

3D-CAD (application1)

We create an impeller of a centrifugal pump using FreeCAD.

The created model will be used in CFD calculation.

The dimensions are shown in Fig.1.

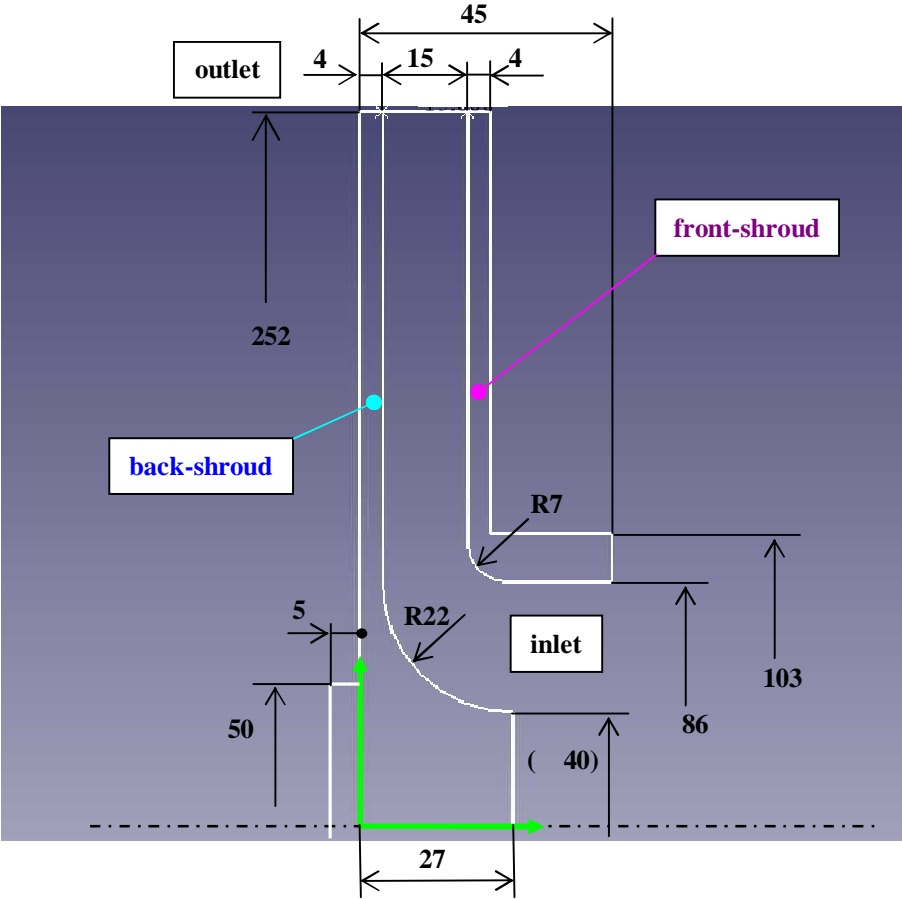


Fig.1 Primary dimensions

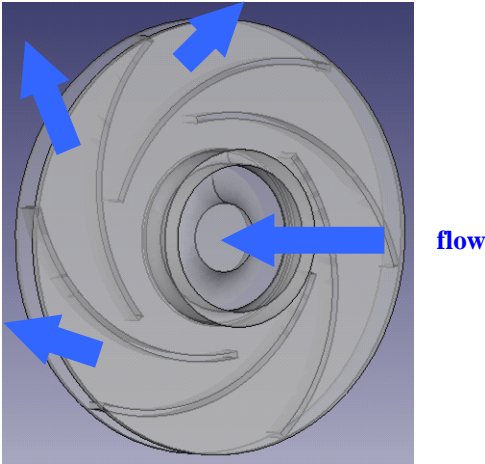
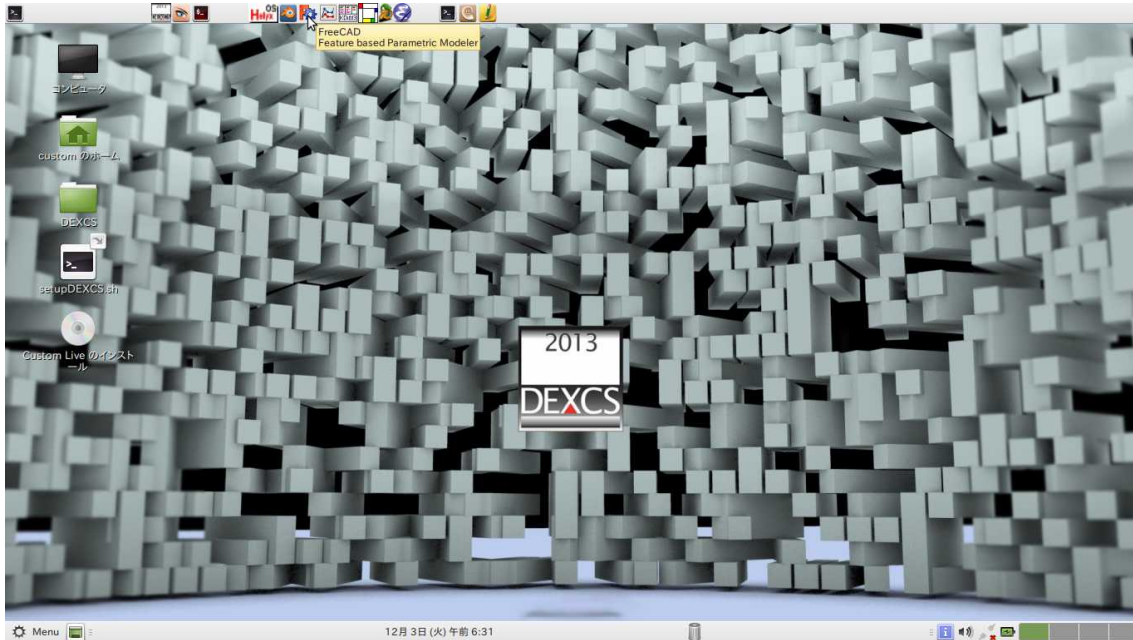


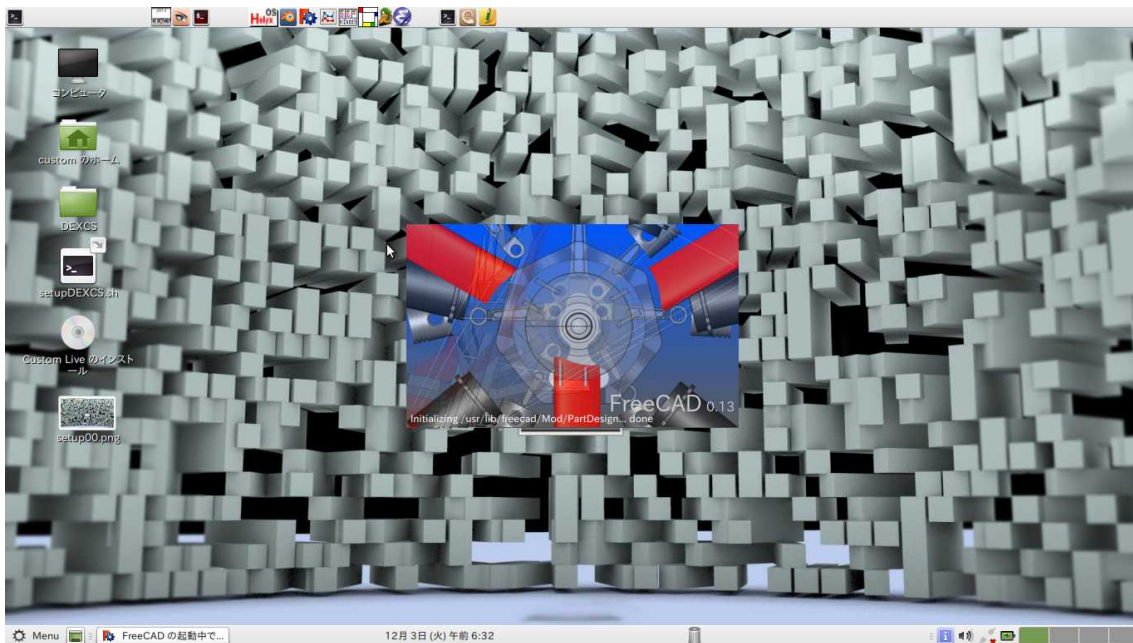
Fig.2 Final shape (rotating direction is ccw)

Boot FreeCAD

Click the FreeCAD icon.

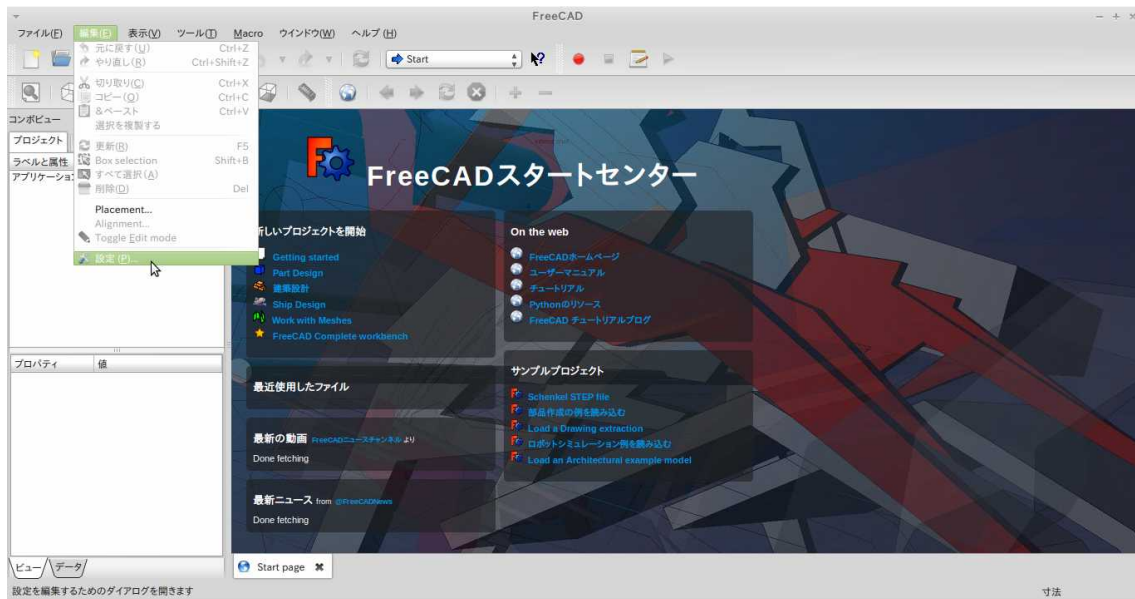


FreeCAD is starting

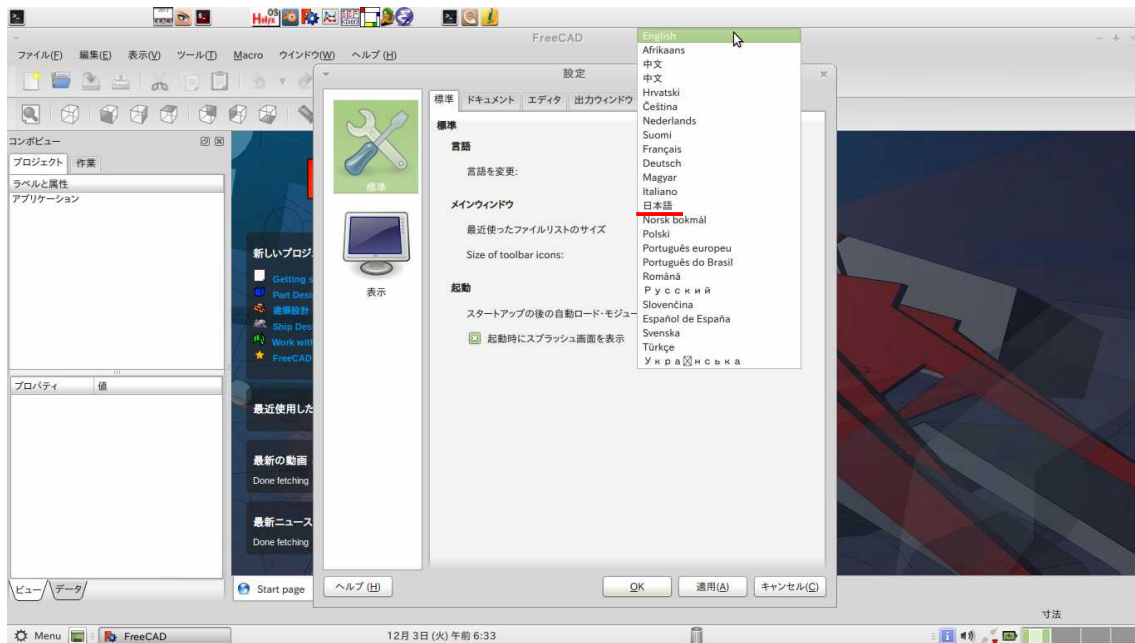


Change language

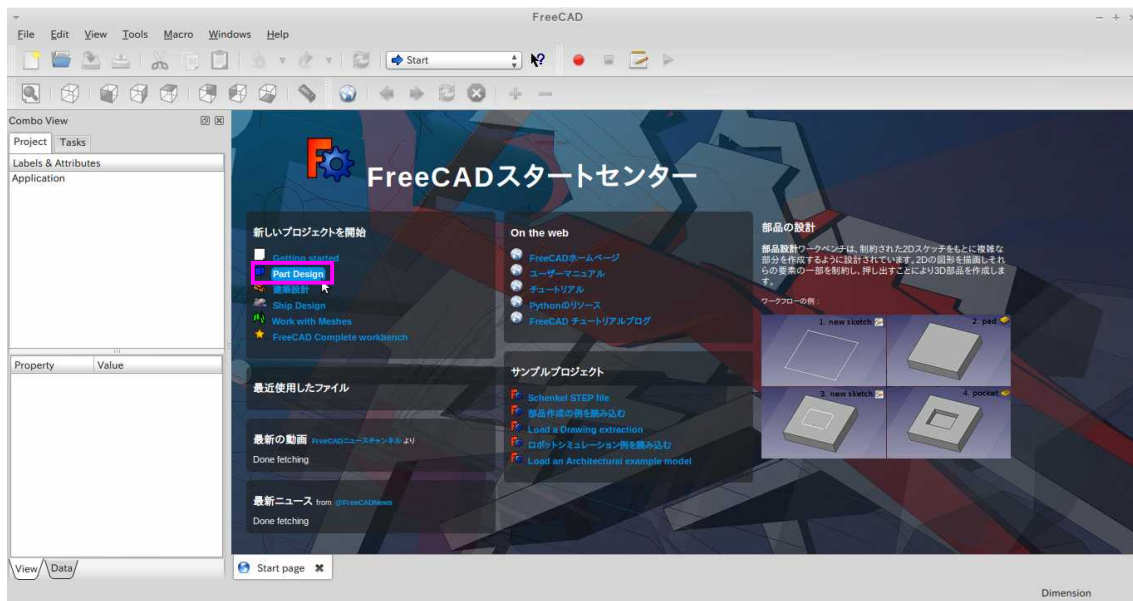
Select “[編集] - [設定]”



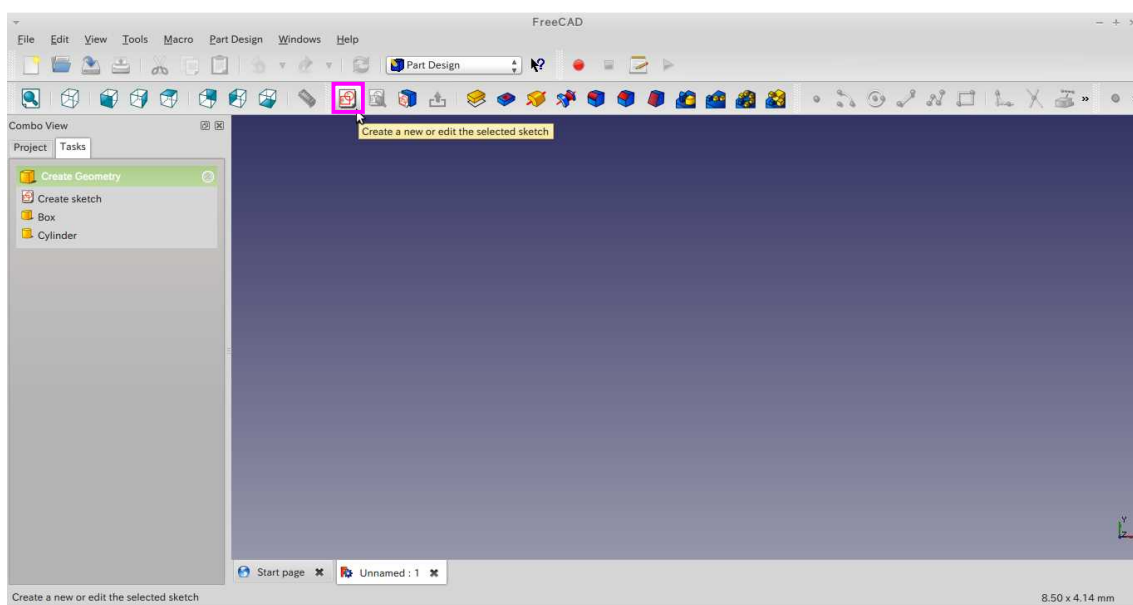
日本語 English



Click “Part Design”

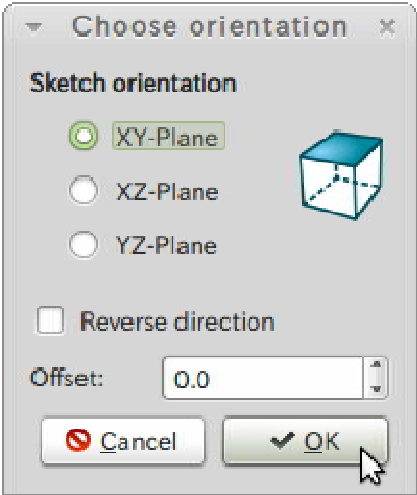


Click “Create a new or edit the selected sketch” icon.

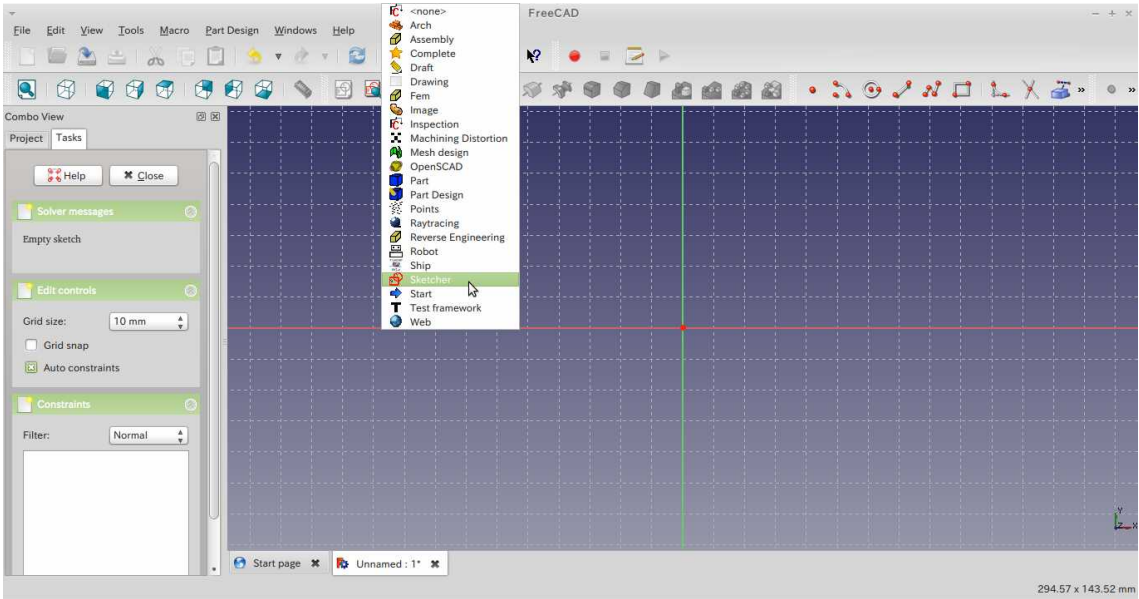


Sketcher

Sketch orientation: XY-Plane, Offset: 0.0



The grids are shown. Select "Sketcher".

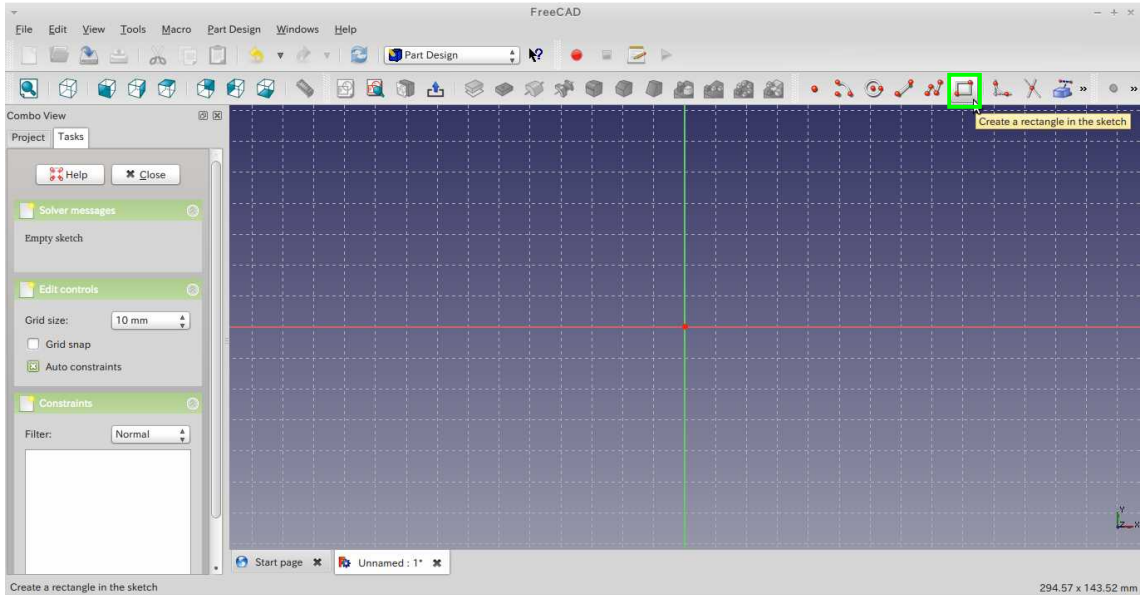


Draw a back-shroud

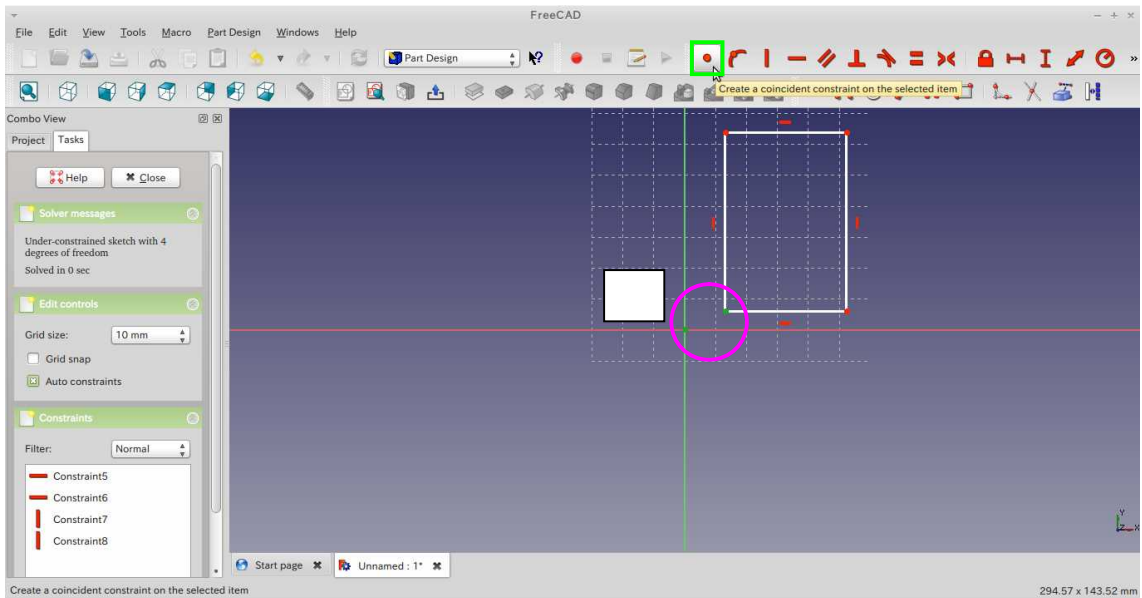
Create a rectangle.

Firstly, click “Create a rectangle in the sketch” icon.

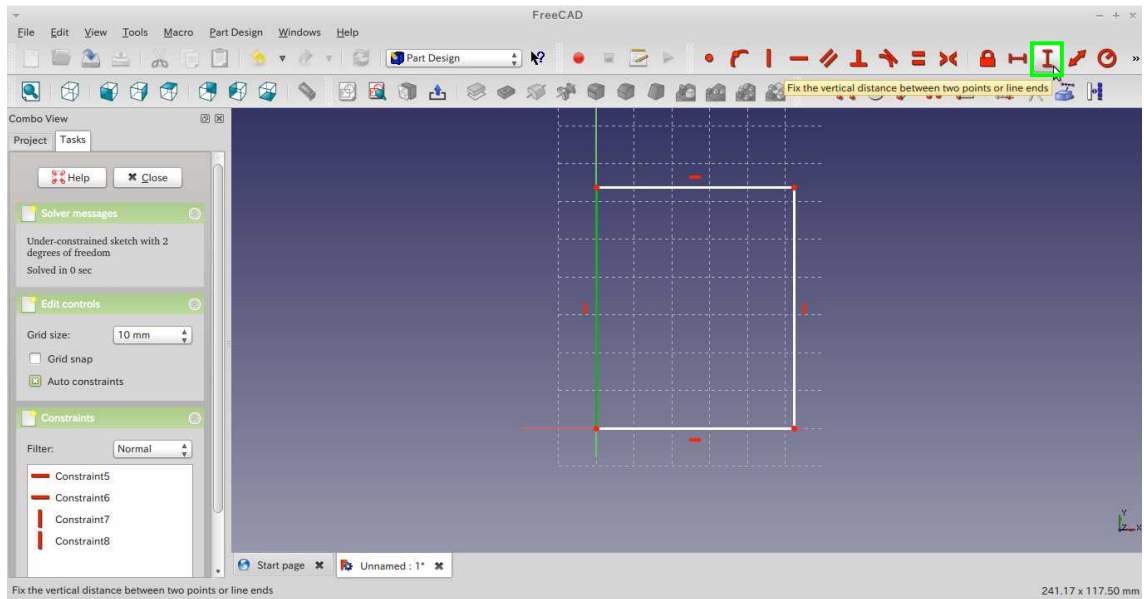
Click twice in the window and a rectangle is created.



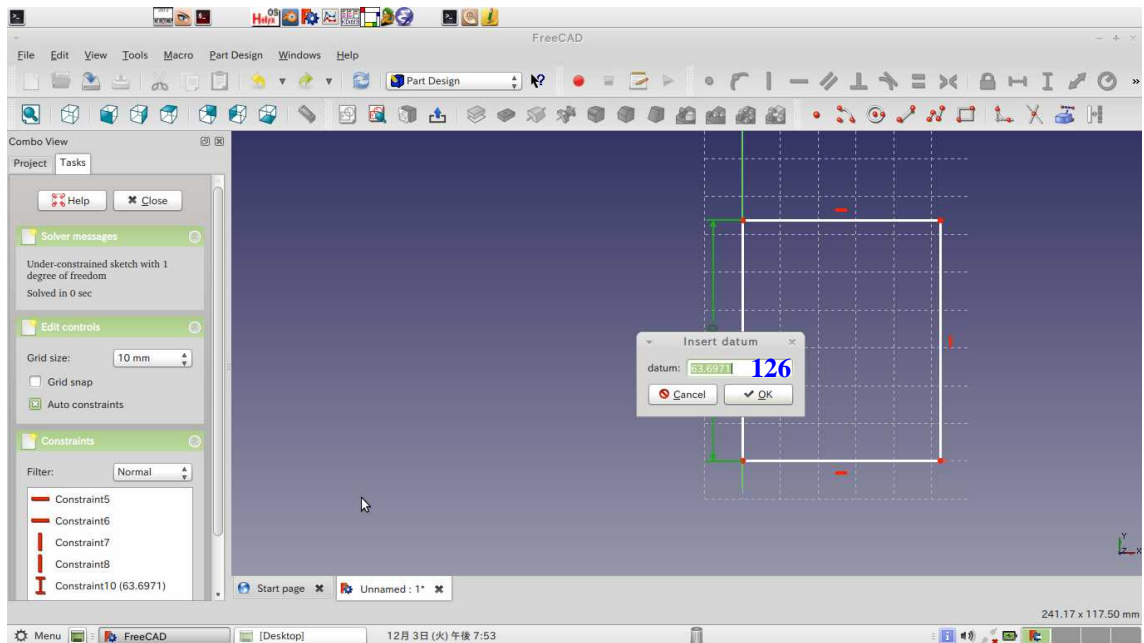
Select two points and click “Create a coincident constraint on the selected item” icon.



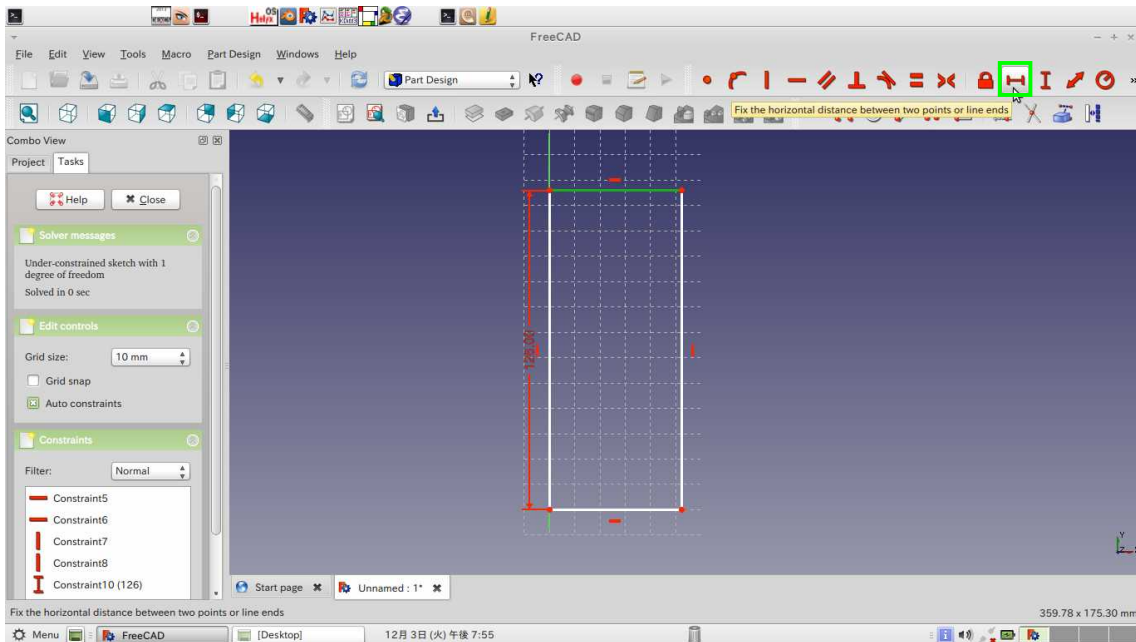
Select the line . Click “Fix the vertical distance between two points or line ends” icon.



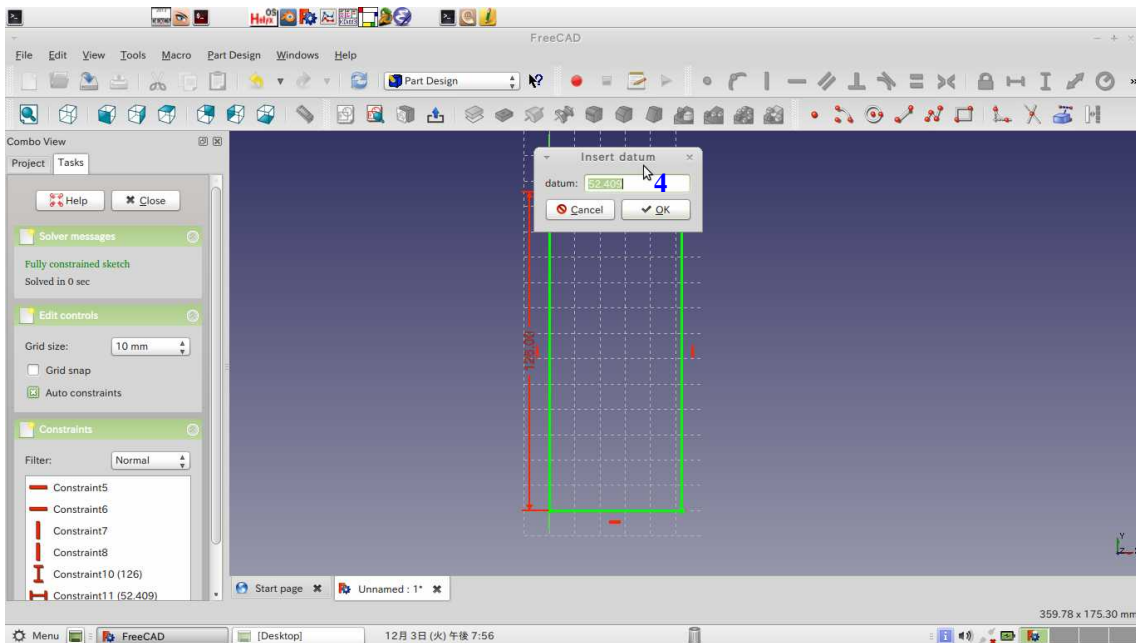
Double-click the dimension. Replace datum: 126 and click “OK”.



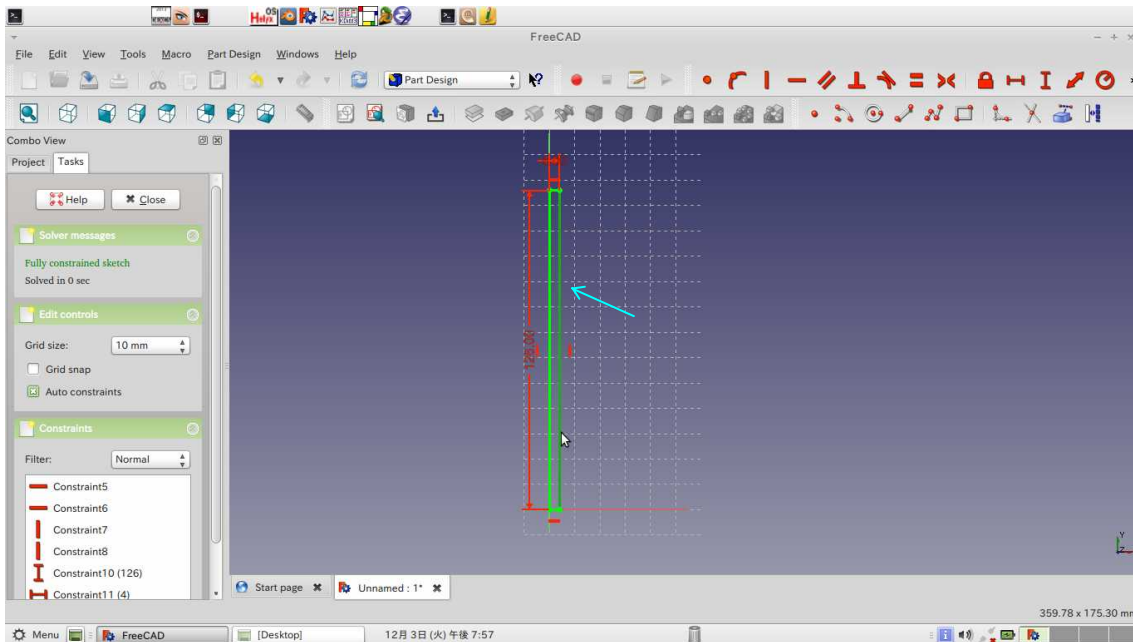
Select the line . Click “Fix the horizontal distance between two points or line ends” icon.



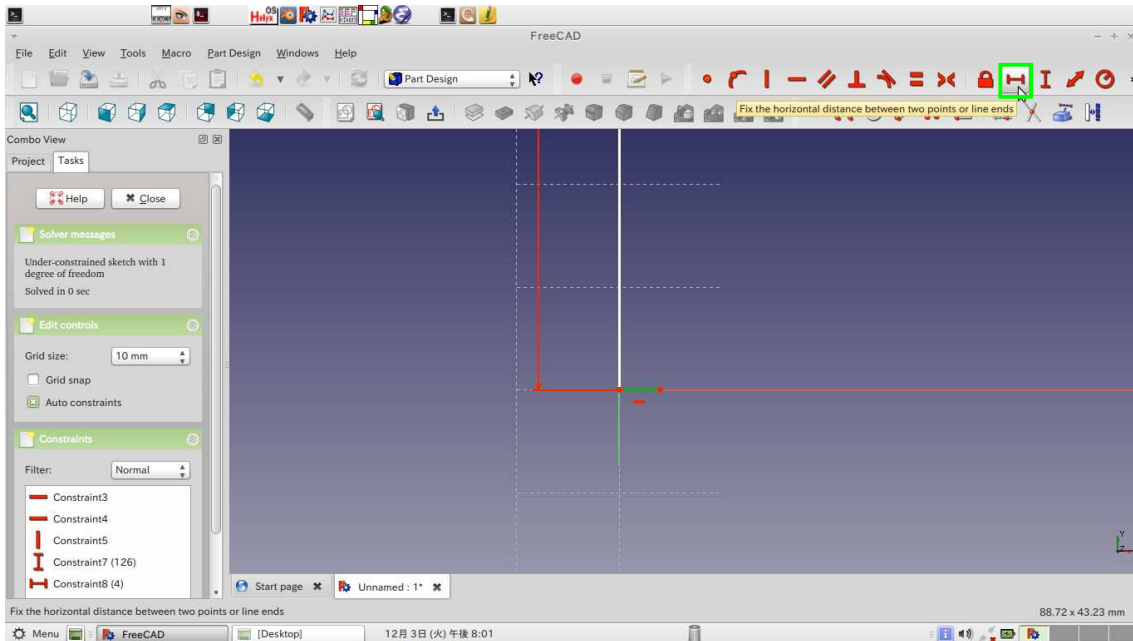
Double-click the dimension. Replace datum: 4 and click “OK”.



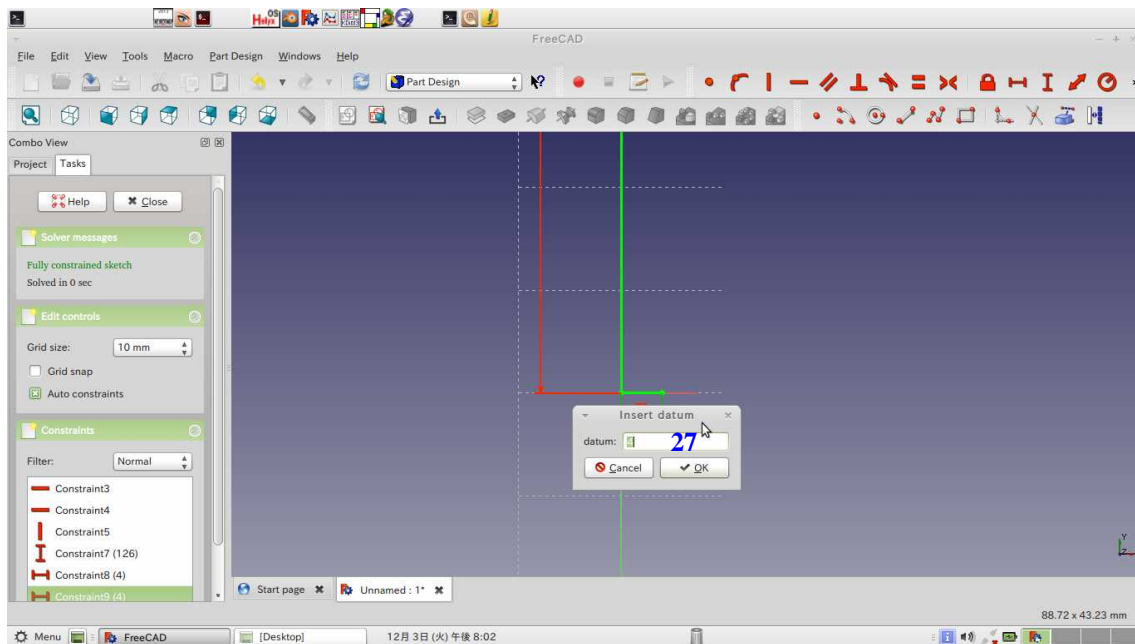
Select the line . Push **Delete** key. The line is removed.



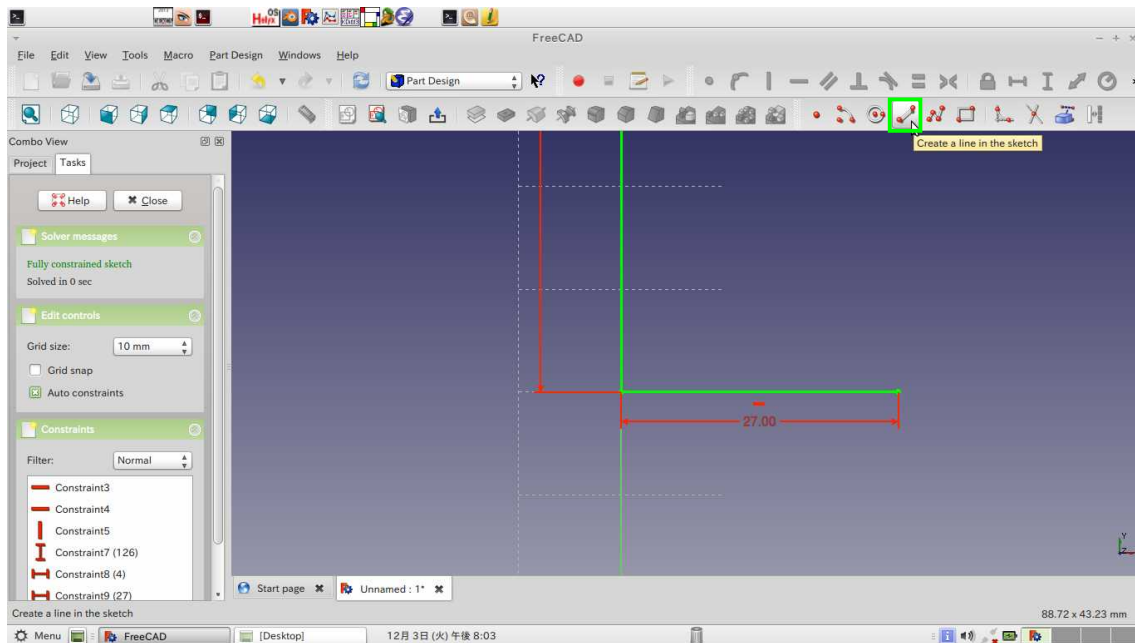
Select the line . Click “Fix the horizontal distance between two points or line ends” icon.



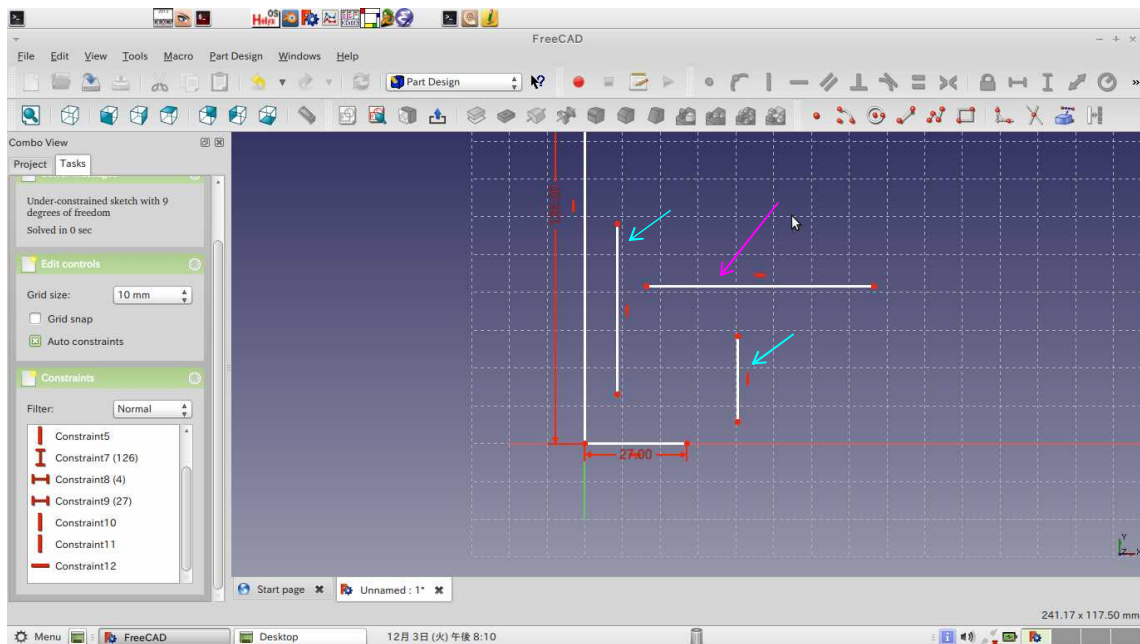
Double-click the dimension. Replace datum: 27 and click “OK”.



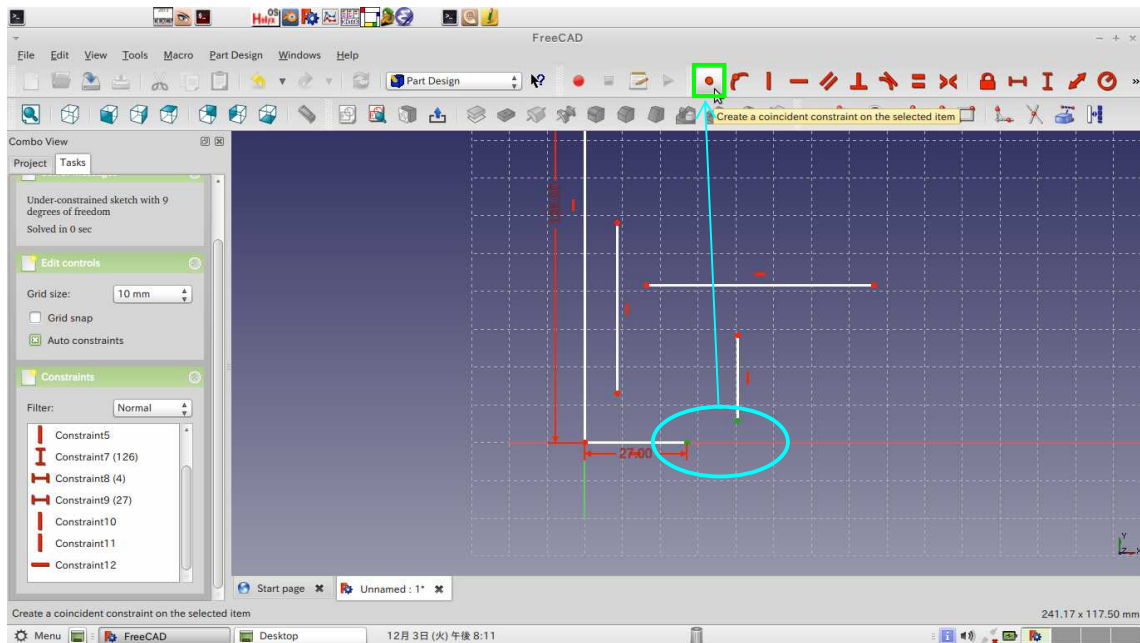
Click “Create a line in the sketch” icon.



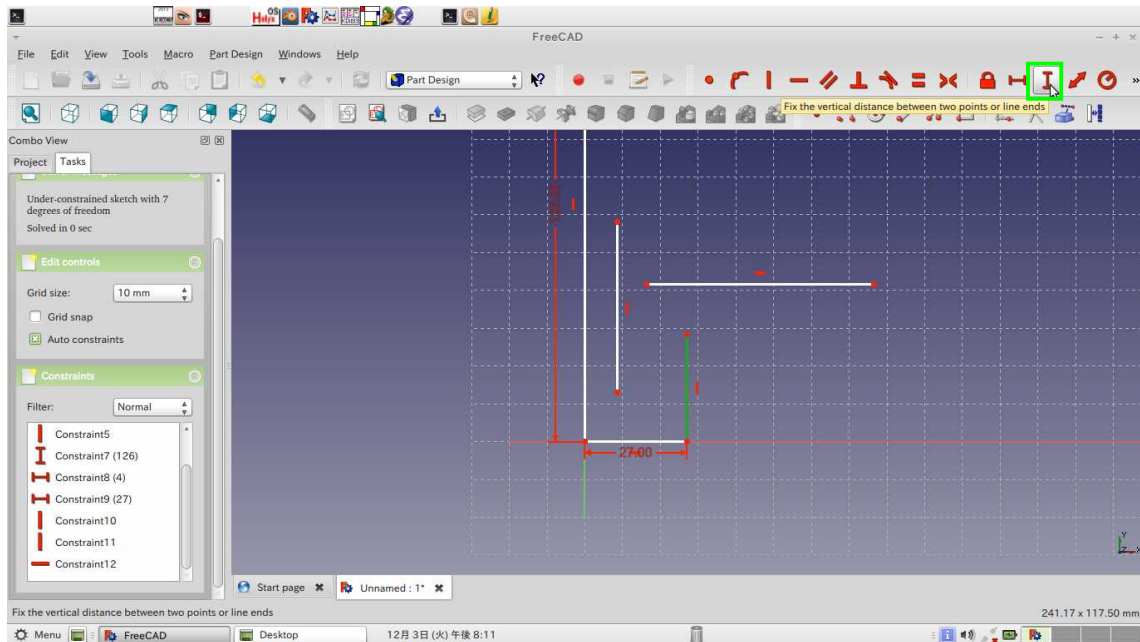
Add three lines. One is **horizontal** and the other is **vertical**.



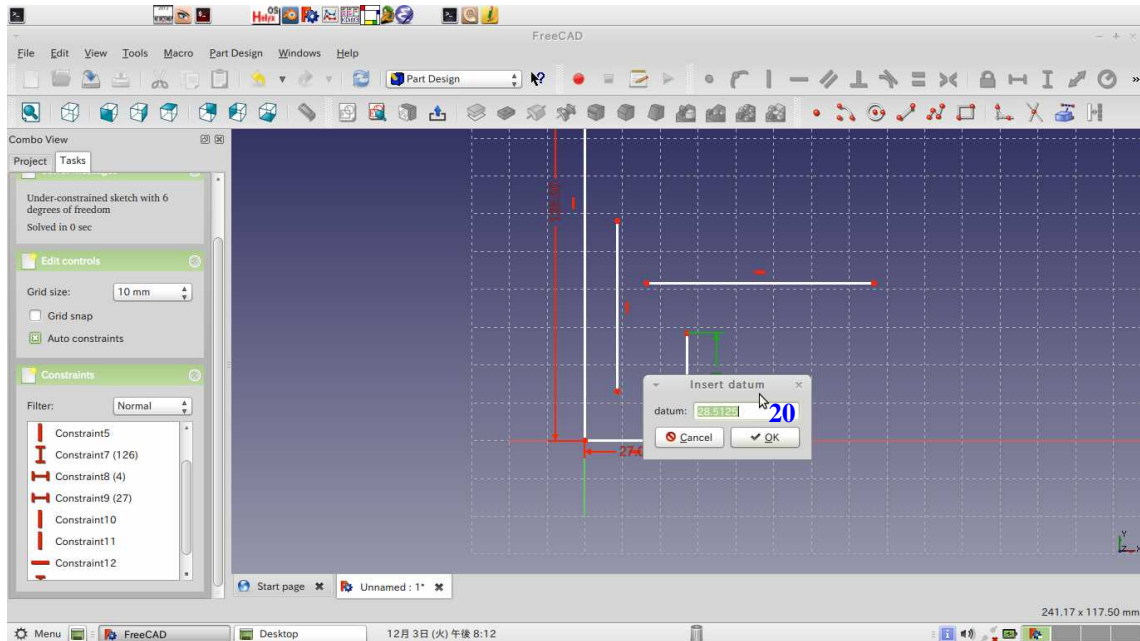
Select two points and click “Create a coincident constraint on the selected item” icon.



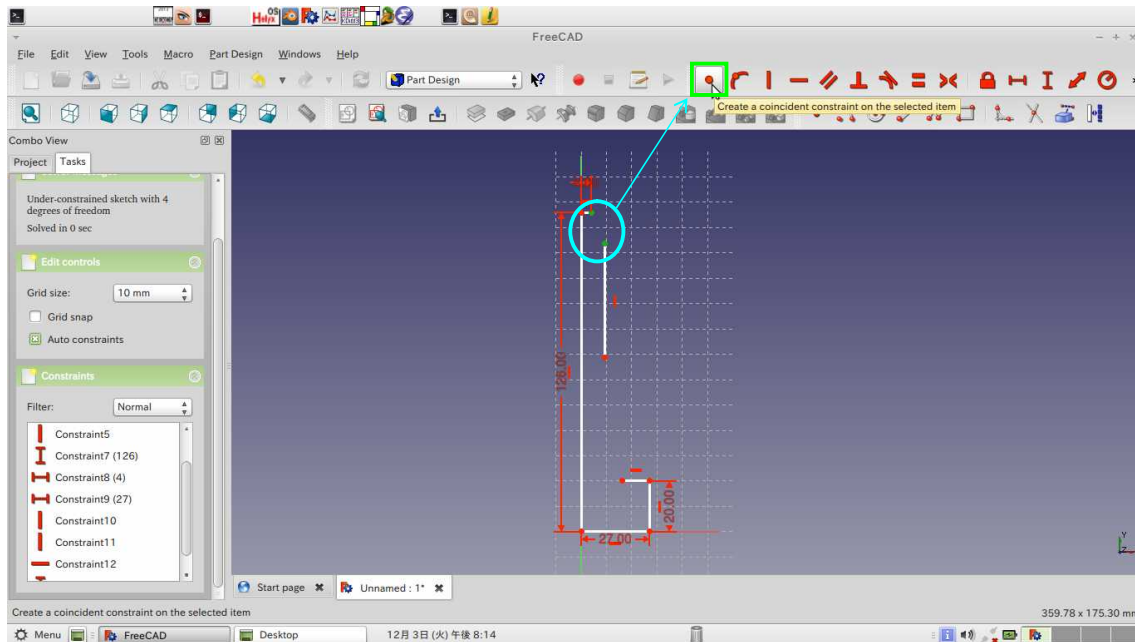
Select the line and click “Fix the vertical distance between two points or line ends” icon.



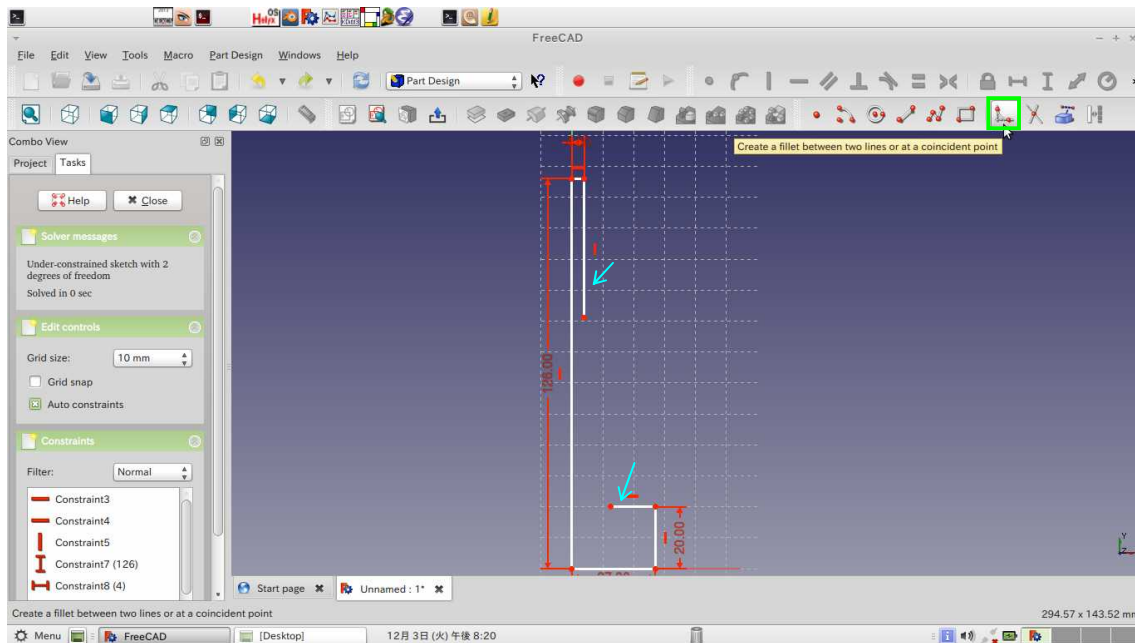
Double-click the dimension and replace the datum: **20**. Then, click “OK”.



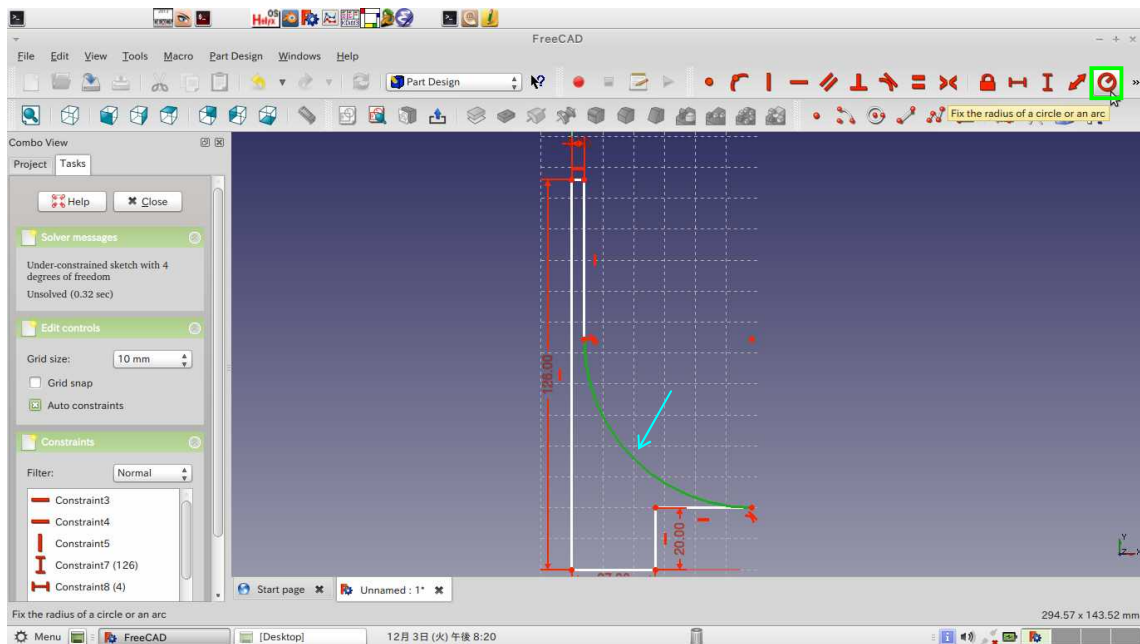
Select two points and click “Create a coincident constraint on the selected item” icon.



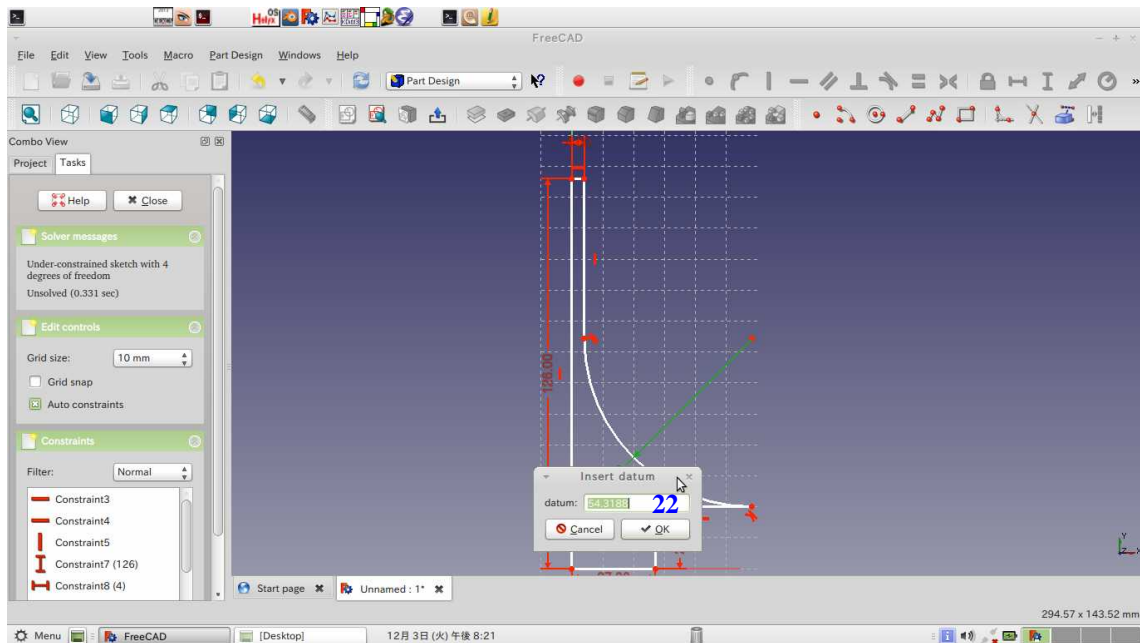
Click “Create a fillet between two lines or at a coincident point” icon . Select two lines and .
Then, the fillet is created.



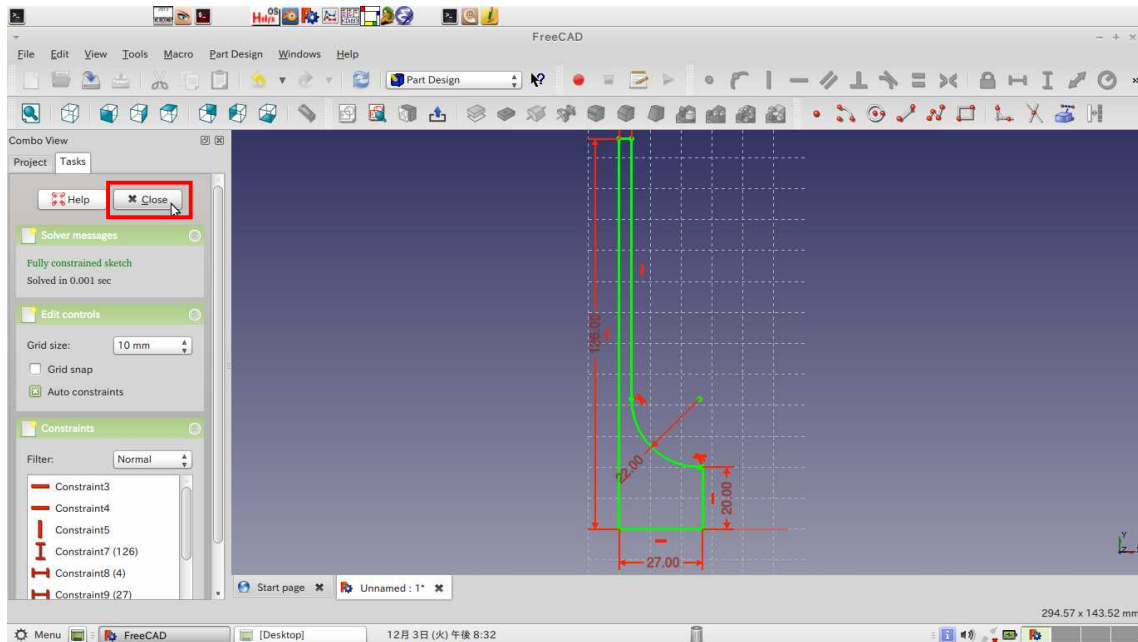
Select the fillet arc and click “Fix the radius of a circle or an arc” icon.



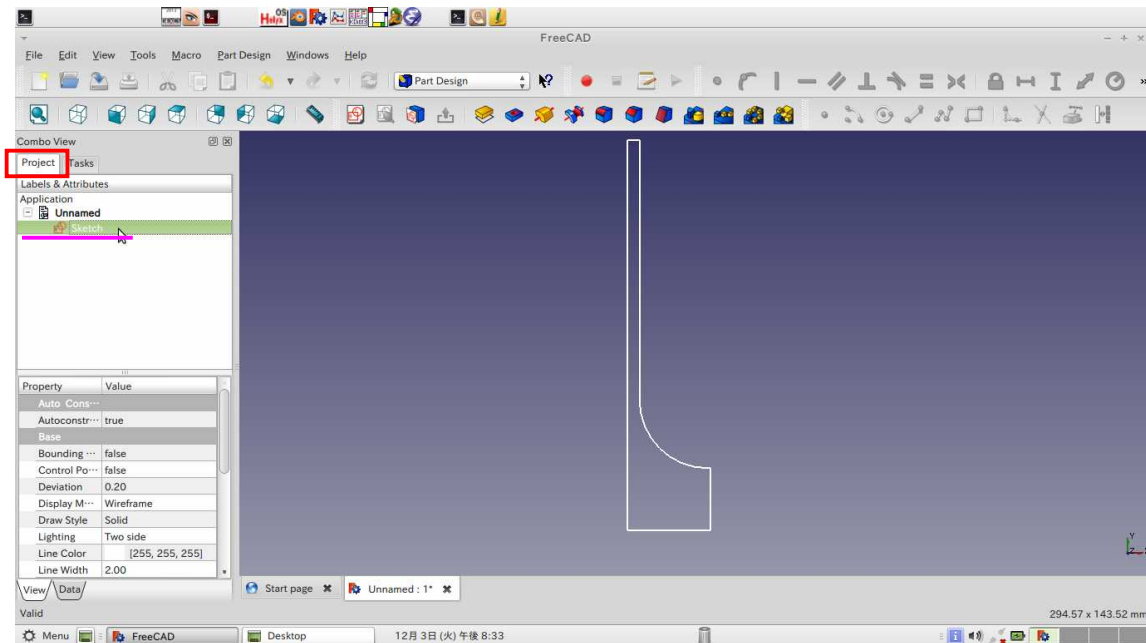
Double-click the dimension and replace the datum: 22



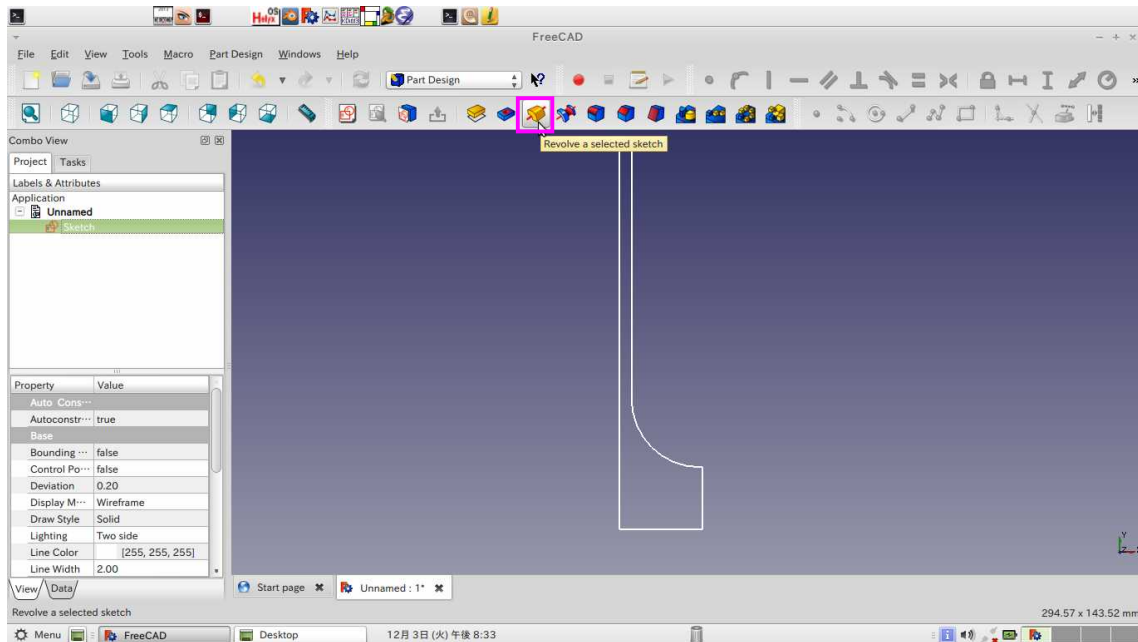
Drawing the back-shroud is finished. Click “Close”.



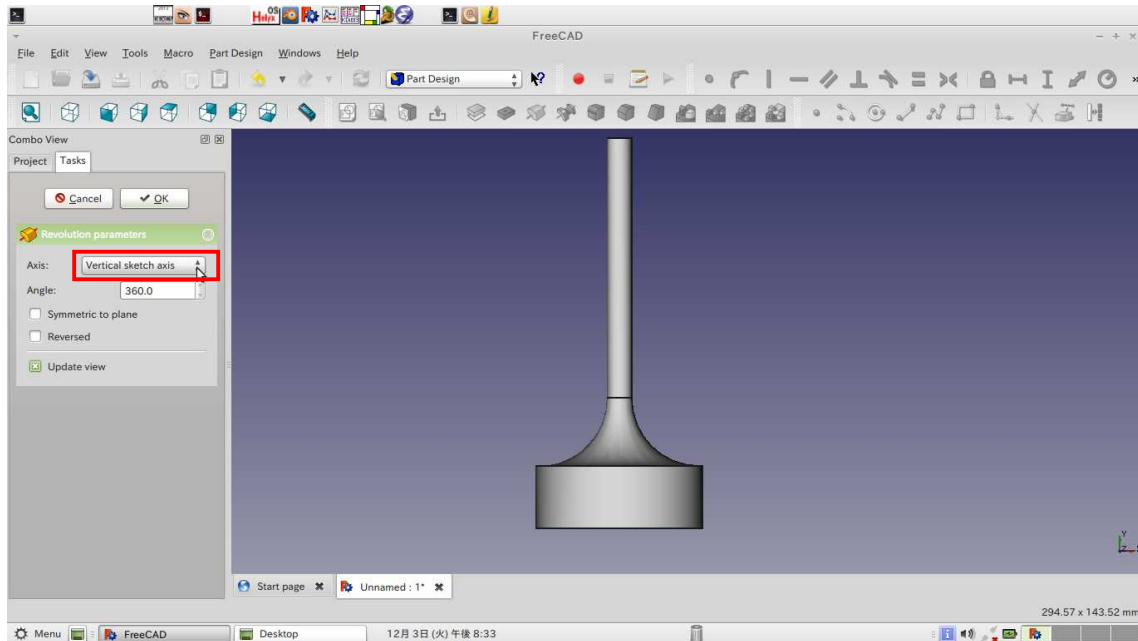
Click “Project” tab and select “Sketch”.



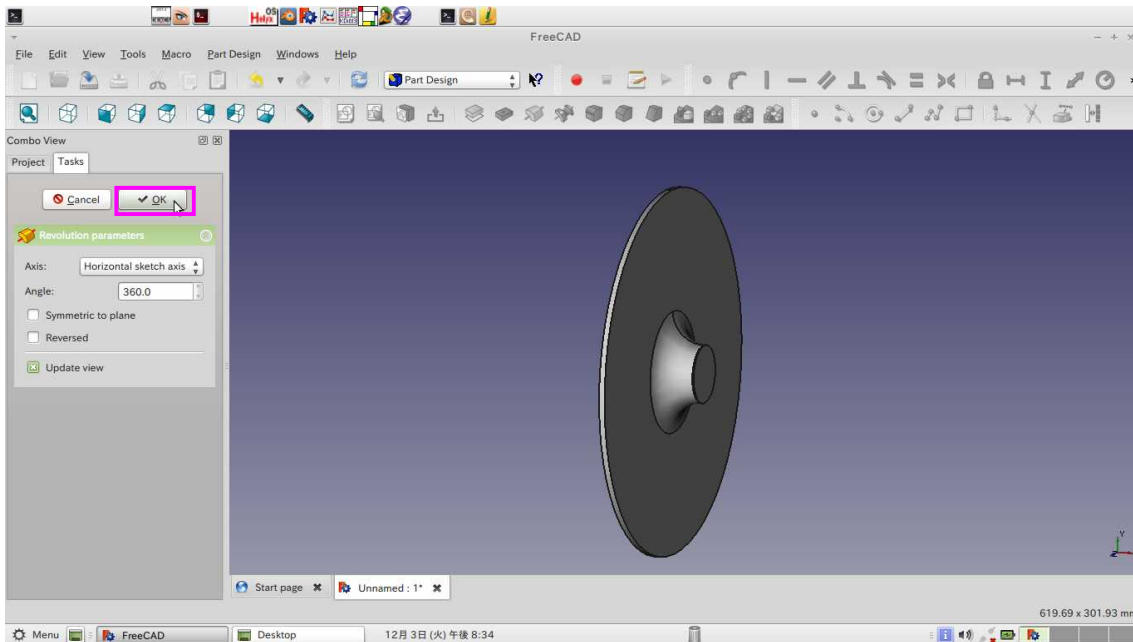
Click “Revolve a selected sketch” icon.



Change the axis: Vertical sketch axis Horizontal.

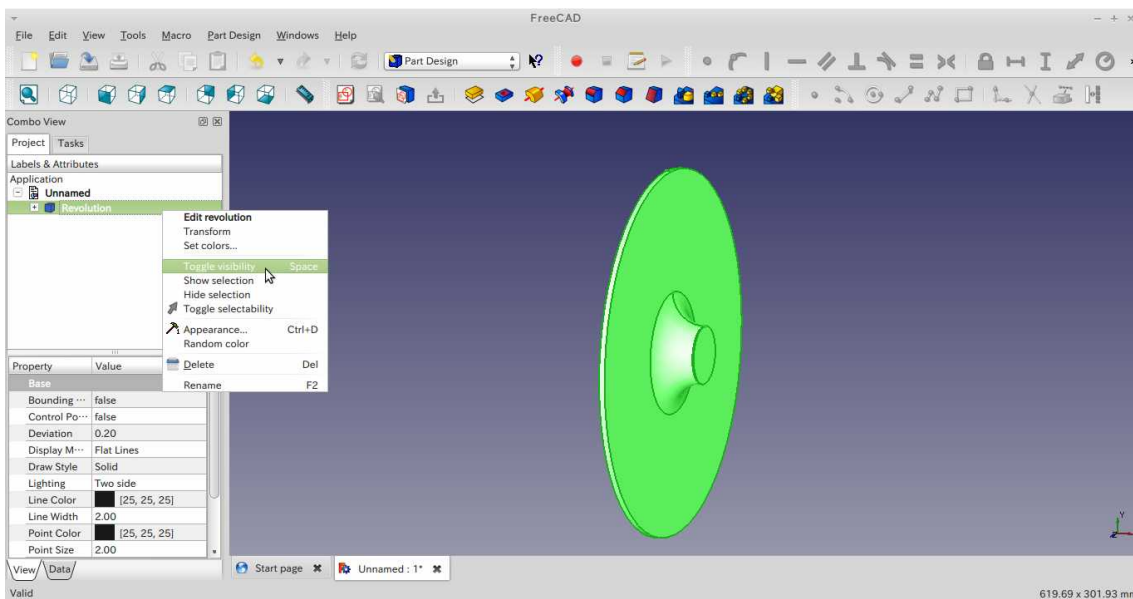


The 3D back-shroud was finished. Click “OK”.



The back-shroud was created. Then, we will make a front-shroud.

Select “Revolution” and right-click. Then, select “Toggle visibility”.

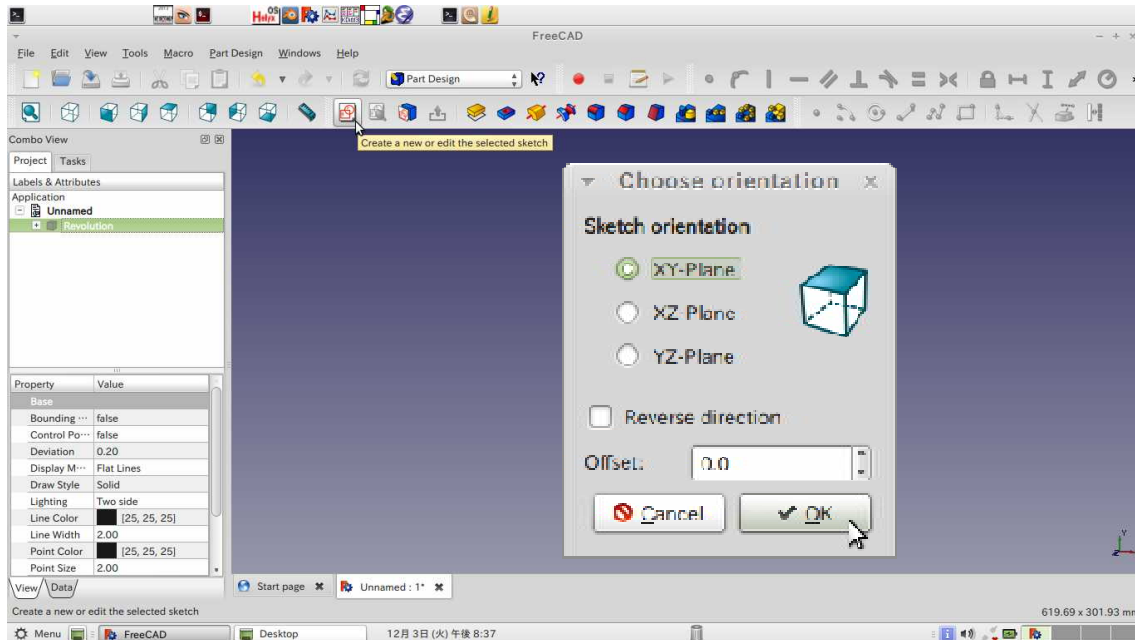


Create a front-shroud

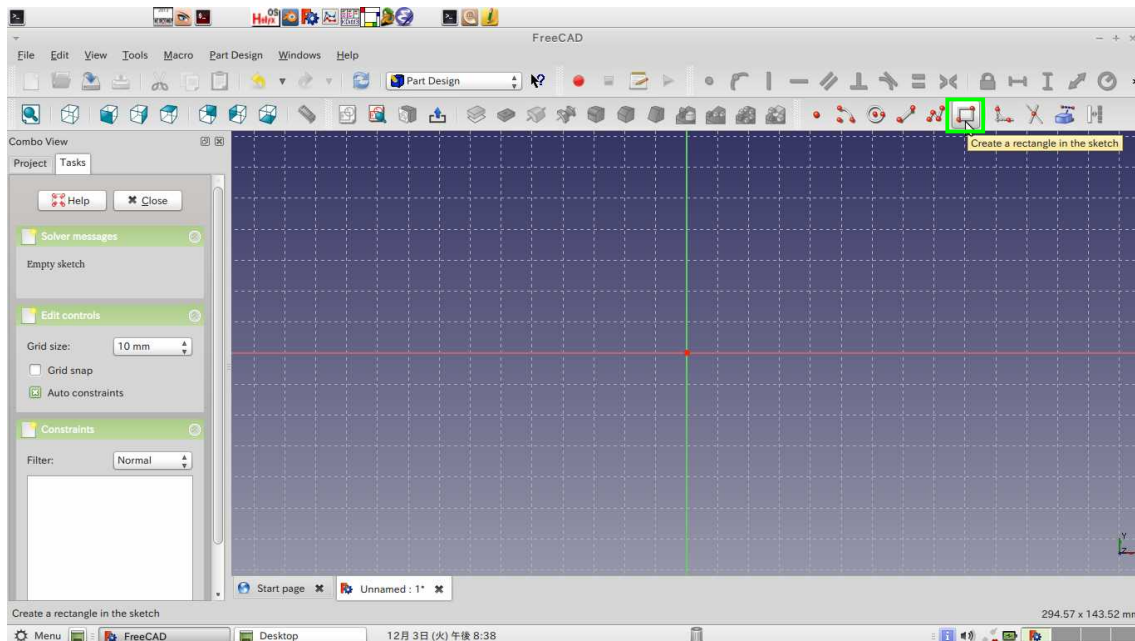
Click “Create a new or edit the selected sketch” icon .

Sketch orientation: XY-Plane, Offset: 0.0

Click “OK”.

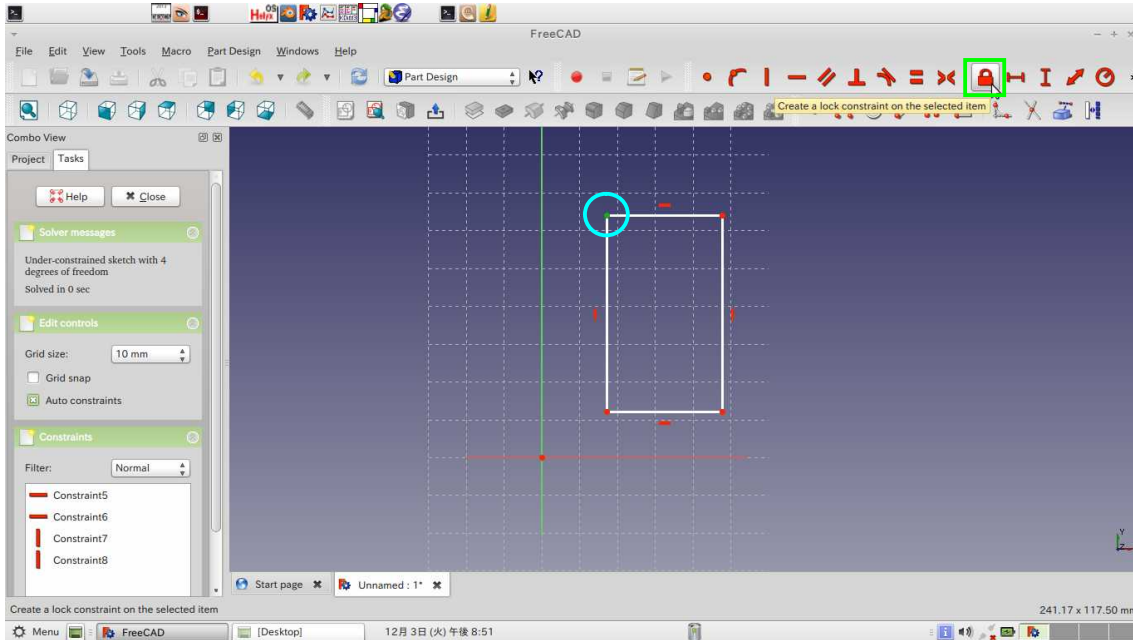


The grids are shown. Click “Create a rectangle in the sketch” icon.

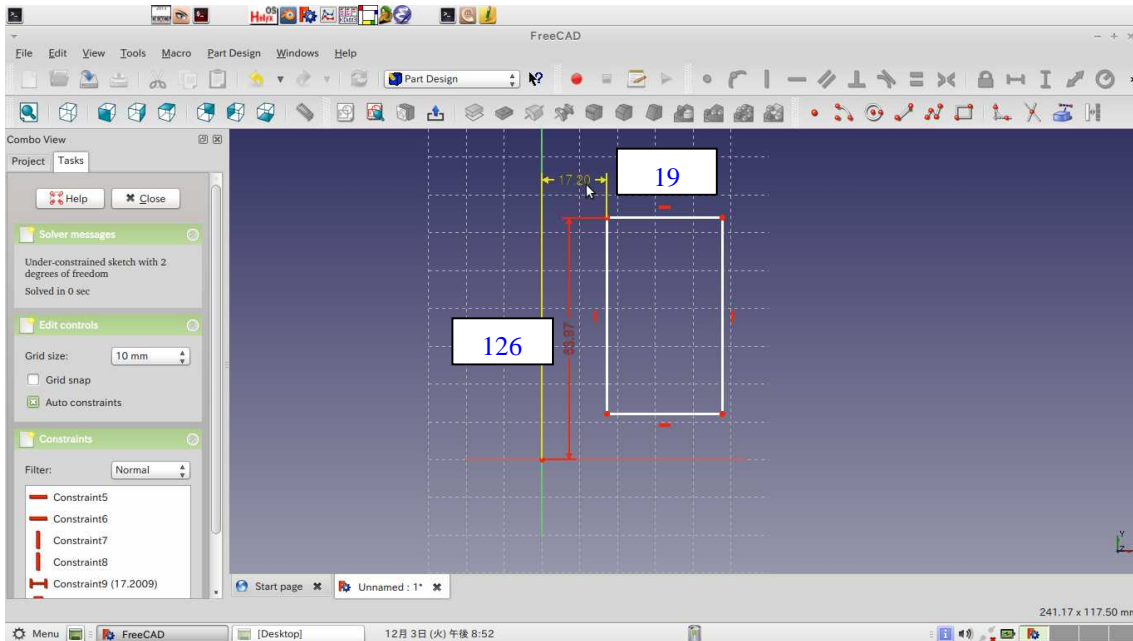


Click twice in the sketch window and a rectangle is created.

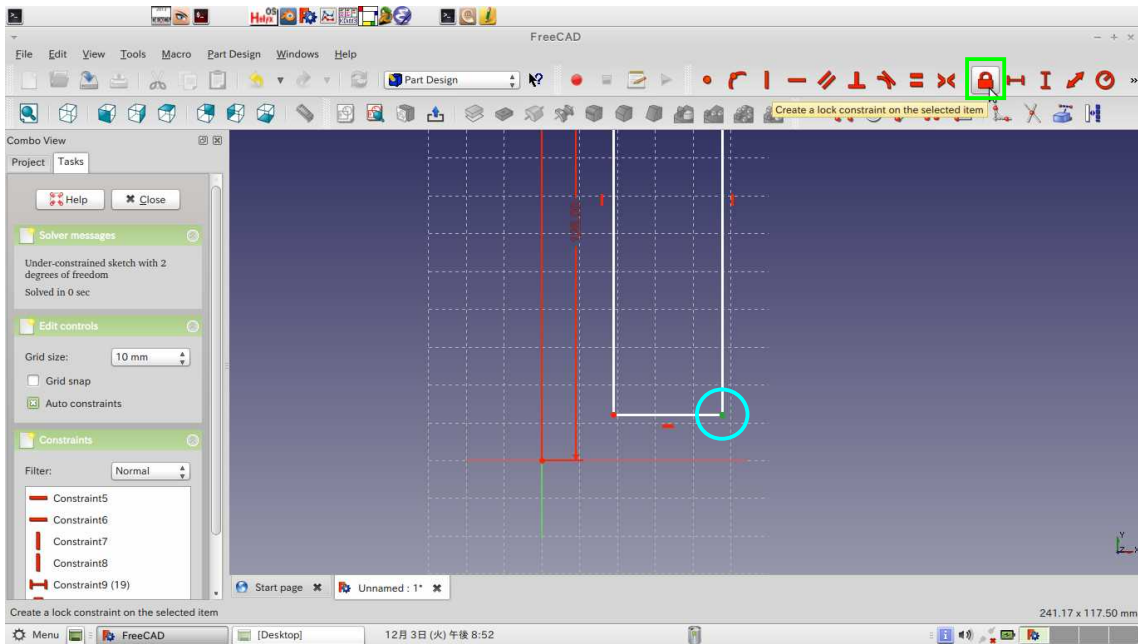
Select the point and click “Create a lock constraint on the selected item” icon.



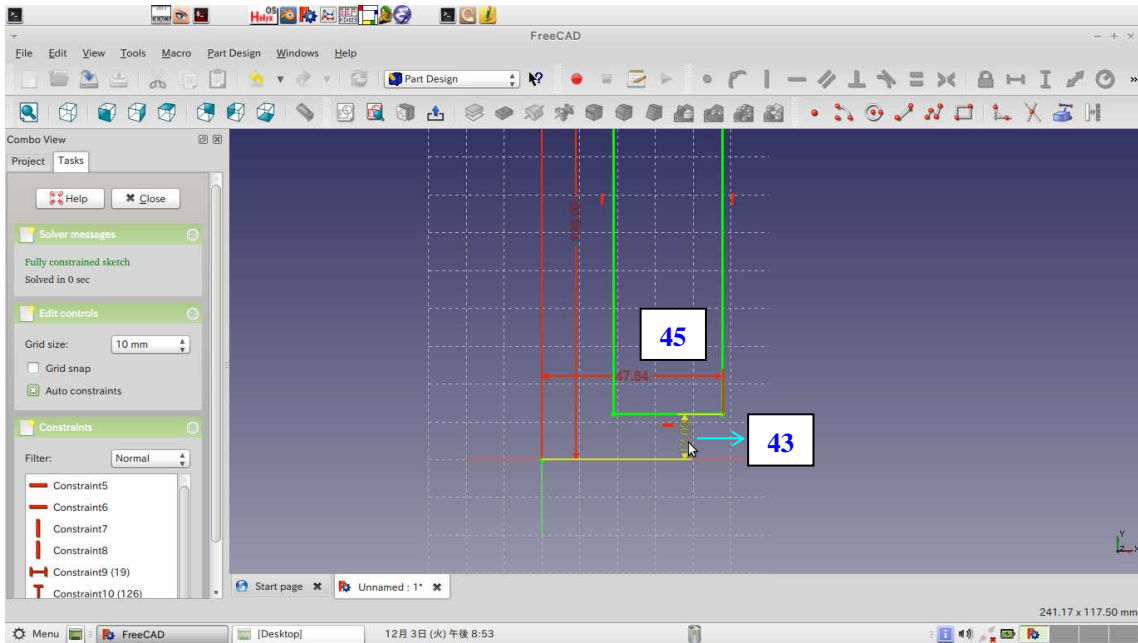
Double click the dimensions and replace them as shown in the figure.



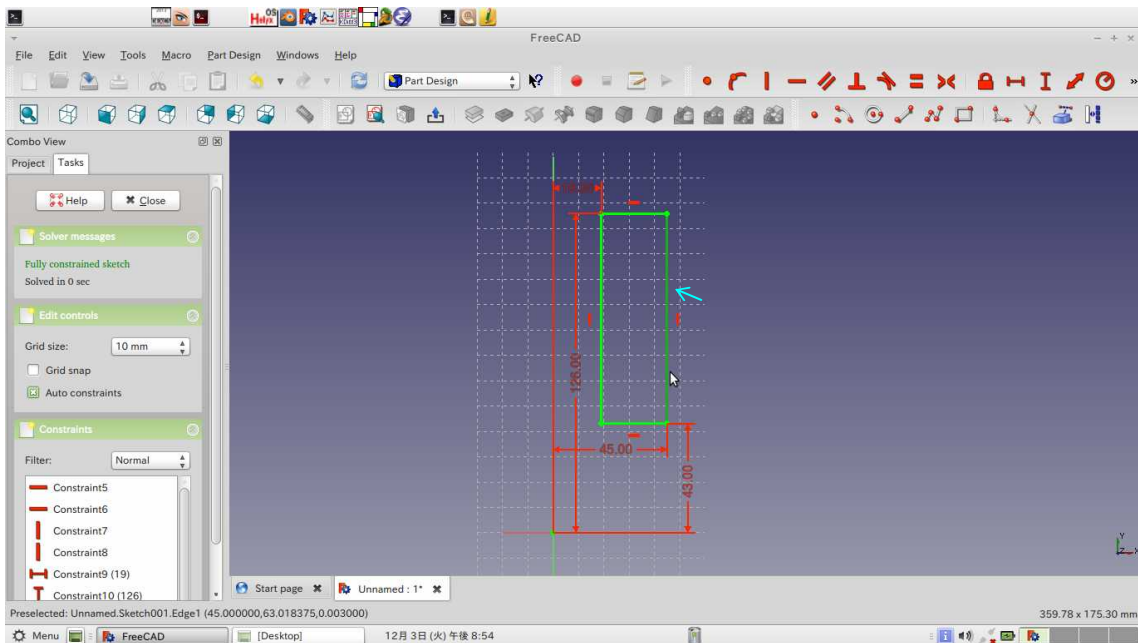
Select the point and click “Create a lock constraint on the selected item” icon.



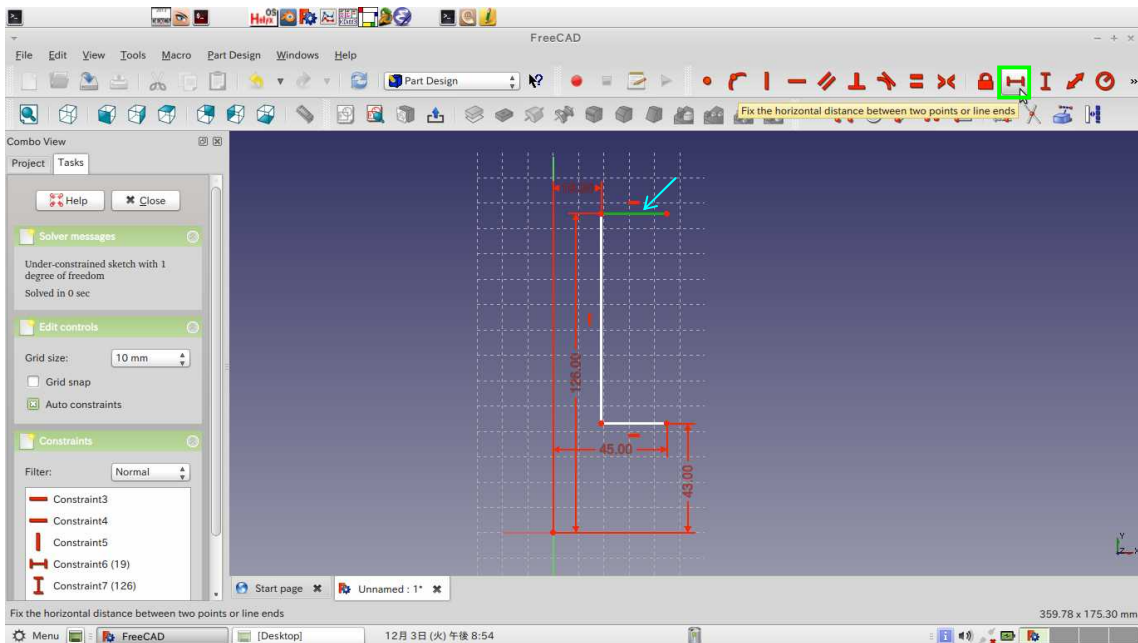
Double-click the dimensions and replace them as shown in the figure.



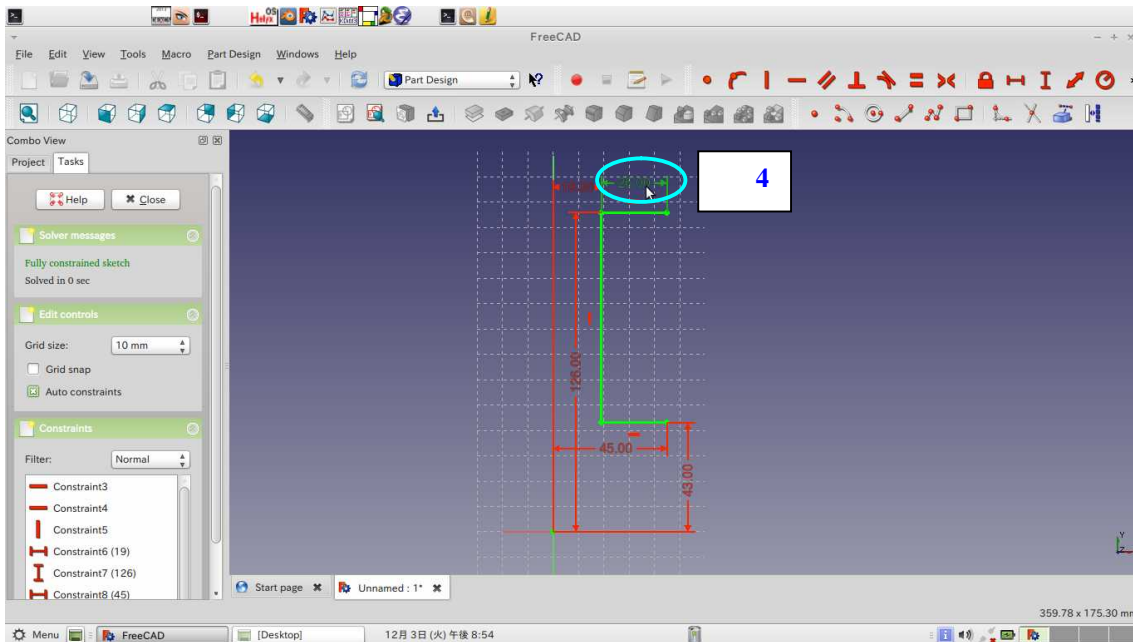
Select the line and press **Delete** key.



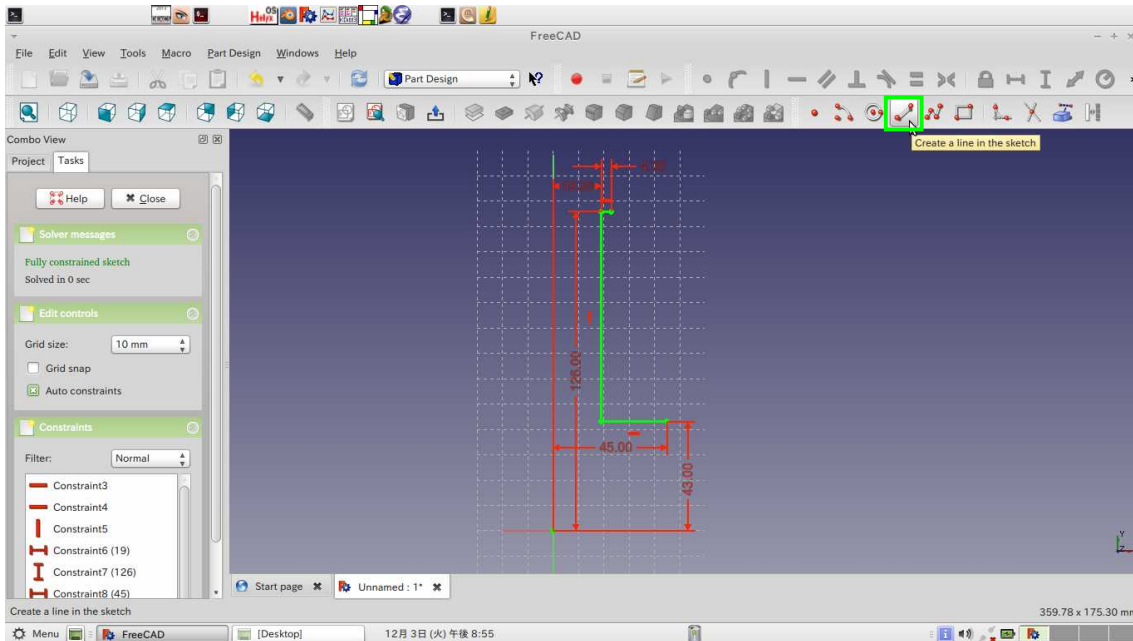
Select the line and click “Fix the horizontal distance between two points or line ends” icon.



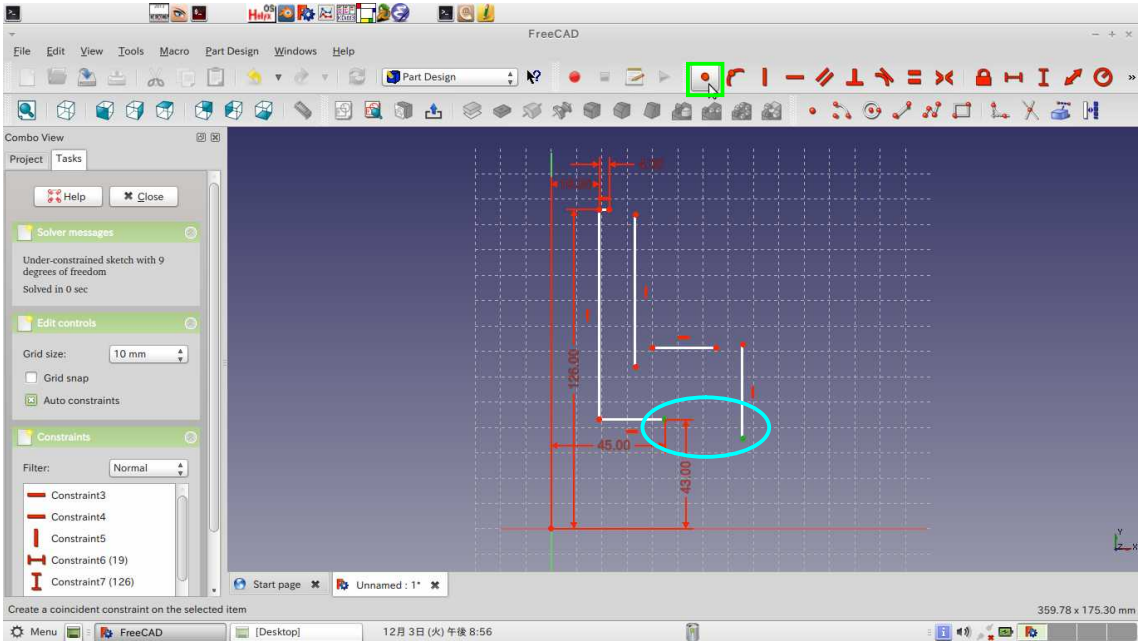
Double-click the dimension and replace the dimension: 4



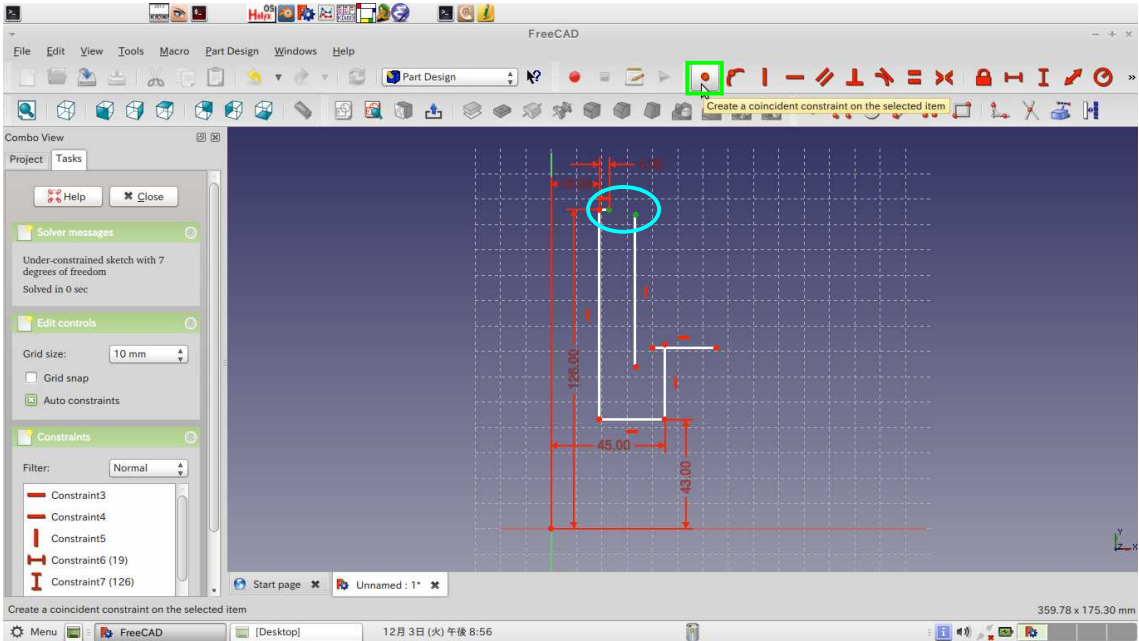
Click “Create a line in the sketch” icon and add three lines.



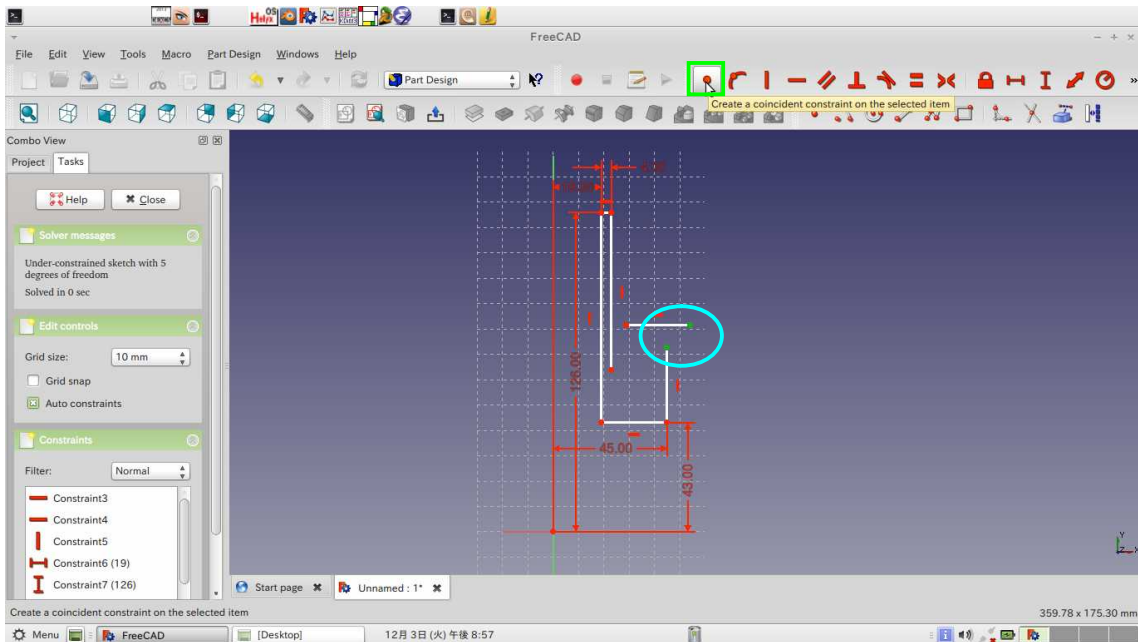
Select two points and click “Create a coincident constraint on the selected item” icon.



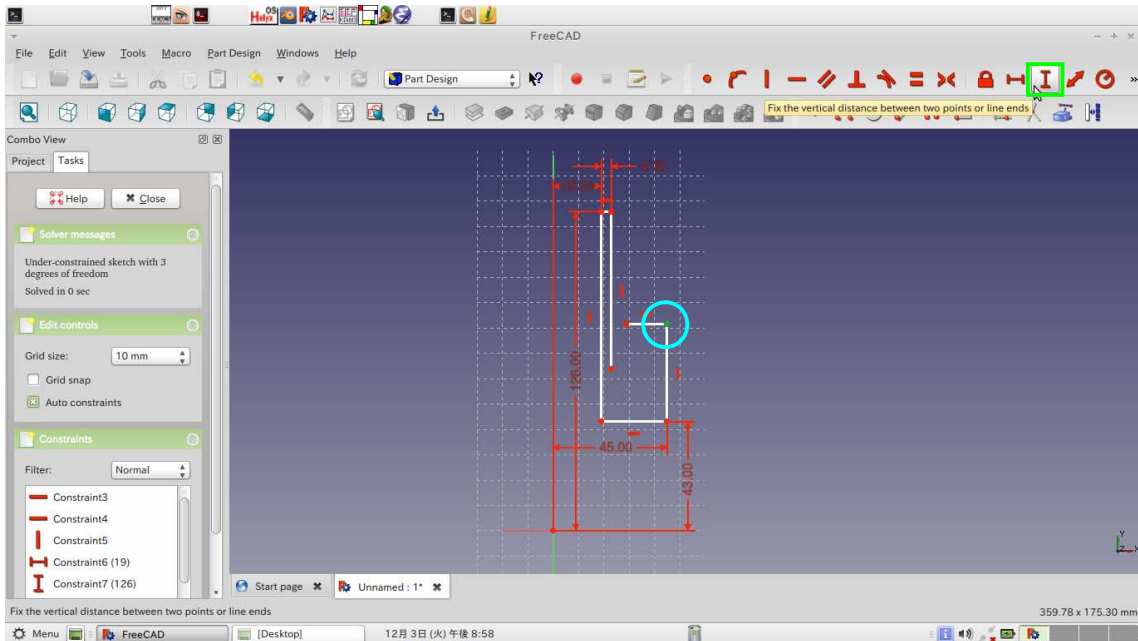
Select two points and click “Create a coincident constraint on the selected item” icon.



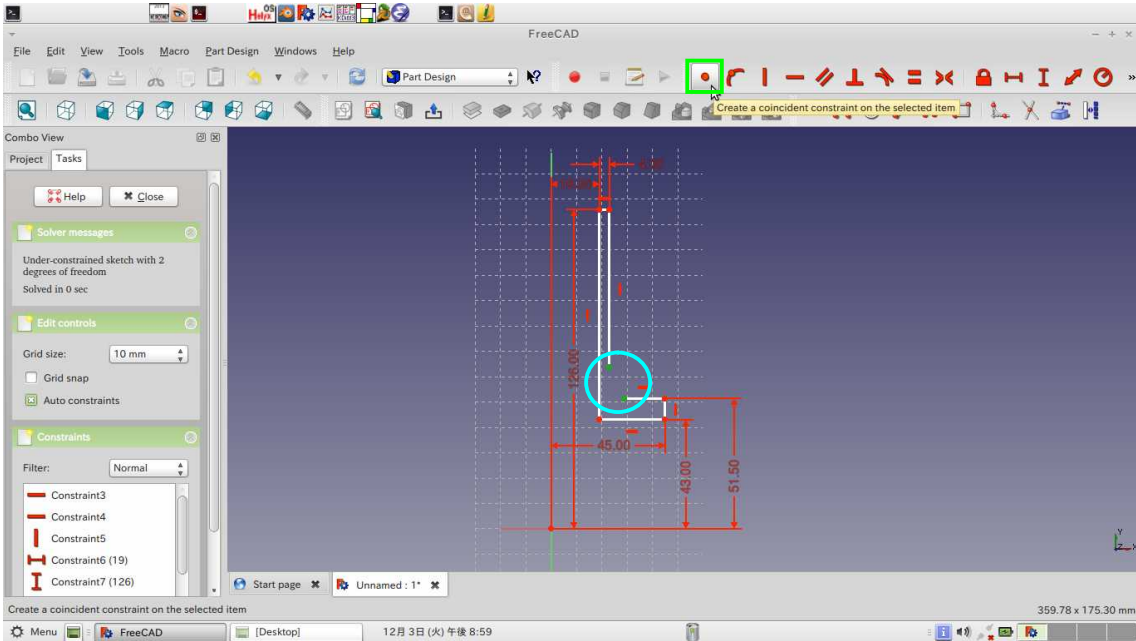
Select two points and click “Create a coincident constraint on the selected item” icon.



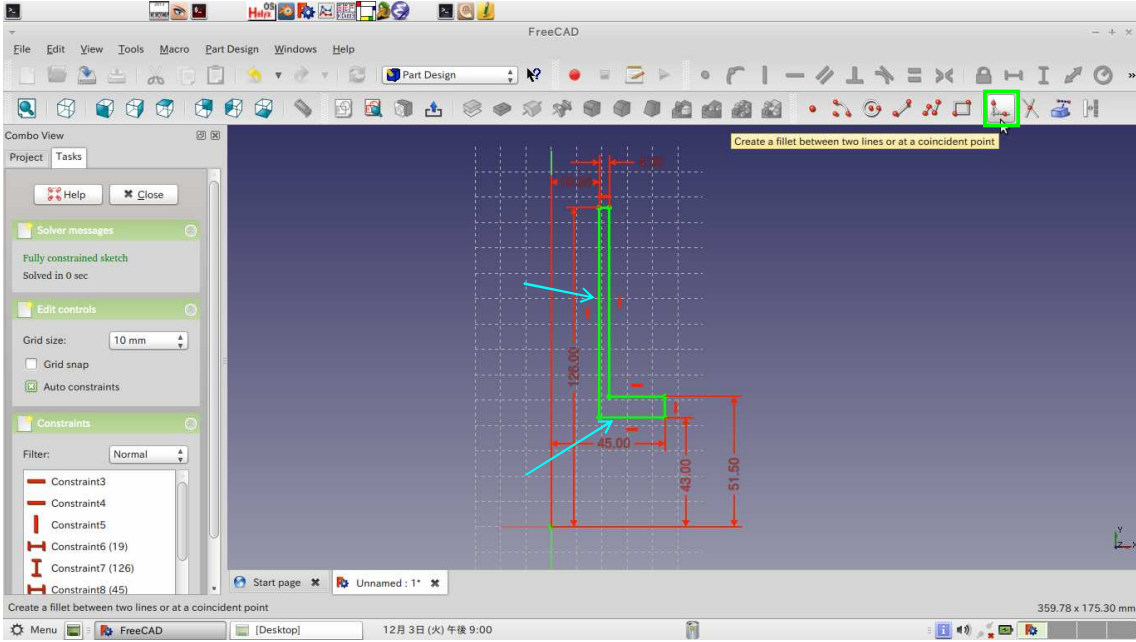
Select the point and click “Fix the vertical distance between two points or line ends” icon.



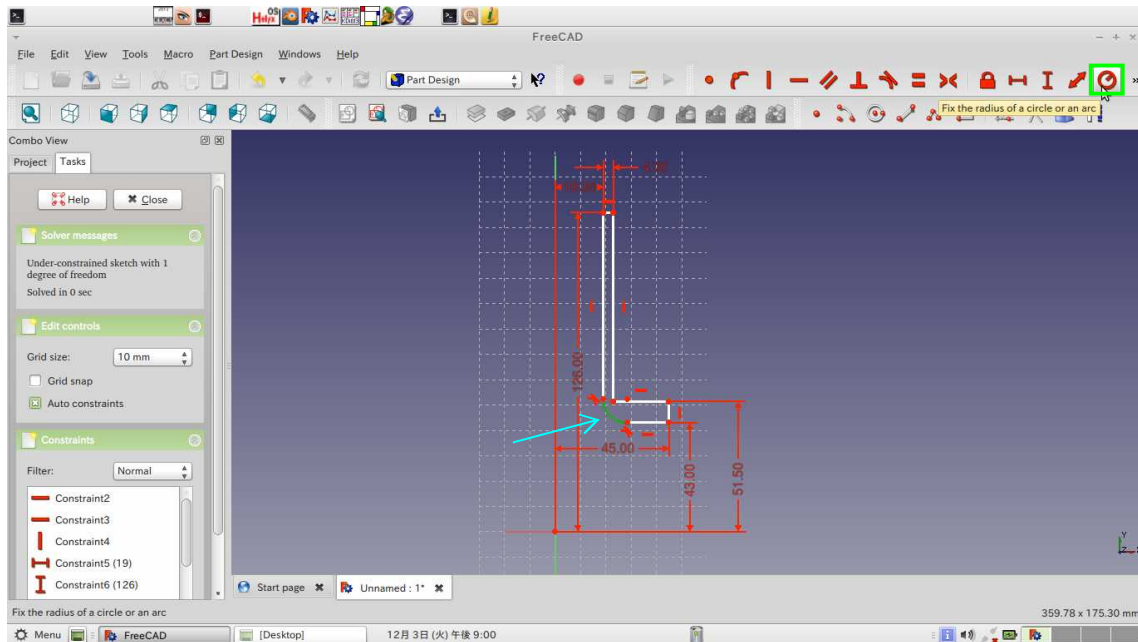
Select two points and click “Create a coincident constraint on the selected item” icon.



Click “Create a fillet between two lines or at a coincident point” icon .
Select two lines (and) indicated in the figure.

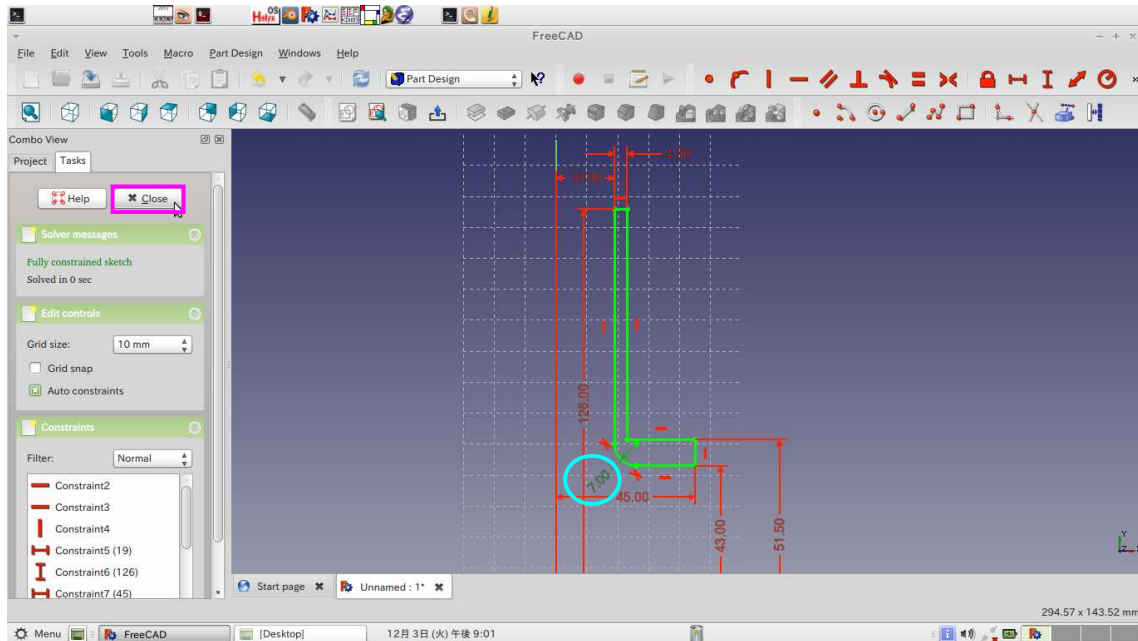


Select the fillet arc and click “Fix the radius of a circle or an arc” icon .

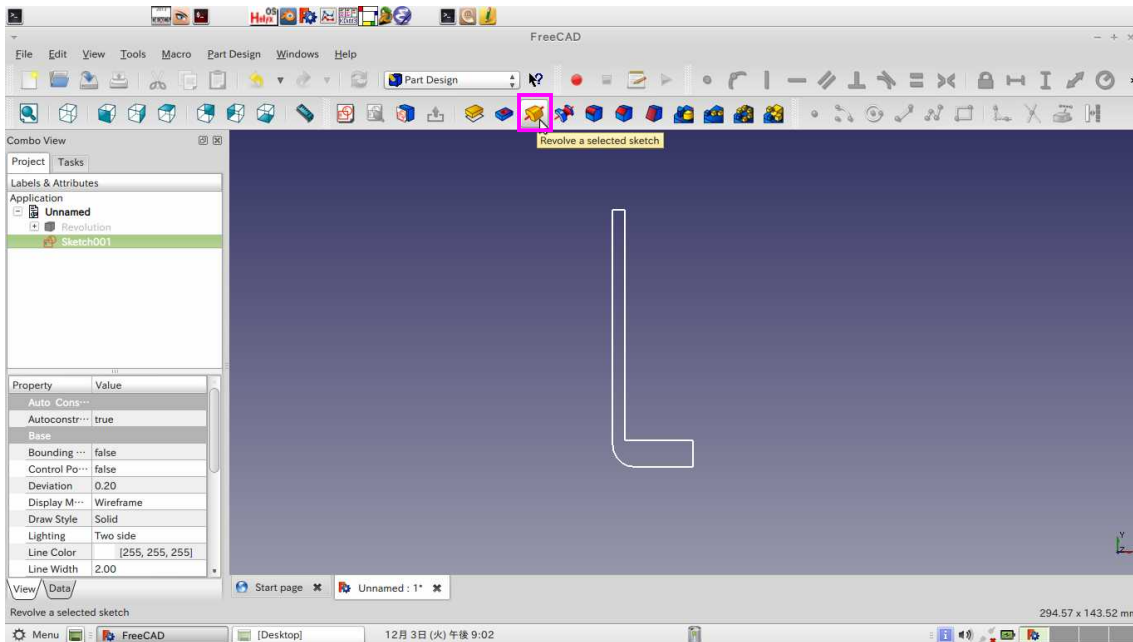


Double-click the dimension of the fillet arc and replace the dimension: 7

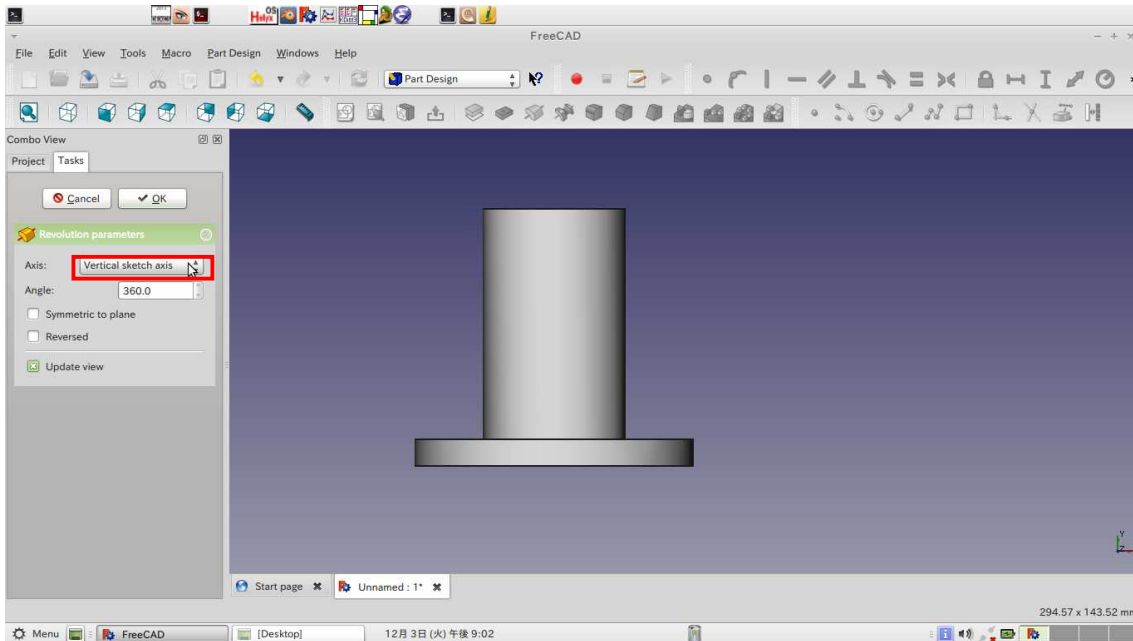
Drawing the front-shroud was finished. Click “Close”.



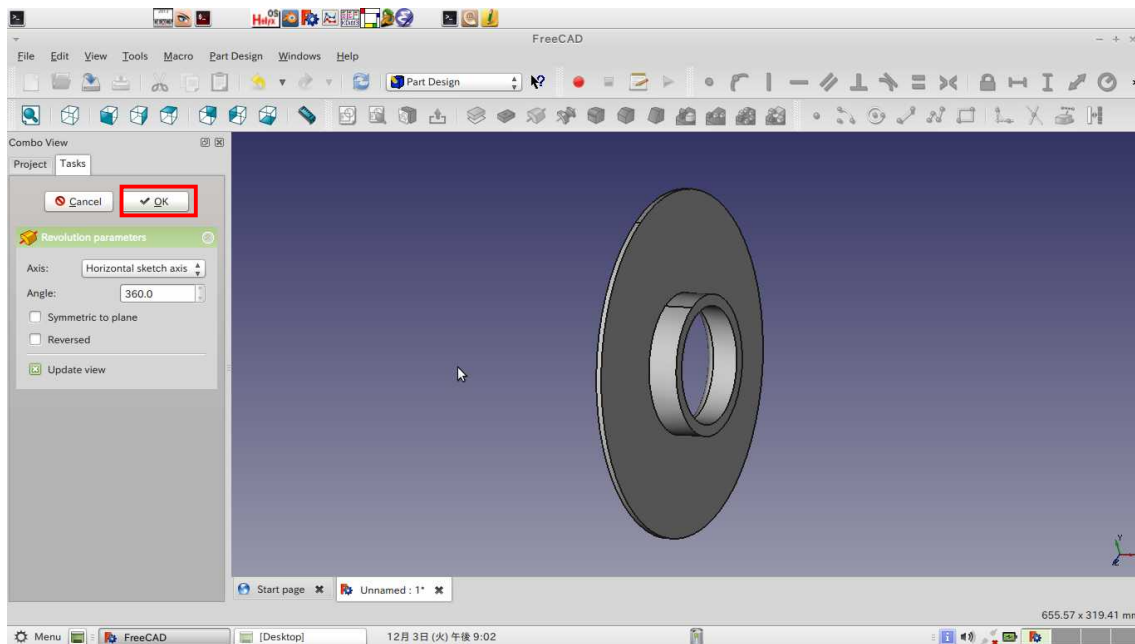
Click “Revolve a selected sketch” icon.



Change the axis: Vertical sketch axis Horizontal.



The 3D front-shroud was finished. Click “OK”.



Next step is blade.