MESHES IN OBJECT MODE

In this section we'll cover the following topics:

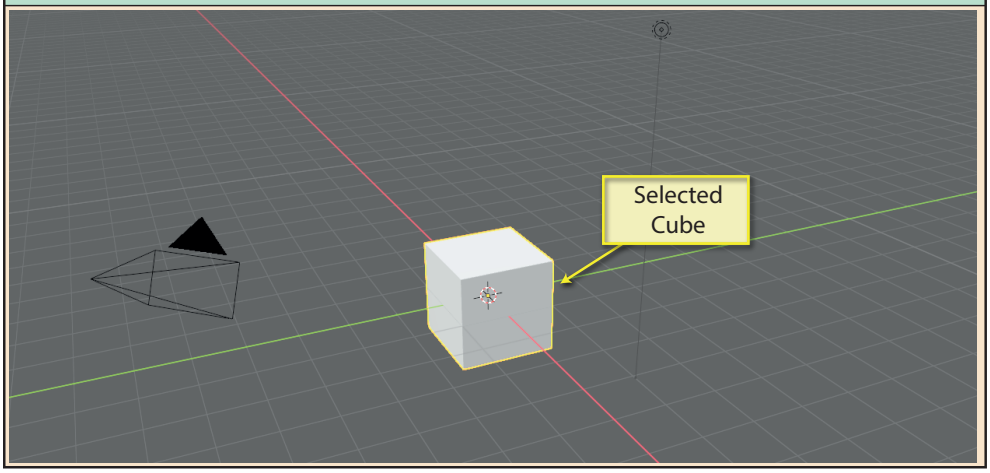
How to create and delete mesh primitives such as cubes, spheres and cones.
How to set the initial properties of primitives.
How to adjust the units of measurement.
The purpose of the 3D cursor.
How to adjust an object's origin.
How to resize, rotate and move mesh objects.

Creating Primitives

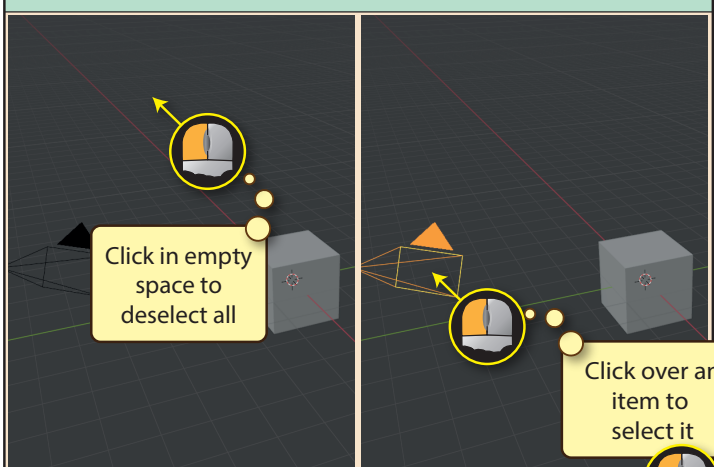
When constructing a scene we often start with one or more primitives.

We have some control over the initial appearance of these primitives so we can adjust some of their characteristics to suit our requirements.

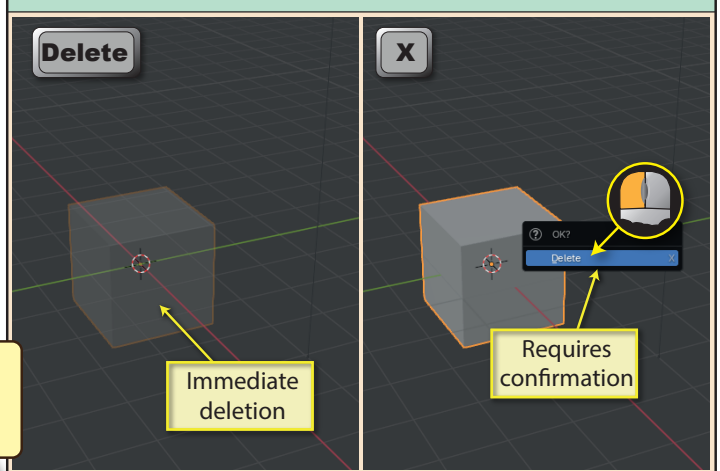
When we start a new project, Blender automatically adds a Cube. We can see from the orange outline that the Cube is also selected.



When working in the ***3D Viewport***, we can deselect an object by clicking in an empty area of the scene.
We can select an item by left-clicking on it.



To delete a selected object, press either the **Delete** key or the **X** key. Using **Delete** deletes the item immediately, but **X** requires confirmation before the deletion is actioned.

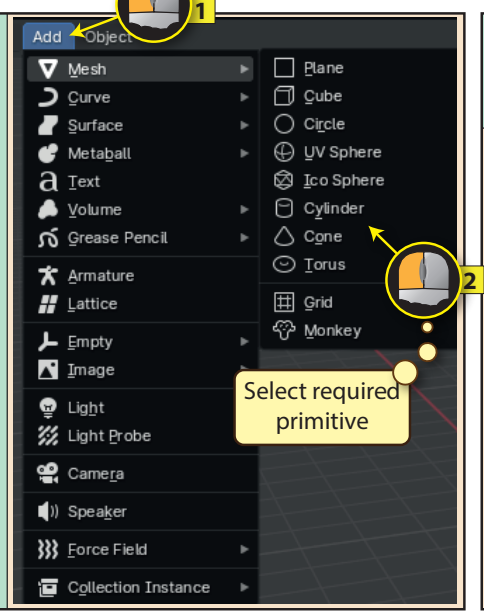


It's also useful to know that any action we perform can be undone by pressing **Ctrl Z**. For example, if we have deleted the Cube but then decide we want to keep it instead, we need only press **Ctrl Z** to have it restored.

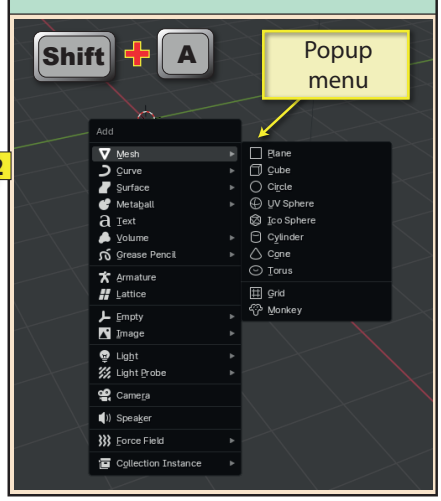
To add a new primitive to our scene, we need to use a menu option.

There are two ways to do this.

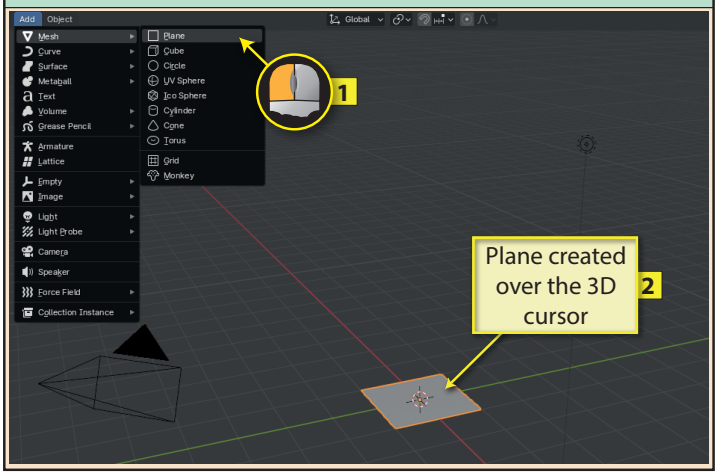
The first option is to choose **Add>Mesh** from the ***Viewport's*** main menu and then choose from the submenu list of primitives.



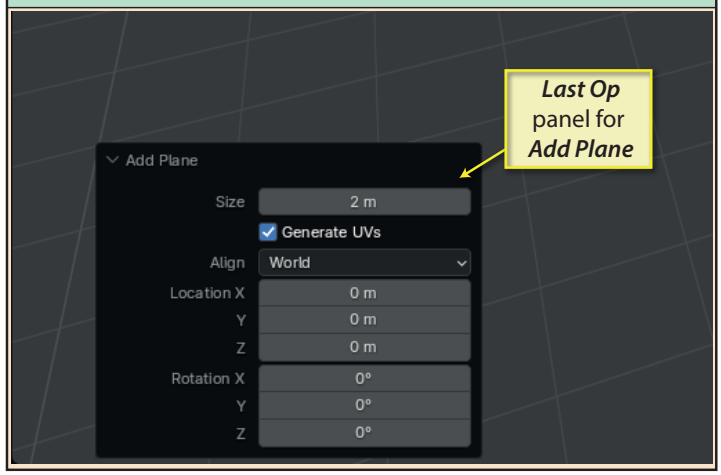
The second option is to choose **Shift A** to create the same menu but this time as a popup.



We'll start by creating a **Plane**, the first of the listed primitives and also the simplest with only four vertices, four edges and a single face. Remember, a new object is always placed over the ***3D cursor***.



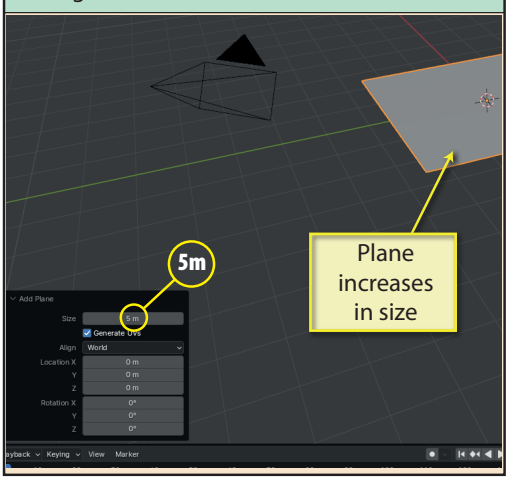
Many operations we perform during modelling creates a **Last Op** panel (also known as the ***Operator*** panel) in the bottom left of the ***3D Viewport***. This allows us to adjust various parameters of the operation we've just performed.



NOTE

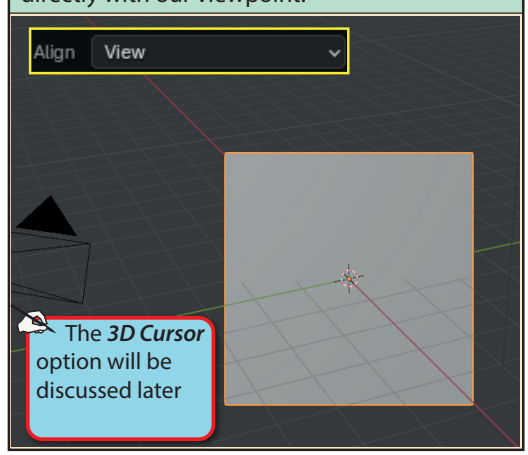
A Last Op panel only exists until another operation is performed at which point it is replaced by a new Last Op panel.

The first parameter for the ***Plane*** is **Size** which specifies the length of each side. If we change the value here, the ***Plane*** itself will change size.

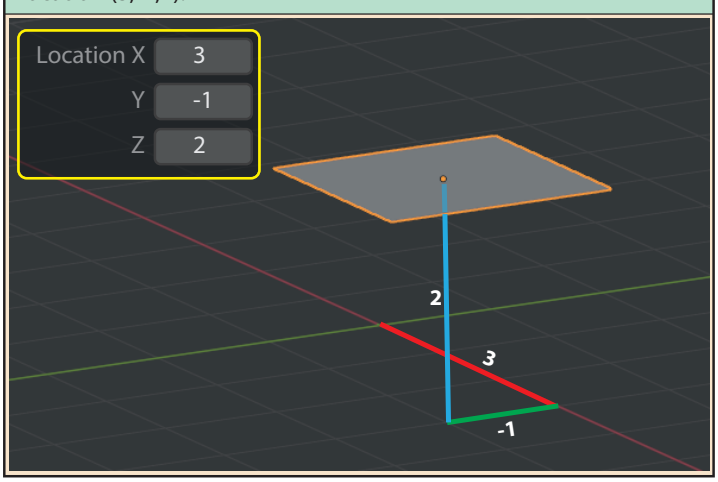


Generate UVs refers to texturing and will be discussed in a later chapter.

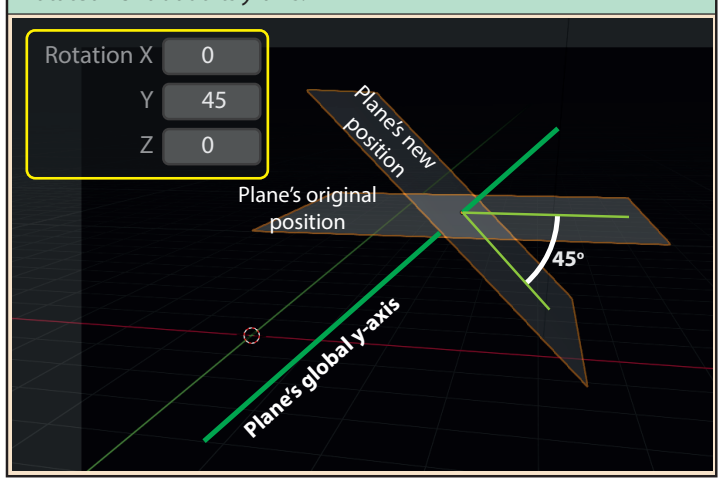
Align determines which ***z-axis*** the mesh is aligned along. By default it is the ***World's z-axis***, but if we change this to ***View*** (whose **z-axis** points out of the screen), the Plane aligns directly with our viewpoint.



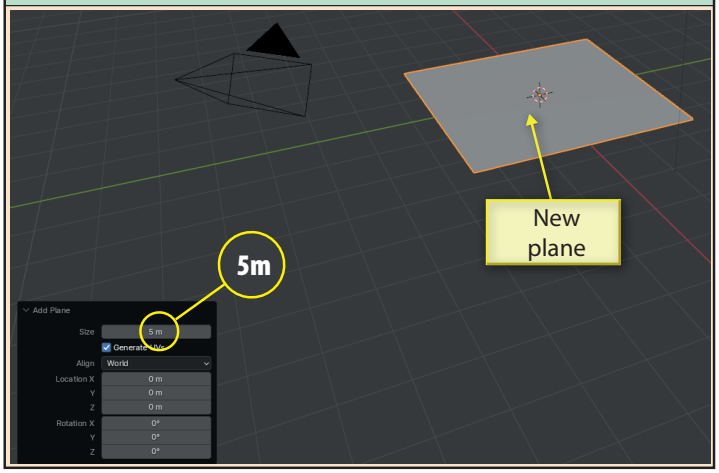
The next set of values, labelled **Location**, sets the position of the plane by moving it so that its origin is at the specified location. In the example below the plane is moved so that its origin is at location (3,-1,2).



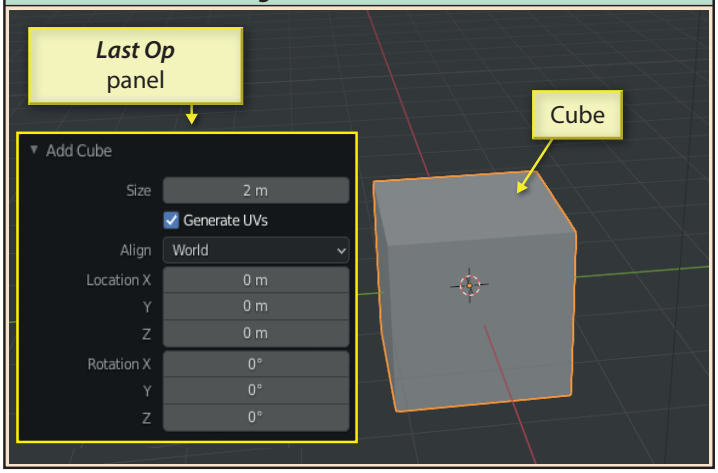
Finally, **Rotation** specifies the plane's rotation about the *x*, *y* and *z* axes. Normally, this will be measured from the plane's own global axes. **Rotation** is measured in degrees by default. Below a plane is rotated 45° about its *y*-axis.



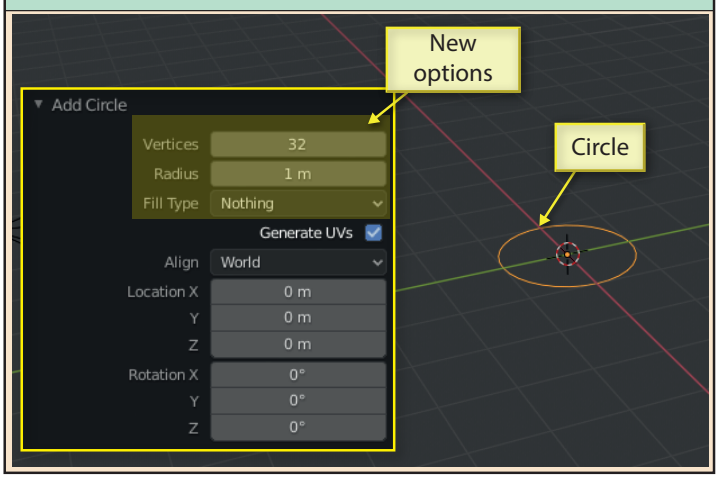
If we delete our plane and then create a new plane we'll see that Blender has remembered the last **Size** setting and has created this new plane with sides 5 metres in length but the ***Location*** and ***Rotation*** values are reset.



Once we've selected ***Add>Mesh>Cube*** from the ***3D Viewport***'s menu, we can see that the cube offers the same initial properties in the **Last Op** panel as the Plane:
Size, Generate UVs, Align, Location and ***Rotation***.

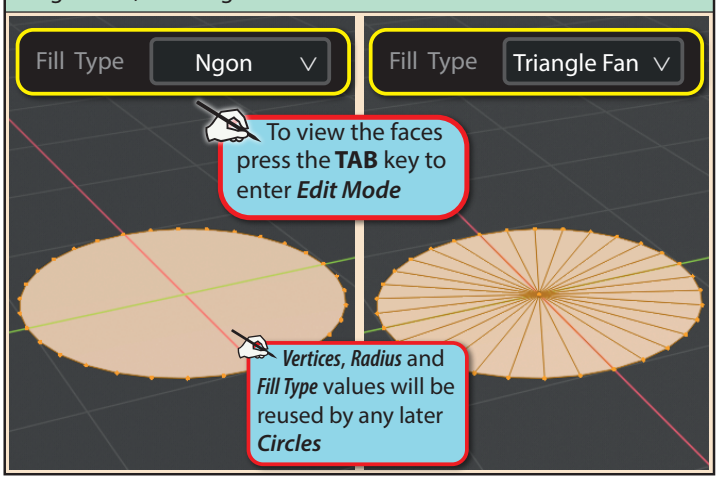


After deleting the Cube we can add the next mesh option, **Circle**. This creates a shape made only of vertices and edges. There are no faces. But the **Last Op** panel has some additional options.

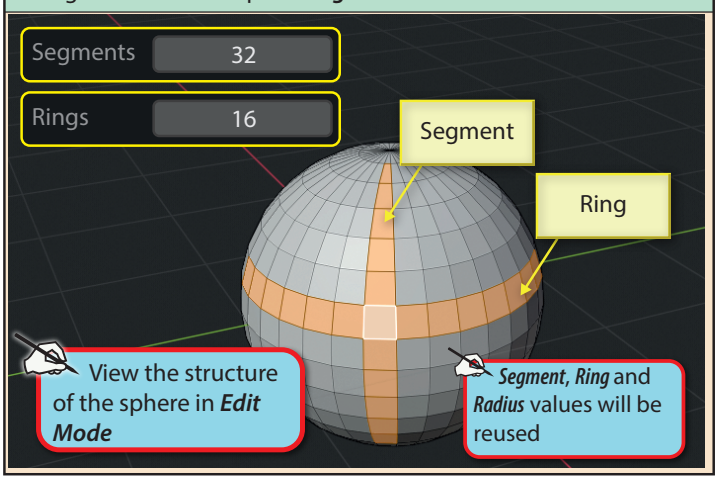


Vertices gives the number of vertices around the circumfrence of the circle. If we reduce this value the shape becomes less circle-like.

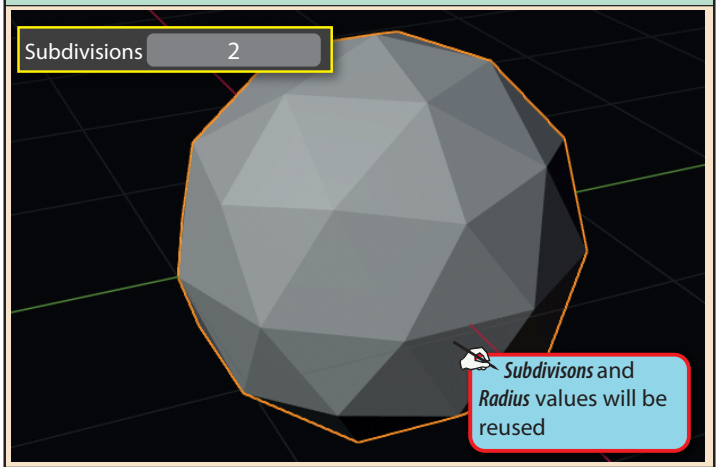
Radius sets the radius of the circle. **Fill Type** offers options to create one or more faces for the inner part of the circle. ***Ngon*** fills the circle with a single face. ***Triangle Fans*** creates a set of ***tris*** (3 edge faces) meeting at the circle's centre.



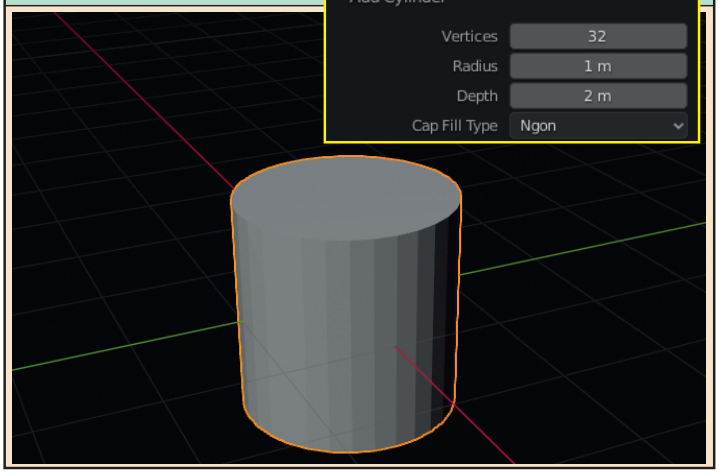
UV Sphere is the next mesh option. The ***Last Op*** panel has two new options. These are **Segments** and **Rings**. The faces that make up a single vertical loop is a ***segment***. Faces that make up a single horizontal loop is a ***ring***.



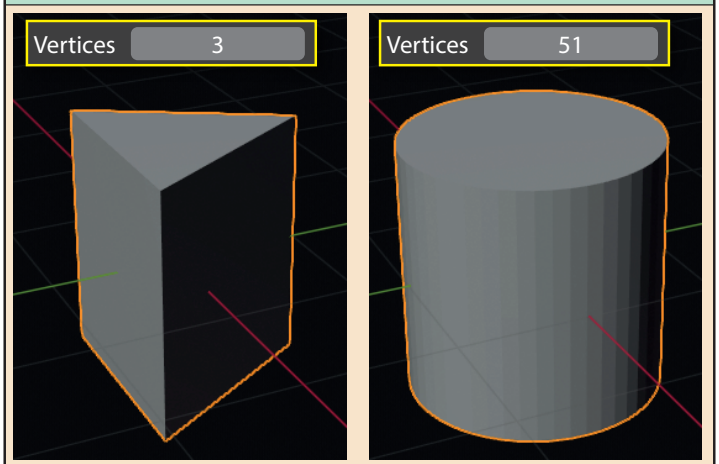
The **Ico Sphere** mesh is constructed from tris. The only new ***Last Op*** panel option is **Subdivisions** which, in effect controls how many ***tris*** are used to create the sphere.



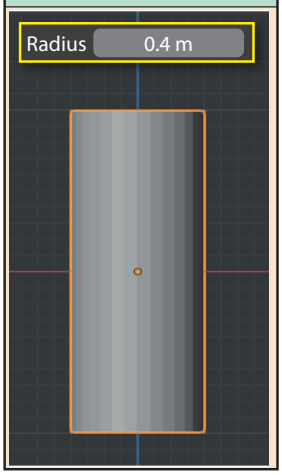
The **Cylinder** has some features similar to the *Circle* since the top and bottom of the cylinder are, in effect circles. This means that some of the ***Last Op*** panel options are similar to those of the ***Circle***.



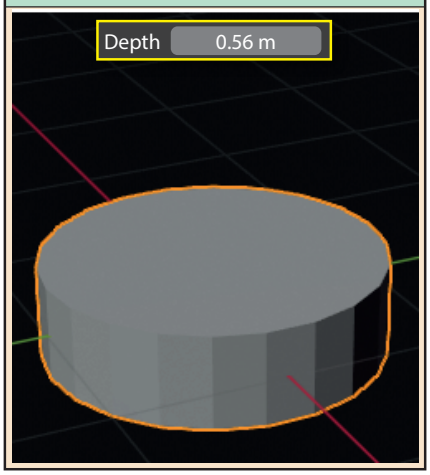
Reducing the **Vertices** value gives a less rounded shape. Increasing the **Vertices** makes the curve smoother.



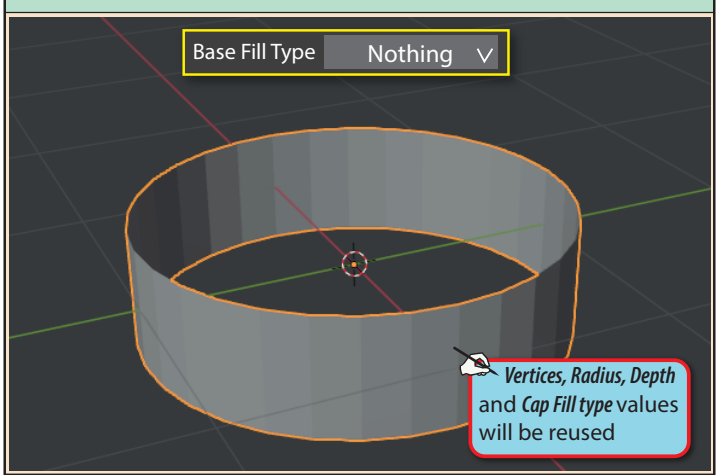
Radius sets the radius of the cylinder.



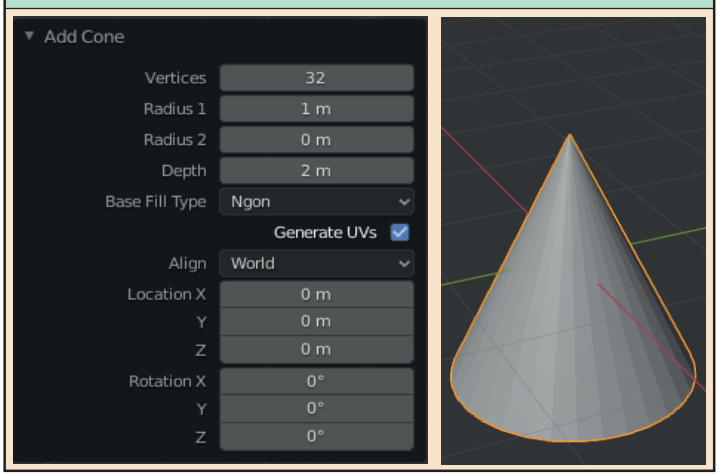
The **Depth** setting adjusts the height of the cylinder.



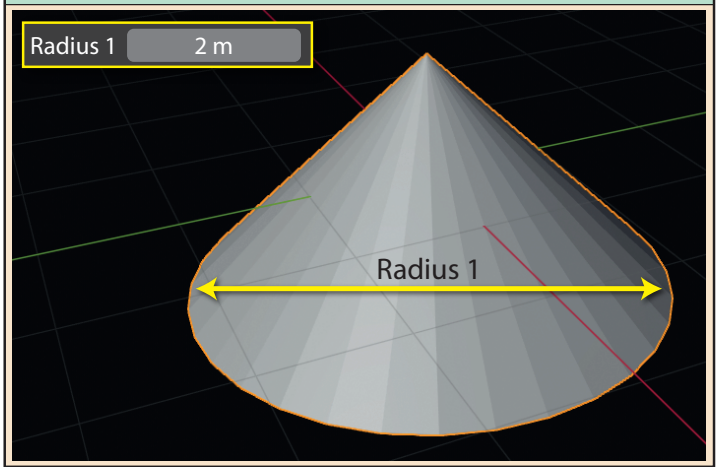
Cap Fill Type determines the type of face used to fill the top and bottom of the cylinder (***ngon*** or ***tris***) or to leave them unfilled.



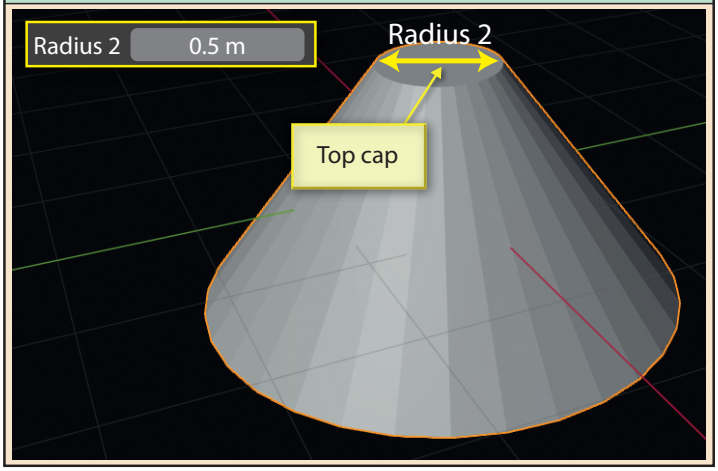
The **Cone** mesh's options are mostly familar but they include **two Radius values**.



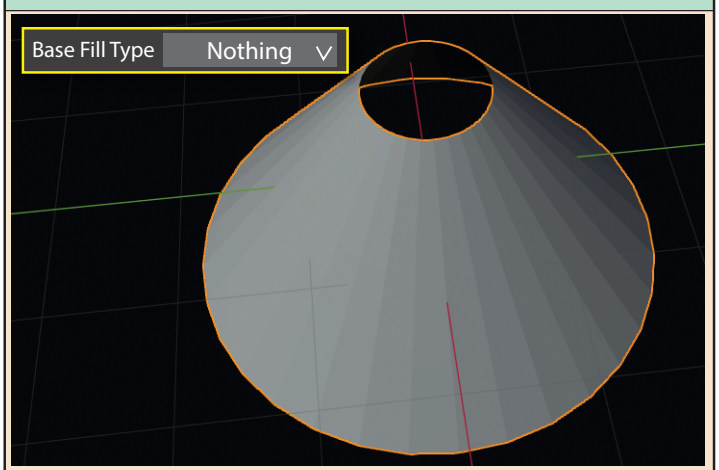
Radius 1 adjusts the width of the Cone's base.



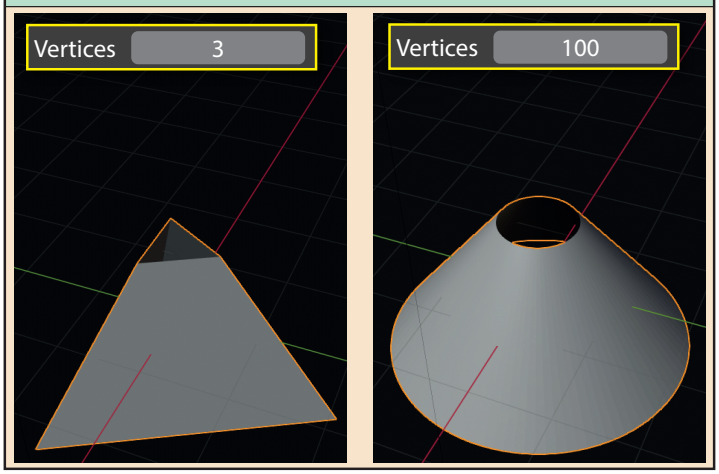
Radius 2 adjusts the width at the top of the Cone. For any value other than zero, we no longer have a true cone shape with the mesh acquiring a top cap.



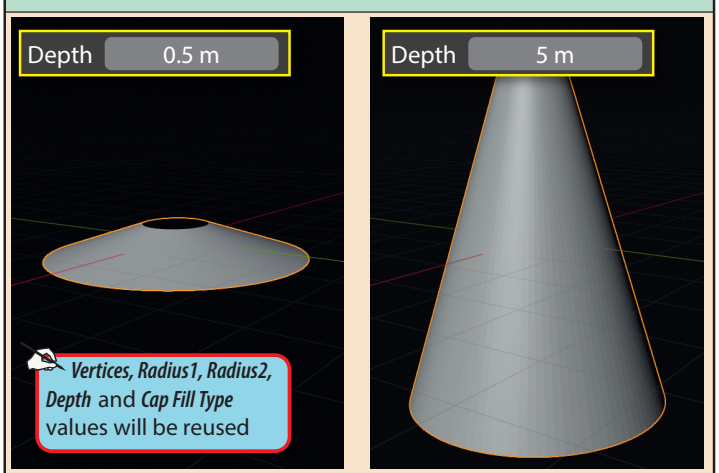
Base Fill Type determines how the base and top caps are handled (options being: *none*, *ngon*, or *tris*). Below, we see the result of the caps having been removed.



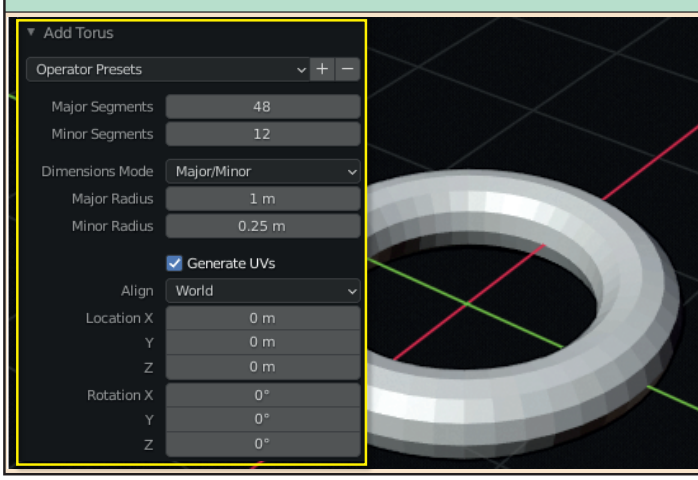
Vertices allow us to create a pyramid shape (values 3 or 4) or a very smooth curved cone shape (value 100).



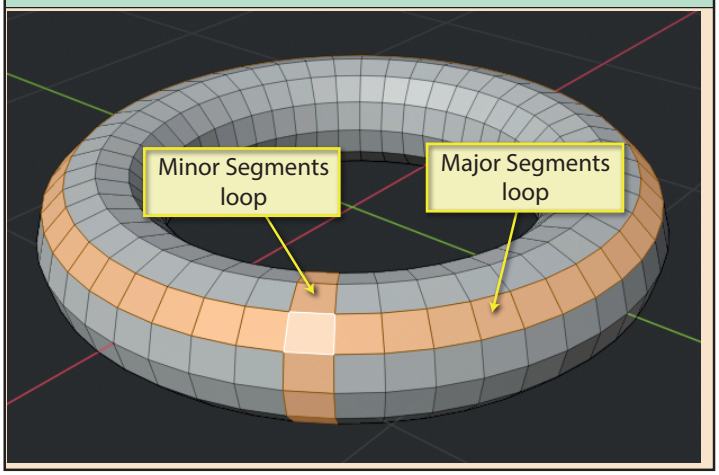
Depth sets the height of the Cone.



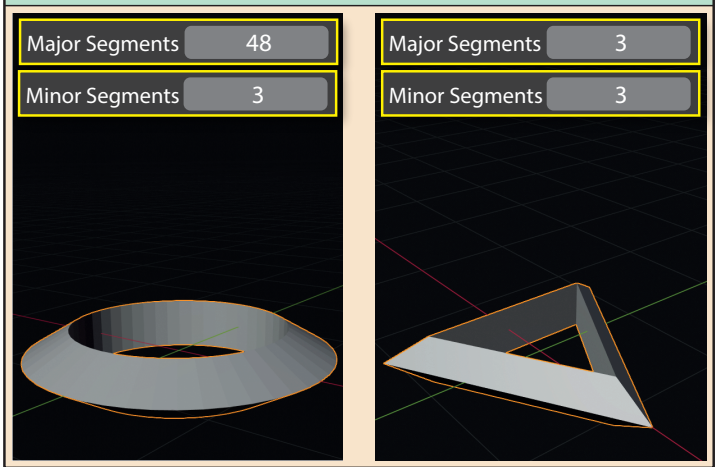
The **Torus** is a doughnut-shaped mesh with many unique options.



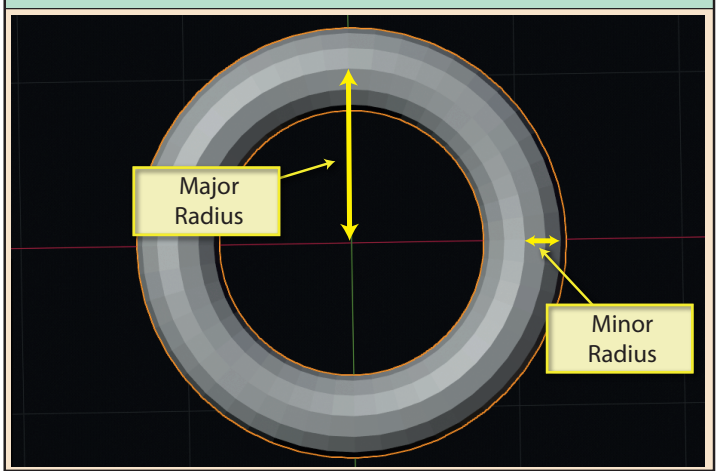
The option **Major Segments** refers to the number of faces that make up a horizontal loop. **Minor Segments** refers to the number of faces that make up a vertical loop.



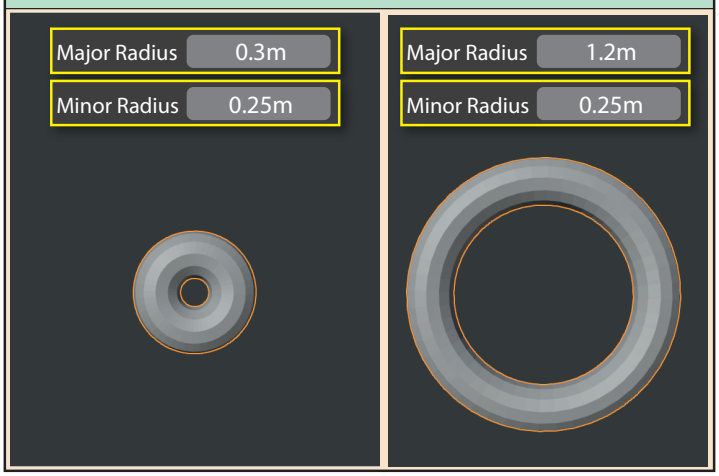
Reducing the **Minor Segments** to 3 gives us the shape shown below left. Reducing the **Major Segments** to 3 as well, gives us the shape shown below right.



The **Major Radius** is the distance from the centre of the Torus to half way through the solid ring.
The **Minor Radius** is half the width of the outer ring.

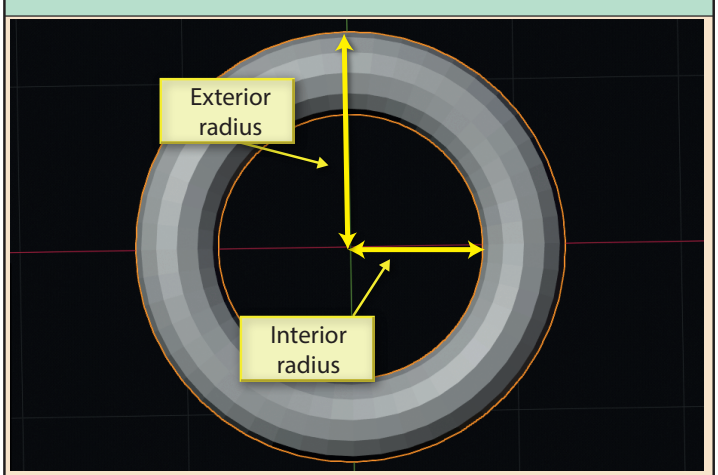


By adjusting the **Major** and **Minor Radius** values we change the overall size of the Torus, the size of the hole in the middle and the thickness of the Torus.

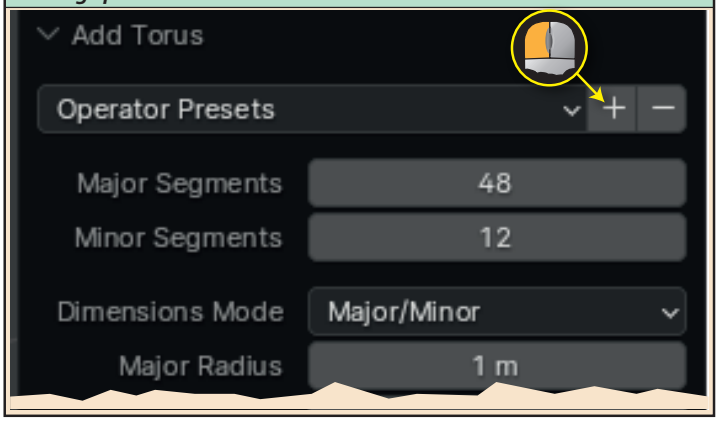


An alternative method of resizing the Torus is to select the **Dimensions Mode's Exterior/Interior** option This changes the two values displayed below to **Exterior Radius** and the **Interior Radius**.

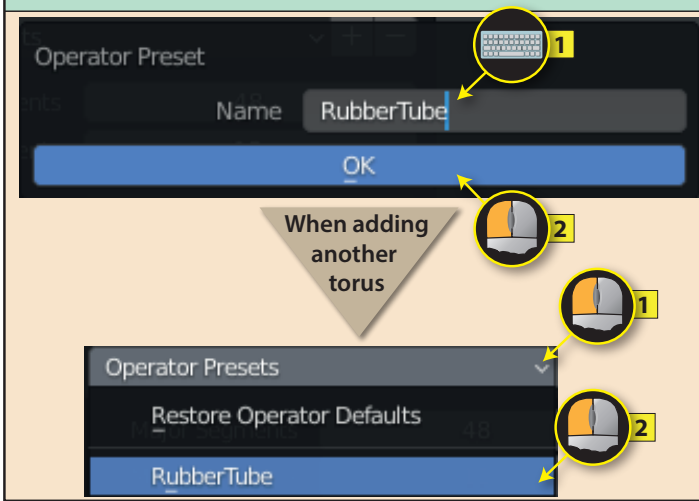
The radii measured by **Exterior Radius** and **Interior Radius** are shown below.



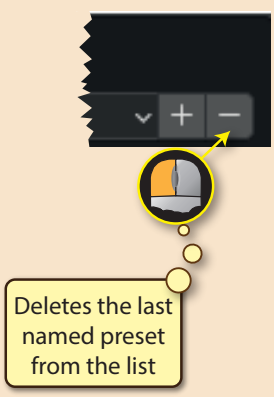
Because of the many options available when setting up a Torus, Blender offers a way of saving and naming a set of attribute values so that another matching Torus is easily created. To do this we must first set all the necessary Torus values and then click on the + sign to the right of **Operator Presets** in the ***Command Settings panel***.



This opens a new panel where we can specify a name for the current value settings. When another Torus is added, the name can then be selected to apply the associated settings to the Torus.



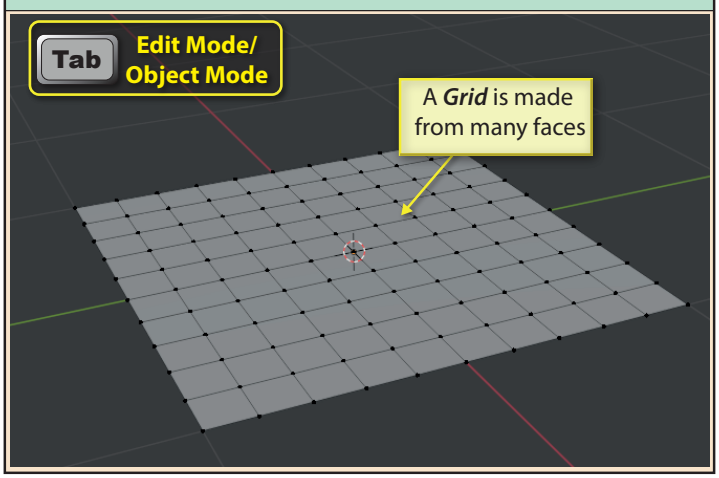
Clicking on the - icon will delete the last named preset to have been used.



Even if we haven't saved the various Torus settings in the way described, any new Torus will make use of the current settings of the following parameters:

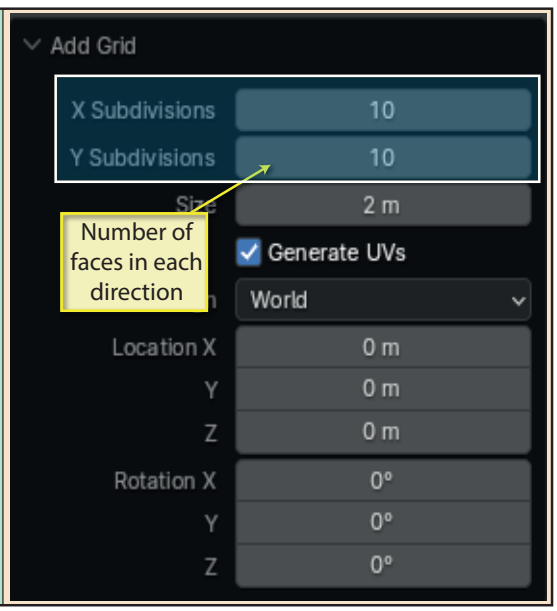
Major Segments
Minor Segments
Dimensions Mode
Radius settings

The next mesh option, **Grid**, may look identical to the ***Plane*** mesh but if we look at its structure in ***Edit Mode***, we can see that it is constructed from many more faces.

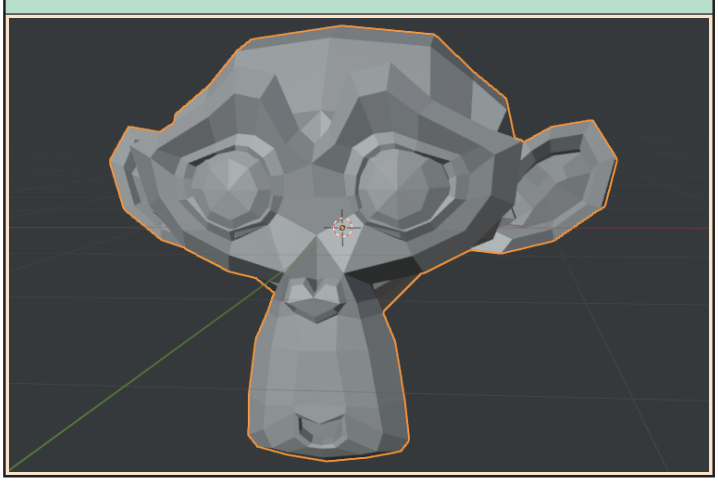


Grid's *Last Op* panel options allow us to specify the number of faces in both the *x* and *y* directions.

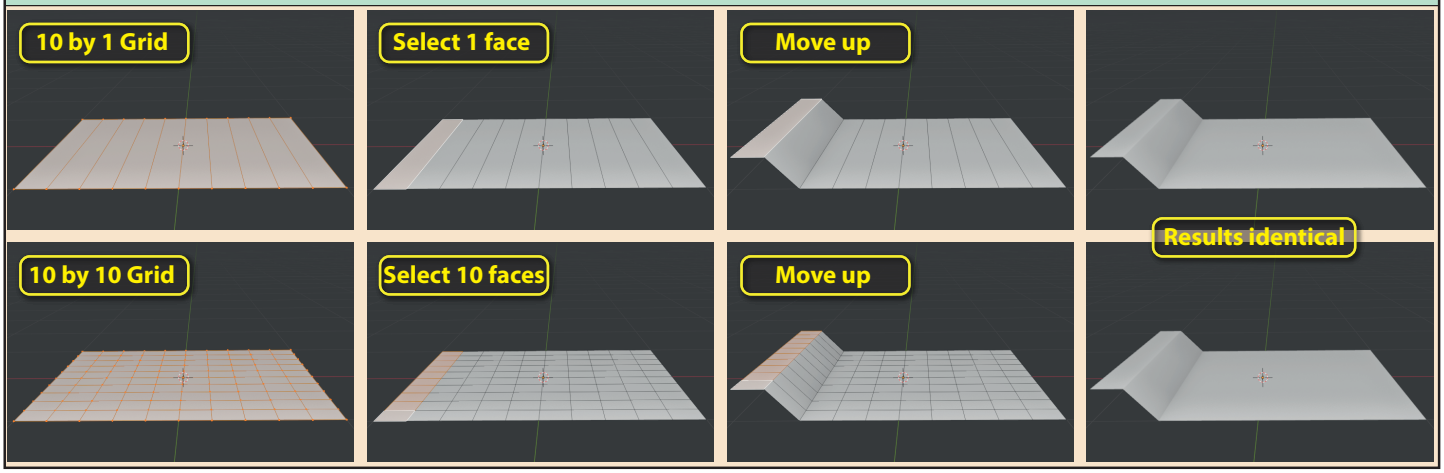
X Subdivisions, ***Y Subdivisions*** and ***Size*** settings are reused by subsequent ***Grids***.



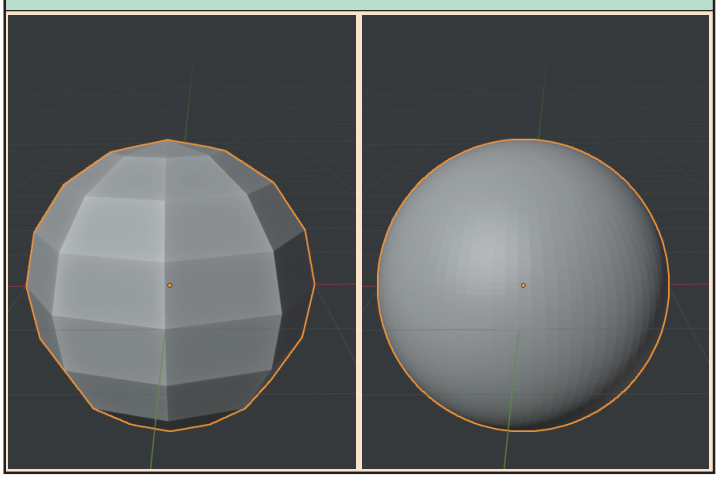
The final mesh is a monkey head - affectionately known as **Suzanne.** Although not a true primitive, it is often used to show off various features of Blender.



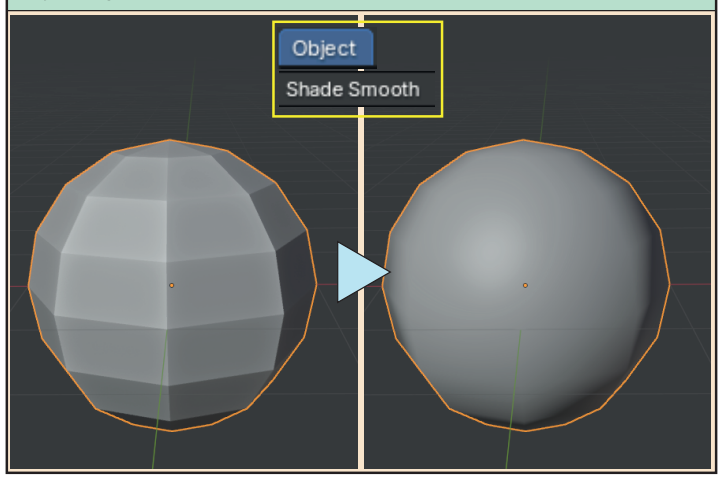
When creating a mesh we should always go for the minimum number of faces we require since not only will we reduce memory and processing requirements, but this can also make the modelling process much easier when we are working in ***Edit Mode***. For example, one of the Grids below is created with 10 faces while the other has 100. In the modelling process we want to raise one end of the grid. Both end up with exactly same result but one takes a lot less effort for both the modeller and the machine.



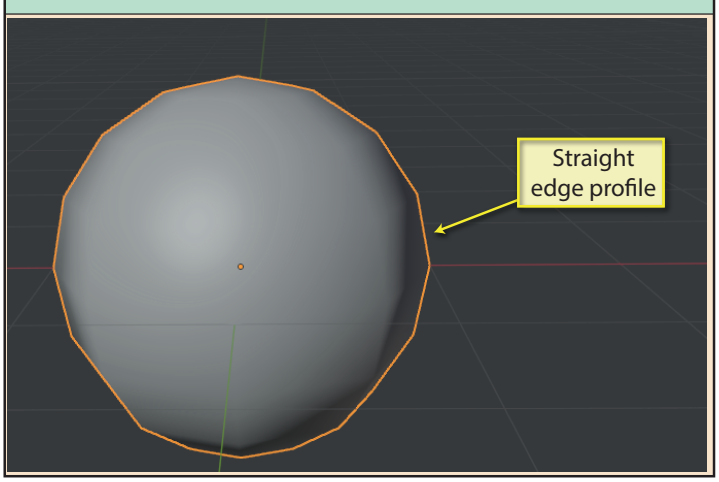
One situation where we might be tempted to increase the number of faces is when creating a curved surface. For example, we can see that the second sphere below looks more curved than the first.



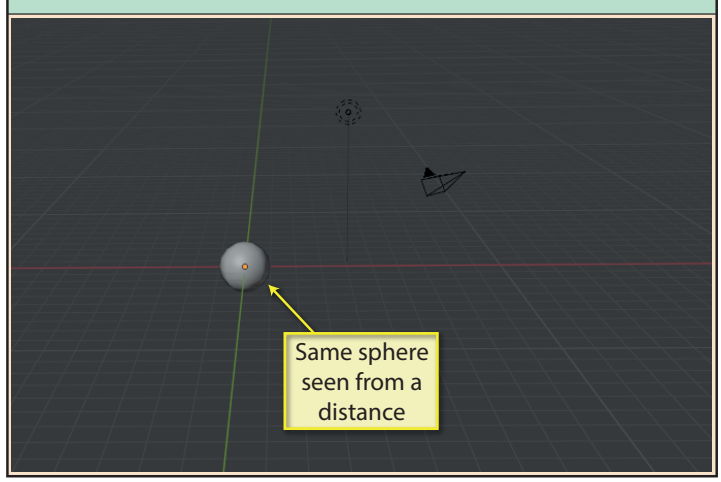
But if we use the first version of the sphere and apply smooth shading (***Object>Shade Smooth***) we get a more curved look to the object without adding more faces. This effect is achieved by adjusting the normals of the sphere.



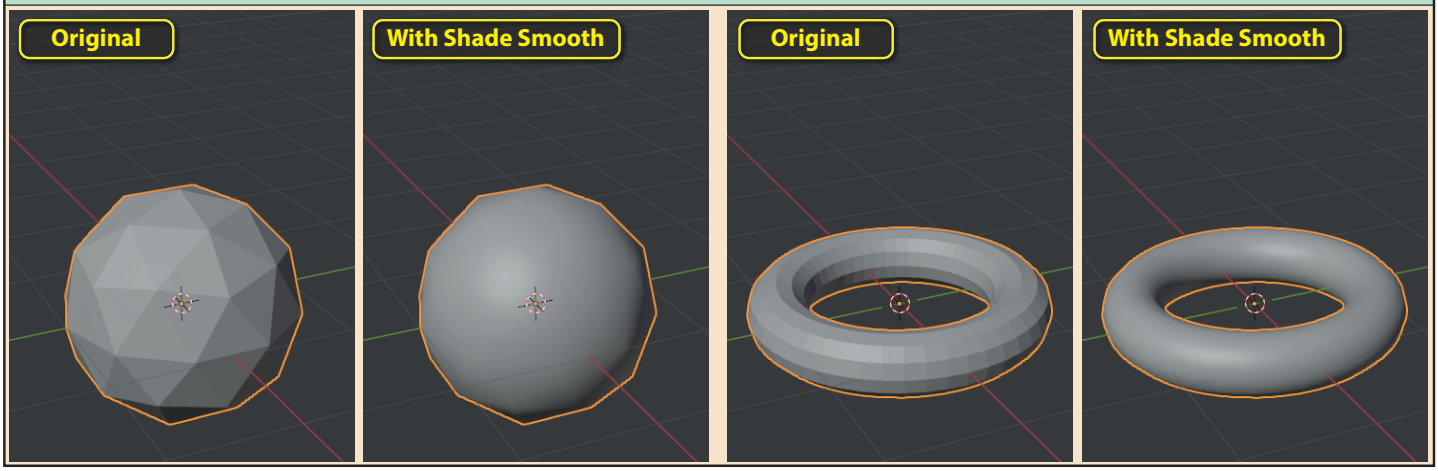
In fact, the only visual clue to the sphere's low face polycount is the straight edges on its profile.



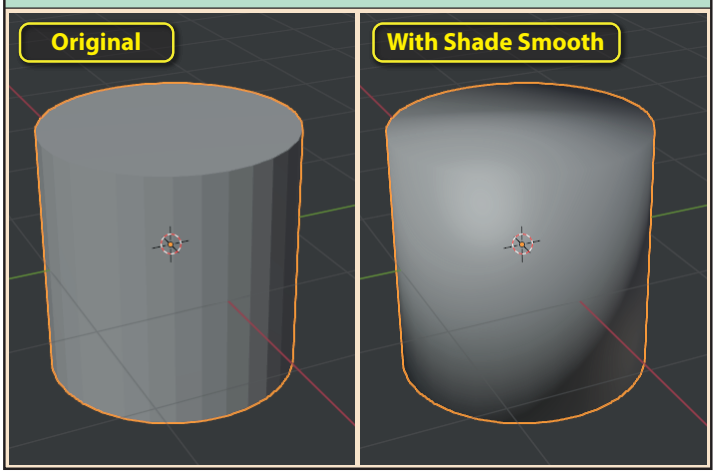
However, if the sphere will only ever be viewed from a distance in our completed scene, the problem with the the profile disappears as seen below.



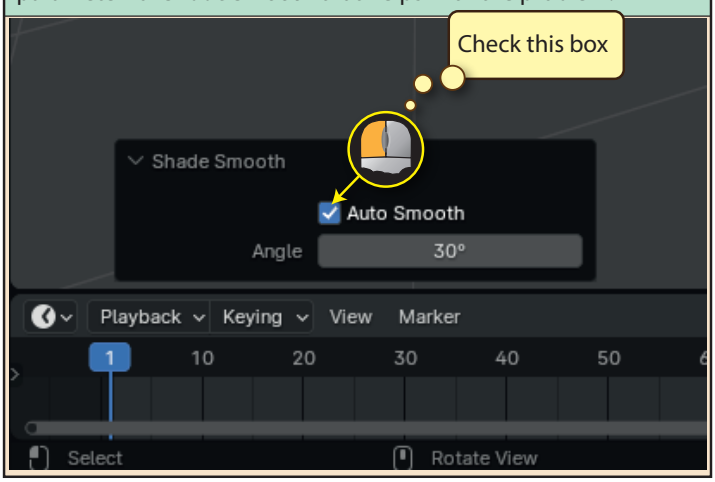
The ***Shade Smooth*** option works well with the ***IcoSphere*** and ***Torus*** as we can see from the before and after pictures shown below.



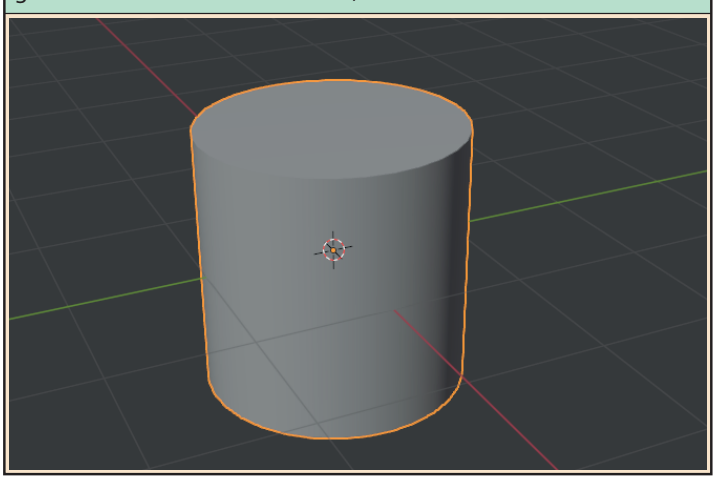
However, when we apply ***Shade Smooth*** to a ***Cylinder***, the result looks wrong.



The trouble is that ***Shade Smooth*** is attempting to smooth out the whole surface of the Cylinder when all we want is to smooth out the vertical, curved section. Luckily, the ***Last Op Panel*** has a parameter for ***Shade Smooth*** that helps with the problem.



By checking **Auto Smooth**, Blender only smoothes out faces which are at an angle of 30° or less to each other - the angle value can be changed. Since the top faces of the cylinder are at an angle greater than 30° to the side faces, we can achieve a better result.



We need to check the same ***Auto Smooth*** option when applying ***Shade Smooth*** to a ***Cone***.