Geometric shapes and forms

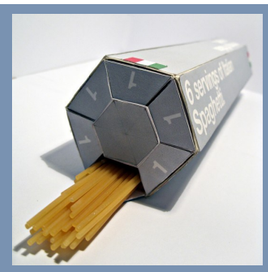
Geometric forms are the basis for many different 'real-life' objects, and it is important you understand their properties. You need to know what they would look like after being manipulated—such as cuts or being 'unfolded' into **developments.**

Your **'AquaJ'** bottle consisted of three cylinders with extra features, and the label was the development of a cylinder.

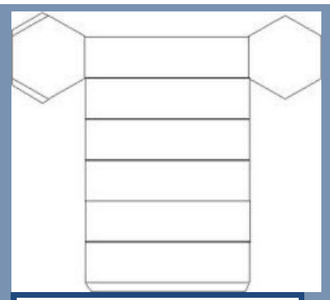
Here are some examples of **prisms, cones, cylinders and prisms** with cuts to them, developments and 'real-life'

Surface developments

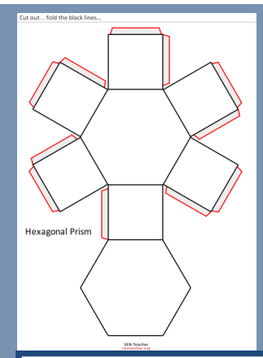
Surface developments are the **'2½D/ 3D'** form 'unfolded' to form what is known as a 'flat pattern' in 3D modelling. It is this form which has to be planned out and drawn accurately before the object can be produced for its intended purpose. If it has not been accurately draw, then it shall not fit together. Even a simple 'cube' as shown here will not be successful if poorly constructed—for example all the sides must be the same height.



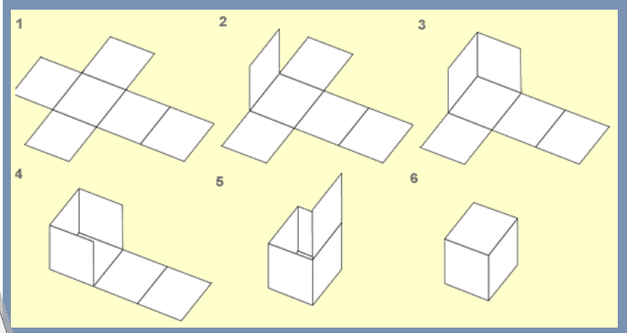
Hexagonal-based prism



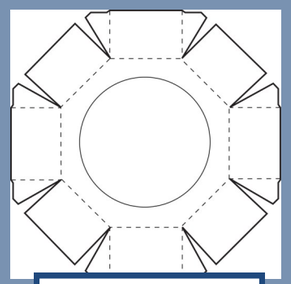
Probable development of spaghetti packet—note the **'long'** sides.



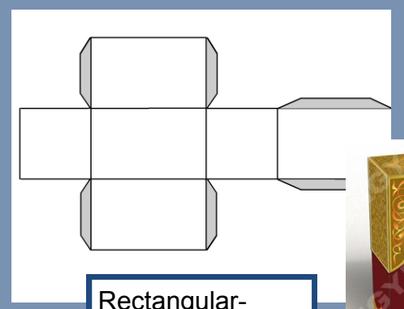
This development has been arranged around the base.



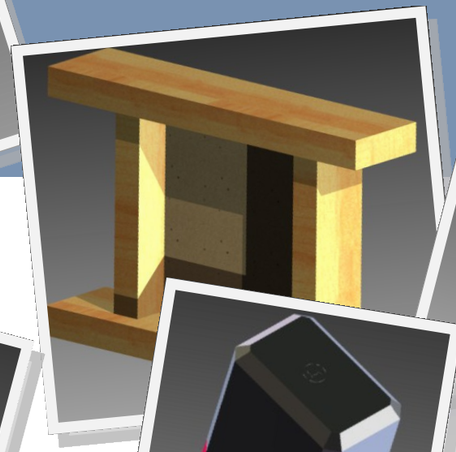
Square-based prism

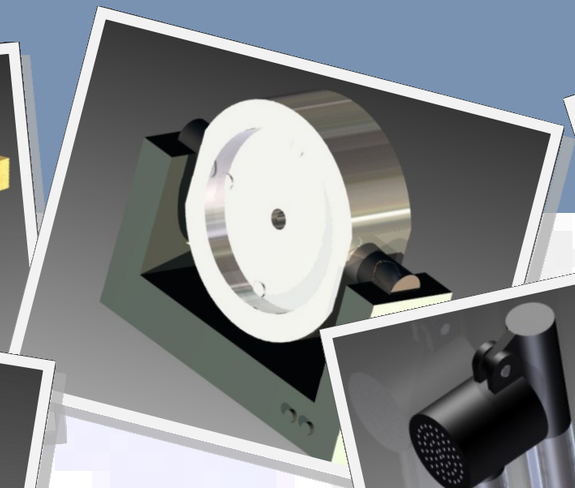


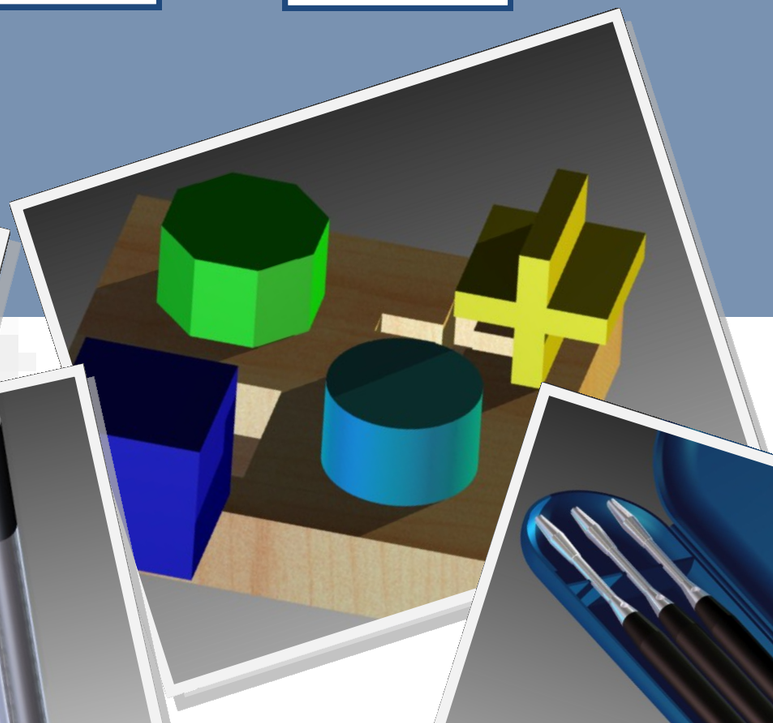
Octagonal-based prism



Rectangular-based prism



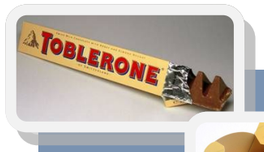




Geometric shapes and forms

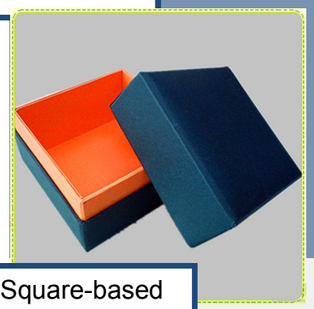
Prisms

These are the simplest of the geometric forms. They have a **straight sided base**—square, rectangle, hexagon, etc.— and **vertically straight** sides. Each prism's name is due to the shape of its base—hexagonal prism, etc. and provide the basis for many uses, especially product packaging.



Triangular-based prism

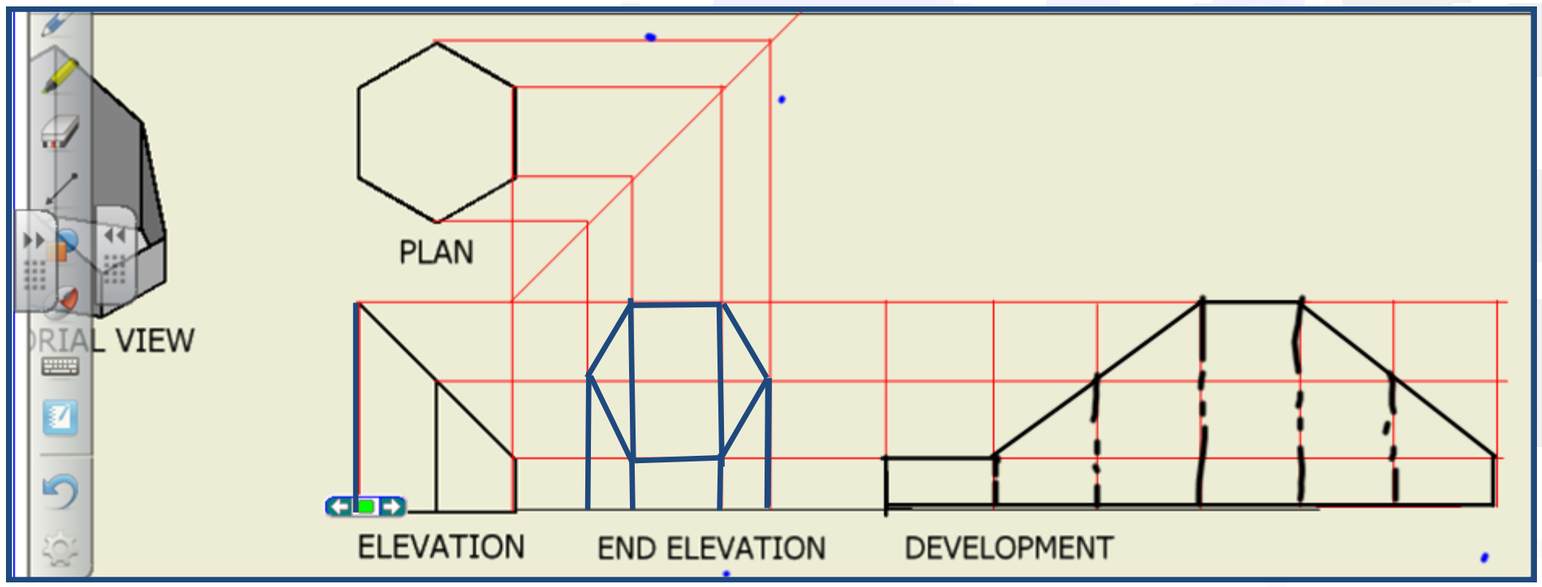
Hexagonal-based prism



Square-based prism

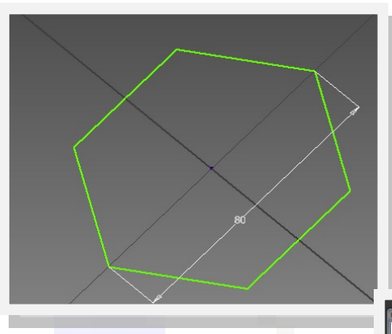
Octagonal-based prism

Using manual methods

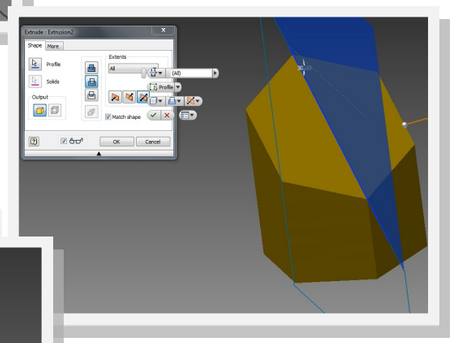


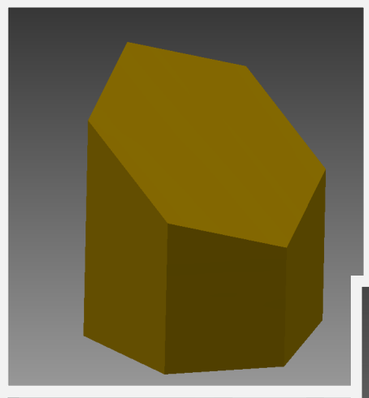
Three views of a cut hexagonal prism and its development.

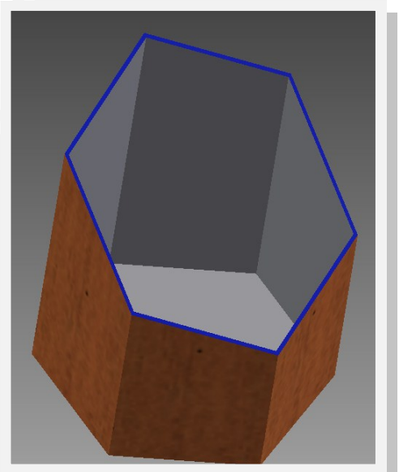
Using 3D modelling



This hex based prism has been produced and cut using the **Extrude** tool.







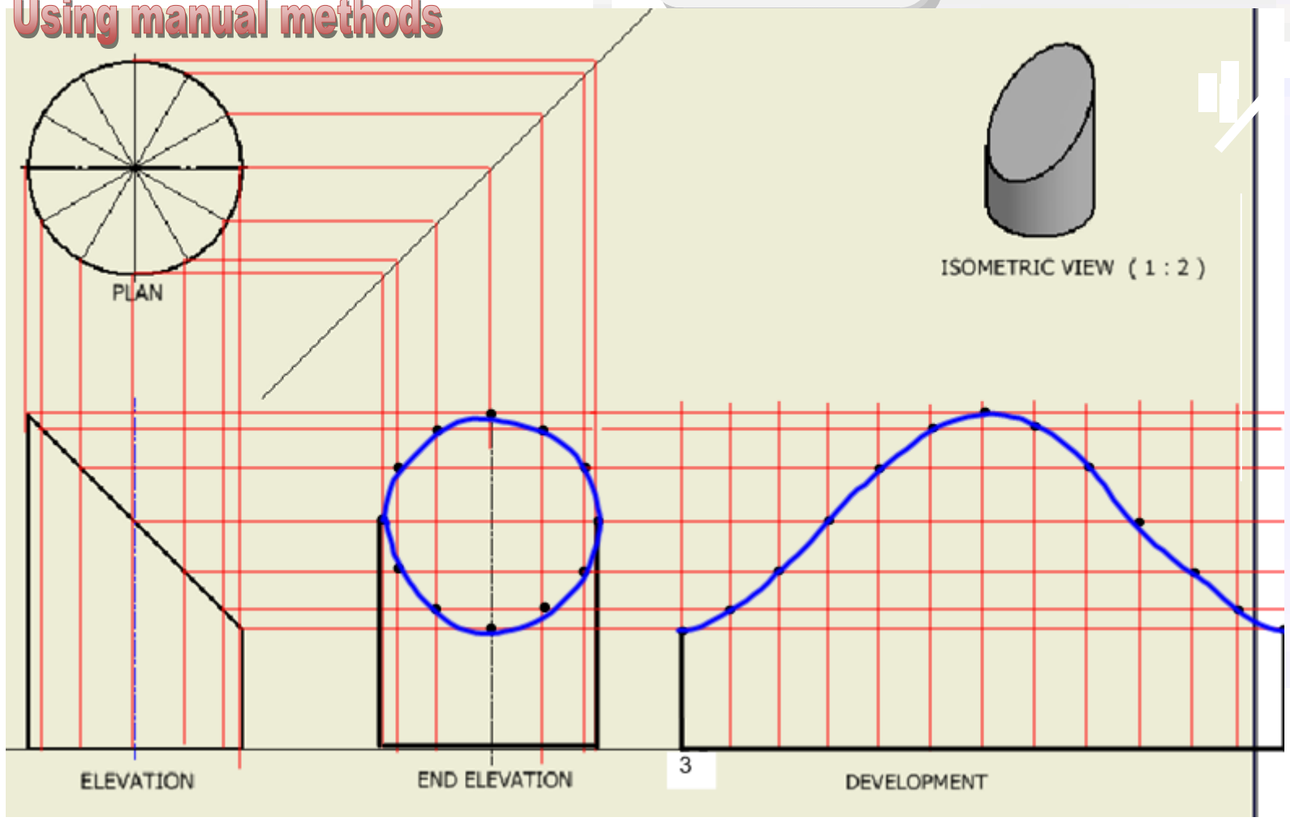
The solid prism has been **shelled** to give it a hollow characteristic to enable it to be used for packaging.

Geometric shapes and forms

Cylinders

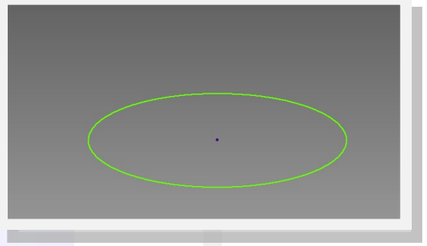
Cylinders are fundamentally circular-based prisms. Cylinders are widely used for many purposes and are frequently cut or **truncated** depending on their function.

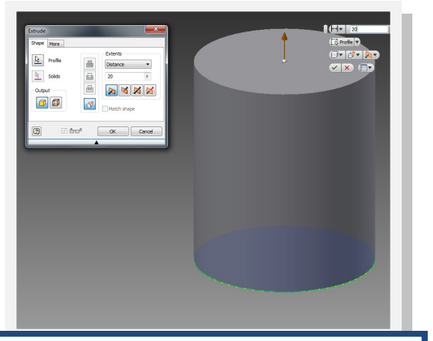
Using manual methods

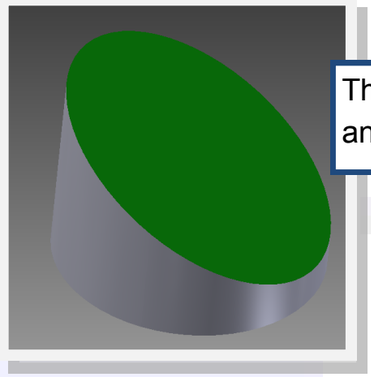


Three views of a cut cylinder and its development.

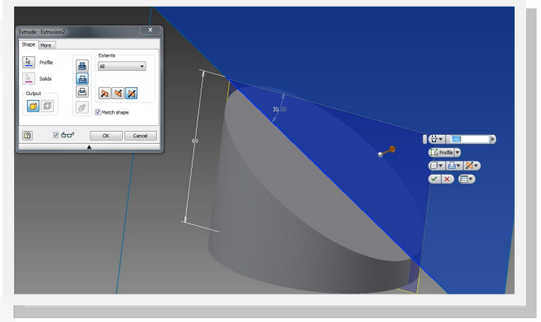
Using 3D modelling



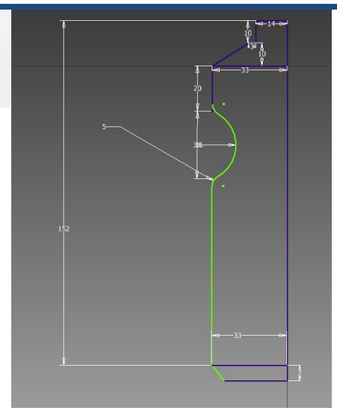


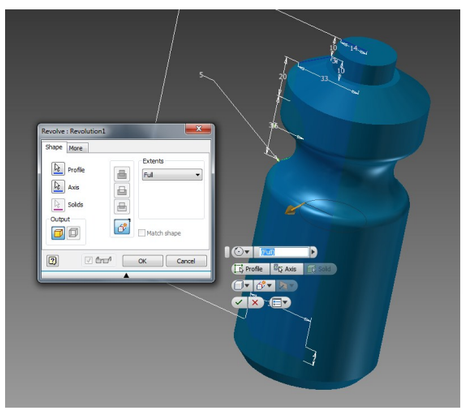


This cylinder has been produced and cut using the **Extrude** feature.



This cylinder has been produced and cut using the **Revolve** feature. It enables more complex cylinders to be achieved.





Geometric shapes and forms

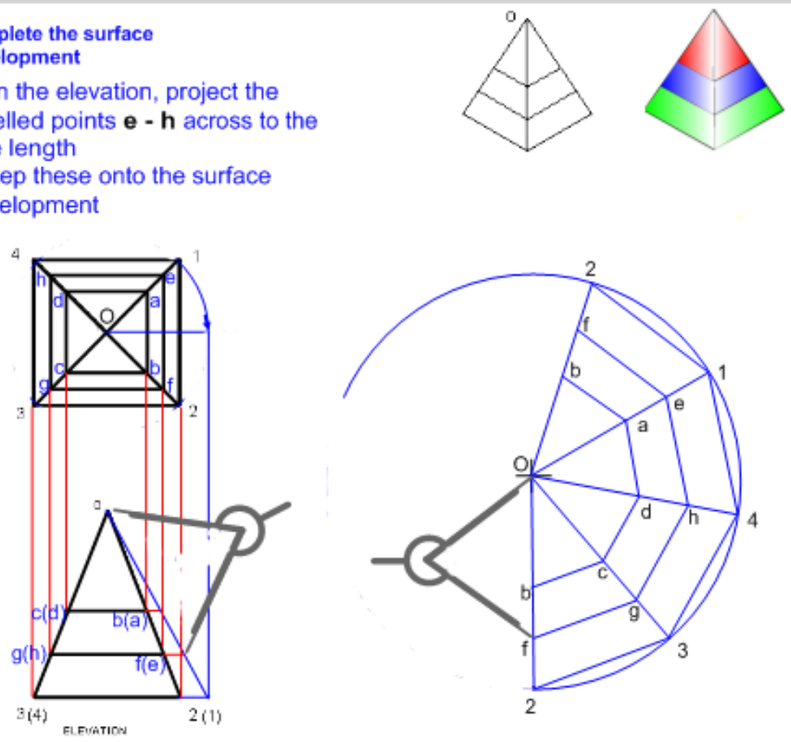
Pyramids

Pyramids may be thought of as prisms with a straight-edged base with sides which rise to a single point. The base can be any number of sides just like a prism. They can form the basis for a range of functions from buildings to furniture to packaging.

Using manual methods

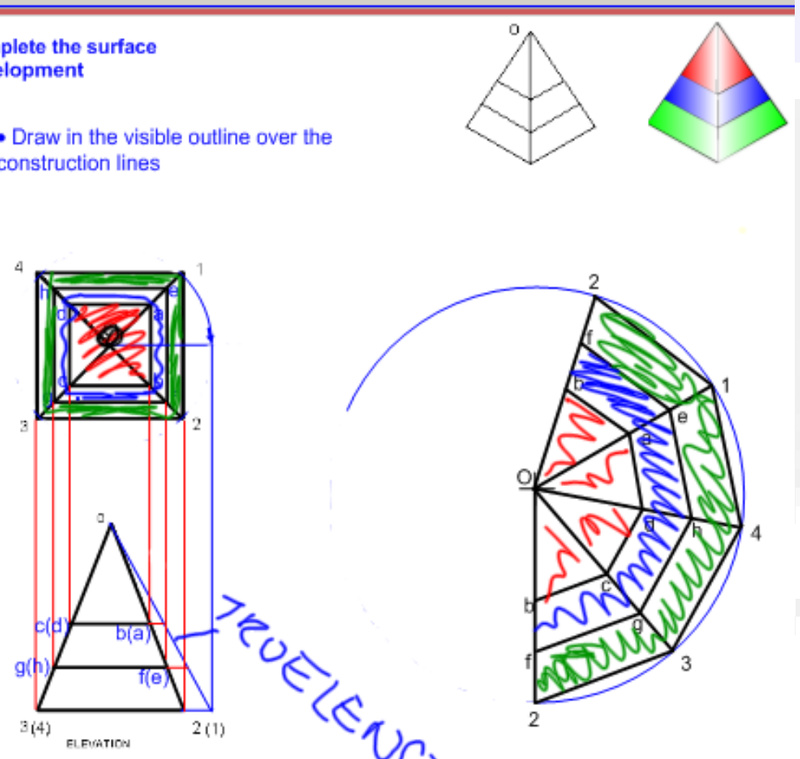
Complete the surface development

- On the elevation, project the labelled points **e - h** across to the true length
- Step these onto the surface development

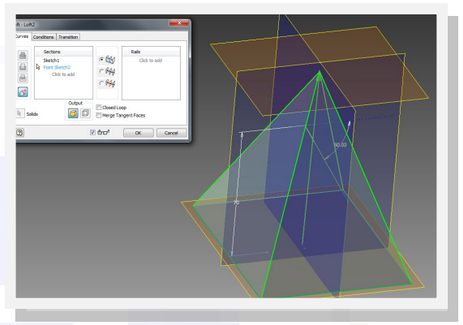


Complete the surface development

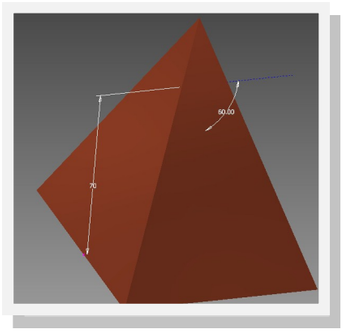
- Draw in the visible outline over the construction lines

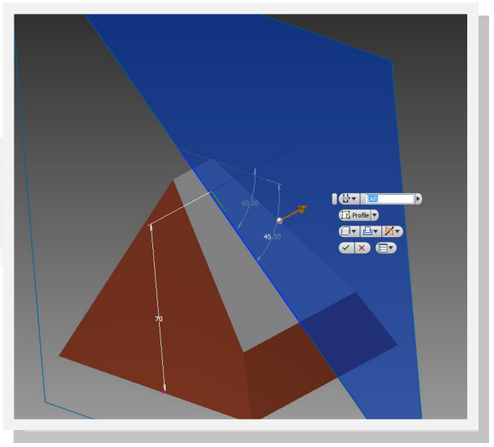


Using 3D modelling

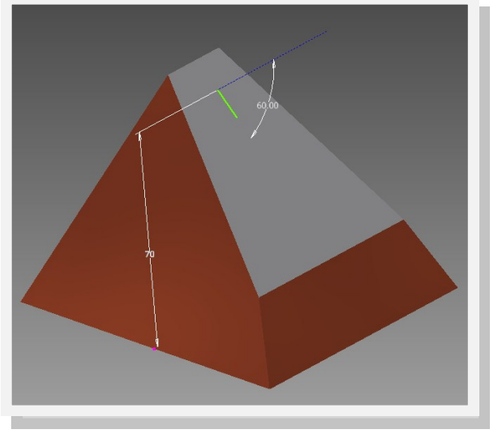


This pyramid has been produced using the **Loft** tool.





The pyramid has been cut using the **subtraction** tool within extrude.

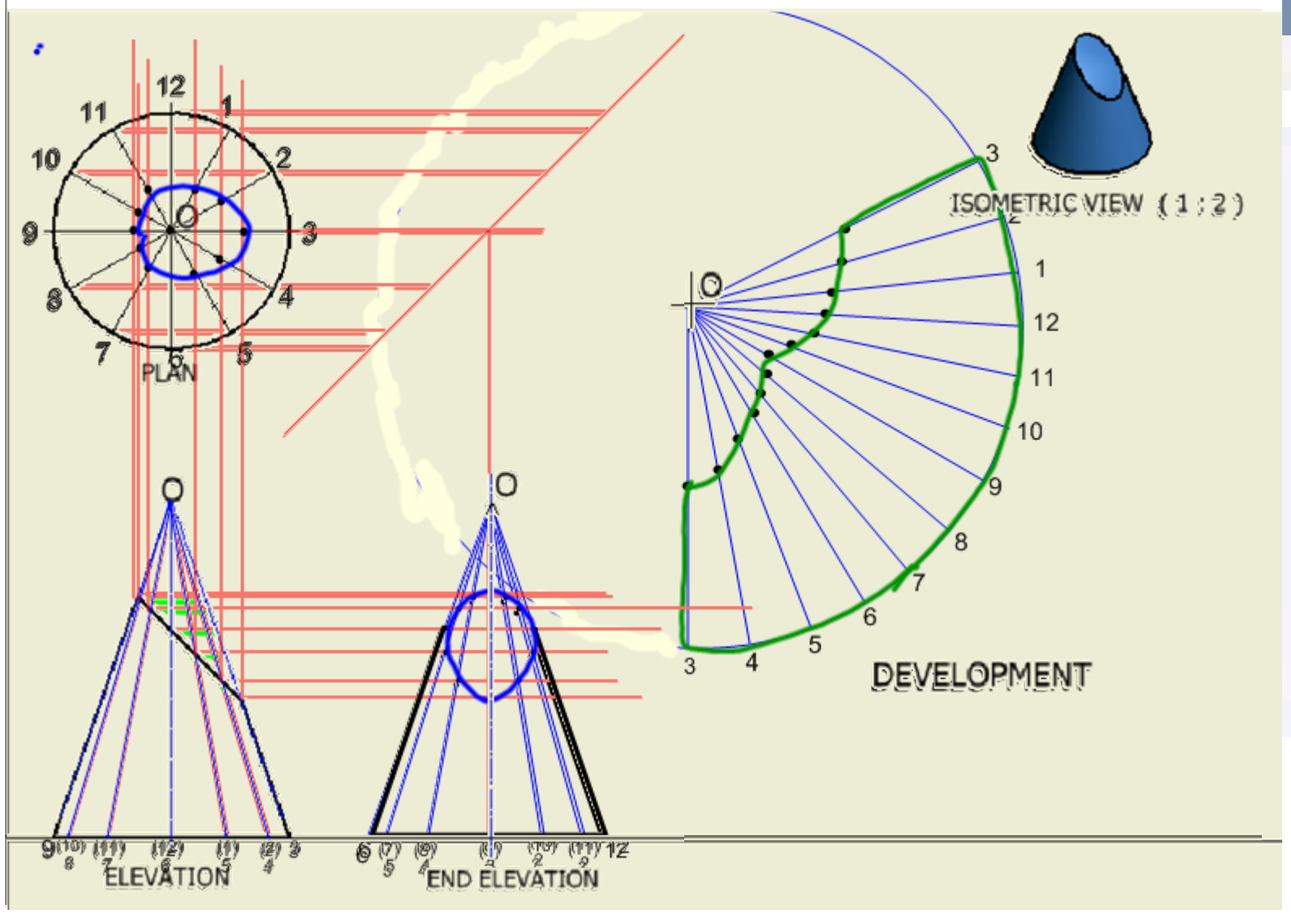


Geometric shapes and forms

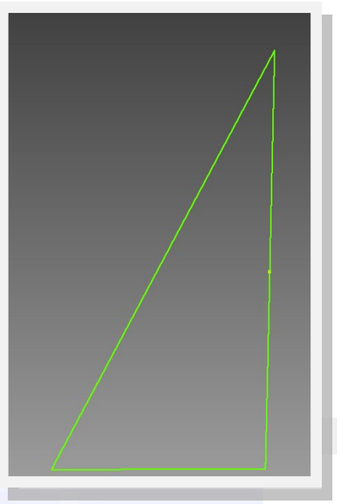
Cones

Cones have **round** bases and this rises towards a singular point. They are frequently used for displays, packaging and other designs.

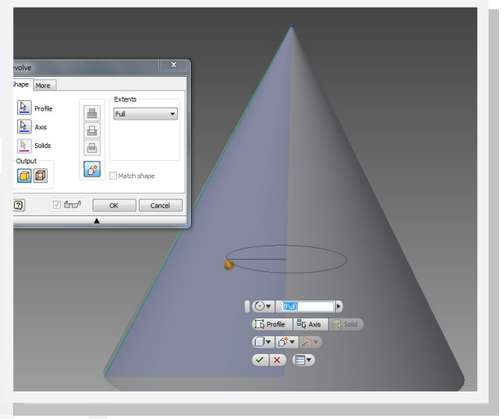
Using manual methods

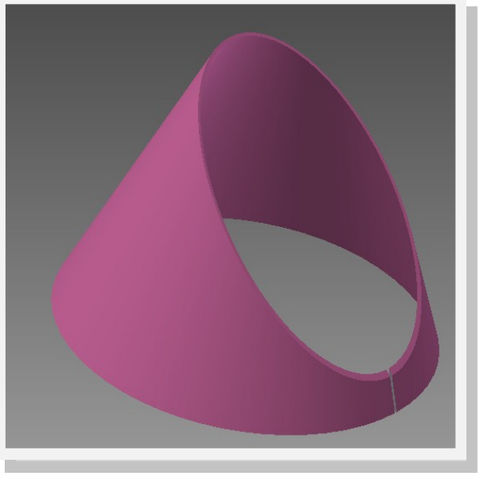


Using 3D modelling



The cone has been produced using the **revolve** tool.



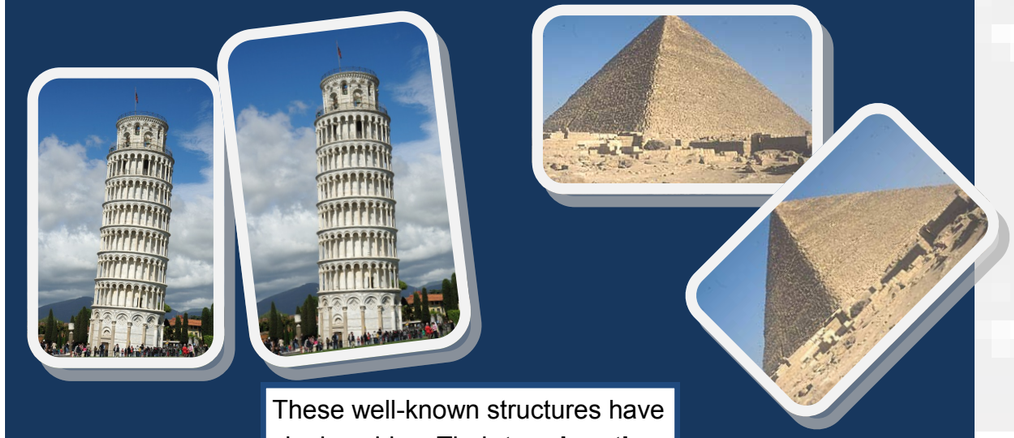


The cone has been cut and shelled here.

Geometric shapes and forms

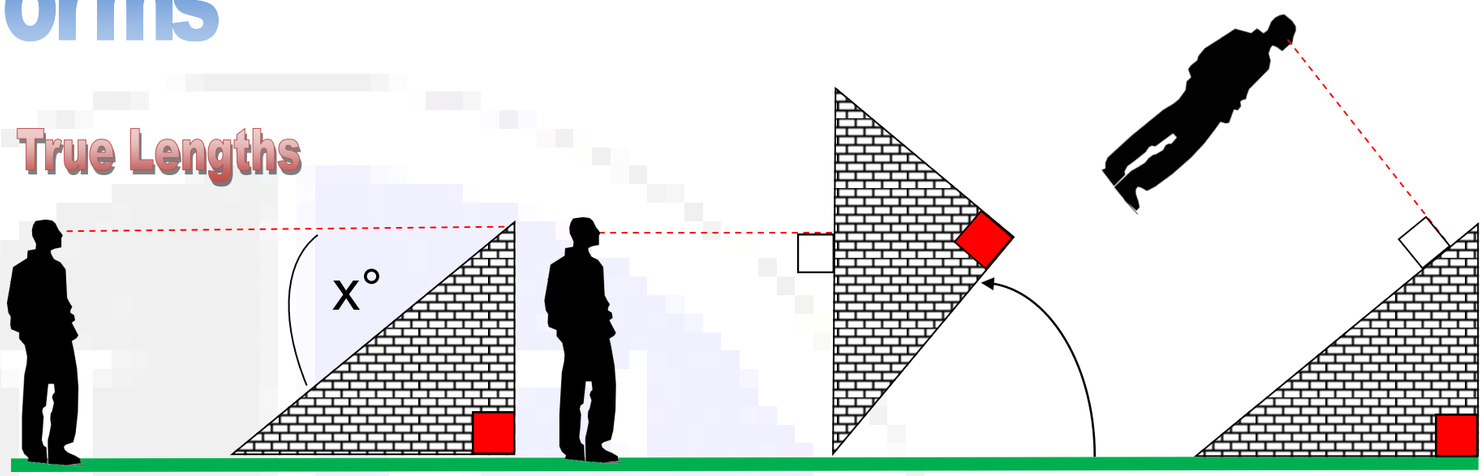
True lengths and shapes

The **true shape** and/ or **length** of an object can only be seen if one looks at the surface at an angle of 90°. In your exam you can be asked to identify different true shapes of sectioned objects



These well-known structures have sloping sides. Their **true length** can only be observed as shown by the graphic to the right.

True Lengths



The line of the man's sight is at an acute angle to the slope of the wall. That means that he is not seeing the **True Length** of the slope. If you think of Pythagoras' Theorem you did in maths, you will remember that this side is the largest of the three in a right an-

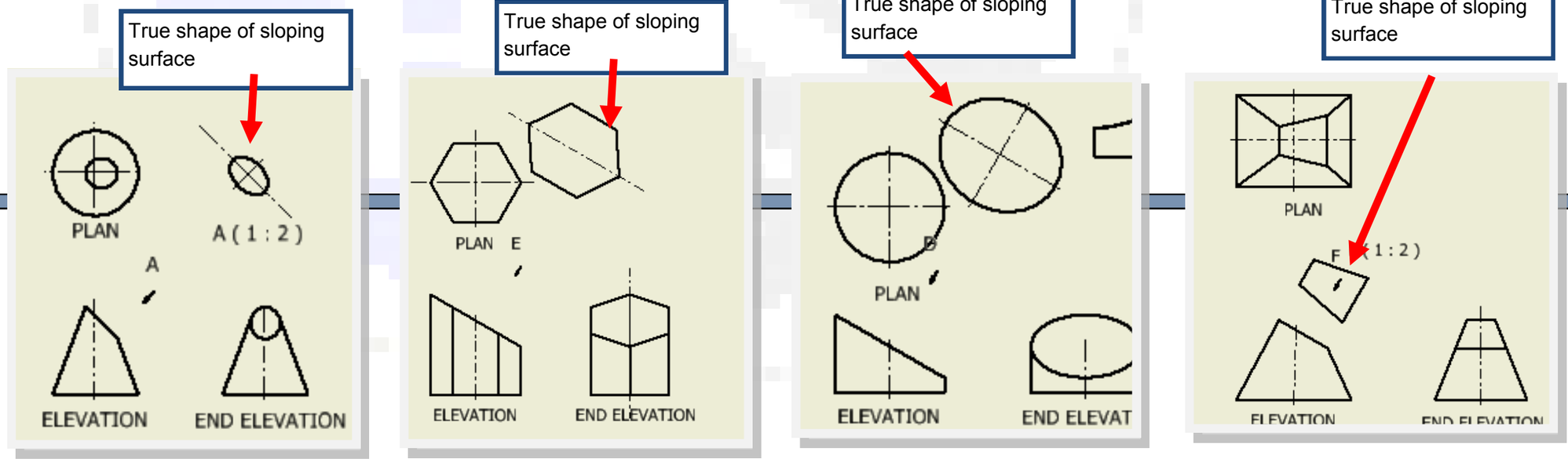
If the wall has been rotated so the man is seeing the 'slope' at an angle of 90°. This means that he is seeing the **true length** of the sloping wall. Note that it is now a lot higher in relation to his vertical height.

This view shows what the man would see if it was **his** position which had changed in relation to the sloping wall. He is still looking at the slope at an angle of 90° so he is looking at its **True Length.** It is this concept—of looking at the object at 90° to the sloping surface— that you need to understand when identifying true

True Shapes

Drawing and identifying these views requires you to use the same principles adopted to achieve the **true length.** In this case, it is the entire **surface** of the sloping face which is created, rather than a single line.

So think of the third graphic above, with the man 'hovering' above the wall at an angle of 90° to the slope. Several



Geometric shapes and forms

True lengths and shapes using 3D modelling

3D modelling is an excellent way to visualise objects from different angles. It enables the user to quickly rotate it via the mouse and therefore is ideal for looking at the true shapes of many different angled surfaces. Here are several examples of various forms. Doing this yourself is a very effective way to reinforce the ideas previously covered in these notes.