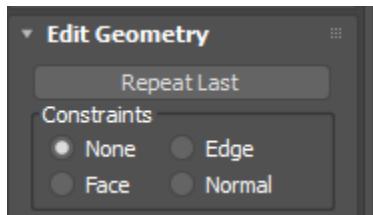


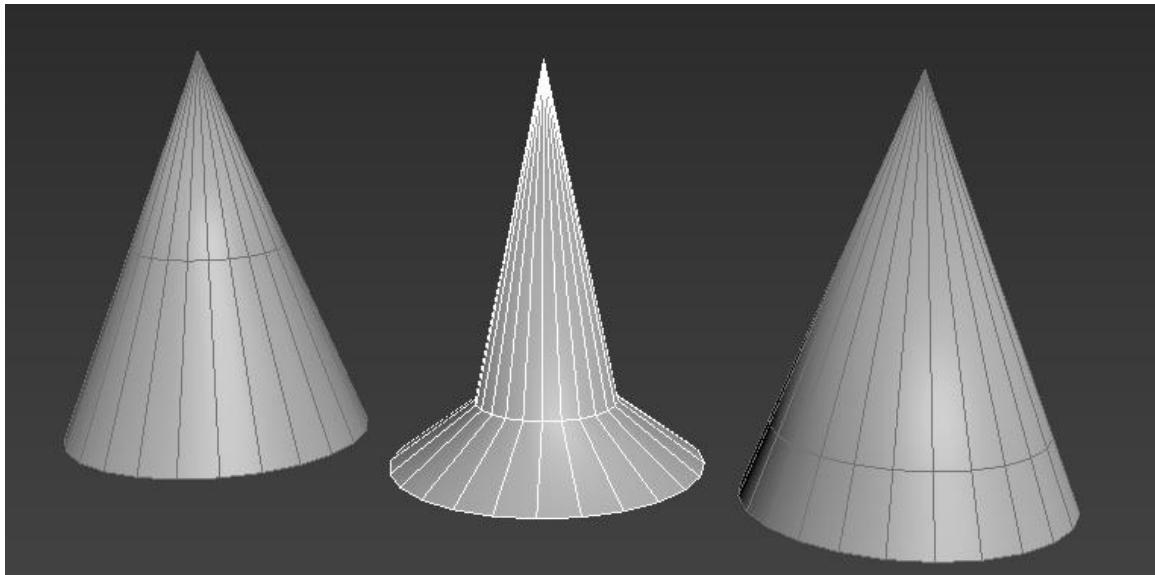
Course: 1030 – Modeling 1

Edit(able) Poly Commands and Modifier stack

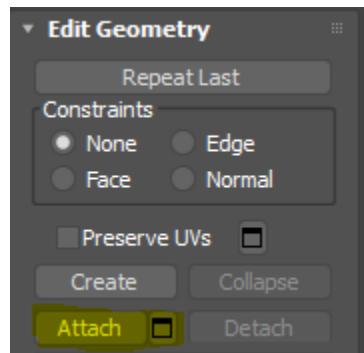


Constraints – Has four variations: None (no effect), “Edge” will move your selection along existing edges only, “Face” will move your selection along existing faces only, and “Normals” will move your selection based on the individual Normal axis of your selection. [Normals in this case refers to the orientation (angle) of an object on X,Y,Z based on individual vertices and faces. Each Vertex has its own unique X and Y direction or facing, and its Z is directly towards or away the center of the mesh that it is a part of.]

This tool is used to alter the placement and position of vertices, edges and to a lesser extent polygons without disrupting the overall edge flow and silhouette of the object. For example; if you add an edge loop in the middle of a cone but later on decide that it needs to be higher or lower on the cone but you don't want the overall silhouette of the cone to change (so you want it to keep its shape and size), you would select the edge loop that you want to move, turn on “Edge” constraint with SHIFT+X and then move the edge loop. The edges will move but the overall shape of the object will remain the same.

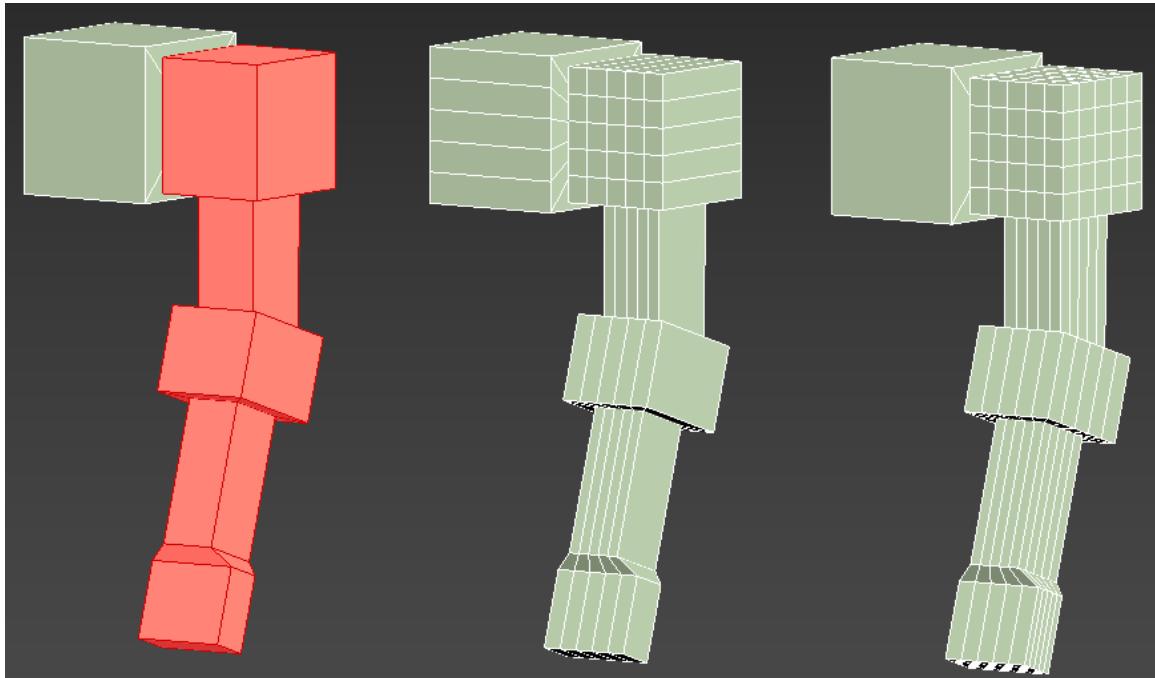


After creating the edge loop in the middle of the cone on the left, two copies were made. On the first copy (the middle cone) the edge has been moved down without constraints. The third cone has had edge constraints turned on, then the edge was moved the same distance. Notice that the silhouette has not changed.



[Attach / Detach](#) – When you create a box, that is one mesh or as max refers to it “element”. If you do multiple extrusions from one side of the box to make a robotic arm for example, and decide that it needs to have more subdivisions added to it, but some of those subdivisions would end up running down into the box that it was created from essentially wasting the resulting polygons on the box, then you can select all of the polygons that make up what you have of the arm, select “detach” and choose “Detach to Element”. This will keep the mesh for the box and the arm as one object inside of the scene explorer, but you can select each “chunk” separately with the “Element Select” option (5 on the keyboard). You can add additional edge loops throughout the “arm” portion of the mesh but not affect the box mesh that it was created from. Similarly, if you have modeled

two separate objects, again using the box and arm as examples, but need them to function as one entity for a character for example, you would move the arm into place on one side of the box, select the box and then choose the “attach” command, then click on the arm. This will make it one object and allow you to apply a symmetry modifier to the entire character, duplicating the placement and mesh of the arm on the other side of the box.



Above is an image of the previously mentioned arm. For the far-right copy, the highlighted polygons have had the “Detach” command performed. The shoulder is then subdivided the same way on both the middle and right copies. Notice that the subdivisions don’t run into the “chest”. As long as the open border edges of the arm and the shoulder joint don’t need to move, revealing/causing a gap, this is a good way to isolate areas to receive different levels of subdivision.

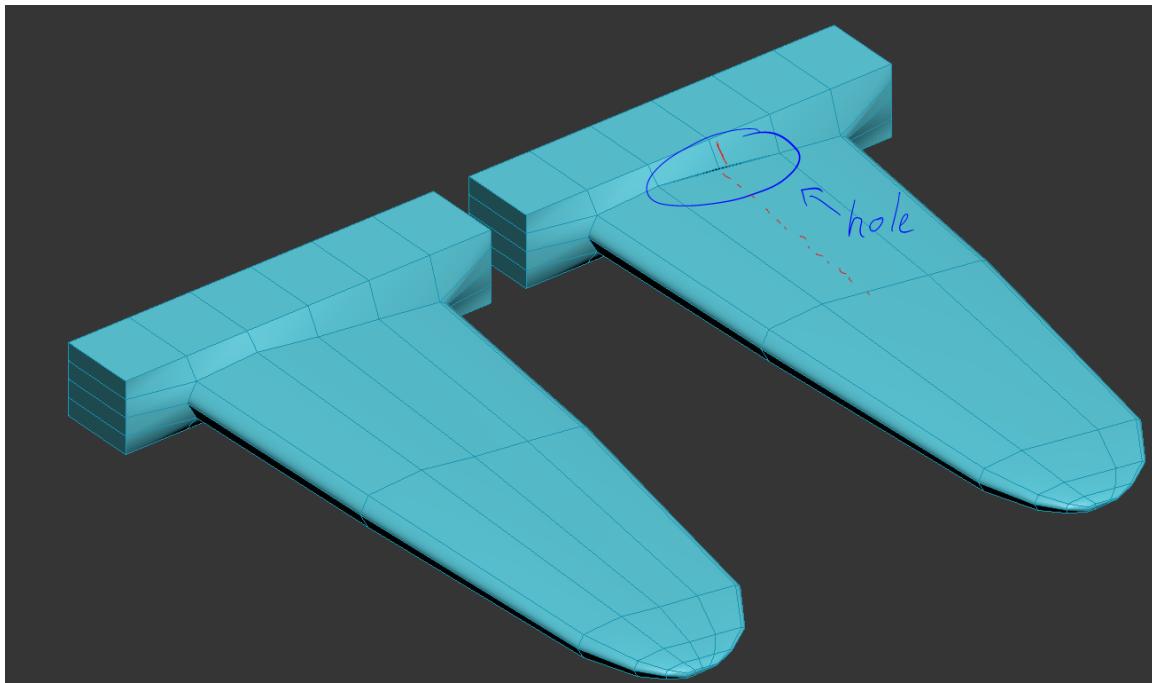


Just like in texturing, look for areas of the mesh where you can break the object into multiple pieces based on any existing or evident seams in the object. Breaking an object into multiple piece has pros and cons which you will learn with practice and experience.

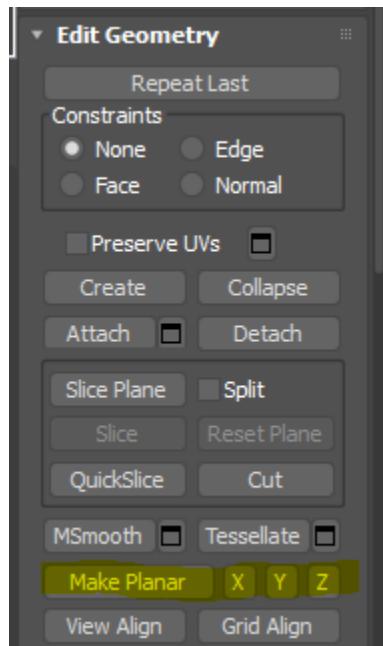
Here are a couple examples of things to consider for each object:

While you certainly could break the rims of the barrel into multiple pieces, if you extrude the metal bands as we did in Texturing and then detach them, leaving a polygon gap between the two pieces, it will no longer be possible to weld those seams inside of the UV editor. If you create separate tubes or cylinders for the rims of the barrel and then attach them to the main body, you will end up with strips on the UV shell of the barrels main body that will not be seen, effectively wasting that UV texture space.

Both the airplane and the car have very smooth and organic lines for the same reason; aerodynamics. In the case of the plane you would want to make sure that you had the profile of the wing completed as part of the main body first so that if you do end up detaching the wing into its own element or object (say in order to do two versions, the standard intact version and then another where it has sustained damage) it still has the same number of vertices in roughly the same place on the edge where it has broken away as the main body of the plane.



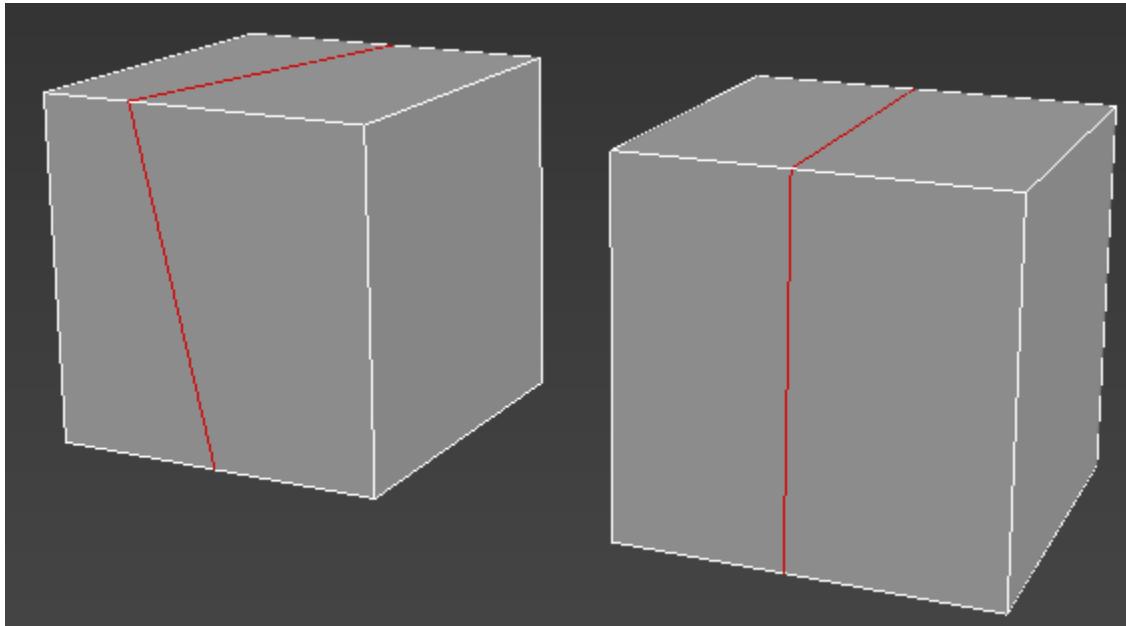
The same issue can present itself with the car door. If you start the model by focusing on the shape of the car, once you have all the subtle curves in place then you can consider breaking off the geometry for the door, if it needs to open. If the car door doesn't need to open, leave it as one piece and let your textures take care of the seam.



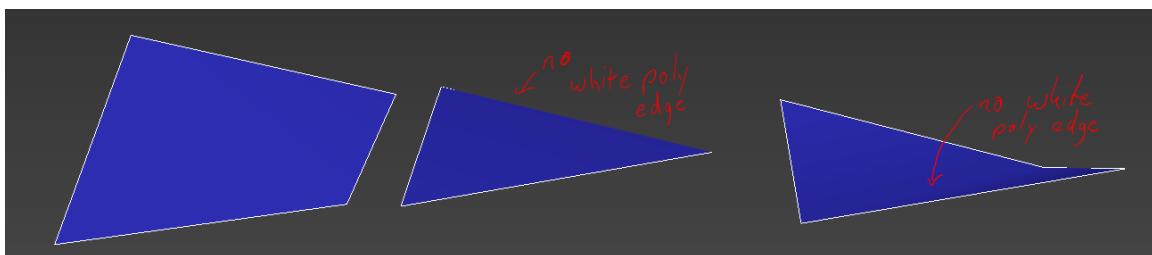
Make Planar – This tool has four variations: “Make planar” by itself will take an average of all of the verts/edges/polys that you have selected and

align them to that average value (so if you have three polys at a 40 degree angle and three at a 30 degree angle it will set all of them to a 35 degree angle), “X” will align your selection to the X axis, “Y” to align your selection to the Y axis, and “Z” to align your selection to the Z axis.

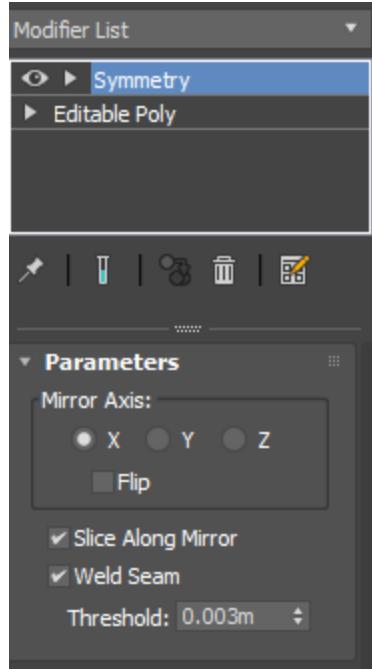
This tool is used to keep mesh lines straight and aligned on one axis, and in some cases fix non-planar faces.



The edge loop on the box on the left has had one of its vertices misplaced. By clicking the “X” option (left/right) next to “Make Planar” command, the line is now perfectly straight



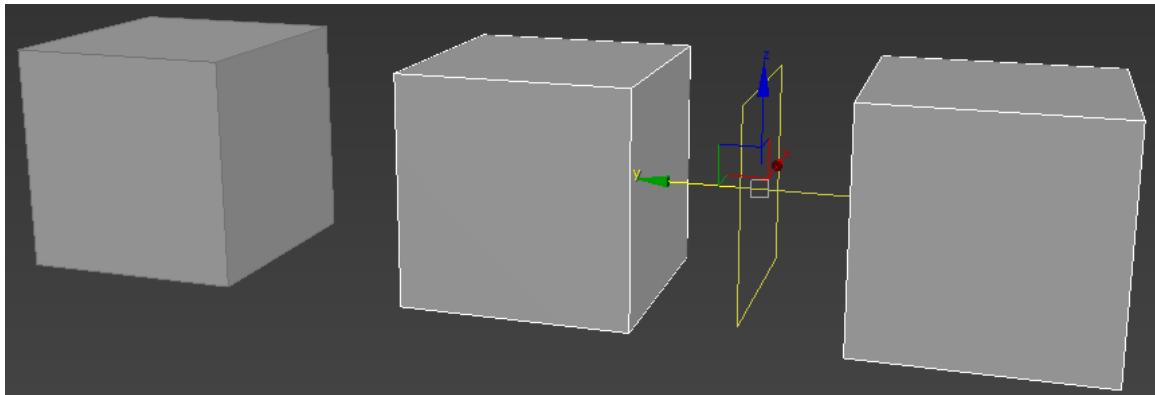
The plane on the left has had two verts on opposite sides of the mesh moved down, resulting in what is known as a non-planar face, that is a face or polygon that has been twisted to the point that the 3D software is trying to interpret how it should be broken down into triangles, with unreliable results. The second image is the same plane rotated 24 degrees so that you can see that while there appears to be an edge running from the left side of the mesh to the right, there is no actual white poly edge. The second image has Max drawing its imaginary edge between the other two verts. Max will not always get this right, so either create the edge yourself or (preferably) fix the poly to make it planar.



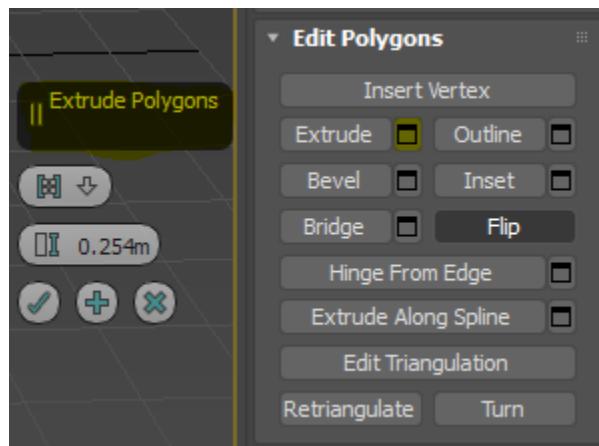
Symmetry – Pretty self-explanatory, the symmetry modifier will create a non-rendering gizmo referred to as a “Mirror” (which you can move and alter by pressing the small arrow icon to the left of the modifier, then selecting it), which will then sample one side of your mesh based on your choice of X,Y or Z axis, then project everything on that side of the mesh to the other, then weld any vertices that come within the weld threshold value, making anything that crosses the mirror into one element. Assuming that you are working at the 0,0,0 origin with the front of your object directed at the camera when in front view, by default Max will sample the right-hand side of your mesh and duplicate it on the left-hand side. If you have been making adjustments to the meshes left hand side and you want it to flip, select the “Flip” option in the modifier.

For the majority of projects, this is the modifier to use if you want your mesh to be completely identical left to right/top to bottom/front to back.

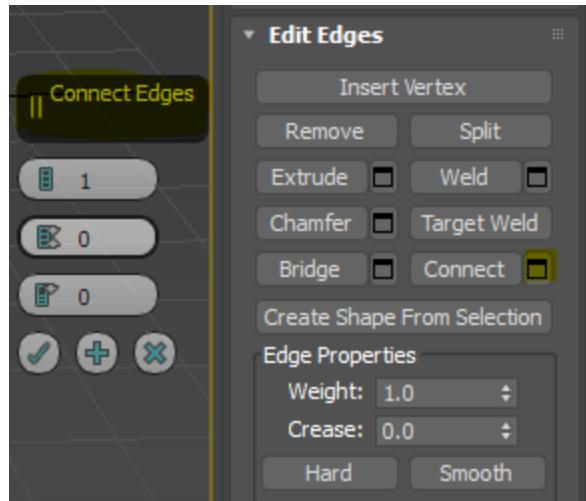
** Important Note – Unless it’s your intention, be sure to not have any sub-objects (verts, edges, poly, elements) selected when adding modifiers to the stack. Also, if when you create the mirror it is at an angle, it most likely means that the mesh has rotational Xform values. The mesh should have its Xform reset and the symmetry re-applied **



The cube has had “symmetry” applied, and then the mirror was moved in Y to create a mirrored copy of it.

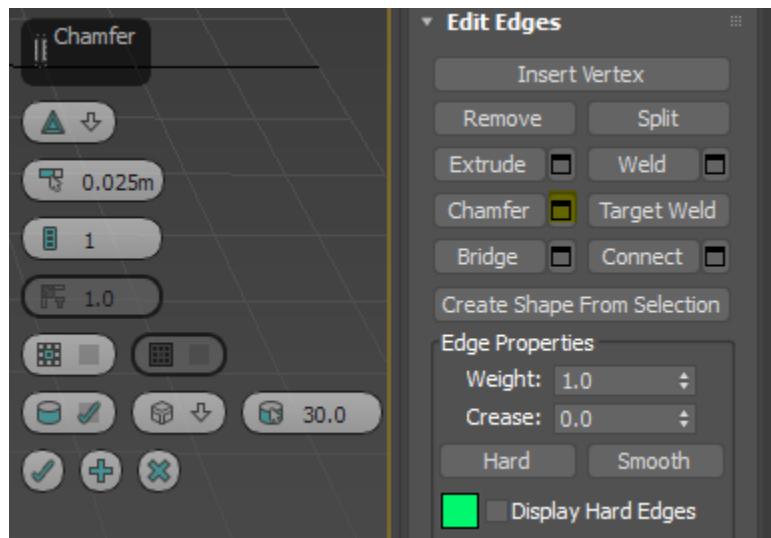


Extrude – Can be done either via the graphite tools (the ribbon commands above the viewport), the “Extrude” command in the Edit(able) Poly modifier on polygons or edges, or if you have a border edge selected, holding down SHIFT and moving, rotating or scaling the selection will cause a new set of polygons to be created. The dropdown menu will allow you to extrude faces based on the selections Z axis, the local Z axis, or per polygon. You can also set the distance of the extrusion with the number field.



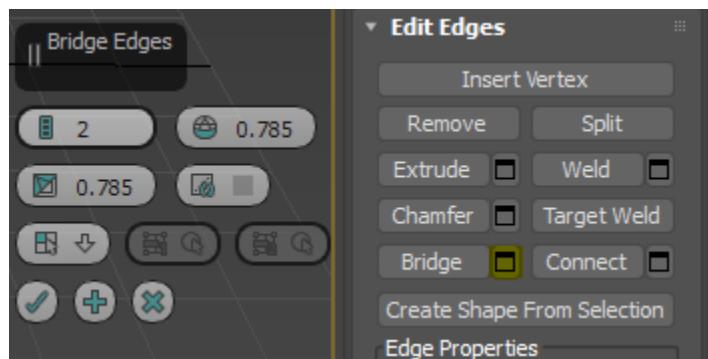
[Connect](#) – In vertex selection mode this will create a new edge in between the selected verts. In edge mode this will create a new edge to be created on the currently selected edge. When used on edges the “Connect” command has the added benefit of the “settings” dialogue box to the right of the command itself, which when opened will allow you to choose how many edges are created, how close together they are (Pinch value) and if they are to be placed closer to one side of your selection or the other (Slide).

This tool is used to add subdivisions or edge loops to a mesh to add more detail, generally to make the mesh objects silhouette more accurate to the source/reference material.

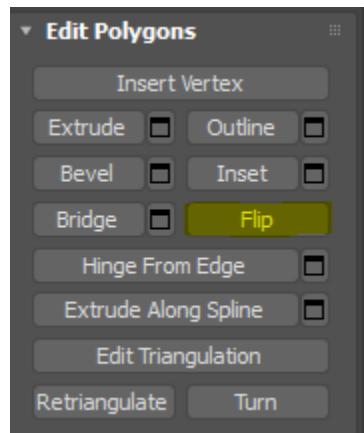


Chamfer – Our most common use of this tool is using it with edges selected, and by choosing the “settings” dialogue option to the right of the command itself. The settings dialogue box will allow you to set how many edges are being made, how far apart they are, as well as whether you want any faces that would be created by the chamfer operation to be immediately deleted.

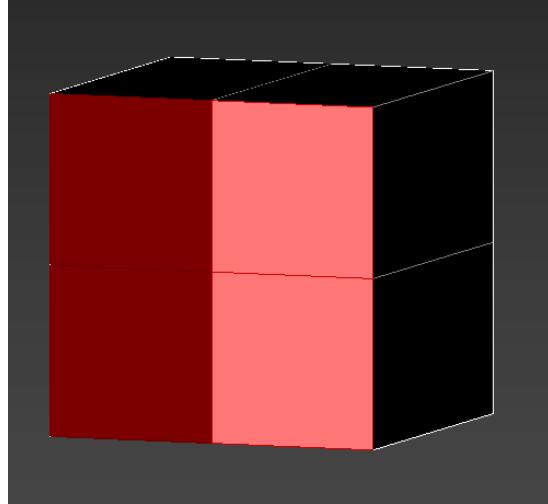
This is good for punching holes in mesh or separating mesh pieces, as well as preparing a mesh for SubD modeling, which we will go into in Week 7 and 8.



Bridge – With two or more facing border edges selected, this will create a new polygon to connect them. It's best to have an equal number of edges on each side of the gap that you want the polygons to cross in order to keep them as quads. If you do end up with a hole in your mesh that is defined by only three edges and wish to close it off, simply select the border edges making up the hole, then click “Cap”



Flip – Depending on construction method, mesh will display black, or a darker version of the assigned color. Mesh has an inside and an outside to it, defined by positive vs negative Z normals. If a mesh is displaying black, it most likely means that the mesh is inverted, or inside out. The “Flip” command which is visible in only polygon or element selection modes when applied to these dark areas will reverse the Z value and make the mesh “right side out”.



Of the four polygons facing us, the polygons on the left are flipped, the ones on the right are not.