



Your wonderful parents have returned from their vacation from Hawaii while you were studying for midterms. At the airport, you stack their luggage, which can be modelled as box A. Box A has a width $w_A = 0.5 \text{ m}$ and height $h_A = 0.8 \text{ m}$. If box A has a mass of $m_A = 50 \text{ kg}$, determine the maximum force F you can apply on the 12 kg cart before tipping their luggage over. Assume slipping does not occur and that box A has uniform density even though clothing is probably stuffed in all sorts of places to save space for the souvenirs.

Box A

$$\sum M_{A0} = mg \frac{w_A}{2} = ma_{Gx} \frac{h_A}{2}$$

$$50(9.81) \frac{0.5}{2} = 50 a_{Gx} \frac{0.8}{2}$$

$$a_{Gx} = 6.13125 \text{ m/s}^2$$

Cart

$$\begin{aligned} \sum F_x = F &= (m_A + m_{\text{cart}}) a_{Gx} \\ &= (50 + 12)(6.13125) \\ &= \boxed{380.1375 \text{ N}} \end{aligned}$$

