Modelling Lab: Rhino

setting up:

- Osnap should be on (bolded at the bottom toolbar), the boxes (checked and unchecked are the Osnap settings)—this will allow you to snap whatever you’re making to certain points on the geometry you’ve already modelled
  
  o turn on: end, near, mid, int, perp (are my recommendations)

- Gumball: also at the bottom toolbar should also be turned on (bolded)
  
  o when you select something and the blue, green, red arrows appear, that’s the gumball
  
  o it allows you to move your geometry freely (by holding down the arrow pointing in the direction you want to move and dragging) **doing this operation while holding down ALT will move and DUPLICATE the object**
  
  o you can also rotate and scale using gumball

- layers panel: on the right the tab with the piece of cake looking thing is your layers panel…..using layers to stay organized can be VERY helpful
commands from lab:

**line:** select start and end point of the line, hold shift if you only want to move orthogonally

select the line, type `ExtrudeCrv`: then you can type in a distance or just move and click your mouse

now you have a surface

select the surface, type `ExtrudeSrf`: type a distance or move and click your mouse **make sure Solid=Yes is set!! if Solid=No, click it and change it**

**YOU ALWAYS WANT CLOSED POLYSURFACES.....THAT IS WHAT UNREAL WANTS**

now that you have a solid, you can test that it is in fact a closed polysurface, with nothing selected, type `SelClosedPolysrf`: your geometry should become selected (if now, we have a problem)

- if your shape does not appear to be closed, try selecting it and typing `Cap`: it should create a plane to close you shape, thus making it a closed polysurface...test again and see if it is

**Rectangle:** in front or right view, draw a rectangle (for a window) so that it is in the same plane as a side of your box

you can **Copy** or **Array** to create multiple of these rectangles

- array is a really useful command, **ArrayLinear** will array the object along a line—you choose the direction, number of items to be produced, and distance between them

- **ArrayPolar** will array an object about a center which you choose

to create the window: first select your box, type `Explode`: this will turn the closed polysurface into 6 separate surfaces (don't panic)

with the surfaces selected, type **OffsetSrf**: a bunch of white arrows will appear which indicate the normal of each surface, at this point you can flip them if necessary, they should all be pointing the same direction away from the center of the box

here again you can click **Distance** or type **D** hit enter and type the distance you wish to offset (precise), or you can click and drag to choose the distance (less precise) **again make sure Solid=Yes**
- tip: I would actually suggest leaving the normals pointing out (as said above) but either input a negative distance or drag the distance inward toward the center of the box so that the offsets will overlap….think of them as actually walls, you'd want them to meet at the corners

now your house has walls which have a thickness

select the walls and type **BooleanUnion**: this will join them into one solid again

select the rectangles which will be the windows, **ExtrudeCrv**: type a distance or just click

select the walls/house/box, type **BooleanDifference**, when it prompts you to select surfaces or polysurfaces to subtract with: select the window extrusions **which must extend beyond the walls you want to punch holes in**

then hit enter

now you can delete the window extrusions, and they should have left holes in the walls

select all and **BooleanUnion** again or **Cap** as necessary to ensure you still have a closed polysurface

Select the formed polysurface, and **MergeAllFaces**, to clean up the object divisions.

Now let's make a roof

Make a **Rectangle** around the top of the house, select that rectangle and **ExtrudeCrv**, again make sure Solid=Yes

Select that box which now sits on top of your house

Turn on control points by typing **PointsOn**, select the four points which make up the top corners of the box, using the red or green square (depending on the orientation of the box) hold down that square and drag the points together so that your roof looks more like a normal triangular roof

**alternate way to make the roof**

Draw a line on the top of the house from midpoint of the top of the front face of your house to opposite, perpendicular midpoint

Select that line, click the blue arrow and type in a distance you want the height of your roof to be, or hold down the blue arrow and drag the line to the desired height
Draw a **Polyline** from the top left corner of the front face, to the start point of the line above, to the top right corner of the front face, back to the first point (instead though you can also hit `c`, `enter` to close the line)

That triangular curve could be coplanar

Select that curve, **ExtrudeCrv** to the length of the floating line, again making sure it's solid

However you make the roof, the most important thing is that a) it’s solid and b) it is separate from the house itself

Other helpful commands:

- **Rotate**
- **UndoMultiple**: there’s also normal **Undo** which will undo your last operation, but **UndoMultiple** gives you a list of all of your commands and you can go back to a specific point
- **Dir**: shows the normals of your surfaces
- **Scale1D**: allows you to scale an object just in one directions i.e. making it longer or taller
- **MoveFace**: similar to **Scale1D**, if you want to stretch, lengthen, shorten a shape select the face you want to move and it will change the surfaces connecting to it while remaining solid
- **Mirror**: you can flip an object about and axis, if you select Copy=Yes it will make a duplicate
- **Boolean** of any kind: use this to subtract geometries one from another (**BooleanDifference**), or to join them together (**BooleanUnion**)
- **Solids tab**
- **Array**
- **WalkAbout**: lets you look at your model from a person perspective, can “walk about” *turn your head*, adjust the height of the view point, change camera lens length etc.
- **EdgeSrf** lets you make a surface from any two lines. It's really helpful!

Every Rhino issue is super Google-able
