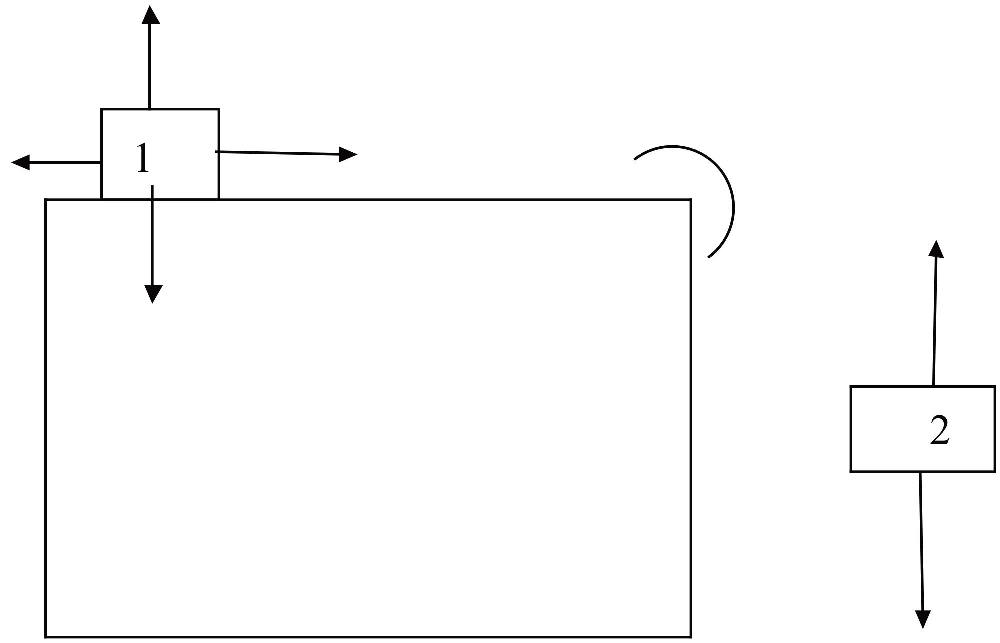
Single Body Analysis #2 Friction



Var	Given value	Units	Description
g	10	$\frac{m}{s^2}$	acceleration due to gravity
m_1	10	kg	mass 1
m_2	25	kg	mass 2
a		$\frac{m}{s^2}$	acceleration of system
$T_{1,2}$		N	Tension
$F_{surface,m1}$		N	Friction

Single Body Analysis #2 Friction (continued)

N		N	Normal Force
a_y	0	$\frac{m}{s^2}$	Acceleration of Mass 1 in the Y direction
μ	0.20		Coeffiecient of Friction

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

$$T_{1,2} - F_{surface,m1} = m_1 a$$

$$N = m_1 g$$

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

$$= \boxed{100\,N}$$ ✓

Single Body Analysis #2 Friction (continued)

$$F_{\text{surface,m1}} = \mu N$$

$$\boxed{F_{\text{surface,m1}} = \mu m_1 g}$$

$$= (0.20)(10\,\text{kg})\left(10\,\frac{\text{m}}{\text{s}^2}\right)$$

$$= \boxed{20.\,\text{N}}$$

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

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

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

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

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

Single Body Analysis #2 Friction (continued)

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

$$= \frac{(25\,\mathrm{kg})\left(10\,\frac{\mathrm{m}}{\mathrm{s}^2}\right) - (0.20)(10\,\mathrm{kg})\left(10\,\frac{\mathrm{m}}{\mathrm{s}^2}\right)}{(25\,\mathrm{kg}) + (10\,\mathrm{kg})}$$

$$= \boxed{6.57\,\frac{\mathrm{m}}{\mathrm{s}^2}}$$ ✓

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

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

$$= (10\,\mathrm{kg})\left(6.57\,\frac{\mathrm{m}}{\mathrm{s}^2}\right) + (0.20)(10\,\mathrm{kg})\left(10\,\frac{\mathrm{m}}{\mathrm{s}^2}\right)$$

$$= \boxed{86.\,\mathrm{N}}$$ ✓