2007 F=ma Exam: Problem 30

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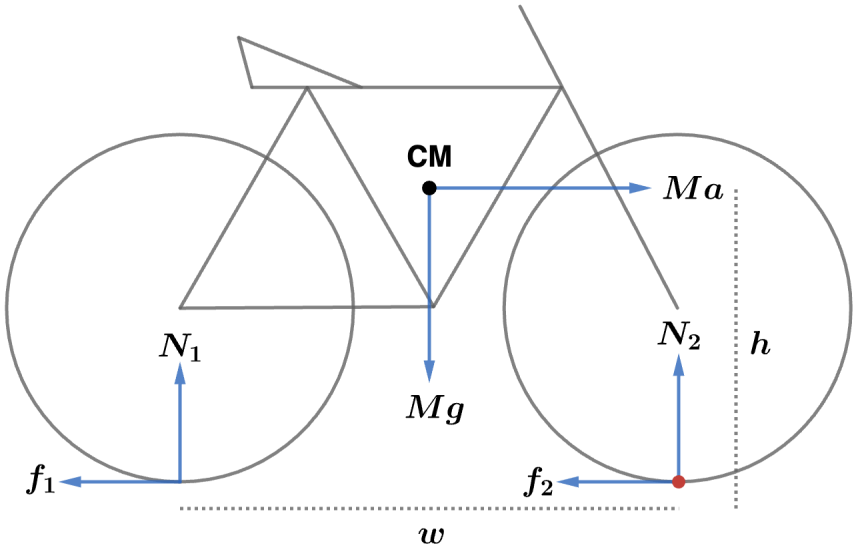

We go to the accelerating frame to reduce the setup to a statics problem, introducing the fictitious inertial force $-M\vec{a}$ on the bicycle's CM. Choosing the contact point of the front wheel with the ground as the pivot point, we can balance torques:

$$Mah + N_1 w = Mg\left(\frac{w}{2}\right)$$

$$Mah = \left(\frac{Mg}{2} - N_1\right) w \leq \frac{Mgw}{2}$$

using the fact that the normal force $N_1 \geq 0$. Then

$$a \leq \frac{gw}{2h}$$

Note this is the same derivation and answer as the previous problem since we don't assume anything about the coefficients of friction. The answer is $\boxed{\text{E}}$.