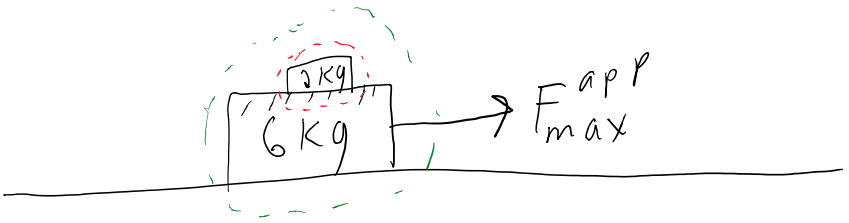
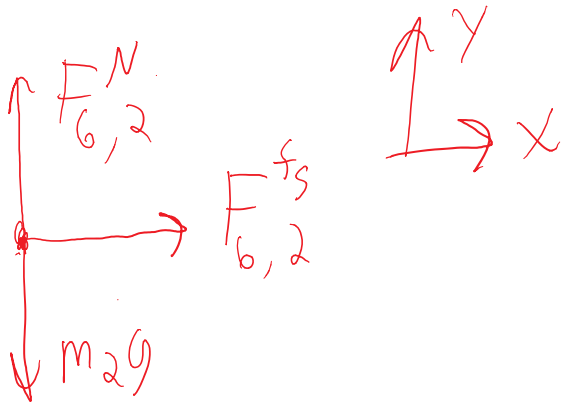
A 2 kg block rests on a 6 kg block. The coefficient of static friction between the two blocks is 0.4 . If there is no friction between the ground and the 6 kg block, what is the largest force that can be applied to the 6 kg block before the 2 kg block will slip?



Will need to look at two systems to solve this problem. We will look at the 2 kg block (circled in red) and the whole 2+6 kg block system (circled in green)

$|\vec{a}_2| = |\vec{a}_6| \equiv \vec{a}$

2)



$\sum F_{x_2} = m_2 a_{x_2}$

$\sum F_{y_2} = m_2 a_{y_2}$

$F_{6,2}^{f_{s_{max}}} = m_2 a_{x_2}$

$F_{6,2}^{N} - m_2 g = m_2 a_{y_2}^{0}$

$F_{6,2}^{N} = m_2 g$

$F_{6,2}^{f_{s_{max}}} = \mu_s F_{6,2}^{N}$

$$\mu_s F_{6,2}^N = m_2 a_{x_2}$$

$$\mu_s (m_2 g) = m_2 a_{x_2}$$

$$\mu_s g = a_{x_2}$$

$$3.92 = a_{x_2} = a_x$$

$$\sum F_{x_{2-6}} = m_{2-6} a_{x_{2-6}}$$

$$F_{max}^{app} = m_{2-6} a_{x_{2-6}}$$

$$F_{max}^{app} = m_{2-6} a_x$$

$$F_{max}^{app} = (m_2 + m_6) a_x = 31.4\ N$$