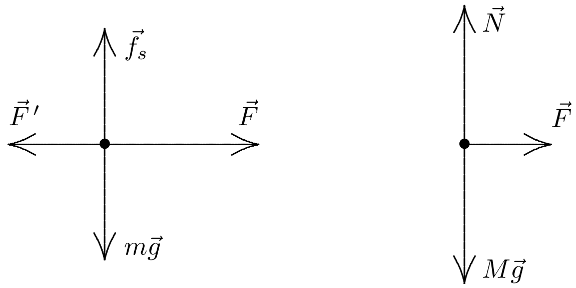
25. The free-body diagrams for the two blocks, treated individually, are shown below (first m and then M). F' is the contact force between the two blocks, and the static friction force $\vec{f}_s$ is at its maximum value (so Eq. 6-1 leads to $f_s = f_{s,\max} = \mu_s F'$ where $\mu_s = 0.38$).



Treating the two blocks together as a single system (sliding across a frictionless floor), we apply Newton's second law (with $+x$ rightward) to find an expression for the acceleration.

$$F = m_{\text{total}}\, a \implies a = \frac{F}{m+M}$$

This is equivalent to having analyzed the two blocks individually and then combined their equations. Now, when we analyze the small block individually, we apply Newton's second law to the x and y axes, substitute in the above expression for a, and use Eq. 6-1.

$$\begin{aligned} F - F' = ma \quad &\implies \quad F' = F - m\left(\frac{F}{m+M}\right) \\ f_s - mg = 0 \quad &\implies \quad \mu_s F' - mg = 0 \end{aligned}$$

These expressions are combined (to eliminate F') and we arrive at

$$F = \frac{mg}{\mu_s\left(1 - \frac{m}{m+M}\right)}$$

which we find to be $F = 4.9 \times 10^2$ N.