

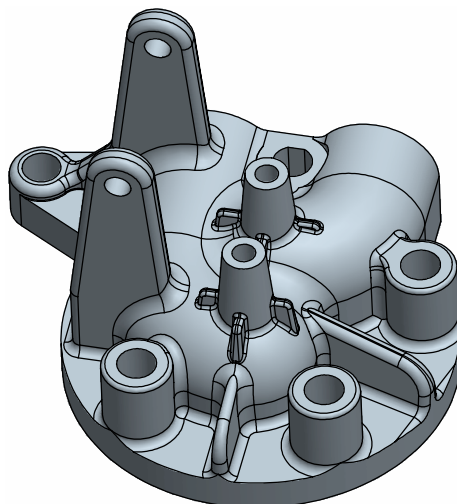
Advanced Rounds

Introduction and Terms

Many types of rounds can be created. The order in which the rounds are created can produce differing results in the model. The use of 'round sets' and 'transitions' is powerful and can become complex depending on the geometry of the part.

The following terms apply to rounds:

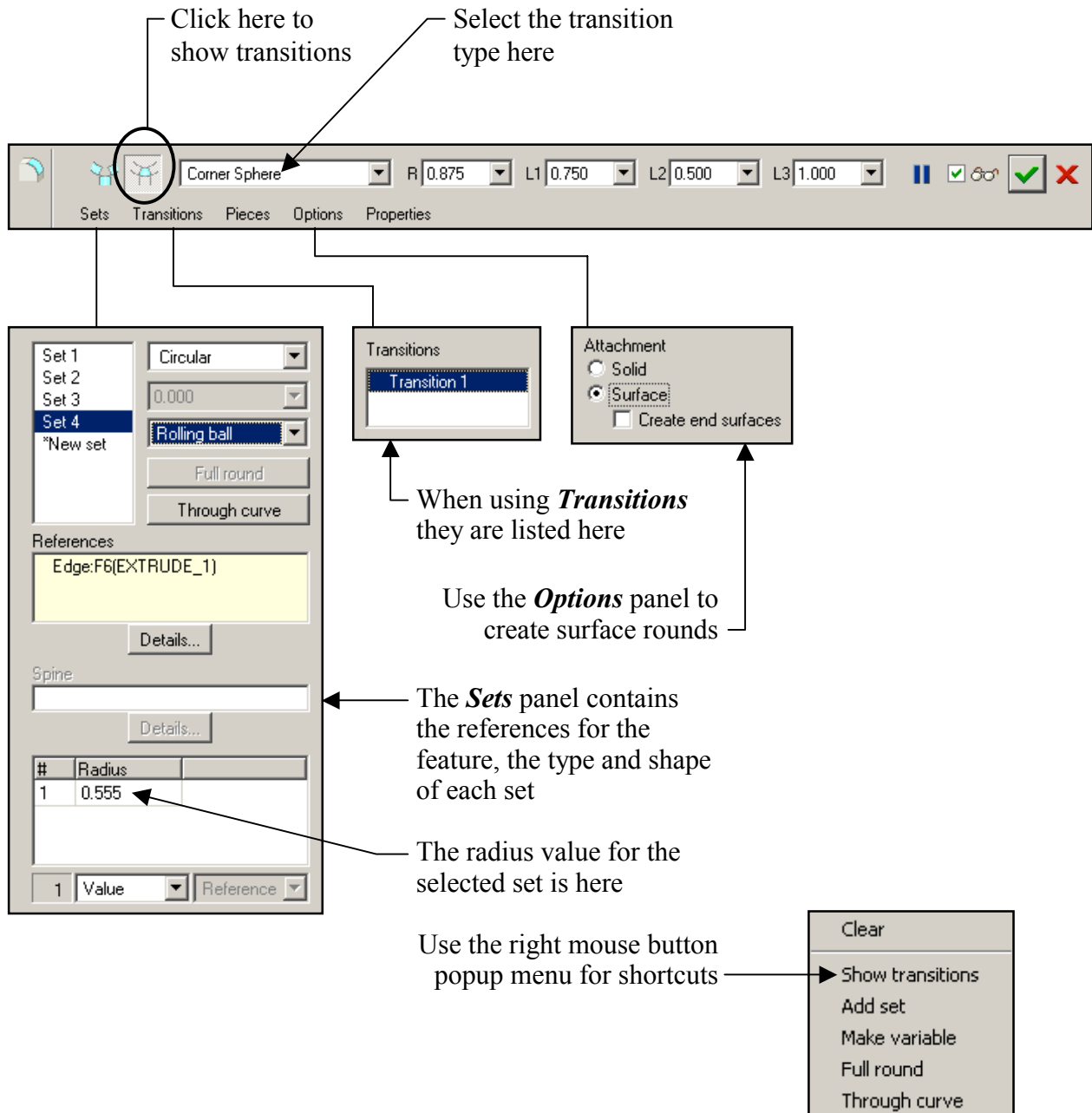
Constant	The radius of the round is constant along the selected references.
Variable	Radii are specified at endpoints, and optionally at intermediate vertices and/or datum points along the edges being rounded.
Full Round	Replaces a whole surface with a rounded surface. The radius will be automatically calculated to replace the bounded surface and be tangent to the adjacent surfaces.
Sets	Different types of rounds collected into one feature.
Transitions	Transition areas between round sets can be defined using one of several options.
Trim	Stop the round at a specified reference.
Value	The dimensional size of the round is controlled by a value.
Reference	The dimensional size of the round is controlled by a reference entity.



The Round Dashboard Tool

The **Round** dashboard tool is used to create all types of rounds.

- When possible, select the references for the round *first*.
- Click **Insert, Round** or click the icon shown above.
- The right mouse button popup menu has shortcuts to common options for the round.
- The **Round** dashboard tool is shown below.



Click here to show transitions

Select the transition type here

Corner Sphere R 0.875 L1 0.750 L2 0.500 L3 1.000

Sets Transitions Pieces Options Properties

Set 1
Set 2
Set 3
Set 4
*New set

Circular
0.000
Rolling ball
Full round
Through curve

References
Edge:F6(EXTRUDE_1)
Details...

Spine
Details...

#	Radius
1	0.555

1 Value Reference

Transitions
Transition 1

Attachment
Solid
Surface
Create end surfaces

When using *Transitions* they are listed here

Use the *Options* panel to create surface rounds

The *Sets* panel contains the references for the feature, the type and shape of each set

The radius value for the selected set is here

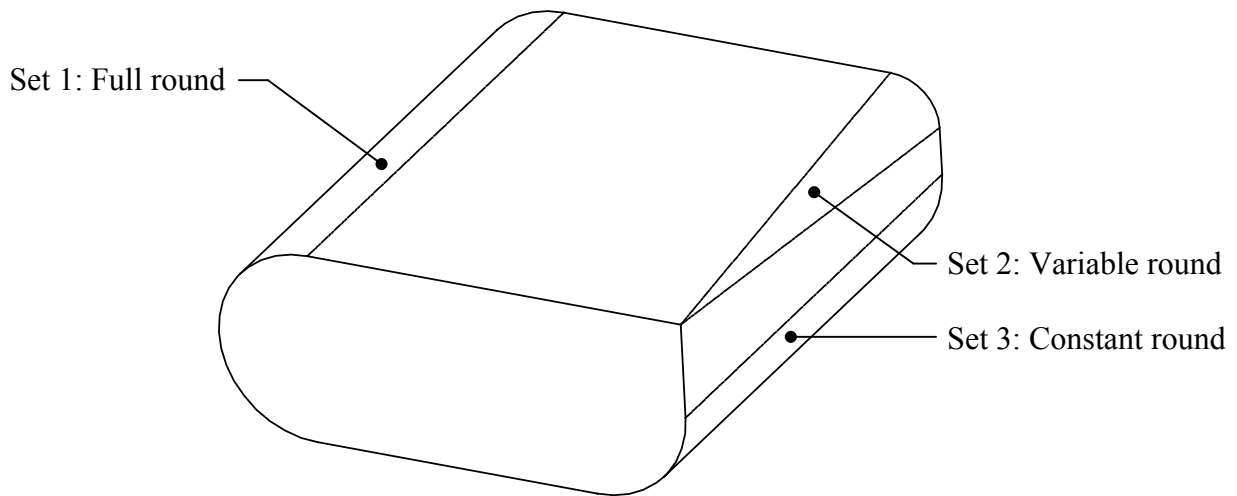
Use the right mouse button popup menu for shortcuts

- Clear
- Show transitions
- Add set
- Make variable
- Full round
- Through curve

Round Sets

Rounds can include one or more 'Round Sets'. Each 'Set' may have unique attributes, references and radius values. Round sets can be used in conjunction with 'transitions' to create the required geometry.

The part shown below is an example of round sets. Three 'sets' make up *one feature*, the 'full round', the 'constant' round, and the 'variable' round.



Rounds have the following options available in the **Sets** panel of the dashboard tool:

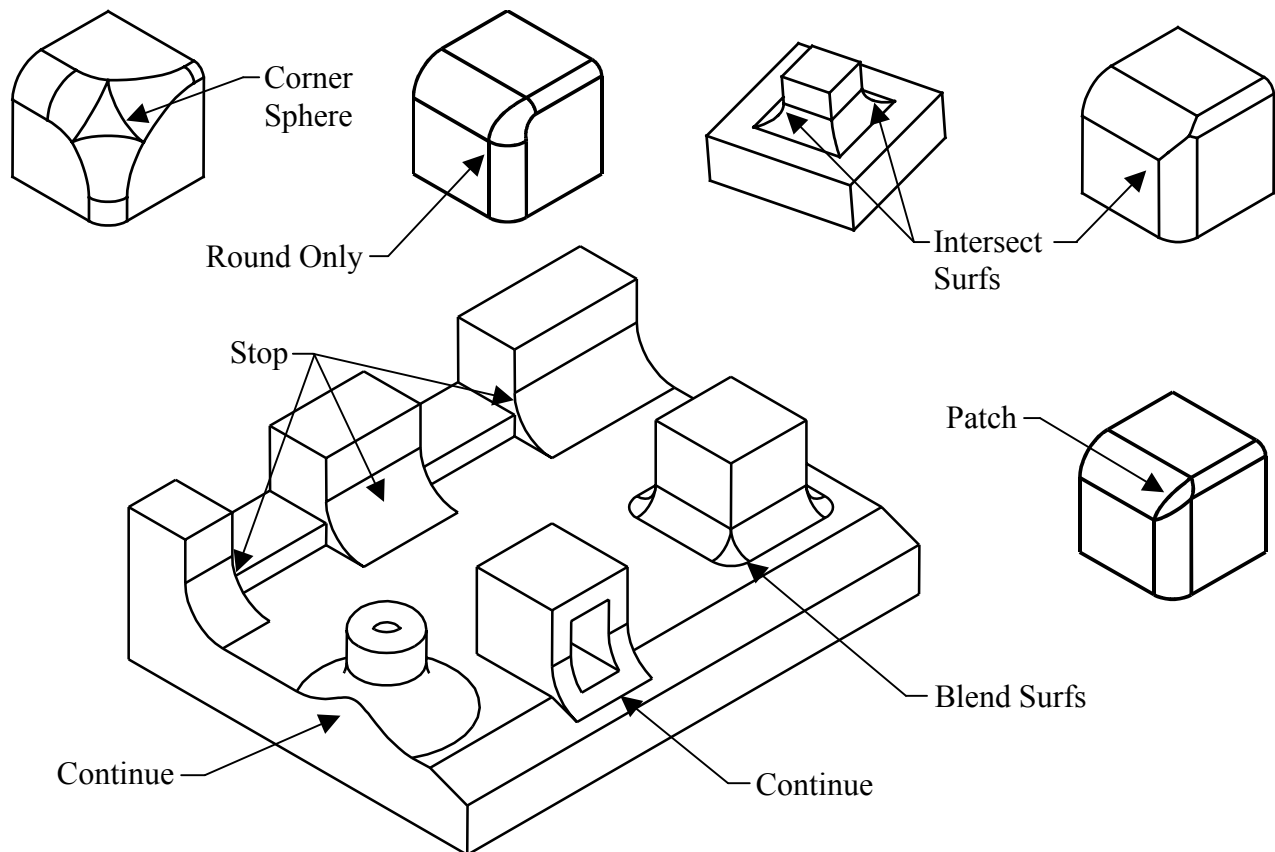
Rolling Ball	Create a round that looks like you rolled a ball between the two references.
Norm To Spine	Create the round surface by sweeping an arc normal to the selected spine.
Circular	The shape of the round is circular.
Conic	The shape of the round is a conic.

Transitions

The *Transitions* panel in the **Round Tool** allows you to specify how Pro/ENGINEER will handle the intersection of rounds.

Stop	The round will stop at or extend to an intersecting solid surface.
Blend Srfs	The round set is blended into the next adjacent round set.
Intersect Srfs	The geometry of the round set intersects with the next adjacent round set.
Continue	The round set continues into the next adjacent round set.
Corner Sphere	Results in a ball shaped corner.
Round Only	Sweeps the smallest radius round set along the edge of the largest radius round set.
Patch	The geometry between three converging round sets is created as a patch.

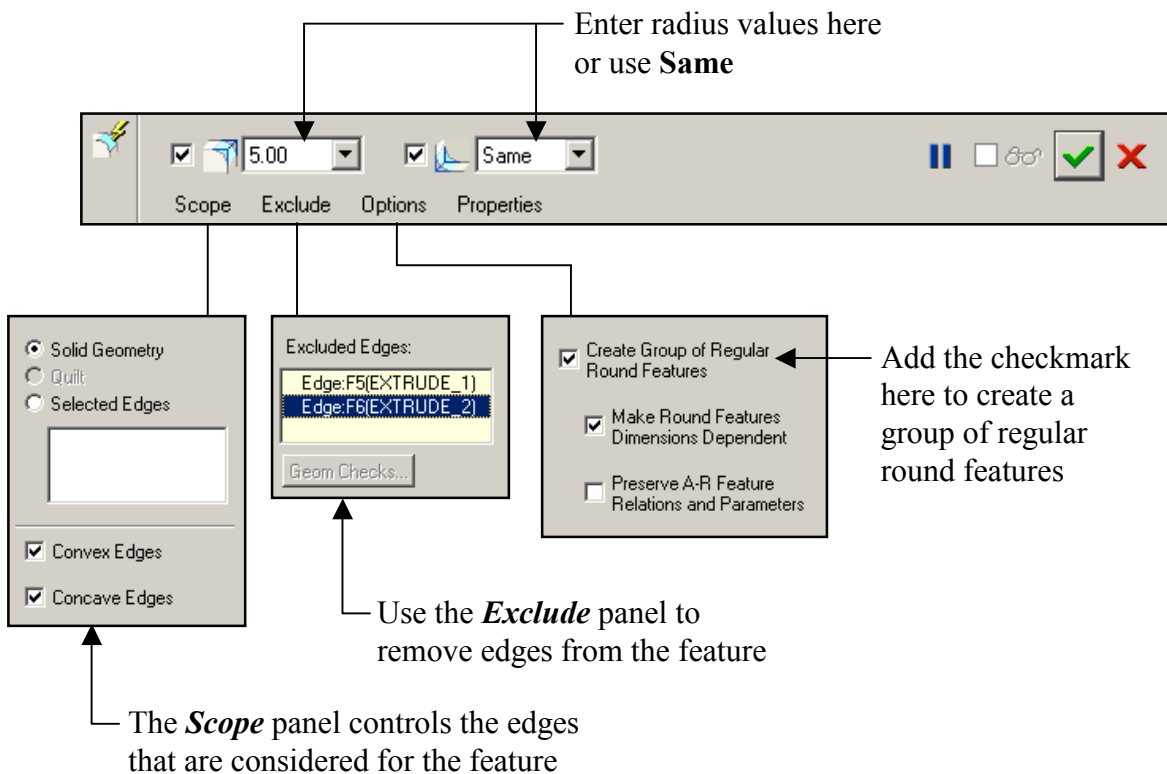
Examples of rounds using **Transitions** are shown below.



The Auto Round Command

The **Auto Round** command adds rounds on all edges of the model.

- Click **Insert, Auto Round** or click the icon shown above.
- The system attempts to round all the edges in the model. Use the **Scope** panel of the dashboard tool to control the edges that are considered for the feature.
- Use the **Exclude** panel to select edges to be excluded from the feature.
- By default, the system creates a series of sub-features that you cannot reorder or otherwise change. Use the **Options** panel to force the system to create a group of regular round features. These regular features can be reordered within the group and can be redefined and transitions can be added or changed.
- Concave and convex edges can have different radius values. Enter the radius values in the dashboard tool as shown below.
- The **Auto Round** dashboard tool is shown below.



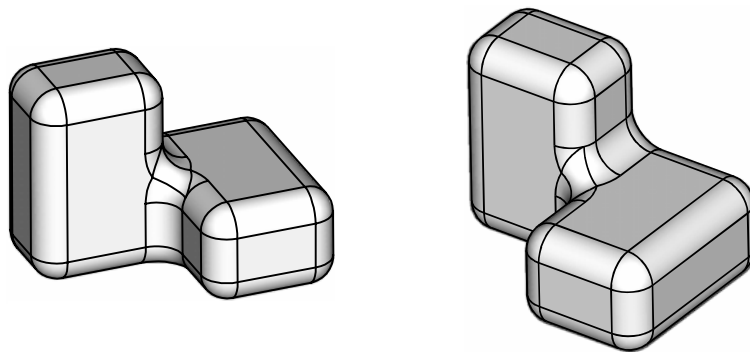
Tips on Rounds

The following are some tips and techniques when working with rounds:

- Create round features as late in the design as possible. There are cases where rounds must be created early in the design, but in general, wait until last to create the rounds.
- Create draft features (**Insert, Draft**) *before* creating rounds.
- One way to add additional features to the part and keep the rounds last is to use **Insert Mode** and create the features before the rounds.
- To avoid unwanted and unnecessary parent-child relationships, *do not* dimension to edges or tangent edges created by rounds.
- Use the configuration option listed below to automatically create a layer and assign all round features to that layer as they are created.

```
def_layer layer_round_feat all_rounds
```

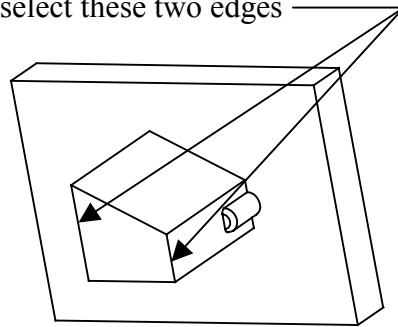
- When creating multiple rounds that converge at a corner, the order of creation can make a big difference. Unfortunately, there are no rules to govern which round to create first, second, last, etc. Try several combinations if you don't get the desired results the first time. The part below was completed using a series of simple edge rounds.



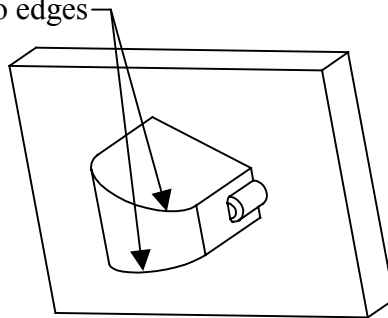
EXERCISE 8 - ADVANCED ROUNDS


Task 1: Create a two rounds.

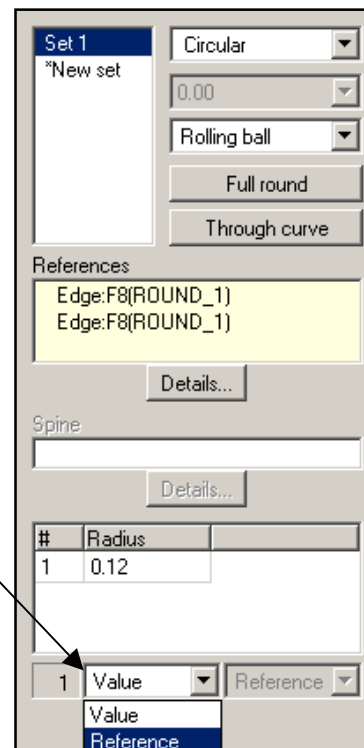
- **Open** the part called 'rounds-1.prt'
- Set the selection filter to **Geometry** then select these two edges



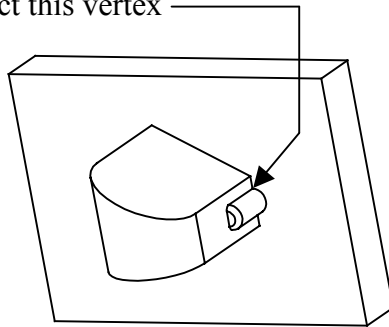
- Click **Round Edges** in the RMB popup menu
- Click **Full Round** in the RMB popup menu
- Click the checkmark in the dashboard tool to complete the feature
- Select these two edges



- Click **Insert, Round** or click the icon 
- Click the **Sets** panel in the dashboard tool
- Select **Reference** in the pull-down menu here



- Select this vertex



- Click the checkmark in the dashboard tool to complete the feature

Task 2: Create two 'surface to surface' rounds.

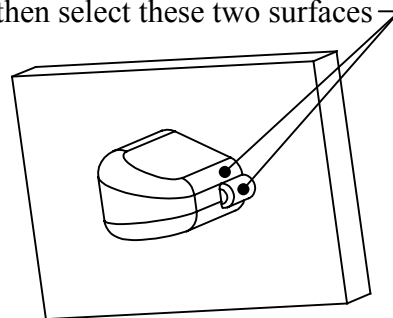
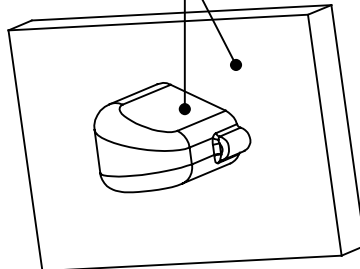
- Be sure the selection filter is set to **Geometry** then select these two surfaces

- Click **Insert, Round** or click the icon 

- Enter < 0.100 > for the radius value

- Click the checkmark in the dashboard tool to complete the feature

- Select these two surfaces



- Click **Insert, Round** or click the icon 

- Enter < 0.063 > for the radius value

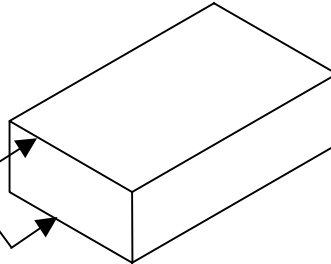
- Click the checkmark in the dashboard tool to complete the feature

- **Save** the part and **Close** the window

Task 3: Create a round with multiple sets.

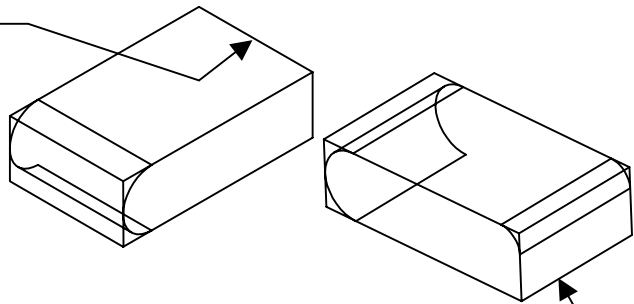
- **Open** the part called 'round-sets.prt'
- Set the selection filter to **Geometry**

- Select these 2 edges
- Click **Round Edges** in the RMB popup menu



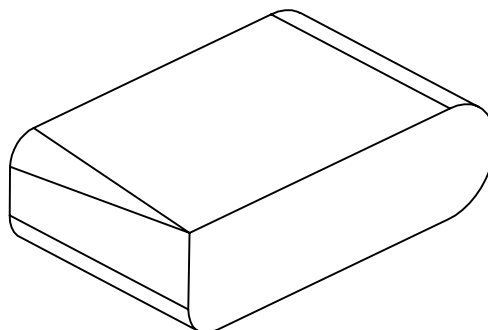
- Click **Full Round** in the RMB popup menu
- Click **Add Set** in the RMB popup menu

- Select this edge
- Enter < 0.930 > for the radius value
- Click **Add Set** in the RMB popup menu



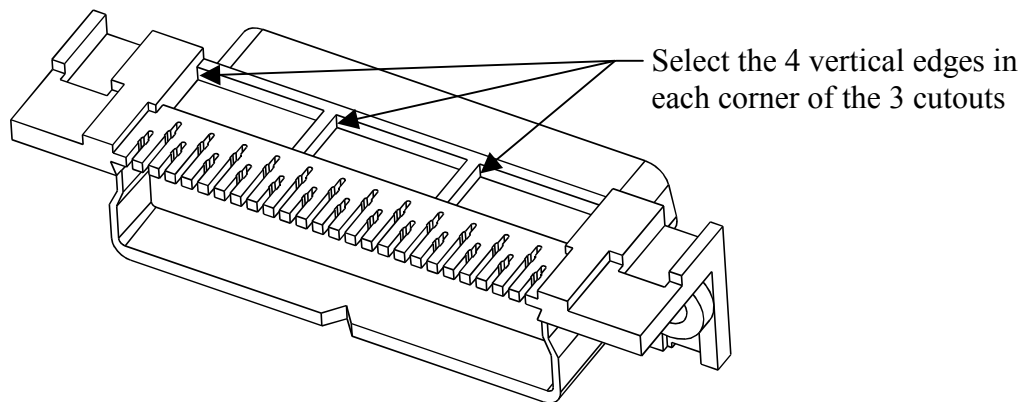
- Spin the model then select this edge
- Click **Make Variable** in the RMB popup menu
- Enter < 0 > for the radius value at one end of the edge
- Enter < 0.750 > for the radius value at the other end
- Click the checkmark in the dashboard tool to complete the feature

- The result is shown below
- The result is a single feature that can be easily suppressed. Use **Edit Definition** to add more sets or delete existing sets from the feature.
- **Save** the part and **Close** the window

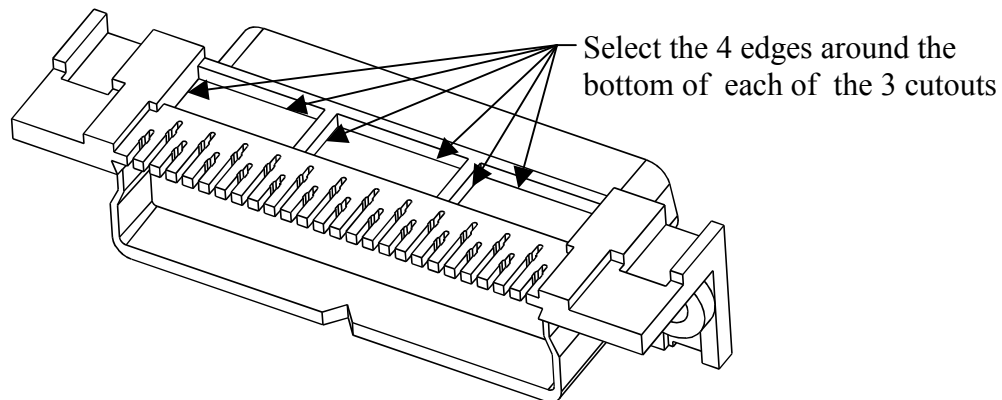


Task 4: Create another round with multiple sets.

- **Open** the part called 'housing.prt'
- Orient the model using the saved view called 'bottom_iso'
- Set the selection filter to **Geometry**
- Select the 12 edges inside the bottom cuts as shown below

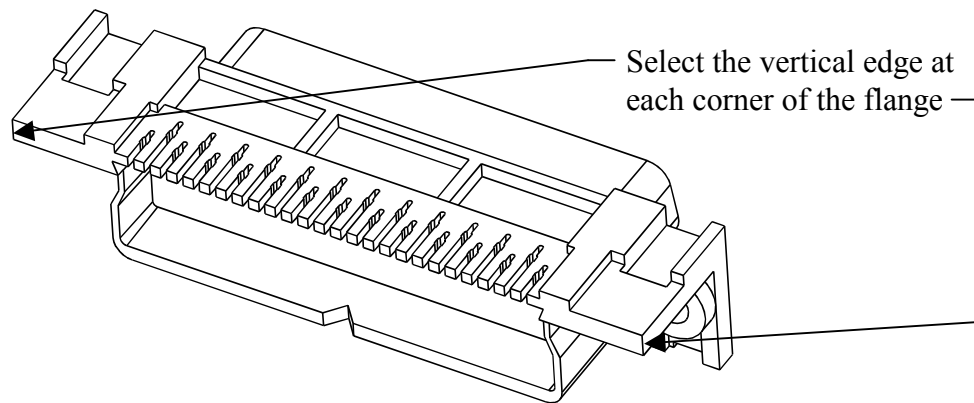


- Click **Round Edges** in the RMB popup menu
- Enter < 0.031 > for the radius value
- Click **Add Set** in the RMB popup menu
- Select the 12 edges inside the bottom cuts as shown

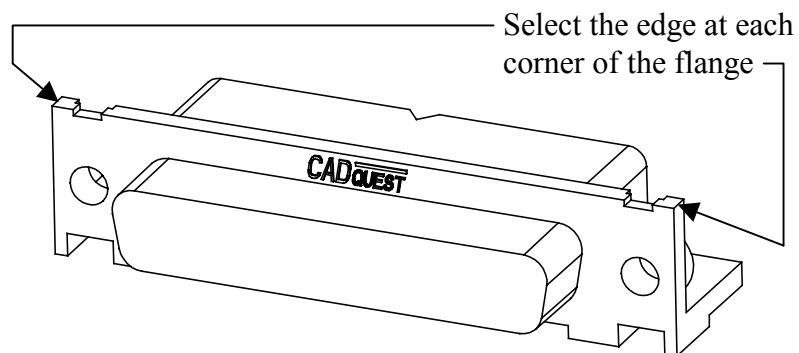


- Click **Add Set** in the RMB popup menu

- Select the edges shown below

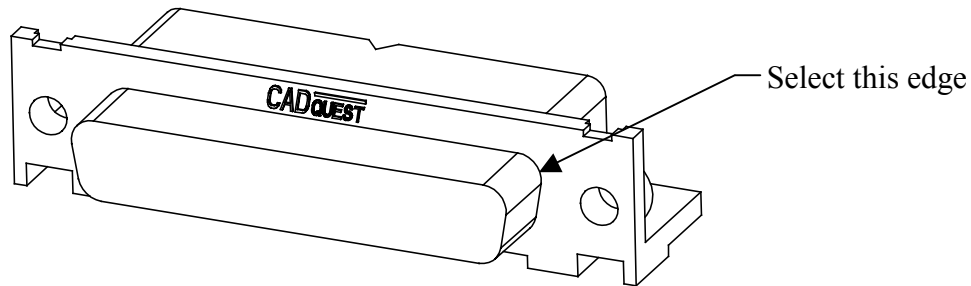


- Enter < 0.005 > for the radius value
- Click **Add Set** in the RMB popup menu
- Orient the model using the saved view called 'front_iso'
- Select the edges shown below

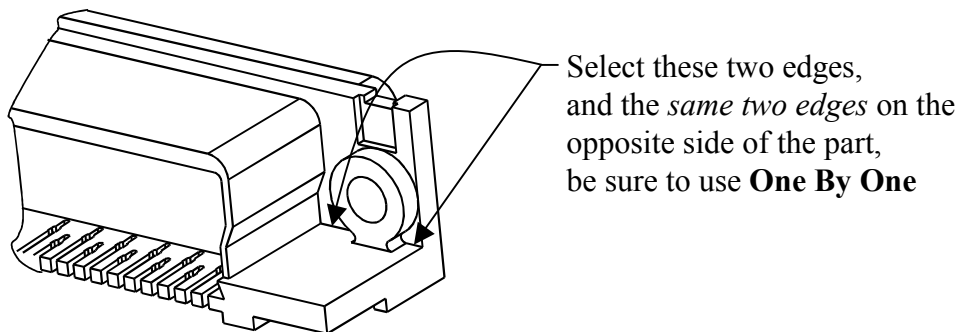


- Enter < 0.062 > for the radius value
- Click **Add Set** in the RMB popup menu

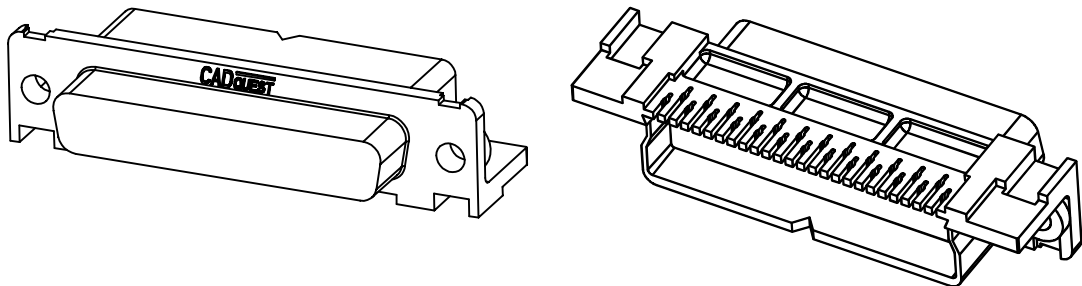
- Select the edge shown below



- Enter < 0.010 > for the radius value
- Orient the model using the saved view called 'back_iso'
- Click **Add Set** in the RMB popup menu
- Using **One By One**, select the four edges shown below

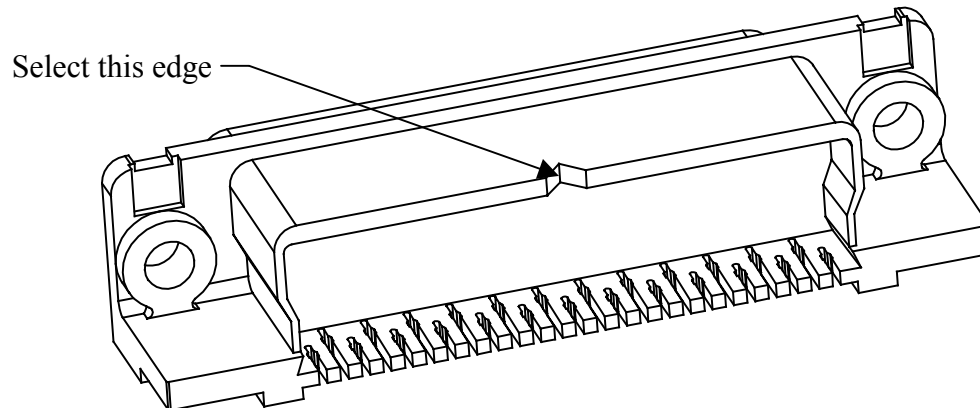


- Enter < 0.031 > for the radius value
- Click the checkmark in the dashboard tool to complete the feature
- The result is shown below

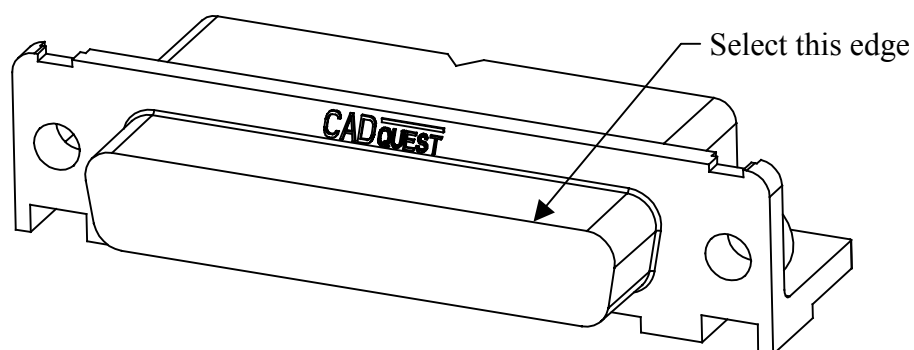


Task 5: Create another multiple set round feature.

- Orient the model using the saved view called 'rear_iso'
- Be sure the selection filter is set to **Geometry**
- Select the edge at the base of the 'V' notch as shown below

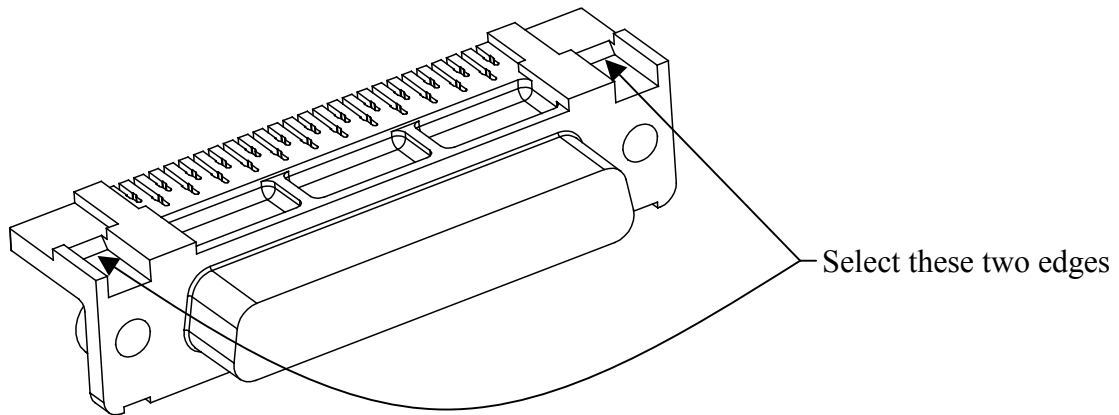


- Click **Round Edges** in the RMB popup menu
- Enter < 0.020 > for the radius value
- Orient the model using the saved view called 'front_iso'
- Click **Add Set** in the RMB popup menu
- Select the edge as shown below




- Enter < 0.005 > for the radius value
- Orient the model using the saved view called 'iso-3'
- Click **Add Set** in the RMB popup menu

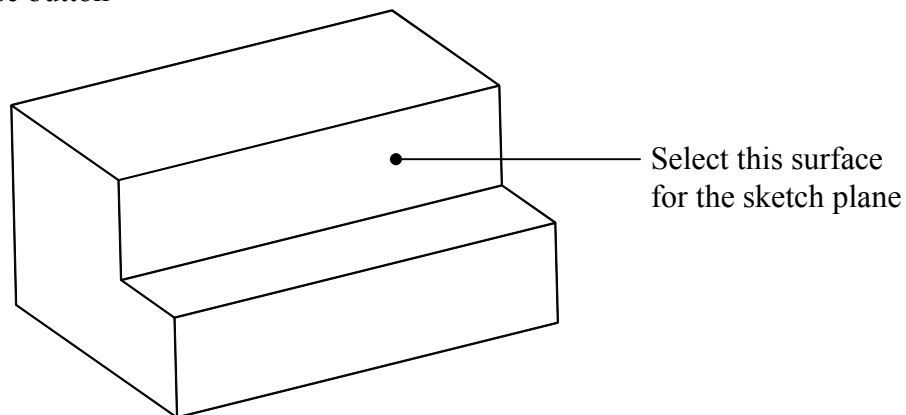
- Select the edges shown below



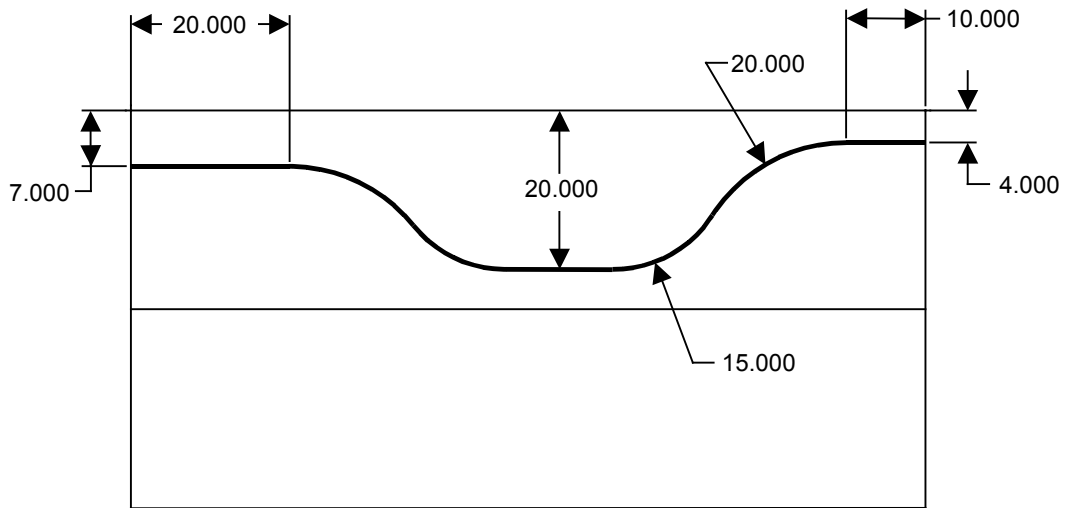
- Enter < 0.015 > for the radius value
- Click the checkmark in the dashboard tool to complete the feature
- **Save** the part and **Close** the window

Task 6: Create a sketch.

- **Open** the part called 'round-curve.prt'
- Orient the model using the saved view called 'iso-1'
- Click **Insert, Model Datum, Sketch** or click the icon 
- Select the part surface as shown below for the sketch plane, then click the middle mouse button



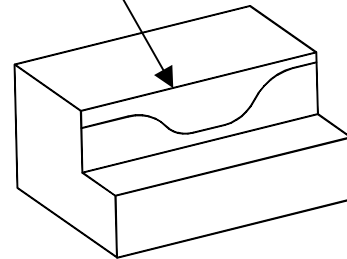
- Sketch and dimension the geometry as shown below



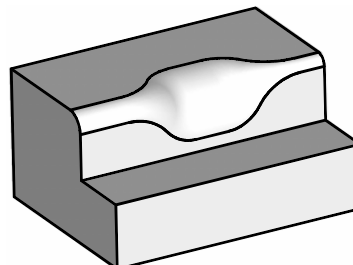
- Click the checkmark to complete the sketch

Task 7: Create a round through the datum curve.

- Set the selection filter to *Geometry* then select this edge

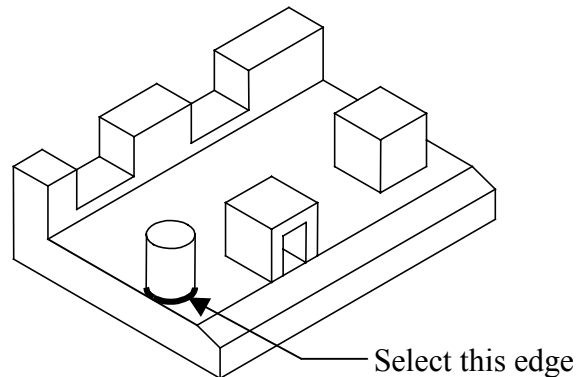


- Click **Round Edges** in the RMB popup menu
- Click **Through Curve** in the RMB popup menu then select the sketch you just created
- Click the checkmark in the dashboard tool to complete the feature
- The result is shown here →
- **Save** the part and **Close** the window



Task 8: Create a round with a ‘transition’.

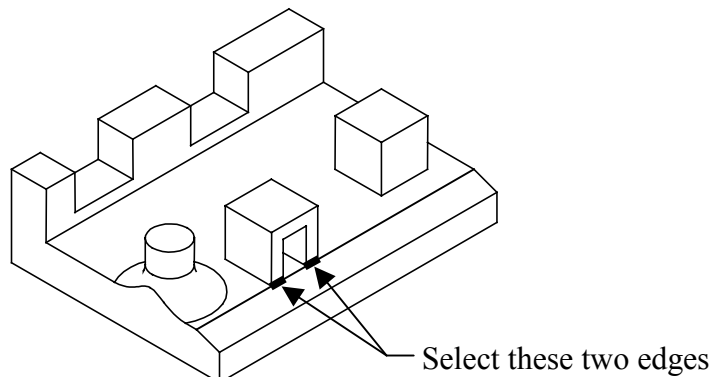
- **Open** the part called ‘rounds-2.prt’
- Set the selection filter to **Geometry** then select the edge shown below



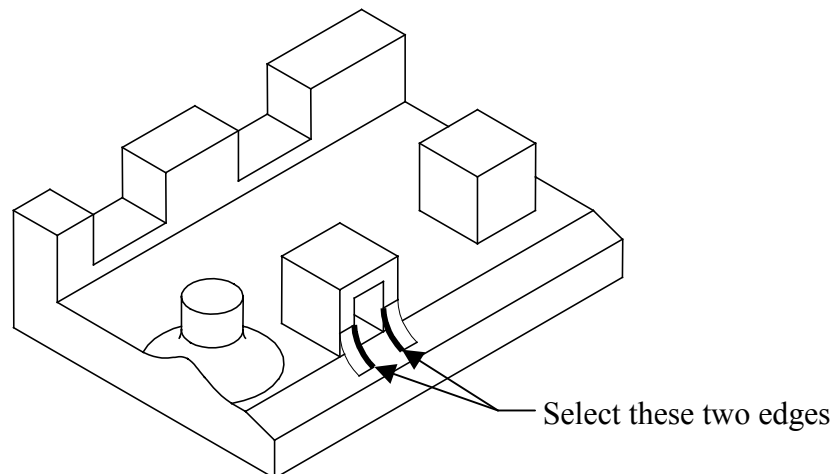
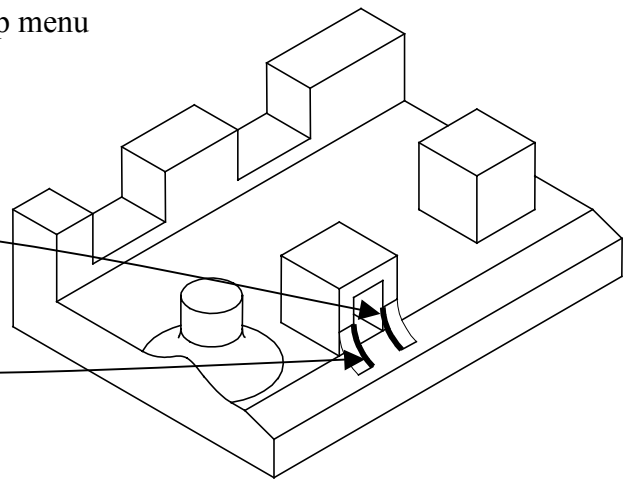
- Click **Round Edges** in the RMB popup menu
- Enter < 1 > for the radius value
- Click **Show Transitions** in the RMB popup menu
- Select the transition area on the model then press and hold the right mouse button
- Move the cursor back and forth over **Default (Continue)** and **Blend** in the popup menu
- Select **Default (Continue)**
- Click the checkmark in the dashboard tool to complete the feature

Task 9: Create another round with a ‘continue’ transition.

- Be sure the selection filter is set to **Geometry** then select the edges shown below



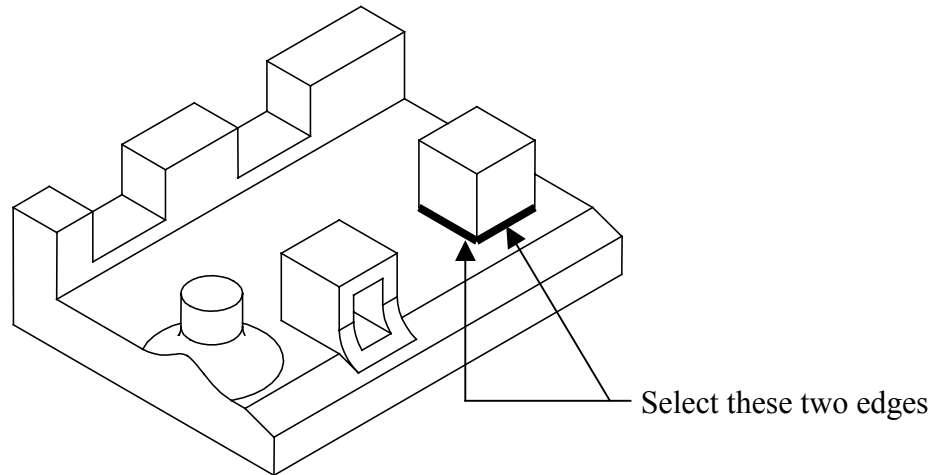
- Click **Round Edges** in the RMB popup menu
- Enter < 1 > for the radius value
- Click **Show Transitions** in the RMB popup menu
- Click here —————
- Click **Delete Transition** in the RMB popup menu
- Click here —————
- Click **Delete Transition** in the RMB popup menu
- Select the two edges of the transition shown below



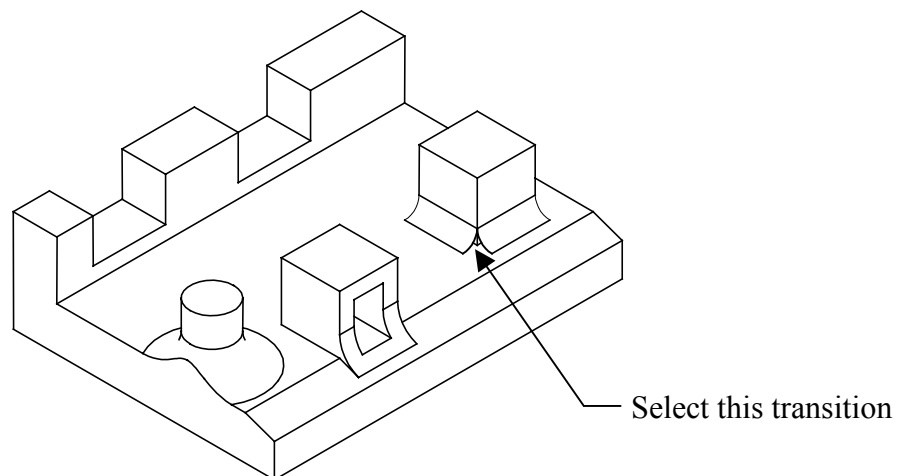
- Click **Make Transition** in the RMB popup menu
- Click the checkmark in the dashboard tool to complete the feature
- The result is shown on the next page

Task 10: Create a round with a 'blend' transition.

- Be sure the selection filter is set to *Geometry*
- Select the two edges shown below

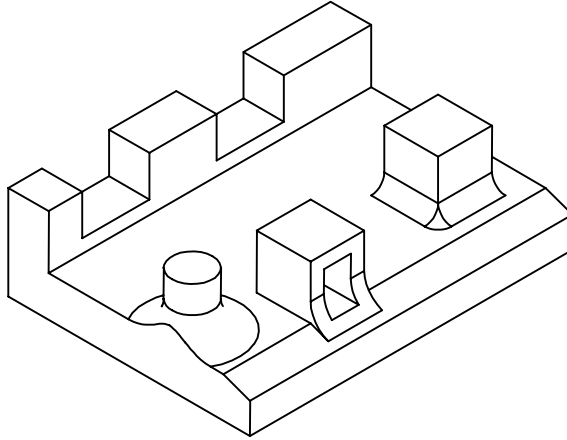


- Click **Round Edges** in the RMB popup menu
- Enter < 0.500 > for the radius value
- Click **Show Transitions** in the RMB popup menu
- Select the transition shown below



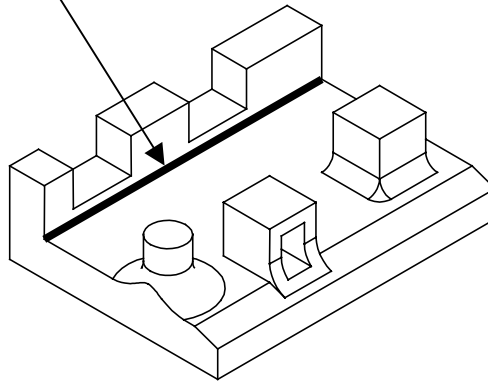
- Click **Blend** in the RMB popup menu

- Click the checkmark in the dashboard tool to complete the feature
- The result is shown below



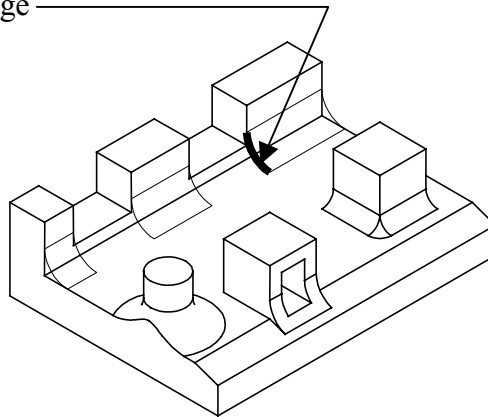
Task 11: Create a round with a ‘stop’ transition.

- Be sure the selection filter is set to *Geometry*
- Select this edge

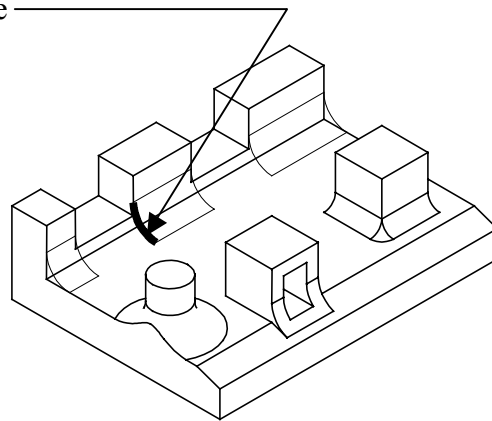


- Click **Round Edges** in the RMB popup menu
- Enter < 1 > for the radius value
- Click **Show Transitions** in the RMB popup menu
- Delete the two middle transitions (select the transition then click **Delete Transition** in the RMB popup menu)

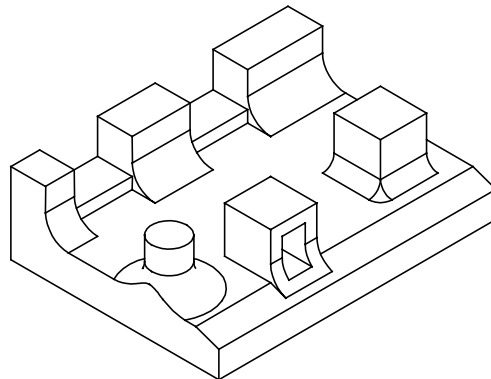
- Select this edge



- Click **Make Transition** in the RMB popup menu
- Select this edge

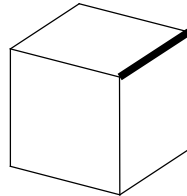


- Click **Make Transition** in the RMB popup menu
- Click the checkmark in the dashboard tool to complete the feature
- The result is shown below
- **Save** the part and **Close** the window

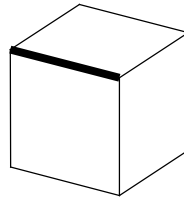


Task 12: Create a round with transitions.

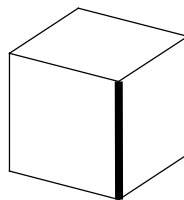
- **Open** the part called 'rounds-3.prt'
- Set the selection filter to **Geometry** then select the edge shown below in bold



- Click **Round Edges** in the RMB popup menu
- Enter < 1 > for the radius value
- Click **Add Set** in the RMB popup menu
- Select the edge shown below in bold

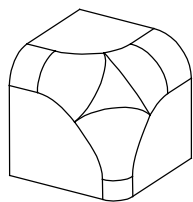
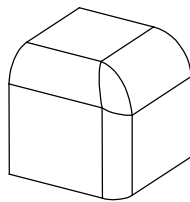
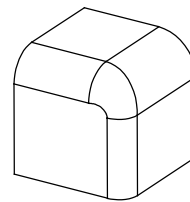


- Enter < 0.750 > for the radius value
- Click **Add Set** in the RMB popup menu
- Select the edge shown below in bold



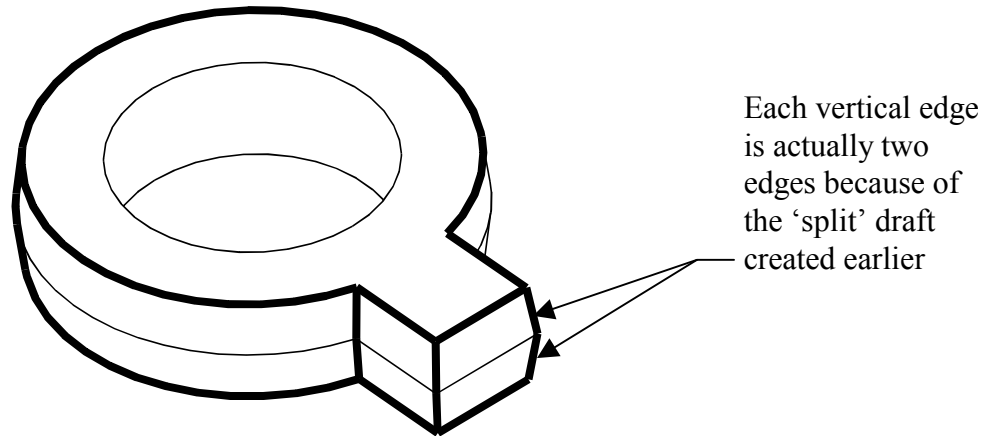
- Enter < 0.500 > for the radius value
- Click **Show Transitions** in the RMB popup menu
- Select the transition area on the model
- Press and hold the right mouse button and move the cursor over the different transitions in the popup menu

- Click **Corner Sphere** in the RMB popup menu
- Double click the radius dimension and enter < 1.250 > for the radius of the corner sphere
- Click the checkmark in the dashboard tool to complete the feature
- The result is shown at the bottom of the page
- Set the selection filter to **Features**
- Select the round then click **Edit Definition** in the RMB popup menu
- Click **Show Transitions** in the RMB popup menu
- Select the transition area then click **Patch** in the RMB popup menu
- Click the checkmark in the dashboard tool to complete the feature
- The result is shown at the bottom of the page
- Select the round then click **Edit Definition** in the RMB popup menu
- Click **Show Transitions** in the RMB popup menu
- Select the transition area then click **Round Only 1** in the RMB popup menu
- Click the checkmark in the dashboard tool to complete the feature
- The results are shown below
- **Save** the part and **Close** the window

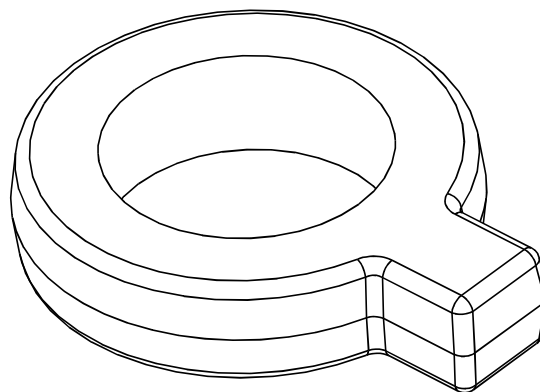
**Corner Sphere****Patch****Round Only**

Task 13: Add rounds to the casting part.


- **Open** the part called 'casting.prt'
- Set the selection filter to *Geometry*
- Select the 16 edges shown below in bold

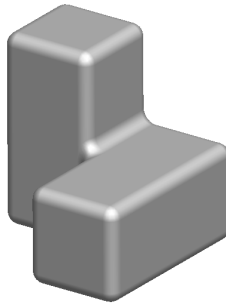



- Click **Round Edges** in the RMB popup menu
- Enter < 0.125 > for the radius value
- Click the checkmark in the dashboard tool to complete the feature
- The result is shown below
- **Save** the part and **Close** the window



Task 14: Add rounds using the Auto Round command.

- **Open** the part called 'rounds-4.prt'
- Click **Insert, Auto Round** or click the icon 
- Enter < 0.125 > for the convex radius value in the dashboard tool
- Click **Same** for the concave radius value in the dashboard tool
- Click the checkmark in the dashboard tool to complete the feature
- Notice the **Auto Round** feature in the model tree
- The result is shown below
- **Save** the part and **Close** the window



- **Open** the part called 'rounds-5.prt'
- Click **Insert, Auto Round** or click the icon 
- Enter < 0.250 > for the convex radius value
- Enter < 0.625 > for the concave radius value
- Click **Create as a Group** in the RMB popup menu
- Click **Exclude** in the dashboard tool then select the edges around the top and bottom of the hole
- Click the checkmark in the dashboard tool to complete the feature
- Notice the group of regular round features in the model tree
- **Save** the part and **Close** the window