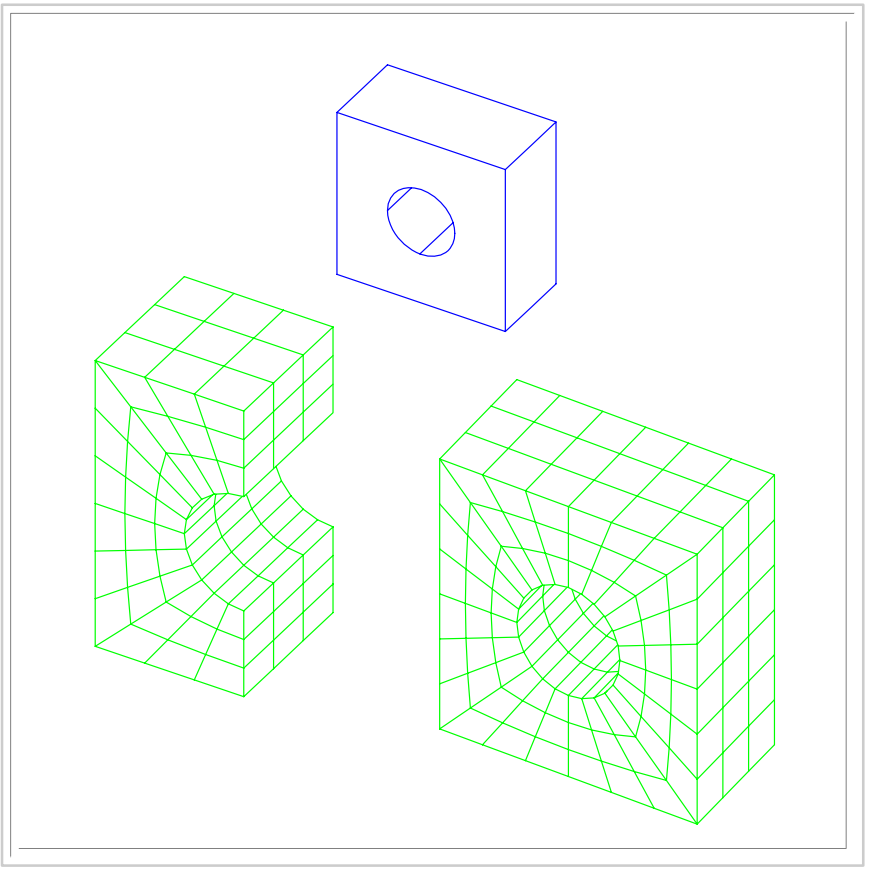


Mapped Meshing of Volumes

I-DEAS™ Tutorials: Fundamental Skills

This tutorial covers techniques for mapped meshing of volumes.

Learn how to:

- partition volumes for meshing
- mesh volumes

Before you begin...

Prerequisite tutorials:

- Getting Started (I-DEAS™ Multimedia Training)

  –or–

  Quick Tips to Using I-DEAS
  –and–
  Creating Parts
- Introduction to Simulation
- Managing Parts in Model Files
- Free Meshing
- Mapped Meshing on Surfaces

This tutorial builds on the concepts introduced in the Free Meshing and Mapped Meshing on Surfaces tutorials.

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:

Simulation
Master Modeler

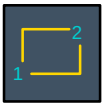
Set your units to mm.

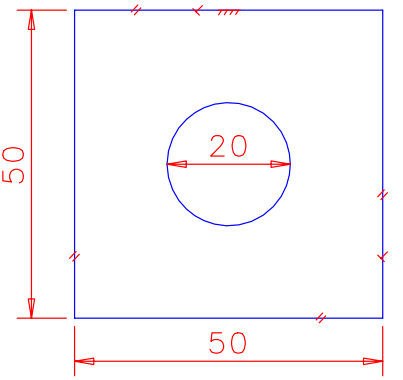
Options
Units

mm (*milli newton*)

What: Sketch the square and circle to the dimensions shown.

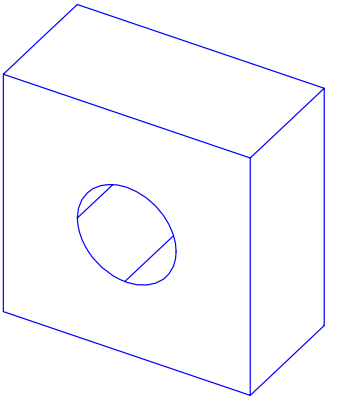
Hint





What: Extrude the square and circle together 25mm.

Hint

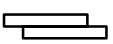


What: Name this part.

Hint

☐ *Name*: Mapped Volume

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.

Why:
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.

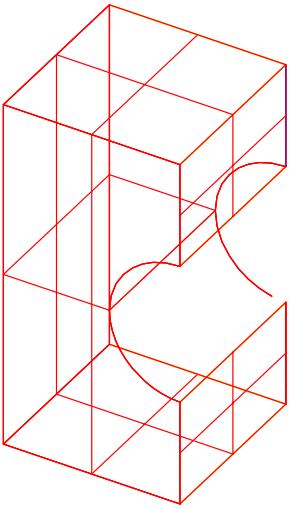
Hint
To reopen your model file to the previous save, press Control-Z.

Partition volumes for meshing 1 of 4

The same concepts apply regardless of whether you're meshing volumes or surfaces. When defining the mesh on a volume, you must do the following for each surface:

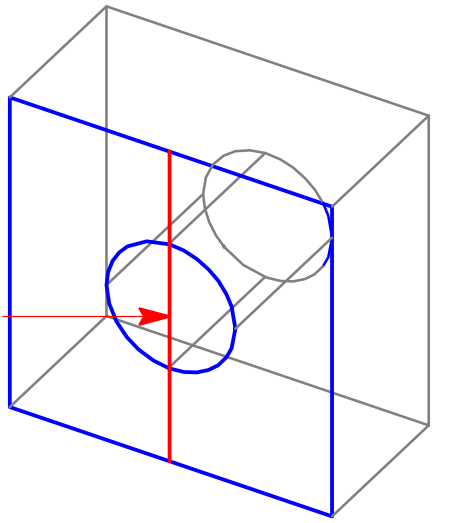
- define corners
- define elements per side
- set edge biasing

You have to combine surfaces when there are more than 6 surfaces defining the volume.



What: Sketch a vertical line on the front surface (from the center of one side to the center of the other side).

Hint



What: Partition the part to divide it into two volumes.

How:

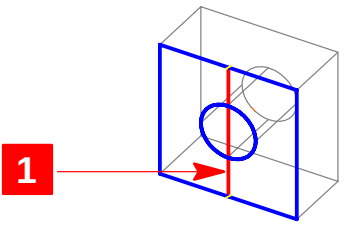
 *Sections Options...*

 *Stop at intersections* (off)

 *OK*

 *Partition*

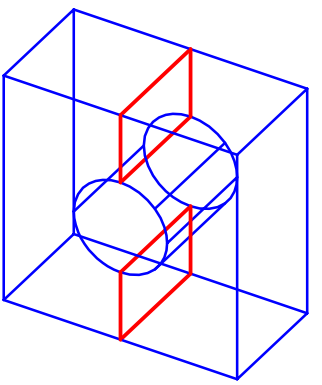
1



 *Done*

Extrude Section form

 *OK*

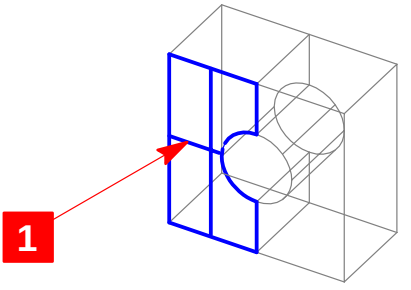


What: Select the left volume to see that the part contains 2 volumes.

How:

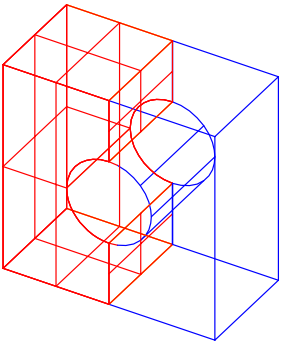
Deselect All

1 pick 4 times on surface



Done

Things to notice Notice that multiple picking at the same location highlights first a surface, the part, a feature, then a volume.



Partition is like the *Split* command except that it splits surfaces and creates interior surfaces to partition the solid into multiple volumes.

Recovery Point

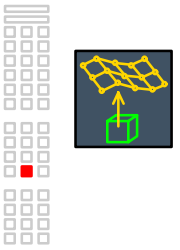
File
Save

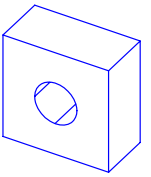
In the next steps, you'll mesh the volume.

What: Create an FE model to use for the mesh.

How:

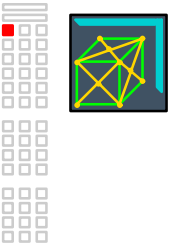
Meshing

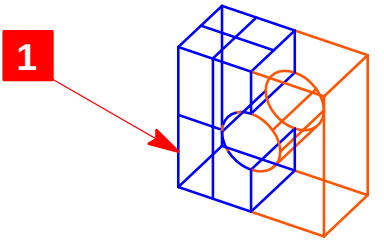




What: Define the corners of each surface.

How:





1 pick left volume

Done

Define Mesh form

Mapped

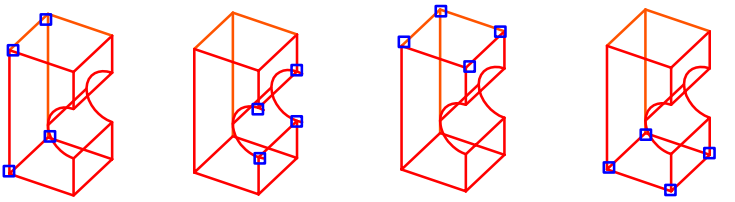
Mapped Options...

Mapped Meshing Options form

Define Corners

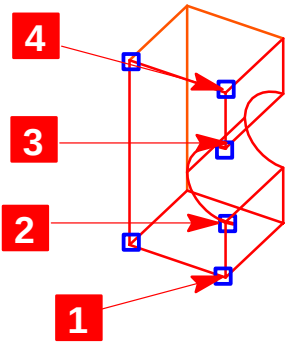
Hint

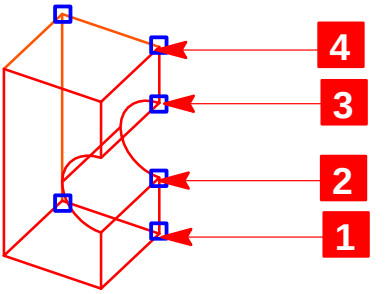
Accept the default (using the middle mouse button) of 4 corners for all surfaces except the front and back (shown with picks below). (Note: For clarity, the right half is not being shown.)



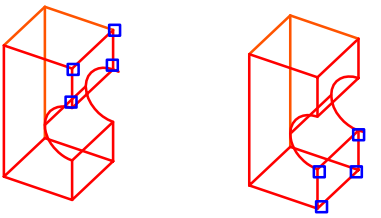
On these two surfaces, shift-pick the 4 points in a line.

 shift-pick 1 thru 4





Accept the remaining defaults.



 Do not dismiss any of the forms.

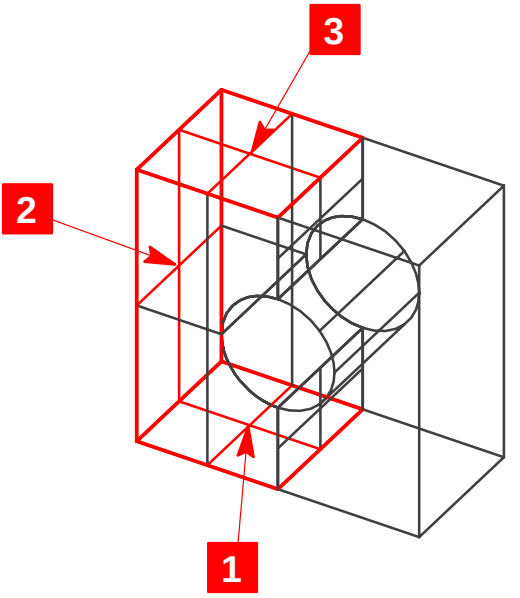
What: Combine the 3 surfaces into a combined surface for meshing.

How:

Mapped Meshing Options form

Combine Surfaces

pick surfaces 1-3



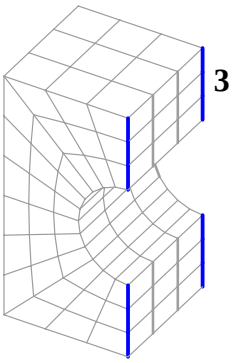
Why: A mesh volume must be made up of 6 surfaces to define a rectangular volume, or 5 surfaces to define a wedge. This volume is bounded by 8 surfaces, so 3 have to be combined to create a composite surface.

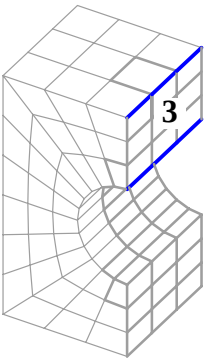
What: Define elements for each side.

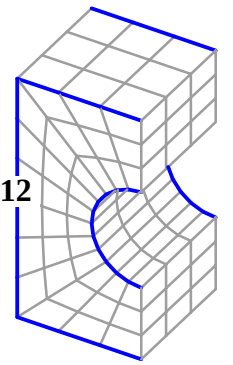
How:

Mapped Meshing Options form

Define Elements/Side







Check *I-DEAS Prompt*.

number of elements for highlighted sides: See the figures above to determine the number of elements to enter for each edge.

Done

What: Repeat the process for the remaining edges.

Mapped Meshing Options form

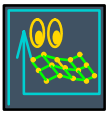
Dismiss

Do not dismiss the Define Mesh form.

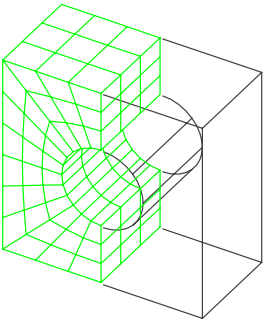
What: Generate the solid mesh.

Hint

Define Mesh form



Modify Mesh Preview form



Keep Mesh

Hint

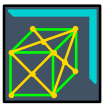
Use *Redisplay* to generate a new display for the model. It displays the mesh without interior lines.

Recovery Point

File
Save

What: Complete the model by defining and generating the mesh on the other volume.

Hint



 pick right volume

 *Done*

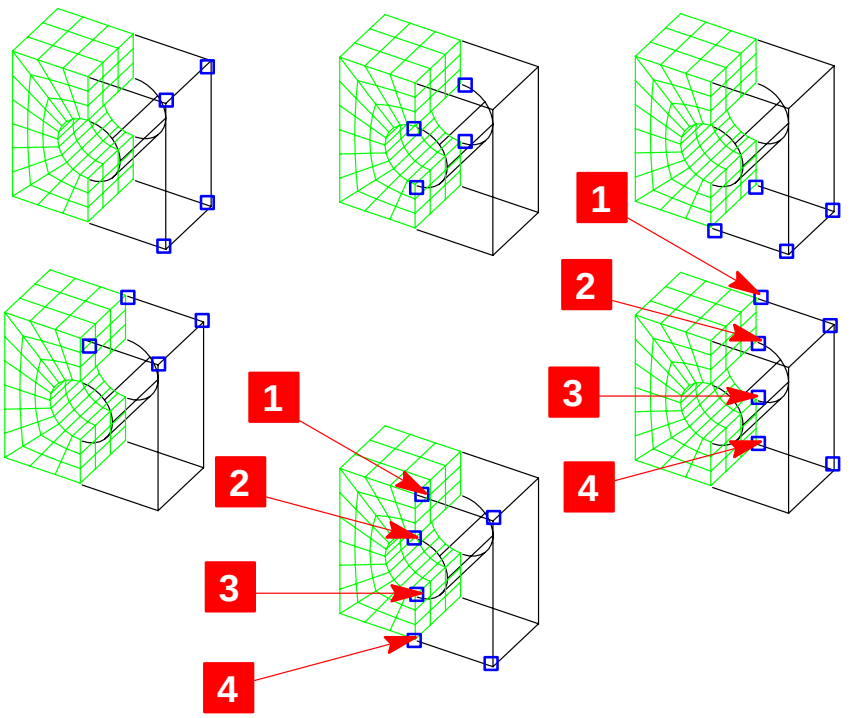
Define Mesh form

 *Mapped*

 *Mapped Options...*

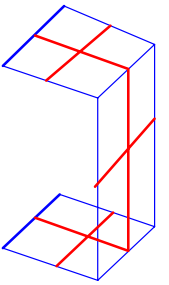
Mapped Meshing Options form

 *Define Corners*

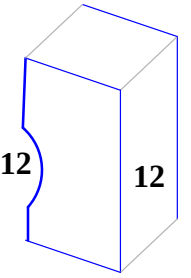


Mapped Meshing Options form

Combine Surfaces



Define Elements/Side

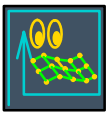


Mapped Meshing Options form

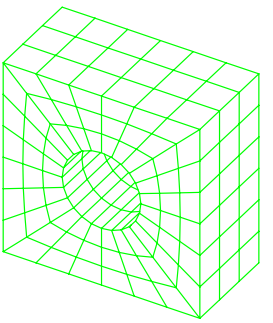
Dismiss

Do not dismiss the Define Mesh form.

Define Mesh form



Modify Mesh Preview form



Keep Mesh

There are two methods to create a part that can be used for meshing surfaces. However, it may be easier to extrude to create a solid part rather than to create a single surface.

When working with individual surfaces for meshing, create the outer boundary first, then trim or split the surface into regions.

Remember to use *Sketch in Place*.

When using *Trim*, remember to pick all the regions to keep.

Use the *Split* option of *Extrude* to divide surfaces. The *Split* icon is not as useful for finite element modeling, because it requires you to create a splitting part first.

Use the *Partition* option of *Extrude* when you want to split surfaces on a part and also create partitioning surfaces interior to the part to prepare volumes for meshing. The *Partition* icon requires you to create a partitioning part first.

You have completed the Mapped Meshing of Volumes tutorial.

Delete the FE model, then delete the part. This part is not used in any other tutorial.

Hint

See also...

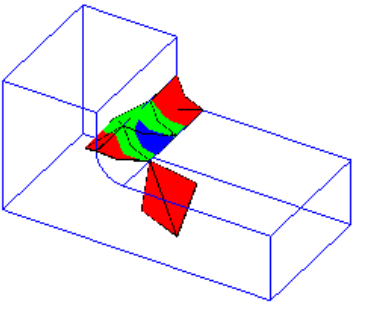
For additional information on the concepts covered in this tutorial, see the following:

Help, Manuals, Table of Contents

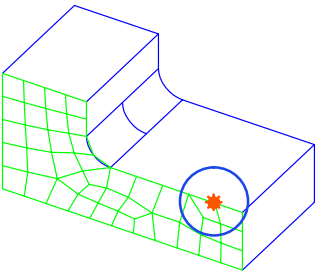
Simulation: Finite Element Modeling User's Guide
- Simulation Techniques and Examples
  - Creating Geometry
- Meshing a Model
  - Icon Overview for Meshing
  - Creating a Mesh

What's next?

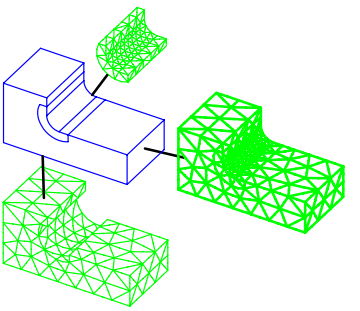
The tutorial on checking element quality shows how to compute element quality checks.



The tutorials on boundary conditions cover related information on ways to control node locations.



The tutorial on preparing a part for analysis includes partitioning a part into multiple volumes to control meshing.



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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