Altair HyperMesh 2019 Tutorials

HM-2040: Creating and Editing Line Data

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In this tutorial, you will learn how to:

- Create circle, arc, line, and tangent lines
- Duplicate and translate lines
- Edit lines by splitting and displaying their IDs
- Delete redundant arcs and lines
- Duplicate and reflect an arc
- Create a surface square and two parallel lines on an X-Y plane
- Create a fillet between two lines
- Exporting geometry in IGES format

Sometimes CAE users need to create models from sketches where there is no pre-existing geometry. The tools in this tutorial will help you accomplish that task.

Exercise: Creating and Editing Line Data

In this exercise, you will learn how to create lines and surfaces.

Step 1: Create a component collector to geometry.

1. To create a component, right-click in the **Model** browser and select *Create* > *Component* from the context menu, or click *Collectors* > *Create* > *Components* from the menu bar.

2. In the **Create Component** dialog, enter `geometry` in the **Name** field.

3. Click the **Color** swatch and select yellow from the box of colors.

4. Click *Create*.

Step 2: Create nodes.

1. On the standard toolbar, click 🔾.

2. To open the **Create Nodes** panel in the **XYZ** subpanel, click *Geometry* > *Create* > *Nodes* > *XYZ* from the menu bar.5

3.   Enter the following **X**, **Y**, and **Z** coordinates listed in the table below to create five nodes. Click **create** for each of the nodes.

Node	X	Y	Z
1	0	0	0
2	0	0	25
3	0	0	37
4	0	5	25
5	0	5	-2

4.   Click **return**.

5.   To fit the size of the model to the graphics area, press **f**.

Step 3: Display the node IDs.

1.   To open the **Numbers** panel, click 123 on the **Display** toolbar.

2.   Verify that the entity selector is set to **nodes**.

3.   To select all of the nodes in the model, click **nodes >> all**.

4.   Select the **display** check box.

5.   Click **on**. HyperMesh displays the node IDs.

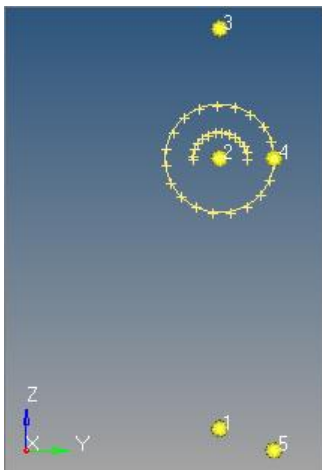6.   Click **return**.

Step 4: Create a circle.

1.   To open the **Circle Center and Radius** panel, click **Geometry** > **Create** > **Lines** > **Circle Center and Radius** from the menu bar.

2.   Verify that the **node list** selector is active.

3.   Select **Node 2**. This will be the location of the circle's center.

4. Set the **orientation vector** to **x-axis**.

5. In the **radius** field**,** enter 5.

6. Click *create*. HyperMesh creates the circles's center.
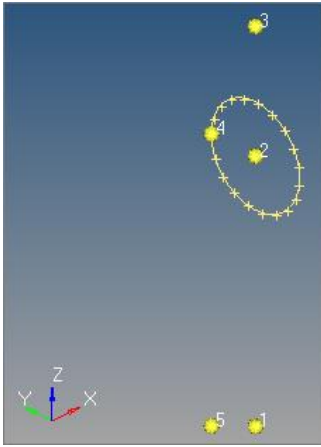
Step 5: Create an arc.

1. To open the *Arc Center and Radius* subpanel, click .

2. Verify that the **node list** entity selector is active.

3. Select **node 2**. This node will be the center of the arc as well as the base for the axis of rotation.

4. Verify that the **orientation vector** is set to **x-axis**.

5. In the **Radius** field, enter 2.5.

6. In the **Offset** field, enter 90.

7. In the **Angle** field, enter 180.

8. Click *create*. HyperMesh creates an arc.

9. On the **Standard** toolbar, click .

Step 6: Create a line.

1. To open the **Linear Nodes** subpanel, click △.
2. Select *Node 4* and *Node 5*.
3. Click *create*. HyperMesh creates a line between nodes 4 and 5.
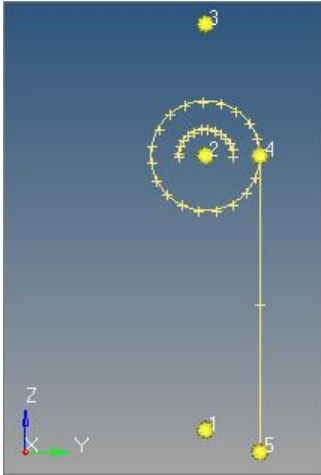
4. Click *return*.


Step 7: Duplicate and translate lines.

1. To open the **Translate** panel, click *Geometry* > *Translate* > *Lines* from the menu bar.
2. Verify that the entity selector is set to **lines**.
3. Select the line that was created between nodes 4 and 5.
4. Click *lines >> duplicate >> current comp*. Hypermesh copies the new line into the current component, **Geometry**.
5. Set the **orientation vector** to *y-axis*.
6. In the *magnitude =* field, enter 10.0.
7. Click *translate-*.

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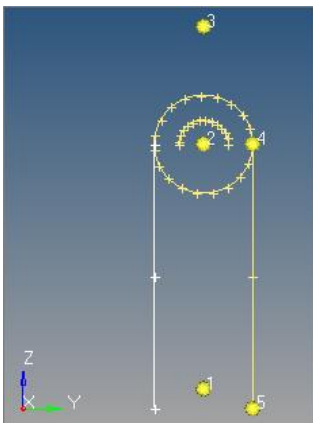
8. Click *return*.

Step 8: Edit lines by splitting at a line.

1. To open the **Line Edit** panel, click *Geometry* > *Edit* > *Lines* > *Split at Line* from the menu bar.

2. Verify that the **lines** selector is active.

3. Select the top, right curved line of the circle indicated in the following image.
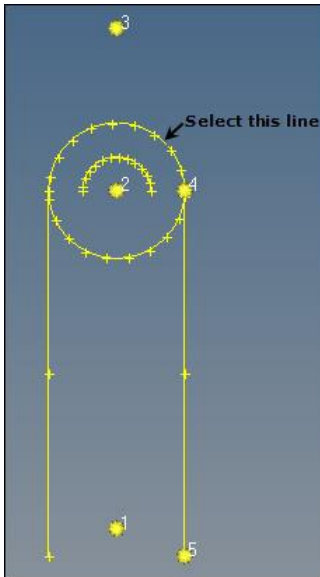
4. Click *cut line*.

5. Select the line between nodes 4 and 5.

6. Click *split*. The circle has one quarter of it's radius split off from the rest.

7. Repeat steps 8.2 through 8.6 to select the top, left curved line of the circle and the other line that was translated in step 7.

8. Click *return*.

Step 9: Display the line IDs.

1. Go to the **Numbers** panel.

2. Set the entity selector to *lines*.

3. Click *lines >> all*. HyperMesh selects all of the lines in the model.

4. Verify that the **display** check box is selected.

5. To display all of the line IDs, click *on*.

6. Click *return*.

Step 10: Delete a redundant arc.

1. To open the **Delete** panel, click ✖ on the **Collectors** toolbar, or press **F2**.
2. Set the entity selector to **lines**.
3. Select the bottom right curved line of the circle indicated in the following image.
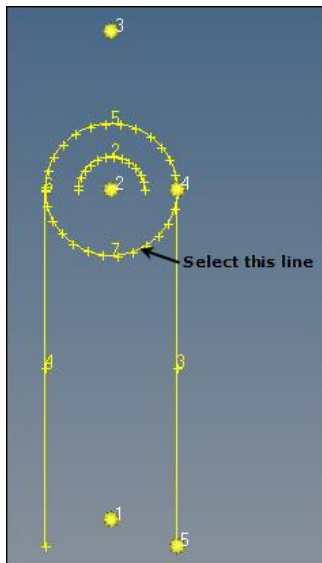
4. Click **delete entity**. HyperMesh deletes the redundant arc.
5. Select the bottom left curve and then click **delete entity**.
6. Click **return**.

Step 11: Duplicate and reflect an arc.

1. To open the **Reflect** panel, click **Geometry** > **Reflect** > **Lines** from the menu bar.
2. Set the entity selector to **lines**.
3. Select the arc (line ID 2).
4. Set the **orientation vector** to **z-axis**.
5. Select **Node 2** as the base node.
6. Click **lines** >> **duplicate** >> **original comp** to copy the new line into the current component, **Geometry**.
7. Click **reflect**. HyperMesh creates the lower arc.

8. Click *return*.
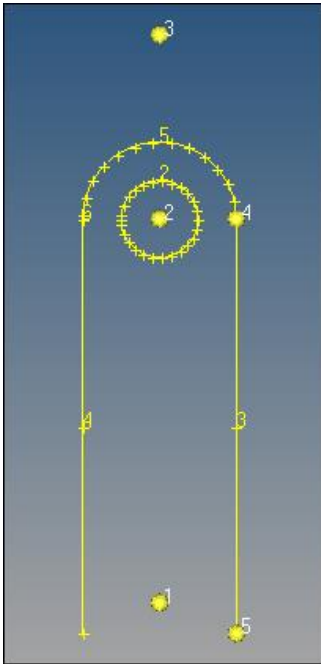
Step 12: Create two tangent lines.

1. To go to the **Tangents** panel, click *Geometry* > *Create* > *Lines* > *Tangent* from the menu bar.

2. Set the entity selector to *node list*.

3. Select *Node 3*.

4. Activate the *line* selector.

5. Select the semi-circular line (line ID 5).

    Note: Your line IDs may be different, depending on whether you needed to perform the split/delete/duplicate tasks more than once.

6. Click *create*. HyperMesh creates two tangent lines.

7. Select one of the tangent lines.

8. Repeat steps 12.3 through 12.7.

9. Select the other tangent line.

10. To exit the panel, click ***return***.
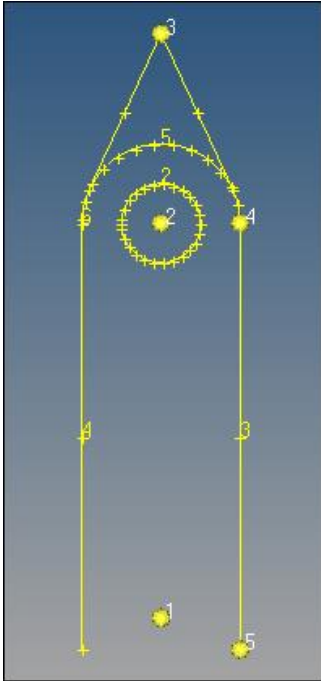
Step 13: Redisplay the line IDs.

1. Go to the **Numbers** panel.

2. Set the entity selector to ***lines***.

3. Click ***lines >> all***.

4. Verify that the **display** check box is selected.

5. Click ***on***. HyperMesh displays all of the line IDs.

6. To exit the panel, click ***return***.

Step 14: Split curves by tangent line and delete redundant line.

1. Go to the **Split at Line** subpanel.

2. Verify that the **lines** selector is active.

3. Select the semi-circular line (ID 5).

    Note: The line IDs may be different.

4. Click ***cut line***.

5. Select the left tangent line (ID 9).

6. Click ***split***. HyperMesh splits the semi-circular line (ID 5) with the selected tangent line (ID 9).

7. Repeat steps 14.2 through 14.6 to cut the semi-circular line (ID 5) with the right tangent line (ID 8).

8. Go to the **Delete** panel.

9. Verify that entity selector is active and set to *lines*.

10. Select the semi-circular line between the two tangent lines indicated in the following image.
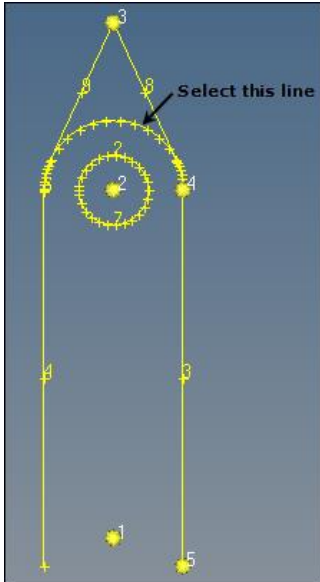
11. Click *delete entity*. HyperMesh deletes the semi-circular line.

12. To exit the panels, click *return* twice.
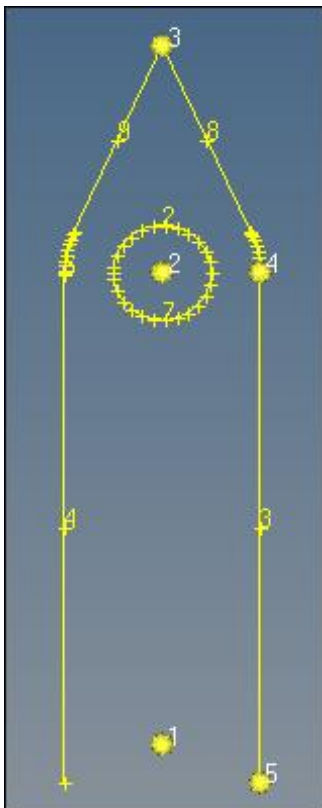
Step 15: Create a component collector for surfaces.

1. In the **Model** browser, right-click and select *Create* > *Component* from the context menu.

2. In the **Create component** dialog, enter `surfaces` in the **Name** field.

3. Click the **Color** icon, and select purple.

4. Click *Create*.

Step 16: Create a surface square on an X-Y plane.

1. From the main menu, go to the **2D** page and select *Planes*.

2. Go to the **Square** subpanel.

3. Set the **orientation vector** to *z-axis*.

4. Select *Node 1* as the base reference node.

5. Switch **mesh, keep surf** to *surface only*.

6. In the **size=** field, enter `30`.

7. Click *create*. HyperMesh creates a square surface.

8. To exit the panel, click *return*.
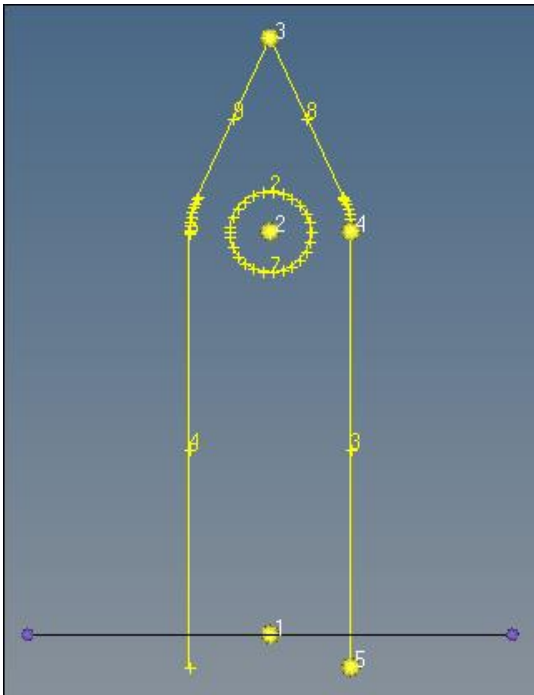
Step 17: Create a line that connects two parallel lines on an X-Y plane.

1. To open the **Intersect** panel, click *Geometry* > *Create* > *Lines* > *Intersect*.

2. To create a line on the X-Y plane, set the **orientation vector** to *z-axis*.

3. Select **Node 1** as the base node.

4. Activate the **line list** selector.

5. Select the two straight lines that are perpendicular to the X-Y plane indicated in the following image. HyperMesh displays a bold, white line in the graphics area to represent the results.
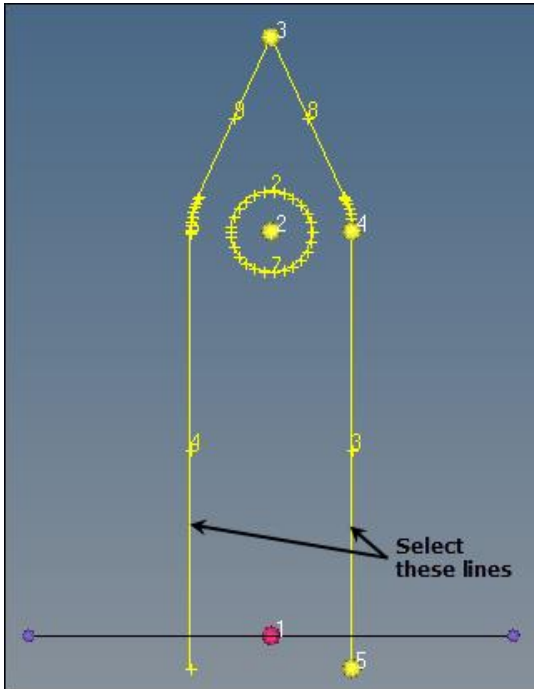
6. Click **create**. HyperMesh creates the line.

7. To exit the panel, click **return**.

Step 18: Switch the current working component surfaces to *geometry*.

1. In the **Model** browser, **Component** folder, right-click on **geometry** and select **Make Current** from the context menu.

   Note: From this point on, when you create any new elements or geometry, HyperMesh will place them in the **geometry** component collector.


Step 19: Extend a line to a surface edge.

1. On the **Standard Views** toolbar, click .

2. To open the **Extend** panel, click *Geometry* > *Edit* > *Lines* > *Extend* from the menu bar.

3. Toggle from **distance =** to *to:*.

4. Set the entity selector to *line*.

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5. Activate the top **line** selector.

6. Select the line that you created in step 17 (the line that passes through **Node 1**) as the line to be extended. HyperMesh places a red V at the beginning of the line to be extended.

7. Activate the lower **line** selector.

8. Select the lower-right edge of the purple plane indicated in the following image.
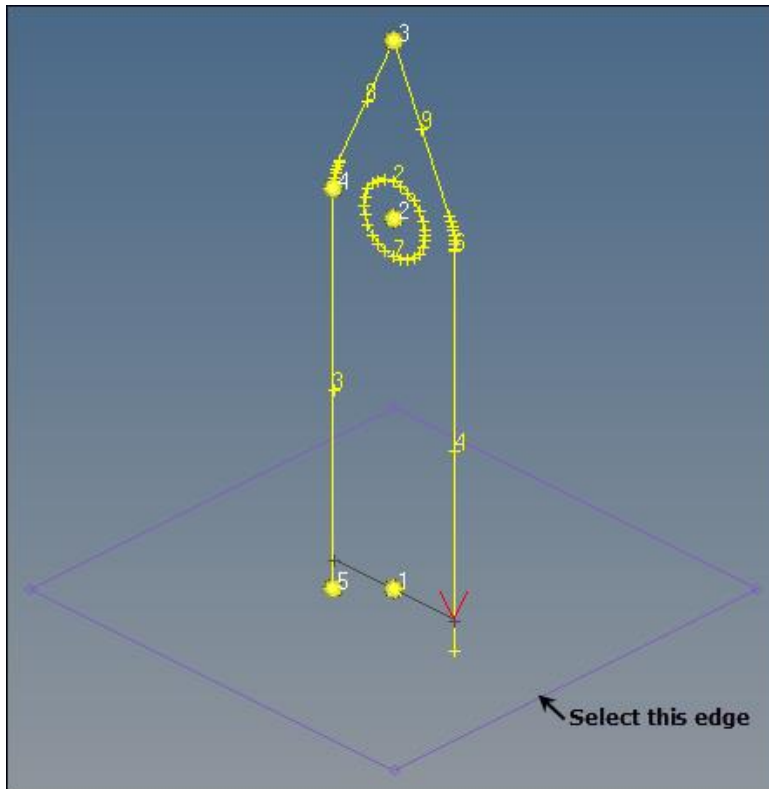
9. Click *extend-*. HyperMesh extends the line to reach one surface edge.

10. To exit the panel, click *return*. Your model should resemble the following image.
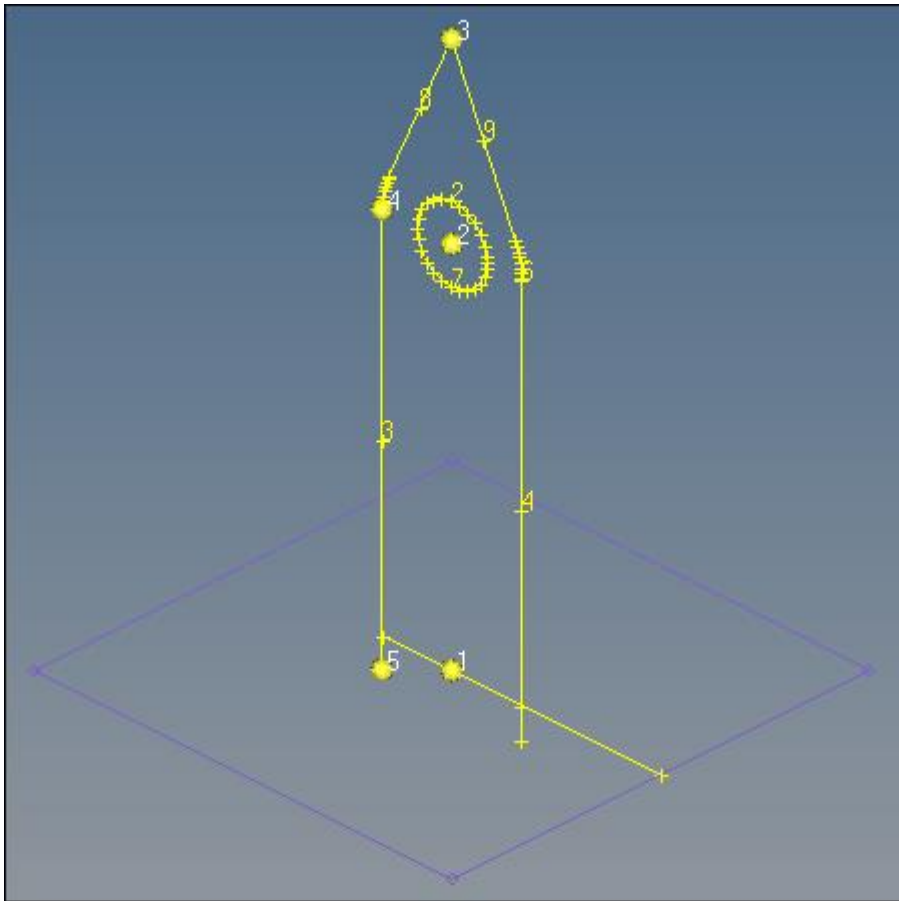
## Step 20: Create a fillet between two lines.

1. To open the **Fillet** subpanel, click *Geometry* > *Create* > *Lines* > *Fillet* from the menu bar.

2. Select the *Trim original lines* check box.

3. In the **Radius=** field, enter 5.

4. Activate the **1st line** selector.

5. Select the vertical line through which the extended line passes indicated in the following image.
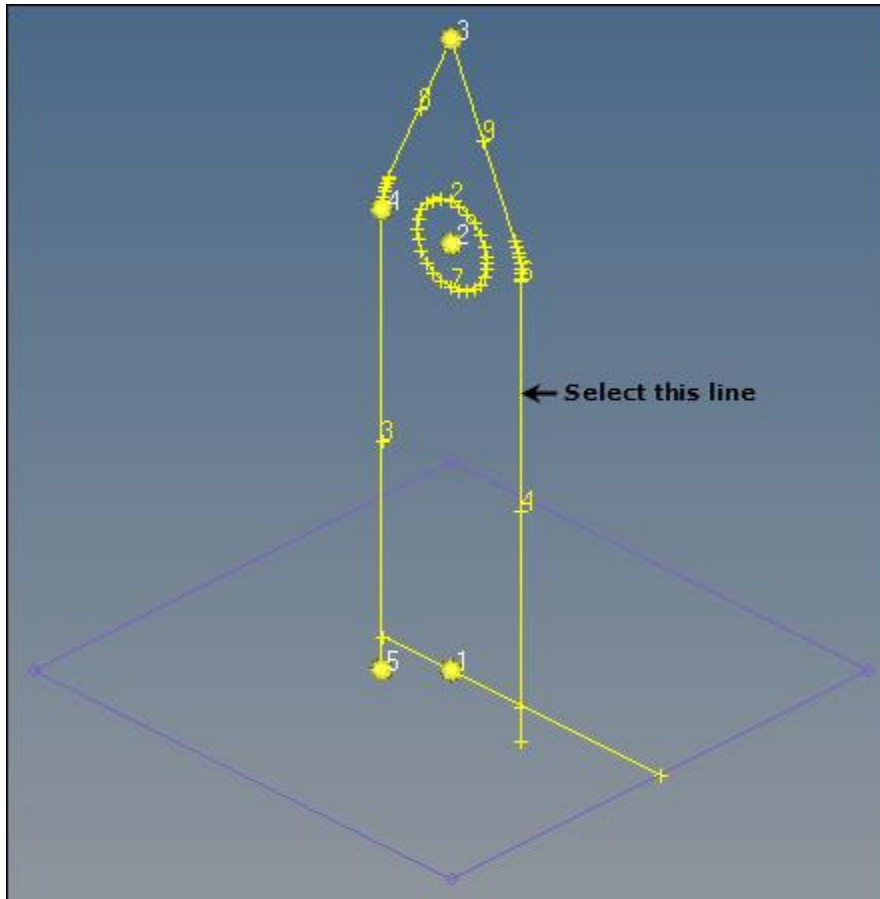

6. Activate the **2nd line** selector.

7. Select the extended line that you created in step 19. The **status bar** reads, "Please select fillet quadrant", which indicates that HyperMesh wants you to select a reference location for the fillet.

8. Select the top, right X for the fillet quadrant indicated in the following image. HyperMesh creates a fillet.
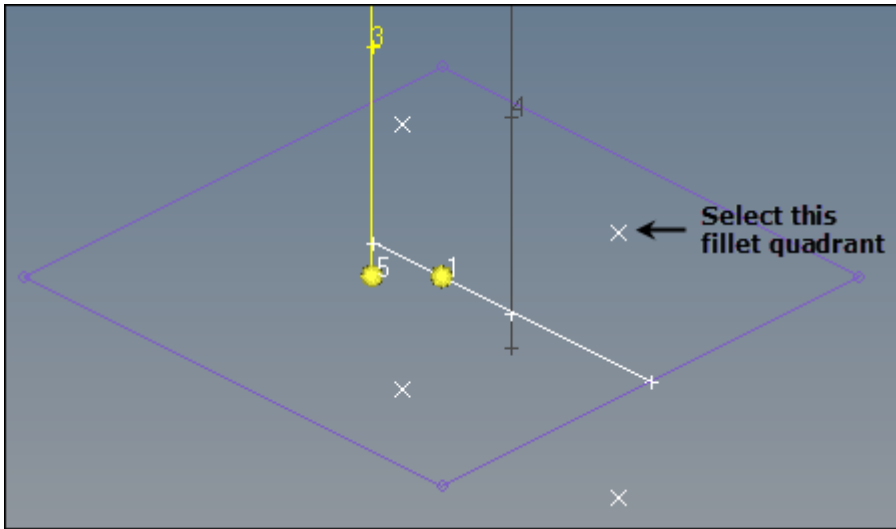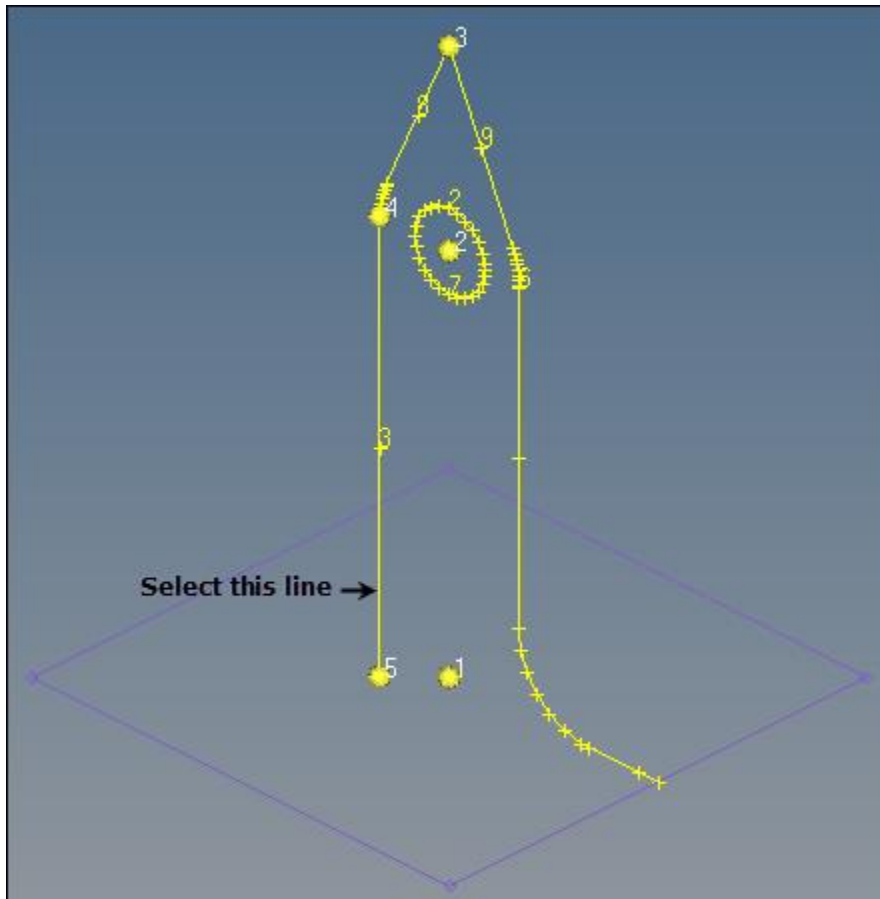

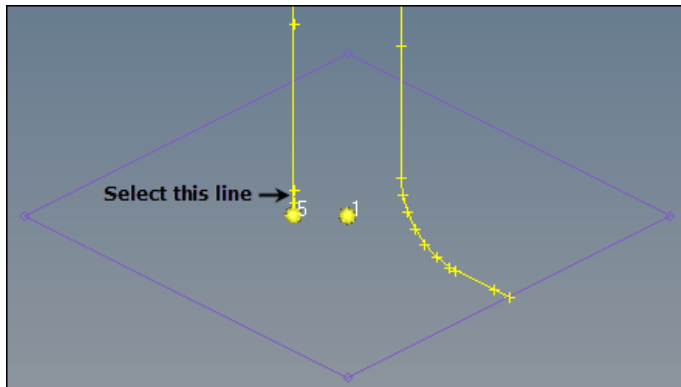9. To return to the **Lines** panel, click **_return_**.
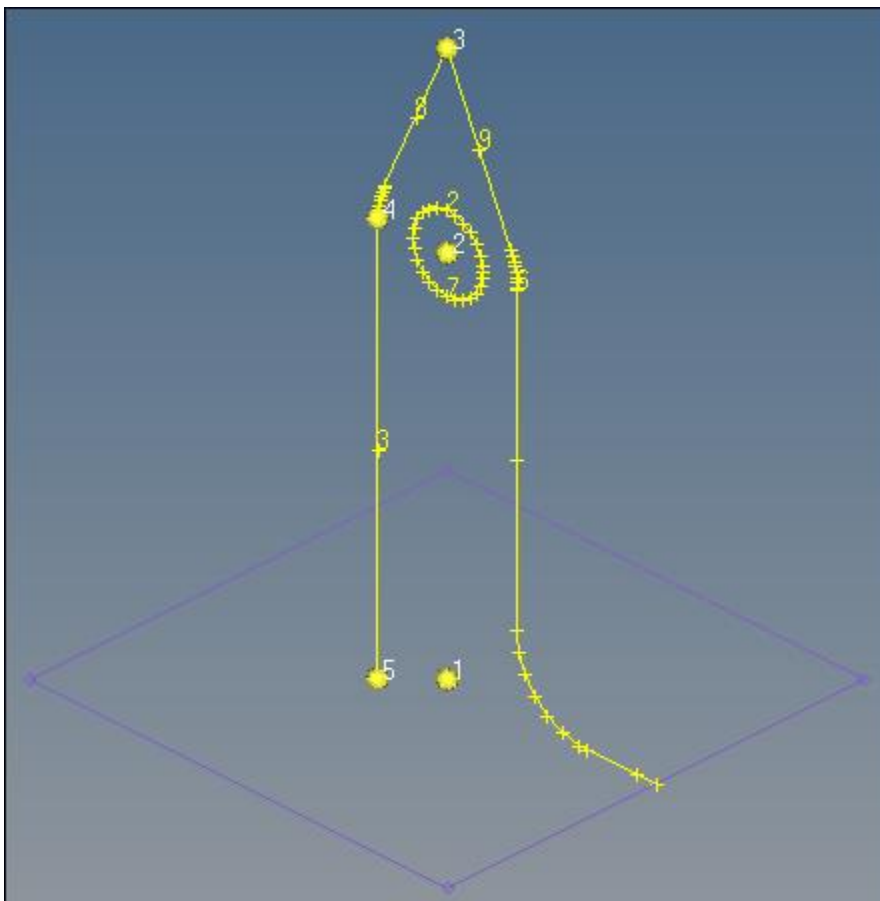
Step 21: Trim a line by plane and delete a redundant line segment.

1. To open the **Split at Plane** panel, click *Geometry* > *Edit* > *Lines* > *Split at Plane* from the menu bar.

2. Verify that the **lines** selector is active.

3. Select the vertical line that does not have a fillet indicated in the following image.

4. Set the **orientation vector** to *z-axis*.

5. Select *Node 1* as the base node.

6. Click *split*. HyperMesh splits the line by the X-Y plane.

7. Go to the **Delete** panel.

8. Set the entity selector to *lines*.

9.   Select the small line segment under the X-Y plane.

10. Click *delete entity*. HyperMesh removes the line segment.

11. To exit the panels, click *return* twice.

Step 22: Remove all temp nodes.

1.   To go to the **Temp Nodes** panel, click *Mesh* > *Delete* > *Nodes* from the menu bar, or press *Shift* + *F2*.

2.   Click *clear all.* HyperMesh removes all of the temp nodes.

3.   To exit the panel, click *return*.

Step 23: Change the rendering mode.

1.   To shade the model's geometry and surface edges, click 🔘 on the **Visualization** toolbar. The plane (purple) becomes shaded instead of wire frame.
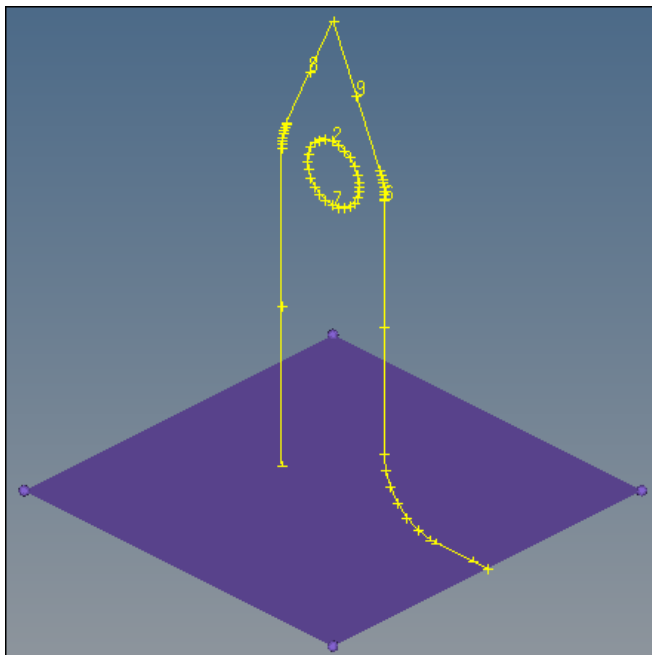
Step 24: Export all geometry as an IGES file.

1. To open the **Export Geometry** tab, click *File* > *Export* > *Geometry* from the menu bar.

2. From the **File type** list, select *Iges*.

3. From the **File** field, navigate to the location of your working directory and save the file.

4. From the **Units** field, select an export unit system.

5. Click *Export*. HyperMesh generates the IGES file.

   Note: This file can be shared with other CAD packages such as UG, Catia, and ProE.