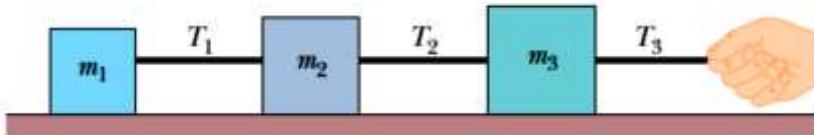




Q.1: In Figure three connected blocks are pulled to the right on a horizontal frictionless table by a force of magnitude $T_3 = 65.0 \text{ N}$. If $m_1 = 12.0 \text{ kg}$, $m_2 = 24.0 \text{ kg}$, and $m_3 = 31.0 \text{ kg}$, calculate (a) the magnitude of the system's acceleration, (b) the tension T_1 , and (c) the tension T_2 . (10M)



Solution:

53. We apply Newton's second law first to the three blocks as a single system and then to the individual blocks. The $+x$ direction is to the right in Fig. 5-48.

(a) With $m_{\text{sys}} = m_1 + m_2 + m_3 = 67.0 \text{ kg}$, we apply Eq. 5-2 to the x motion of the system, in which case, there is only one force $\vec{T}_3 = +\vec{T}_3 \hat{i}$. Therefore,

$$T_3 = m_{\text{sys}} a \Rightarrow 65.0 \text{ N} = (67.0 \text{ kg})a$$

which yields $a = 0.970 \text{ m/s}^2$ for the system (and for each of the blocks individually).

(b) Applying Eq. 5-2 to block 1, we find

$$T_1 = m_1 a = (12.0 \text{ kg})(0.970 \text{ m/s}^2) = 11.6 \text{ N}.$$

(c) In order to find T_2 , we can either analyze the forces on block 3 or we can treat blocks 1 and 2 as a system and examine its forces. We choose the latter.

$$T_2 = (m_1 + m_2) a = (12.0 \text{ kg} + 24.0 \text{ kg})(0.970 \text{ m/s}^2) = 34.9 \text{ N}.$$