

# ***Blender Basics***



























***Classroom  
Tutorial  
Book***

***By  
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***Information regarding the Blender program and development can be found at [www.blender.org](http://www.blender.org).***

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## **About Blender**

### ***How can Blender be free?***

People usually associate freeware software with the terms “bad”, “with limited features” or just a “demo”. Blender is fully functional. It works as an open-sourced, community development program where people from around the world contribute to its success. Blender is a rendering\animation\game development open-sourced freeware program maintained by the Blender Foundation and can be downloaded, free of charge, from [www.blender.org](http://www.blender.org). The goal of the foundation can be summarized as follows:

“The Blender Foundation is an independent organization (a Dutch “stichting”), acting as a non-profit public benefit corporation, with the following goals:

- To organize a fund raising campaign in order to finance the €100,000 one time license fee
- To give the worldwide Internet community access to 3D technology in general, with Blender as a core
- To establish services for active users and developers of Blender
- To maintain and improve the current Blender product via a public accessible source code system under the GNU GPL license
- To establish funding or revenue mechanisms that serve the foundation’s goals and cover the foundation’s expenses”

*Blender website ([blender.org](http://blender.org))*

Blender can be a difficult program to learn with limitless possibilities. What do you teach in the time you have to teach? That’s a tough question because you can’t teach it all. This tutorial book is designed to get you up and running in the basics of creating objects and scenes and animating. The best advice I can give you about learning this program is *Don’t Give Up!* Any rendering and animation program has a tough learning curve and Blender is no exception. After a few weeks, things get easier. This tutorial has been developed to be used in conjunction with daily lesson planning and demonstrations. Because of this, some areas of Blender have not been described as fully as they could be. If you are using this guide as a stand-alone teaching or “self-help” tool, you may need to seek additional help from reputable places like [www.blender.org](http://www.blender.org) and [www.elysiun.com](http://www.elysiun.com) to make sense of things. These sites give you access to help forums and tutorials. There are literally thousands of Blender users world-wide that browse the forums to give and get advice. Make use of that vast knowledge base!

## **Rendering and Animation Basics**

### **RENDERING:**

A rendering is a pictorial output of a 3D scene or object. Features like materials, lighting, oversampling and shadows control the effects and quality of the rendering. The more of these features you add, the more realistic your scene become, but also lengthens rendering times.

#### **Materials and Textures:**

You can control the way an object appears by applying color and textures. Materials provide realism with added effects. You can control glossiness (specularity), self-emitting lighting characteristics, transparency and pattern repetition. Textures can be made from any scanned photograph or drawn object in paint. The file needs to be saved as a jpeg or bitmap in most cases, depending on the program. For Blender, the image should be square and based off of 8 x 8 pixels (16x16, 64x64, 256x256), however, off size and rectangular images usually work also. Higher pixel images provide sharper images, but increase file sizes.

#### **Lighting:**

Lighting provides the realism to your scene through reflections and shadows. You can control the type of light, intensity and color. Some lights can give a “fog” or “dusty” look with a halo or volume lighting effect. Illumination distances can also be set.

#### **Cameras:**

Your camera is your point-of-view for the scene. Just like a real camera, you can control lens length to achieve close-ups or wide angles. Clipping distance can also be set to control how far and near the camera sees.

### **ANIMATION:**

An animation is a series of rendered images that form a movie. The quality of your movie is controlled by all of the above mentioned features including frames per second (fps), output size, file type and compression. The most common method of animation is called *keyframing*. Key frames are created at various points in the animation while the computer generates all of the transition frames between the two keys. Basic animation options include changing size, rotation and location of objects.

## **Time Factors:**

In order to animate, you must first set the length of your animation in frames and your frames per second (fps). The length in time can be calculated from these.

### Frame Rate Options:

*NTSC*- U.S. and Japan video standard of 30 fps

*Film*- Movie standard of 24 fps

*PAL*- European video standard of 25 fps

*Custom*- set your own fps

\*We typically use a frame rate of 15 fps because most computers will display this rate smoothly, rendering times are shorter, and the animation quality is still high. With better computers, we've been using 25 fps more often.

## **Creating Keys:**

A key is placed at the beginning and end of a desired move, size change or rotation of an object. Think in terms of how long you want a change to occur and relate it to your fps. For example, if you want an object to move from point A to point B in 2 seconds and you have 15 fps, place 2 keys 30 frames apart.

## **Following Paths and Objects:**

In most animation programs, a camera can follow a path or object (or both) as it moves. This feature saves a lot of animation time and reduces the number of keys needed.

## **Output Options:**

We typically save our movies in AVI format for windows. This type of file plays easily on most media players. Compression agents allow us to control file size to a degree. However, animations can be rather large in size and may take up to several hundred megabytes of disk space. A compression agent, which we found to work well with most computers, is Indeo 5.1. For good output size, we typically use a resolution of 640 x 480 pixels. This is considered low resolution for computers and produces good full-screen quality when played.

## **Real-Time Animation (Blender only):**

Real-time animation allows you to add physical properties to your objects and use the keyboard and other features to control them. You can create actors, change masses, control dampening (friction), set force and torque in x, y, and z planes and create relationships with other objects within the scene. With time and practice, interesting 3D games and real-time architectural walk-throughs can be created.

## Basic Blender Commands

*This is just a partial list of Blender commands.  
Please visit the [Blender.org](http://Blender.org) website for more details and tutorials*

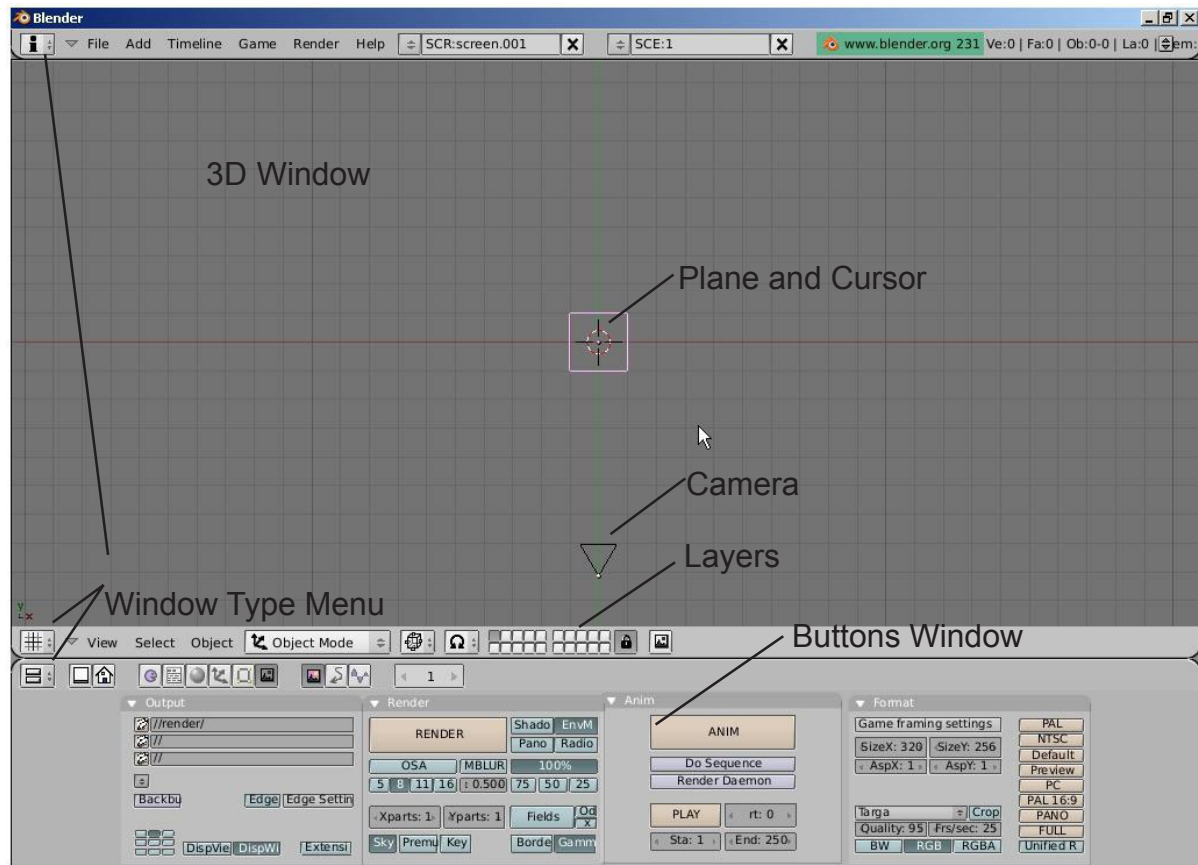
<b>TAB key-</b>	Toggles between edit mode (vertex editing) and object select mode. If you're in edit mode when you create a new object, it will be joined to the selected object.
<b>“O” key-</b>	The “O” key (not zero) will put you into proportional vertex editing while in edit mode.
<b>“A” key-</b>	While in edit mode it's good for selecting all vertices for commands like remove doubles and subdivide. “A” twice will clear selected and reselect.
<b>“B” key-</b>	Gives you a box (window drag) to select multiple objects. In edit mode, works the same to select multiple vertices, but hitting “B” twice gives you a circle select that can be sized by scrolling the mouse wheel.
<b>Space Bar-</b>	Brings up the tools menu where you can add meshes, cameras, lights, etc.
<b>Number Pad-</b>	Controls your views. “7” top, “1” front, “3” side, “0” camera, “5” perspective, “.” Zooms on selected object, “+ and –“ zoom in and out. The +- buttons also control affected vertices size in proportional vertex editing.
<b>Mouse-</b>	Left to manipulate, right to select, center wheel to zoom and rotate view. If you hold down “shift” and center wheel you can pan around on the screen.
<b>Shift Key-</b>	Hold down the shift key to make multiple selections with the right mouse button.
<b>Arrow Keys-</b>	Used to advance frames in animation. Left/right goes 1 frame at a time, up/down goes 10 frames at a time.
<b>“R” key-</b>	Rotates an object or selected vertices.
<b>“S” key-</b>	Scales a selected object or vertices.
<b>“G” key-</b>	Grabs or moves the object or selected vertices.
<b>“P” key-</b>	While in edit mode, selected vertices can be separated into a single object by pressing P.
<b>Shift-“D”-</b>	Duplicates or copies selected objects or selected vertices.
<b>“E” key-</b>	While in edit mode, selected vertices can be extruded by pressing E.
<b>“U” key-</b>	In Object Mode, brings up the Single-User menu to unlink materials, animations (IPOs), etc. for linked or copied objects. Undo command. Only works in edit mode and can now go back multiple steps. Sorry, no system-wide undo command.
<b>“M” key-</b>	Moves selected objects to other layers. <b>Mirror-</b> while in <u>edit mode</u> , “M” will give you a mirror command.
<b>“Z” key-</b>	Toggles view from wireframe to solid.
<b>Alt “Z”-</b>	Toggles a rough texture/shaded view.
<b>“P” key-</b>	Starts game mode
<b>ATL/CTRL “P”-</b>	Creates or breaks child/parent relationships. To create C/P relationships, hold down shift key and select child first, then parent. Hit Ctrl P. To clear a relationship, do the same except hit Alt P.
<b>“N” key-</b>	Brings up the numeric info. on a selected object (location, rotation and size). Info. can then be changed in the window.
<b>Ctrl “J”-</b>	Joins selected objects together.
<b>Alt “A”-</b>	Plays animation in selected window. Your cursor must be in that window for it to play.
<b>“F” key-</b>	Makes a face in edit mode of the selected vertices. You can only select 3-4 vertices at a time to make a face.
<b>“W” key-</b>	Boolean expression to union, create a difference, or subtract objects from one another. “W” will also give you a “ <b>specials</b> ” menu while in edit mode.
<b>“X” or Delete-</b>	Delete selected objects, vertices or faces.
<b>Function Keys-</b>	F1-Load File; F2-Save File; F3-Save Image; F4-Lamp Buttons; F5-Material Buttons; F6-Texture Buttons; F7-Animation Buttons; F8-Real Time Buttons; F9-Edit Buttons; F10-Display Buttons; F11-Last Render; F12-Render



- “I” Key-** The “I” key is used to insert animation keys for various things. Objects can be animated with basic Rotation, Location and Size keys and combinations thereof. If your cursor is down in the buttons portion of the screen, animation keys can be added to lights, materials and world settings.
- Ctrl “0”-** If using multiple cameras, this will switch to the selected camera. (Number pad “0”)
- Armatures-** Meshes can be controlled by “bones” or armatures. Create a mesh with vertices at the joint locations, then create an armature string within it. Child/Parent the mesh to the armature using the armature option. You can then animate the armature in Pose Mode.
- Ctrl-Tab-** Puts you into Pose mode for manipulating armatures.
- Import/Export-** Blender accepts .DXF and VRML(.wrl) files. Just use the OPEN option from the file menu to insert these types of files into an already existing scene. When inserting other Blender files or objects into another scene, use the APPEND option from the file menu and select the appropriate options. Multiple objects can be selected with Shift-Right mouse button.
- Springs/Screw-** Blender can create these objects in the edit buttons. You need a profile of the object, the cursor at the center of revolution, and 2 vertices to show the length of the revolution. The profile and the length vertices need to be in the same object. All vertices need to be selected when performing the operation. You will also need to be in the front view. There are several tutorials to help with this operation. Results are great!
- Multiple Viewports-** To create multiple viewports, move your cursor over the edge of the viewport (to start, you only have the drawing window and the button window-move your cursor to the break between them). Right click on the break and select split area. Blender will break the area that you brought the cursor from

## The Blender Interface

When I first looked at Blender and read some tutorials I thought that this looked easy and made sense. After taking the program for a test run, I decided to forget about it for a while because I couldn't make anything. The interface is different than any other programs I've experienced before. After a few week however, things began to make sense and I realized the potential of the program. Here's what you are looking at when you open the program:

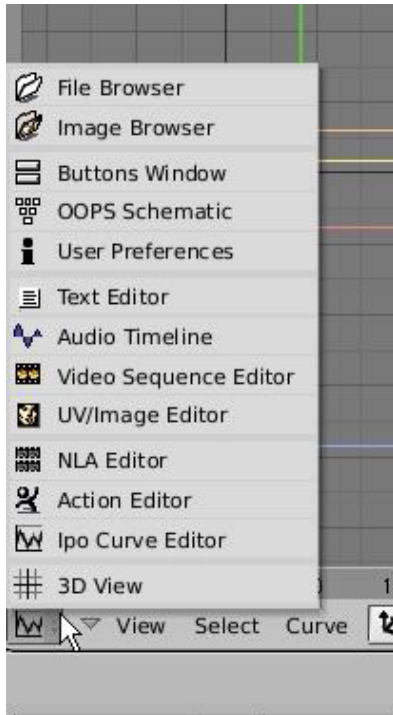


You are looking down at a scene consisting of a plane and a camera (top view). Newer versions of Blender may open with different scenes (a cube instead of a plane and a light), but the idea stays the same. The cursor in the middle of the plane is used to locate where new items will be placed along with some other uses. It can be moved around on the screen by clicking the Left Mouse Button (LMB). Along with familiar pull-down menus like other programs, you have a viewport along the bottom that changes every time you select a different button. This "Buttons Window" can be changed around, but for now, lets keep it where it's at.

Blender works with layers much like other programs where objects can be placed in different layers and displayed as needed. It's a good idea to get comfortable with layers because as your scenes get bigger, turning layers on and off help with the speed of your work and being able to see things better. To change things between layers, select the object with the Right Mouse Button (RMB) and type "M" for move. Try it with the plane and change layers. By the way, if you put it in a layer that's turned off, it will disappear. To turn that layer visible, click on that button. To turn on multiple layers, hold down "Shift" and click on the buttons.

## Window Types

Blender has a variety of different window types and every window can be set to any type. For example, your initial screen has 3 windows, the top one with the toolbars, the 3D window, and the bottom buttons window. You can set all 3 of them to display the buttons if you like (but I'm not sure why you would want to). The various window types are as follows:

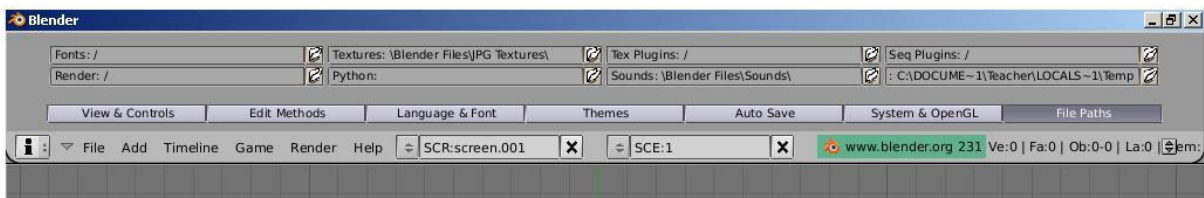


The window types that we are most interested in right now are:

- File/Image Browsers- comes up automatically on demand in most cases
- Buttons Window- for commands
- User Preferences- menus and options
- UV/Image Editor- for applying game textures
- Action Editor- for animations
- Ipo Curve Editor- also for animations
- 3D View- to see our work and model items

## The User Preferences Window

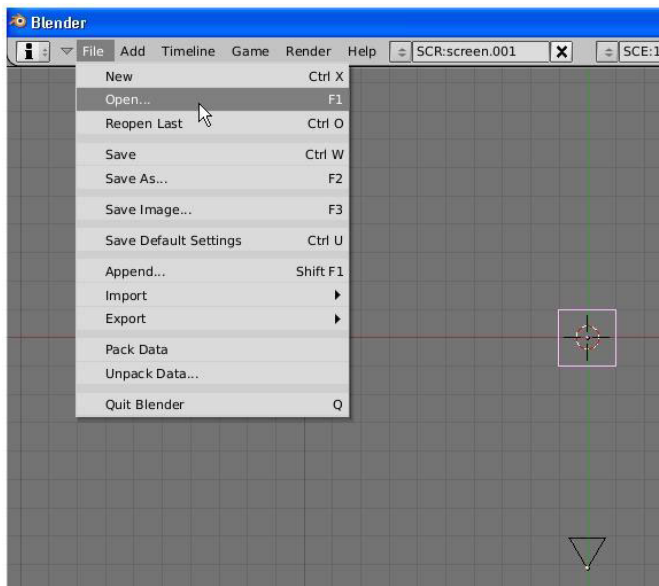
If you place your mouse on the line between the 3D window and the User Preferences window (at the top), hold down the Left Mouse Button (LMB) and drag down, you will expose a number of setting options at the top of the screen.



Settings of interest to us at this time-

- View and Controls- tool tips and mouse settings
- Edit Methods- how things are linked and duplicated
- Language and Fonts- text style and sizes
- System and OpenGL- change some system settings
- File Paths- tells Blender where to look for certain things

## Open, Save and Append

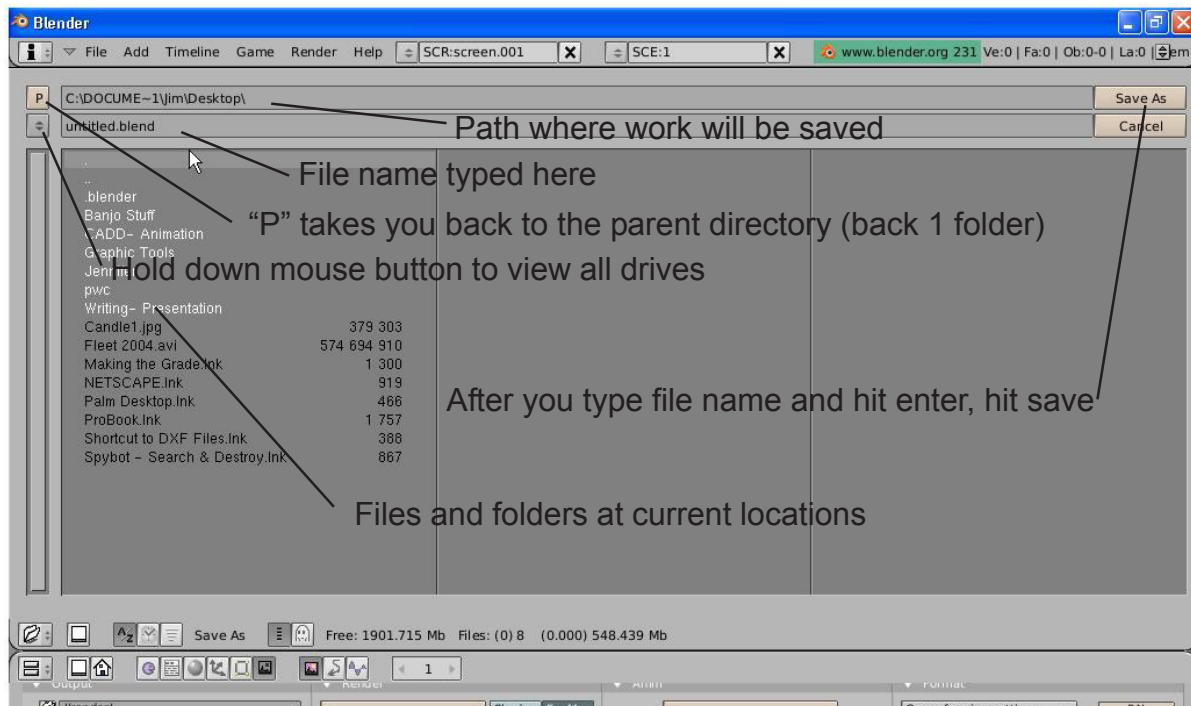


Blender utilizes commands similar to other programs when it comes to saving and opening your work with a few exceptions. Other programs use “import” and “insert” commands to bring other files together. Blender just uses “Open” and “Append”. If you are bringing elements in from another Blender (.blend) file, you use “Append”. If you are bringing other types of files into Blender, you only need to use the “Open” command and this will insert the other file types into your Blender file. Blender accepts VRML (.wrl) and .DXF files into the

program. This is ideal because most 3D drawing programs (like all our applications) use these types of files to export work. Blender does an excellent job of accepting work from other programs. We rarely see any problems with our imported models.

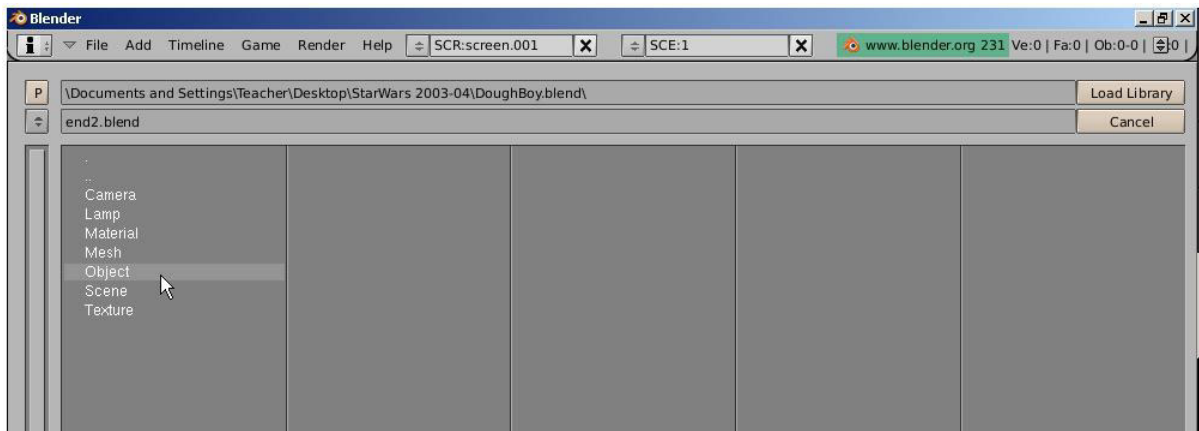
### The Save Command

When you first start working with Blender, it seems almost impossible to figure out how to save your work. The file interface almost resembles old MS-DOS. Also, every time you save over an existing file, your previous save becomes a back-up file and is saved with a new extension (.blend1). This always gives you a back-up if a problem occurs. Here’s what you see when you hit the save command:

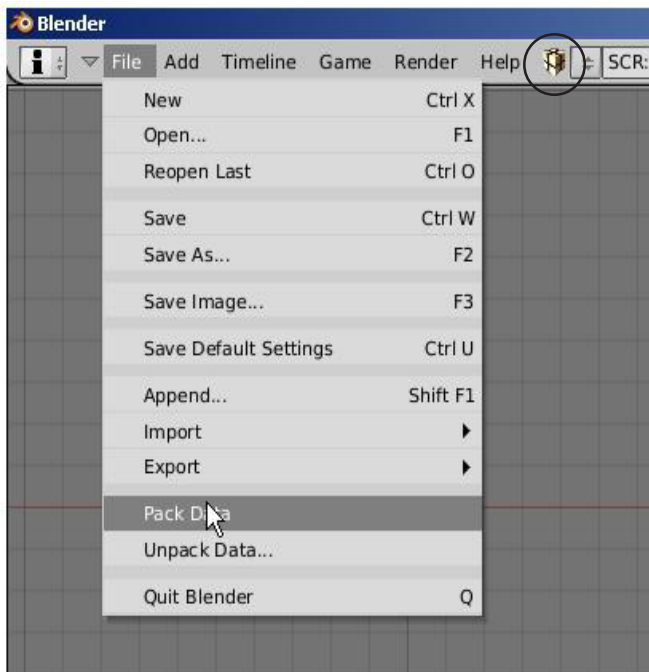


## The Append Command

When you need to insert elements from one Blender (.blend) file into another one, you need to use the Append command from the file pull-down menu. While in Append, you need to navigate to the Blender file you wish to insert from, then select what you want to append into the open file. You can append anything from cameras, lights meshes, materials, textures, scenes and objects. For most purposes, use the **Object** option. By appending objects, any materials, textures and animations that are linked to that object will automatically come in with it. Right Mouse Button (RMB) clicking on objects will select/deselect them. Typing “A” will select them all. After you select all objects to append, click the “Load Library” button in the upper right corner of the screen.



## Packing Data

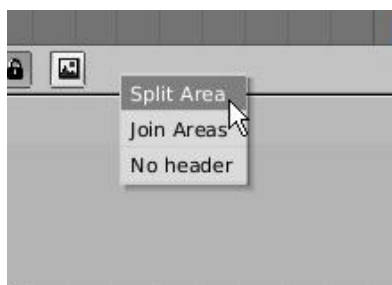


If you plan to open this file on other computers, you will need to select the “Pack Data” option in the file menu. Textures and sounds are not automatically included in your Blender file in order to keep the file size down. Every time your file opens, it looks for the textures and sounds and places them into your model. If it can’t find the files, you won’t have any textures and sounds. If you pack data, those files are included with the .blend file so they can be opened anywhere, however, your file size may explode. When data is packed, a small package shows up on the top of your screen letting you know that the file is packed. You can also unpack data to bring the file size back down.



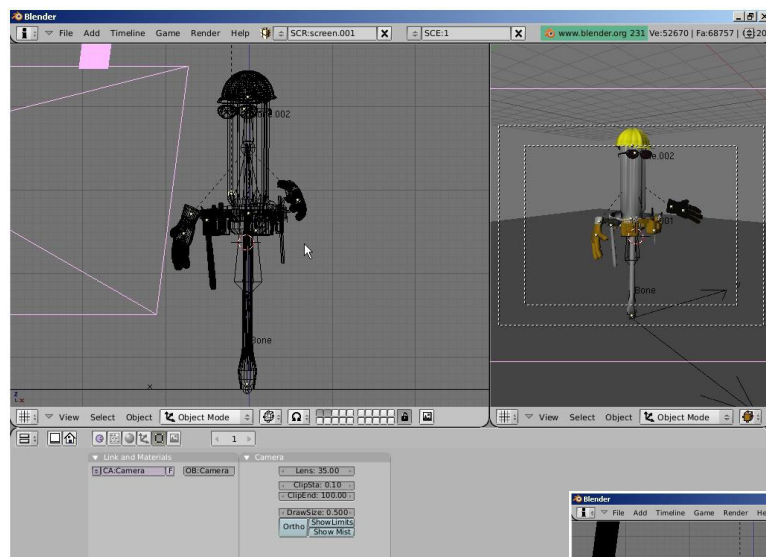
## Working with Viewports (windows)

Most times, you need more than one 3D window to work with since you're trying to locate objects in three dimensions. Most rendering and animations programs allow for multiple viewports along with graphical views of various data. Blender allows the same. Remember that Blender starts with 3 viewports that are set to User Preferences, 3D Window and the Buttons Window. You can change the size of any of these windows by using the LMB and dragging on the line between the viewports. You will notice the arrow pointer changes to a double headed arrow while over the line.

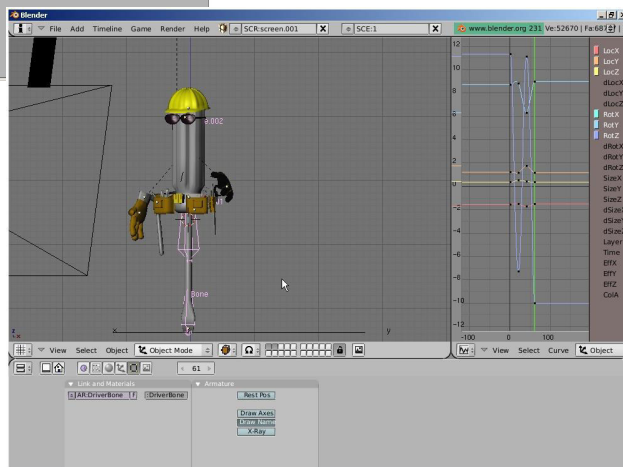
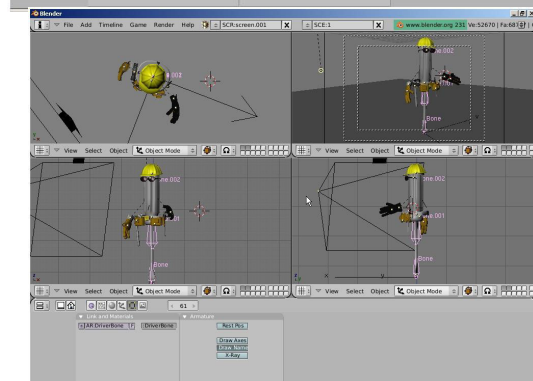


In order to split the screen and create another viewport, while the cursor is over the line, Right Click (RMB) and select Split Screen. Drag the line to a desired location and size. *You need to watch which side you approach the line from because that is the side that will be split!* Joining viewport together works the same way. There's no limit to the number of times you can split your windows. I like to traditionally work with 2 views like the

example shown below. I use the left view to flip between my principle views (top, front, side) and the right view for camera view and animation tracks (which we'll discuss later).

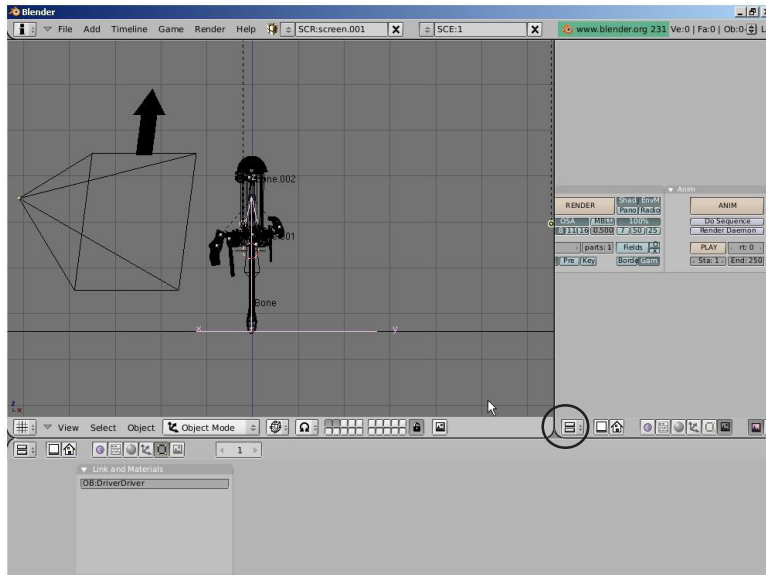


Windows can also be split along a vertical line. Some 3D programs traditionally give you 4 viewports that are set-up as front, top, right side, and perspective or camera views. Basically, it is up to what you want to work with.



## The Buttons Window Option:

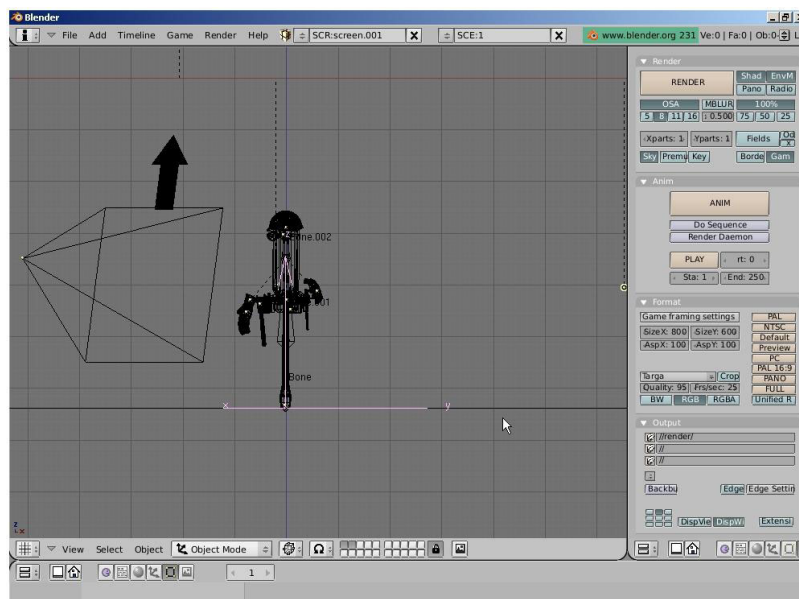
Traditionally, Blender has placed the Buttons Window at the bottom of the screen, but has recently given us an option to arrange them vertically on the side like some other 3D programs out there. This has been done in an effort to make learning the program easier for new users. You first need to split your 3D window in half, then select the Buttons Window type from the menu.



Looks good, but needs some adjustment. The buttons are arranged horizontally and off the screen. To change the arrangement, Right Click

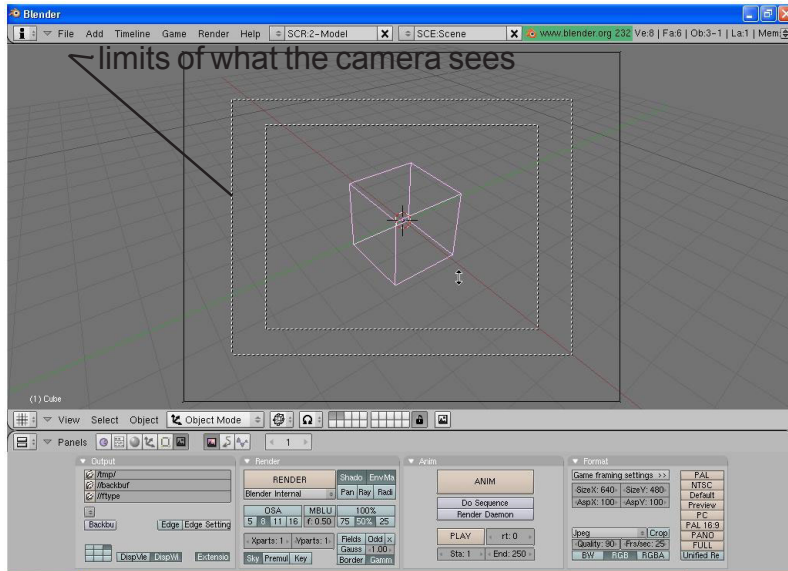


(RMB) in the window and select "Vertical". Adjust the windows to a desired size and use the plus and minus keys on the number pad to zoom in and out on the buttons to get them sized to fill the screen. Hold down the mouse wheel (don't scroll) to move the buttons around. The only problem with this method is that the buttons at the bottom of the window are still off the screen. In order to access those buttons, you need to hold down the center wheel on the buttons and drag the buttons around. I still prefer the buttons window at the bottom of the screen, but this is another option available.



## Moving Around in 3D Space:

In a 3D program, not only do you have to worry about where you are in 2 dimensions (height and width), but you also need to consider depth (how close or far away). Before you can work in 3D space, you should have some skills in 2D drawing and layout. Moving around in the 3D window is controlled by the mouse and the keyboard number pad. Think of a standard 3-view orthographic drawing- top, front and right side views. These views match up with the number pad 7, 1 and 3 keys (look at their arrangement on the keyboard- just like the views). Put your cursor in the 3D window and try typing those numbers. Typing “0” will put you into camera view (what the camera sees).



The camera is represented by 3 lines. The outer solid line is what you can click to select the camera. The outer dashed line represents the limits of what the camera can see. The inner dashed line helps with centering your scene.

The number pad 5 key will toggle you between perspective and orthographic views. The number pad arrow keys (2,4,6,8) will rotate you around in 3D space. The “+” and “-” keys on the number pad will zoom in and out. The number pad “.” (period) key will center your view up on the selected object on your screen.

The mouse serves a number of functions. The Left Mouse Button (LMB) will move the 3D cursor around on the screen and for dragging windows for selecting objects. Wherever the 3D cursor is located is where the next item you create will be placed. The 3D cursor serves other purposes that we will discuss later. The Right Mouse Button (RMB) is used to select object or vertices (in edit mode). The mouse wheel serves 2 purposes. Scrolling the wheel zooms in and out (like the + and - keys). Holding down the mouse wheel will let you rotate the view. Holding down *Shift and Mouse Wheel* will let you pan around on the screen.

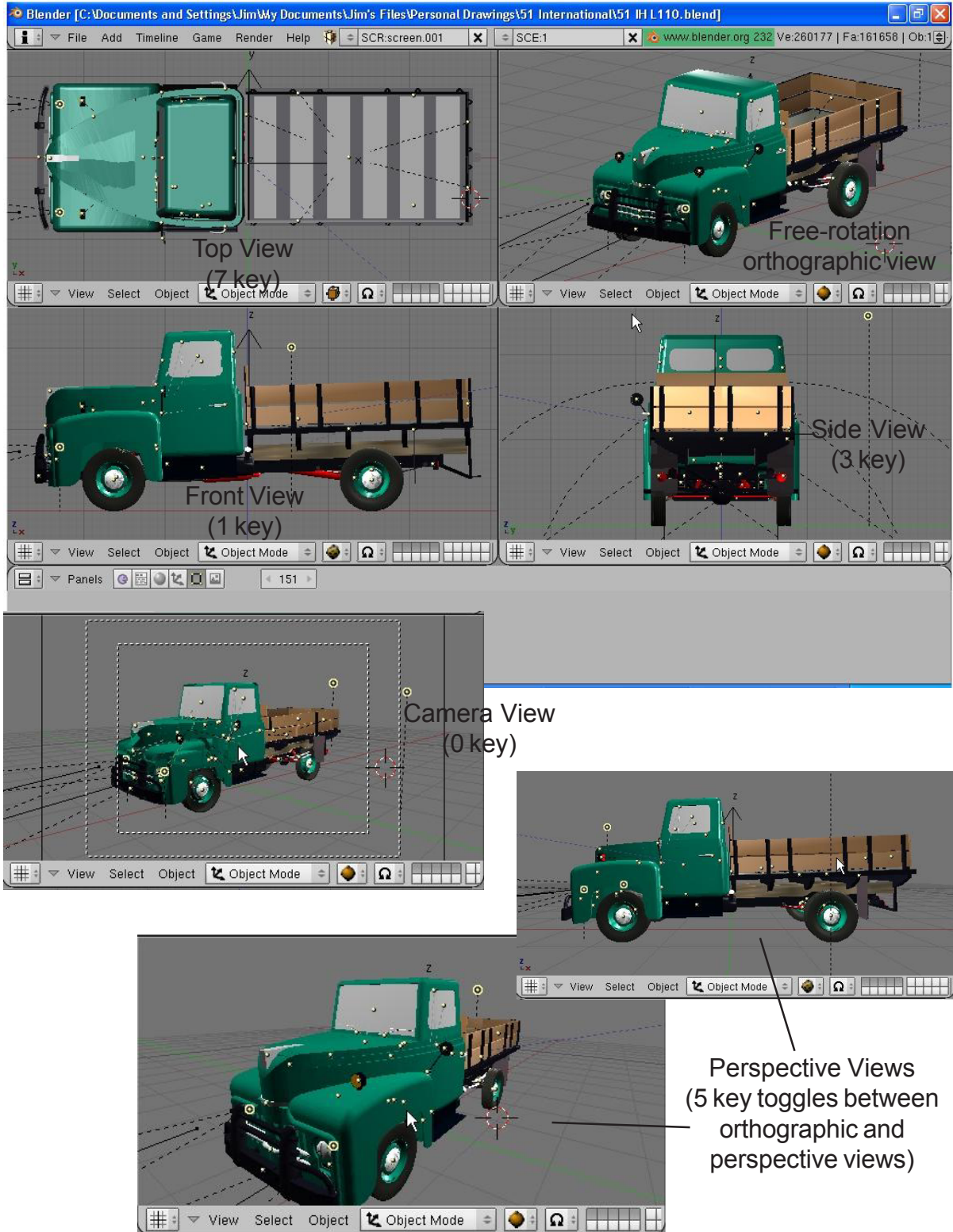
Practice using these controls before moving on to other lessons. Without getting a grasp on working in 3D space, you will have a difficult time creating and modifying objects.

Now that you know what you’re looking at and how to move around on the screen, we can begin making objects in Blender!



## Typical Views and Buttons:

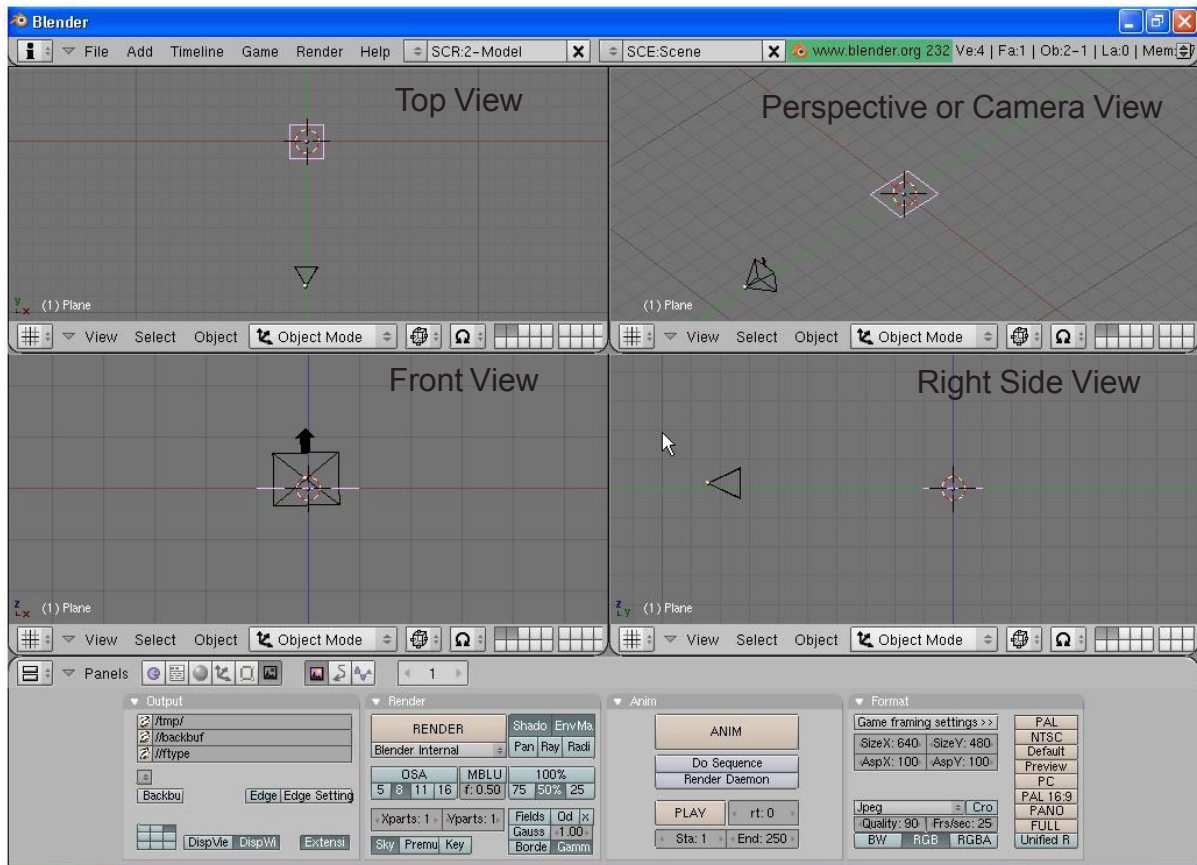
Here are some typical views used to model in 3D and the buttons on the number pad that go along with them. In order to make them work, you need to have the “Num Lock” button pressed. Get use to working with the principle views (top, front, side) in orthographic mode when locating the 3D cursor. You will usually need to check the location of the cursor in at least 2 views when placing objects.





## Viewports Practice Exercise

In order to get some experience with these commands, set up the following screen, then call the instructor.



Be prepared to be able to demonstrate the following techniques to the instructor when asked:

- *Panning around on the screen*
- *Zooming*
- *Changing window types*
- *Centering the view on a certain object*
- *Switching views (top, front, side, camera, free-rotate)*



## Creating and Editing Objects

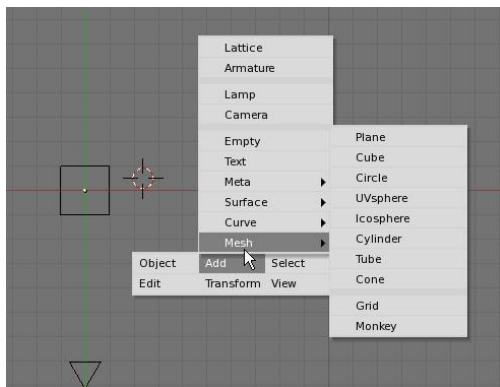
Now that we know how to move around in Blender, let's start doing some basic building and shaping. In this chapter we will talk about creating basic shapes and using modifiers to form them. There are a lot of different types of things to draw in Blender. Right now we will only discuss *Meshes*.

Start a new drawing in Blender and save it in your "My Documents" directory. Call it *Sculpture*. In Windows XP, in order to get to your "My Documents" folder, do the following:

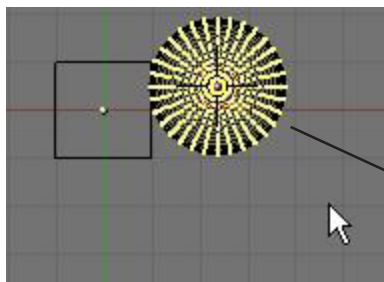
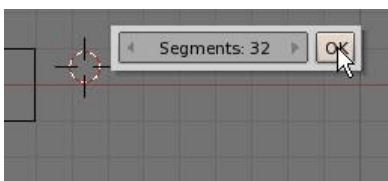
1. Go to File- Save
2. Select the C: drive (see page 8 in Open, Save, and Append chapter)
3. Click on the "Documents and Settings" folder, find your login folder.
4. In your folder you will find "My Documents"
5. Type in the file name (Sculpture), hit enter, then "Save"

**\*\* Blender doesn't have a generic Undo command nor does it warn you to save. \*\***  
**\*\* Save your file often so you don't lose a lot of your work! \*\***

### Placing Objects On Your Screen



The 3D Cursor (bullseye) location is used to place new objects. Use the left mouse button to move the cursor in 3D space. When you have it in a good location, press the *Space Bar* to bring up the insert menu. Select *Add*, then *Mesh* and select *UV Sphere*. You will then be asked how many segments and rings you want. You can change these by dragging the mouse in the block or by holding down the *Shift* key and clicking in the box. This will allow you to type in a number. You can

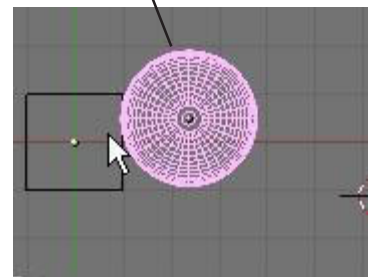


keep it at 32 for now. After that, your sphere will be displayed on the screen.

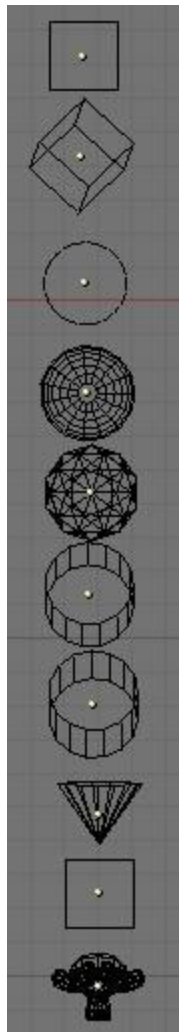
*Edit Mode*

*Object Mode*

When you place an object in Blender, it comes into the scene in *Edit Mode*. There are basically 2 states in Blender- *Edit Mode* and *Object Mode*. Edit mode is intended for modifying the shape of the object by selecting vertices on the object. Object mode affects the object as a whole. The *Tab* button toggles you between the two. *After inserting an object into your scene, press the Tab key to exit edit mode. Otherwise, the next object you create will be joined to that mesh!*



## Mesh Types:



- Plane-* A simple two-dimensional shape ideal for grounds. Can be sub-divided and used with proportional vertex editing to make nice hilly terrain.
- Cube-* Basic 3D shape. Nice object to start with to shape into rectangles and other shapes.
- Circle-* Won't display as a 3D object, but can be extruded and shaped.
- UV Sphere-* A sphere generated with rings and segments, like the latitude and longitude of the earth.
- Icosphere-* A sphere generated with triangular shapes. Like Epcot Center.
- Cylinder-* Like a can, closed with a top and bottom.
- Tube-* Just like the cylinder, except open at ends.
- Cone-* Basic closed cone shape.
- Grid-* Can be used and extruded like the plane.
- Monkey-* A fun shape that someone decided to include in the mesh list.

## Basic Mesh Notes:

Remember that whenever you create something new, it enters your scene in Edit Mode. *Any new objects you create while in edit mode for the previously selected object will be joined to that object.* After you create a new object, remember to hit the "Tab" key to exit edit mode. Also, remember that a new object will be created where the 3D cursor is located.

The three main modifiers you can use to change an object (outside of edit mode) are moving it, resizing (scaling) it or rotating it.

"G" key- move or grab

"S" key- sizing or scaling

"R" key- rotate

If you would like to do any of these operations through an exact number (i.e. rotate 90 deg. on x axis), type "N" key to bring up a numeric window.





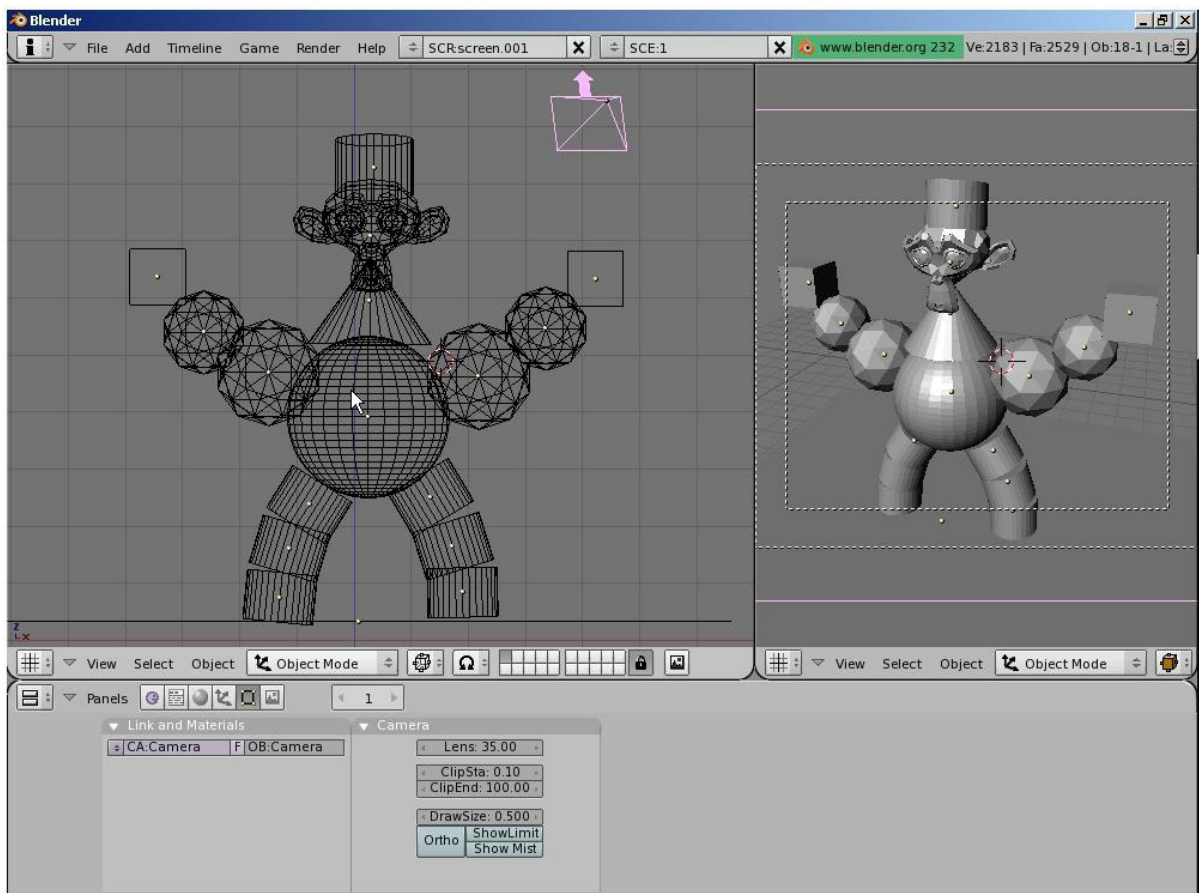
## “Creating Objects” Practice Exercise

Create a sculpture using at least 1 of every type of mesh found in the Add-Mesh menu (do not use grid or circle). Remember to exit edit mode (Tab key) after every object you create. Use a plane for the ground and scale it large. Divide your 3D window into two so you can have one working view and one camera view. Use the RMB to select objects on the screen. Experiment with sizing and rotating objects. New commands:

- Size** (“S” key)- to change the size/scale of the object.
- Rotate** (“R” key)- to rotate the object.
- Move** (“G” key)- to change the location of objects.
- Shaded** (“Z” key)- used to toggle the window from wireframe to shaded view.

*Remember to make use of the number keys 1,3 and 7 to change your principle views!  
Also play with the camera location and angle to get a nice view!*

*\*\* You do not have to make a monkey-this is just an example of using the meshes! \*\**

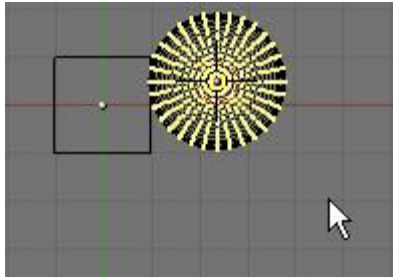


***\*\* Call the instructor when finished\*\****

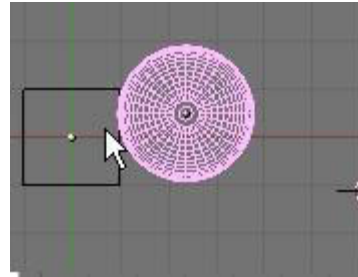


## Basic Mesh Editing:

After you have created a mesh, you can go into edit mode (Tab key) and change its shape. In edit mode, you can work with the shape's individual vertices (mesh intersections) to create the shape you want. You know you're in edit mode when you see pink or yellow dots on the selected object. Pink dots are unselected vertices while yellow dots are selected vertices.



Edit Mode for Sphere



Object Select Mode for Sphere


### Selecting Vertices:

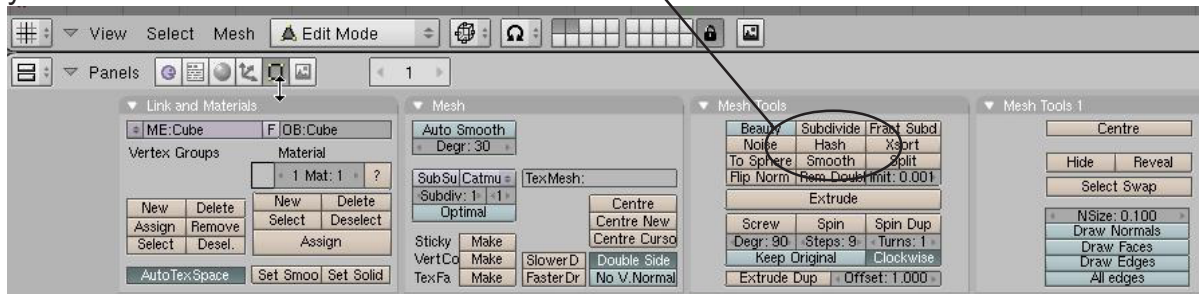
While in edit mode, to select a single vertex, RMB click on the vertex. To select multiple vertices, hold down the *Shift* key while RMB clicking on them. To drag a window around vertices, type "B" key and drag a window to select. Typing the "B" key twice will bring up a circular selection tool that can be sized by pressing the "+" or "-" keys on the number pad. Scrolling the center mouse wheel will do the same as "+" and "-" keys. Pressing "Esc" will get you out of the circular selection tool. In order to select *all* vertices or deselect currently selected ones, hit the "A" key (for all) once or twice.

### Basic Modifiers:

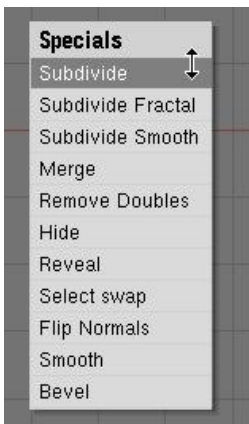
After selecting the vertices, you can use the same basic modifiers we talked about in the previous exercise ("G"-grab or move, "S"-scale, "R"-rotate).

### Creating More Vertices:

Sometimes you need to add more vertices to some or all of the mesh in order to manipulate it to your desired detail. To do this, you must first select all the vertices you wish to split, then find the edit menu. Look at the bottom Buttons Window and find the  edit button (looks like a plane in edit mode). Find the *Subdivide* button and click it as many times as you need to.



By pressing the "W" key will give you a shortcut menu in edit mode where you can select subdivide also.

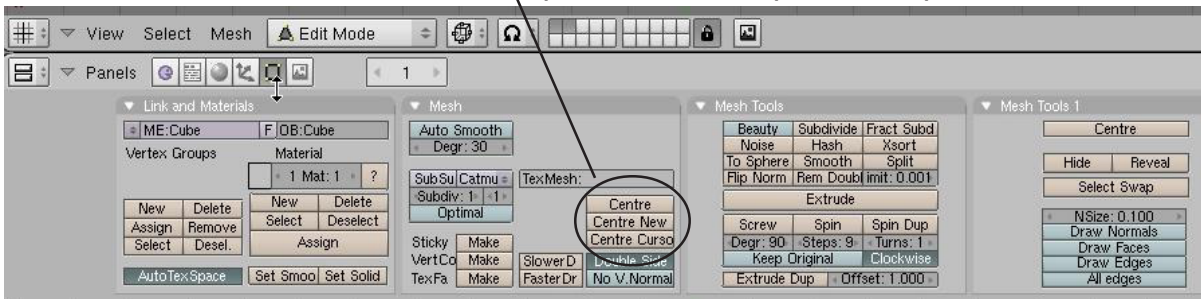


### Specials Menu:

In edit mode, pressing the “W” key will bring up a shortcut menu that will give you a variety of editing options. Most of these options can also be selected in the edit buttons as discussed on the previous page. A neat new command that appears in the specials menu is the bevel command.

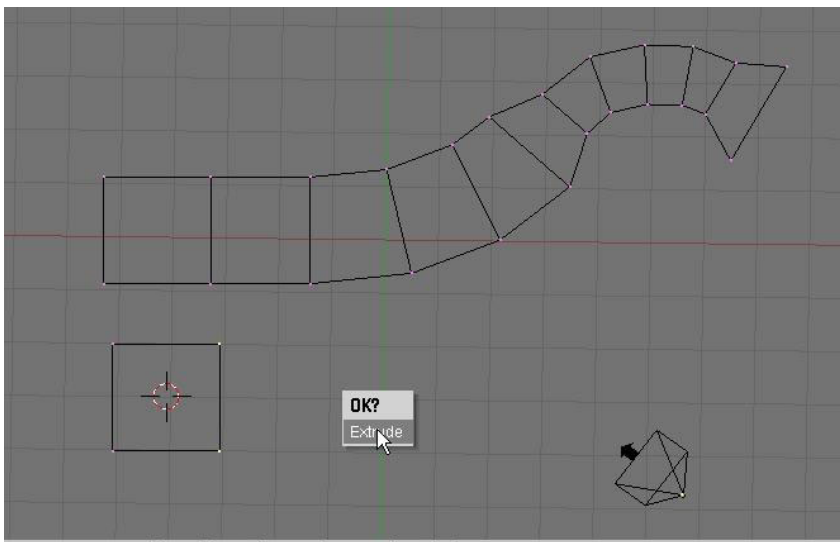
### Center Points:

Every object you create in Blender has a small dot somewhere in the object (by default, usually in the center of that object). This is the object's center, or pivot point. Beginners in Blender often get these center points moved around to points other than where they want them. This happens because they move all the vertices of the object in edit mode, but the center point fails to move. If you want to move an entire object, hit tab to get out of edit mode and into object select mode. Using the “G” key to move the object in this mode will move the center point along with the object. If you ever need to relocate an object's center point, move the 3D cursor to the desired center location, then find the “Centre Cursor” button in the edit buttons. This will change the object's center location. You also have 2 other center options in the edit panel to experiment with.



### Extruding shapes:

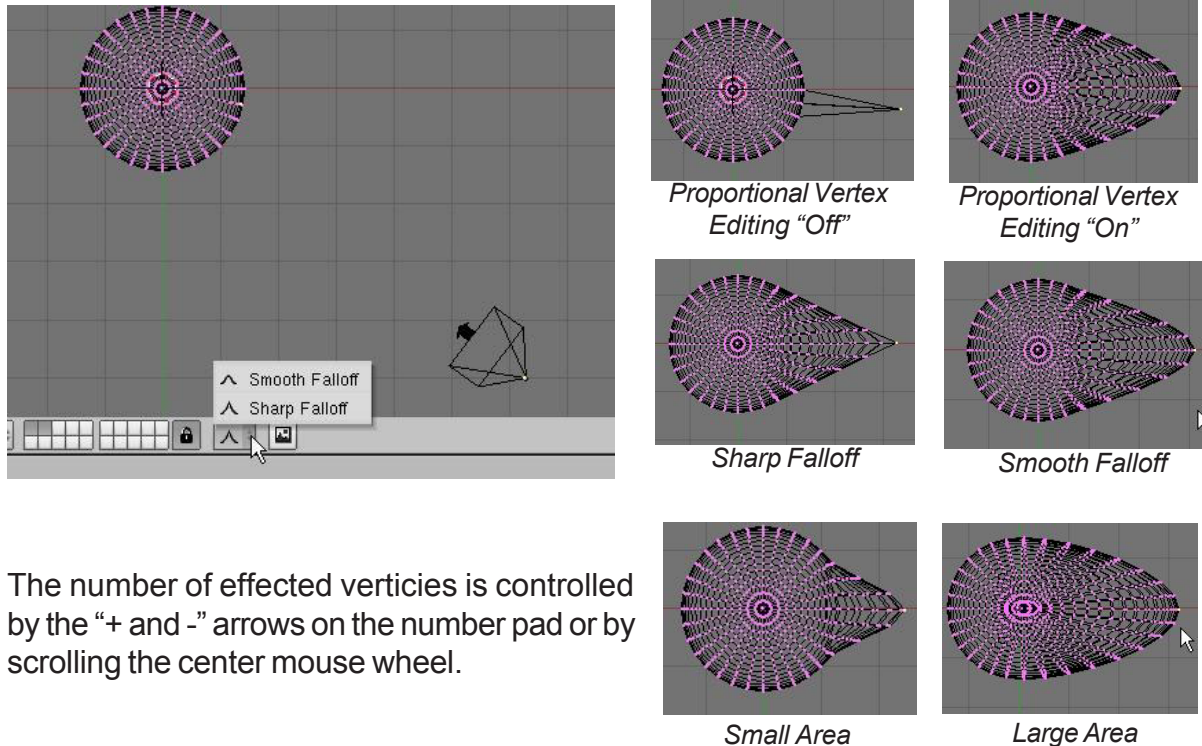
Shapes can be lengthened by selecting a group of vertices, then by pressing the “E” key and confirming by clicking “ok”, you will make a duplicate of those vertices. They can then be “G” (moved), “S” (scaled), and “R” (rotated).



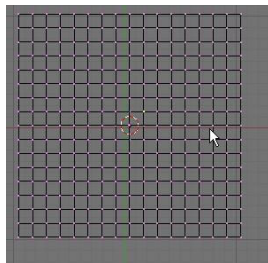
Extrude is a great command for making long tubes and tunnels. It is also good when you don't want to subdivide an object too much in order to add detail.

## Proportional Vertex Editing:

Proportional Vertex Editing is used to create a flow in the shape when editing vertices. To turn proportional vertex editing on, press the “O” key while in edit mode. This will activate a small panel in the tool bar that lets you pick “sharp” or “smooth falloff”.

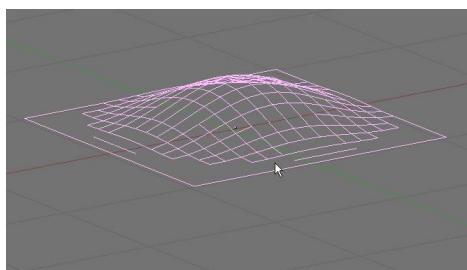
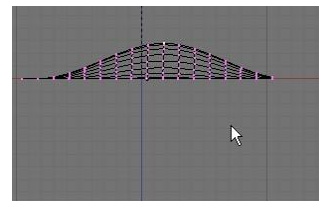



## Creating Ground:



You can use proportional vertex editing to create flowing landscape easily. The first thing you need to do is create a plane in the top view (7 key). While in edit mode, make sure all vertices are selected (vertices are yellow). You can use the “A” key to select them all. Press “W” key for specials menu, then select “Subdivide”. Do this a few times. Select a single vertex somewhere near center.

Next, switch to a front view (“1” key on number pad) and press the “O” key to enter proportional vertex editing mode. Select sharp or smooth falloff depending on what effect you want. Type “G” to grab (move) the vertex. Use the “+ -” keys on number pad or scroll mouse wheel to change the size of the selection.



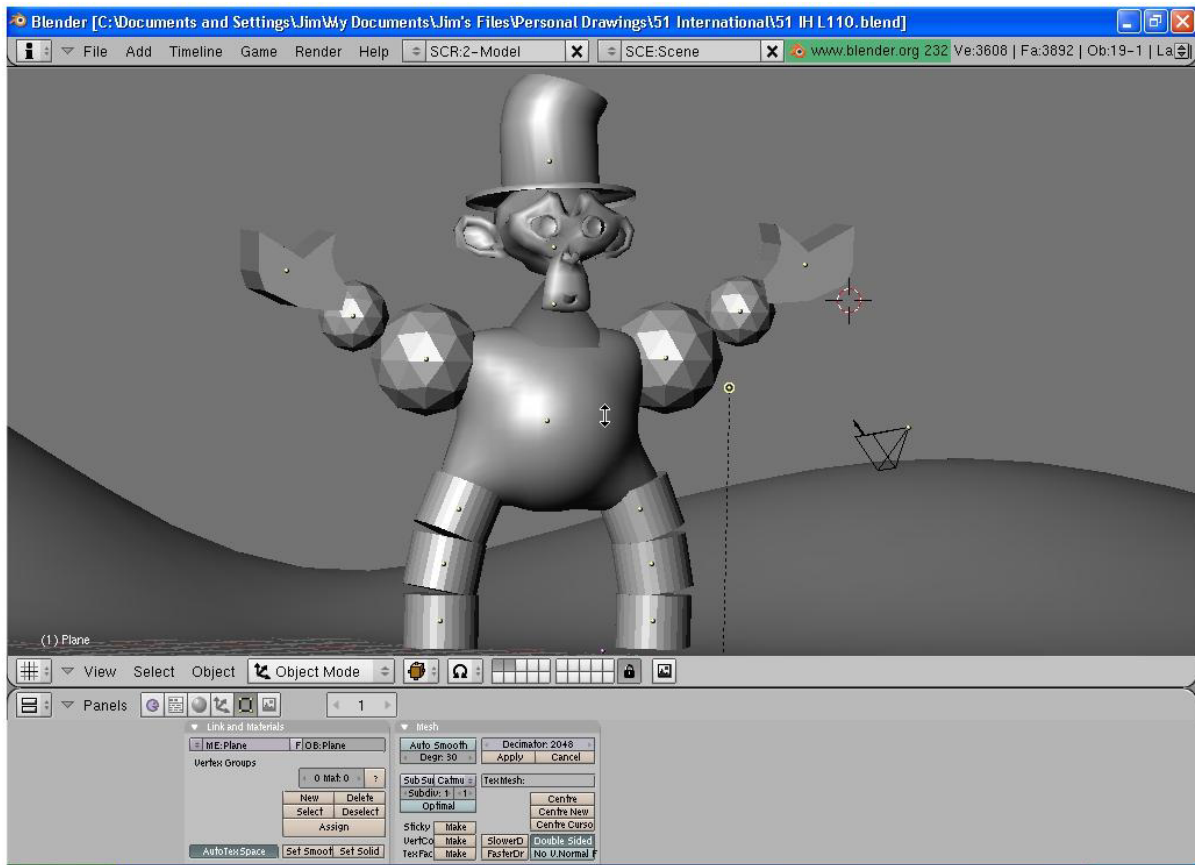
Experiment with different size selections and different falloffs. To see your final work in a smooth display, exit edit mode (“Tab” key) and, with the object selected, go to the edit buttons  and find the “Set Smooth” button. This will smooth the mesh in display and final output. Finally, hit the “Z” key to shade your view.





## Basic Editing Practice Exercise

Open your Sculpture file from the previous exercise and modify it using the basic editing commands discussed in this section. Modify the ground that your sculpture rests on with the proportional vertex editing tool. Use extrude to add a new object or modify an existing object. Modify several of your shapes by subdividing, moving or scaling vertices in edit mode. Use the “Set Smooth” in the edit buttons to smooth several of your shapes in shaded view (“Z” key).



**\*\* Call the instructor when finished\*\***



## More Basic Editing:

Now that you have some experience with basic editing, here's a few more options:

### Joining Meshes:

To join 2 or more meshes together, Hold down the “*Shift*” key to select them, then press “*Ctrl*” and “*J*” to join them. They will retain any materials you have placed on them, but will be one object.

### Separating Meshes:

In order to break up a mesh, you need to be in edit mode (*Tab* Key) and select the vertices you wish to separate from the rest of the mesh. With vertices selected, type the “*P*” key (I like to think of it as partition) and select your option. The newer Blender releases give you an option to separate all loose parts.

### Deleting Vertices:

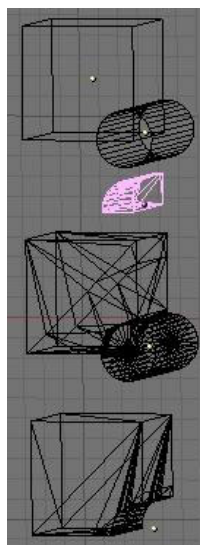
If you want to make a hole in a mesh, select the vertices you wish to remove, then hit the “*Delete*” key.

### Adding Faces:

Sometimes, you need to fill in holes in a mesh by creating your own faces. To do this, go into edit mode and select the vertices you wish to face together (you are limited to 4 vertices in a group). With vertices selected, hit the “*F*” key. A face will be formed.

### Boolean Operations:

Boolean operations allow you to cut or join meshes by using other meshes. This is done by selecting the 2 meshes (not in edit mode), then typing the “*W*” key. You will see the options “*Intersection, Union, and Difference*”. Below, you will see the results of each:

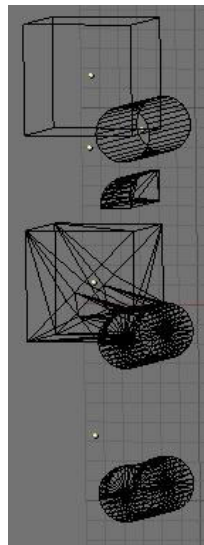


*Basic shapes (before boolean operation)- Cube selected 1st*

*Intersection Option*

*Union Option*

*Difference option*



*Basic shapes (before boolean operation)- Cylinder selected 1st*

*Intersection Option*

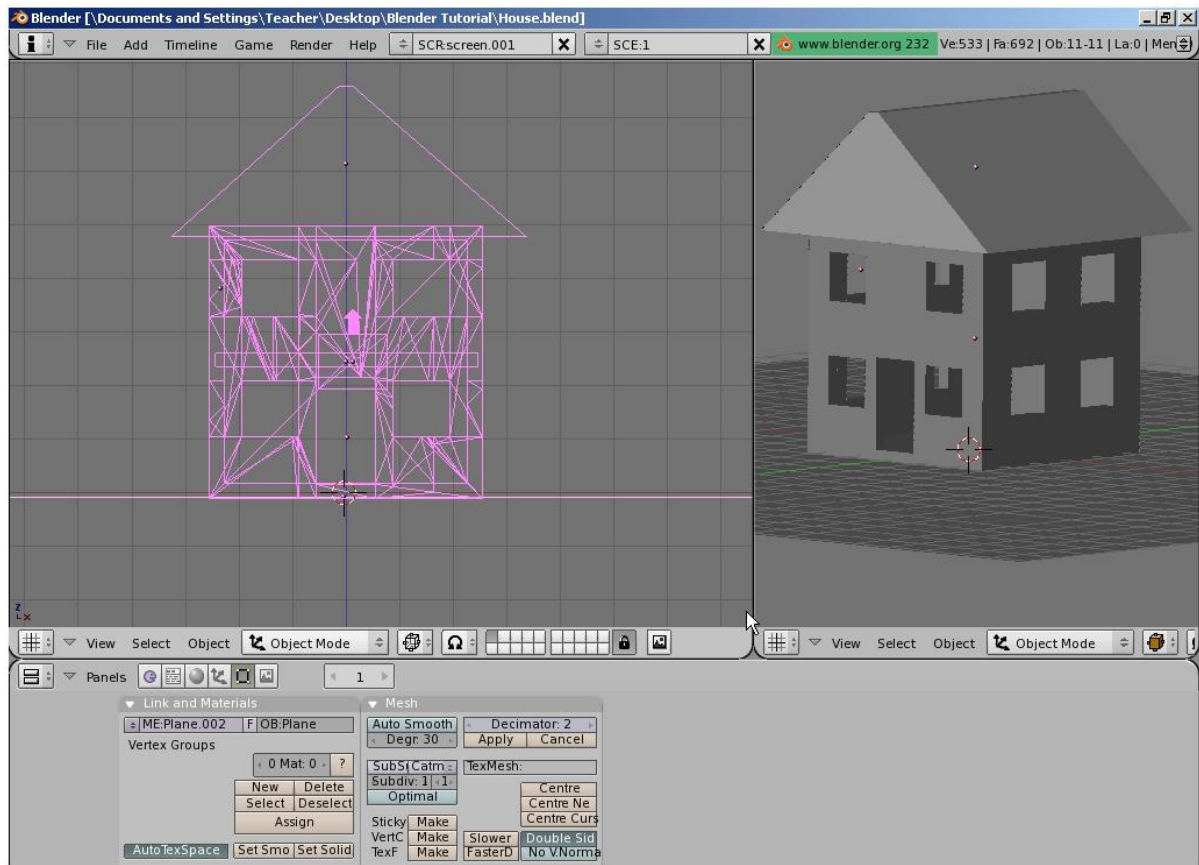
*Union Option*

*Difference option*



## More Basic Editing Practice Exercise

Create a simple house model like the one shown below using all your editing skills. Save the file as *House*. Begin by creating a cube. Create a slightly smaller cube inside the first cube and use boolean difference to subtract it from the larger one. This will make the house hollow. Create a roof using a cube and shape it in edit mode. Create smaller cubes to subtract out the doors and windows. Add a plane for ground. Feel free to add other details to the structure.



**\*\* Call the instructor when finished\*\***

