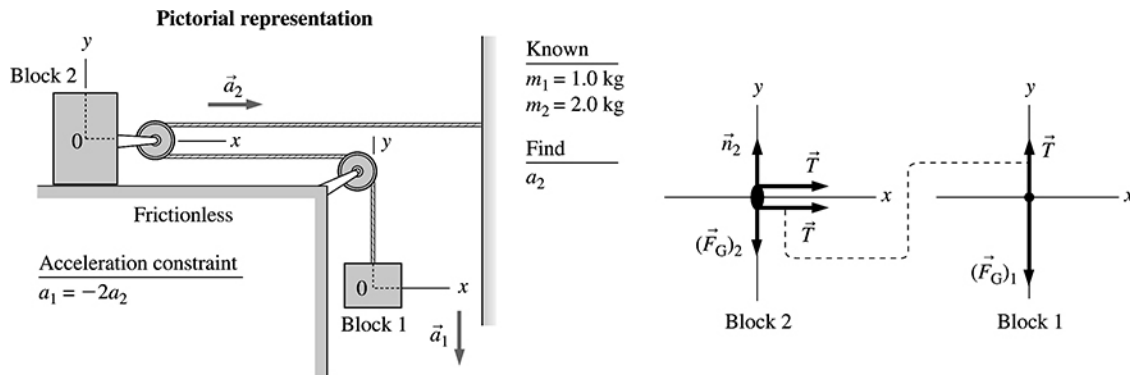


**7.52. Model:** Use the particle model for the two blocks. Assume a massless rope and massless, frictionless pulleys.

**Visualize:**



For every one meter that the 1.0-kg block goes down, each rope on the 2.0-kg block will be shortened by one-half meter. Thus the acceleration constraint is  $a_1 = -2a_2$ .

**Solve:** Newton's second law for the two blocks is

$$2T = m_2 a_2 \quad T - (F_G)_1 = m_1 a_1$$

Since  $a_1 = -2a_2$ , the above equations become

$$2T = m_2 a_2 \quad T - m_1 g = m_1 (-2a_2)$$

$$\Rightarrow m_2 \frac{a_2}{2} + m_1 (2a_2) = m_1 g \Rightarrow a_2 = \frac{2m_1 g}{m_2 + 4m_1} = \frac{2(1.0 \text{ kg})(9.8 \text{ m/s}^2)}{(2.0 \text{ kg} + 4.0 \text{ kg})} = 3.3 \text{ m/s}^2$$

**Assess:** If  $m_1 = 0 \text{ kg}$ , then  $a_2 = 0 \text{ m/s}^2$ , which is expected.