Sketcher

Part 2

The Constraints

Setting Constraints

- **Without Constraints geometry can be moved freely just by using a mouse to drag them. If Sketcher profiles are moved, so are the solids that are supported by them. In the context of an assembly, if one part moves, another part that is related to it may also move.**

- **Geometrical Constraints – determine how a geometric elements is positioned with respect to another one. You can set a constraint on one element or between two or more elements.**

- **Dimensional Constraints – a type of Geometrical Constraints, specify the distance between two elements, which can be a linear distance, an angular distance or a radial distance. You can set a dimensional constraint on one element or between two elements.**

Symbol Constraint type

- **Perpendicularity**
- **Coincidence**
- **Verticality**
- **Horizontality**
- **Fix/Unfix**
- **Parallel**
-

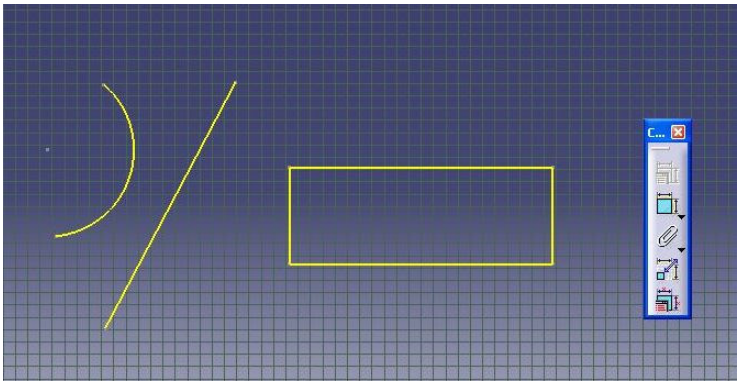
Quick Constraints

You will use the Constraint command to finalize your profile.
Dimensional constraints and Contact constrains **are frequently used. Hence, they are accessible with just one click.**

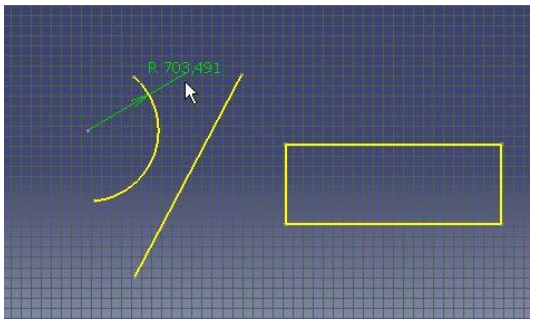
Example No. 1.

Dimensional Constraints

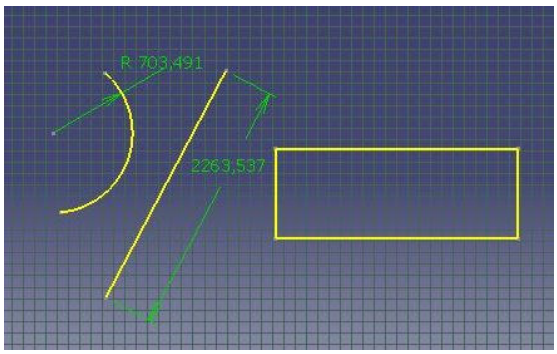
1. Create those profiles by freehand



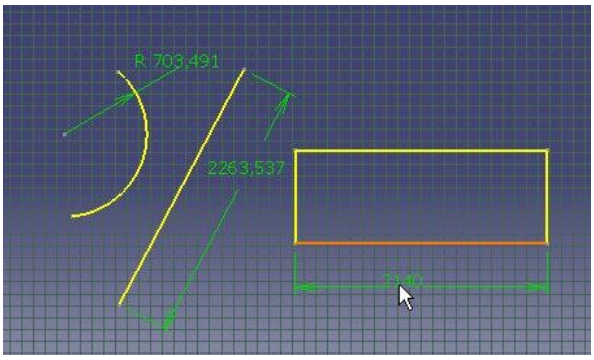
2. Click the Constrain icon and select the arc and locations of dimension on the desktop.

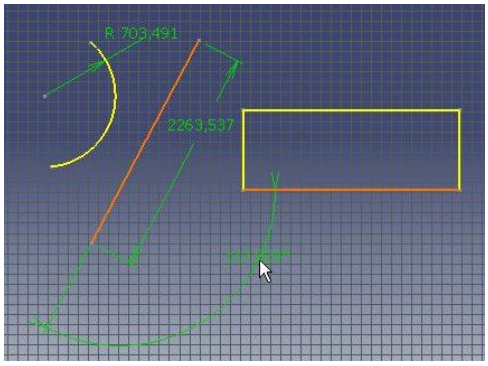


3. Click the Constraint icon and select the line and locations of dimension on the desktop.



4. Click the Constraint icon and select the rectangle (the horizontal line). Post - selecting of the rectangle produces a linear dimension but the selection the line dimension turns the dimension to a angle. Select locations of dimension on the desktop.

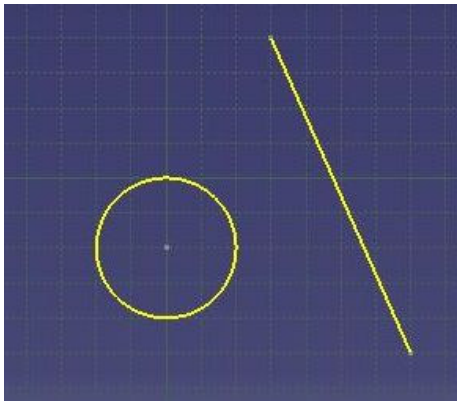




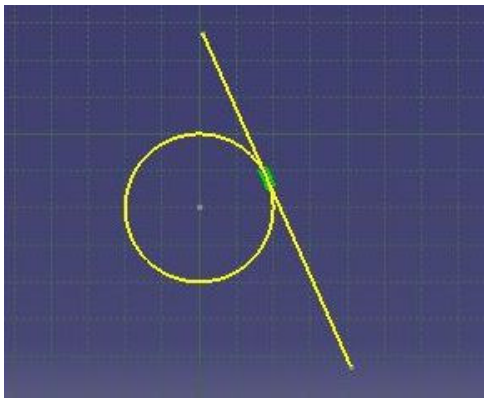
Example No. 2.

Contact Constraints

1. Create those profiles by freehand



2. Click the Contact Constrain icon and select the arc and the line.

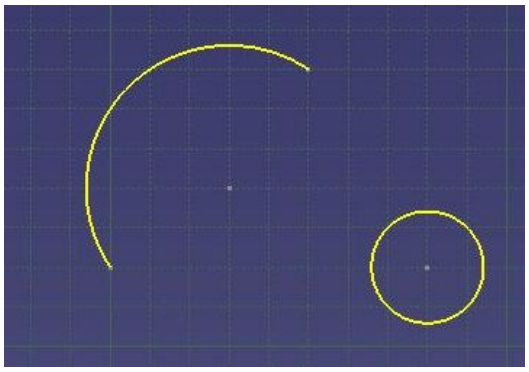


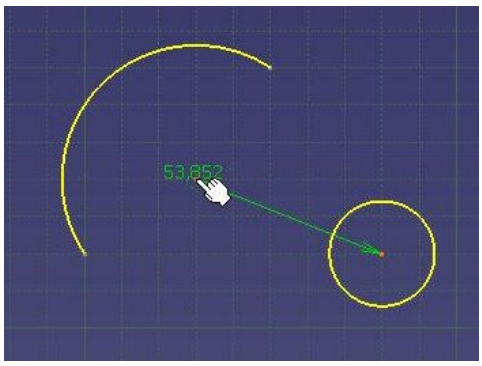
The circle and the line are now tangent.

Example No. 3.

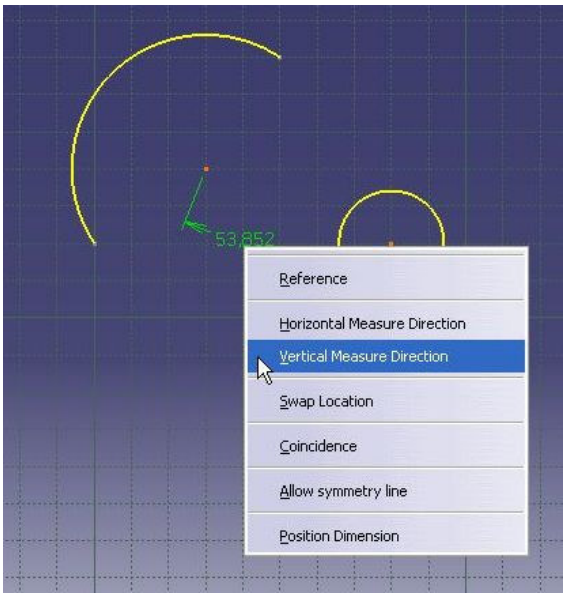
Contextual menu

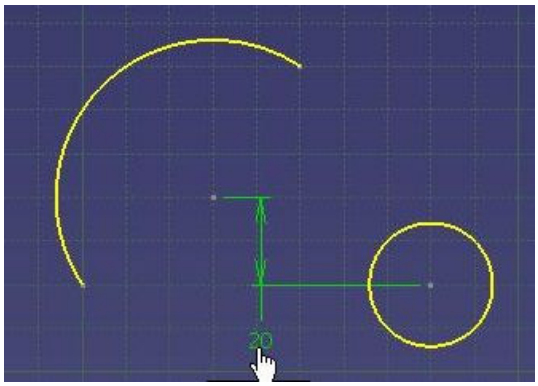
1. Create one circle and one arc, then create a constraint between them. Use the Constraint icon **.**





2. Select the central point of the circle and the central point of the arc. Next Right-click the mouse button and select the Vertical Measure Direction from the Contextual menu.

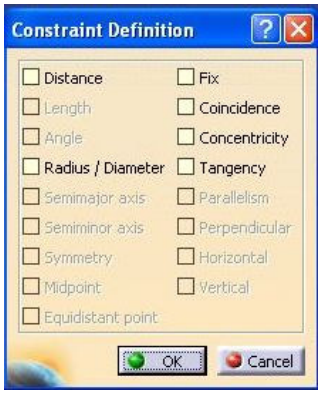




3. Select locations of dimension on the desktop.

Constraints Defined in Dialog Box

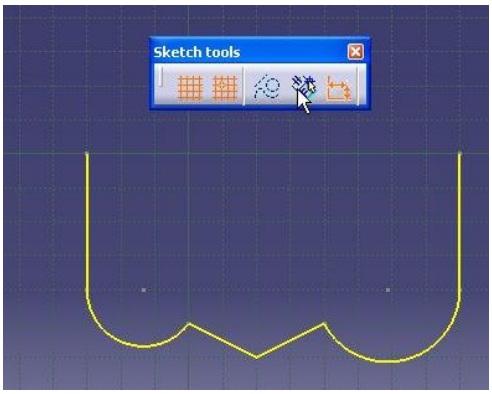
Dimension constrains and Contact constraints are frequently used but if you need to use other constraint, are chosen from the Constraints Defined in Dialog Box .



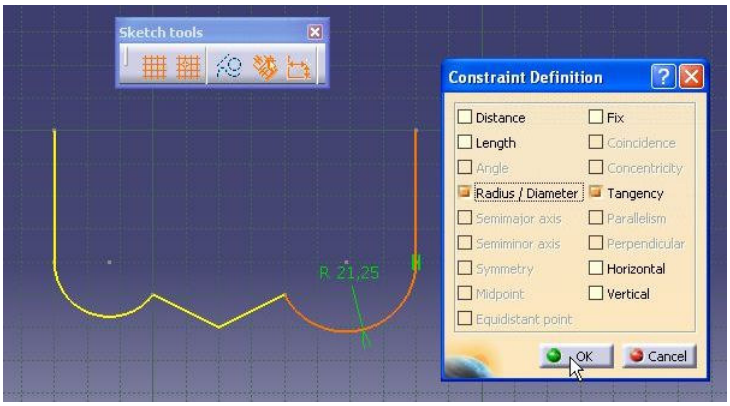
You may define several constraints simultaneously using the Constraint Defined in Dialog Box.

Example No. 4.

1. Switch off the Geometrical Constraints on the Sketch Toolbar and create such profile.



2. Switch on Geometrical Constraints. Select the vertical line and arc (hold Ctrl). Select the Constraint Defined in Dialog Box and select Tangency and Radius/Diameter Constraints. Then click Ok.



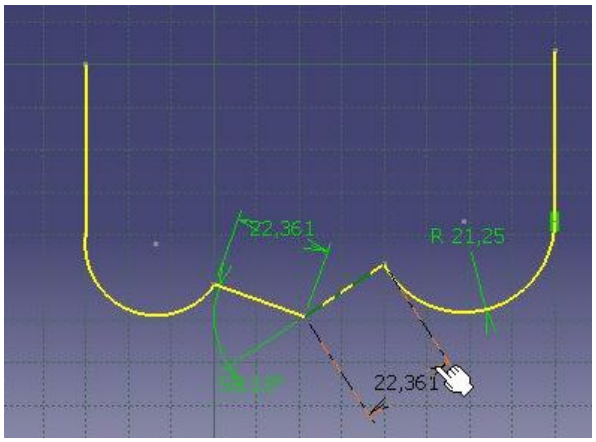
3. Select two lines (hold Ctrl). Select the Constraint Defined in Dialog Box and select the Angle and Length Constraints. Confirm by clicking Ok.

Modification in the Constraint Defined Dialog Box

- **All geometric and dimensional constraints may be deleted.**
- **All values of dimensions and location of dimensional may by changed.**
- **The type of Geometrical constraints on elements can be modified by the Constraint Defined in Dialog Box.**
- **A geometrical or dimensional constraint can be reconnected to a different element**

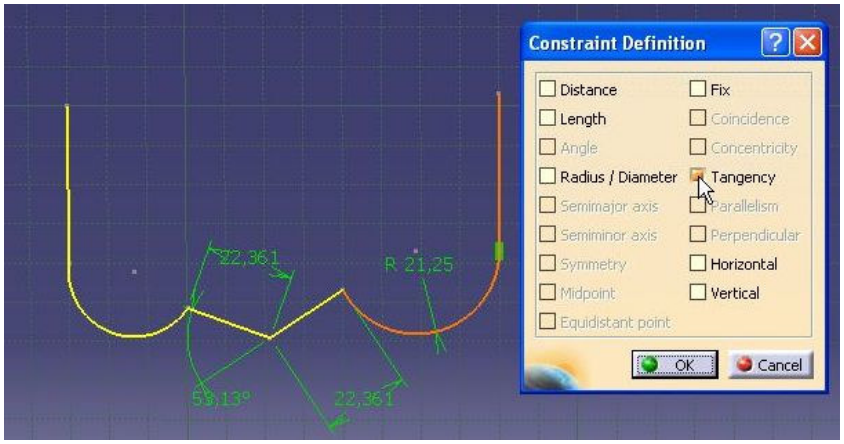
Example No. 5.

1. Change location of Angle and Length Constraints. Choose one of them (click and hold arrow) and move on the desktop.



Example No. 6.

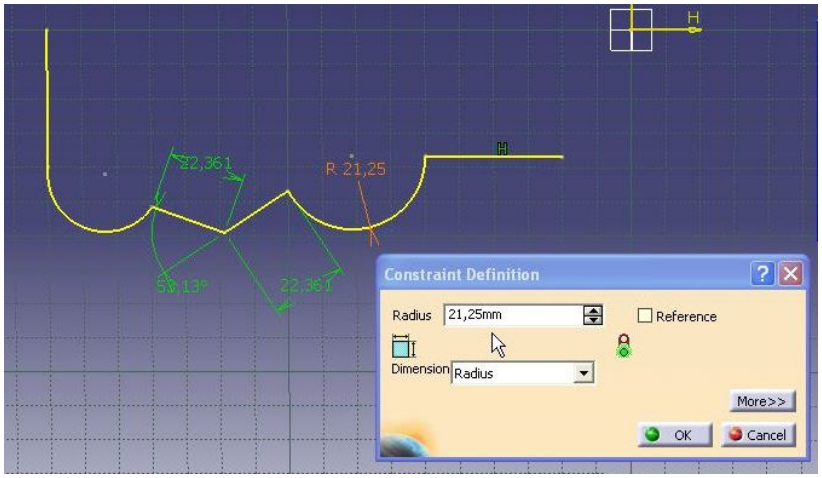
1. Modify the type of the geometrical constraint. Select line and arc and select the Constraint Defined in Dialog Box .



2. Deselect Tangency constraint and select Horizontal constraint. Next select Ok.

Example No. 7.

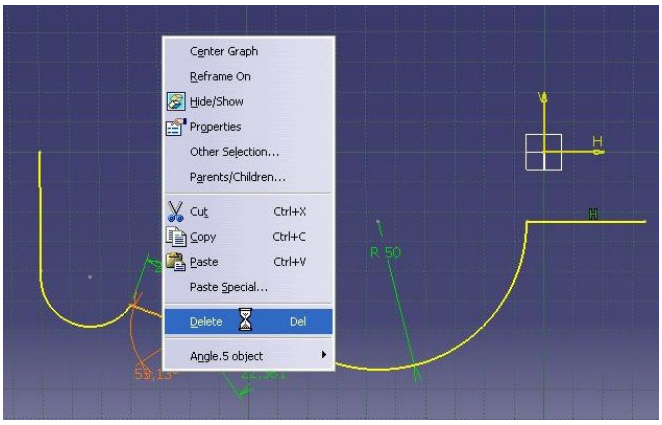
1. Change value of dimension. Double – click on the Radius values.



2. Write in a new value of the Radius (eg. 50) and select Ok.

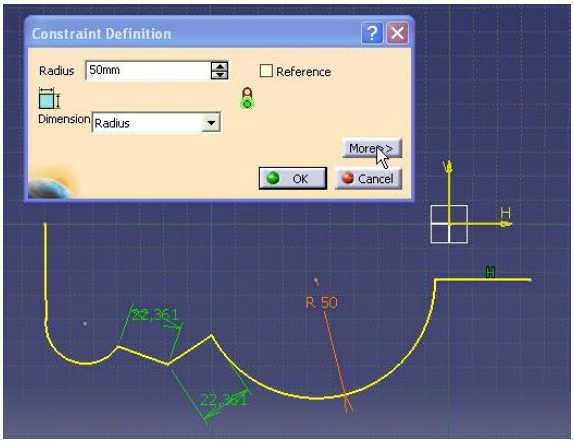
Example No. 8.

1. Delete the constraint. Select Angle constraint by using the Contextual Menu (click the right button of the mouse)

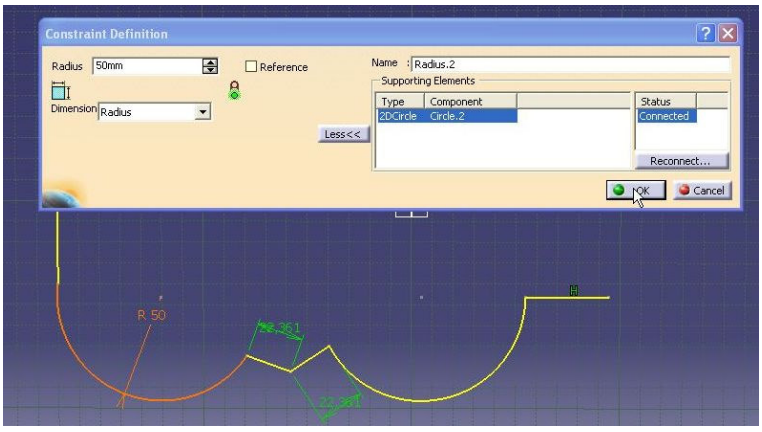


Example No. 9.

1. Reconnecting a Constraint. Double click on the Radius constraint and select More button to proceed.



2. Select the Circle element and select Reconnect option.



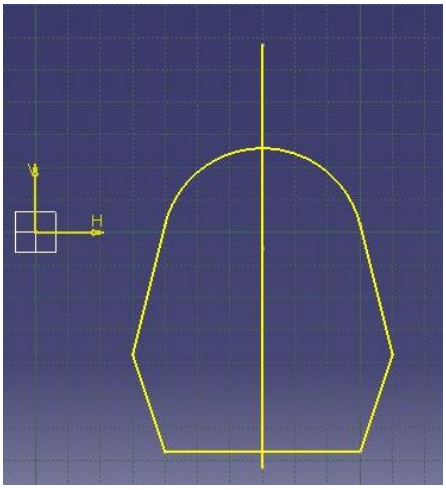
3. Select the second arc and select Ok.

Auto – Constraint

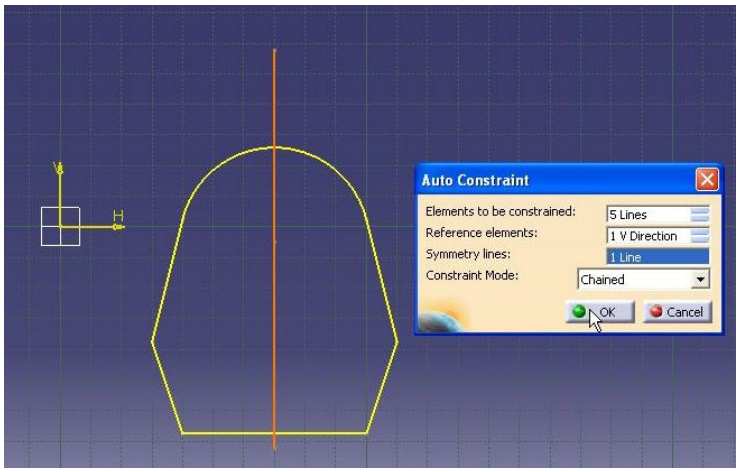
The Auto – Constraints command automatically detects constraints between selected elements and imposes these constraints.

Example 10.

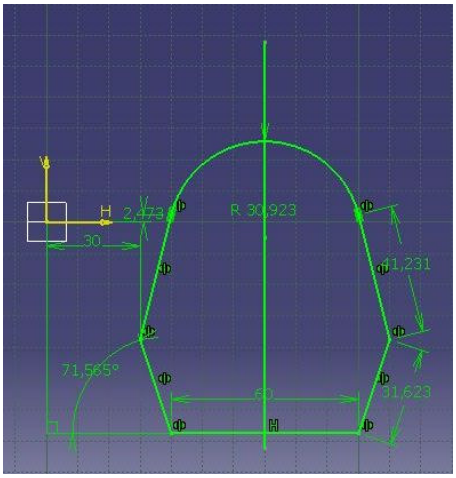
1. Deselect the Geometrical Constraints and create those profiles by freehand.



2. Select the Geometrical Constraints. Next, the select profile(without the vertical line) and select the Auto Constraint **.**



From Reference elements option select two Sketcher axes [axes horizontal (H) and vertical (V)]. All elements will be constrained from the Sketcher Axes.
From Symmetry lines option select Vertical line. Constraints will be created between elements symmetrical to that line (symmetry lines themselves will not be constrained).
Next select Ok.

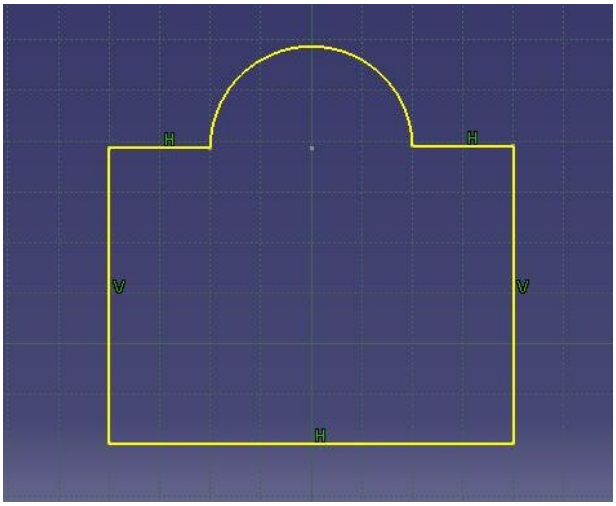


Relation between Dimensions

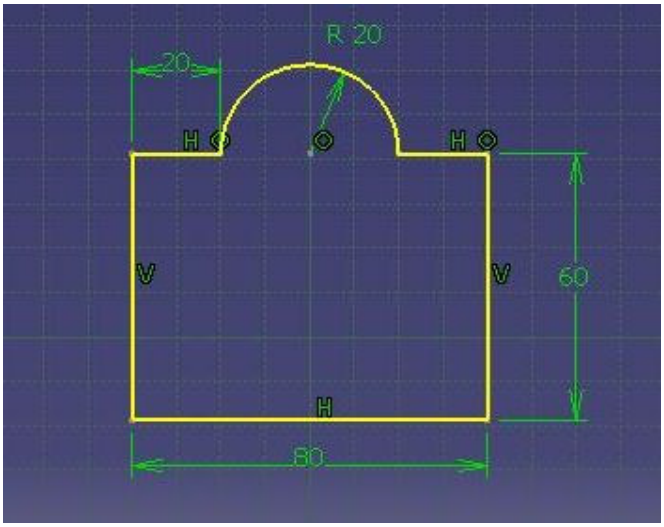
Dependencies can be established between dimensions. In addition to relationships between dimension values, dimensions can be made dependent on other parameters such as force, temperature, time or material properties.

Example 11.

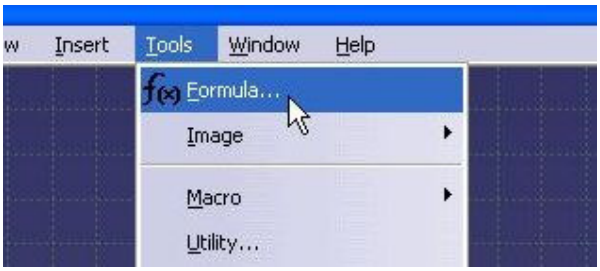
1. Creating relations between dimensions. Create this profile by freehand.

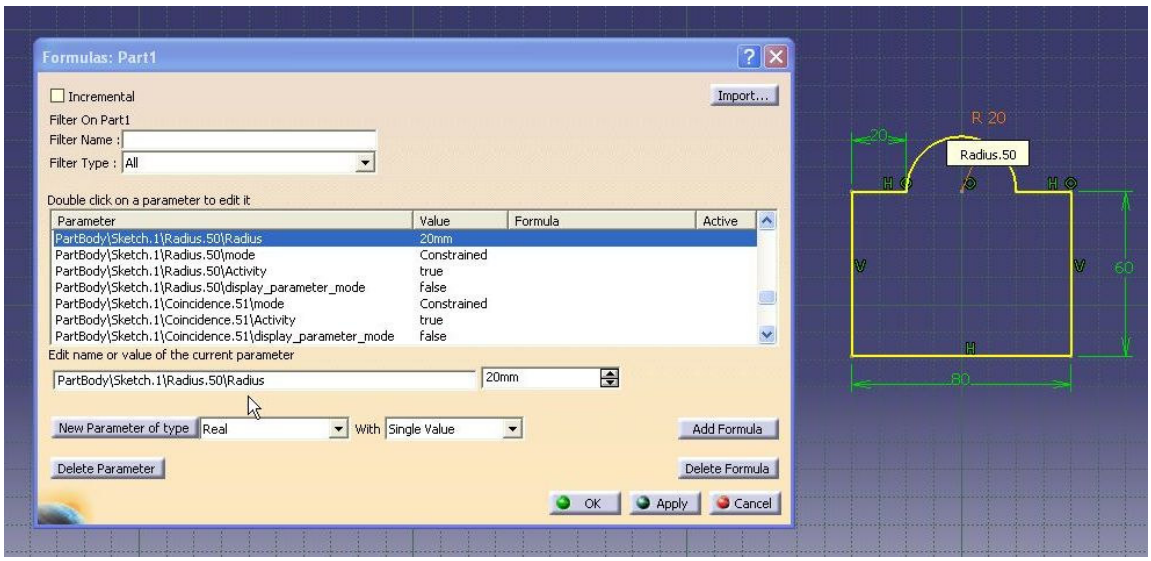


2. Creating Dimensional and Geometrical Constraints.



3. Select f(x)Formula from Tools in the Menu bar. Select a Radius value and choose Add Formula.





4. Select a vertical dimension that equals 60 and write "/3" and select Ok.

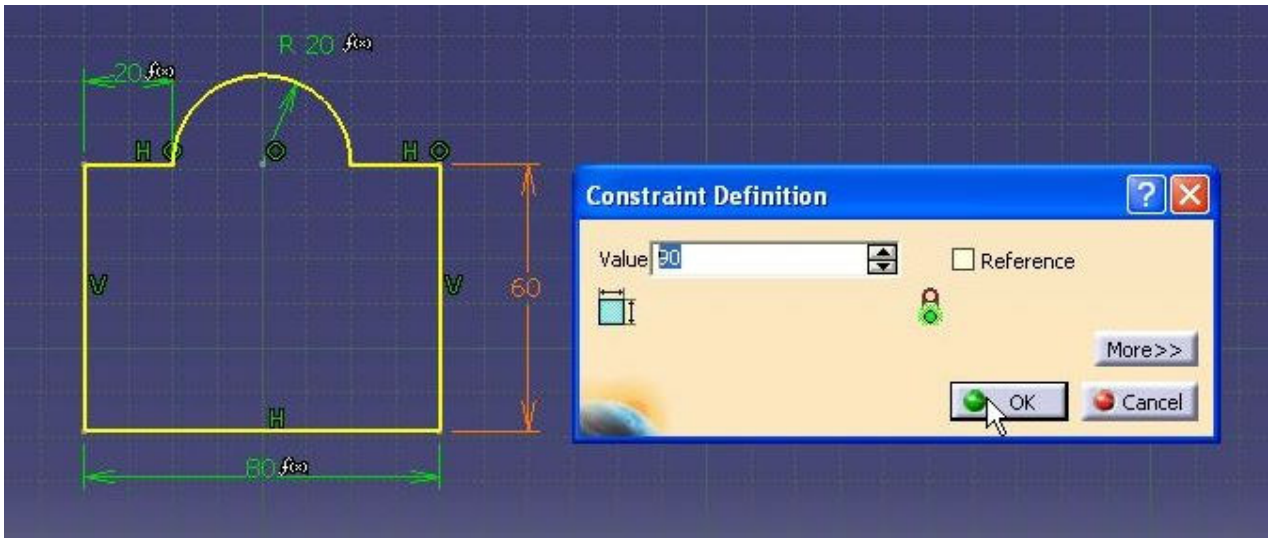
Relation has been created.

5. Next creates other relation.

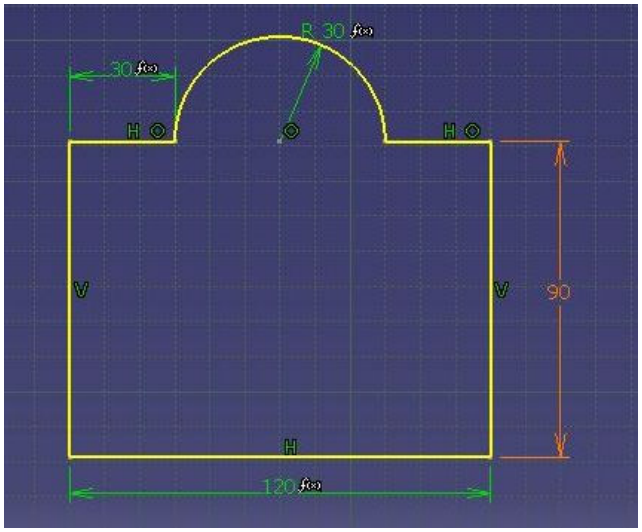
- **Select a horizontal dimension that equals 80 and select Add Formula. Then, select a horizontal dimension that equals 20 and write "*4" and select Ok. Relation has been created.**
- **Select a horizontal dimension that equals 20 and select Add Formula. Next select a horizontal dimension that equals and write "/3". Click Ok in order to confirm. Relation has been created.**

Select Apply and Ok.

6. Select a dimension that equals 60 and change its value to 90. Click Ok to confirm

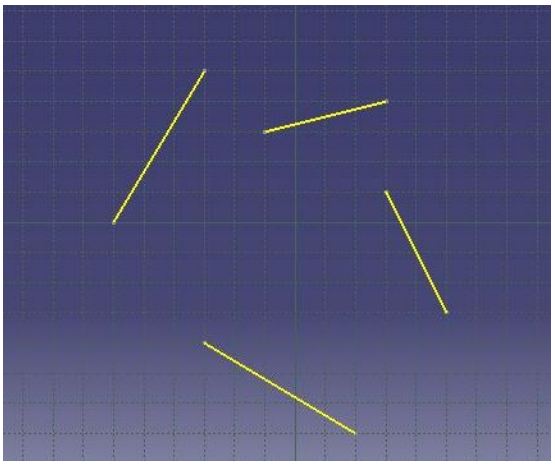


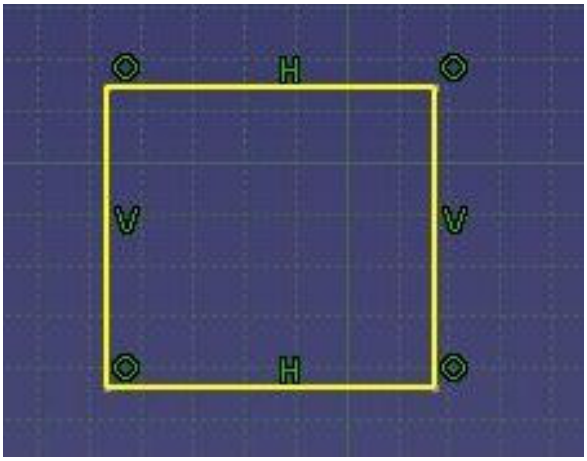
Dependencies dimensions and the profile have been changed.



Task No. 1.

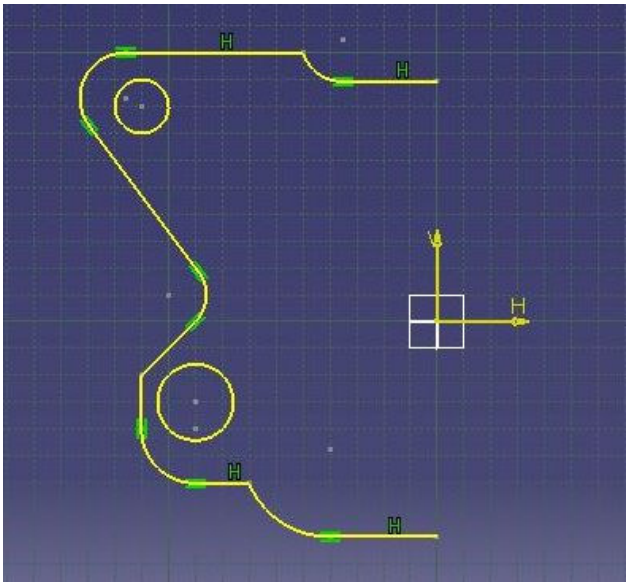
Create four lines like on the picture. Use only Geometrical Constraints and create a square.



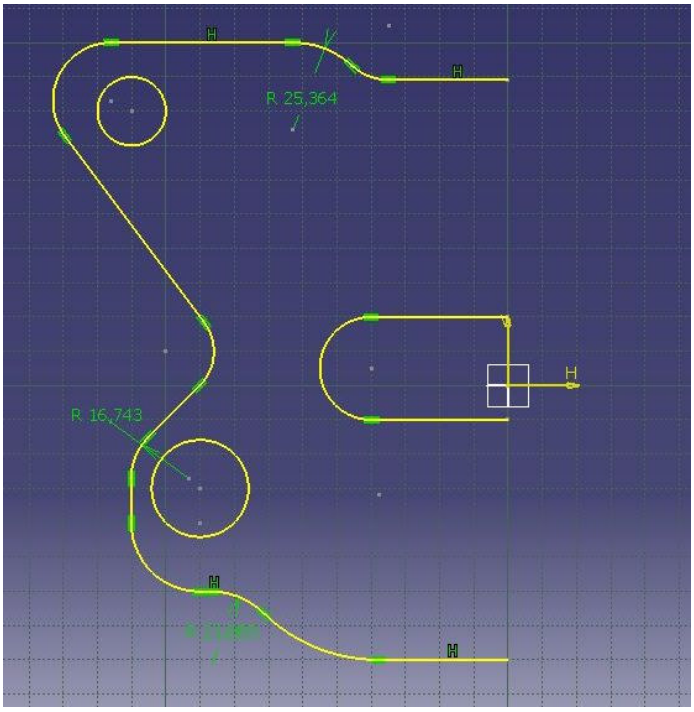


Task No. 2.

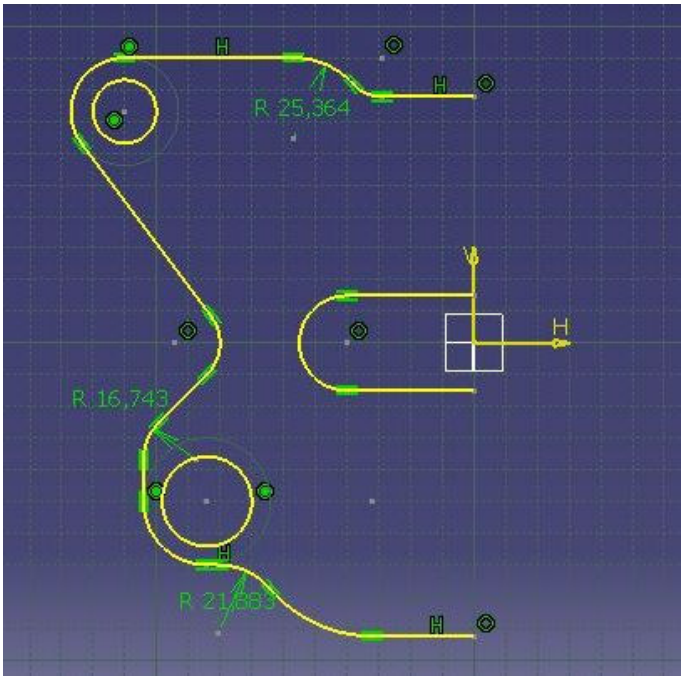
1. Create those profiles by freehand.



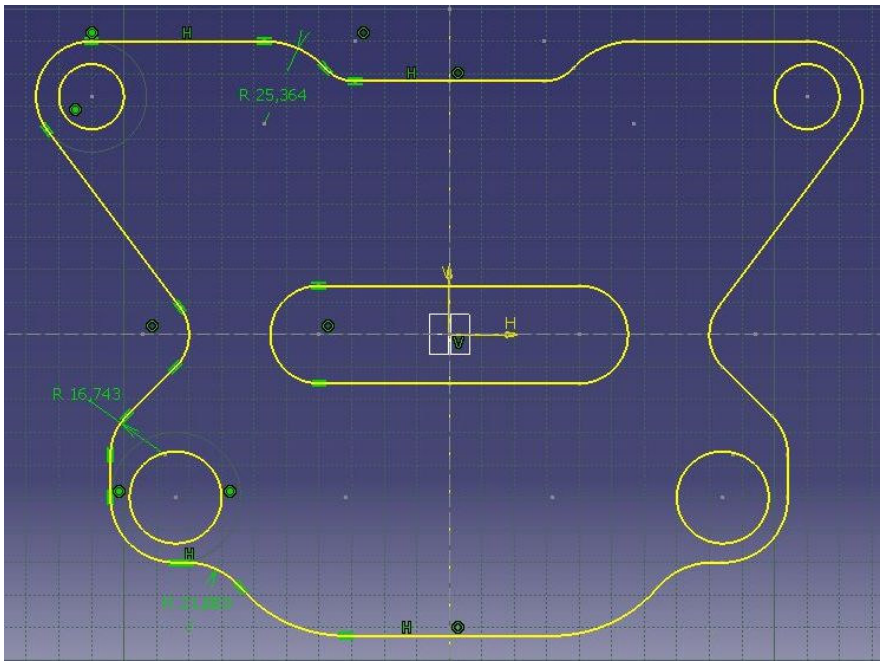
2. Modify them and create Horizontal, Vertical and Tangency constraints.



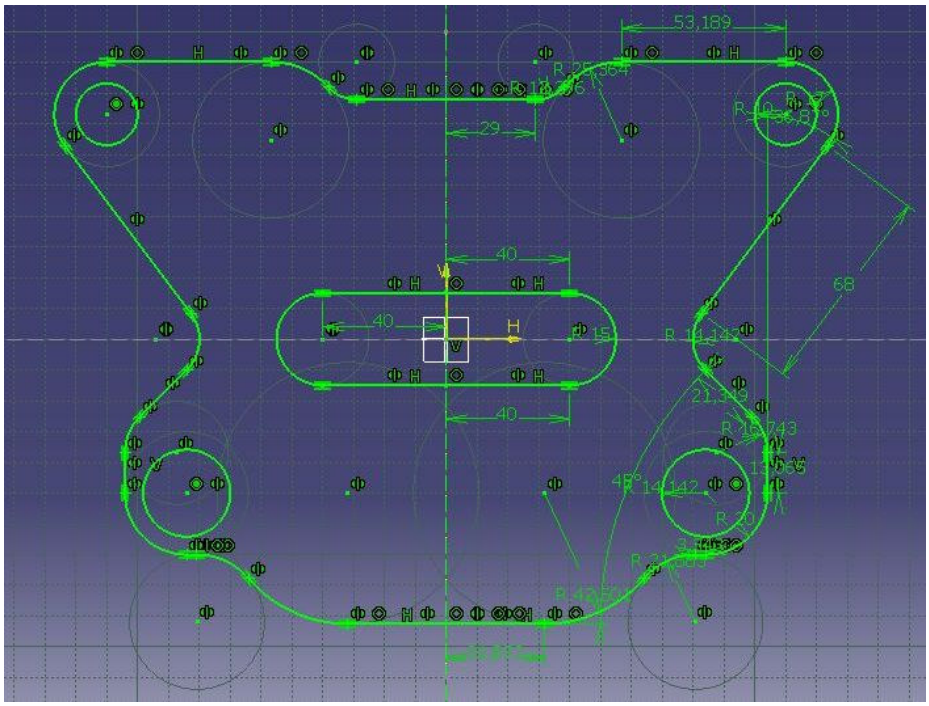
3. Create other Geometrical constraints (Coincidence and Concentricity)



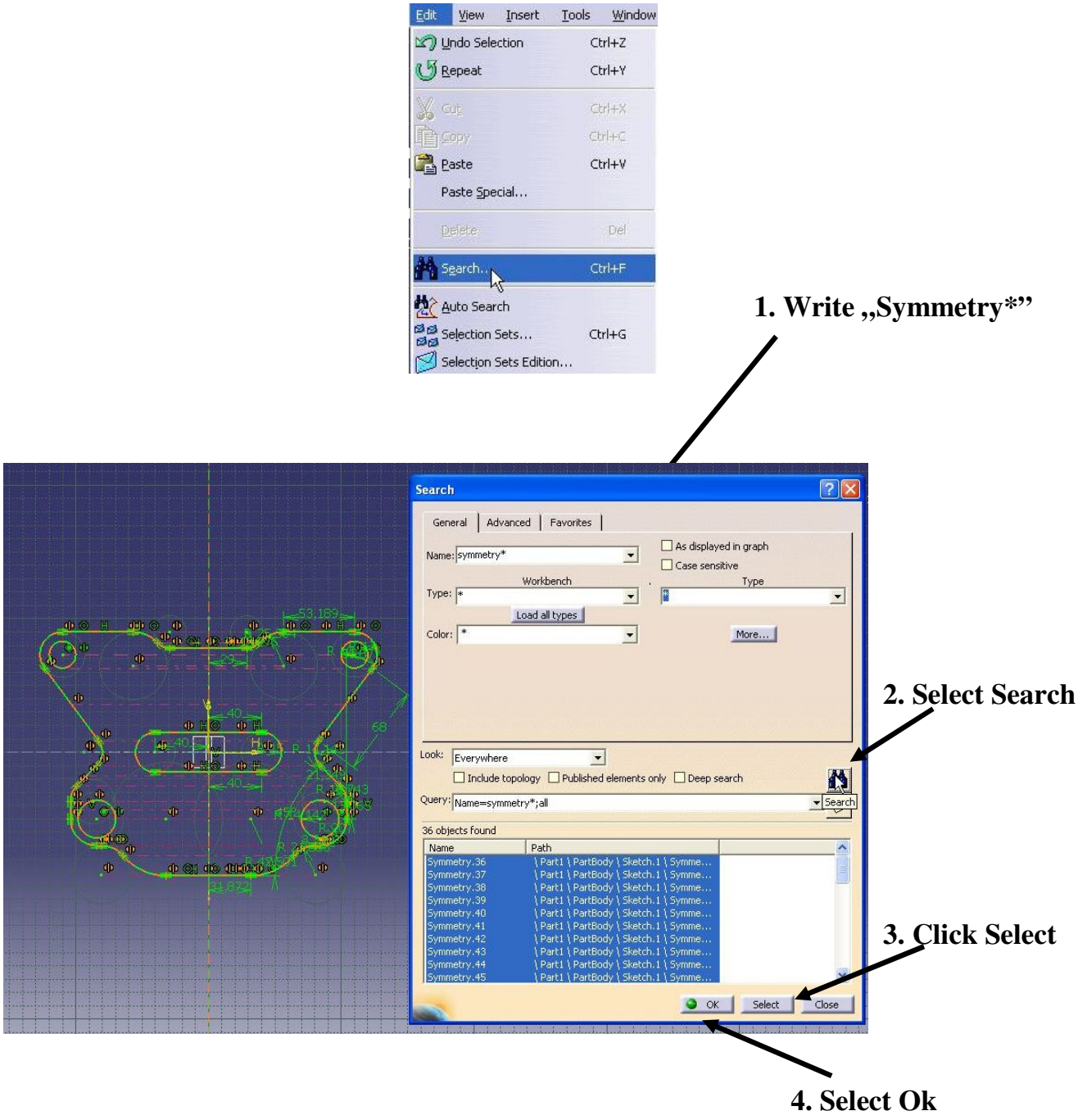
4. Use Mirror option to copy profiles.



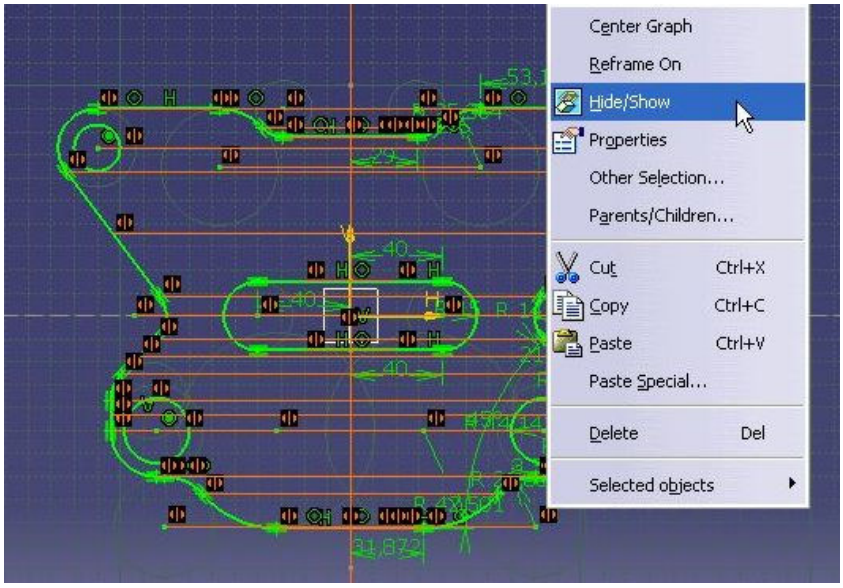
5. Create Geometrical and Dimensional constrains (you can use Auto Constraint)



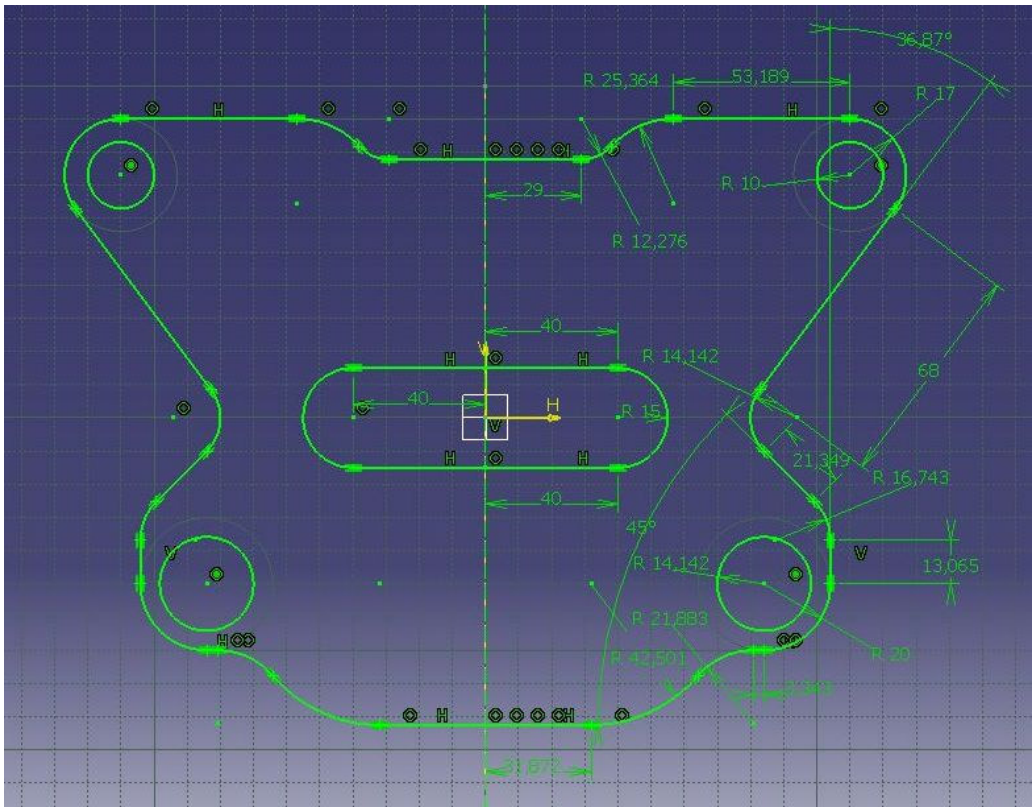
6. Select all Symmetry constrains and switch off projecting them (use Search tool under Edit in Menubar).



7. Select one of Symmetry and click the Right mouse button to select Hide/Shown option.

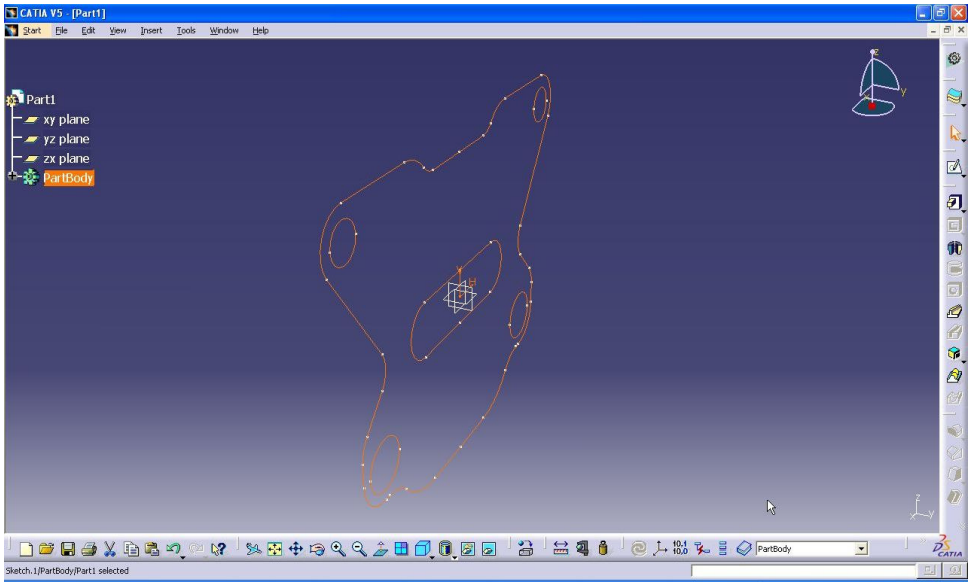


8. Change location of Dimensional constrains and save your file.

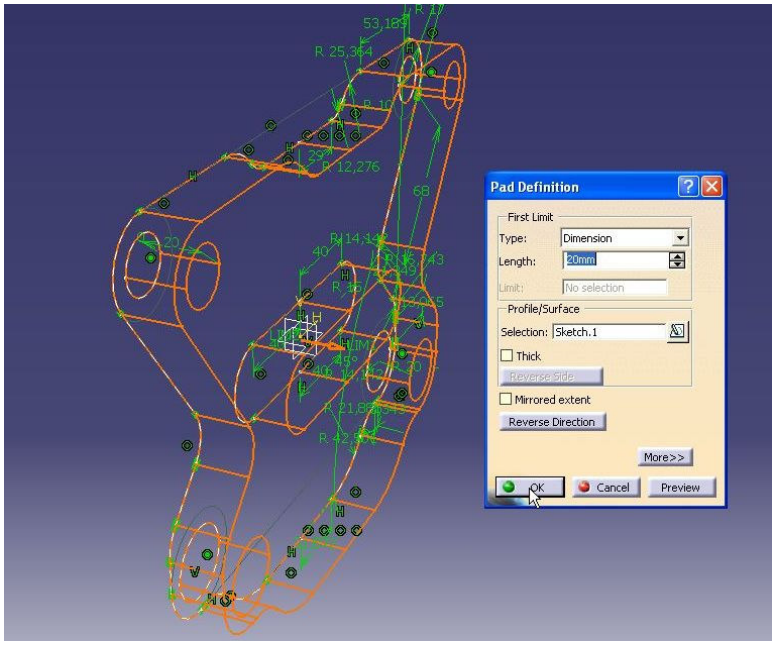

36,87°
R 25,364
53,189
R 17
R 10
29
R 12,276
40
R 14,142
68
40
R 15
21,349
R 16,743
40
45°
R 14,142
13,065
R 21,883
R 20
R 42,501

Your first Pad

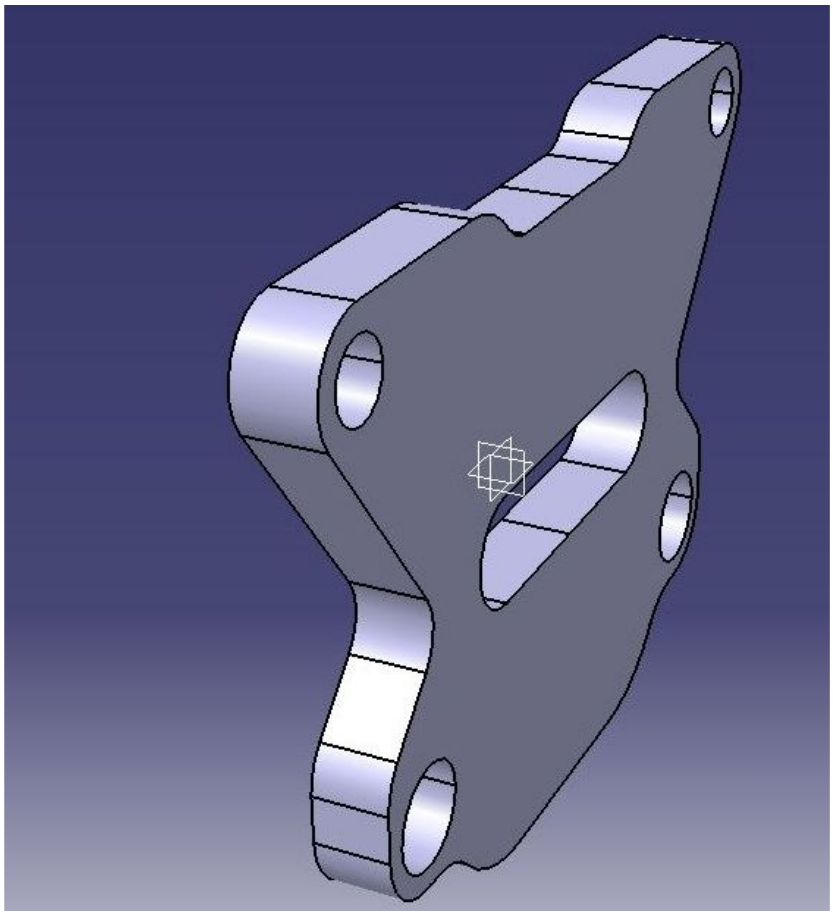
1. Select Exit Workbench . The Sketcher will switch over to part design module automatically.



2. Select Part (you can change the Length or Direction extraction).



3. Select the Ok.



You have created your first Pad.

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