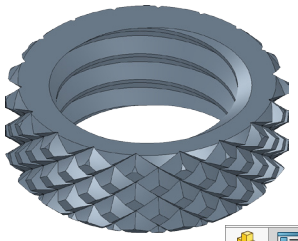
Chapter 2

Whomp Rocket
Nut



A. Extrude.

Step 1. Click File Menu > New, click **Part Metric** and OK.

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

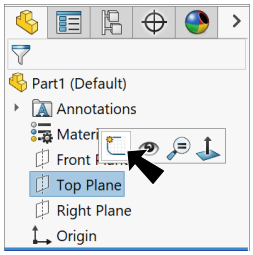


Fig. 1

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

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

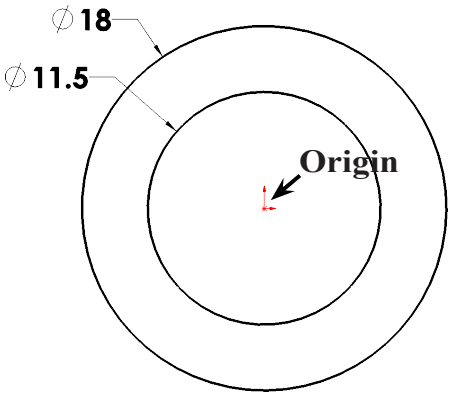


Fig. 2

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

Step 6. Dimension **diameters 18 and 11.5**, **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 Boss-Extrude Property Manager set:

under Direction 1, **Fig. 3**

End Condition **Blind**

Reverse Direction

Depth **6**

click OK .

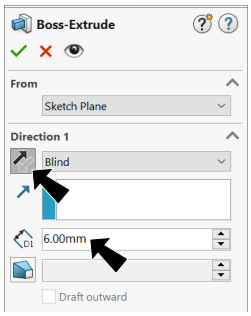


Fig. 3

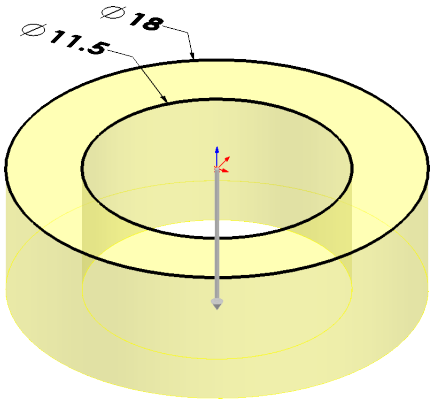


Fig. 4

B. Save as "NUT".

Step 1. Click File Menu > Save As.

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

C. Thread Feature.

Step 1. Click **Thread**  in the **Hole Wizard flyout**  on the Features toolbar.

Step 2. In the Thread Property Manager set:

under Thread Location  , **Fig. 5**
click **top inside circular edge of Extrude**, **Fig. 6**
check **Offset**
Offset Distance 2
Reverse Direction 

under End Condition
select **Blind**
Depth  **10**

under Specification
Type **Metric Die**
Size **M14x2.0**

Thread method **Cut thread**
check **Mirror Profile**
select **Mirror horizontally**

under Thread Options
select **Right-hand thread**
click OK  .

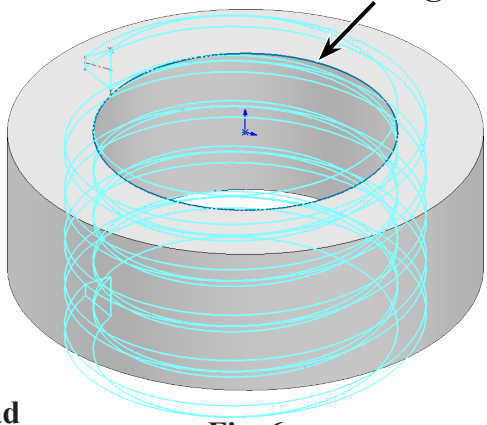


Fig. 6

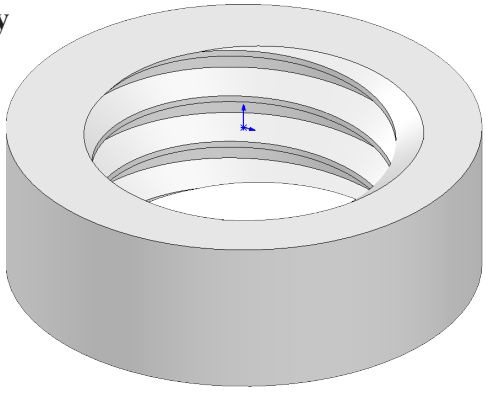


Fig. 7

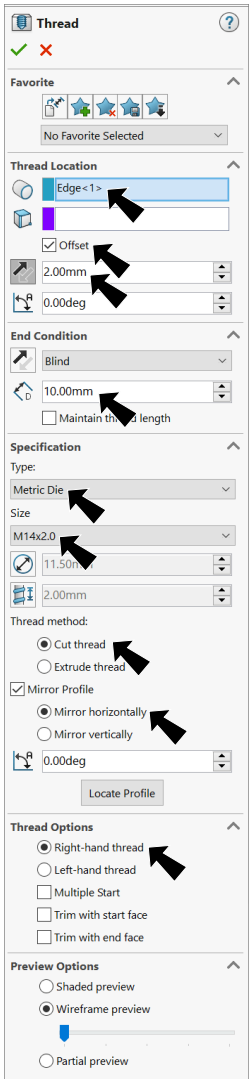


Fig. 5

D. Chamfer.

Step 1. Click **Chamfer** 

in the **Fillet flyout** 

on the Features toolbar.

Step 2. In the Chamfer Property Manager set:
under Chamfer Type, **Fig. 8**
select **Angle Distance** 
under Chamfer Parameters
Distance  **.8**
Angle  **45º**
click **both outside circular edges**, **Fig. 9**
click OK  .

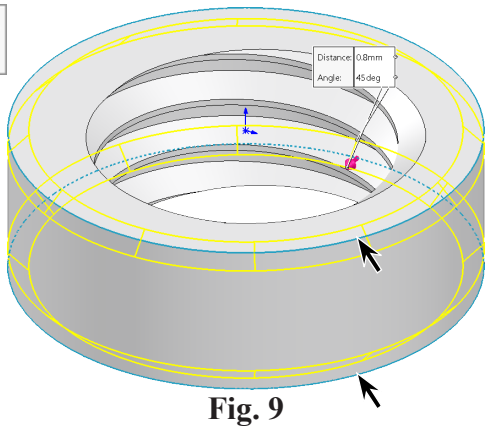


Fig. 9

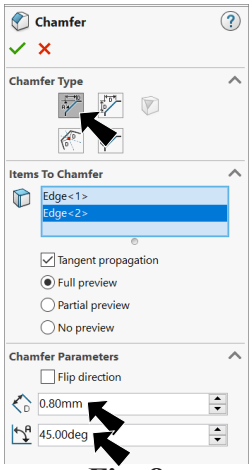


Fig. 8

E. Helix Knurl.

Step 1. Click **Top Plane**  in the Feature Manager and click **Sketch**  on the context toolbar, **Fig. 10**.

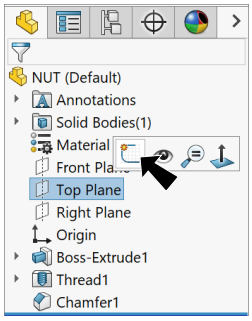


Fig. 10

Step 2. Click **Convert Entities** 

on the Sketch toolbar.

Step 3. In the Convert Entities Property Manager:
under Entities to Convert, **Fig. 11**
click **outside circular edge of top chamfer**, **Fig. 12**
click OK  .

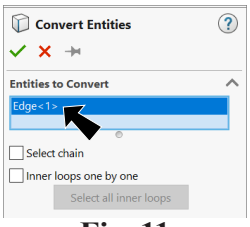


Fig. 11

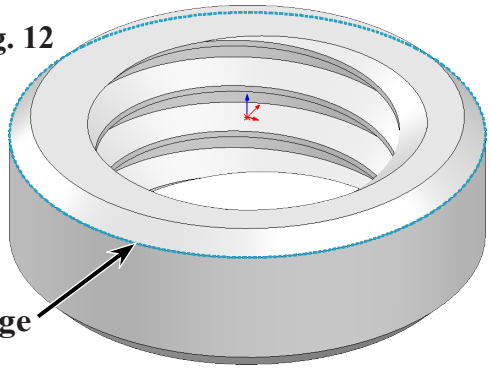


Fig. 12

Step 4. Click Insert Menu > Curve > Helix/Spiral.

Step 5. In the Helix/Spiral Property Manager set:
under Defined By, **Fig. 13**
select **Pitch and Revolution**
under Parameters
Pitch: 40
check **Reverse direction**
Revolutions: .15
Start angle 0
select **Clockwise**
click OK  .

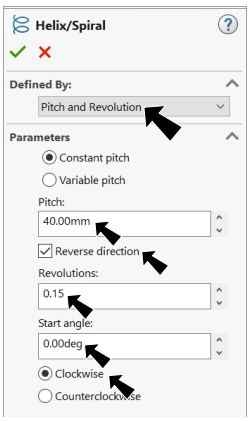


Fig. 13

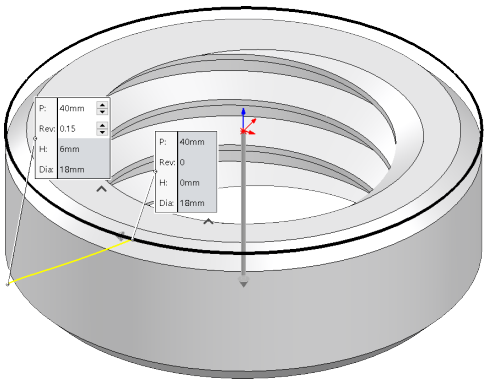


Fig. 14

F. Sweep Cut Knurl.

Step 1. Click **Top Plane** in the Feature Manager and click **Sketch** on the context toolbar, **Fig. 15**.

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

Step 3. Click **Polygon** on the Sketch toolbar.

Step 4. In Polygon Property Manager set under Parameters, **Fig. 16**
Number of Sides **4**.

Step 5. Sketch **polygon** below the part, **Fig. 17**.

Step 6. **Unselect Polygon tool**. To unselect, **right click graphics area and click Select** from menu.

Step 7. **Ctrl click opposite vertices of polygon** and click **Make Vertical** on the context toolbar, **Fig. 18**.

Step 8. **Ctrl click centerpoint of polygon and helix** to select both. **Release Ctrl key** and click **Make Pierce** on the context toolbar, **Fig. 19**. Make Pierce adds a Pierce relation between sketch and helix.

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

Step 10. Dimension **opposite vertices 2**, **Fig. 20**.

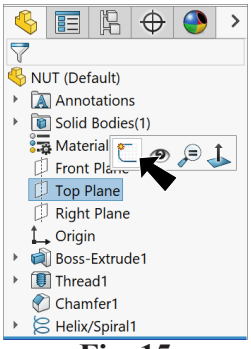


Fig. 15

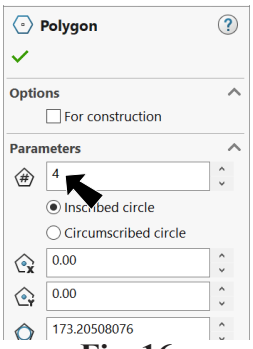


Fig. 16

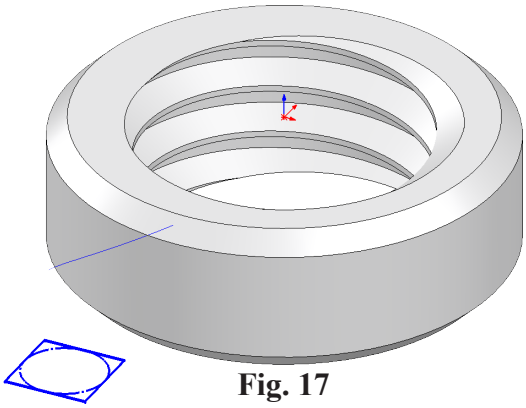


Fig. 17

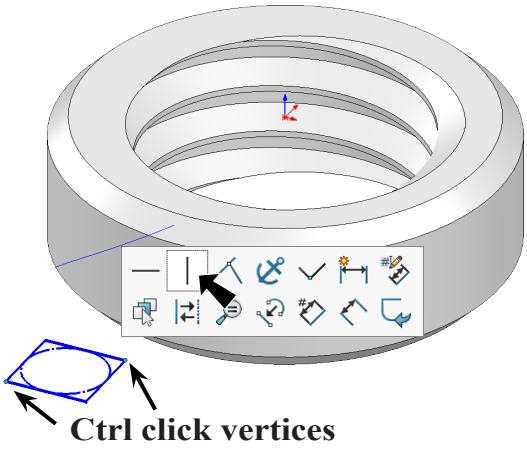


Fig. 18

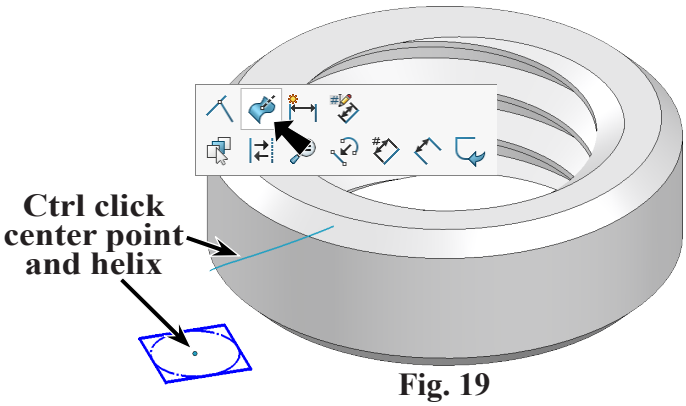


Fig. 19

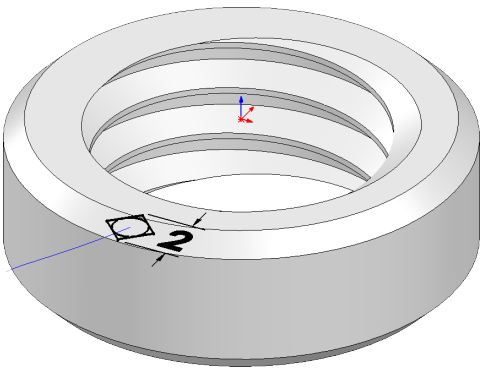
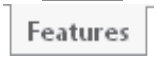


Fig. 20

Step 11. Click **Exit Sketch** 

on the Sketch toolbar.

Step 12. Click **Features** 

on the Command Manager toolbar.

Step 13. Click **Sweep Cut** 

on the Features toolbar.

Step 14. In the Cut Sweep Property Manager set:
under Profile and Path, **Fig. 21**
Profile click **Sketch3**, **Fig. 22**
Path click **Helix**
click OK .

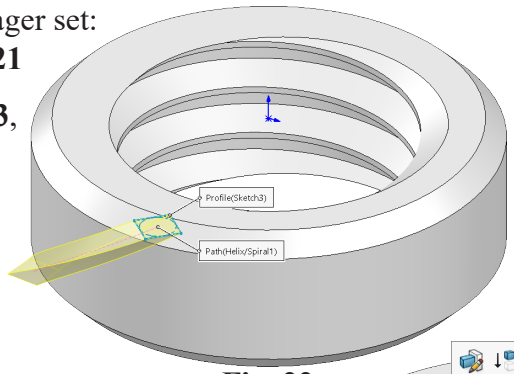


Fig. 22

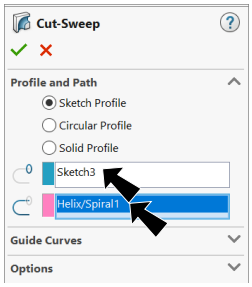


Fig. 21

Step 16. Save (**Ctrl-S**).

G. Circular Pattern Knurl.

Step 1. **Hide Helix/Spiral1**. To hide, click **the Helix** in the graphics area and **Hide** on the context toolbar, **Fig. 23**.

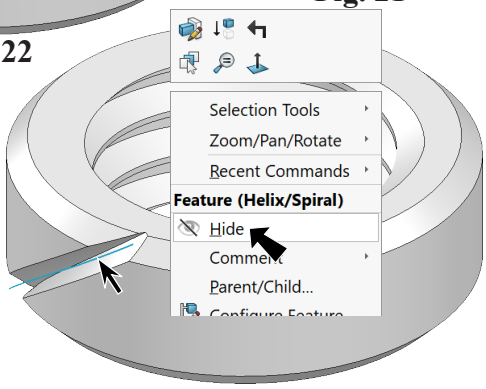
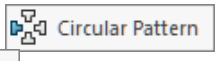


Fig. 23

Step 2. Click **Circular Pattern** 

in the **Linear Pattern flyout** 

on the Features toolbar.

Step 3. In the Circular Pattern Property Manager set:
under Features and Faces, **Fig. 24**
click **Cut-Sweep1** in graphics area, **Fig. 25**
under Direction 1
click in **Pattern Axis** box
click **cylindrical face**
select **Equal spacing**
Number of Instances **18**
click OK .

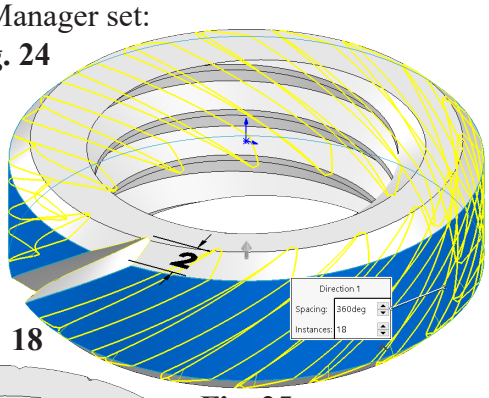


Fig. 25

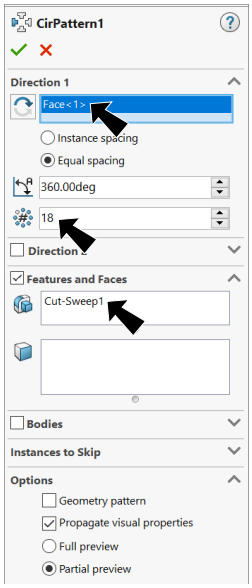


Fig. 24

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

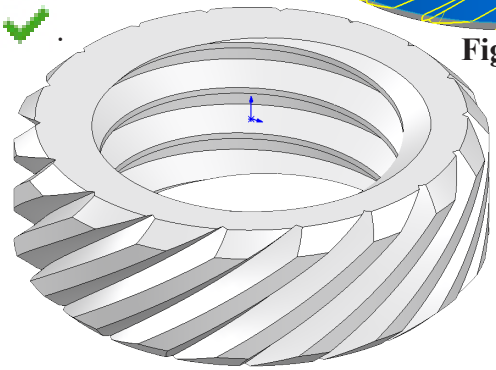


Fig. 26

H. Mirror Circular Pattern Knurl.

Step 1. **Ctrl click Front Plane** and **Circular Pattern1** feature in the Feature Manager to select plane and feature, **Fig. 27**.

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

Step 3. In the Mirror Property Manager click OK ✔, **Fig. 28**.

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

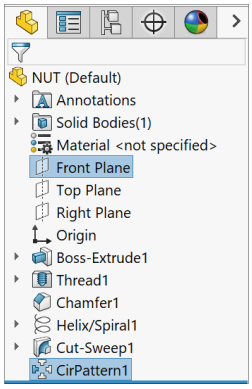


Fig. 27

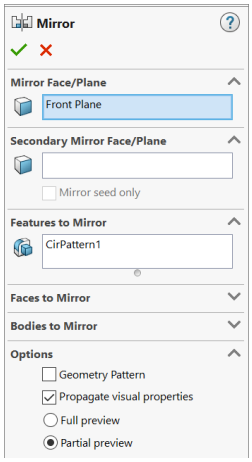


Fig. 28

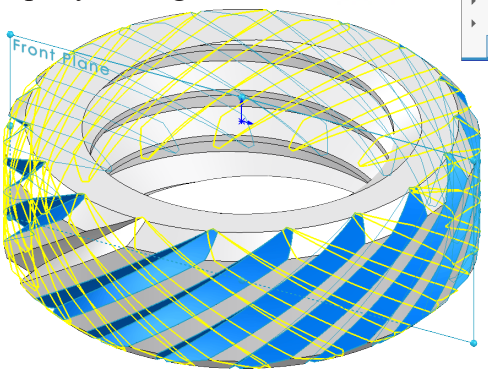


Fig. 28

I. Appearance: Blue.

Step 1. Click the part to select part, click **Appearances Callout** on the context toolbar and click **NUT**, **Fig. 30**.

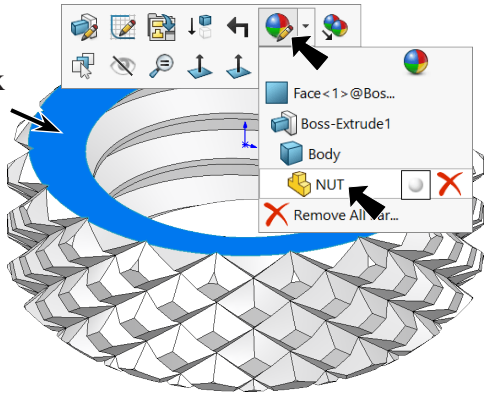


Fig. 30

Step 2. In the Appearances Property Manager set:

under Color, **Fig. 31**

set **RGB values**

R 112

G 128

B 144

click OK ✔.

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

Note: The knurling design is deep cut for 3D printing.

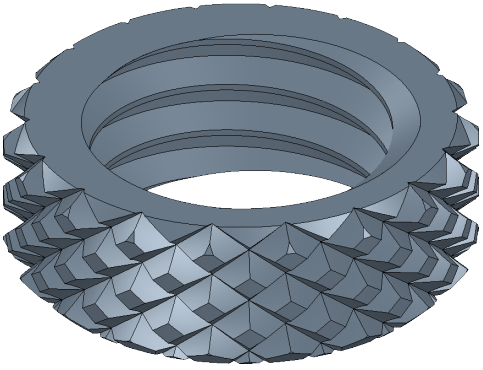


Fig. 31

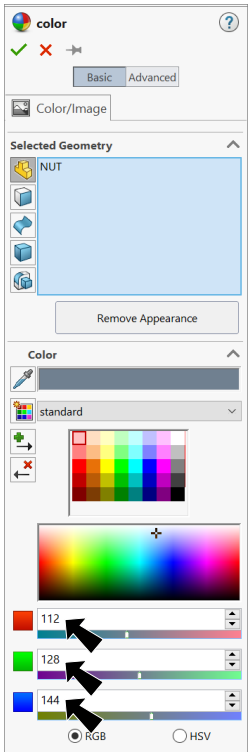


Fig. 31