

# INTRO TO BLENDER MESH MODELING –EDITING VERTICES

By Mr. D at Delta 3D

## Helpful Keyboard Shortcuts

### Selecting Objects in EDIT MODE

**‘Shift’** when click selecting (sub)objects hold down the ‘Shift’ Key to select multiple objects.

**‘b’** Gives you border select tool for rectangular/marquee selection of an area. Hit the ‘b’ key and you’ll see dash vertical and horizontal lines extending out from your mouse’s cursor, now hold down your select mouse button and drag out a selection marquee area.

**‘Ctrl LMB/RMB’** by default ‘Ctrl LMB’ allows you to lasso select. However if in preferences you’ve changed to LMB for selecting, then ‘Ctrl RMB’ can be used to lasso select (sub)objects.

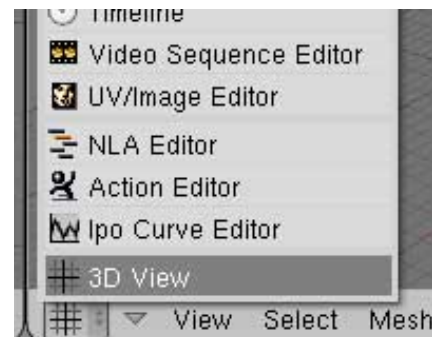
**‘a’** Toggles all (sub)objects selected or no objects selected. Useful to make sure you’ve nothing accidentally selected.

**‘Less’ and ‘More’** sub-object selection. **‘Ctrl NumPad –’** and **‘Ctrl NumPad +’** with a sub-object (vertex, edge, face) selected use the plus (+) and minus (-) keys to increase and decrease connected similar sub-objects.

(Blender shortcuts show capital letters, but it is not necessary to Caps Lock, small letters work).

Try it out in Blender.

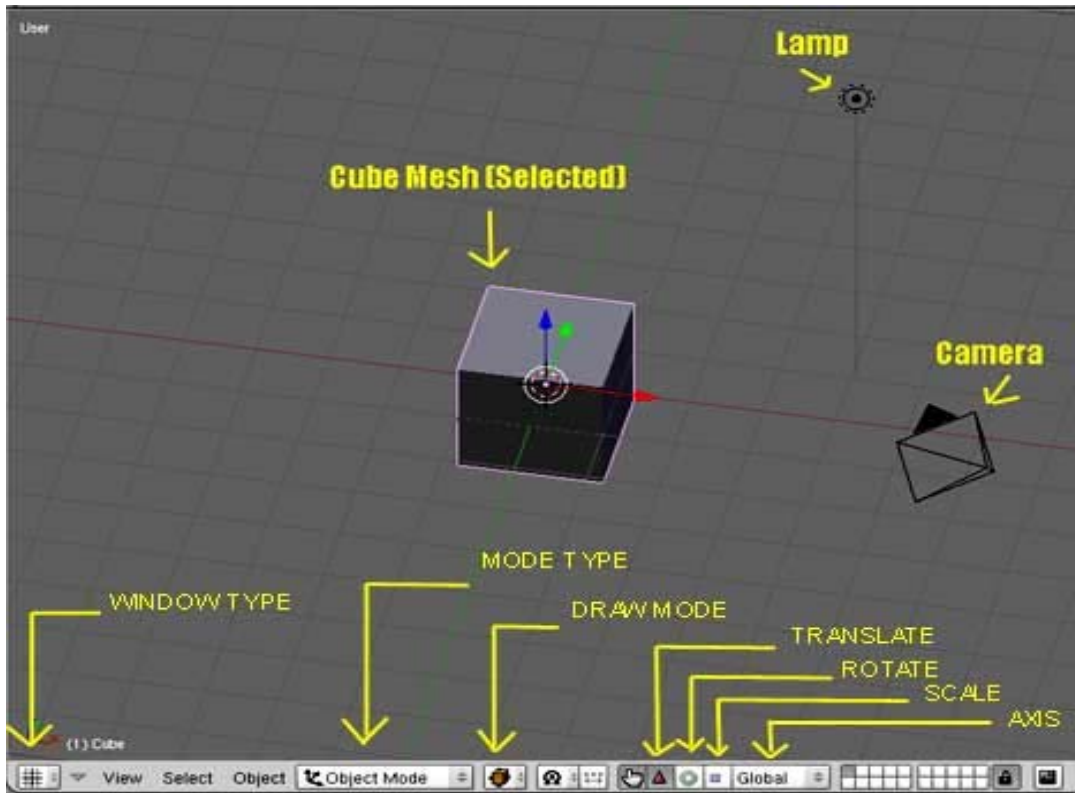
Open Blender: If no Window is set for 3D go to the far left of a **Header Menu Bar** and press and hold on the **Window Type Select** icon. A pull down (or up depending on if the menu bar is set to appear at the top or bottom of the Window) will appear and still holding down your mouse button move it over the list till ‘3D View’ is highlighted and release.



Normally by default Blender starts off a new scene with a default Cube in the 3D View to begin modifying.

A quick rundown on the 3D View follows.

This is a Default view where Blender has put in a Lamp, needed to see the object shaded in View and for Rendering shaded. Also a camera for Rendering has been added by Blender, a render is from a camera’s viewpoint. By Default there is a selected mesh cube, which you can see is outlined in pink to signify this to begin building from. This is where the **‘a’** key comes in handy, so press ‘a’ to deselect all objects.



At the bottom is the **Header Menu Bar**, but remember this can be user set to appear at the top of the **View** or not at all to increase the workspace.

Far left is the **Window Type**, here set for **3d View**, the View-Select-Object are hot areas where when clicked on bring up rollouts related to actions that can be used in this window. Click and hold to take a look at the actions. The small arrow when clicked toggles these three items as shown are not.

**Mode Type** when clicked brings up a list of modes available to this **Window Type**. With **3D View** as **Window Type** these modes deal with Object and Sub-Object manipulation choices. For purpose of this paper we will be only interested in **Edit Mode**.

**Draw Mode** deals with how the objects in a scene are represented or drawn in the scene. Click and try some of the other modes, however remember no textures or shaders have been added to the Cube so it stays default grey. But the Cube will shaded based on the scene light's position.

**Translate-Rotate-Scale** is what type of action will be performed on the selected object(s) or sub-object(s). The hand icon toggles if you can view these items or not.

**Axis** is for what axis to use when carrying out manipulations.

'Global' – axis based on the 3D View's world. 'Local' – axis from object.

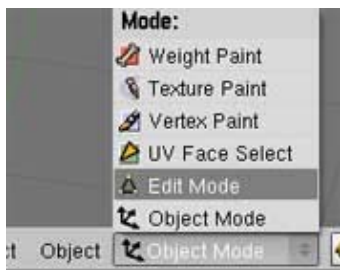
'Normal' – axis based on normal of selected sub-object.

'View' – treats window an orthographic/flat view (Y up, X left/right, Z in/out).

Depending on how you wish to manipulate and object in relationship to other objects, or sub-object components of an object to itself, may require you to choose a different axis to work with.

## EDIT MODE

Time to go into 'Edit Mode', click on your Cube to select it if not already highlighted; then click on the up/down arrows next to **Mode Type**, and from the list highlight and select 'Edit Mode' (shortcut is TAB key).



Upon doing so you will notice two changes to your **Header Menu Bar**.

To the left 'Mesh' has replaced 'Object' as a hot area, giving you new manipulation options.



And at the right end a set of 4 new icons have appeared. These icons allow you to select the type of sub-object component you wish to work on, Vertices – Edges – Faces, plus a fourth limiting selection to only visible sub-components also known as culling or clipping.

A darkened icon denotes selection, so in the above image I have Vertices selected and clipping is turned on.

First choose 'Translate' for the type of action you wish to carry out. If you need to look at the image of the **3D View Window** to locate the translate icon. By default it is normally selected when you enter 'Edit Mode', remember the darkened icon is the one selected.

You should now see the vertices of your Cube either as pink dots if not selected or yellow if they are. If all your vertices are showing as yellow hit the 'a' key to deselect them, and they should all turn pink.

If you are not in a user perspective view, but a side –top –front view, rotate into a user view by holding down your **MiddleMouseButton or (MMB)**. Try to get a view similar to the **3D View Window** above, where you get a  $\frac{3}{4}$  view of the Cube.

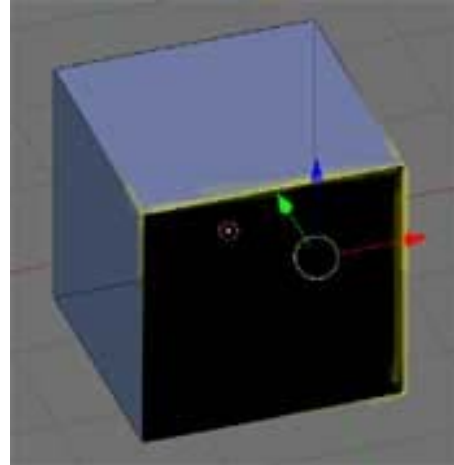
### **(IMPORTANT NOTE)**

Rotating any flat view such as top-front-side puts you into 'User' view. Even just a small movement where you might not notice the difference can affect your modeling. Because what might appear as straight up in a viewport, might actually now be slightly up and outwards or inwards.

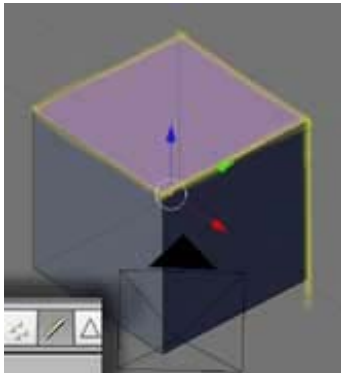
One useful item to do is set your viewport to show their name, done under the 'Users Preferences' Window Type >Views&Controls; sub category Display: >View Name.

However this only tells you're the views name top-front-side-user, but not whether your in Perspective or Orthographic view.

Pick a vertex by clicking on it, the vertex should turn Yellow. Hold down the 'Shift' key to click a few more. In the picture to the left I have selected the two front top vertices and the lower right one. For ease of illustrating I've brightened the yellowed edges for effect. On your cube you should see that an edge running between two selected vertices is yellow all the way across. Between one selected and one non-selected it is yellow only toward the end nearest the selected vertex.

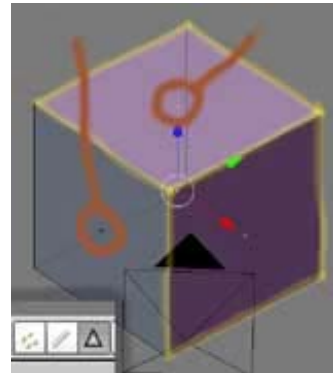


This is Blender helping you to visually see what edges will be affected by your manipulating those vertices.



Hit 'a' to deselect all and then try Edges as on the left, to do so click on the edges you want but notice if your click all the edges around a face it too highlights.

Lastly Faces (right image) and look close for a small back dot in the center of the face to click to choose that face (circled in orange).



Blender does this highlighting to help you get an easier feel for the area you are selecting, as on complex objects what is picked can get confusing at times.

## VERTEX MANIPULATION ACTIONS

Hit 'a' to deselect all items, then put yourself back in Vertex for Sub-Object type, and you should see your cube showing pink dots to indicate the vertices again.

Now we shall look at the Vertex manipulation tools available in Blender. Since we are merely practicing with various tools, you may wish to expand/maximize your workspace if you are not already working in a single window space. To do this go to the View Window you wish to enlarge and press 'Ctrl UpArrow' to maximize that Window. Pressing the keys again will return you to your multi window view.

There are two main ways to bring up your Vertex Actions, first using the **'Mesh'** hotspot area on the **Window Menu Bar**. Click here to see a list of Mesh Options while in **Edit Mode**, then highlight the 'Vertices' list item which will show a list of actions that can be taken on vertices. For this paper we will deal with Merge-Rip-Split-Separate.

A second way is to use the **Marker Menu** sometimes also called a **HotBox**, from within the Window View itself. To do this move your mouse to an area of the window where it is not close enough to an object to select it, then press and hold down either left or right mouse button (**LMB, RMB**). After a few seconds a popup menu will appear under your mouse, then release and move your mouse to highlight 'Edit'. Off to the side another list showing Edit Options pops up, then slide your mouse over to highlight 'Vertices' and see a new pop up appear that lists Vertex Actions.

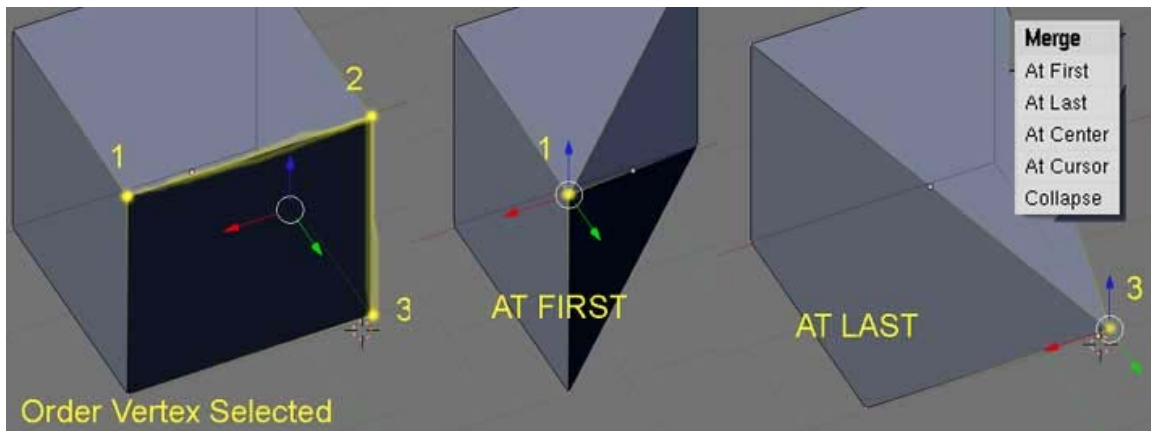
Either way works fine, and which way you prefer to use will depend more on how you like to model.

**Merge 'Alt m'** - use this to merge two or more vertices together. Select two vertices on your Cube either through a menu, Mesh> Vertices> Merge, or the keyboard short cut of 'Alt m' execute the merge command.

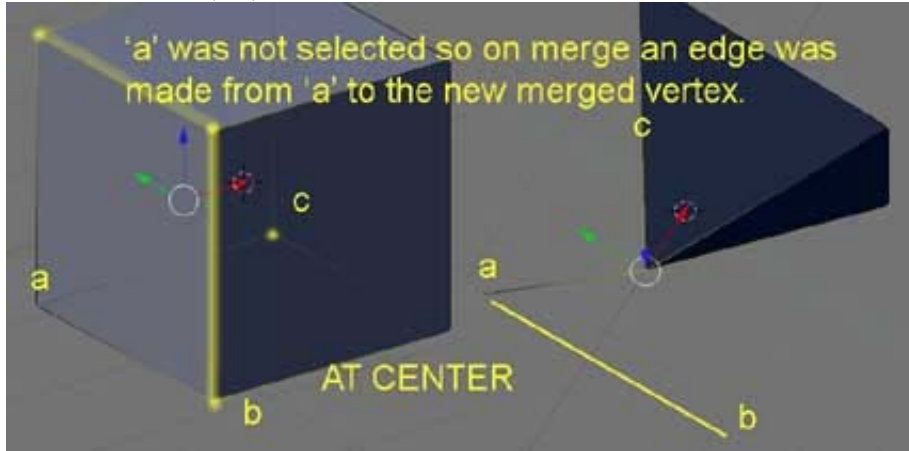
A new pop up menu appears beneath your mouse cursor (caution moving the mouse off to the side ends the pop up) for what type of Merge you wish to do.

**AT FIRST:** New single vertex is created at location of first vertex selected.

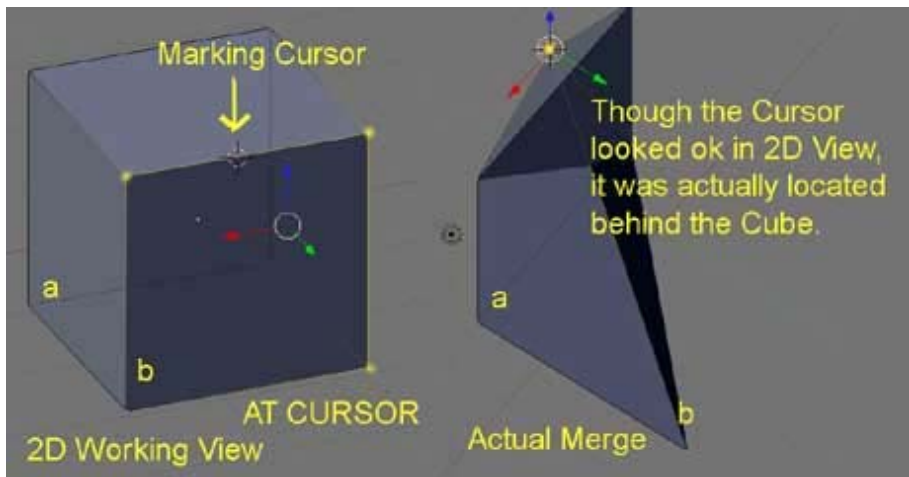
**AT LAST:** New single vertex is created at location of last vertex selected.



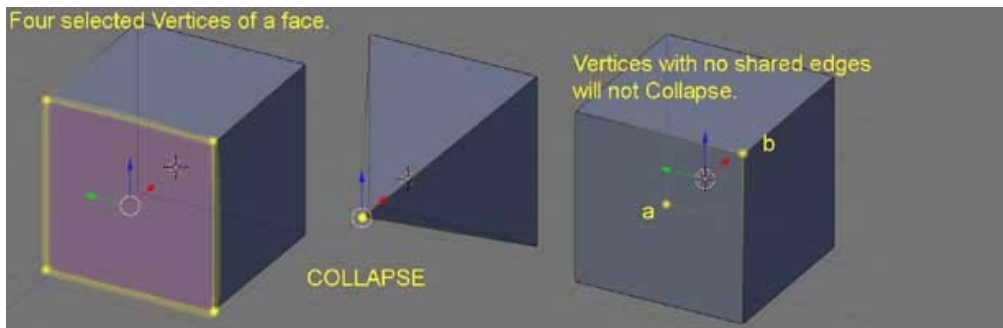
**AT CENTER:** Blender calculates what would be the center of the vertices selected, or another way to think about it, the half the distance between the vertices furthest apart in each of the X, Y, and Z axis'.



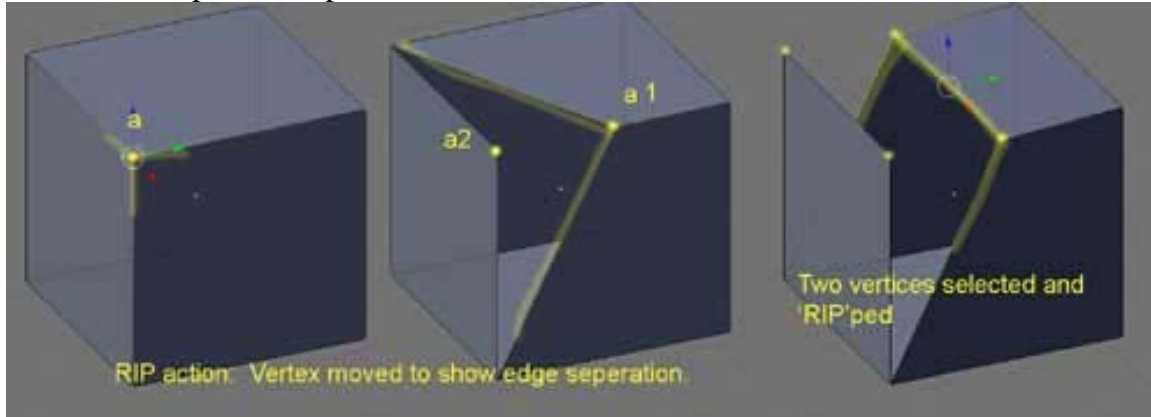
**AT CURSOR:** New vertex placed at the location of the **Marking Cursor**, a caution here to remember the Marking Cursor is in 3D space. Simply placing it where it looks right from a 2D Window View, might not be where you really want it to be. So check from several views.



**COLLAPSE:** Like AT CENTER placing new vertex at center of selected vertices, but vertices must share an edge.



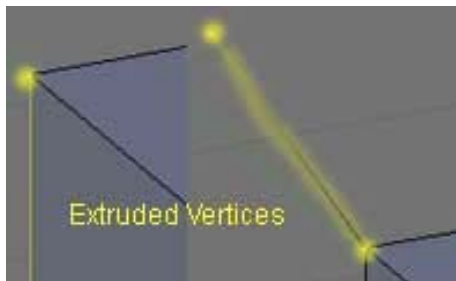
**RIP 'v'** - Creates another vertex from the one(s) selected, and splits edges used by that vertex. Or 'Rips' them apart in Blender's terms.



**SPLIT 'y'** – Duplicates selected vertices and copies them, but the vertices are still part of the object.

**SEPARATE 'p'** – Duplicates selected vertices and copies them, but the vertices are a separate object. Similar to 'Detach' command used by other 3D modeling programs.

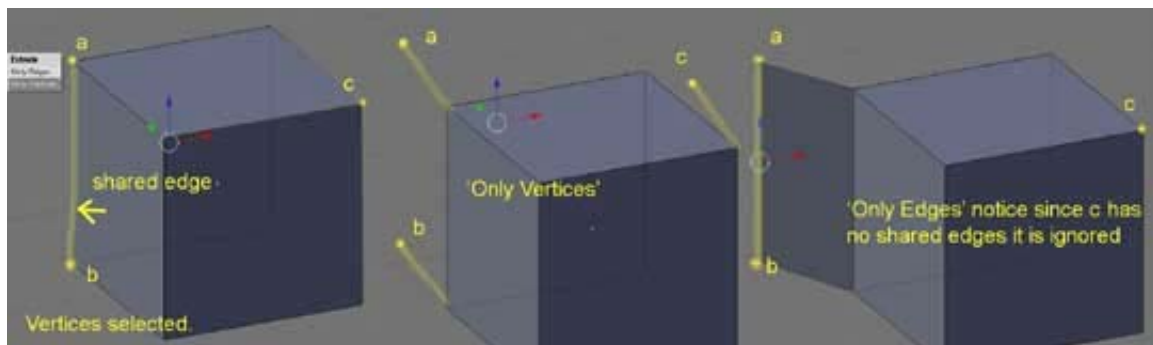
### EXTRUDING VERTICES



To Extrude a Vertex simple select it and go to **Mesh > Extrude** or 'e', and drag away the vertex which will create an edge connecting to the vertex first selected.

If however more than one vertex is selected during **Mesh > Extrude** a pop up appears asking 'Only Edges' and 'Only Vertices'. 'Only Edges' only those vertices that have an edge shared with other selected vertices will be extruded, and produce an extruded edge/face from the shared edge along with the vertices.

'Only Vertices' ignores whether an edge is shared and just extrudes all selected vertices.



**SMOOTH 'w, Alt1'** - Flattens the angles of selected faces. So why in 'Vertices', it's also in the 'Faces' actions as well, but remember that 3 'Vertices' make a face. So if you select and area so that the vertices selected compose a number of connecting faces of sufficient angle Blender will try to do smoothing or flattening of the angles.

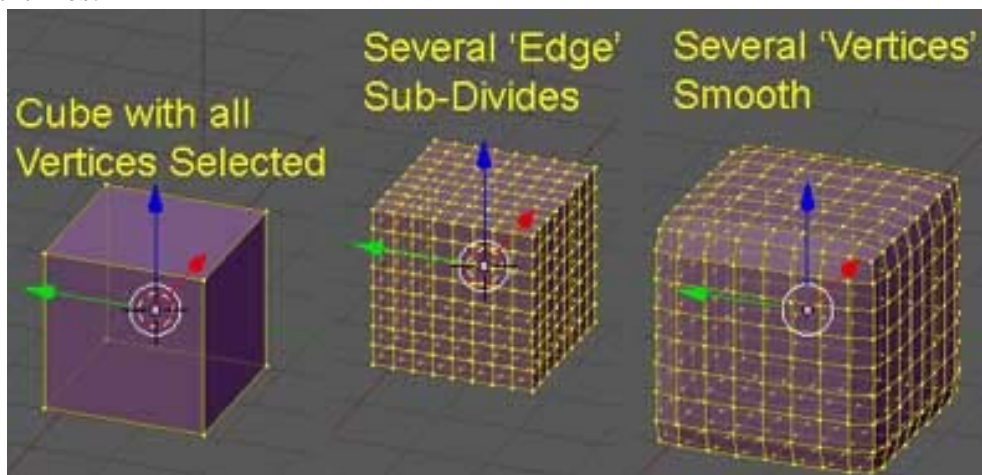
**(Note:** At times actions may seem to do nothing in Blender, but the program is smart enough to understand if you pick 2 vertices that share an edge, some 'Edge' actions are available in 'Vertices'. Same with 'Faces' as well, so when working with sub-objects you are dealing with more than one component. Two vertices can share an edge, a quad has 4 vertices and five edges, recall that a quad is two tri-faces so they share a non-shown inner edge. So you can be in 'Vertices' Mode but still do a 'Face' Action.

But a listed 'Action' in the 'Vertices' Menu can pertain to an edge or face function, and unless the correct Vertices are selected to make an edge or face the 'Menu Action' does not seem to work. Once you've started using Blender for modeling you'll begin to know what is needed for what 'Action'.)

Take your Cube with all 'Vertices' selected, try using the 'a' key, and then 'Tool Box' or use the 'Header Menu' of *Mesh > Vertices > Smooth* or 'w, Alt1' to perform the 'Smooth'. Your Cube looks to shrink a bit but not much else, this is because the smooth must work with the existing Geometry. Your Cube just does not have enough faces to work with.

So we shall add a few more faces, but let's Not go to Face Mode. From the *Note* above since all 'Vertices' are selected the 'Edges' that connect them are also considered selected by Blender. So use the **Tool Box**, or **Header Menu**; or 'w, 1' to carry out the 'Edges' Action of Sub-Divide.

When you get enough Sub-Divisions to your liking, run the 'Smooth' Action again, but take into account it works in small increments and you may need to apply the command several times.



## A TRICK FOR SMOOTH

Tired of going through the Menu or Tool Box, or hit multiple key combinations several times?

Try this way of doing it instead.

Setup a window for '**Buttons Type**', then from the '**Panels**' Icon locate and select '**Editing**' (F9) and click it. Now look in the Sub-Menu Items for '**Mesh Tools**'. This and Mesh Tools 1 are Editing Actions that can be carried out on Sub-Components of the Mesh (Vertices-Edges-Faces).

Just click on 'Smooth' several times, to see how this button basically can handle all those other paths in one click.



### **REMOVE DOUBLES:**

This would be in Max or Maya a Vertex Weld which operates on Selected Faces. Say you have 2 objects, or example 2 Planes, you arrange one so it edge overlaps the other also overlapping their vertices. Now by selecting all the overlapping vertices you can 'weld' them together or in Blender terms 'Remove Duplicate' Vertices.

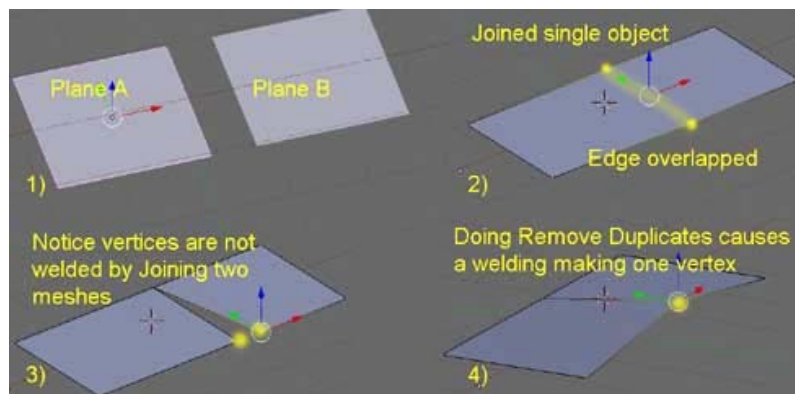
In Blender go to a top down view and *Mesh >Add >Plane*. When you add a object Blender snaps into **Edit mode**, figuring if you're adding a Primitive you intend to start manipulating it. So '**Tab**' back to **Object mode** and add another plane, again back into 'Object' Mode, and move one Plane placing the two meshes side by side with an edge overlapping.

Next join the two Planes by selecting both and *Object >Join Objects*, or '**Ctrl j**'. Switch to 'Edit' Mode – Vertices and check to see if the overlapping Vertices automatically welded on join, and you'll find they did not. If you need to undo a Vertice move made while checking use '**Ctrl z**' to **Undo**.

Once the Vertices are back in place, grab all overlapping vertices, and since this is difficult by try to click hit '**b**' to evoke a box/marquee select or use '**Ctrl RMB**' to lasso select the needed vertices. Now carry out *Mesh >Vertices >Remove Doubles*, or '**W, 6**'.

Finally check you vertices to see if they welded. If not it maybe that your Vertices were not close enough, as with Max or Maya when welding you have a distance threshold.

This threshold is set in the **Buttons Windows – Editing –Mesh Tools Area**



as well. So look in the **Mesh Tools** area again like you did for Smooth, but now look for a box titled '**Rem Doubl**'. Next to it is a numeric input box – 'Limit:'. Try adjusting this value, the higher the value the further apart the Vertices being worked on can be and still get welded or doubles removed.

**Caution:** If you are working on a very small object, for example if these Planes were very small, and you set your Limit high you could Remove or weld all Vertices in to one.

**Modeling Tip:** You might make it a habit to do an object weld on a mesh you make before beginning texturing or rigging for animation. To help remove unwelded vertices, and duplicate face and edges that may have been accidentally created in modeling your object. To do this in Vertices Mode do a select all ('a'), and set your **Rem Doubl limit** low then do a Remove. Hopefully this will get rid of the above listed problems.