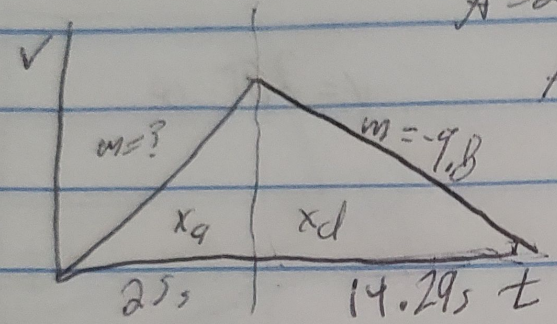
# PHYS 407

1.




$A = 20{,}000\ m$

$A = \frac{25v}{2} + \frac{-9.8v}{2}$

$x_a = \frac{25v}{2}$

$vt$ $\quad t = (-9.8v)$

$20{,}000 = \frac{25v}{2} +$ [illegible]

$20{,}000 = \frac{25v}{2} + v(9.8v)$

$\frac{1}{2} \cdot v \cdot \frac{v}{9.8}$

$20{,}000 = \frac{25v}{2} - 9.8v - v^2$

$2.7v - v^2$ $\quad v(2.7 - v) = 20{,}000$

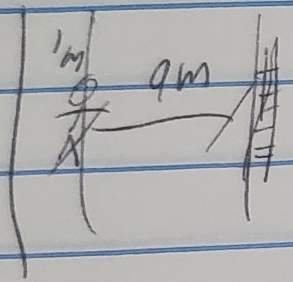
$v = 140$

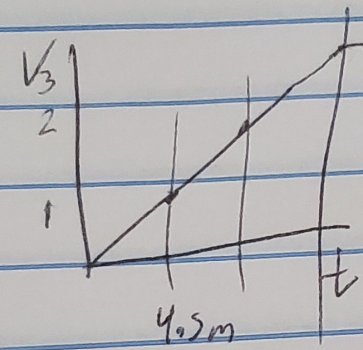
$20{,}000 = \frac{25}{2}v + \frac{1}{19.6}v^2$ $\quad v = 515.47$

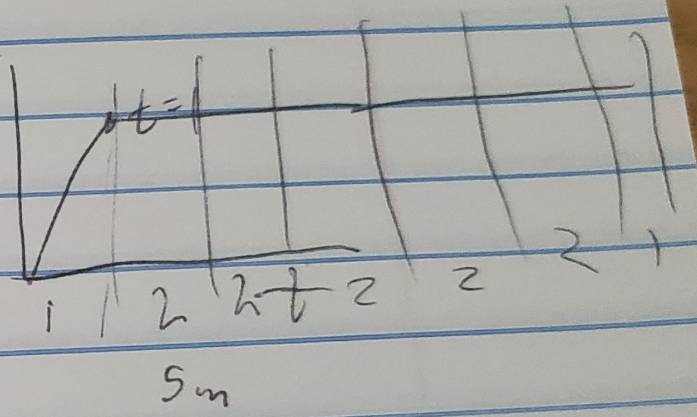
**20.62 m/s**

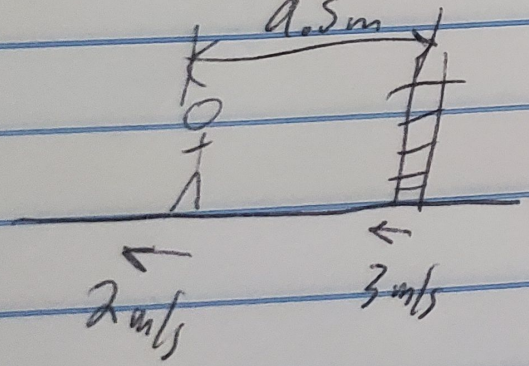
# PHYS 407

100.



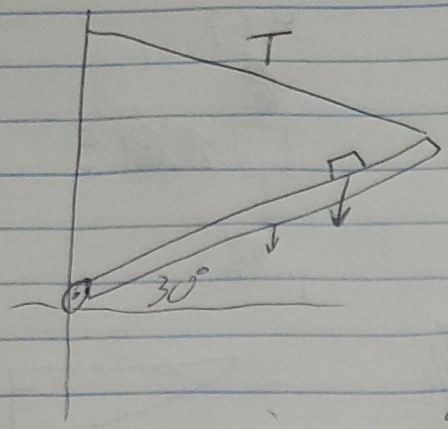




9.5 seconds

17m

PHYS 907

4.




$m_b = 15{,}000\ kg$

$m_c = 8{,}000\ kg$

$\tau = \tau_B + \tau_C - \tau_T = 0$

$\tau_b = m_b g \cdot 20$

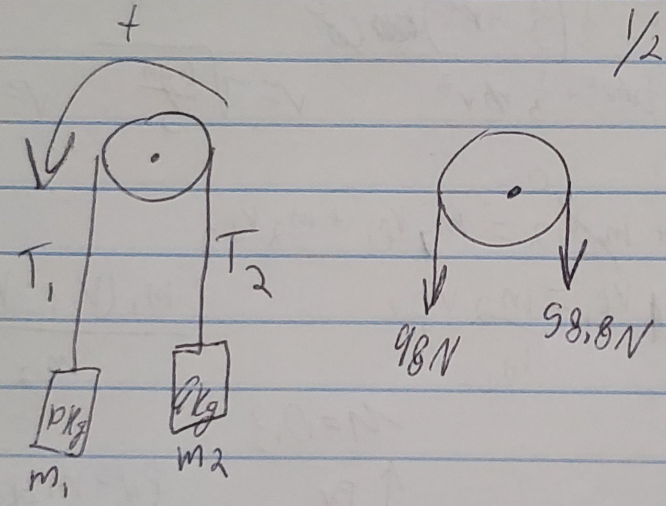
$\tau_c = m_c g \cdot 30$

$\tau_T = \tau_b + \tau_c$ $\quad 5{,}292{,}000\ Nm$

$132{,}300\ N$

$T = 140{,}790.72\ N$

7.




$\frac{1}{2} mr^2$

$m_p = 8\ kg$

$r = 0.2\ m$

$\tau = I\alpha$

$T_2 - T_1 = \frac{1}{2} m_p a$

$58.8 - m_2 g - m_1 a - 98 = \frac{1}{2} m_p a$

$58.8 - 98 = a\left(\frac{1}{2} m_p + m_2 + m_1\right)$

$58.8 - 98 = \frac{1}{2} m_p a + m_2 a + m_1 a$

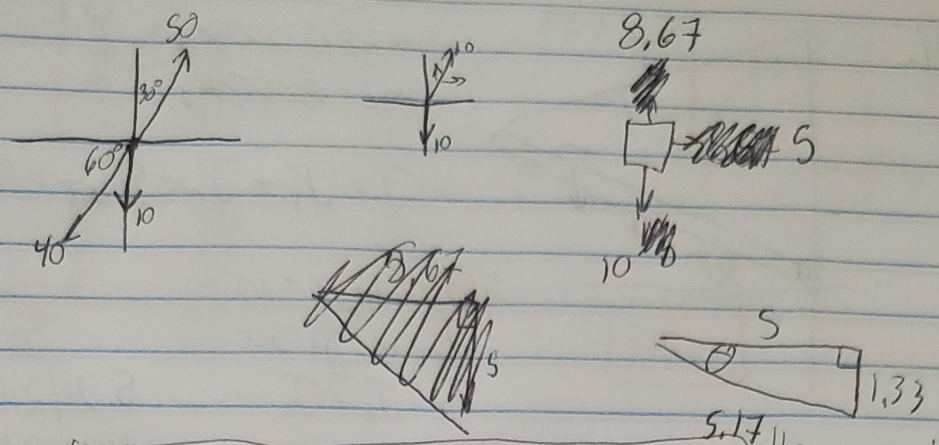
$\frac{58.8 - 98}{\frac{1}{2} m_p + m_2 + m_1} = a$

$a = -1.96$

$t = 0.71\ s$

# PHYS 407

2.




5.17 lbs $\theta = 14.9°$

5.17 lbs at 14.9° south of east

3.

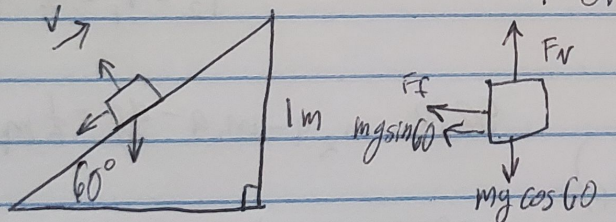
$m_b = 8\,kg$ $m_s = 15\,kg$

$mgh = \frac{1}{2}mv^2 + \frac{1}{2}\left(\frac{2}{3}mr^2\right)\frac{v^2}{r^2}$

$mgh = \frac{1}{2}mv^2 + \frac{1}{3}mv^2$ $v = \sqrt{\frac{6gh}{5}}$ $v = 9.7\ m/s$

$m_1 v_{i1} + m_2 v_{i2} = m_1 v_{f1} + m_2 v_{f2}$

$\frac{m_1 v_{i1} - m_1 v_{f1}}{m_2} = \frac{m_2 v_{f2}}{m_2}$ $\frac{m_1(v_{i1} - v_{f1})}{m_2} = v_{f2} = 2.51\ m/s$




$\mu = 0.3$

$F_N = mg\cos 60$

$F_f = \mu mg\sin 60 = ma$

$38.19\,N \quad 2.55\ m/s^2$

$38.19 \cdot 1.15 = 43.92$

$W_{NC} + mgh_i + \frac{1}{2}mv_i^2 = mgh_f + \frac{1}{2}mv_f^2$

$W_{NC} + \frac{1}{2}mv_i^2 - mgh_f = \frac{1}{2}mv_f^2$

$\frac{2\left(W_{NC} + \frac{1}{2}mv_i^2 - mgh_f\right)}{m} = v_f^2$

$1.27s$

$1.15 = \frac{1}{2}(2.55)t^2 + 2.51t$

$y_f = -4.9t^2 + v_i \sin 60\, t + 4$

$v_i = 0.52\ m/s$

$t = 0.95\,s$

$x_f = v_i \cos 60\, t$

$x_f = 0.247\,m$