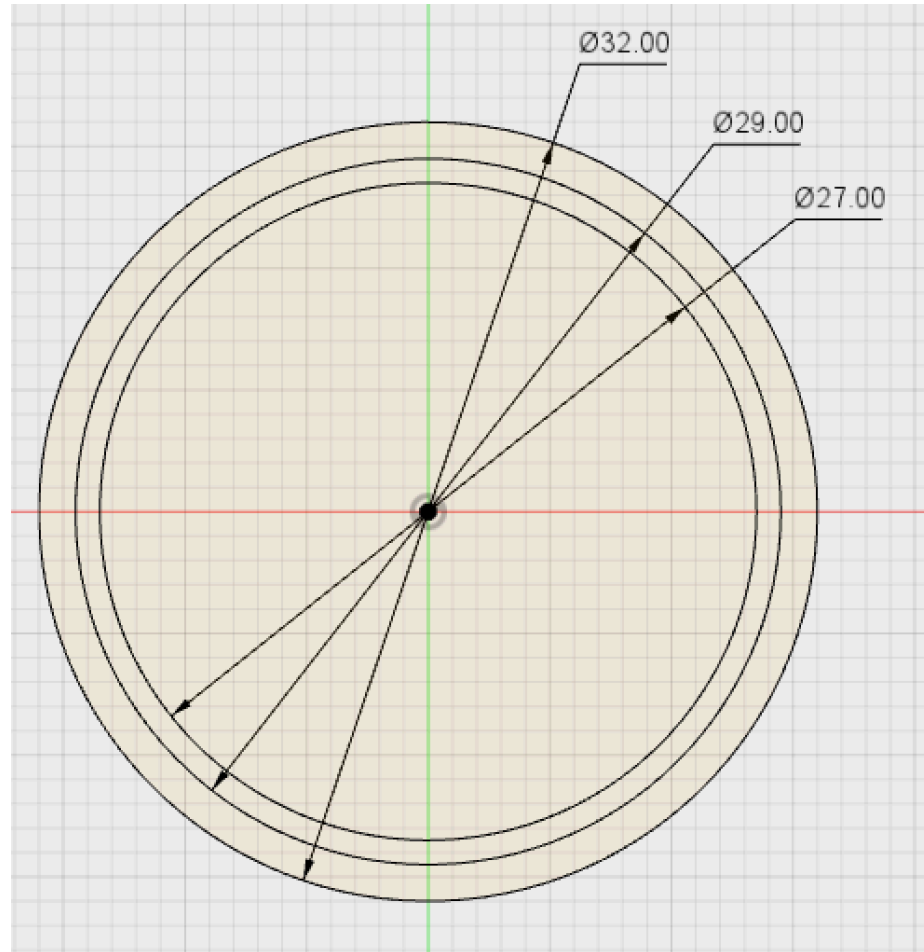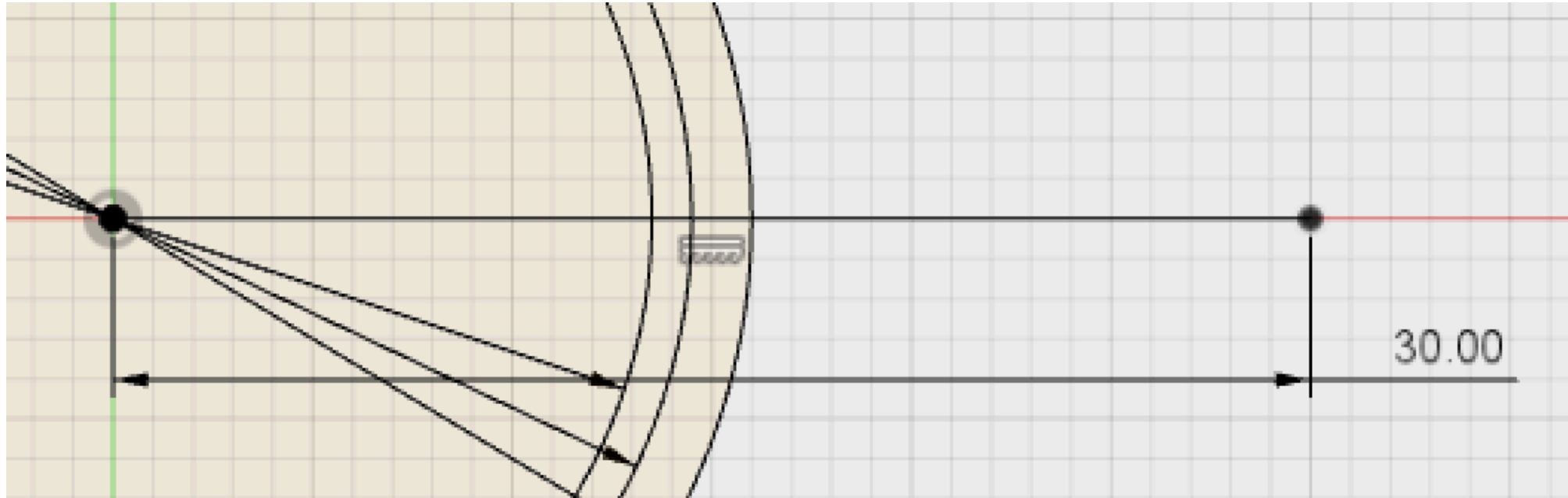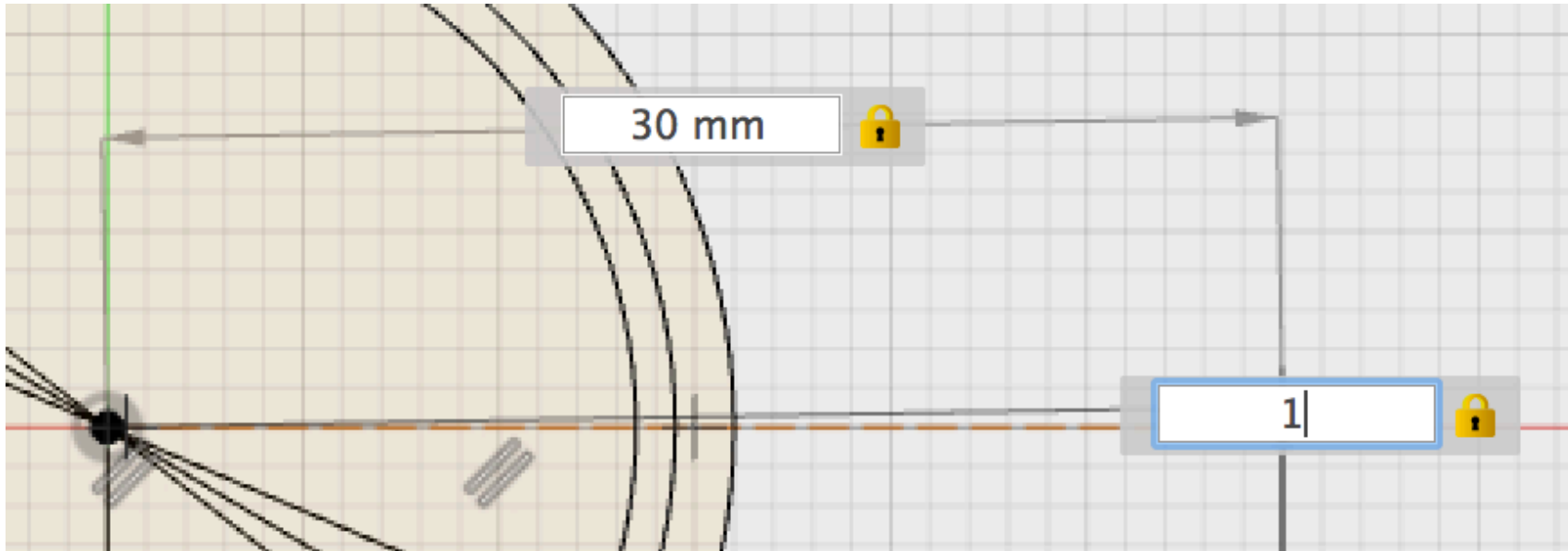# Lesson 8

Gear Design

Step 1: Draw 3 circles with the diameter of 27mm, 29mm and 32mm respectively.

Step 2: Draw a 30mm horizontal line starting from the center of the circle.
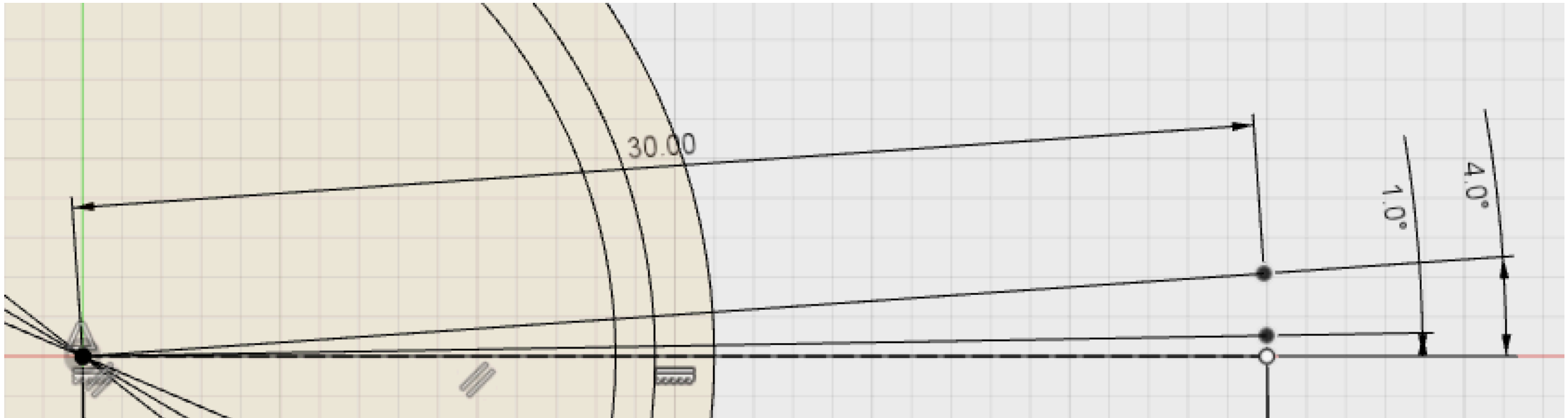
Step 3: Draw a second line measuring 30mm long, 1 degree above from the first line.

Note: Click "Line", choose the circle's center point as the first point, then drag your mouse diagonally to your upper right. Key in "30mm", hit "tab" then "1".
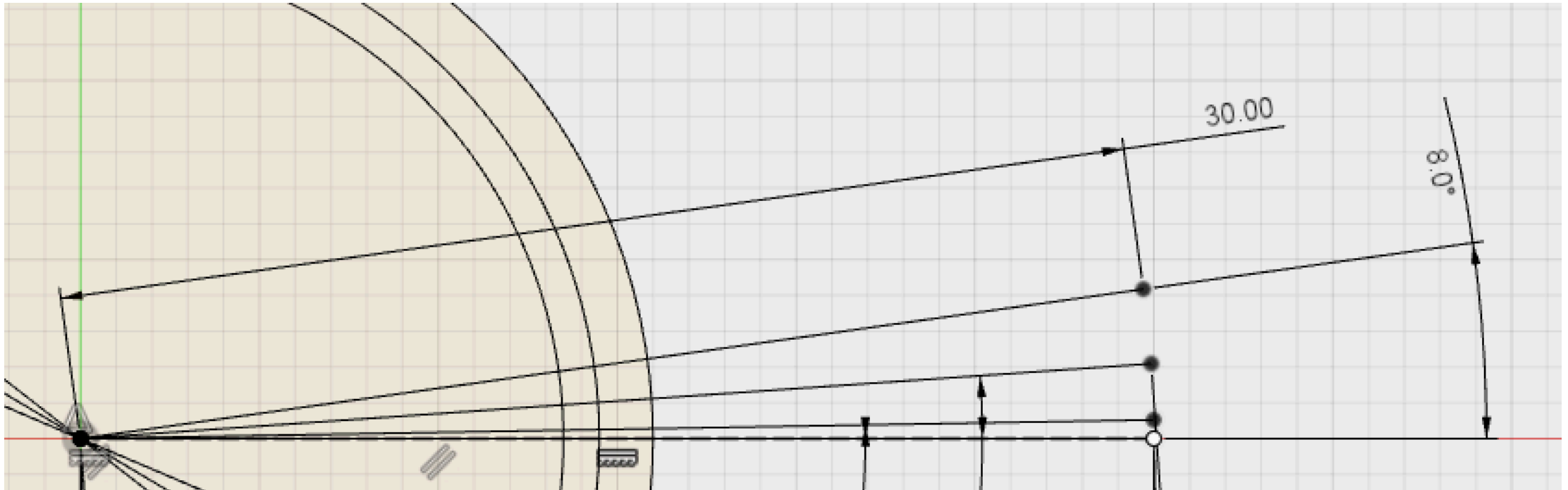
Step 4: Draw a third line measuring 30mm long 4 degrees above from the first line.


Note: Click "Line", choose the circle's center point as the first point, then drag your mouse diagonally to your upper right. Key in "30mm", hit "tab" then "4".

Step 5: Draw the fourth line measuring 30mm long 8 degrees above from the first line.

Note: Click "Line", choose the circle's center point as the first point, then drag your mouse diagonally to your upper right. Key in "30mm", hit "tab" then "8".
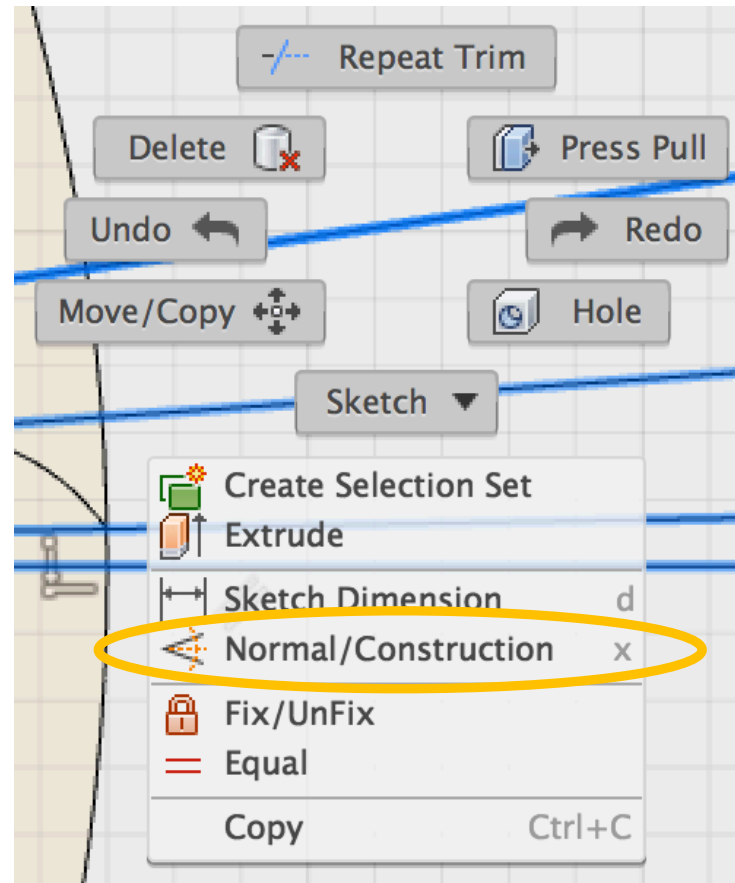
Check your result.
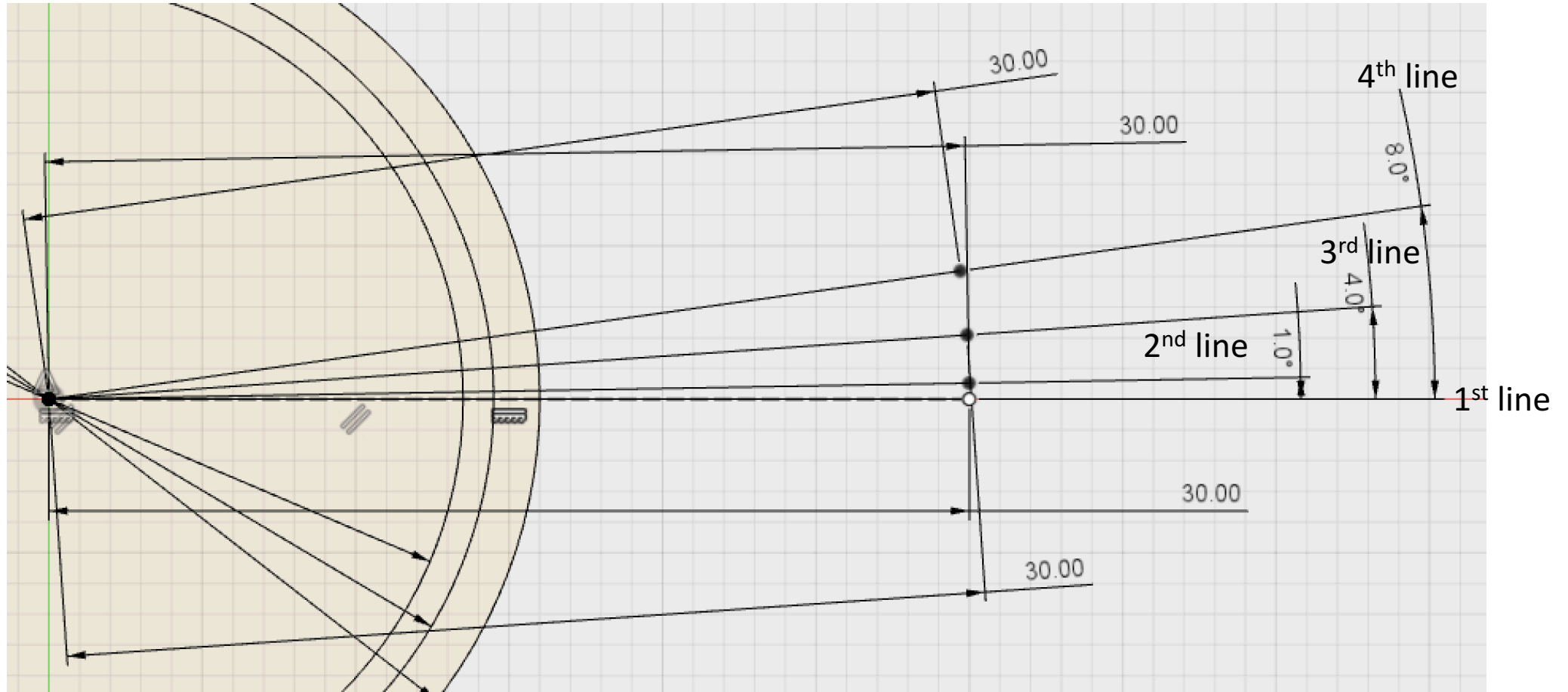
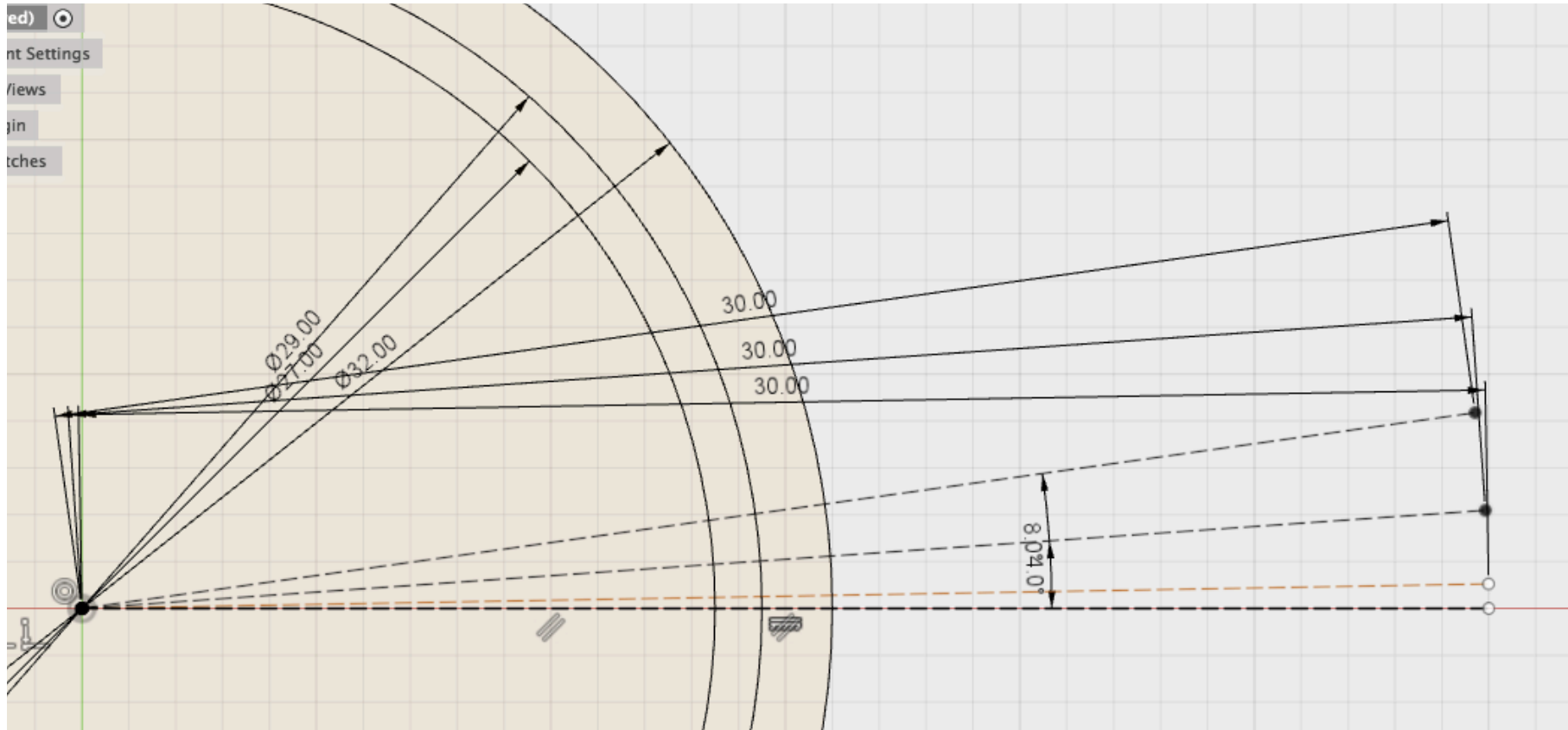# Step 6: Select all the 4 lines that we have drawn just now.
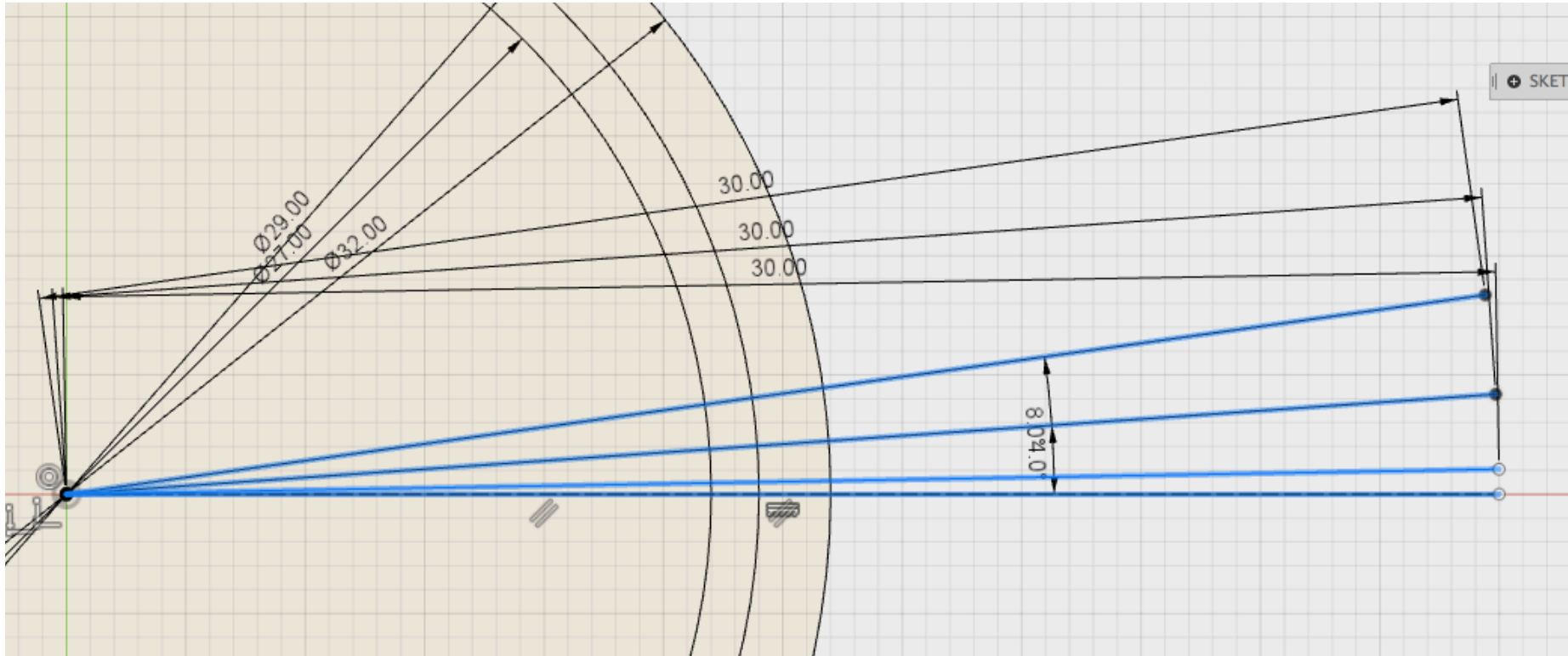
Note: Press the 'control' key or 'shift' key while selecting all 4 lines.

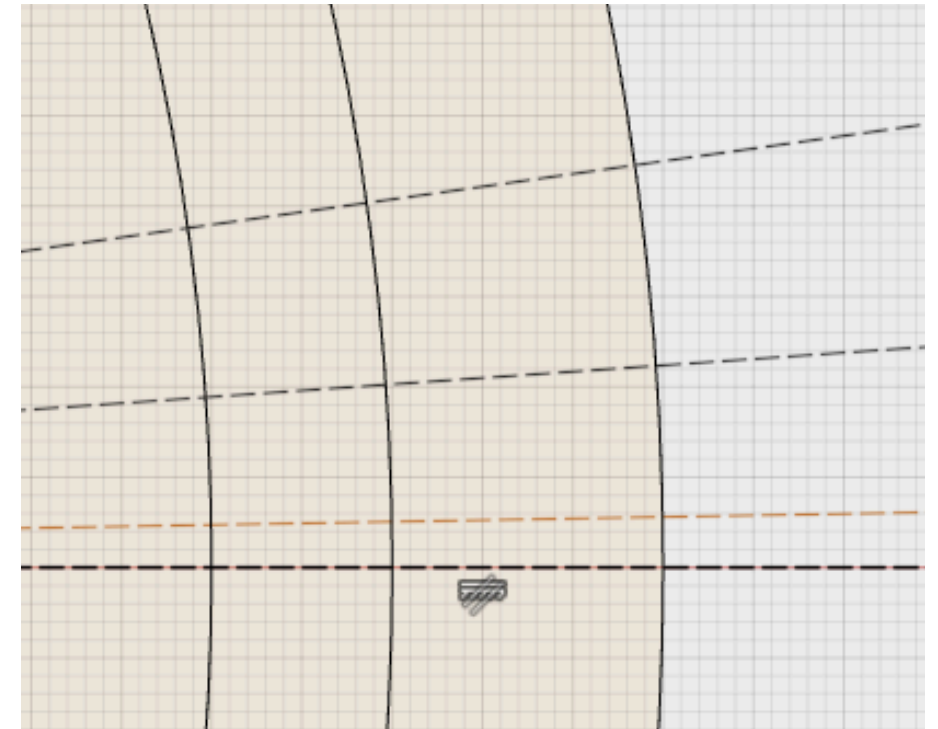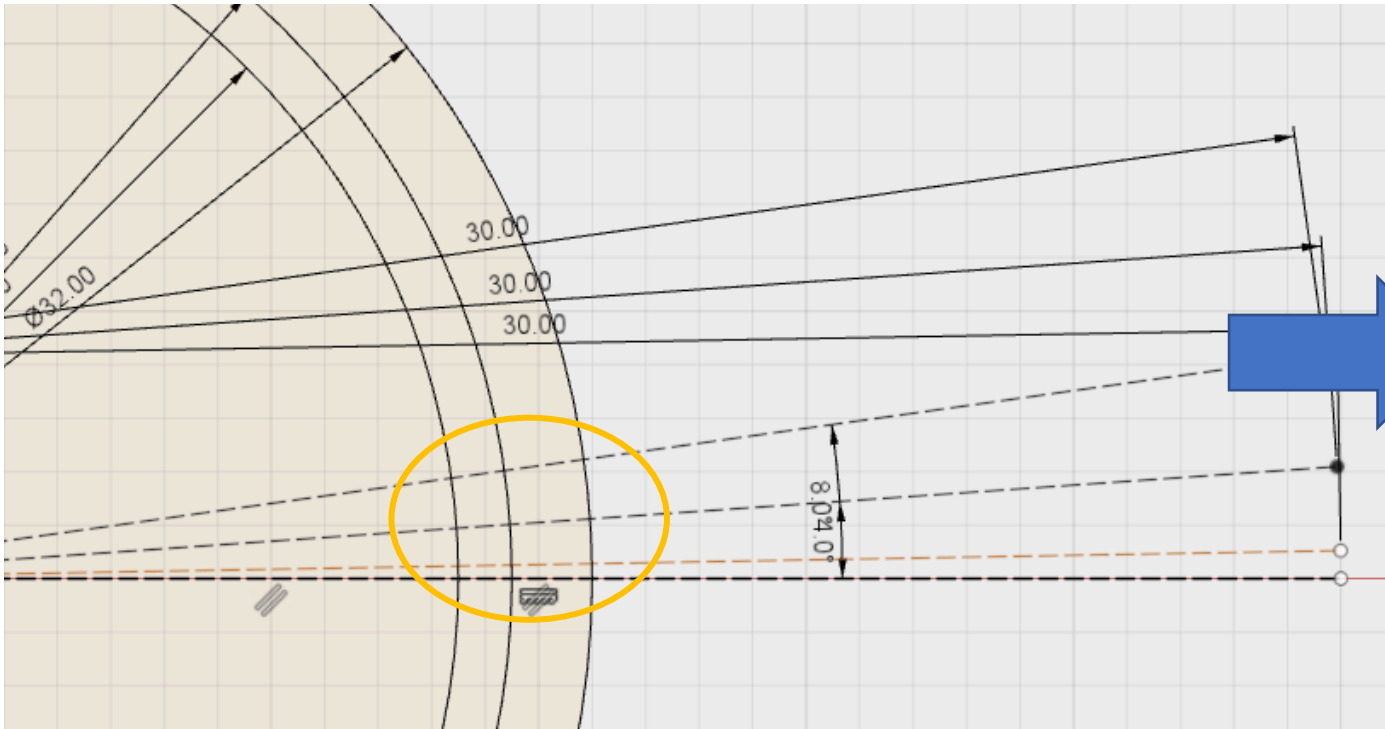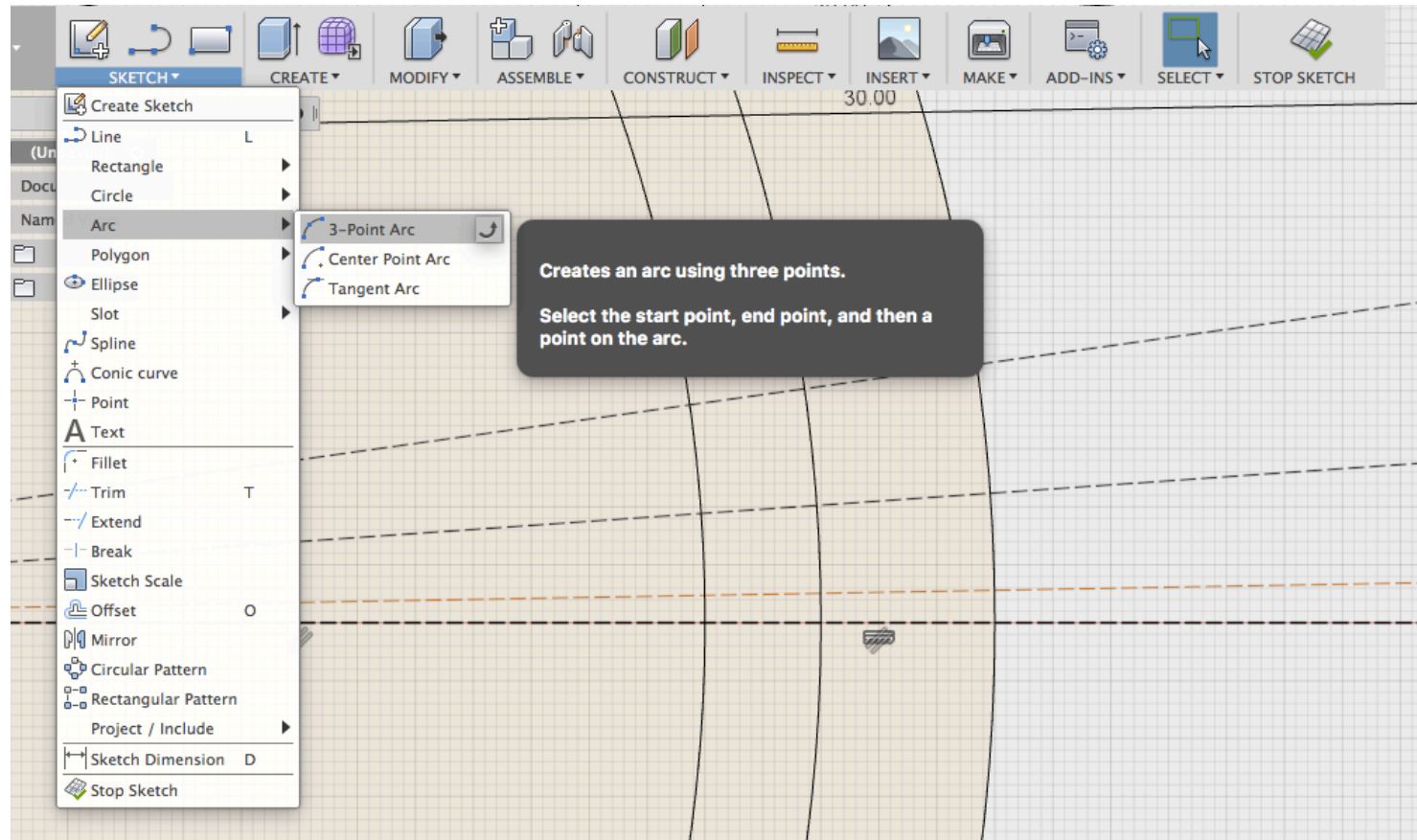# Step 7: Right click, then select "Normal/Construction".

Check your result.

Note: Step 6 & 7 are to change a solid line into a dashed line.

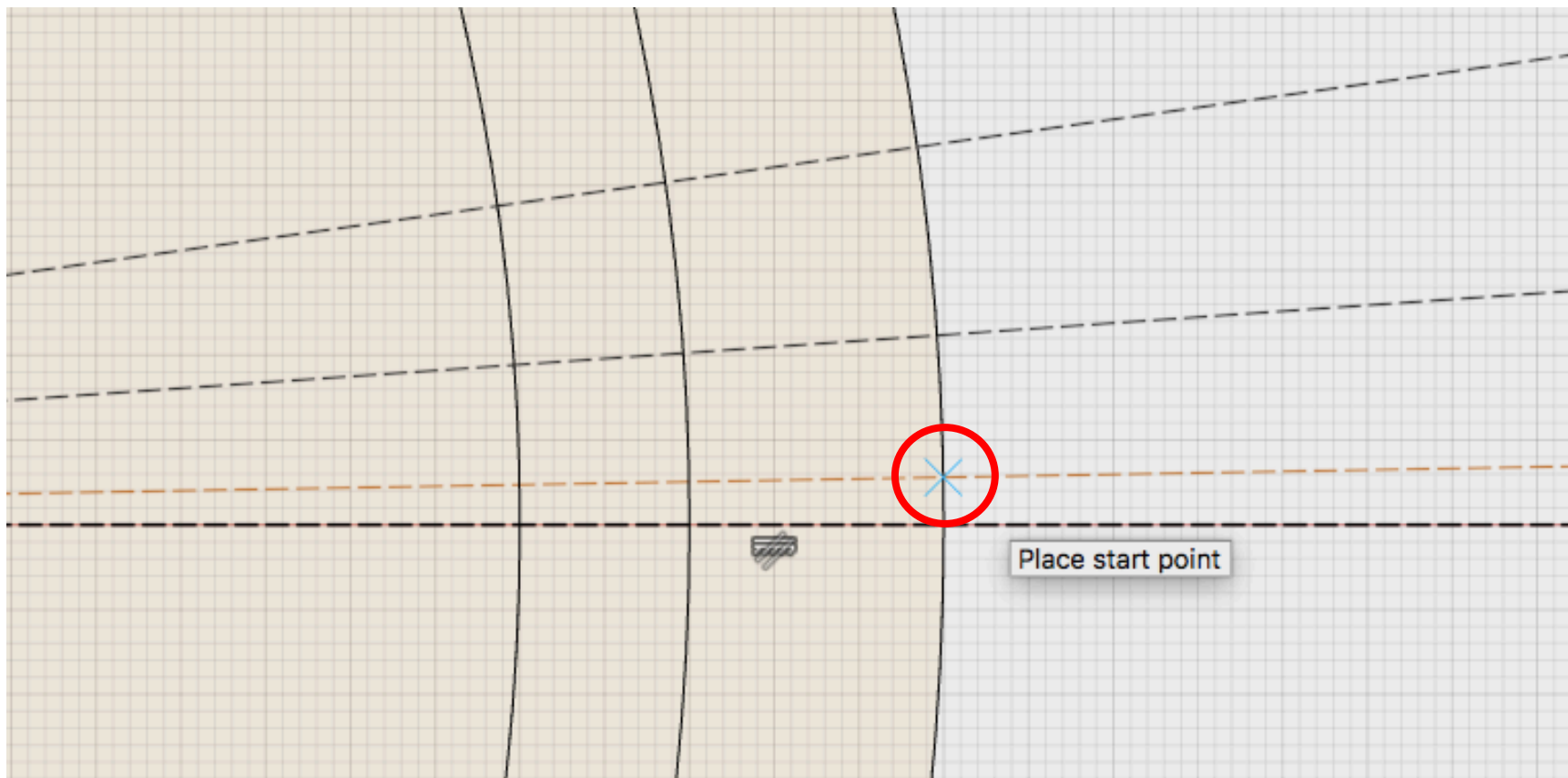# Step 8: Zoom into the area circled below.

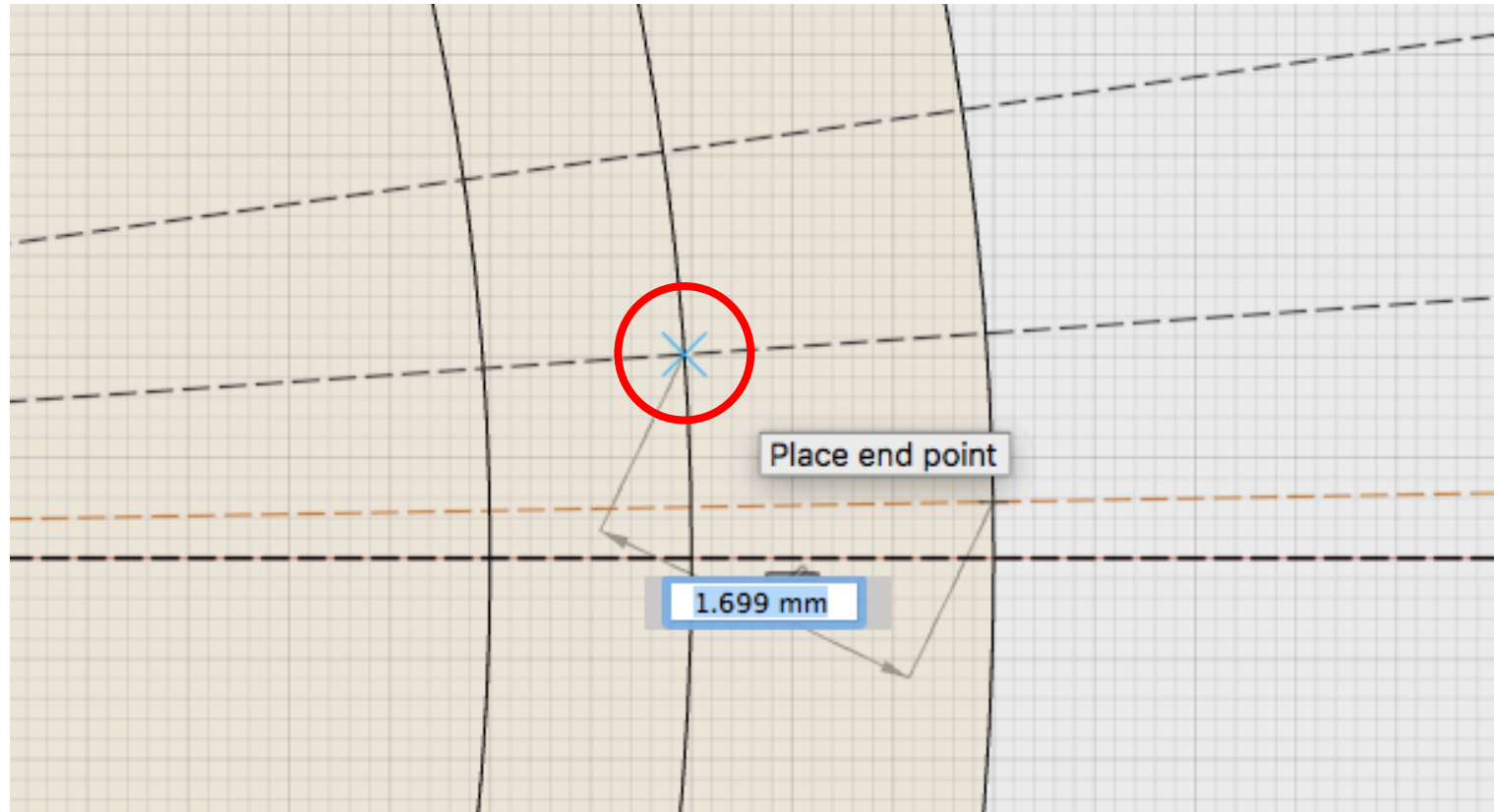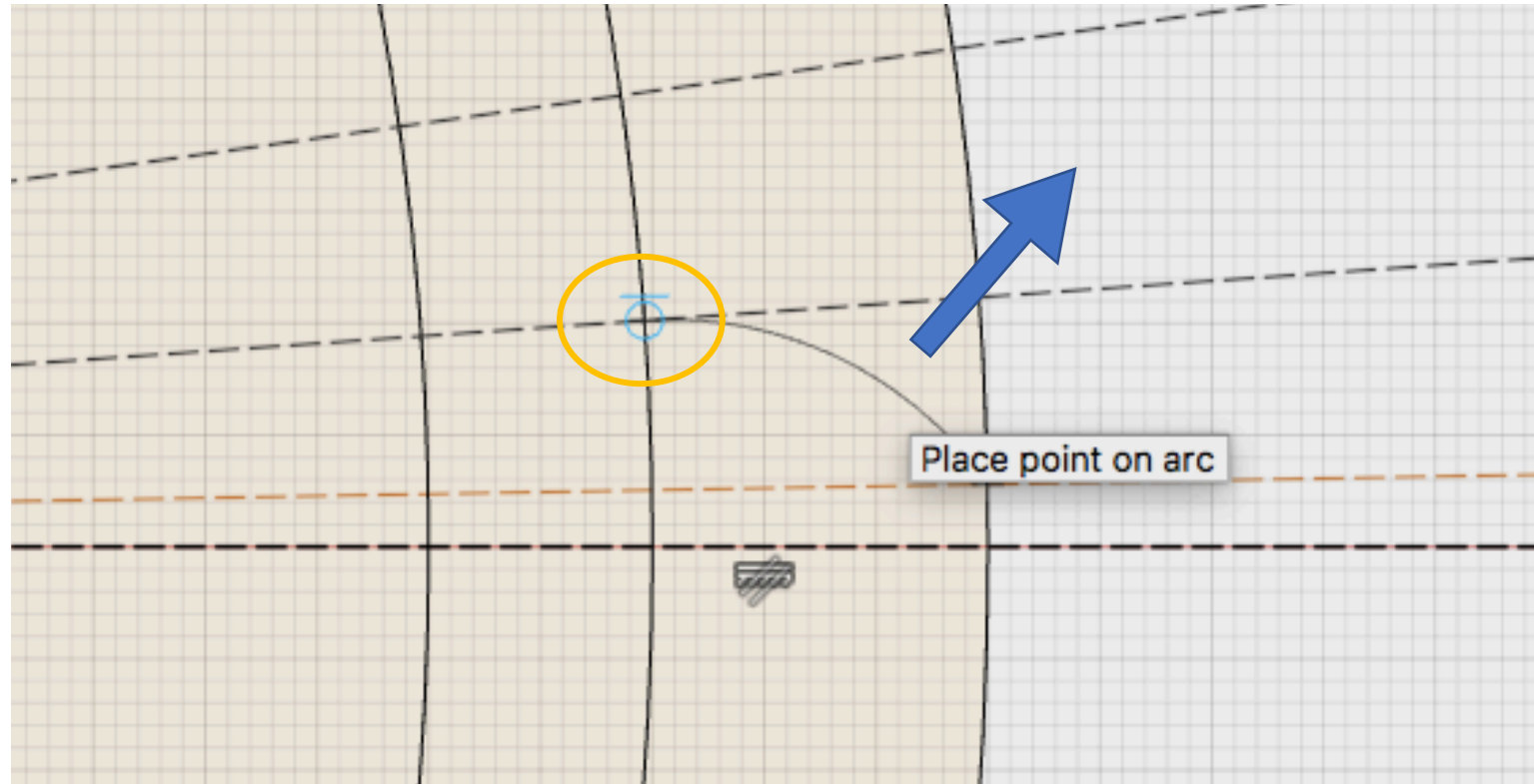# Step 9: Next, go to "Sketch" > "Arc" > "3-Point-Arc".

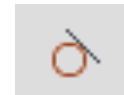# Step 10: Then click on the intersection as the first point.

Step 11: Select the circled intersection as the second point.
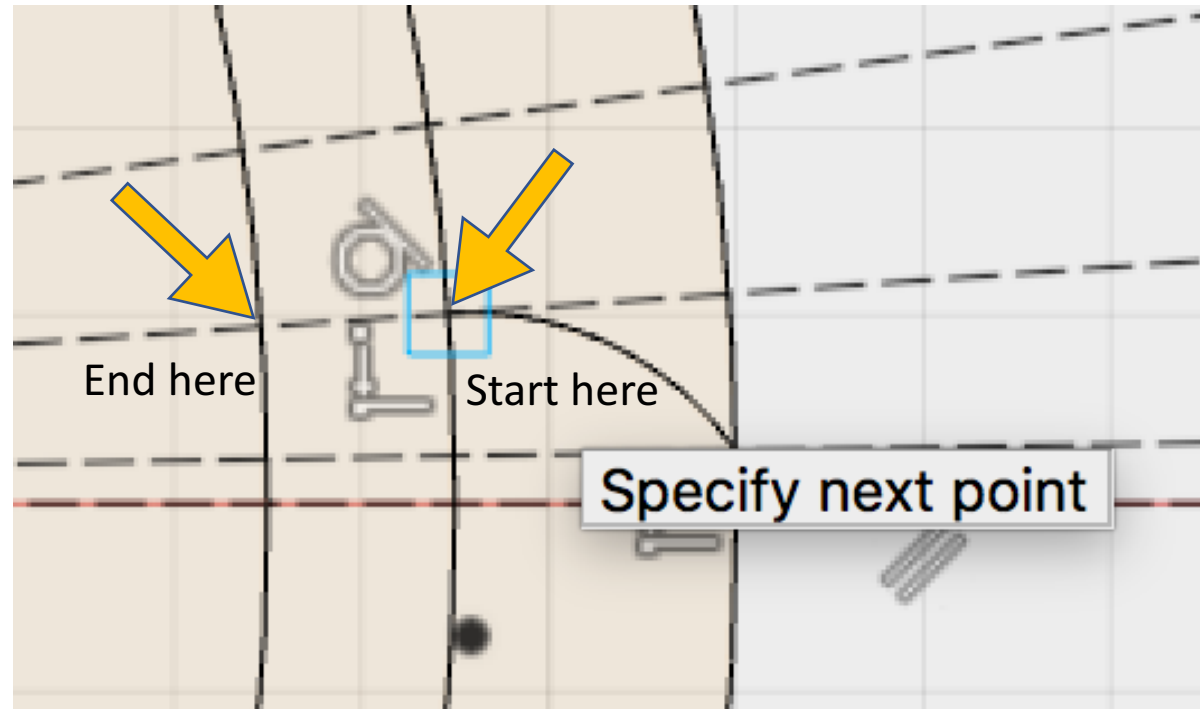
Step 12: Then drag your mouse slightly up until you see the tangent symbol (refer to 'Note'), do a left-click.
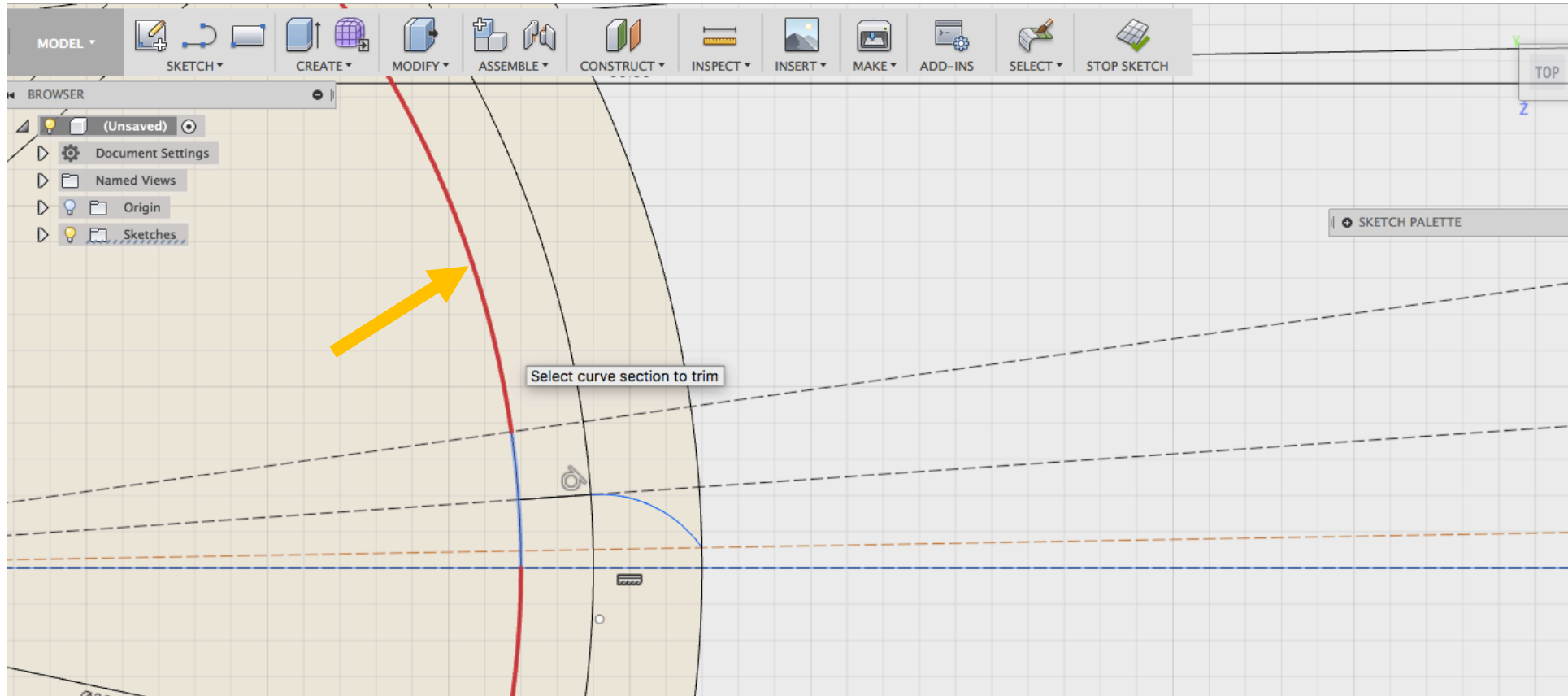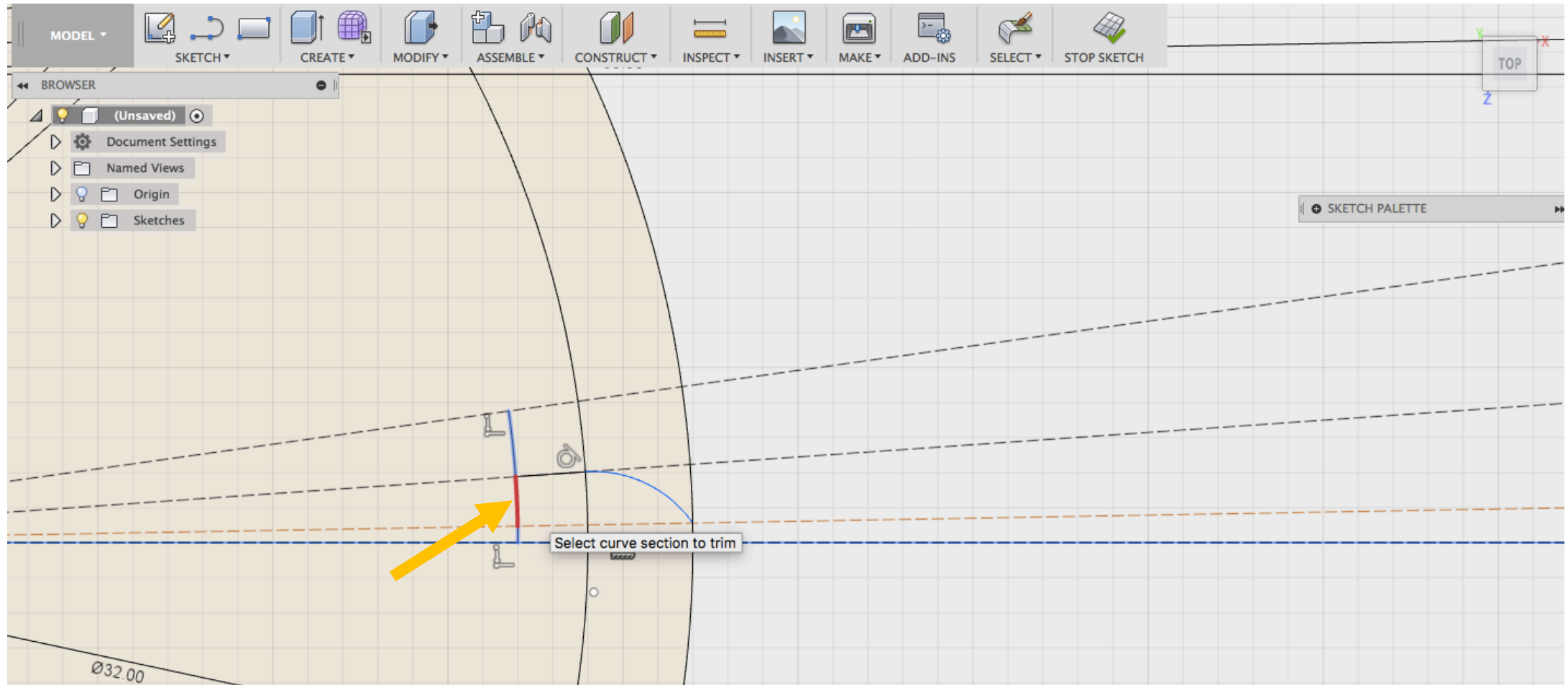

Note: The tangent symbol

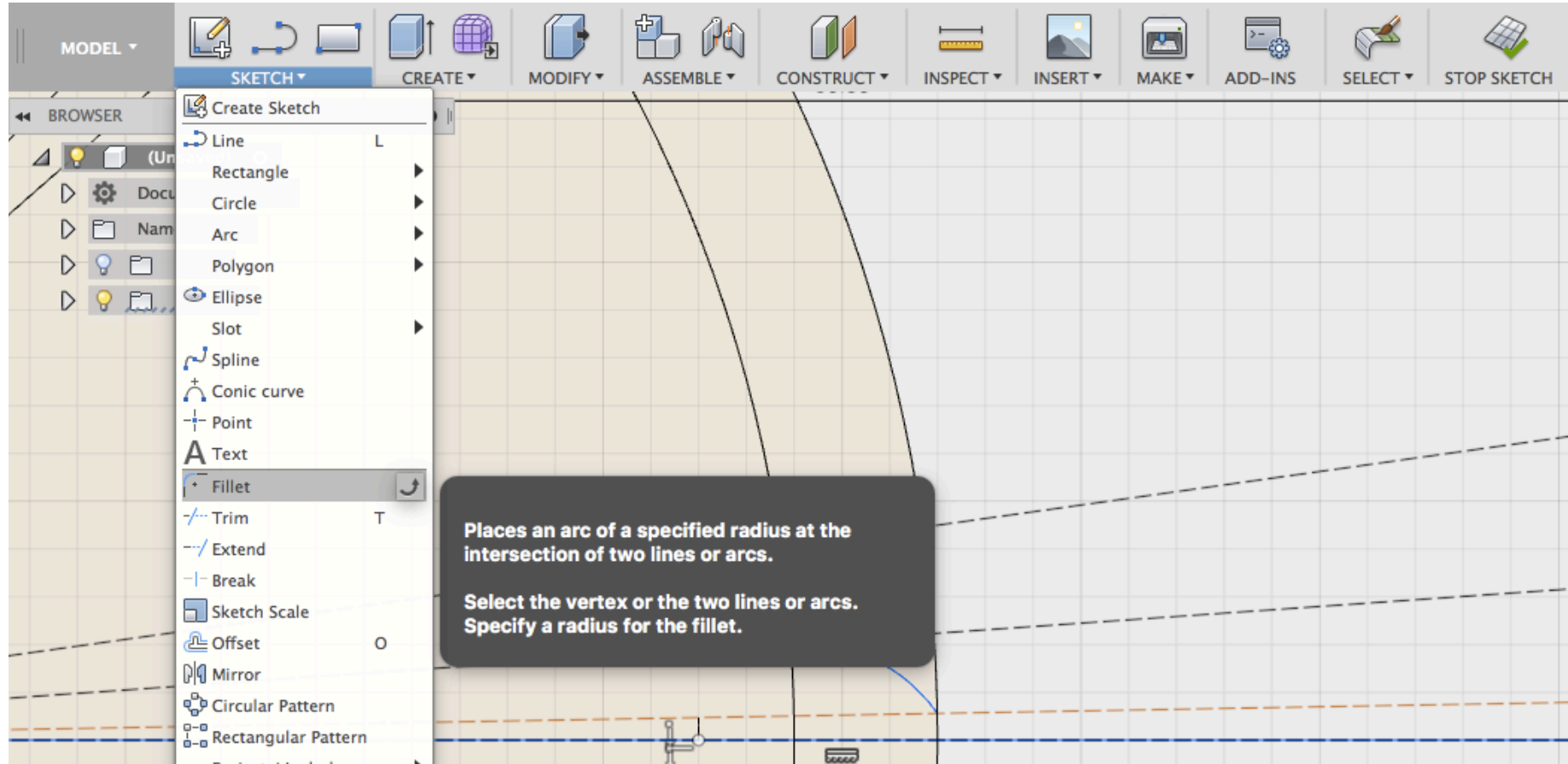# Step 13: Draw a line from the start to the end point shown below.

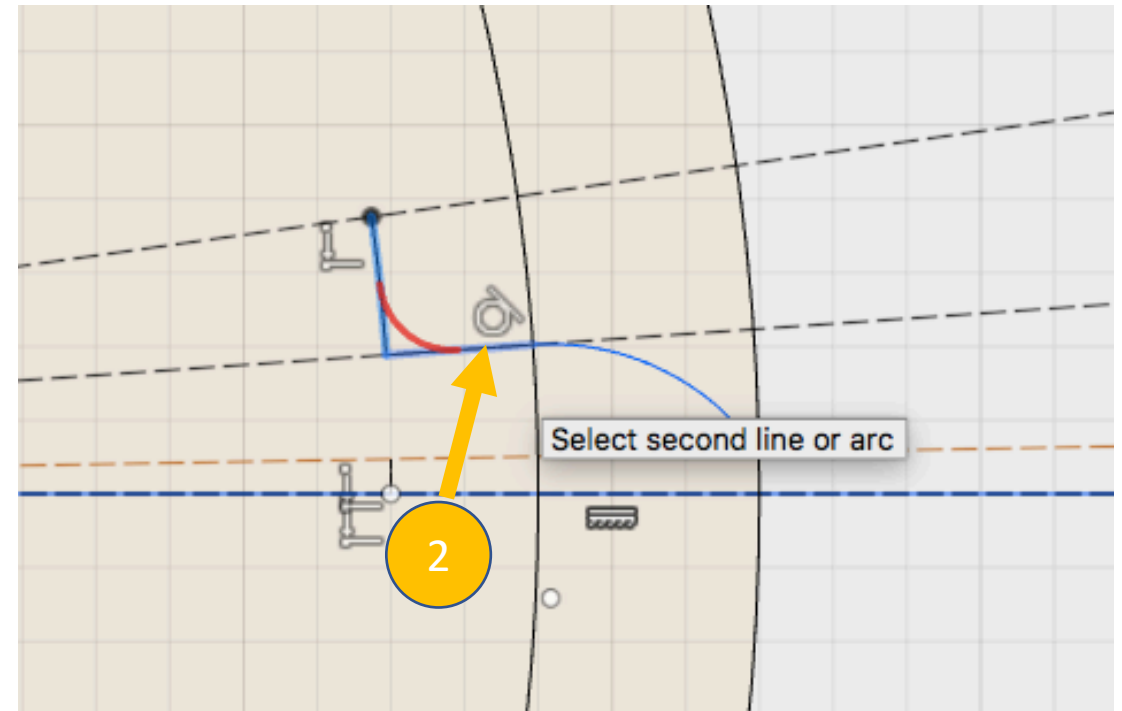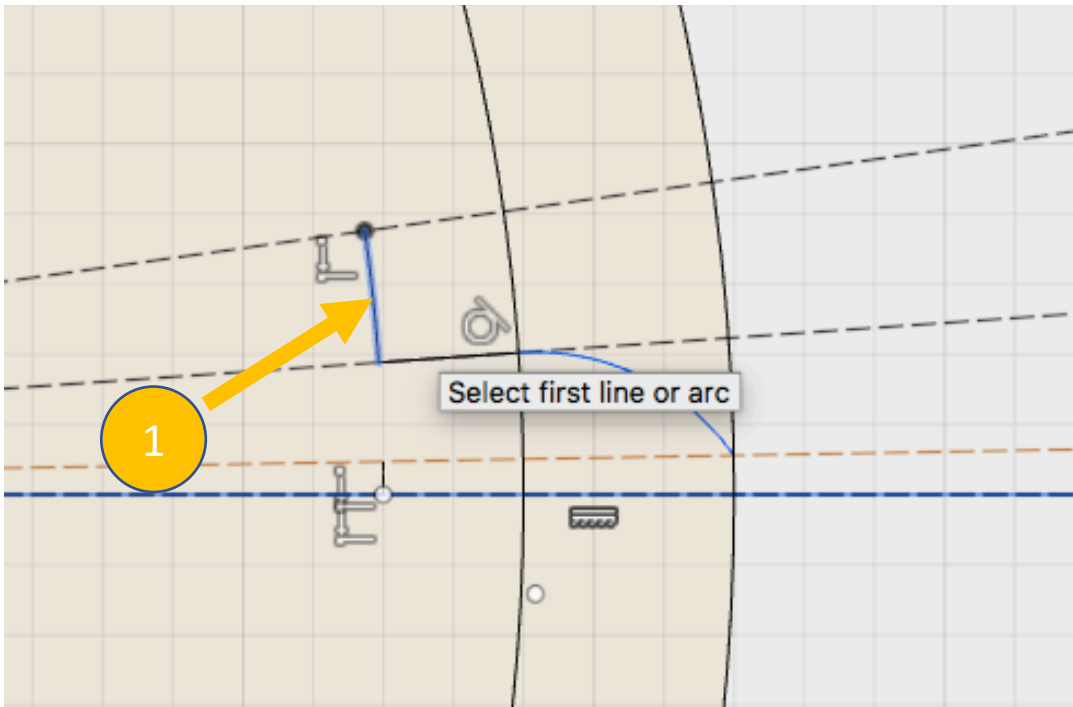# Step 14: Next, trim the below highlighted line shown below.

Step 15: Then trim the other highlighted line.
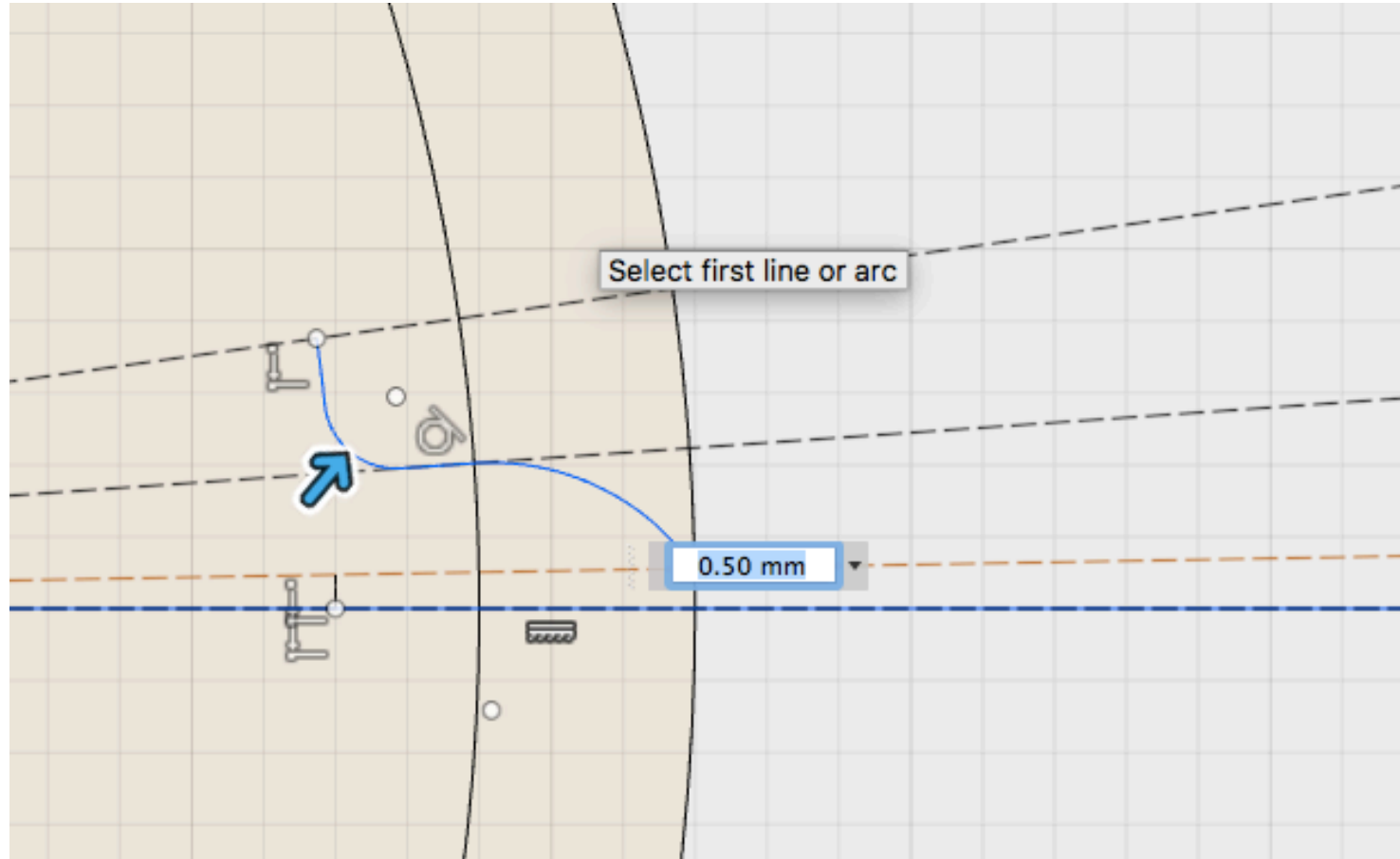
Step 16: Go to "Sketch" > "Fillet".

Step 17: Select the first line then followed by the second line as shown below. Immediately, you will see a new curve line appears between the 2 lines.
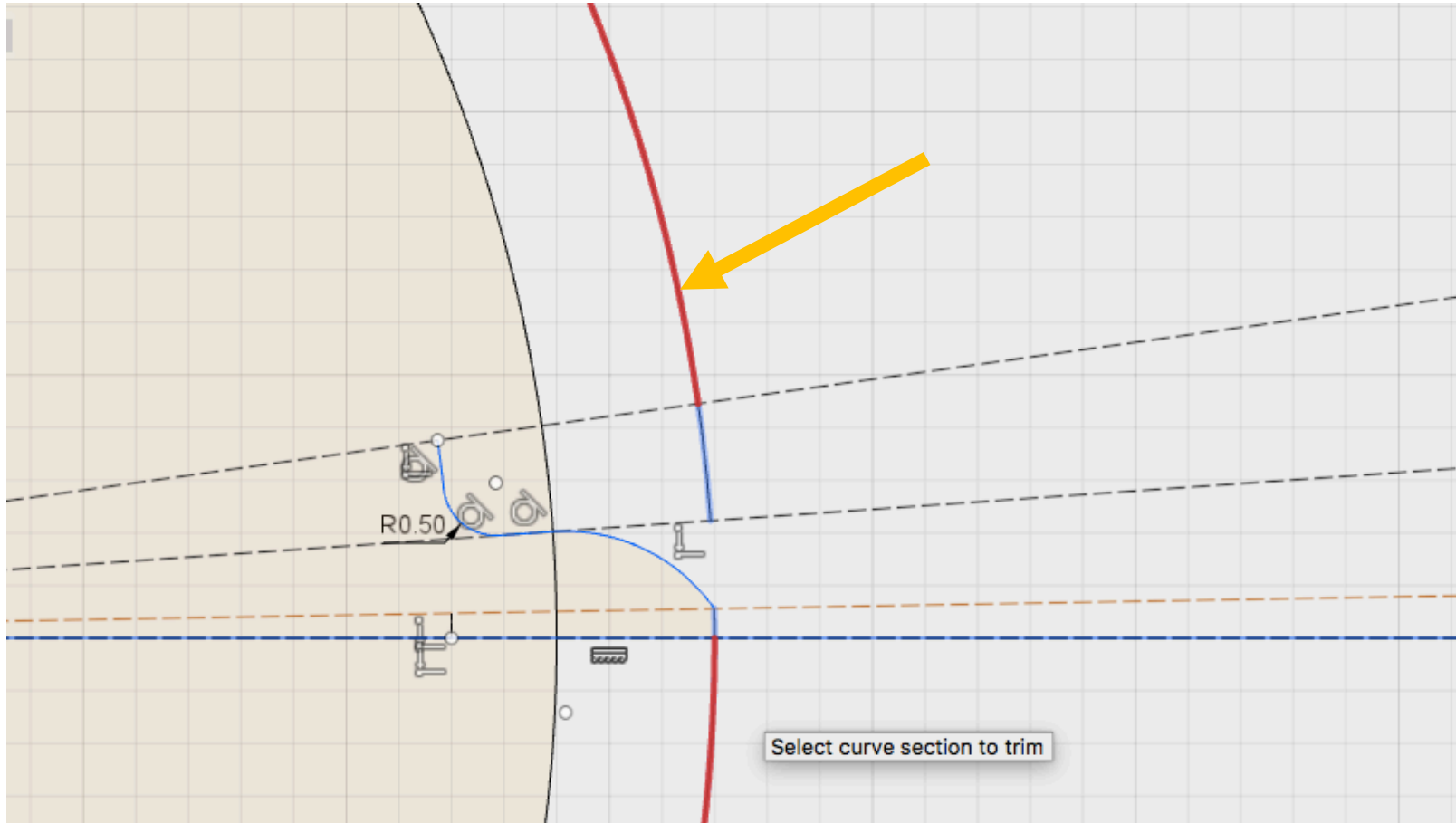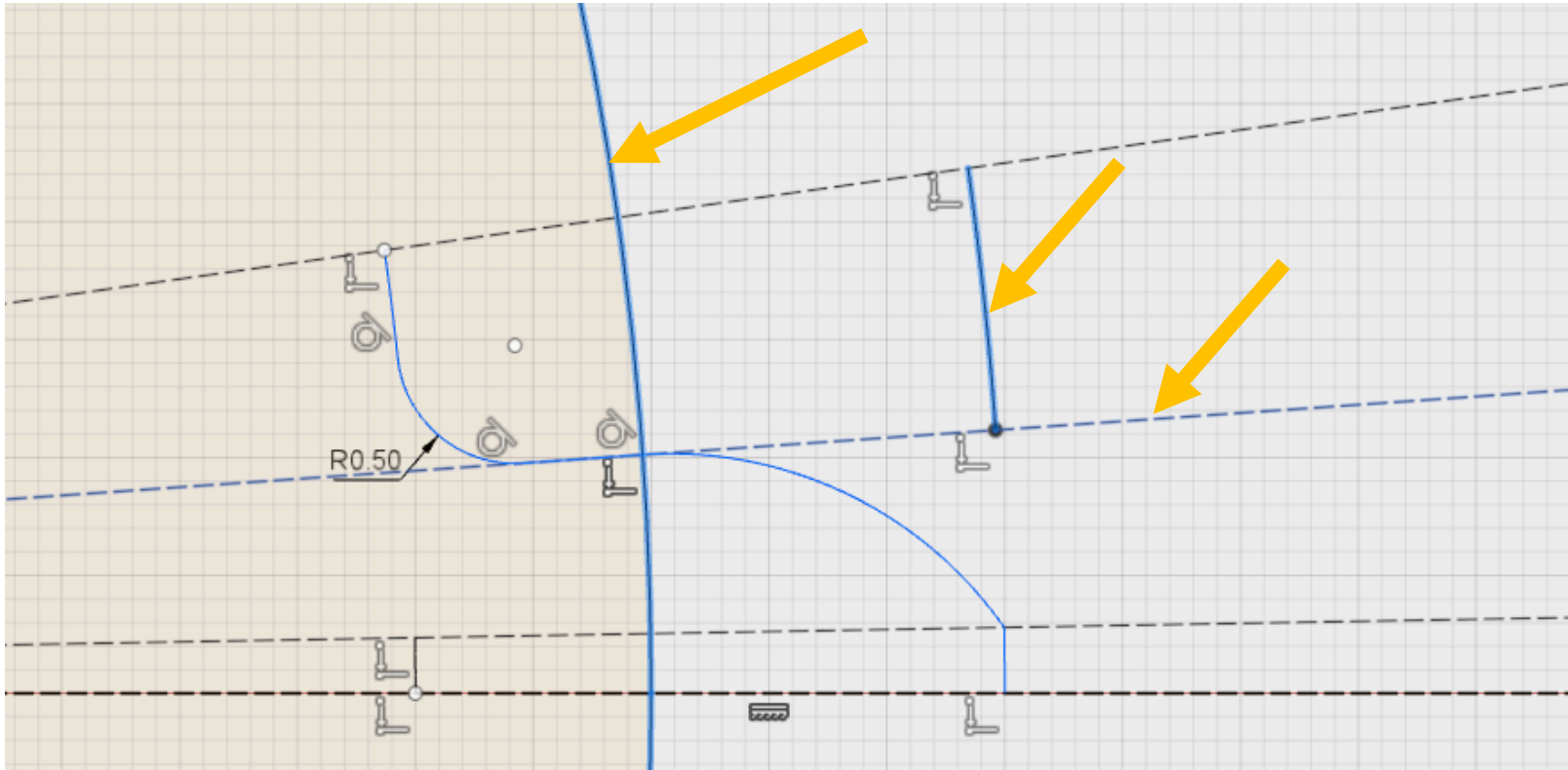
Step 18: Key in "0.5" then hit "Enter".

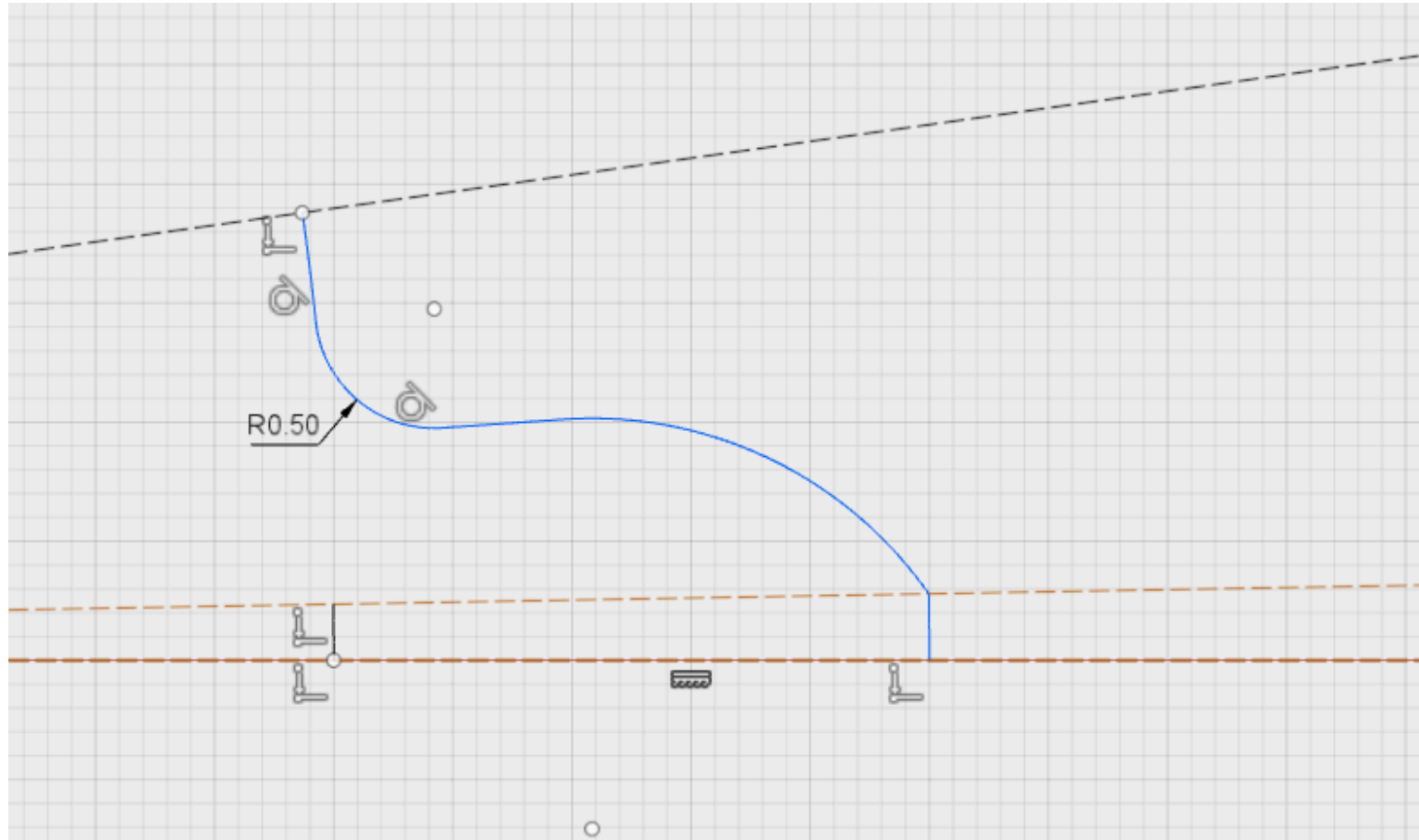# Step 19: Next, trim this highlighted line.

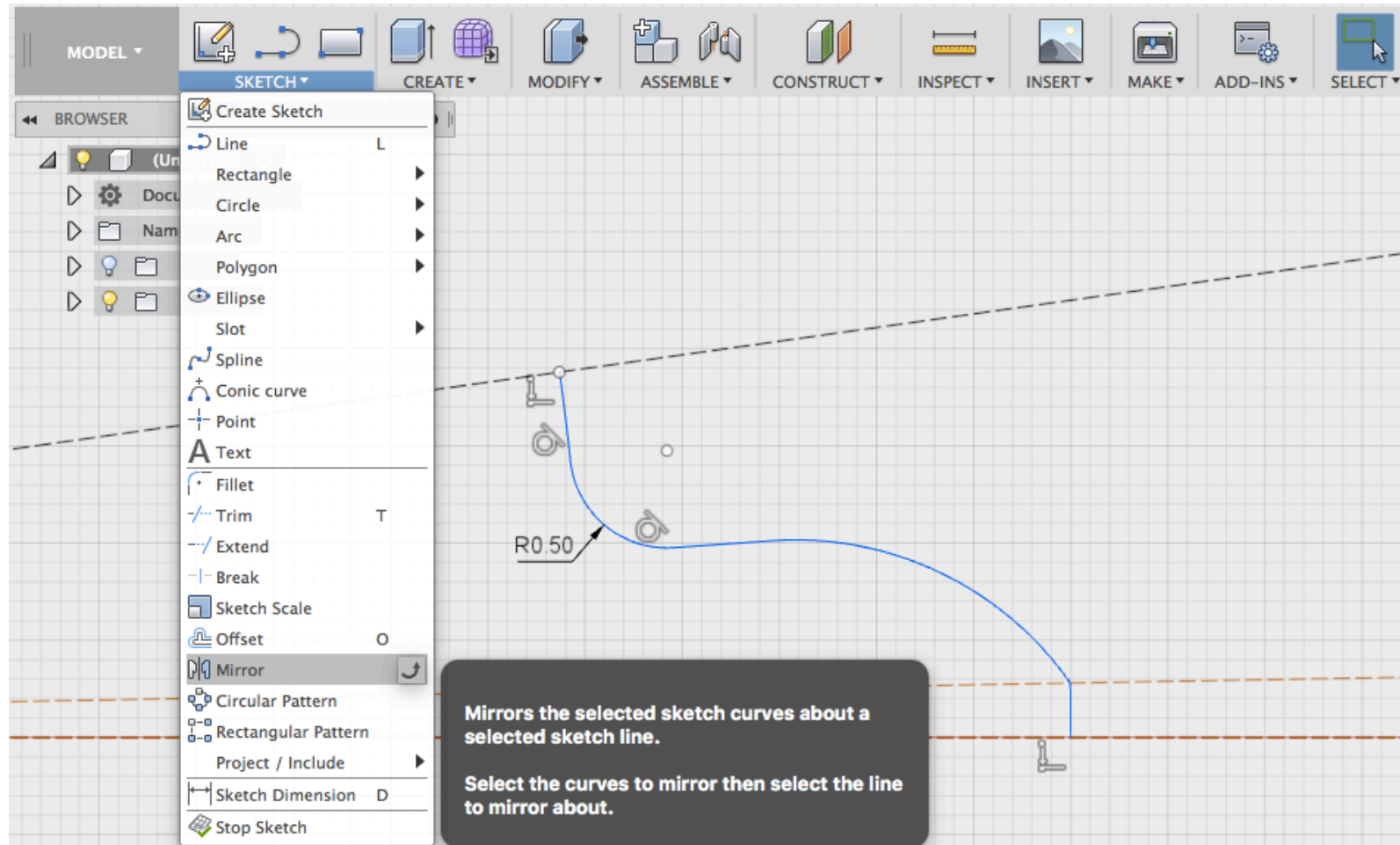# Step 20: And trim the line shown pointed out below as well.
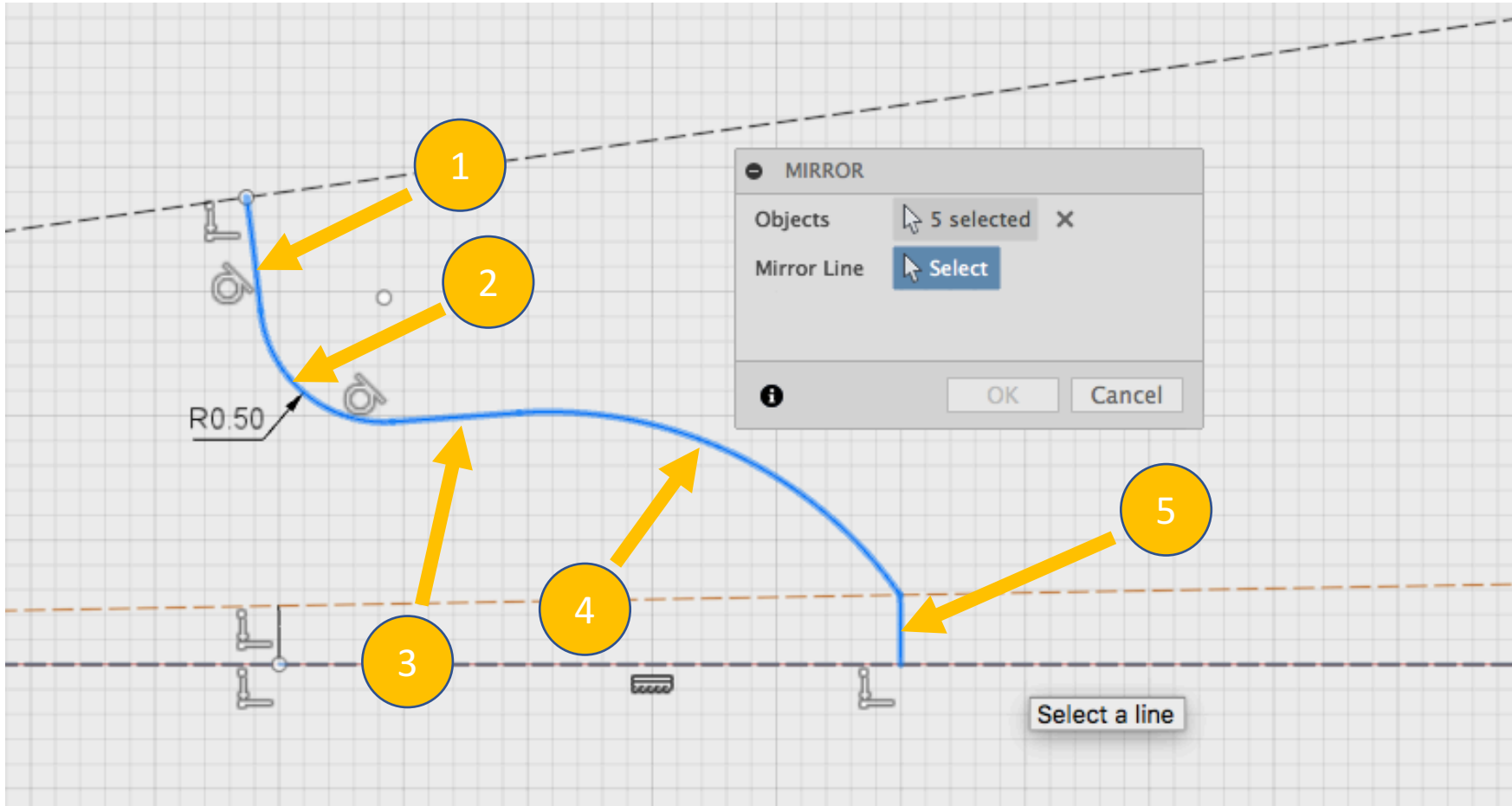
Step 21: Next, delete these 3 lines.

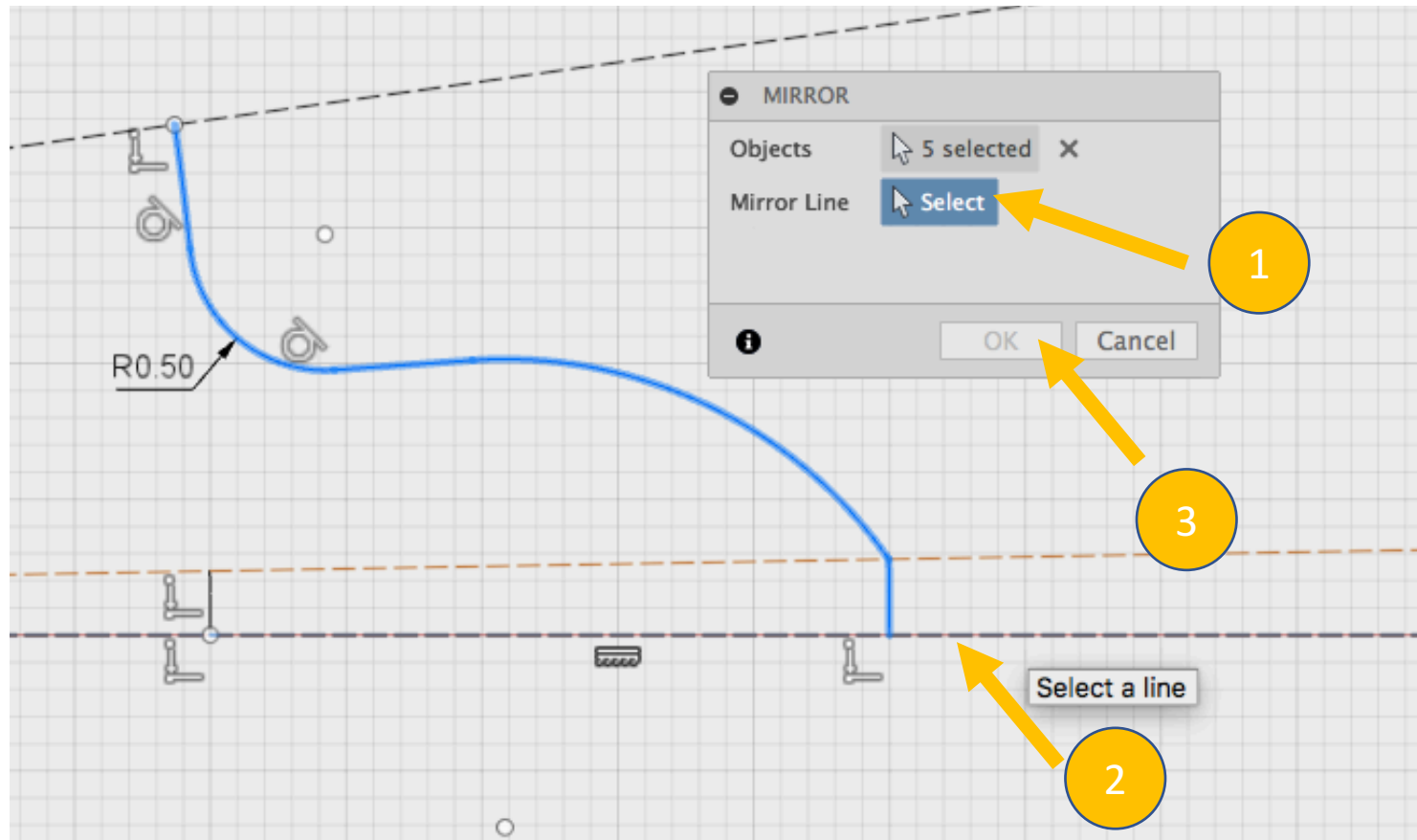# Finally, this is what you will get.

Step 22: Go to "Sketch" > "Mirror".

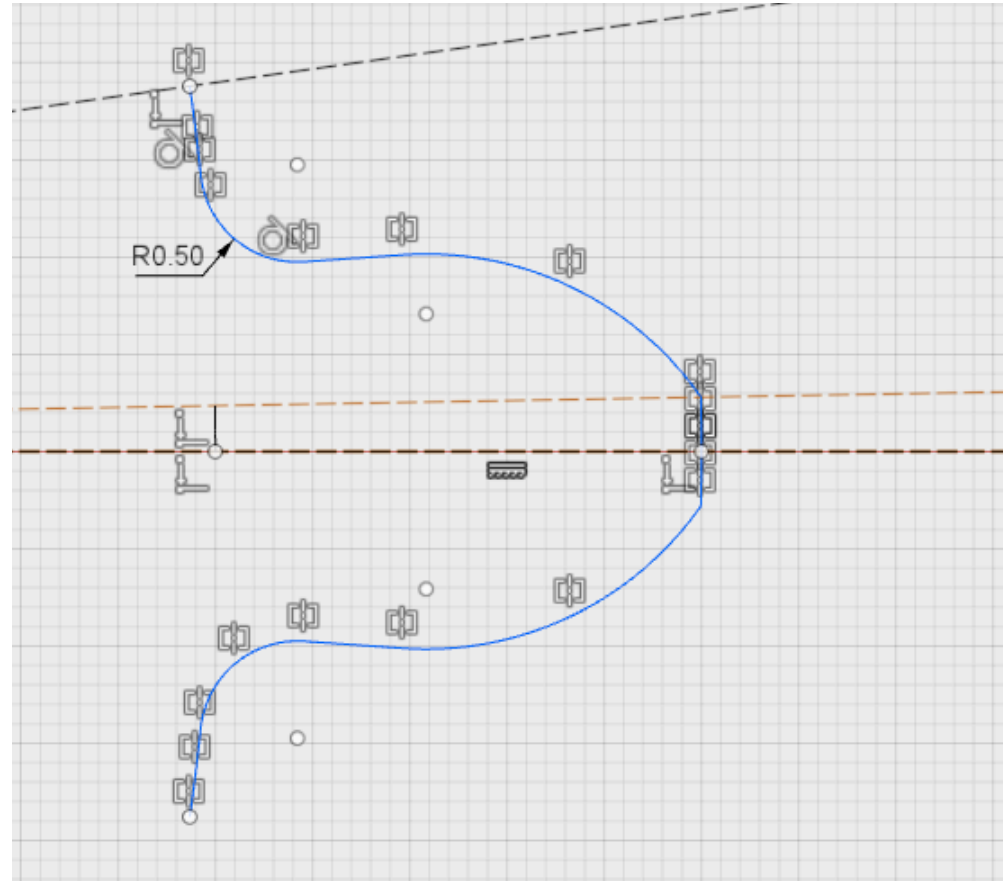# Step 23: Select all the 5 lines shown below.

Step 24: Next, click on the "Mirror Line" selection. Then select the bottom line as "Mirror Line". Then click "OK".
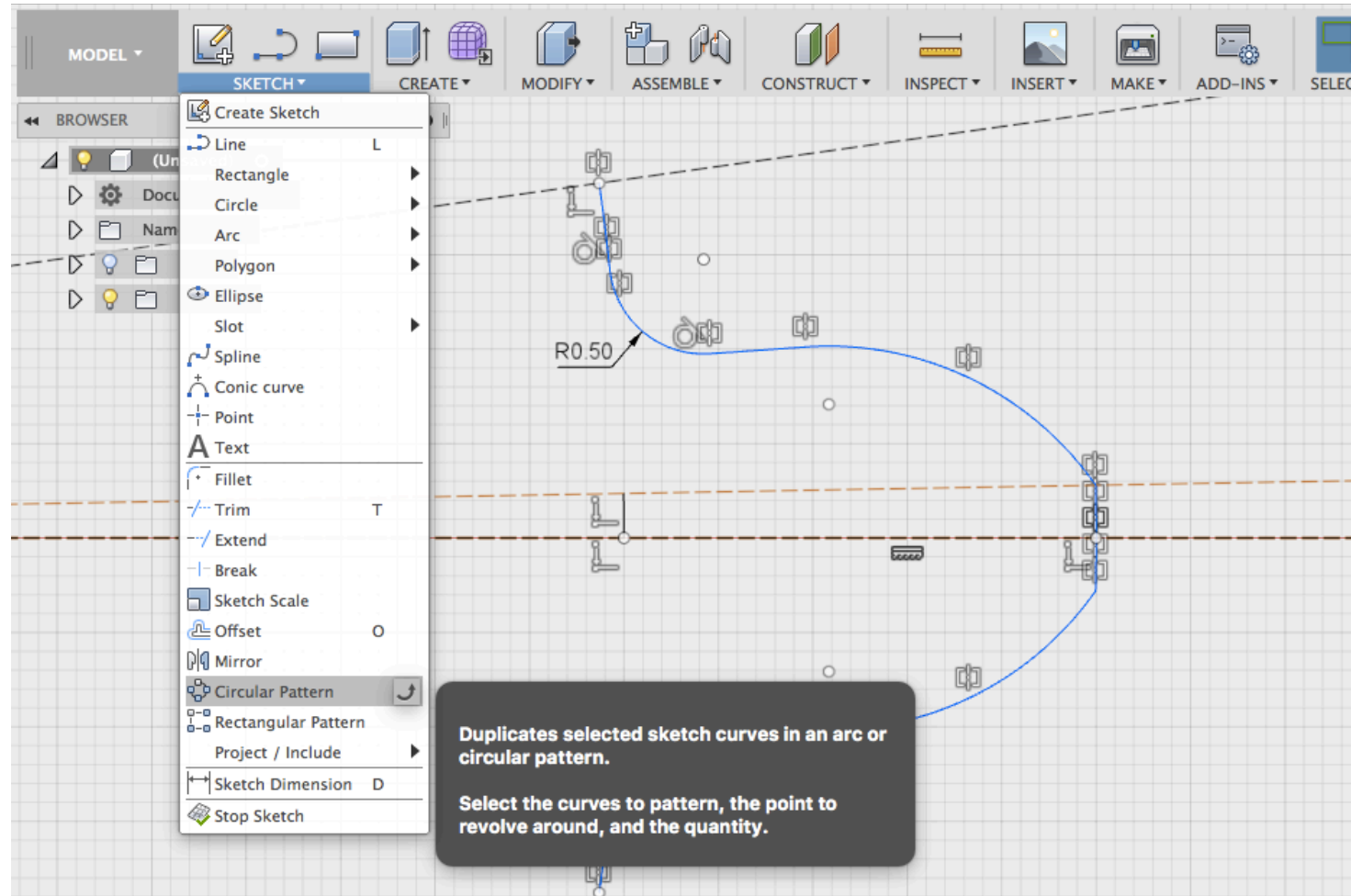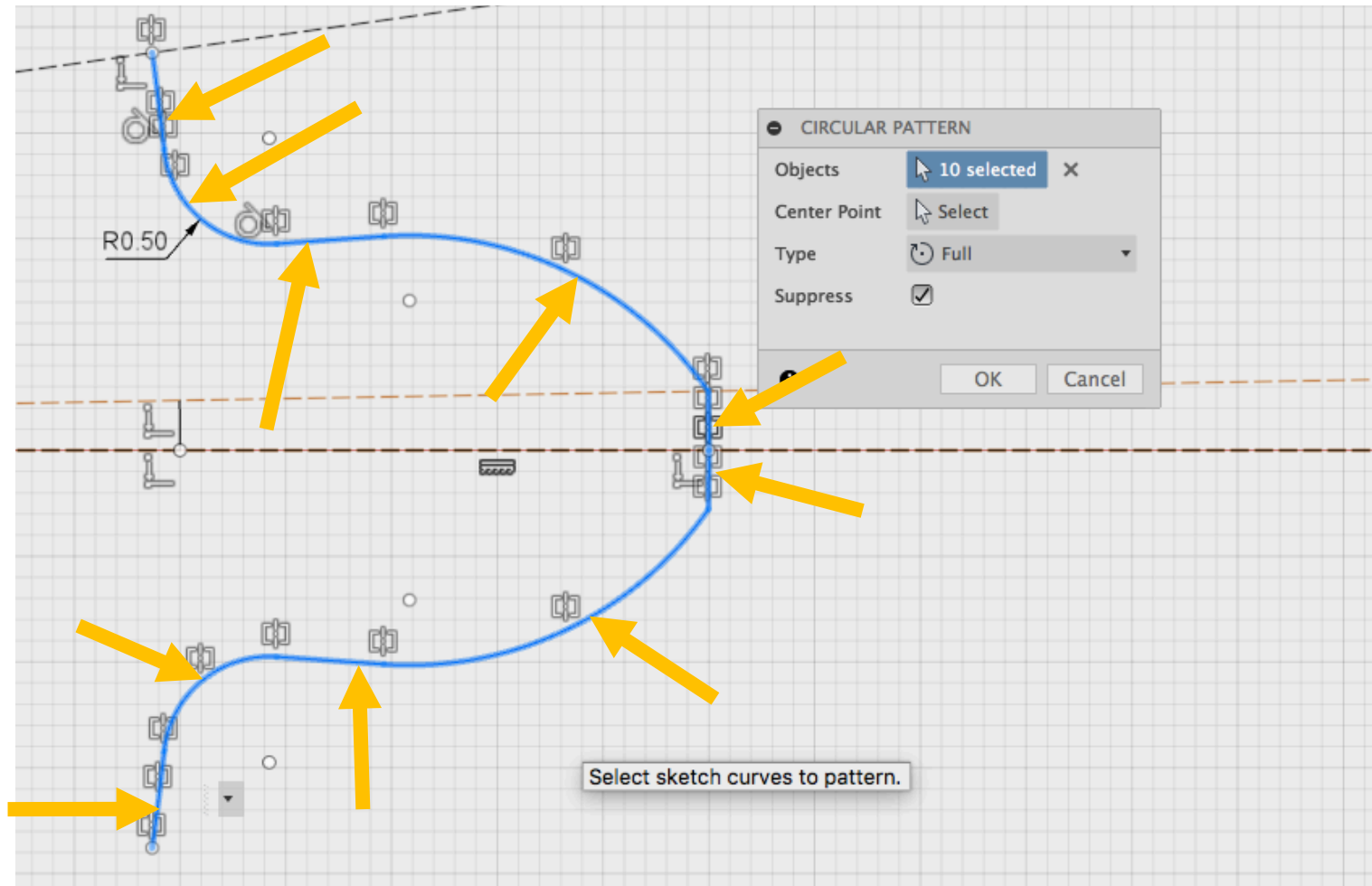
Check your result.

Note: You have successfully 'mirrored' the curve lines to the opposite side based on the middle line we picked.
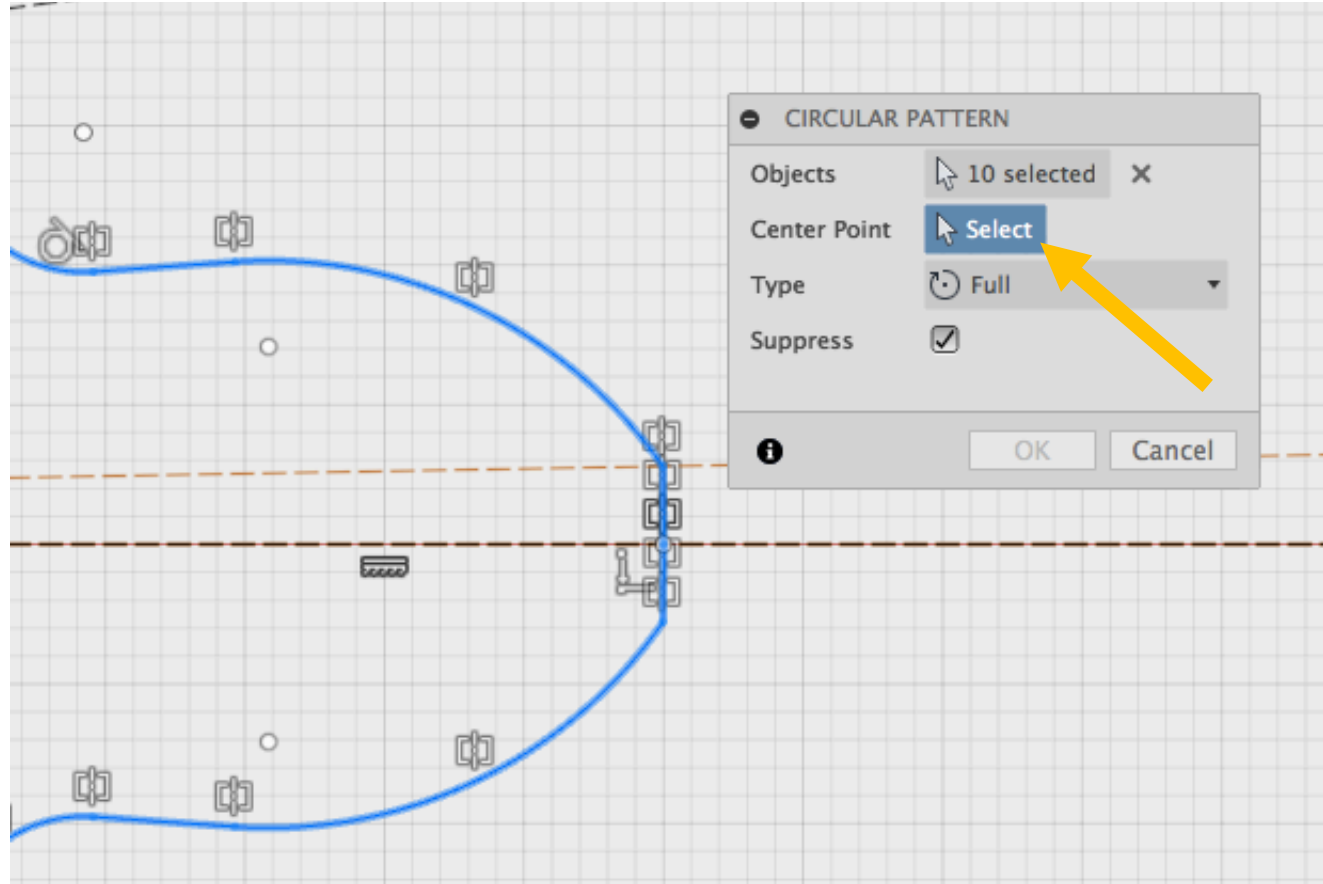
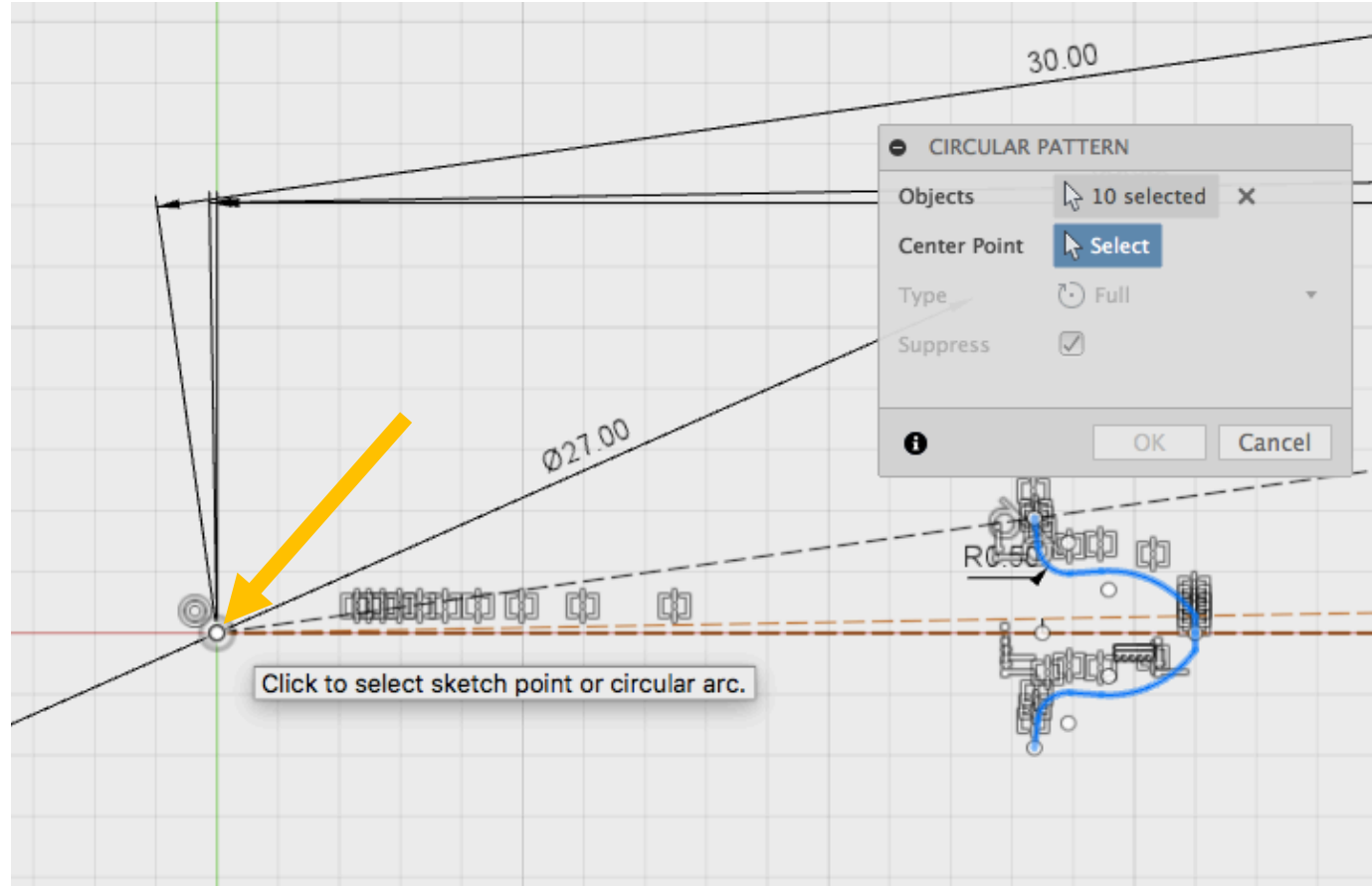# Step 25: Go to "Sketch" > "Circular Pattern".

Step 26: Select all the 10 curve lines.

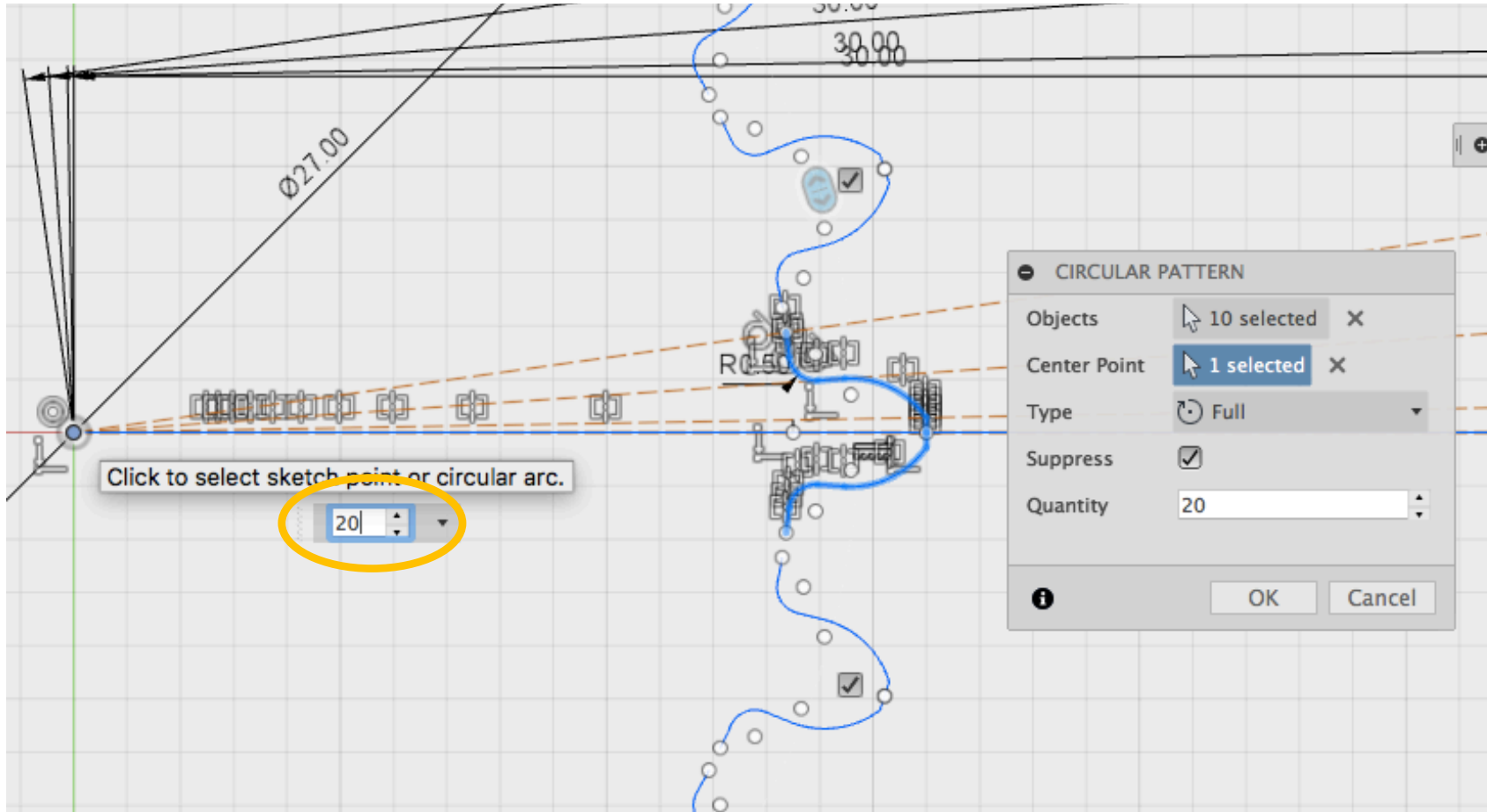# Step 27: Click on the "Center Point" selection box.

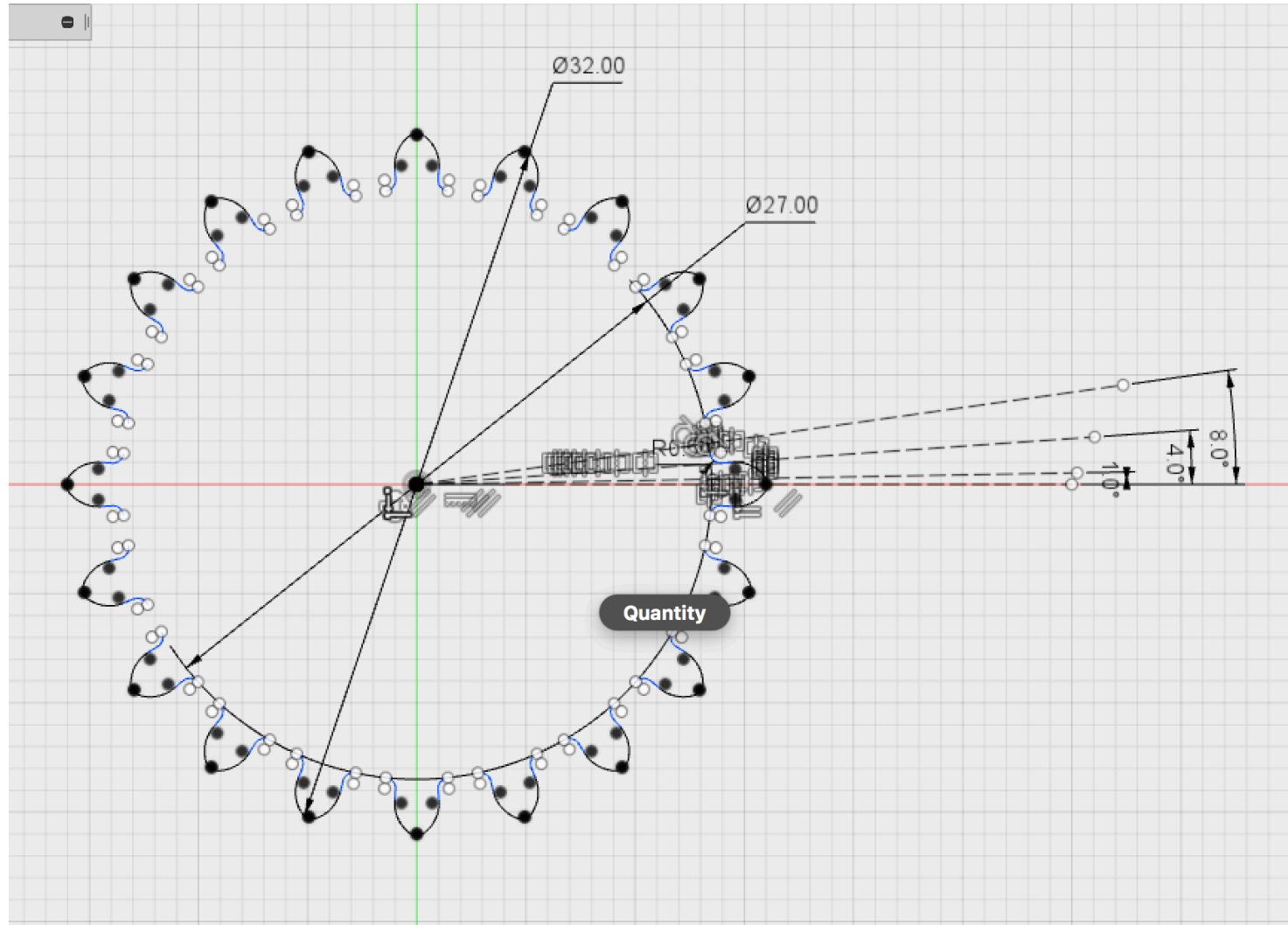# Step 28: Then click on the initial center point.

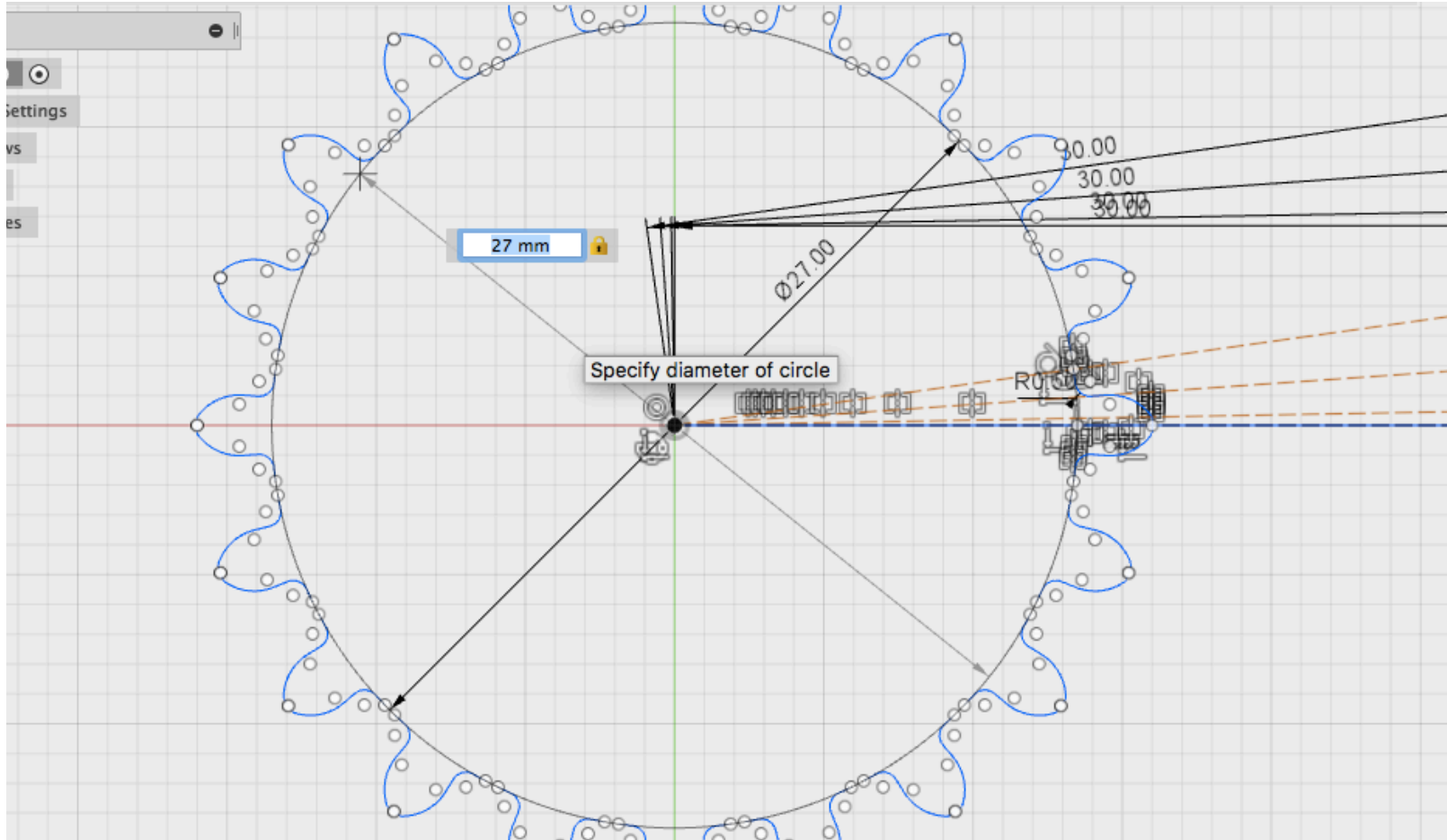Note: You can use the zoom tool to zoom out on your drawing to get the center point.

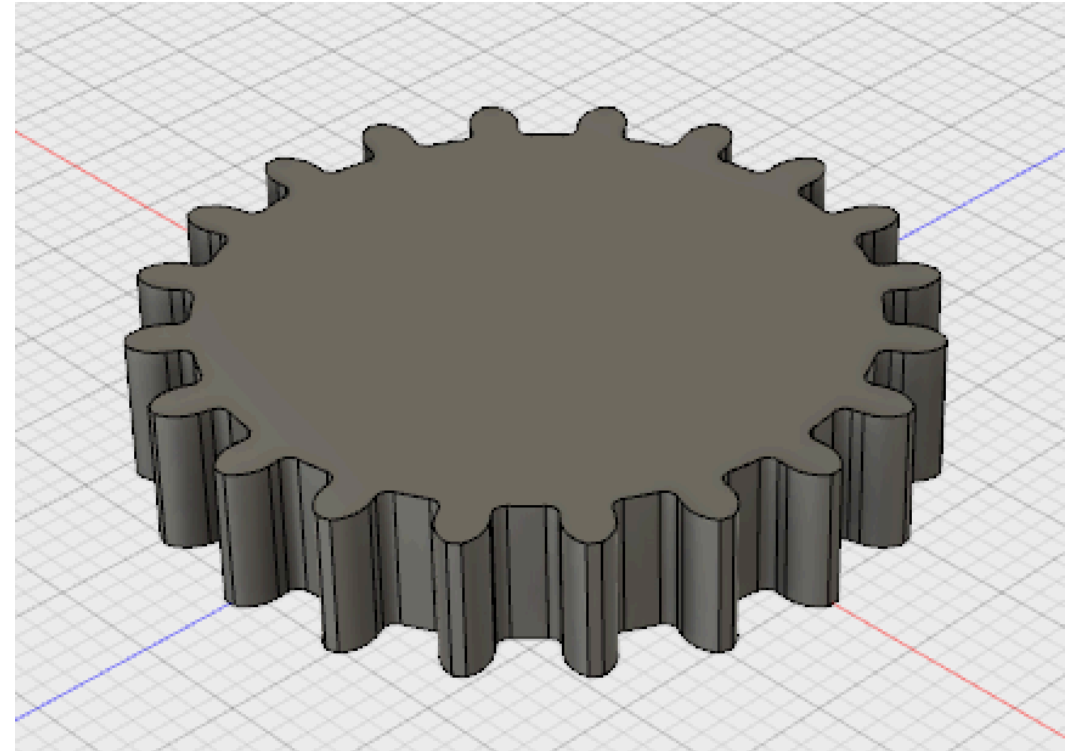# Step 29: Key in "20", then click "OK".
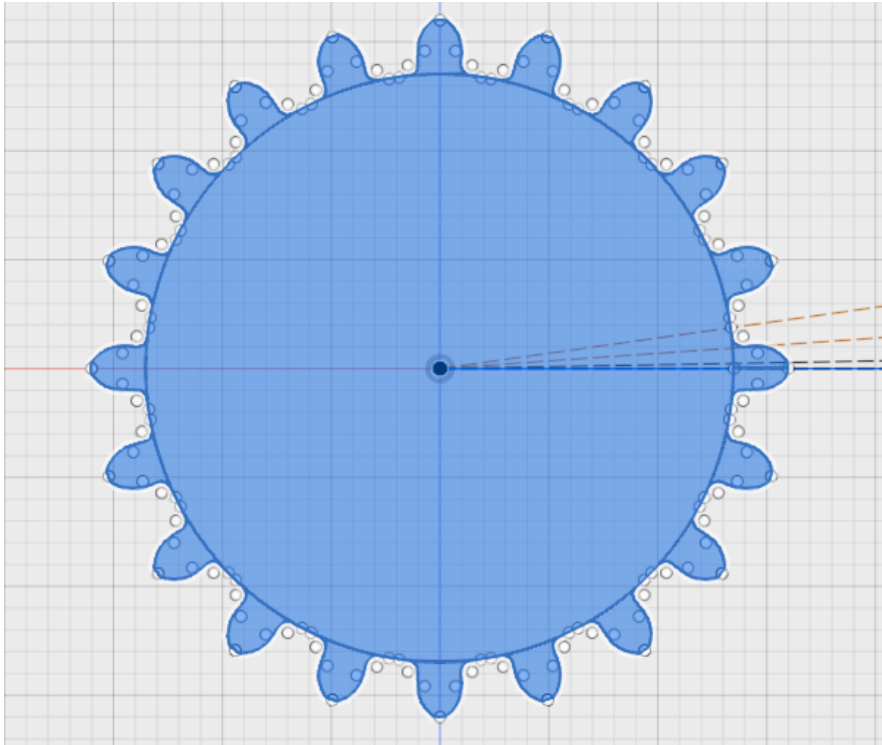
Check your result.

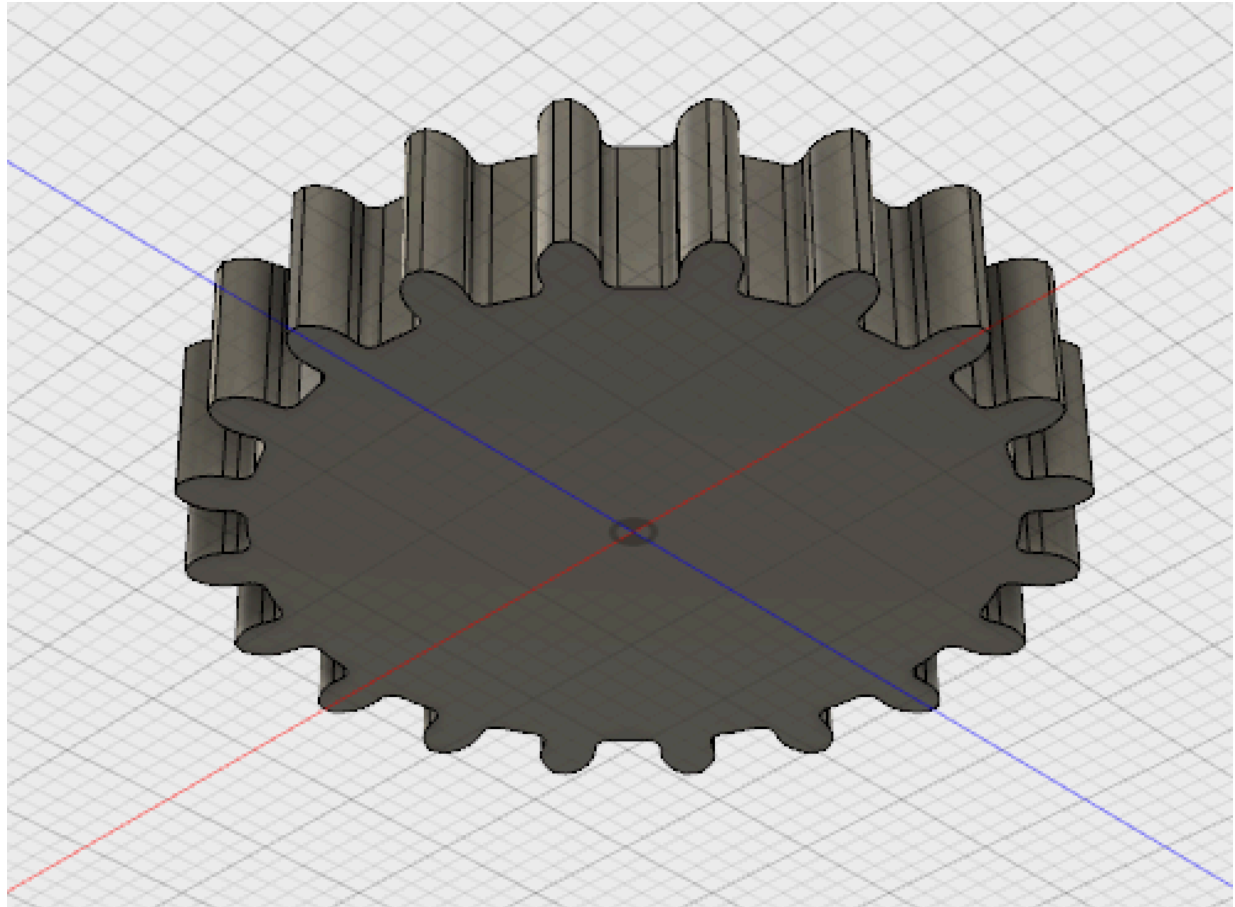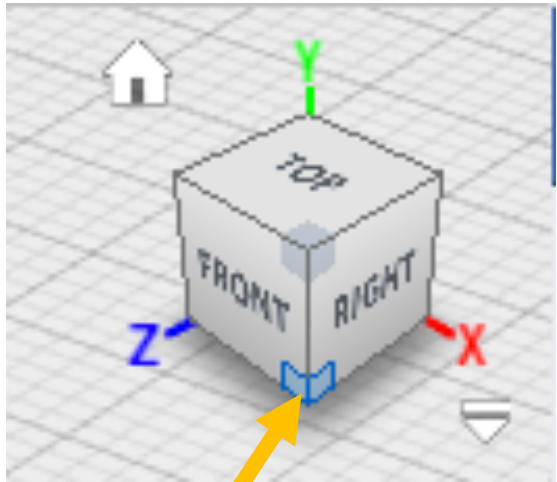# Step 30: Draw a circle with a 27mm diameter.

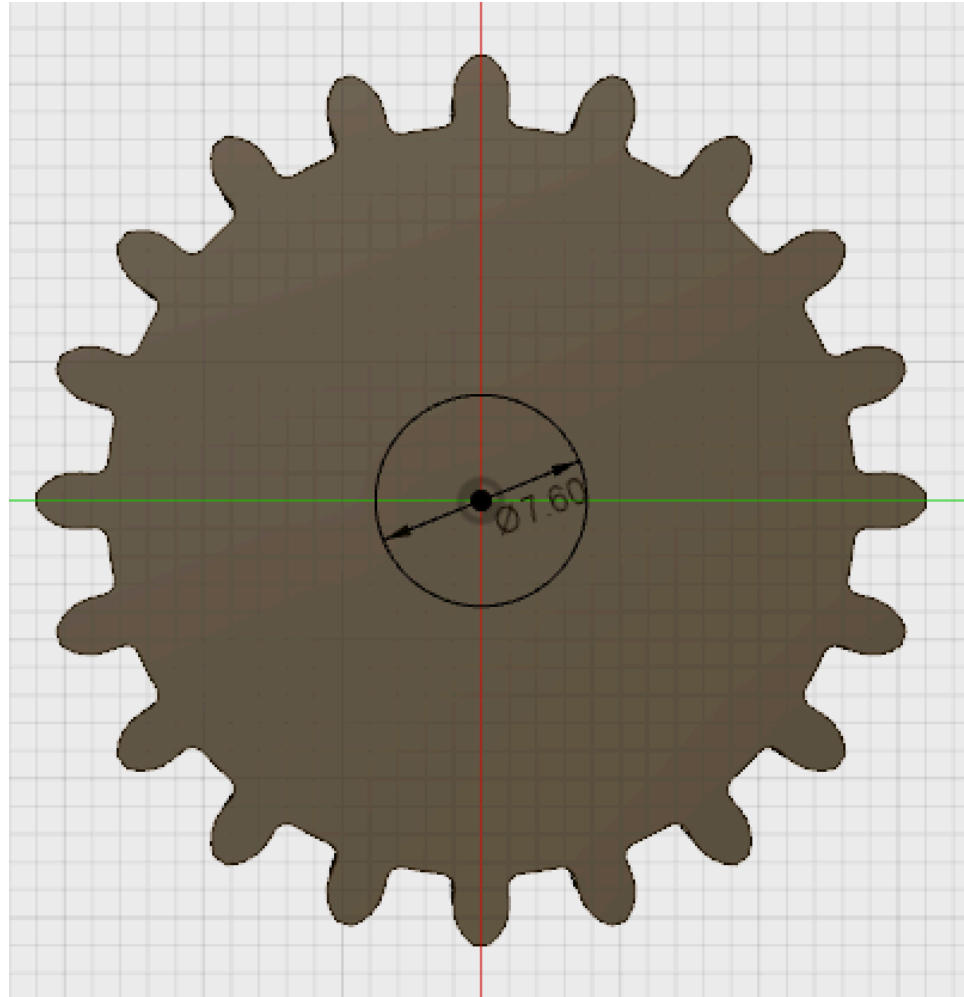# Step 31: Extrude the entire drawing by 6mm.

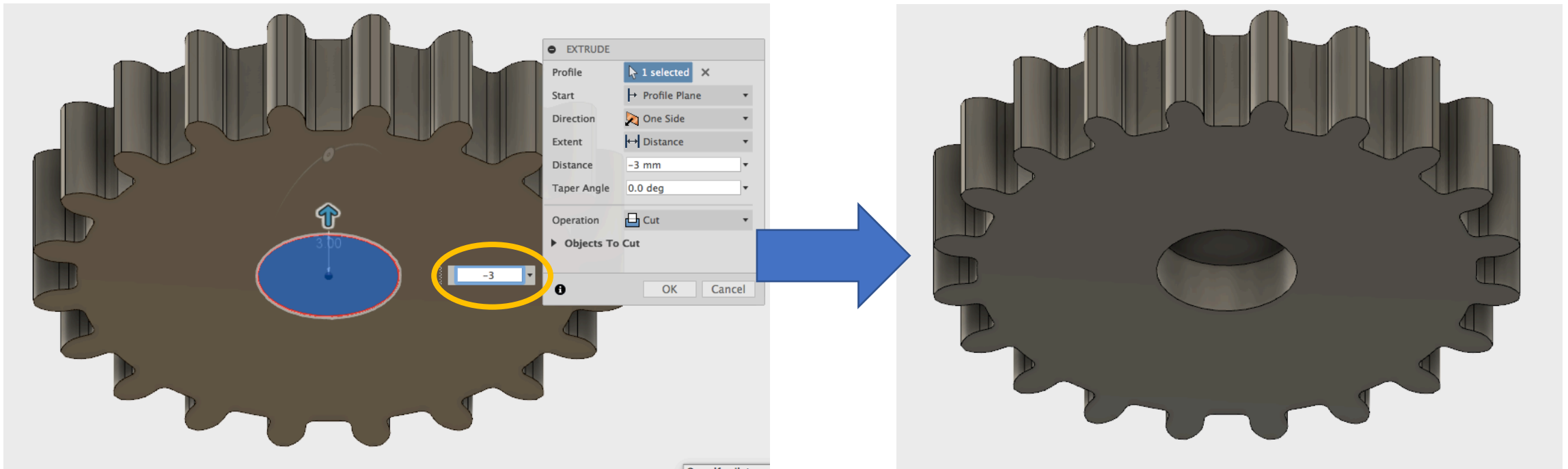Note: You will need to select every component while extruding (as highlighted above).

Step 32: Change to 'bottom view'.

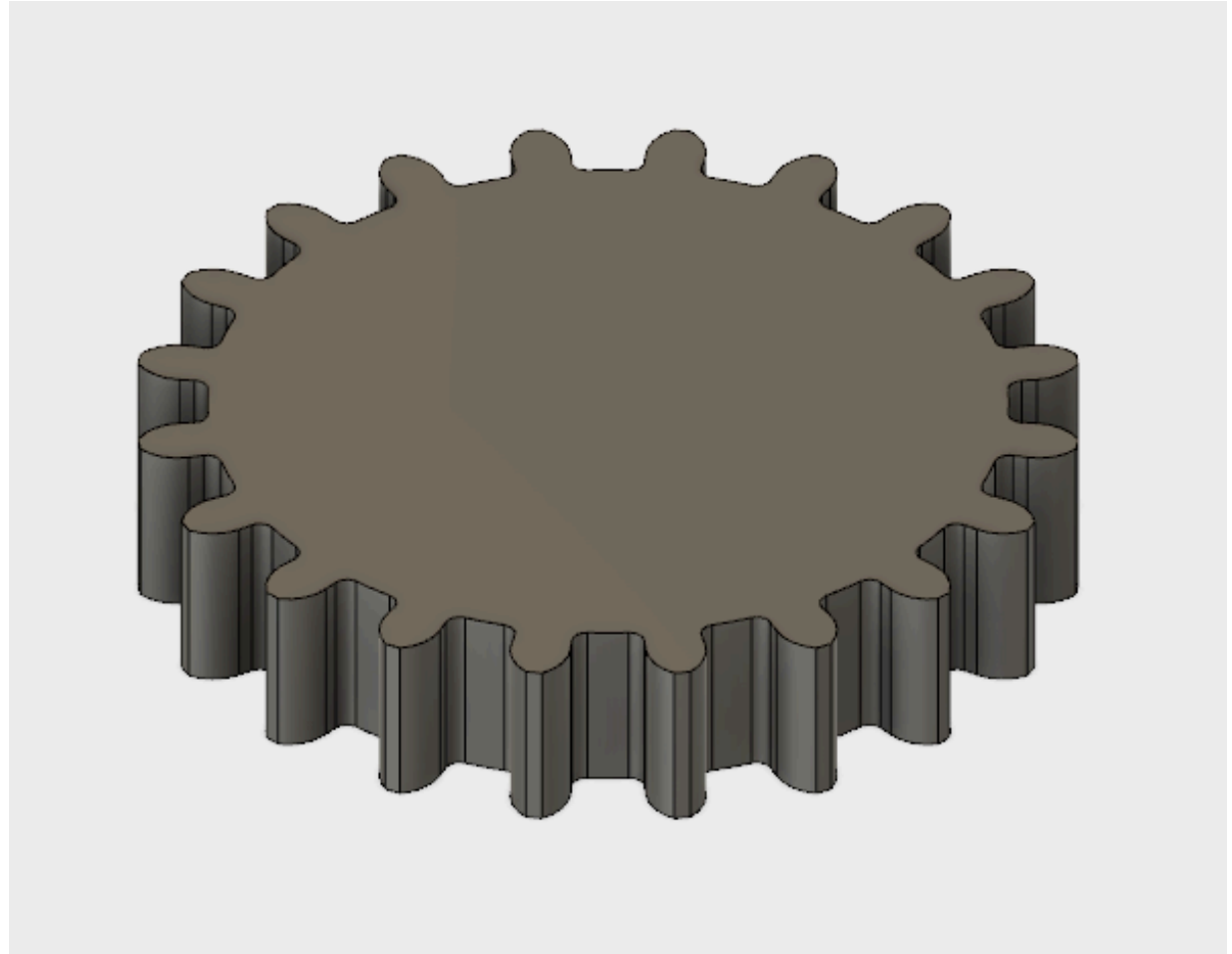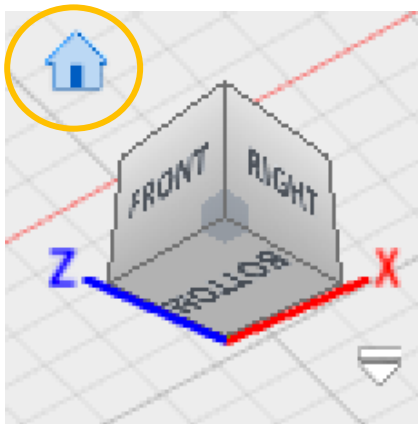# Step 33: Draw a 7.6mm diameter circle at the bottom surface.

Step 34: Use "Extrude", select the little circle shown then key in "-3mm".
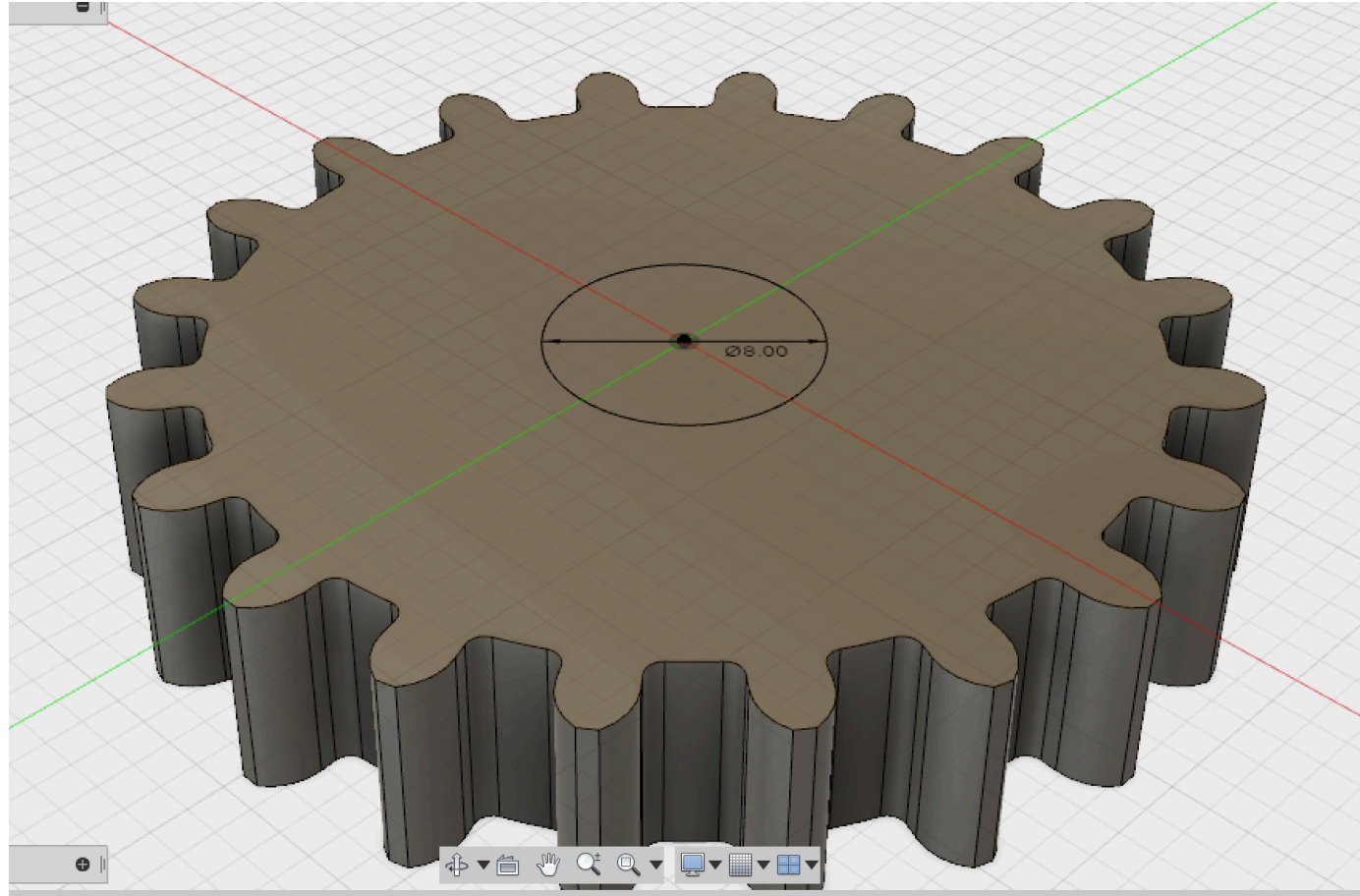

Note: This step will allow you to cut a 3mm deep hole in the middle of your gear.
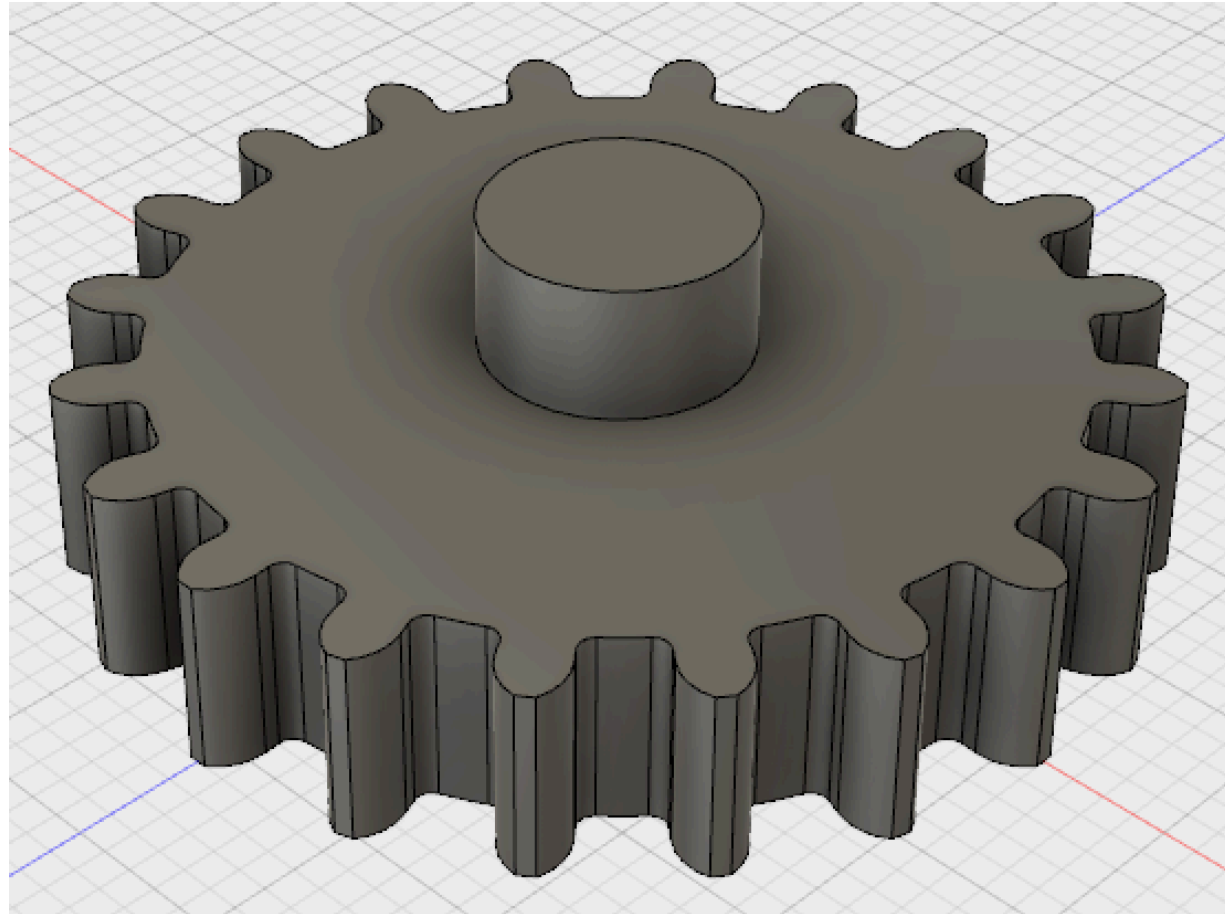
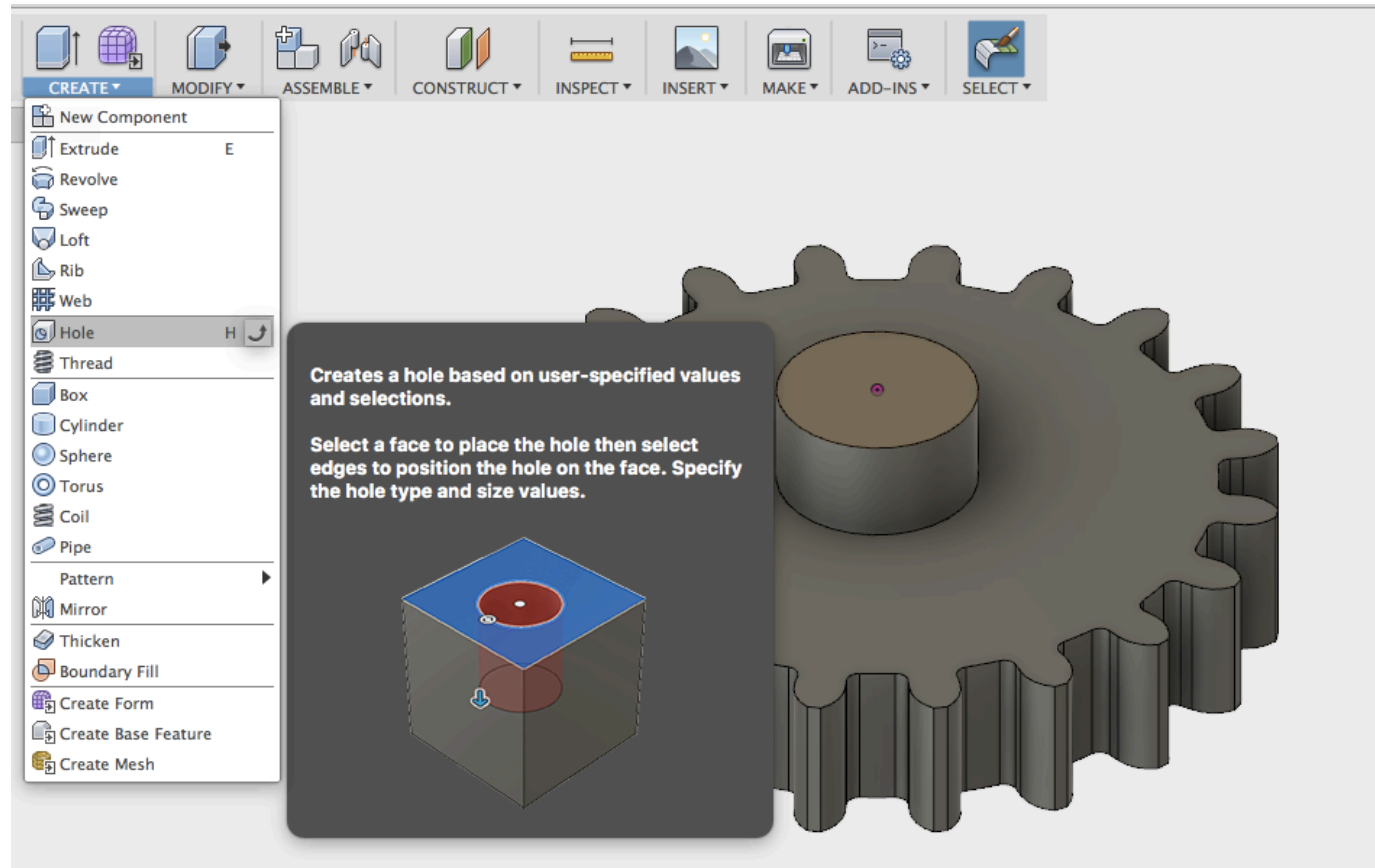# Step 35: Click "Home" to change to top view.

Step 36: Draw a 8mm diameter circle from the center of the top surface.
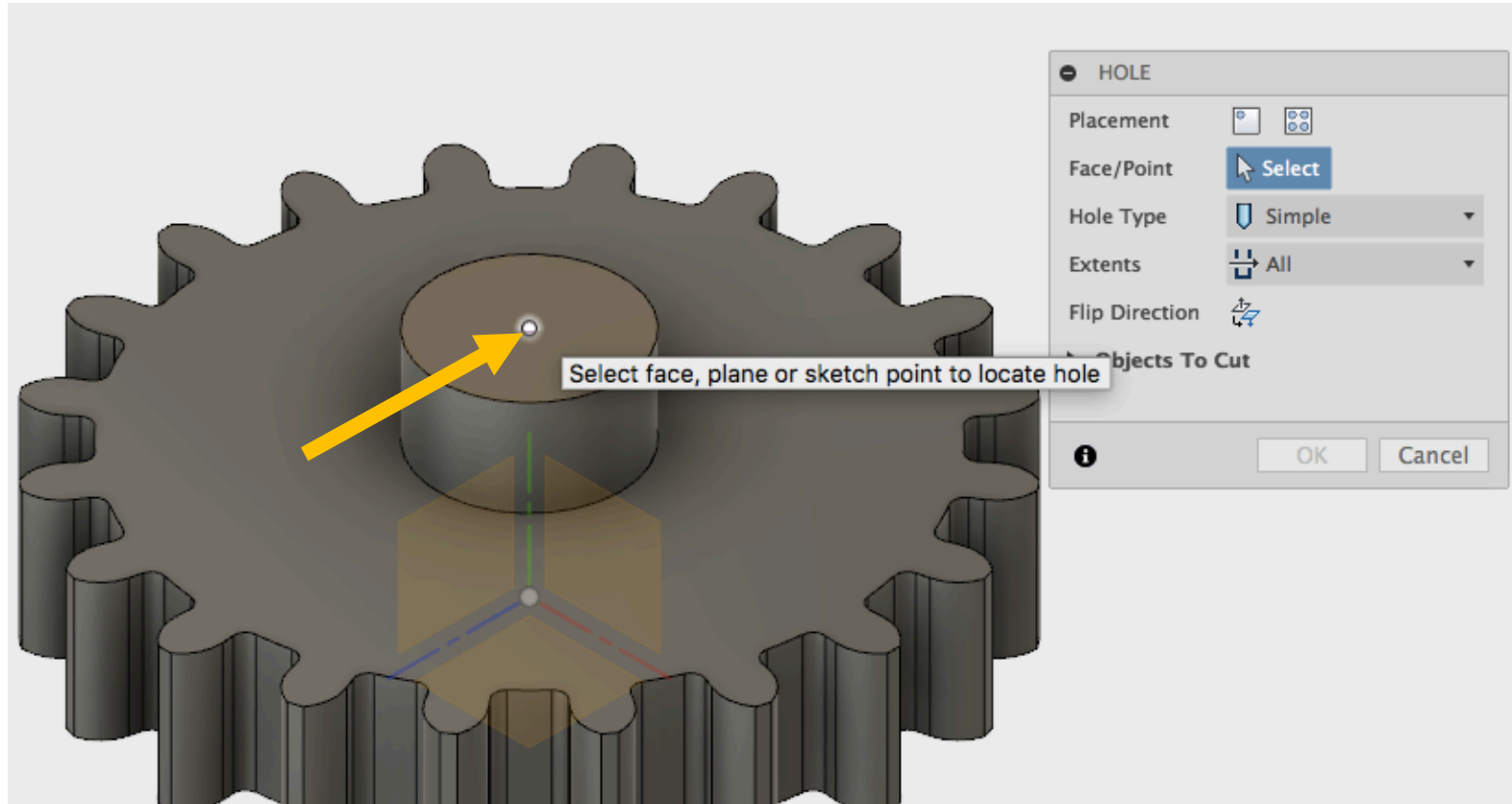
Step 37: Extrude that circle by 4.2mm.

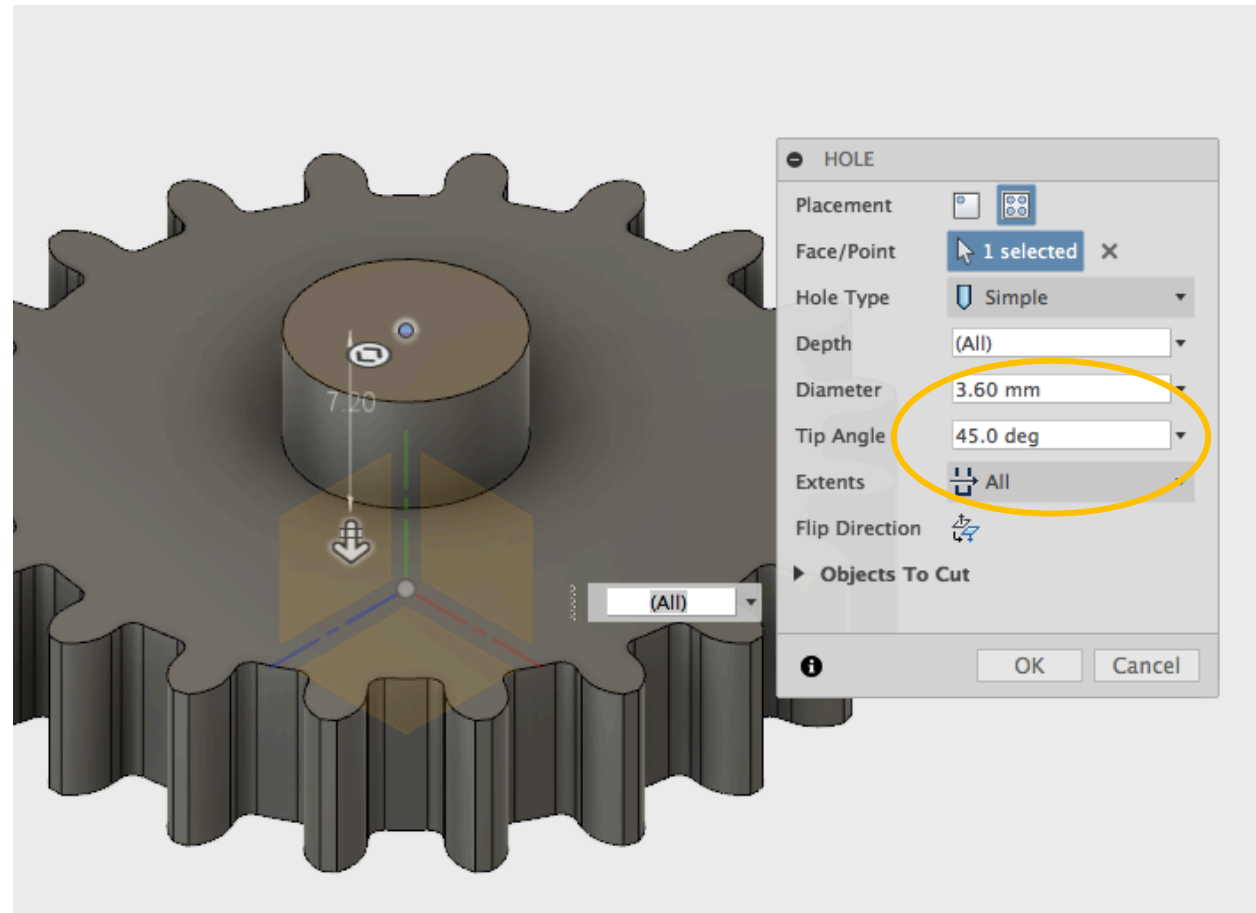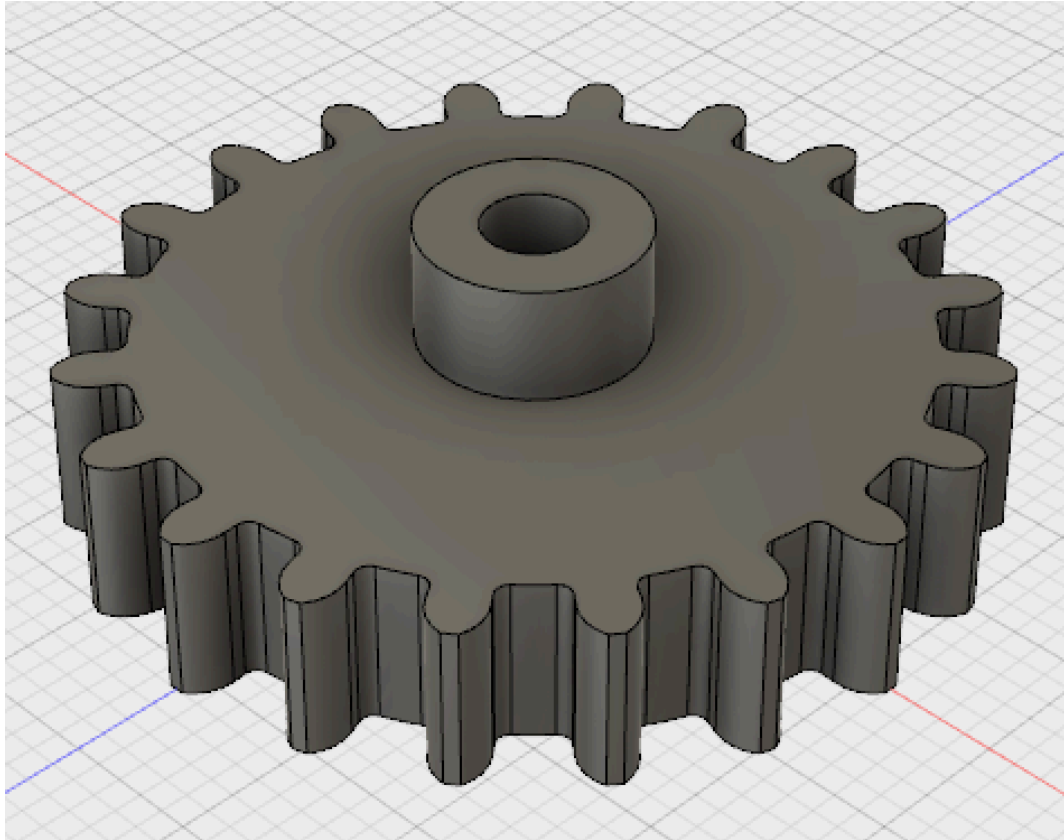# Step 38: Next, go to "Create" > "Hole".

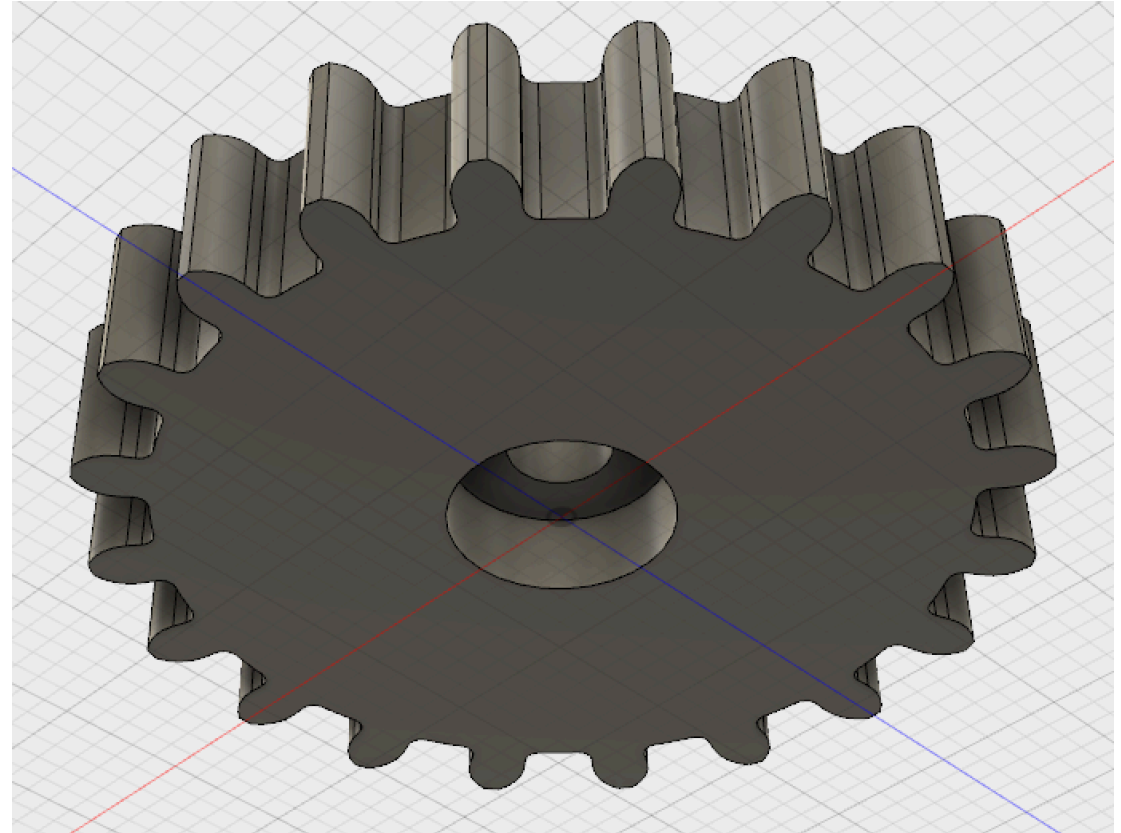# Step 39: Click on the center point of the cylinder.

Step 40: Key in "3.6" for diameter, "45" for the tip angle and select "All" for extents as show below.
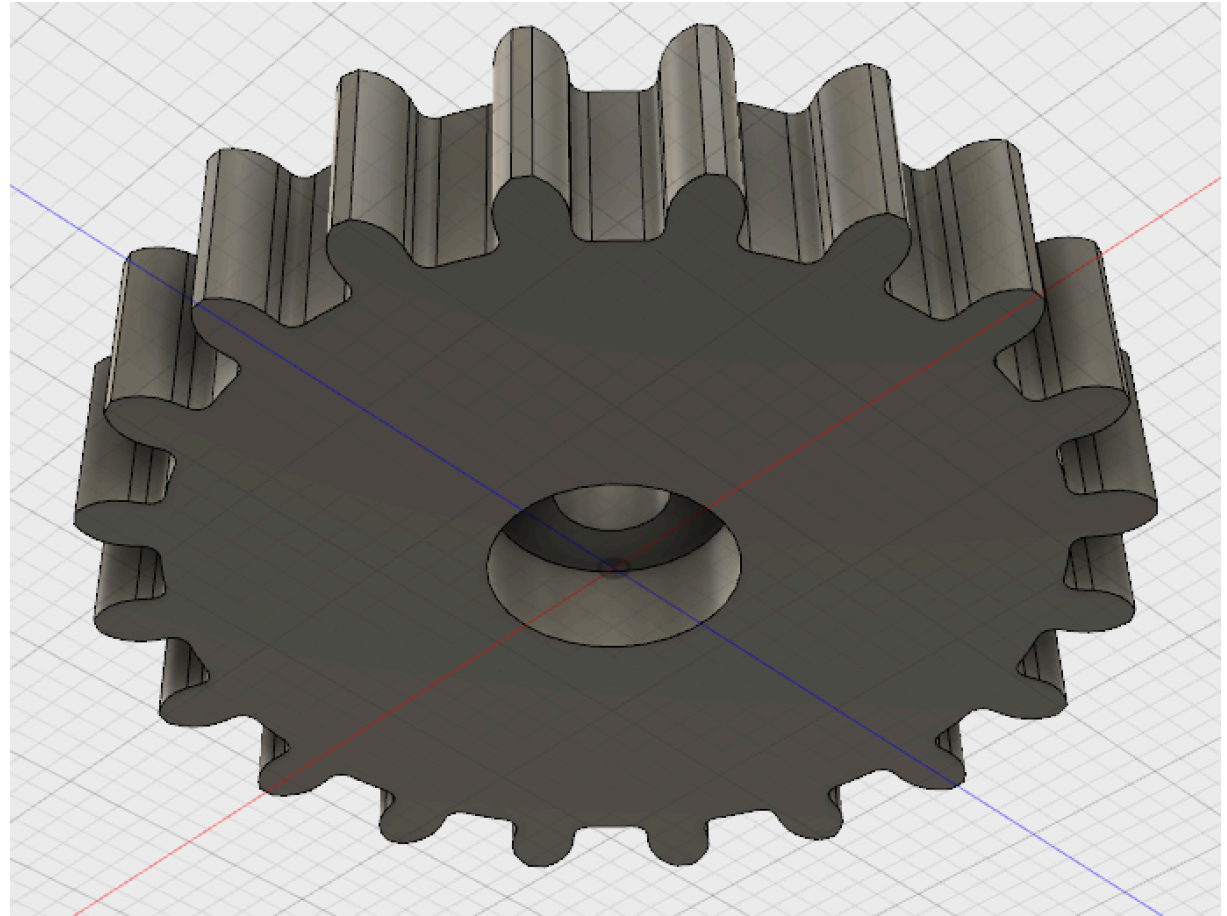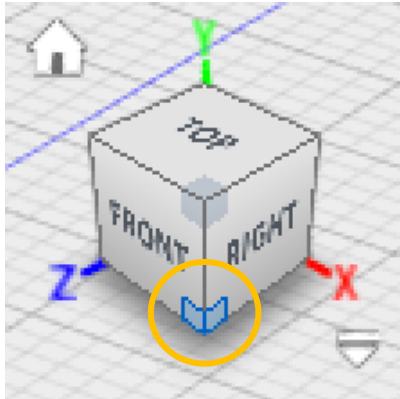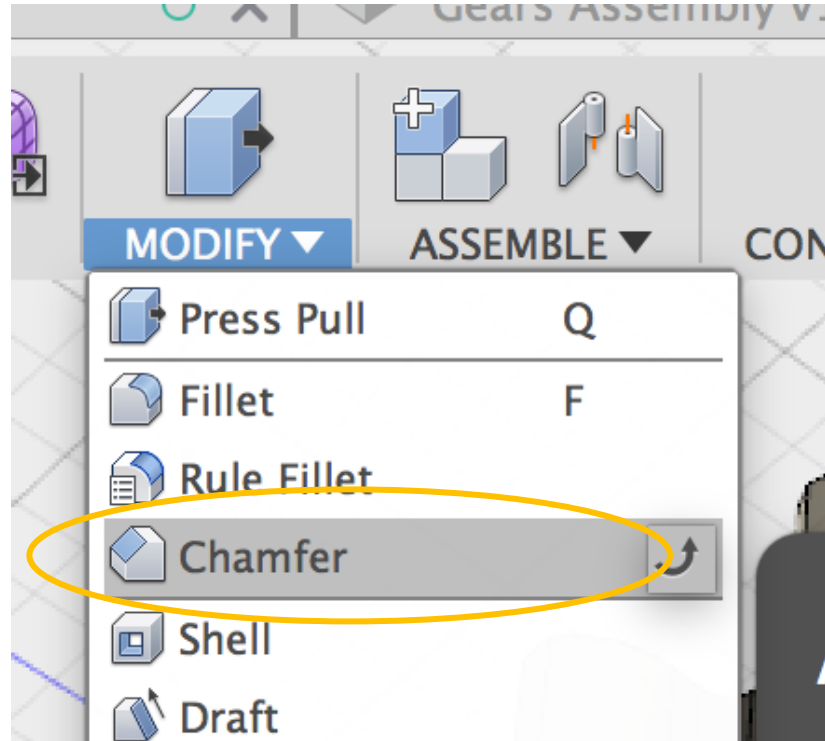
Check your result.
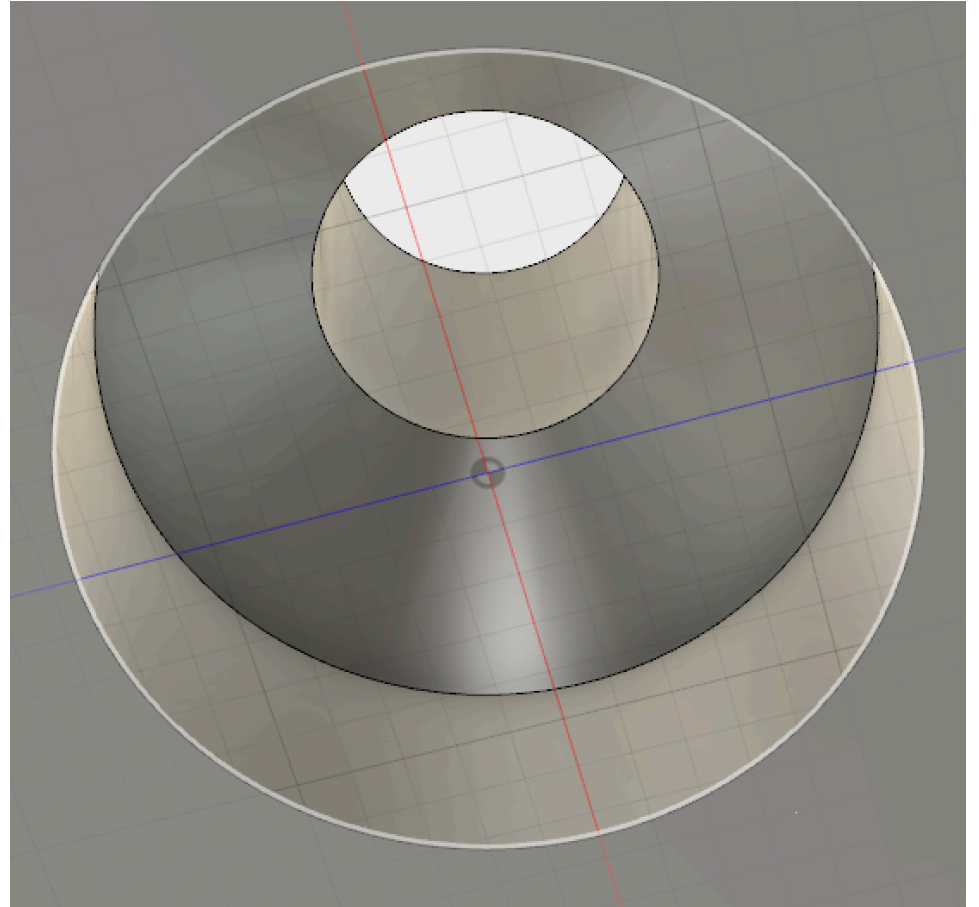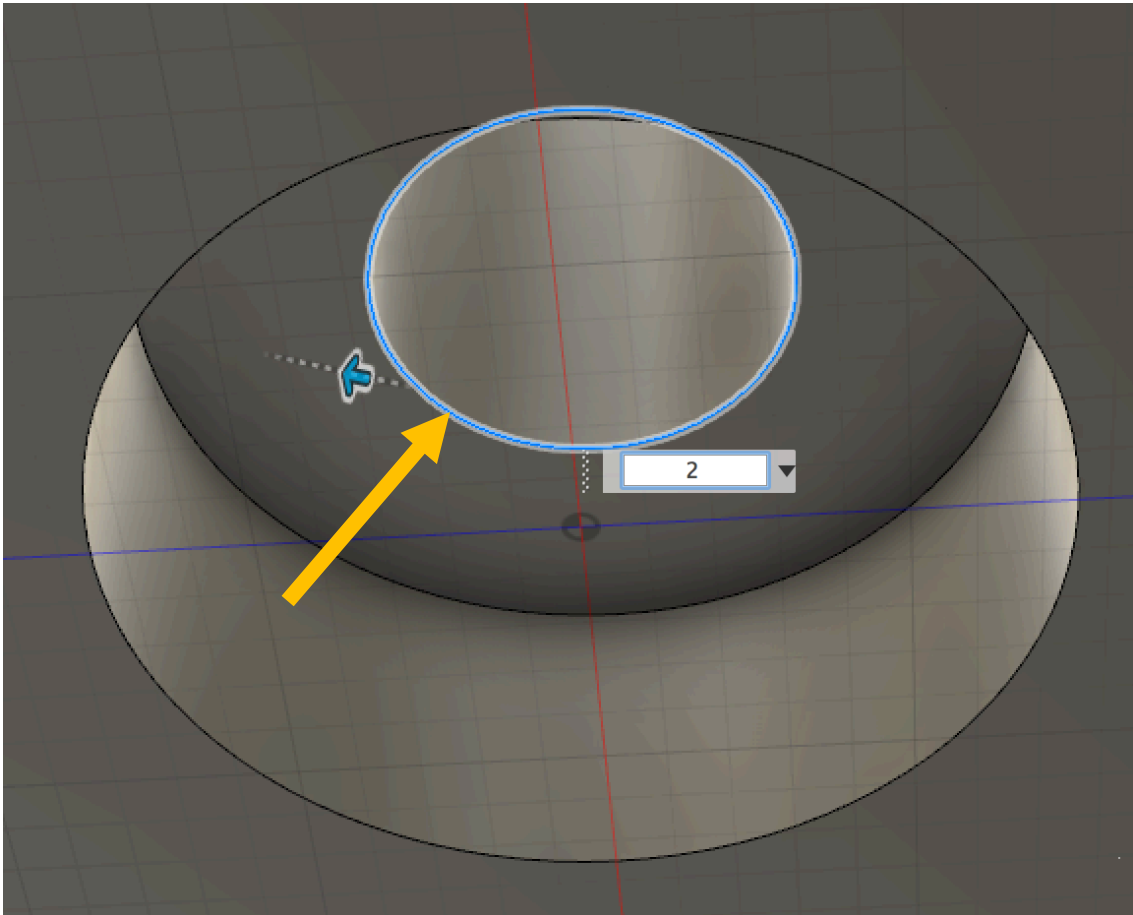

Top View

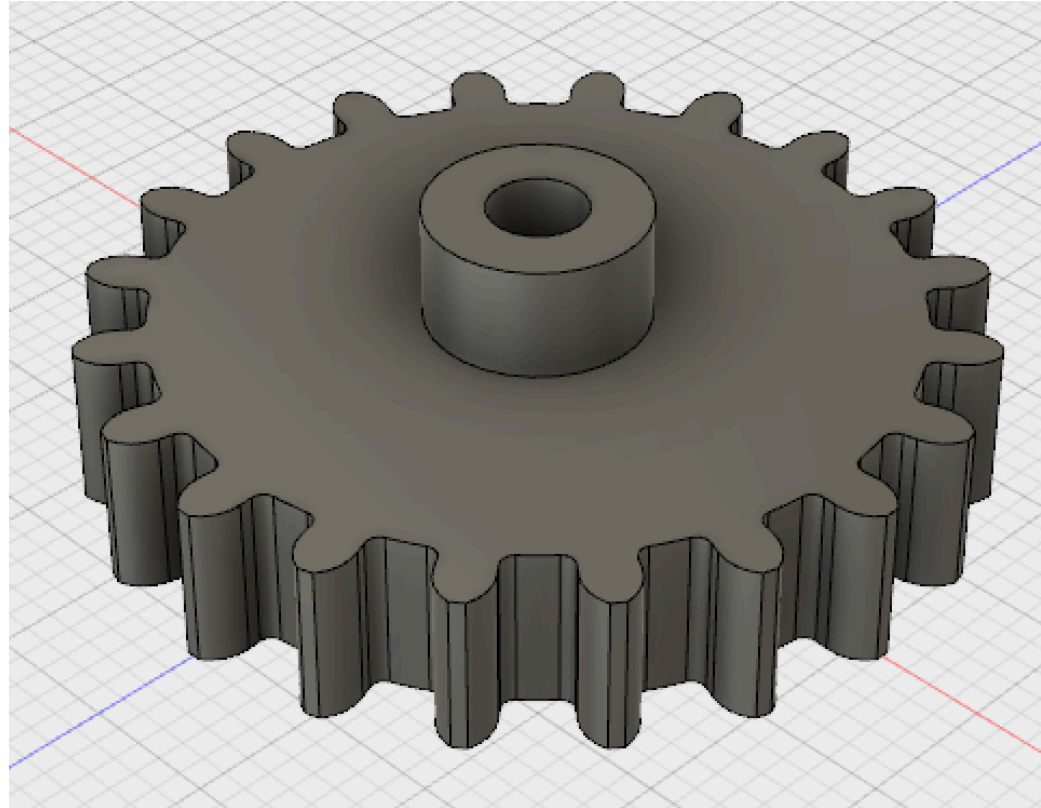Bottom View

Step 41: Go to bottom view.

Step 42: Go to "Modify" > "Chamfer".

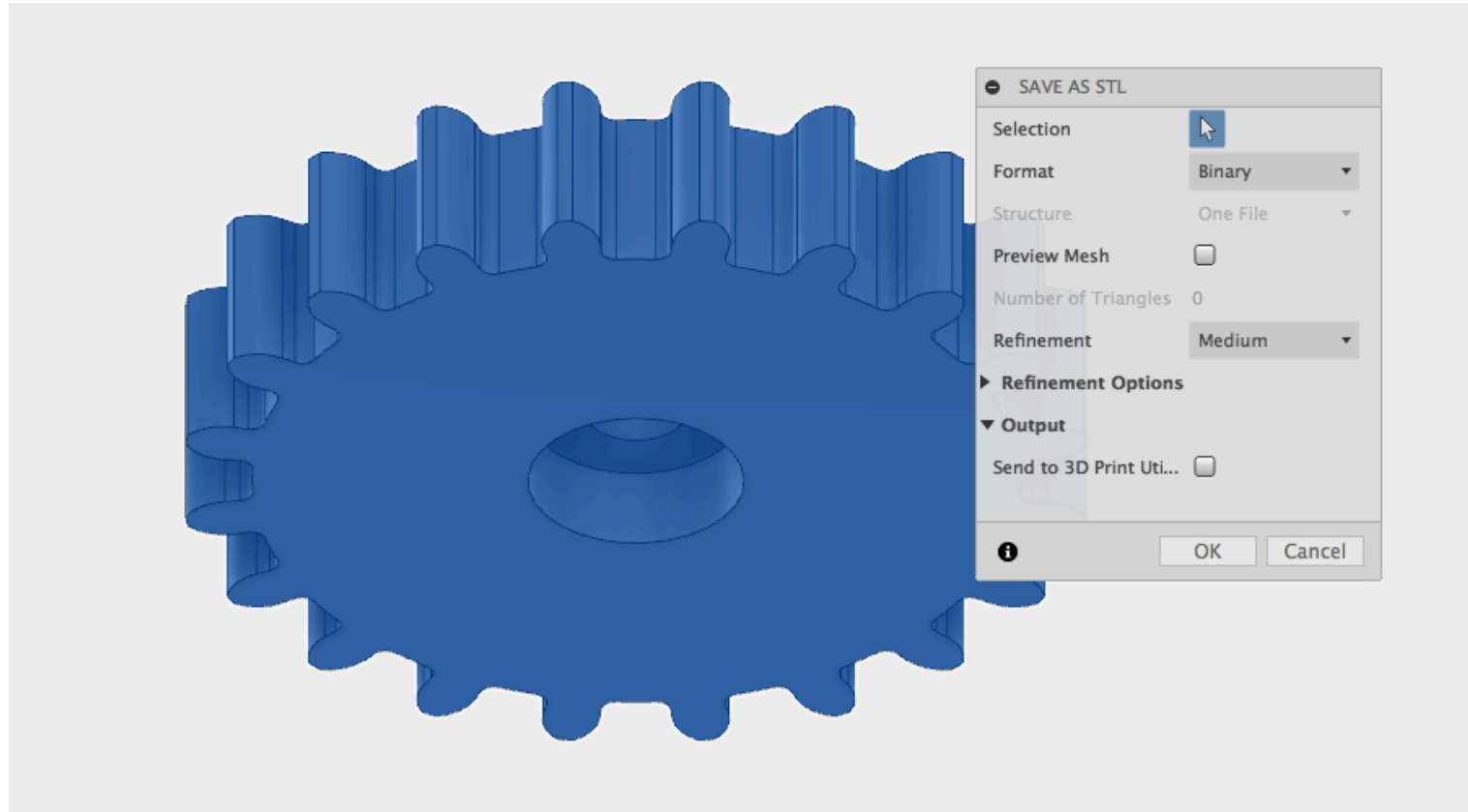# Step 43: Select the edge pointed out below, key in "2mm", then hit "Enter".

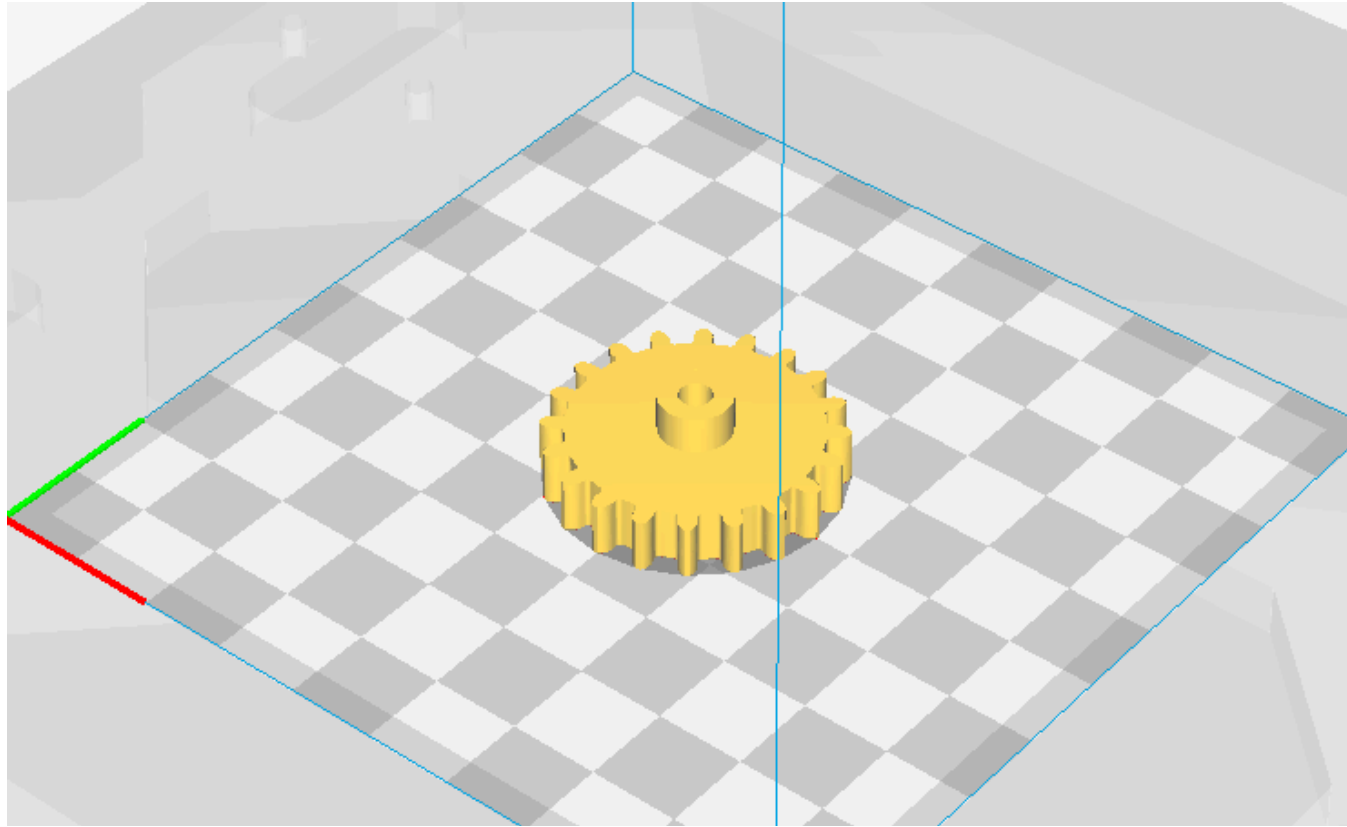# Congrats! You have finished drawing a gear. Let's print it out.

Note: Remember to save this drawing before you proceed to the next step.

Step 44: As usual, save the part into "STL" file before we move it into the Cura software.

Step 45: Please make sure the gear is in the orientation shown below.

Step 46: Follow the print setting shown below.

Step 47: While waiting for the gear to be printed, get an Allen key to unfasten the bolt on top of the G15.
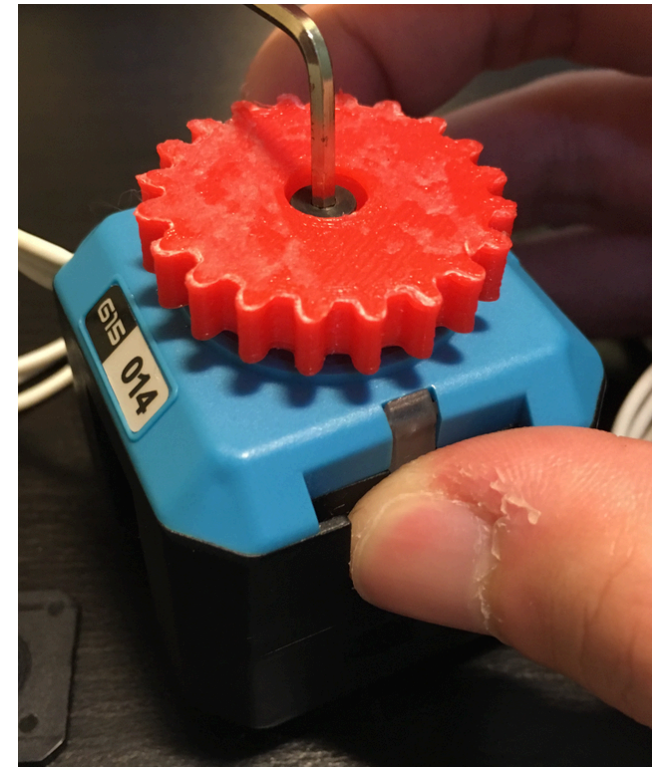
Step 48: Remove the bolt and the output connect.
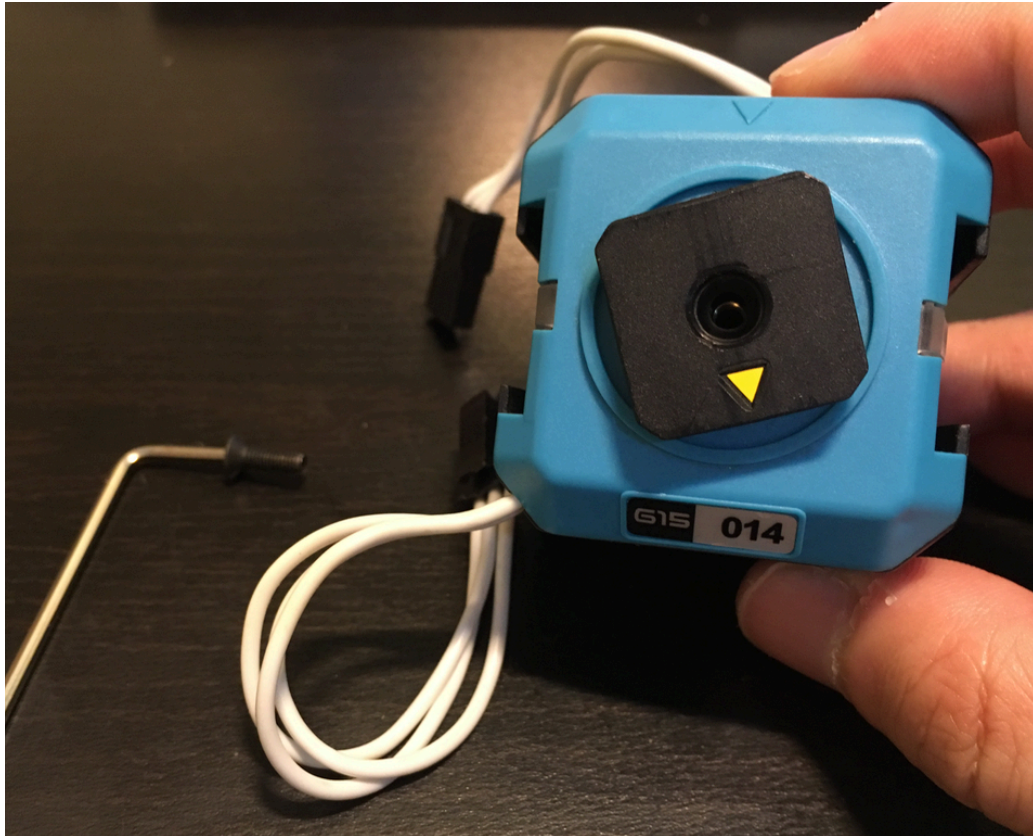
Step 49: Insert the gear that you have printed and tighten it with the bolt. And you are done with this lesson!

In the next lesson, we will learn how to add few more parts to turn it into a gripper.