**Higher Graphic Communication**

**3D Modelling**

**Revision NotesHigher Graphic Communication**

**3D Modelling**

Introduction

3D CAD modelling is a time saving process. The 3D model can be used for several functions once it is made.

Accuracy is the key to success.

What can a 3D CAD model be used for?

**Manufacturing**

Computer aided manufacture (CAM) allows 2D or 3D graphics to control computer numerically controlled (CNC) machines to produce physical objects. Some 3D CAD software simulates (tests) the manufacturing process prior to machining. CAD/CAM has had major social implications: many factories have replaced workers with automated CNC machines and this has caused unemployment, but has also created new jobs for workers who programme or control the CNC machines.

**Transfer of 3D Modelling Files**

In many cases manufacturing will take place elsewhere to where the 3D models are created. If the 3D modelling files need to be sent to other users, they can be sent it two different files formats **(IGES** and **STEP**). These file type allow the 3D models to be opened in any 3D modelling software and be edited if required.

**Production Drawings**

Most 3D CAD software can create technical (production) drawings of the 3D model. This allows the designer or engineer to produce orthographic, pictorial, sectional, detailed and exploded views. It is a time saving feature, removing the need to produce the engineering drawings on traditional drawing boards or 2D CAD software.

**3D Prototype Printing**

Models are exported as standard tessellation language (**STL**) files and imported into a 3D model machine. The model is then digitally ‘sliced’ into thin horizontal layers. These layers can be printed. 3D printed prototypes help the designer to evaluate aesthetics and functions of a design.

**Simulation (testing)**

Simulation allows testing of products, training of people or predicting real world events. 3D simulations have preloaded physical data about materials, temperature and environments. Simulation using CAD reduces the costs of producing products and is a safer method for training staff.

**3D Illustration**

Illustration software improves the visual impact of a 3D model. Some illustration software allows the user to animate the model. Most CAD software has illustration capabilities included but stand alone applications are available.

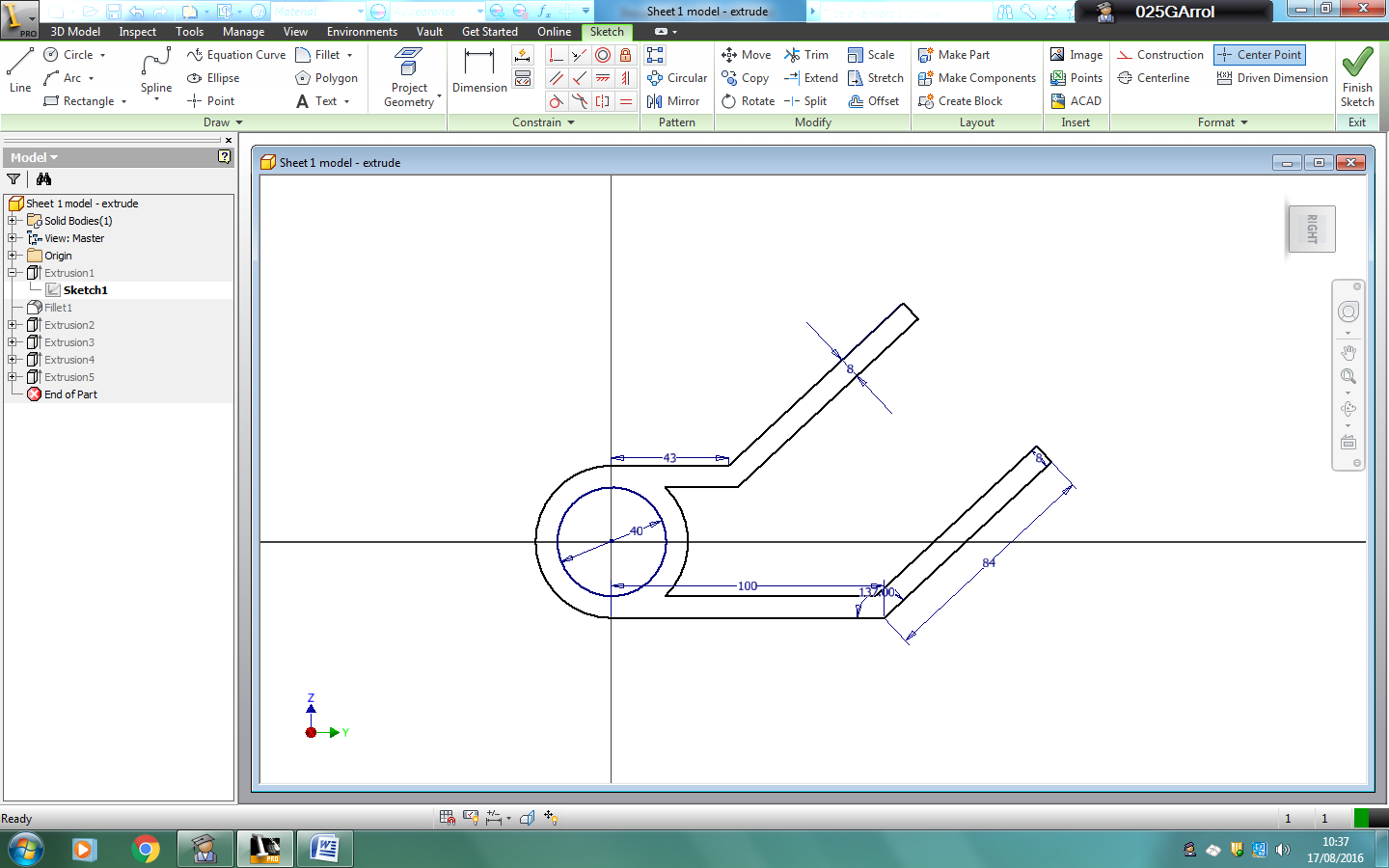
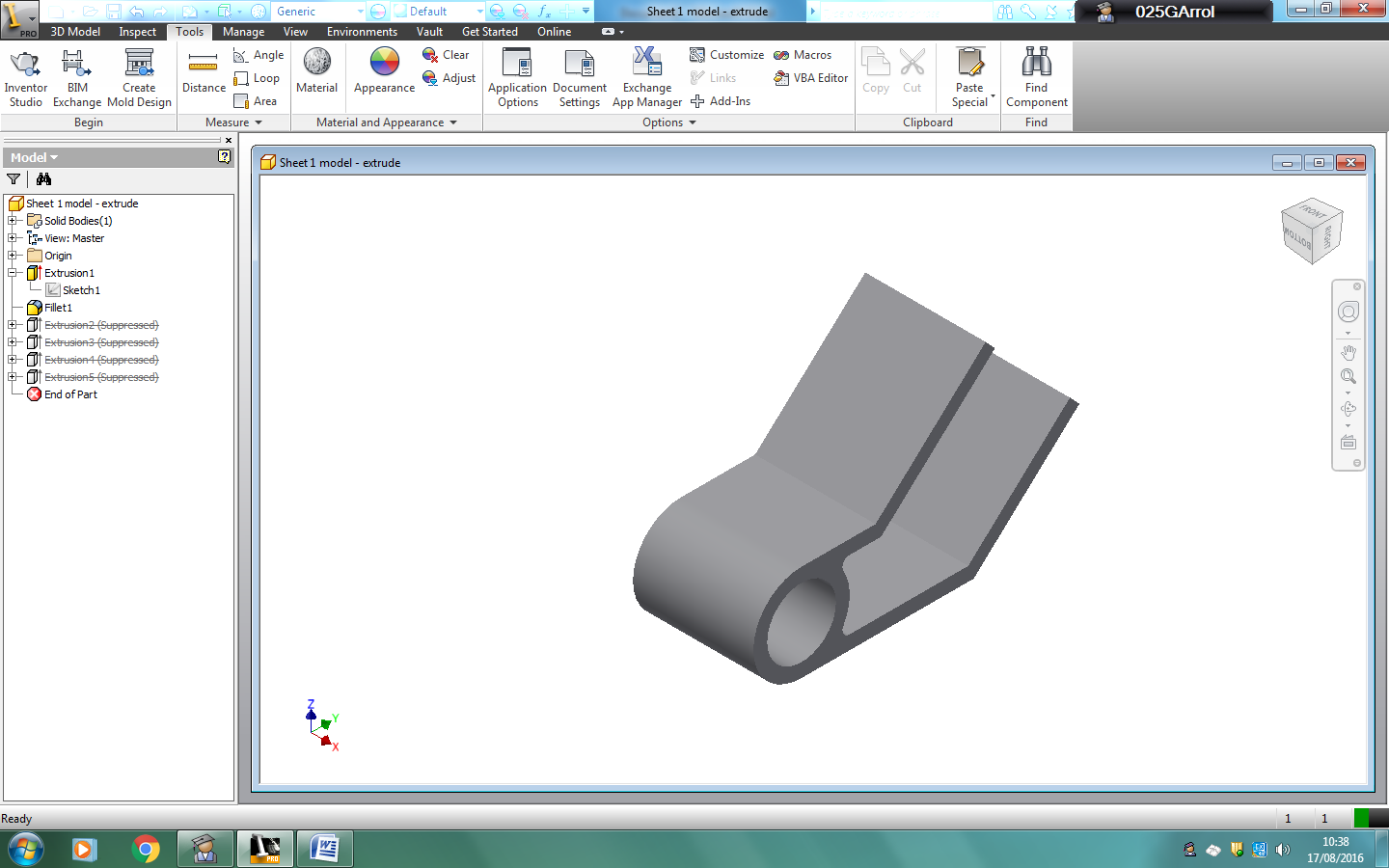
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**3D Modelling Techniques and edits**

The following is a list of modelling techniques which we learned before the summer holidays. You will need to know all five and be able to write a modelling plan to explain each.

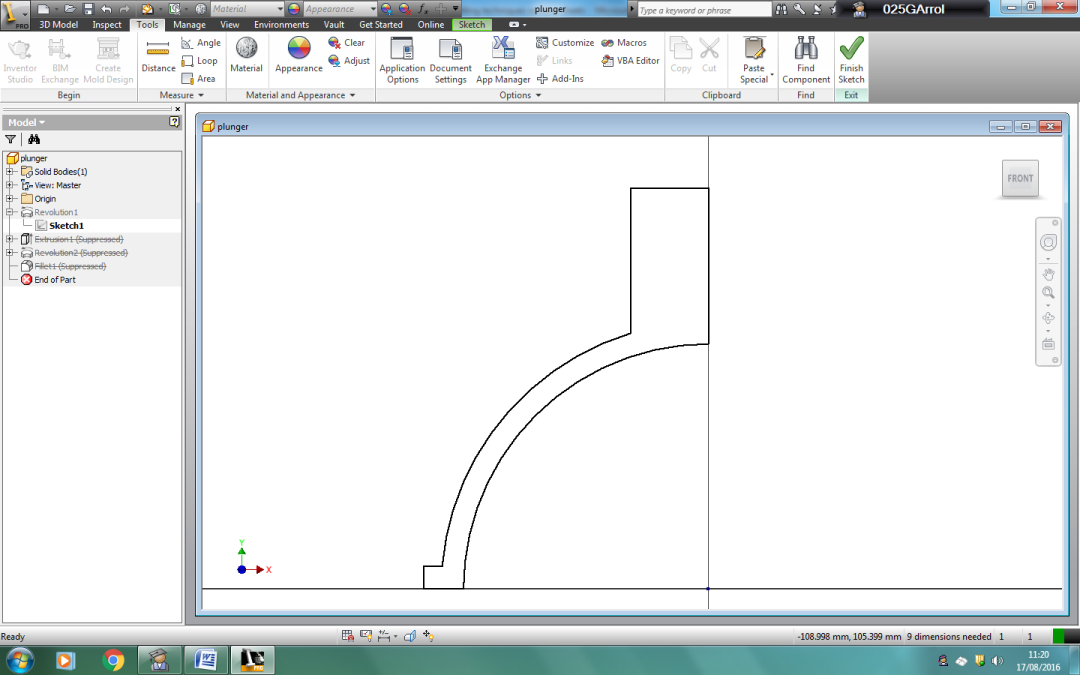
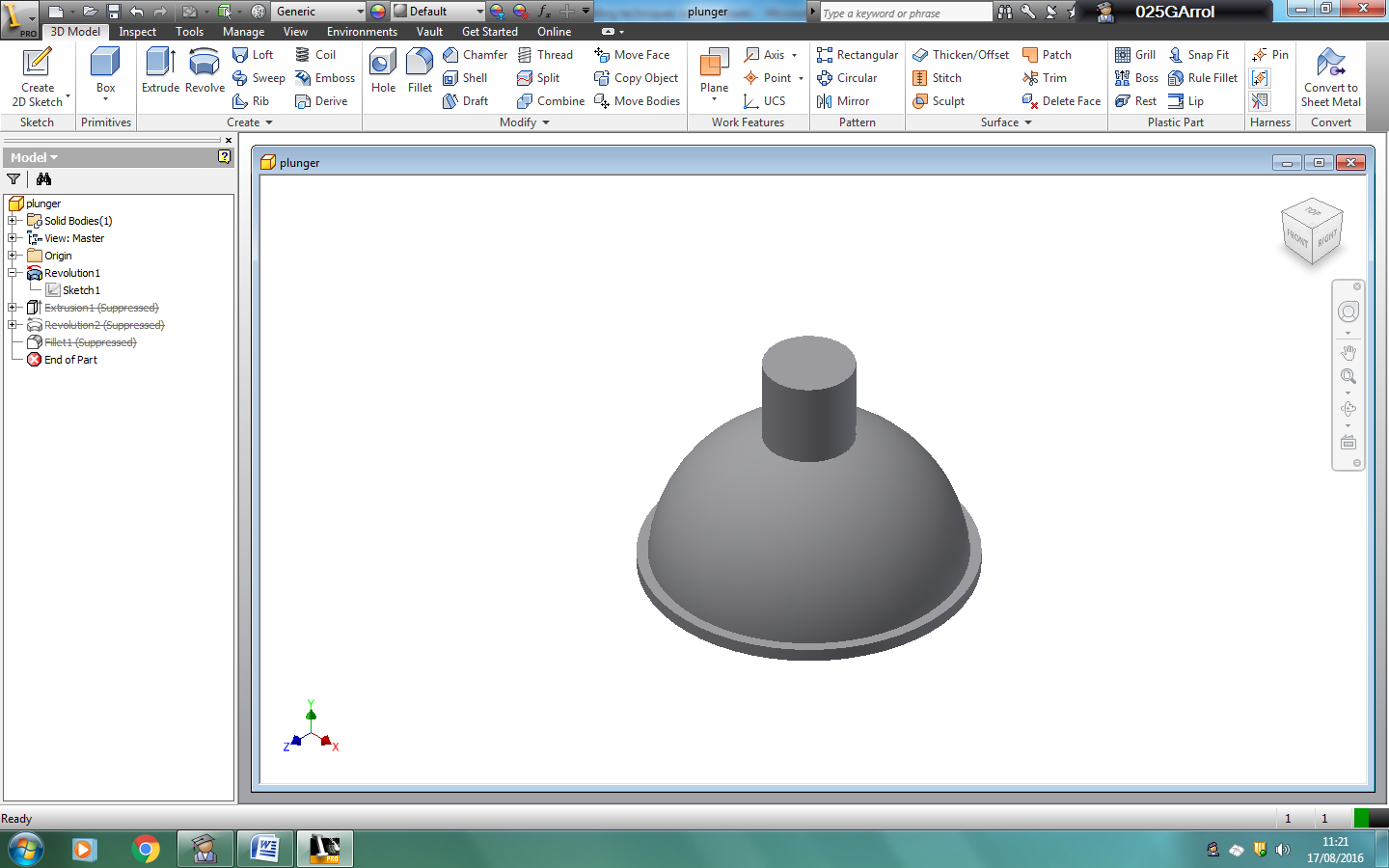
**Extrude**

Extrude is the most basic command in 3D modelling. It allows a designer to sketch a 2D shape and then “Extrude” the sketch by giving it a depth to turn it into a 3D shape.



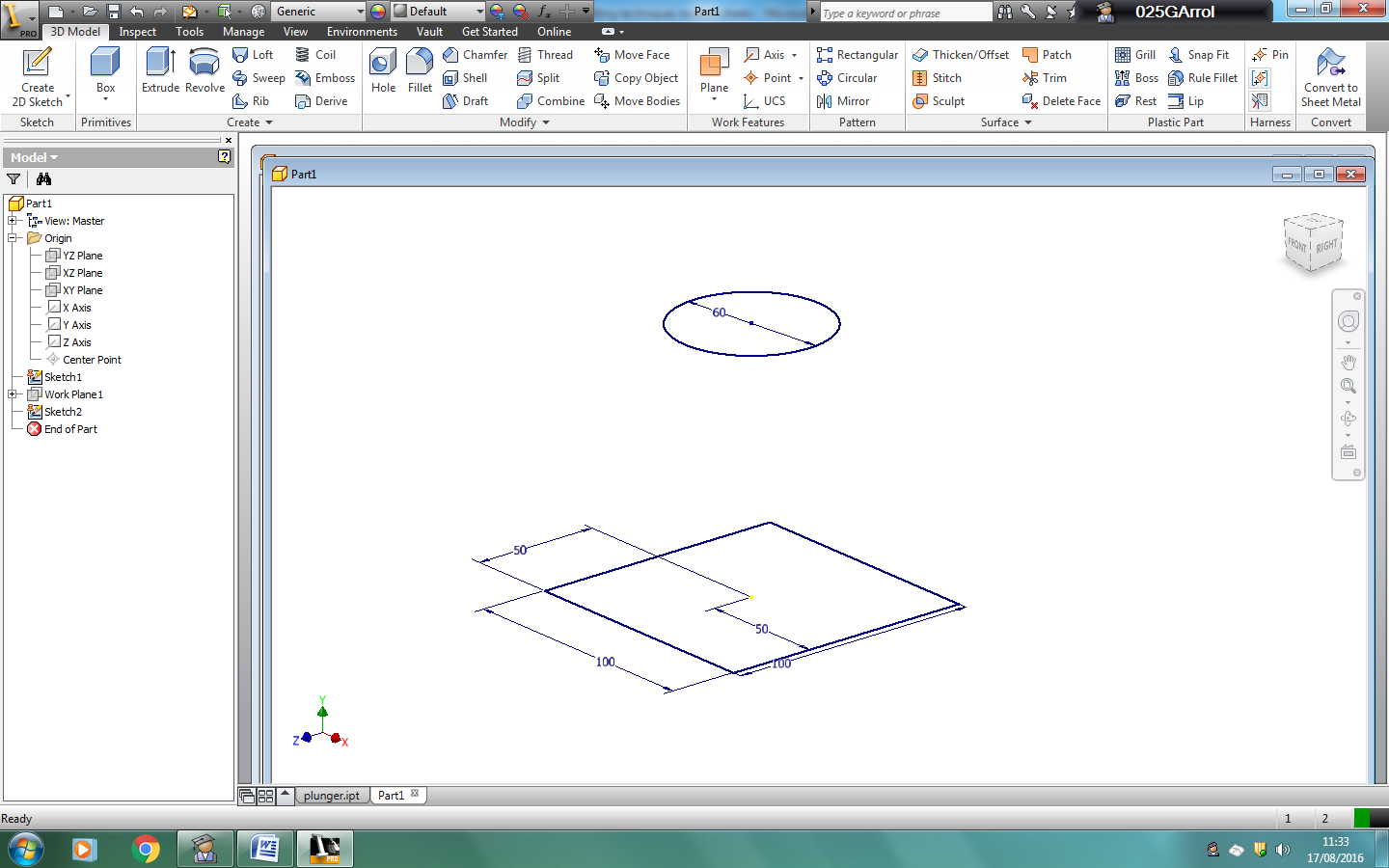
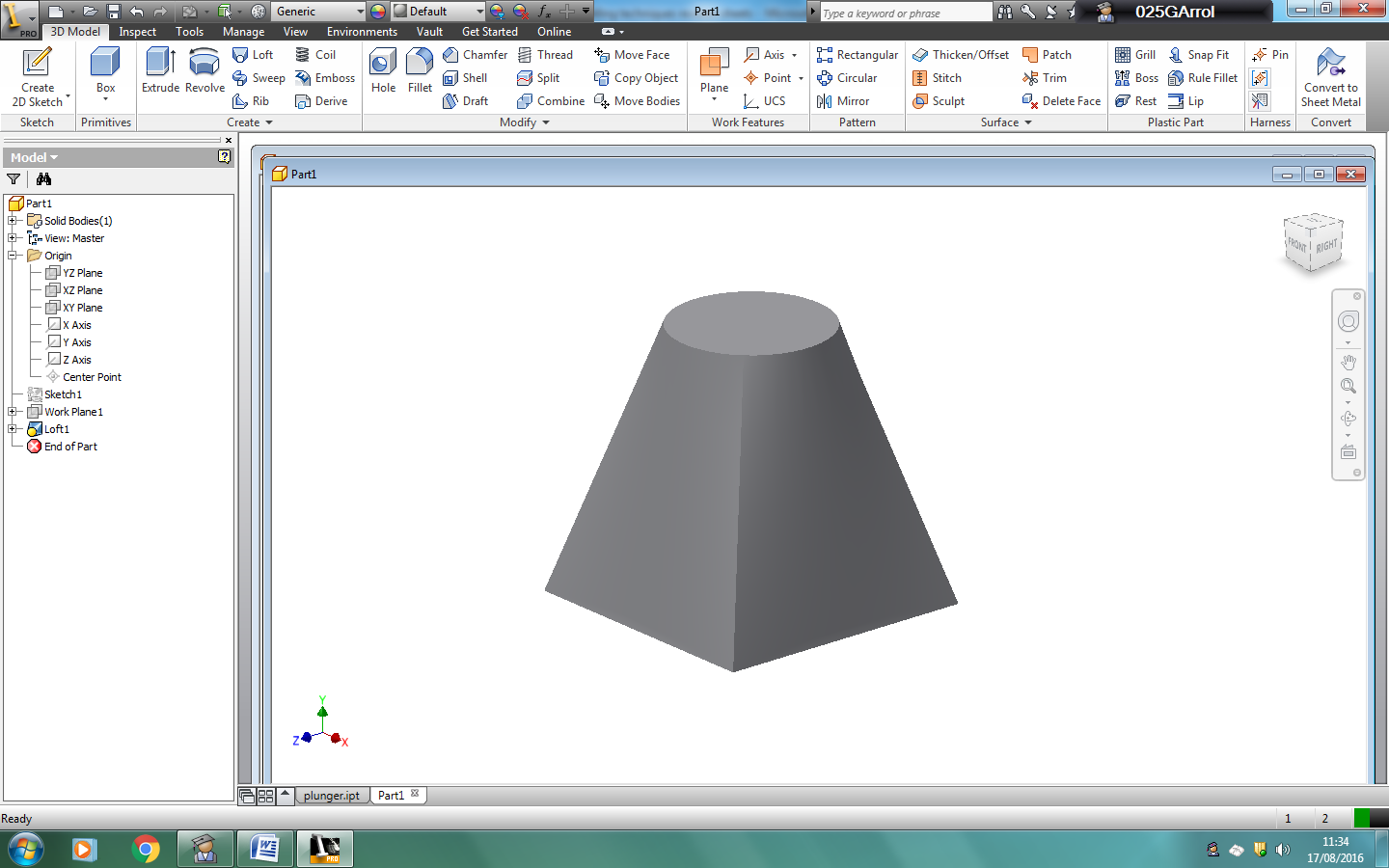
2D Sketch 3D Extruded Model

**Revolve**

Revolve is a powerful tool which is used to create 3D models which are cylindrical or conical. A 2D sketch is the starting point, which is then revolved around an axis to create the 3D model.

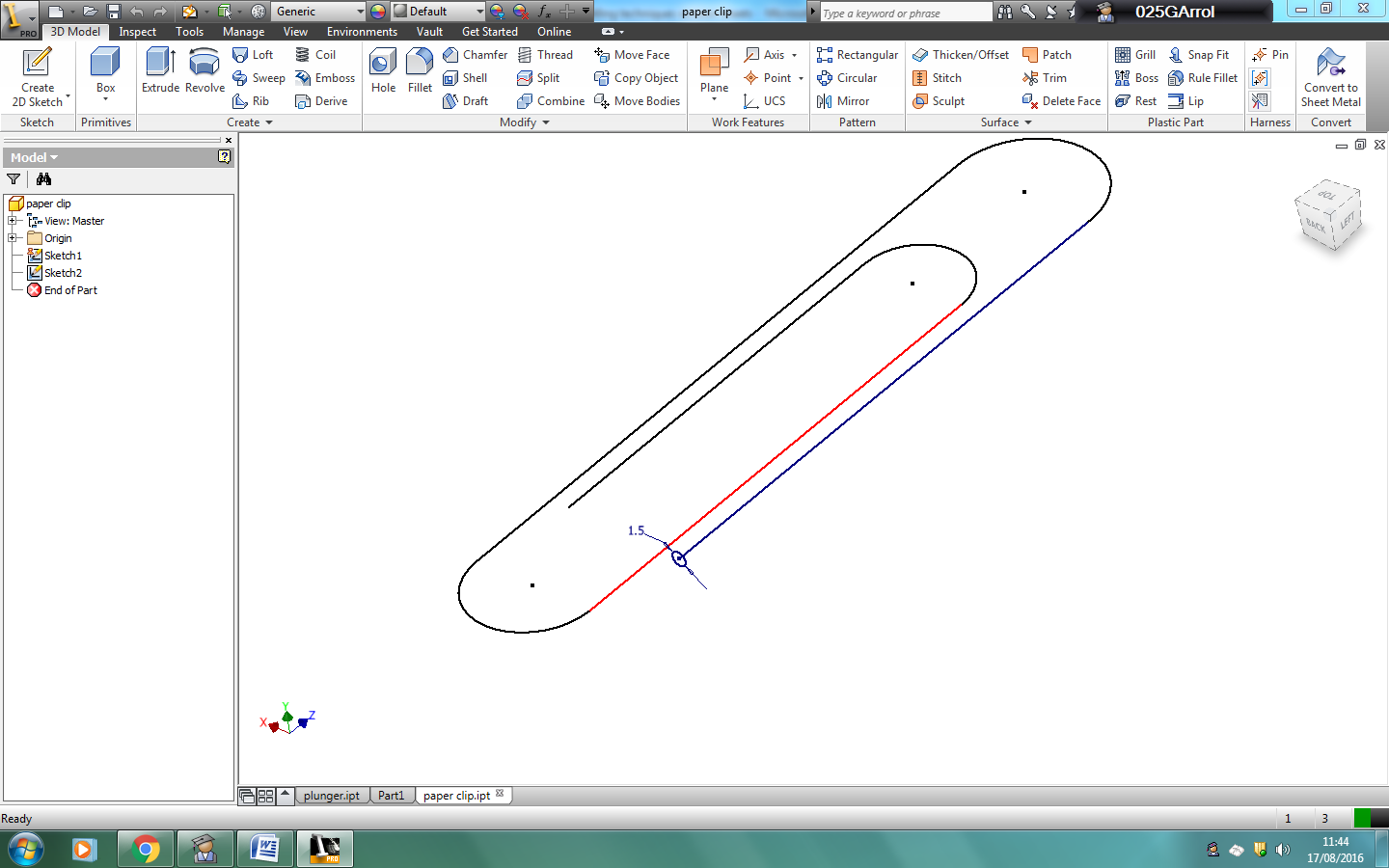
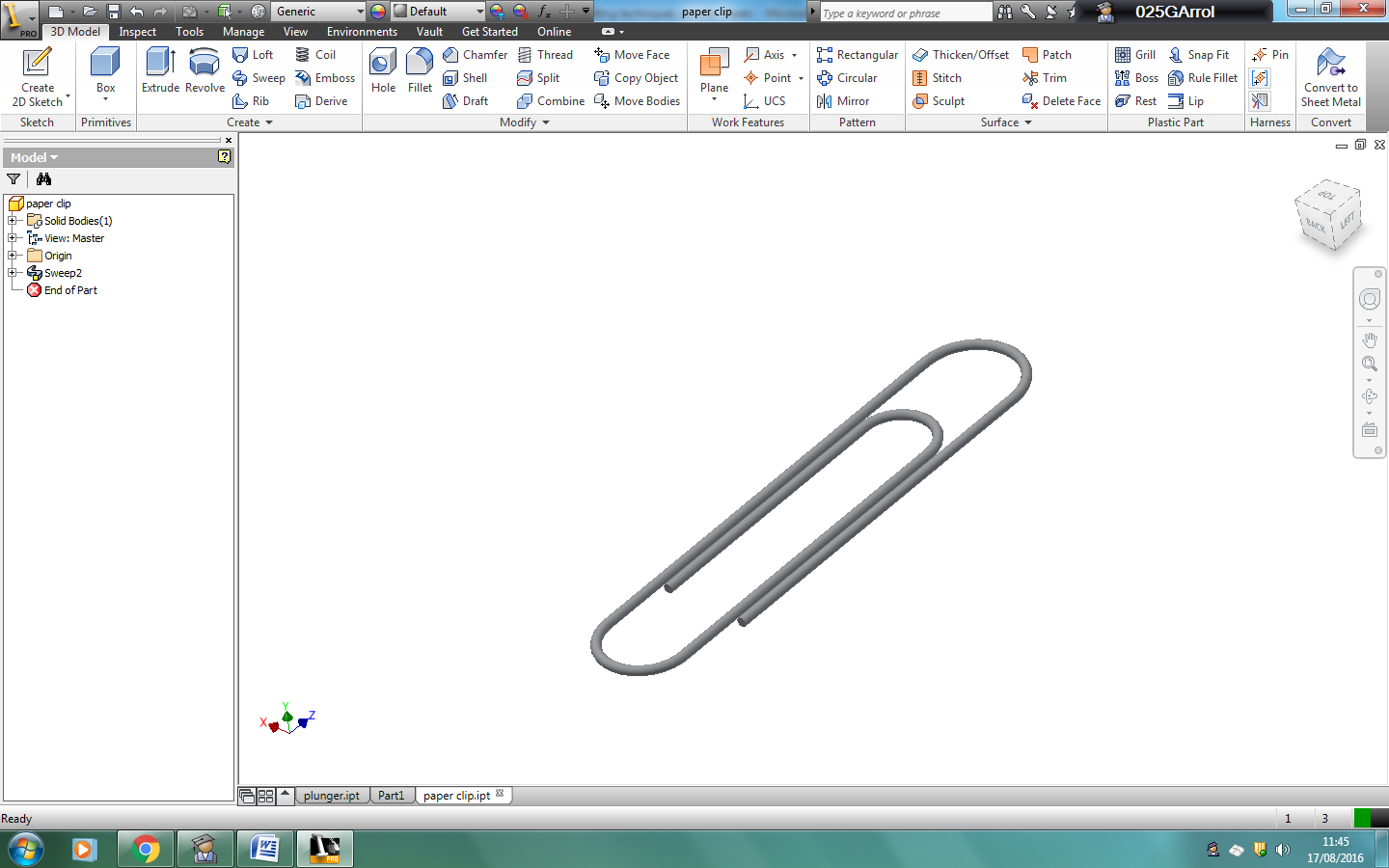
2D Sketch 3D Revolved Model

**Loft**

A loft is a 3D modelling technique which allows you to create complex shapes which have a transition in shape from one profile to another; e.g. from square to circle.

Sketches of two shaped profiles Lofted 3D Model

**Extrusion Along a Path (sweep)**

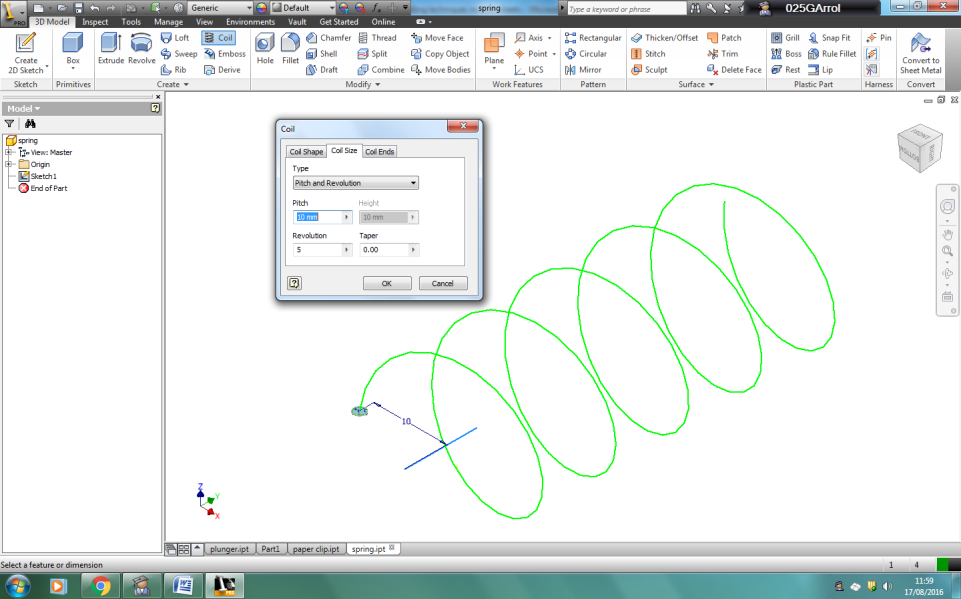
Extrusion along a path works in the same way as a normal extrusion, a 2D profile or sketch is drawn then this is extruded to create a solid 3D model. The difference with an extrusion along a path is that the extrusion follows a curve or drawn path to create the solid 3D model.

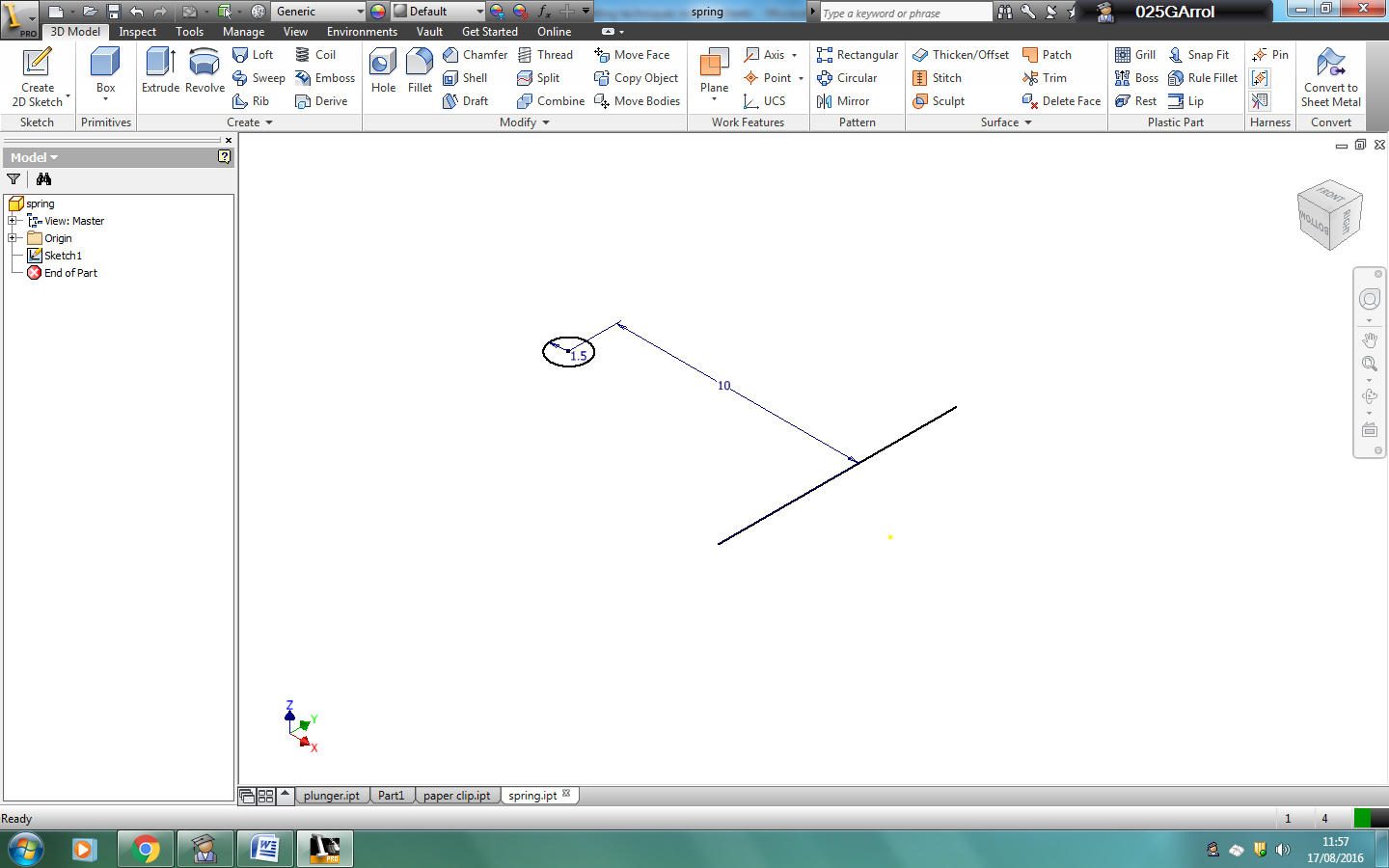
Path for extrusion to follow

Circular Profile

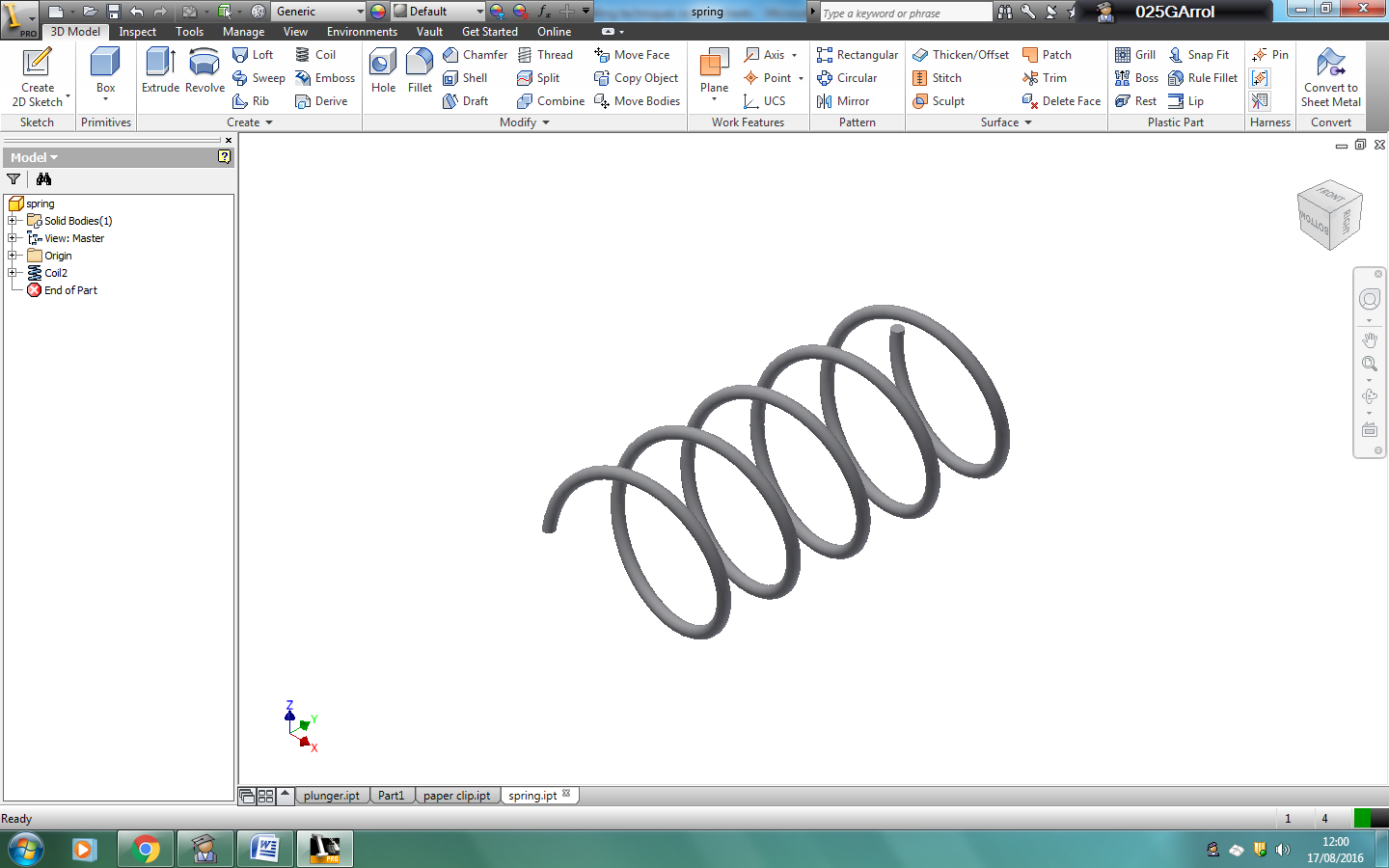
Circular Profile and a sketched curved Path Completed 3D Model

**Helix**

This technique is used to create springs or the thread on a screw. It involves drawing a profile which is then revolved about an axis at the same time as extruding. The number of rotations about the axis and pitch or distance between revolutions must be specified to complete the 3D model.



Circular profile and axis sketched

 Helix command specifying pitch and number of Revolutions.

Finished Helix 3D model of a spring.

**Edits**

In addition to the techniques outlined above, you will also have to have knowledge of the following editing techniques.

1. Shell
2. Fillet
3. Chamfer
4. Array (radial, linear and box)
5. Mirror