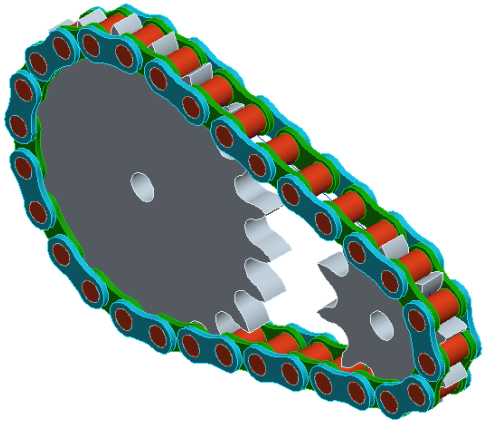
Activity 2b

Chain Drive
Patterned Datum Points
Top-Down Modeling (Review)
Release Creo 2.0



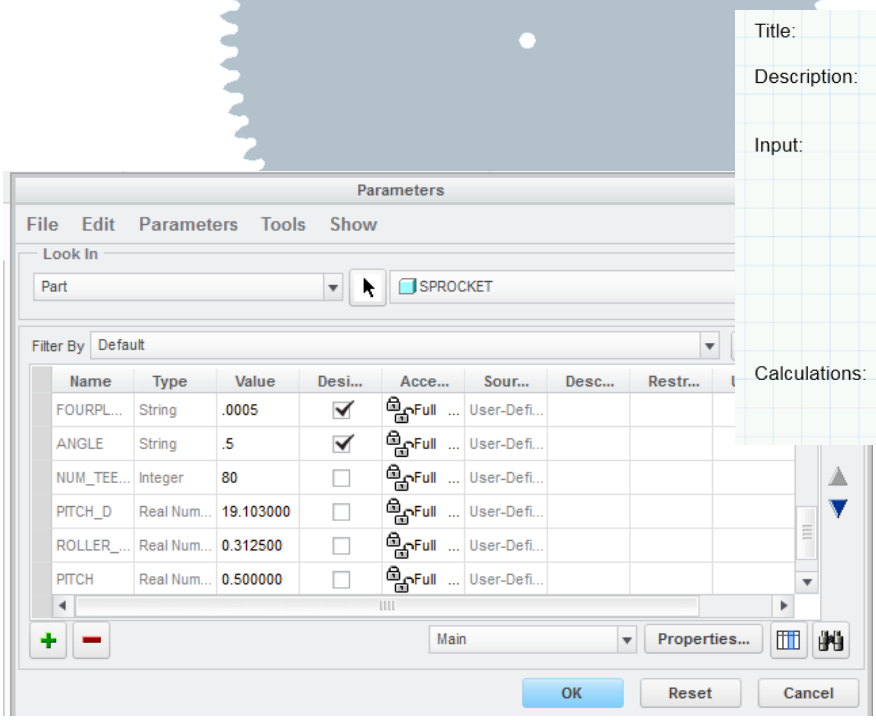
Level 7 continued

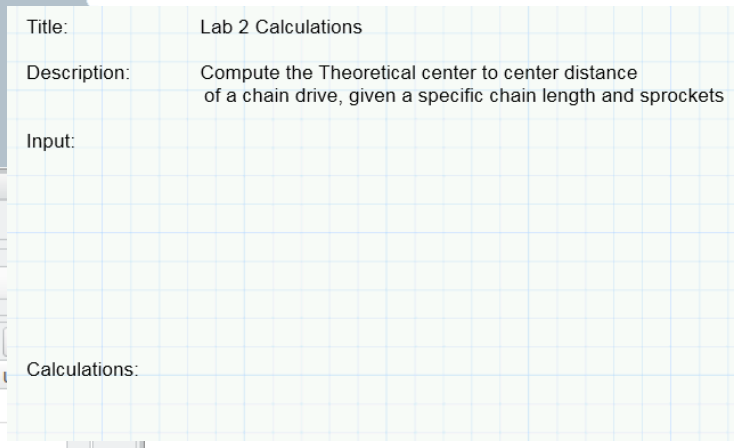
Purpose: To review top-down modeling practices and gain additional experience using datum curves and points

Create a roller chain assembly as shown below.

Assume a No. 60 chain, with 30 links. Use 21 tooth and 10 tooth sprockets.

Refer to your Mott text or the internet for determining the theoretical center to center distances using a 30 link chain as well as most of the basic chain dimensions. Using Mathcad **Prime**, produce and **print** a worksheet that will compute this value. Make sure that the user can modify all input parameters for different chain drives. The general format is to be as shown.

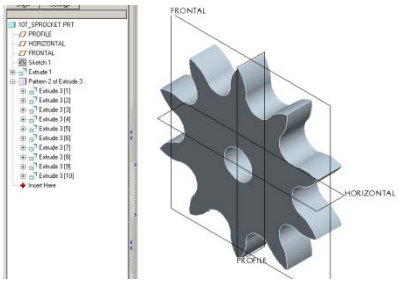




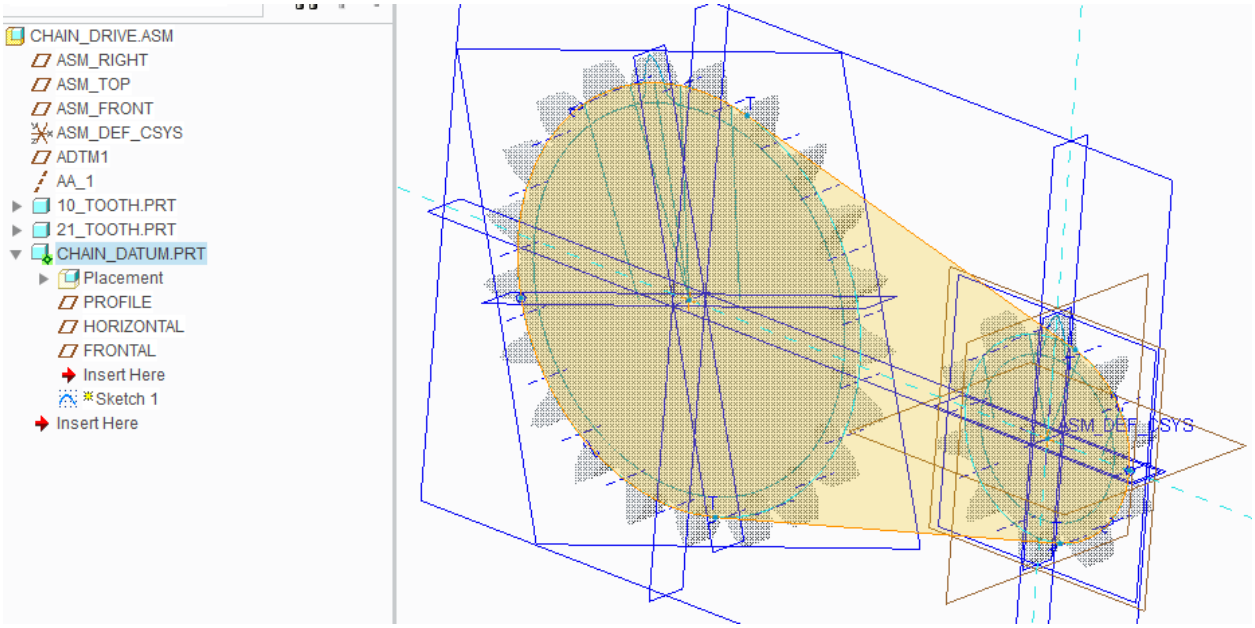
A modifiable sprocket (sprocket.prt.1) has already been created for you and is located on the V: drive in the MET_306 subdirectory.

You can change the size of the sprocket by simply modifying the parameters for the Number of Teeth (NUM_TEETH) Pitch Diameter (PITCH_D), the Roller Diameter (Roller_DIA) and Pitch (PITCH). The example above shows the parameters for an 80 tooth sprocket using a No. 40 chain.

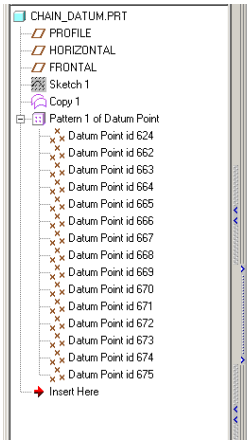
10 Tooth sprocket:

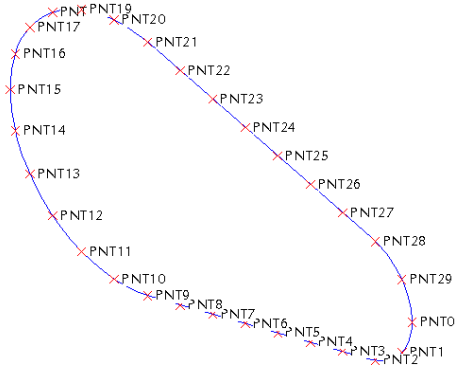


Using top-down techniques, generate a datum curve that will define the center of the chain as shown below.



Apply datum points to this curve, following the instructions below.





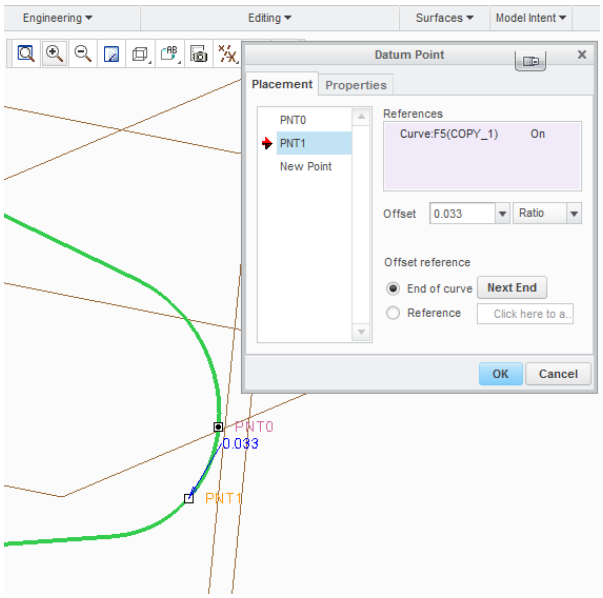
Creating the pattern of the datum points for the Chain_Link:

After assembling the sprockets, use **top-down** modeling procedures to create the Chain_Datum part datum curve, then apply datum points to this curve.

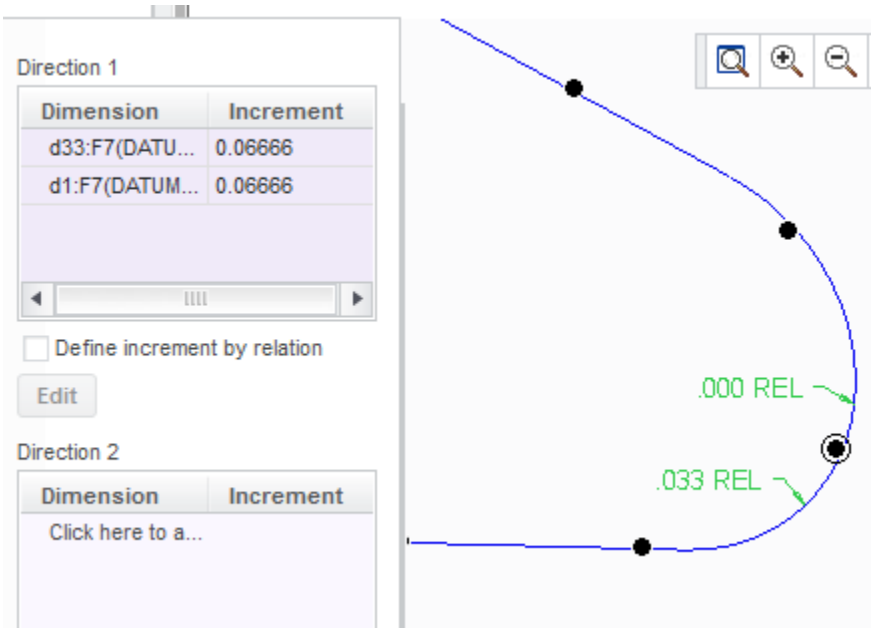
Important: In order to properly pattern the links, you need to have X sets of datum points, **AND** the points must start at a specific location. The obvious place to begin is on 10 tooth sprocket on the horizontal plane.

When defining the first "Set" the first point will be defined as in the level 7.0 portion of the assignment with an offset of 0. Make sure that when you create both points, you right click and Pick from List to select the entire curve (not just one segment) when defining the curve reference. This point will be offset at a 1/30 (30 links) ratio from the first point.

Keep in mind that a copied/pasted composite curve can only have one break point defined. This will become important later.

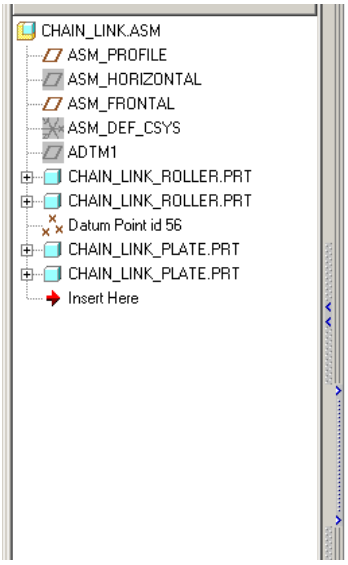


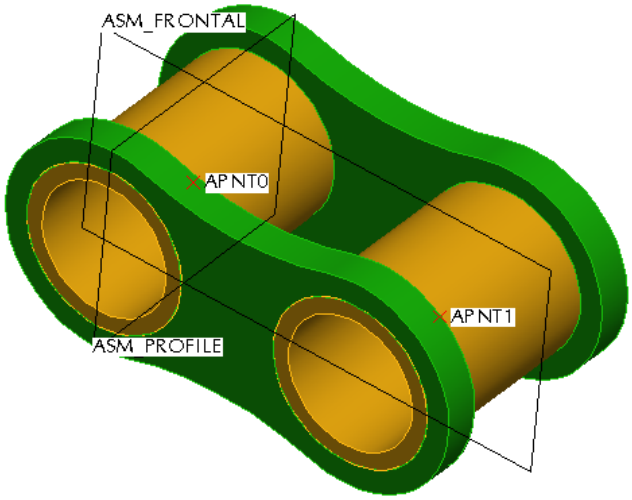
When patterning this set use a Dimension pattern. The first direction will have two dimensions associated with it. Select on the ratio of PNT0 and use .06666 (2x the 1/30 ratio) for the increment. Do the same thing for PNT1 as shown below. Create 15 sets.



Build a Chain_Link sub assembly to add to the full Chain_Drive assembly.

Make sure that your Chain_Link sub assembly has datum points located on the center axis of the rollers and are also constrained to the center line of the part.

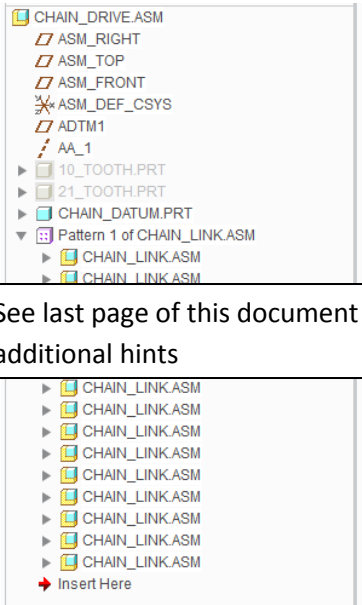


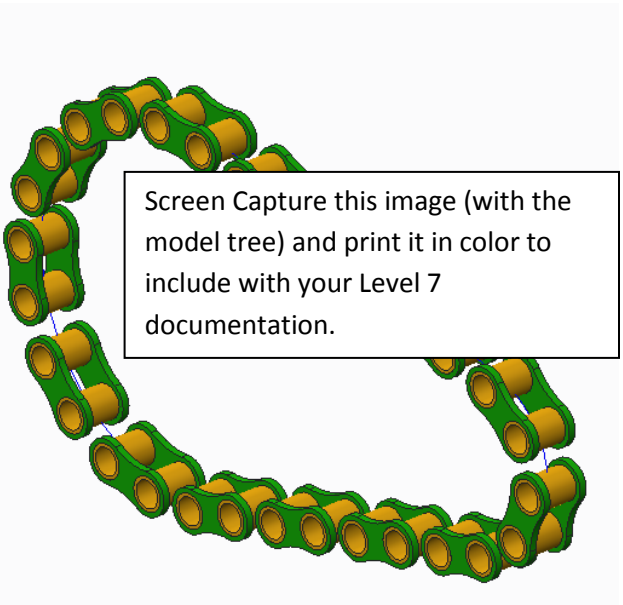


Before assembling the Chain_Link subassembly to the Chain_Drive main assembly, **hide** the sprockets to make sure you do not end up with unintended references to the sprockets. If you do, your sub assembly probably will not pattern.

When constraining the link to the datum curve, Align the center datums, use a Coincident align on the first point and a Oriented align on the second point. A point-on-line alignment will probably not pattern.

After assembling (and patterning) the Chain Links (no connecting plates) the assembly (with the sprockets suppressed) should appear as shown.





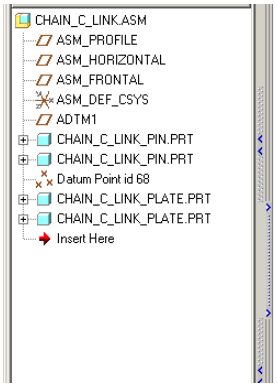
See last page of this document for additional hints

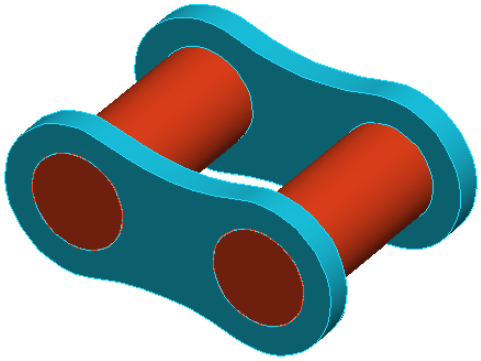
Screen Capture this image (with the model tree) and print it in color to include with your Level 7 documentation.

You will have printed one Mathcad worksheet and one color screen capture to include with the Level 7 documentation.

Begin Level 8.5

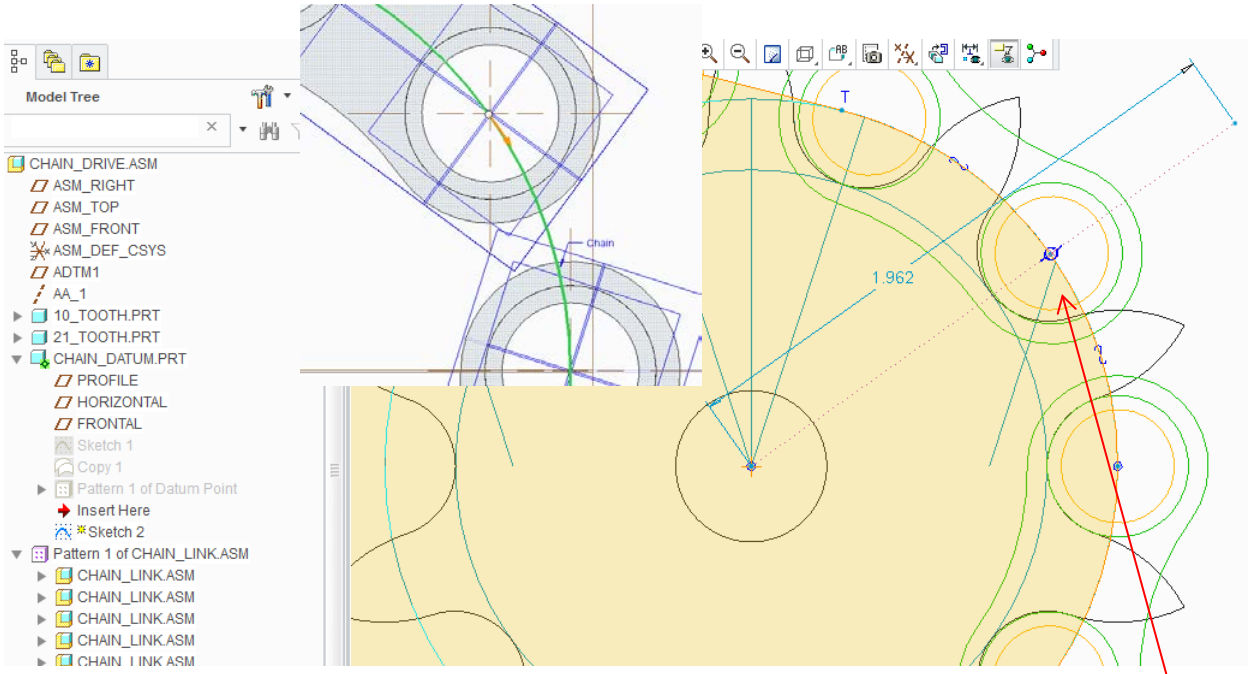
A review of the full assembly with the datum points on the Chain_Datum part displayed will indicate that the axis of some of the links do not exactly fall on the patterned datum points. The reason for this is that the datum points are located (equally spaced) on the curve yet the chain links actually are located on the chord of the curve. The arc length cannot be the same as the chord length unless the points are on a 1st degree curve (straight line). This issue will come back to haunt us later.





Build a sub assembly of the Chain Link Connectors similar to what is shown:

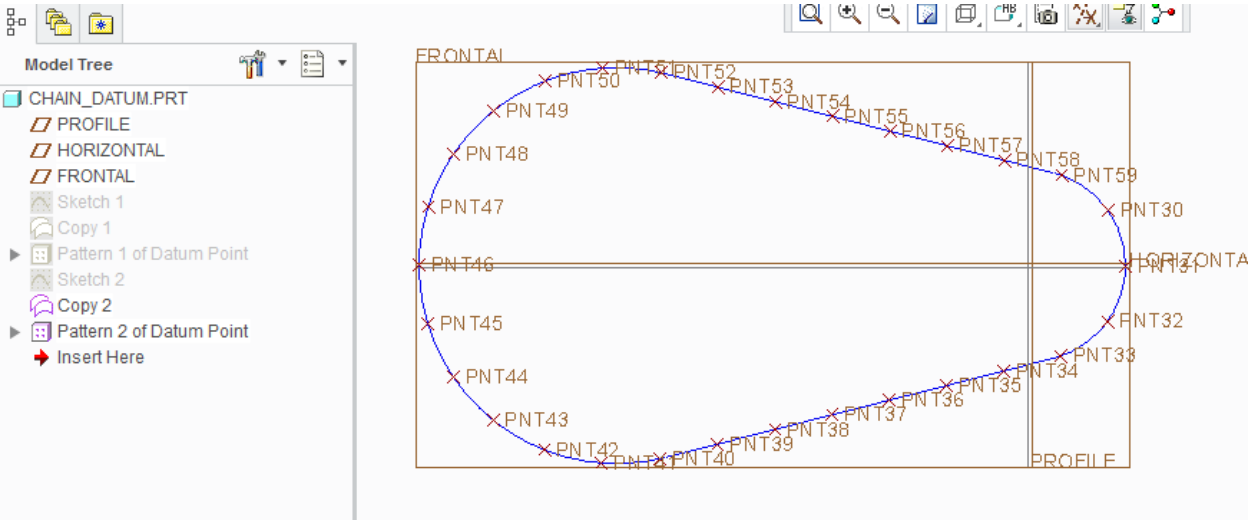
The **ONLY** way to effectively assemble the connecting link is to duplicate the datum curve/point procedure that was used before. Hide the original (1st) datum curve on the Chain_Datum part and re-create one using top-down techniques except this time break the curve **one link location** above the horizontal datum.



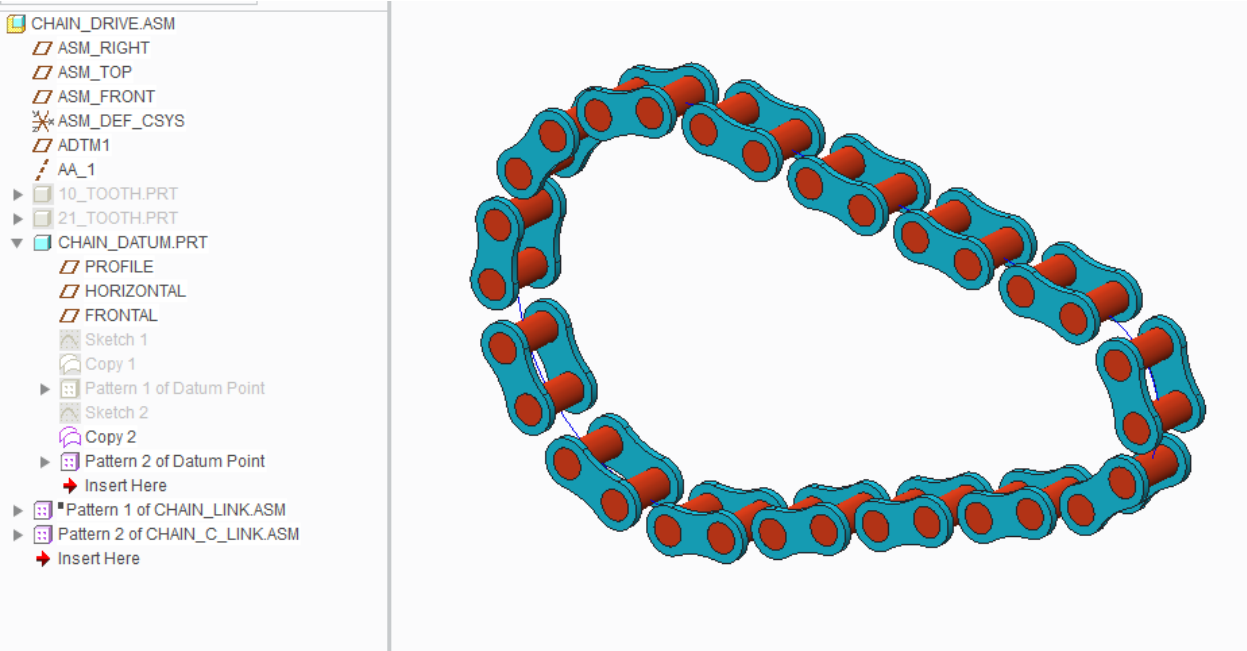
This will allow the creation of a pattern (use the same dimensional pattern dimensions) that is essentially independent of the first set of links. The reason for having the original links displayed is to locate this point in space. If you simply use the exact rotational angle to locate the first datum point, you will find that the links are too far off when finally assembled.

Break the new curve at this location. Create a construction line that goes through the center of the axis on the Chain_Link sub-assembly.

The final version of the Chain_Datum part is shown below. Note that there are TWO sketches, each one having their own Copy (so as to allow the “break” to be properly inserted) and their own set of patterned datum points.

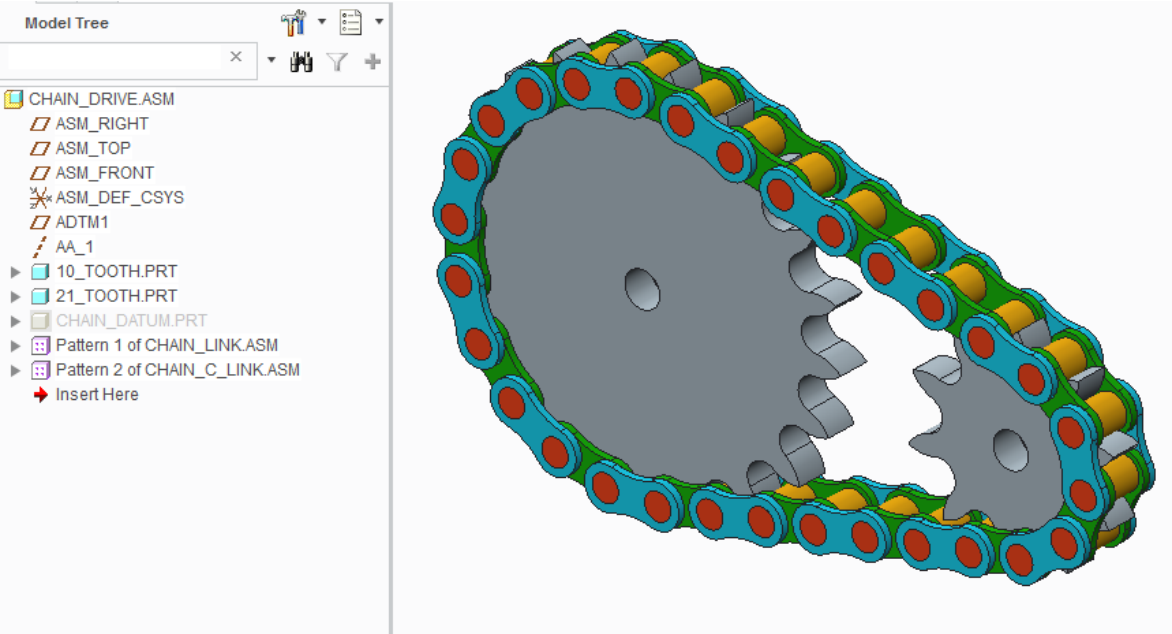


When assembling the Pins and Links, it is easiest to simply suppress the prior Links and their associated datum points as the new sub assembly is using the second sketched curve and points.



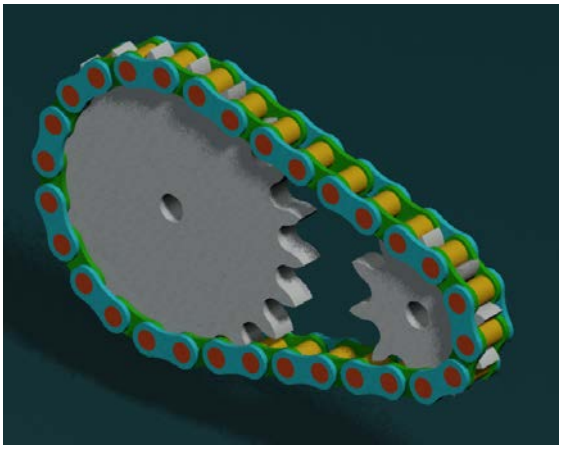
The following documentation is required (color where shown):

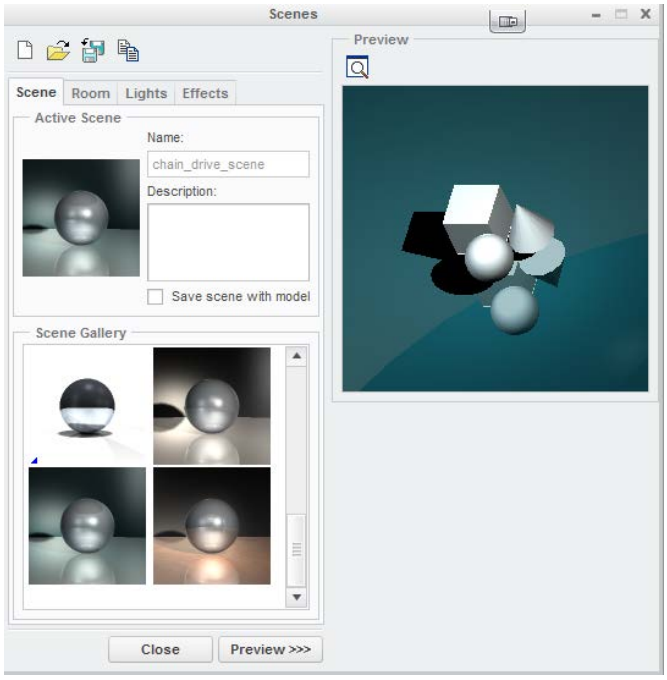
Print a screen capture of full assembly showing the model tree and below that a rendered version. Select Features from the Model Tree Tree Filter to display the datums and axis. Make sure that the chain components are colored so they are easily differentiated.



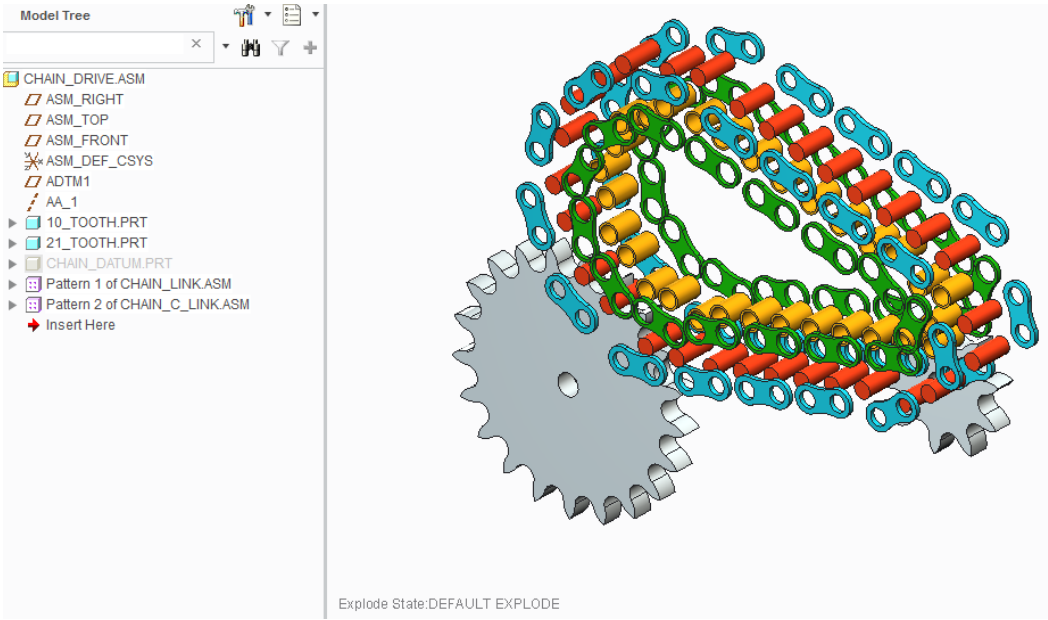
Note: In order to change the number of links, one would have to modify the center to center distance, change the datum point initial location values, modify the datum point dimensional pattern values and change the number of instances for the patterns. This could be accomplished through the use of relations.

On the Render Tab, select scene and select the one from the lower left corner. Use this to Render the Window. Snip this and add it to the capture done above.

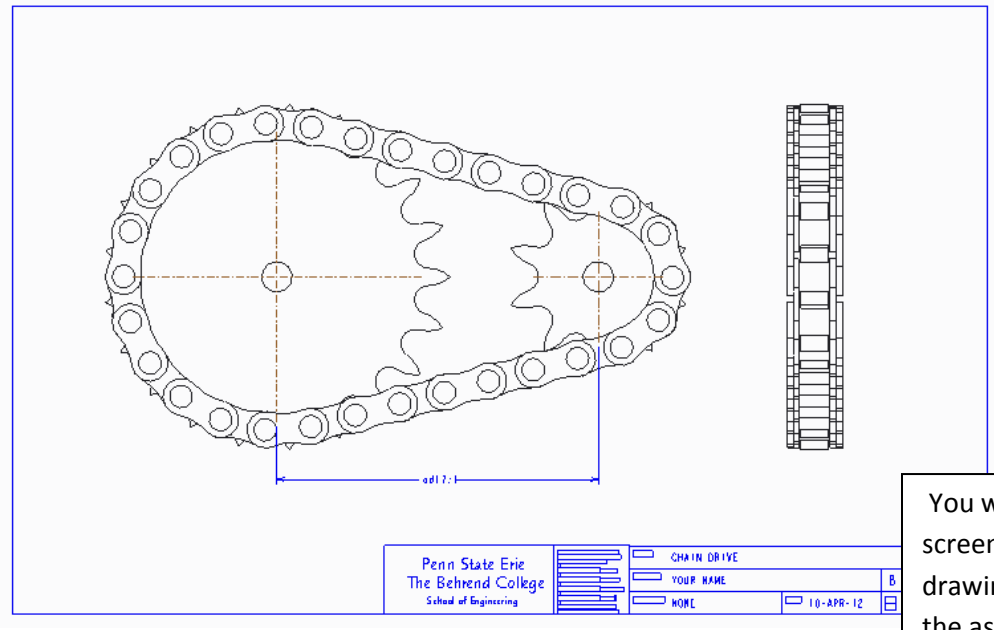




Print a screen capture of the default exploded assembly. There is no need to edit the explosion to move parts around. This is to document the fact that you have in fact created sub-assemblies of the links.



Print the full assembly, no hidden lines for both views on A size paper using a B size title block. Show axis as indicated and include the center to center dimension. Your value will be the actual number, **not** the symbolic value shown below. The purpose of the right side view is to check your width dimensions and make sure your parts are properly centered.



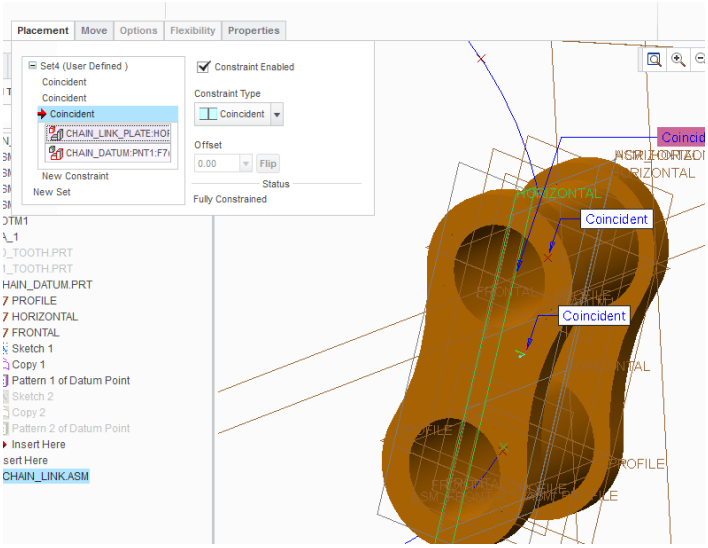
You will have printed two color screen captures and one assembly drawing for the Level 8.5 portion of the assignment.

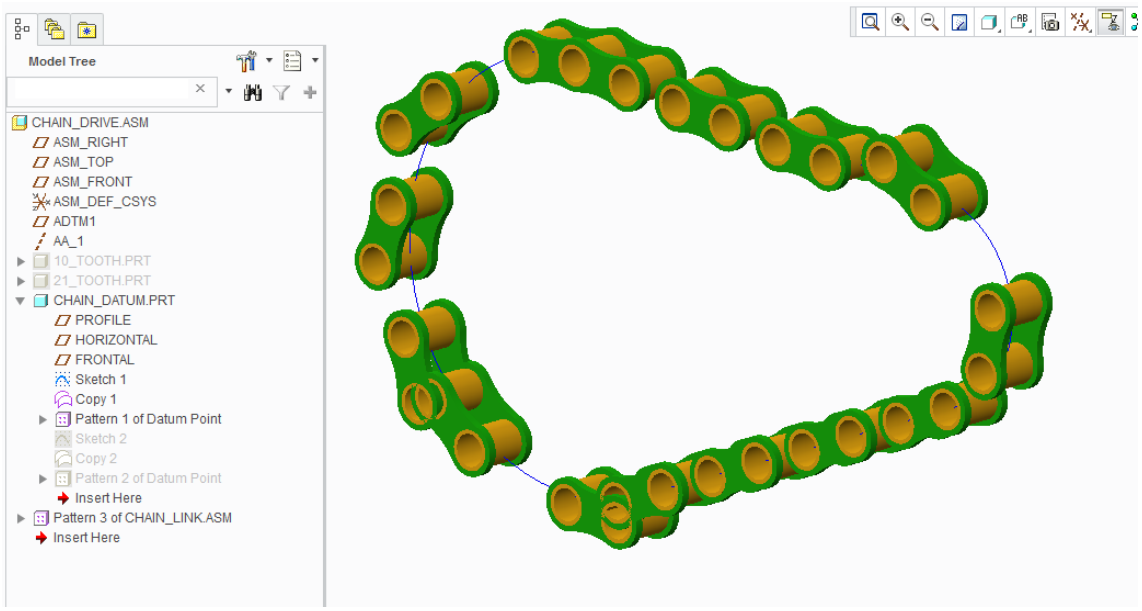
End Level 8.5

Patterning Issues:

Placement:

If you define the third Constrain using a plane on sub-assembly with point on datum curve as indicated below, you will generate the following general pattern:





You should have used “Automatic” and selected a point on the sub-assembly, a point on the datum curve and then set the Constraint type to Oriented.