Textbook Solutions

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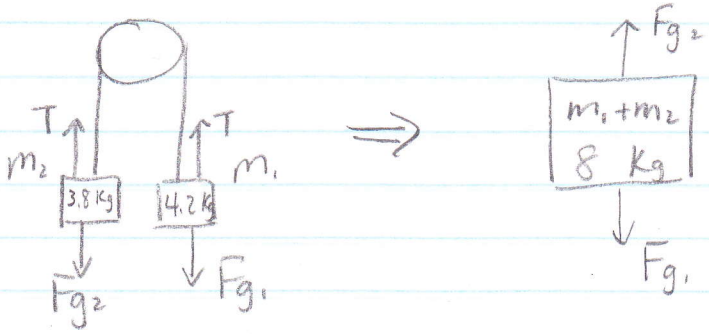
19.



$F_{net} = m\vec{a} \Rightarrow F_{g_1} + F_{g_2} = (8\ kg)\vec{a}$

$(4.2\ kg)(9.81\ m/s^2) - (3.8\ kg)(9.81\ m/s^2) = (8\ kg)\vec{a}$

$3.924\ N = (8\ kg)\vec{a}$

$\vec{a} = 0.4905\ m/s^2 = 0.49\ m/s^2$ down

For tension, I picked m_1:

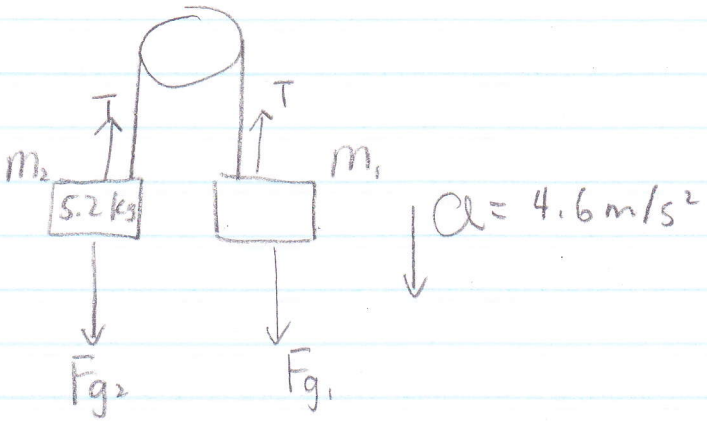
$F_{net} = m\vec{a} \Rightarrow -F_{g_1} + T = m_1\vec{a}$

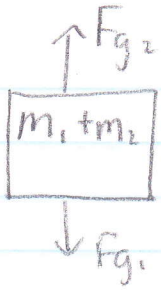
$-(4.2\ kg)(9.81\ m/s^2) + T = (4.2\ kg)(-0.4905\ m/s^2)$

$T = 39.1419\ N$

$T = 39\ N$ up.

20.





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

$-m_1(9.81\ m/s^2) + (5.2\ kg)(9.81\ m/s^2) = (m_1 + 5.2\ kg)(-4.6\ m/s^2)$

$51.012\ N - 9.81\ m_1 = -4.6\ m_1 - 23.92\ N$

$74.932\ N = 5.21\ m_1$

$14.38\ kg = m_1$

$14\ kg = m_1$

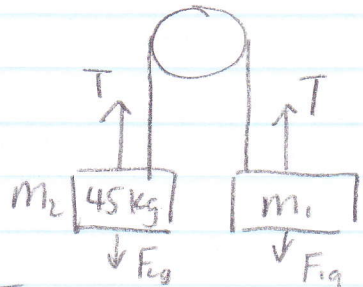
$-F_{g_1} + T = m_1\vec{a}$

$-(14.38\ kg)(9.81\ m/s^2) + T = (14.38\ kg)(-4.6\ m/s^2)$

$T = 74.932\ N$

$T = 75\ N$

21.



$T = 512\ N$

For $\vec{a}$: $-F_{2g} + T = m_2 a$

$-(45\ kg)(9.81\ m/s^2) + 512\ N = (45\ kg)\vec{a}$

$\vec{a} = 1.57\ m/s^2$ up

$\vec{a} = 1.6\ m/s^2$ up

For m_1: $-F_{1g} + T = m_1 a$

$-(m_1)(9.81\ m/s^2) + 512\ N = m_1(1.57\ m/s^2)$

$m_1 = 62\ kg$

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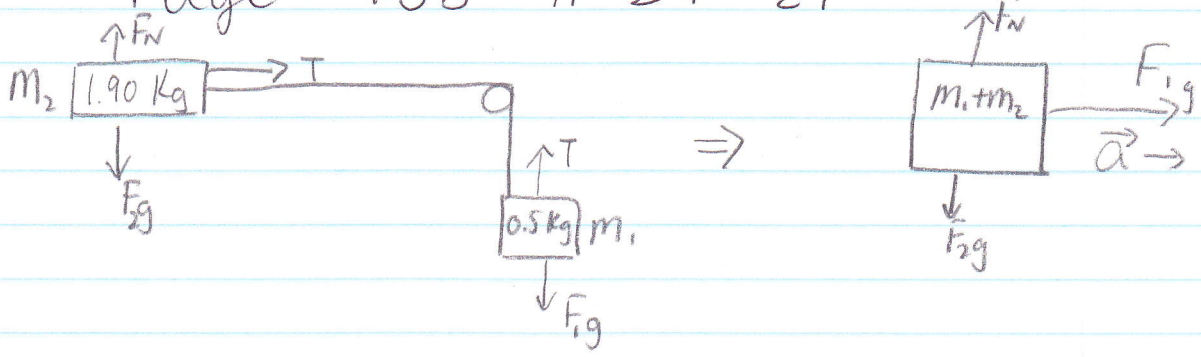
24.



(b) $F_{2g} + F_N = 0\ N$, so $F_{net} = m\vec{a} = F_{1g} = (m_1+m_2)\vec{a}$

$F_{1g} = (m_1+m_2)\vec{a}$

$(0.5\ kg)(9.81\ m/s^2) = (1.90\ kg + 0.5\ kg)\vec{a}$

$\vec{a} = 2.04\ m/s^2$

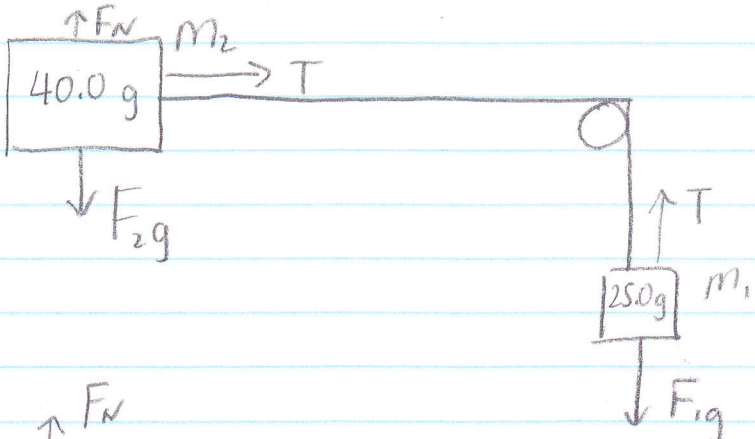
(a) $-F_{1g} + T = m_1\vec{a}$

$-(0.5\ kg)(9.81\ m/s^2) + T = (0.5\ kg)(-2.04\ m/s^2)$

$T = 3.885\ N$

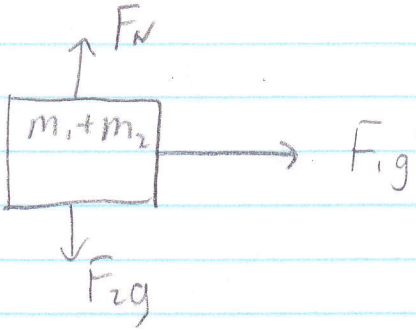
$T = 3.89\ N$

25.



$d = 0.85\ m$

$V_i = 0\ m/s$



$F_N = -F_{2g}$, So $F_{net} = ma \Rightarrow F_{1g} = (m_1 + m_2)a$

$(0.025\ kg)(9.81\ m/s^2) = (0.025\ kg + 0.040\ kg)\vec{a}$

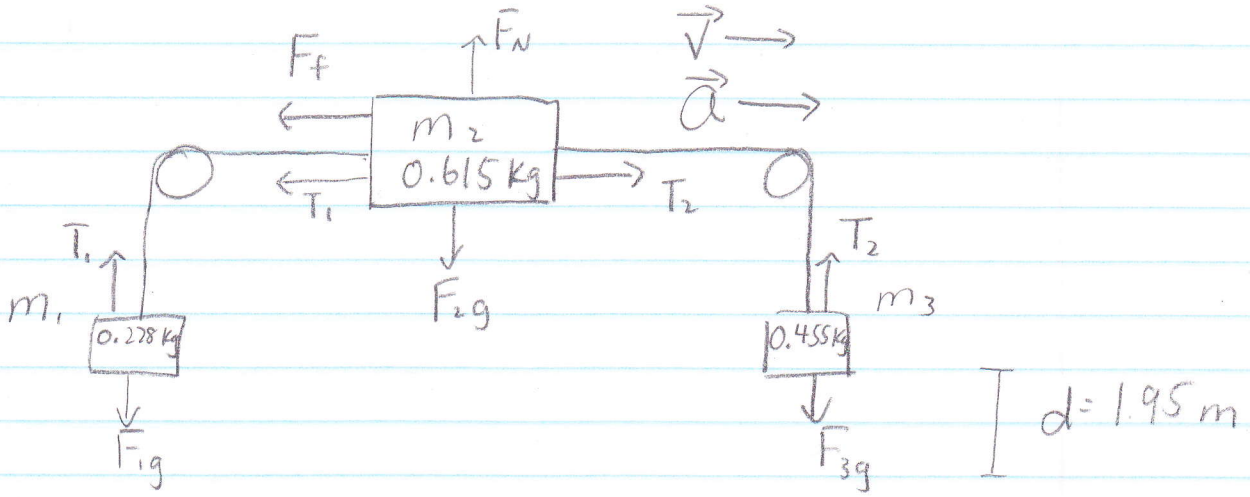
$\vec{a} = 3.773\ m/s^2$

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

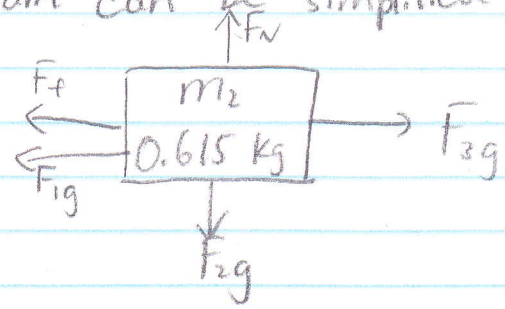
$0.85\ m = 0 + \frac{1}{2}(3.773\ m/s^2)t^2$

$t = 0.67\ s$

26.



This diagram can be simplified to:



$F_N + F_{2g} = 0N$

$F_f = \mu F_N$

$F_f = \mu F_{2g}$

$F_f = \mu m_2 g$

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

$F_{3g} - F_f - F_{1g} = (m_1 + m_2 + m_3)\vec{a}$

$m_3 g - \mu m_2 g - m_1 g = (m_1 + m_2 + m_3)\vec{a}$

$g(m_3 - \mu m_2 - m_1) = (m_1 + m_2 + m_3)\vec{a}$

$(9.81\ m/s^2)[0.455\ kg - (0.260)(0.615\ kg) - 0.228\ kg] = (1.298\ kg)\vec{a}$

$0.658251\ N = (1.298\ m/s^2)\vec{a}$

$\vec{a} = 0.507\ m/s^2$

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

$1.95\ m = 0 + \frac{1}{2} (0.507\ m/s^2) t^2$

$t = 2.77\ s$