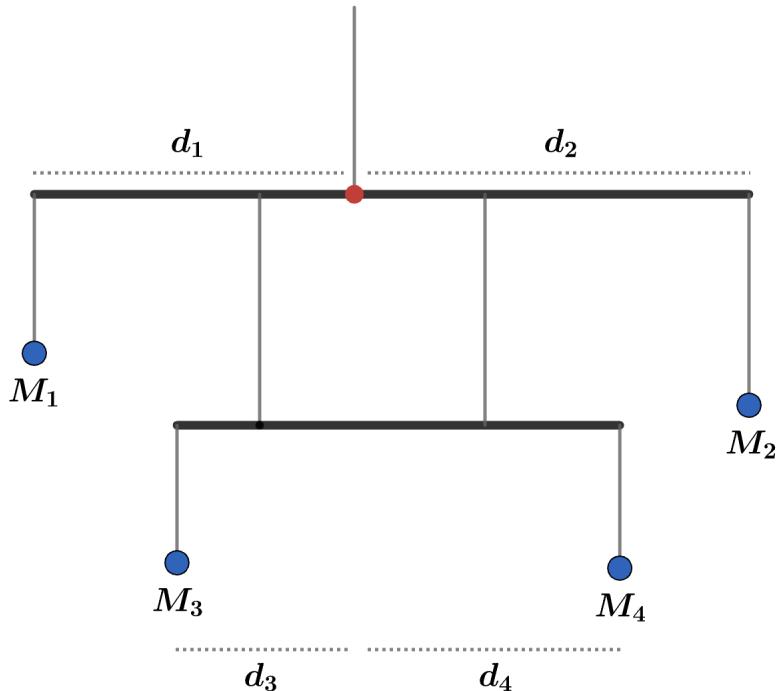


2017 F=ma Exam: Problem 6

Kevin S. Huang



Choosing the point where the top beam hangs from as the pivot point, we balance torques from the external forces of gravity on the masses. Note that the external tension from above goes through the pivot point so does not contribute to the torque.

$$M_1gd_1 + M_3gd_3 = M_2gd_2 + M_4gd_4$$

Solving for M_3 ,

$$\begin{aligned}
 M_3d_3 &= M_2d_2 + M_4d_4 - M_1d_1 \\
 M_3(0.1 + 0.1) &= (200 \text{ g})(0.5) + (500 \text{ g})(0.2 + 0.2) - (400 \text{ g})(0.4) \\
 0.2M_3 &= 140 \text{ g} \\
 M_3 &= 700 \text{ g}
 \end{aligned}$$

so the answer is E.