**IB Physics**

Center O' Mass

**Here you get to try four different ways to find the center o' mass of a two-dimensional rectangular solid. Then you will break through new frontiers trying to find the center of mass of an irregular four-sided figure using geometric methods. This lab is unique in that you will do your very own.**

**Here's what to do:**

1. Get a rectangular piece of heavy paper, and cut out a rectangular chunk from the corner. There are only two rules, the dimensions of the rectangle that you cut out should be between 1/3 and 1/2 the dimensions of the piece, and all the angles formed when you cut it out must be 90o. (Right angles, that is)

2. Find the center of mass by trial and error. (This is an empirical method) The piece will balance on the bottom of a whiteboard marker when the center of mass is directly above it. (Trace around where the center of mass must be) **•How does the area of the point on which you are balancing the object affect the precision with which you can locate the center of mass in this way?**

3. Punch one hole near one corner, and another near a different corner. **Find the center of mass using a chalked plumb line** by using the fact that it is always directly beneath the point of suspension. How does this point agree with the one you have already marked? (This too is an empirical method)

4. **•Find the center of mass geometrically using the method I showed you on the blackboard.**  (by subdividing the solid into two rectangles whose COMs you know - and using Murray's Theorem) (This is a geometric method)

5. Pick one of the subdivisions you made in the previous step and use the center of mass equation to find the C.O.M. but instead of M1 and M2, use the areas of the rectangles. (You will have to measure the distance from the center of one rectangle to the center of the other, and then also the lengths of the sides of the rectangles. Area = LxW) (This is an analytic method) **•Show this calculation on the heavy paper itself, and measure and mark that distance from the center you calculated.**

6. Put a paper clip on the edge of the solid somewhere, and find its center of mass again using an empirical method. **•Did the center of mass shift toward or away from the clip?**

7. Make a small four-sided figure perhaps from the piece you cut out, with no angle congruent or 90o, and no side parallel. Locate its center using an empirical method of your own choosing and **mark it with ink.**

(Extra Credit) Drawing lightly in pencil so you can erase it, try to devise a geometric way to locate the center of your solid from number 7. When you think you have it, try it on another solid with different angles. You can use a straight edge and a compass.

Turn in for credit:

* The answers to the questions in parts 2 and 6
* The calculations you made from part 5 - written on the solid itself.
* Your rectangular solid from parts 1-6
* Your four-sided figure from part 7
* (Extra credit 10 pts) Your explanation for part 7