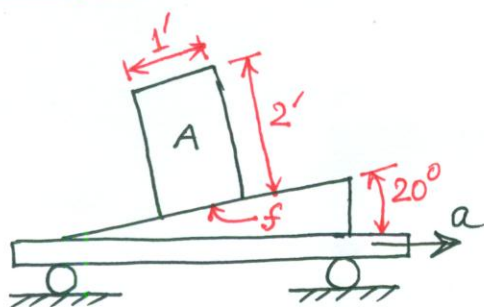


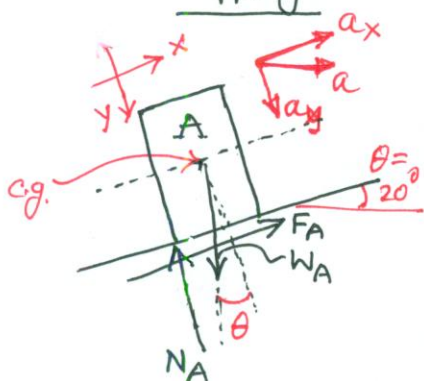
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$f = 0.4$
 $W_A = 200 \text{ lb}$
 a gradually increased
 (a) tip over or slide?
 (b) $a_{\max} = ?$

Solⁿ

Tipping



$$\Sigma F_y = 0, \text{ +ve y as +ve}$$

$$\Rightarrow -W_A \cos \theta + N_A = 0$$

$$\Rightarrow -200 \times \cos 20^\circ + N_A = 0$$

$$\therefore N_A = 187.94 \text{ lb}$$

$$\Sigma M_{cg} = 0 \quad (\curvearrowright \text{ +ve})$$

$$\Rightarrow N_A \times 0.5 - F_A \times 1 = 0$$

$$\therefore F_A = N_A \times 0.5 = 187.94 \times 0.5 = 93.97 \text{ lb}$$

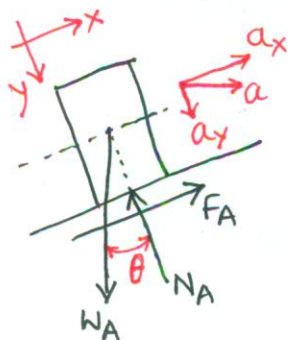
$$\Sigma F_x = m a_x$$

$$\Rightarrow F_A - W_A \sin \theta = \frac{W_A}{g} \cdot a_x$$

$$\Rightarrow 93.97 - 200 \sin 20^\circ = \frac{200}{32.2} \times a \cos 20^\circ$$

$$\therefore a = 4.38 \text{ fps}^2$$

Sliding



$$\Sigma F_y = m a_y, \text{ +ve y as +ve}$$

$$\Rightarrow W_A \cos \theta - N_A = \frac{W_A}{g} \cdot a_y$$

$$\Rightarrow 200 \cos 20^\circ - N_A = \frac{200}{32.2} a_y$$

$$\therefore N_A = 187.94 - 2.12a$$

$$F_A = N_A \cdot f$$

$$= (187.94 - 2.12a) \times 0.4$$

$$= 75.18 - 0.848a$$

$$\Sigma F_x = m a_x, \text{ +ve x as +ve}$$

$$\Rightarrow F_A - W_A \sin \theta = \frac{W_A}{g} \cdot a_x$$

$$\Rightarrow 75.18 - 0.848a - 200 \sin 20^\circ = \frac{200}{32.2} \times a \cos 20^\circ$$

$$\Rightarrow 6.685a = 6.776$$

$$\therefore a = 1.014 \text{ fps}^2 < a \text{ for tipping.}$$

Therefore, the body will slide and $a_{\max} = 1.014 \text{ fps}^2$