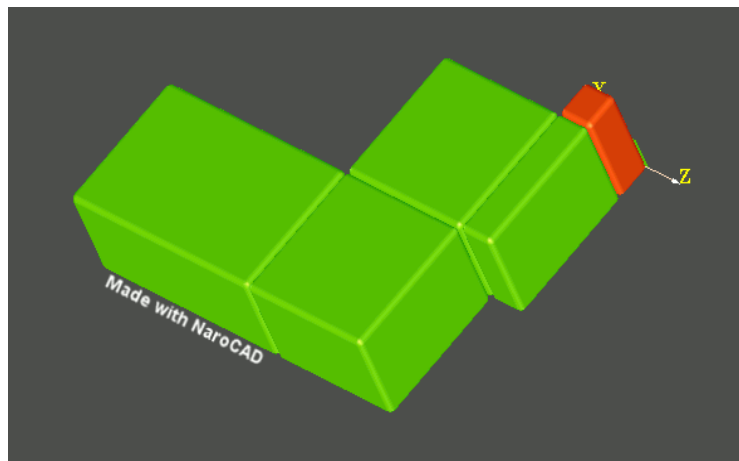
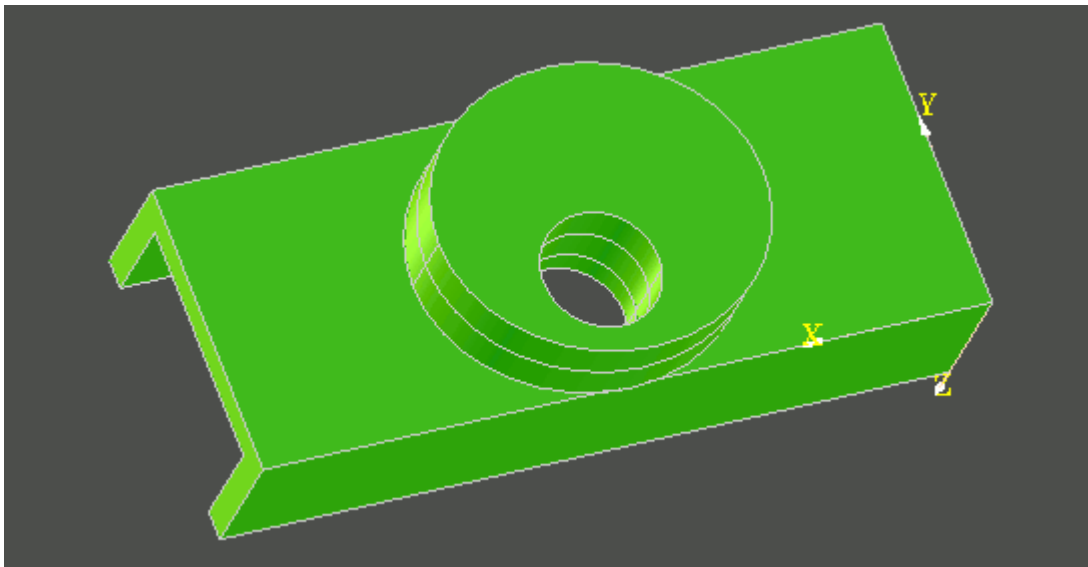


NaroCAD 1.0 Drawing Tutorial
26 June 2009

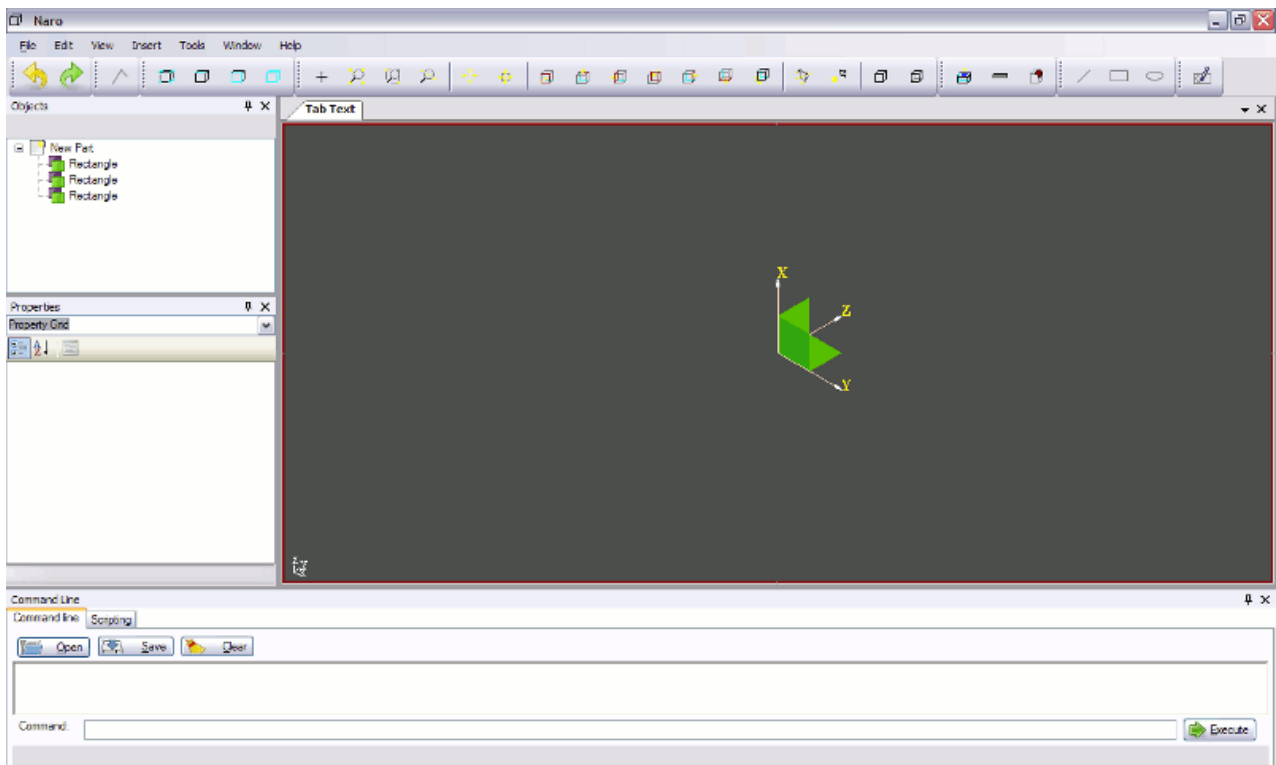


This tutorial shows how to create a part using shape drawing, cut and extrude. The resulting part after making this tutorial is the following:



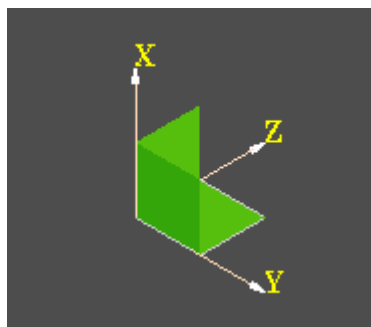
Step 1. Launch NaroCAD

When the application starts it has on the left side a tree view list containing the objects drawn and a property grid that allows changing the properties of the objects from the scene. On the bottom there is a command line window used to introduce commands or files of commands. The drawing area is located on the right side containing at the beginning 3 rectangles oriented on the the 3 planes: xoy, xoz, yoz.



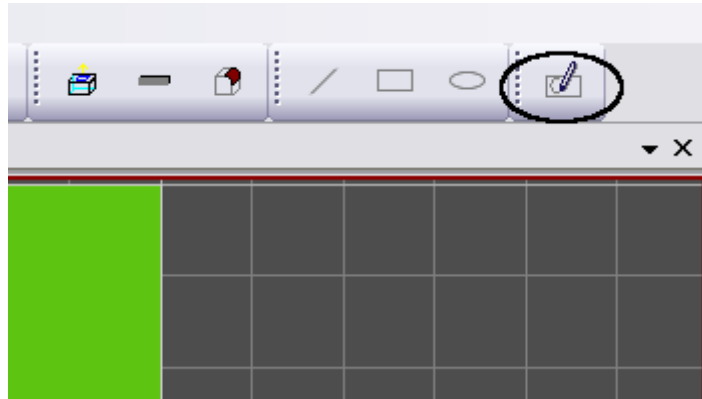
Step 2. Select one of the 3 helper rectangles by clicking on it

Initially the application starts in selection mode. When any tool is started changing back to selection mode is made by pressing the Esc key.



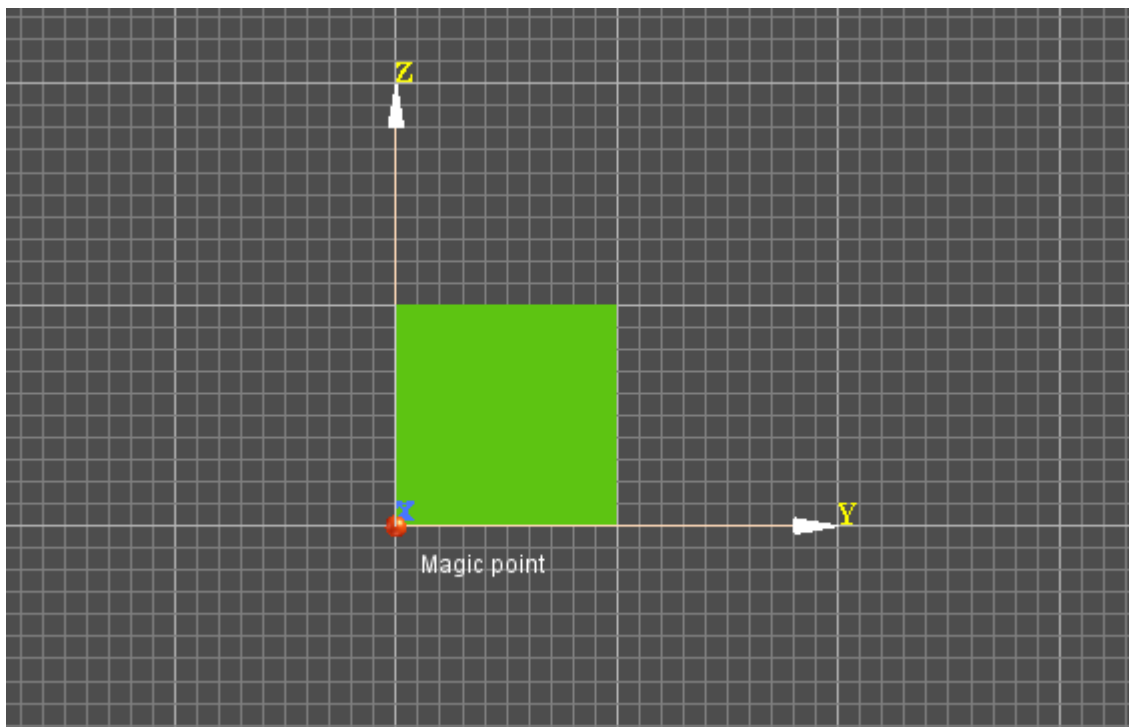
Step 3. Select Sketcher

The Sketcher tool is used for higher precision drawing. When it is clicked it rotates the selected plane so that it becomes parallel with the viewer's screen. In this way angles and lengths are not affected by the angle of viewing.



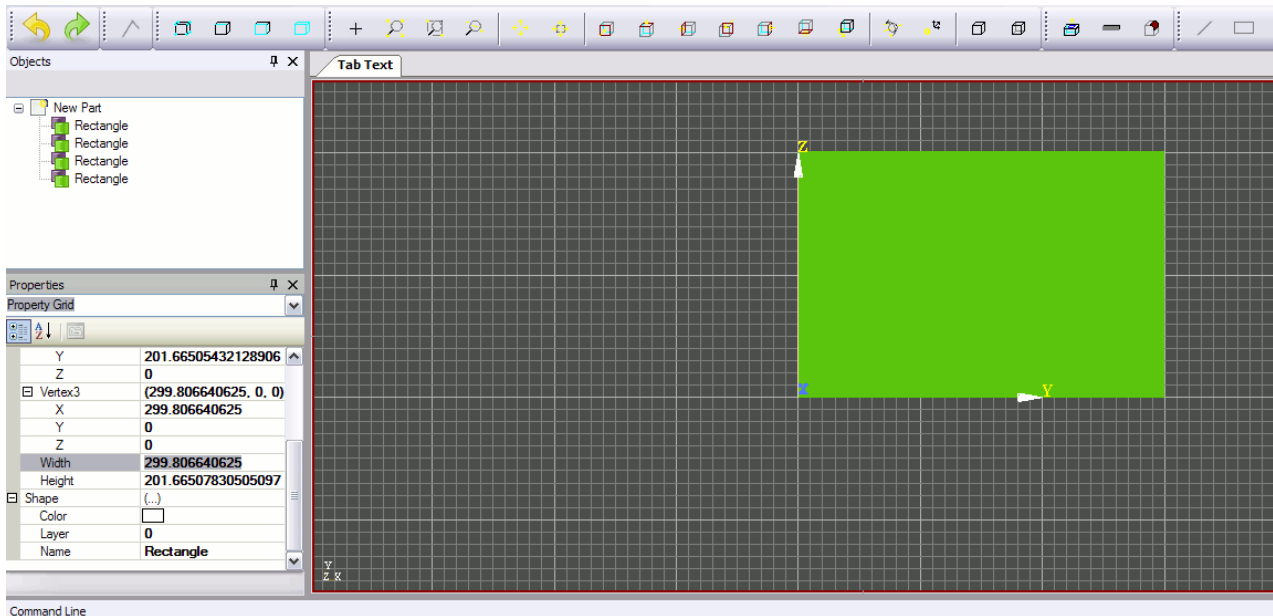
Step 4. Click on the rectangle tool from the drawing toolbar and start looking for a magic point.

Magic points help the user locate vertexes of one object, edge midpoints or center of shapes.

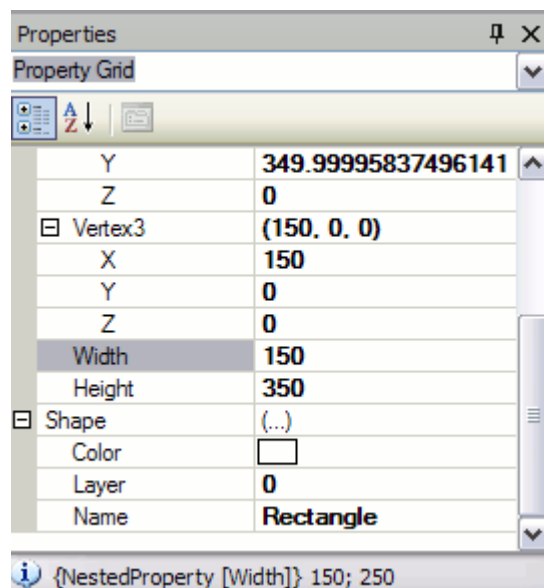


Step 5. Draw a rectangle by clicking on the point where we want to have the bottom left vertex, then click on the top left vertex and on the bottom right.

The rectangle drawn is the following:



Step 6. In order to have a rectangle with a desired width and height use the property grid to set these values. If these are changed from the property grid the rectangle is redrawn so that its edges match the desired lengths.



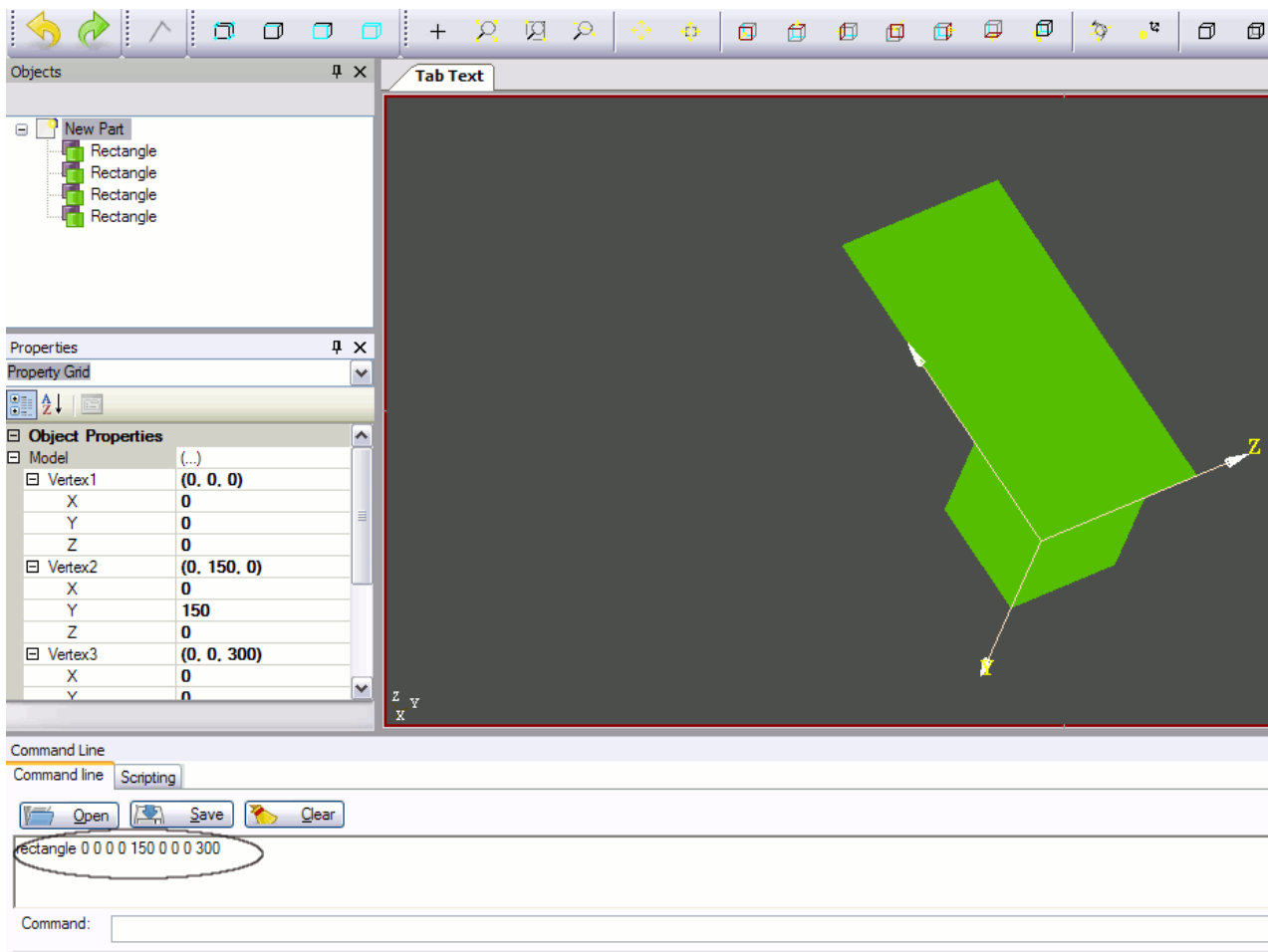
Note: The operations made on Steps 2 to 6 can be made easier and with a higher precision from the command line:



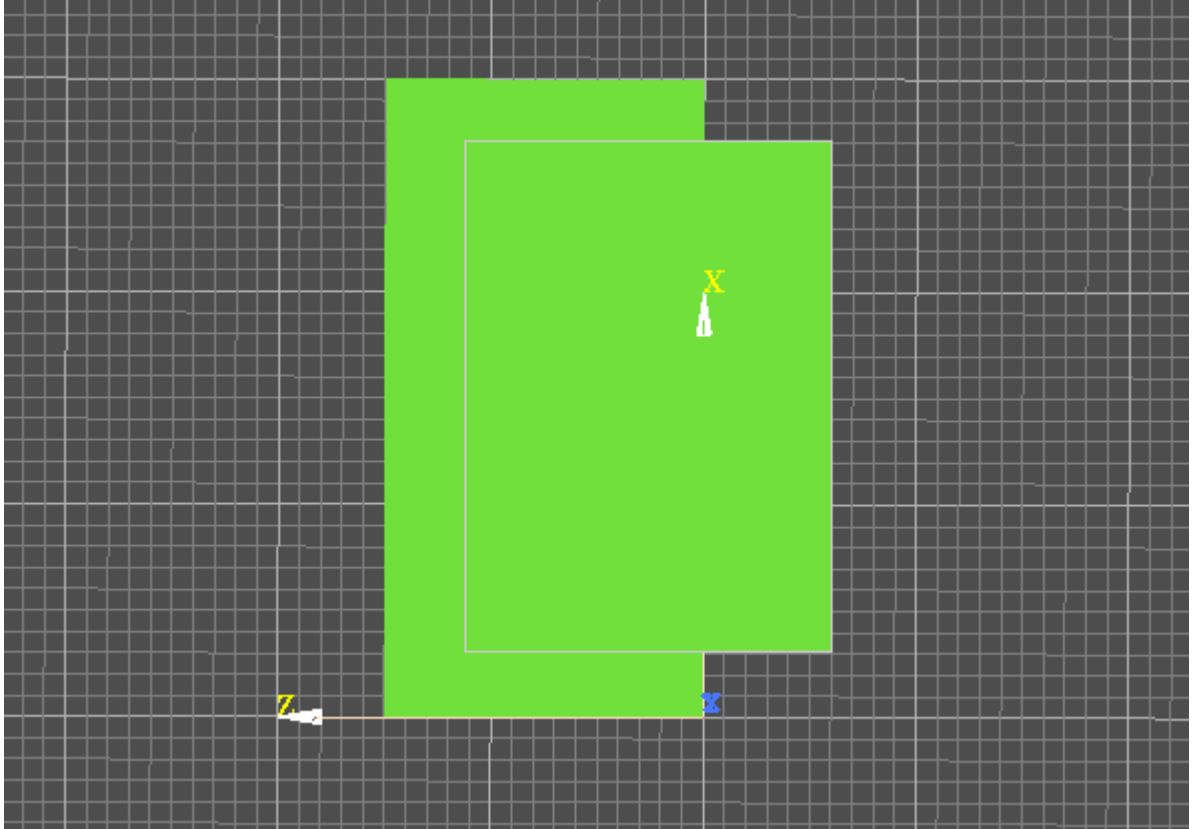
If the "r" character is entered a helper appears on the bottom of the window suggesting possible commands to introduce. The rectangle command looks like the following:

rectangle 0 0 0 0 100 0 0 0 350

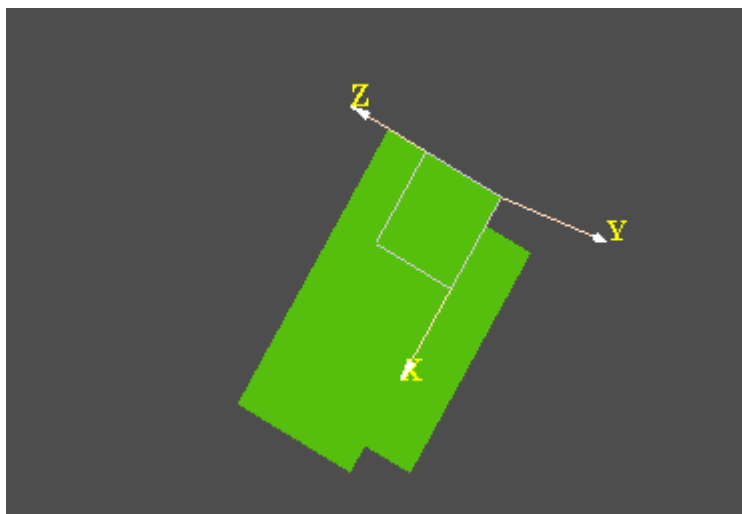
The parameters of the command are the coordinates of the 3 rectangle vertexes. The result of the command is the same shape like the one drawn with the mouse:



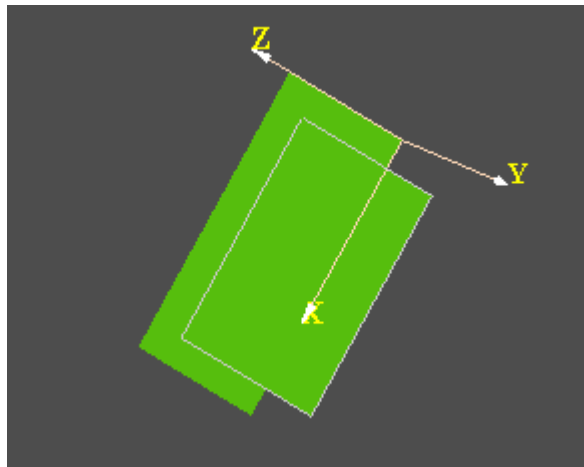
Step 7. Like the rectangle previously drawn draw another rectangle. This new shape will be used to cut through the first shape drawn:



Step 8. Remove the initial helper rectangles so that they will not be affected by the Cut operation. The shape removal is made by selecting it and pressing Del key from the keyboard:



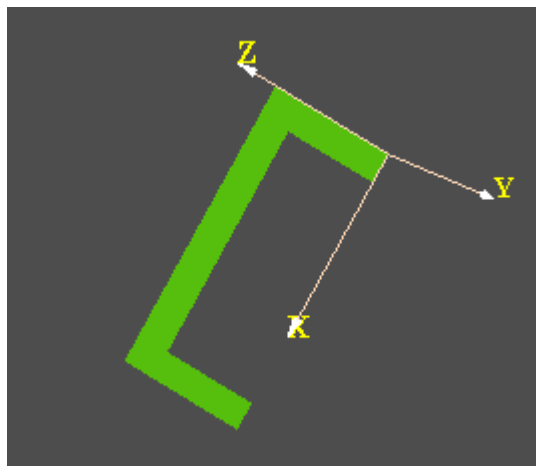
Step 9. Select again the rectangle that will cut through the other shapes:



Step 10. Launch the Cut operation by clicking its icon from the toolbars:



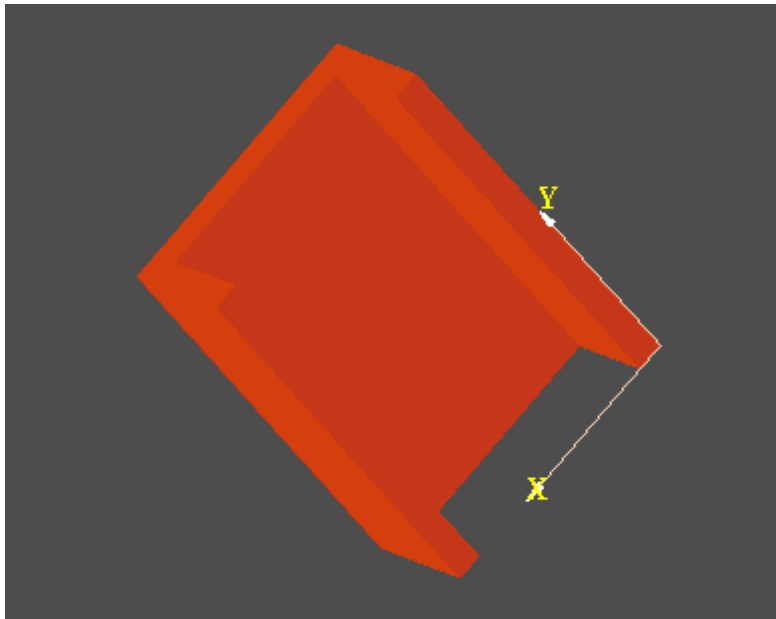
The result of the Cut operation is the following:



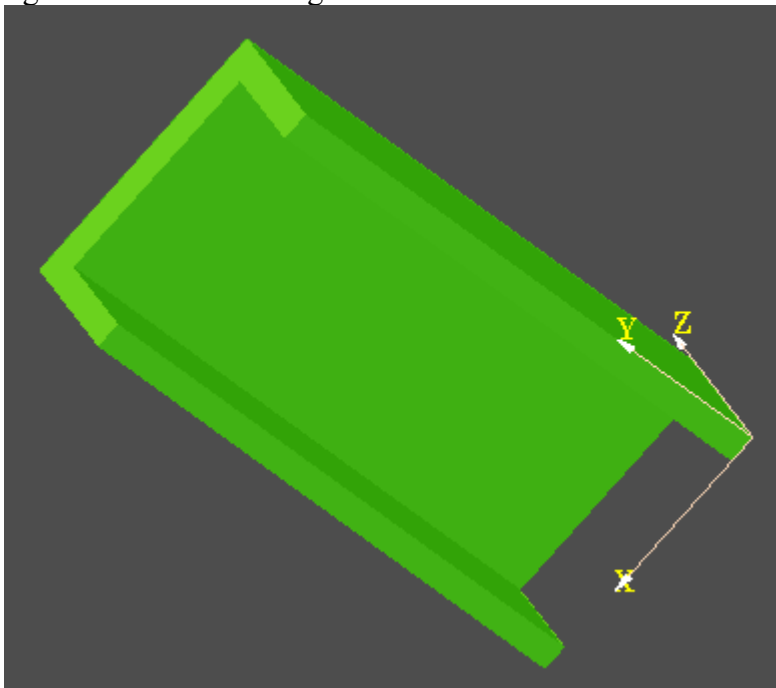
Step 11. Click on the extrude tool:



Step 12. Click on the shape generated with the Cut operation and start extruding it:

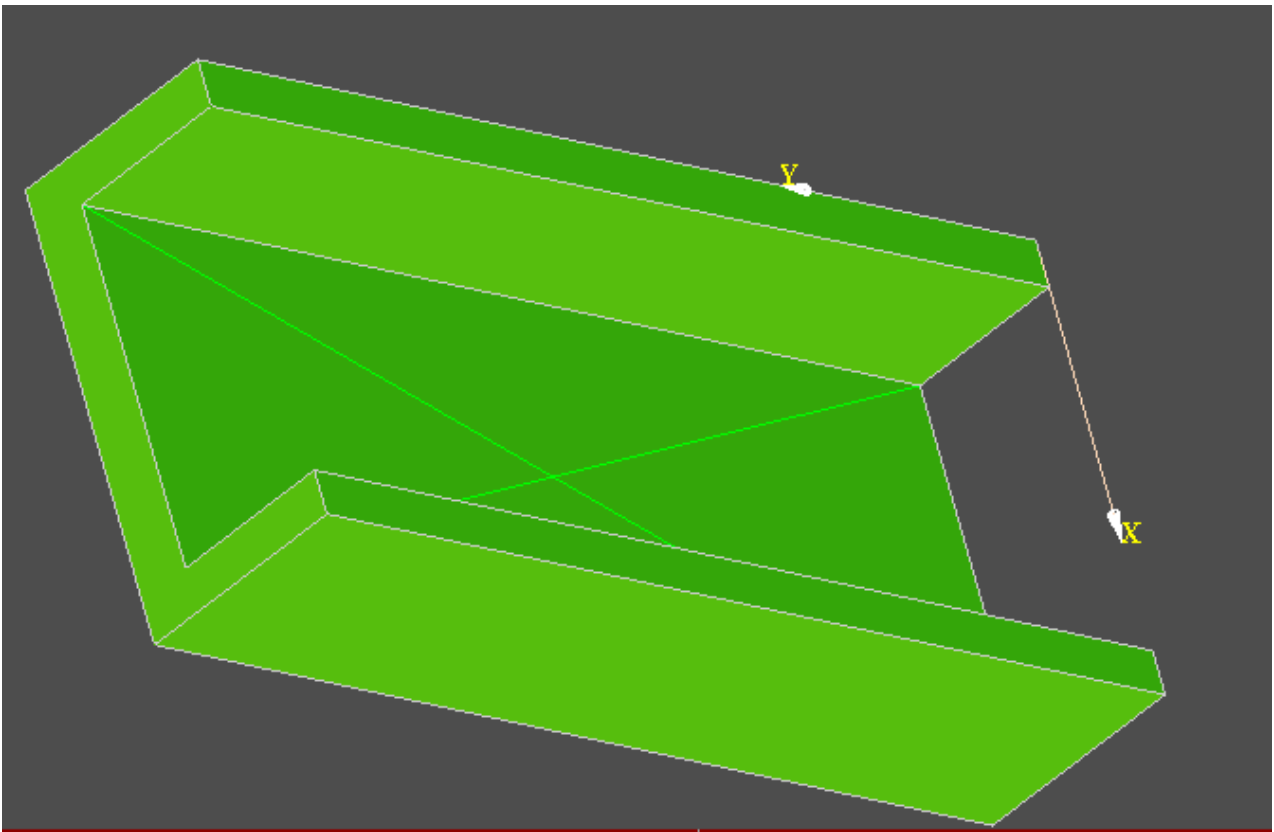


After the desired height is achieved click again:

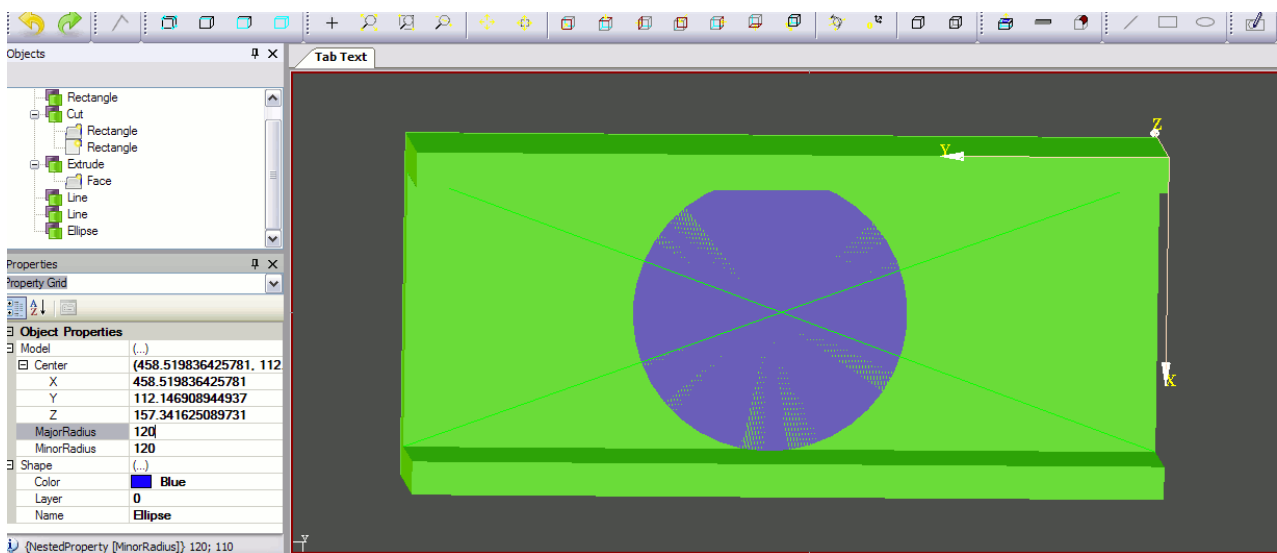


For a higher precision the extrusion height can be changed from the property grid.

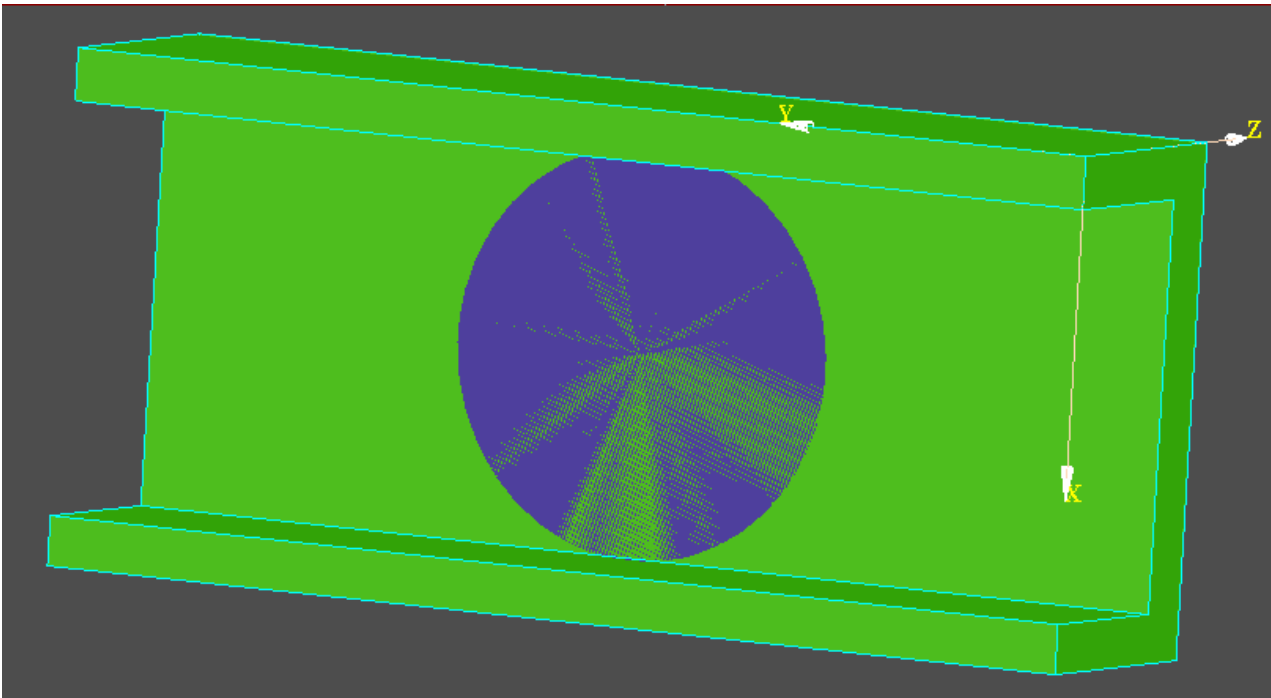
Step 13. If needed, helper lines can be drawn. The geometric solver detects magic points on the line ends and middle, this might be useful at drawing.



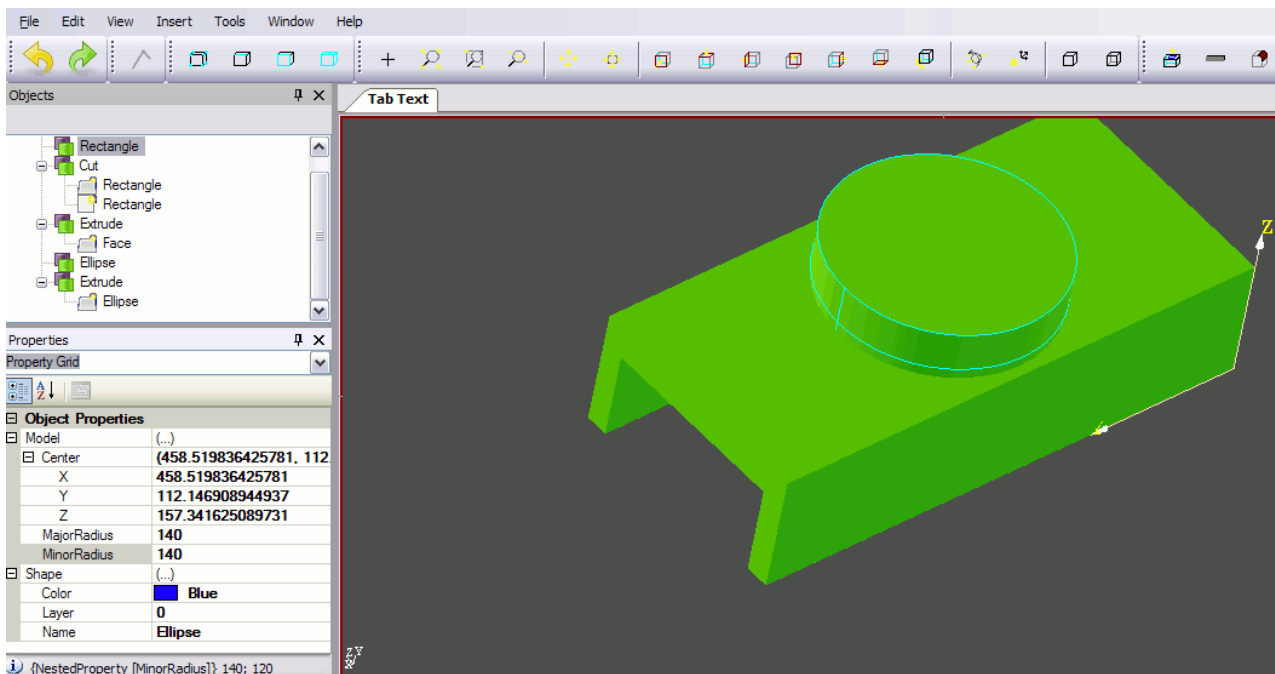
Step 14. Draw an ellipse and set from property grid its minor and major radius to have the same value so that the shape becomes a circle. Also the shape color can be changed from the property grid.



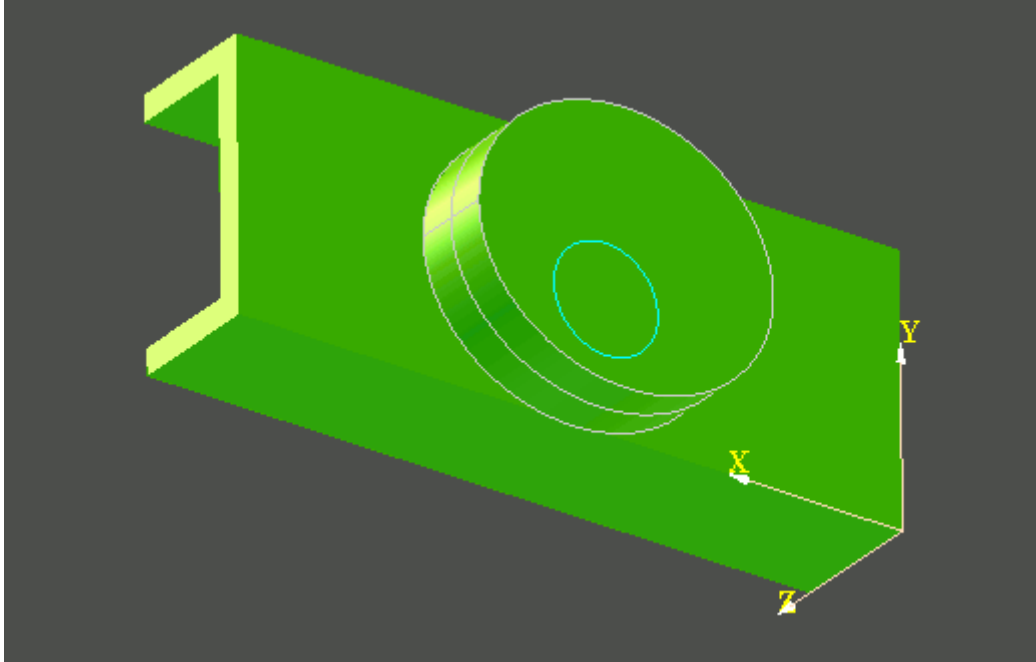
Step 15. Remove the helper lines by selecting them and pressing the Del key:



Step 16. Extrude the previously drawn ellipse:



Step 17. Draw an ellipse and make it circle by setting in property grid its minor and major radiuses to have the same value:



Step 18. Select the small circle and perform a Cut operation using the Cut tool:

