

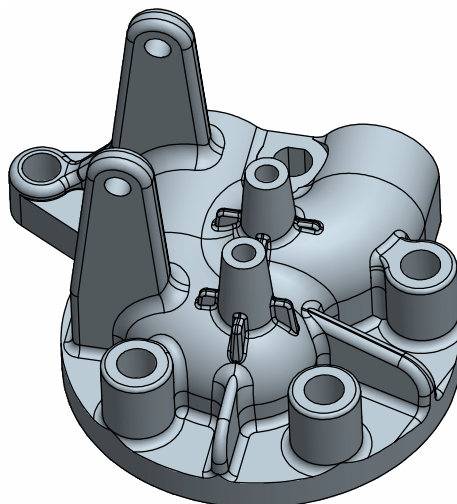
Advanced Rounds

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:

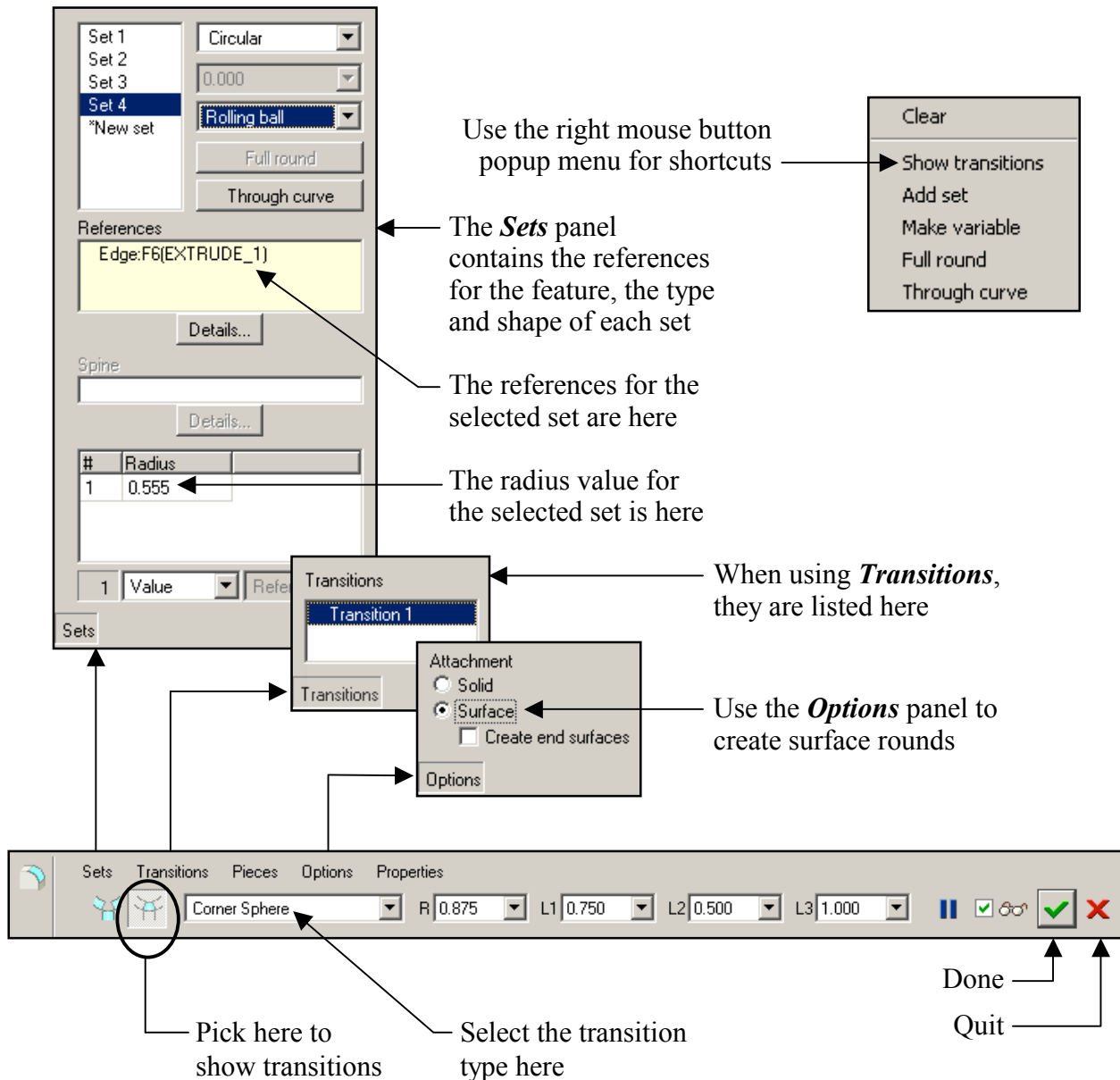
Constant	The radius of the round is constant along the selected references.
Variable	Radii are specified at endpoints, and optionally at intermediate vertices and/or datum points along the edges being rounded.
Full Round	Replaces a whole surface with a rounded surface. The radius will be automatically 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 Tool

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

- When possible, select the references for the round *first*.
- Pick **Insert, Round** or pick 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.



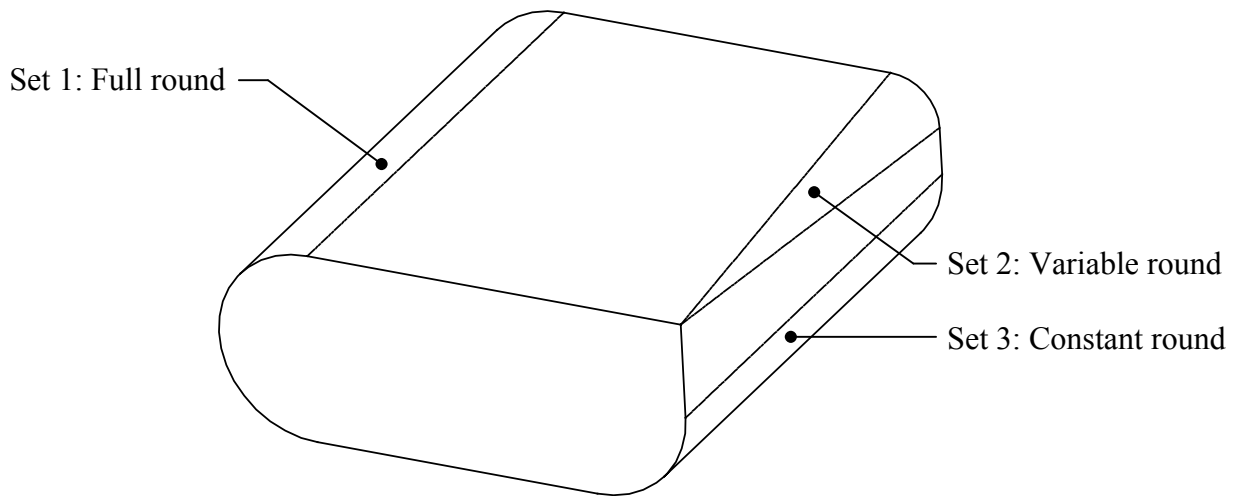
The image shows the Round dashboard tool interface with several panels and options. Annotations explain the following components:

- Sets panel:** Contains the references for the feature, the type, and shape of each set. It includes a list of sets (Set 1 to Set 4) and a "New set" button. The selected set (Set 4) is highlighted in blue. The type is set to "Circular" and the shape to "Rolling ball". Buttons for "Full round" and "Through curve" are also present.
- References:** A list of references for the selected set, currently showing "Edge:F6(EXTRUDE_1)". A "Details..." button is available.
- Spine:** A field for the spine of the round, currently empty, with a "Details..." button.
- Radius table:** A table showing the radius for the selected set. The table has two columns: "#", "Radius", and "Value". The first row shows "# 1", "Radius 0.555", and "Value".
- Transitions:** A panel showing the transitions for the round, currently showing "Transition 1".
- Options panel:** A panel for creating surface rounds. It includes an "Attachment" section with radio buttons for "Solid" and "Surface" (selected), and a checkbox for "Create end surfaces".
- Right mouse button popup menu:** A menu with options: "Clear", "Show transitions", "Add set", "Make variable", "Full round", and "Through curve".
- Bottom toolbar:** Contains tabs for "Sets", "Transitions", "Pieces", "Options", and "Properties". The "Transitions" tab is active. The toolbar shows a "Corner Sphere" transition type, a radius of "R 0.875", and three length values: "L1 0.750", "L2 0.500", and "L3 1.000". There are also "Done" and "Quit" buttons.

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:

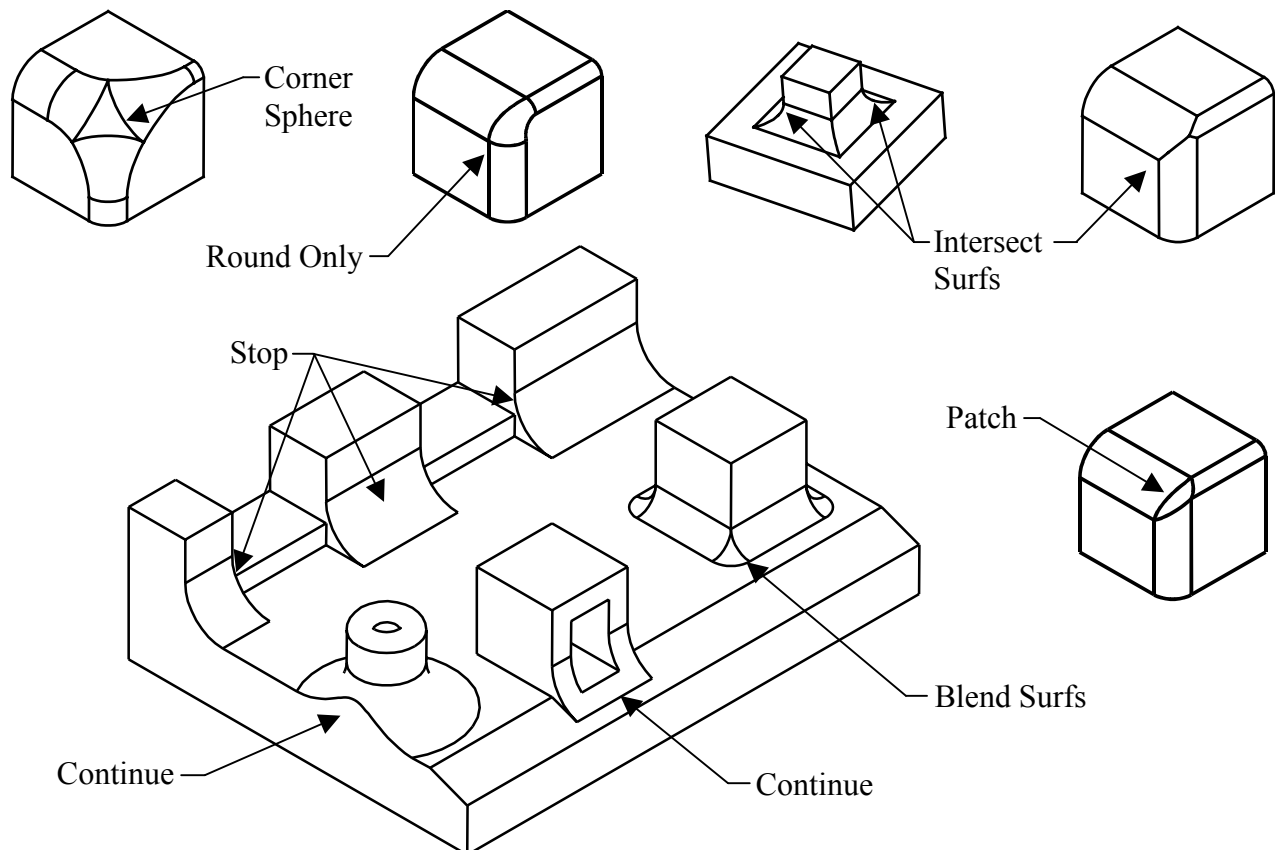
Rolling Ball	Create a round that looks like you rolled a ball between the two references.
Norm To Spine	Create the round surface by sweeping an arc normal to the selected spine.
Circular	The shape of the round is circular.
Conic	The shape of the round is a conic.

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.

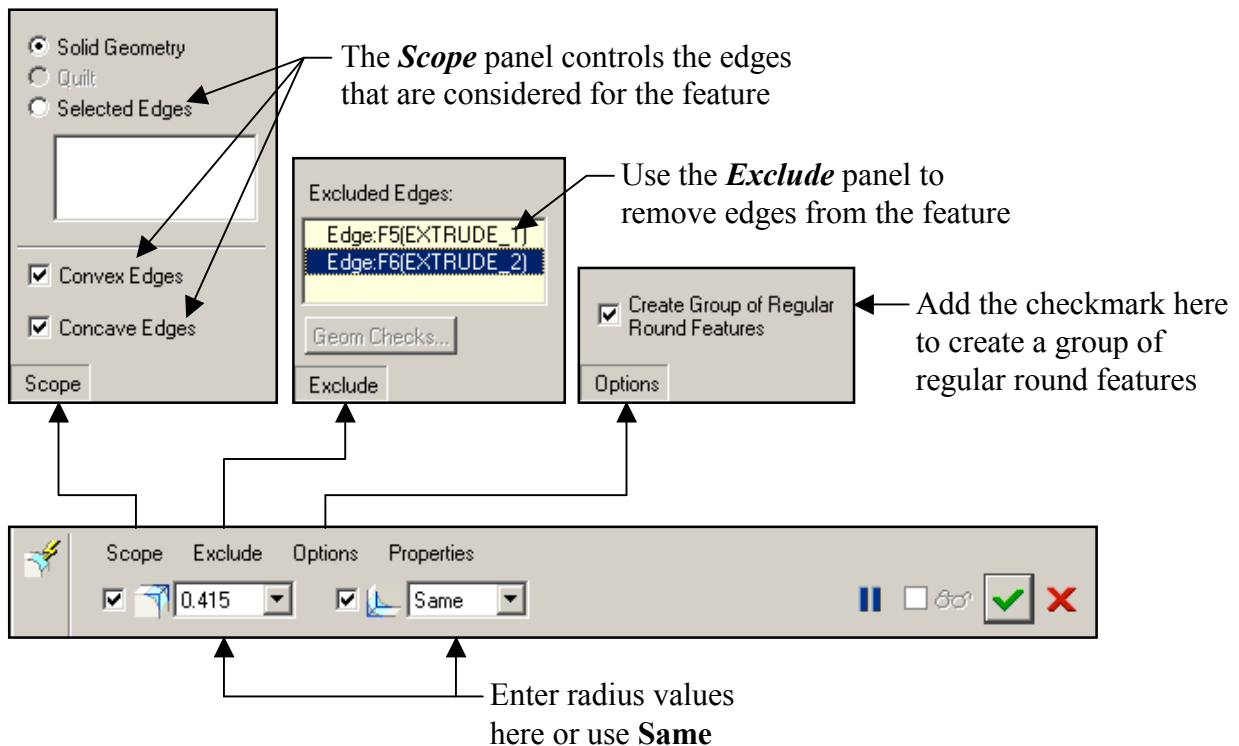
Examples of rounds using **Transitions** are shown below.



The Auto Round Command

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

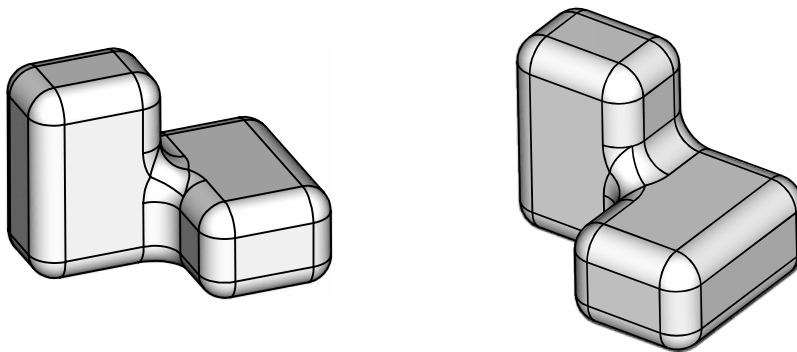
- Pick **Insert, Auto Round** or pick the icon shown above.
- The system attempts to round all the edges in the model. Use the **Scope** panel of the dashboard tool to control the edges that are considered for the feature.
- Use the **Exclude** panel to select edges to be excluded from the feature.
- By default, the system creates a series of sub-features that you cannot reorder or otherwise change.
- Concave and convex edges can have different radius values. Enter the radius values in the dashboard tool as shown below.
- 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.
- The **Auto Round** dashboard tool is shown below.



Tips on Rounds

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

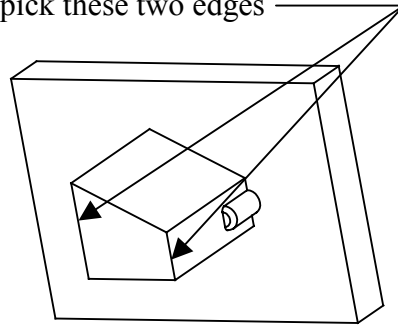
- Add rounds as late in the design as possible. There are cases where rounds should be added early, but in general, wait until last to add the rounds.
- Create draft features (**Insert, Draft**) *before* creating rounds.
- One way to add additional features to the part and keep the rounds last is to use **Insert Mode** and create the features before the rounds in the part.
- To avoid unwanted and unnecessary parent-child relationships, *do not* dimension to edges or tangent edges created by rounds.
- Use the 'def_layer' config.pro option 'layer_round_feat' to automatically create a layer and assign all round features to that layer as they are created.
- 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 is completed using simple rounds without any transitions.



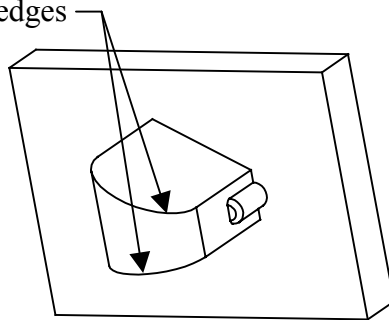
EXERCISE 8 - ADVANCED ROUNDS

Task 1: Create a two rounds.

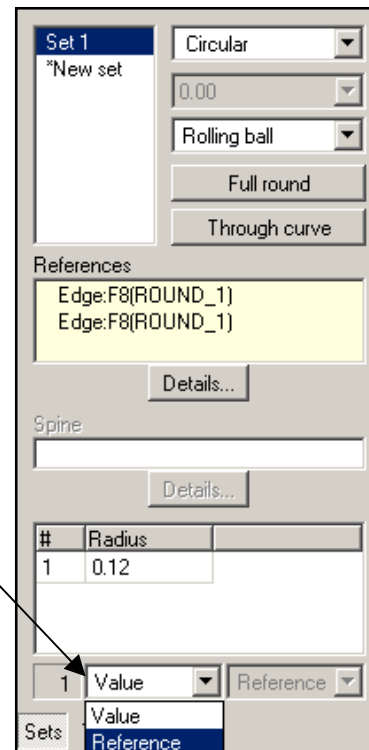
- **Open** the part called 'rounds-1.prt'
- Set the selection filter to **Geometry** then pick these two edges



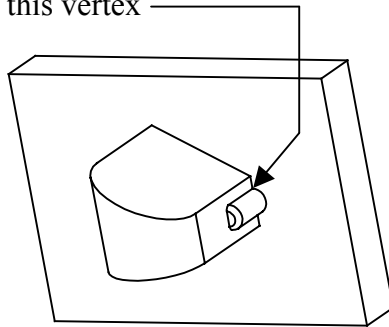
- Press and hold the right mouse button and select **Round Edges**
- Press and hold the right mouse button and select **Full Round**
- Pick the checkmark in the dashboard tool to complete the feature
- Pick these two edges



- Pick the **Round** icon 
- Pick the **Sets** panel in the dashboard tool
- Pick **Reference** in the pull-down menu here



- Pick this vertex



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

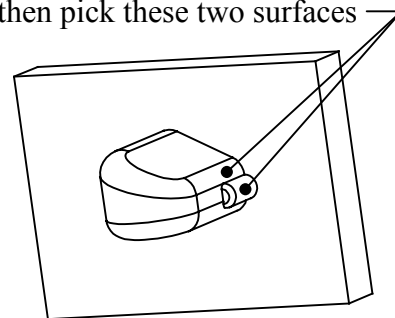
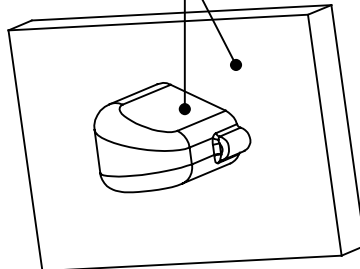
Task 2: Create two 'surface to surface' rounds.


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

- Pick the **Round** icon 

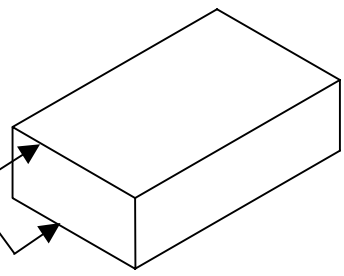
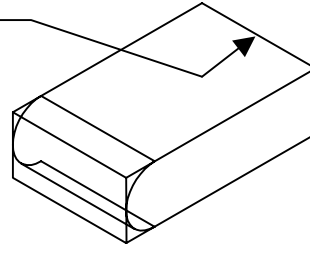
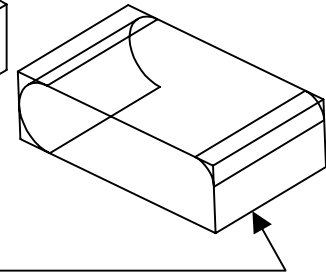
- Enter < 0.100 > for the radius value
- Pick the checkmark in the dashboard tool to complete the feature

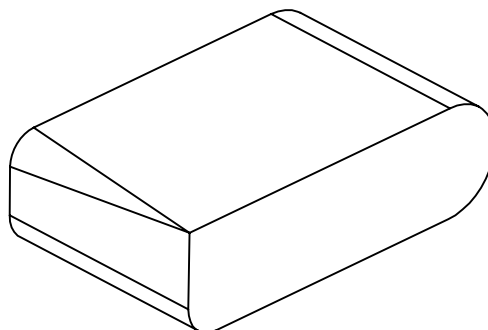
- Pick these two surfaces



- Pick the **Round** icon 
- Enter < 0.063 > for the radius value
- Click the middle mouse button to complete the feature
- **Save** the part and **Close** the window

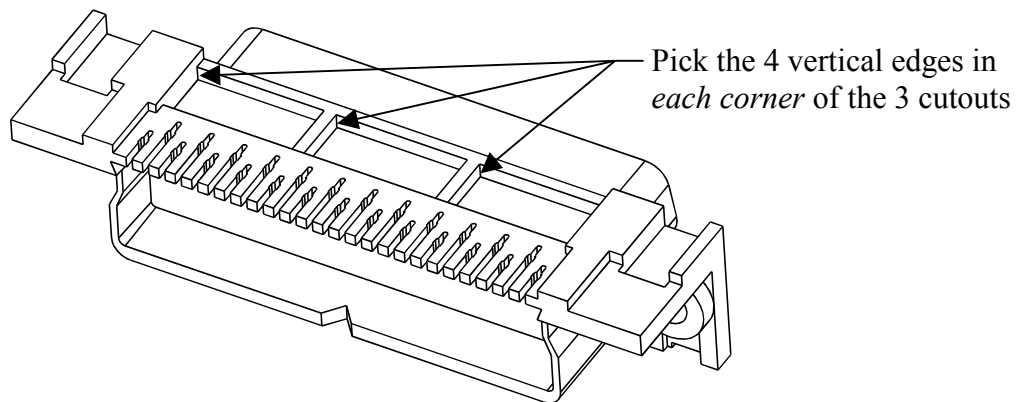
Task 3: Create a round with multiple sets.

- **Open** the part called 'round-sets.prt'
- Set the selection filter to **Geometry**
- Pick these 2 edges 
- Press and hold the right mouse button and select **Round Edges**
- Press and hold the right mouse button and select **Full Round**
- Press and hold the right mouse button and select **Add Set**
- Pick this edge 
- Enter < 0.930 > for the radius value
- Press and hold the right mouse button and select **Add Set**
- Spin the model then pick this edge 
- Press and hold the right mouse button and select **Make Variable**
- Enter < 0 > for the radius value at one end of the edge
- Enter < 0.750 > for the radius value at the other end
- Pick 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

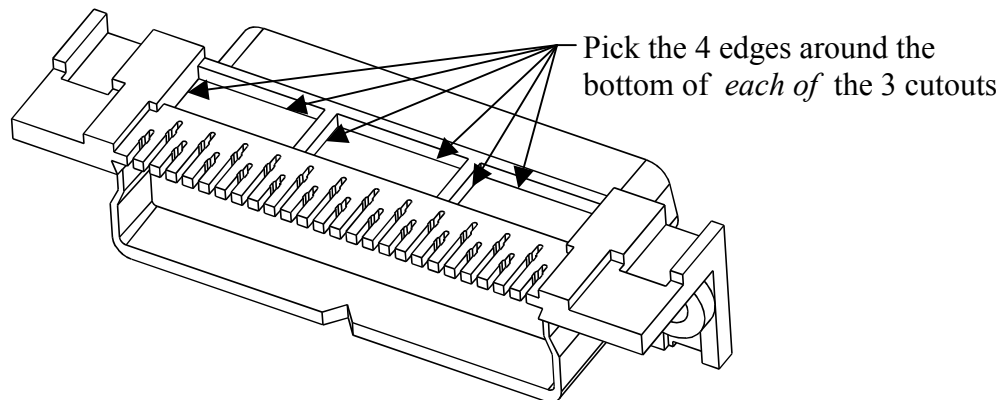


Task 4: Create another round with multiple sets.

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

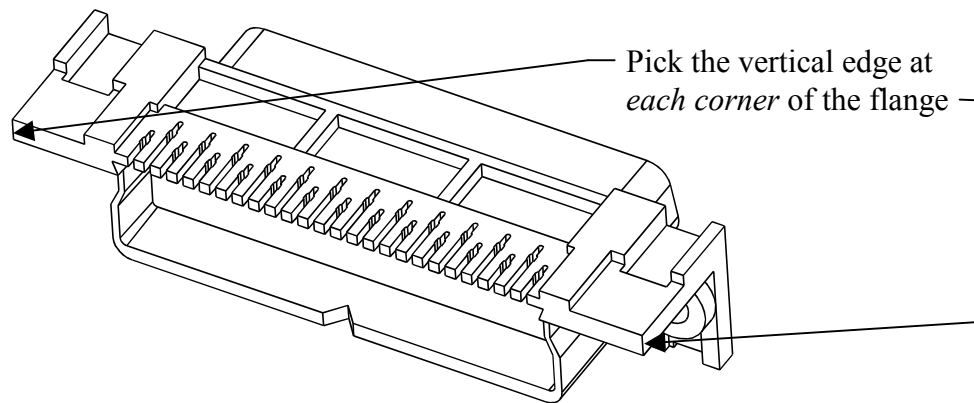


- Press and hold the right mouse button and select **Round Edges**
- Enter < 0.030 > for the radius value
- Press and hold the right mouse button and select **Add Set**
- Pick the 12 edges inside the bottom cuts as shown

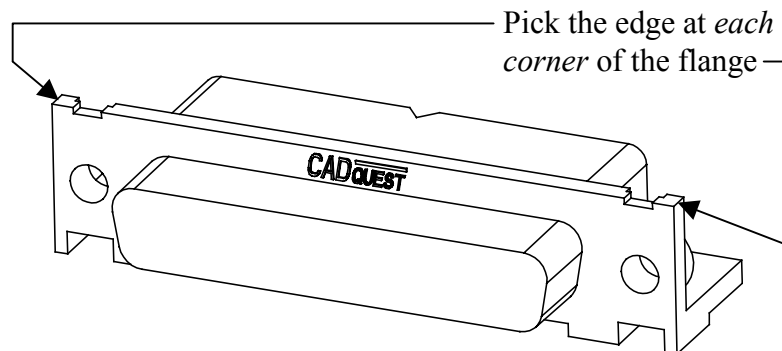


- Press and hold the right mouse button and select **Add Set**

- Pick the 2 edges on the corner of the flanges as shown

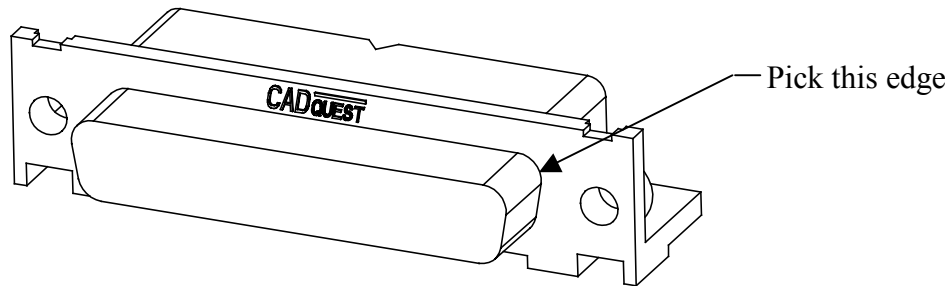


- Enter < 0.005 > for the radius value
- Press and hold the right mouse button and select **Add Set**
- Orient the model using the saved view called 'front_iso'
- Pick the 2 edges on the top corner of the flanges as shown

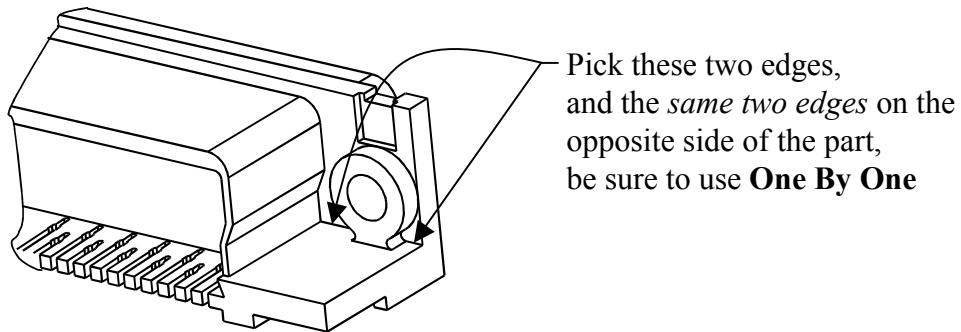


- Enter < 0.062 > for the radius value
- Press and hold the right mouse button and select **Add Set**

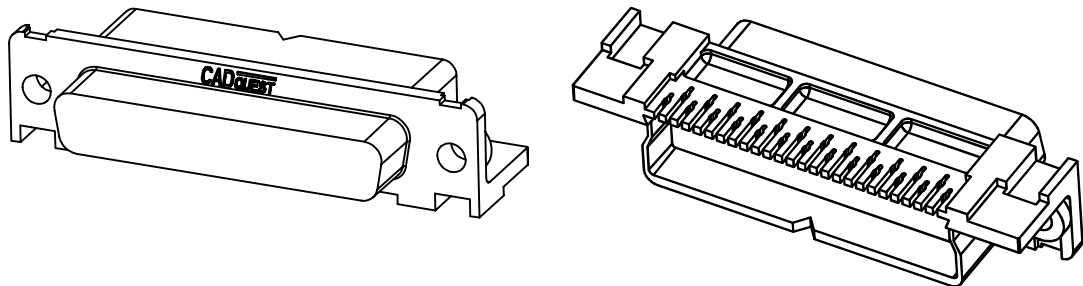
- Pick the edge at the base of the front protrusion as shown below



- Enter < 0.010 > for the radius value
- Orient the model using the saved view called 'back_iso'
- Press and hold the right mouse button and select **Add Set**
- Using **One By One**, pick the 4 edges as shown

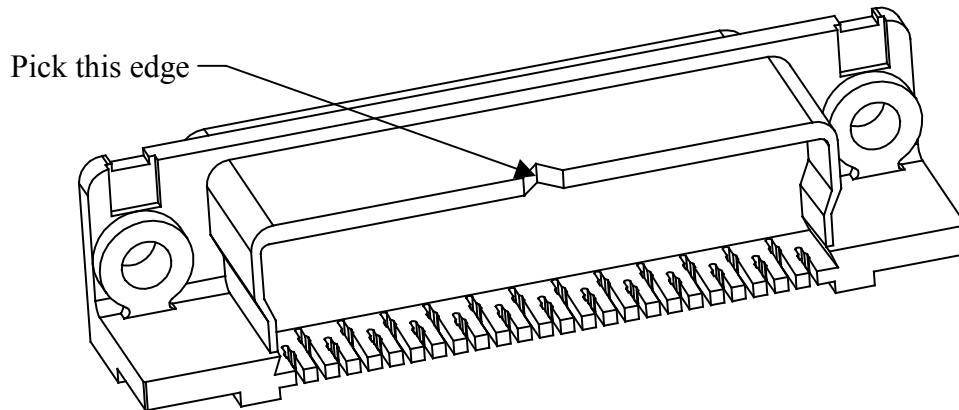


- Enter < 0.031 > for the radius value
- Pick the checkmark in the dashboard tool to complete the feature
- The result is shown below

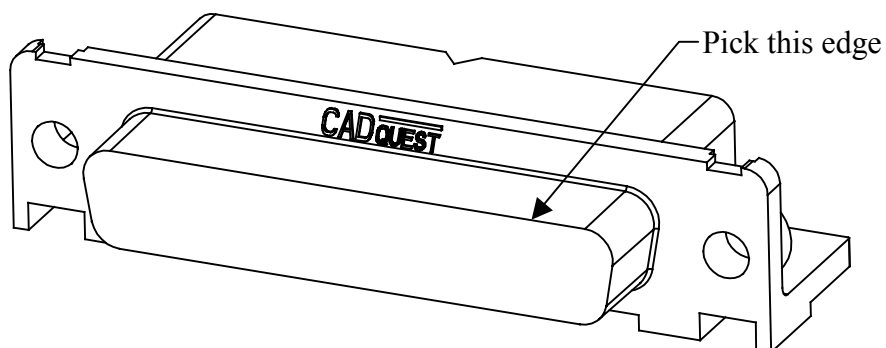


Task 5: Create another multiple set round feature.

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

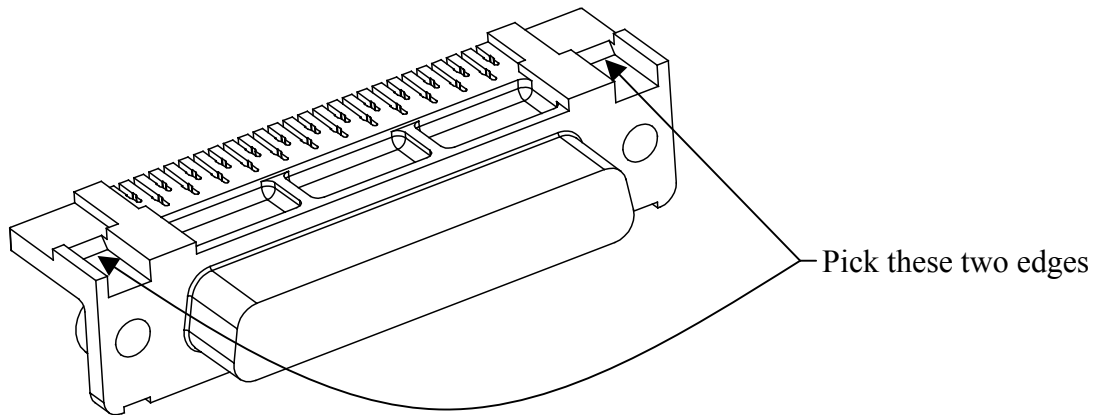


- Press and hold the right mouse button and select **Round Edges**
- Enter < 0.020 > for the radius value
- Orient the model using the saved view called 'front_iso'
- Press and hold the right mouse button and select **Add Set**
- Pick the edge on the front of the front protrusion as shown




- Enter < 0.005 > for the radius value
- Orient the model using the saved view called 'iso-3'
- Press and hold the right mouse button and select **Add Set**

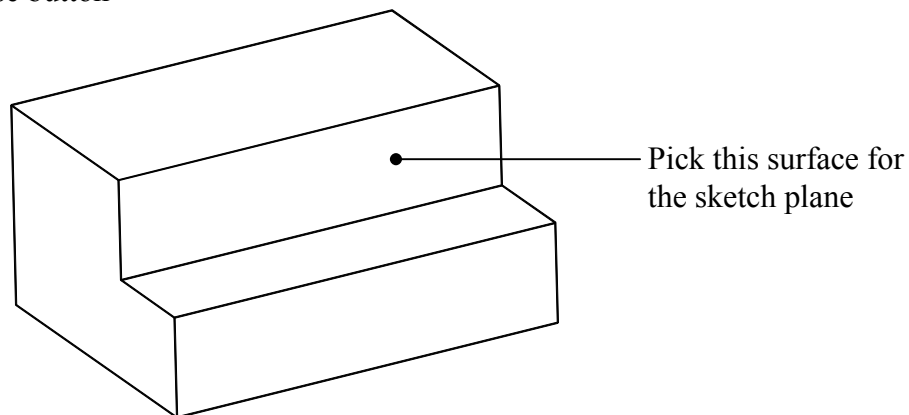
- Pick the 2 edges as shown below



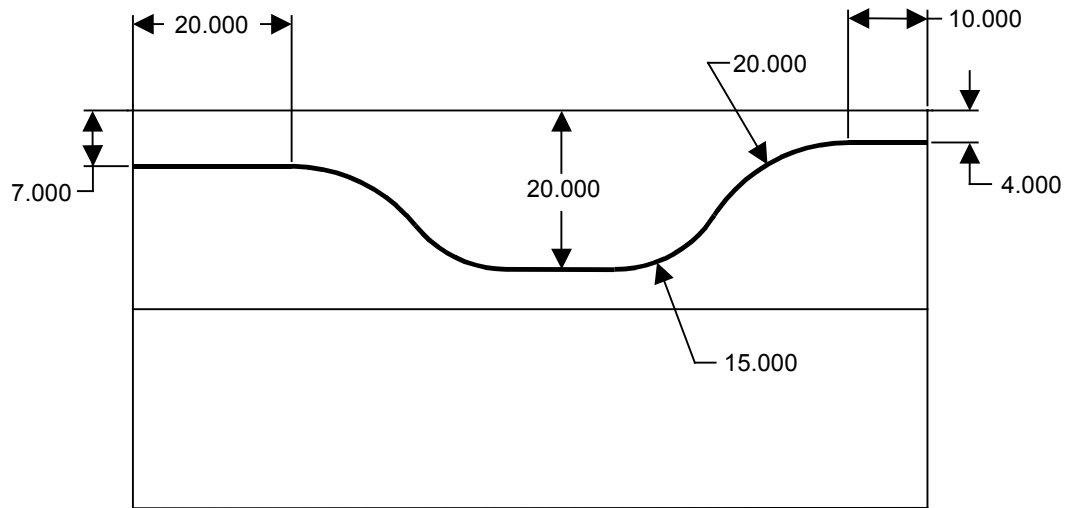
- Enter < 0.015 > for the radius value
- Pick the checkmark in the dashboard tool to complete the feature
- Save the part and **Close** the window

Task 6: Create a sketch.

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



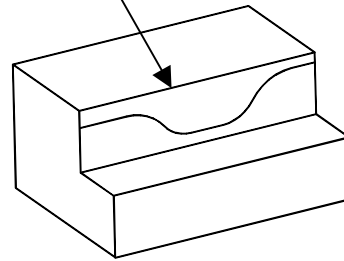
- Sketch and dimension the geometry as shown below



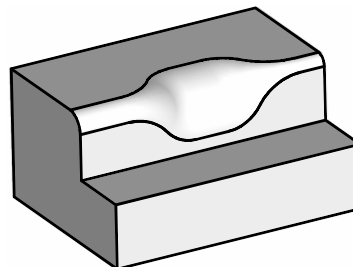
- Pick the checkmark to complete the sketch

Task 7: Create a round through the datum curve.

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

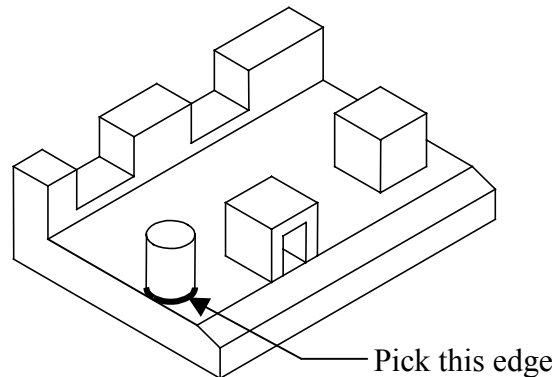


- Press and hold the right mouse button and select **Round Edges**
- Press and hold the right mouse button and select **Through Curve** then pick the sketch you just created
- Pick the checkmark in the dashboard tool to complete the feature
- The result is shown here
- **Save** the part and **Close** the window



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

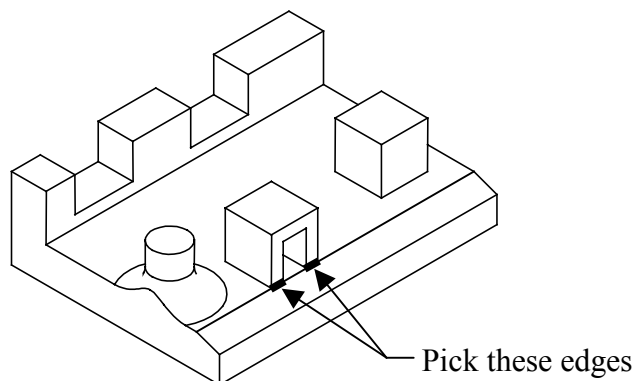
- **Open** the part called ‘rounds-2.prt’
- Set the selection filter to **Geometry** then pick the edge as shown below

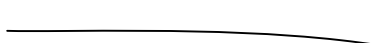
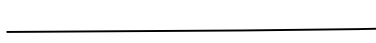


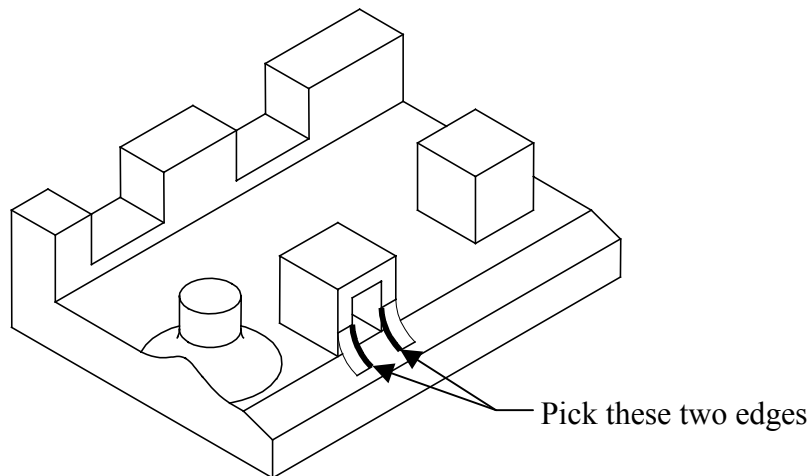
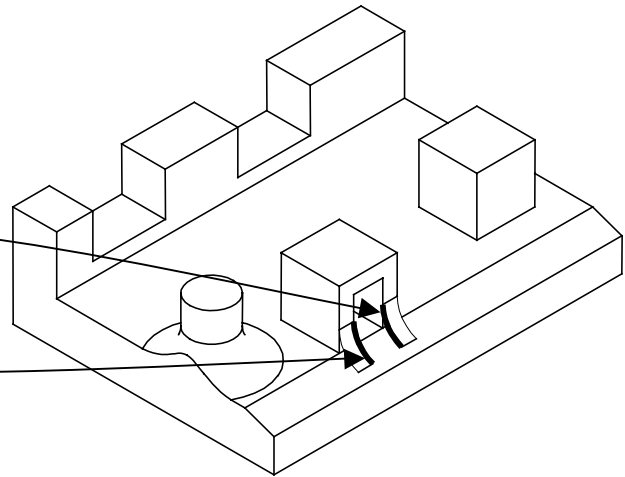
- Press and hold the right mouse button and select **Round Edges**
- Enter < 1 > for the radius value
- Press and hold the right mouse button and select **Show Transitions**
- Pick the transition area on the model then press and hold the right mouse button
- Move the mouse back and forth over **Blend** and **Continue** in the popup menu
- Select **Continue**
- Pick 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 pick the two edges shown below



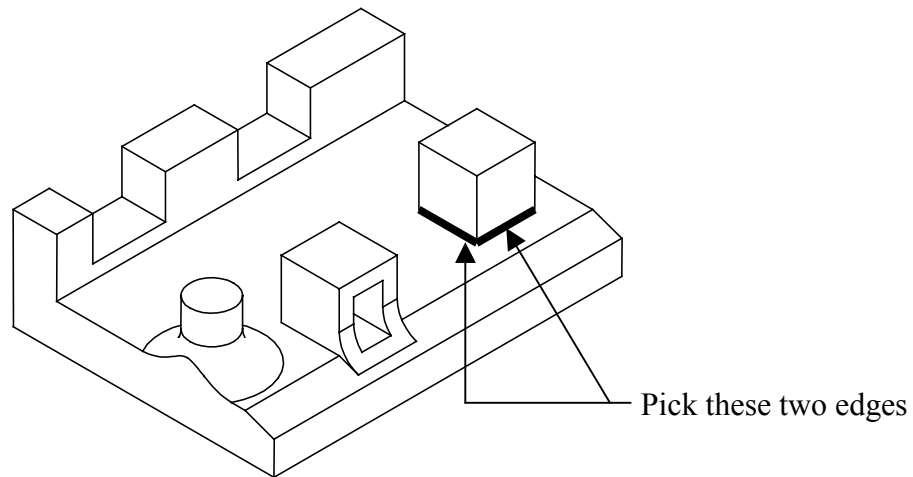
- Press and hold the right mouse button and select **Round Edges**
- Enter < 1 > for the radius value
- Press and hold the right mouse button and select **Show Transitions**
- Pick here 
- Press and hold the right mouse button and select **Delete Transition**
- Pick here 
- Press and hold the right mouse button and select **Delete Transition**
- Pick the two edges of the transition as shown in bold below



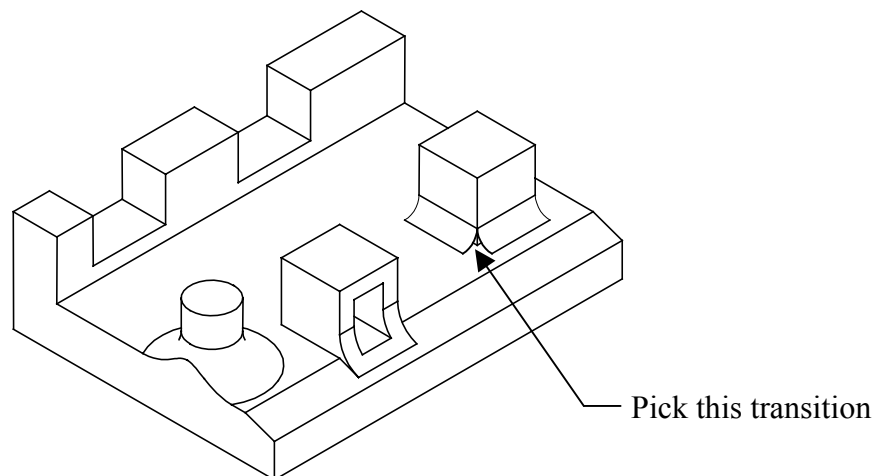
- Press and hold the right mouse button and select **Make Transition**
- Pick the checkmark in the dashboard tool to complete the feature
- The result is shown on the next page

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

- Be sure the selection filter is set to *Geometry*
- Pick the two edges as shown

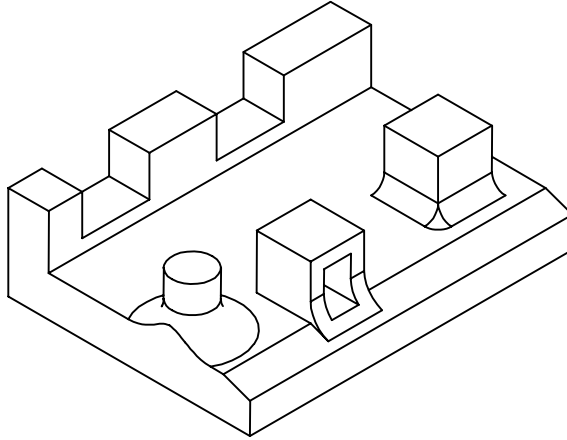


- Press and hold the right mouse button and select **Round Edges**
- Enter < 0.500 > for the radius value
- Press and hold the right mouse button and select **Show Transitions**
- Pick the transition as shown



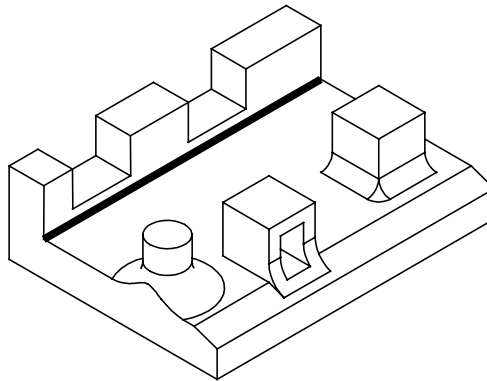
- Press and hold the right mouse button and select **Blend**

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



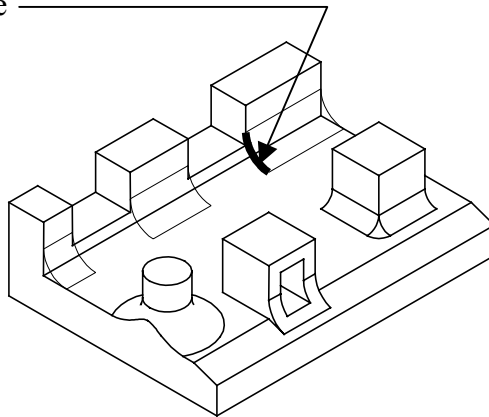
Task 11: Create a round with a ‘stop’ transition.

- Be sure the selection filter is set to *Geometry*
- Pick the edge as shown in bold

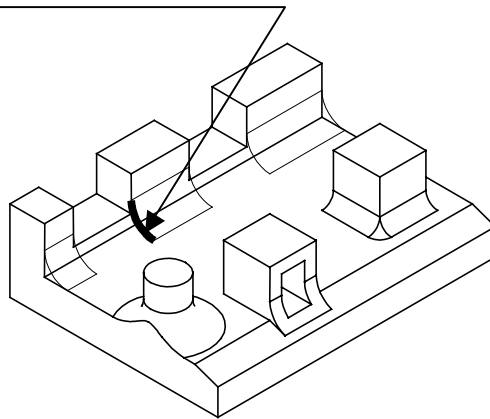


- Press and hold the right mouse button and select **Round Edges**
- Enter < 1 > for the radius value
- Press and hold the right mouse button and select **Show Transitions**
- Delete the two middle transitions using the right mouse button (select the transition then pick **Delete Transition** in the popup menu)

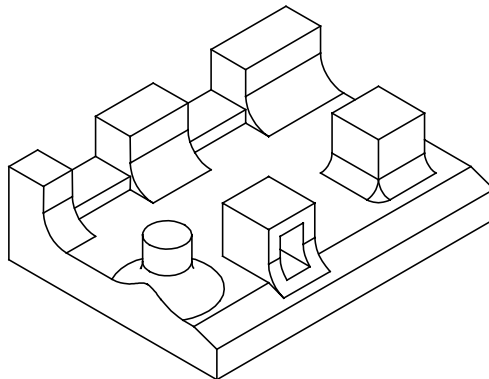
- Pick this edge



- Press and hold the right mouse button and select **Make Transition**
- Pick this edge

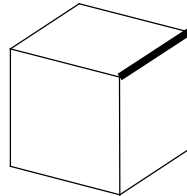


- Press and hold the right mouse button and select **Make Transition**
- Pick the checkmark in the dashboard tool to complete the feature
- The result is shown below
- **Save** the part and **Close** the window

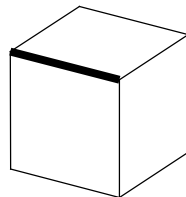


Task 12: Create a round with transitions.

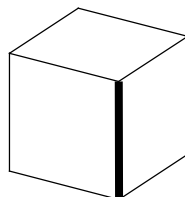
- **Open** the part called 'rounds-3.prt'
- Set the selection filter to **Geometry** then pick the edge shown in bold below



- Press and hold the right mouse button and select **Round Edges**
- Enter < 1 > for the radius value
- Press and hold the right mouse button and select **Add Set**
- Pick the edge shown in bold below

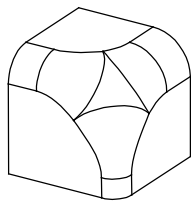
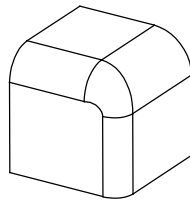
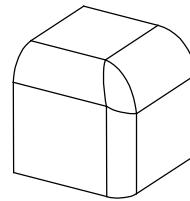


- Enter < 0.750 > for the radius value
- Press and hold the right mouse button and select **Add Set**
- Pick the edge shown in bold below



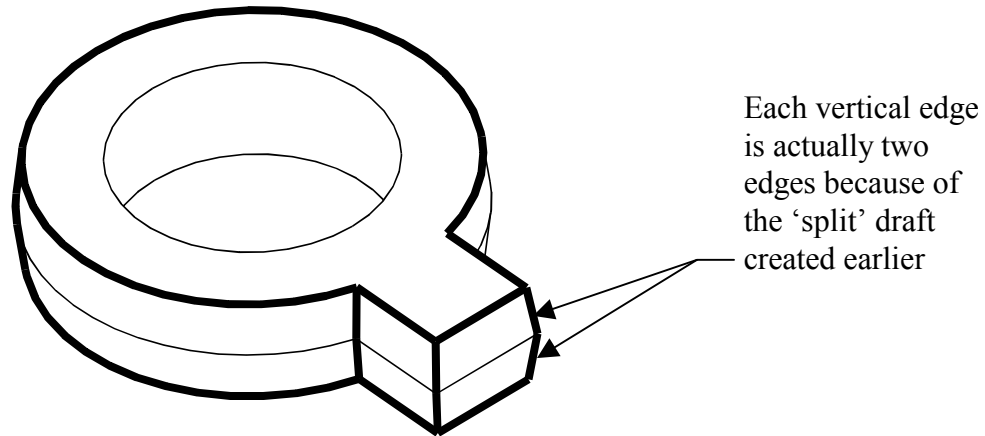
- Enter < 0.500 > for the radius value
- Press and hold the right mouse button and select **Show Transitions**
- Pick the transition area on the model then press and hold the right mouse button
- Move the mouse back and forth over the different transitions in the popup menu

- Select **Corner Sphere**
- Double pick the radius dimension and enter < 1.250 > for the radius of the corner sphere
- Pick 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**
- Pick the round then pick **Edit Definition** in the popup menu
- Press and hold the right mouse button and select **Show Transitions**
- Pick the transition area on the model then press and hold the right mouse button
- Move the mouse back and forth over the different transitions in the popup menu
- Select **Patch**
- Pick the checkmark in the dashboard tool to complete the feature
- The result is shown at the bottom of the page
- Be sure the selection filter is set to **Features**
- Pick the round then pick **Edit Definition** in the popup menu
- Press and hold the right mouse button and select **Show Transitions**
- Pick the transition area on the model then press and hold the right mouse button
- Move the mouse back and forth over the different transitions in the popup menu
- Select **Round Only 1**
- Pick the checkmark in the dashboard tool to complete the feature
- The results are shown below
- **Save** the part and **Close** the window

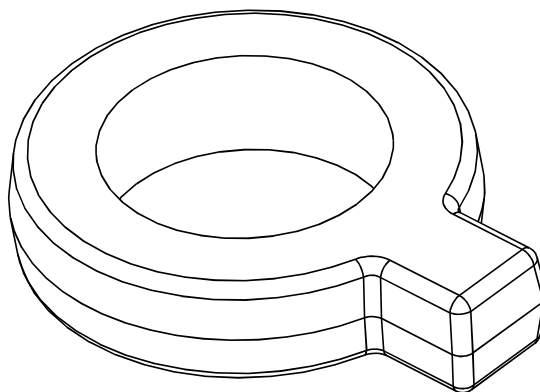
**Corner Sphere****Round Only****Patch**

Task 13: Add rounds to the casting part.


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

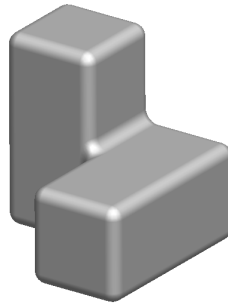



- Press and hold the right mouse button and select **Round Edges**
- Enter < 0.125 > for the radius value
- Pick the checkmark in the dashboard tool to complete the feature
- The result is shown below
- **Save** the part and **Close** the window



Task 14: Add rounds using the Auto Round command.

- **Open** the part called ‘rounds-4.prt’
- Pick **Insert, Auto Round** or pick the icon 
- Enter < 0.125 > for the convex radius value in the dashboard tool
- Use **Same** for the concave radius value in the dashboard tool
- Pick 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’
- Pick **Insert, Auto Round** or pick the icon 
- Enter < 0.250 > for the convex radius value
- Enter < 0.625 > for the convex radius value
- Press and hold the right mouse button and select **Create as a Group** in the popup menu
- Pick **Exclude** in the dashboard tool then pick the edges around the top and bottom of the hole
- Pick 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