TopSolid Wood

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Geometric driver components

Serial copy

MASTER YOUR MANUFACTURING PROCESS

7, Rue du Bois Sauvage
F-91055 Evry, FRANCE
Web: www.topsolid.com
E-mail: info@topsolid.com

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Note: If you are experiencing problems using this training guide, please feel free to send your feedback and comments at edition@topsolid.com.

Contents

Create the geometric component

To create a geometric driver component, it is necessary to don't design the component on the absolute coordinate system.
The entire component has to have no link to the absolute coordinate system. So the driver elements have to be basics.

Create the document and the geometrics drivers

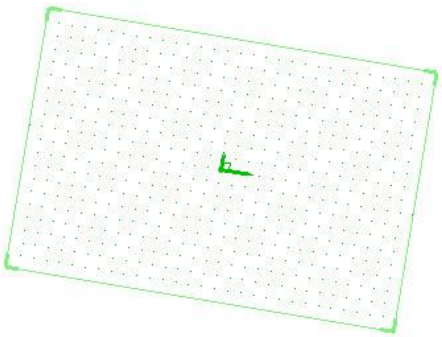
- Create a new design document. 
- Set the level 1 current and hide the level 0. 

Note: The goal is to hide the absolute coordinate system to don't draw on it.

- Create 3 points in the graphical zone with the function **Tools > Points.**
- Break the associativity of these points with the function **Edit > Break associativity.** 
- Select the 3 previously created points to transform them in simple points. 

Note: Before breaking associativity, the points where relative to the absolute coordinate system. After breaking associativity, there are independent.
Depending to these independent points, a coordinate system will be created. It will be used to create the part.

- Start the function **Tools > Coordinate system > Coordinate system 3 points.** 
- Select as **Origin point** the bottom left point.
- Select as **Point towards x** the bottom right point and as **Point towards y** the top point.
- Select the button **Set as current** to use this coordinate system. 

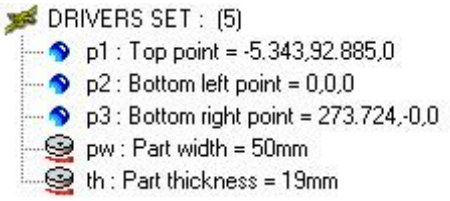


- Save the document in a new folder **Chair** and named this document **Chair seat.** 
- Start the function **Edit > Name.**
- Select as **Element to name** the 3 created points and name them:
  - **Name:** *p1* **Designation:** *Top point*
  - **Name:** *p2* **Designation:** *Bottom left point*
  - **Name:** *p3* **Designation:** *Bottom right point*

Note: When the chair seat will be included in the assembly document, the 3 points will be modified to modify the geometry of the chair. So these 3 points have to be defined as drivers.

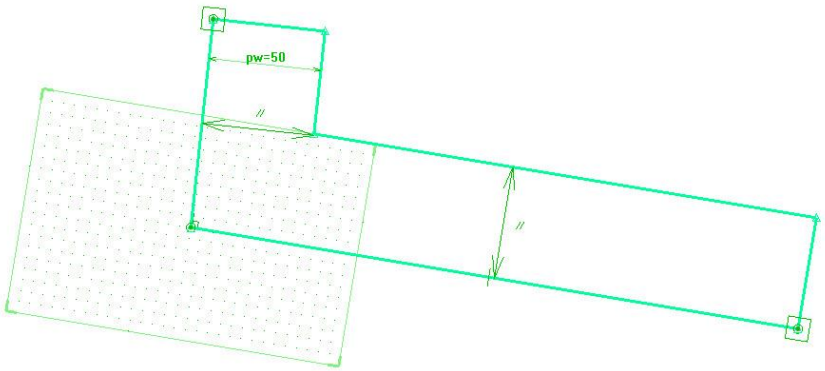
- Define the point as **Driver element** with the function **Assembly > Define component > Define drivers.** 
- Write as **Driving element to insert:** *p1* and validate with enter.
- Validate the default **Designation** and do the same operation with the point **p2** and **p3.**

- Create 2 other **Length parameter:**
  - **Value:** *50mm* **Name:** *pw* **Designation:** *Part width*
  - **Value:** *19mm* **Name:** *th* **Designation:** *Part thickness*
- Set these parameters as drivers.

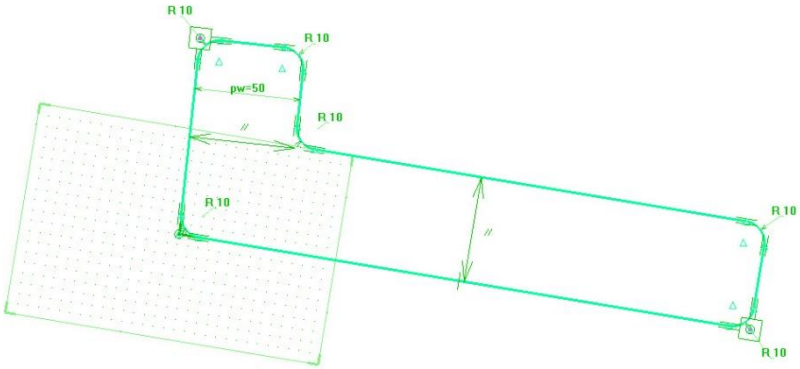


Create the part

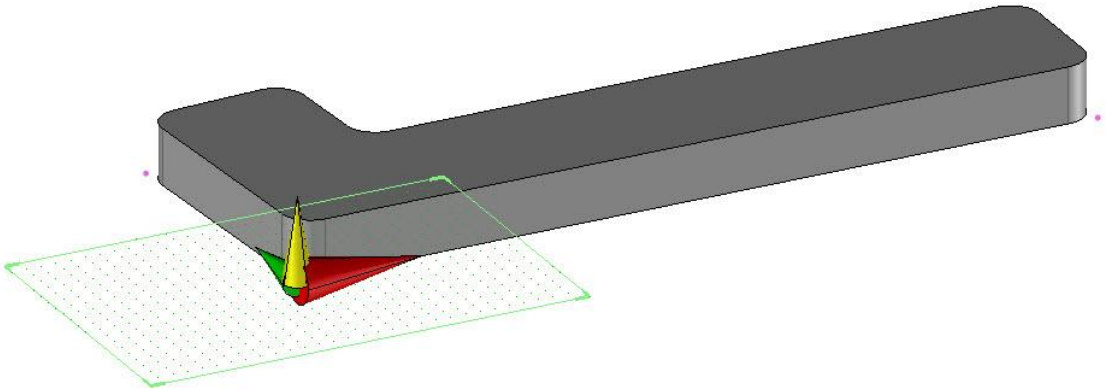
- Create the bellow sketch in passing by the 3 driving points.
  - Create two lines passing by the point **p1, p2** and **p3.**
  - Create a parallel contour of these lines at the value of **pw.**
  - Close the contour with two lines and apply a perpendicular constraint with the original contour.



- Apply a **Global fillet** of *10mm* on this contour.



- **Close** this sketch and extrude it with a thickness value of ***th***.
- Define this part. Set the **cutting-up axis** as the bellow picture.

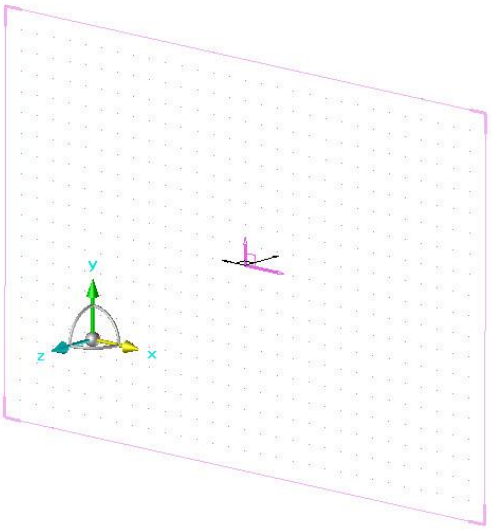


- Set the **Part's designation:** *Chair seat part* and chose a material.
- Save this document.

Create the chair component

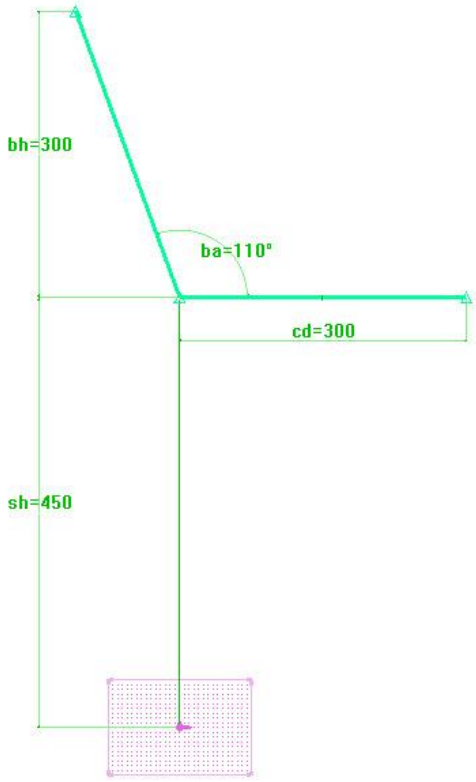
- Create a new design document. 
- Create 5 parameters:
  - **Value:** *450mm* **Name:** *sh* **Designation:** Seat height
  - **Value:** *300mm* **Name:** *bh* **Designation:** Back height
  - **Value:** *110°* **Name:** *ba* **Designation:** Back angle
  - **Value:** *350mm* **Name:** *cw* **Designation:** *Chair width*
  - **Value:** *300mm* **Name:** *cd* **Designation:** *Chair depth*
  - **Value:** *19mm* **Name:** *th* **Designation:** *Panel thickness*
- Save this document and name it **Chair.**

Note: In a furniture document, the conception is better if the absolute coordinate system is oriented as the **X+** axis is on the **furniture width**, the **Y+** axis on the **depth** and the **Z+** on the **height**.



- Set the level 1 current and hide the level 0.
- Create a **2 axis coordinate system** with:
  - **X axis:** *Y-*
  - **Y axis:** *Z+*
- Set current this coordinate system.

- Create this sketch with the previously parameters.
- Close this sketch.
- Set the level 2 current.
- From the tab **Layers** of the tree, make a right click on the levels to **Set name:**
  - **0-** *Absolute coordinate system*
  - **1-** *Chair lateral sketch*
  - **2-** *Back sketch*



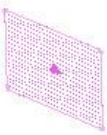
Note: Actually, there are two parameters for the chair width and for the panel thickness which will be make the real chair width.
So here we need a parameter to calculate the real chair width.

- Create a new parameter.
- Set the value: **floor((cw-th)/(th*2))*(th*2)**
- Set **Name:** *rcw* and **Designation:** *Real chair width.*

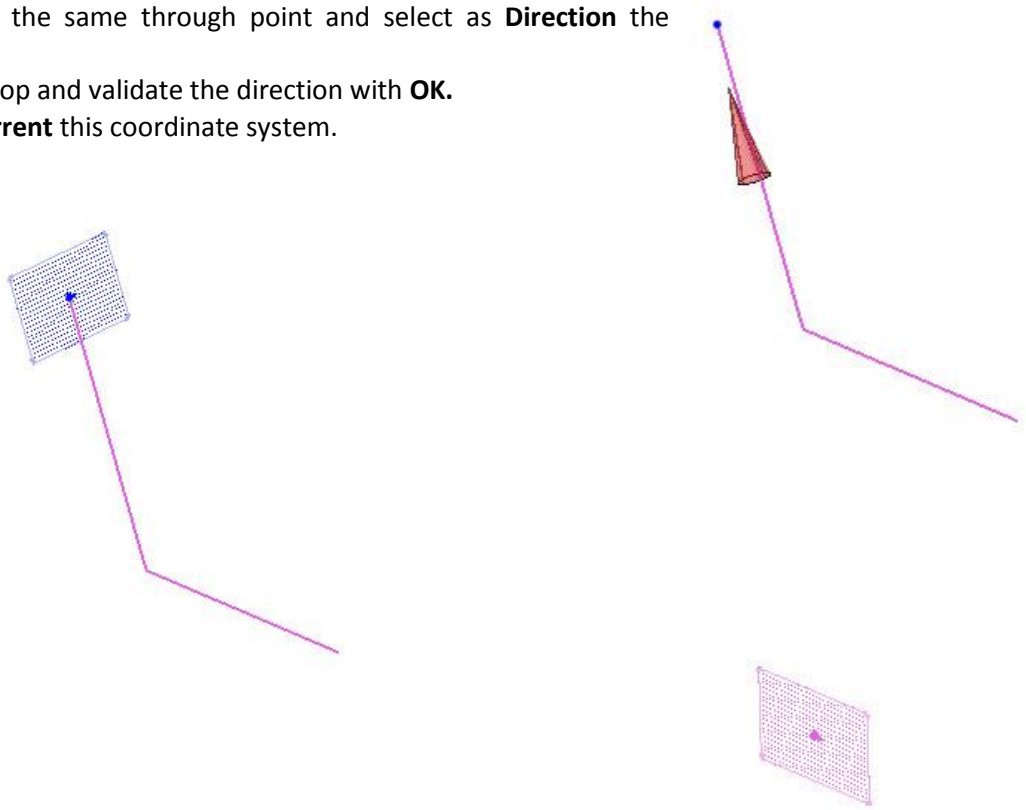
Remark: The floor function is an expression function which allows calculating the inferior rounded value of the calculated value in brackets.
So if the result of **(cw-th)/(th*2)=8.71, floor((cw-th)/(th*2))=8.**

- Create a **2 axis coordinate system.** 
- For the **X axis,** select **Through point** and select the top sketch point. 

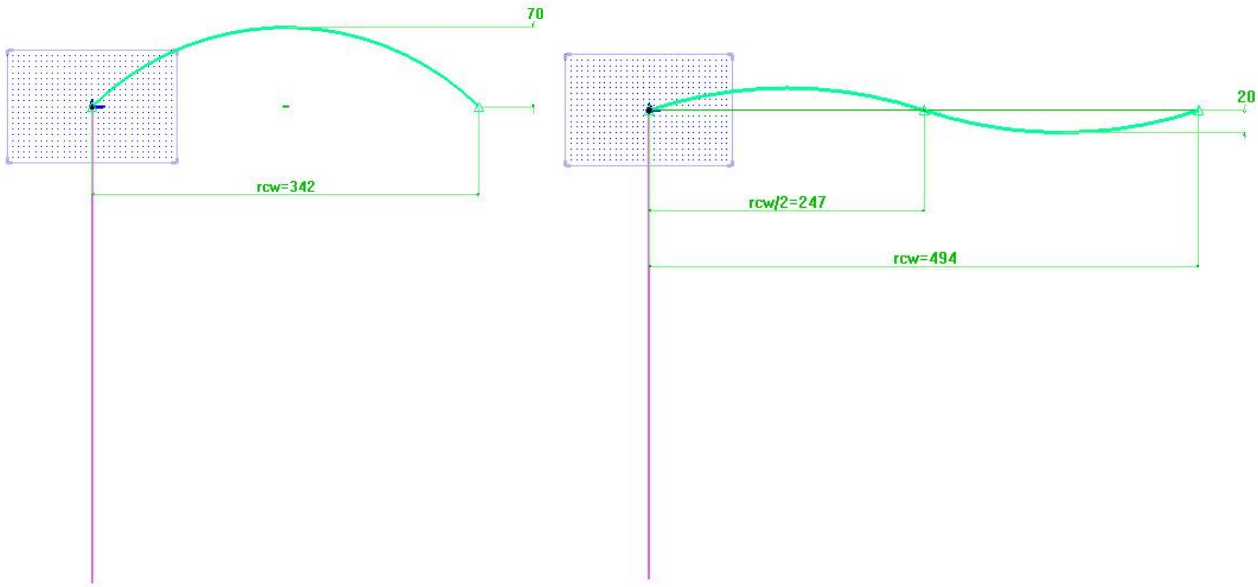
- Then select the **Z-** axis. 



- For the **Y axis,** select the same through point and select as **Direction** the sketch line.
- Rule the arrow to the top and validate the direction with **OK.**
- Select **Quit** and set **Current** this coordinate system.



- Create a new sketch. 
- Create the top pattern for the chair as you want. The total width of the contour must be the parameter ***rcw*.**

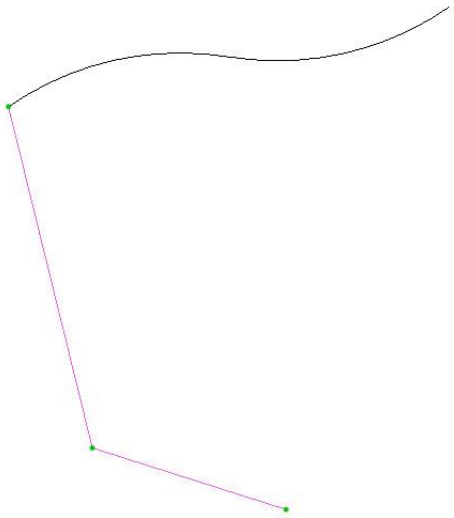


- Close this sketch and save the document. 

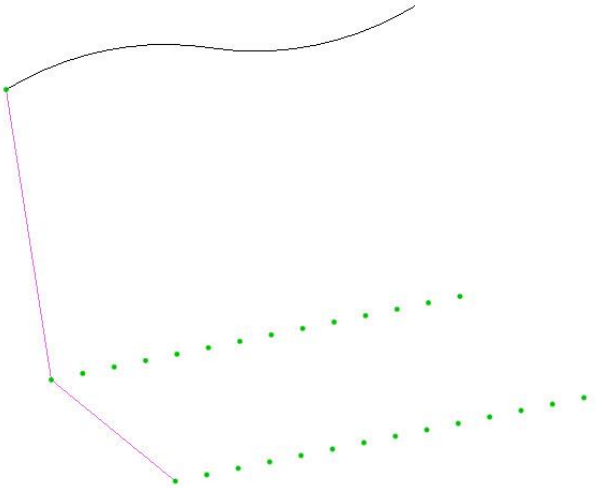
Points creation

- Set the level 3 current and name it ***Points.***
- Select the function **Current coordinate system**  and select **Absolute coordinate system.**

- Change the conception color. 
- Start the function **Tools > Points** and create the 3 driving point as the following picture.



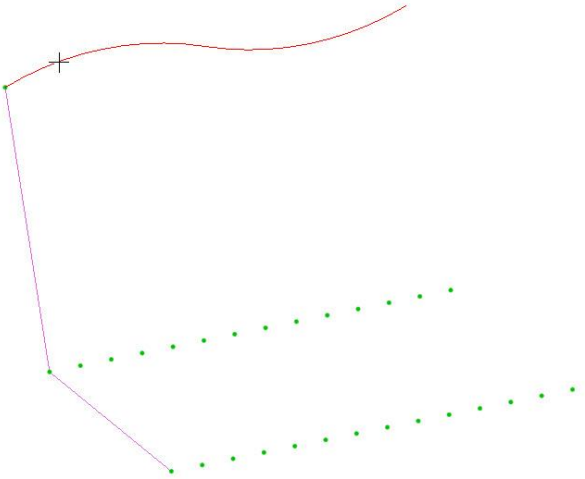
- Repeat the two bottom points with the function **Edit > Repeat:**
  - **Linear**
  - **X+**
  - **Distance per instance =** *2*th*
  - **Total number =** *(rcw/(2*th))+1*



- Then select **Redefine** to create a new repetition. 

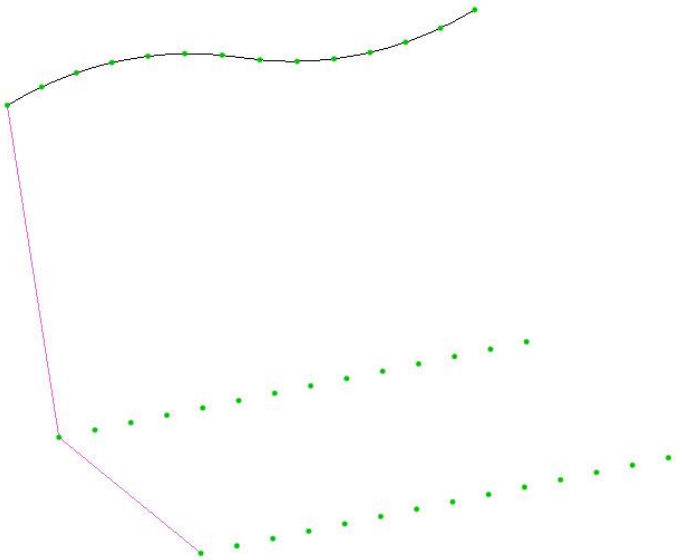
- Select in the drop down list **On curve.** 

- Select as **Curve on which to propagate** the top sketch.



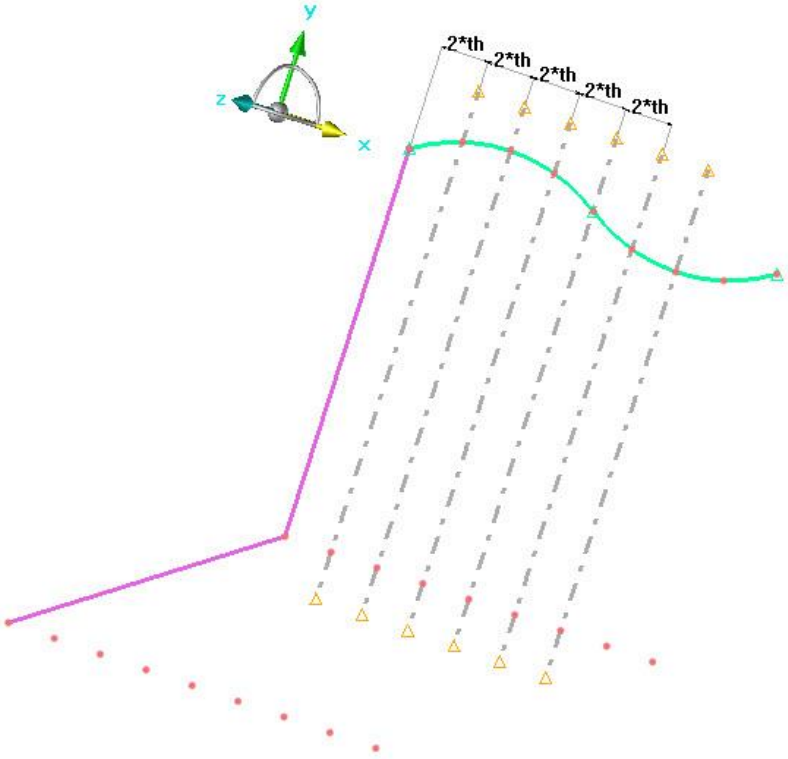
- Rule the propagation:
  - **Distribution mode:** *Mark out*
  - **Distance computing mode =** *Fixed direction*
  - **Transformation mode =** *Frenet coordinate system*
  - **Distance =** *2*th*

- Validate with **OK.**
- Select as **Direction X.**
- For the **Number of instance,** select the option **On all curve** to calculated automatically the point number on the curve. ON ALL CURVE
- Then select the top point to repeat it.



<u>Remark:</u> Distribution mode:

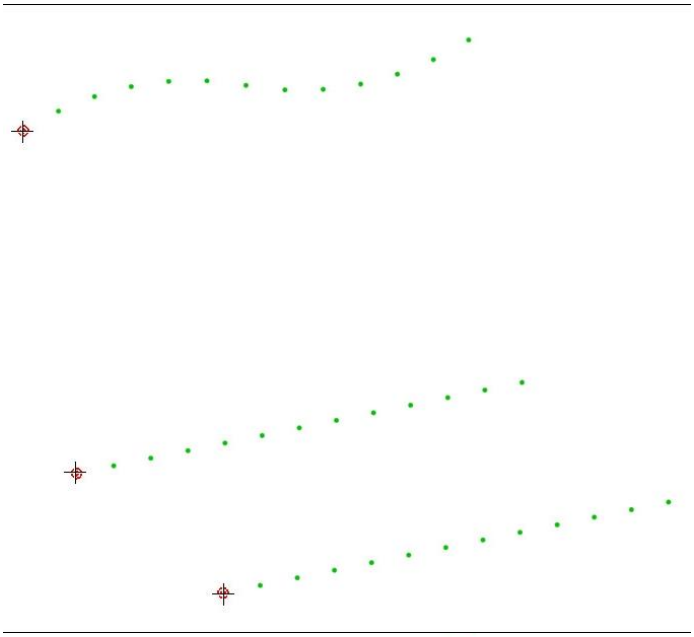
- **Mark out**: Allows giving a distance between each instance.
  The number of instance can be given or automatically calculated with the curve length, but the last length between the last element and the curve endpoint can't be managed.
- **Distribute**: Allows giving only an instance number automatically distribute on the curve length.



Repeat an element on curve with a fixed direction allows repeating the element on the selected curve and obtaining a distance between each point on a specific direction (here **X axis**).

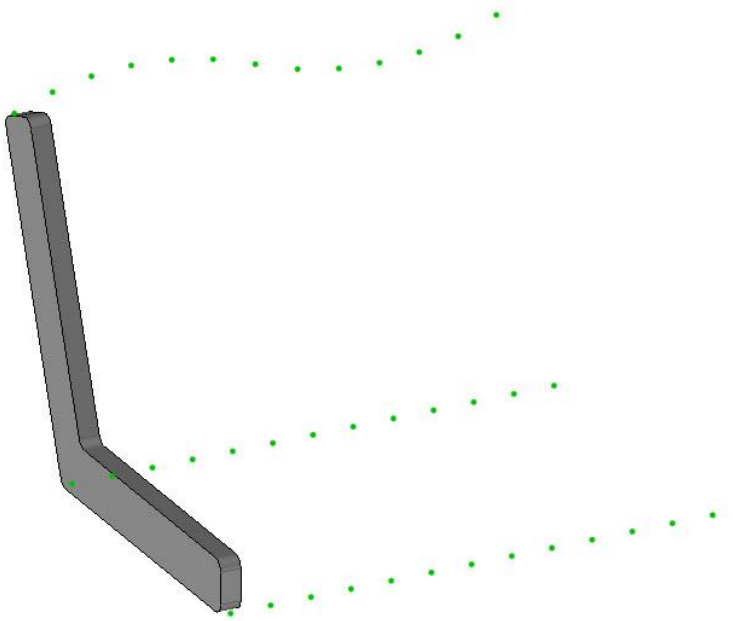
Include the part

- Set the level 4 current and name it *Seat parts.*
- Hide the level **0, 1** and **2.**
- Include the component **Chair seat** with the function **Assembly > Include sub-assembly / Part.** 
- Select for the **Top point,** the **Bottom left point** and the **Bottom right point** the 3 first points of the repetitions.



- Give a value for the **Part width.**
- Merge automatically the parameter **th** of the component with the parameter **th** of the assembly document with the button **AUTOMATIC > Panel thickness=19mm.** 

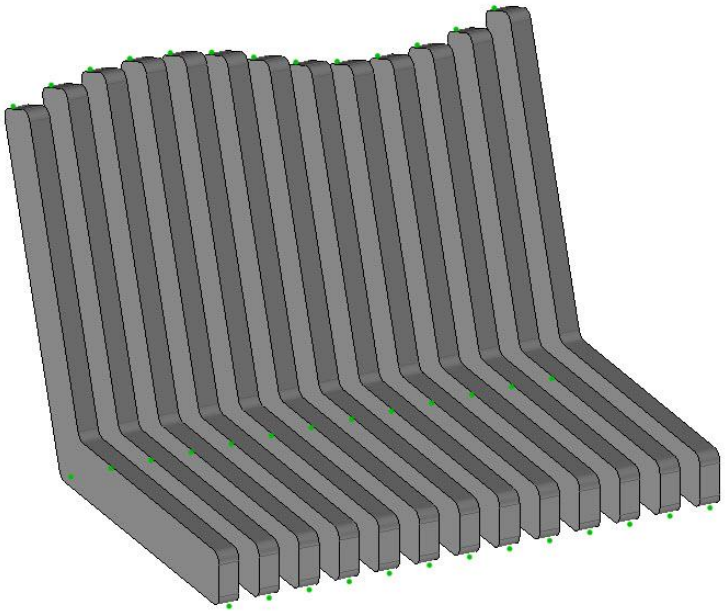
- Then the first component is calculated.



- Select **Stop** to don't apply constraint on this element. STOP
- In the dialog to propagate the component, select **Serial Copy.** SERIAL COPY

Note: During a **Serial copy** of a component, it's possible to select some elements in the document to create the list to copy the component in serial.
But when the component is created on a repetition like here, it's possible to select the repetition automatically as the serial component list.
Note: It's possible to do a **Serial copy** after component inclusion. Start the function **Assembly > Copy component > Serial copy.**

- Let the default **Serial mode = Normal** and select as **Top point** list the option **Automatic.** AUTOMATIC
- Select **Automatic** again for the **Bottom left point** and **Bottom right point.**



Feet creation

Seat modification

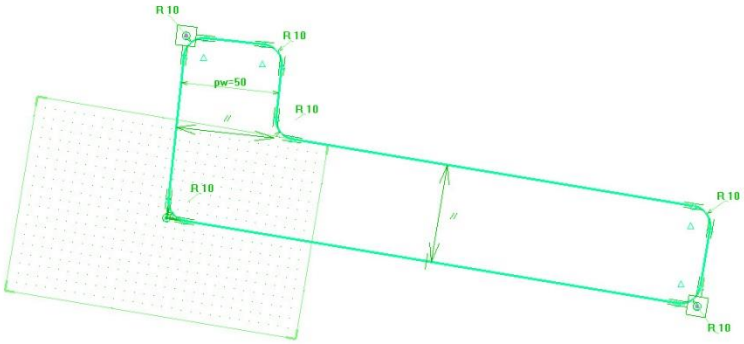
The seat will be modified to create two slots to position the feet. The slot for the back foot will be sloped.

- In the chair document, launch the function **File > Lock document update.** 

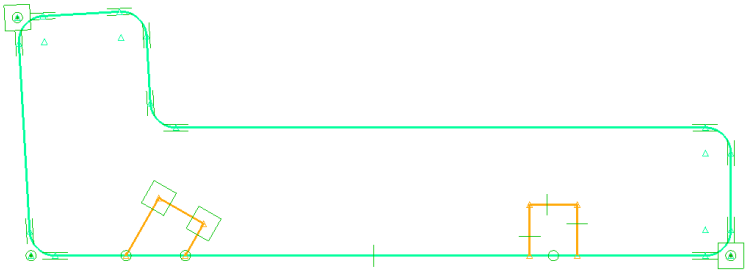
Note: When an assembly contains a component, if this component is modified, the assembly is updated at each modification.
The function **Lock document update** allows doesn't updating the assembly at each modification. With this, it's possible to do all the modification in the component and to update the assembly only one time.
The red frame around the design area show if the document is locking for update.

- Start the **modify element** function and select the seat. 
- Select the button **Template** to open the seat template document. 

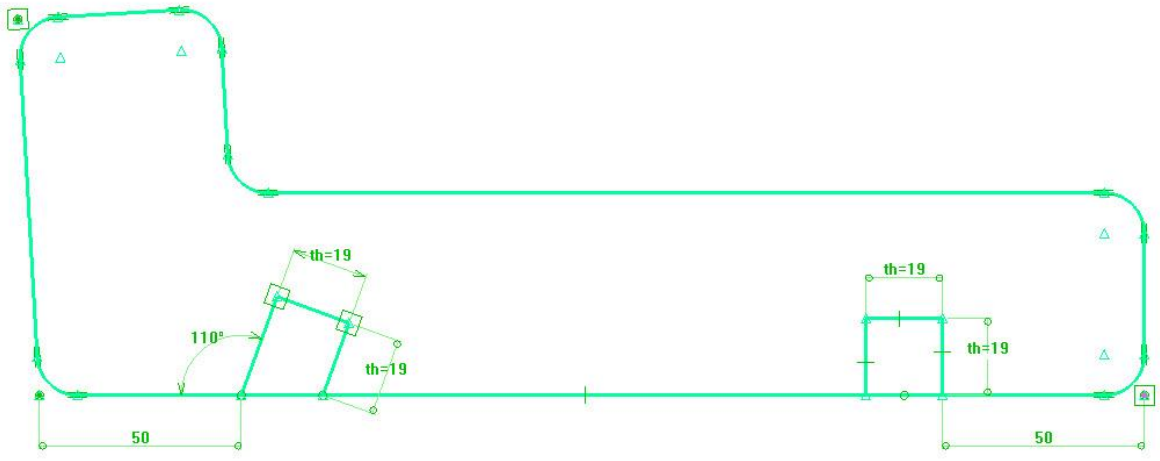
- Modify the original part's sketch.



- Create two rectangular slots. The back slot is sloped.

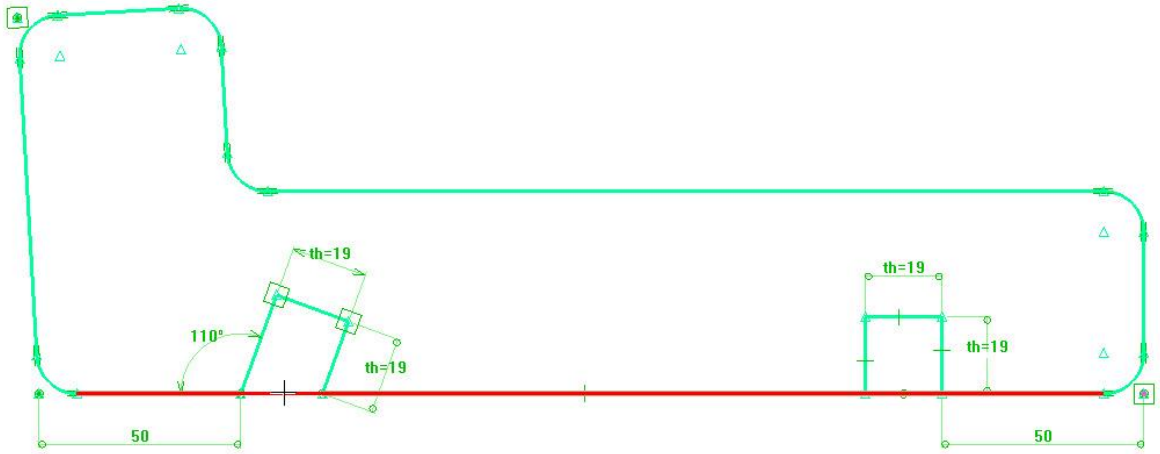


- Dimension these slot:
  - **Width:** *th*
  - **Height:** *th*
  - **Distance from the side:** *50mm*
  - **Left slot angle:** *110°*

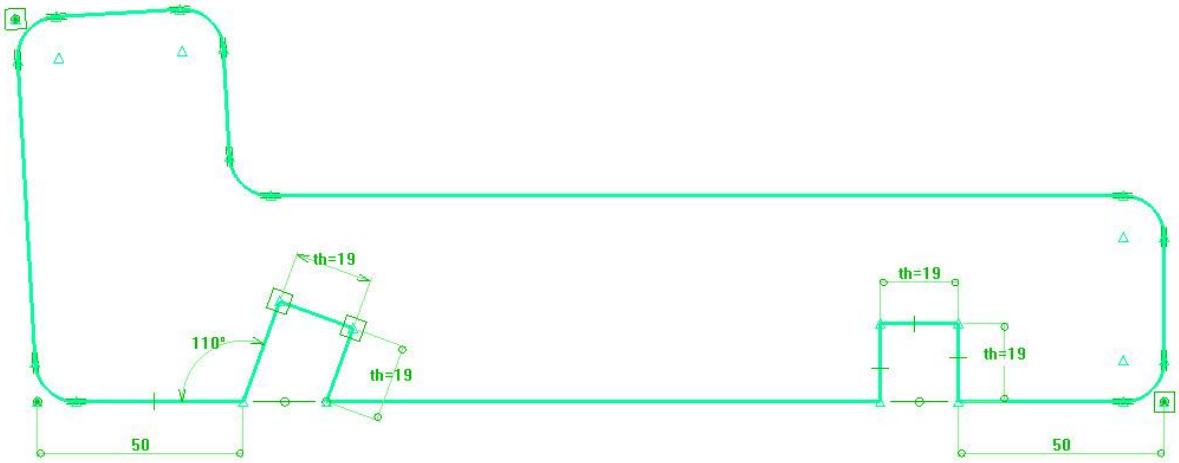


- Start the function **Trim.** 
- Rule:
  - **Mode = Delete**
  - **Mode = Trim**

- Select the superposed segment to trim and sew automatically the contour.



- Apply 4 filets with a 5mm radius in the two slots



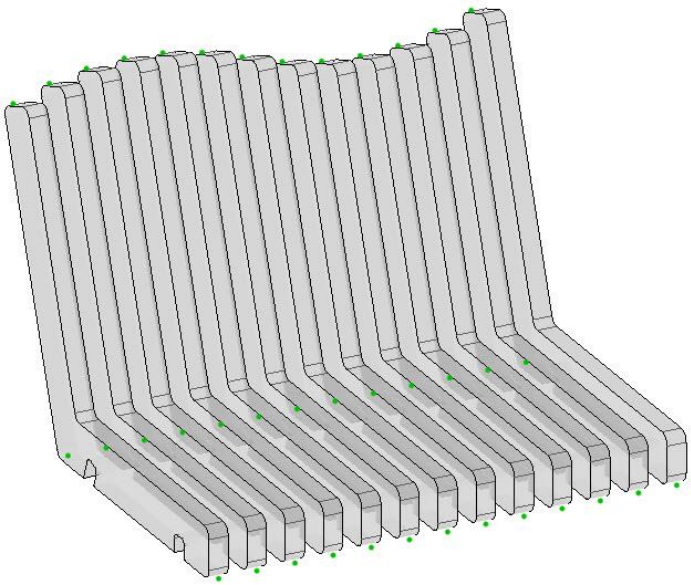
- Close the sketch to update the part. 
- Open the chair document.

The component chair seat has been modified, so the assembly must be update now.

- Click on the button **Delayed update** to update the document. 

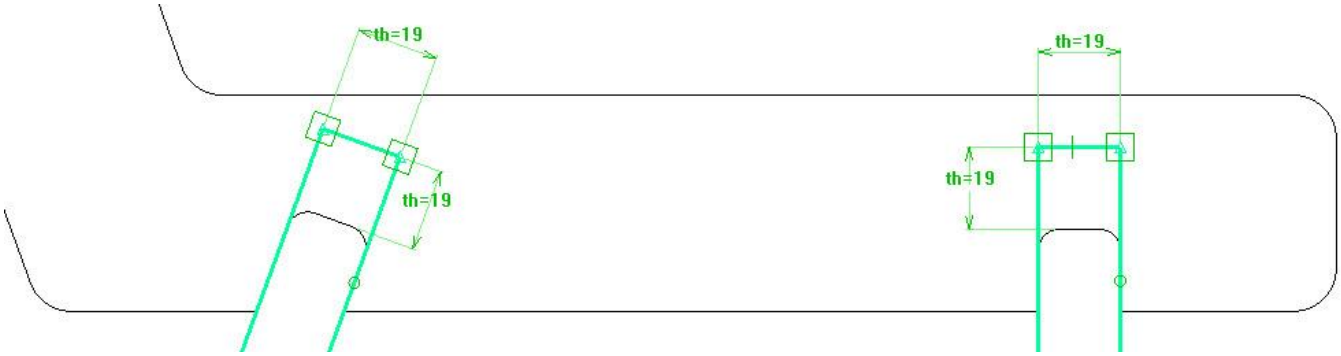
The serial component is update with the slots.

- Quit the update lock with the function **File > Lock document update.**



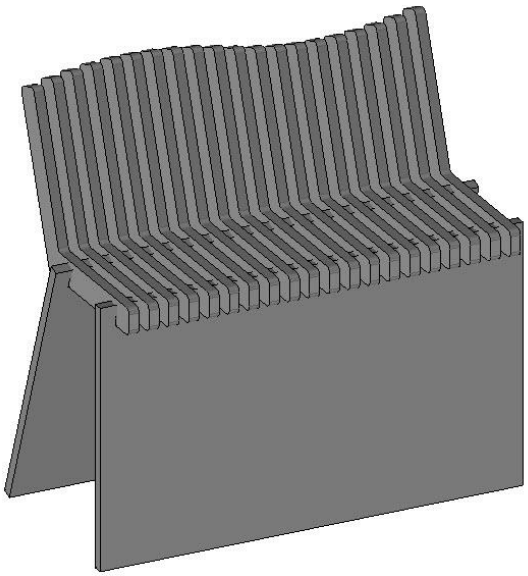
Feet creation

- In the chair document, set the level 5 current and name it **Feet.**
- Set the **coordinate system 2 axis** created on the level 1 to design the chair sketch **current**. 
- Display only the levels **0, 4 and 5.**
- Create the bellow sketch for the feet. The sketch is constrained on the slot of the first serial copy part.



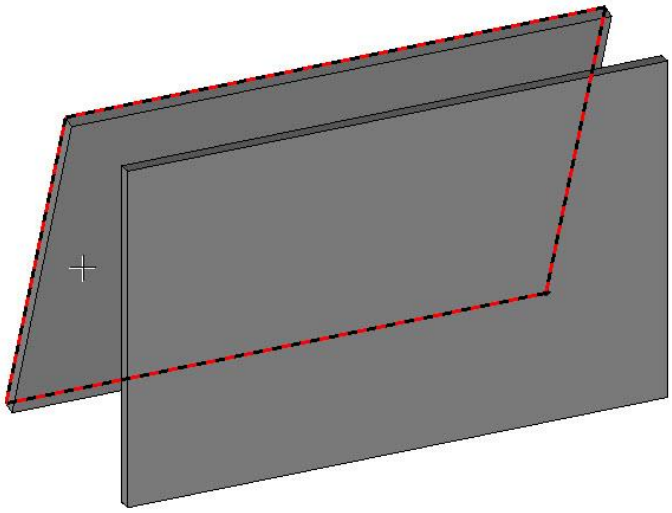
- The bottoms of the rectangles are constrained on the **absolute coordinate system.**

- Close this sketch and extrude it in **Global mode** and **One shape per profile mode:**
  - **Offset from starting curve =** *-((cw-rcw)/2)*
  - **Direction: Z-**
  - **Height:** *cw*

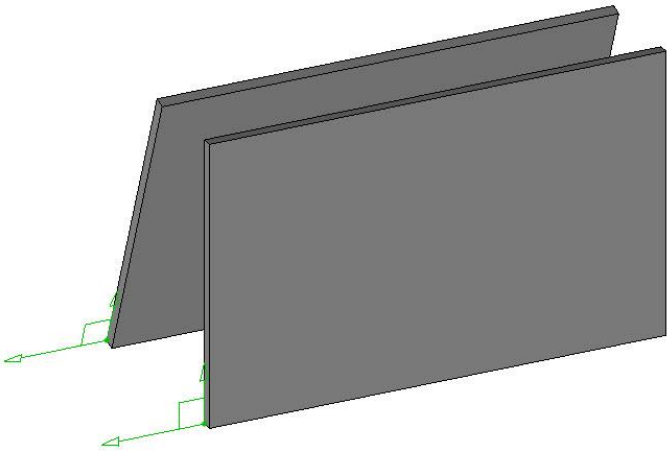


Trim the feet

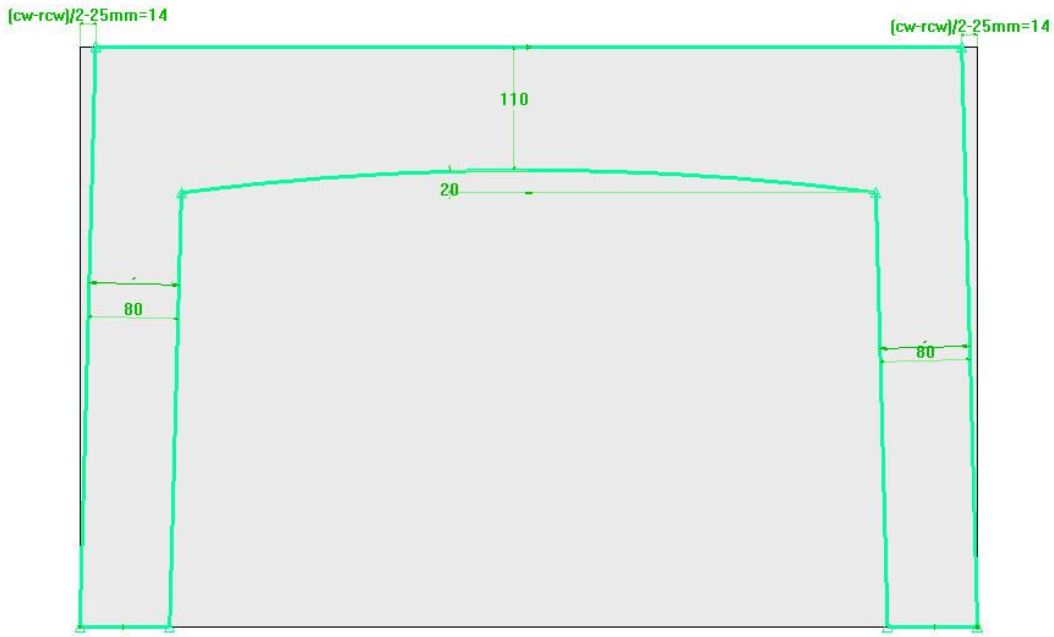
- Hide the levels **0 and 4.**
- Create a **coordinate system on face and point.**
- Select as **Reference face** the back face of the back foot.
- Select as **Origin point** the bottom right point of the selected face.



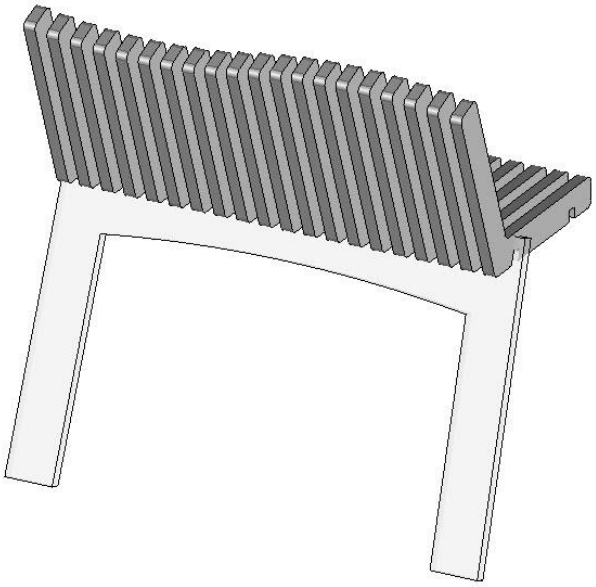
- Orient the coordinate system with the red arrow to obtain the sided coordinate system.
- Do the same operation to obtain a coordinate system on the front foot.



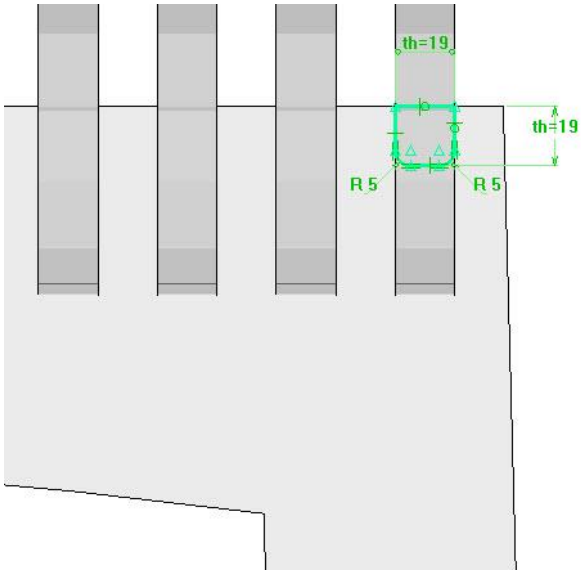
- Set current the back coordinate system and create the bellow sketch.

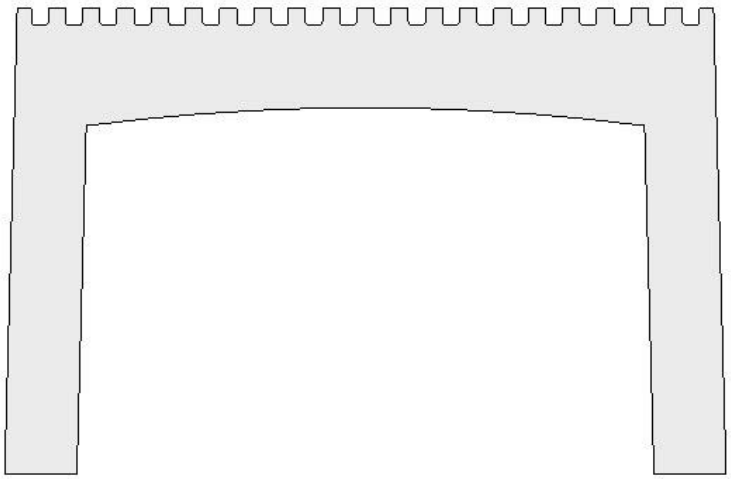


- End the sketch and trim the part with it.

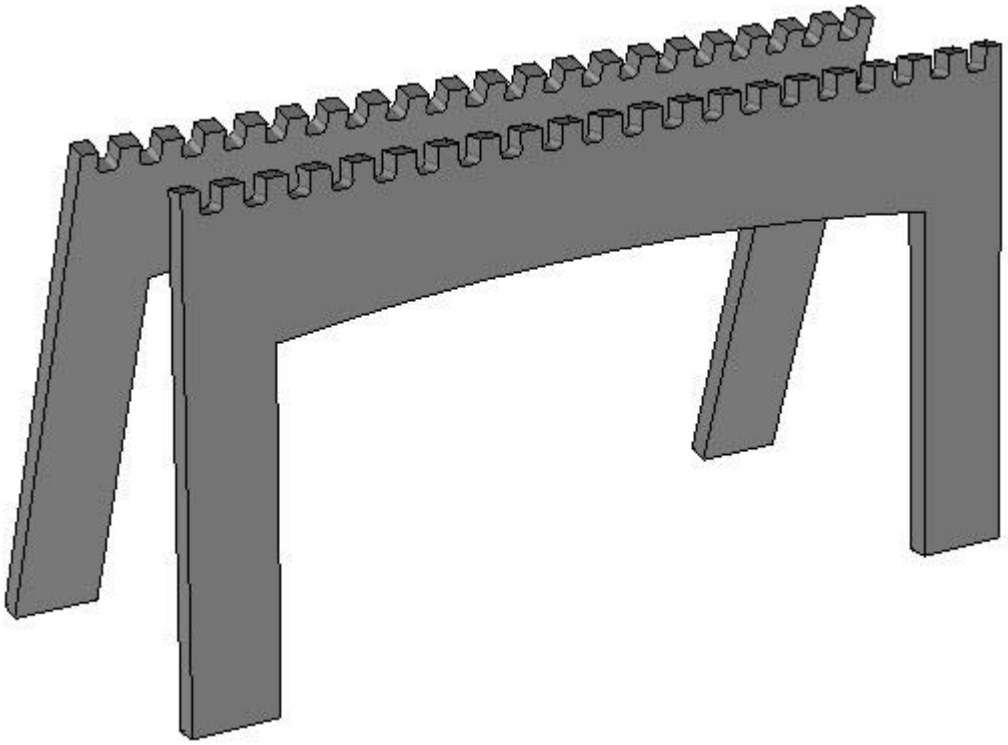


- To create the slot on the feet, create the bellow sketch. This sketch is created on the first serial component, which will always exist.
- Close this sketch and trim the feet with.
- Start the function **Shape > Propagate operation** to propagate the trim. 
- Select the last trim and configure:
  - **Linear**
  - **X-**
  - **Distance per instance =** *2*th*
  - **Total number =** *rcw/th/2+1*





- Do the same operation for the front foot.



- Then define the two feet to finish the chair.

Notes