
LUT
University

# Exercise 2 Tutorial:
# Bottle Modeling

**Exercise 2 task:**
Measure bottle with measurement tool(s) (such as ruler, measure tape) that is/are available with you and make 3-D model based on those measurements. Convert 3-D model into a technical drawing. You are encouraged to use other features in SolidWorks to perfect your design. If you have any questions, you can send email or attend the exercise class in LUT campuses at Lahti or at Lappeenranta.

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# Exercise 2 Tutorial:
# Bottle Modeling

In this exercise we are going to model a bottle. First of all, you need to find a bottle, we suggest you find some bottle with symmetrical structure. If your bottle cap has thread, you can ignore or using thread feature, there are lots of Youtube video teaching you how to model in SolidWorks using different features.

**Methods**:
1. **Measure** the dimension of any bottle that you have with ruler
2. **Model** the bottle using basic features given in this tutorial

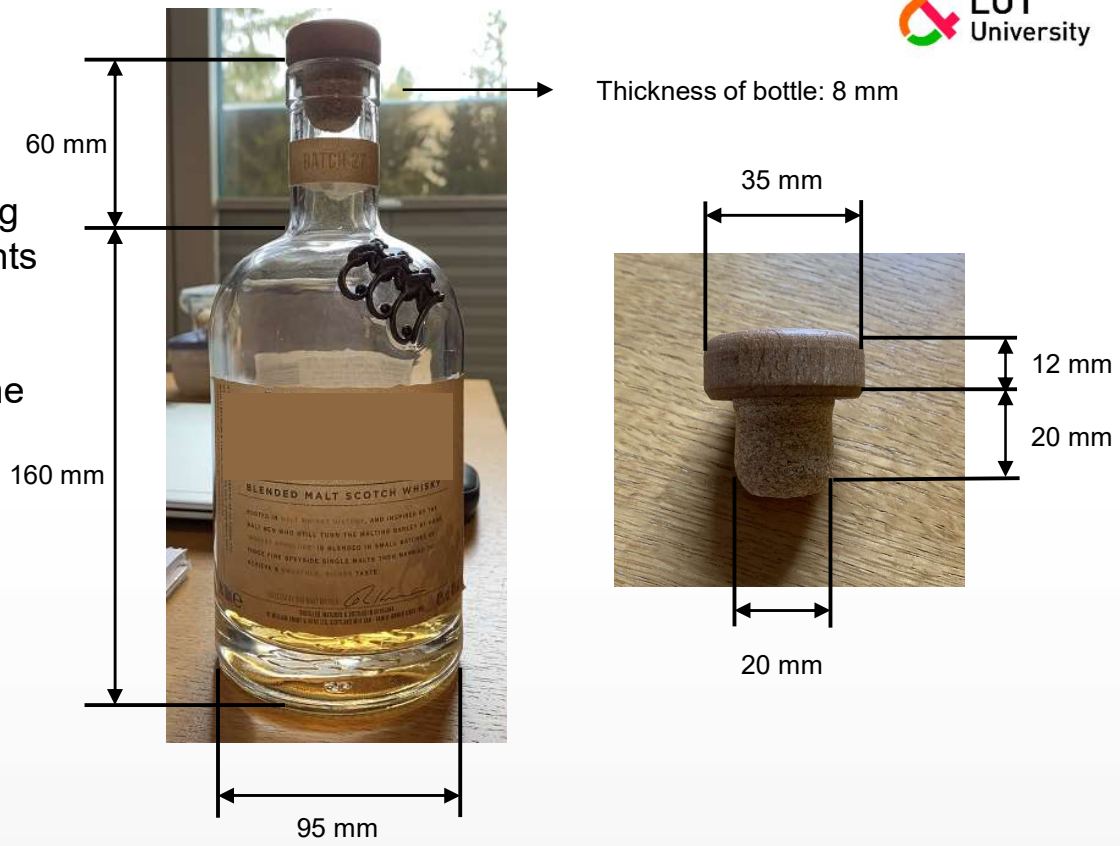
**Goal**:
1. Able to **measure** dimensions of simple object using ruler and apply them to make 3-D CAD model using SolidWorks
2. Able to **assemble** two objects in SolidWorks
3. Able to make **assemble drawing**

# Exercise 2 Tutorial: Bottle Modeling

To start with this exercise, first step is to collect the measurements of the bottle using ruler (accuracy: 1 mm). Some measurements methods are introduced in the next slide.

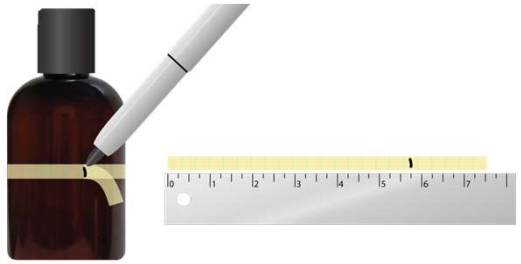
Figure on the right side is the example of the dimension of the bottle measured by ruler.

1. The bottle will be modeled first
2. The cork stopper will be modeled next
3. The bottle and cork stopper will be assembled
4. The technical drawing will be made

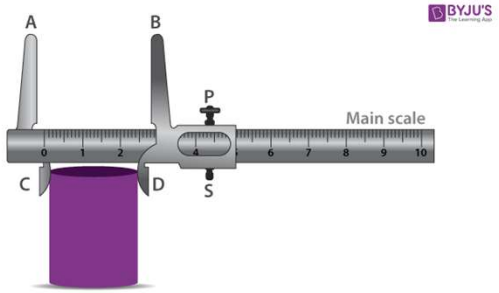


# Exercise 2 Tutorial: Bottle Modeling

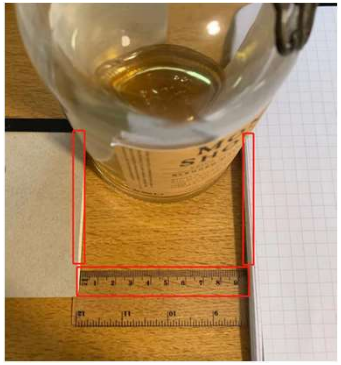
There are different ways to measure the diameter of the bottle/stopper in a more accurate way than using ruler directly.



- Using tape or string to circle the bottom, then use ruler to measure the length of string, which is the perimeter of the circle, then calculate the diameter of the circle

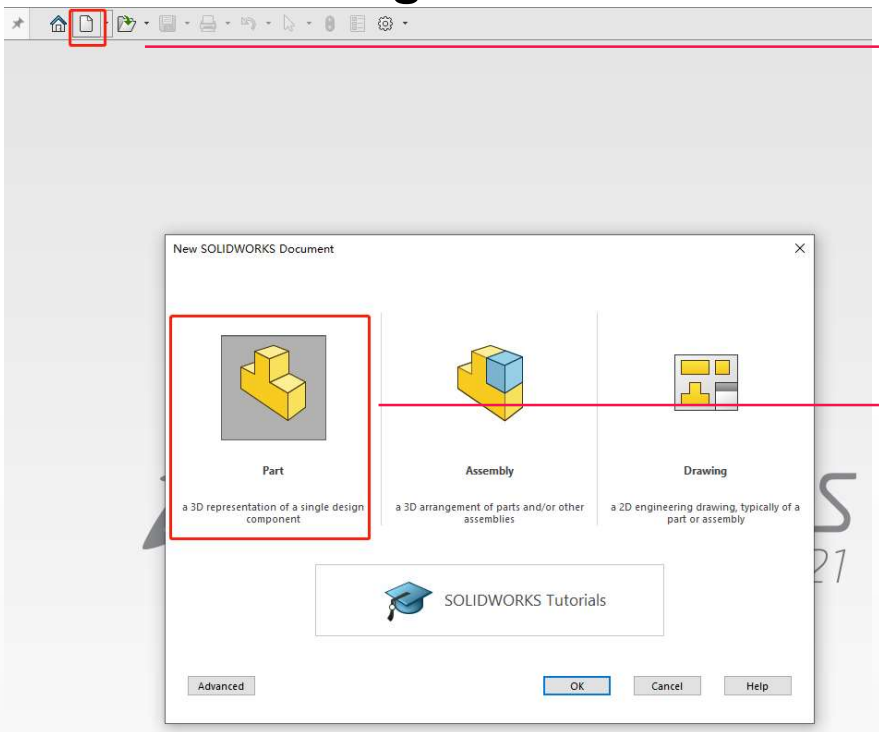



- Using caliper is more accurate if you have one



- Using other objects has straight side to surround a rectangle area, measure the diameter using ruler.

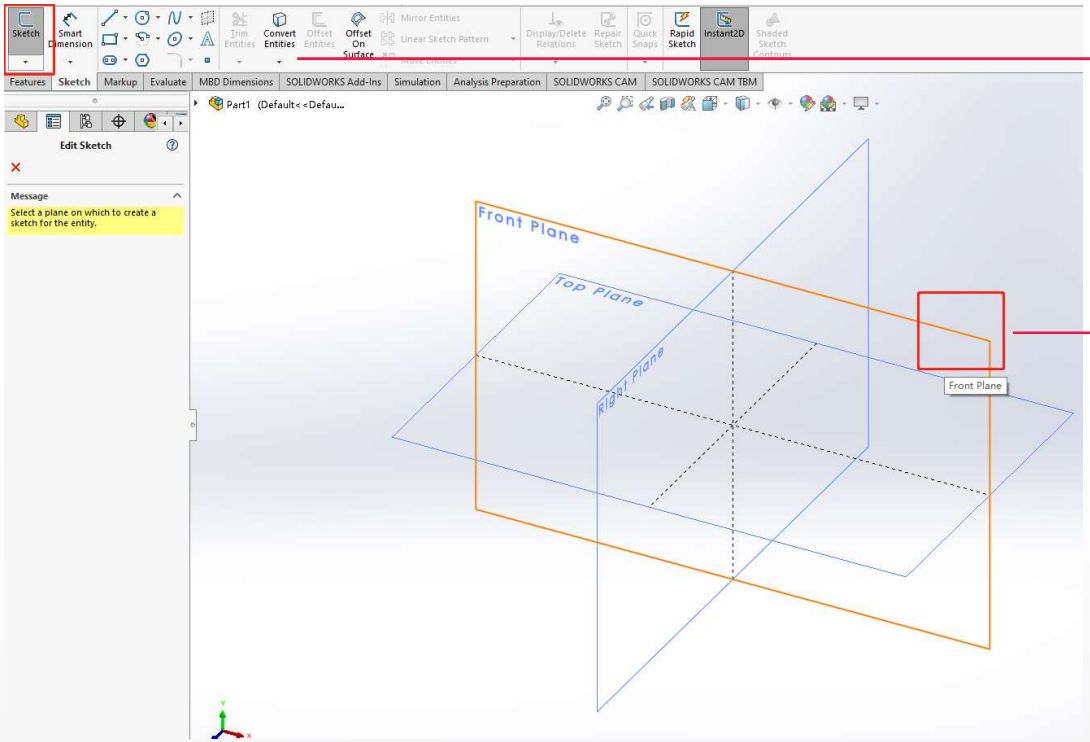
# Exercise 2 Tutorial: Bottle Modeling




1. Click “New”

2. Click “Part”

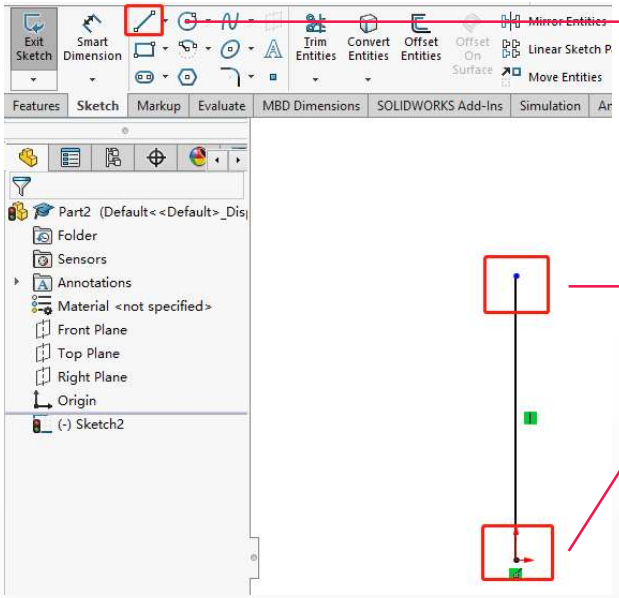
# Exercise 2 Tutorial:
# Bottle Modeling



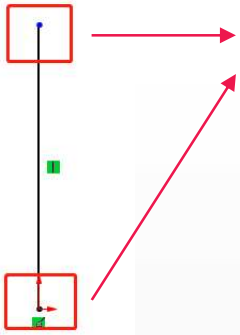

3. Click “Sketch”

4. Click “Front Plane”

# Exercise 2 Tutorial: Bottle Modeling

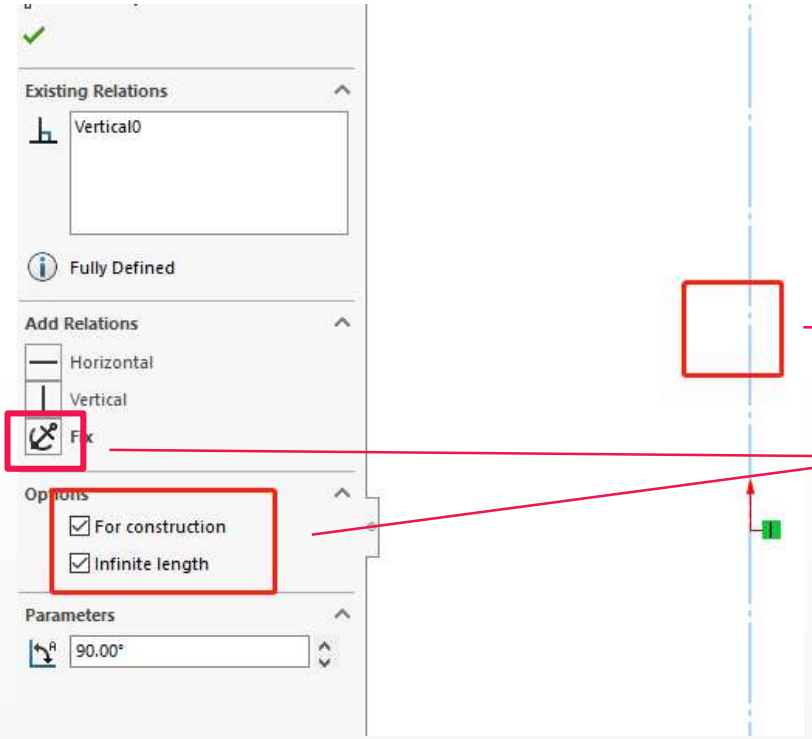



5. Click “Line”



6. Click two point to draw vertical straight line

# Exercise 2 Tutorial: Bottle Modeling



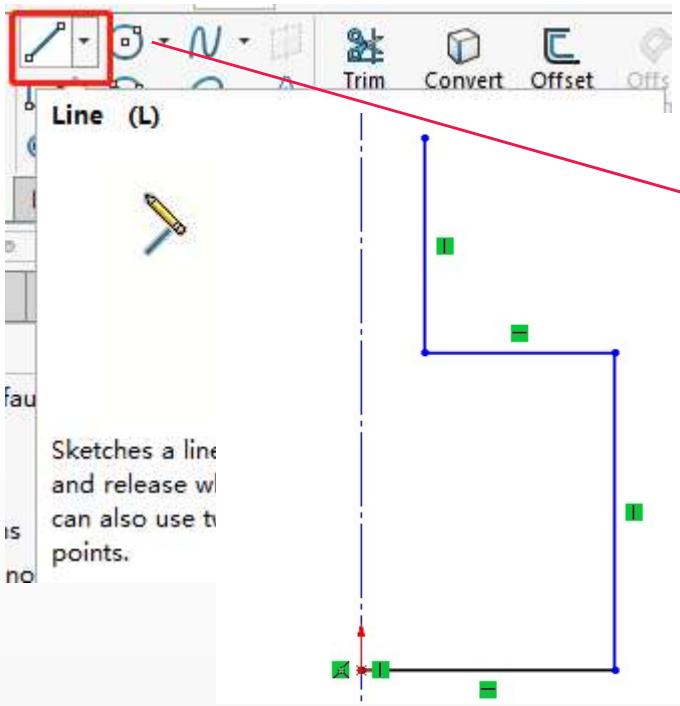

Note: Later we use revolved Boss/Base to make the hollow bottle, this line drawn here is "**For construction**" purpose, and work as central axis for the revolving, the "**Infinite length**" is for visualization purpose.

7. Click this line

8. Select "Fix", "For construction" and "Infinite length"

Note: **Add Relations** will constraint the geometry in different ways, if you over constraint the geometry, the error happens, for example, you cannot fix one line, and set it as horizontal or vertical again.

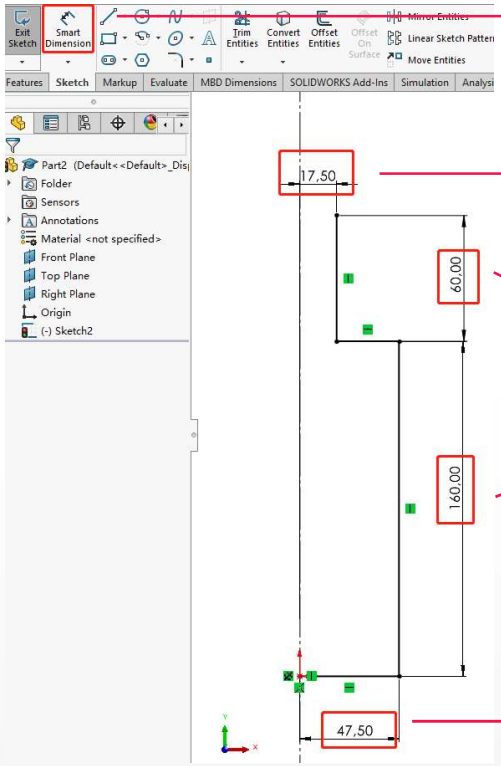
# Exercise 2 Tutorial: Bottle Modeling




9. Select “Line” and draw the outer surface of the bottle

Note: the top side is opened so we can make hole later, but bottom must be closed

# Exercise 2 Tutorial: Bottle Modeling



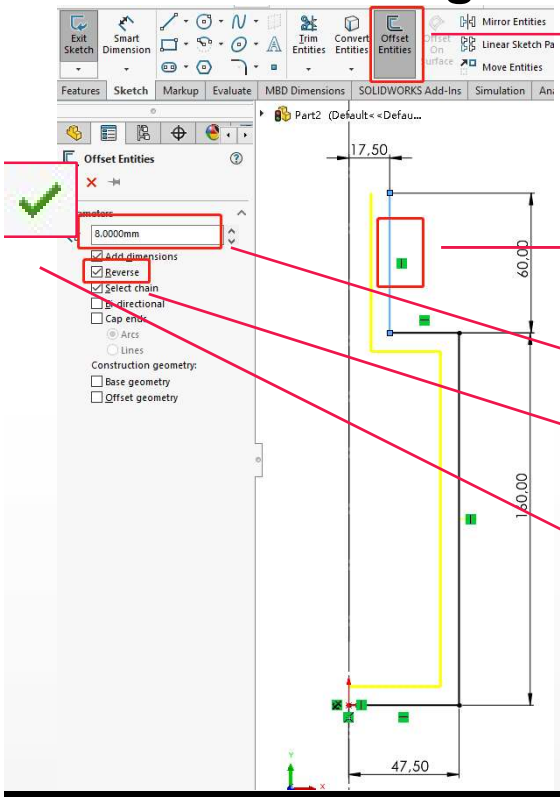

10. Select “Smart Dimension” to dimension each line based on your measurements.

Value “17.50 mm” is the radius of the bottle opening, which is also the radius of the cork stopper, calculated as 35 mm / 2 = 17.50 mm.

Value “60.00 mm” and “160.00 mm” refer to slide 4, which is the length of the bottle.

Value “47.50 mm” is the radius of the bottle bottom, calculated as 95 mm / 2 = 47.50 mm.

# Exercise 2 Tutorial: Bottle Modeling




11. Click “Offset Entities”

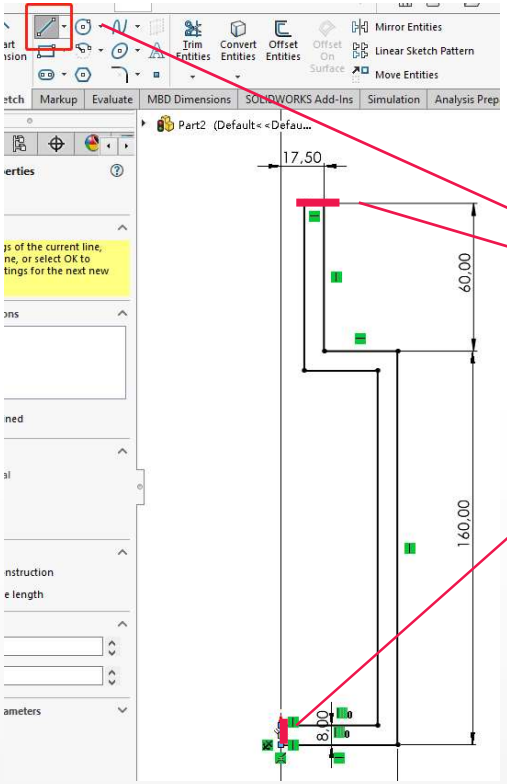
12. Click this line, the “Select chain” will automatically select other connected lines

13. Set value to “8 mm”, which is the thickness of the bottle

14. If the offset is outside the selected line, then select “Reverse”, to ensure the offset is inside the selected line

15. “Accept”

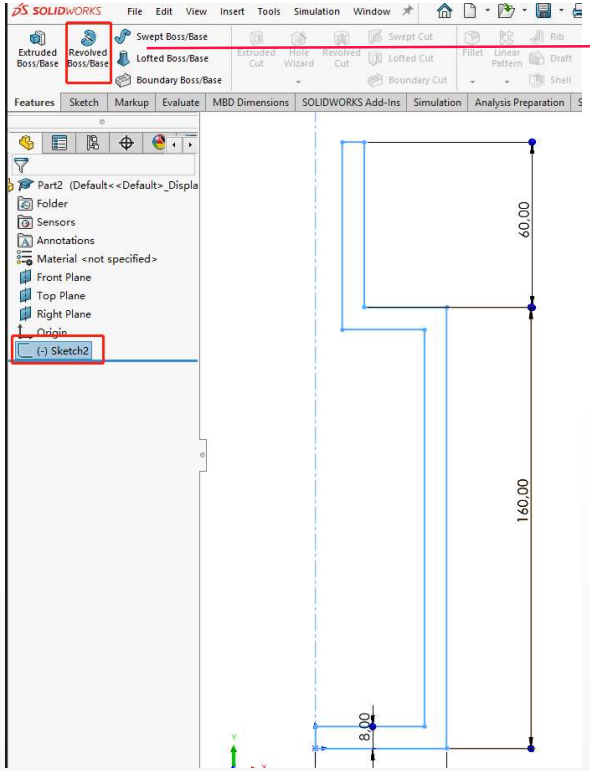
# Exercise 2 Tutorial: Bottle Modeling




16. Select “line”, then connect open points by drawing two lines marked as “I”, then click “Exit sketch”

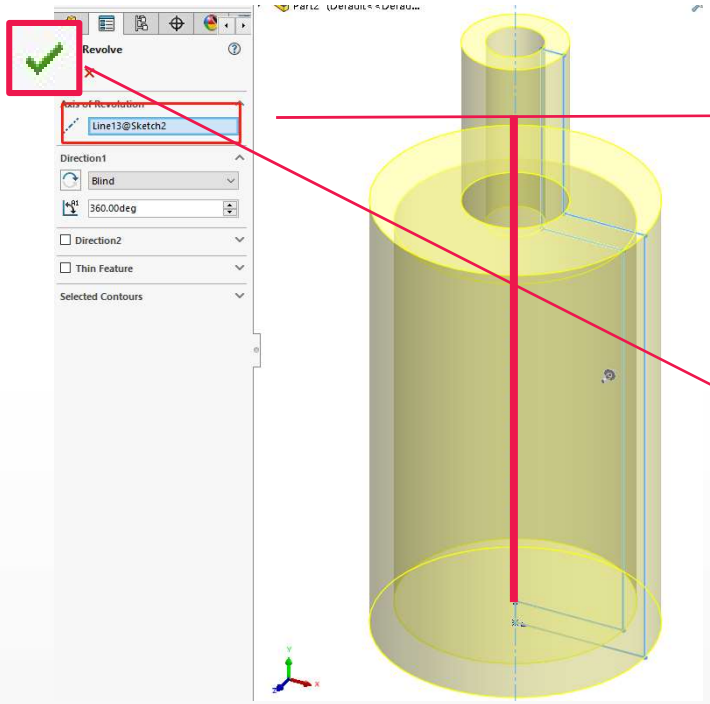
# Exercise 2 Tutorial: Bottle Modeling

17. Click “Sketch”



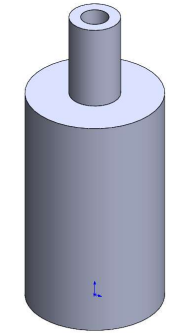

18. Click “Revolved Boss/Base”

# Exercise 2 Tutorial: Bottle Modeling

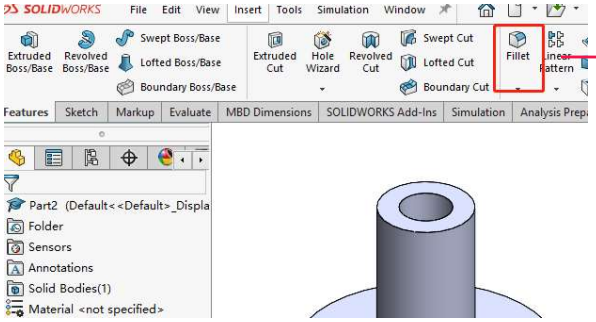


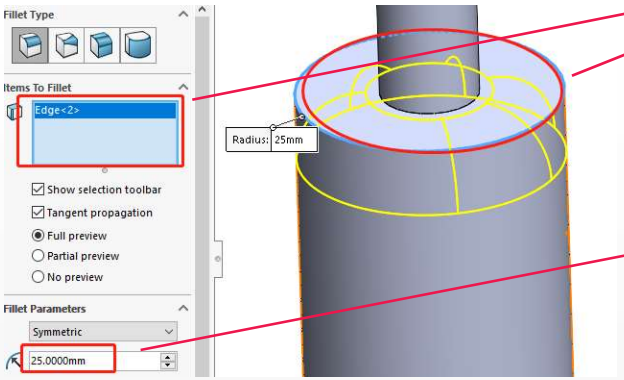

19. The “axis of revolution” should be automatically detected as the line marked as “ | ” after previous step 18.

20. Click “Accept”



# Exercise 2 Tutorial: Bottle Modeling

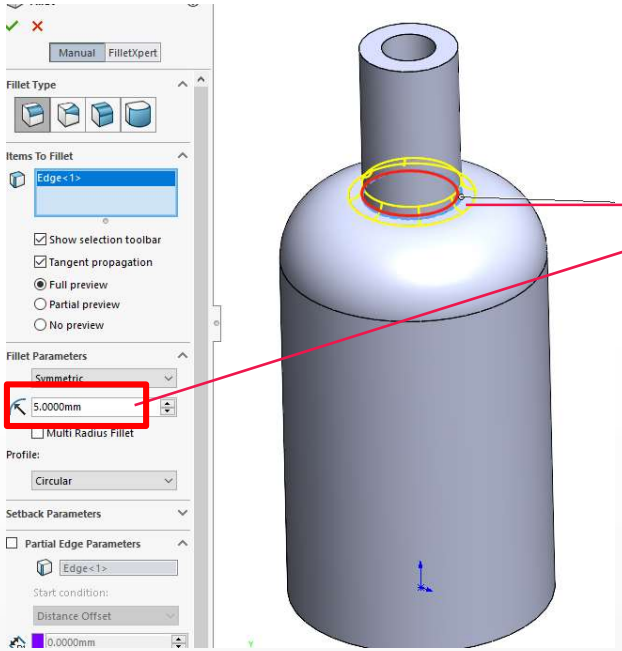



21. Select “Fillet”

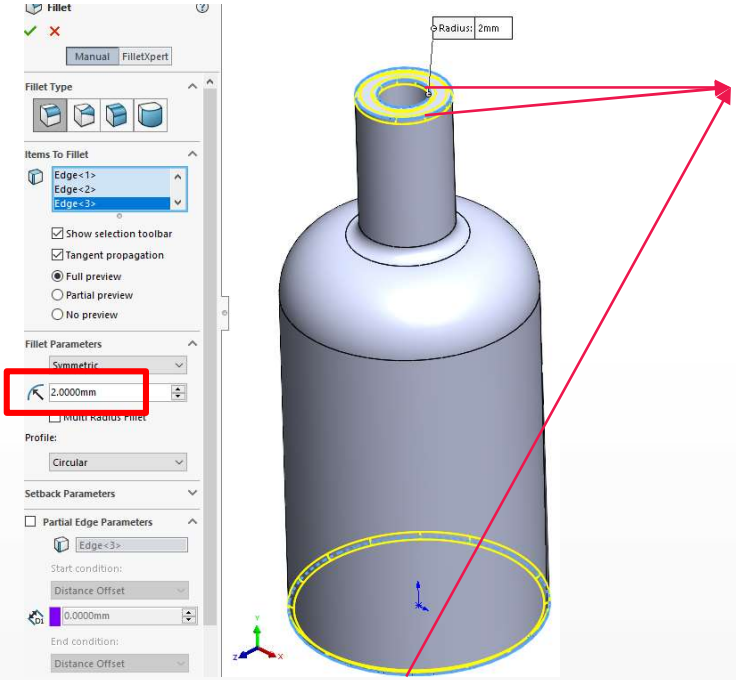
22. Select edge marked as “”. It is difficult for you to measure the fillet radius by hand tool, so I estimate it and try different values to make the visualization as similar as possible, here I set the radius to “25 mm”. Then “Accept”

# Exercise 2 Tutorial: Bottle Modeling



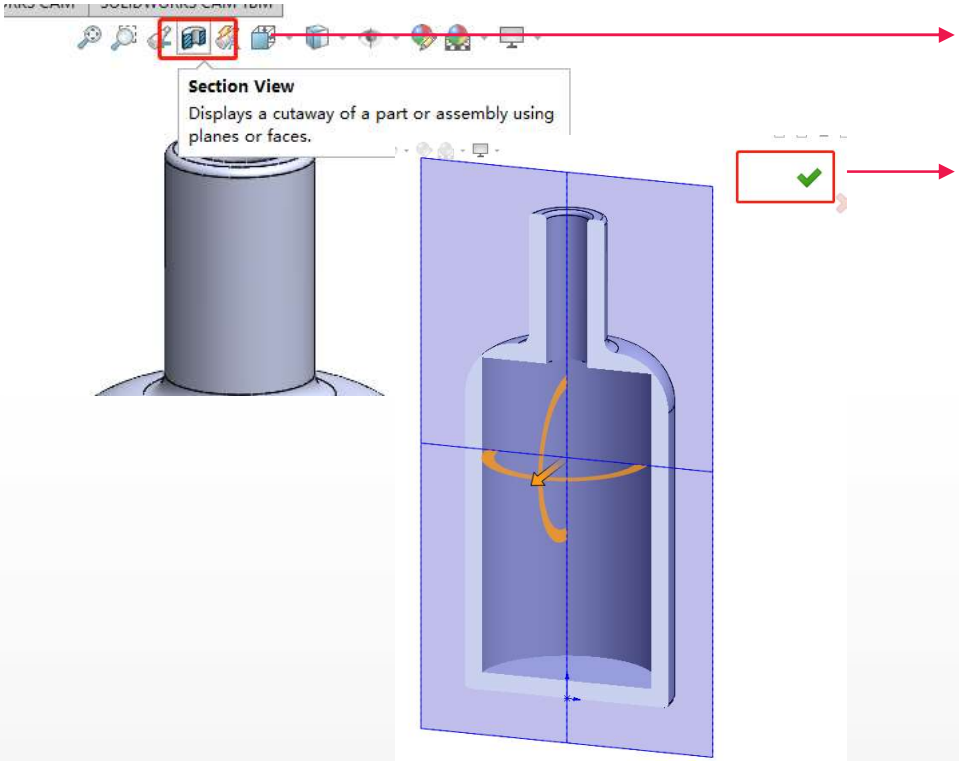

23. Apply the same “Fillet” feature on another edge marked as “ ”, here I set the estimated radius to “5 mm”, and then “Accept”.

# Exercise 2 Tutorial: Bottle Modeling




24. Apply the different “Fillet” feature on another edge marked as well, here I set the estimated radius to “2 mm”, and then “Accept”.

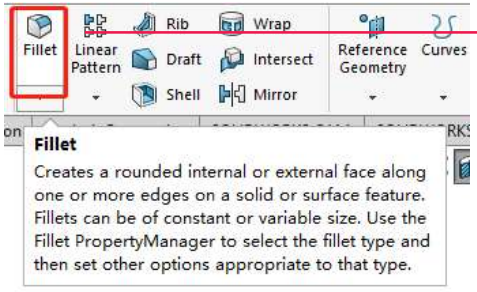
# Exercise 2 Tutorial: Bottle Modeling




25. Click “Section View”

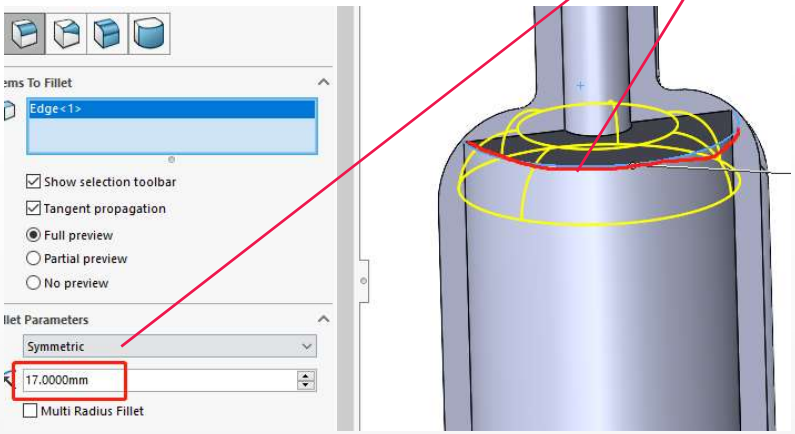
26. Click “Accept”

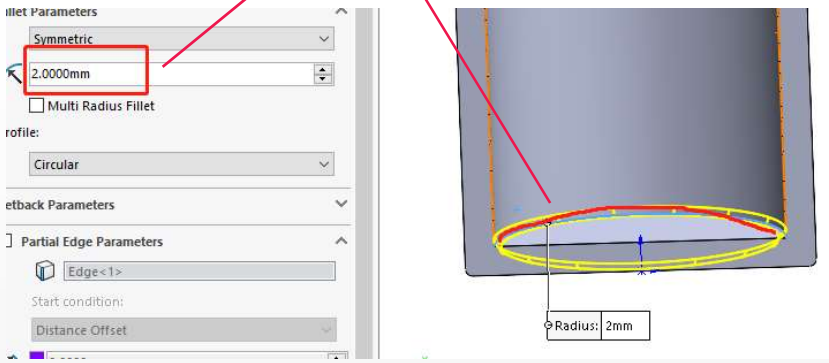
# Exercise 2 Tutorial: Bottle Modeling



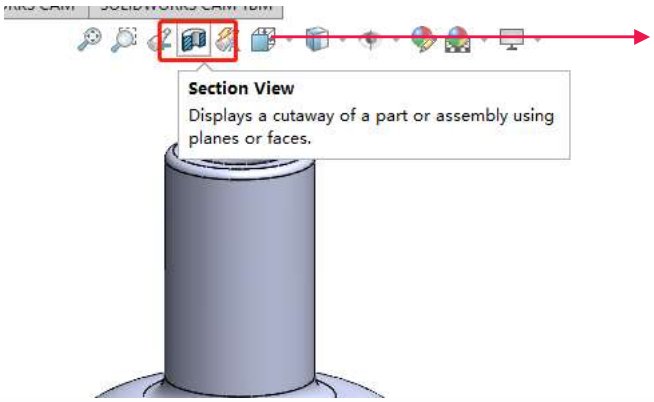

27. Click “Fillet”

28. Select the edge of the inner side of the bottle body, I set “17 mm” for this, 17 mm is calculated as 25 mm (outer radius of the edge) – 8 mm (Thickness) = 17 mm, and set bottom fillet to “2 mm”, you can decide the value by yourself for good appearance

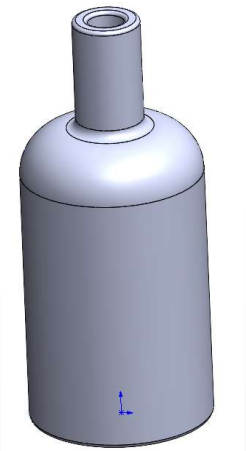


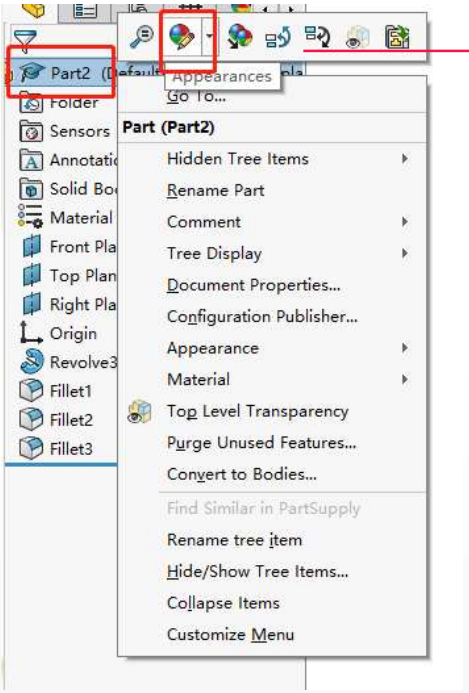
# Exercise 2 Tutorial: Bottle Modeling



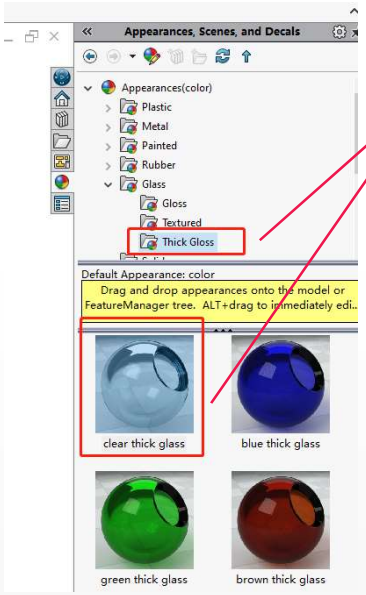

29. Click “Section View” again to exit section view



# Exercise 2 Tutorial: Bottle Modeling

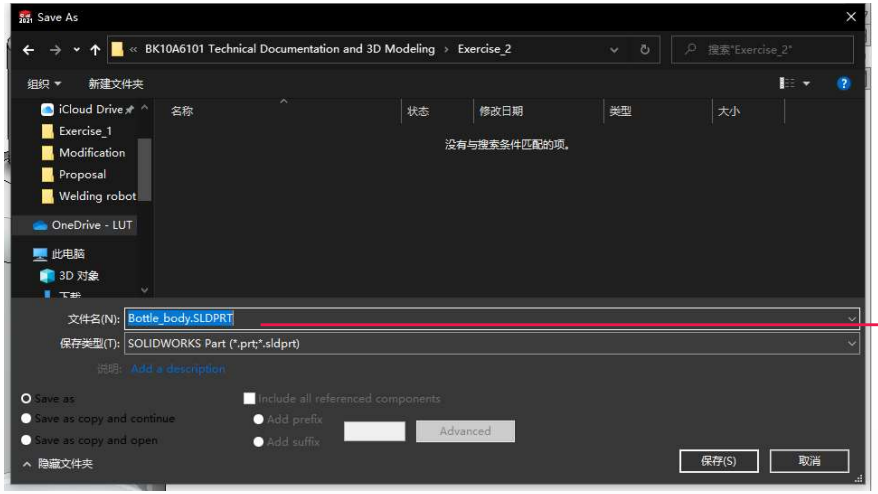



30. Right click the “Part”, and select “Appearances”



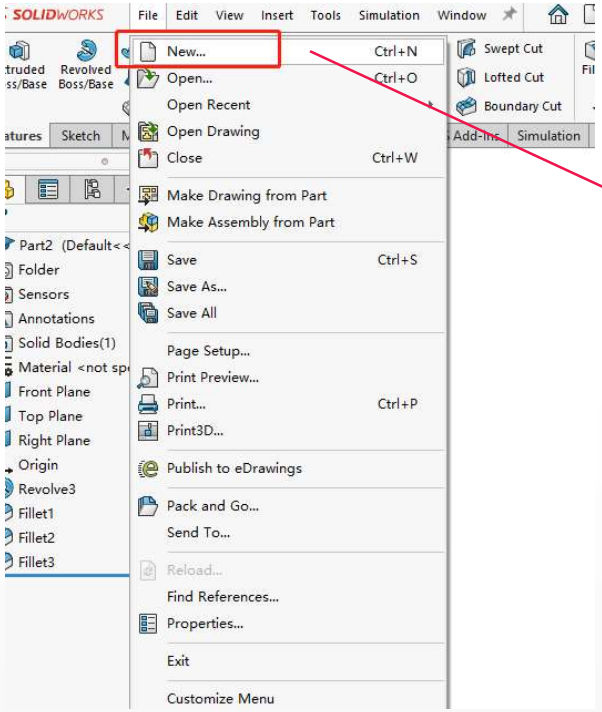

31. Then based on the bottle, I select “Appearance(color) – Glass – Thick Gloss – Clear thick glass”, you should choose different appearance **based on your bottle**.

# Exercise 2 Tutorial: Bottle Modeling



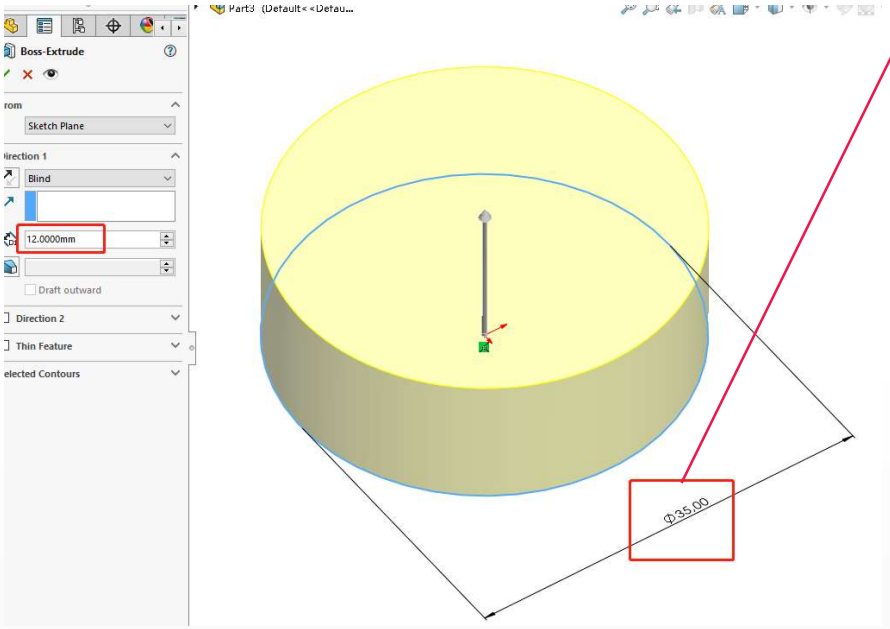

32. Save this part to SLDPRT format with a name, here I use “Bottle_body” as the file name

# Exercise 2 Tutorial: Bottle Modeling



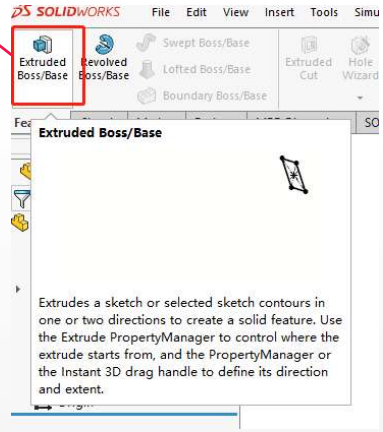

33. Then we are going to model the cork stopper separately in another file, click “New”, and then “Part”

# Exercise 2 Tutorial: Bottle Modeling

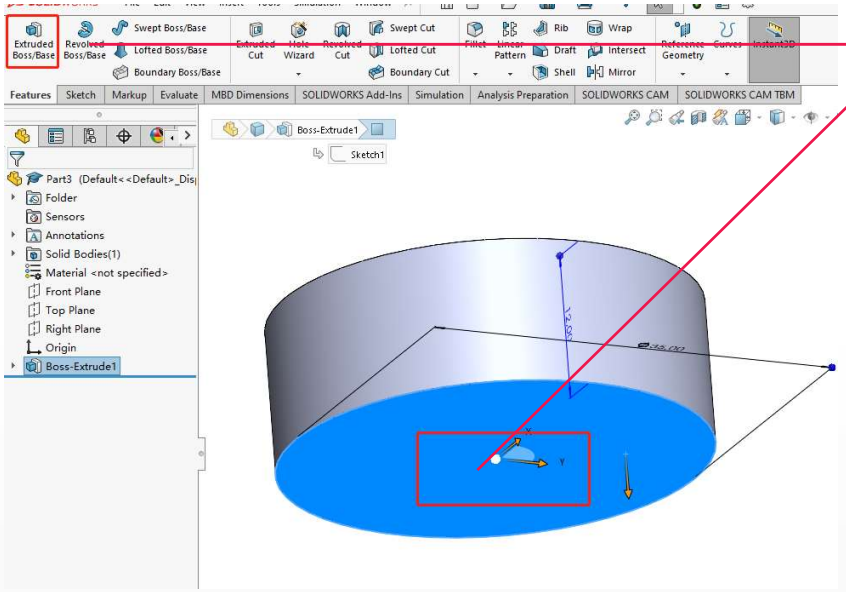



34. Sketch “Circle”, and recall steps in exercise 1, model a cylinder with diameter “35 mm”

35. and click “Extruded Boss/Bass” thickness “12 mm” from measurements. Then “Accept”.

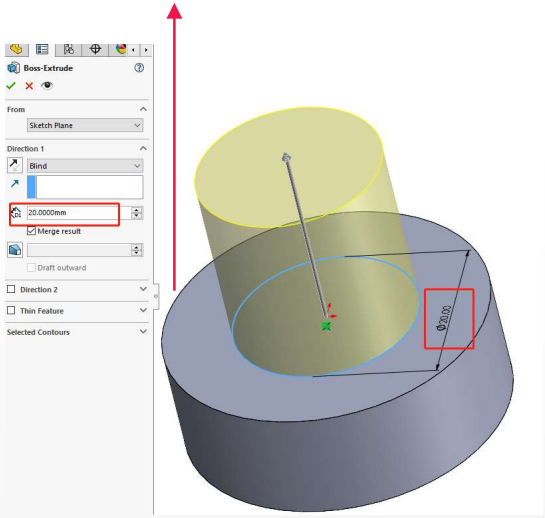


# Exercise 2 Tutorial: Bottle Modeling

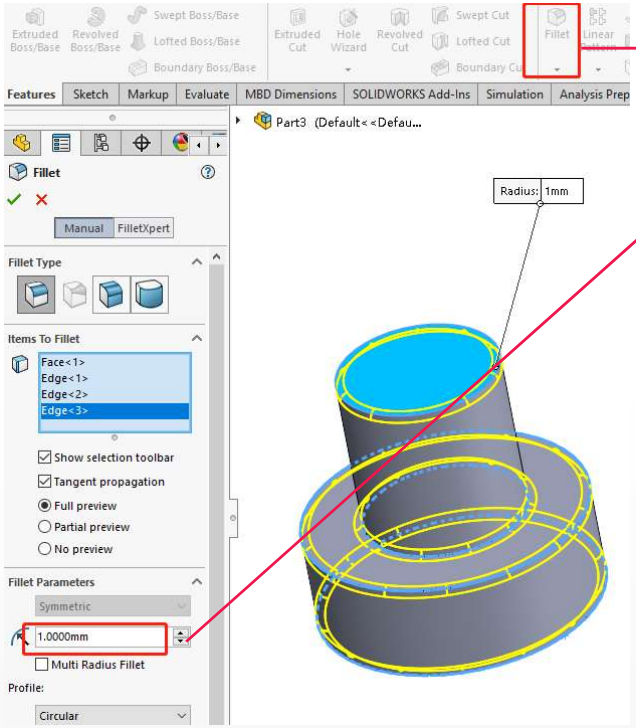



36. First, click the bottom surface of the cylinder Click “Sketch”, draw a circle with diameter “20 mm”.

37. then click “Extruded Boss/Base” and set thickness “20 mm” from measurements. Then “Accept”.



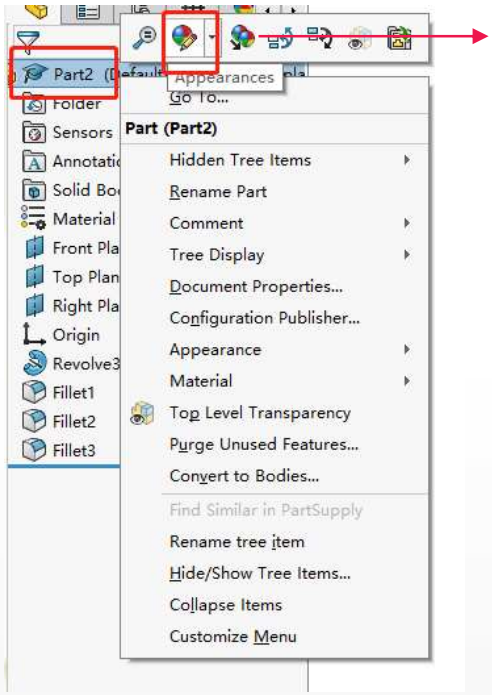
# Exercise 2 Tutorial: Bottle Modeling



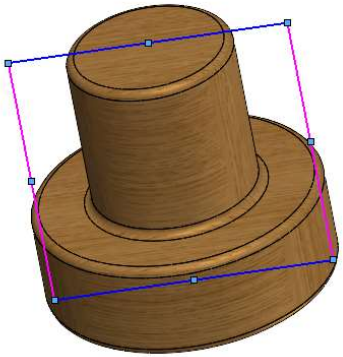

38. Click “Fillet”, put “1 mm” fillet on each edge of the cork stopper.

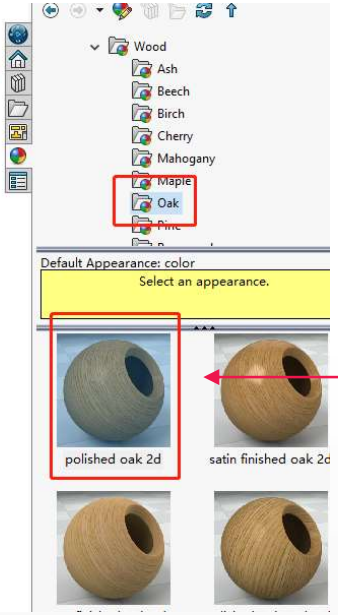
Note: fillet feature is good for assembly and ergonomic consideration in many field.

# Exercise 2 Tutorial: Bottle Modeling



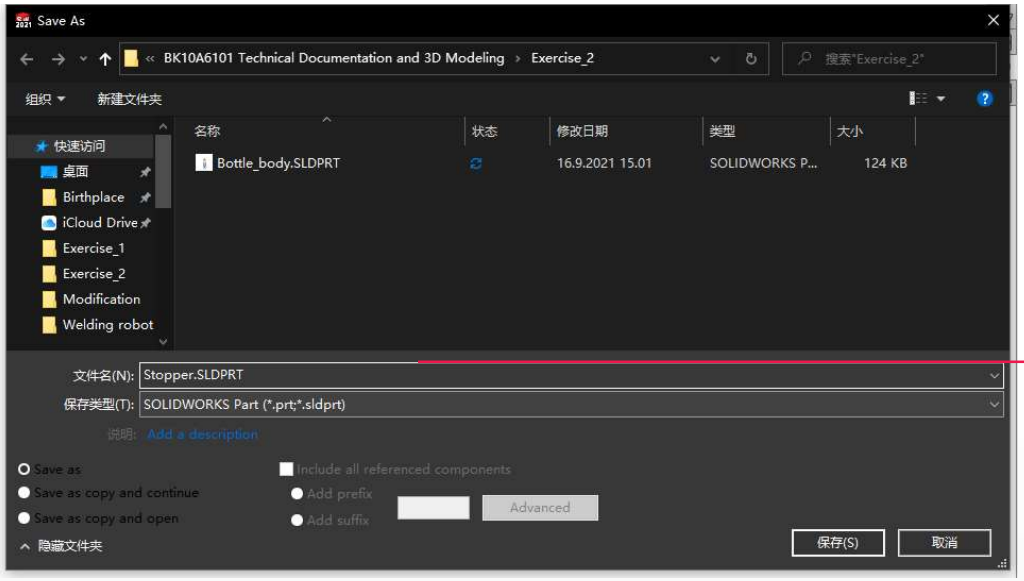

39. Right click the “Part” and click “Appearances”





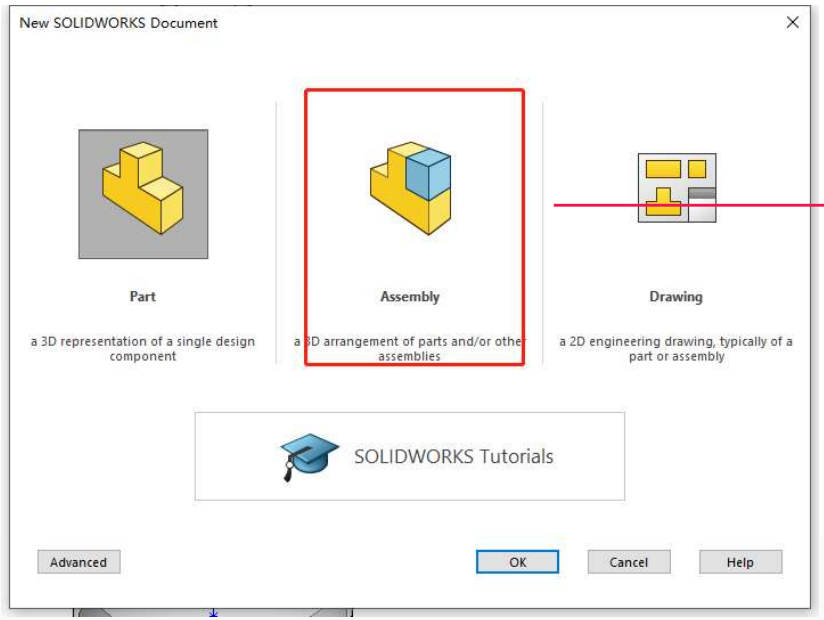

40. Here I choose “Oak”, Click “Accept”

# Exercise 2 Tutorial: Bottle Modeling




41. Save this part to SLDPRT format with a name, here I use “Stopper” as the file name

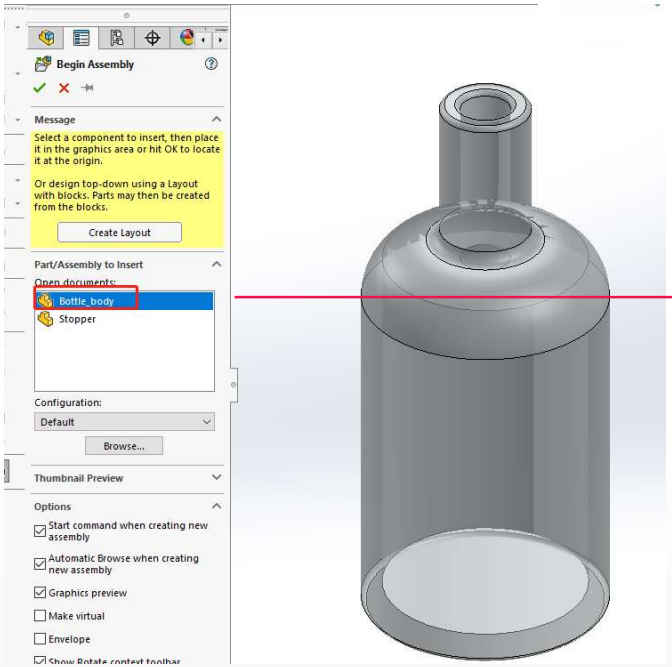
# Exercise 2 Tutorial: Bottle Modeling




Now, we have 2 parts, cork stopper and bottle body, the next step is to assemble them together

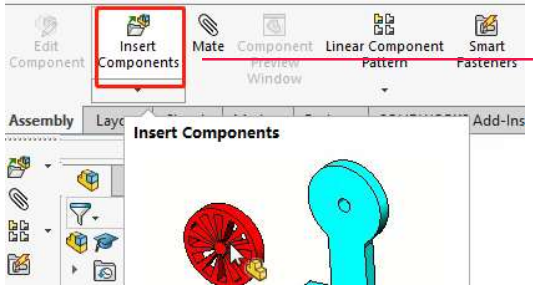
42. Create new, and select “Assembly” this time

# Exercise 2 Tutorial: Bottle Modeling

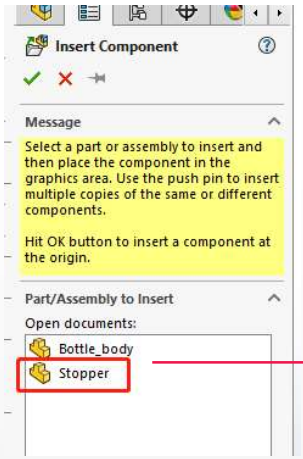



43. If you did not close previous part file window, you can find open documents here, otherwise, you need to browser and find the file
Click “Bottle_body”, and put it in the space

# Exercise 2 Tutorial: Bottle Modeling

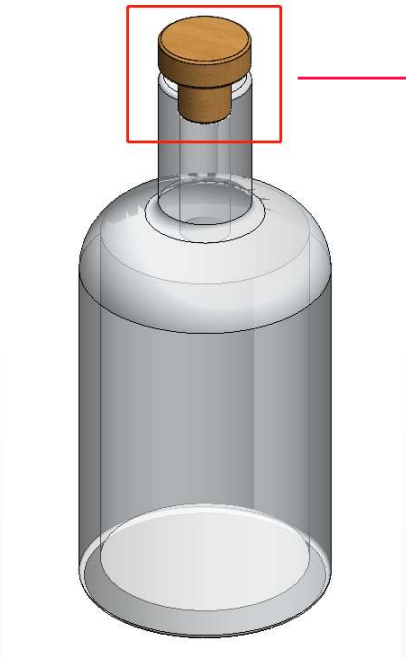



44. Click “Inset Components”



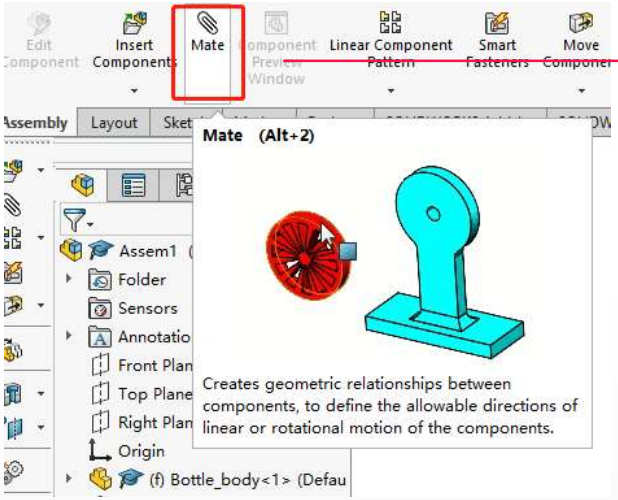

45. Click “Stopper”

# Exercise 2 Tutorial: Bottle Modeling

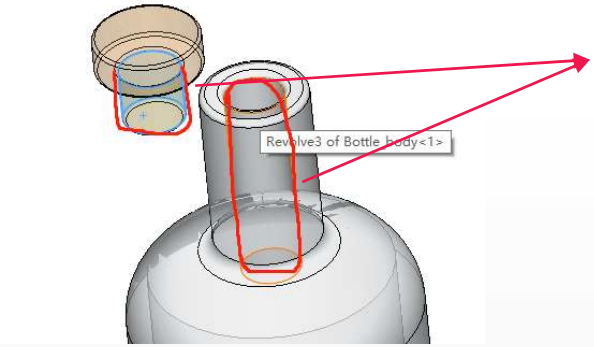


46. Drag the “stopper” to any location, but prefer somewhere near your desired location, later we will put the stopper in exact location

# Exercise 2 Tutorial: Bottle Modeling

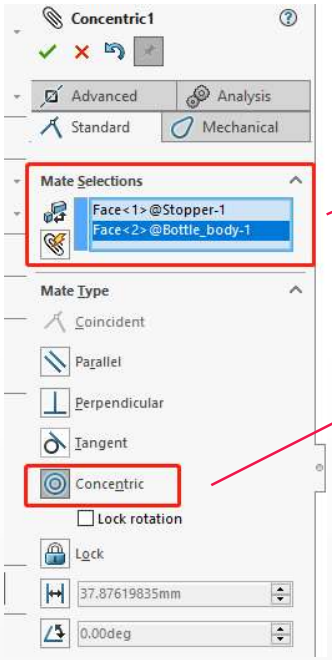



47. Click “Mate”




48. Click two cylinders surfaces of stopper and bottle

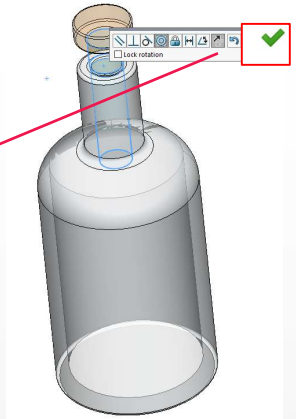
# Exercise 2 Tutorial: Bottle Modeling



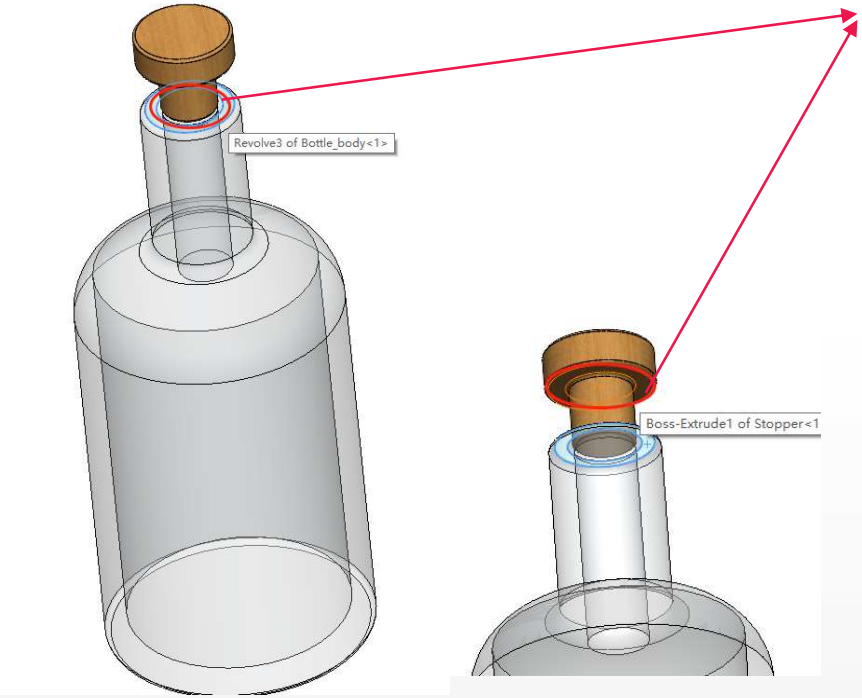

This shows the mate selections

49. This is usually automatically chosen based on chosen surface/axis/point, select “Concentric”

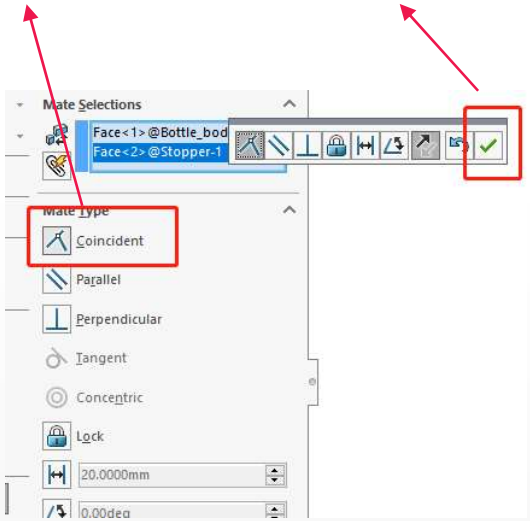
50, Now the model looks like this, click “Accept”



# Exercise 2 Tutorial: Bottle Modeling

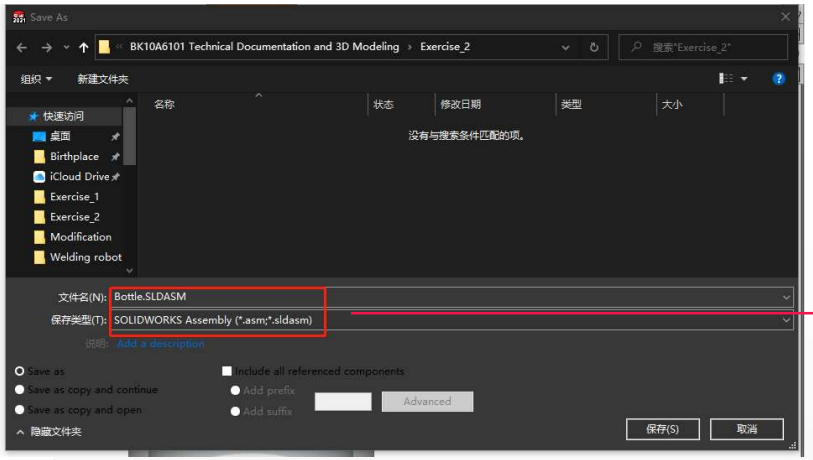



51. Then select the top surface of the bottle body and the surface of the cork stopper, we want them to be “coincident”, then select “Accept”



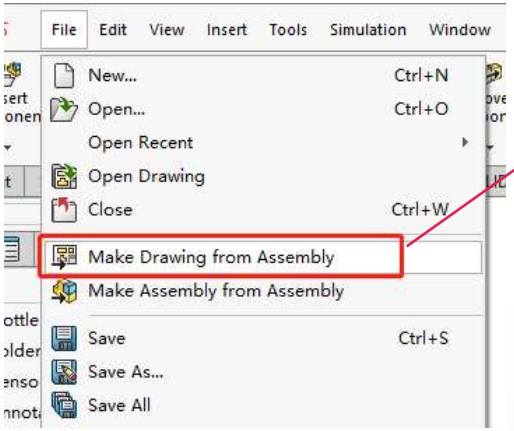
# Exercise 2 Tutorial: Bottle Modeling


52. Select “Shaded” from “Display Style”, this style removes the edges, and it is more realistic for visualization

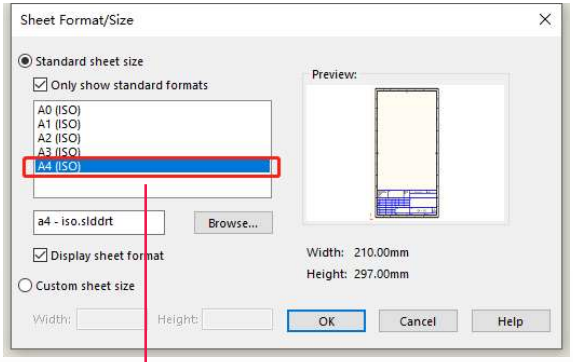



53. Save file as “SLDASM”

# Exercise 2 Tutorial: Bottle Modeling

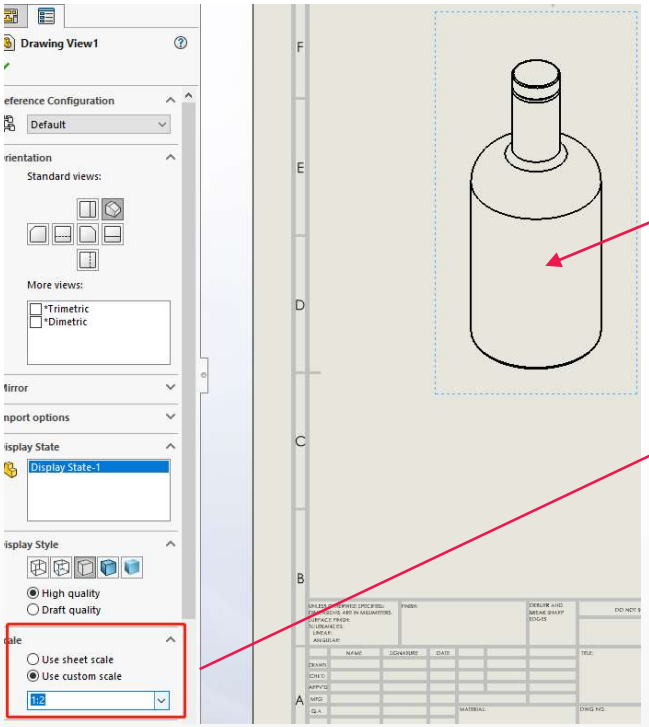



54. Select “Make Drawing from Assembly” from “File”



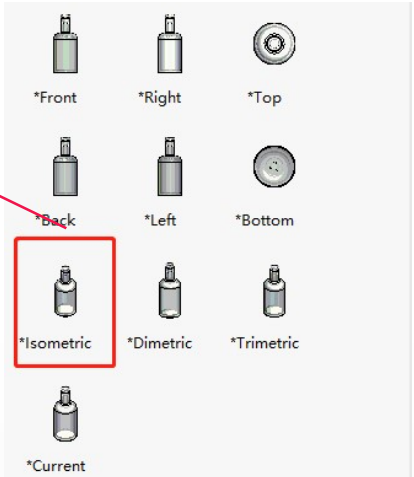

55. Select “A4 (ISO)” as template, then click “OK”

# Exercise 2 Tutorial: Bottle Modeling

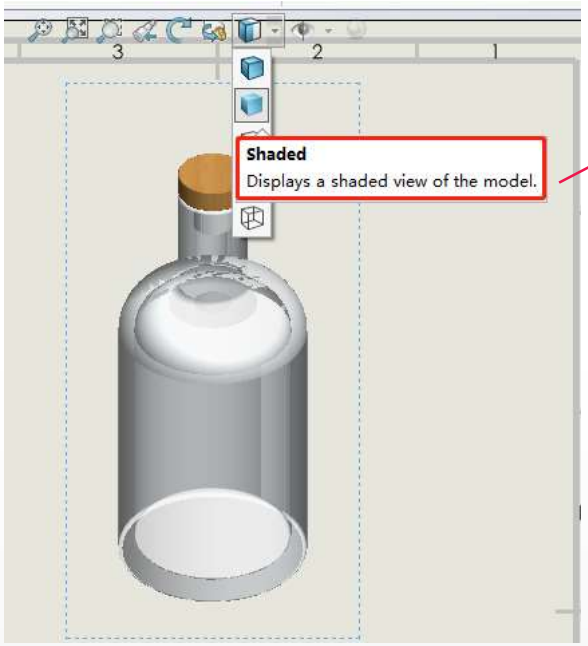



56. Select “*Isometric” and drag the bottle to empty space

57. To scale the size, “Use custom scale” and set the parameter to “1:2”, or any value that the figure, notes, details are **visible**.

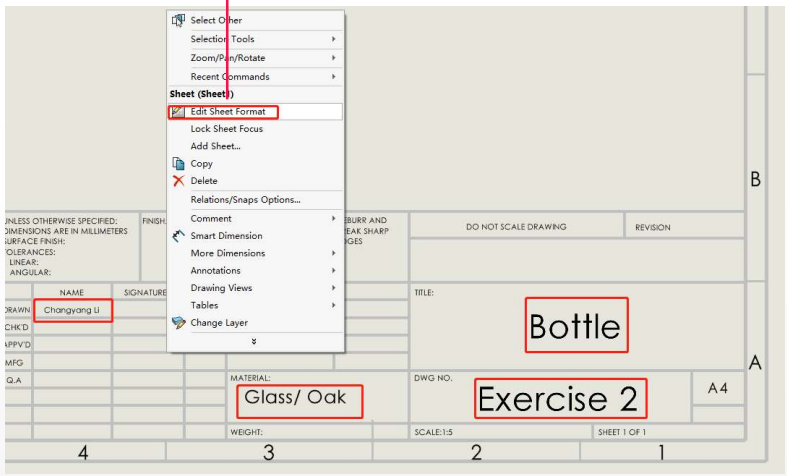


# Exercise 2 Tutorial: Bottle Modeling

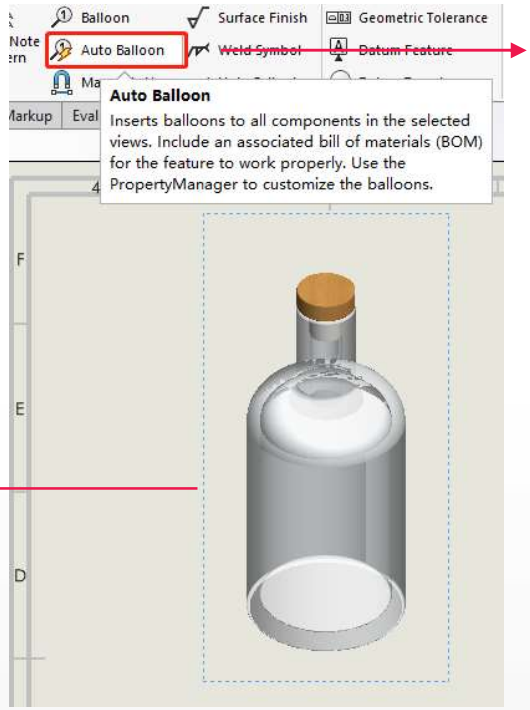



58. Click on the bottle, then select “Shaded”

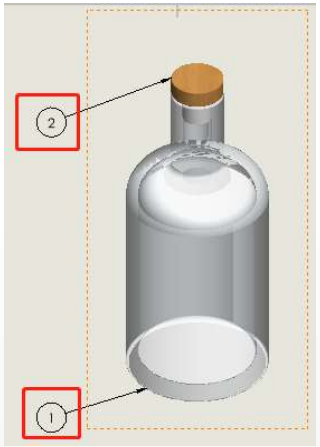
59. Right click the drawing, and click “Edit Sheet Format”, then add related information



# Exercise 2 Tutorial: Bottle Modeling



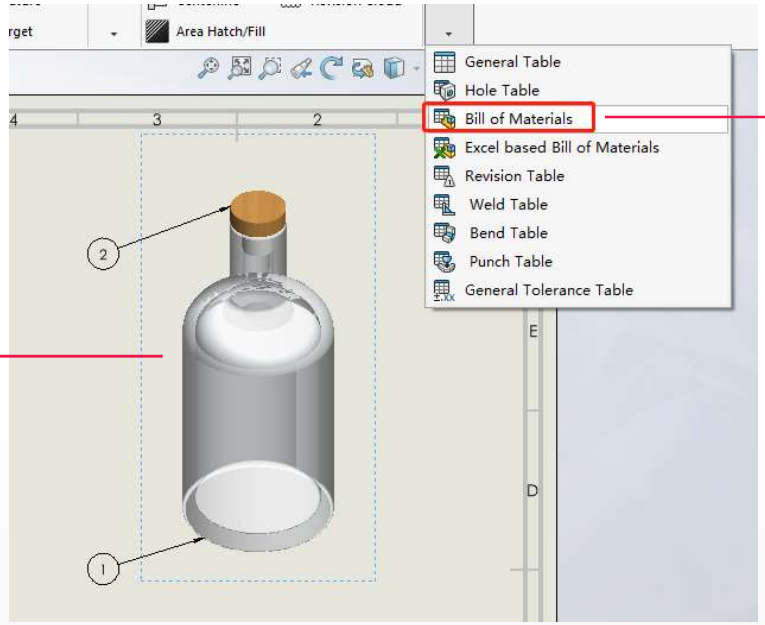

61. Click “Auto Balloon”, this automatic identify different parts in this assembly and give balloon for each.




60. Click the bottle or this area, so this object is selected

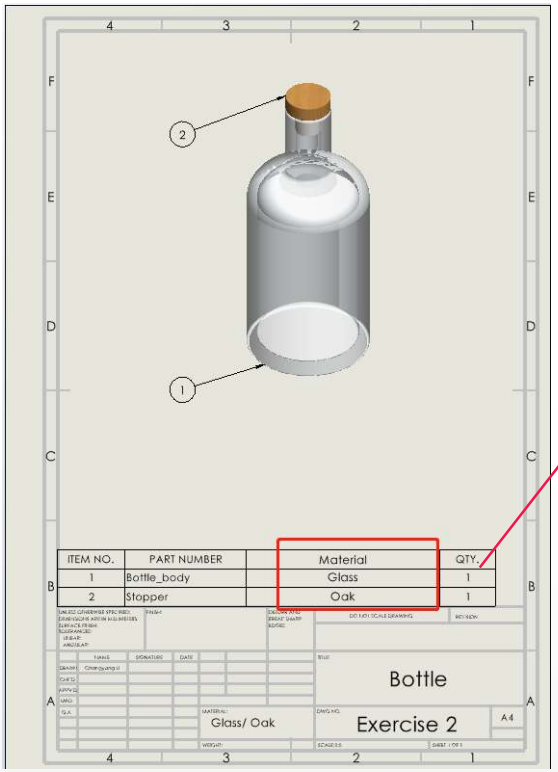
# Exercise 2 Tutorial: Bottle Modeling

62. Click the bottle or this area, so this object is selected

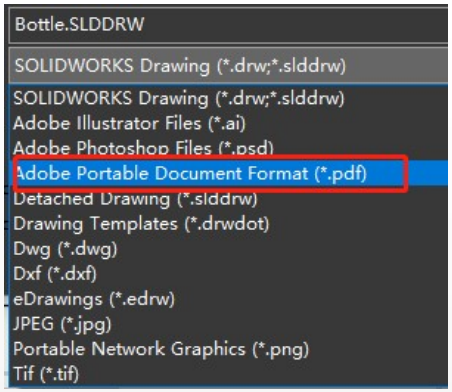



63. Click “Bill of Materials”, this automatic identify different parts in this assembly and give balloon for each. Then click “Accept”

# Exercise 2 Tutorial: Bottle Modeling

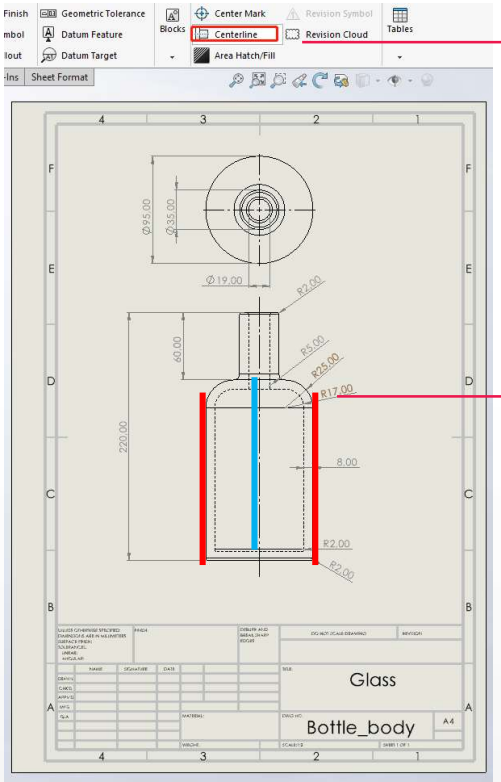



64. You can modify the content in the table, here I add the materials of each part




65. Save the file as “*.pdf”

# Exercise 2 Tutorial: Bottle Modeling



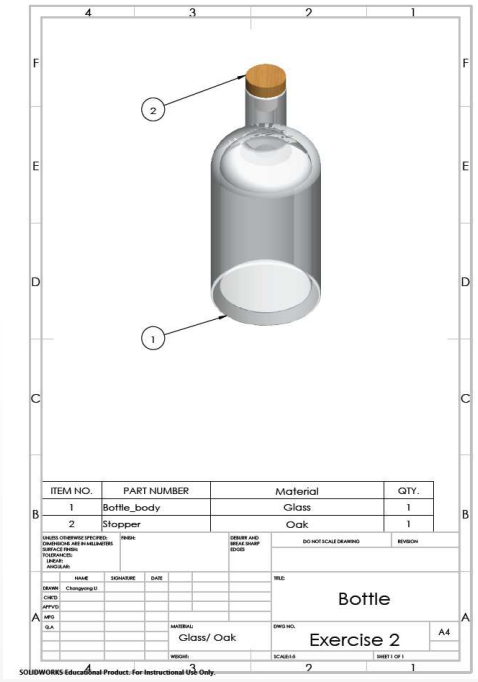

66. Next, you should make drawings for each part, in this stage, you should be able to do it after exercise 1

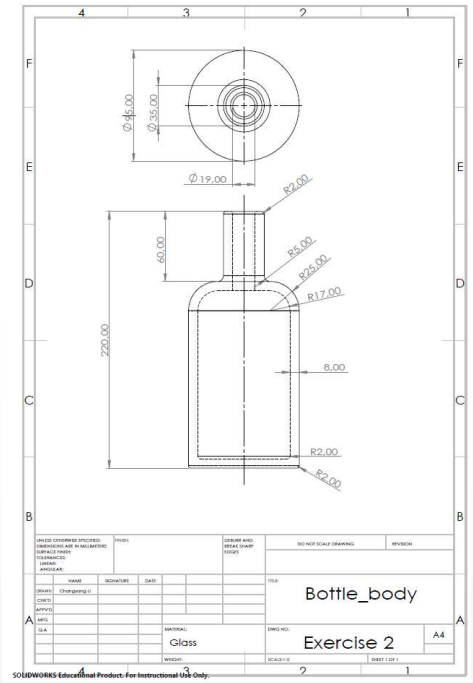
67. The bottle is symmetric, to avoid repeat dimension, First click “Centerline”, then click sides of bottle marked as “ | ”, then the centerline is drawn and marked as “ | ”

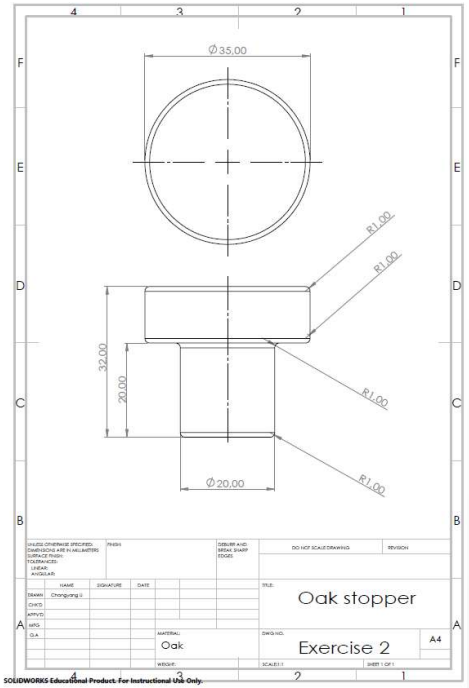
**Note: After the sheet format edit, quiet the edit mode by click “**  **” , then save as PDF format.**

# Exercise 2 Tutorial: Bottle Modeling

68. The finished drawing will be 1 PDF file with 3 drawings PDF inside.



# Exercise 2 Tutorial:
# Bottle Modeling

Summary:
New features used in this exercise 2:

- Part (Sketch)
- Part (Revolved boss/bass)
- Part (Appearance)
- Part (Offset entities)
- Part (Display style)

- Assembly (Mate)

- Technical drawing (Assembly)
- Technical drawing (Bill of material)
- Technical drawing (Balloon)