Chapter 10

Circuit Cubes All Terrain

Tire

A. Revolve.

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

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

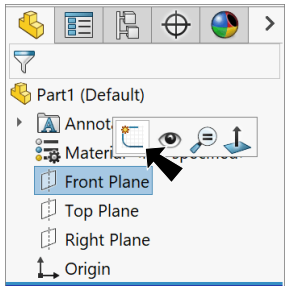

Fig. 1

Step 3. Click **Centerline** in the **Line flyout** on the Sketch toolbar.

Step 4. Sketch **vertical and horizontal centerlines from Origin**, **Fig. 2**.

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

Step 6. Sketch **line horizontal and vertical line**, **Fig. 3**. Double click to terminate the chain.

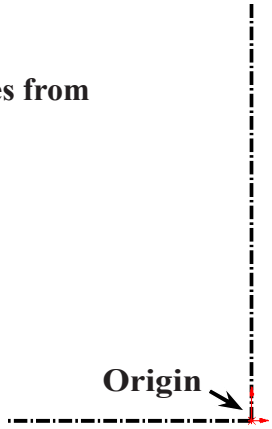

Fig. 2

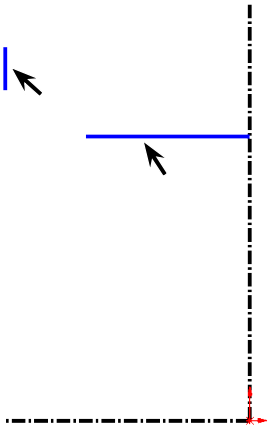

Fig. 3

Step 7. Click **3 Point Arc** **(S)** in the **Arc flyout** on the Sketch toolbar.

Step 8. Sketch **two arcs**, **Fig. 4**.

Step 9. **Unselect Arc tool**. To unselect, right click graphics area and click Select from menu.

Step 10. **Drag** a **selection to left** to select all but horizontal centerline, **Fig. 5**.

Step 11. Click **Mirror Entities** Mirror Entities on the Sketch toolbar, **Fig. 6**.

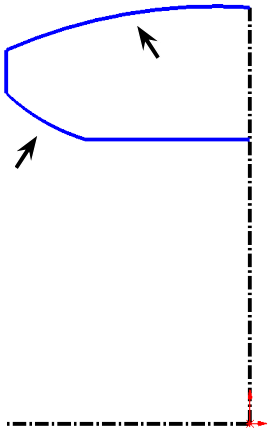

Fig. 4

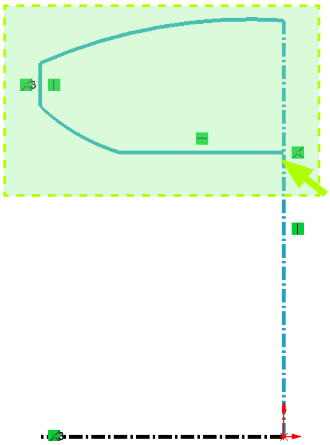

Fig. 5

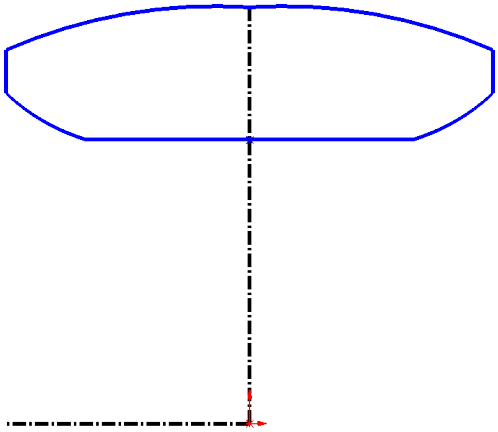

Fig. 6

Step 12. **Drag a selection to right to select both top 3 Point Arcs** and click **Make Tangent** on the context toolbar, **Fig. 7**.

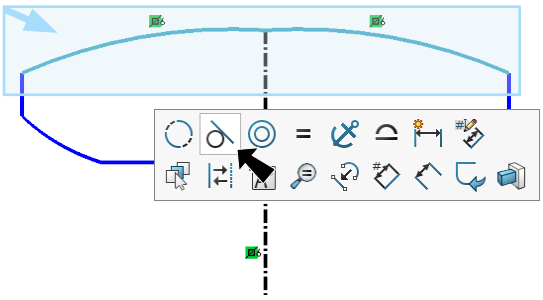

Fig. 7

Step 13. Click **Smart Dimension** (**S**) on the Sketch toolbar.

Step 14. Add dimensions, **Fig. 8**. Start with the 3 dimension and work your way CW around sketch. Dimension **double distance** last. To double distance dimension, click horizontal centerline and inside horizontal line, move the cursor below centerline (Origin) and click. Key-in 30 in the Modify box and press ENTER. Double distance 44 dimension.

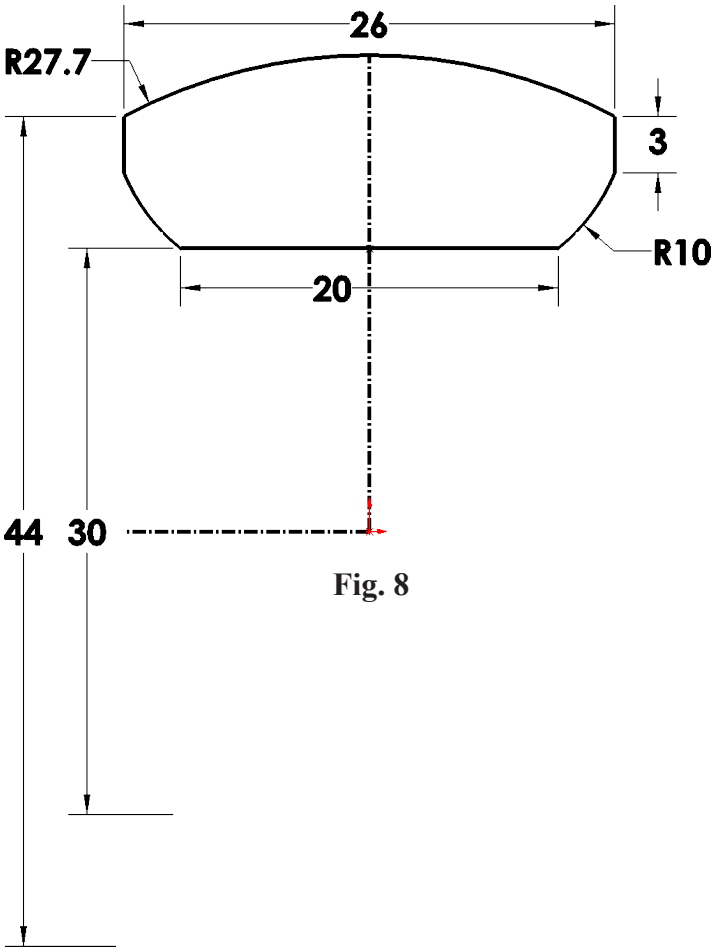

Fig. 8

Step 15. Click **Features** on the Command Manager toolbar.

Step 16. Click **Revolved Boss/Base** on the Features toolbar.

Step 17. In the Revolve Property Manger set:

under Axis of Revolution
click **horizontal centerline**, **Fig. 9**
click OK .

B. Save as "TIRE".

Step 1. Click File Menu > Save As.

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

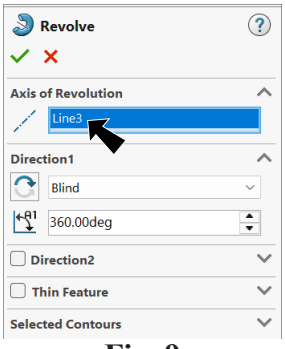

Fig. 9

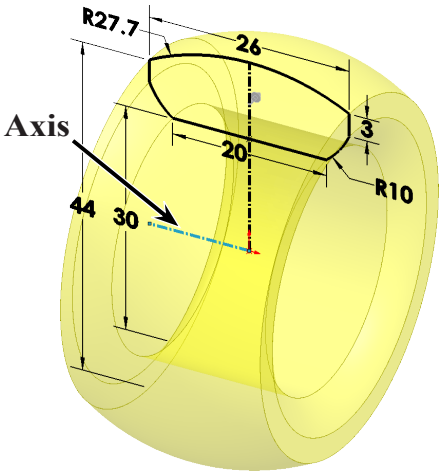

Fig. 10

C. Extrude.

Step 1. Click **Top Plane** in the Feature Manager and click **Sketch** on the context toolbar, **Fig. 11**.

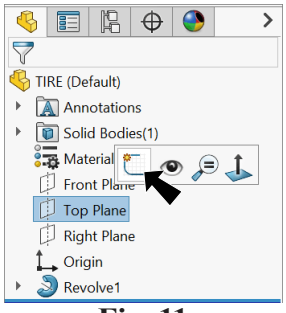

Fig. 11

Step 2. Click **Normal To** on the Standard Views toolbar. **(Ctrl-8)**

Step 3. Click **Centerline** in the **Line flyout** on the Sketch toolbar.

Step 4. Sketch **horizontal centerline from Origin out beyond the edge**, **Fig. 12**.

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

Step 6. Sketch **8 lines** starting an end-point of centerline, **Fig. 13**.

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

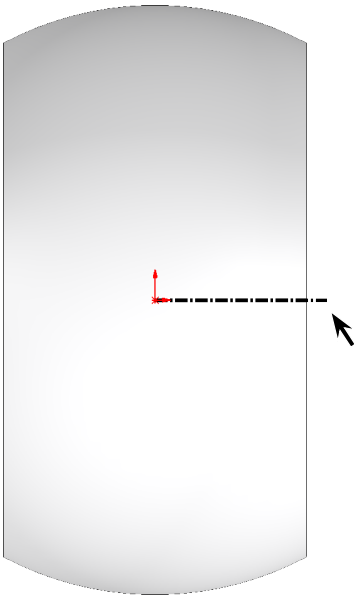
Fig. 12

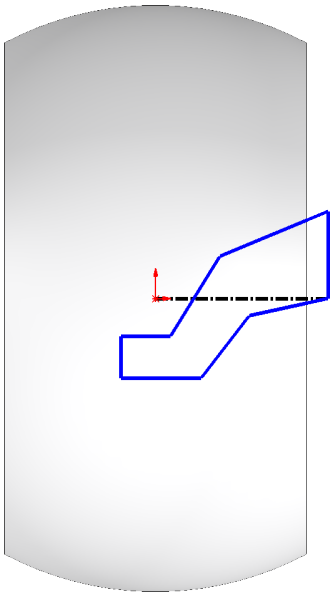
Fig. 13

Step 8. **Ctrl click left set of angled lines** to select both. Release Ctrl key and click **Make Parallel** on the context toolbar, **Fig. 14**.

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

Step 10. Add dimensions, **Fig. 15**. To dimension angle to imaginary line, click line and left endpoint, then click the **right horizontal crosshair** and place dimension.

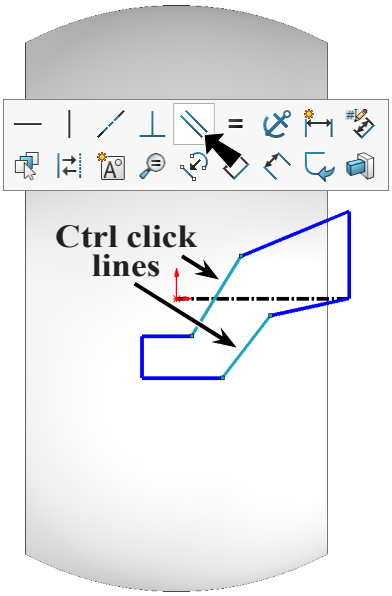

Fig. 14

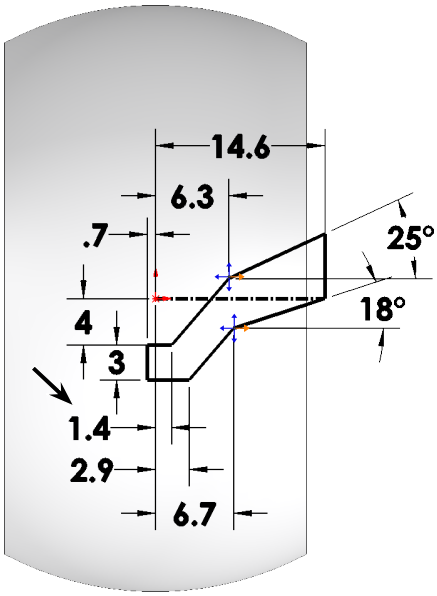

Fig. 15

Step 11. Click **Isometric** on the Standard Views toolbar. (**Ctrl-7**)

Step 12. Click **Features** Features on the Command Manager toolbar.

Step 13. Click **Extruded Boss/Base** Extruded Boss/Base on the Features toolbar.

Step 14. In the Boss-Extrude Property Manager set:

under Direction 1, **Fig. 16**

End Condition **Blind**

Depth D1 **28**

uncheck **Merge result**

click OK ✔ .

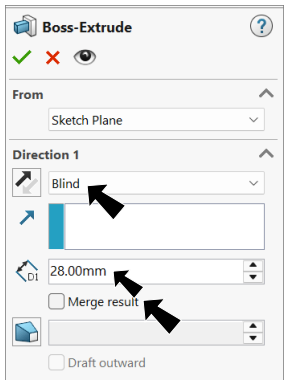

Fig. 16

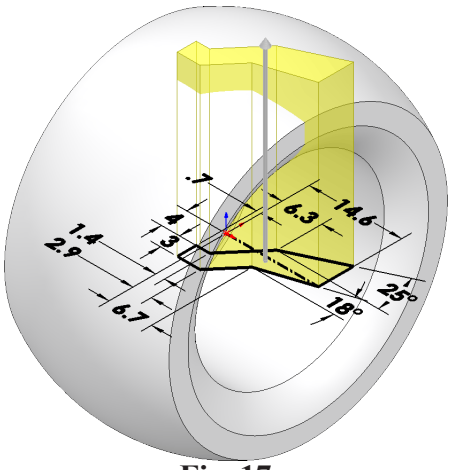

Fig. 17

Step 15. Save (**Ctrl-S**).

D. Revolved Cut.

Step 1. Click **Front Plane** in the Feature Manager and click **Sketch** on the context toolbar, **Fig. 18**.

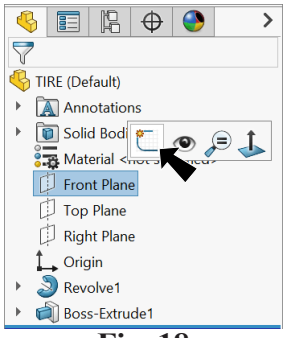

Fig. 18

Step 2. Click **Normal To** on the Standard Views toolbar. (**Ctrl-8**)

Step 3. Click **Wireframe** on the View toolbar.

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

Step 5. In the Offset Entities Property Manager set:

under Parameters, **Fig. 19**

Distance D **2**

click **top curved edge of Revolve, Fig. 20**

click OK ✔ .

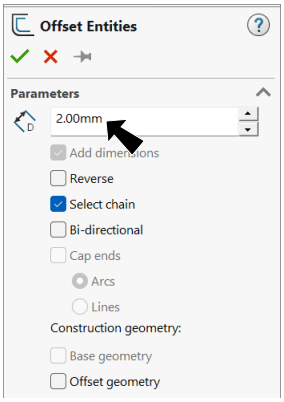

Fig. 19

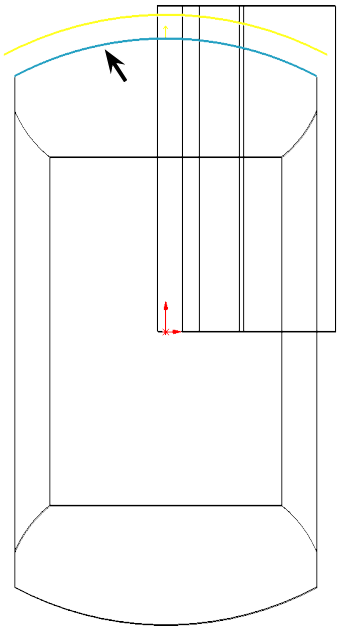

Fig. 20

Step 6. Click **Line** (**L**) on the Sketch toolbar.

Step 7. Sketch **horizontal line coincident with curve outer edge and vertical outer edge of Revolve across to vertical edge of the Extrude**. And a **vertical line along edge of Extrude up to offset arc**, **Fig. 21**.

Step 8. Click **3 Point Arc** (**S**) in the **Arc flyout** on the Sketch toolbar.

Step 9. Sketch **arc with start endpoints at left endpoint of line1, right endpoint at endpoint of offset arc and radius to outside tire**, **Fig. 22**.

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

Step 11. **Ctrl click curved edge of Revolve and arc** to select both. Release Ctrl key and click **Make Tangent** on the context toolbar, **Fig. 23**.

Step 12. Click **Centerline** in the **Line flyout** on the Sketch toolbar.

Step 13. Sketch a **horizontal centerline from Origin** , **Fig. 24**.

Step 14. Click **Shaded With Edges** on the View toolbar.

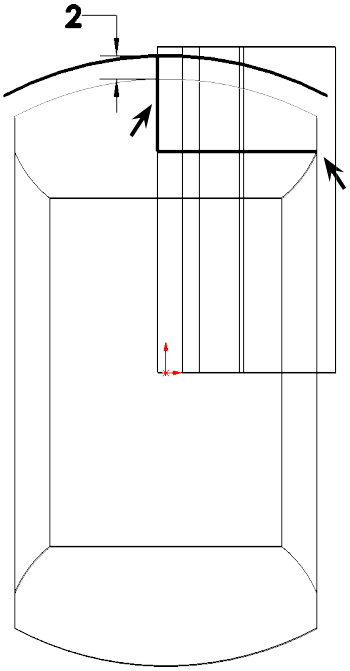

Fig. 21

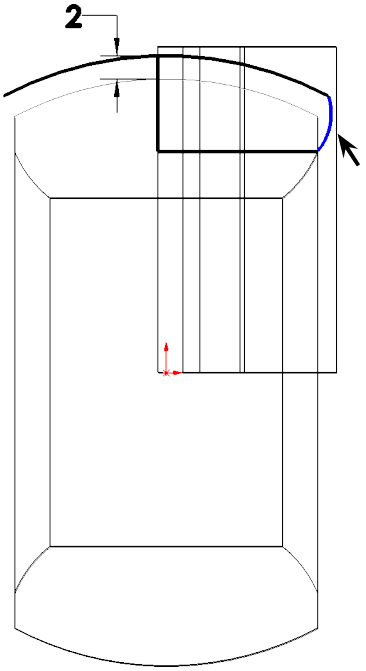

Fig. 22

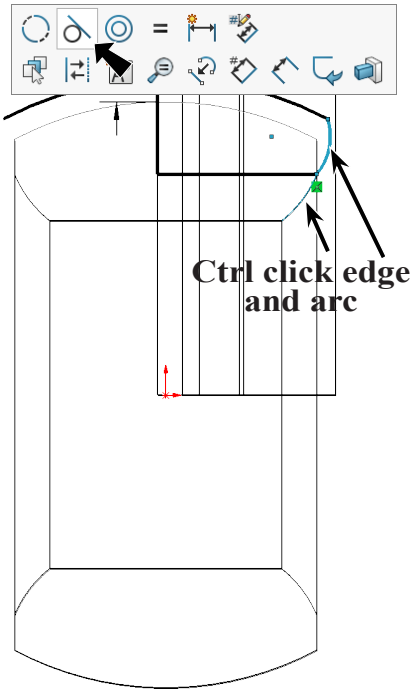

Fig. 23

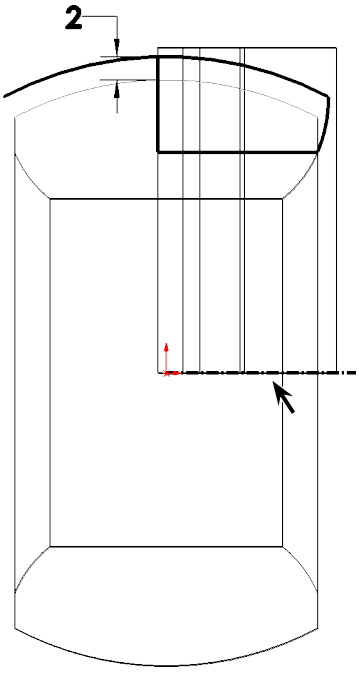

Fig. 24

Step 15. Click **Isometric** on the Standard Views toolbar. (**Ctrl-7**)

Step 16. Click **Features** Features on the Command Manager toolbar.

Step 17. Click **Revolved Cut** Revolved Cut on the Features toolbar.

Step 18. In the Cut-Revolve Property Manger set:

under Axis of Revolution , **Fig. 25**
horizontal centerline will be selected
under Direction 1
End Condition **Blind**
Direction 1 Angle **360º**
check **Flip side to cut**
uncheck **Thin Feature**
under Selected Contours
click **contour**, **Fig. 26**
under Feature Scope
uncheck **Auto-select**
click the **Extrude**
click OK .

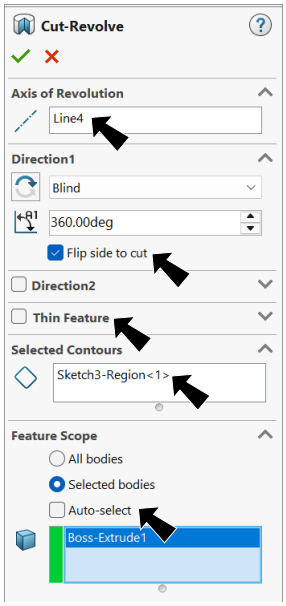

Fig. 25

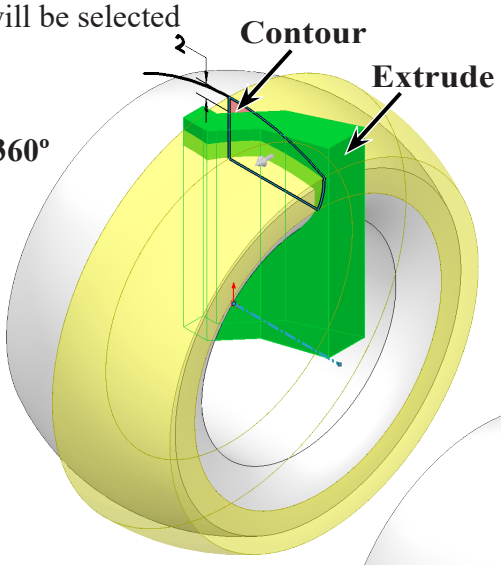

Fig. 26

Step 19. Save (**Ctrl-S**).

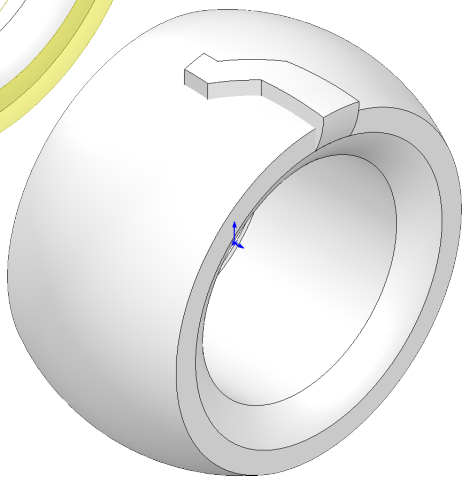

Fig. 27

E. Fillet.

Step 1. Click **Fillet** 

on the Features toolbar.

Step 2. In the Fillet Property Manager set:
select **FilletXpert**, **Fig. 28**

① **Radius** **1**
click **top inside and outside edge of Cut-Revolve**, **Fig. 29**

click OK ✔ .

Step 3. Save (**Ctrl-S**).

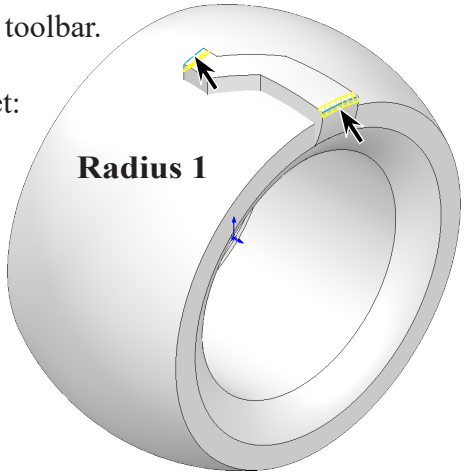

Fig. 29

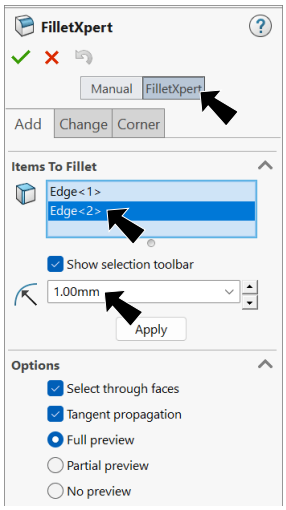

Fig. 28

F. Mirror Body.

Step 1. Expand Solid Bodies folder in the Feature Manager. **Ctrl click Fillet1 body and Right Plane** to select Body and Plane, **Fig. 30**.

Step 2. Click **Mirror** Mirror on the Features toolbar.

Step 3. In the Mirror Property Manager click OK ✔ .

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

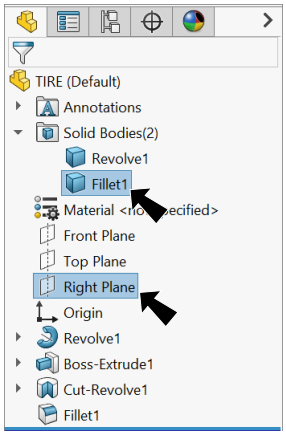

Fig. 30

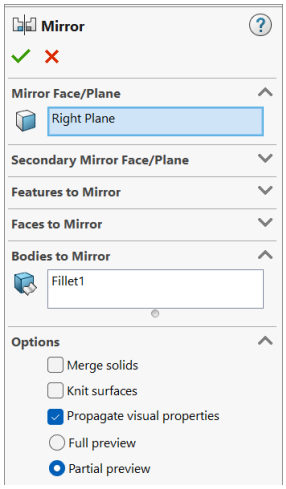

Fig. 31

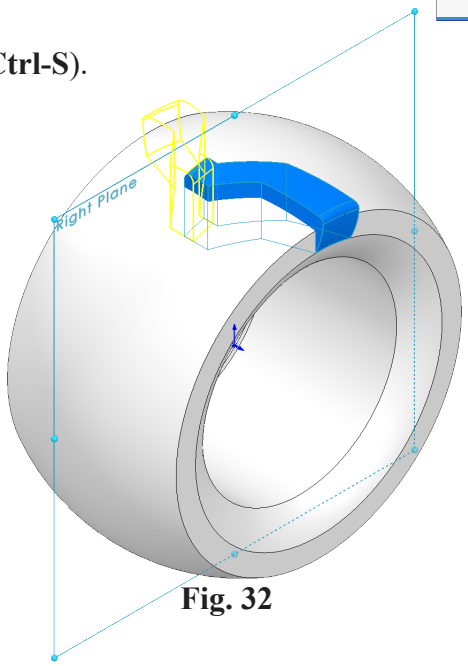

Fig. 32

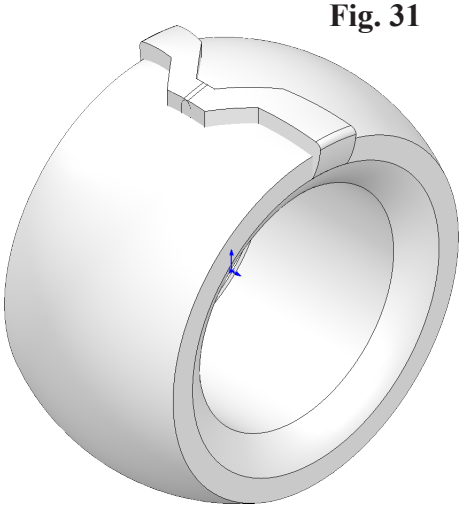
Fig. 33

G. Move Copy Body.

Step 1. Click Insert Menu > Features > Move/Copy.

Step 2. In the Move/Copy Body Property Manager set:
under Bodies to Move/Copy, **Fig. 34**
click **Mirror1**, **Fig. 35**
uncheck **Copy**
under Rotate
click in the Rotation Reference box
click the **Origin**
X Rotation Angle **11.25º**
click OK .

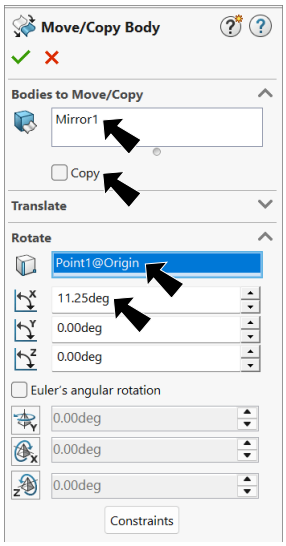

Fig. 34

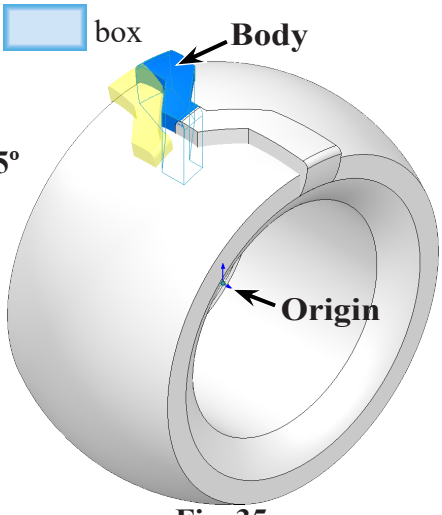

Fig. 35

Step 3. Save (**Ctrl-S**).

H. Circular Pattern.

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

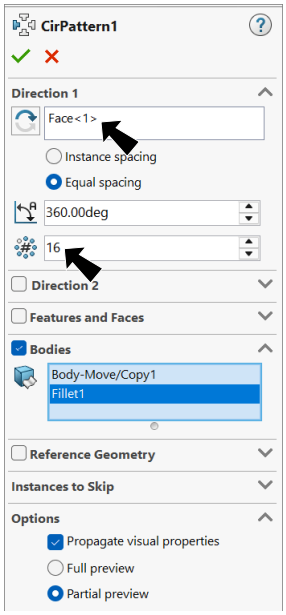

Fig. 36

Step 2. In the Circular Pattern Property Manager set:
under Direction 1, **Fig. 36**
click in Pattern Axes box
click a **cylindrical face**, **Fig. 37**
select **Equal spacing**
Total Angle **360º**
Number of Instances **16**
under Bodies
click **Fillet1 and Body-Move/Copy1**
click OK .

Step 3. Save (**Ctrl-S**).
Be sure to save here and often. Combining all the bodies could stress your computer.

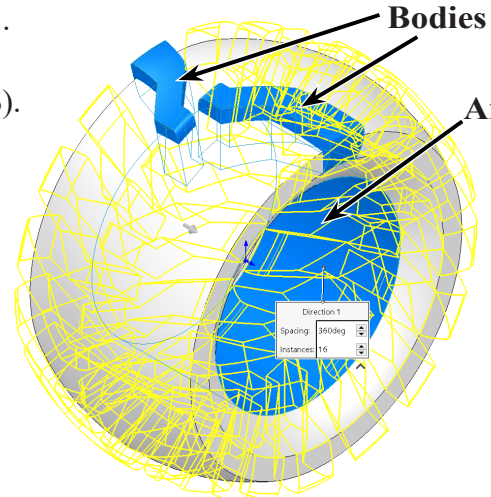

Fig. 37

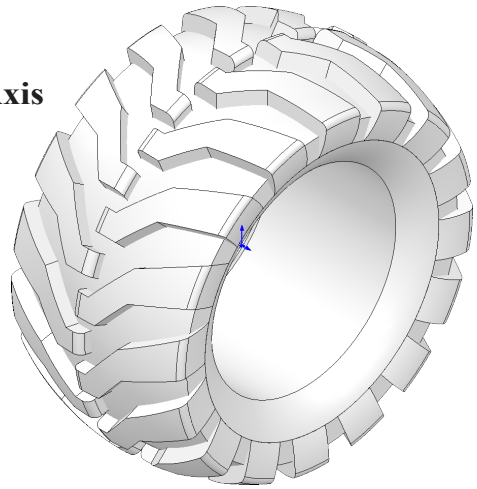
Fig. 38

I. Combine Bodies.

Step 1. Click Insert Menu > Features > Combine.

Step 2. In the Combine Property Manager:
under Operation Type, **Fig. 39**
select **Add**
drag a selection to select all bodies, **Fig. 40**
click OK ✔.

Step 3. Save (**Ctrl-S**).

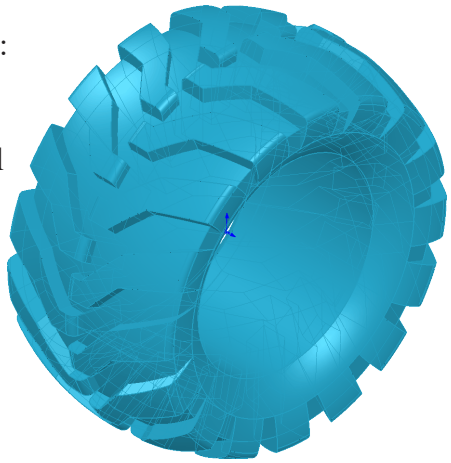

Fig. 40

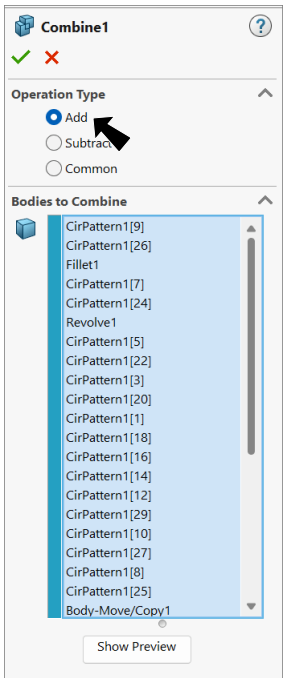

Fig. 39

J. Appearance: Rubber.

Step 1. Click the part to select part, click **Appearances Callout** on the context toolbar and click **TIRE**, **Fig. 41**.

Step 2. In the Appearances Task pane, expand **Rubber**, click **Matte** and in the lower pane select **matte rubber**, **Fig. 42**.

Step 3. In the Appearances Property Manager click OK ✔.

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

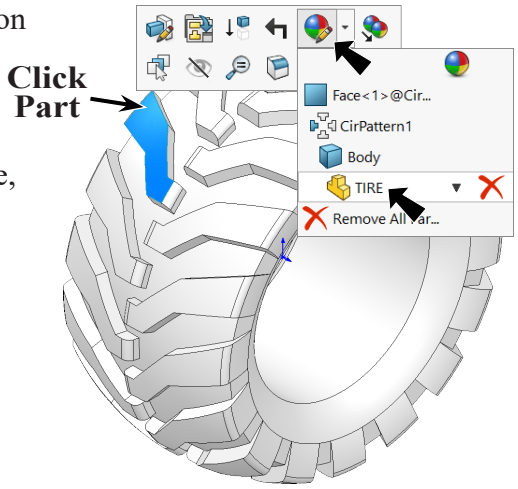

Fig. 41

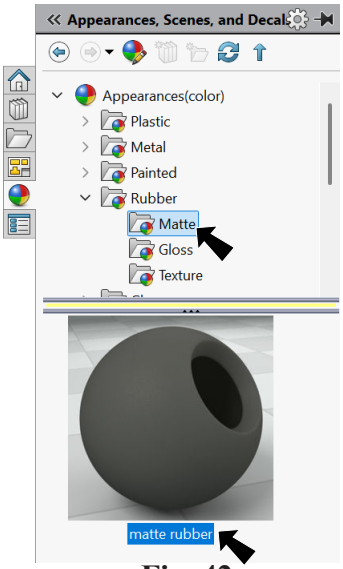

Fig. 42

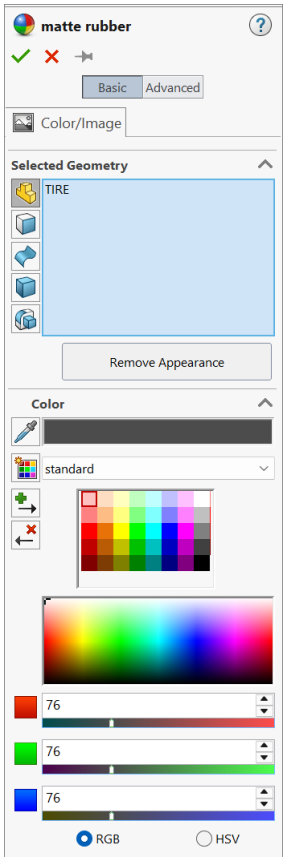

Fig. 43

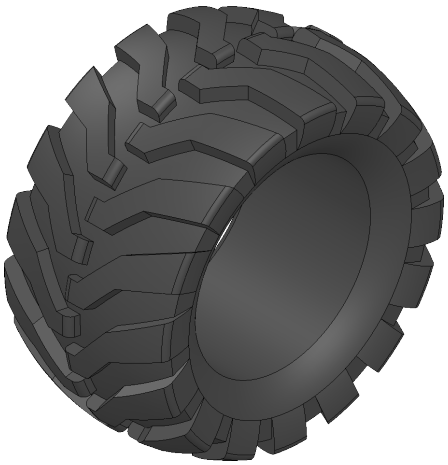

Fig. 44