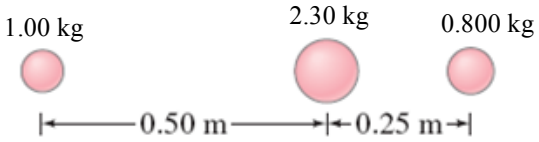
Name:_____

AP Physics 1: Rotational Motion
Torque and Center of Mass

Center of Mass

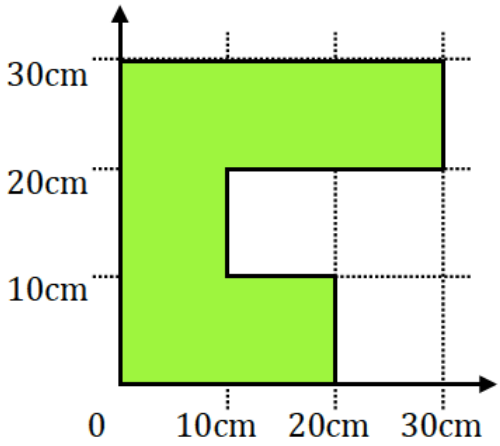
1. Find the center of mass of the three-mass system shown below. Specify this distance in reference to the 1.00 kg mass at the very left.



2. The masses of the Earth and the Moon are 5.98×10^{24} kg and 7.35×10^{22} respectively. A distance of 3.84×10^{8} separates the two from the center of the Earth to the center of the Moon.
   A. Calculate the CM of these two celestial bodies.
   B. Give the value from part A some thought. What does this tell you about the movement of these two objects around this center of mass? Consider looking at the radii of each celestial body.

3. A flat piece of metal of uniform density has the shape and dimensions shown here. Consider each 10 cm by 10 cm piece to have a mass *m. Hint: Consider breaking up the object shown into several pieces to evaluate.*
   The center of mass for the piece of metal is located at:

	x_{CM} (cm)	y_{CM} (cm)
A.	$\frac{65}{6}$	$\frac{95}{6}$
B.	$\frac{70}{6}$	$\frac{95}{6}$
C.	$\frac{65}{6}$	$\frac{100}{6}$
D.	$\frac{55}{6}$	$\frac{80}{6}$
E.	$\frac{70}{6}$	$\frac{100}{6}$



Torque:

4. A 400 N child and 300 N child sit at either end of a 2.00 m long see-saw. Where along the see-saw should the pivot point be placed to ensure the see-saw remains in rotational equilibrium?

5. Based on the location of the pivot point in problem #4, suppose a 225 N child sits 0.20 m away from the 400 N child. Where must a 325 N child sit to maintain rotational equilibrium?

6. A larger Landon (50.0 kg) decides to play on a playground with a large balance beam (mass = 40.0 kg) placed on two supports as shown.
   A. What is the numerical value of $N_1 + N_2$ (Total normal force)?
   B. Landon walks towards the end of the beam, towards point X. How close to the point X does Landon have to be before the beam starts to tip making beam leave the left support?