

Episode 1: Where do Products come from?

Engineered products are all around us, from smartphones, to hairdryers. In this session, we will examine the complex processes of engineering a hairdryer, and explore how Product Lifecycle Management (PLM) and Computer-Aided Design (CAD) modelling can help us to design, manufacture and distribute products more efficiently.

1. The Lifecycle of a Hairdryer

Using the Siemens NX: Designing The Future Interactive, explore the Product Lifecycle of a hairdryer. Using the boxes below, create a flowchart showing a hairdryer's product lifecycle.

Research & Problem Definition



Research is undertaken to decide the requirements of the product and the problems that it needs to solve.

Product Design



Product designers model the hairdryer and its parts using computer aided design (CAD).

Simulation & Prototyping



Materials data and CAD models are used to simulate and test the performance of the design ideas. Prototypes are also built and tested using rapid prototyping.

Product Verification



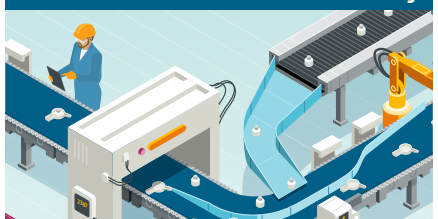
The final design is verified. The verified design must meet all of the design requirements of the product.

Production Planning



Manufacturing engineers plan out the entire supply chain, including sourcing, manufacture, assembly and distribution of the product.

Product Manufacture & Assembly



The product components are manufactured and assembled at one or more factories.

Quality Control



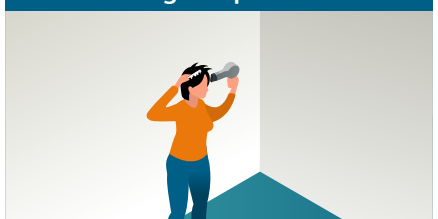
The finished product and its components are tested for their quality. Improvements to the design or manufacturing are made as needed.

Finishing & Distribution



The product is packaged and distributed to its users, with user and sales data feeding back into the production process.

Using the product



The user gets a funky new hair style. Maintenance data and user experience feeds back into the design process.

2. Product Lifecycle Management

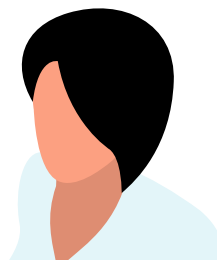
Using Product Lifecycle Management software has many benefits for engineers and product users.

Read the quotes below and answer the questions overleaf. You can find additional hints by exploring in the Siemens NX: Designing The Future Interactive.

Product Lifecycle Management software enables us to coordinate all the steps of the production process.

We can work as one huge team from one database to deliver products efficiently and sustainably.

Sara, Product Manager



As a product designer, I can create digital models using Siemens NX that can be easily updated and tested. 3D simulations of the product enable me to quickly test, prototype and share my ideas with the rest of the team over the PLM database.

Manjur, Product Designer

Using PLM, I can instantly use the product designer's models and technician's data in order to plan for efficient manufacture of the product. I can simulate the whole production process with a digital twin of the production line.

Ivan, Product Engineer



I can coordinate the entire manufacture and assembly using PLM. I can track every physical part through the factory, and also use data from sensors to understand our processes better. This enables us to increase the efficiency, sustainability and costs of production as well as product quality

Katrin, Production Technician

- How does PLM enable the production team to work together more easily?

- What is the advantage of using digital modelling for the Product Designer?

- What are the advantages of using PLM for an engineering company?

- How does the product user benefit from the use of PLM in engineering the product?

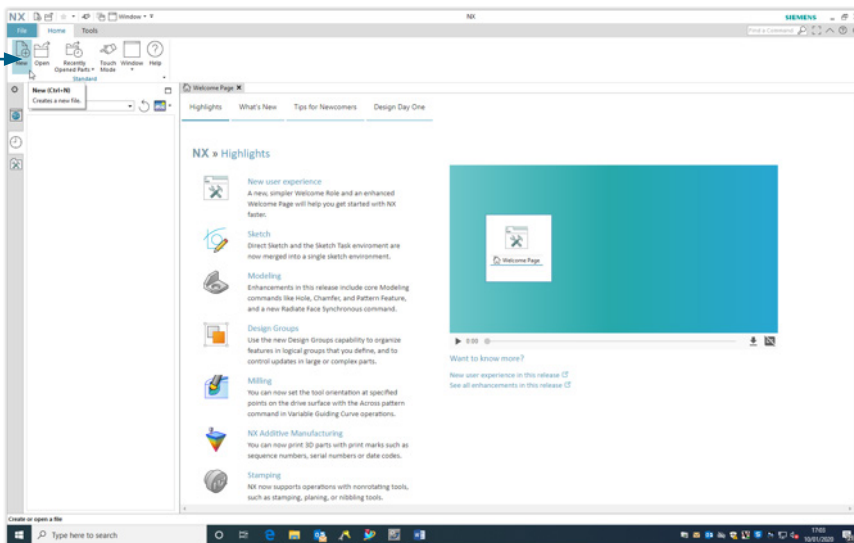
- What are the other benefits of companies using PLM?

3. NX Challenge – Earn your Badge

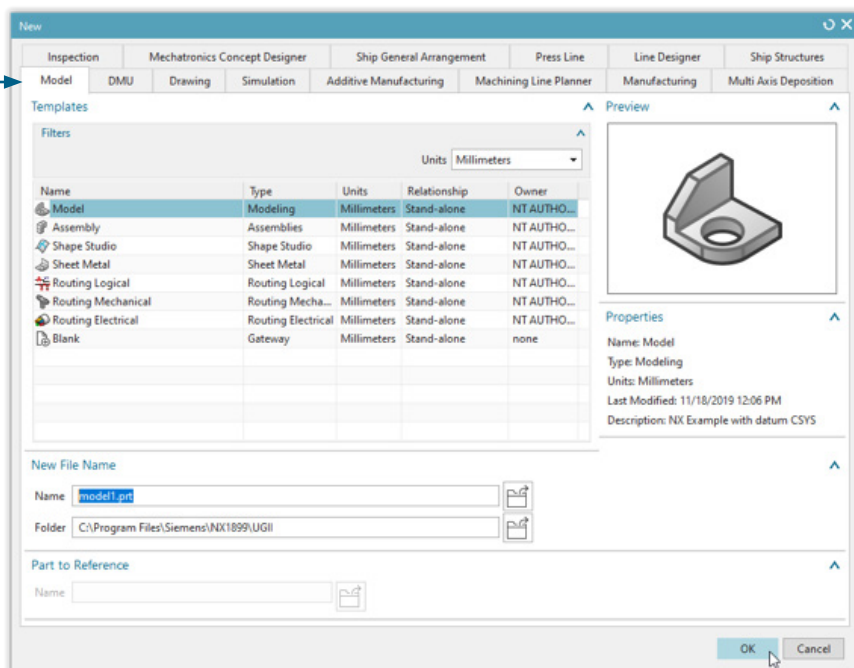
Many engineered products that you will have encountered will have been designed using Siemens NX – just like the hairdryer in Activity 1.

You can use NX to design and engineer your own projects. Follow the steps below to make a snazzy smiley badge and learn how to get started with Siemens NX.

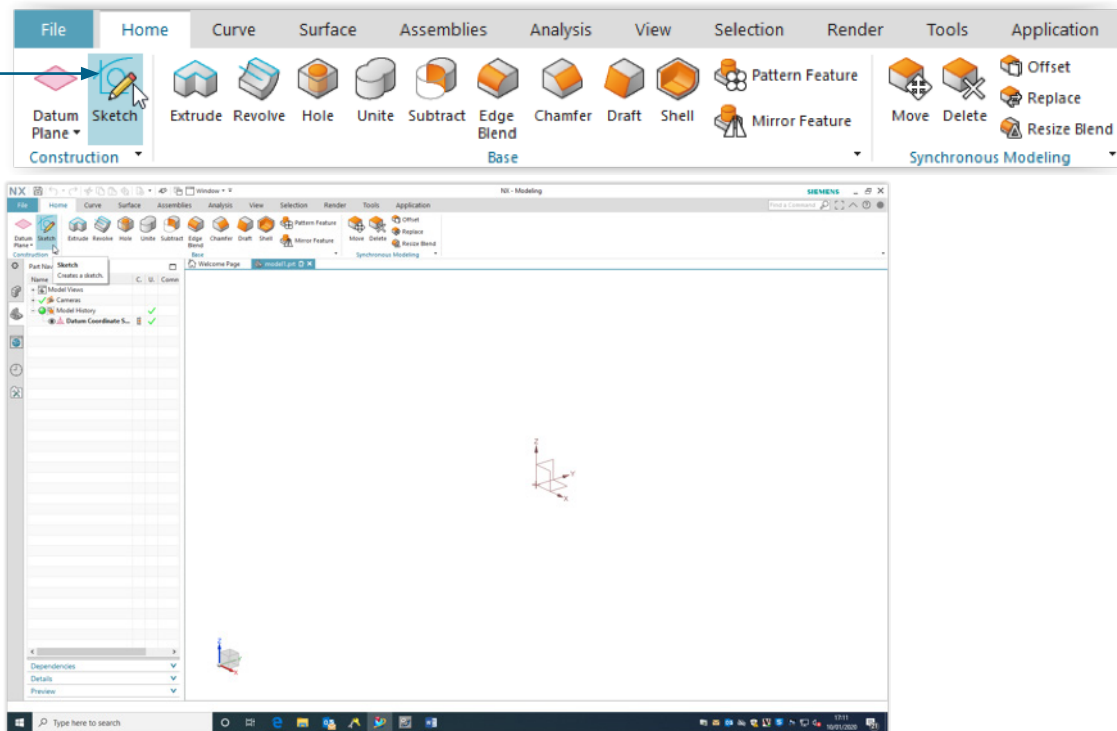
1. Open Siemens NX and click 'New' to start a new project.



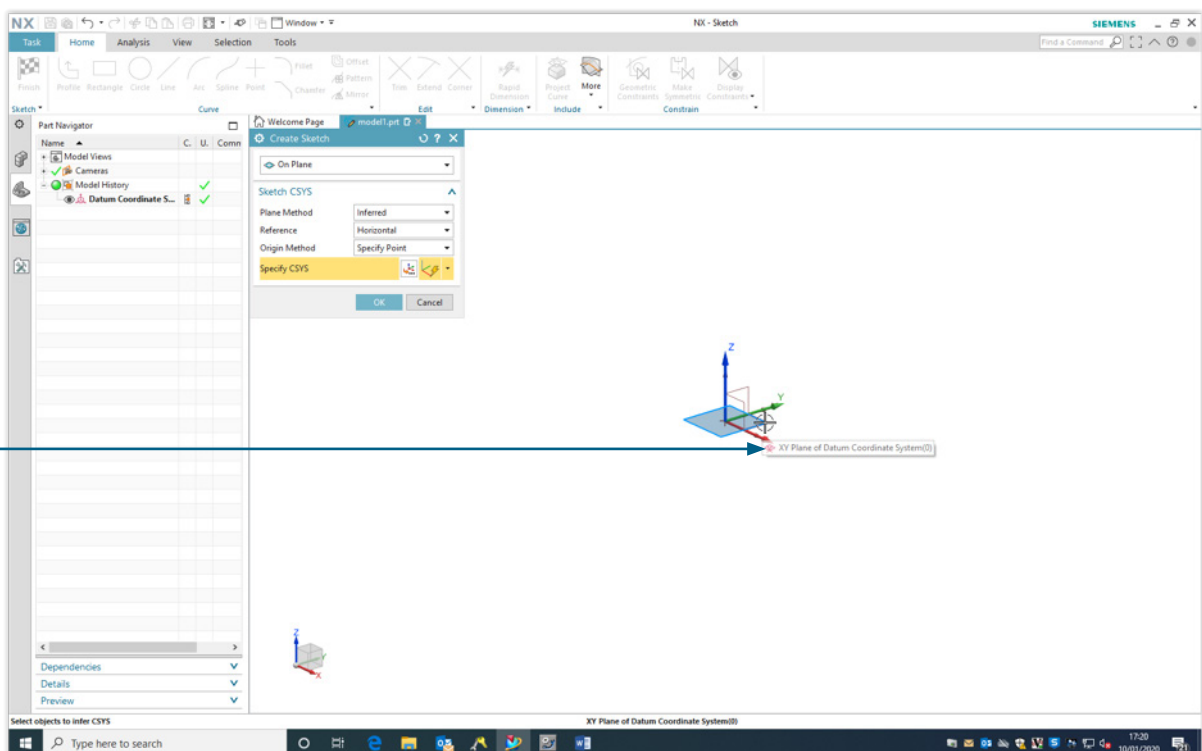
2. Select 'Model' and enter a file name. Don't forget to save this somewhere that you can find it again later.



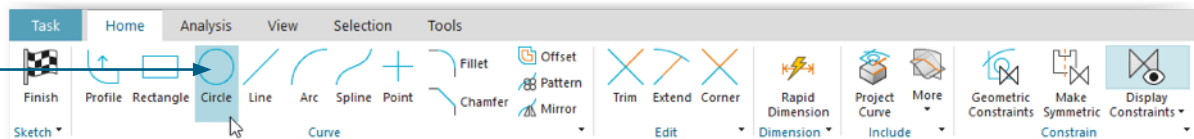
3. Select 'Sketch' from the Base Menu to begin a sketch.



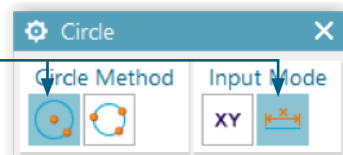
4. Choose which of the three 'planes' you wish to sketch onto. Choose the XY Plane. Once selected, press 'OK' in the Create Sketch Dialog Box



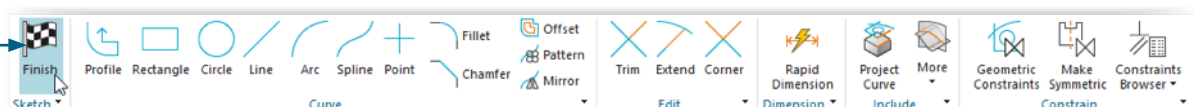
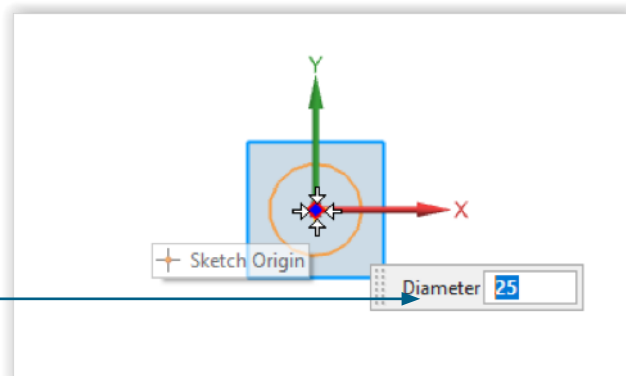
5. Sketch a circle by selecting the Circle Tool in the Home Menu. If you can't find it, use the 'Find Command' tool in the top right of your screen to search for it.



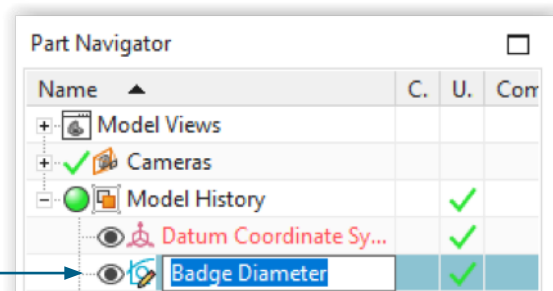
6. Ensure that method 'Circle by Centre and Diameter' and Input mode 'Parameter Mode' are selected in the Circle Tool dialog box. This enables you to sketch a circle from its centre, with a fixed diameter.



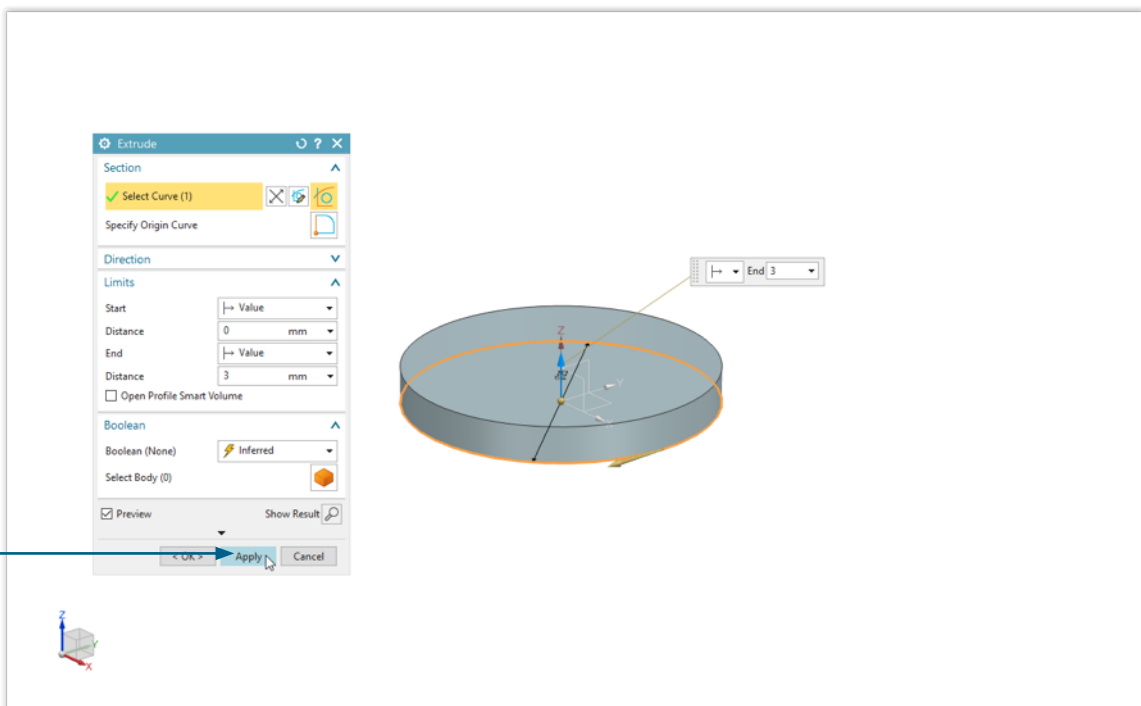
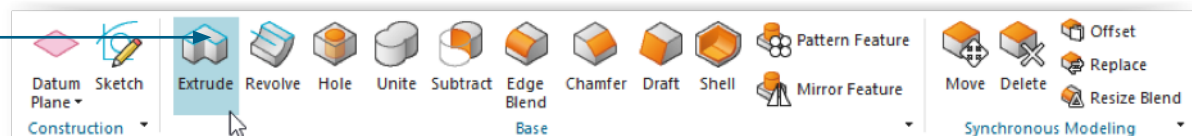
7. Define the diameter of your circle as 25mm using the dialog box. Press enter. Place your circle on the sketch origin. It should 'snap' to the sketch origin. Click to place your circle, then finish your sketch by clicking the Finish button in the Home Menu.



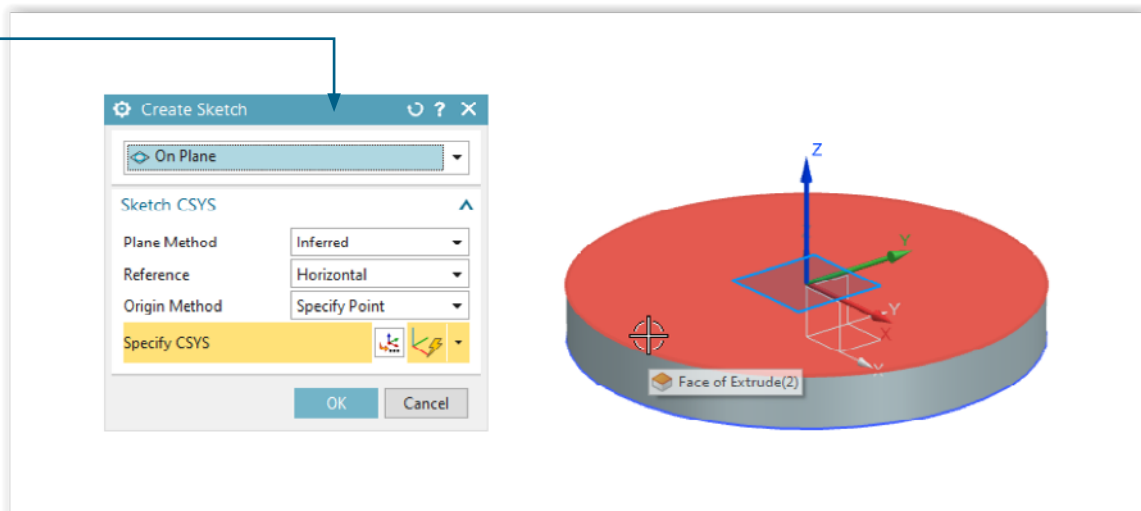
8. Rename your sketch by right clicking on the sketch name in the Part navigator. Name it 'Badge diameter'. It's good practice to name your sketches; this will help you to stay organised during complex builds.



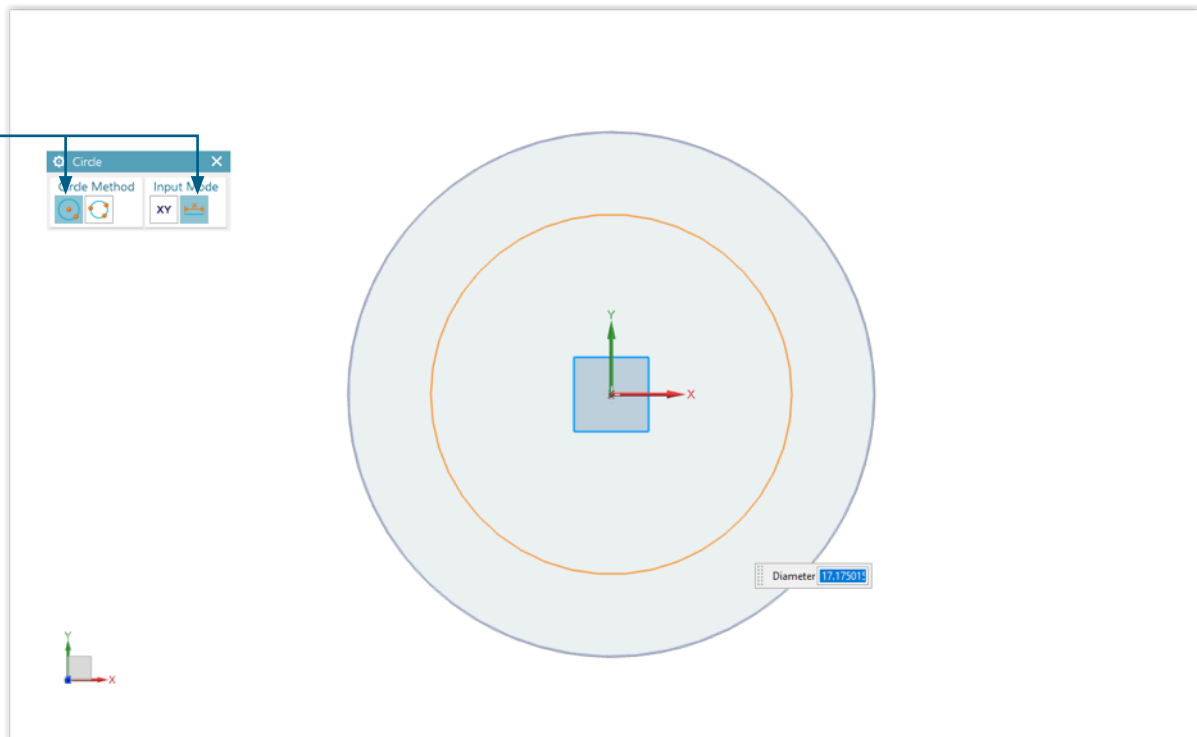
9. Extrude your 2D sketch into a 3D model. Select the Extrude Tool. Select your circle, and type 3mm into the distance option in the dialog box. Press 'Apply'. The circle should now be extruded into a cylinder. Exit the dialog. This disc will form the back of your badge.



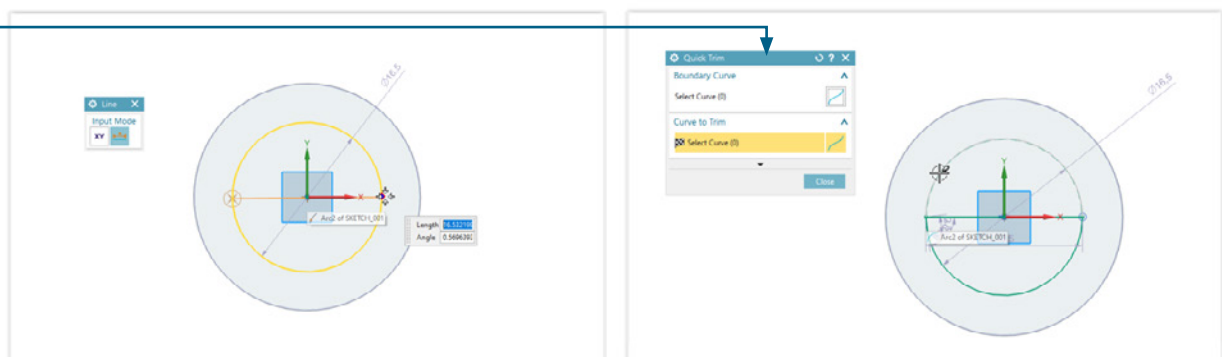
10. We will now add a smiley face to the top surface of the cylinder. Select the Sketch Tool and then select the top surface of your cylinder. Select 'OK' on the dialog box. Right Click on your new sketch in the Part Navigator and name it 'Badge design'.



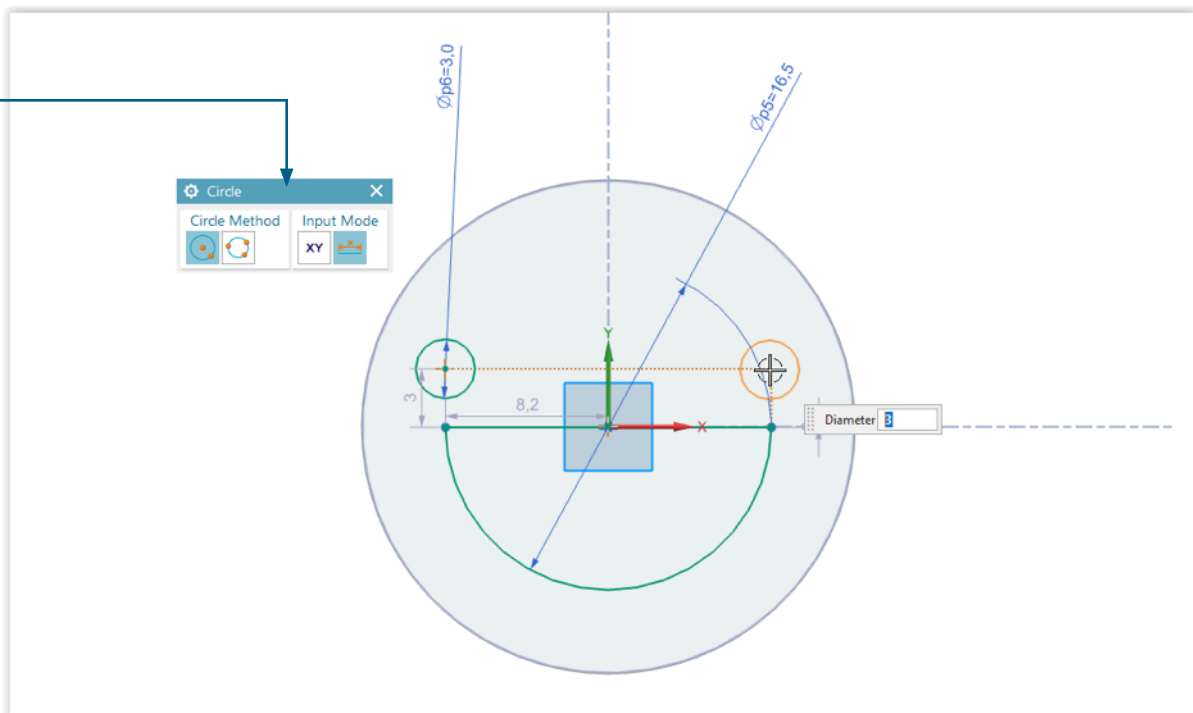
11. Start by sketching the mouth. Open the circle tool, and select the 'midpoint and diameter' method and 'parameter mode' input mode. Click on the centre of your circle (your cursor should 'snap' to the centre on approach) and drag your circle out to 18mm. Click to place it.



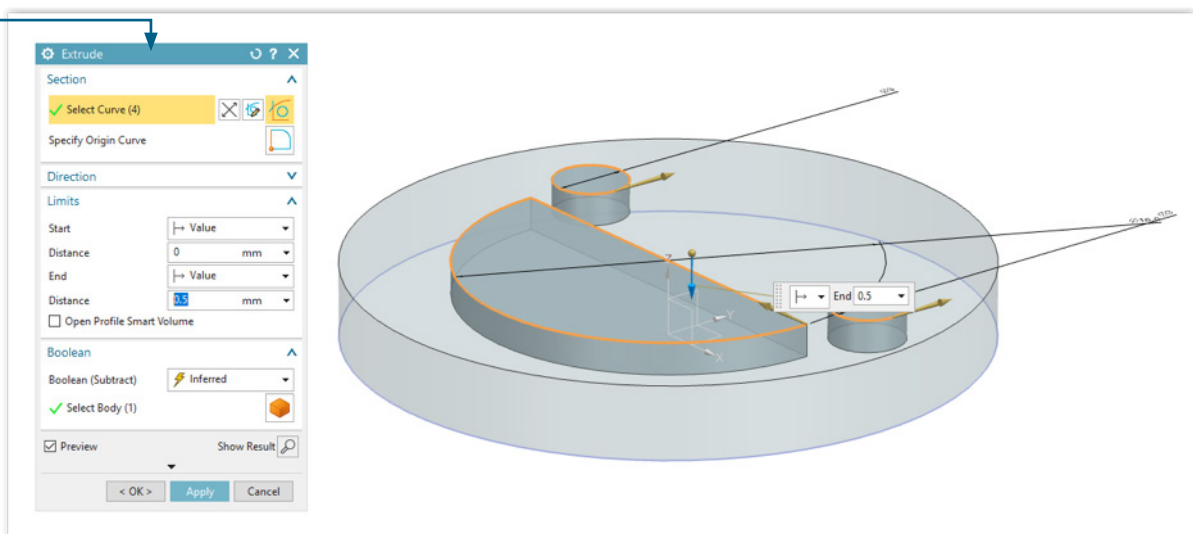
12. Divide the circle in half. Select the Line tool from the sketch menu. Sketch a line from the centre of the circle to the edge. Repeat to the opposite edge. Your cursor should 'snap' to the centreline of your circle as you hover over it. Use the 'Trim' tool to delete the top half of your circle to create a semicircle. Close the Line tool.



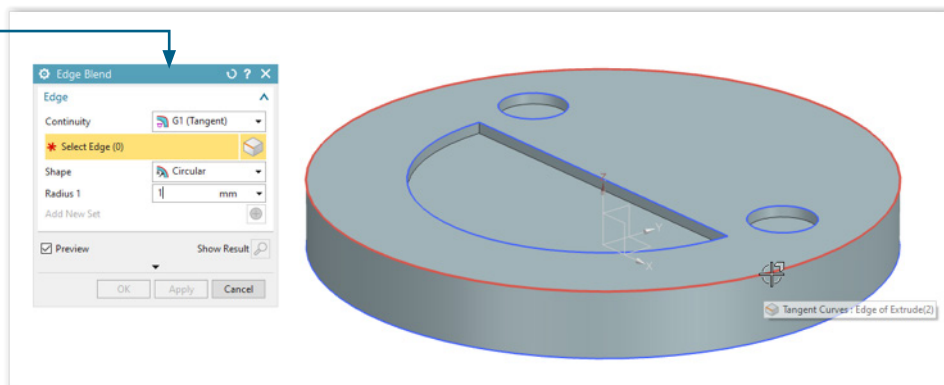
13. Add some eyes by using the Circle tool. To keep them the same size, use the Input mode 'Parameter Mode' and enter a 3mm diameter. You could align the first eye with the corners of the mouth by passing the centre over the corner and following the constraint line that appears. You can align the second eye to both the corner of the mouth and the first eye in the same way. Finish the sketch.



14. Click on the facial features that you have sketched (they should turn from blue to orange) and then press the 'Extrude' tool. Subtract material by clicking the 'reverse direction' button in the extrude dialog box, or double click the blue arrow, with a 0.5mm extrusion distance. Press apply.

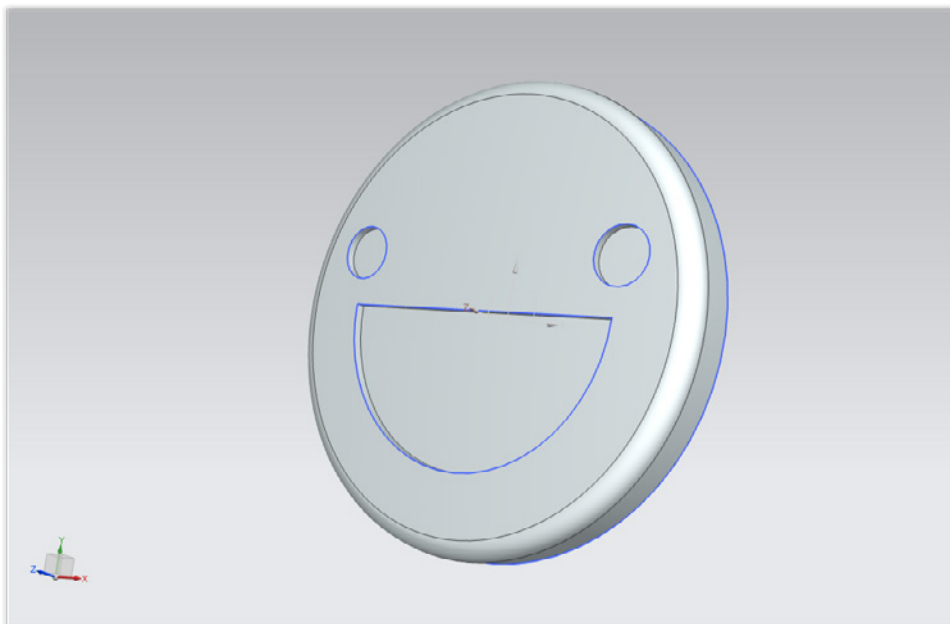


15. Press the Edge Blend tool in the Construction Menu. Enter 1mm into the box for 'Radius 1' and then click the top edge of your cylinder. Click 'Apply' then exit the menu.



16. You have now created your first NX art! Follow the 3D printing instructions on Worksheet 3 to print out your badge. Ask your teacher to help you to attach a badge pin to the back of your badge, or take a screen grab of your finished badge design.

Right click anywhere on the screen to change the view of your badge. You can orient the view or rotate your view by pressing F7 on your keyboard and dragging your cursor.



Extension – How are you feeling?

Try out some different shapes and expressions for your badge. Once you have completed this scheme of work, you could 3D print your badges, or re-design them with a well placed hole as flashy and expressionful buttons or medals.