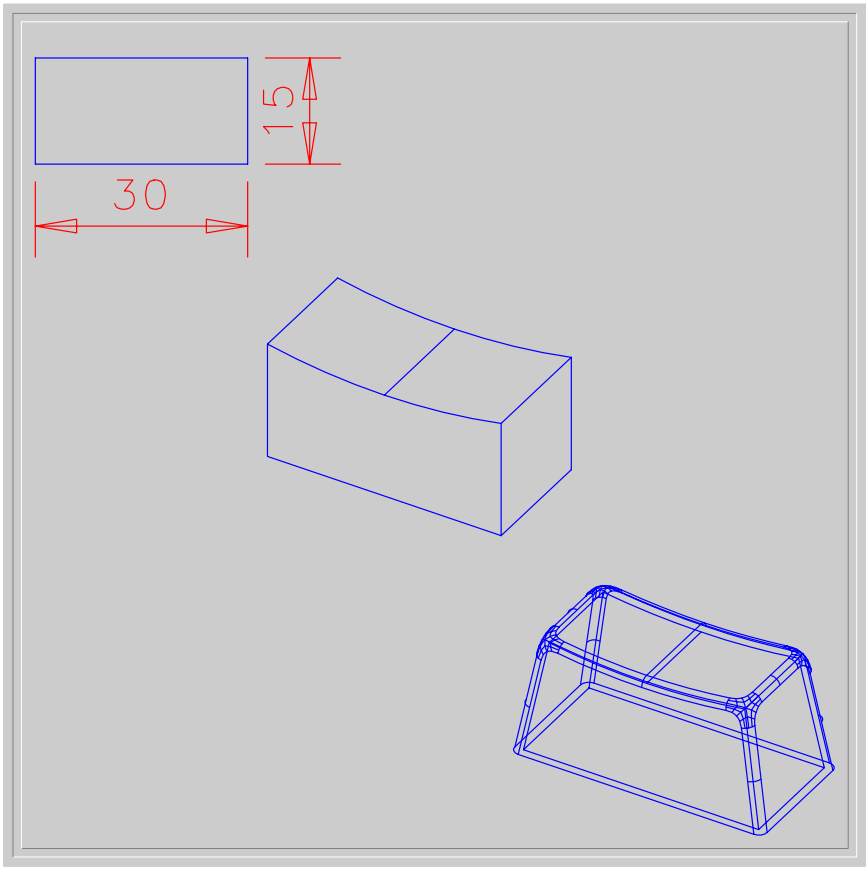


Adding Fillet, Shell, and Draft Features

I-DEAS™ Tutorials: Fundamental Skills

Learn how to:

- add draft features
- add fillet features
- use the *Ball Corner Fillet* option
- add shell features

Before you begin...

Prerequisite tutorials:

1. Getting Started (I-DEAS™ Multimedia Training)

   –or–

   Quick Tips to Using I-DEAS
   –and–
   Creating Parts

2. Sketching and Constraining
3. Using Sections and Sketch Planes
4. Extruding and Revolving Features

If you didn't start I-DEAS with a new (empty) model file, open a new one now and give it a unique name.

File
Open

Open Model File form

Model File name: any unique name
OK

Make sure you're in the following application and task:

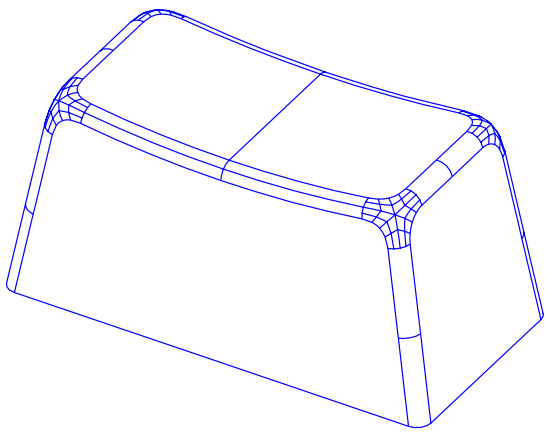
Design, *Manufacturing*, or *Simulation*
Master Modeler

Set your units to mm.

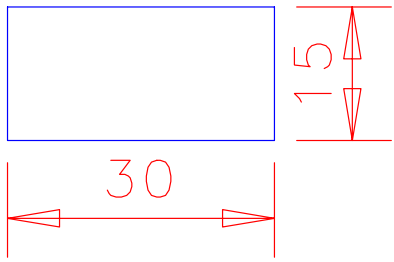
Options
Units

mm (*milli newton*)

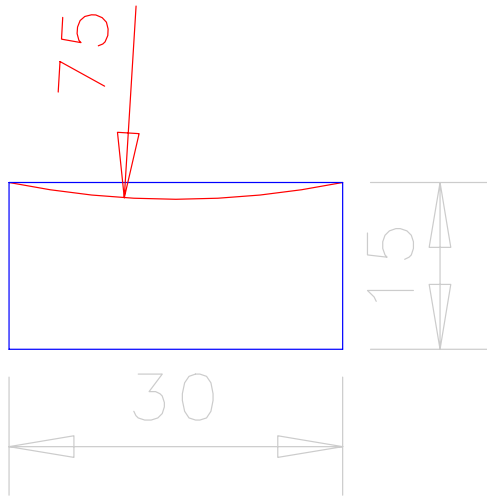
This tutorial shows some draft, fillet, and shell options using a model of a computer keyboard key that you will create.



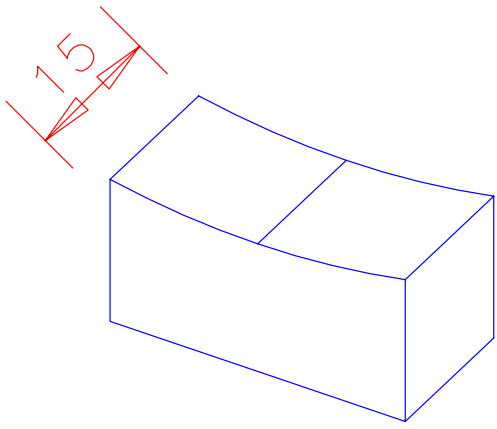
Step 1. Sketch a rectangle representative of the basic size of a keyboard key. Modify dimensions to those shown.



Step 2. Sketch a 3-point arc to shape the key's top surface.



Step 3. Extrude the section with the arc 15mm to create the basic key shape.



Save your model file.

File
Save

Warning!
If you are prompted by I-DEAS to save your model file, respond:

No

Save only when the tutorial instructions tell you to—not when I-DEAS prompts for a save.

If you make a mistake at any time between saves and can't recover, you can reopen your model file to the last save and start over from that point.

Hint
To reopen your model file to the previous save, press Control-z.

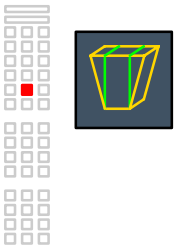
You should already be familiar with the draft option on the *Extrude* command. That's one way to create drafted surfaces. Two limitations on this method are that you can draft only in the direction of the extrude, and you can't use different draft angles on multiple faces.

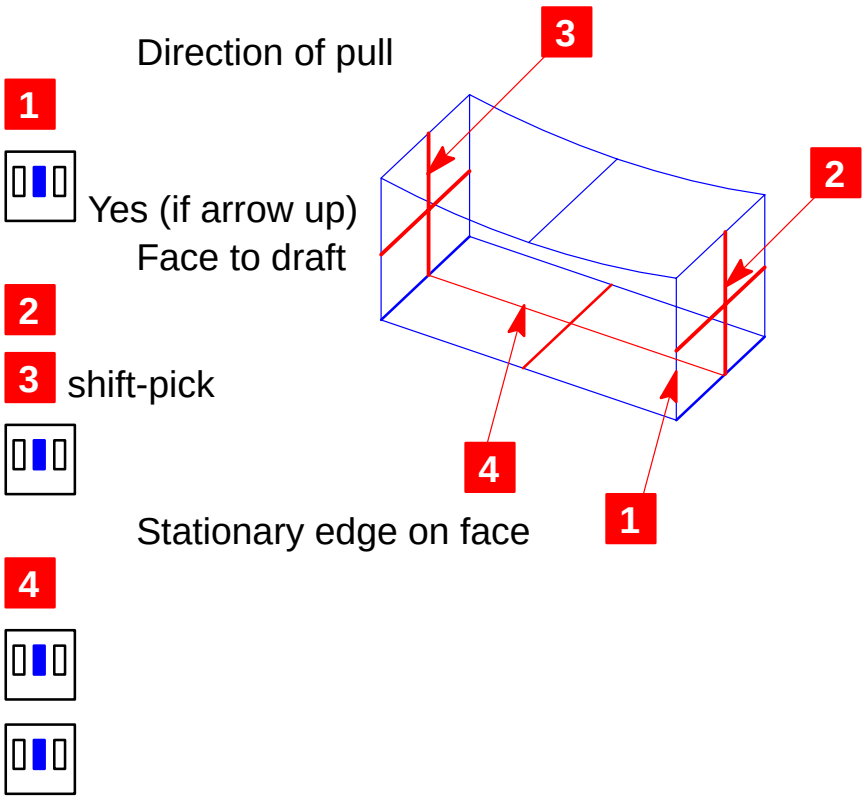
The *Draft* icon allows you to add draft angles to individual faces of a part. This gives you more control.

With the *Draft* icon:

- the pull direction does not have to be in the extrude direction
- you can define different draft angles for each face
- you can define stationary edges which the drafted face rotates about

Add a draft angle of 10 degrees to the two shorter sides, using the bottom face as the stationary face.





Things to notice

Pay attention to the graphic preview, which shows the pull direction and direction of rotation of the faces to draft.

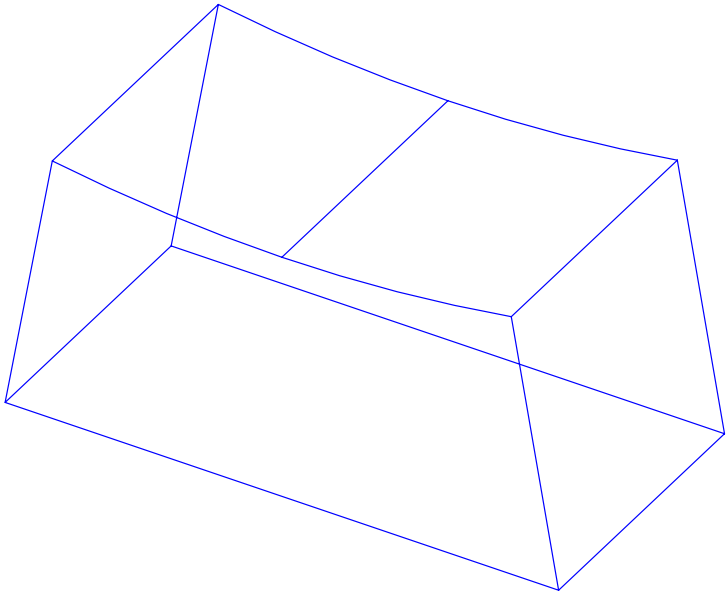
General Draft form

Constant Angle

–10

OK

Result



Recovery Point

File
Save

Add draft features 4 of 6

Draft the front and back (the longer) faces with a draft angle of 5 degrees.

Normal to Surface

1

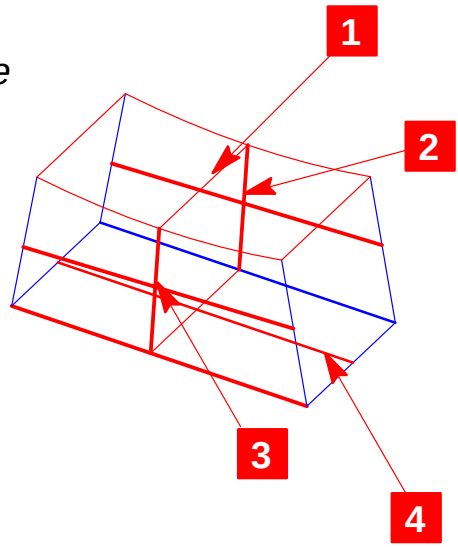
Key In

Yes (if arrow up)

2

3 shift-pick

4 pick bottom surface



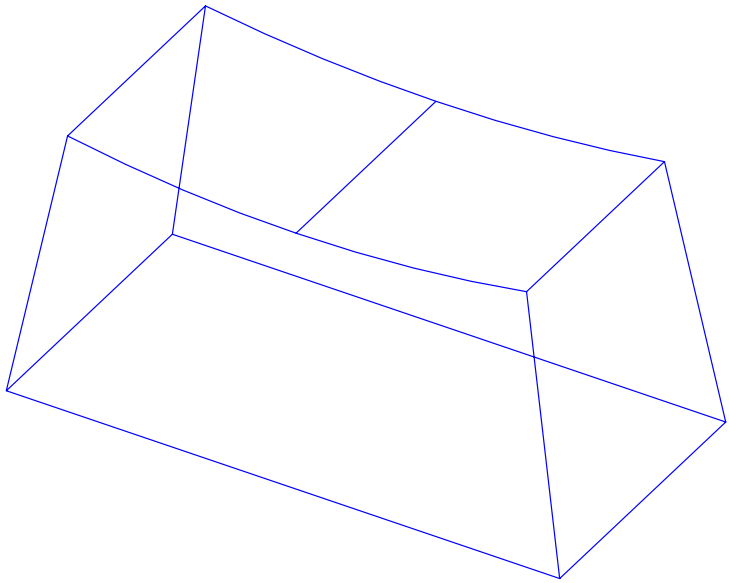
General Draft form

Constant Angle

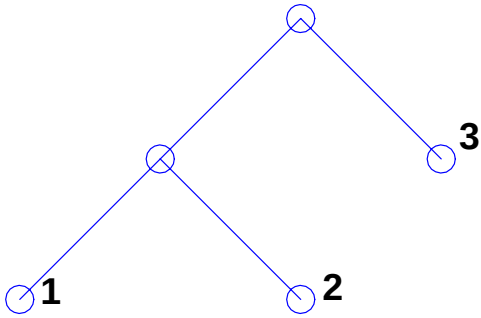
–5

OK

Result



Check the history tree to see how the general draft operations are stored as features.

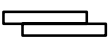


1. base extrusion
2. draft info
3. draft info

You could have done the draft operationi in one step, which would have made the history tree shorter. We chose to do it in two steps to give you more practice.

Deselect All

Recovery Point



File
Save

The *Fillet* icon fillets (rounds) the edges of parts. You can select edges by picking:

- surfaces (pick all associated edges)
- edges
- vertices (pick all edges coming into corner)

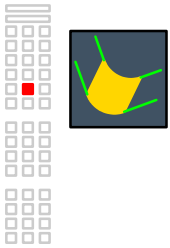
In most cases, you'll enter just one radius value, but there are several other options, such as variable radii and ball corner fillets, that are demonstrated in this section.

Don't confuse the 2D *Fillet* command and the 3D *Fillet* command.

The 2D fillet works on wireframe.

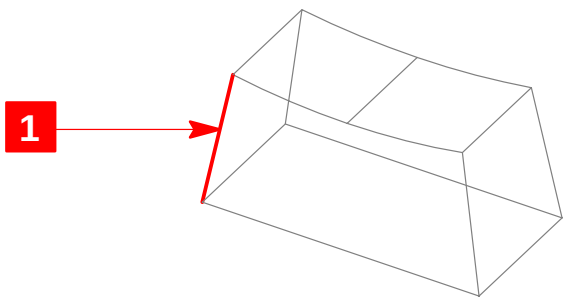
The 3D fillet works on part edges.

To see the difference between a constant and a variable radius, fillet one vertical edge with a constant 3mm radius.



1

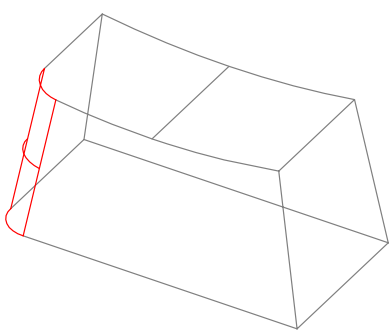
(Done)



Check ***I-DEAS Prompt***.

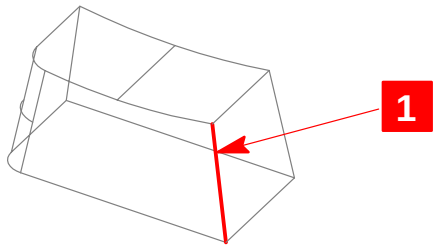
3 (type in and press Return)

(Done)



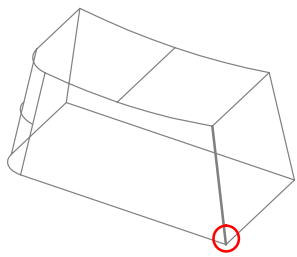
Next, fillet another edge with a variable radius fillet, with 3mm at the top and 6mm at the bottom.

1 pick edge



(Done)

Variable Radius

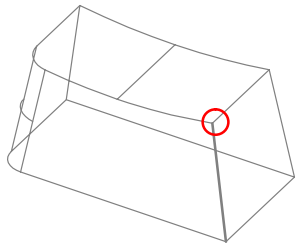


Check *I-DEAS Prompt*.

6 (type in and press Return)

If your circle is on the top corner, enter 3 in the *I-DEAS Prompt* window and press Return.

Continued on next page...

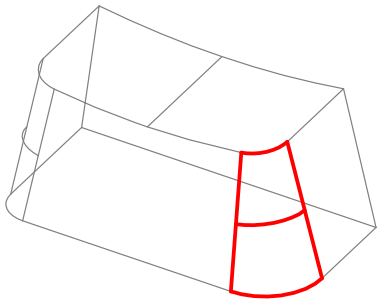


Check *I-DEAS Prompt*.

3 (type in and press Return)

If your circle is on the bottom corner, enter 6 in the *I-DEAS Prompt* window and press Return.

(Done)



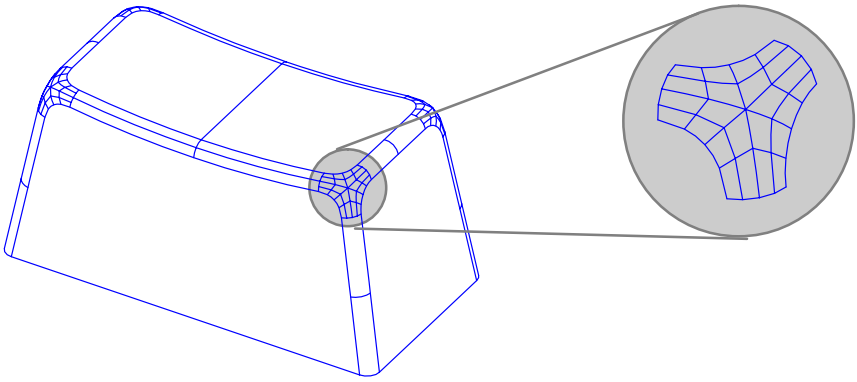
Things to notice

This fillet is larger at the bottom than at the top, resulting in a more natural looking fillet, because of the draft angle. Before you create this type of fillet, make sure your manufacturing facility has the capability to manufacture them.

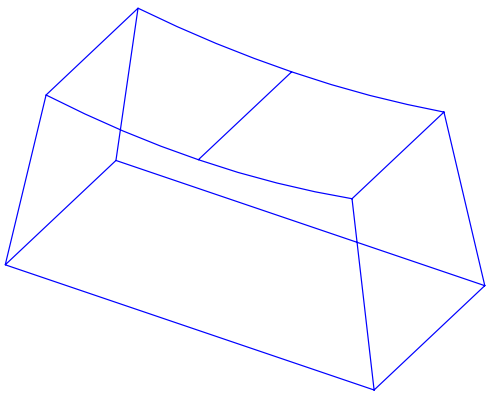
Do not save your model file.

Use the *Ball Corner Fillet* option 1 of 3

A ball corner fillet allows a larger radius at the corner. This is useful for formed sheet metal parts to minimize the stretch in the corner. It also produces a more durable part because the corner isn't as sharp.



To try this fillet option, first open your model file to the point before you applied the two fillets.



Hint
Control-z.

Use the *Ball Corner Fillet* option 2 of 3

Fillet by selecting the four upper vertices. Use a ball corner radius of 1.5mm and 1mm on the edges.

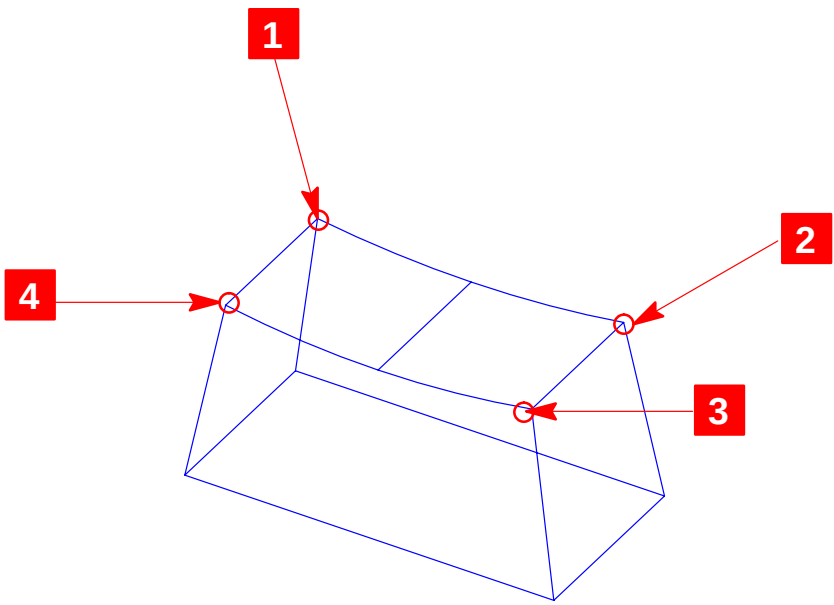
1 pick vertex

2 shift-pick

3 shift-pick

4 shift-pick

 (Done)



 *Options...*

Fillet Options form

Corner Radius

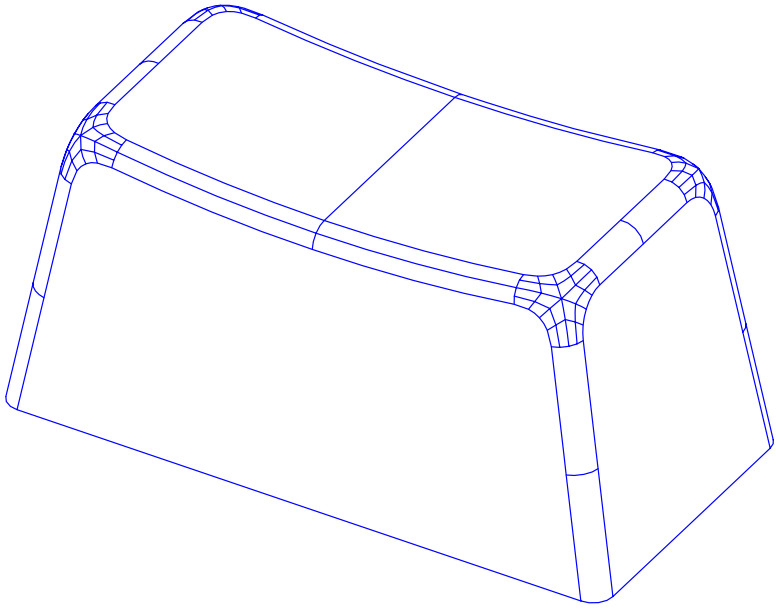
Corner Radius 1.5

OK

Check *I-DEAS Prompt*.

1 (type in and press Return)

(Done)

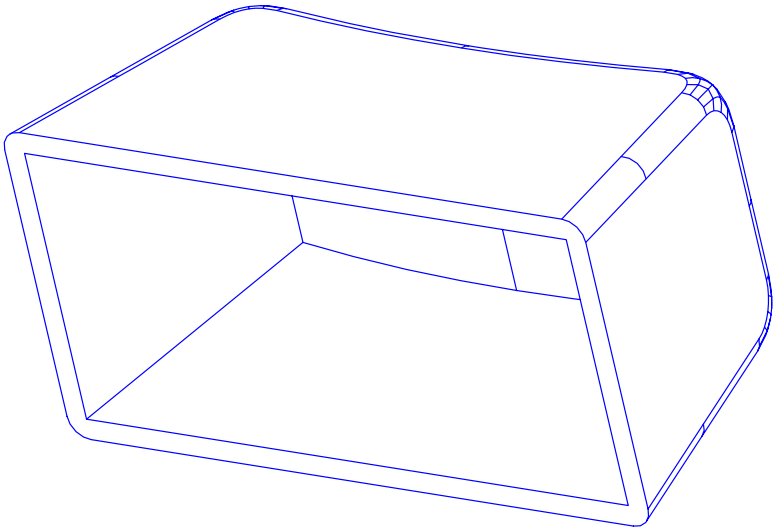


Recovery Point

File
Save

The *Shell* command adds thickness to surfaces. This command can be used to convert open-surface parts into thin solid parts.

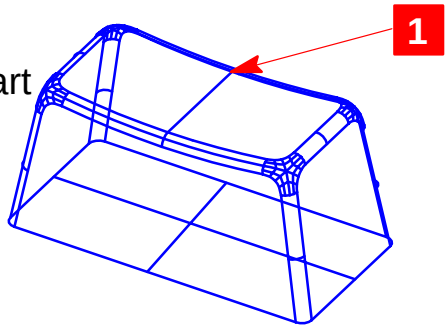
The *Shell* command can also create thin-walled parts from solid parts by deleting faces during the shell operation.



In this section, you will shell the part, leaving the bottom surface open to create a thin-walled plastic key cap.

Shell the part with a thickness of 1mm, deleting the bottom surface, which will be left open.

1 pick anywhere on part



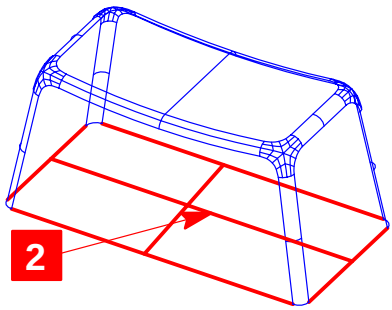
(Done)

Shell form

Thickness: 1

(to delete the bottom face)

2 pick face

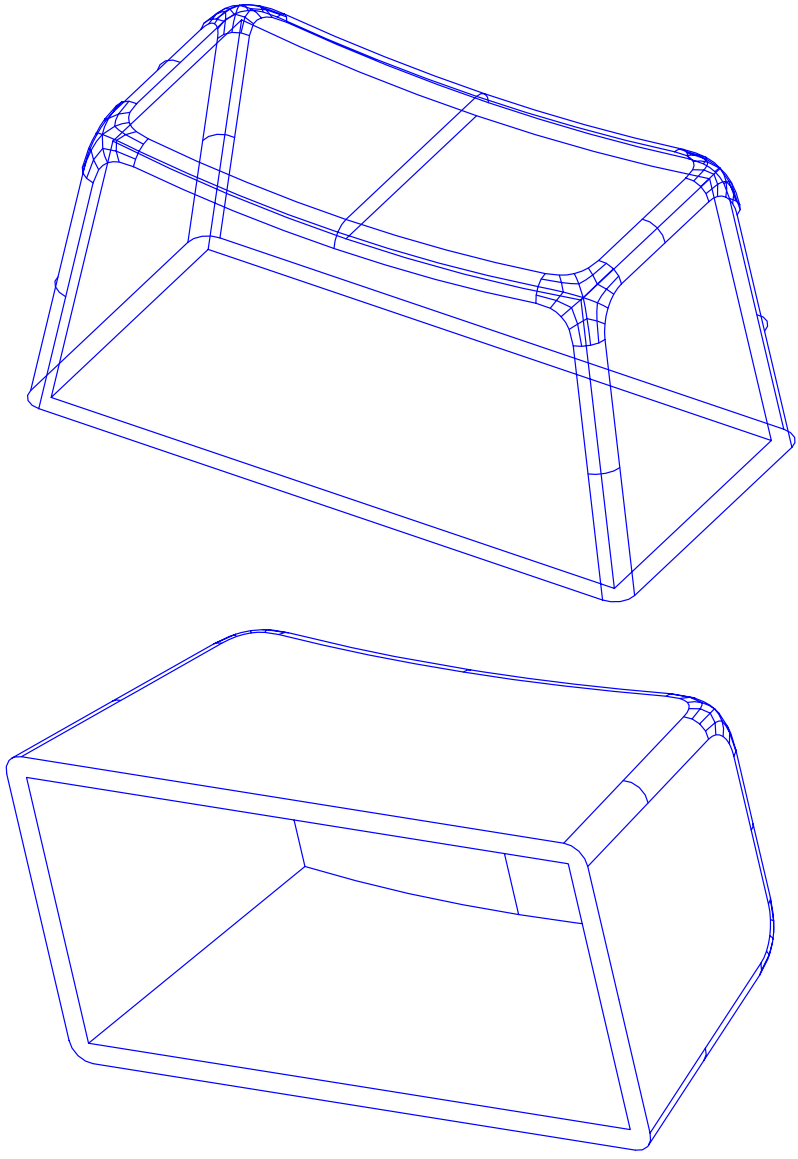


(Done)

Shell form

OK

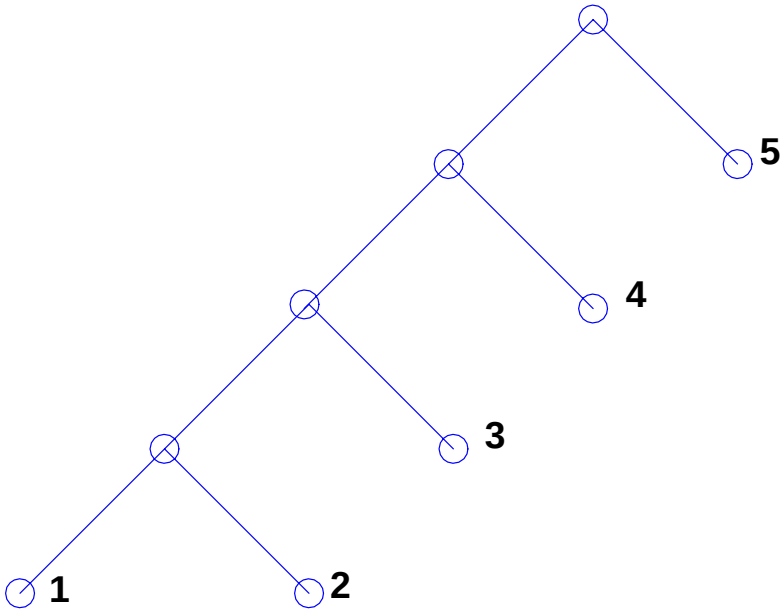
Result



Things to notice

Notice that the part is now open from the bottom.

Check the part's history to see how the fillet, shell, and draft features are stored with the part.



Things to notice

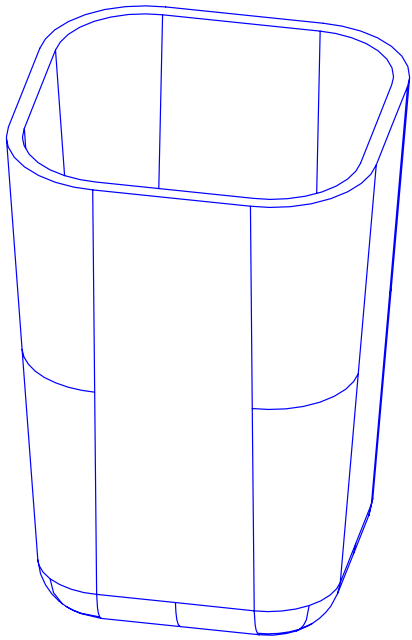
If you made the part following the instructions exactly, your history tree will have these features:

1. extrude
2. draft info
3. draft info
4. fillet round info
5. shell info

In most parts, fillet, shell, and draft feature types are related. Usually, you should apply draft before fillets. You may, in some cases, want to also shell before applying fillets. You would then fillet the inside and outside separately.

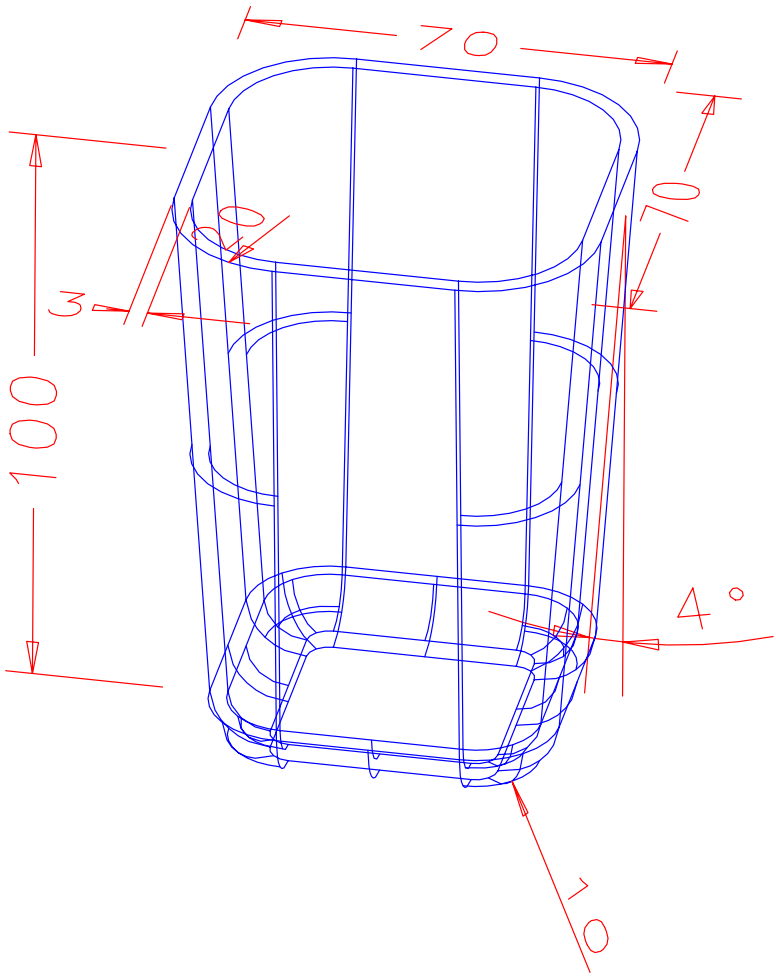
Before exiting the tutorial, try the “On your own” exercise on the next page. If you would rather try it later, skip to the last page for wrap-up instructions.

Design a simple pencil holder as a thin-walled shelled plastic part.



Try this on your own. You should be able to do this with the skills learned in this and previous tutorials.

If you need help, refer to the next page, which gives you the dimensions and hints on how to create the part shown.



Hint

Step 1. Start with a filleted square (the shape of the top).

Step 2. Extrude with draft (negative value).

Step 3. Fillet the bottom surface.

Step 4. Shell the part, deleting the top face.

Tutorial wrap-up

You have completed the Adding Fillet, Shell, and Draft Features tutorial.

Delete or put away the parts. These parts are not used in any other tutorials.

See also...

For additional information on many of the concepts covered in this tutorial, see the following in the I-DEAS *Help* facility:

Help, Manuals, Table of Contents

Design User's Guide
Design Techniques and Examples
Feature Creation Strategy

Help, On Context



What's next?

After exiting, choose the Fundamental Skills tutorial that is next in the learning path you are following.

To exit this tutorial, select:

File
Exit

Warning!
Do not use the menu in the *I-DEAS Icons* window to exit. Use the menu in the Acrobat Reader window.

I-DEAS Master Series™ Online Tutorials

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