SolidWorks/CAD

- an introductory tutorial

Xiao Shang

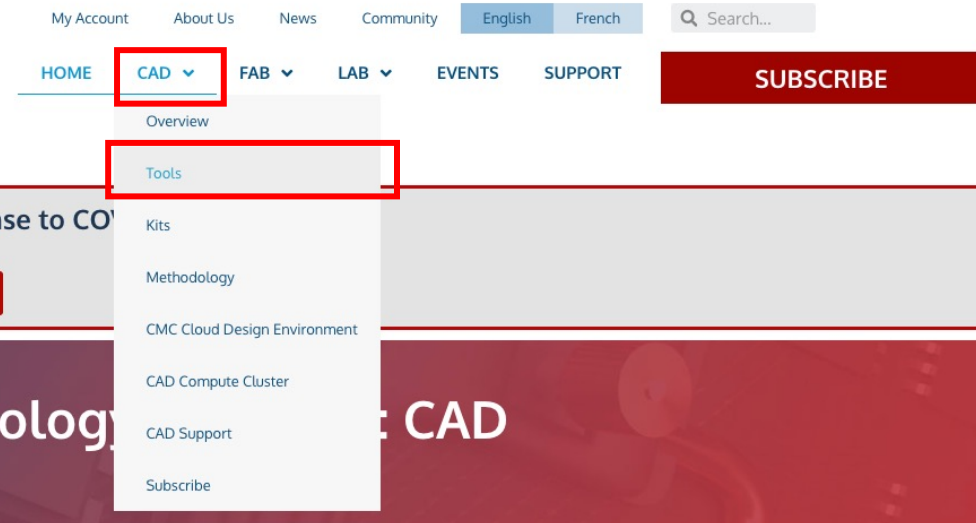McGill University

2021-05-11

Outline

- Getting started

- Solidworks step by step guide – Creating your first CAD model!

  - Part

  - Assembly

  - Drawing

- Evaluating your model

- Sharing your design

- GrabCAD

- Design to manufacturing

  - 3D printing

  - Conventional machining

Getting started

Setup (with cmc.ca)

Getting started

Getting started

- The software (SolidWorks)

Step by step installation guide by CMC:
https://community.cmc.ca/docs/DOC-1568

- The license (CADpassR20)
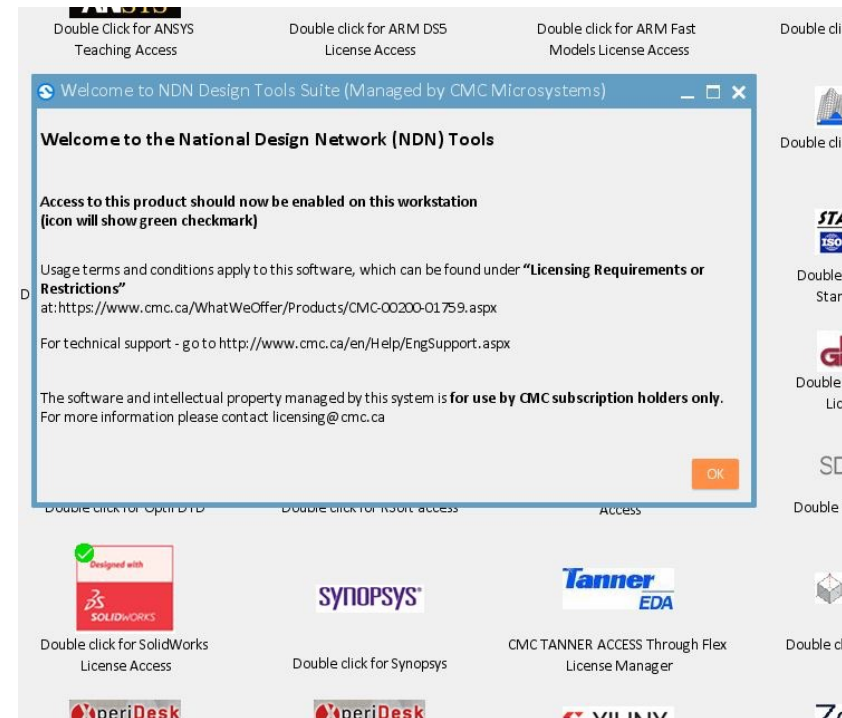
Solidworks step by step guide

– Creating your first CAD model

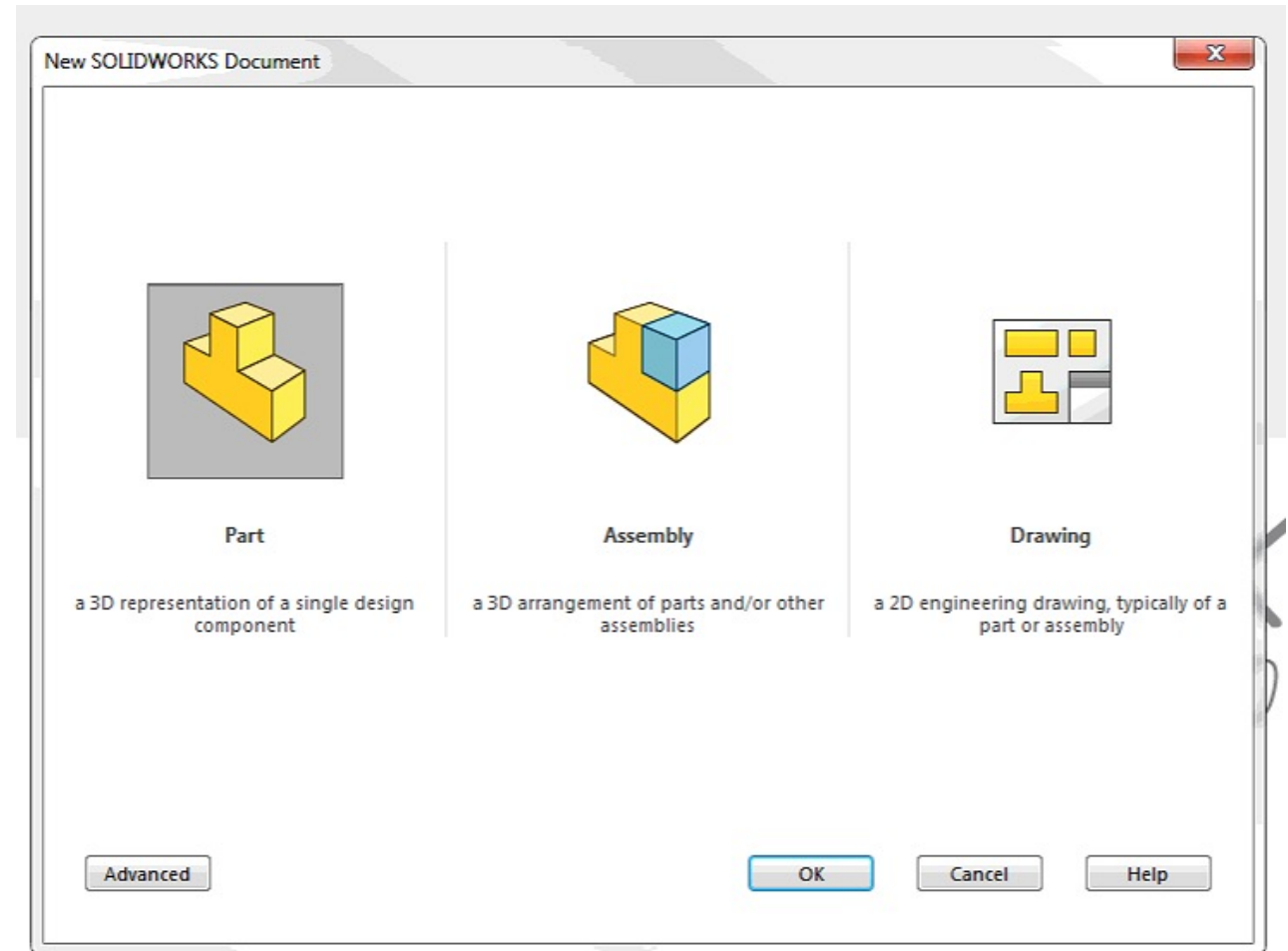- **3 types of Solidworks files**

1. Part – basic element in a design

   .sldprt

2. Assembly – various parts mated together

   .sldasm

3. Drawing – 2D mechanical drawgs
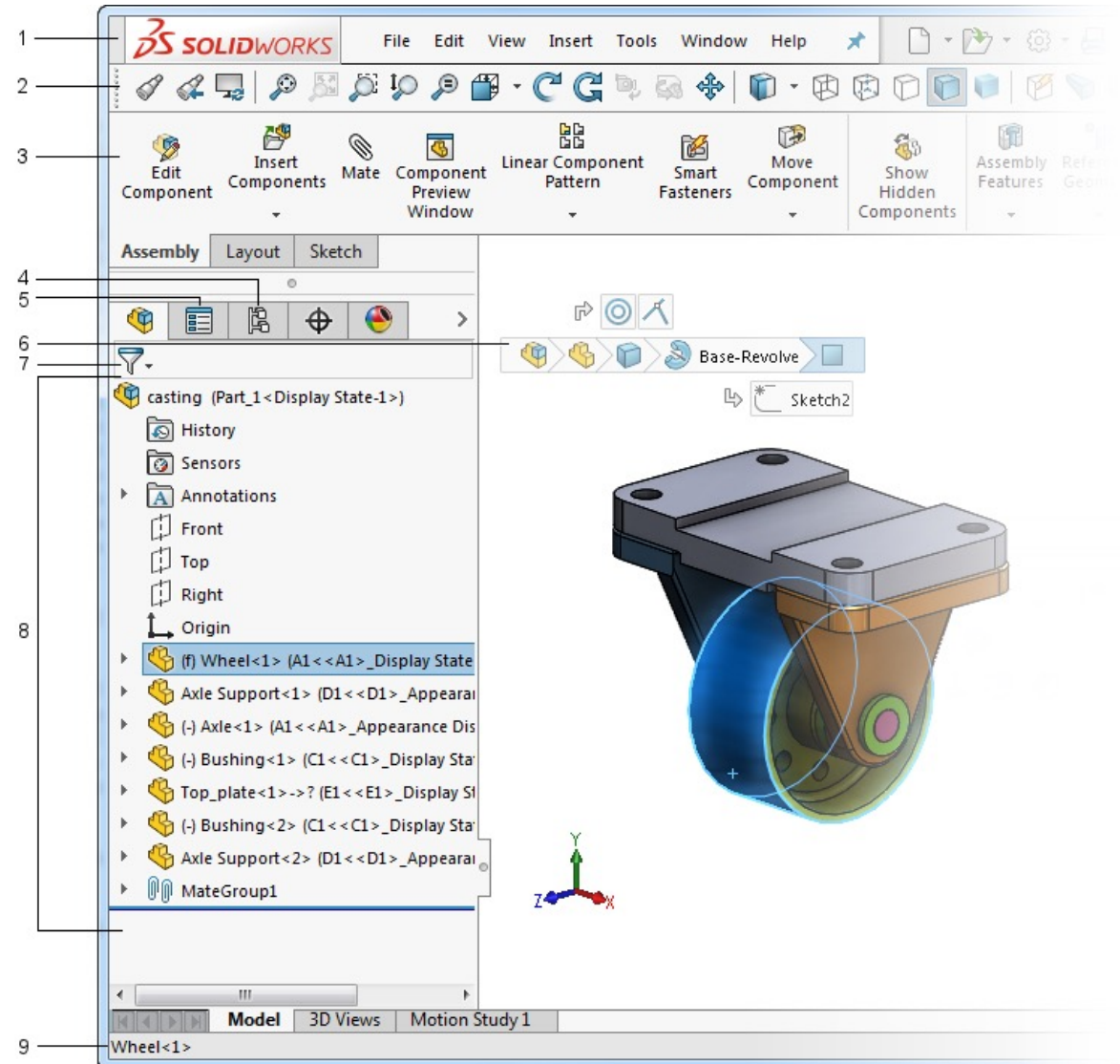
   .slddrw

Solidworks step by step guide

– Creating your first CAD model

• **Solidworks GUI**

1. Menu Bar

2. Toolbars

3. CommandManager

4. ConfigurationManager

5. PropertyManager

6. Selection Breadcrumbs

7. FeatureManager Design Tree Filter

8. FeatureManager Design Tree

9. Status Bar

Solidworks step by step guide
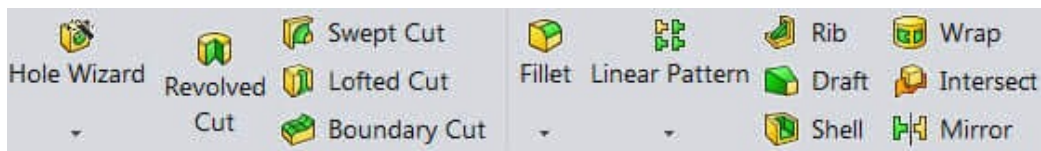
– Creating your first CAD model
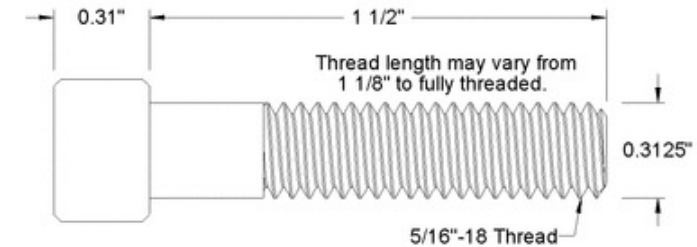
- ## Creating your first part:

Sketch

Features (2D->3D)

Extruded Boss/Base | Revolved Boss/Base | Swept Boss/Base | Lofted Boss/Base | Boundary Boss/Base | Extruded Cut

More features

Hole Wizard | Revolved Cut | Swept Cut | Lofted Cut | Boundary Cut | Fillet | Linear Pattern | Rib | Draft | Shell | Wrap | Intersect | Mirror

Partially threaded 5/16"-18 socket head screw

0.469"

1/4" Hex

0.31"

1 1/2"

Thread length may vary from 1 1/8" to fully threaded.

0.3125"

5/16"-18 Thread

McMASTER-CARR. CAD | PART NUMBER | 92185A587

http://www.mcmaster.com

© 2014 McMaster-Carr Supply Company

Information in this drawing is provided for reference only.
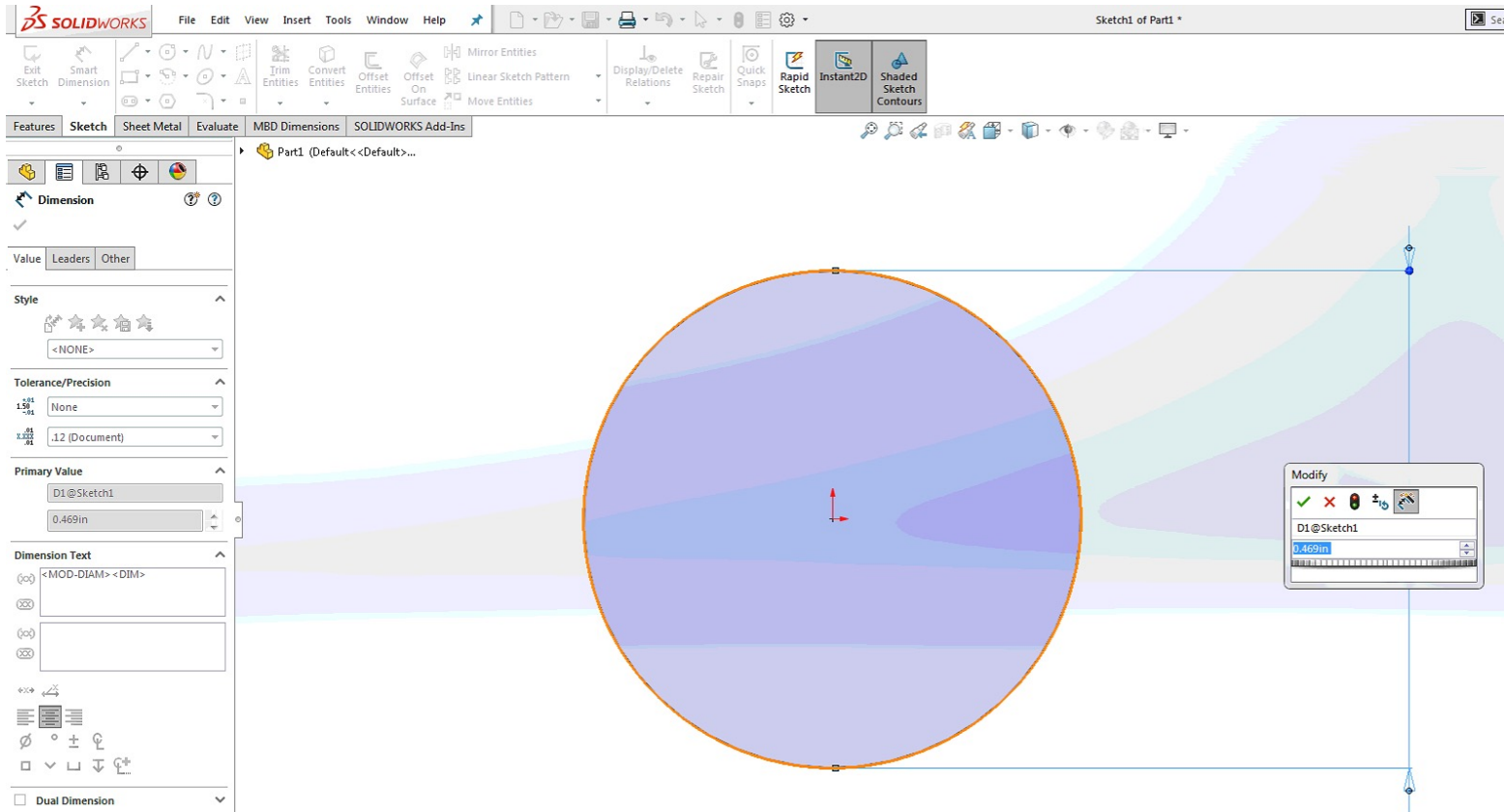
Stainless Steel Socket Head Cap Screw

Solidworks step by step guide
– Creating your first CAD model
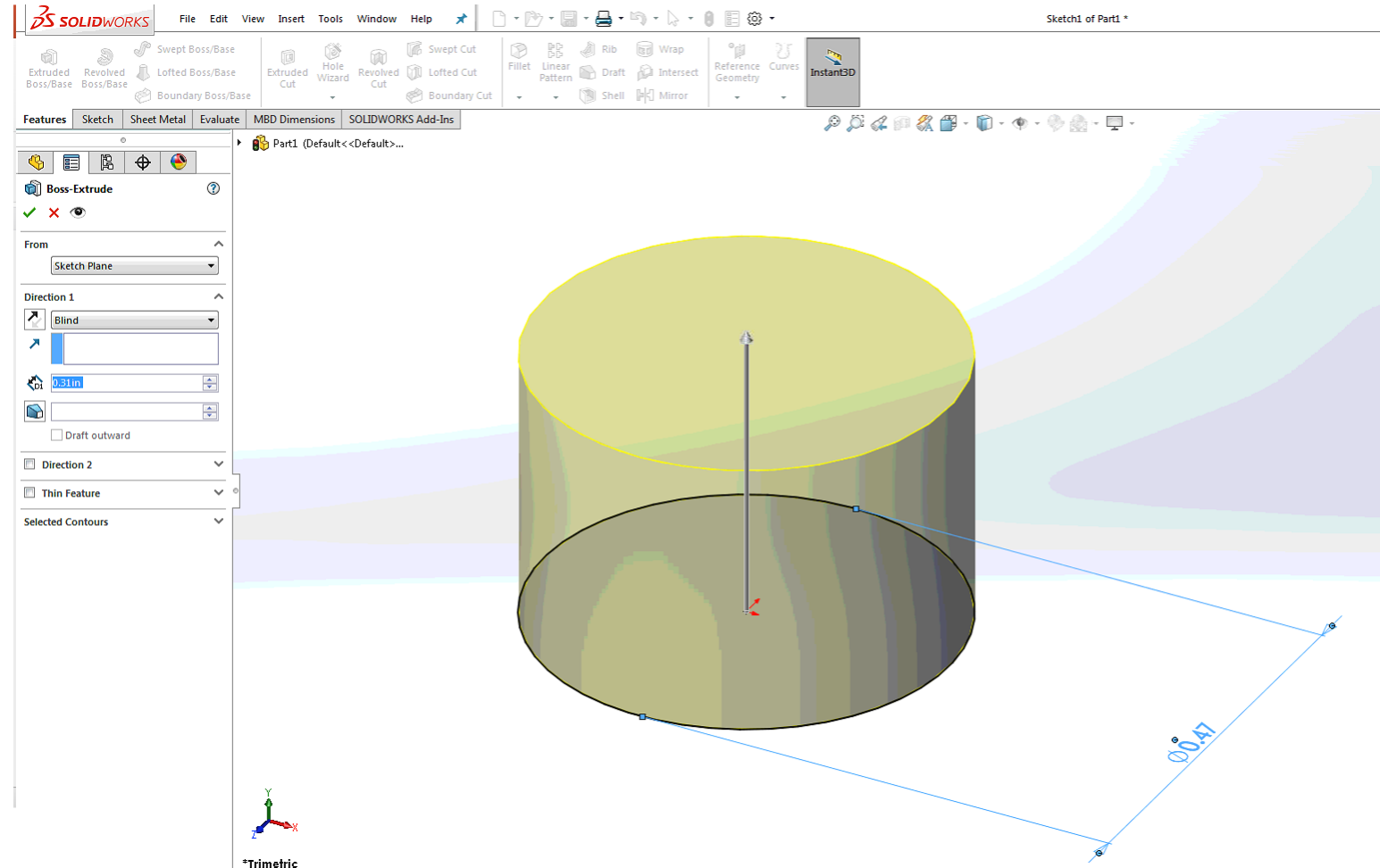
- ## Creating your first part:

- Basic geometries

- Mirror

- Pattern

- Relations

Solidworks step by step guide
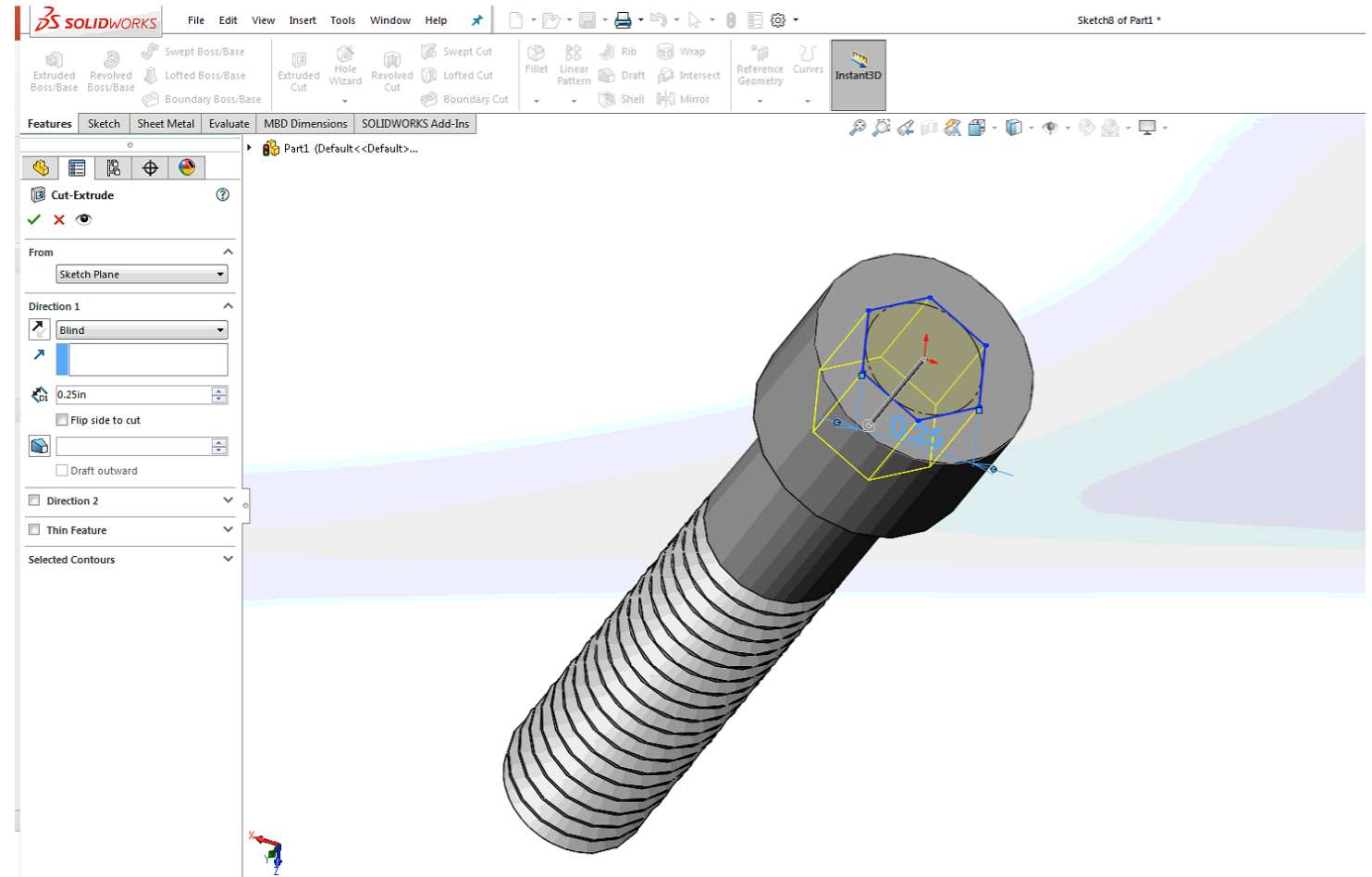
– Creating your first CAD model

- Creating your first part:

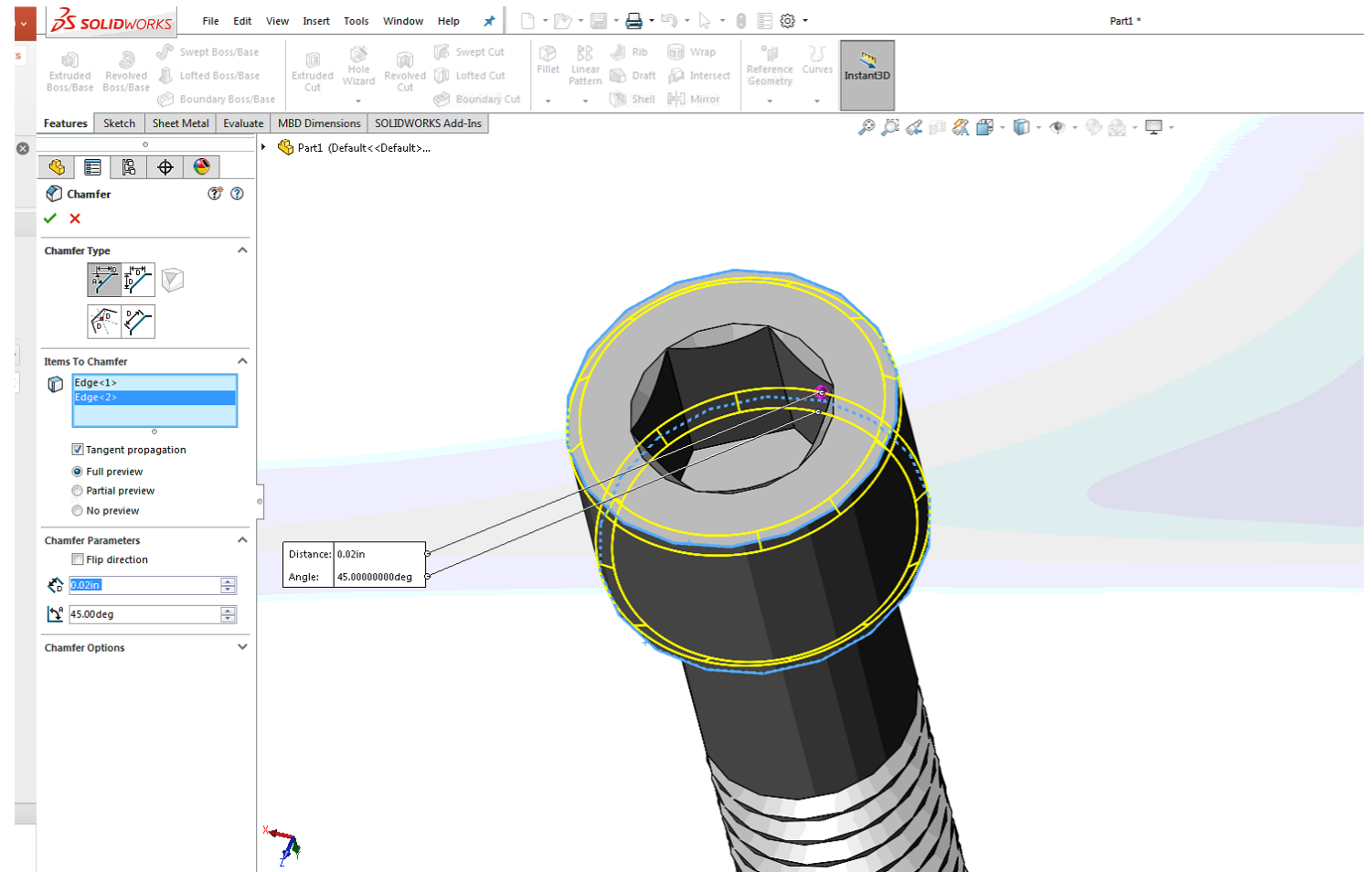# Solidworks step by step guide
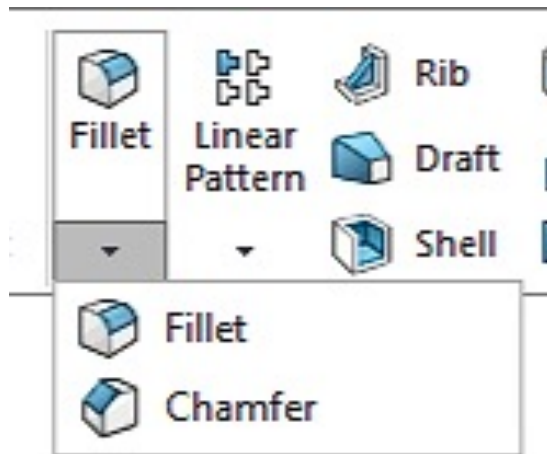– Creating your first CAD model

- Creating your first part:

Solidworks step by step guide
– Creating your first CAD model

• Creating your first part:

Solidworks step by step guide
– Creating your first CAD model

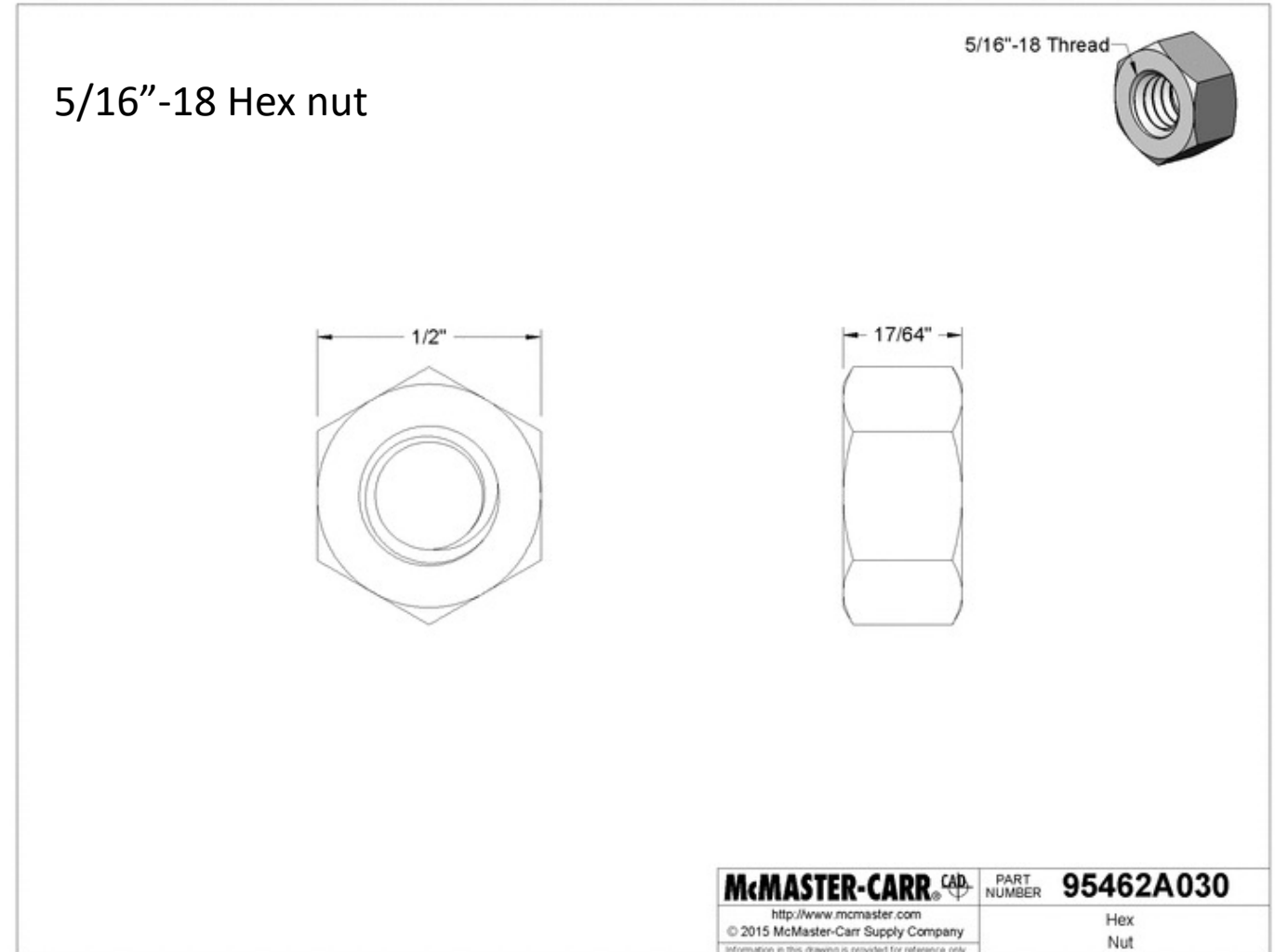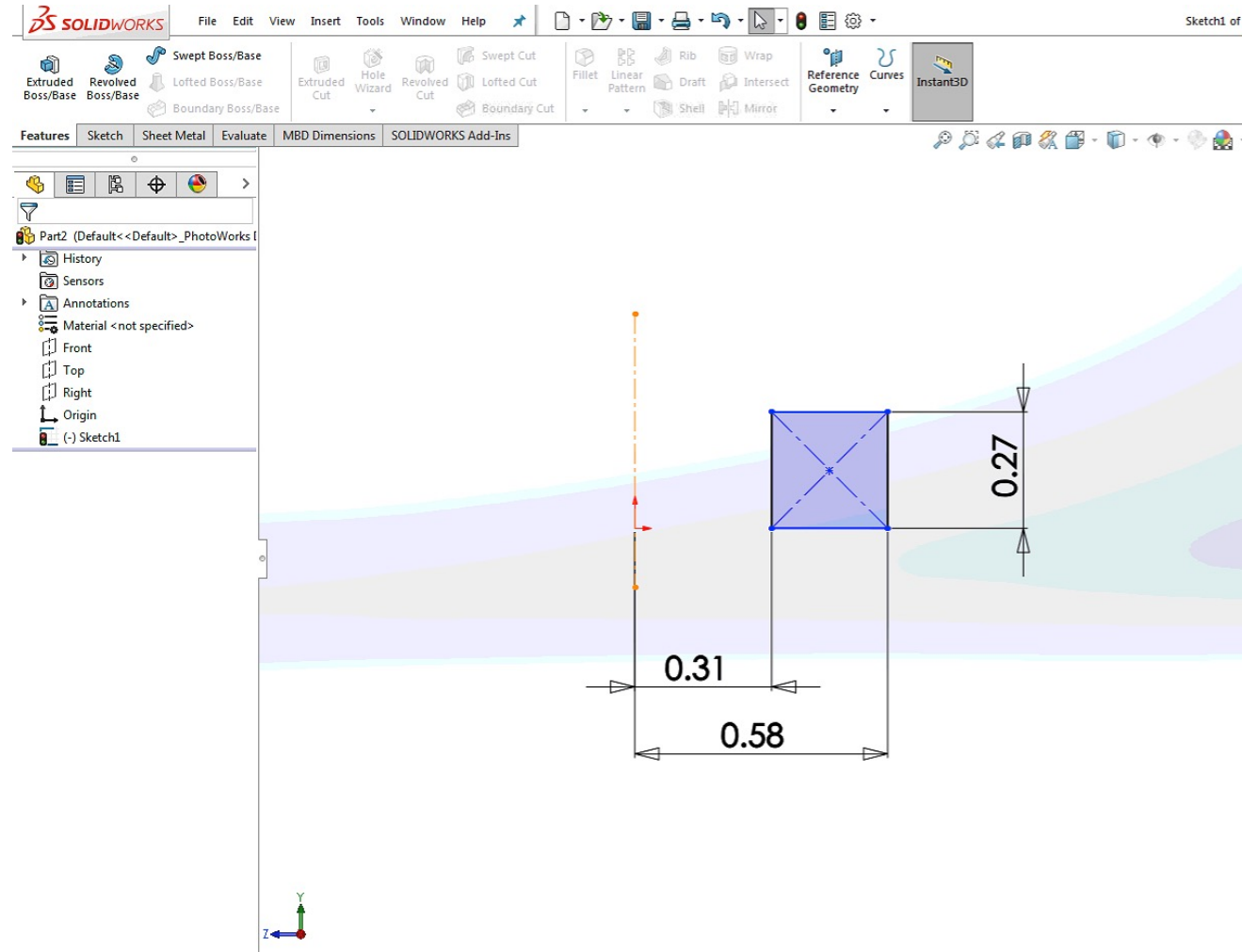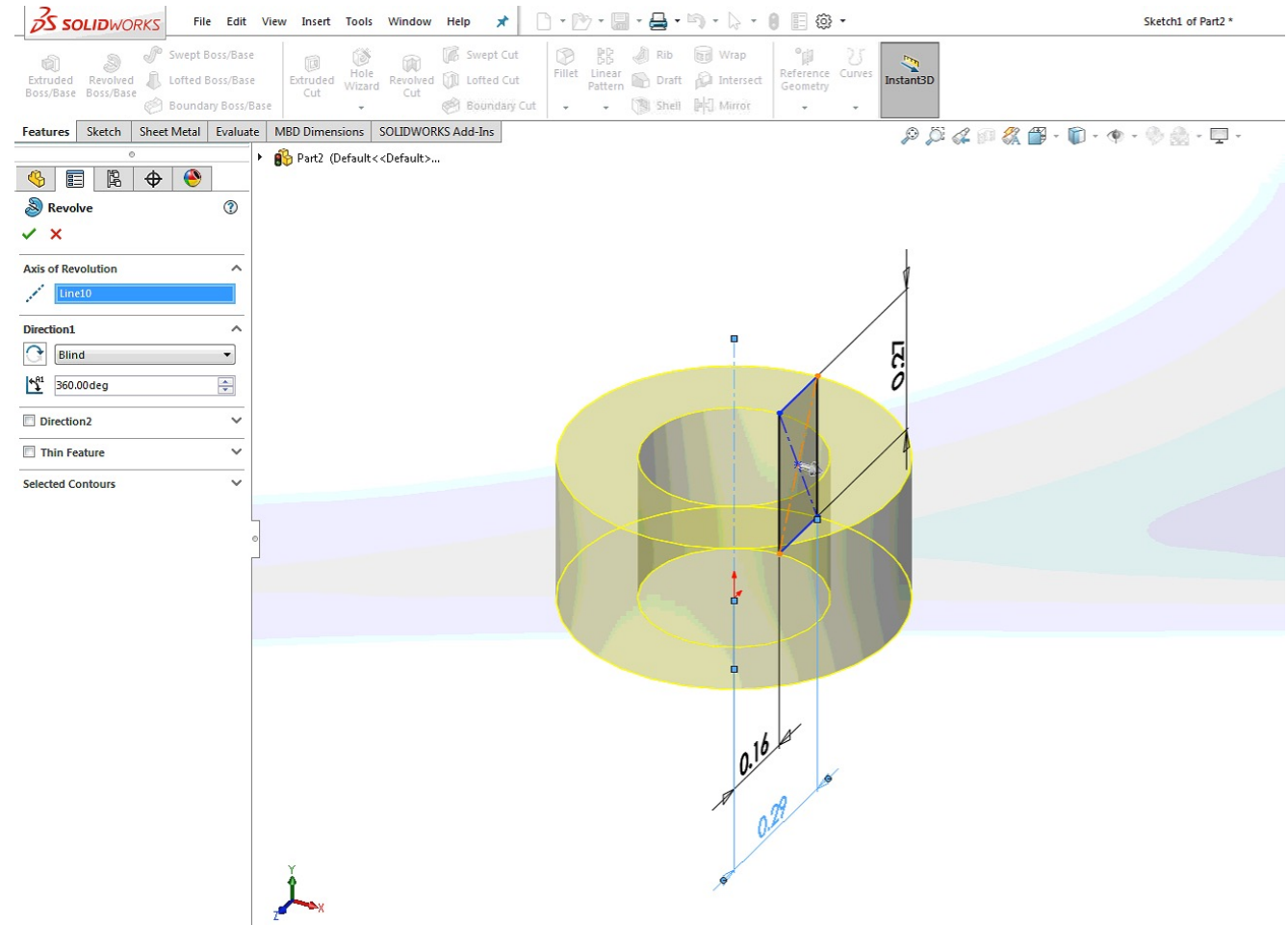- Creating your first part:

Rotational symmetrical part

5/16"-18 Hex nut

5/16"-18 Thread

1/2"

17/64"

McMASTER-CARR. CAD.
http://www.mcmaster.com
© 2015 McMaster-Carr Supply Company
Information in this drawing is provided for reference only

PART NUMBER: 95462A030

Hex Nut

Solidworks step by step guide
– Creating your first CAD model

• Creating your first part:

Solidworks step by step guide
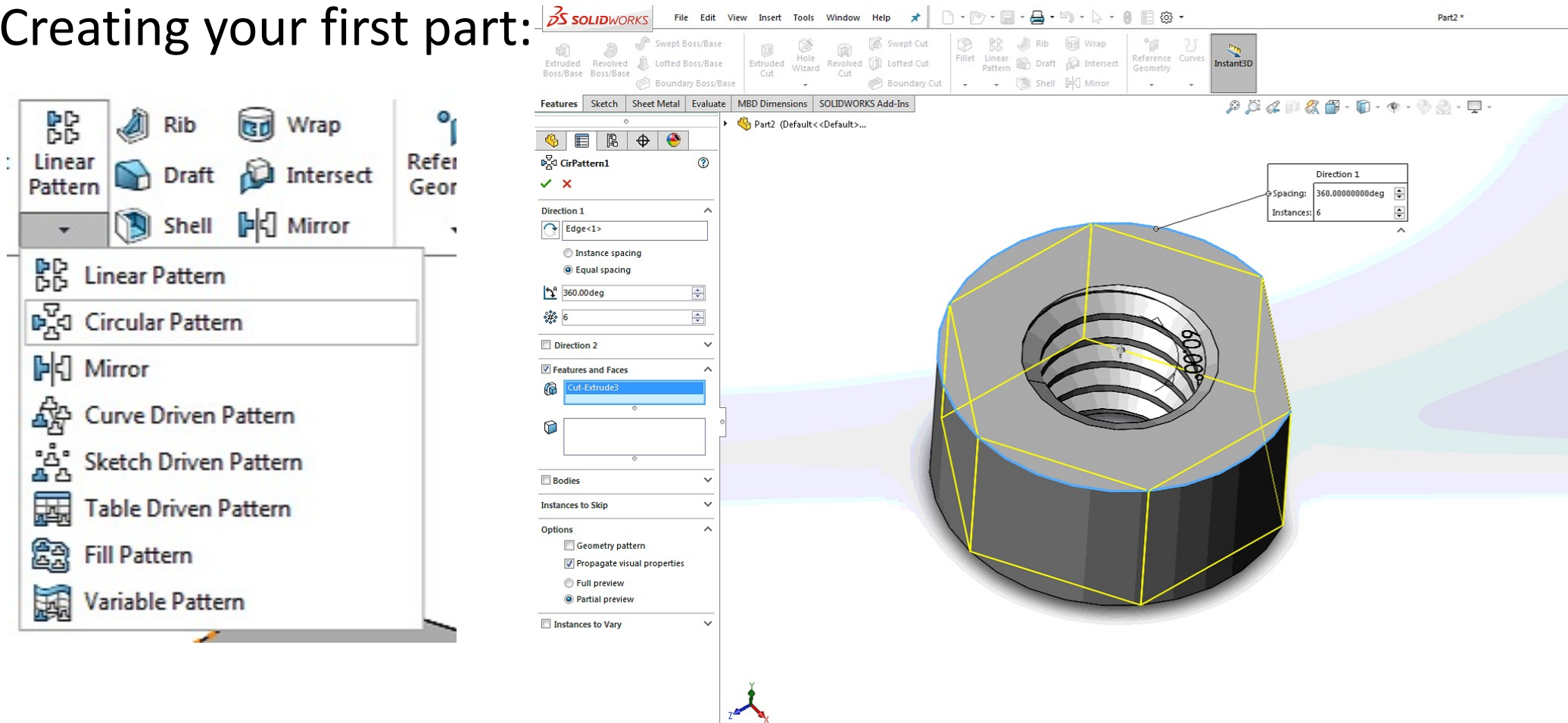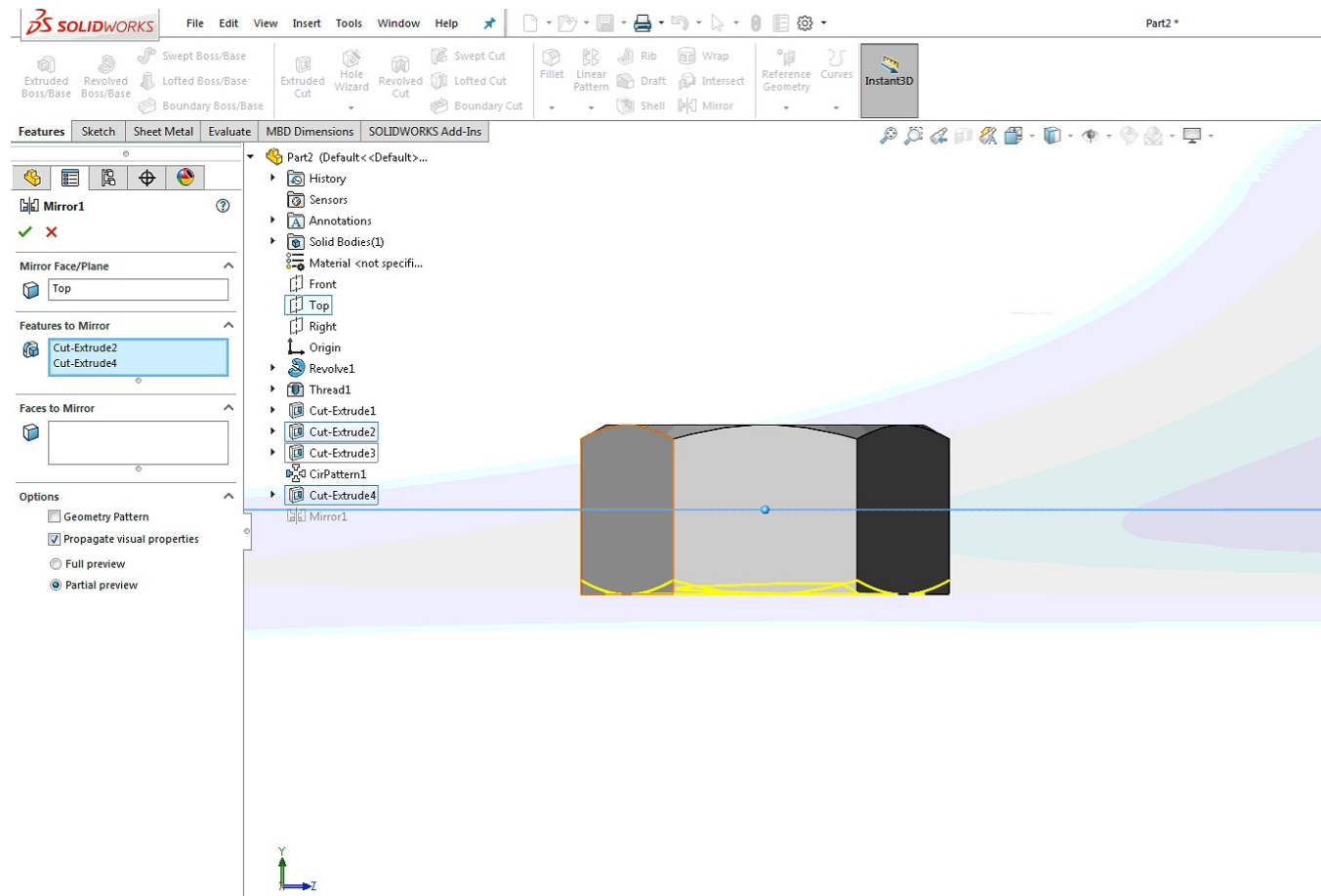– Creating your first CAD model

• Creating your first part:

Solidworks step by step guide
– Creating your first CAD model

• Creating your first part:

Solidworks step by step guide
– Creating your first CAD model

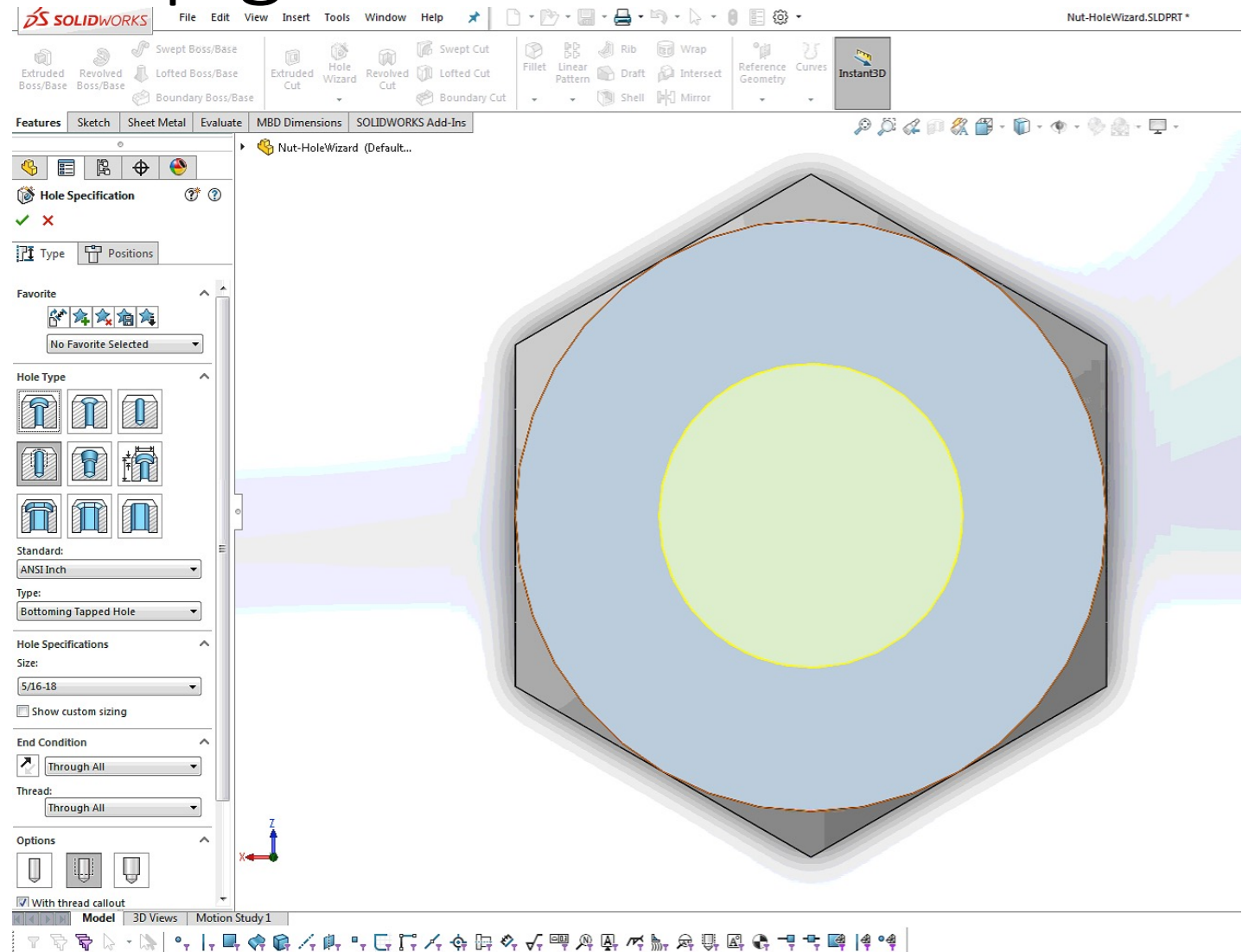- Creating your first part:

Solidworks step by step guide
– Creating your first CAD model

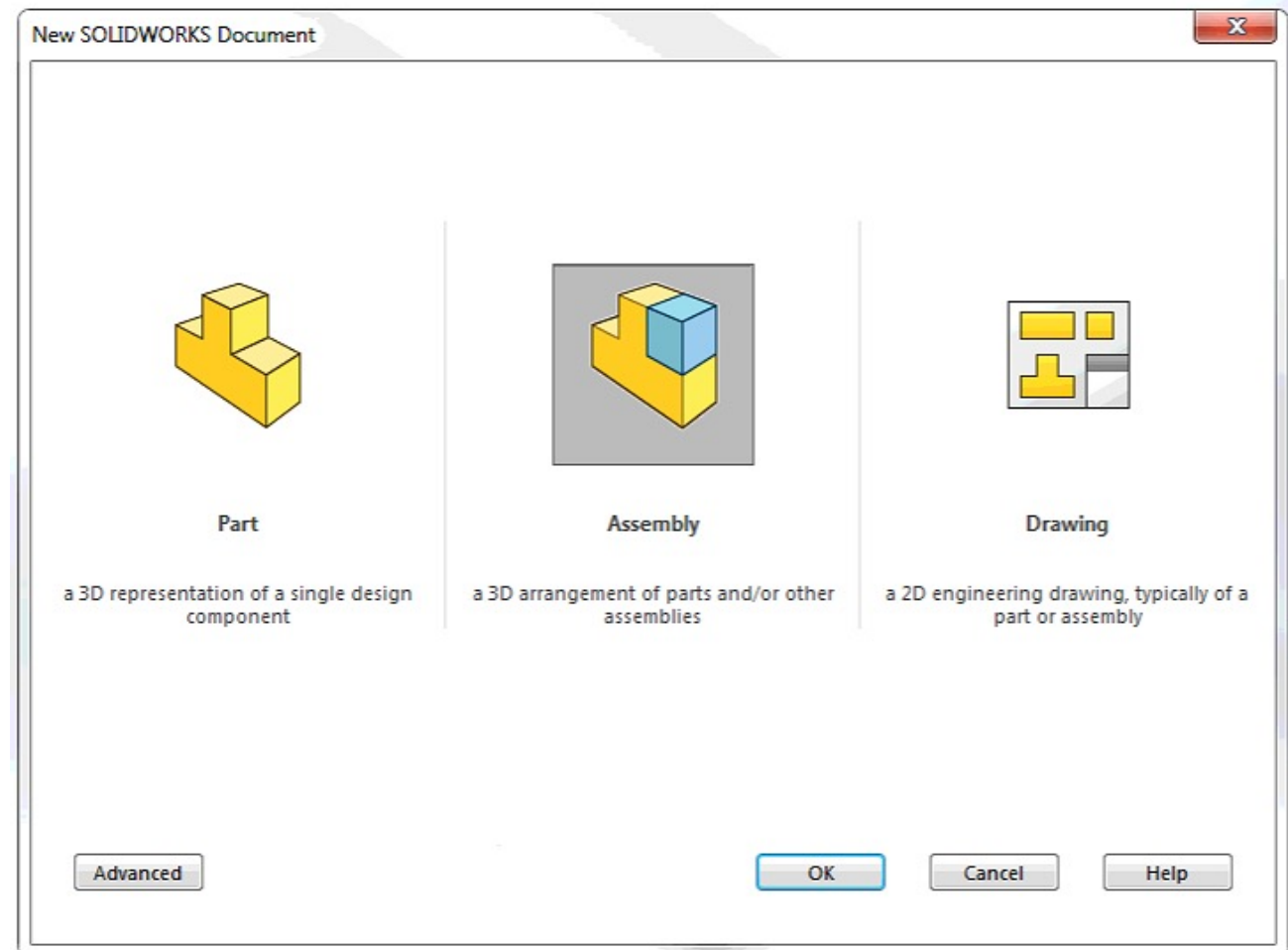- Creating your first part:

❖ A simplified way

Hole Wizard

- Standard
- Details not required
- Easier to make (3d model&drawings)
- 3D printing/Machining

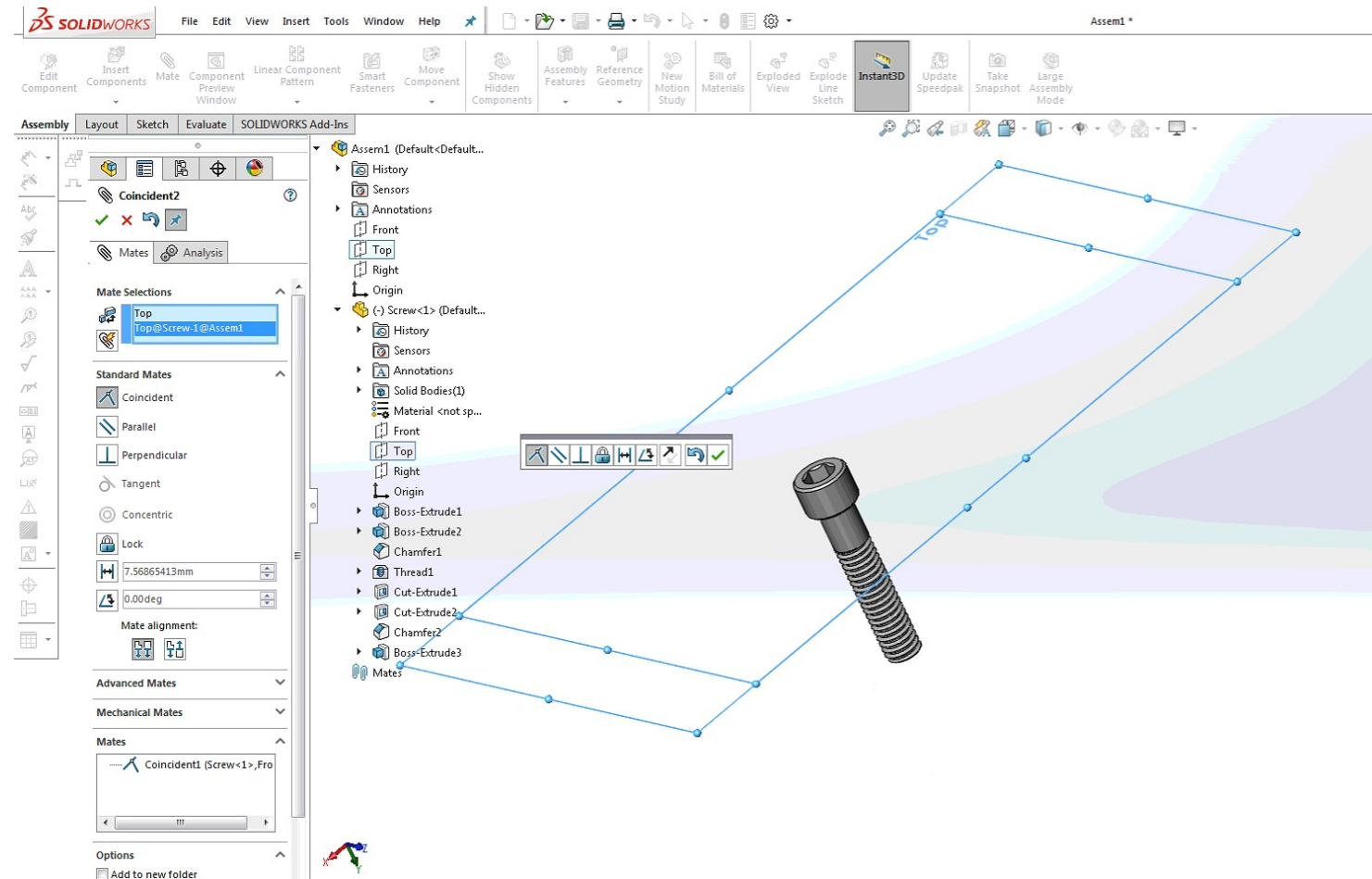# Solidworks step by step guide

– Creating your first CAD model

- Creating your first assembly

Solidworks step by step guide
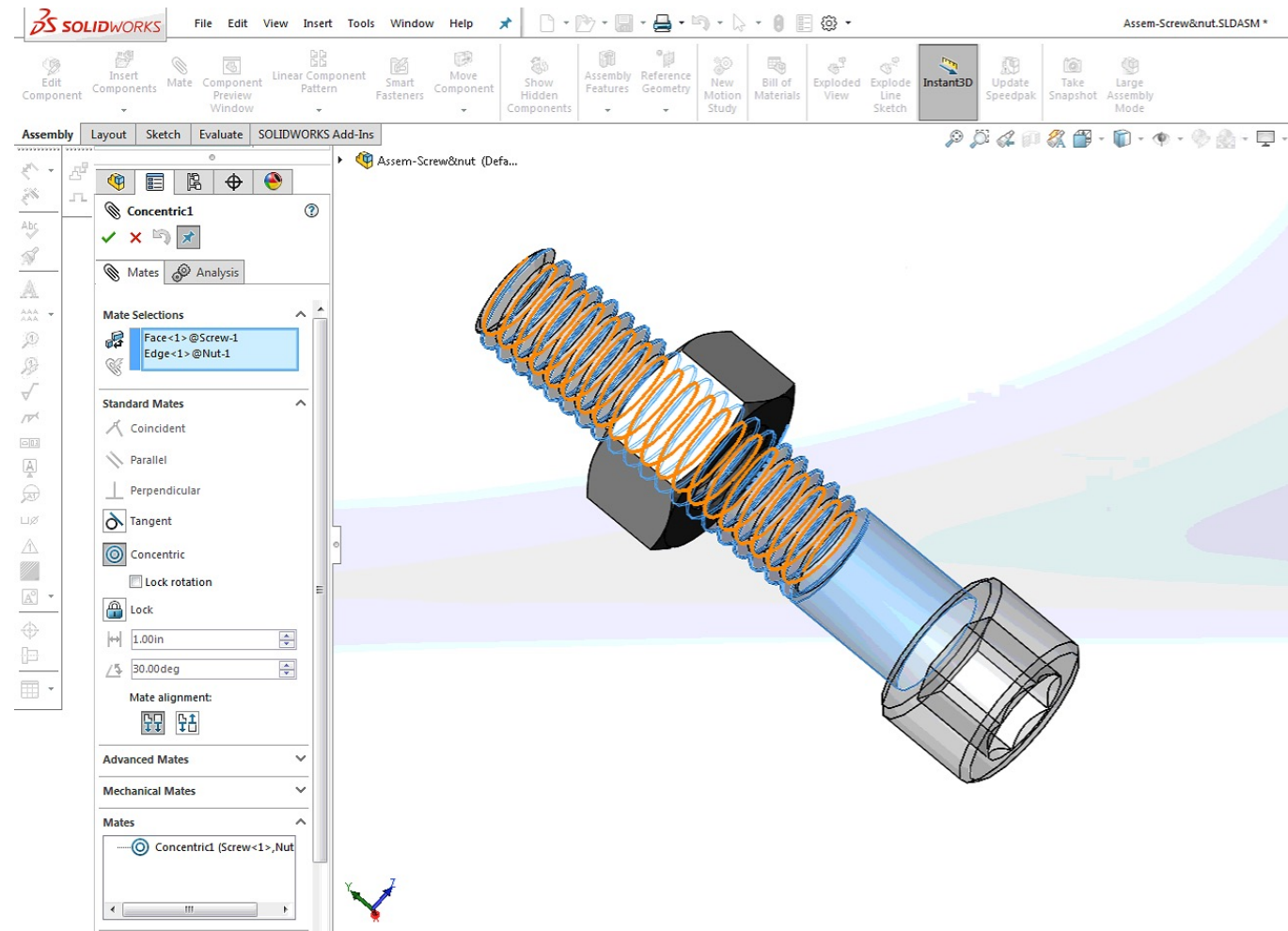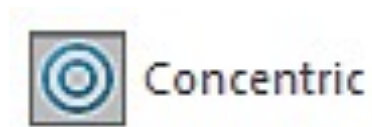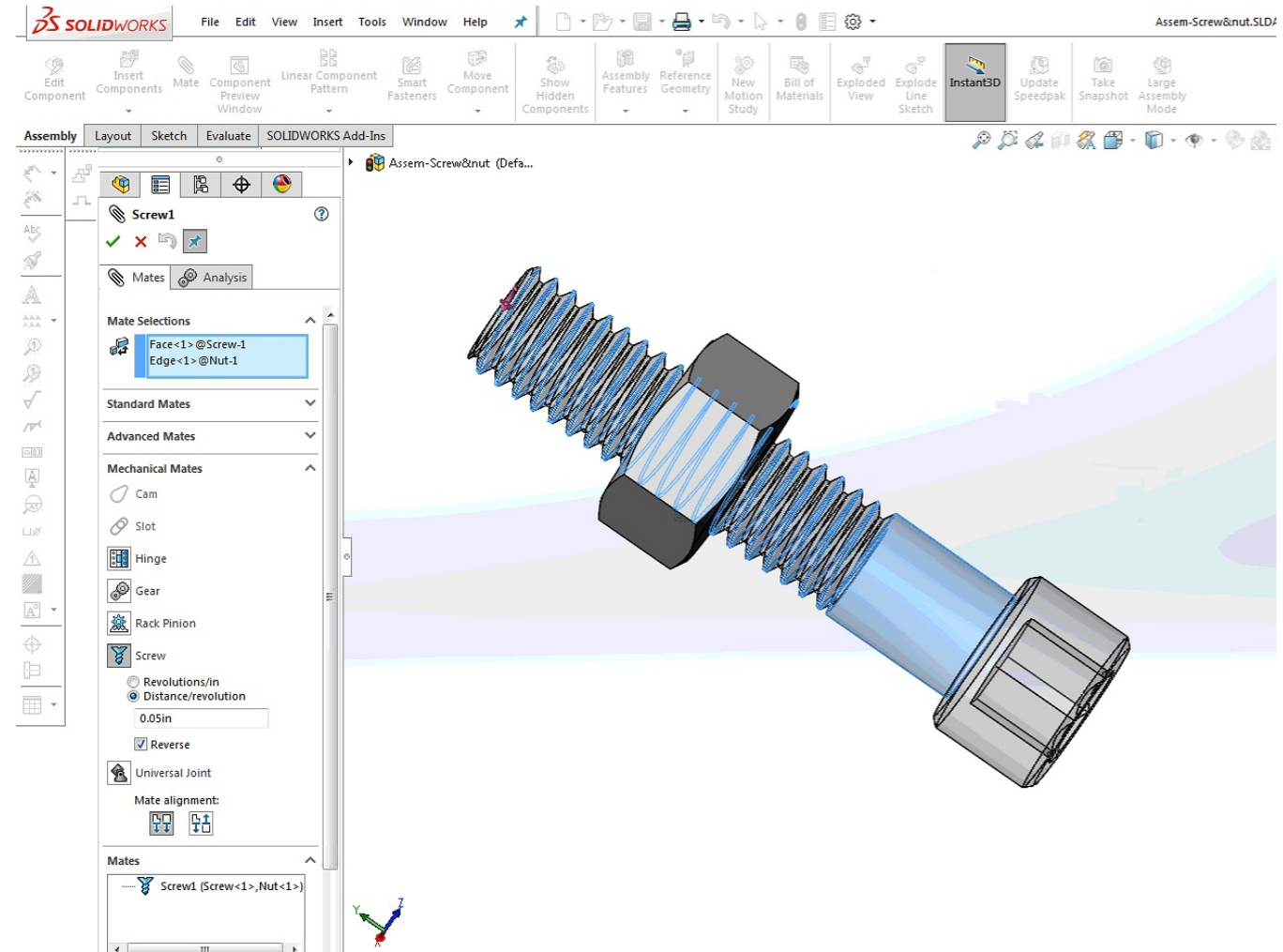– Creating your first CAD model

- Creating your first assembly:

Solidworks step by step guide
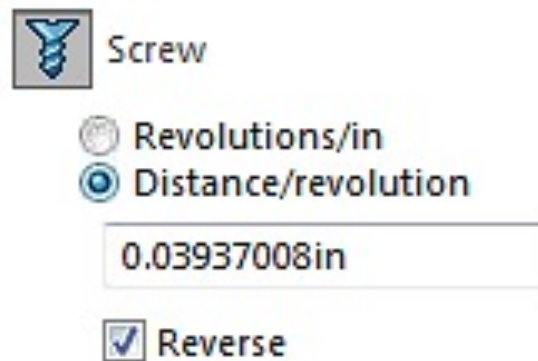– Creating your first CAD model

• Creating your first assembly:

Solidworks step by step guide

– Creating your first CAD model

- Creating your first assembly:

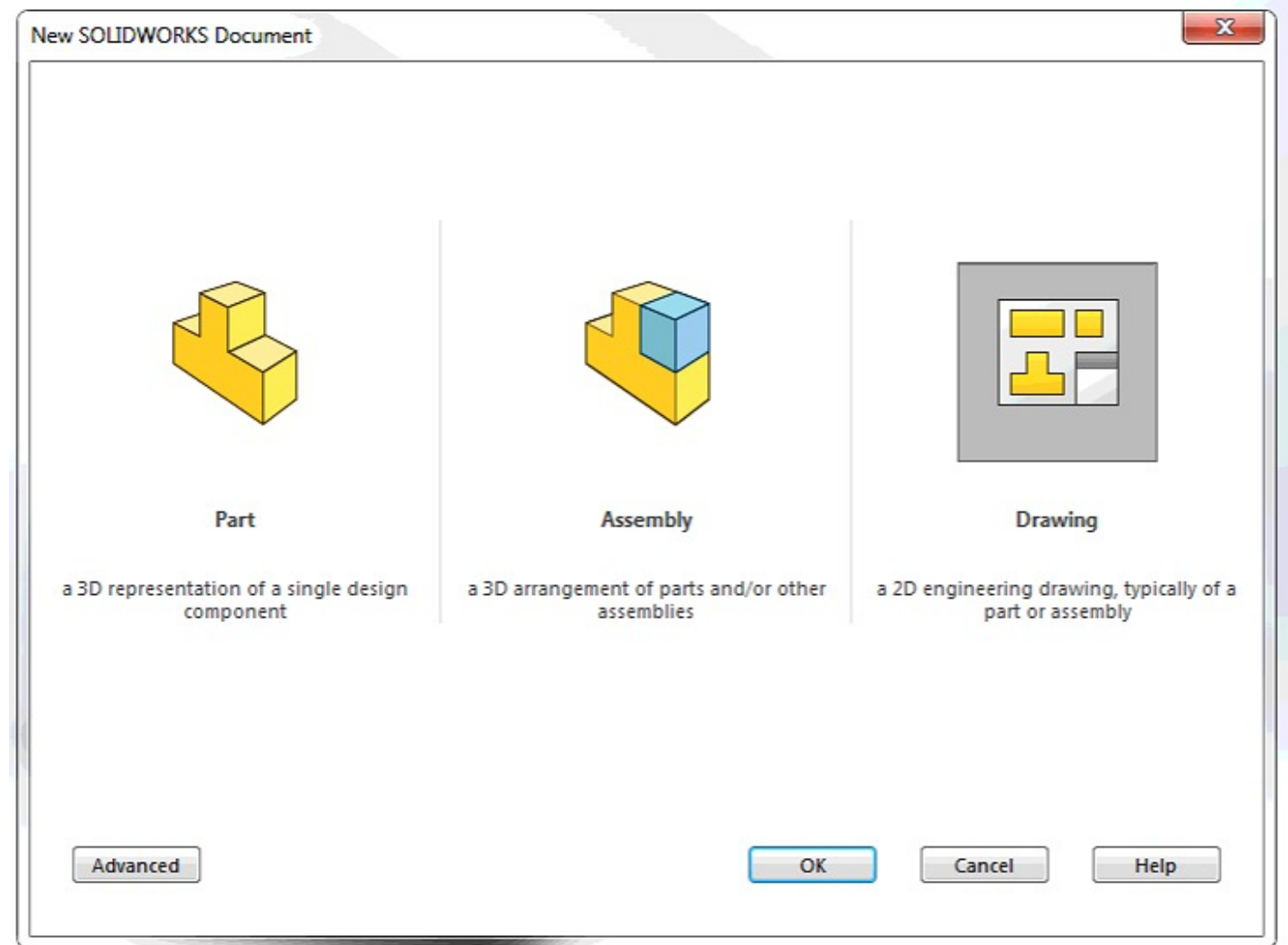# Solidworks step by step guide

– Creating your first CAD model

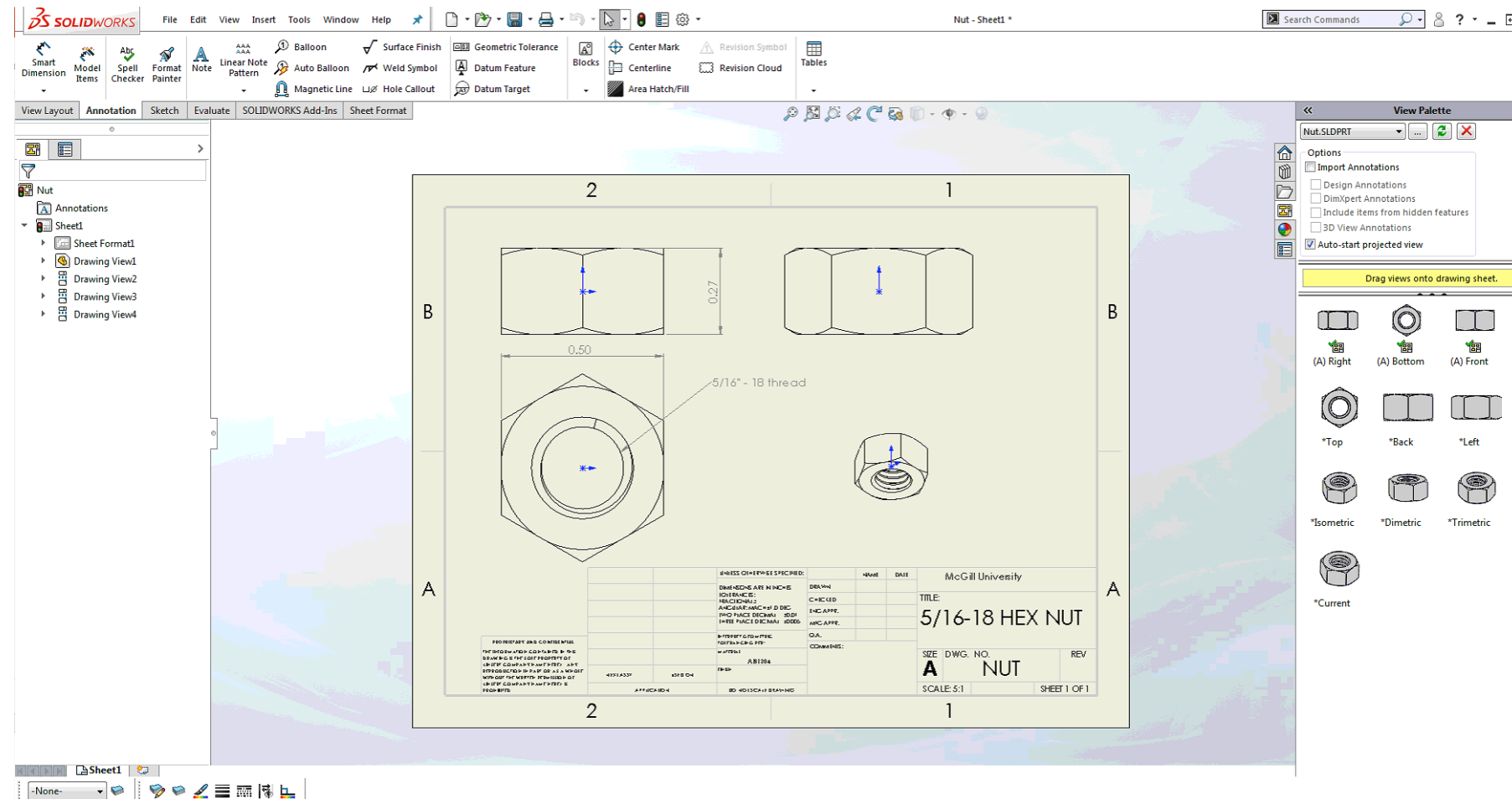• Creating your first mechanical drawing

Solidworks step by step guide
– Creating your first CAD model
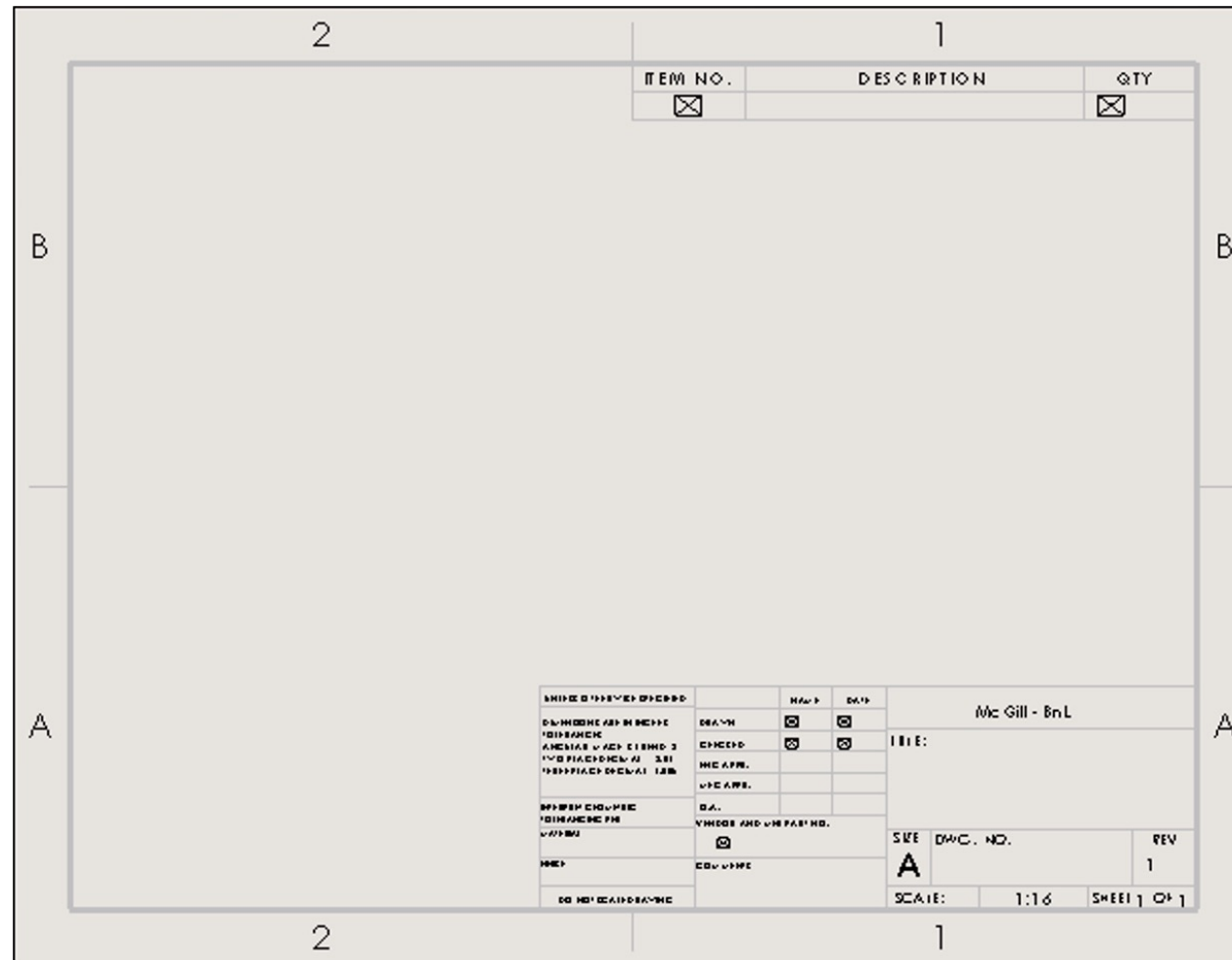
- Creating your first mechanical drawing:
- ✓ Importing views
- ✓ Dimensioning
- ✓ Tolerances

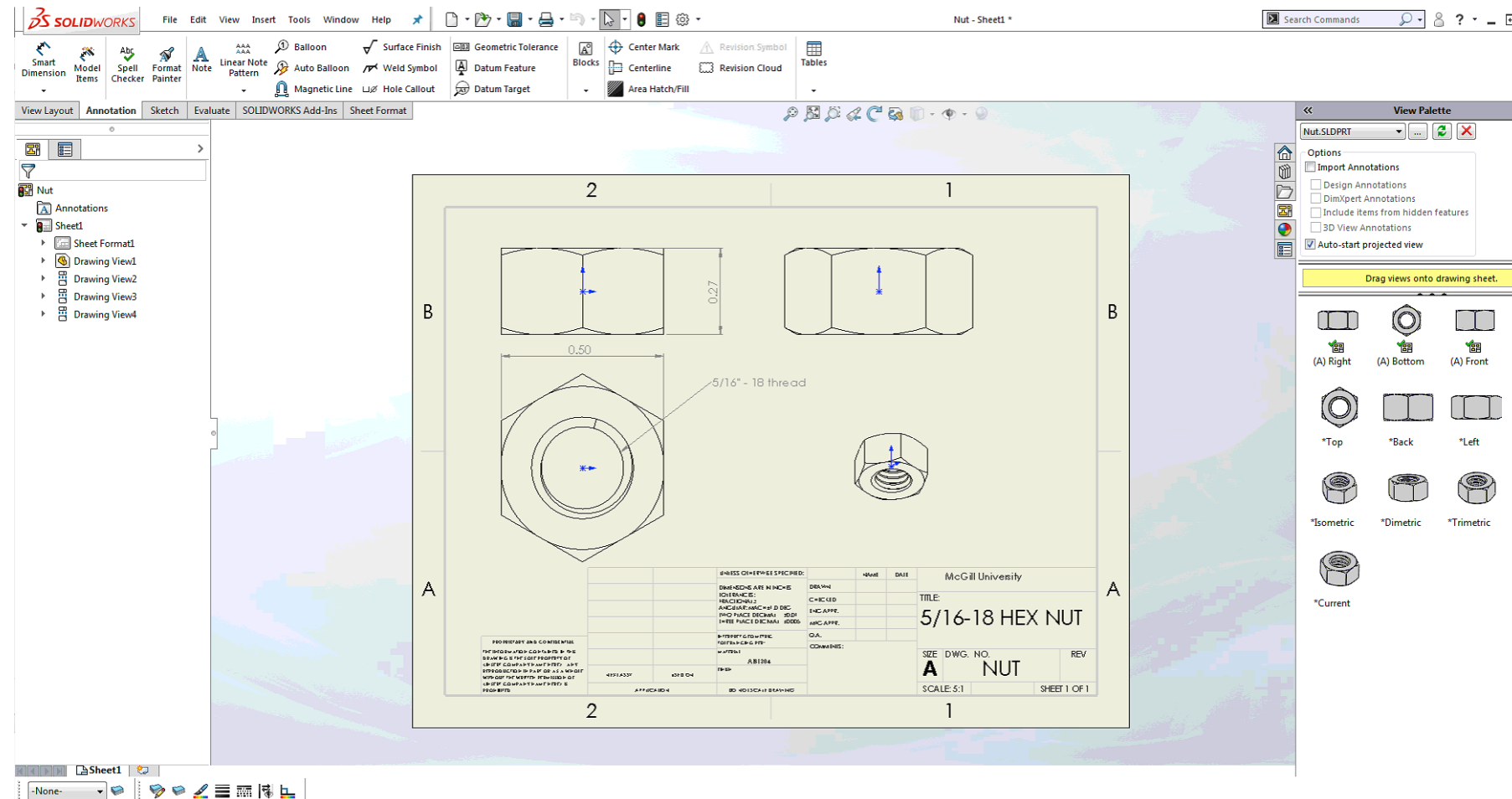# Solidworks step by step guide

– Creating your first CAD model

- Setting up a sw drawing template

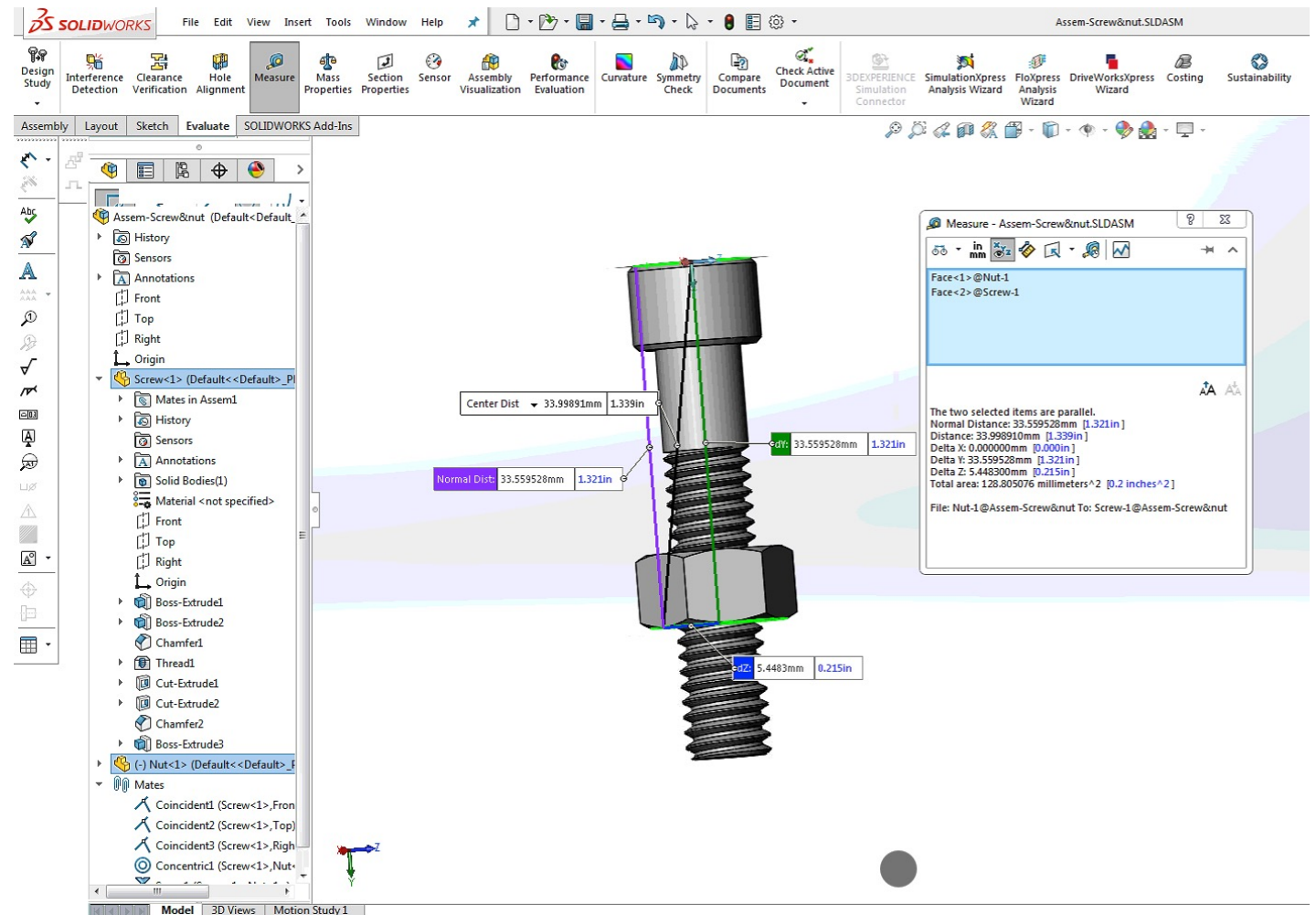# Solidworks step by step guide
– Creating your first CAD model

- Hole callout
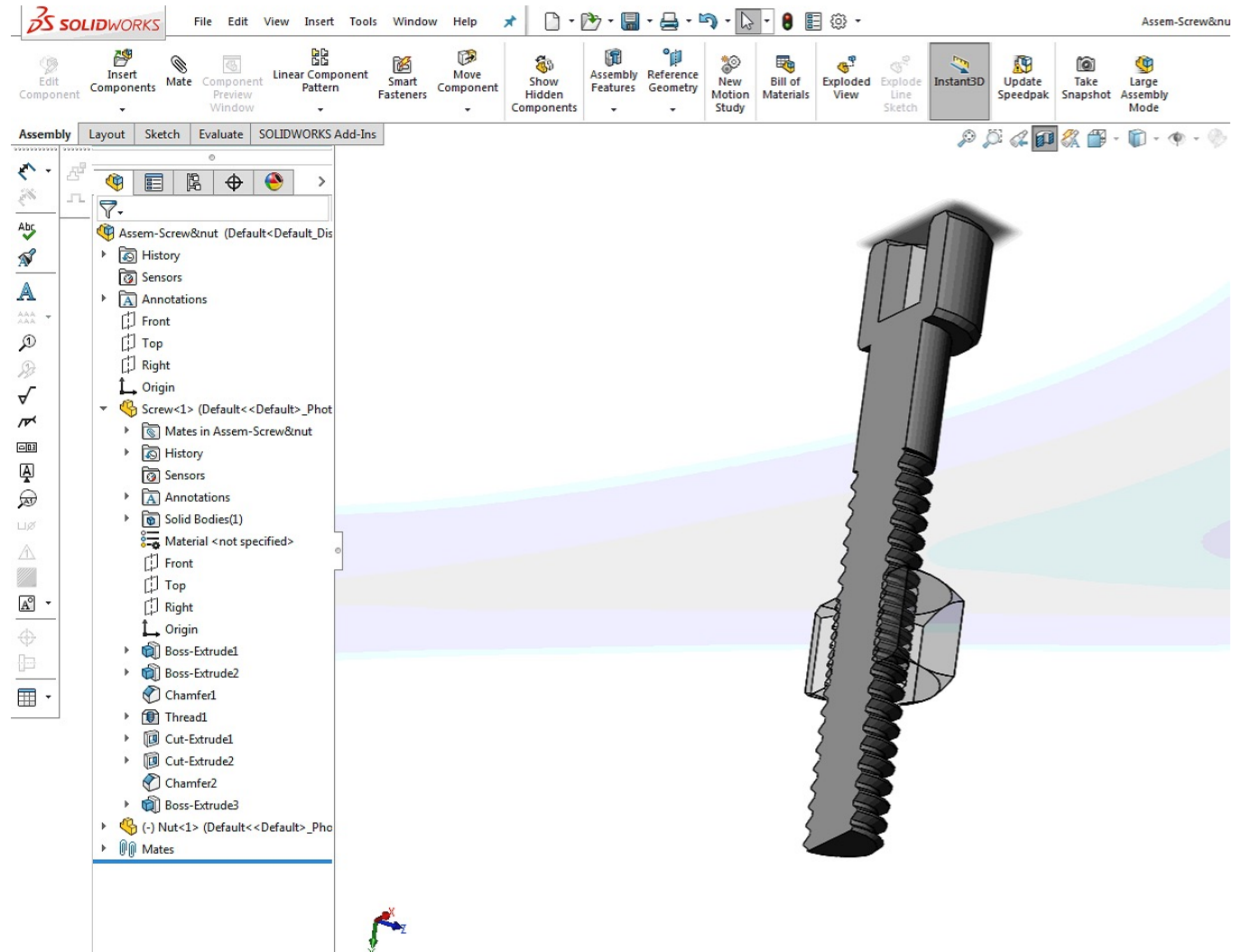 (holes created
  by hole wizard)

Evaluating your model

- Basic measurements:
- Distance
- Area
- Perimeter

- Mass properties:
- Weight
- Moments of inertia
- Etc.

Evaluating your model
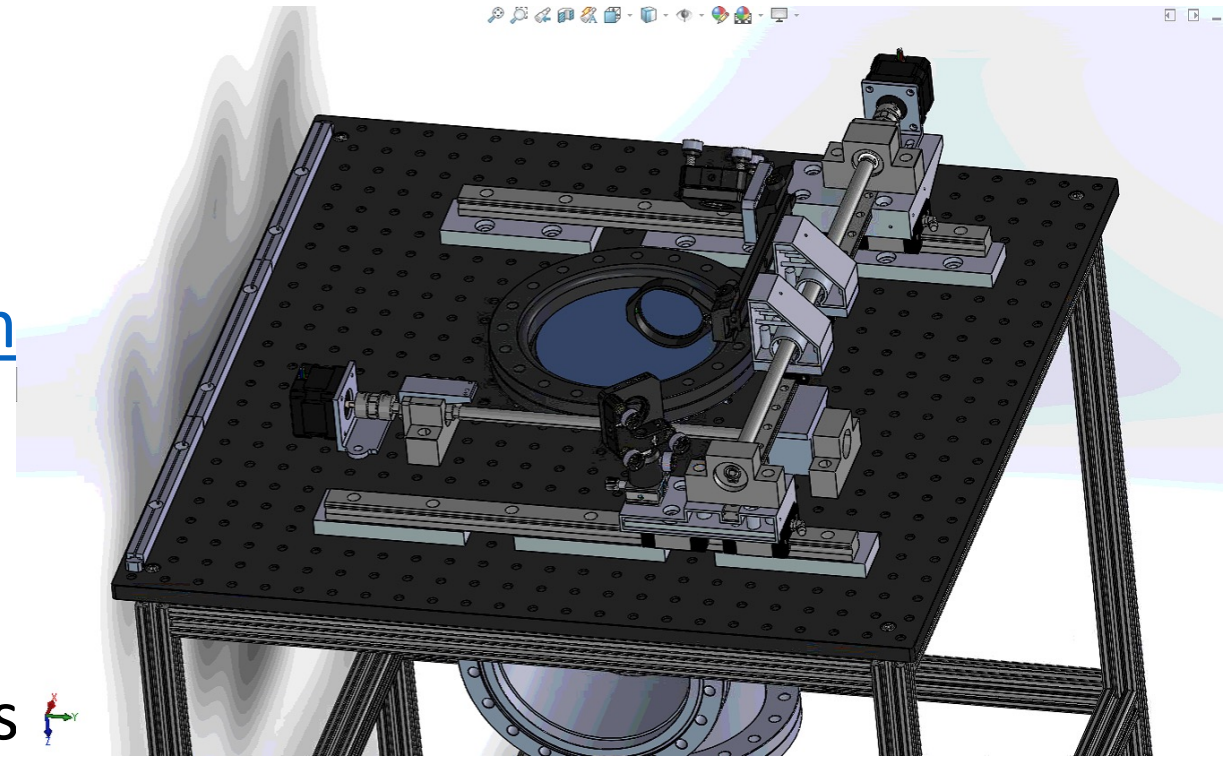
- Transparency

- Show/hide

- Section view

Save some (tons of) time

- Take advantage of already-made parts for a complicated design system

- https://www.mcmaster.com/
- https://www.lesker.com/index.cfm
- https://grabcad.com/library

- Most manufactures today provides

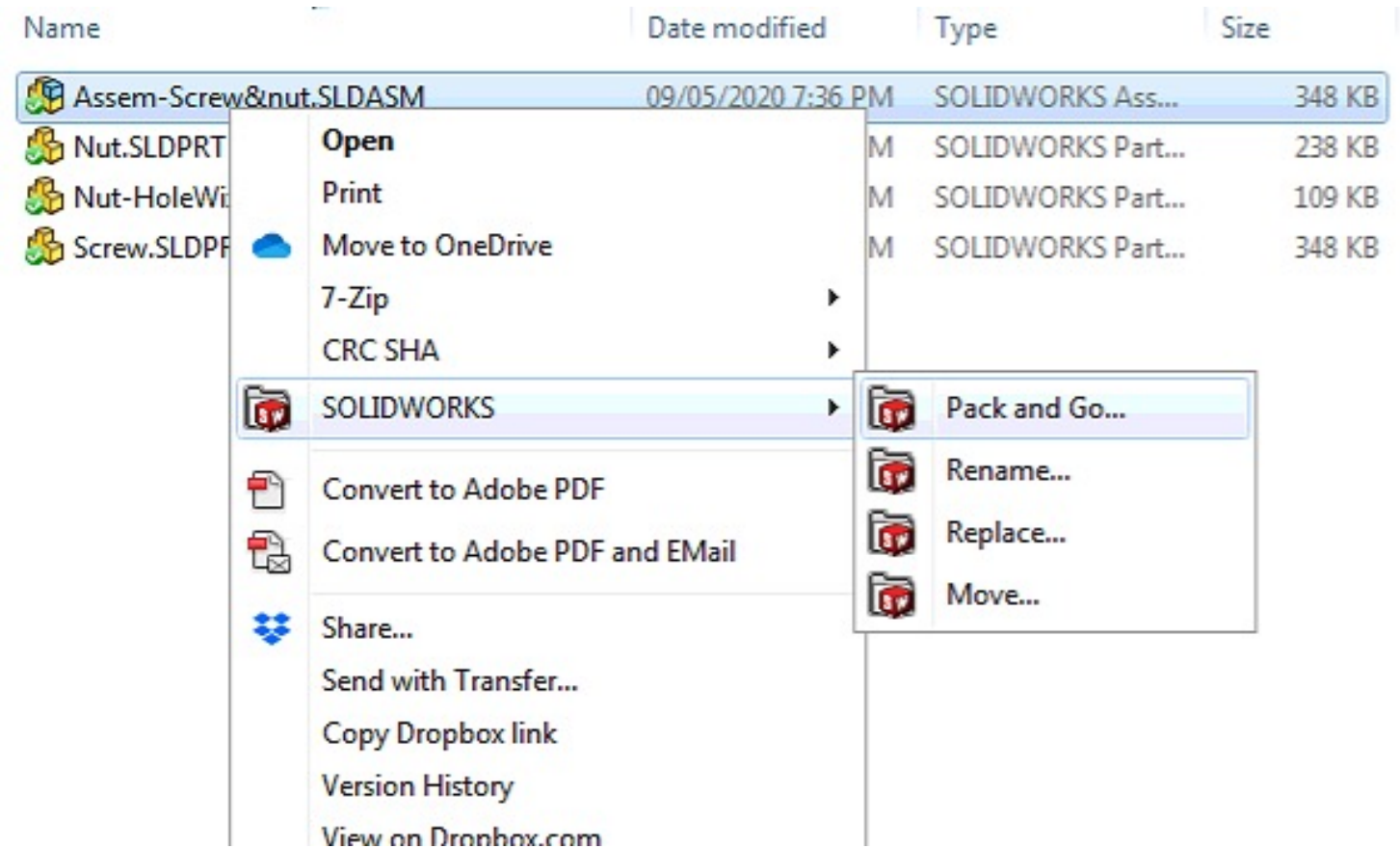# Sharing your designs

- Solidworks Explorer

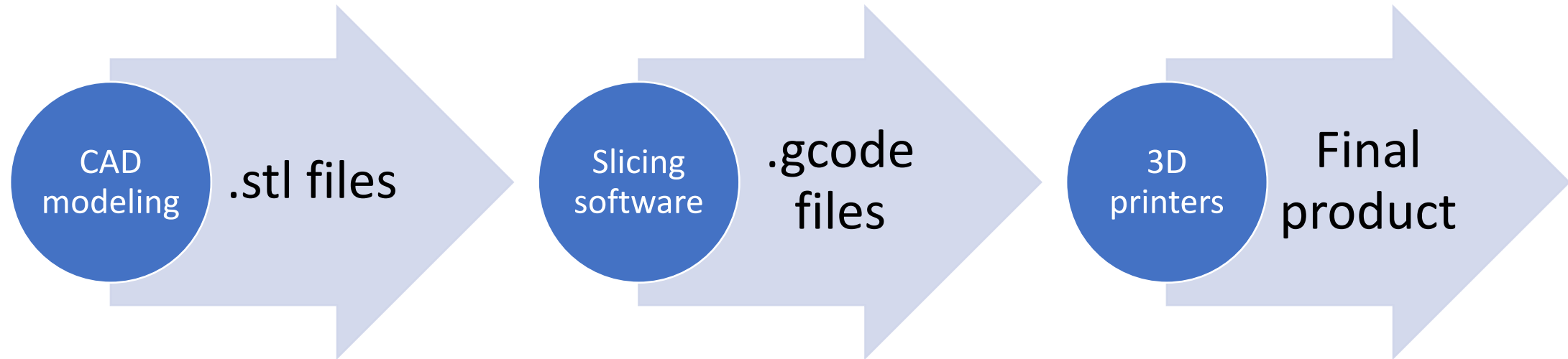➢Pack and go

➢Rename

➢Replace

➢Move

Sharing your designs

- Exporting your design to other formats
- ➢ .step (ISO standard exchange format)
- ➢ .stl (3D printing)
- ➢ .pdf
- ➢ .jpeg, .png etc
- ➢ And more
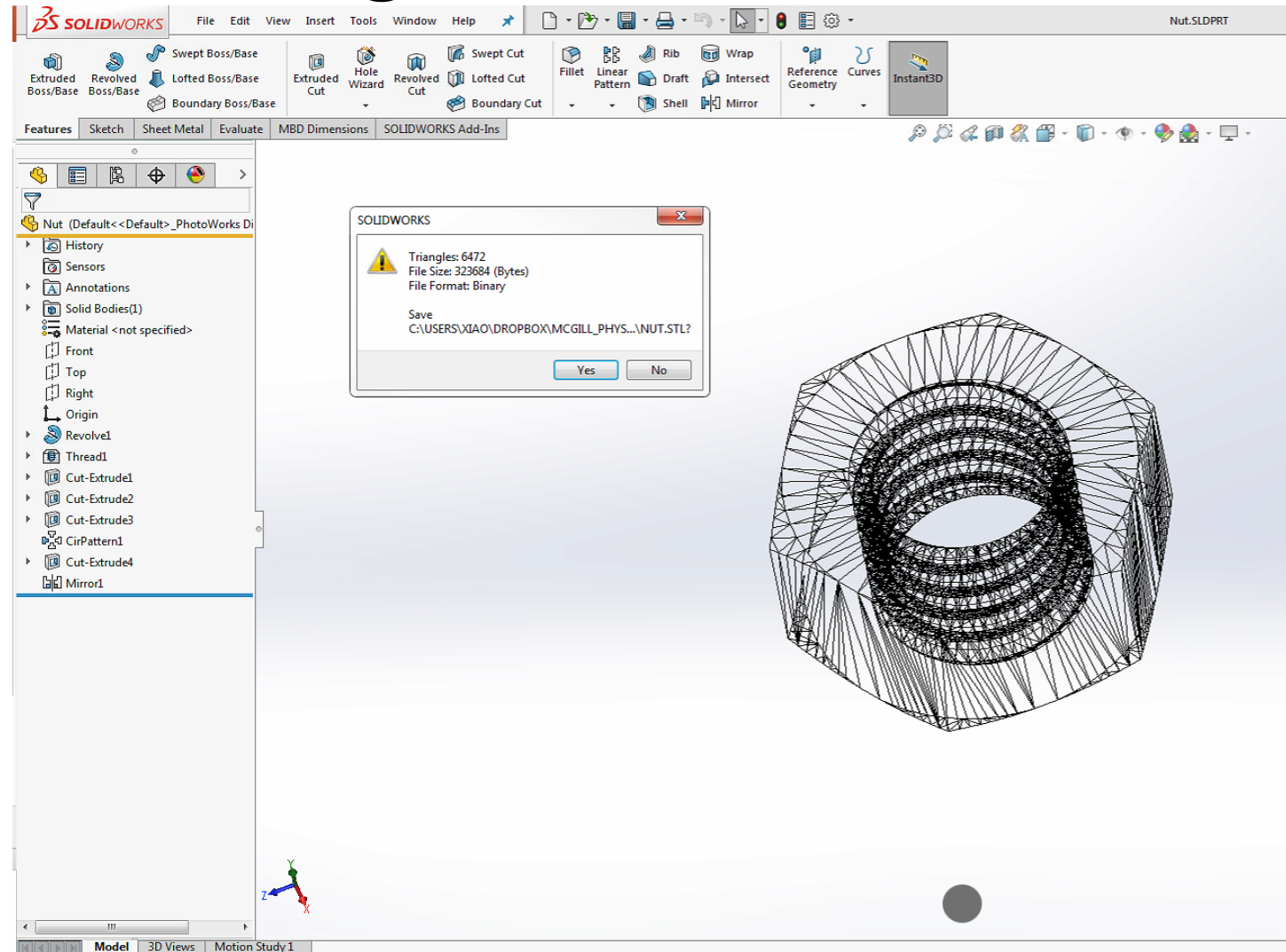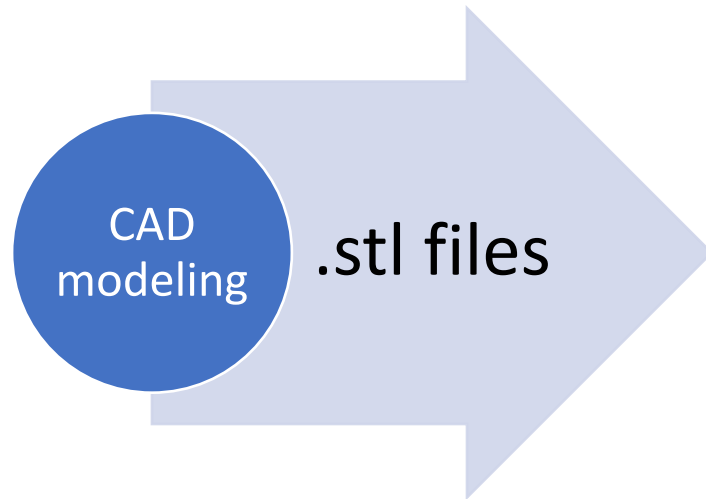- GrabCAD Workbench
- ➢ Sharing and collaborating with others
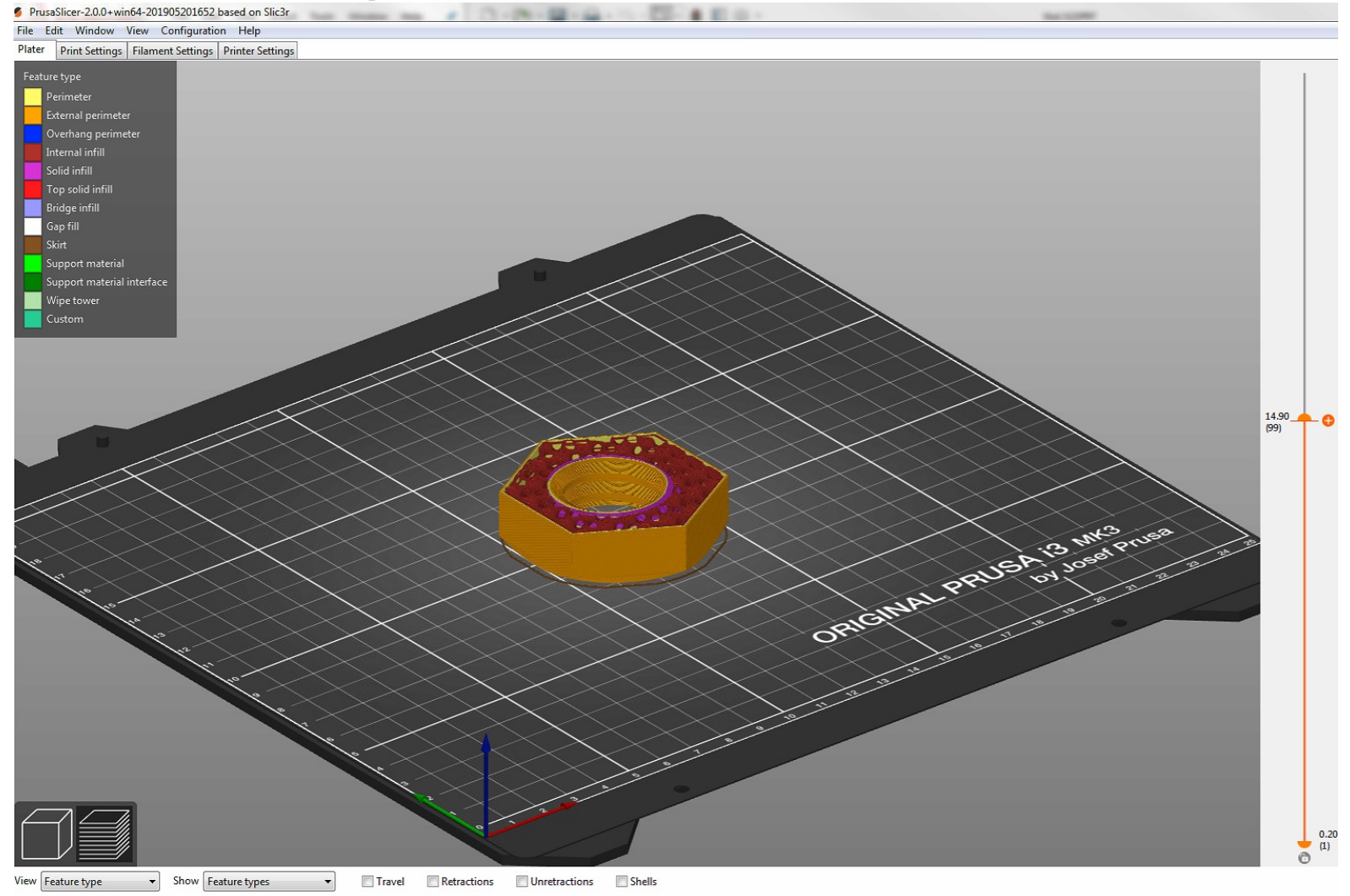
Design to manufacturing

- 3D printing

CAD modeling → .stl files → Slicing software → .gcode files → 3D printers → Final product

Design to manufacturing

- 3D printing

CAD modeling → .stl files

Design to manufacturing

- 3D printing

Slicing software → .gcode files

Design to manufacturing

- 3D printing

3D printers → Final product
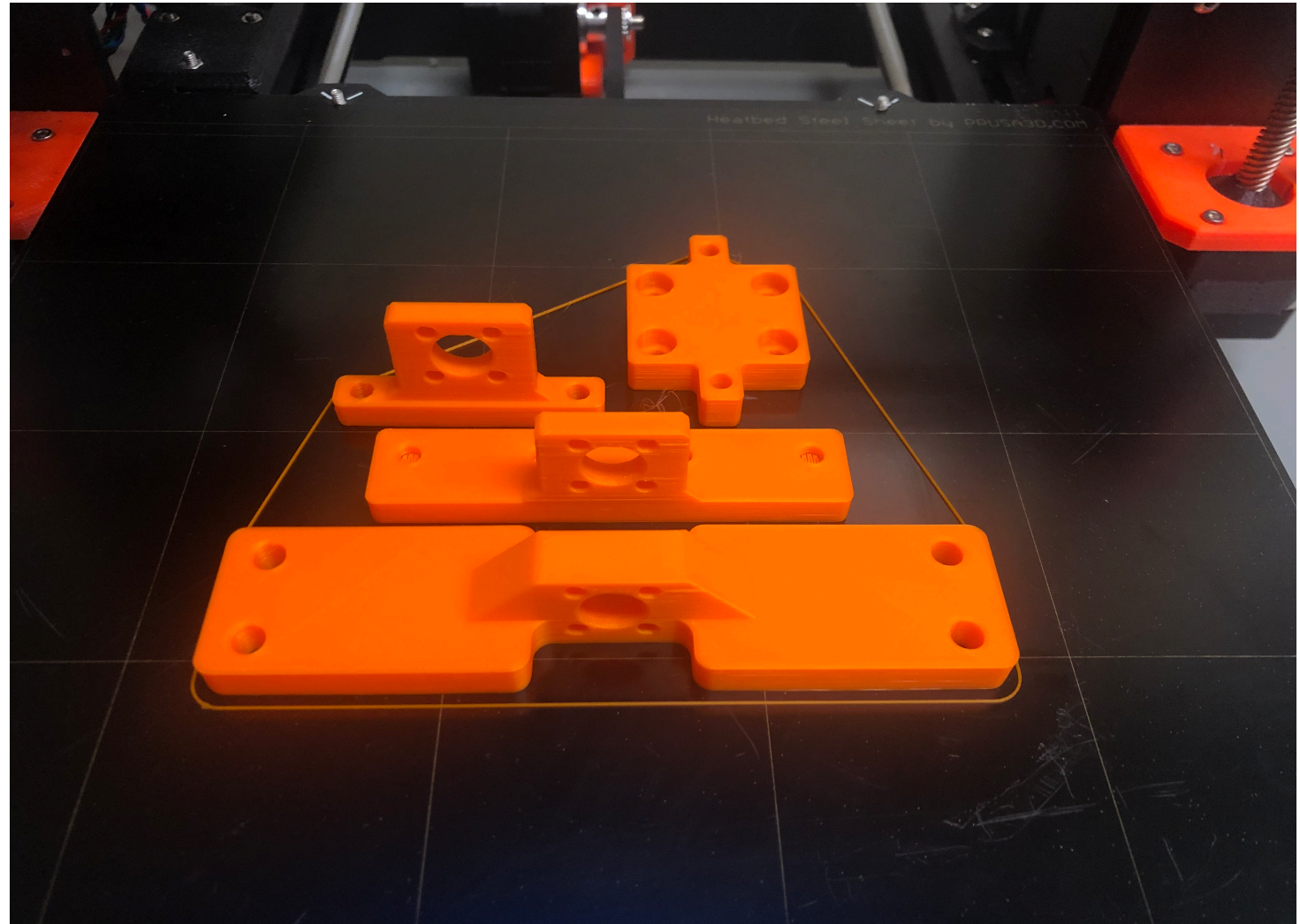
Design to manufacturing

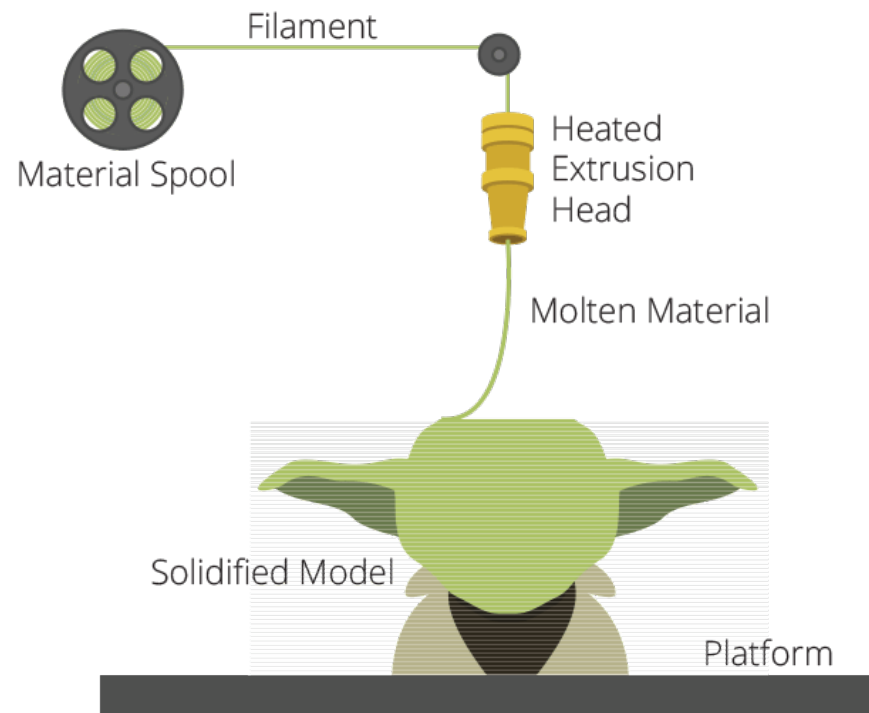**FDM**

- Most common

- Cost effective

- Simple

SLA

- More accurate
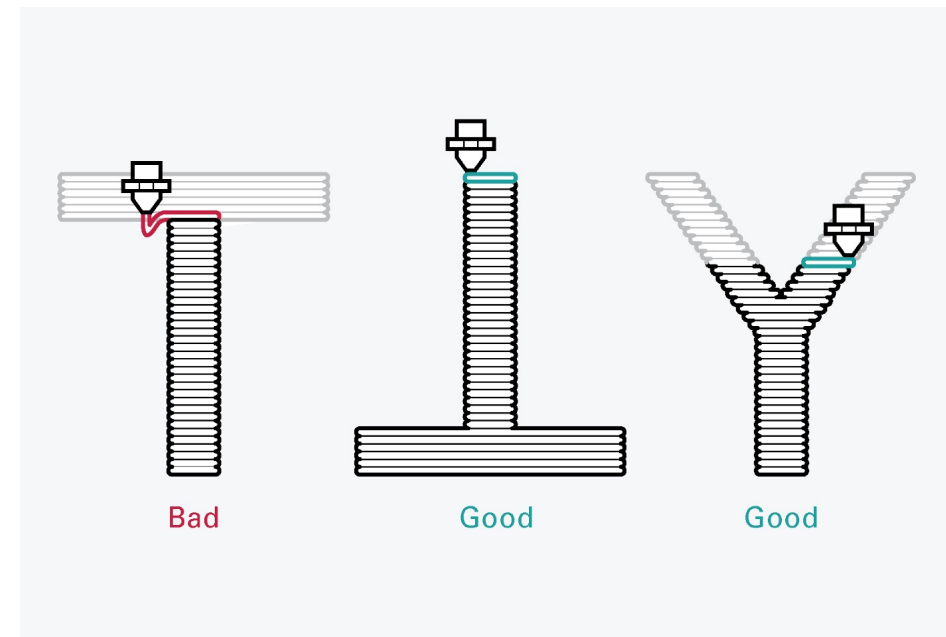
- Better surface finish

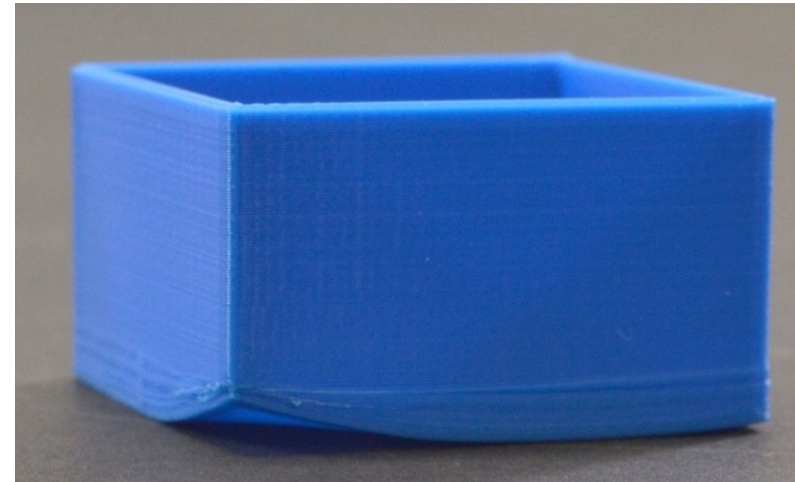# Design to manufacturing
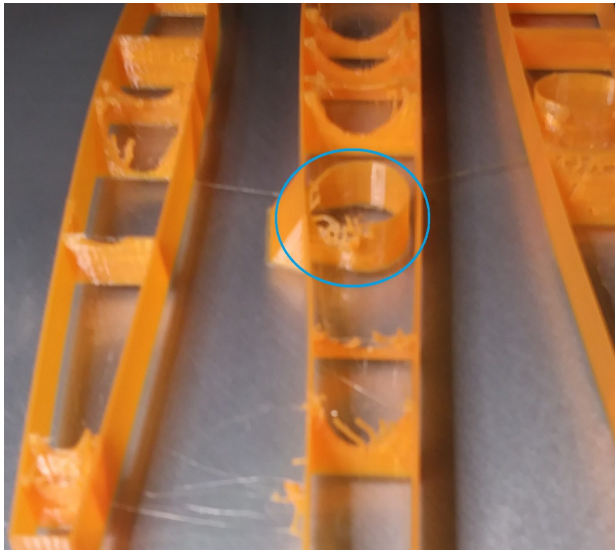
- 3D printing – rules of thumb

- Avoid overhangs when possible – use angles smaller than 45°

Design to manufacturing

- 3D printing – rules of thumb

- Pay attention to minimum wall thickness – 0.8mm (printer dependent)

- Avoid large flat surface & use rounded corners – avoid wrapping
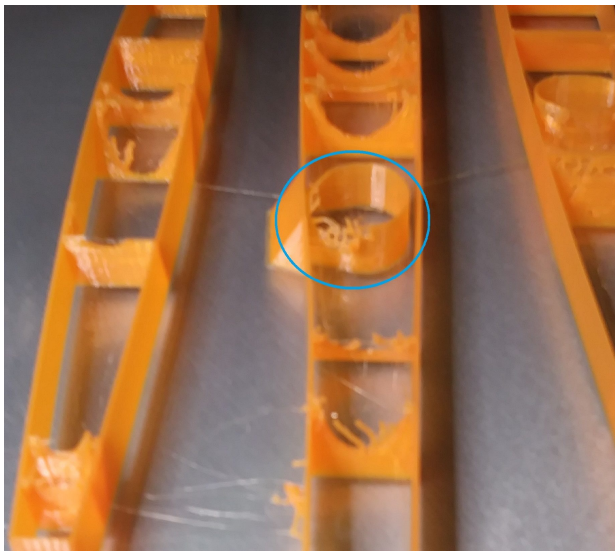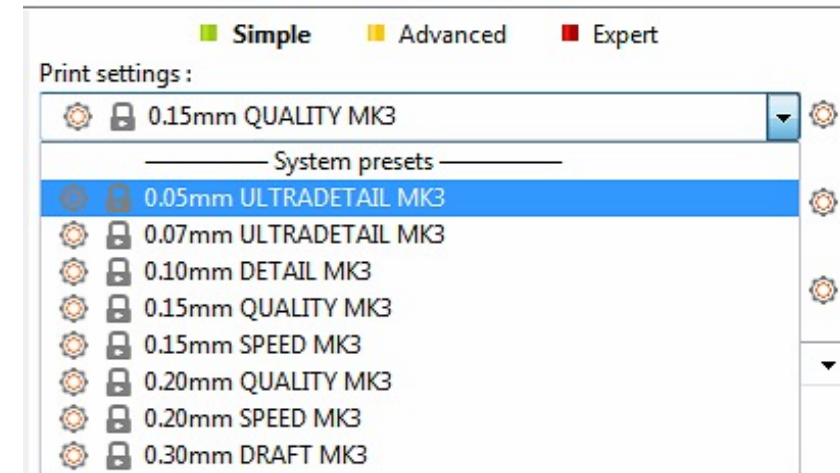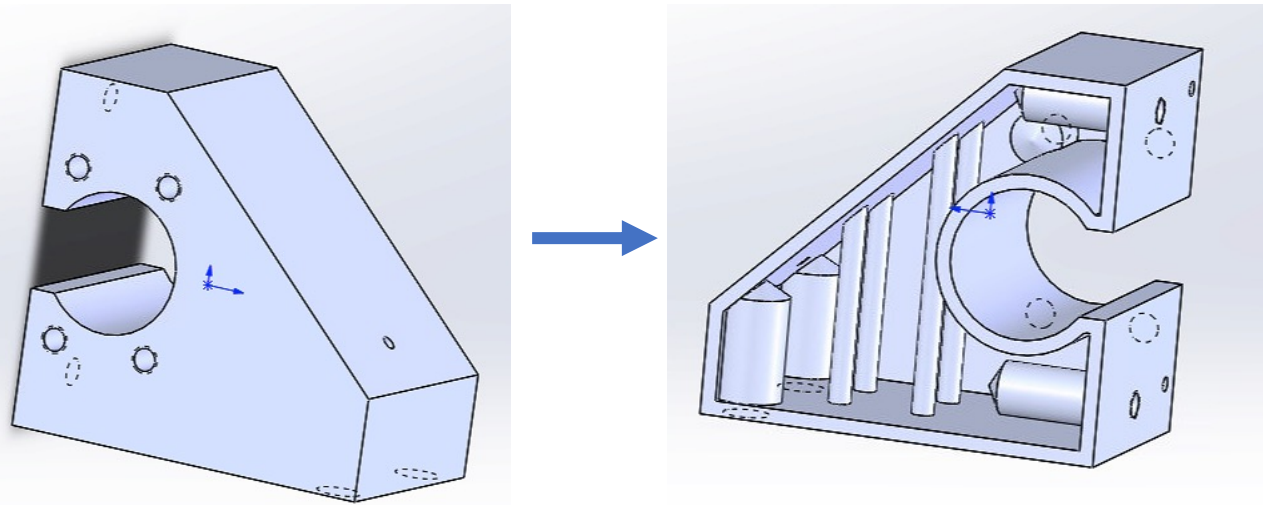
Design to manufacturing

- 3D printing – rules of thumb

- Pay attention to minimum wall thickness – 0.8mm (printer dependent)

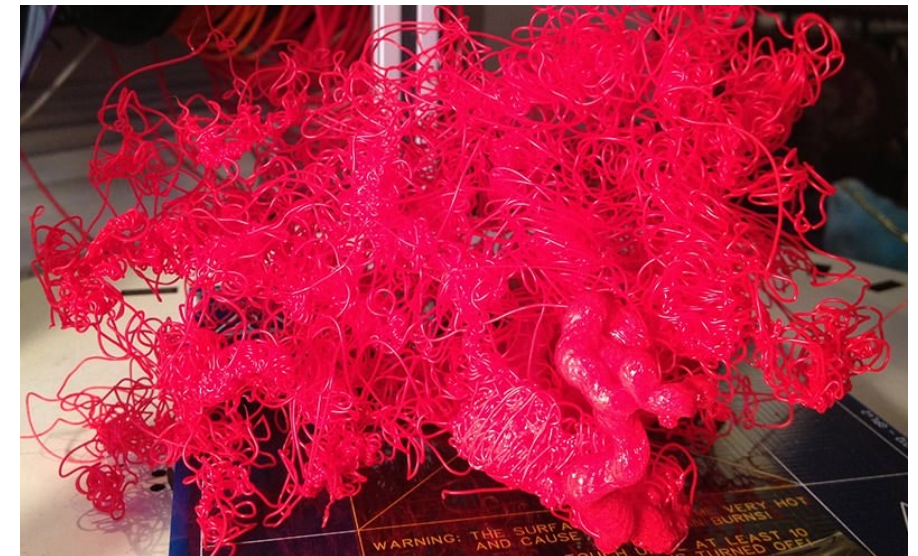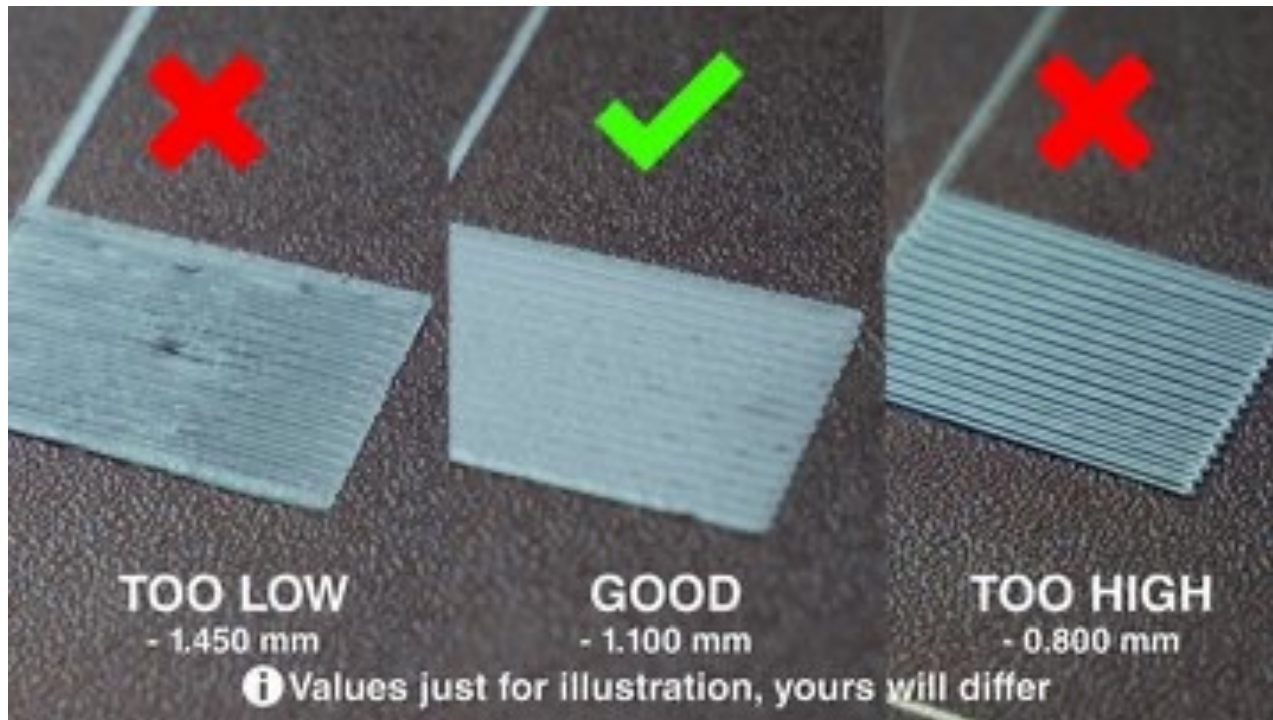- Avoid large flat surface & use rounded corners – avoid wrapping
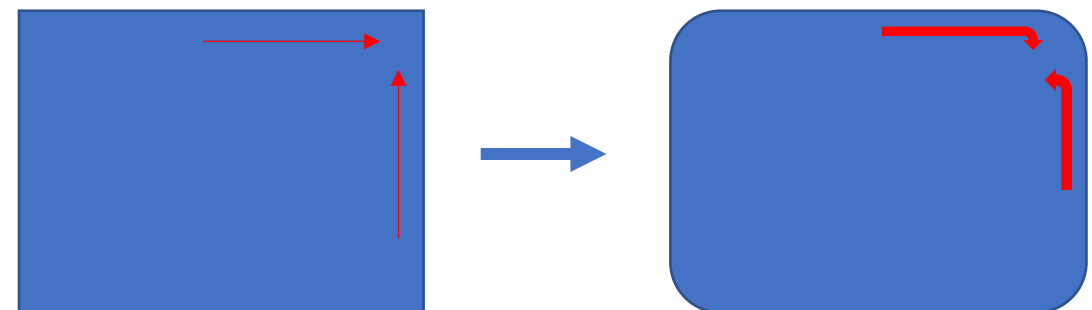
Design to manufacturing

- 3D printing – rules of thumb

- Avoid bulking designs (SLA) – use thin shells

- Use pre-defined settings – often good enough

Design to manufacturing

- 3D printing – first layer is important

Design to manufacturing

- Machine shops

- Proper mechanical drawings

- Not too complicated parts

- Know available equipment

- Plan before design