Single Body Analysis #5

$$T_{1,2} - m_1 g = m_1 a$$

$$T_{2,3} - T_{1,2} = m_2 a$$

$$T_{3,4} - T_{2,3} = m_3 a$$

$$m_4 g - T_{3,4} = m_4 a$$

$$\boxed{m_4 g - m_1 g = m_1 a + m_2 a + m_3 a + m_4 a}$$

$$m_4 g - m_1 g = (m_1 + m_2 + m_3 + m_4) a$$

$$\boxed{a = \frac{m_4 g - m_1 g}{m_1 + m_2 + m_3 + m_4}}$$

$$m_4 g - T_{3,4} = m_4 a$$

$$T_{3,4} = m_4 g - m_4 a$$

Single Body Analysis #5 (continued)

$$T_{3,4} - T_{2,3} = m_3 a$$

$$T_{2,3} = T_{3,4} - m_3 a$$

$$T_{1,2} - m_1 g = m_1 a$$

$$T_{1,2} = m_1 a + m_1 g$$

Var	Given value	Units	Description
g	10	$\frac{m}{s^2}$	Acceleration due to gravity
m_1	30	kg	Mass 1
m_2	20	kg	Mass 2
m_3	35	kg	Masss 3
m_4	60	kg	Mass 4

Single Body Analysis #5 (continued)

a		$\frac{m}{s^2}$	Acceleration
$T_{1,2}$		N	Tension 1
$T_{2,3}$		N	Tension 2
$T_{3,4}$		N	Tension 3

$$a = \frac{m_4 g - m_1 g}{m_1 + m_2 + m_3 + m_4}$$

$$= \frac{(60\,\text{kg})\left(10\,\frac{m}{s^2}\right) - (30\,\text{kg})\left(10\,\frac{m}{s^2}\right)}{(30\,\text{kg}) + (20\,\text{kg}) + (35\,\text{kg}) + (60\,\text{kg})}$$

$$= 2.068965517\,\frac{m}{s^2}$$ ✓

Single Body Analysis #5 (continued)

$$T_{1,2} = m_1 a + m_1 g$$

$$= (30\,\text{kg})\left(2.068965517\,\frac{\text{m}}{\text{s}^2}\right) + (30\,\text{kg})\left(10\,\frac{\text{m}}{\text{s}^2}\right)$$

$$= 362.0689655\,\text{N}$$ ✓

$$T_{3,4} = m_4 g - m_4 a$$

$$= (60\,\text{kg})\left(10\,\frac{\text{m}}{\text{s}^2}\right) - (60\,\text{kg})\left(2.068965517\,\frac{\text{m}}{\text{s}^2}\right)$$

$$= 475.8620690\,\text{N}$$ ✓

$$T_{2,3} = T_{3,4} - m_3 a$$

$$= (475.8620690\,\text{N}) - (35\,\text{kg})\left(2.068965517\,\frac{\text{m}}{\text{s}^2}\right)$$

$$= 403.4482759\,\text{N}$$ ✓