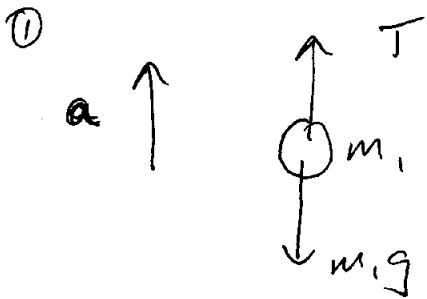
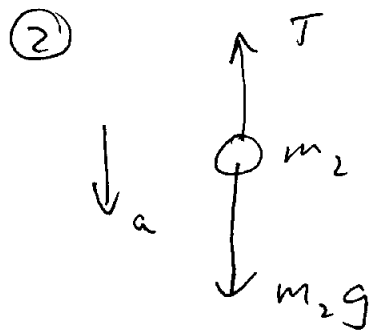


PROBLEM 4-38

FIRST, DRAW FREE-BODY DIAGRAMS  $m_2 > m_1$



3 kg mass,  $m_1$



5 kg, mass,  $m_2$

FROM ①:  $m_1 a = T - m_1 g$       FROM ②  $m_2 a = m_2 g - T$

SOLVE ① FOR  $T$ :  $T = m_1 (a + g)$

SUBSTITUTE INTO ②  $m_2 a = m_2 g - m_1 (a + g)$

$$m_2 a = m_2 g - m_1 a - m_1 g$$

$$(m_2 + m_1) a = (m_2 - m_1) g$$

$$\Rightarrow a = \left( \frac{m_2 - m_1}{m_2 + m_1} \right) g = \left( \frac{5 \text{ kg} - 3 \text{ kg}}{5 \text{ kg} + 3 \text{ kg}} \right) (9.8 \text{ m/s}^2)$$

⑥  $a = 2.45 \text{ m/s}^2$

FIND  $T$ :  $T = m_1 (a + g) = (3 \text{ kg}) (2.45 \text{ m/s}^2 + 9.8 \text{ m/s}^2)$

(a)  $T = 36.75 \text{ N}$

(c)  $\Delta y = \frac{1}{2} a t^2 = \frac{1}{2} (2.45 \text{ m/s}^2) (1 \text{ s})^2 = 1.225 \text{ m}$