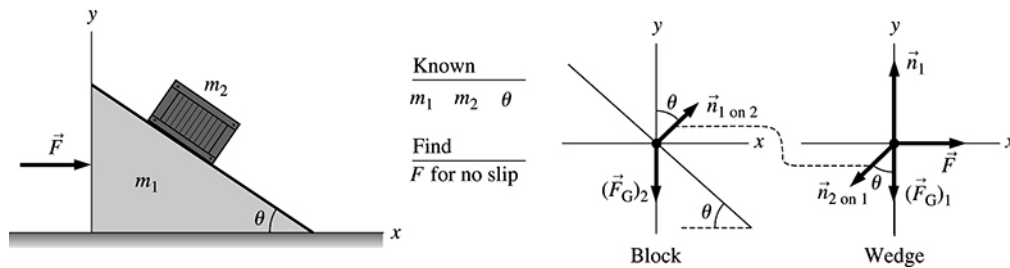


7.46. Model: Use the particle model for the wedge and the block.

Visualize:

Pictorial representation



The block will not slip relative to the wedge if they both have the same horizontal acceleration a . Note:

$n_{1 \text{ on } 2} = n_{2 \text{ on } 1}$.

Solve: The y -component of Newton's second law for block m_2 is

$$\sum (F_{\text{on } 2})_y = n_{1 \text{ on } 2} \cos \theta - (F_G)_2 = 0 \text{ N} \Rightarrow n_{1 \text{ on } 2} = \frac{m_2 g}{\cos \theta}$$

Combining this equation with the x -component of Newton's second law yields:

$$\sum (F_{\text{on } 2})_x = n_{1 \text{ on } 2} \sin \theta = m_2 a \Rightarrow a = \frac{n_{1 \text{ on } 2} \sin \theta}{m_2} = g \tan \theta$$

Now, Newton's second law for the wedge is

$$\begin{aligned} \sum (F_{\text{on } 1})_x &= F - n_{2 \text{ on } 1} \sin \theta = m_1 a \\ \Rightarrow F &= m_1 a + n_{2 \text{ on } 1} \sin \theta = m_1 a + m_2 a = (m_1 + m_2) a = (m_1 + m_2) g \tan \theta \end{aligned}$$