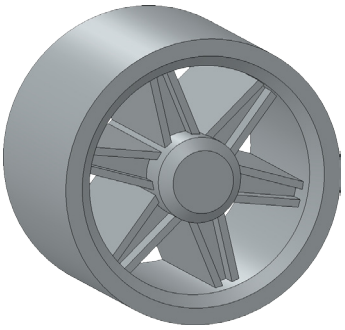
Chapter 9

Circuit Cubes All Terrain
Rim



A. Extrude1.

Step 1. Click **New** on the Standard toolbar, click **Part Metric** and OK.

Step 2. Click **Right Plane** in the Feature Manager and click **Sketch** on the context toolbar, **Fig. 1**.

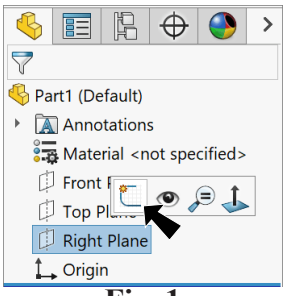


Fig. 1

Step 3. Click **Circle** (**S**) on the Sketch toolbar.

Step 4. Sketch **three circles at Origin**, **Fig. 2**.

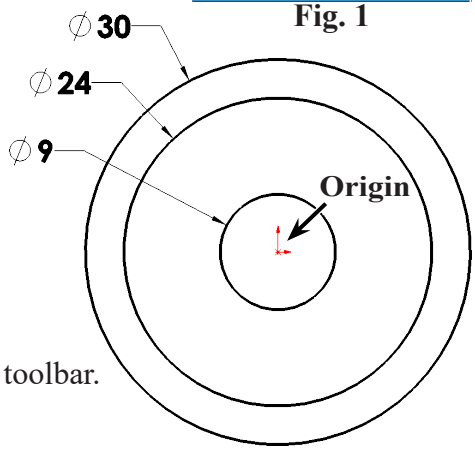


Fig. 2

Step 5. Click **Smart Dimension** (**S**) on the Sketch toolbar.

Step 6. Dimension **diameters 30 and 24 and 9**, **Fig. 2**.

Step 7. Click **Features** on the Command Manager toolbar.

Step 8. Click **Extruded Boss/Base** on the Features toolbar.

Step 9. In the Property Manager set:
under Direction 1, **Fig. 3**
End Condition **Mid Plane**
Depth **20**
under Selected Contours
click the **two contours**, **Fig. 4**
click OK .

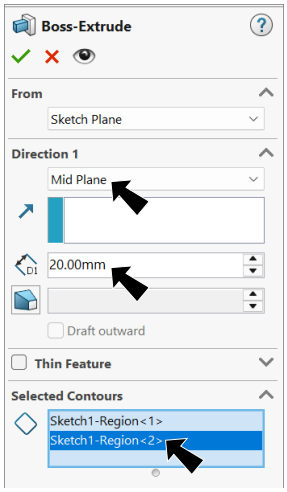


Fig. 3

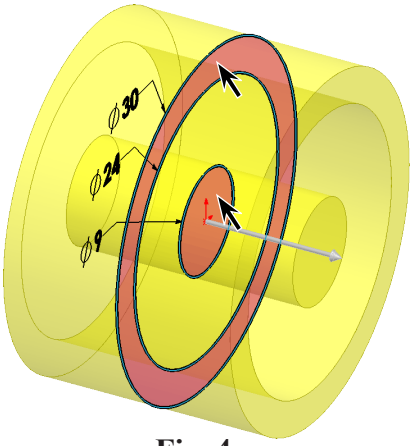


Fig. 4

B. Save as "RIM".

Step 1. Click File Menu > Save As.

Step 2. Key-in **RIM** for the filename and press ENTER.

C. Extrude2 Spoke.

Step 1. Click **Left** on the Standard Views toolbar. (**Ctrl-3**)

Step 2. Click a **rear side** and click **Sketch** on the context toolbar, **Fig. 5**.

Step 3. Unselect face.

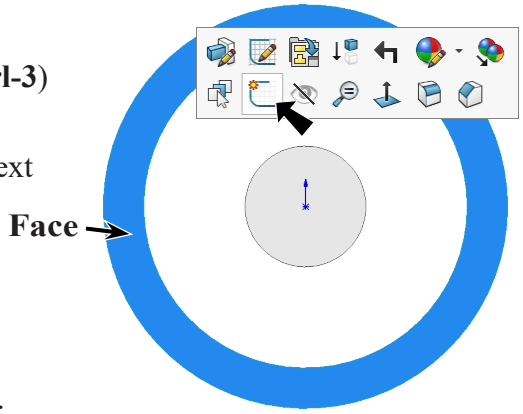


Fig. 5

Step 4. Click **Convert Entities** on the Sketch toolbar.

Step 5. In the Convert Entities Property Manager:
under Entities to Convert, **Fig. 6**
click the **two inside circular edges**, **Fig. 7**
click OK .

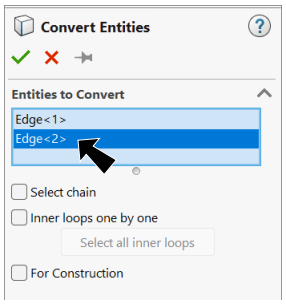


Fig. 6

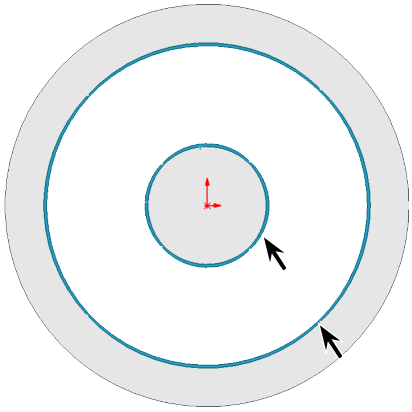


Fig. 7

Step 6. Click **Centerline** in the **Line flyout** on the Sketch toolbar.

Step 7. Sketch a **vertical centerline from the Origin up to converted circle**, **Fig. 8**.

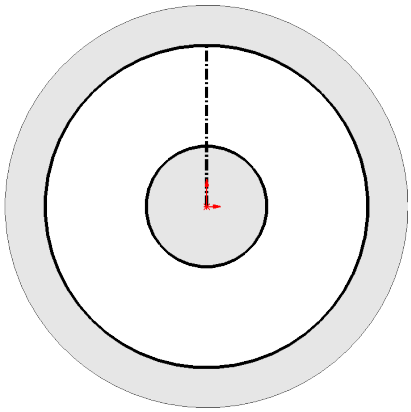


Fig. 8

Step 8. Click **Line** (**L**) on the Sketch toolbar.

Step 9. Sketch **line at angle co-incident with converted circles**, **Fig. 9**.

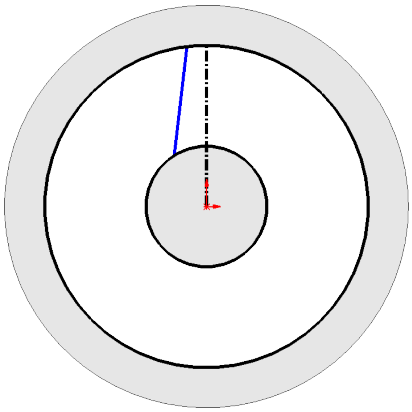


Fig. 9

Step 10. **Unselect Line tool**. To unselect, right click graphics area and click Select from menu.

Step 11. **Ctrl drag a selection to left to select spoke geometry**, **Fig. 10**.

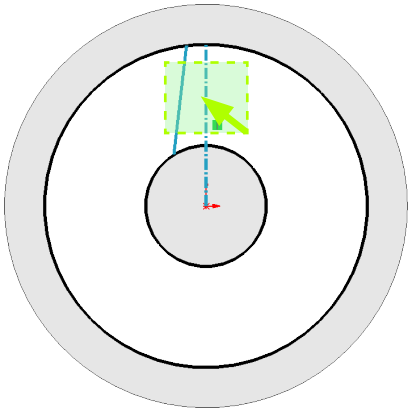


Fig. 10

Step 12. Click **Mirror Entities** on the Sketch toolbar, **Fig. 11**.

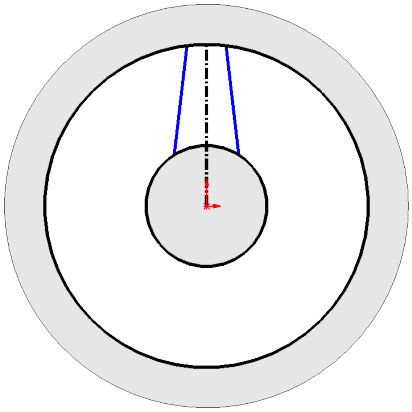


Fig. 11

Step 13. Click **Smart Dimension** 

(S) on the Sketch toolbar.

Step 14. Add dimensions, **Fig. 12**.

Step 15. Rotate view to **view extrude**, **Fig. 14**. Use **Left Arrow key**  **once**.

Step 16. Click **Features** 

on the Command Manager toolbar.

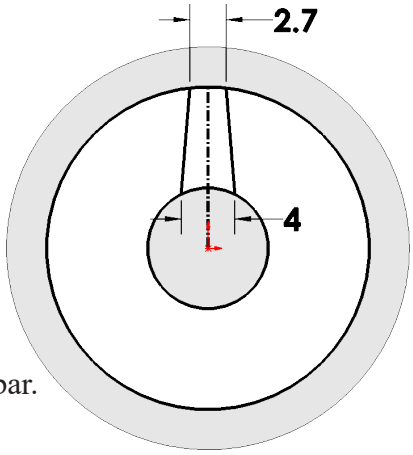
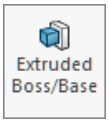


Fig. 12

Step 17. Click **Extruded Boss/Base** 

on the Features toolbar.

Step 18. In the Boss-Extrude Property Manager set:
under Direction 1, **Fig. 13**
End Condition **Blind**
Depth  **17**
under Selected Contours
click the **two contours**, **Fig. 14**
click OK  .

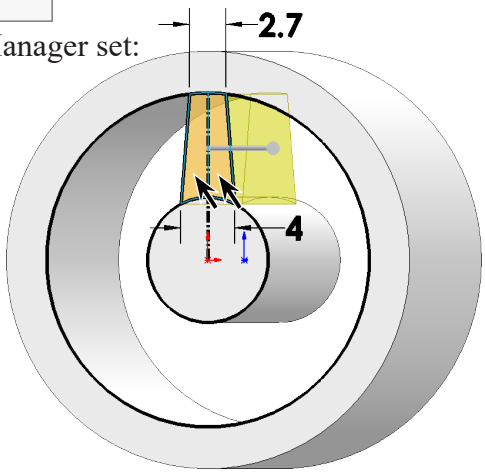


Fig. 14

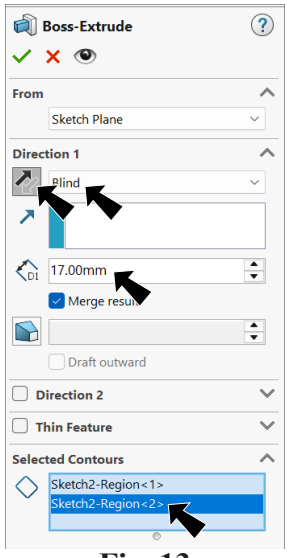


Fig. 13

D. Extruded Cut1 Sketch3 Cut Spoke.

Step 1. Click **Right**  on the Standard Views toolbar. **(Ctrl-4)**

Step 2. Click the **side face of spoke** and click **Sketch**  on the context toolbar, **Fig. 15**.

Step 3. Unselect face.

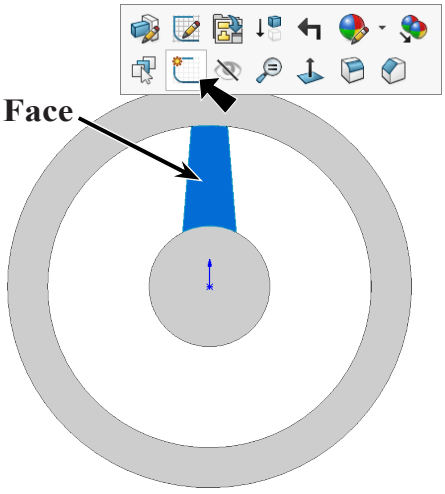


Fig. 15

Step 4. Click **Convert Entities** 

on the Sketch toolbar.

Step 5. In the Convert Entities Property Manager:
under Entities to Convert, **Fig. 16**
click the **circular edges**, **Fig. 17**
click OK ✔ .

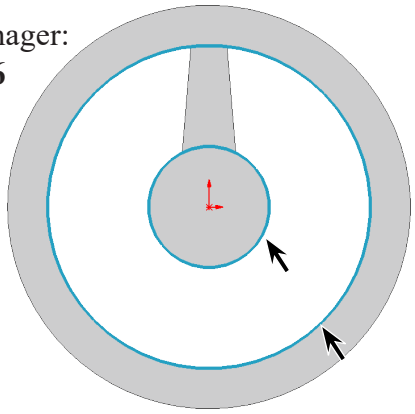


Fig. 17

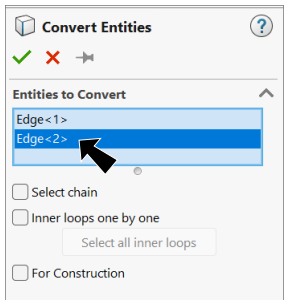


Fig. 16

Step 6. Click **Offset Entities** 

on the Sketch toolbar.

Step 7. In the Offset Entities Property Manager set:
under Parameters, **Fig. 18**
Distance .8
check **Reverse**
uncheck **Bi-directional**
click **edge of spoke**, **Fig. 19**
yellow offset circle on inside
Click **Keep Visible** and OK ✔ .
The Push Pin on allows selection of another offset.
under Parameters, **Fig. 20**
Distance .8
uncheck **Reverse**
click **other edge of spoke**, **Fig. 21**
yellow offset circle on inside
click OK ✔ **twice**.

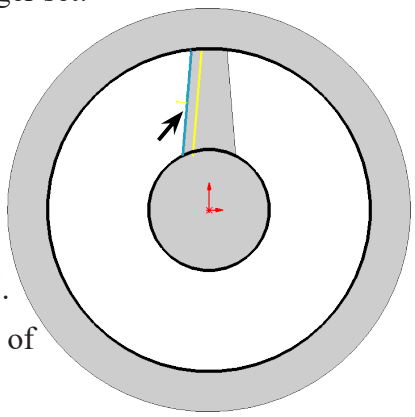


Fig. 19

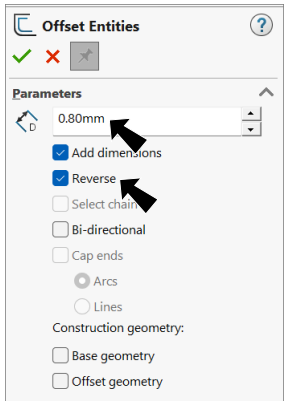


Fig. 18

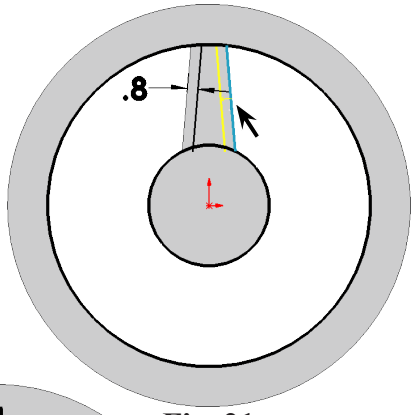


Fig. 21

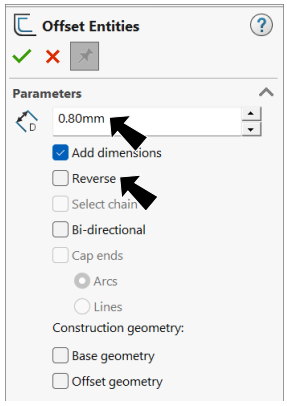


Fig. 20

Step 8. Drag top endpoints of offset lines to above converted edge, **Fig. 22**.

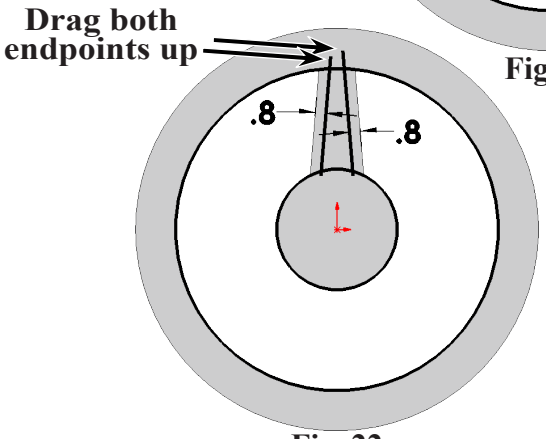


Fig. 22

Step 9. Rotate view to **view depth of cut, Fig. 24**. Use **Left Arrow key** once.

Step 10. Click **Features** Features on the Command Manager toolbar.

Step 11. Click **Extruded Cut** Extruded Cut on the Features toolbar.

Step 12. In the Cut-Extrude Property Manager set:
under Direction 1, **Fig. 23**
Depth D1 **2**
under Selected Contours
click **contour**, **Fig. 24**
Tip: You might have to tinker with **Instant3D** Instant3D turn off and on
click OK .

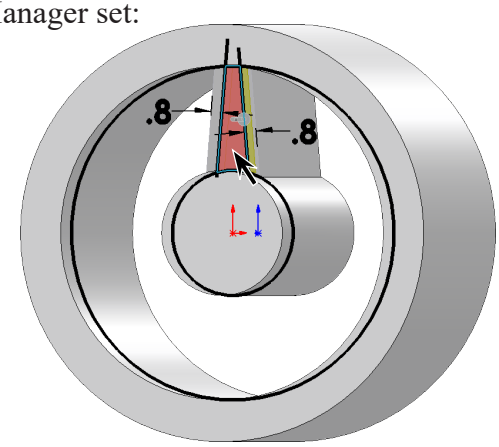


Fig. 24

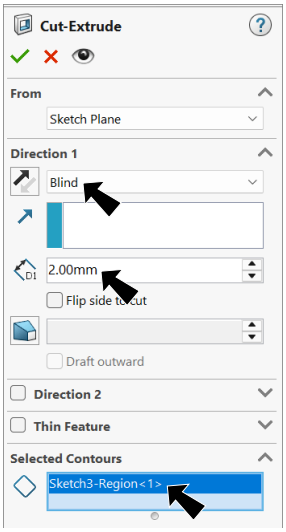


Fig. 23

E. Circular Pattern.

Step 1. Click **Circular Pattern** Circular Pattern in the **Linear Pattern flyout** Linear Pattern on the Features toolbar.

Step 2. In the Circular Pattern Property Manager set:
under Features and Faces, **Fig. 25**
click **Boss-Extrude2 and Cut1** in graphics area, **Fig. 26**
under Direction 1
click in Pattern Axis box
click a **cylindrical face**
select **Equal spacing**
Number of Instances # **6**
click OK .

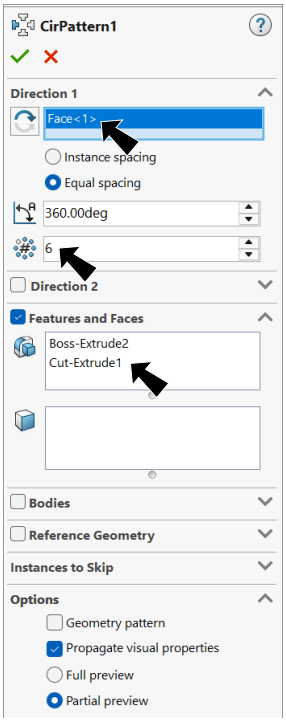


Fig. 25

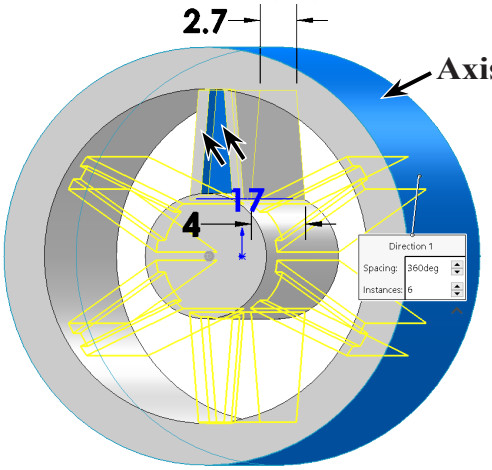


Fig. 26

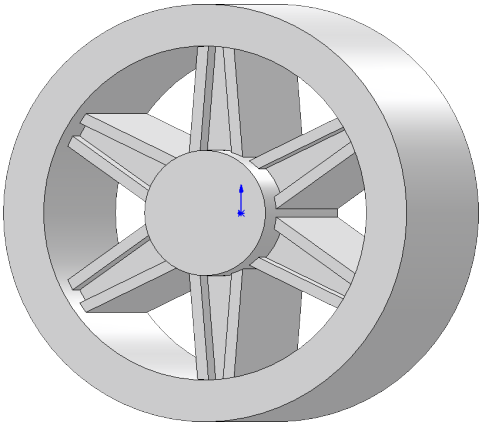


Fig. 27

F. Extruded Cut2 Axle Hole.

Step 1. Click **Left** on the Standard Views toolbar. (**Ctrl-3**)

Step 2. Click **rear face** and click **Sketch** on the context toolbar, **Fig. 28**.

Step 3. Click **Circle** (**S**) on the Sketch toolbar.

Step 4. Sketch circle at Origin , **Fig. 29**.

Step 5. Click **Line** (**L**) on the Sketch toolbar.

Step 6. Sketch **two horizontal lines across circle** , **Fig. 30**. Double click to terminate chain.

Step 7. **Unselect Line tool**. To unselect, right click graphics area and click Select from menu.

Step 8. **Drag selection to left to select both lines** and click **Make Equal** on the context toolbar, **Fig. 31**.

Step 9. Click **Smart Dimension** (**S**) on the Sketch toolbar.

Step 10. Add dimensions, **Fig. 32**.

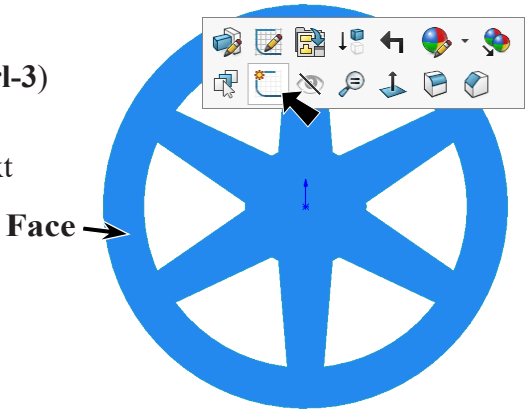


Fig. 28

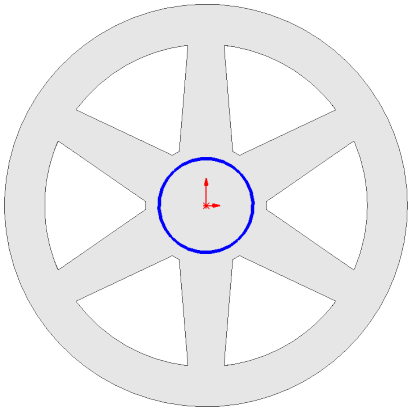


Fig. 29

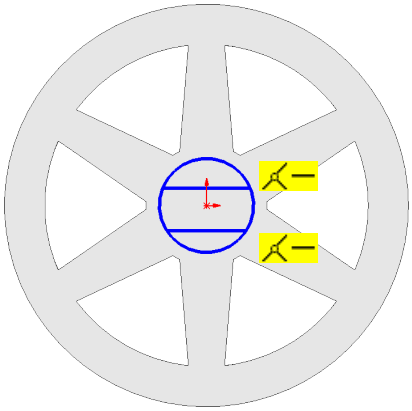


Fig. 30

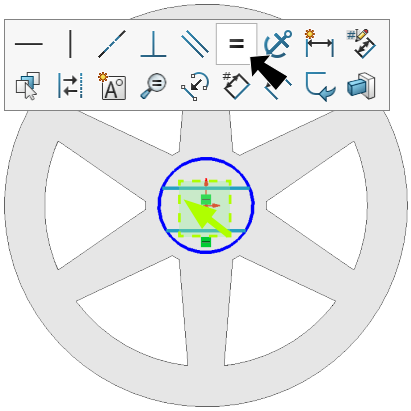


Fig. 31

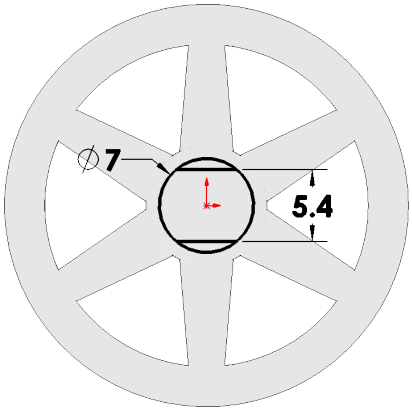


Fig. 32

Step 11. Click **Trim Entities** 

(S) on the Sketch toolbar.

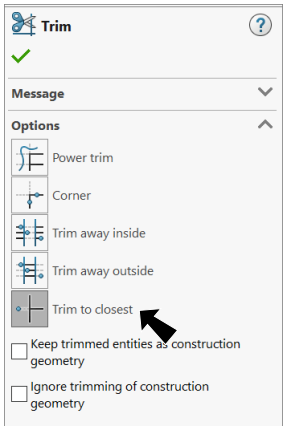


Fig. 33

Step 12. In the Trim Property Manger:

select **Trim to closest**  , **Fig. 33**

Trim the and bottom arc segments, **Fig. 34**.

Click segments to trim.

Results shown in **Fig. 35**.

Click OK ✔ when done.

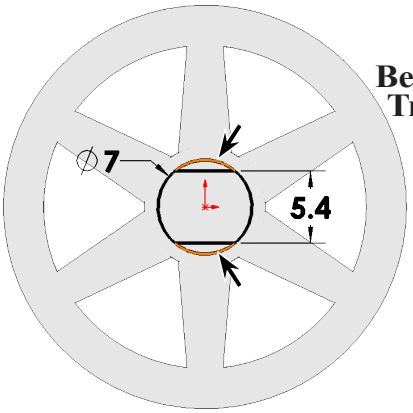


Fig. 34

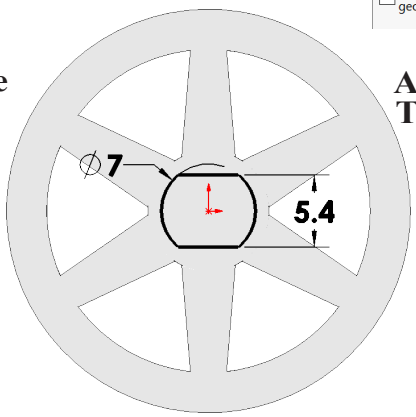
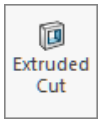


Fig. 35

Step 13. Rotate view to **view depth of cut**, **Fig. 37**. Use **Left Arrow key**  **once**.

Step 14. Click **Features** 

on the Command Manager toolbar.

Step 15. Click **Extruded Cut** 

on the Features toolbar.

Step 16. In the Cut-Extrude Property Manager set:

under Direction 1, **Fig. 36**

End Condition **Blind**

Depth  **9.7**

click OK ✔ .

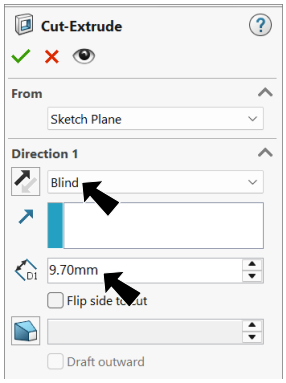


Fig. 36

Step 17. Save  **(Ctrl-S)**.

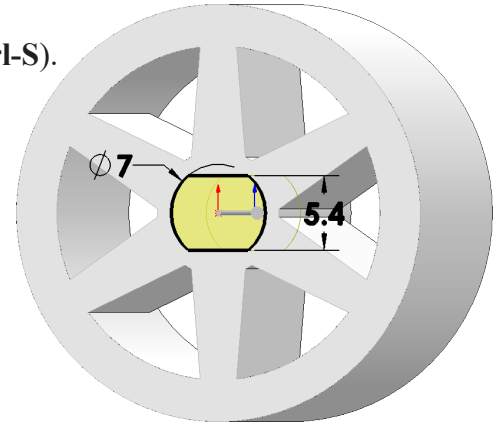


Fig. 37

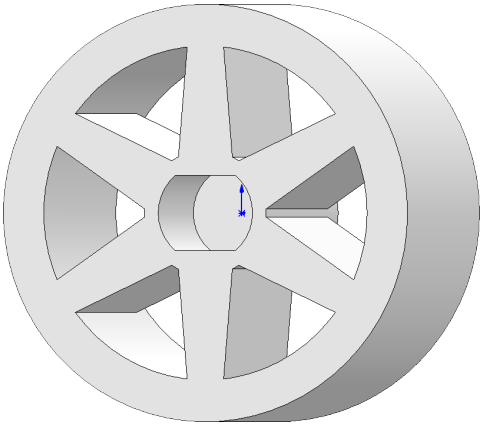


Fig. 38

G. Chamfer1 Bottom of Axle Hole.

Step 1. Click **Chamfer** 

on the Features toolbar.

Step 2. In the Chamfer Property Manager set:
under Chamfer Type, **Fig. 39**
select **Angle Distance** 
click **edge at bottom of hole**, **Fig. 40**
under Chamfer Parameters
Distance  **2.9**
Angle  **45º**
click OK  .

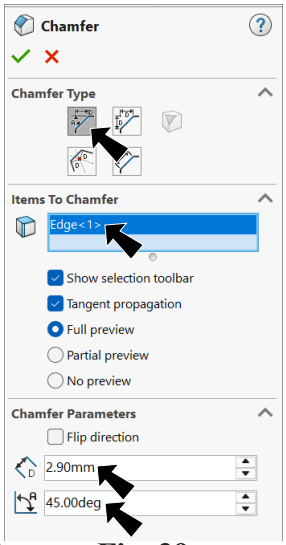


Fig. 39

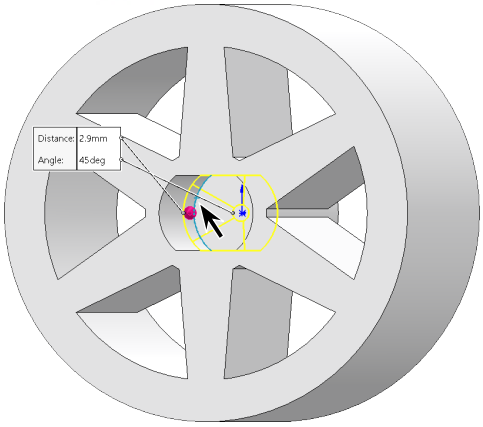


Fig. 40

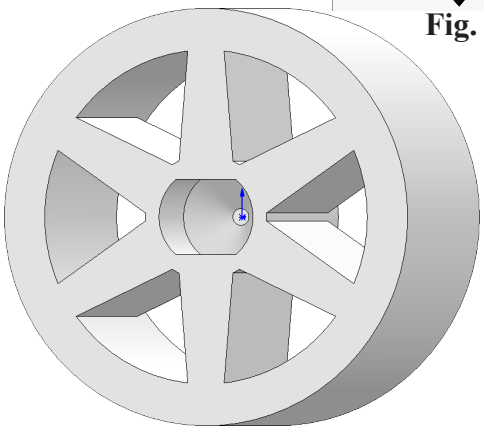


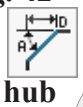
Fig. 41

H. Chamfer2 Front Edge.

Step 1. Click **Isometric**  on the Standard Views toolbar. (**Ctrl-7**) then **Left Arrow key** 
twice and Up Arrow key  **once**.

Step 2. Click **Chamfer** 

on the Features toolbar.

Step 3. In the Chamfer Property Manager set:
under Chamfer Type, **Fig. 42**
select **Angle Distance** 
click **circular edge of hub and inside circular edge of rim**, **Fig. 43**
under Chamfer Parameters
Distance  **1.2**
Angle  **45º**
click OK  .

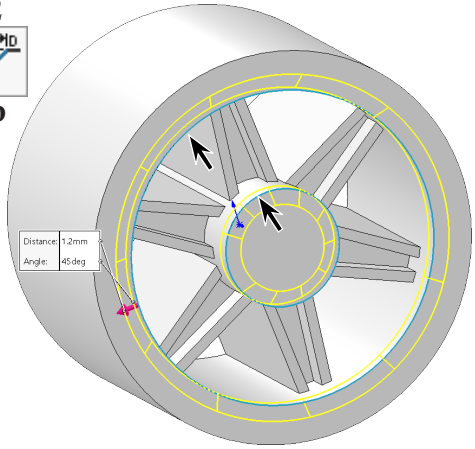


Fig. 43

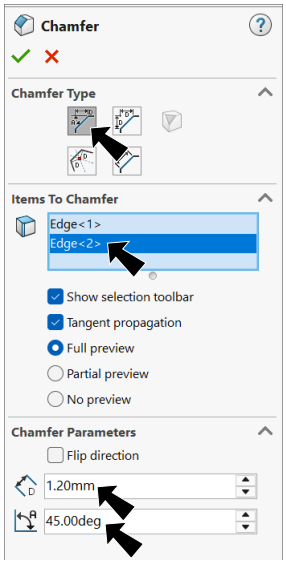


Fig. 42

Step 4. Save  (**Ctrl-S**).

I. Appearance: Chrome.

Step 1. Click part to select, click **Appearance Callout** on the Context toolbar and click **RIM**, **Fig. 44**.

Step 2. In the Appearances Task pane, expand **Metal**, click **Chrome** and in the lower pane select **chromium plate**, **Fig. 45**.

Step 3. Click OK in the Property Manager.

Step 4. Save (**Ctrl-S**).

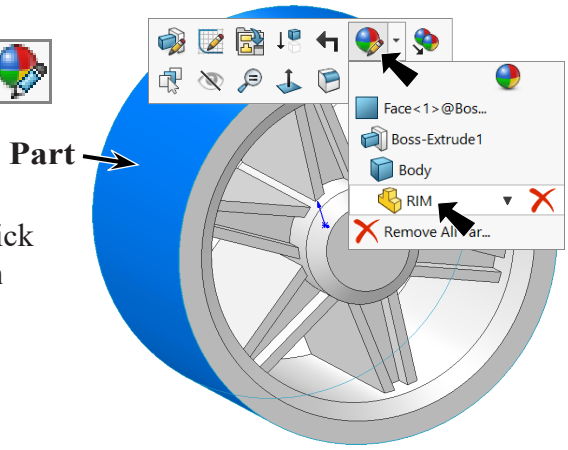


Fig. 44

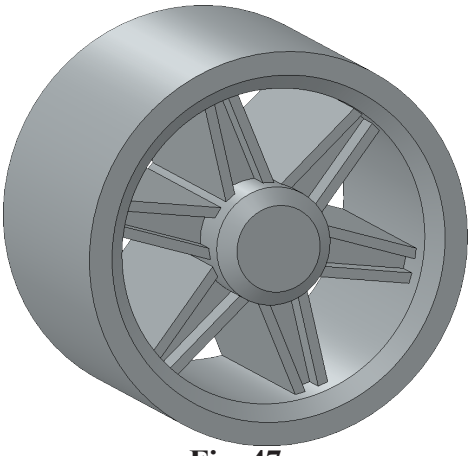


Fig. 47

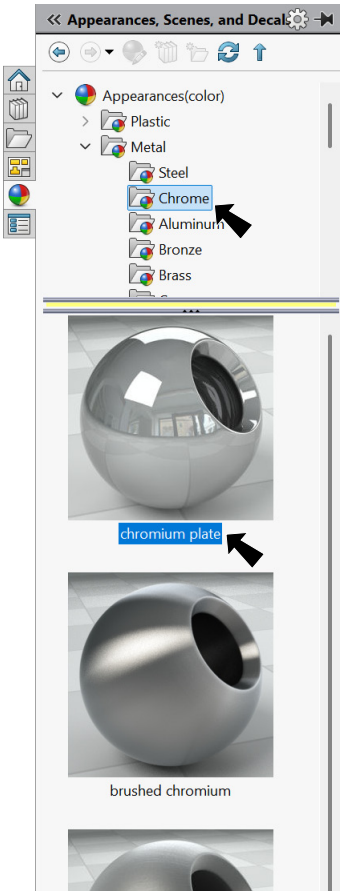


Fig. 45

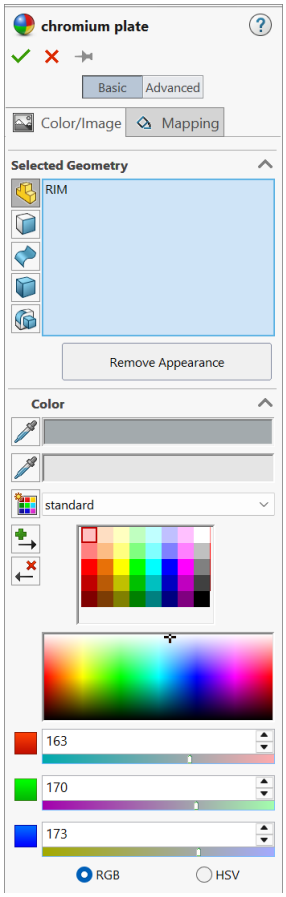


Fig. 46