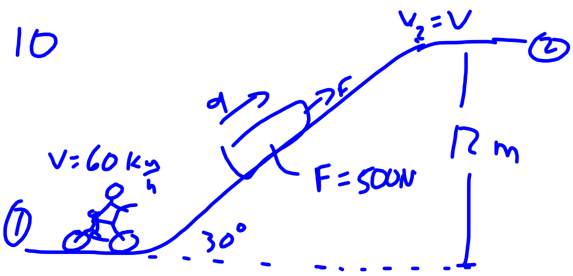
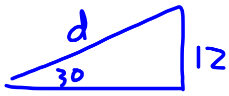




$\sin 30 = \frac{12}{d}$

$\therefore d = 24\ m$

$V_1 = 16.7\ \frac{m}{s}$

$E_f = mgh_2 + \frac{1}{2} m v_2^2$
$= (92)(9.8)(12) + \frac{1}{2}(92)v^2$
$= 10819 + 46 v^2$

$E_i = mgh_1 + \frac{1}{2} m v_1^2$
$= 0 + \frac{1}{2}(92)(16.7)^2$
$= 768.2$

$\therefore W = \Delta E$

$\therefore Fd = E_f - E_i$

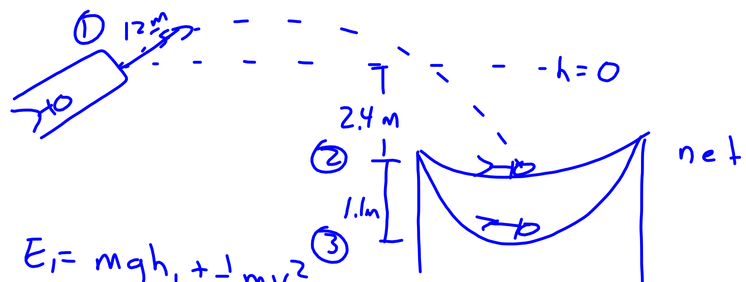
$(500)(24) = (10819 + 46v^2) - 768$

$12000 - 10819 + 768 = 46v^2$

$1949 = 46v^2$

$v^2 = 42.4$

$\boxed{v = 6.5\ \frac{m}{s}}$



$E_1 = mgh_1 + \frac{1}{2}mv_1^2$

$= 0 + \frac{1}{2}(60)(12)^2$

$= 4320\ J$

According to the law of cons. of mech. energy,

$E_1 = E_2 = 4320\ J$

(but $E_3 \neq 4320\ J$ since work is done)

$\therefore W = \Delta E$

$\therefore \vec{F}\cdot\vec{d} = E_3 - E_2$

$-Fd = (mgh_3 + \frac{1}{2}mv_3^2) - (4320)$

since $F\uparrow$ and $d\downarrow$

$v=0$!

$h_3 = -1.1 + (-2.4)$

$= -3.5\ m$

$\cancel{-}F(1.1) = (60)(9.8)(+3.5) + 4320 \quad \times -1$

$1.1F = 2058 + 4320$

$F = 5800\ N$