

## 3D Tutorials

### *Creating and Manipulating Polygon Primitives*

Tutor: Robin Sloan r.sloan@abertay.ac.uk

This series of tutorials will cover the basics of 3D modelling, texturing and animation in **Autodesk Maya 2008**. However, many of the core concepts will be applicable to other versions of Maya and other 3D packages.

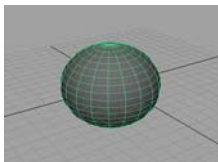
## 1. Introduction

This tutorial is for beginners in 3D or Maya. It deals with the creation and editing of polygon primitives, and touches on the use of Boolean operations for combining polygon meshes. If you are new to Maya, it is recommended that you first read the tutorial *Interface, Navigation and Transformation Tools*. If you wish to learn more about polygon modelling, you should read through the *Basic Polygon Modelling* tutorial.

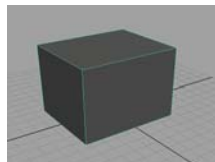
Before you begin this tutorial, make sure that you have Polygons selected in the Menu Selector on the status line. In older versions of Maya, this menu set is called Modelling. For the duration of this tutorial, you will be accessing tools from the Create and Edit Mesh (Edit Polygon in older versions of Maya) drop down menus.

## 2. 3D Primitives

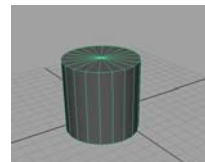
Most 3D polygon models begin with one or a number of polygon primitives, which are like 3D customizable brushes for creating basic geometric forms. Typical primitives across all 3D packages are the cube, plane, cylinder, cone/pyramid and sphere. In Maya 2008, the following polygon primitives can be created by going to Create ► Polygon Primitives:



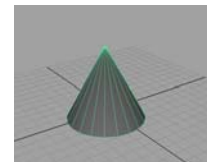
Sphere



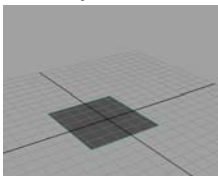
Cube



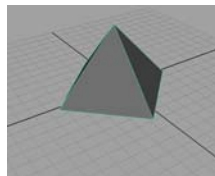
Cylinder



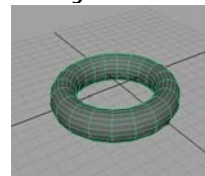
Cone



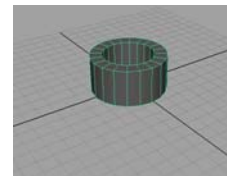
Plane



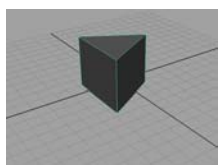
Pyramid



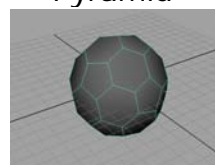
Torus



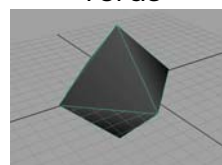
Pipe



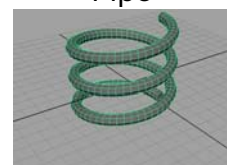
Prism



Soccer Ball



Platonic Solids



Helix

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Generally, most 3D models can be created using cubes, cylinders, planes and spheres as the base forms. Some primitives are very similar. For instance, the pyramid is essentially a 4 sided cone, which in turn is a cylinder in which the top vertices have been merged.

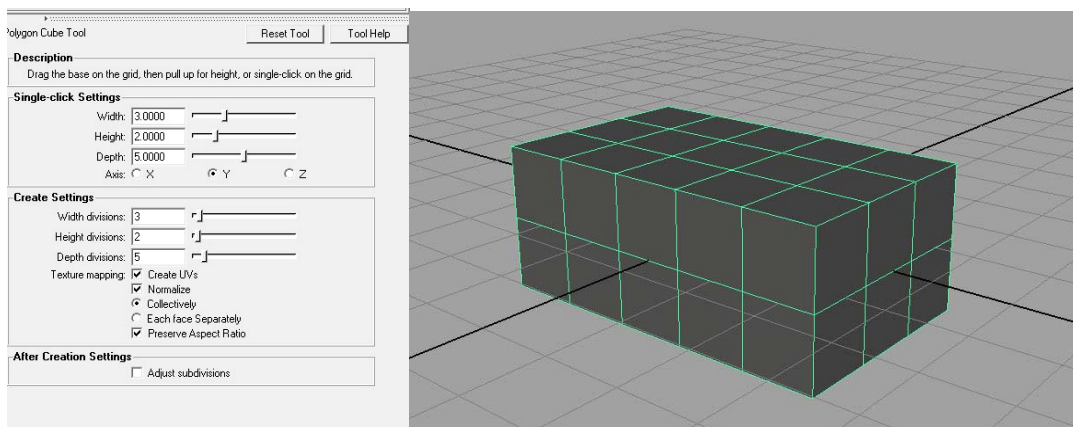
Try creating all of the above primitives in the viewport to get used to the process of creating polygon forms. Remember to press 5 on the keyboard to turn on shaded mode.

### 3. Primitive Creation Attributes

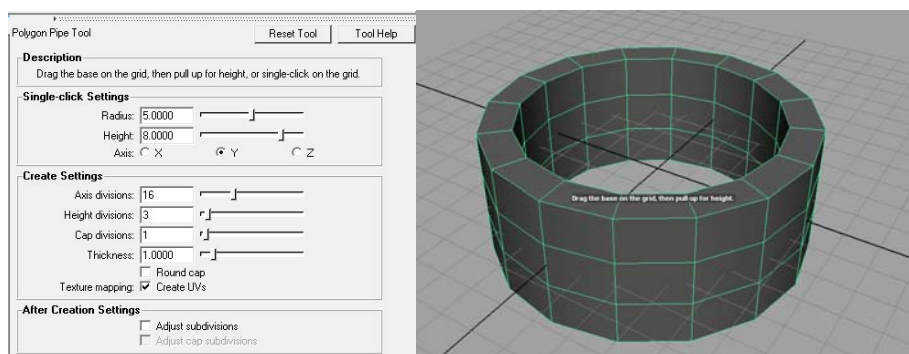
When creating polygon primitives, you will usually want to tweak the attributes of polygon mesh. You can do this before or after you have created the primitive.

To tweak the attributes of a polygon primitive before creating it, simply click on the  next to the polygon primitive under Create ► Polygon Primitives.

For instance, click on Create ► Polygon Primitives ► Cube . This will bring up the Polygon Cube Tool settings on the right of the interface. In here, you can change creation settings such as width, height and depth, and set the number of divisions. The settings below left were used to create the cube below left.



Another example with Create ► Polygon Primitives ► Pipe  is shown below.

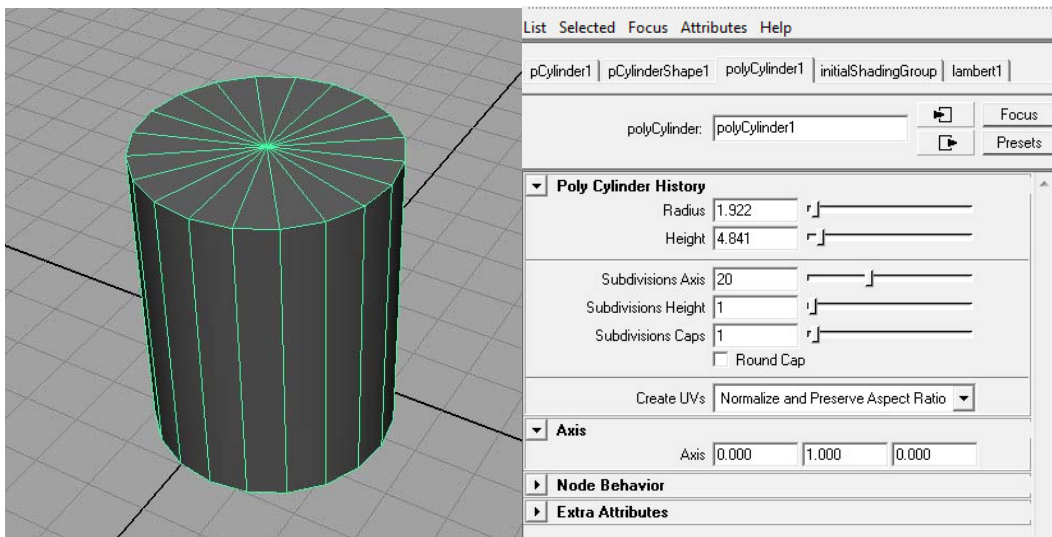


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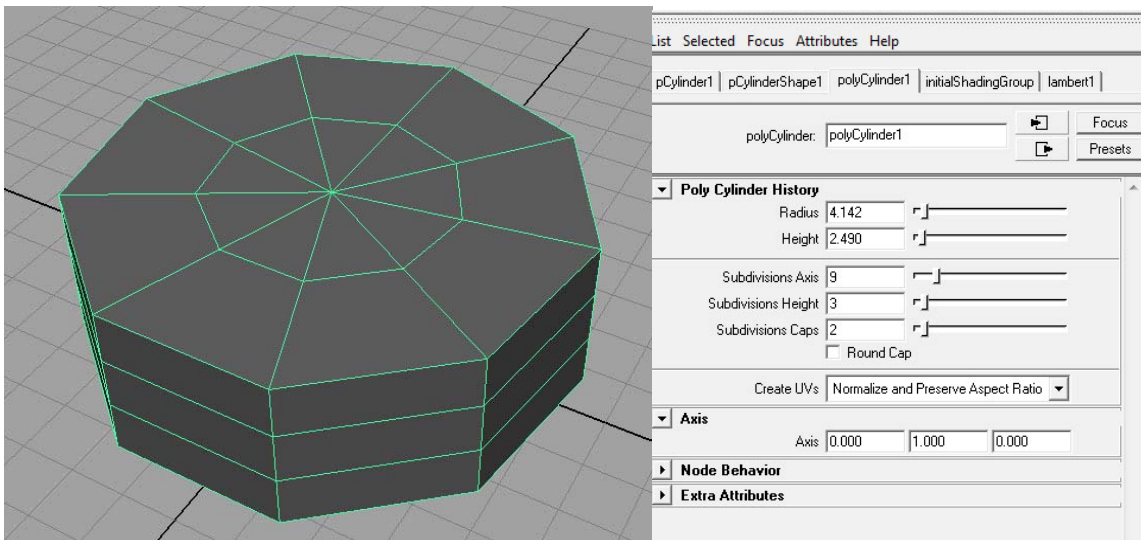
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You can edit the attributes of a polygon primitive after it has been created by using the Attribute Editor. For instance, if a cylinder has been created like the one shown below left, its creation attributes can be modified by clicking on the Attribute Editor (left most of three icons in the top right of the interface) and selecting the polyCylinder tab (below right).



By tweaking the values of various attributes, you can radically change the appearance of the polygon primitive...



Try creating all of the polygon primitives and manipulating the creation attributes to see the wide range of basic polygon meshes you can create using just the polygon primitive tools.

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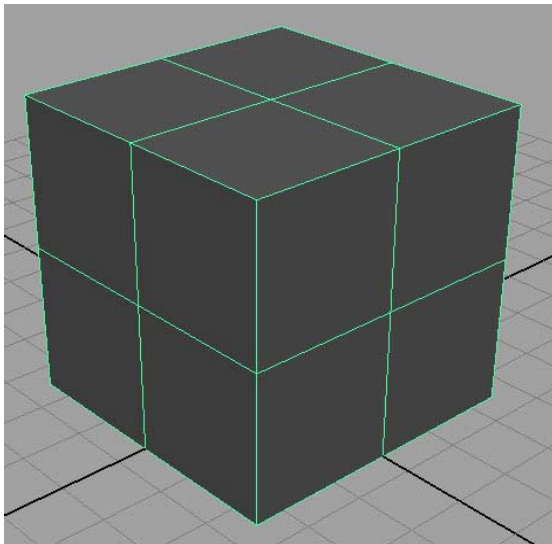
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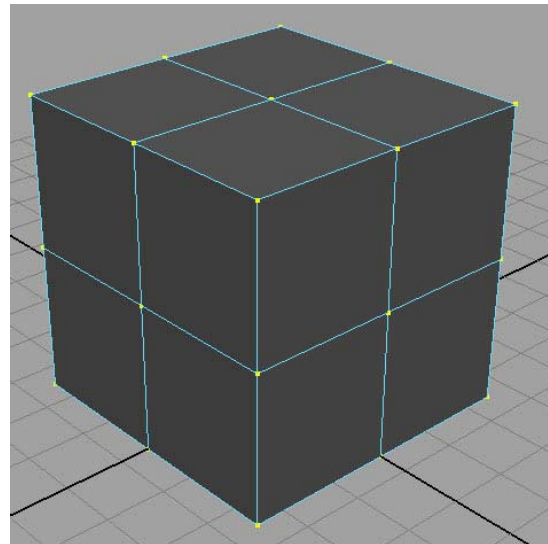
#### 4. Manipulating Polygon Objects at the Sub-Object Level

Polygon meshes can be manipulated at the object level by selecting them and using a range of transformation tools, including move, rotate and scale. Meshes can also be manipulated at the sub-object level, i.e. manipulating the vertices (points) edges (lines) and faces (polygons) that make up the polygon mesh (object).

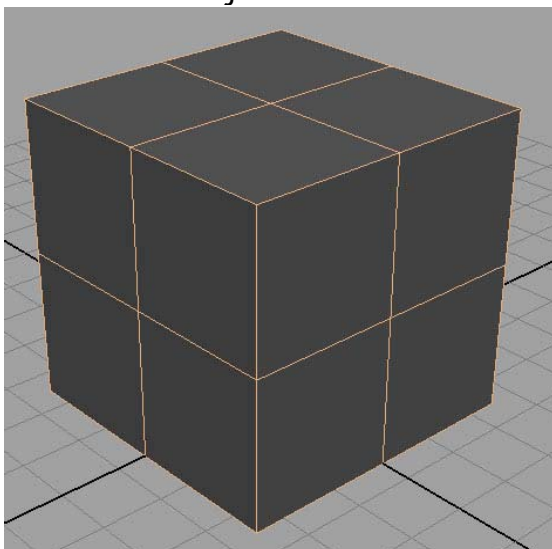
To manipulate a polygon object at the sub-object level, hold the right mouse button over the object and choose which level you want to work with (e.g. vertex, edge etc.) You can also change which sub-object type you wish to select from the Select drop down menu.



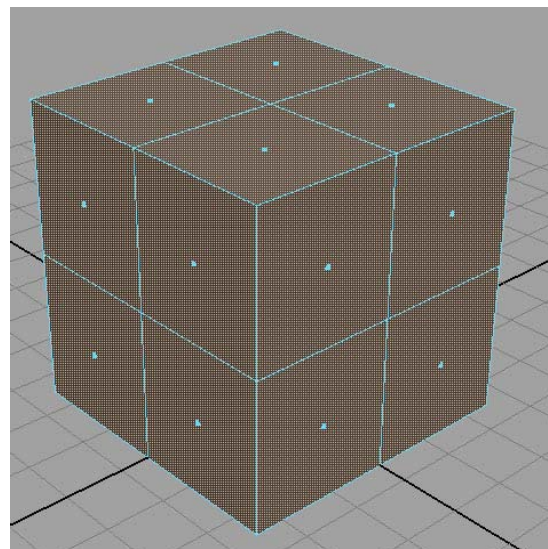
Object mode



Vertex Mode



Edge Mode



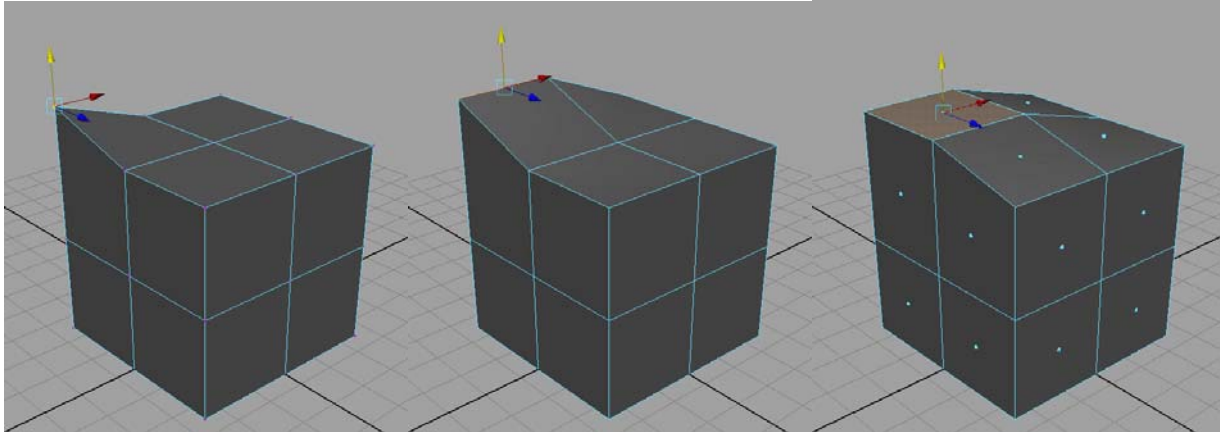
Face Mode

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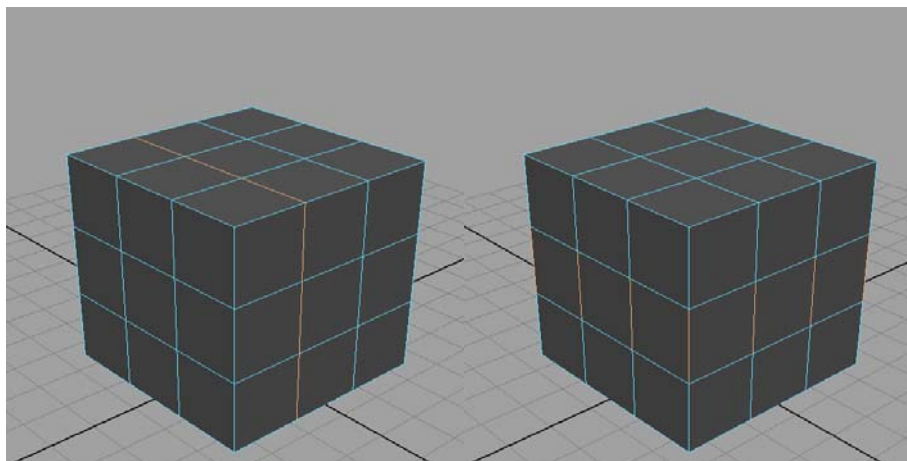
By working at the sub-object level, you can select and manipulate individual or groups of vertices, edges or faces. For instance, you can select and move vertices, edges or faces as shown below...



## 5. Selections

To select multiple elements, simply hold the Shift key while left clicking vertices, edges, faces etc. You can also left click and drag a selection over the sub-object elements you wish to select.

There are also a range of more nuanced selection tools available from the Select drop down menu. Use the Select ► Select Edge Loop Tool and Select ► Select Edge Ring Tool to select loops and rings of edges, as shown below.

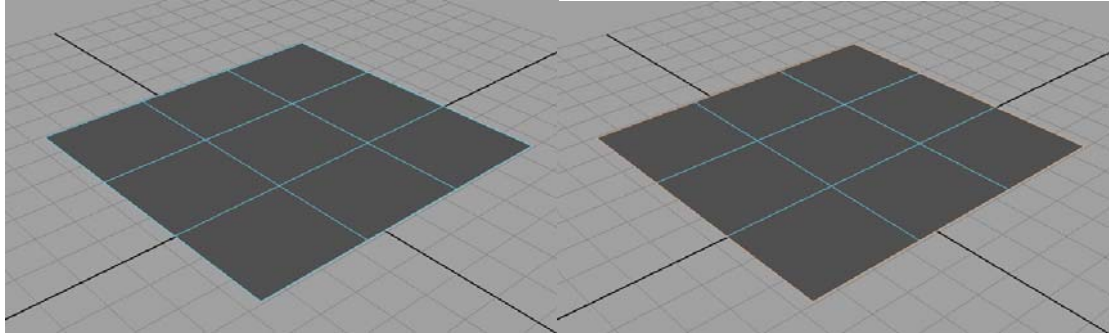


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Similarly, if your object has a border of edges, you can quickly select the border by using the Select ► Select Border Edge Tool.



Select ► Grow Selection Region and Select ► Shrink Selection Region can be used to expand and contract your selection respectively. For example, the selection of one face below can be expanded to all surrounding faces by clicking Grow Selection Region once.

