Single Body Analysis #6

Var	Given value	Units	Description
g	10	$\frac{m}{s^2}$	acceleration due to gravity
m_1	27	kg	mass 1
m_2	42	kg	mass 2
a		$\frac{m}{s^2}$	acceleration of system
T		N	Tension

$$m_2 g - T = m_2 a$$

$$T - m_1 g = m_1 a$$

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

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

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

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

Single Body Analysis #6 (continued)

$$= \frac{(42\,\text{kg})\left(10\,\frac{\text{m}}{\text{s}^2}\right) - (27\,\text{kg})\left(10\,\frac{\text{m}}{\text{s}^2}\right)}{(27\,\text{kg}) + (42\,\text{kg})}$$

$$= \boxed{2.173913043\,\frac{\text{m}}{\text{s}^2}} \quad \checkmark$$

$$T - m_1 g = m_1 a$$

$$T = m_1 a + m_1 g$$

$$= (27\,\text{kg})\left(2.173913043\,\frac{\text{m}}{\text{s}^2}\right) + (27\,\text{kg})\left(10\,\frac{\text{m}}{\text{s}^2}\right)$$

$$= \boxed{328.6956522\,\text{N}} \quad \checkmark$$

$$m_2 g - T = m_2 a$$

$$m_2 g = m_2 a + T$$

$$m_2 g - m_2 a = T$$

$$T = m_2 g - m_2 a$$