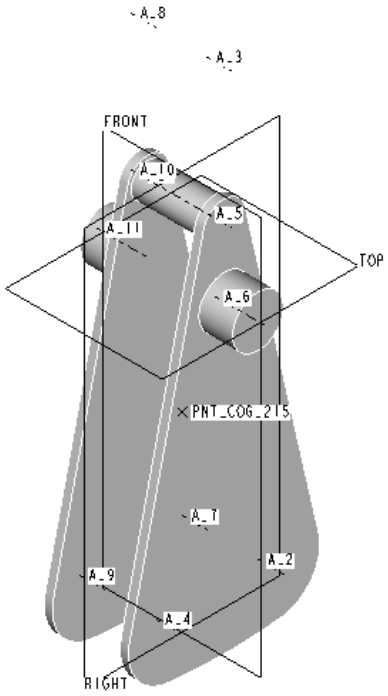
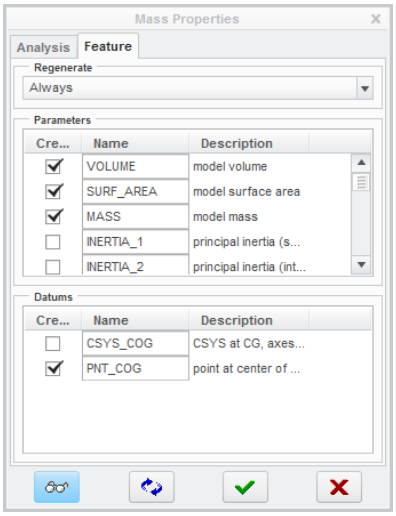
Applications with Behavioral Modeler
Sensitivity Study and Feasibility Analysis
Creo 2.0
Level 8.5

Problem:
Model a crankshaft such that the center of mass (shown as PNT_COG_215) coincides with the axis of rotation (shown as A_6 and A_1).



General Methodology:

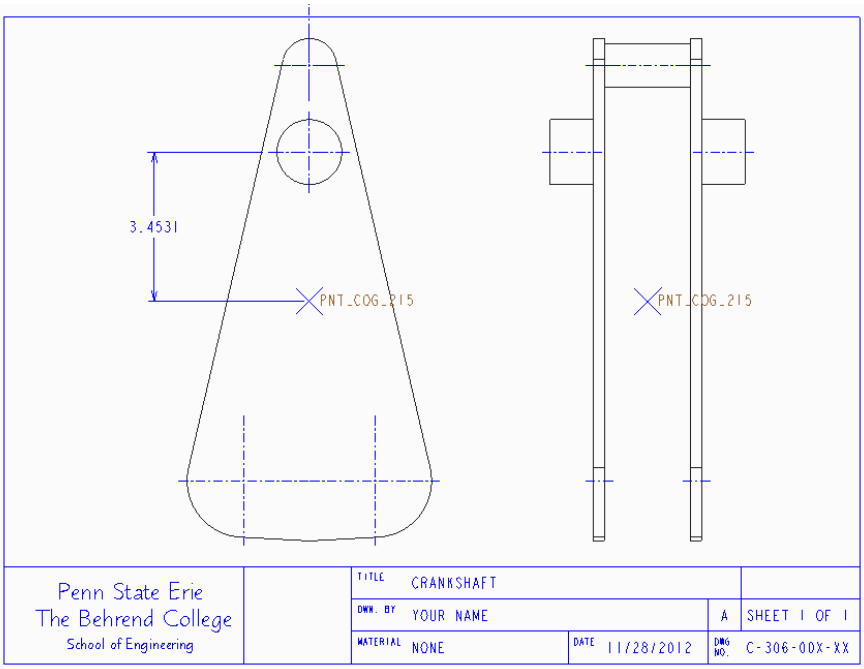
1). Model the crankshaft (any size), constraining the geometry how you see fit. You should realize that the geometry is symmetric in two directions and that the bottom lobes are used as counter balances. The lobes should be able to be adjusted vertically with a **singular** dimensional modification. Take this into account when you model the rest of the features.



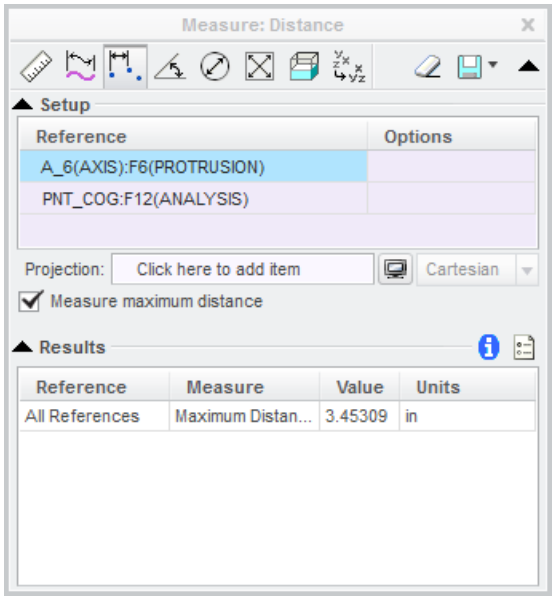
2). Create a **Mass Property** Analysis feature (Select the Feature option in the lower left corner of the Analysis Tab box) that is a Coordinate System at the Center of Gravity (PNT_COG).

3). Modify your model to make sure the lobes can be changed such that the PNT_COG_XXX can vary from below the center of rotation to above the center of rotation with out causing any geometry to fail.

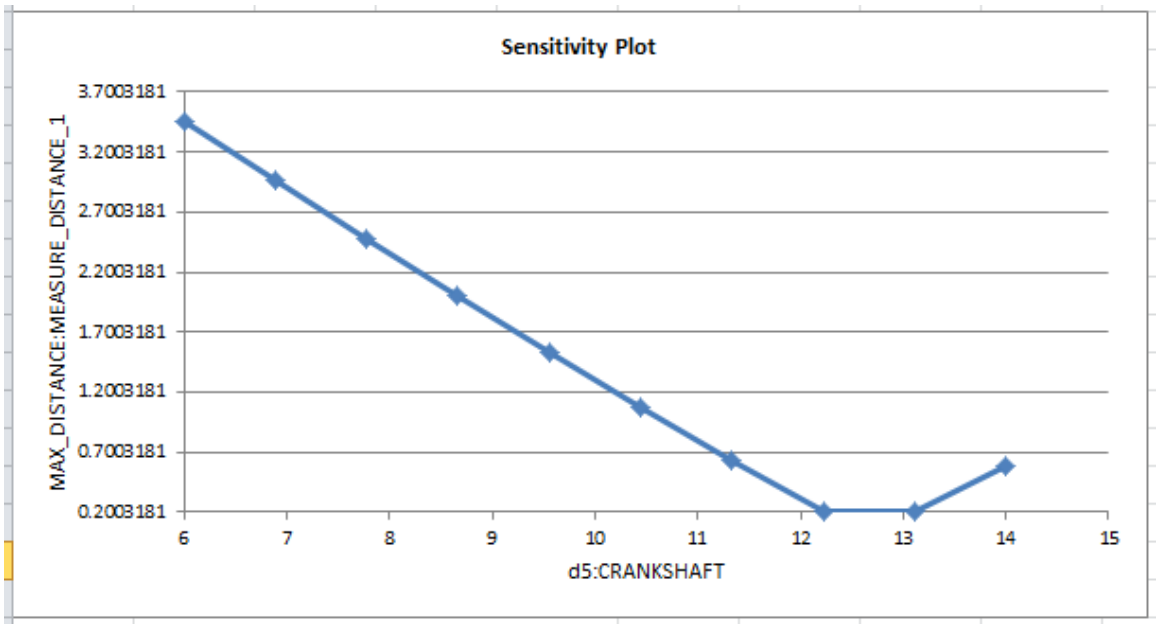
4). Create a drawing that documents your crankshaft at this point in time. Create a dimension from PNT_COG_XXX to the center of rotation. Make sure points are turned on as well as the Axis Tags (Show region of the View Tab) Plot this.



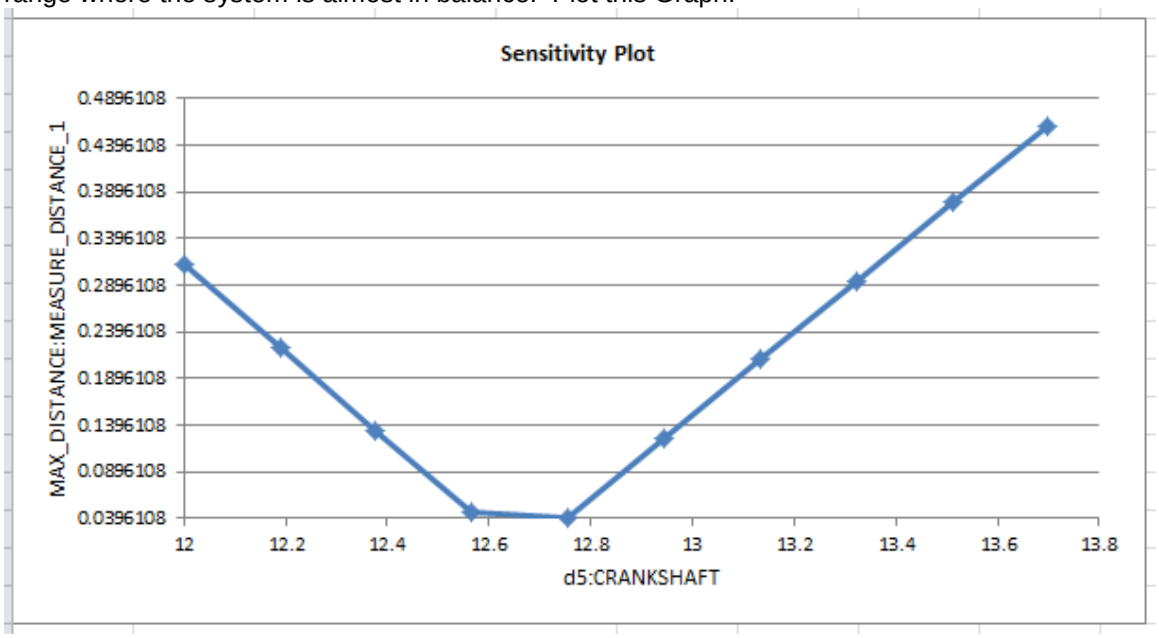
5). Create a second Analysis feature (Measure) to get the distance from the Rotation Axis to PNT_COG_XXX. Select on the Floppy drive icon to save this as a feature.



6). Do a Sensitivity Analysis to see what the net effect making large dimensional modifications has to the Distance analysis feature value as shown below. You may not be using the same dimensional values! Plot this Graph.

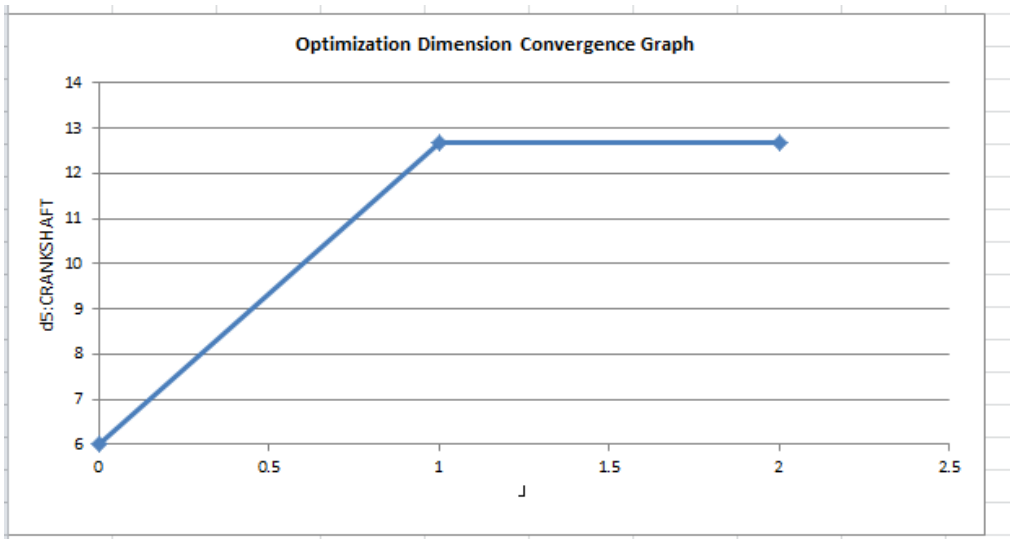


7). Do another Sensitivity Analysis in the range where Distance approaches 0. This will be the range where the system is almost in balance. Plot this Graph.



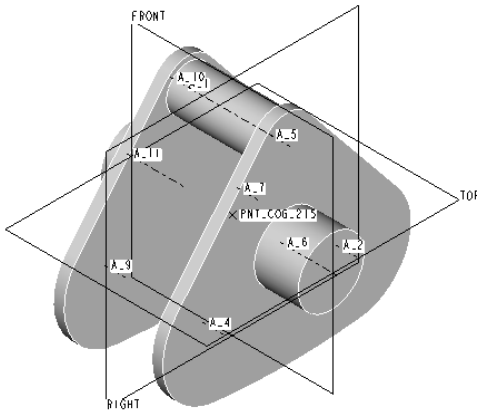
You can see that the final value is somewhere in the 12.6 to 12.8 range.

8). Get an exact value for the geometry by doing a Feasibility study (not optimization…an optimization would require us to do something like minimizing mass while varying multiple dimensions for the lobe). There is **NO goal** (grayed out) when doing a Feasibility Study. Plot the Dimension Conversion Graph (Select Graph variables from Options – Preferences) along with the values associated so we can see the exact value computed in the end

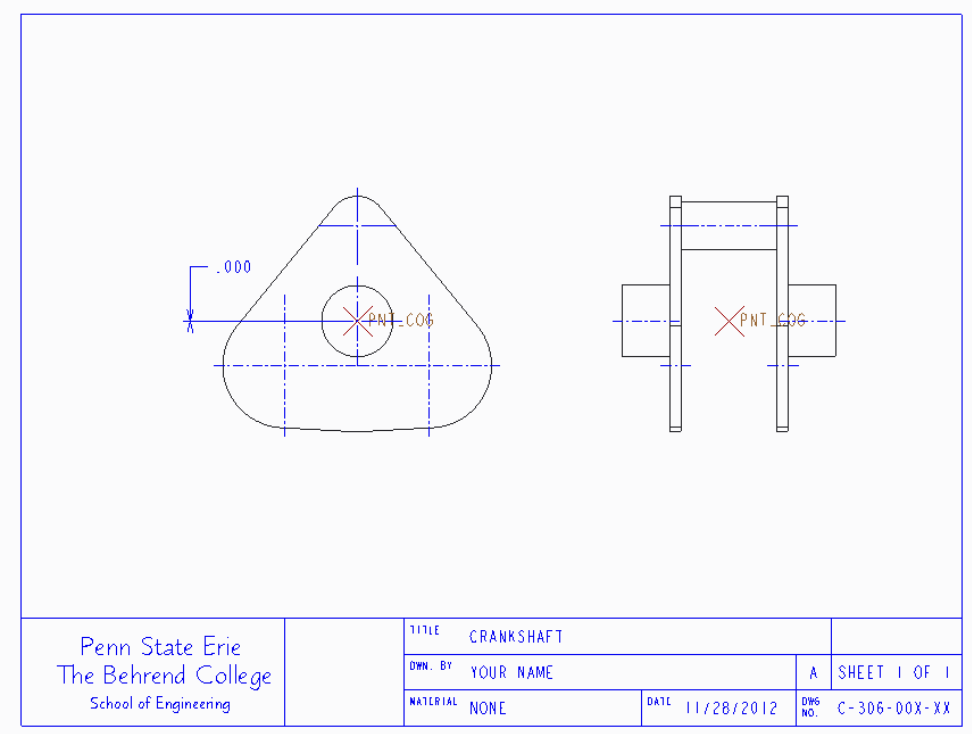


J	d5:CRANKSHAFT
0	6
1	12.66889
2	12.66889

Balanced Design (not pretty, but balanced):



9). Go back to your drawing and plot the updated version as shown. Your offset value should now show essentially 0.



Include the following in your design documentation:

Detail drawing of the original design
Rough dimension sensitivity plot
Refined dimension sensitivity plot
Dimension Convergence plot
Detail drawing of the final design