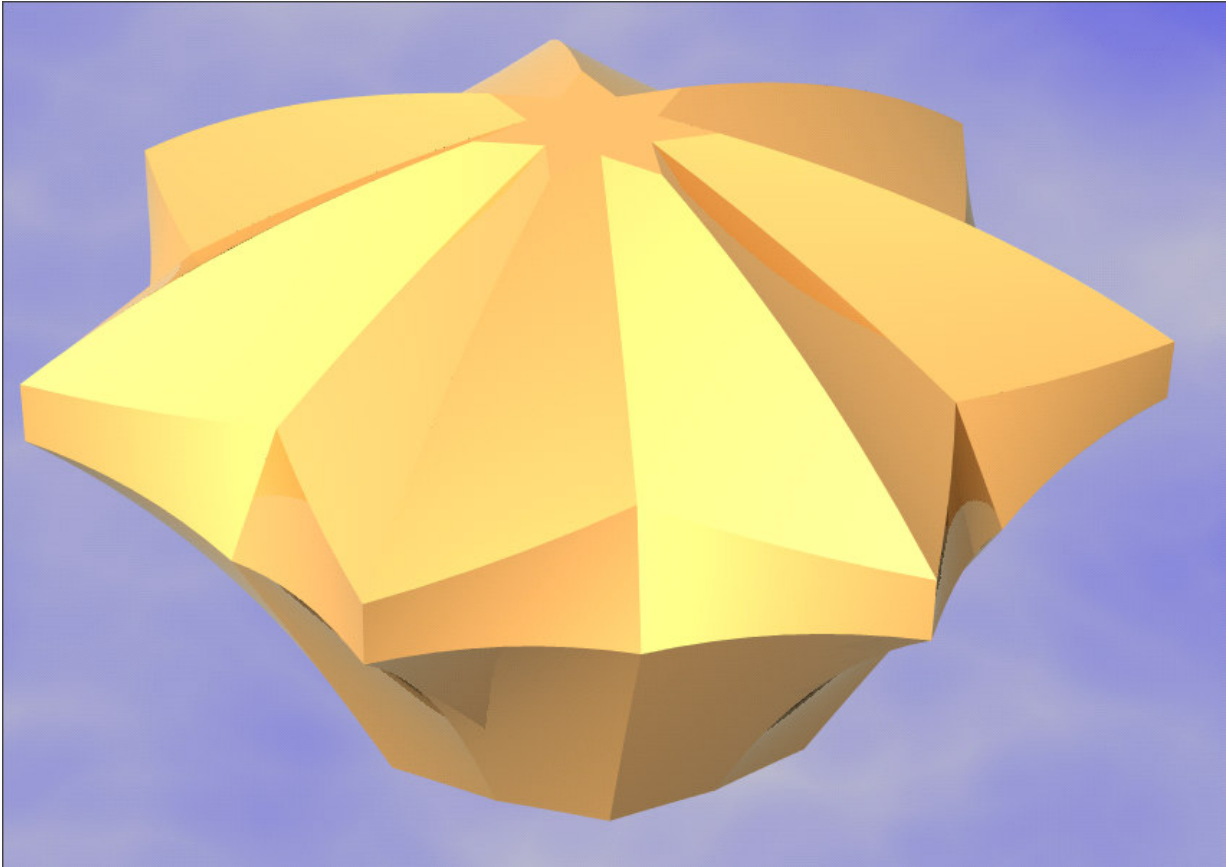


Introduction to Features

Pro/DESKTOP 8

Loft and Modifying Features

Prepared by Stephen Yaffe



What you should familiar with before starting this tutorial.

- Pro/DESKTOP graphical user interface
- Sketching tools
- Object browser
- How to select objects
- What makes a valid profile
- Constraints

What you will learn by completing this tutorial.

- Workplane creation
- Construction lines
- Applying constraints
- Equal length lines
- Loft through profiles
- Chamfering faces
- Projecting Lines

Conventions of this Tutorial

This is the third tutorial in the introductory series for Pro/DESKTOP 8 features. Since most people who attempt this tutorial will have already completed Lessons 1 and 2, this tutorial assumes a nominal knowledge of the Pro/DESKTOP 8 GUI. In this tutorial, features will be introduced using keyboard shortcuts. These will be shown as capital letters within brackets [**]. Feature commands (**extrude**, **revolve**, etc.) will also be shown in brackets but with the **Control key** or **Alternate key** followed by a **plus sign (+)** as a preface, and multiple key strokes separated by a comma.

Example, to create an extrusion using keys rather than the icon, one would first press down the **Alt key**, then while holding it, press and release the **R** key once, then press and release the **E** key, and finally release the **Alt Key**.

In notation form, extrusion looks like this: **[Alt + R, E]**.

Sequential operations will be indicated by commands separated by an arrow [**>**]. For example, the following command "**[C] > Drag a circle**" means - type the letter "**C**" key on your keyboard to select the circle sketching tool, and then drag a circle.

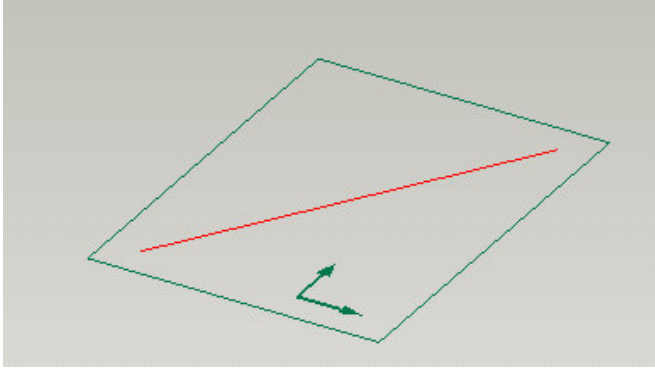
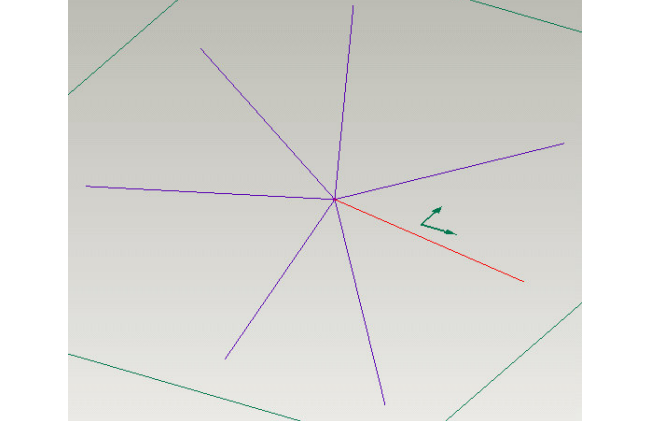
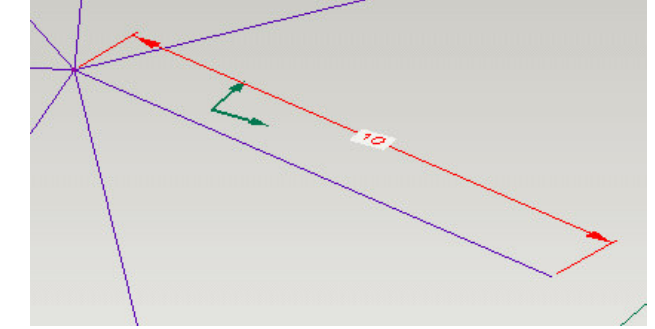
Set Up

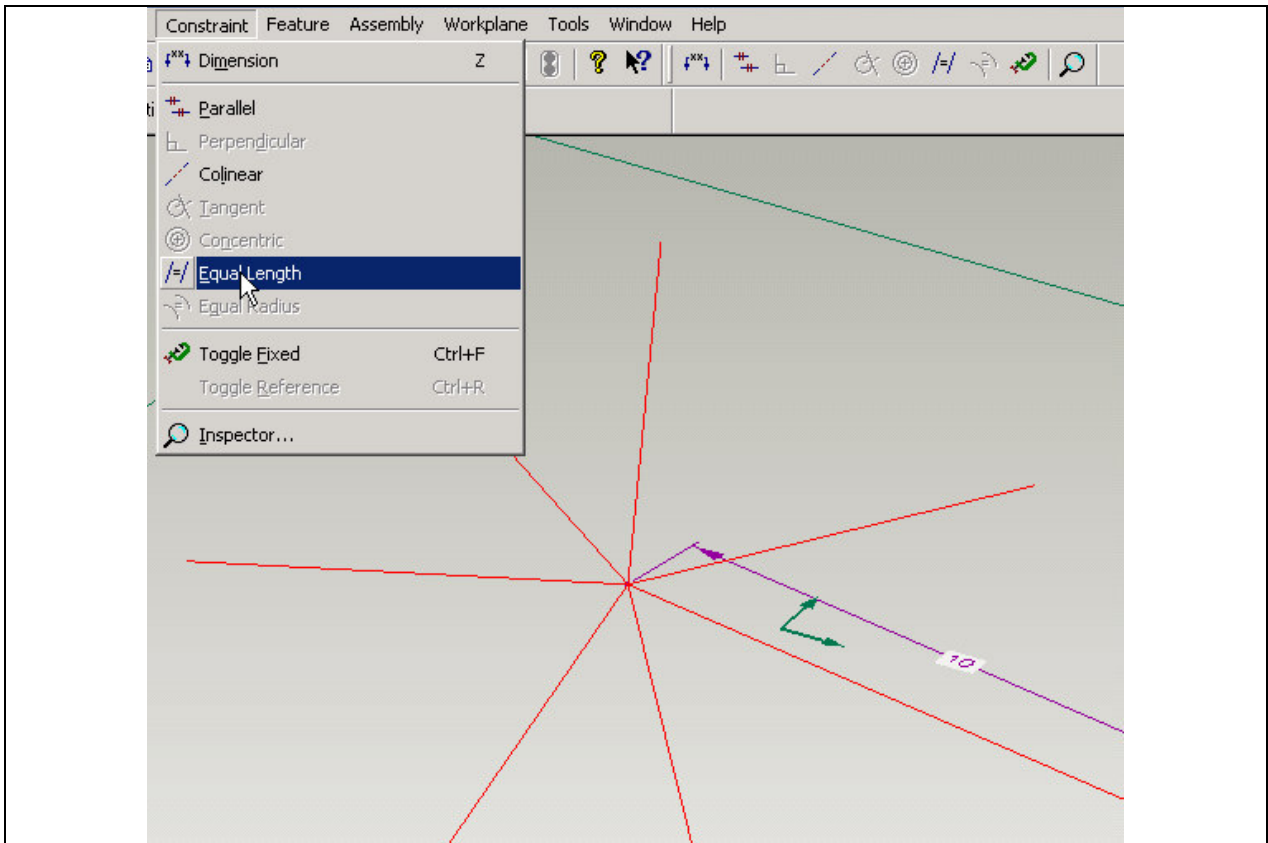
Just in case you didn't complete Lesson 1 or 2, there are a few things you will need to do to get your computer ready for this tutorial. This project has been done in **INCHES**. The first thing you will need to do is make sure that the unit of measurement on your computer is set to inches.

1. Open Pro/DESKTOP

- Start > Programs > **PTC Pro/DESKTOP 8**.
- From the **file** menu > go to **Tools > Options**.
- Select the **Units** tab > change the units to **Inches** in both fields > **OK**.

In this assignment, you will be creating a complex polygon. You will begin by sketching a septagon, and then you will project it up to a newly created workplane - sketch combination. After making some modifications to this new sketch, you will first loft between these two profiles then chamfer the top and bottom of the resulting form.

| | |
|---|--|
| <p>1. Open a new design file</p> <ul style="list-style-type: none">➤ [Ctrl + N] > [Enter]➤ In the Workplane browser, click on the plus sign to show the initial sketch.➤ Click once on the word Initial to select the title > then click it once again to edit it.➤ Change the name to Bottom.➤ In the design field, sketch a straight line. |  |
| <p>2. Sketch six more lines, connected at a single point in the center. These lines will become "spokes" for a seven-sided polygon.</p> |  |
| <p>3. Set the length of a line</p> <ul style="list-style-type: none">➤ [Z] > Sketch the dimension of the red line.➤ Double click on the number tag two or three times to activate its properties box.➤ Enter a new distance of 10" > [Enter]. |  |



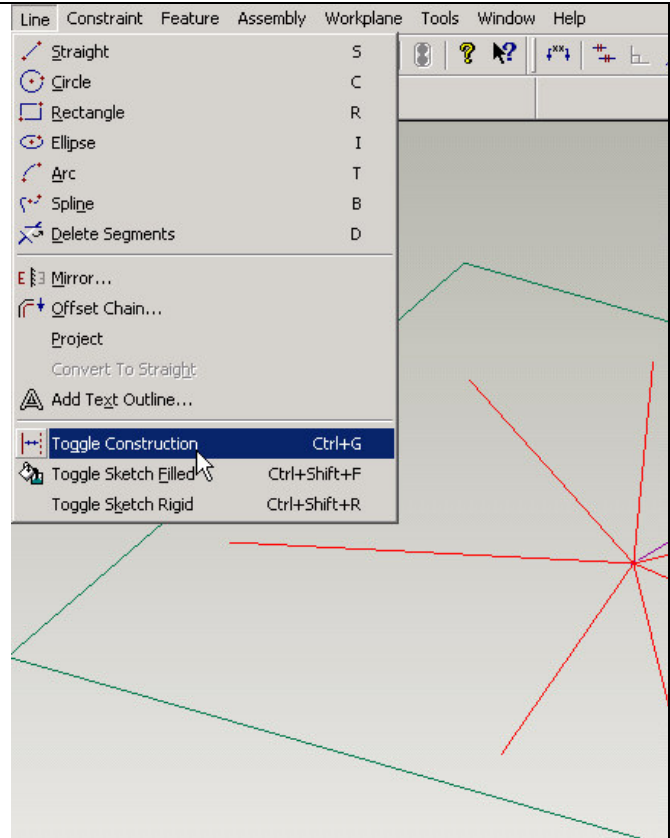
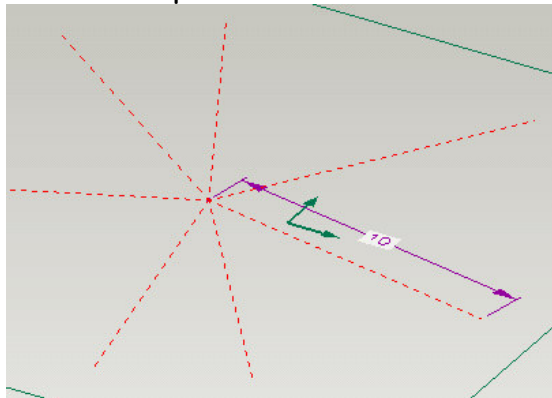
4. Select all the lines and constrain them to be equal length

- [L] > [Ctrl + A] *This selects all the lines.* On the screen, all of the seven lines will turn red, indicating that they are selected.
- Move the mouse to the file menu at the top of the screen > select Constraints > from the drop down menu select Equal Length. Now all your selected lines will 10" in length.

5. Convert lines to Construction Lines

- While all the lines are still selected (red), move your mouse to Line in the File Menu > Select Toggle Construction. The short cut for Toggle Construction is [Ctrl + G].

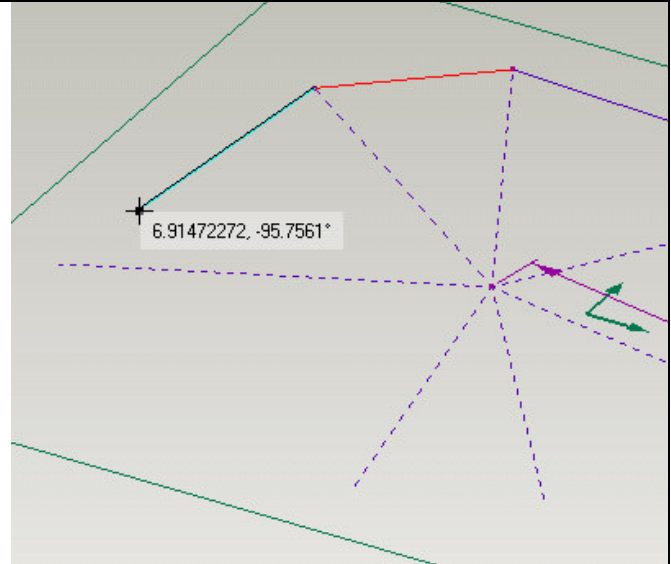
Note: By converting these spokes to Construction lines, they will not become part of the "valid profile", instead they will be considered reference lines. The word Toggle suggests that this command functions as a switch, and can be turned on and off. The value of this will become clear after a few more steps.



6. Connect the ends of the seven equal length spokes with seven new lines

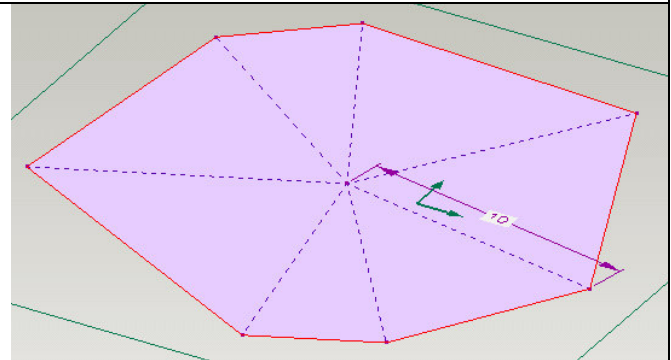
- Select the straight line tool [S] > find the end point of a line (you will see a black "snap-to" square when you have found the end point) and drag the line to the end point of a neighboring line.

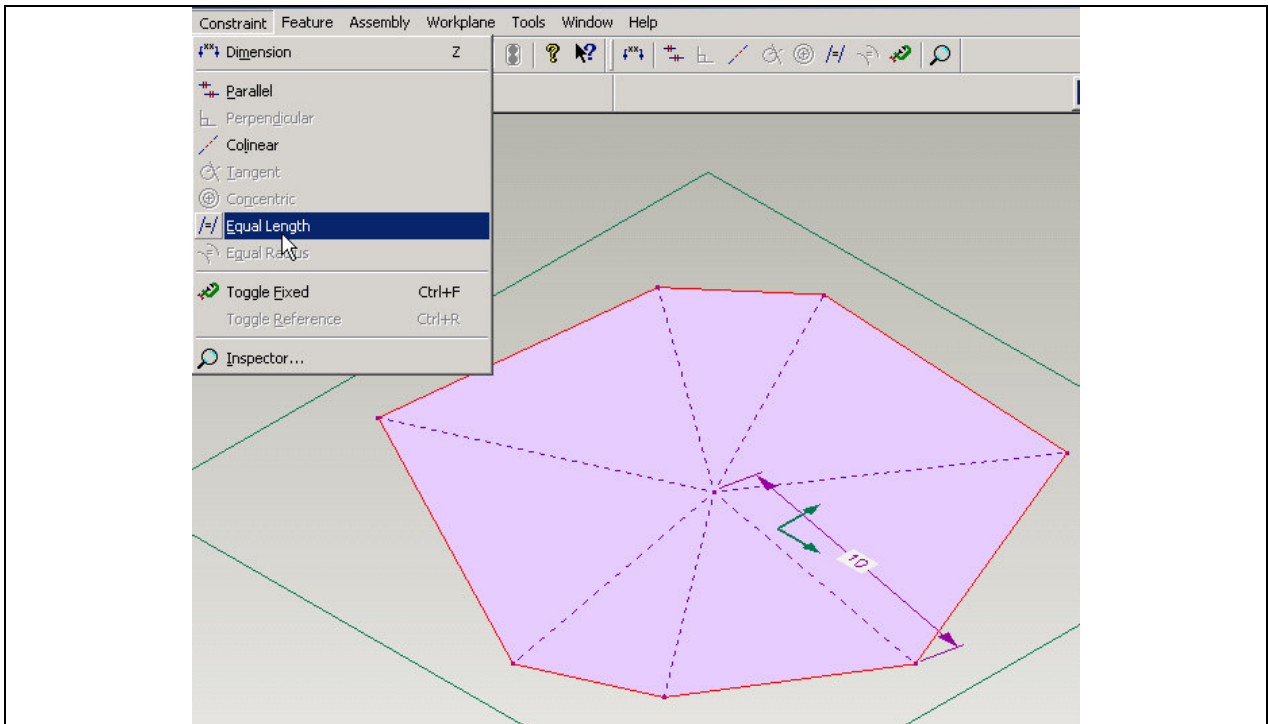
Note: In Pro/DESKTOP 8, once you have connected all the end points, the septagon will be complete and the new valid profile will be filled with a "fill color". In Pro/DESKTOP 2000i2, to get a fill color, you will have to Toggle Sketch filled [Ctrl + Shift + F].



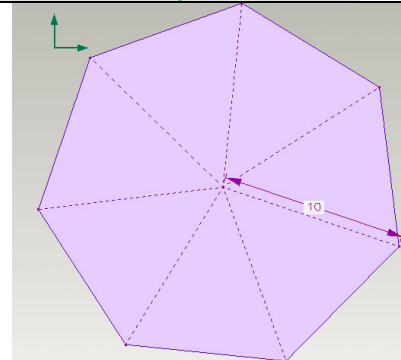
7. Convert the septagon to an equilateral septagon

- [L] > While holding the [Shift] key on your keyboard, select each of the lines that make up the seven-sided wheel (see the picture to the right).
- Again, go to Constraint in the File menu at the top of the screen > from the drop-down menu, select Equal length. (See the picture below).

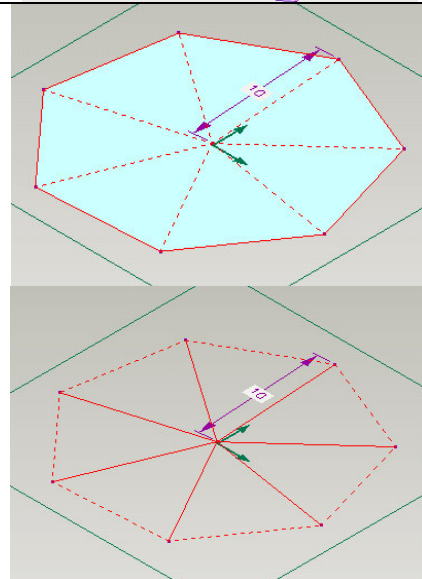




- To verify that the septagon is now equilateral, you might want to **view onto the workplane**. Type [Shift + W] to look straight down on your image. To go back to the default, **isometric view**, type [Shift + I].



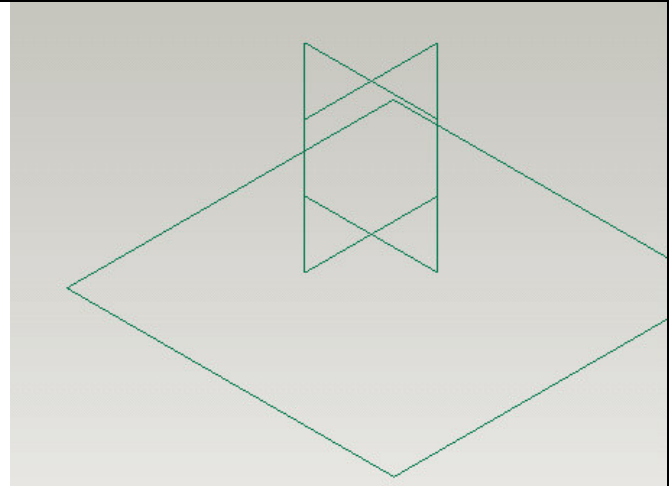
As mentioned above, the word **toggle** suggests an on/off switch. The two images to the right here show you that you can turn selected lines in to construction lines by typing [Ctrl + G]. You can just as easily turn them into regular lines by typing [Ctrl + G] again. Try doing this now and see how the fill pattern turns on and off as the lines of the "spokes" and the lines of the "wheel" take turns being construction lines.



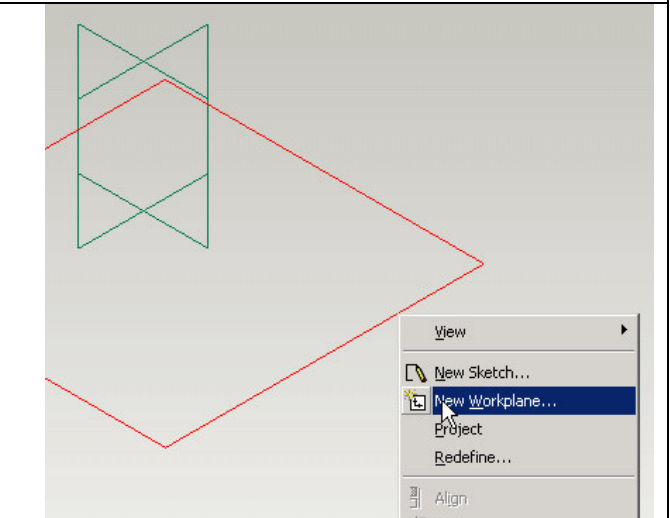
8. Create an Offset Workplane

- In order to Loft two profiles, there needs to be two different workplanes to loft between. These workplanes can be offset evenly, or at an angle or between objects. This tutorial requires the creation of an Offset Workplane.
- Type [W] to select workplanes.

Note: in the select workplane mode, lines are not visible. But since workplanes expand and contract to completely and snugly surround sketches, you should be able to identify the right workplane.

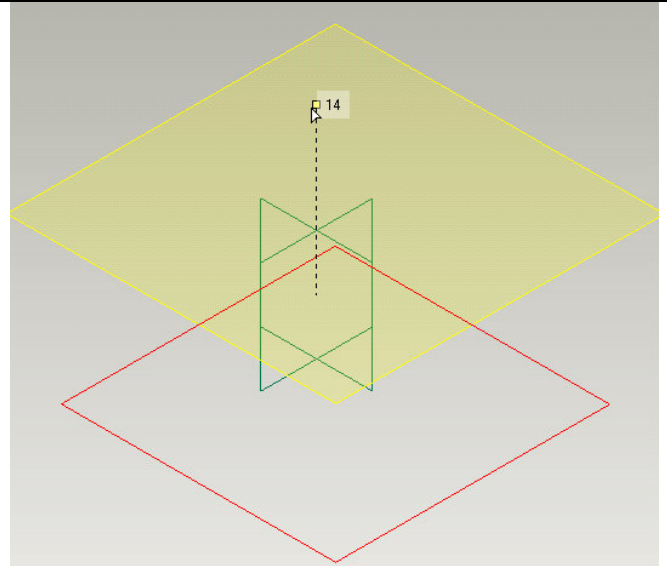


- Left-click on the workplane with the sketch Bottom to select it > While it is selected (red), right click to bring up a context sensitive menu > from this menu, **select New Workplane**.
- A new dialogue box will appear > select Offset > [Enter].



- You will see a small yellow square in the center of your selected workplane; this is called a "handle."
- Click and drag this handle up to 20 inches.

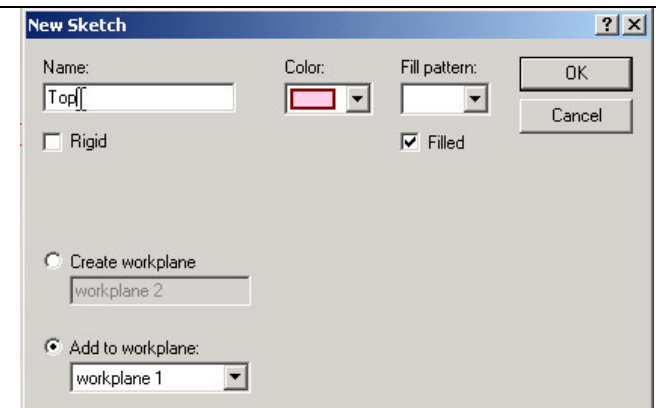
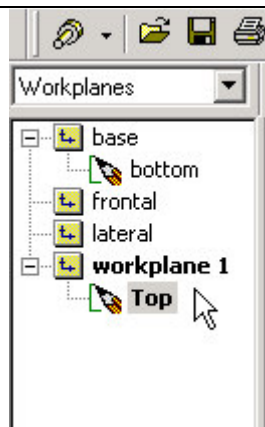
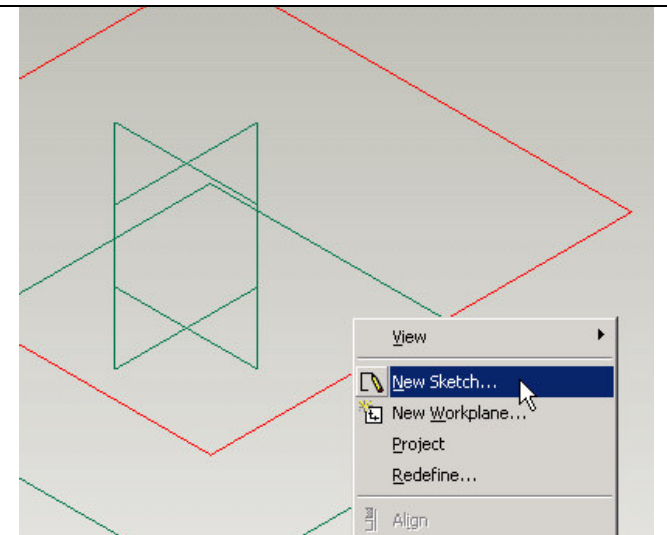
Note: In Pro/DESKTOP 8, you will have a read out at your cursor that indicates the distance of the offset as you drag up or down. Alternatively, you can simply enter the desired value in the New Workplane dialogue box.

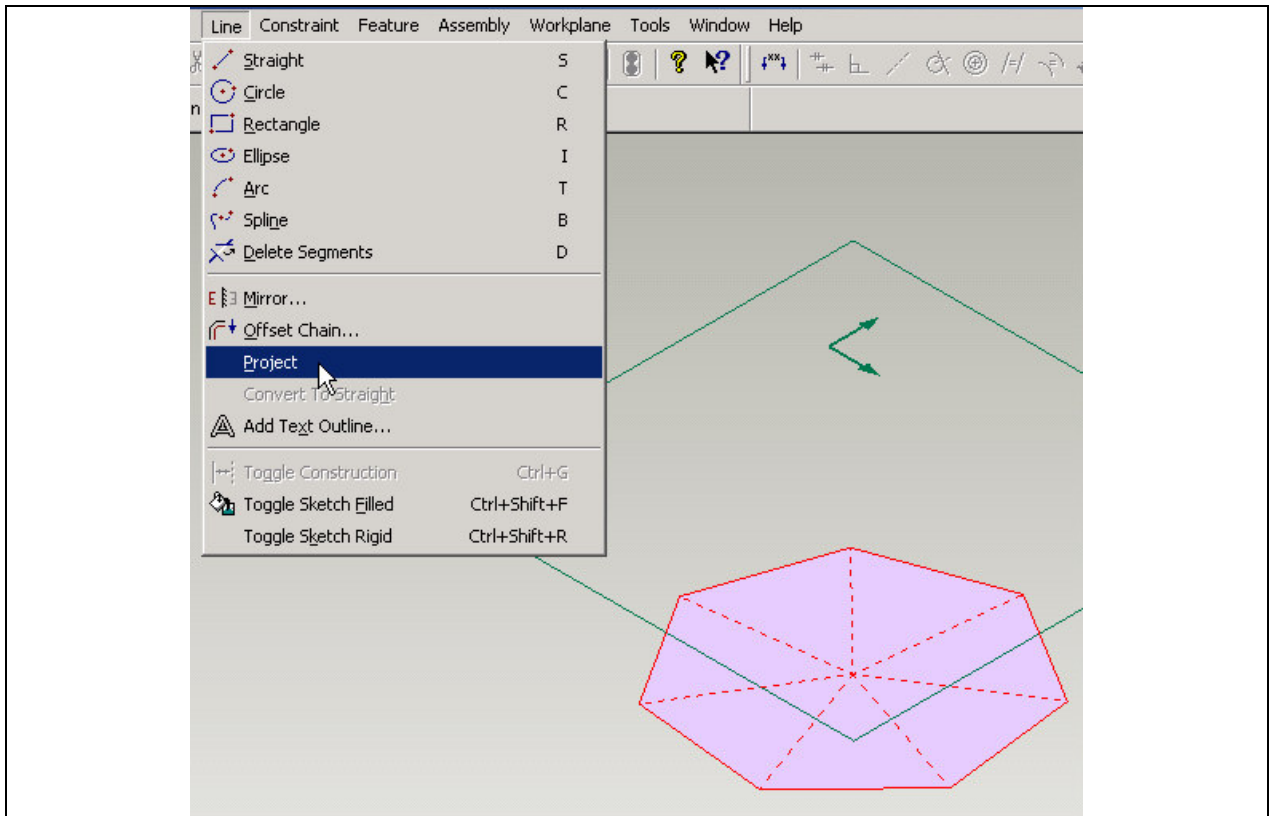


9. Add a New Sketch to your New Workplane.

- While the new, offset workplane is selected, right-click. This will bring up a new context sensitive menu.
- Select New sketch > name it Top > [Enter] (see below right).

Note: Below you will see a picture of the Workplane browser with the new workplane, workplane 1 and the new sketch, Top.



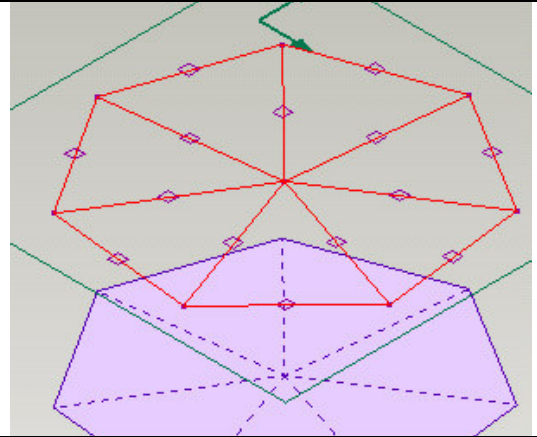


10. Project the septagon up to the new sketch

- Type [L] to select lines > with no sketching tool selected (double-click once on a blank area of the design field to deselect any sketching tool).
- Drag a selection lasso around the septagon in the sketch Bottom to select all the lines.
- In the File menu at the top of the screen, select Line > from the drop-down menu, select Project. This will “pop” the selected lines up into the active sketch Top.

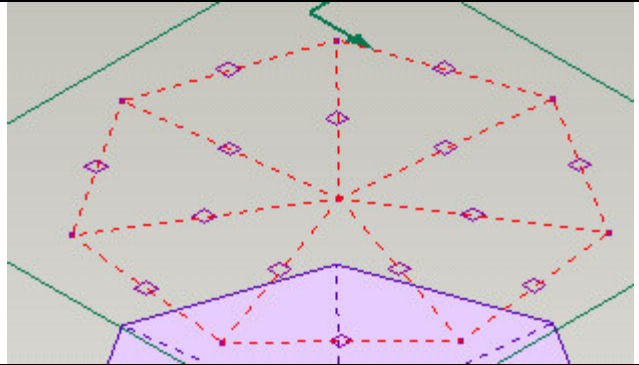
Note: You can tell that a sketch is active by looking in the object browser. If the word by the sketch icon appears in bold, it is active. To activate a dormant sketch, in the object browser, double-click on the sketch name once.

In this image you can see that there are two septagons, one in each workplane. Notice that the projected sketch has small purple squares on each line. These squares indicate the **midpoints** of each line.



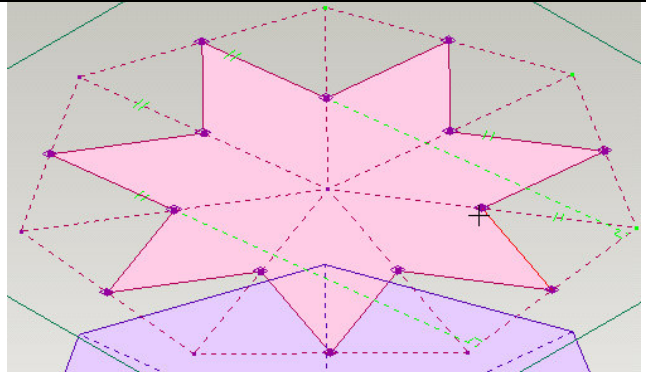
11. Convert all the lines in the projected sketch into construction lines

- While all the lines are still selected (red) type [Ctrl +G].



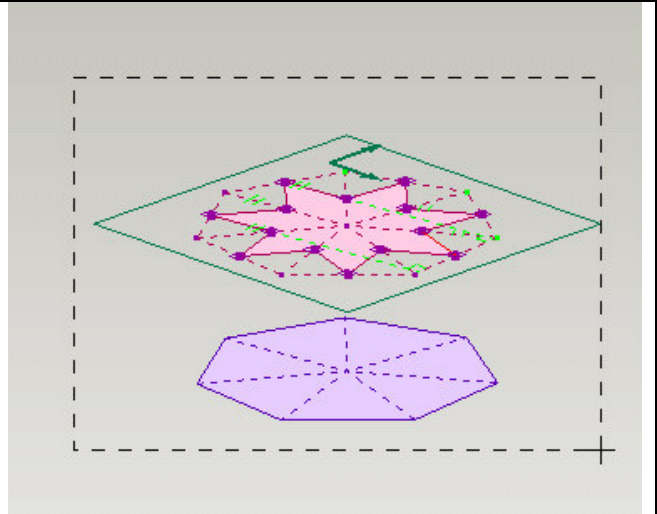
12. Sketch a seven-pointed star

- Type [S] to select the straight-line sketching tool.
- Using the small purple squares in the projected sketch, connect the midpoints to create the star.
- Drag a line from the midpoint on the wheel to a mid point of a spoke. Be sure to wait until you see the small black snap square that indicates you are starting or ending a line on a midpoint.
- [Ctrl + Shift + F] to make sure that all the lines are connected. If the star doesn't fill, this loft will not work.



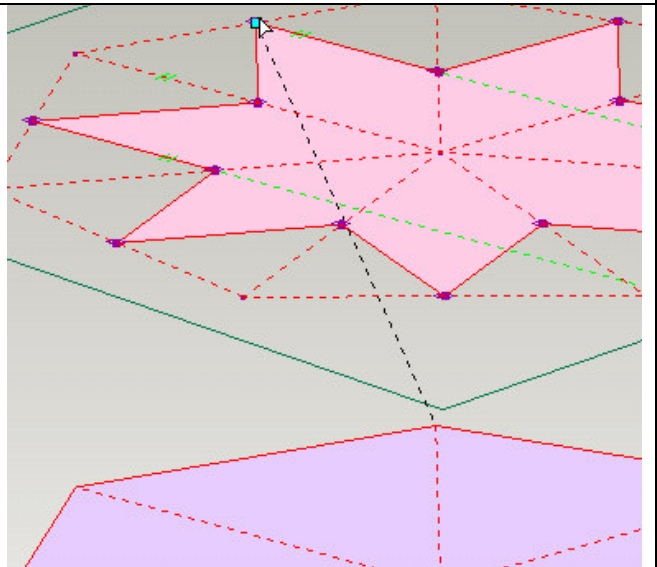
13. Select both sketches

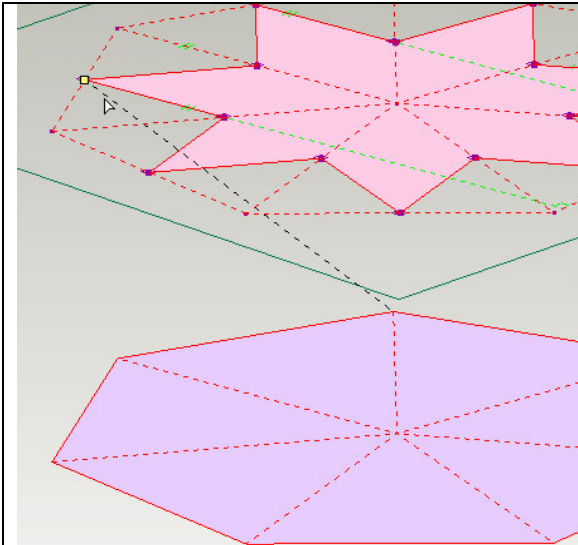
- With no sketching tool selected (double-click on a blank area of the design field to make sure) drag a selection lasso completely around both sketches. Both the septagon and the seven-pointed star will be red.



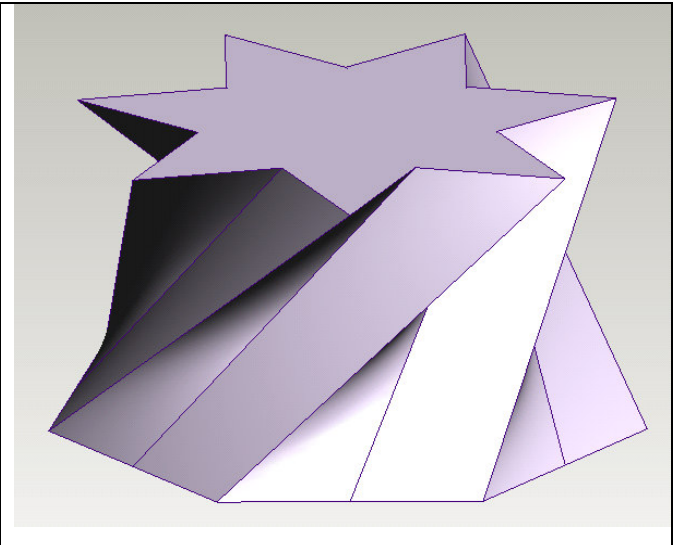
14. Loft the two profiles

- With both sketches selected, go to Feature in the file menu at the top of the screen.
- Select Loft from the drop-down menu.
- A new dialogue box will appear and you should see both sketches listed in the center of this box. One of the sketches will have a blue box around it, indicating that it is selected.
- In the design field, you should see a "handle" somewhere on this sketch. You can drag this handle around to determine the nature of the loft, whether or not it will have a twist to it and if so, how much of a twist.





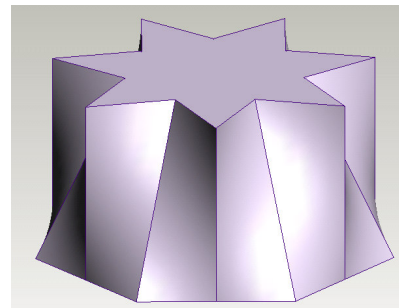
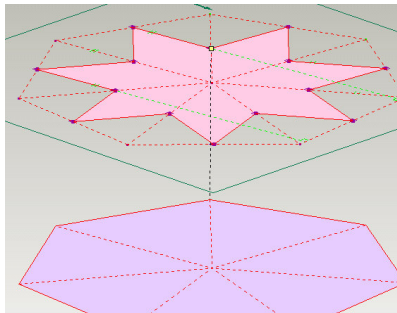
The image above shows one possible configuration of a twisted loft.



This image indicates the resulting shape of this loft.

To complete this tutorial, your loft should not be twisted. If it is, you will need to redefine the loft in the feature browser.

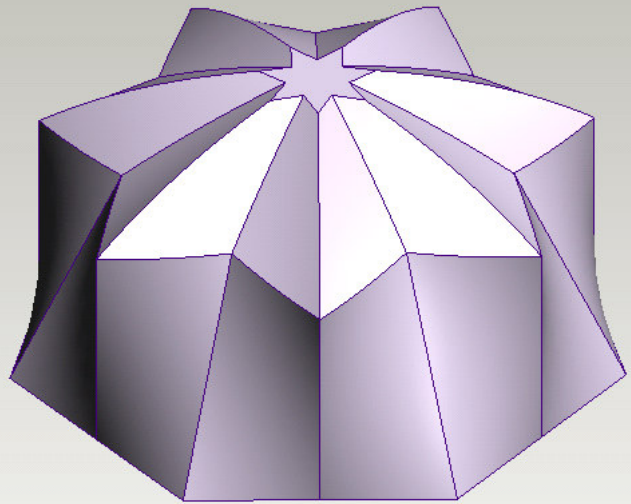
- Right click on the word Loft 1 to active the context sensitive menu > Select Redefine. This will reopen the Loft dialogue box allowing you to drag the handle to the proper location.



If you have successfully followed all the steps above, you will have completed an impressive loft. Congratulations! The next section of this tutorial will show you how to modify the resulting solid to create the image on the cover of this tutorial.

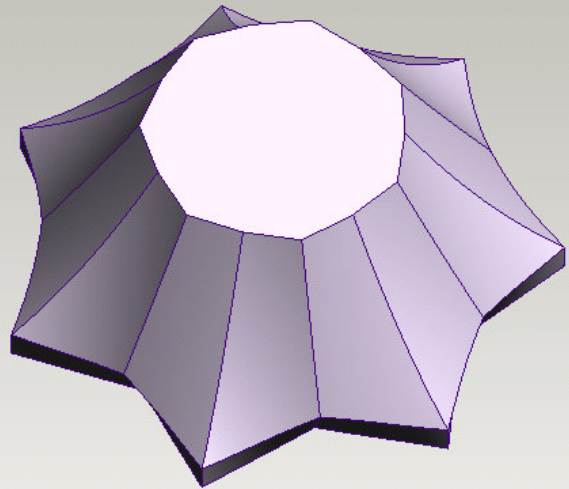
15. Chamfer the top face

- Type [F] to select faces > Select the flat star face of the solid. The face will turn red when selected.
- Right-click to activate the context sensitive menu > Select Chamfer.
- Apply an Equal setback of 3" > [Enter]



16. Chamfer the bottom face

- Type [F] > select the bottom face > Right- click to activate the context sensitive menu > Select Chamfer.
- Apply an Equal setback of 6" > [Enter]



17. Shell the resulting solid

- [F] > Select the bottom face
- Right click to activate the context sensitive menu > Select Shell Solid.
- Enter a value of 1" > Select Inside > [Enter].



18. View Transparent

- To get a better sense of the complex nature of the solid you have created, click on the View Transparent icon in the select views toolbar.



Now, for a little math fun!
How many faces does this form have?

Hint: It is quicker to find the answer by calculation than by counting.

