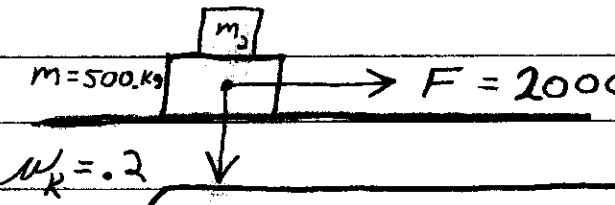
20080311_1446

Find m_2 such that the system can accelerate at $2.500\ m/s^2$ on planet Earth



Total mass to accelerate is $(500\,kg + m_2)$

Force needed for acceleration is $F_{acc} = ma = (500kg + m_2)(2.5\ m/s^2)$

So $F_{acc} = 1250N + (2.5m_2)(m/s^2)$

$F_{TOTAL} = F_g + F_{acc}$ $\qquad F_f = \mu F_N = (.2)(500kg + m_2)g$

$\therefore 2000N = (.2)(500kg + m_2)(9.8\ m/s^2) + (500kg + m_2)(2.5\ m/s^2)$

$2000N = (1.96\ m/s^2)(500kg + m_2) + (500kg + m_2)(2.5\ m/s^2)$

$2000N = (500\,kg + m_2)(1.96\ m/s^2 + 2.5\ m/s^2)$

$2000N = (500\,kg + m_2)(4.46\ m/s^2)$

$500\,kg + m_2 = (2000N)/(4.46\ m/s^2)$

$500\,kg + m_2 = 448.4\,kg$

$m_2 = 448.4\,kg - 500\,kg$

$\boxed{m_2 = -51.6\,kg}$

Note: 51.6 kg must be removed if this system is to work.

The negative mass tells us that mass must be removed.