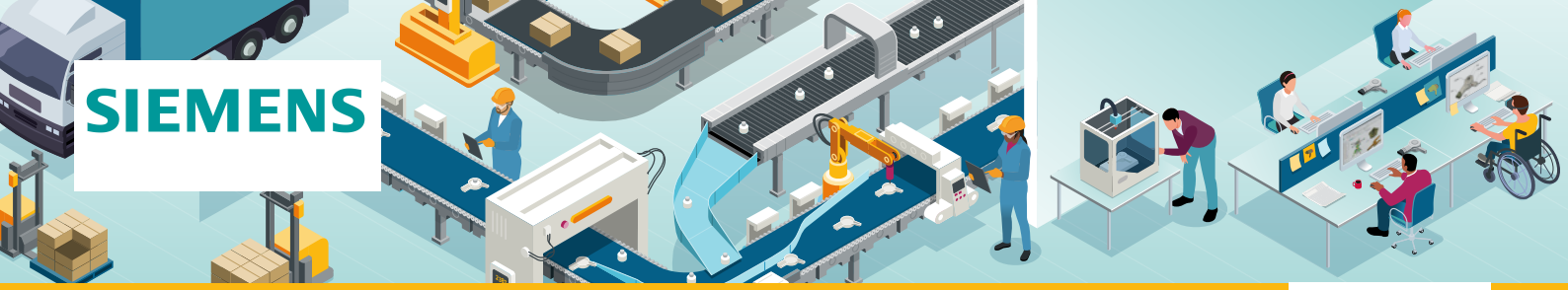


Episode 3: To Manufacturing and Beyond

Siemens NX can connect to many digital manufacturing tools that are available to you in your classroom or local maker centre that could be useful as part of your projects. Digital manufacture also benefits product engineers, from rapid prototyping to the digital simulation of manufacturing processes

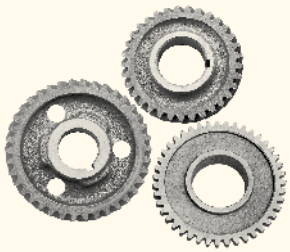
1. Digital Manufacturing in Your Classroom

Using the table below, decide which digital manufacturing tool would best suit the manufacture of each product below. Write the suitable tool below each image.

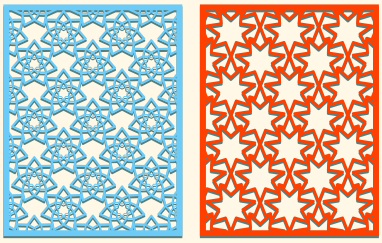
MACHINE	MATERIALS	HOW DOES IT WORK	IDEAL FOR
3D PRINTER	ABS, Nylon filament	Squirts hot liquid plastic into complex 3D shapes.	Precise, complex 3D plastic shapes, interlocking 3D shapes
LASER ENGRAVER	Sheet plastics including acrylic, polypropylene, Manufactured boards including specialist MDF, plywood	Cuts 2D designs into sheet materials precisely with a thin laser beam.	Precise cut-outs of flat shapes, Interlocking 2D shapes
CNC MILL	Manufactured Boards, Timber, Sheet plastics, plastic or foam blocks, Sheet metal including some aluminium, brass	Carves 2D or 3D designs into materials using a rotating cutter	Large 3D Carving or 2D cut outs from wood, plastic and some metals.
CNC LATHE	Blocks or rods of plastic, aluminium, brass, steel	Carves 3D designs using a cutter into rotating blocks of material	Precise shapes which are symmetrical along one axis
WATER JET CUTTER	Sheet metals including steel, aluminium, brass, stone	Cuts 2D designs into sheet materials with a high pressure jet or water and abrasive materials	Precise cutting of complex 2D shapes into hard materials

SMALL PLASTIC GHOST

PLYWOOD PUZZLE PIECE



STEEL GEARS



ACRYLIC PLASTIC STENCILS

ELECTRIC GUITAR BODY

METAL DOORKNOB

ABS PROSTHETICS

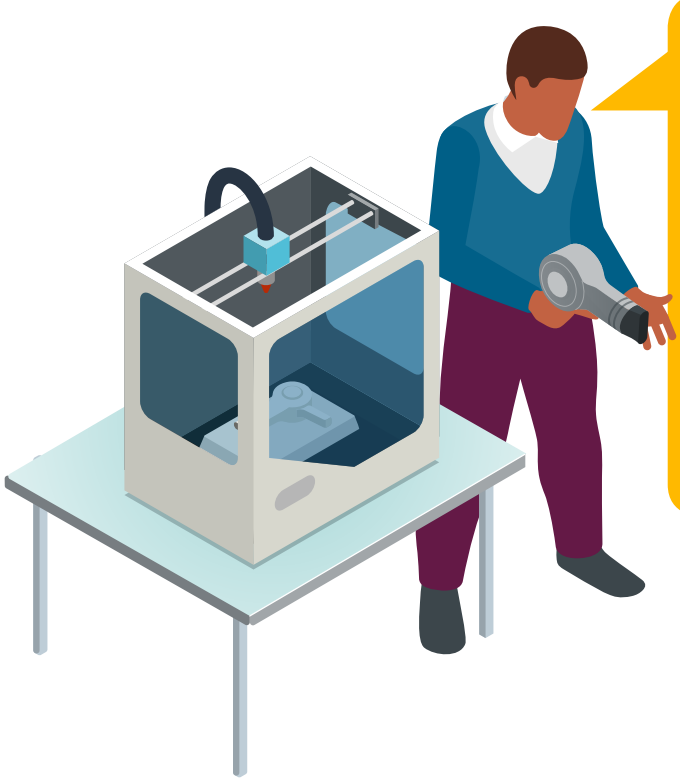
ACRYLIC JEWELLERY

PLYWOOD FURNITURE

2. Digital Manufacture and Product Design

Read below how digital manufacturing is used by product designers to help develop and manufacture their products

You can use the Siemens NX Infographic for extra hints.



Digital manufacture such as 3D printing is great for designers, as we can quickly turn a digital model to a real life model for testing. In the past, plastic prototypes required costly and time consuming moulds and tooling for each part. Now I can quickly print many different parts using the same 3D printer at my desk.

3D printing is also extremely accurate and requires little finishing.

a) Name four advantages of 3D printing

- .....
- .....
- .....
- .....

b) What are the advantages of 3D printing over other methods of making 3D plastic shapes?

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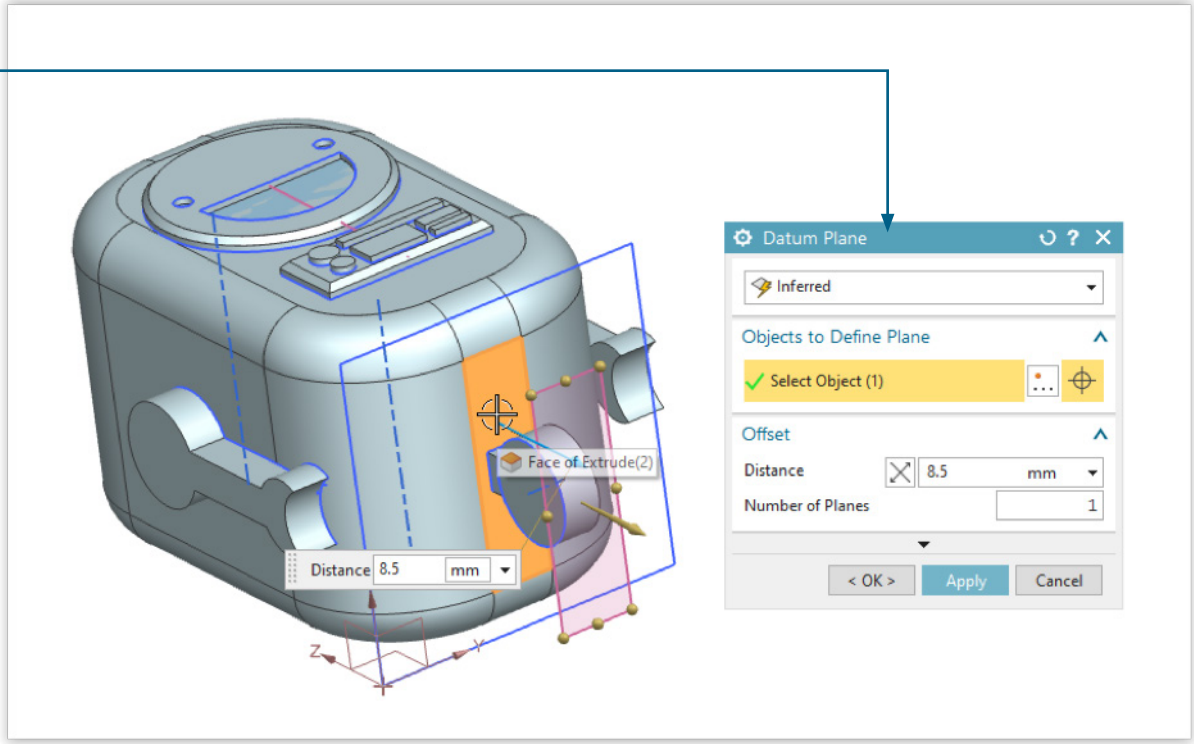
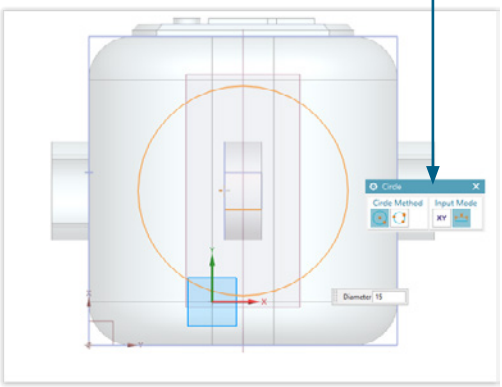
3. NX Challenge: Roblet Figurine

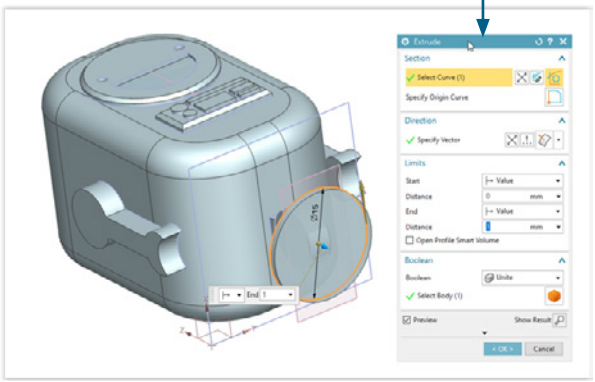
Note: You must have finished your Roblet model from the last session to complete this challenge. Alternatively, download a completed Roblet file from the Siemens Education Website.

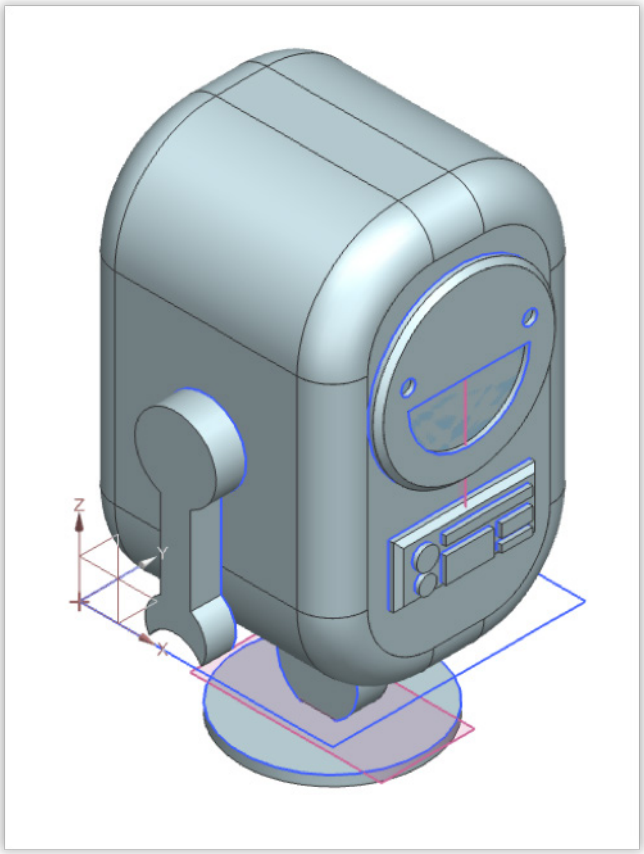
1. Add a stand to your robot by creating a new plane. Select the 'Datum Plane' tool from the Construction menu then select the bottom face of the robot. Offset the distance by 8.5mm.



2. Select the new plane and create a sketch. Sketch an 18mm diameter circle under the centre of the wheel. Finish the sketch and extrude the circle 1mm to make the base.

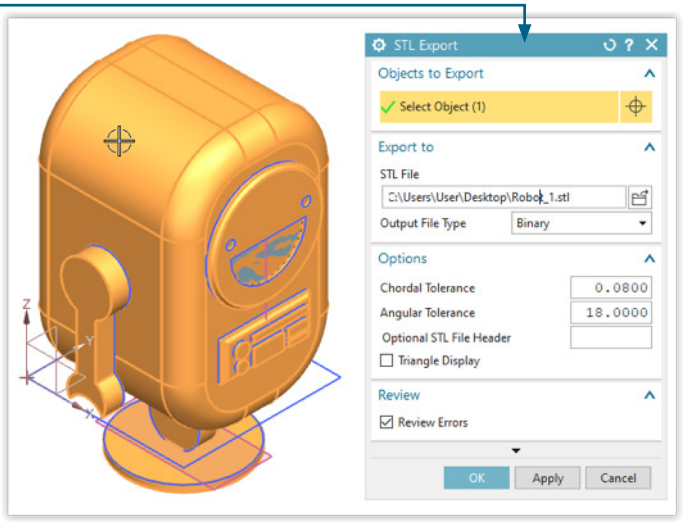






3. Your model is now ready to export as .stl file, the standard file type used in 3D printing.

   Click the file menu, and select export. Choose to export as a .STL File, and name your file and folder destination in the .STL Export dialog window. Click on the main body of your robot (it will turn orange), and click 'Apply'. Ignore the error message – this will appear because you created a base for your robot below the zero point of the 'z' plane.



4. The .stl file is now ready to send to your 3D printer. Follow your teacher's instructions for your next steps.

4. NX Extension Challenge: Tooling Up

Now that you are an NX master, try designing something for yourself.

You could design

- A new tool or accessory for an action figure
- New parts for your favourite construction toy
- Jewellery or accessories for yourself or someone you know
- Pieces for your own boardgame

Just remember that any small parts that you create must not be given to small children, as they could be swallowed, and beware that your 3D printed parts could melt or burn if left on a hot surface or near an open flame.