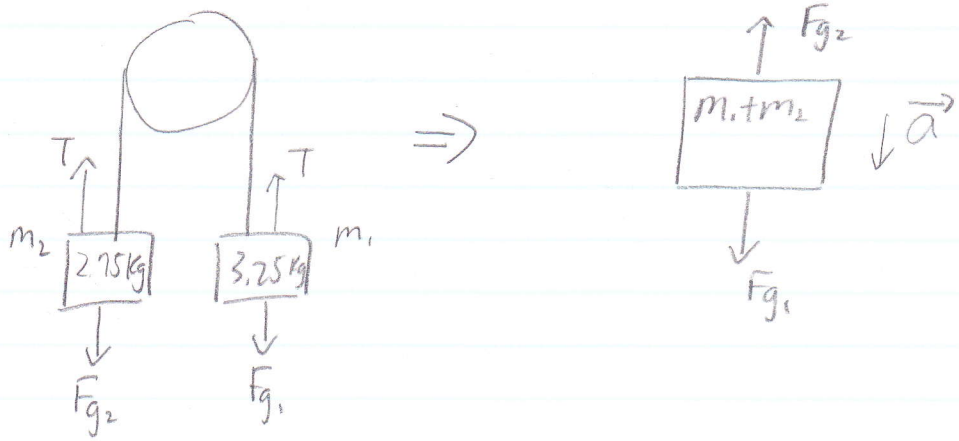
Pulleys Worksheet Solutions

1.



The heavier mass will hit the floor (m_1)

$F_{net} = m\vec{a}$

$-F_{g_1} + F_{g_2} = (m_1+m_2)\vec{a}$

$-(3.25\ kg)(9.81\ m/s^2) + (2.75\ kg)(9.81\ m/s^2) = (6\ kg)\vec{a}$

$\vec{a} = -0.8175\ m/s^2$

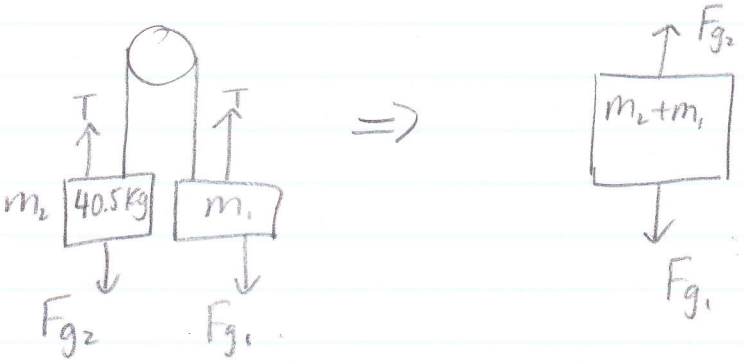
$V_i = 0\ m/s$, $d = -1.50\ m$ (because mass falls down)

$d = V_i t + \frac{1}{2}at^2$

$-1.50\ m = 0 + \frac{1}{2}(-0.8175\ m/s^2)t^2$

$t = 1.92\ s$

2.



$F_{net} = m\vec{a}$

$-F_{g_1} + F_{g_2} = (m_2+m_1)\vec{a}$

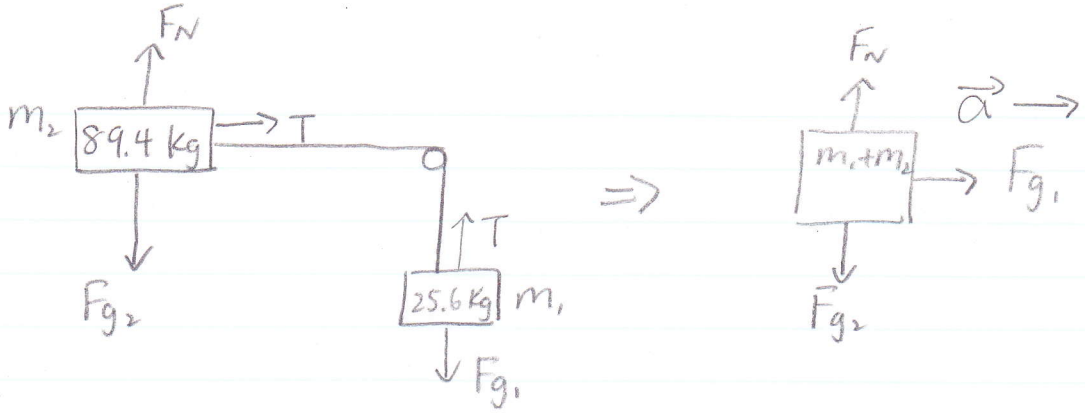
$-m_1(9.81\ m/s^2) + (40.5\ kg)(9.81\ m/s^2) = (40.5\ kg + m_1)(-2.40\ m/s^2)$

$-(9.81\ m/s^2)m_1 + (2.40\ m/s^2)m_1 = -97.2\ N - 397.305\ N$

$-(7.41\ m/s^2)m_1 = -494.505\ N$

$m_1 = 66.7\ kg$

3.



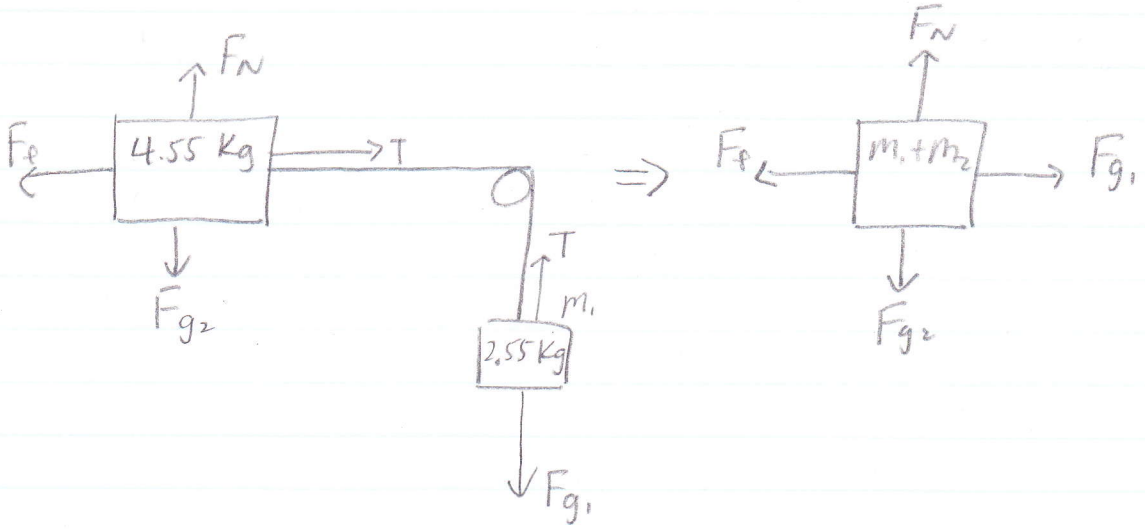
$F_{net} = m\vec{a}$

$F_{g_1} = (m_1+m_2)\vec{a}$

$(25.6\ kg)(9.81\ m/s^2) = (89.4\ kg + 25.6\ kg)\vec{a}$

$\vec{a} = 2.18\ m/s^2$

4.



$F_{net} = 0\ N$, so $F_N = F_{g_2}$, $F_f = F_{g_1}$ in magnitude.

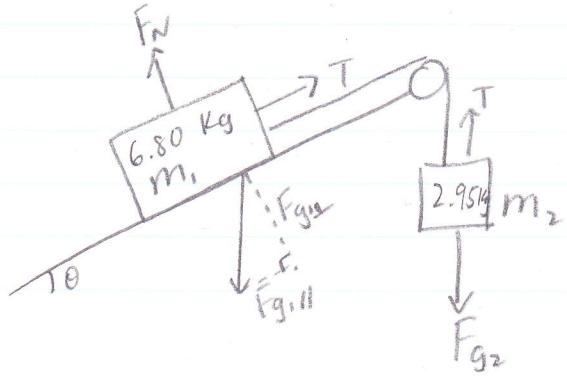
$F_f = \mu F_N \Rightarrow \quad F_{g_1} = \mu F_{g_2}$

$m_1 g = \mu m_2 g$

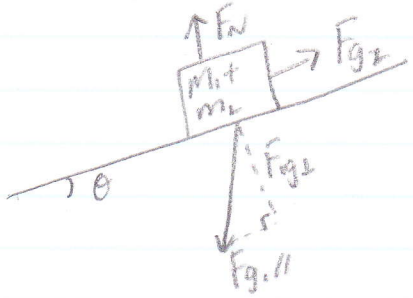
$(2.55\ kg) = \mu(4.55\ kg)$

$\mu = 0.549$

5.



Not moving, so $\vec{a} = 0\ m/s^2$ and $F_{net} = 0N$



So $F_{g,//} = F_{g2}$ in magnitude

$F_{g,//} = F_{g1} \sin\theta = m_1 g \sin\theta$

$m_1 g \sin\theta = m_2 g$

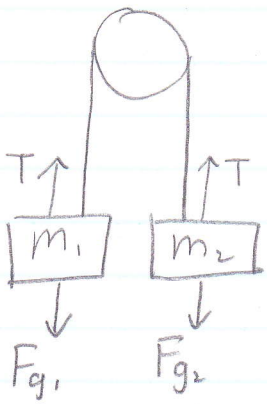
$m_1 \sin\theta = m_2$

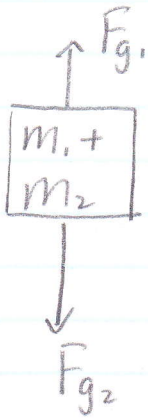
$(6.80\ kg) \sin\theta = 2.95\ kg$

$\sin\theta = 0.4338$

$\theta = 25.7°$

6.





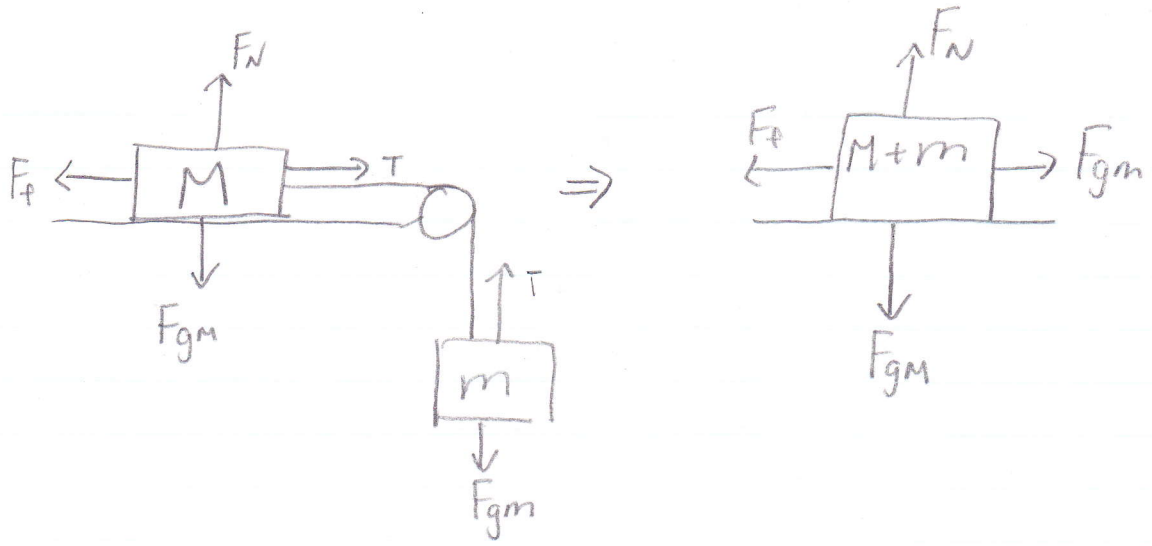
$F_{net} = m\vec{a}$

$F_{g2} - F_{g1} = (m_1 + m_2)\vec{a}$

$m_2 g - m_1 g = (m_1 + m_2)\vec{a}$

$\frac{g(m_2 - m_1)}{m_1 + m_2} = \vec{a}$

7.



No movement, so $F_{net} = 0$ N
So $F_f = F_{gm}$ and $F_N = F_{gM}$ in magnitude.

$$F_f = \mu F_N \Rightarrow F_{gm} = \mu F_{gM}$$

$$\mu = \frac{F_{gm}}{F_{gM}} = \frac{mg}{Mg}$$

So $\mu = \frac{m}{M}$