

Blender: An Introduction

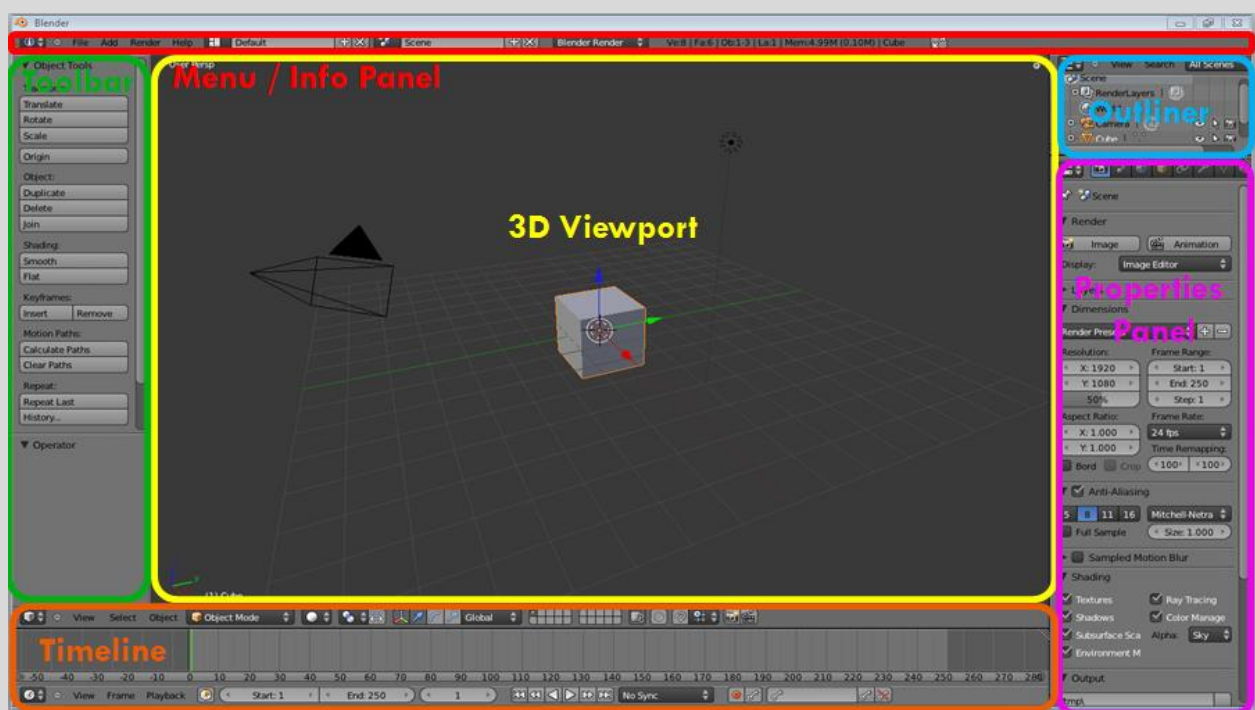
Getting to Know Blender

On opening Blender, you should see a welcome panel, you can dismiss this by clicking off to the side of it:



Opening Blender for the first time can be intimidating. It is important to understand what we are looking at and to get familiar with the workspace before going any further.

Understanding the Interface



Menu / Info Panel

- Here you will find the main menu, where you can do normal stuff like save, open, etc. Next is the screen layout which will give us various interface layouts depending on the task we are trying to do. Then there is also the scene-layout menu, which allows you create several scenes in Blender

Toolbar

- The toolbar is where to find tools as needed. Previously you had to remember some shortcut key for these functionalities

3D Viewport

- This is where you will make your 3D models & movies. This is one of the most important windows in Blender

Outliner

- Every 3D object you have in your 3D viewport (including objects, lights, cameras) will be visible as a list here

Properties Panel

- This is where you will find all settings to change or manipulate objects in Blender. If you want to add materials, or render, etc. you would come here

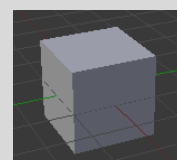
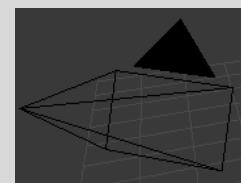
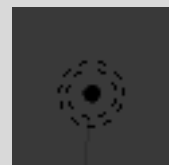
Timeline

- You can set and playback animation here, set start and end times of animations and other timeline related stuff

The 3D Viewport

There are a few default items which will automatically appear in the Blender 3D viewport when we open a new Blender file, which we need to know about – see image below.

- The first is the **Lamp**:
The lamp is an omni-directional point of light, that is, a point radiating the same amount of light in all directions. It's visualized by a circled dot
- The second is the **Camera**:
The camera is how we view the items we put on the 3D window. Every scene is rendered from the camera's point of view. The camera looks like an empty triangle with an small arrow on one side, which shows the top side
- Next is the **cursor**:
The cursor looks like a red, white and black crosshairs. If you click somewhere on the screen, the cursor will move to that position. Wherever you position the cursor, this is where any new shapes or objects will be added to the workspace
- Also on the 3D window, you will see a default **cube object**. Blender automatically puts one shape, a cube, on the 3D window when it opens

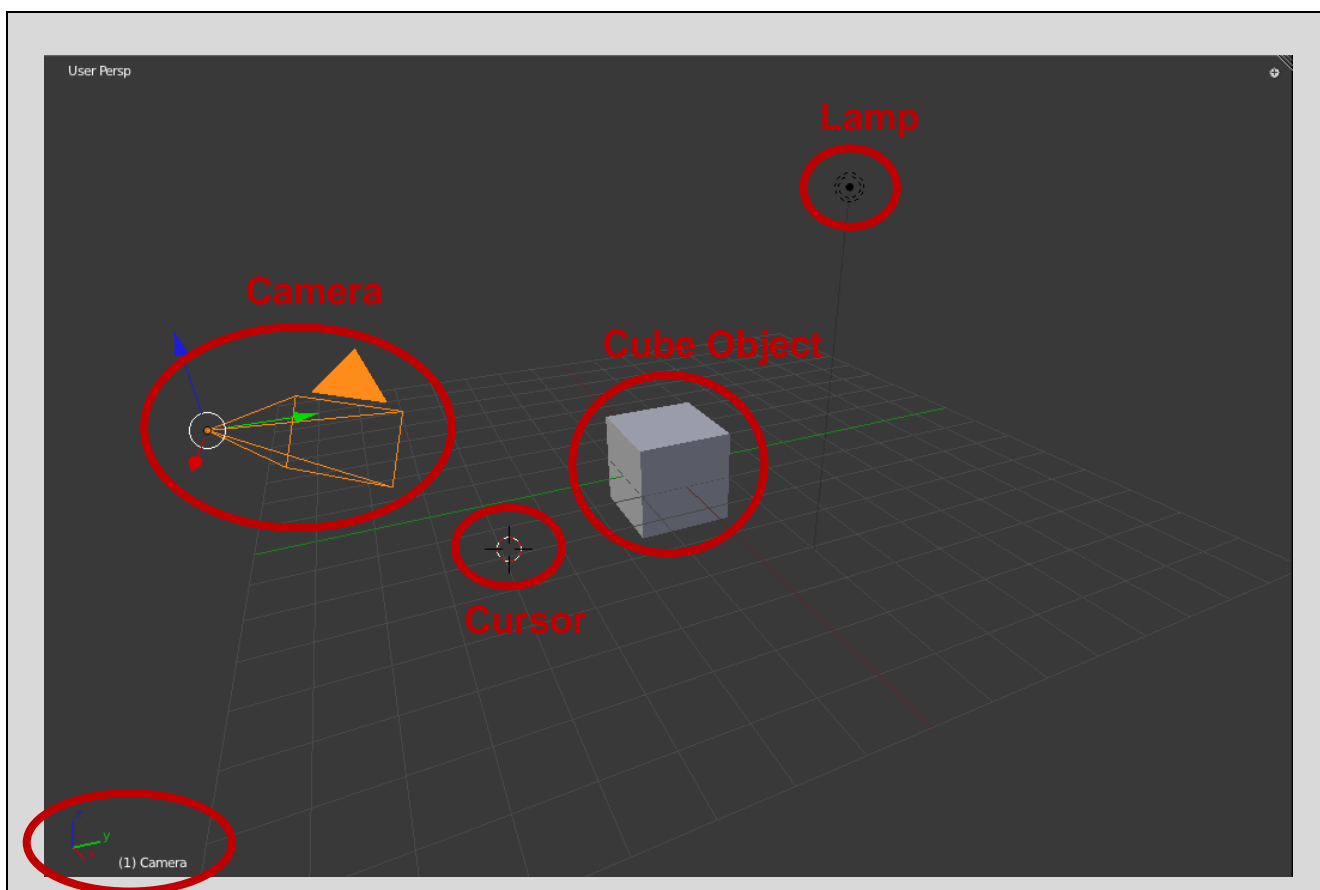


The Properties Panel



The Property Panel is one of the most important features of Blender as it pretty much controls almost everything in Blender.

1. **Render settings:** This is where you go to render an image or animation. You can set the location where you want to store your rendered stuff as well as adjust values here that will give you the best quality renders
2. **Render Layer settings:** This allows you to set up which layers you want to render. For example, you might have objects in your scene that you don't want to be seen in a render. You can put those objects in a separate render layer and hide them during rendering
3. **Scene settings:** Here you can set up your 3D world. You can change from the default Blender unit system to the real-world metric system (the one with centimetres and metres). You can also set the gravity of your 3D world
4. **World settings:** Allow you to define what your sky will look like. Whether you want daytime, night time, cloudy or starry, you light up your sky here
5. **Object settings:** This allows you to modify the current object that is selected in the 3D viewport. You can change things like name, location, rotation and scale
6. **Constraints settings:** Allows you to create one or more constraints for your currently selected 3D object. You can set laws for your objects and they have to obey, such as making your object follow a path, or copy the movements of another object
7. **Modifiers settings:** This is used to transform your object without destroying the original model in any way. There are loads of modifiers in Blender. With modifiers, you can do things such as explode your objects or bend them
8. **Object Data settings:** This adds properties to your currently selected object in Edit Mode. For example, font settings, lamp settings, camera settings, etc.
9. **Materials settings:** This is where you adjust how your 3D object looks. You can set its colour, whether it has a shiny or dull surface, how transparent it is, etc.
10. **Texture setting:** Allows you to import your own image textures or use some of the textures built into Blender
11. **Particle settings:** Allow you to create fur/hair/hairy stuff that emit from your 3D object. You also use this if you want to generate particles emitting from your object, like rain or fireworks
12. **Physics settings:** Here you can simulate real-world physics, such as make a cloth animation, or rain/water, etc.



The image above shows a typical view of the 3D viewport in Blender, with the lamp, the camera, the cursor and a cube

Blender, like other 3D environments, is made up of 3 axes (X-axis, Y-axis and Z-axis). If you look in the bottom left-hand corner of the 3D viewport above, you will see the red, green and blue axes with XYZ letters on them. These are the axes.

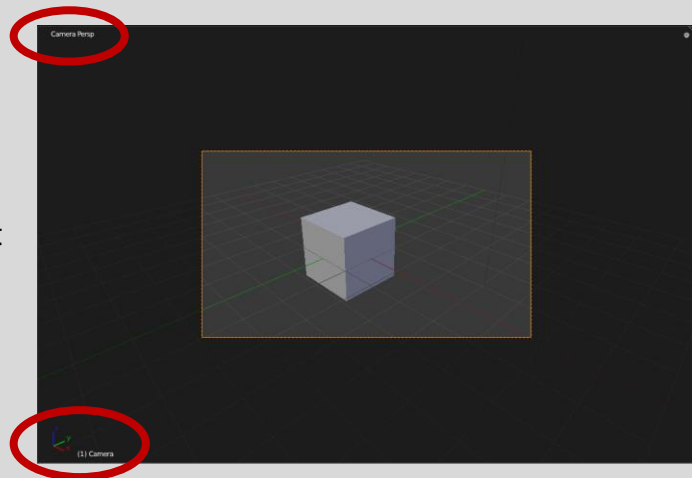
- the **blue** axis represents the **Z**-axis
- the **red** axis represents the **X**-axis, and
- the **green** represents the **Y**-axis

Your 3D object is mapped to a coordinate (X,Y,Z) on these axes. So for example, the default cube is at (0,0,0) meaning it is at the origin (or centre) of the 3D axes. An object at (3,0,0) means the object is at the centre but 3 places to the left of the X-axis.

NOTE: In the image shown above the camera is selected, you can see this as it is highlighted orange. You can also see in the bottom left-hand corner, that it says that the camera is selected

- You should also note the coloured arrows (the axes) are on the camera; these appear once an object has been selected

- The image on the right shows the square, in a 3 dimensional perspective, from the point of view of the camera, or in **camera view**
- The camera, seen in the image above, is pointing at the top right corner of the square, so this is the way we see it in the camera view on the right
- You can also see the different axes on which the camera is sitting, at the bottom left-hand corner of the window



Navigating in Blender

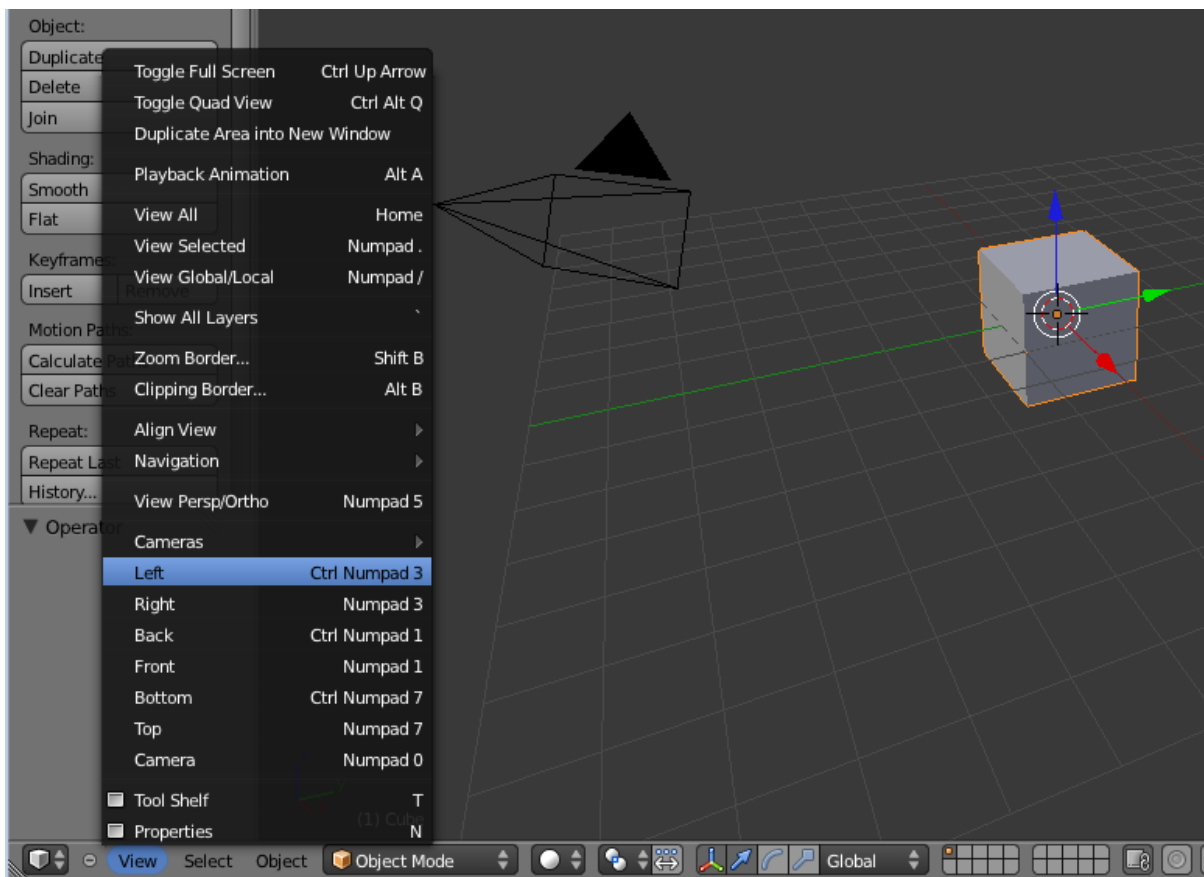
Having opened Blender, and getting familiar with the workspace, we can now start working with the 3D environment, e.g. creating 3D models, etc.

BEFORE BEGINNING; Note that Blender was designed to be used, ideally, with the following recommended input configuration:

- **A three-button mouse with a wheel**
 - ▶ If you have a two-button mouse with a wheel, use the wheel as the third button
- **A full keyboard with a numeric keypad**
 - ▶ If you are using a laptop without a num-pad, use the **function key (Fn)** and the designated number keypad hotkeys e.g. J=1, K=2, L=3 etc.
 - **NOTE:** NumLock should generally be switched on
- Clicking the **Left Mouse Button** in the 3D Window **repositions the cursor** in the scene.
 - Wherever the cursor is positioned is where the next object you add to the scene will be located.
- Clicking the **Right Mouse Button** on an object **selects that object**
- Clicking the **Middle Mouse Button**, or **Mouse Wheel**, and dragging around the 3D window enables you to **rotate the view** of your object
- Holding the **Shift** key and dragging the **Middle Mouse Button**, or **Mouse Wheel**, allows **pan around the object** in the 3D window
- Use the **Mouse Wheel** to **zoom in and out** on the object in the 3D window
 - The + and - keys on the number pad will zoom in and out (or Ctrl and + or -)

It is also possible to view your scene from different views or angles. By default Blender opens a new file in **User Perspective view**. The current view is shown at the top left of the 3D viewport.

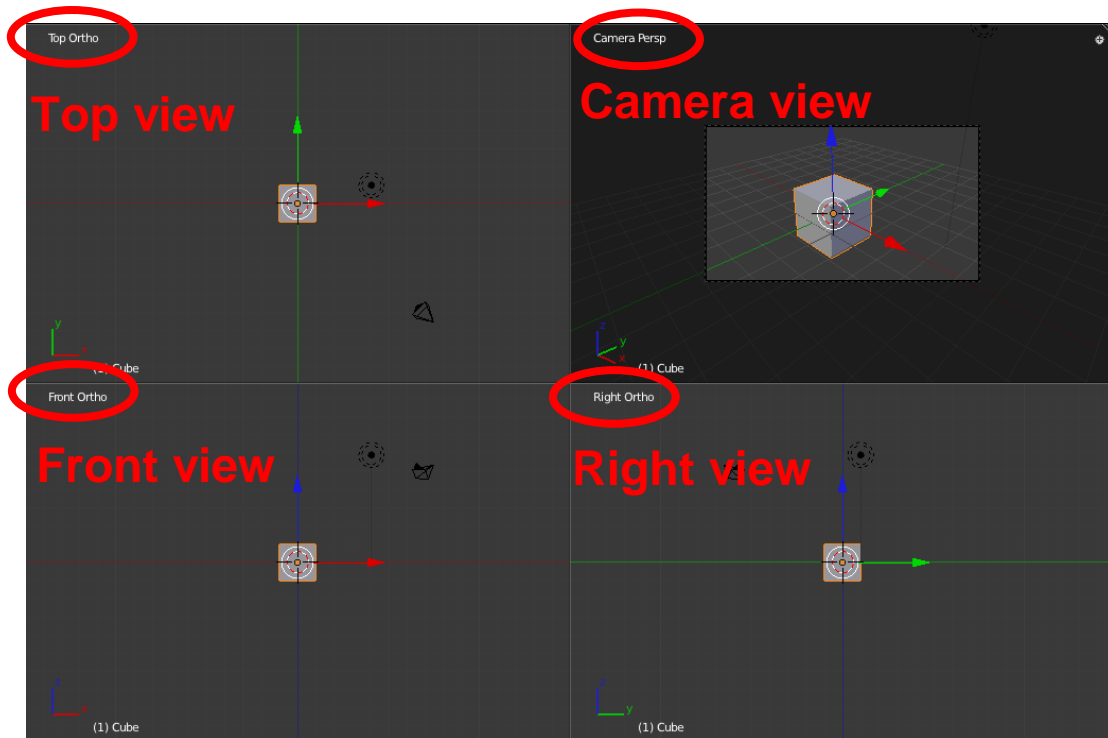
- You can change the current view of your object by clicking on the **View** menu along the bottom of the 3D window, see below
 - Options include; top, bottom, left, right, front, back and camera



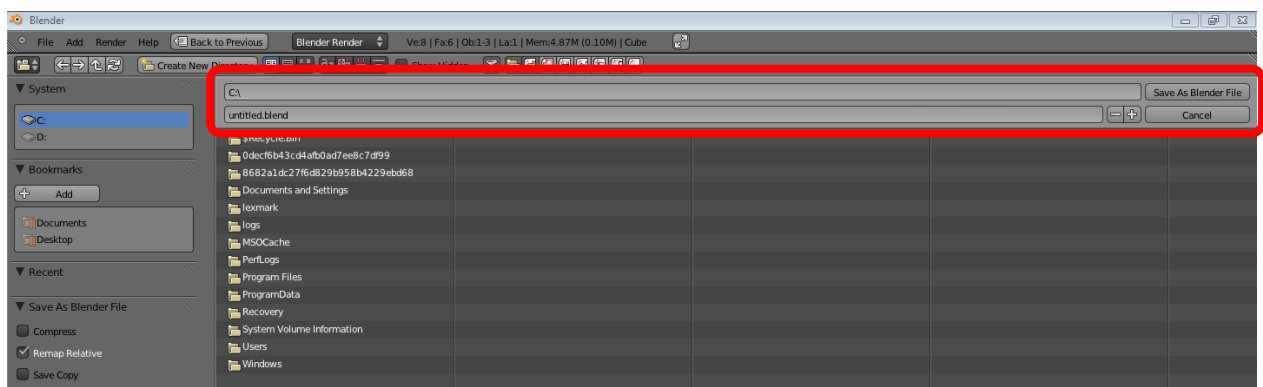
NOTE: You can also navigate using the numpad on your keyboard:

Numpad 1 – Front view	Numpad 2 – Rotates downwards	Numpad 6 – Rotates leftwards
Numpad 3 – Left view	Numpad 4 – Rotates rightwards	Numpad 5 – Orthogonal view
Numpad 7 – Top view	Numpad 8 – Rotates upwards	Point "." – Centres on object

- You can also split the 3D window into four screens, which allows you to have four views, or angles, on the object
 - You can do this by choosing **Toggle Quad View** from the **View** menu
 - Click Toggle Quad View again to turn it off
 - When you split the screen into four views, you will see which view each screen is displaying in the top left hand corners – also notice the differences in the camera and lamp positions in each view



- To save your file, **File >> Save As**. A new window will open, like the one below

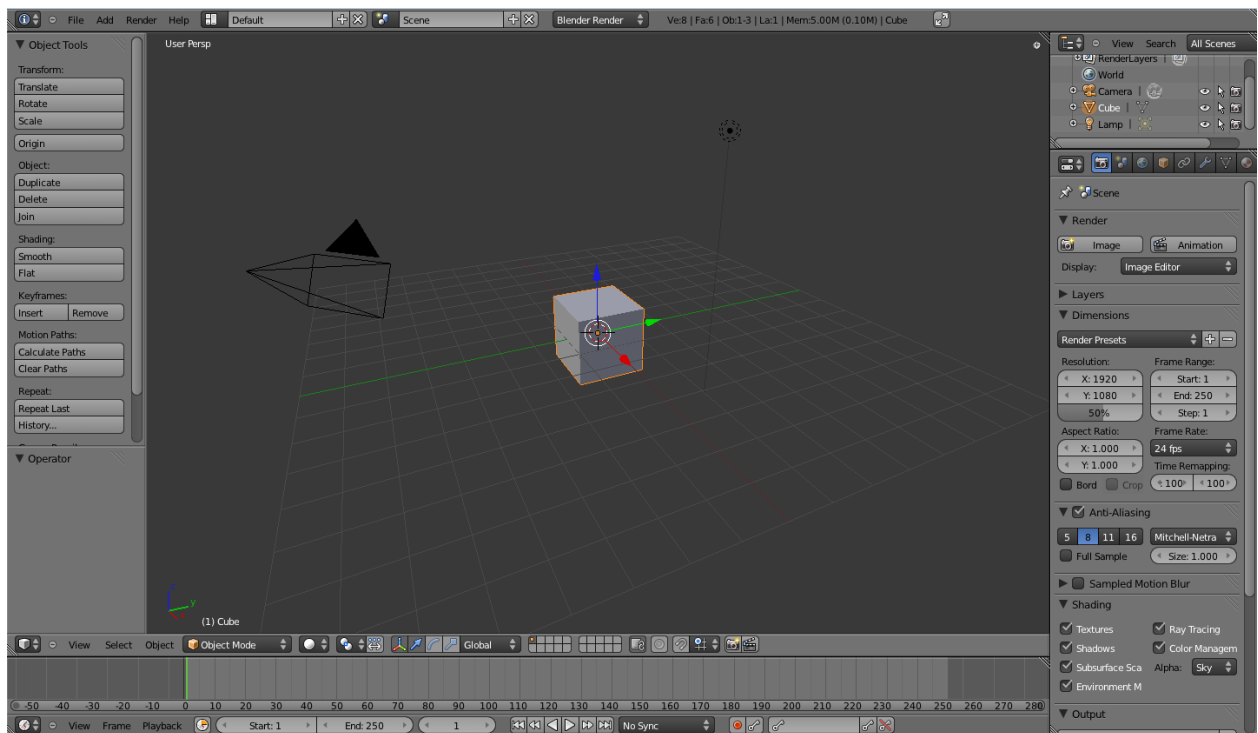


- In the top box **choose the location** where you want to save your blender file
 - At the top left corner of the window, you can see the various drives on your system, if you wish to choose a different drive to save
- In the bottom box, **give the file a name** e.g. **blender01.blend** (note that blender source files have **.blend** file extension)

3D Modelling

Before we can colour, texture, animate or render any 3D objects we have to create, or model, them.

- Create a **new blender file**, if you do not already have one open
 - File > New
- Save this file as **model01.blend**
 - If there is a blender file already open, it might ask if you want to **erase all**, select ok
- At this point, you should take note of the default objects that are already in the 3D viewport to help you orient yourself
 - There is a **cube** that is positioned in the centre
 - The **ground plane**
 - The **lamp**
 - The **camera**



Selection:

- First, we should know how to **select** our objects
 - To select the cube on the 3D plane, **right click** on it
 - ▶ You should now notice that the cube has become highlighted **orange**
 - It is possible to select multiple objects in the window by holding **Shift and right clicking** on the additional objects
 - ▶ Try selecting the cube, lamp and camera altogether
 - **To select all the objects** in your scene, simply press **A** (Make sure your mouse is in the 3D viewport and not somewhere else like the Timeline for example).
 - ▶ You can also de-select all the objects in your scene by pressing **A** again.

Other methods for selecting a few objects at a time, include:

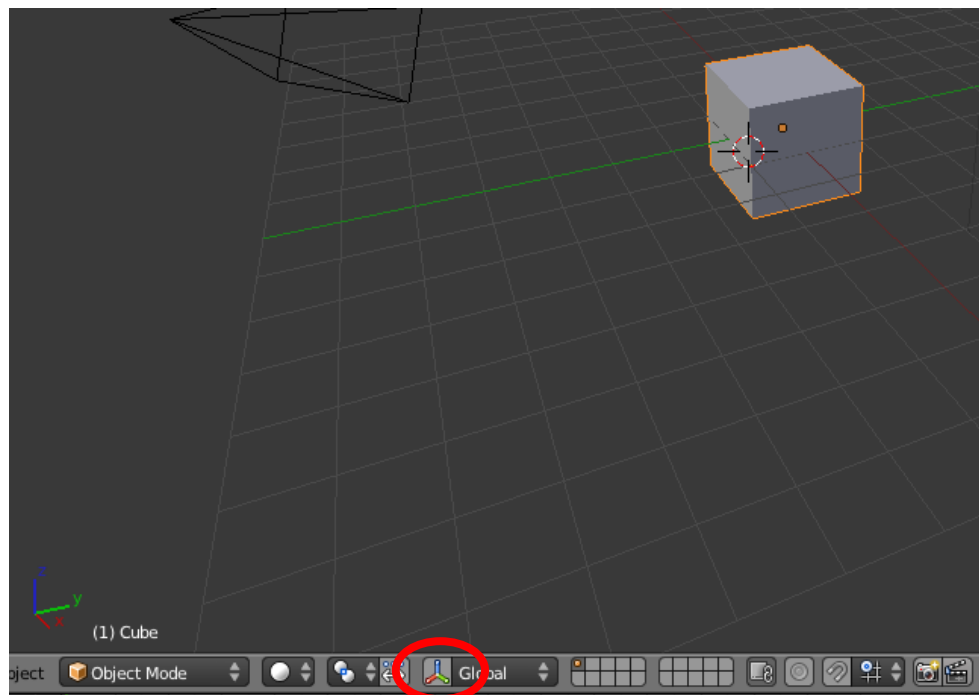
- **Circle select**
 - To circle select, press **C** and then scroll in-out to get the circle size you want. Once you're happy, left click and drag around to select the objects you want. Once you're done selecting, right-click again.
- **Box select**
 - To box select, press **B** (you'll should see crosshairs which follows your mouse everywhere it goes), then left-click and drag until you've covered all the objects you want selected.

Transformation:

- Next we need to know how to manipulate, or **transform**, objects
 - This can be done in two ways;
 1. Using the manipulators
 2. Or using the hotkeys
 - The three basic transformation controls are:
 - **Grab**, or move
 - **Scale**, or resize
 - **Rotate**

First you will need to select the object for transforming, so right click on the cube

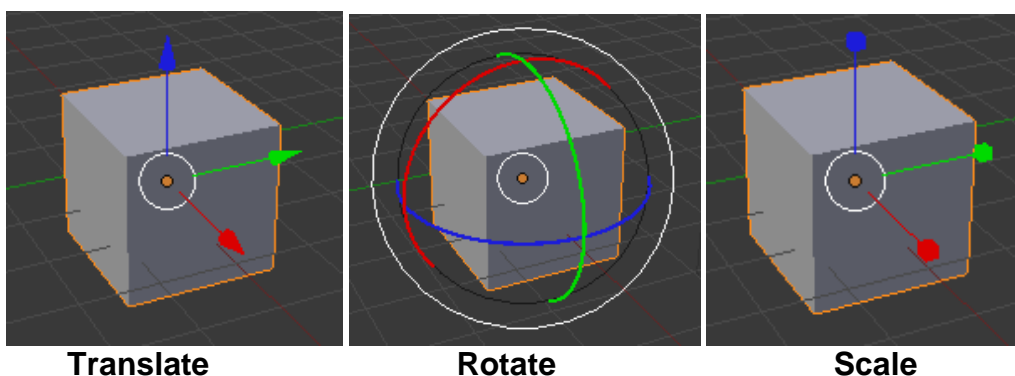
To use the **MANIPULATORS**, select the manipulator button at the bottom of the 3D window



- When this is clicked, you will be given more options from which you can choose to **Translate**, or Grab, **Rotate** or **Scale** the object
 - **NOTE:** The Translate is automatically selected by default



- When you have chosen one of the manipulator options, you can now manipulate your object by left clicking and dragging on along any one of the objects control points, or axes. This will manipulate it along the chosen axis.
 - If you do not wish to move it along an axis, you can left click inside the small white circle in the centre and this will allow you to move it freely



To use the **HOTKEYS** for transforming an object, we need to make sure the manipulators are disabled. If needs be, click again on the manipulators button to disable them



- **Using the hotkeys**, to **translate**, or move an object freely, press the **G** Key with the object selected and drag the mouse
 - To lock the movement to a particular axis press G + X , Y or Z
- To **scale** an object freely, press the **S** Key and drag the mouse
 - To lock the scale to a particular axis press S + X, Y or Z
- To **rotate** an object, press the **R** Key and move the mouse about the objects centre point
 - To lock the rotation to an axis press R + X, Y or Z
- Press **ENTER**, or left click, once you're happy with your transformation.

Some other important transform techniques we should know about are how to **duplicate and delete objects**

- To **duplicate**, or make a copy, of an object, select the object and press **Shift and D**
 - This automatically enables the **Grab** function which allows you to position the duplicate object
- To **delete** an object from the 3D plane, select the object and press **X** or **Delete** on the keyboard
- To **cancel** any movement or transformation, press **Esc** or **right click**

Using the Toolbars:

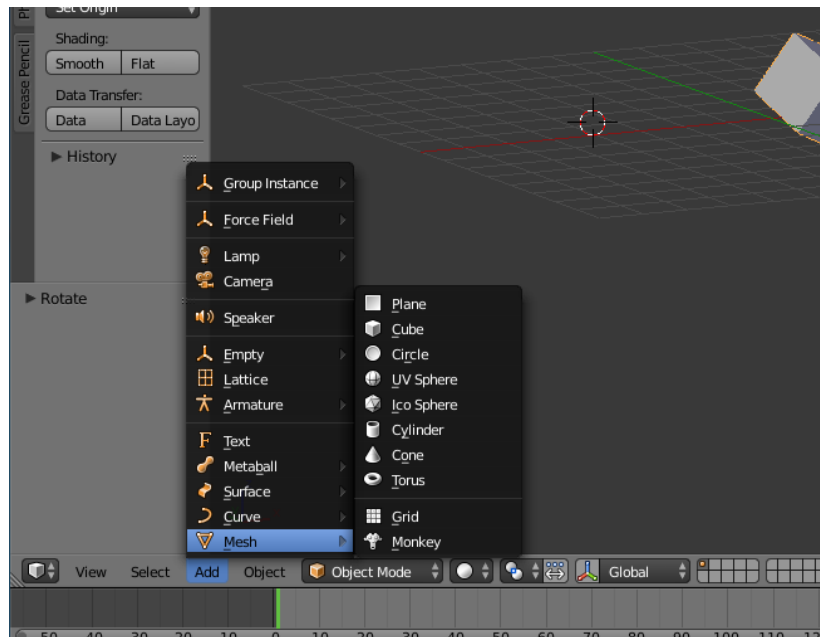
Pressing **N** and/or **T** will open up toolbars on either side depending on which one you pressed. Press them again to hide them.

For example, try opening up the right-toolbar (pressing **N**) and then move an object like a cube (using **G**). Observe the top panel called 'Transform'. You will see these values being changed as you move your object. You can also type values in here directly. Try typing 3 in the **X** box, this should move the object 3 places along the X-axis.

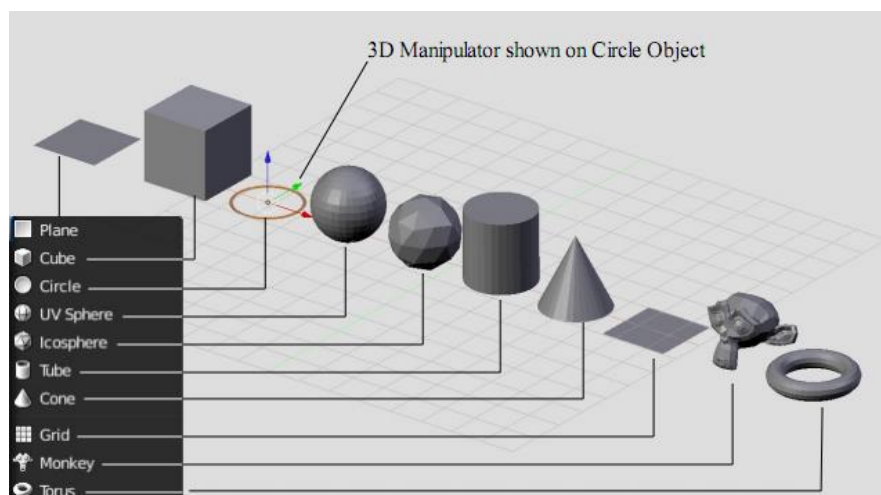
Adding New Objects:

Next, we will **add a new object** onto the 3D plane

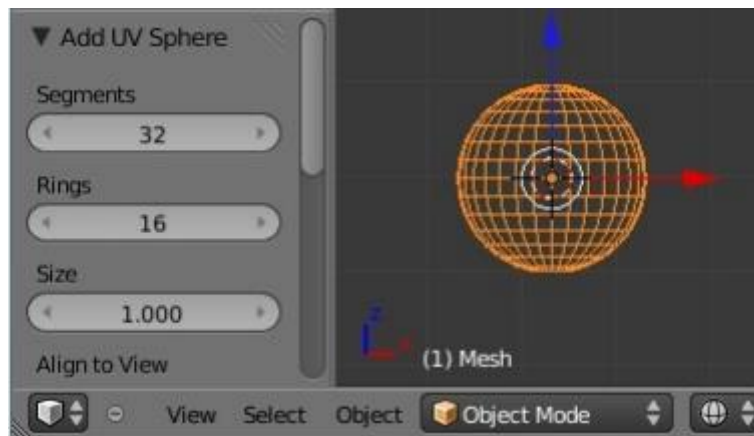
- Choose where you would like to place your new object on the plane and left click there to position the cursor.
 - Blender will add the new object to the place you have positioned the cursor
- Click **Add** at the bottom of the window, or alternatively hold **Shift and A**, to bring up the **Add menu**



- From the Add menu, select **Mesh >> UV Sphere**
 - Notice how the sphere has been added to where the cursor is positioned
 - The mesh option gives us a variety of objects which we can add to our 3D window. The options include:



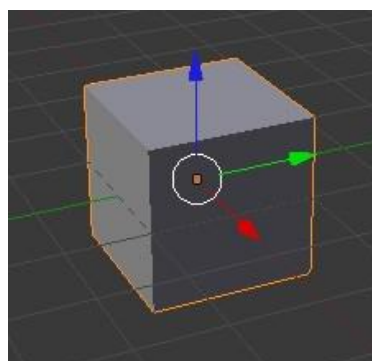
- But **what is a Mesh?** In Blender, objects are comprised of **meshes**, think of a sphere made out of chicken wire or fishing net. A sphere in Blender has a mesh with vertical and horizontal divisions called segments and rings.
 - ▶ Vertical segments, like the inside of an orange, and horizontal rings, like slices through the orange
 - ▶ For example, the default UV Sphere has 32 segments and 16 rings
 - You can change these by altering the values in the panel at the bottom of the Toolbar, which displays when you add the Sphere to the scene



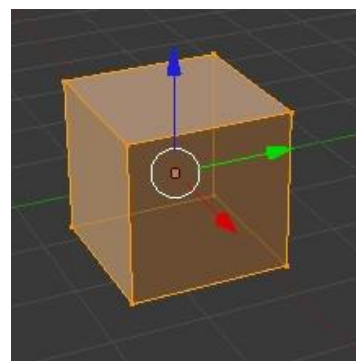
NOTE: When you add a new object, it should come into the scene in **Object Mode** – this is evident by the orange outline around the object when it is selected. The two states used in Blender are:

1. **Object Mode:** This affects the object as a solid object but you cannot model your shape in this mode
2. **Edit Mode:** This is intended for modifying & modelling the shape of the object by manipulating the mesh as you wish

The **Tab** key toggles you between the Object and Edit modes



Object Mode

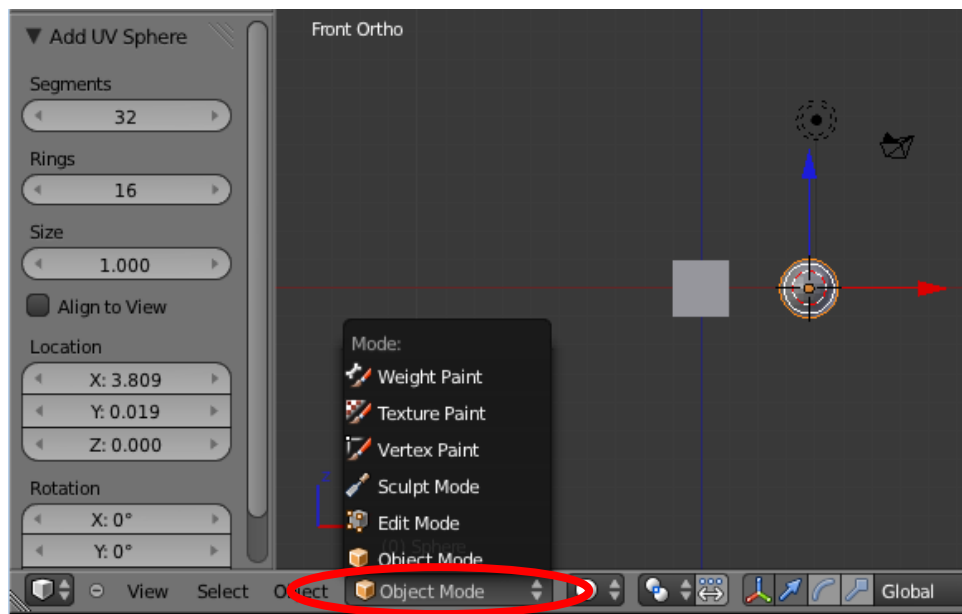


Edit Mode

Working in Edit Mode:

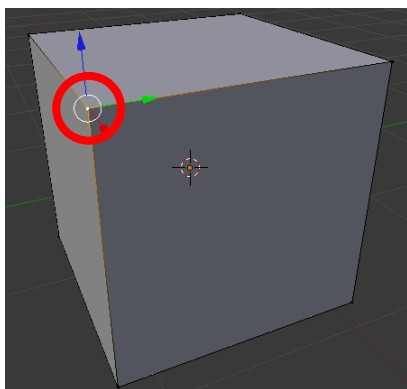
NOTE: Before adding a new object into your scene, make sure any other objects are not in edit mode, otherwise the new object will be joined/linked to existing ones

- Select the cube on the 3D plane whilst in object mode
 - If in any doubt, you can always check the bottom on the 3D viewport to see what mode you are currently in
- Press the **Tab** key on the keyboard to switch the object into edit mode
 - Another way to switch between modes is to use the **Mode Selection** drop down at the bottom of the window

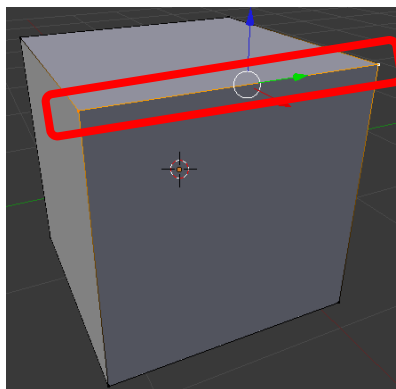


In Blender, a 3D object is made up of vertices, faces and edges

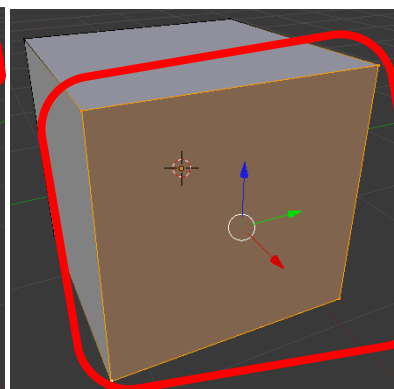
- Once in edit mode, you can work with these to create the shape you want
 - ▶ **Vertices** are the dots found on corners or edges
 - ▶ **Edges** are the lines, which can have 2 or more vertices at its endpoints
 - ▶ **Faces** are the actual surface of your 3D object



Vertices

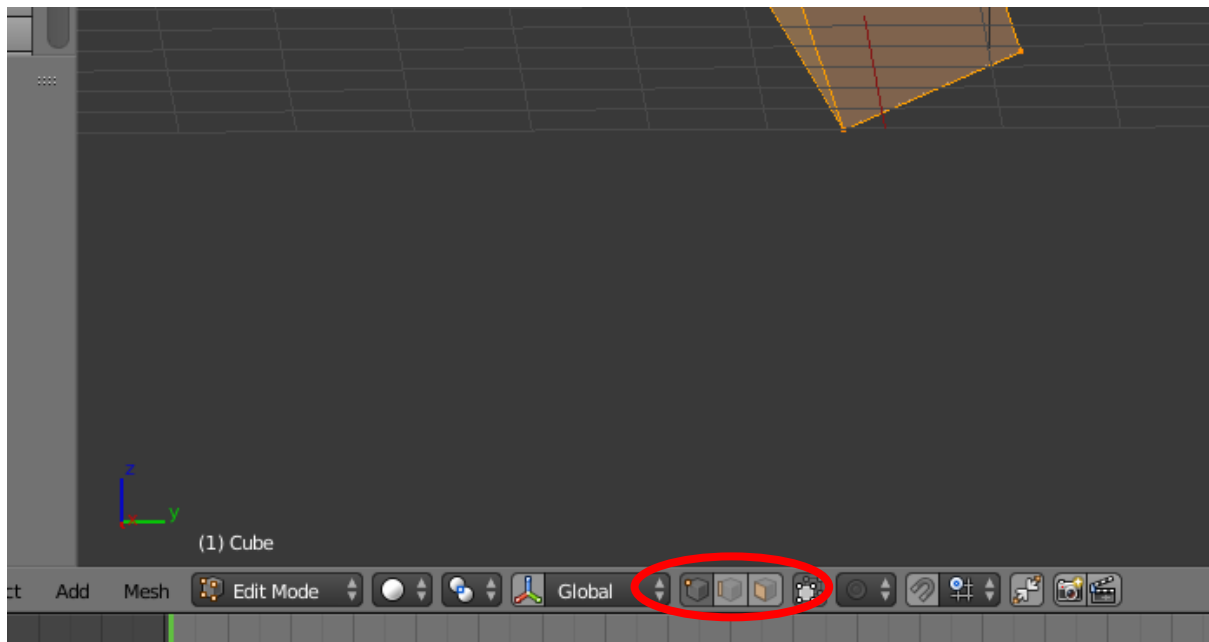


Edges



Faces

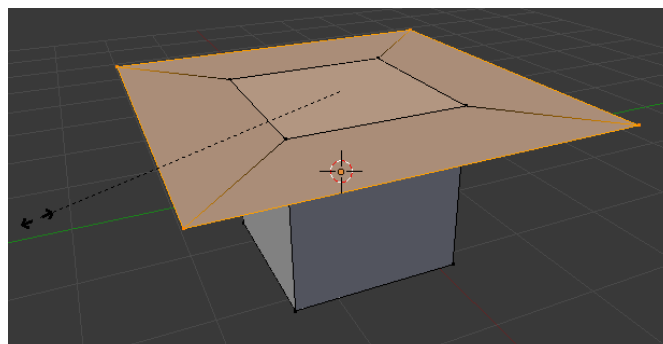
- To select, or work with any of these, we can use the various selection modes found at the bottom of the 3D window



- To work with vertices, you would click the **Vertex Select Mode**
 - To work with edges, you would click the **Edge Select Mode**
 - To work with faces, you would click the **Face Select Mode**
- If you want to select / de-select **individual vertices**, use **Shift and right click** on desired vertices
 - Orange dots are selected vertices while black dots are unselected vertices
- To select / de-select **all** vertices, press **A**

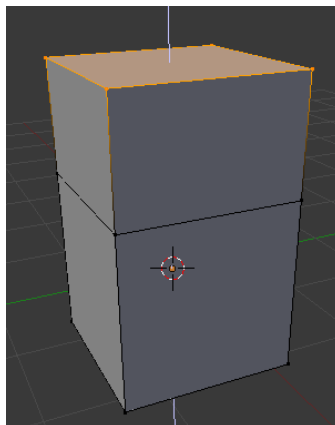
Transformation in Edit Mode:

- It is possible to select one, a few or all vertices and transform them in the same way which we would transform the whole object
 - ▶ Select desired vertices, edges or faces, and press **G** to grab, **S** to scale (scale can only be used with multiple vertices selected) or **R** to rotate
 - ▶ Alternatively use the **Manipulator buttons** along the bottom of the window

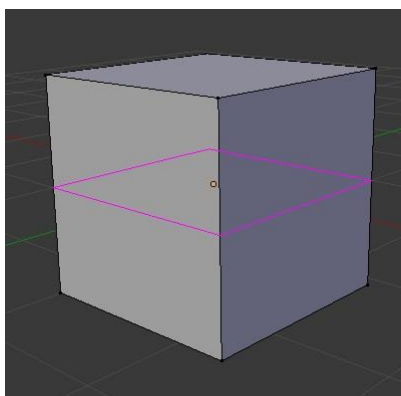


Some Modelling Tools:

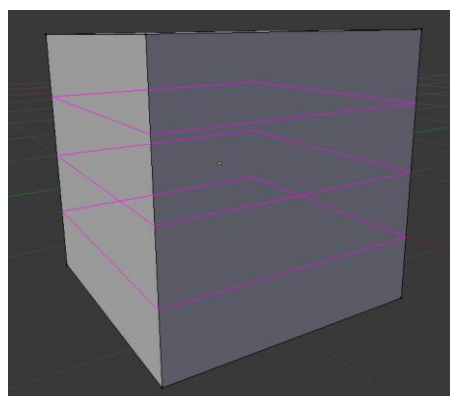
- Whilst there are a lot of tools which we can use for modelling in Blender, one important tool we should know about, which we use in Edit Mode, is the **Extrude Tool**, which allows us to extend part or all of our object
- To extrude an objects face, select **Face Select Mode**, and click on any of the objects faces
 - Extrude out this selected face by pressing the **E key** and then moving the mouse
 - ▶ You should note that there are now a whole new set of vertices, edges and faces made available to you in the extruded section



- The **Loop Cut** tool is also very handy to know about. Loop cuts can help you to add better details to your 3D models and help shape the object to exactly the way you want it.
- To add a loop cut, move the mouse over your 3D object, then press **Ctrl and R**
 - Blender will give you a purple line that “wraps” around your 3D object. This shows you where you are about to add a loop cut.
 - Left click to position the loop cut, and left click again to commit to this position. This will then put a new cut through your 3D object and give you some more vertices, edges and faces to play with.
 - ▶ Before left clicking to confirm the position of the loop, you can **scroll the mouse wheel up and down** to get more loop cuts in the same area

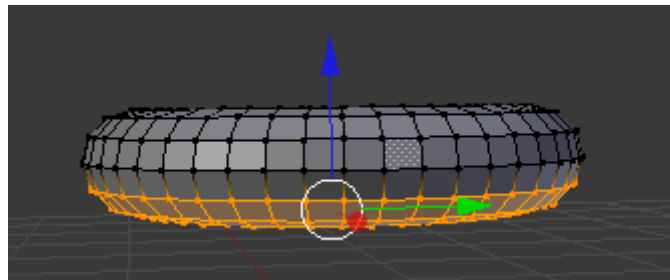
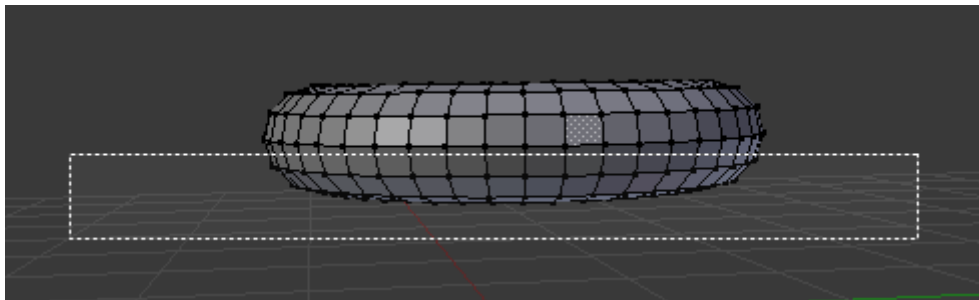


Single Loop Line

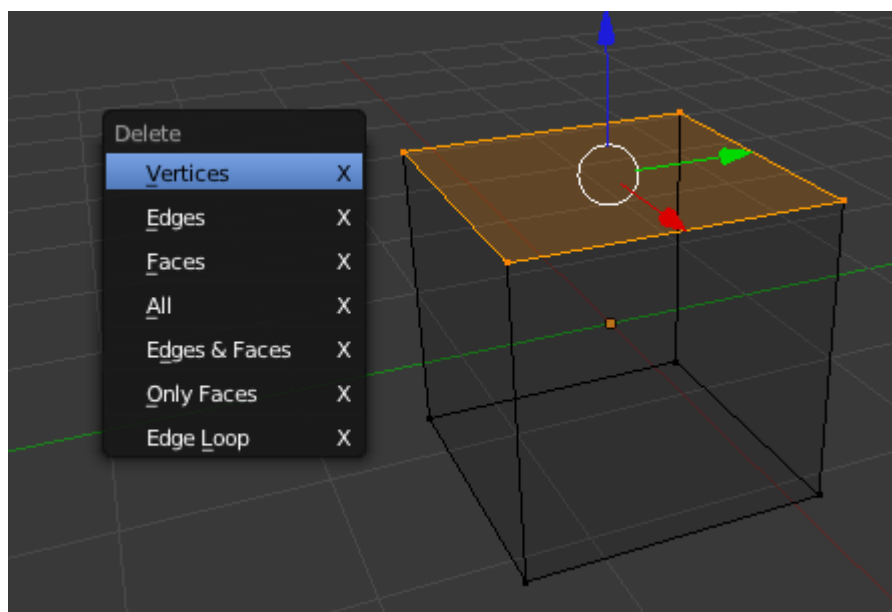


Multiple Loop Lines

- Don't forget about the **Box Select** and **Circle Select**, which we looked at earlier and can also be used in Edit Mode.
- These will allow us to draw a selection box or circle around any particular vertices we wish to manipulate or delete
 - ▶ To use the Box Select, press **B** on the keyboard and then **left click and drag** around the desired vertices
 - ▶ To use the Circle Select, press **C** on the keyboard and then **left click and drag** around the desired vertices



- It is also possible to **delete** (X) in Edit Mode, although it is different from how we delete in Object Mode.
 - ▶ In object mode, we delete the **whole object**
 - ▶ In edit mode, we are given the option of whether we would like to delete **only vertices, edges, faces or the whole object**

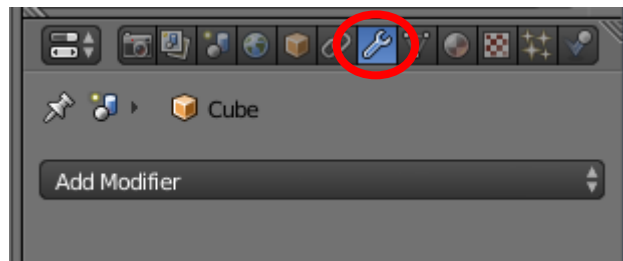


Using Modifiers:

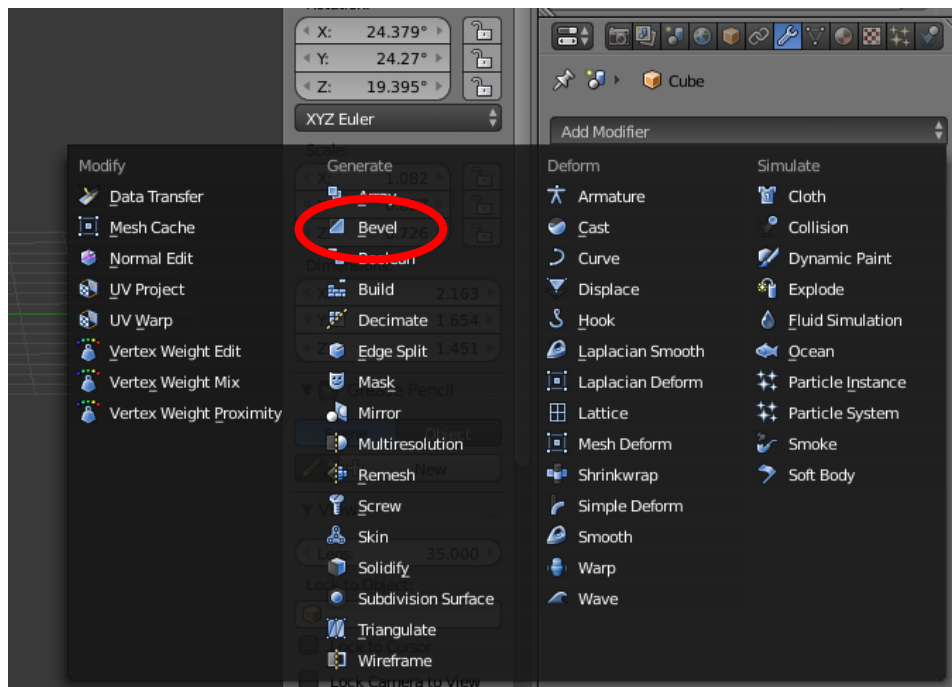
Modifiers are operations that you can carry out on your 3D object in a non-destructive manner. There are a lot of different modifiers you can choose from in Blender. Modifiers can save a lot of time, as they can automatically help you with you modelling.

One example of a modifier would be the **Subdivision Surface Modifier**. When modelling in Blender, you might be left with sharp and jagged edges. The Subdivision Surface modifier will smooth everything out. This is most effective for organic type of models like characters or animals

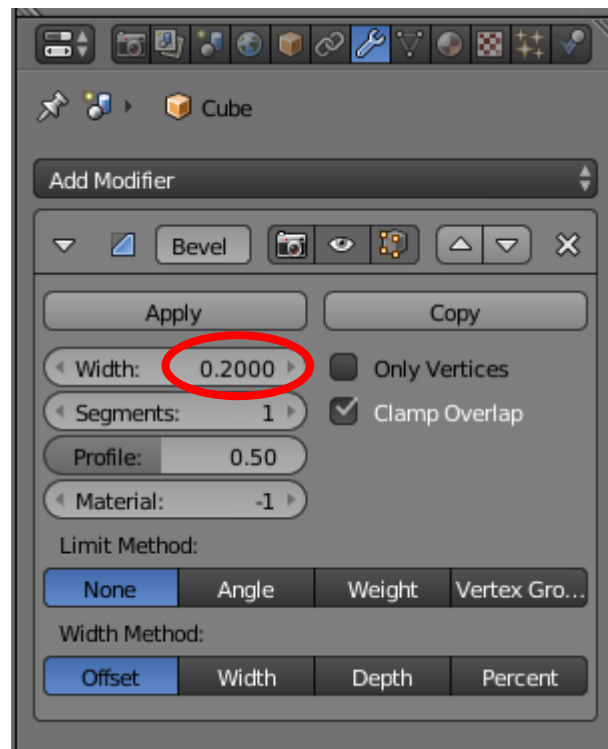
- Let's try adding bevelled edges to the cube, currently on our 3D plane
 - ▶ In **object mode**:
 - Select the cube, and press the **Modifier** button in the properties panel
 - Click on **Add Modifier**



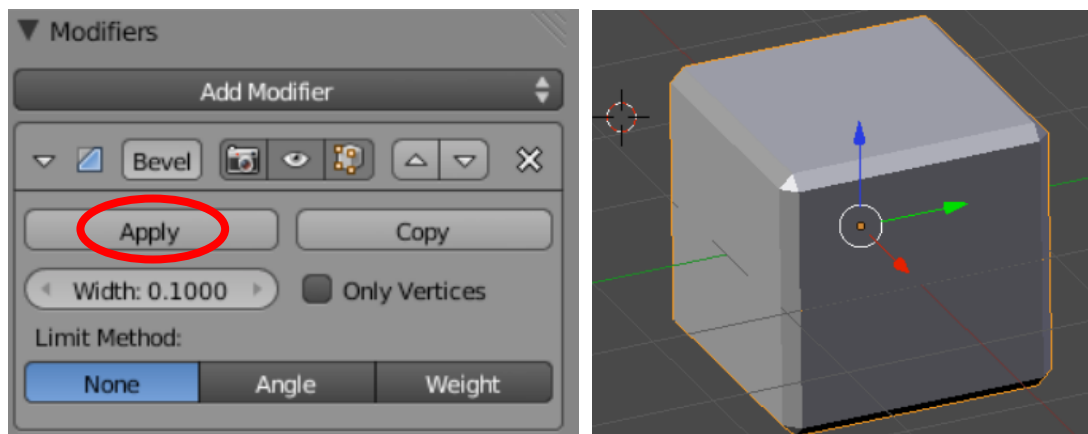
- From the selection of modifiers shown, choose the **Bevel** option to add to the cube



- Using the bevel properties given, set the bevel width to **0.2**



- Click the **Apply** button to confirm and permanently apply the bevel modifier to the cube



- Save your Blender file when finished and close