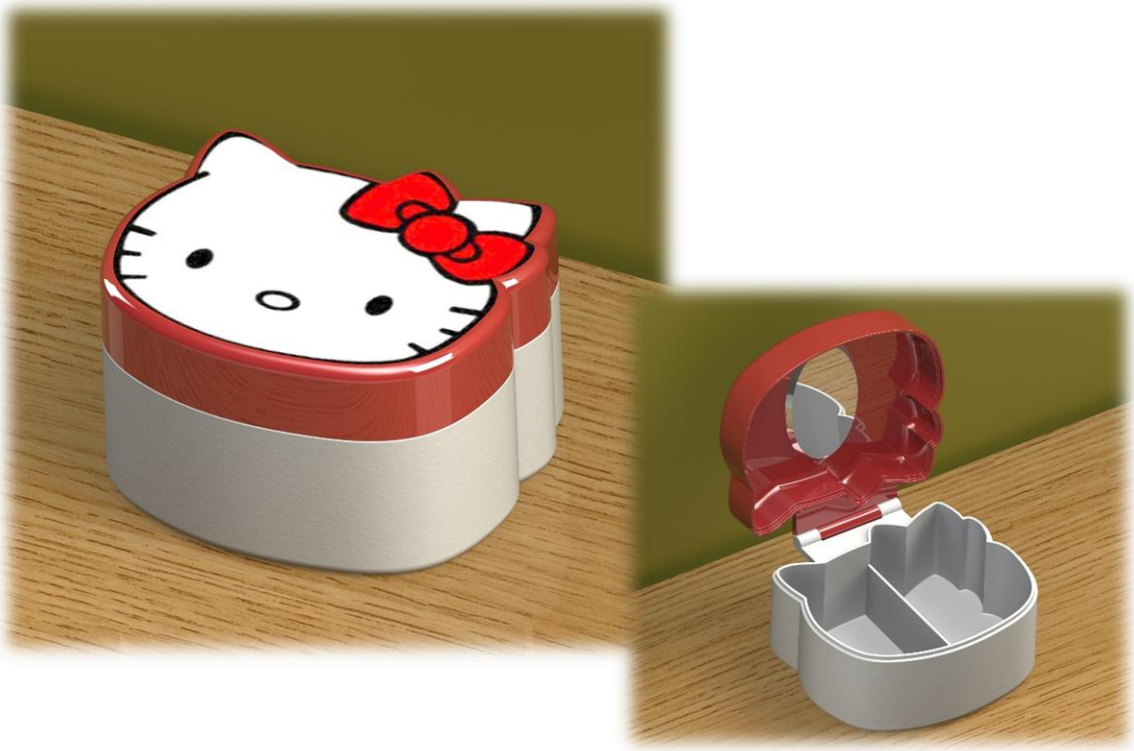
Child's Jewellery Box



Introduction:

This lesson will focus on using the **Sketch Picture** tool to aid in the modelling of everyday objects which may have outlines that may be difficult to sketch using typical methods.

Learning Intentions:

The participant will be able to:

- Insert a **sketch picture** into a sketch and adjust the parameters of the sketch picture.
- Sketch about a sketch picture to create a feature.
- Use the **Save as Copy and Open** option in **Save As** to create multiple parts in a project.
- Insert an internal **Rib feature** in a box.
- Understand the use of the mechanical mate – **Hinge** to form the hinge joint between the lid and base.

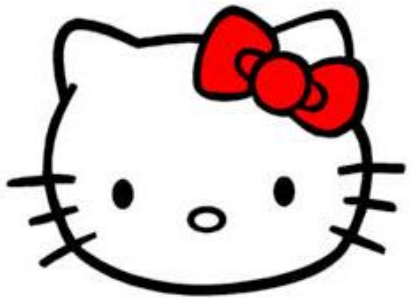
Prerequisite knowledge:

To complete this exercise you should have a working knowledge of SolidWorks 2009 and a previous knowledge of the following commands are required in this lesson: **sketching (spline, dimensioning), Extruded Boss/Base, Extrude Cut, Fillet, Adding Appearances.**

New Part

Start by creating **a New Part** and saving this part as "**Box Base**"

Note: It will become apparent later the importance of saving this part at these initial stages.



Finding an image[1]

Search for an appropriate "**Hello Kitty**" image in Google.

Ensure the image size located is of sufficient size (e.g. 300 x 168) or an image of great dimensions with a white background.

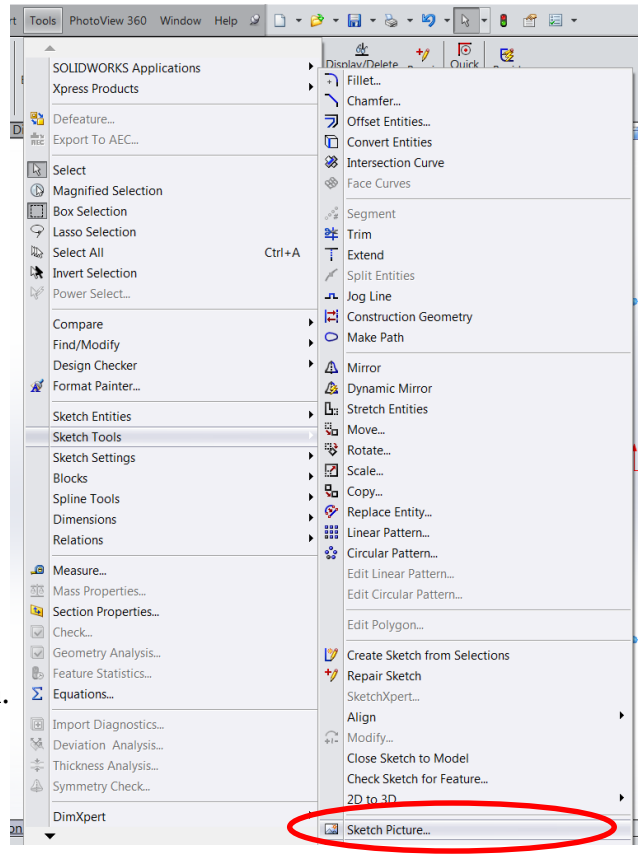
Download this image into the same folder as the **Box Base** SolidWorks part already saved.

Note: Small images may pixelate when being resized in SolidWorks and lead to lack of clarity when sketching.

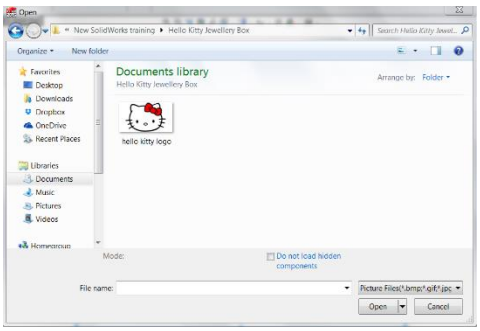
Creating the box outline

Start by creating a sketch on the **Top Plane**.

Select **Sketch Picture** command from the **Tools** menu, **Sketch Tools** and **Sketch Picture**.

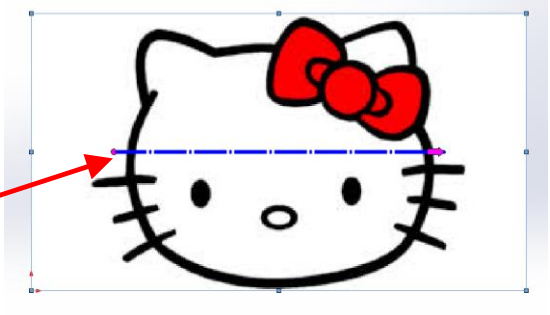


Navigate to the folder where the image has been saved and choose the "**Hello Kitty"** image and **Open**.



[1] http://kotaku.com/sanrio-president-hello-kitty-isnt-a-cat-shes-an-idol-1630914120

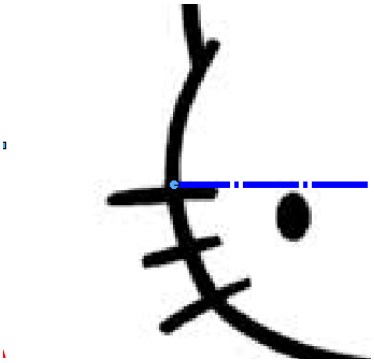
This will insert the picture with the origin at the bottom left corner and a scaling line above the picture.

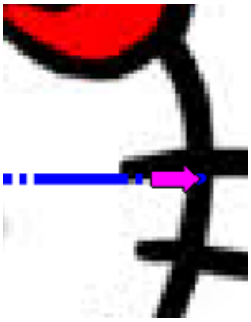


Scaling the picture

The **scaling line** allows the picture to be scaled in the sketch to a particular dimension easily. This achieve by simply placing the scaling line over the picture in a position where the dimension is known.

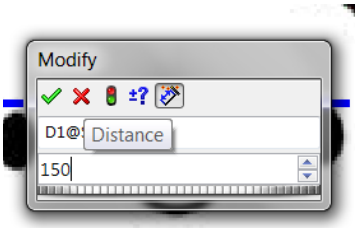
Select the end of the scaling line and move to outer position on the face of the kitty picture.





Move the other end of the **scaling line** (horizontally) onto the other side of the face.

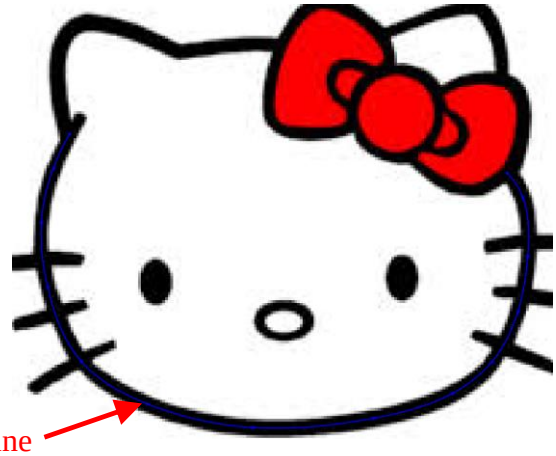
Insert a dimension of **150mm** for the width of the face.



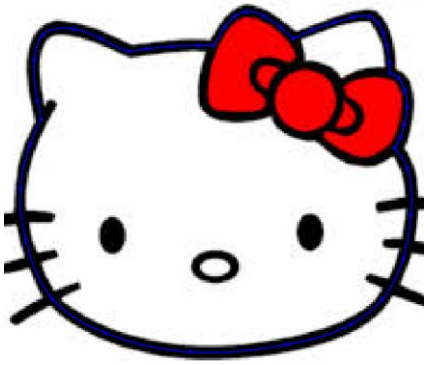
Draw outline

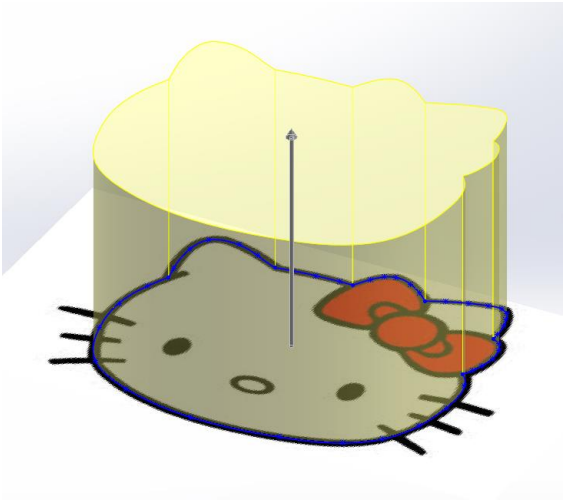
Using the **Spline** tool, sketch about the bottom outline of the face.

> **Note:** Multiple spline sketches will have to be used to sketch this shape because of the sharp corners.



Using the **Spline** tool, draw each of the splines about the picture.

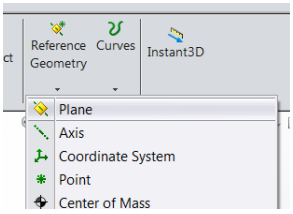


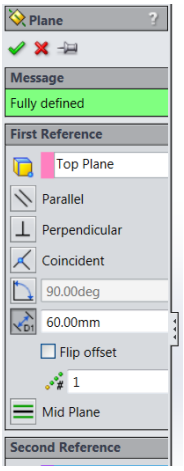


Extrude the sketch **90mm**.

Insert Plane

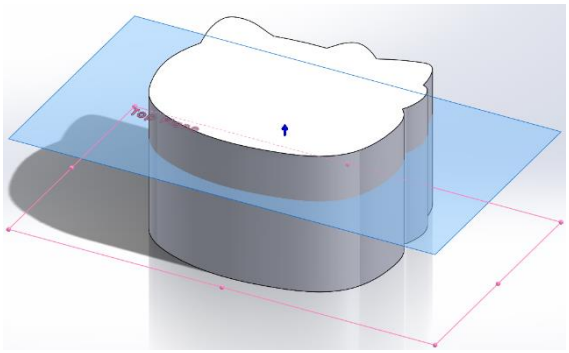
Insert a plane 60mm above Top Plane





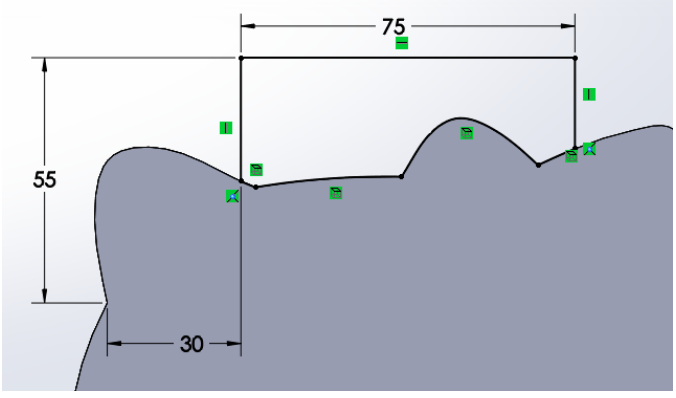
Select **Top Plane** as the First Reference and distance **60mm**.

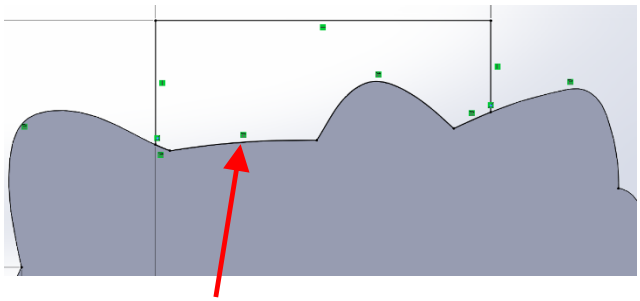
Rename as **Center Plane**



Sketch Hinge

Create the sketch shown on the new **Center Plane**.

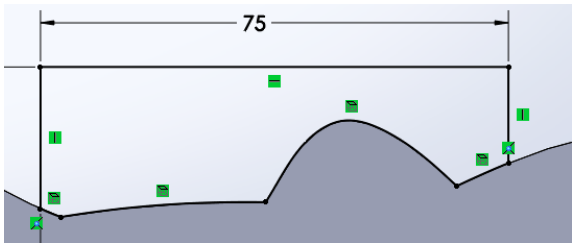


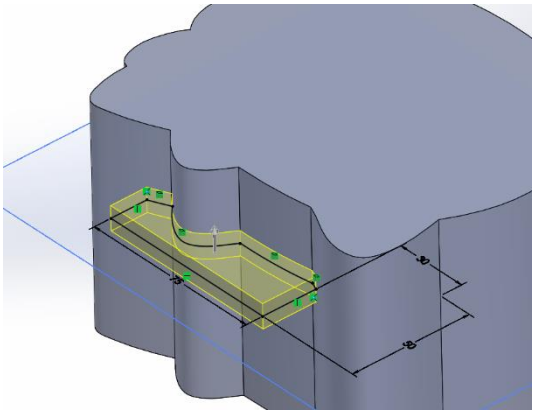


Select edge and convert

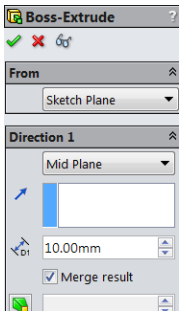
Use **Convert Entities** to draw the outline about the top of the head.

Remove the unwanted lines using **Trim**.



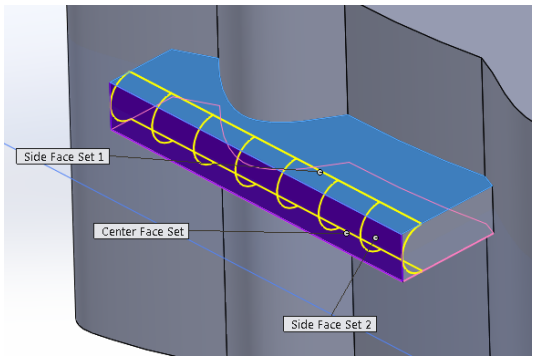


Extrude the sketch **Mid Plane** to a thickness of **10mm**.



Fillet

Add a **Full Round Fillet** to the back edges of the hinge.



Save

Save the "**Box Base**" model.

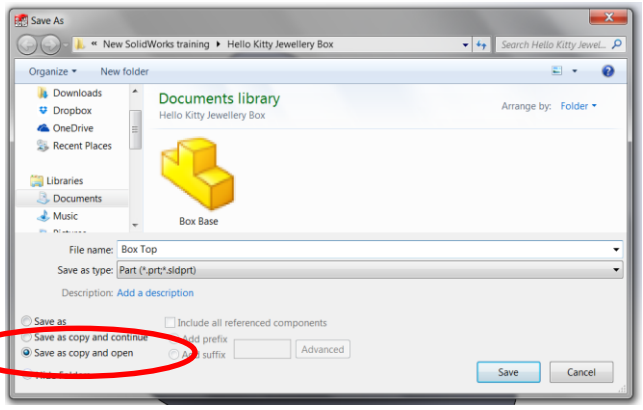
Save as Copy and Open

The model to date is the total jewellery box in it closed stage. The bottom and top of the box are now going to be separated into two different models now by using the **Save as Copy and Open** option. By modelling the box in this manner it ensures that the 2 pieces are identical.

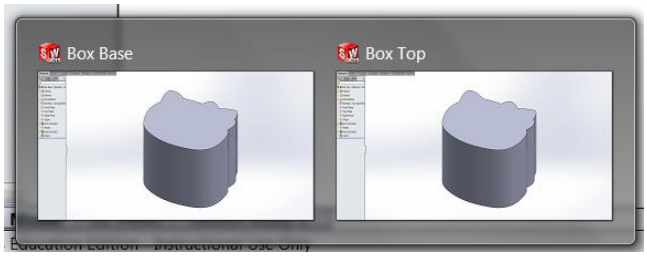
Select **Save As** in the File menu.

Select the option "**Save as Copy and Open**", Enter a new file name "**Box Top**".

Click **Save**.



There are now 2 SolidWorks parts in the folder with the picture.

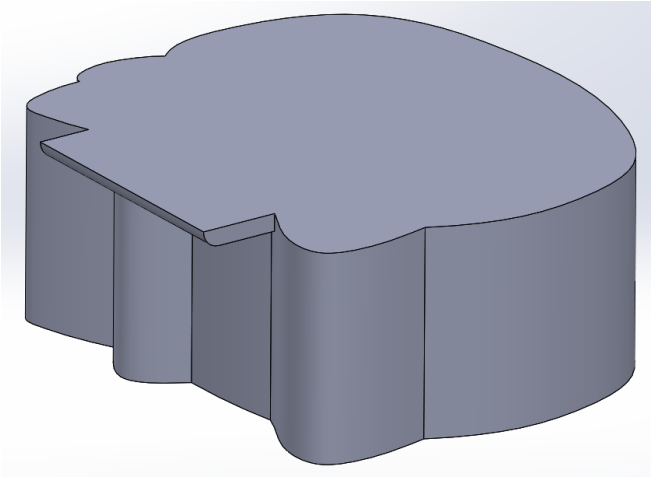


There are also 2 identical SolidWorks parts open in the **taskbar.**

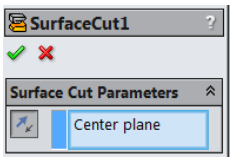
Box Base

Remove Top

Select **Cut - With Surface** feature from Insert, Cut, With Surfaces menu.



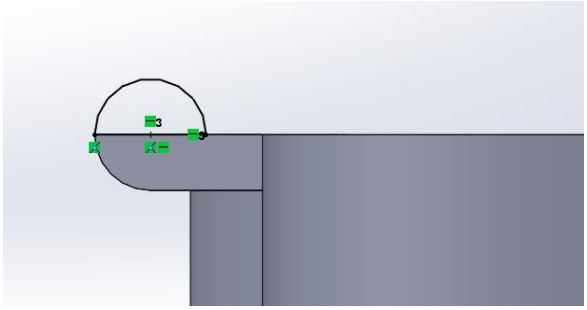
Select **Center Plane** as the Surface Cut Parameter



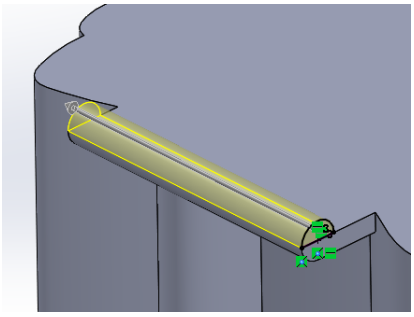
Note: Ensure the cut is applied in the upward direction.

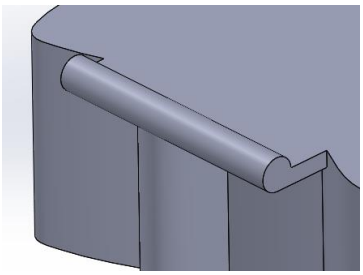
Create Hinge

Create the semi-circle sketch on the side of the hinge surface.



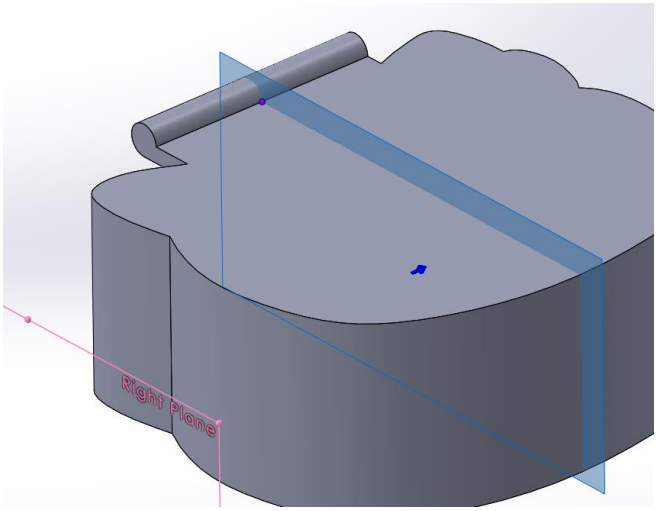
Extrude the sketch to complete the hinge.





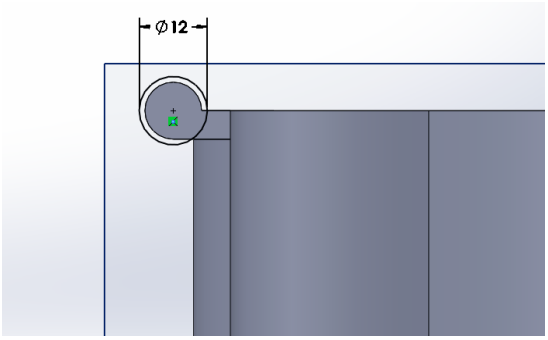
Insert Plane

Insert a plane with its first reference the **Right Plane** and the second a **Midpoint** on the cylindrical hinge.

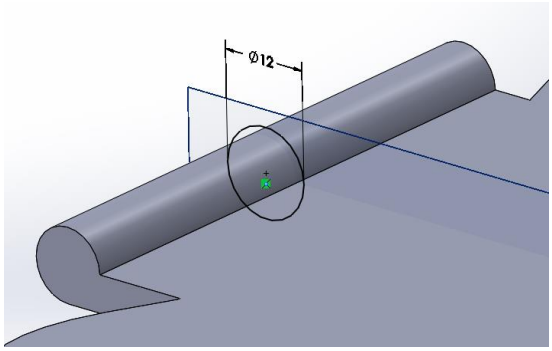


Rename as **Midplane**

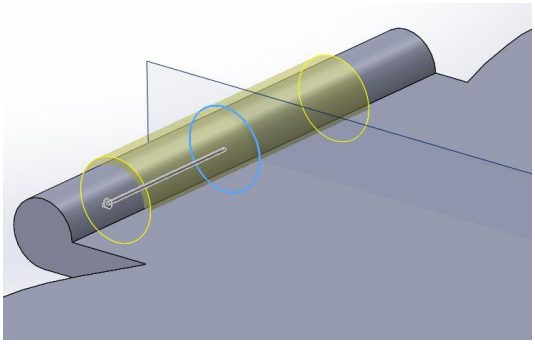
Cut out Hinge

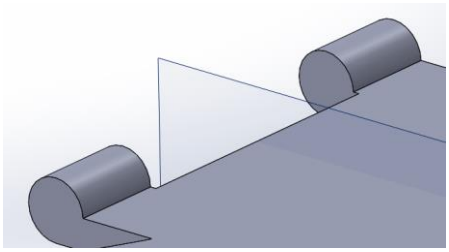


Sketch a concentric circle diameter **12mm** on the **Midplane**.

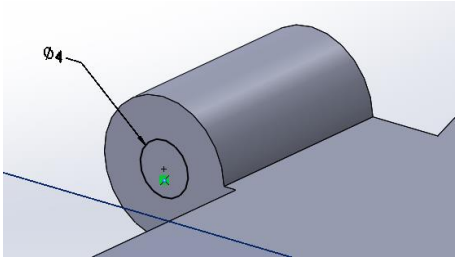


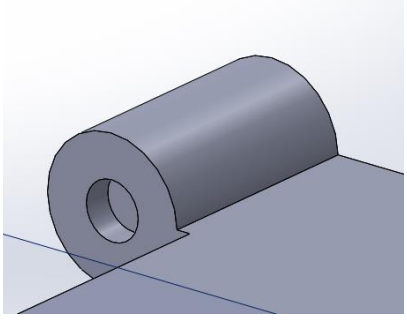
Extrude Cut this sketch **Mid Plane** at a distance of **45mm**.





Sketch a concentric circle diameter **4mm** on the inner surface of the hinge



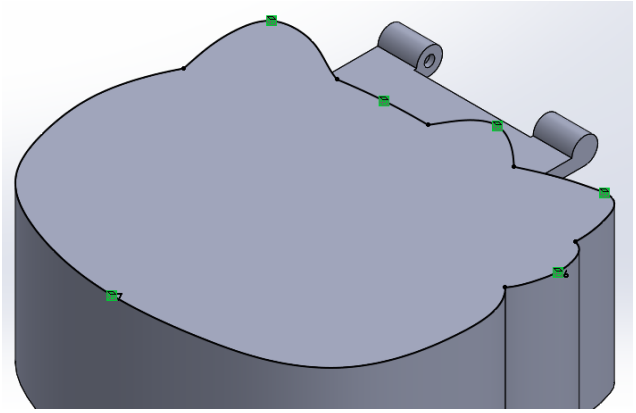


Extrude Cut to a depth of **3 mm**.

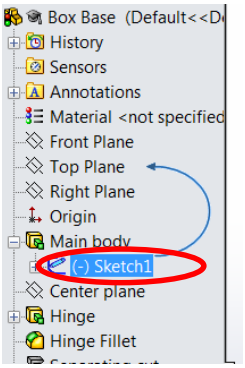
Mirror this Extrude Cut in plane **Midplane** to form other side of the hinge.

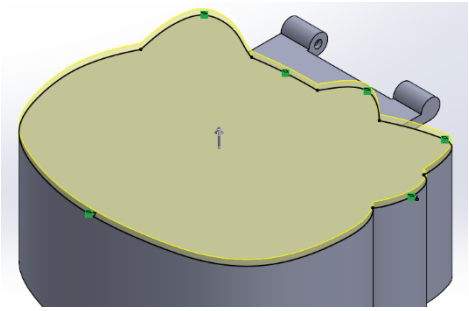
Create Top Edge

Create a sketch on the top surface of the box



Select the initial sketch used to create the box in the feature manager and use **Convert Entities** to convert this outline onto the top surface.

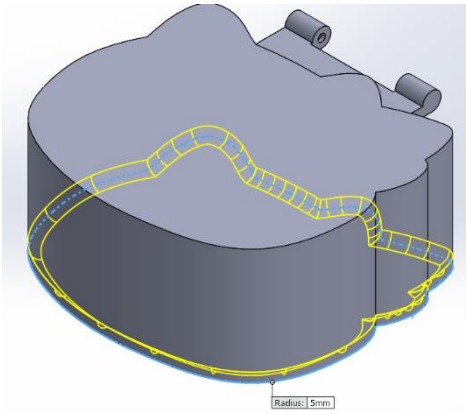




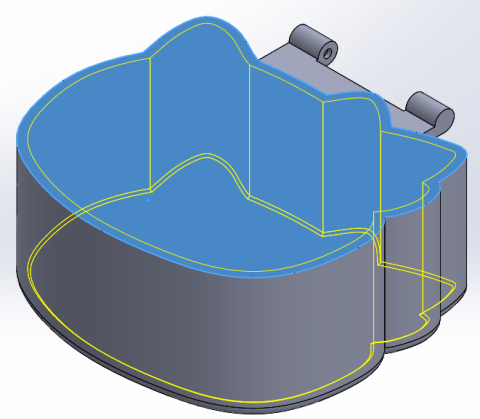
Extrude Boss/Base **3mm**.

Fillet Base

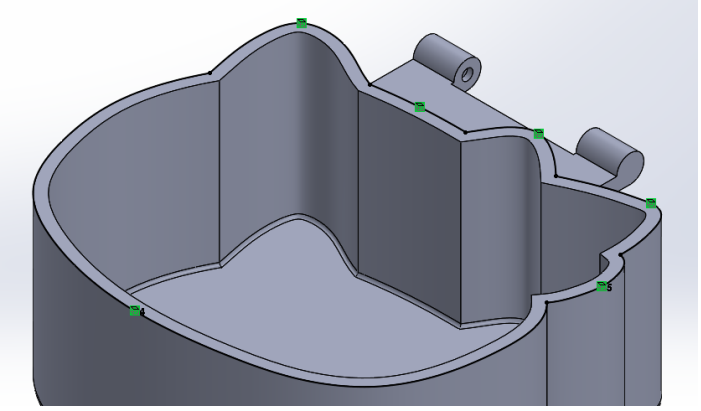
Add a **5mm** fillet about the base of the box.



Shell Box



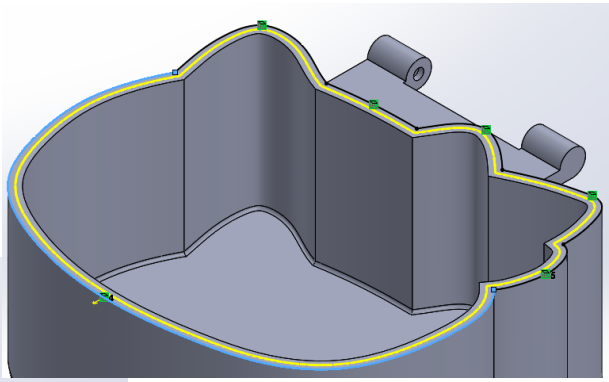
Shell the box to a thickness of **4mm.**

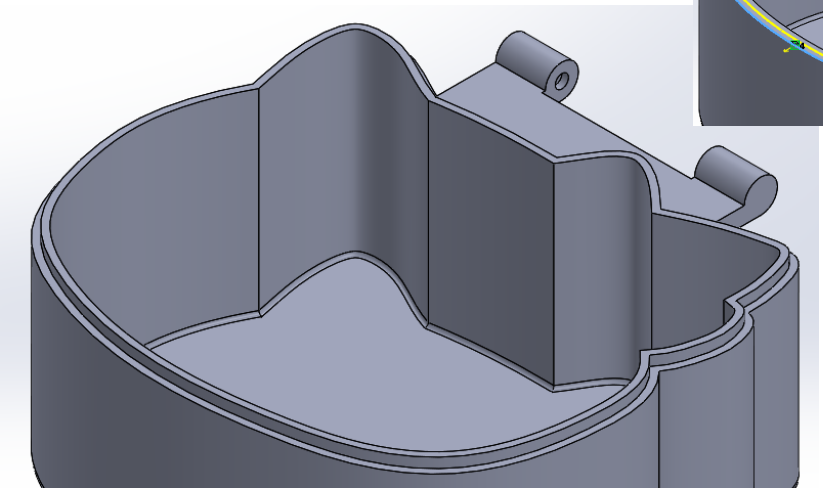


Top Lip

Create a sketch on the top surface of the box. Select the outer edge of the surface and **Convert Entities** to create outer sketch.

Offset Entities 2mm from this outer sketch





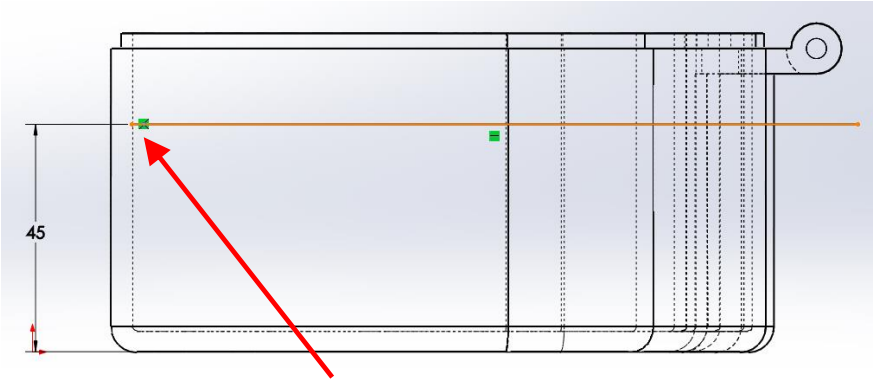
Extrude Cut **3mm** to create joint.

Rib Divider

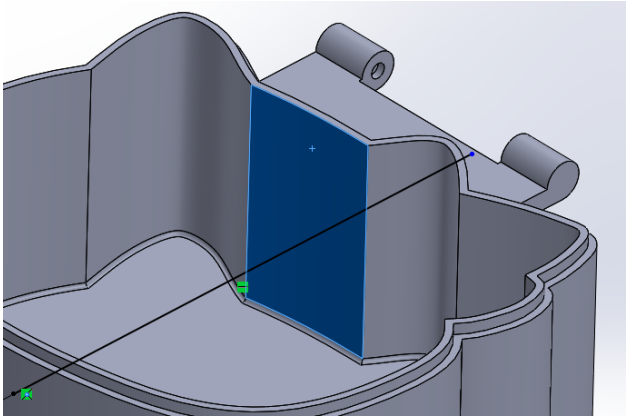
Create a sketch on the **Midplane** plane previous created.

Change the **Display Style** to **Hidden Lines Visible** 

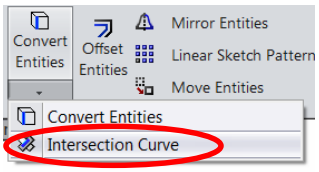
Construct the line shown **coincident** with the inner surface.



Line coincident with inner surface of the box.

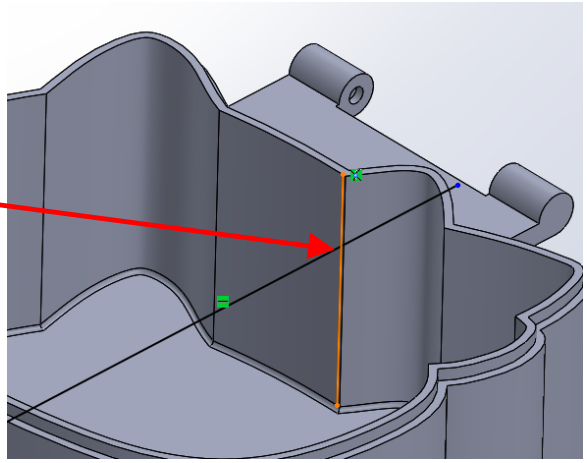


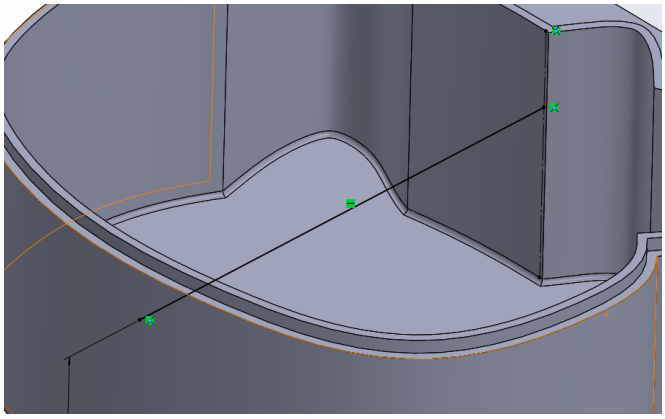
Select the inner surface on the opposite side



Select **Intersection Curve** to locate the Intersection between the surface and the sketch plane.

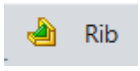
Intersection line between surface and sketch plane



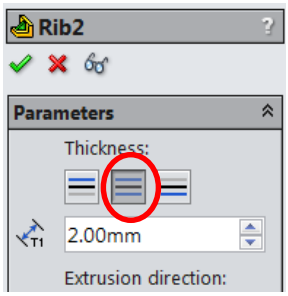


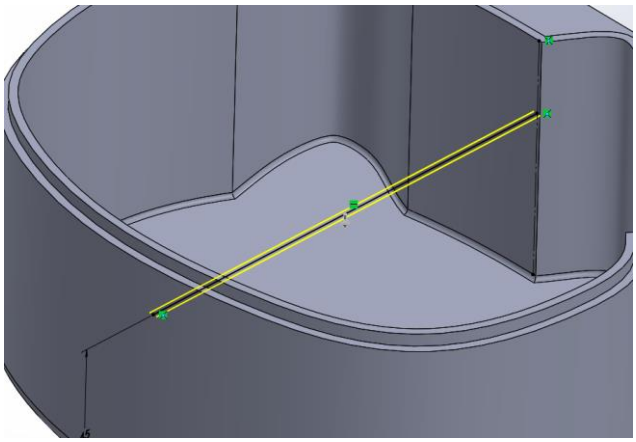
Trim the initial line to the surface.

Change properties of the line of intersection to **For Construction**.

Select Rib 

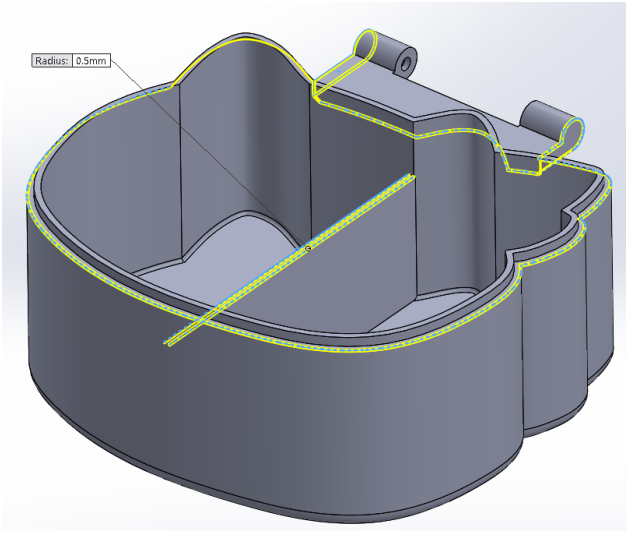
and use the below parameters.



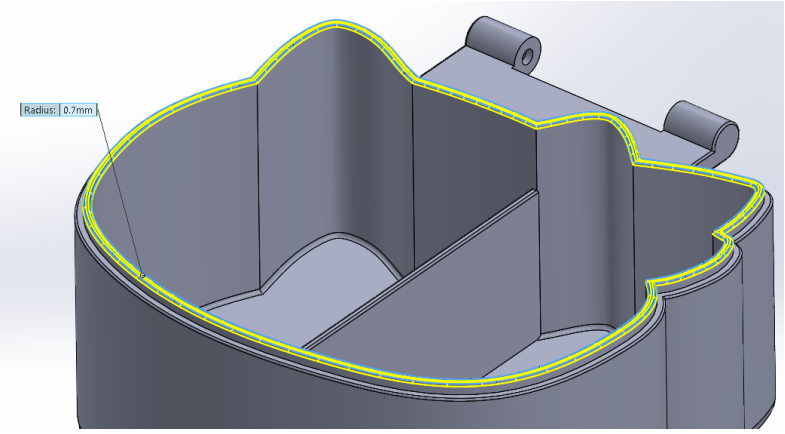


Fillets

Add **0.5mm** fillets to the edge shown

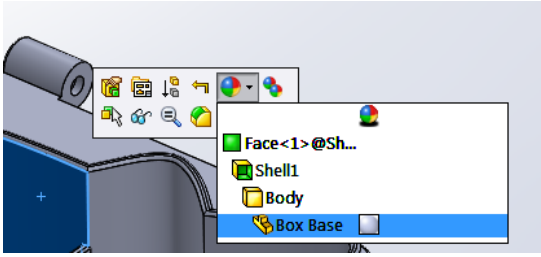


Add **0.7mm** fillets to the top surface of the lip.

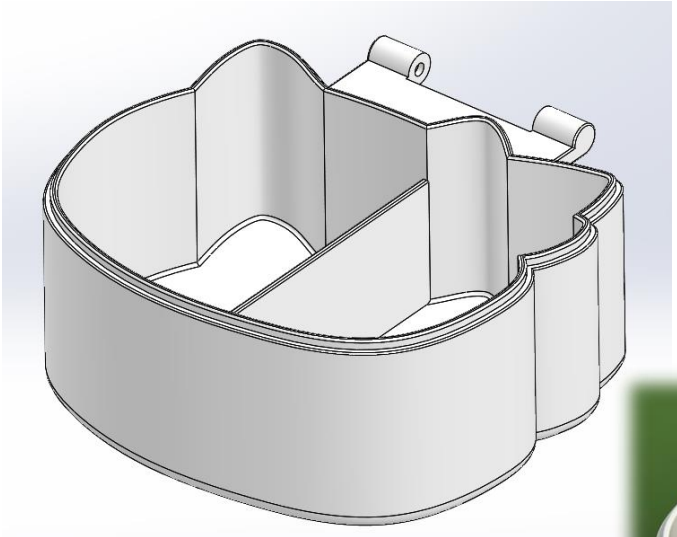


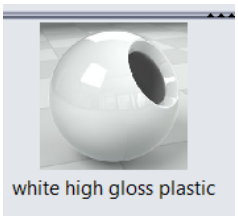
Materials and Appearances

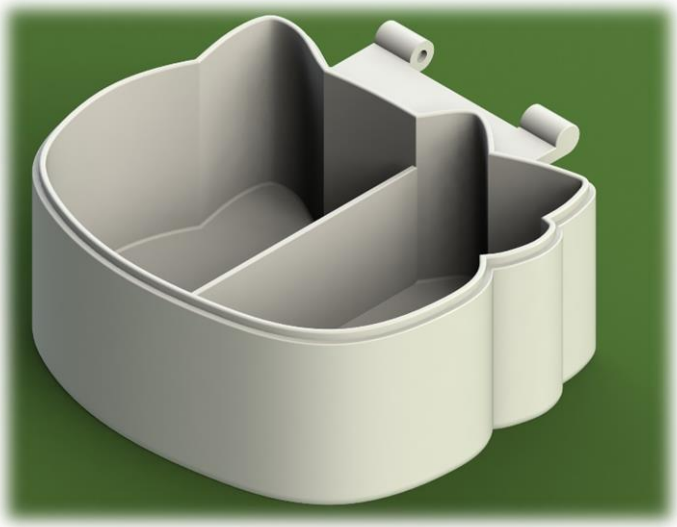
Apply **ABS plastic** as the material



Apply a **White High Gloss Plastic** as the appearance to the part.

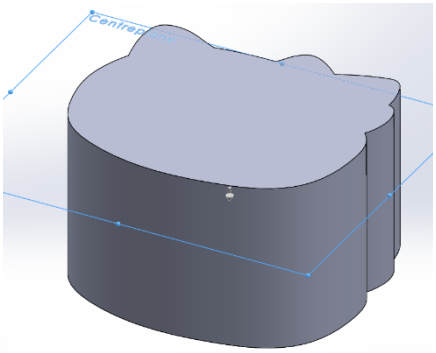




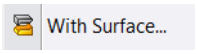


Box Lid

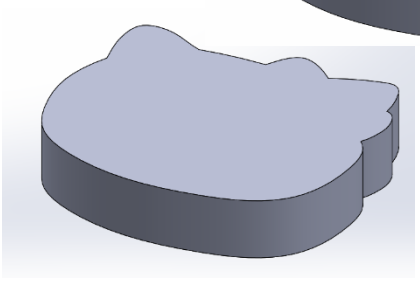
Open the part "**Box Top**".



Remove Bottom

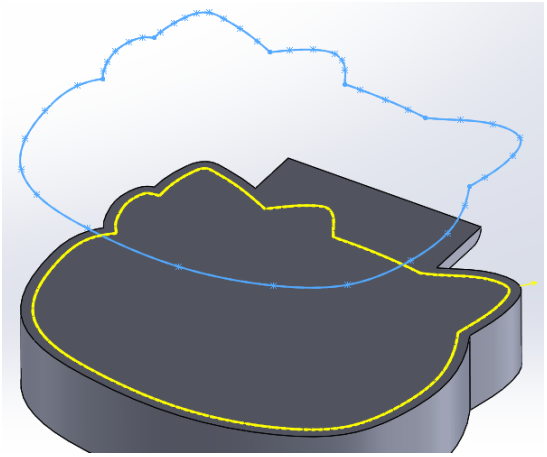


Use **Cut With Surface** and the **centerplane** plane as the cutting plane to remove the bottom of the box.

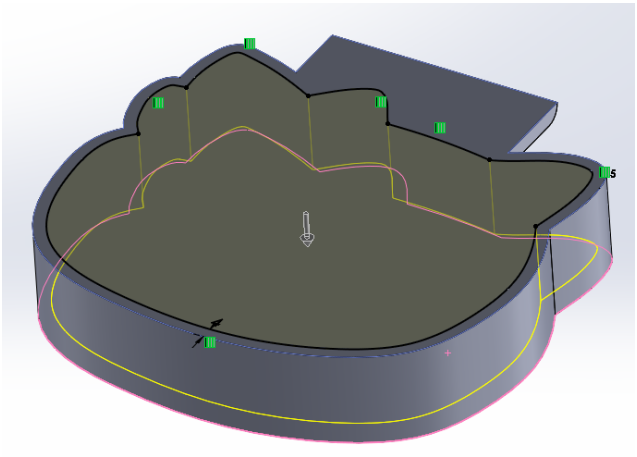


Hollow Box

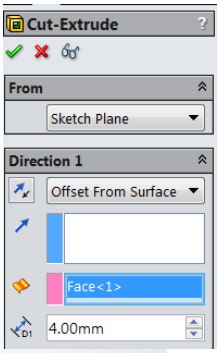
Create a sketch on the underside of the box lid.



Selecting the original outline sketch (sketch 1), use **Offset Entities** to offset **2mm**.

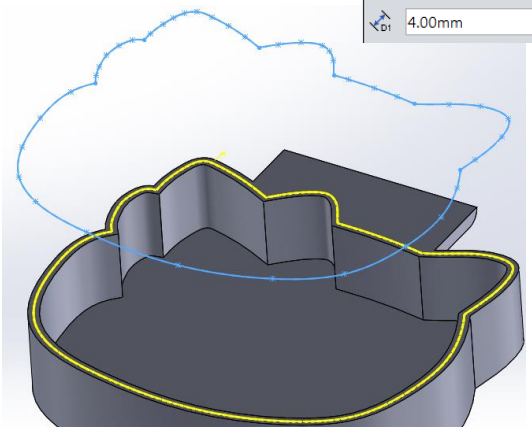


Extrude Cut the centre of the lid using the following parameters.

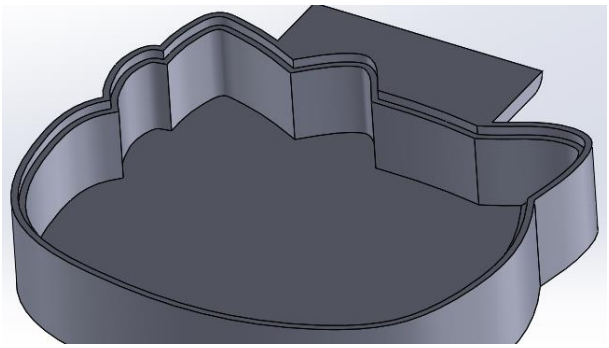


Joint

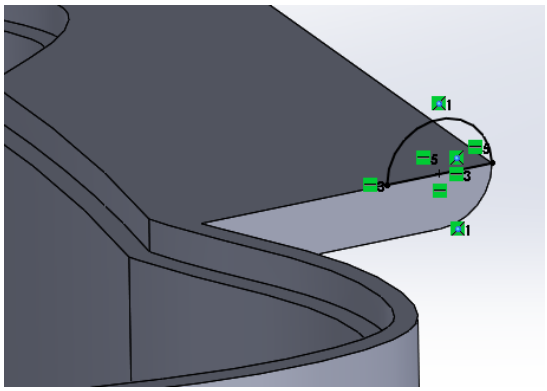
Offset Entities using the original sketch to a distance of **2mm**.



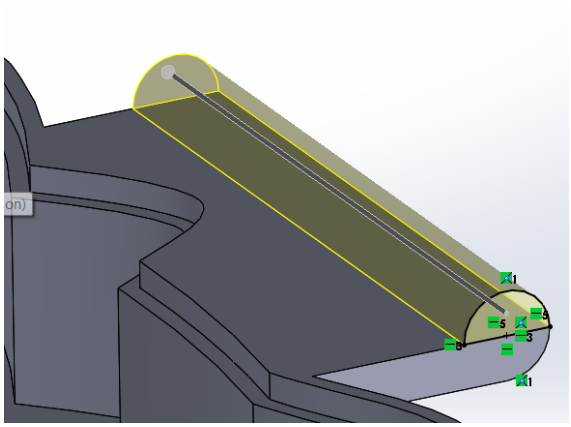
Extrude Cut **3mm**.



Create Hinge

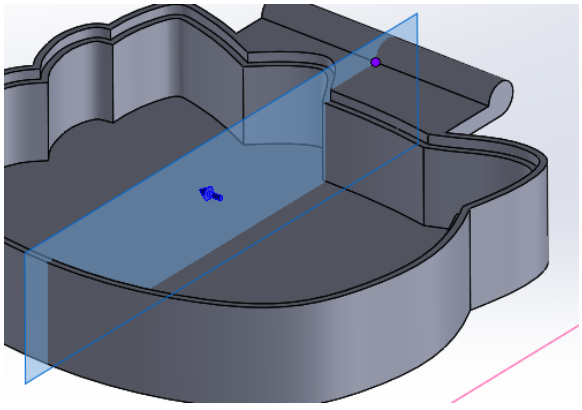


Create the semi-circular sketch on the side of the hinge.



Extrude the sketch to complete the hinge outline.

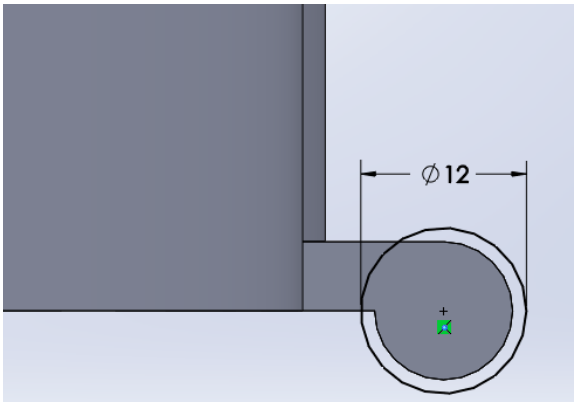
Insert a Mid Plane



Insert a **Plane** using the **Right Plane** as first reference and the **midpoint** on the hinge the second reference.

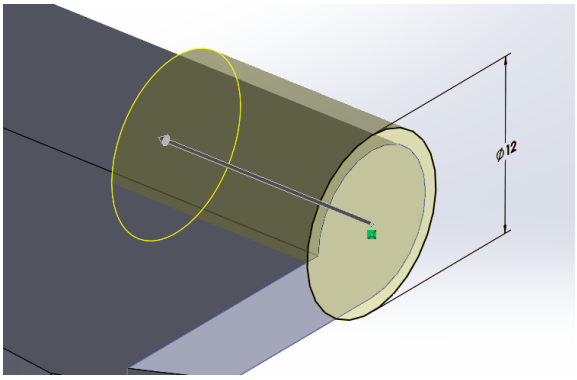
Cut out Hinge

Create the sketch shown on the end of the hinge.

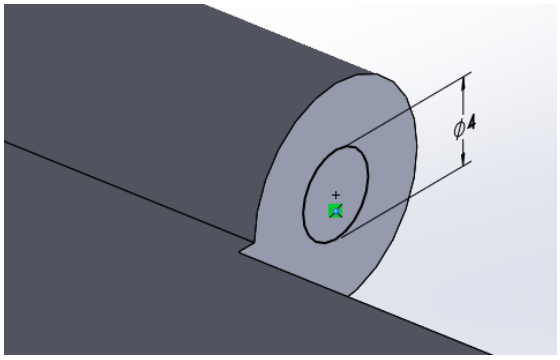


Extrude Cut this sketch a distance of **15mm.**

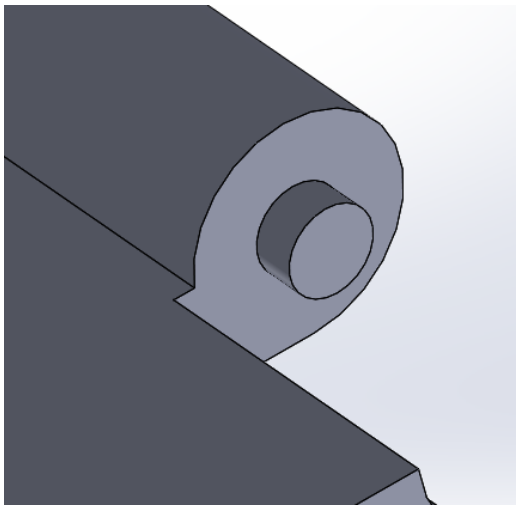
.



Hinge Clips

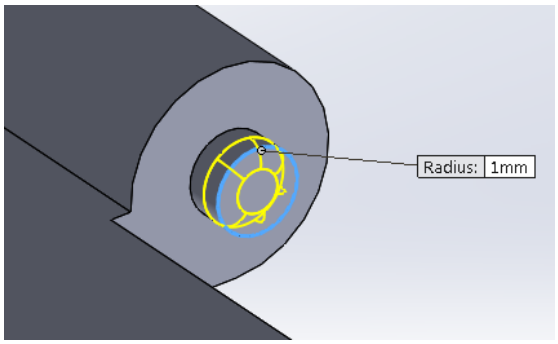


Sketch a concentric circle diameter 4mm on the hinge cut out, as shown.



Extrude the sketch **2mm**.

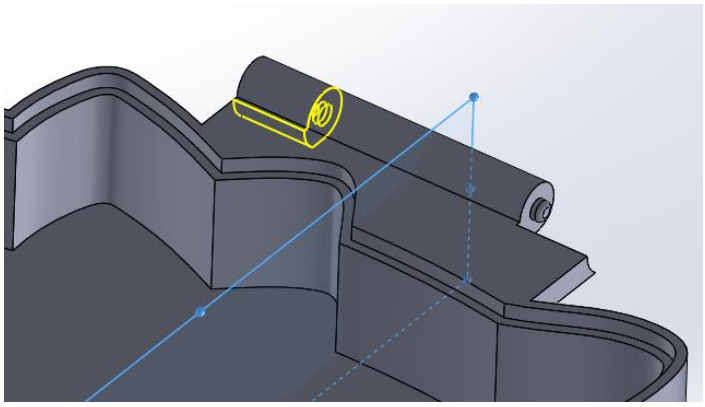
Clip Fillet



Add a **1mm** fillet to the end of the clip.

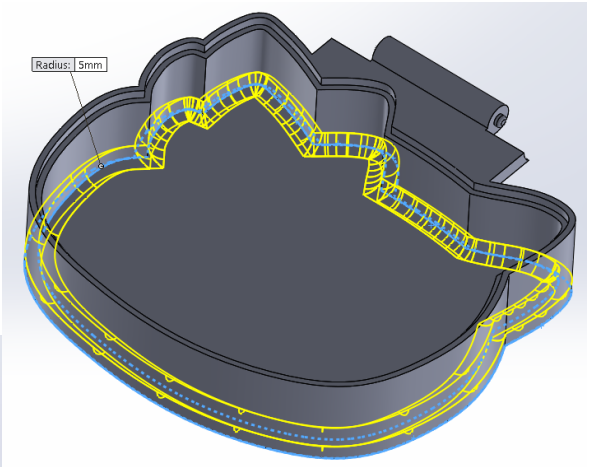
Mirror Features

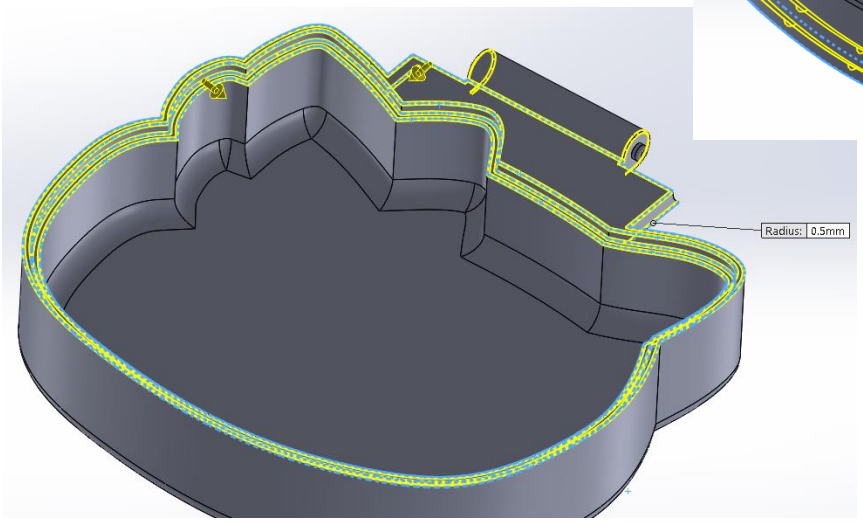
Mirror the **Hinge Cut Out**, **Hinge Clip** and **Hinge Fillet** with the **Midplane** as the Mirror plane.



Fillets

Add radius **5mm** fillets to the outer top edge and internal edge.

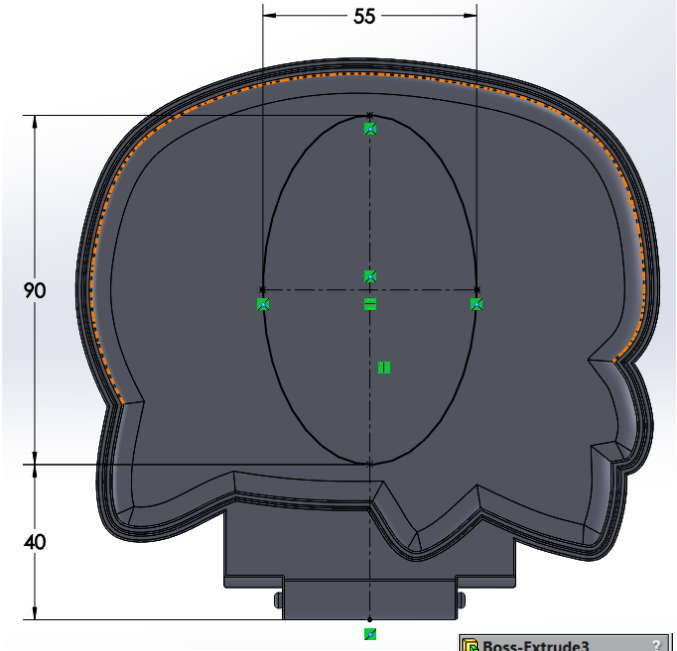


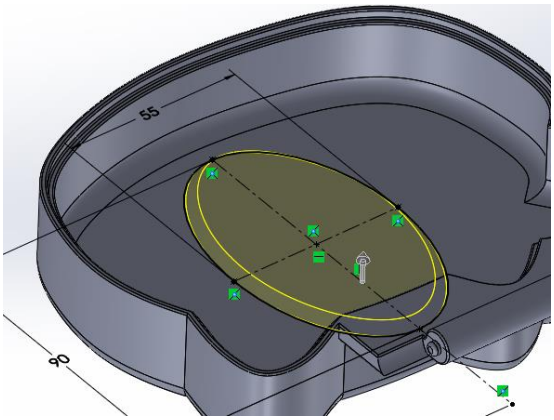


Add a radius 0.5mm fillet as shown.

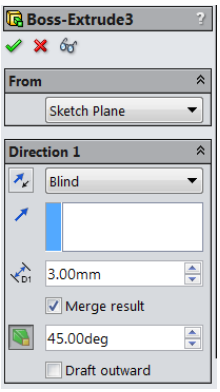
Mirror Sketch

Add the shown sketch to the internal surface of the top.

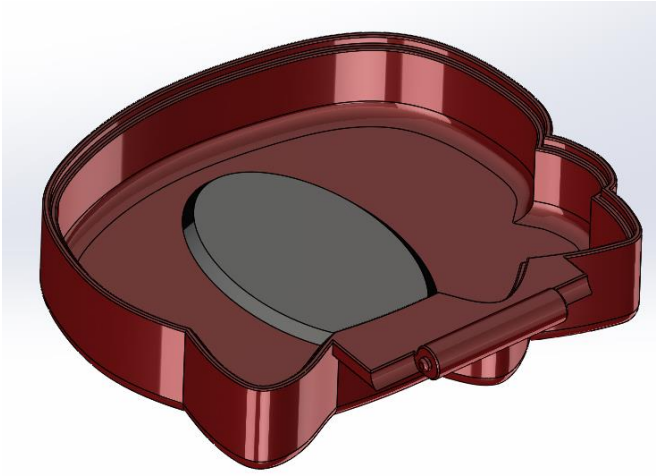




Extrude the ellipse **3mm** with a **Draft** of **45^0**.



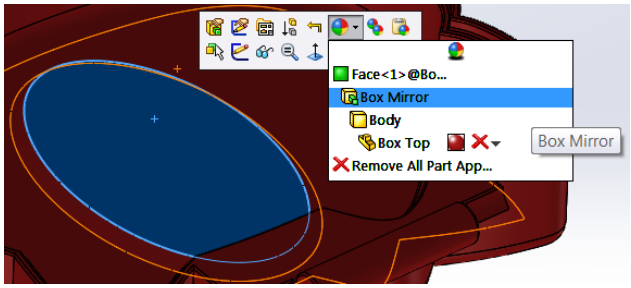
Materials and Appearances



Apply **ABS plastic** as the material.

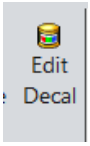
Apply a **Red High Gloss Plastic** as the appearance to the part.

Apply **Mirror** appearance to the **Box Mirror** feature.

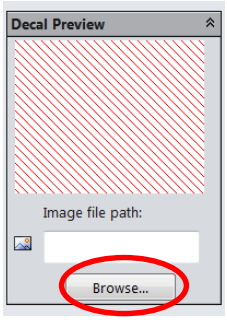


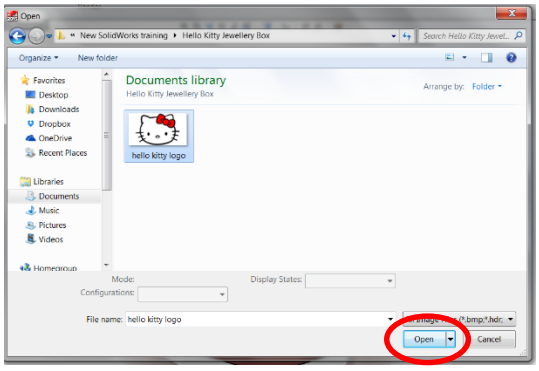
Add Decal

Select Edit Decal in the **Render Tools** Toolbar.



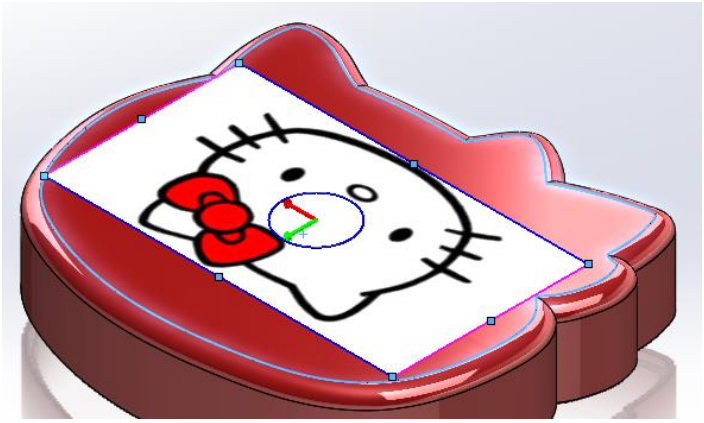
Select **Browse** in the feature manager and navigate to the folder where the original picture was saved.



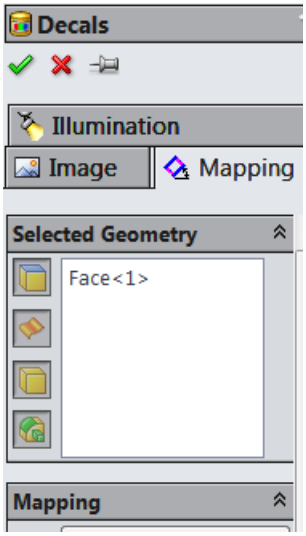


Choose Picture and select **Open**.

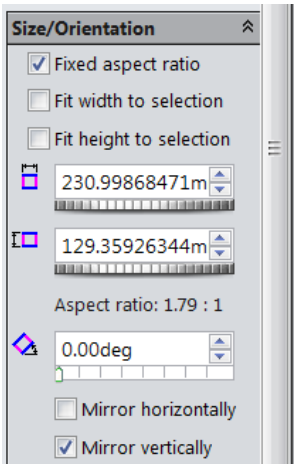
Select the top surface to insert the **Decal** on the surface.

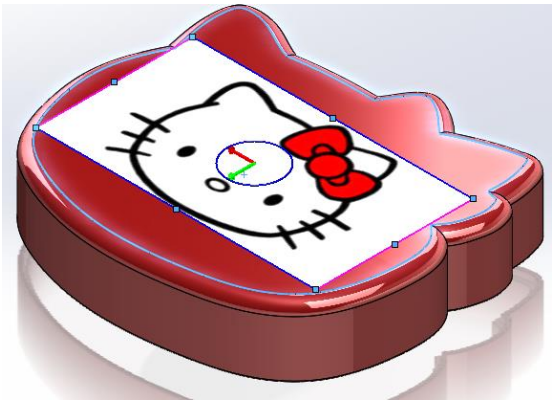


Adjust the orientation of the image by selecting the **Mapping** option.

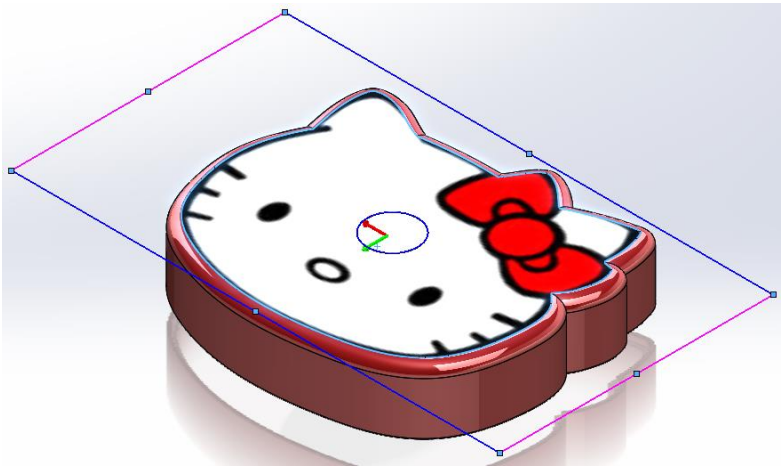


Select the **Mirror Vertically** check box in the Size/Orientation options to adjust the picture.



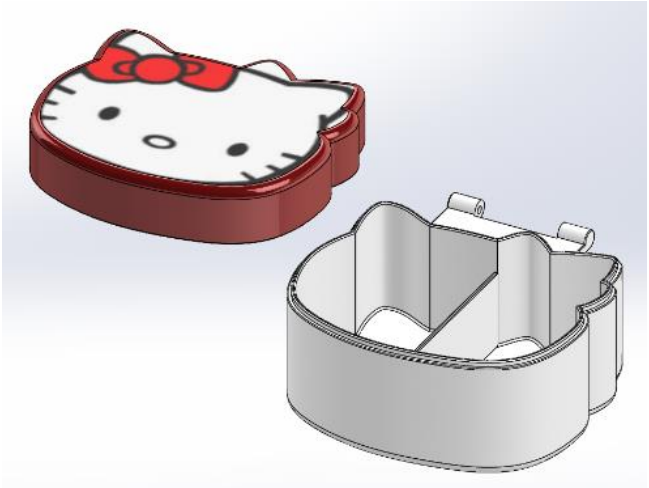


Adjust the size by using the image handles.



Jewellery Box Assembly

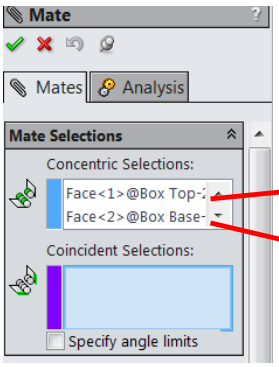
Insert the jewellery box parts into a new **Assembly**.

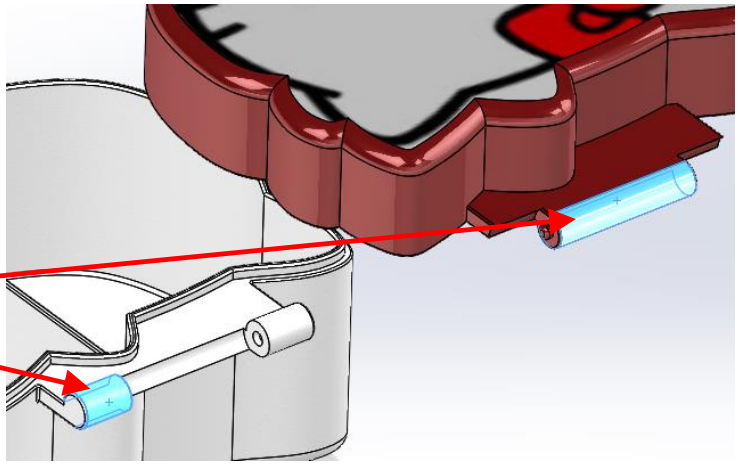


Hinge Mate

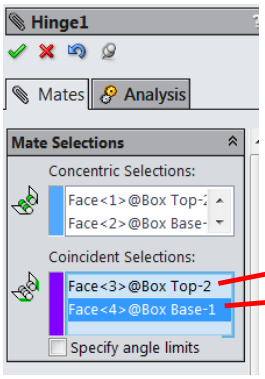
Select **Hinge Mate** under the **Mechanical Mates** options

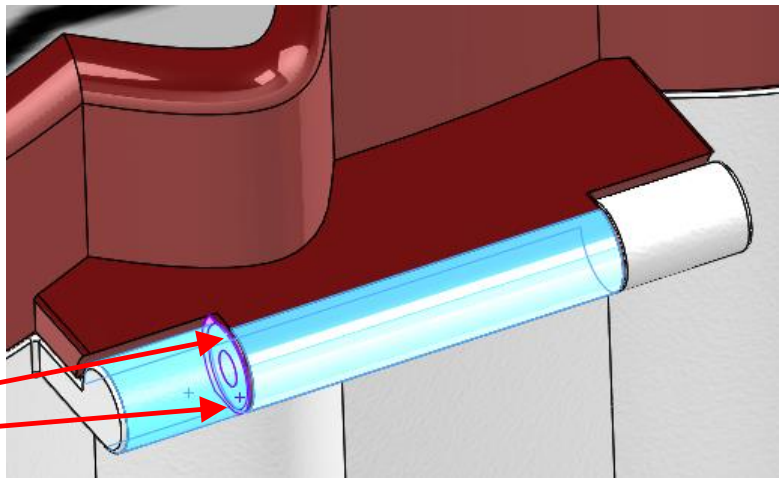
Select the **Concentric** elements of the hinge mate.



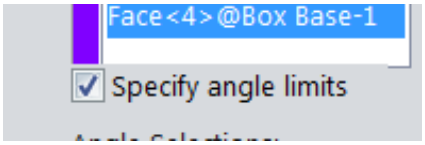


Select the **Coincident Selections** as the side of the hinge joints.



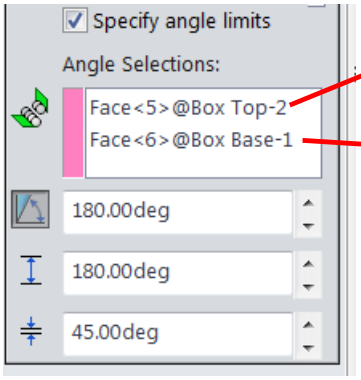


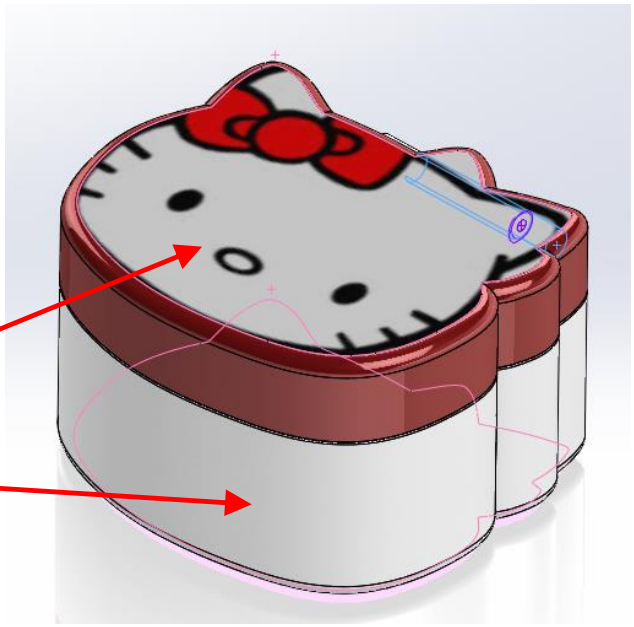
Select the **check box** to specify angle limits of the lid opening.



Select the **Top** and **Bottom** surfaces of the box as the **Angle Selections**.

Insert the angle shown below.





Complete