LECTURE 26 CHECKPOINTS

1. What is the net force in terms of F and N on any one of the N identical blocks in the system on p. 1?
   \[ F_{net}^m = ma = m \frac{F}{N} = \left( \frac{F}{N} \right) \text{ checks with } \]
   \[ \text{force } \frac{F_n}{N} - \frac{F_{n-1}}{N} = \left( \frac{i-h}{N} \right) F \]

2. What is the net force on any one of the N identical blocks in the system in HW26-1(b) on p. 2?
   \[ F_{net}^m = 0 \Rightarrow a = 0 \]
   \[ \Rightarrow F_{net}^m = ma = 0 \]

3. In HW26-3, if the locomotive pulls on the 300 cars with the same force that they pull back on it, how can anybody move?
   
   **The locomotive is pushing against the tracks/Earth!**
   
   (The cars' wheels are free with no friction.)
   
   *i.e. The pull is not the only force on the locomotive.*

4. As we add more kids equally to both sides, so that there are 2N kids overall, how does the outermost tension change and how does the middle tension change?
   
   \[ T_{out} = F \text{ unchanged} \]
   
   \[ F - T_{out} = ma \]
   
   Middle: consider half of kids
   
   \[ NF - T_{mid} = N \text{m} \Rightarrow 0 \]

5. Check that the results \( ma = \frac{1}{5} F, T_3 = \frac{8}{5} F, T_4 = \frac{4}{5} F \) are a solution of the force equation for the fourth kid from the left:
   
   \[ 4^{th} \text{ kid: } F + T_4 - T_3 = \frac{7}{5} F \]
   
   \[ (1: \frac{4}{5} - \frac{8}{5} \text{ F} = \frac{1}{5} F) \checkmark \]

6. What is the torque, about the point O indicated in the figure, due to the weight of the uniform brick shown?
   
   \[ \tau_{tangential} = + mg \frac{L}{2} \rightarrow \theta \]

7. What is wrong with each term for the net torque around the bottom-right corner of the door using our usual conventions (CCW = +)?
   
   \[ \tau = \text{clockwise units} \times \text{negative units} \text{ (need mg)} \]

8. What is the horizontal position of the overall CM for n identical bricks if the horizontal position of the CM of the first n-1 of them altogether is at the origin and the other brick’s CM is at x?
   
   \[ X_{one\ brick} = \frac{m}{n} x \]
   
   \[ X_{n\ bricks} = \frac{m x + (n-1)m}{n} \]
   
   \[ = \left( \frac{n x}{n-1} \right) \text{ famous problem} \]