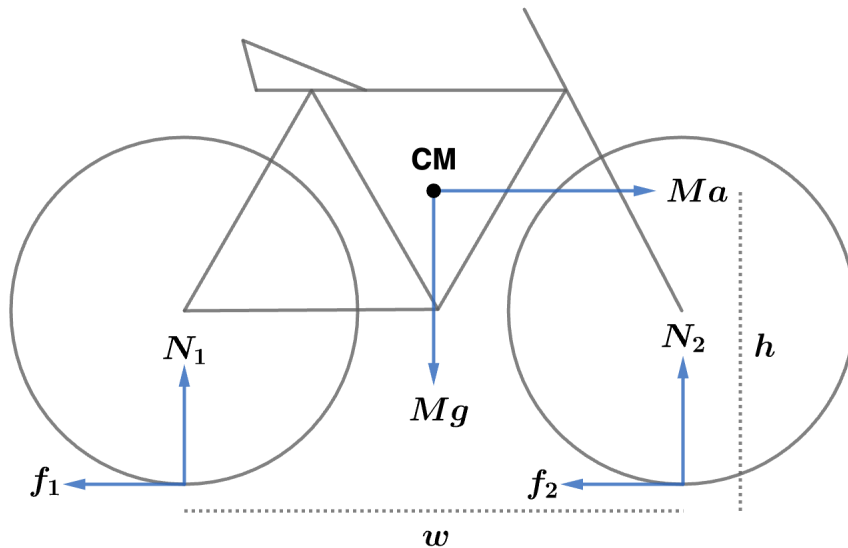


2007 F=ma Exam: Problem 28

Kevin S. Huang



We go to the accelerating frame to reduce the setup to a statics problem, introducing the fictitious inertial force $-M\vec{a}$ on the bicycle's CM. Choosing the CM as the pivot point, we can balance torques:

$$f_1 h + f_2 h + N_1 \left(\frac{w}{2} \right) = N_2 \left(\frac{w}{2} \right)$$

Since $f_1 = \mu N_1$ and $f_2 = \mu N_2$,

$$\mu(N_1 + N_2)h = (N_2 - N_1)\frac{w}{2}$$

Balancing forces in the vertical direction, $N_1 + N_2 = Mg$ so

$$\mu Mgh = (N_2 - N_1)\frac{w}{2}$$

$$\mu = (N_2 - N_1)\frac{w}{2Mgh}$$

Since $N_2 - N_1 \leq Mg$ (realized when $N_1 = 0, N_2 = Mg$):

$$\mu \leq \frac{w}{2h}$$

so the answer is $\boxed{\text{A}}$.