REU Modeling Course - Part I

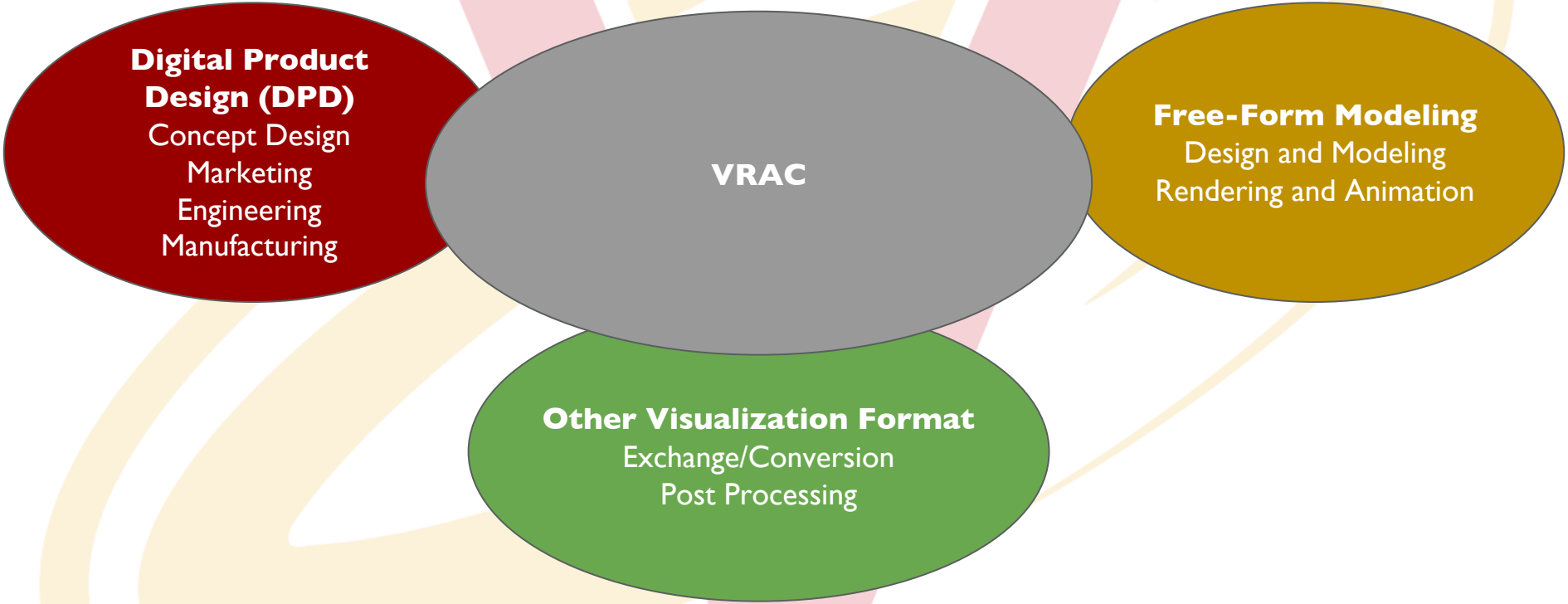
Blender

Program Introduction

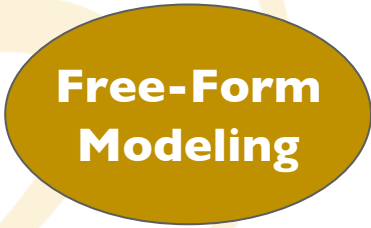
Workshop Workflow

- Compare/Introduce CAD Programs and Purposes
- Blender Interface
- Creating/Experimenting With Polygonal Models
- Today's Mini Creation

VRAC Computer Aided Design (CAD) "Flavors"



Free-Form Design & Modeling CAD

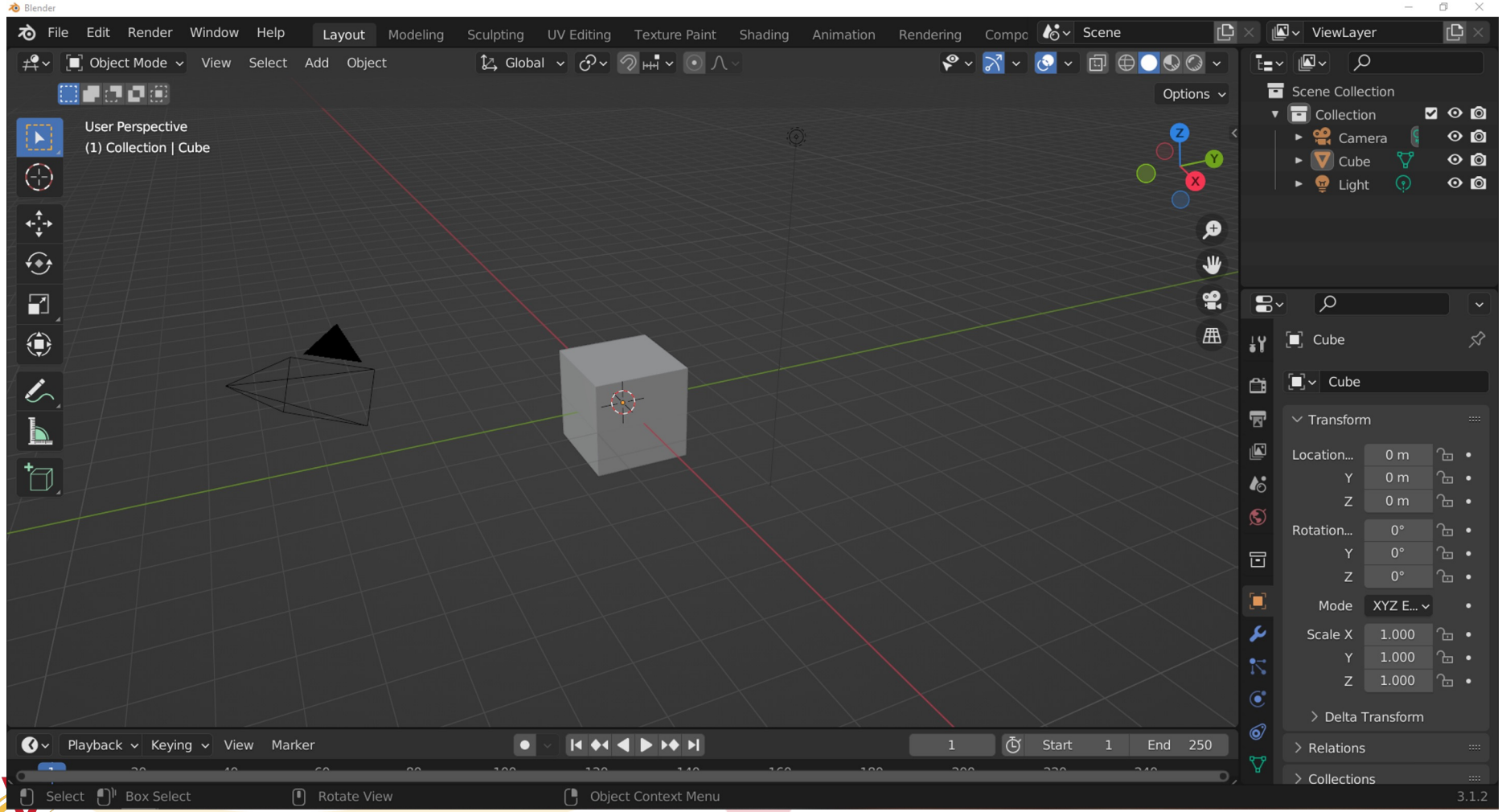


- Design and Modeling
  - Direct modeling
- Scene Rendering and Animation
  - Examples:
    - Cinema 4D
    - 3DS Max
    - Blender
    - Rhinoceros 3D

“Other” Free-Form Modeling

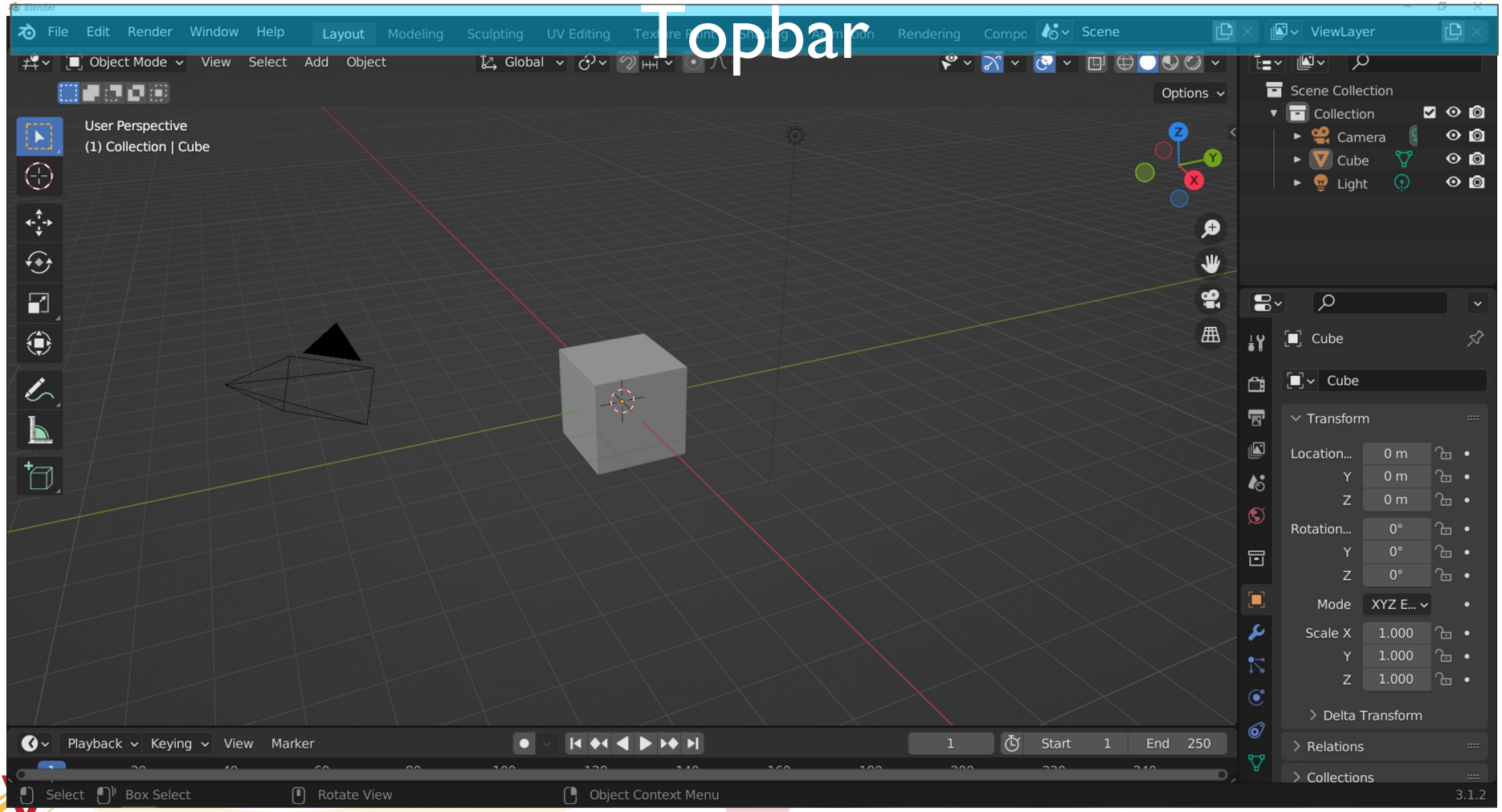
- Conceptual Design: ASDS, SpaceClaim
- Visualization: OpenSceneGraph, Unity, Unreal Engine
- Mesh Edit/Repair: Autodesk Meshmixer, Mesh lab

blender®



VRAC Visualize • Reason • Analyze • Collaborate

Topbar



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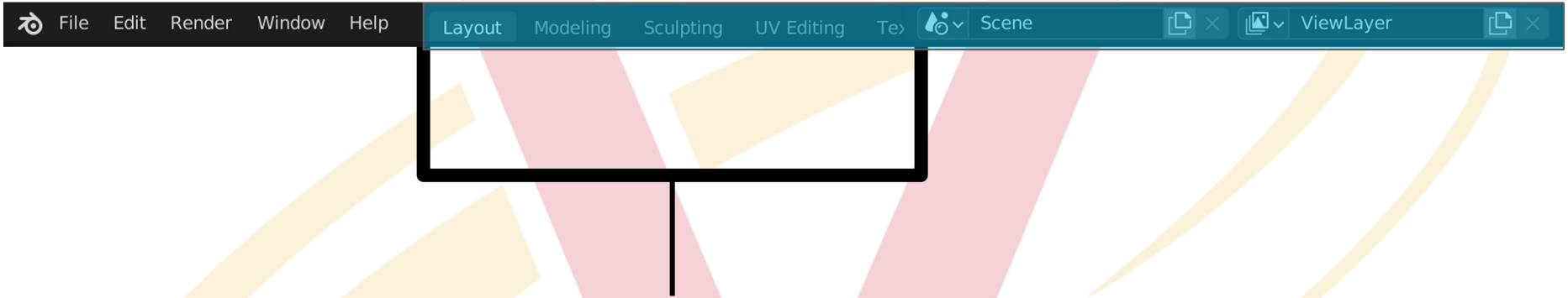
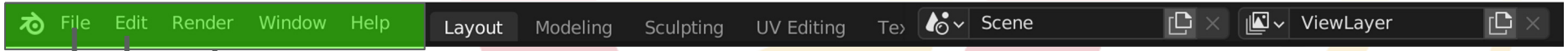
Topbar



Workspaces:
Predefined window views for different editing modes

Topbar



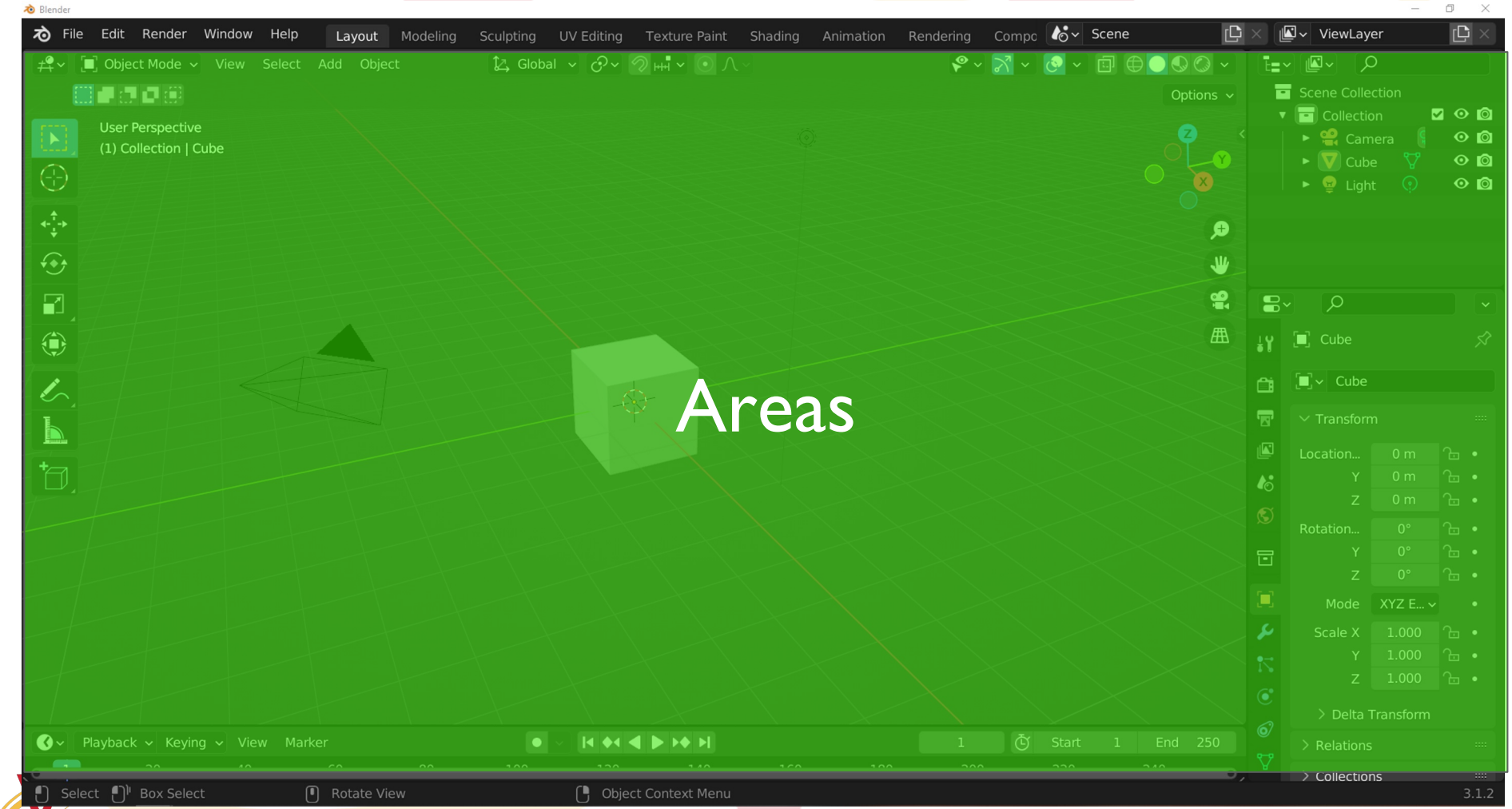
File Menu:
All things related to making/saving files

- Create New Scene
- Save Current Scene
- Copy Scene

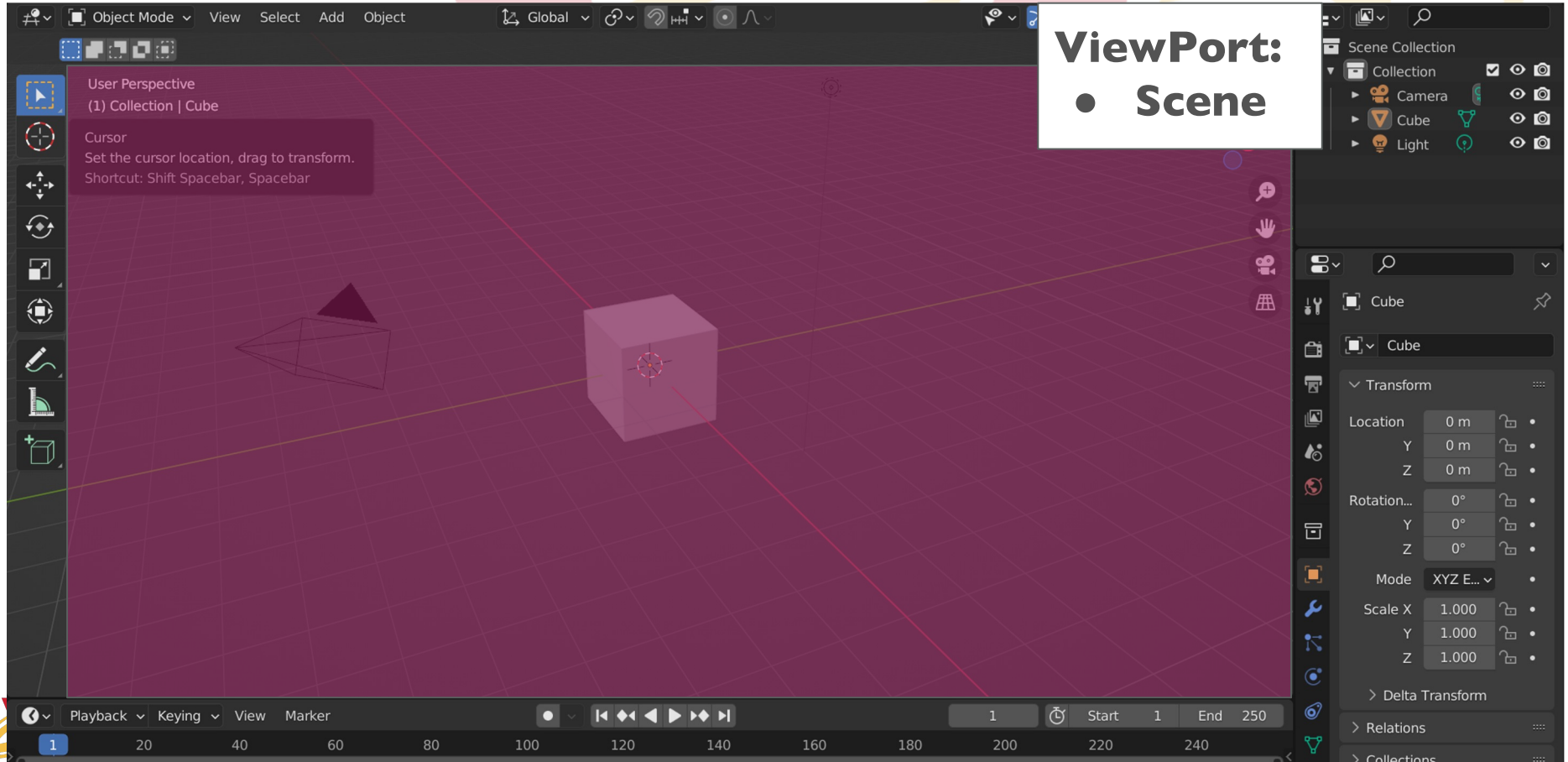
Edit Menu:
All things related to editing files

- Undo/Redo History
- Preferences

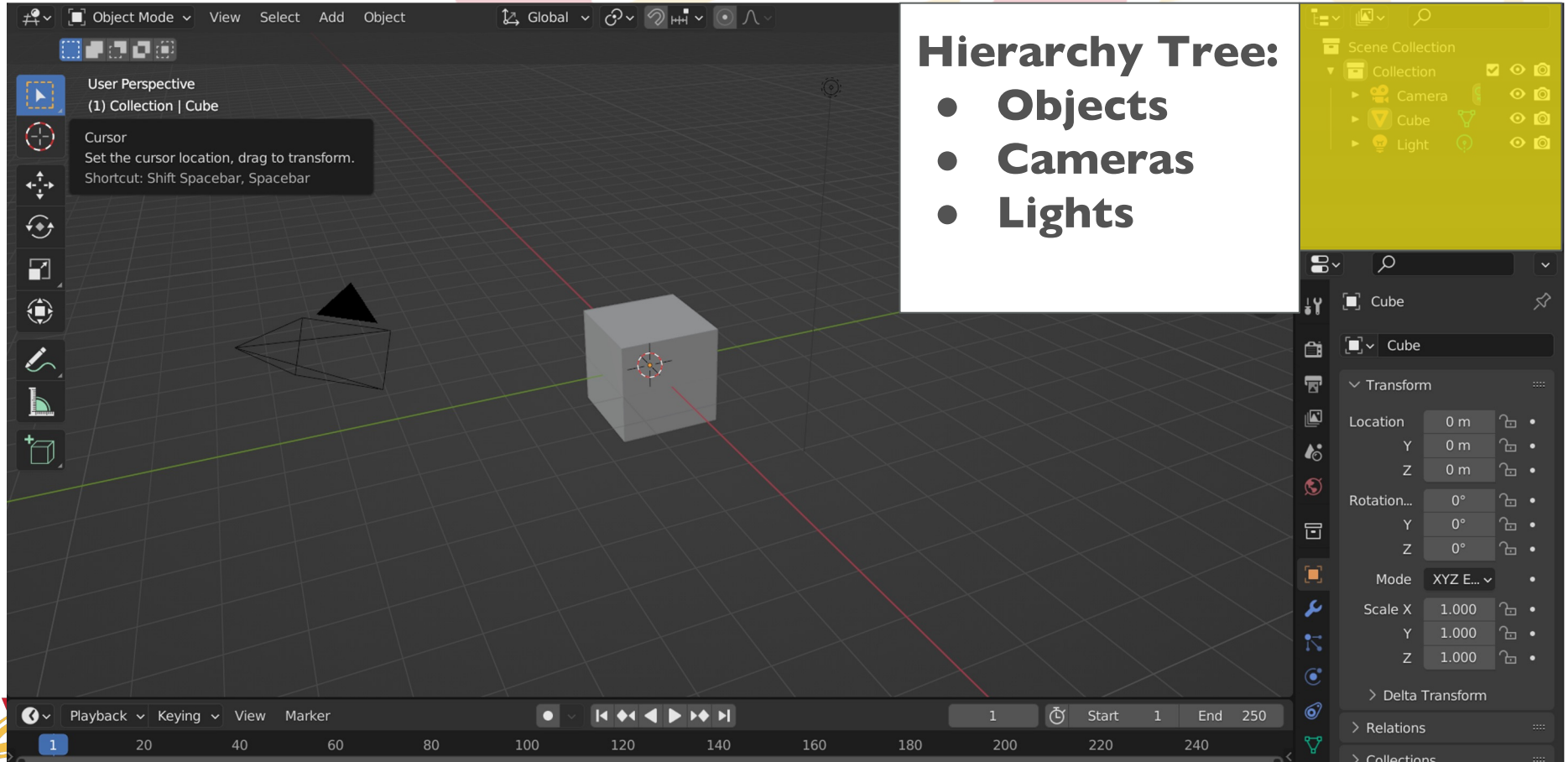
Render Window:
Not important now, but will come back to this in session 3


Blender
File Edit Render Window Help
Layout Modeling Sculpting UV Editing Texture Paint Shading Animation Rendering Compo
Scene
ViewLayer
Object Mode View Select Add Object
Global
Options
User Perspective
(1) Collection | Cube
Scene Collection
Collection
Camera
Cube
Light
Cube
Cube
Transform
Location... 0 m
Y 0 m
Z 0 m
Rotation... 0°
Y 0°
Z 0°
Mode XYZ E...
Scale X 1.000
Y 1.000
Z 1.000
Delta Transform
Relations
Collections
Areas
Playback Keying View Marker
1
Start 1
End 250
Select
Box Select
Rotate View
Object Context Menu
3.1.2

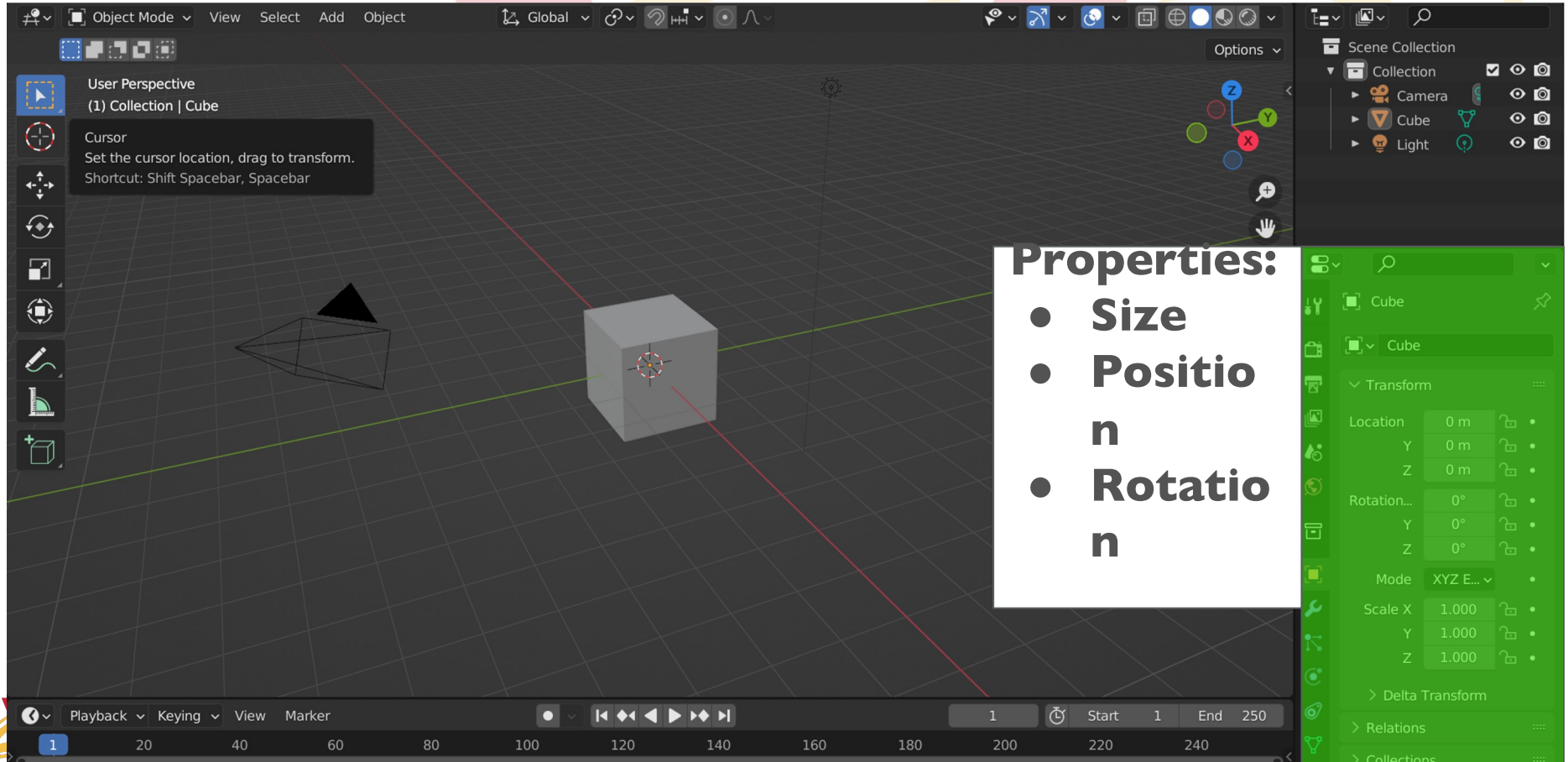
Areas


Object Mode
View
Select
Add
Object
Global
User Perspective
(1) Collection | Cube
Cursor
Set the cursor location, drag to transform.
Shortcut: Shift Spacebar, Spacebar
ViewPort:
• Scene
Scene Collection
Collection
Camera
Cube
Light
Cube
Cube
Transform
Location 0 m
Y 0 m
Z 0 m
Rotation... 0°
Y 0°
Z 0°
Mode XYZ E...
Scale X 1.000
Y 1.000
Z 1.000
Delta Transform
Relations
Playback
Keying
View
Marker
1
Start 1
End 250
1 20 40 60 80 100 120 140 160 180 200 220 240

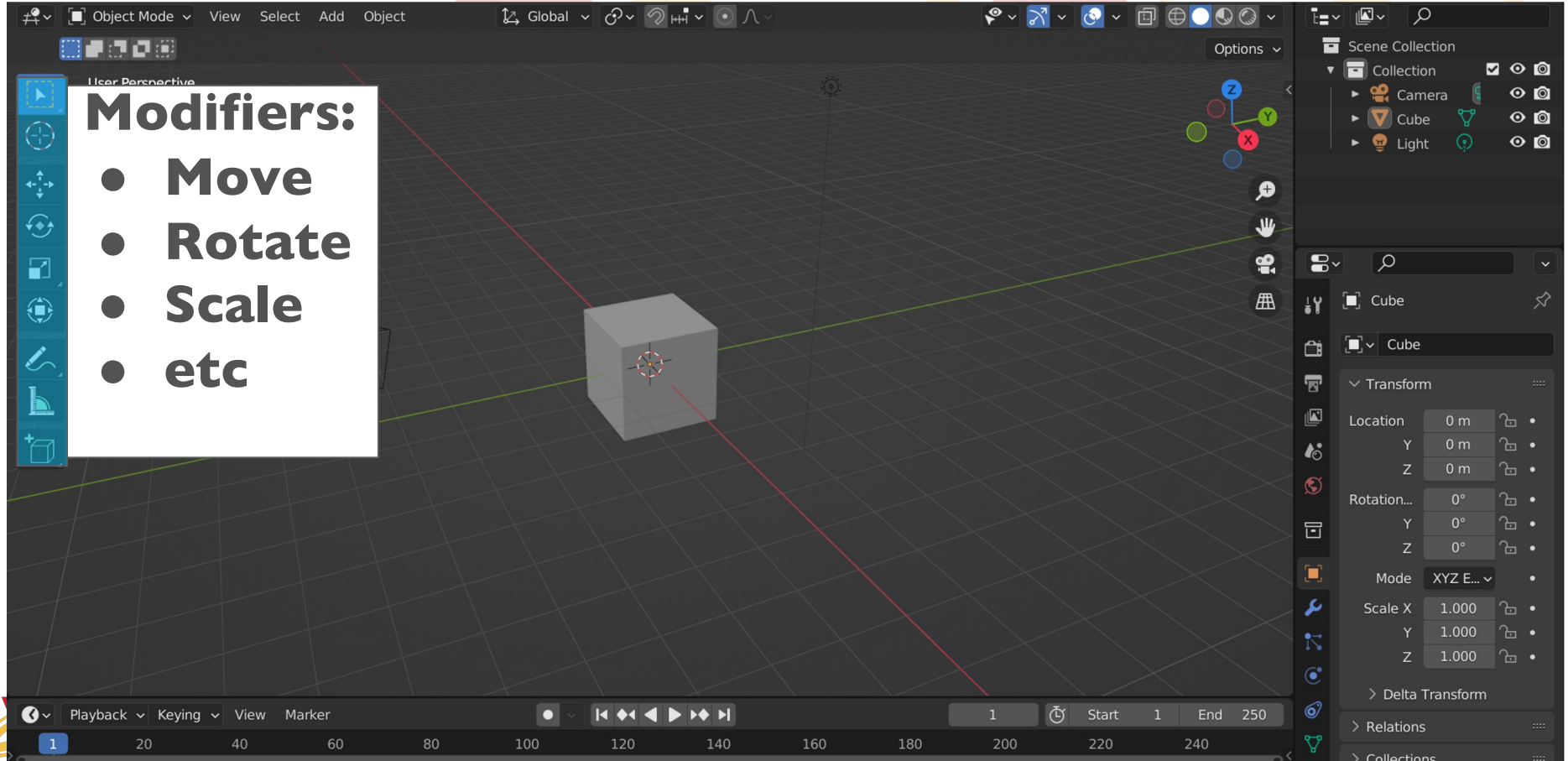
Areas


Object Mode
View
Select
Add
Object
Global
User Perspective
(1) Collection | Cube
Cursor
Set the cursor location, drag to transform.
Shortcut: Shift Spacebar, Spacebar
Hierarchy Tree:
Objects
Cameras
Lights
Scene Collection
Collection
Camera
Cube
Light
Cube
Cube
Transform
Location 0 m
Y 0 m
Z 0 m
Rotation... 0°
Y 0°
Z 0°
Mode XYZ E...
Scale X 1.000
Y 1.000
Z 1.000
Delta Transform
Relations
Playback
Keying
View
Marker
1
Start 1
End 250
1 20 40 60 80 100 120 140 160 180 200 220 240

Areas


Object Mode
View
Select
Add
Object
Global
Options
User Perspective
(1) Collection | Cube
Cursor
Set the cursor location, drag to transform.
Shortcut: Shift Spacebar, Spacebar
Scene Collection
Collection
Camera
Cube
Light
Properties:
Size
Positio
n
Rotatio
n
Cube
Cube
Transform
Location
0 m
Y
0 m
Z
0 m
Rotation...
0°
Y
0°
Z
0°
Mode
XYZ E...
Scale X
1.000
Y
1.000
Z
1.000
Delta Transform
Relations
Collections
Playback
Keying
View
Marker
1
Start
1
End
250
1
20
40
60
80
100
120
140
160
180
200
220
240

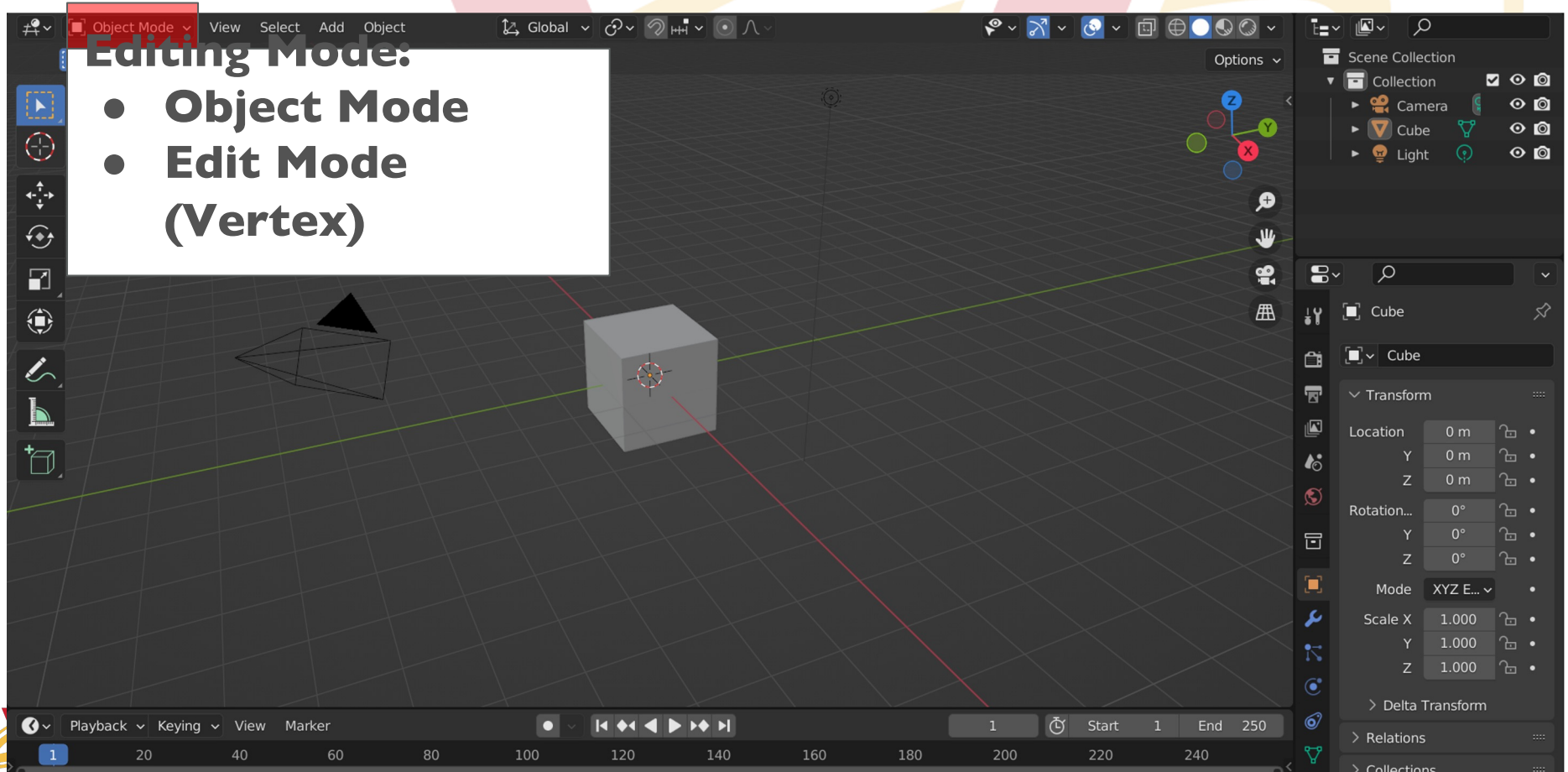
Areas



Modifiers:

- Move
- Rotate
- Scale
- etc

Areas


Object Mode
View
Select
Add
Object
Global
Options
Editing Mode:
• Object Mode
• Edit Mode (Vertex)
Scene Collection
Collection
Camera
Cube
Light
Cube
Cube
Transform
Location
0 m
Y
0 m
Z
0 m
Rotation...
0°
Y
0°
Z
0°
Mode
XYZ E...
Scale X
1.000
Y
1.000
Z
1.000
Delta Transform
Relations
Playback
Keying
View
Marker
1
Start
1
End
250
1
20
40
60
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220
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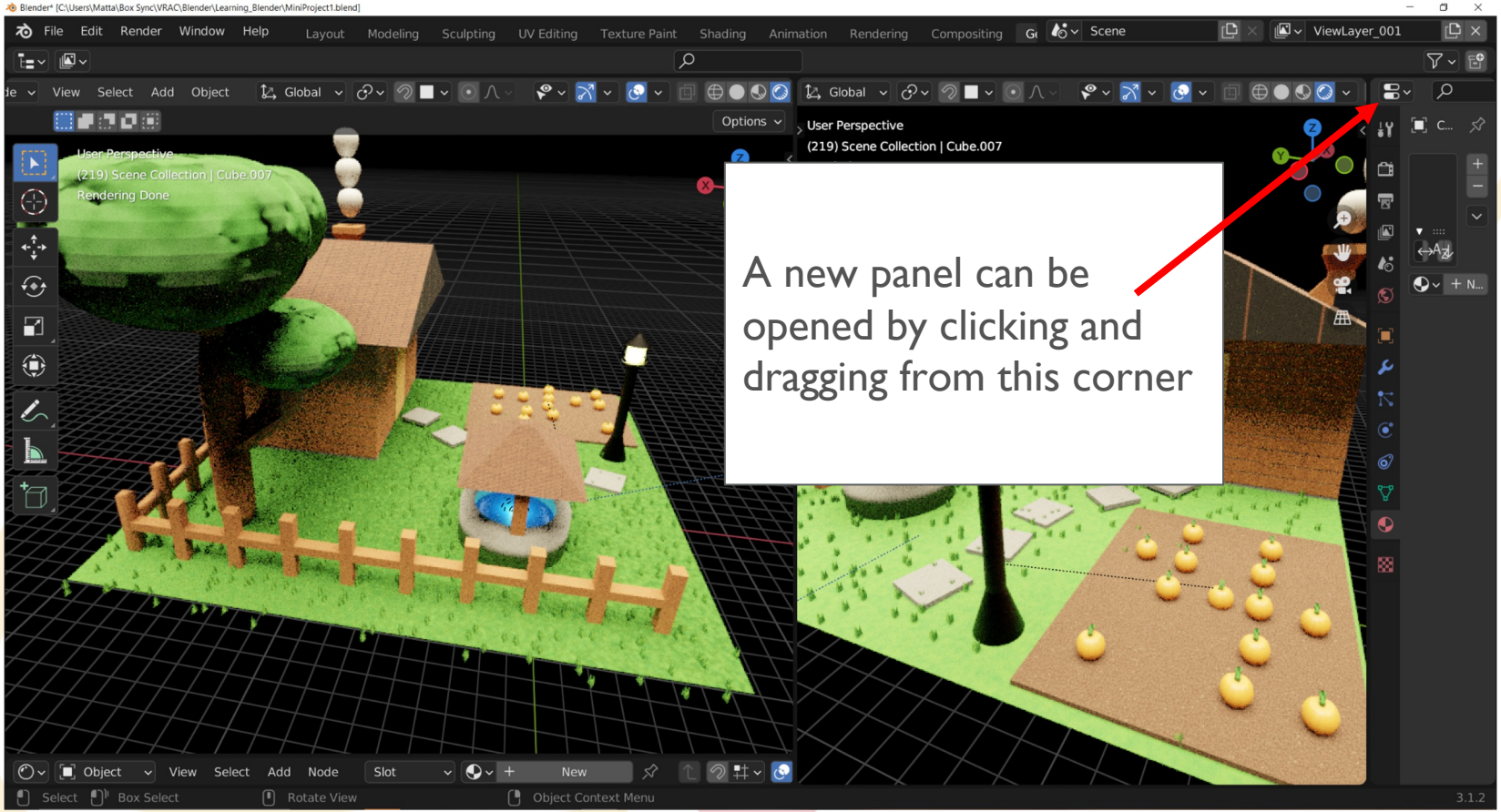
Blender Viewports



Break Time!

Moving Around in Blender

(Almost identical to Solidworks)

Orbit: Middle mouse click and drag

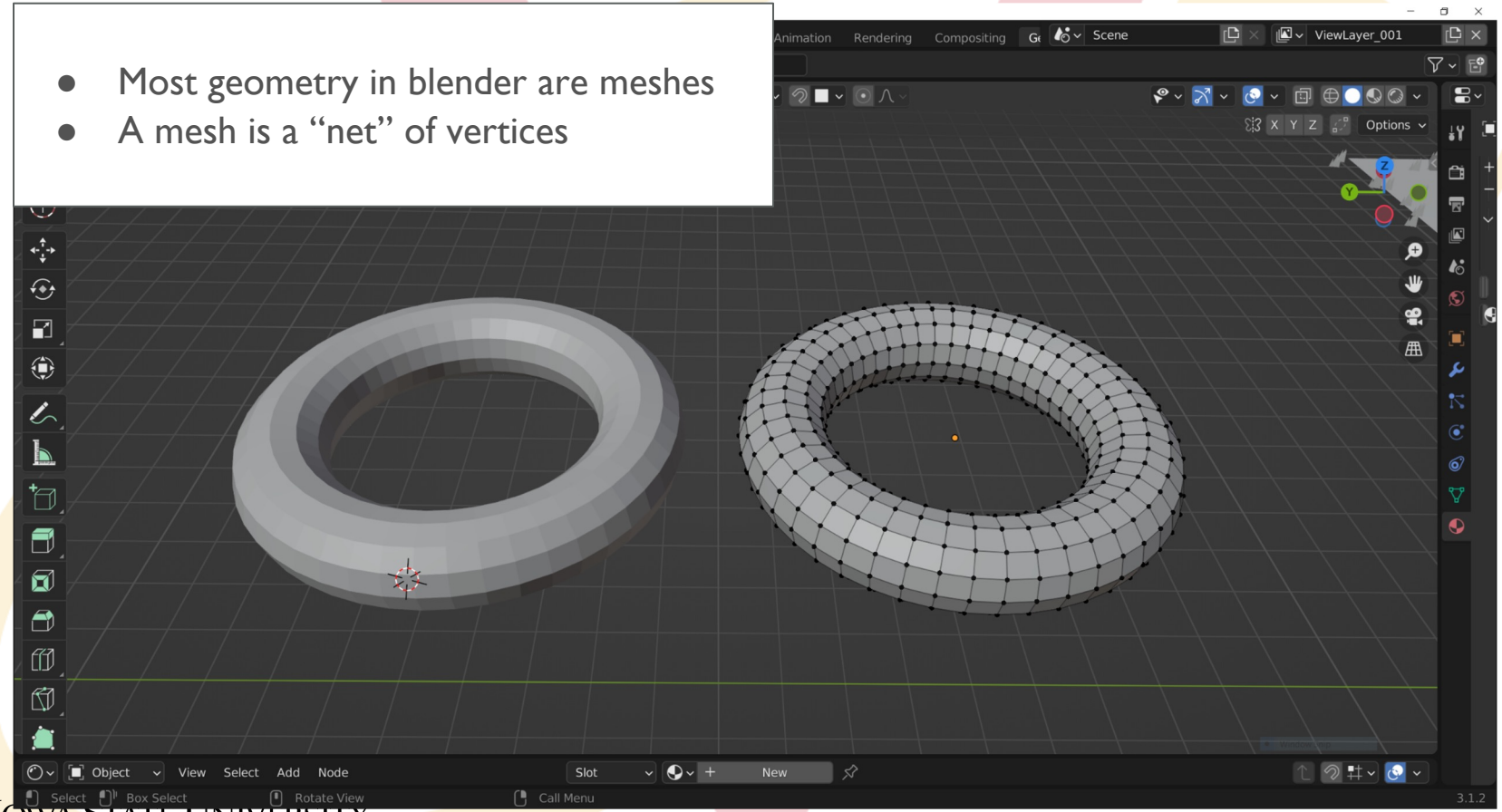
Traverse: Shift + Middle mouse click and drag

Zoom In/Out: Scroll middle mouse wheel

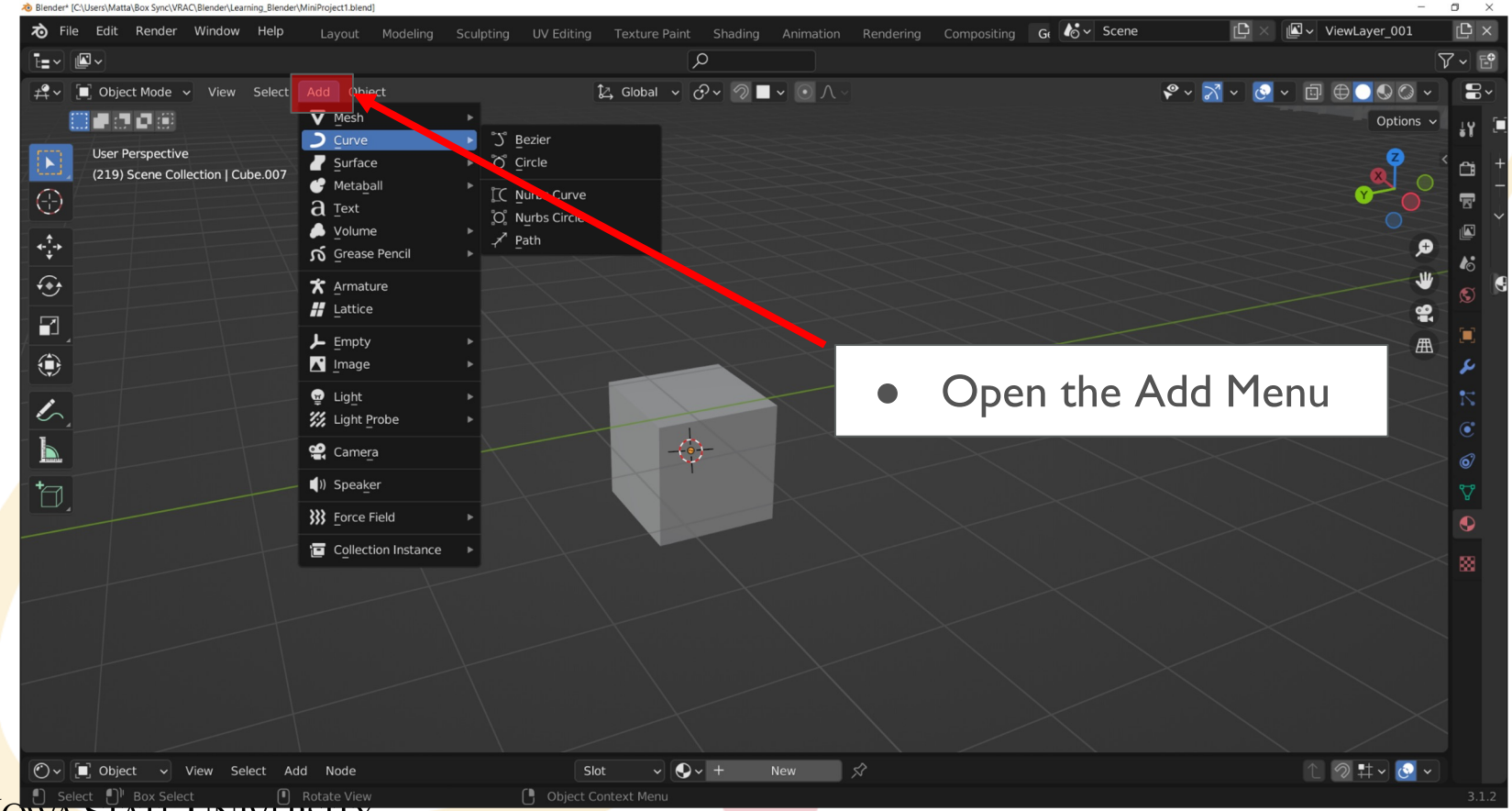
Select: Left mouse click and drag

What is a Mesh?

- Most geometry in blender are meshes
- A mesh is a “net” of vertices



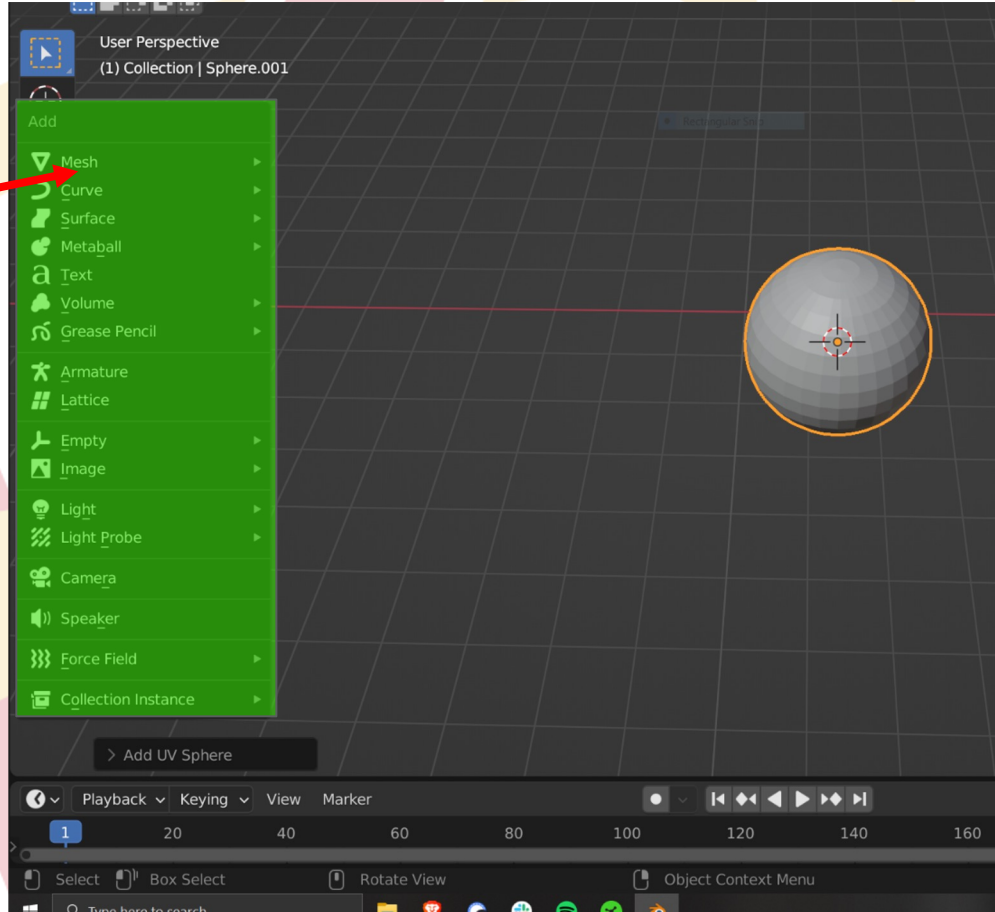
Creating Your First Mesh



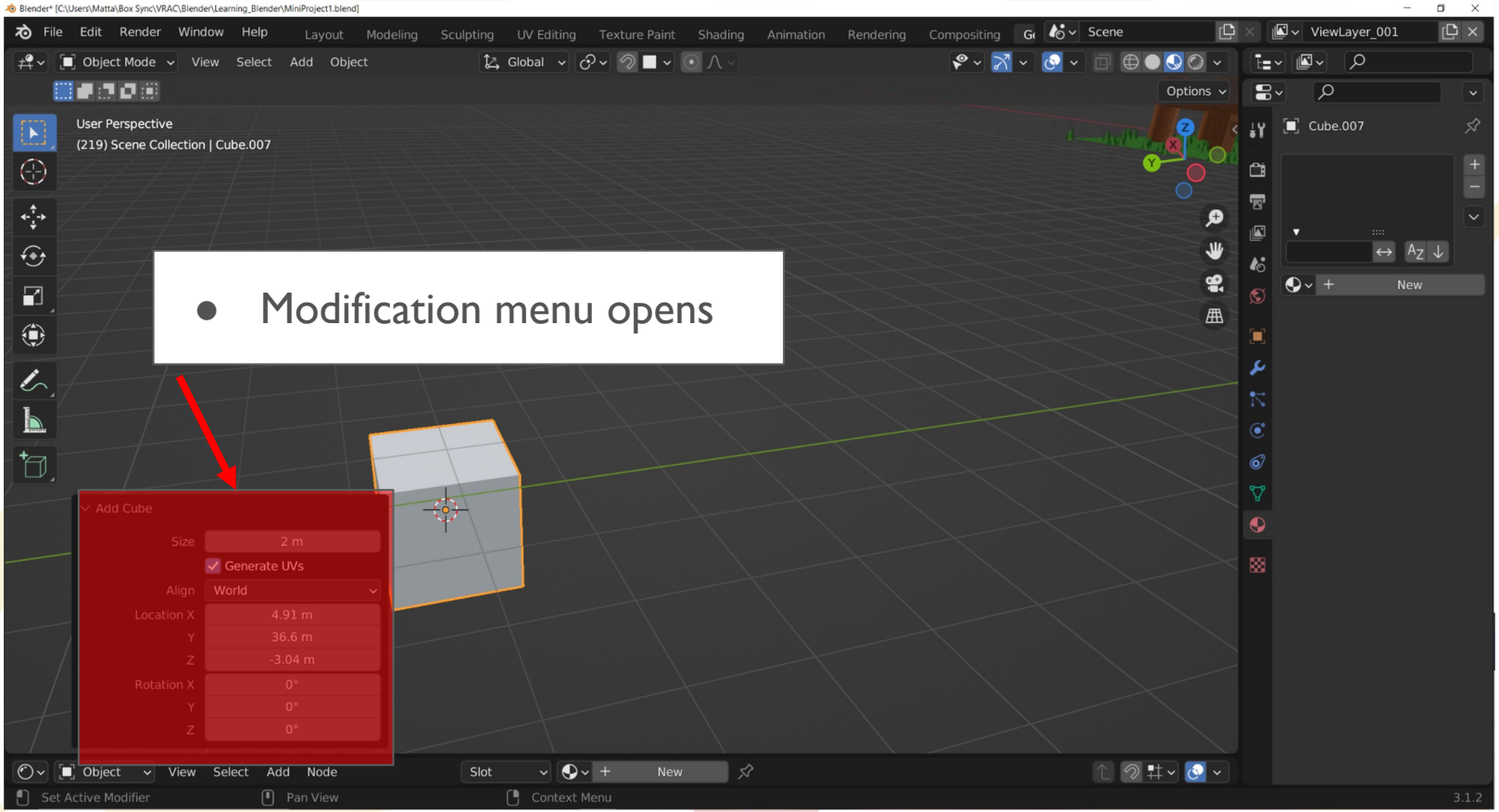
- Open the Add Menu

Creating Your First Mesh

- The "Add Menu" can also be opened with hot keys
- Hotkey: Shift + A
- Add Menu > Mesh > UV Sphere

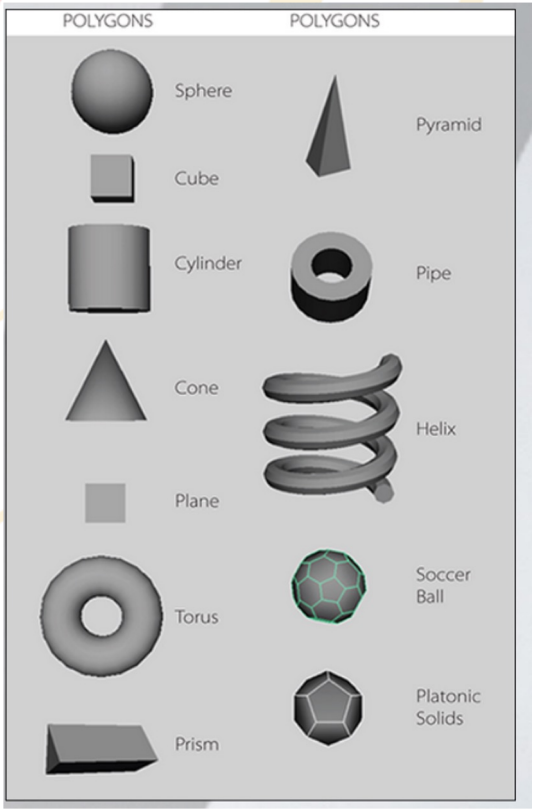


Creating Your First Mesh



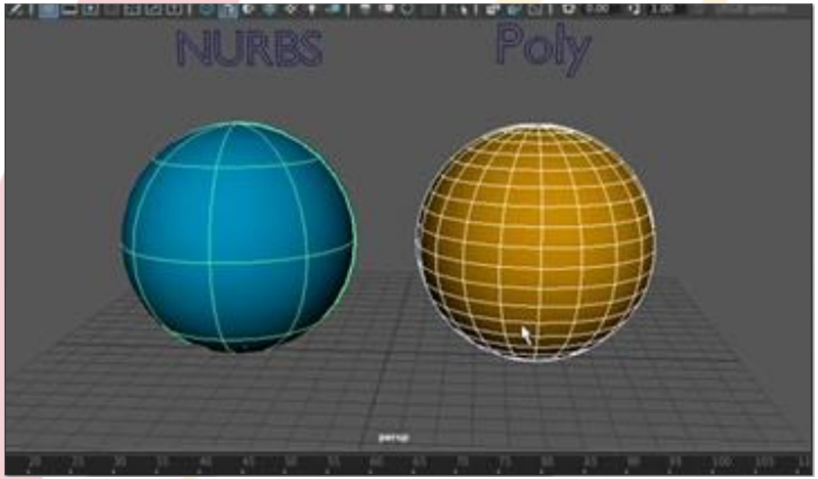
Polygon Models: Primitive Types

- **Polygon Primitives Include:** Sphere, cube, cylinder, cone, plane, torus (dontu), prism, pyramide, pipe, helix, sphere, platonic solids.
- **Hotkey:** Shift + A (opens the add menu)

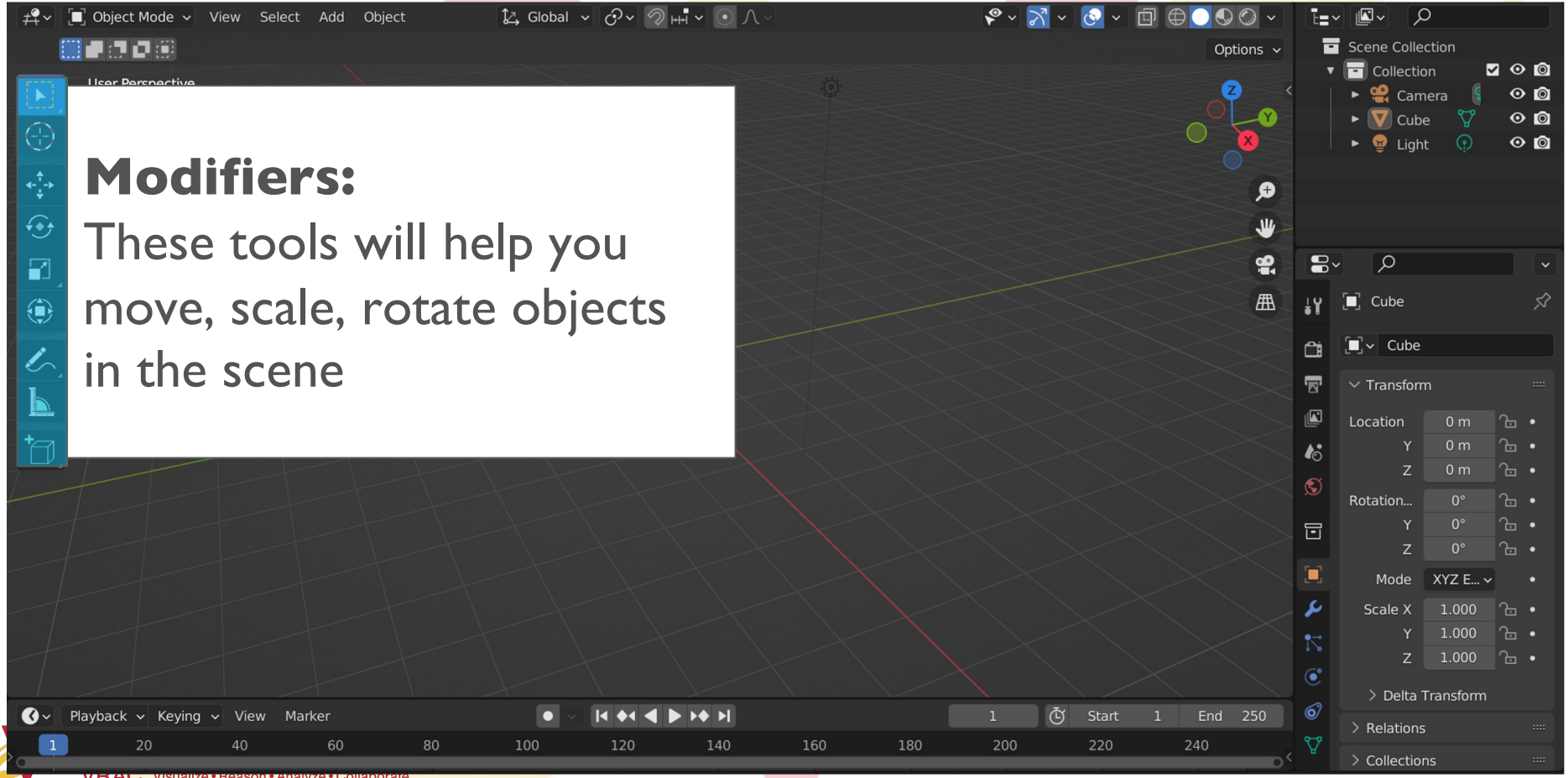


Difference between NURBS & Polygons

- **NURBS (Non-Uniform Rational B-Spline Surface)**
  - Less details for the same amount of curvature
  - Composed of curves rather than straight lines
  - Less flexible when it comes to modeling
- **Polygons**
  - This course deals almost entirely with Polygons
  - Used more frequently than NURBS
  - “Curves” are composed of many small straight lines.



Areas



Modifiers:

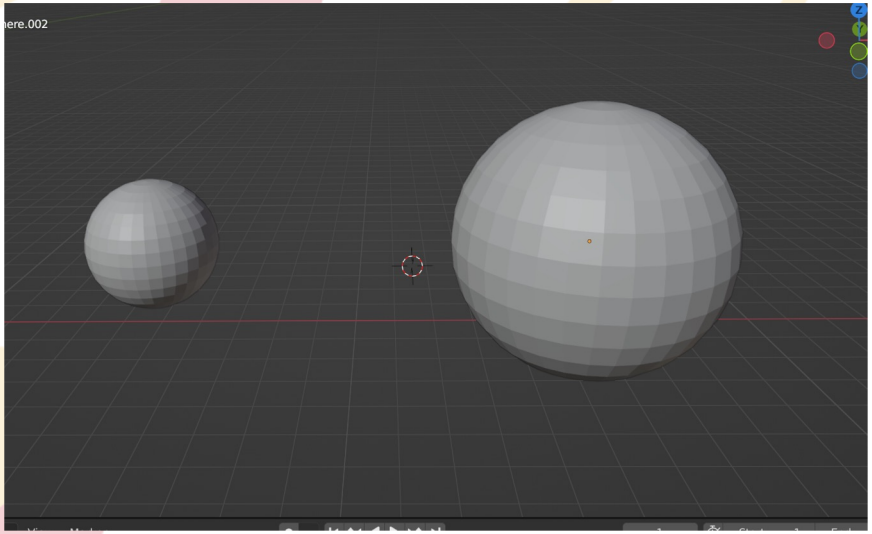
These tools will help you move, scale, rotate objects in the scene

VRAC Visualize • Reason • Analyze • Collaborate

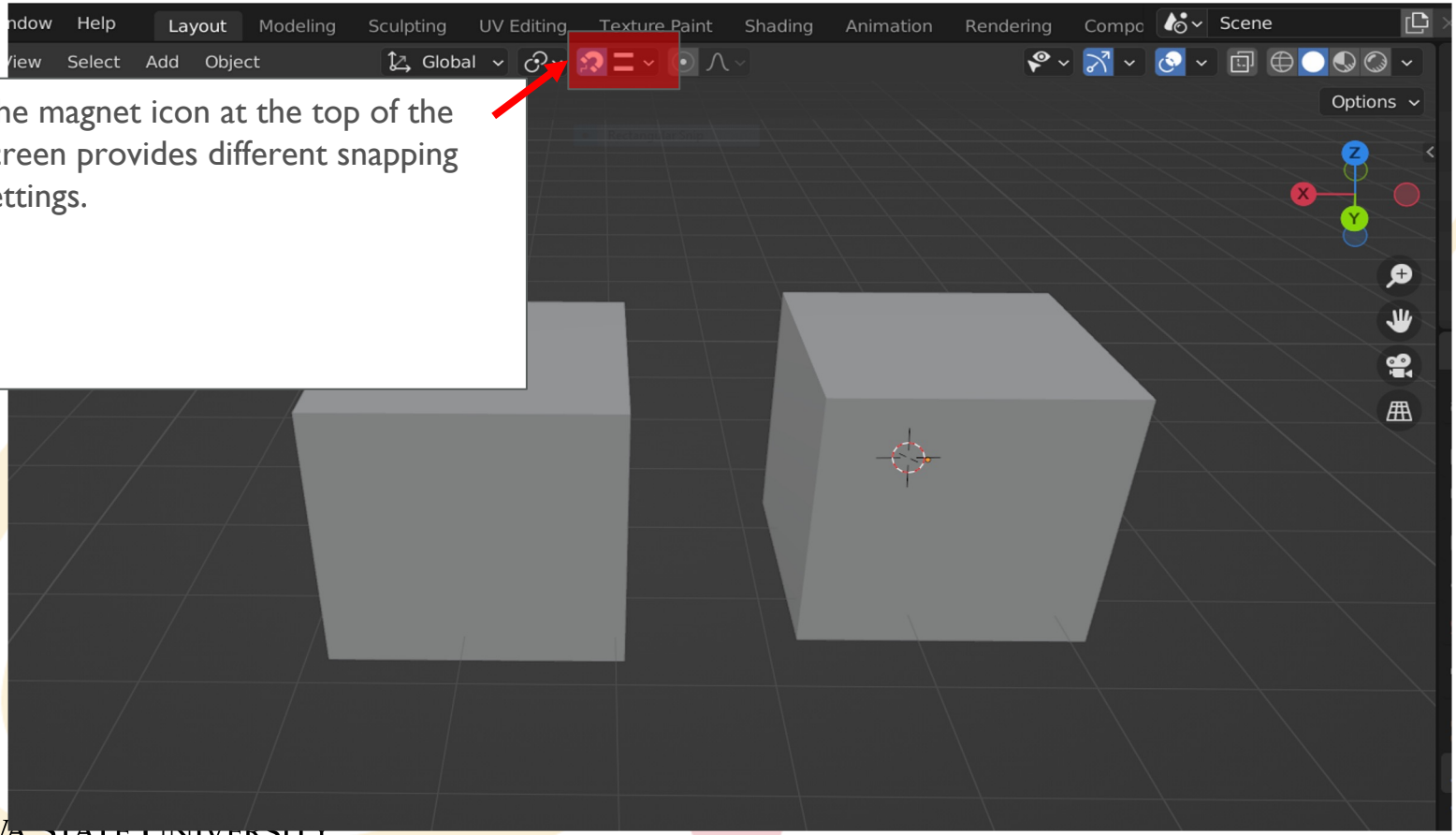
Modifying Your Mesh

- Move:
  - Hotkey: G
- Scale:
  - Hotkey: S
- Rotate:
  - Hotkey: R
- Duplicate:
  - Hotkey: Shift + D
- Restrict Modification:
  - To move, scale, etc along specific axis:
  - Modifier followed by x/y/z (depending on axis you want to modify)

Scaling Example:



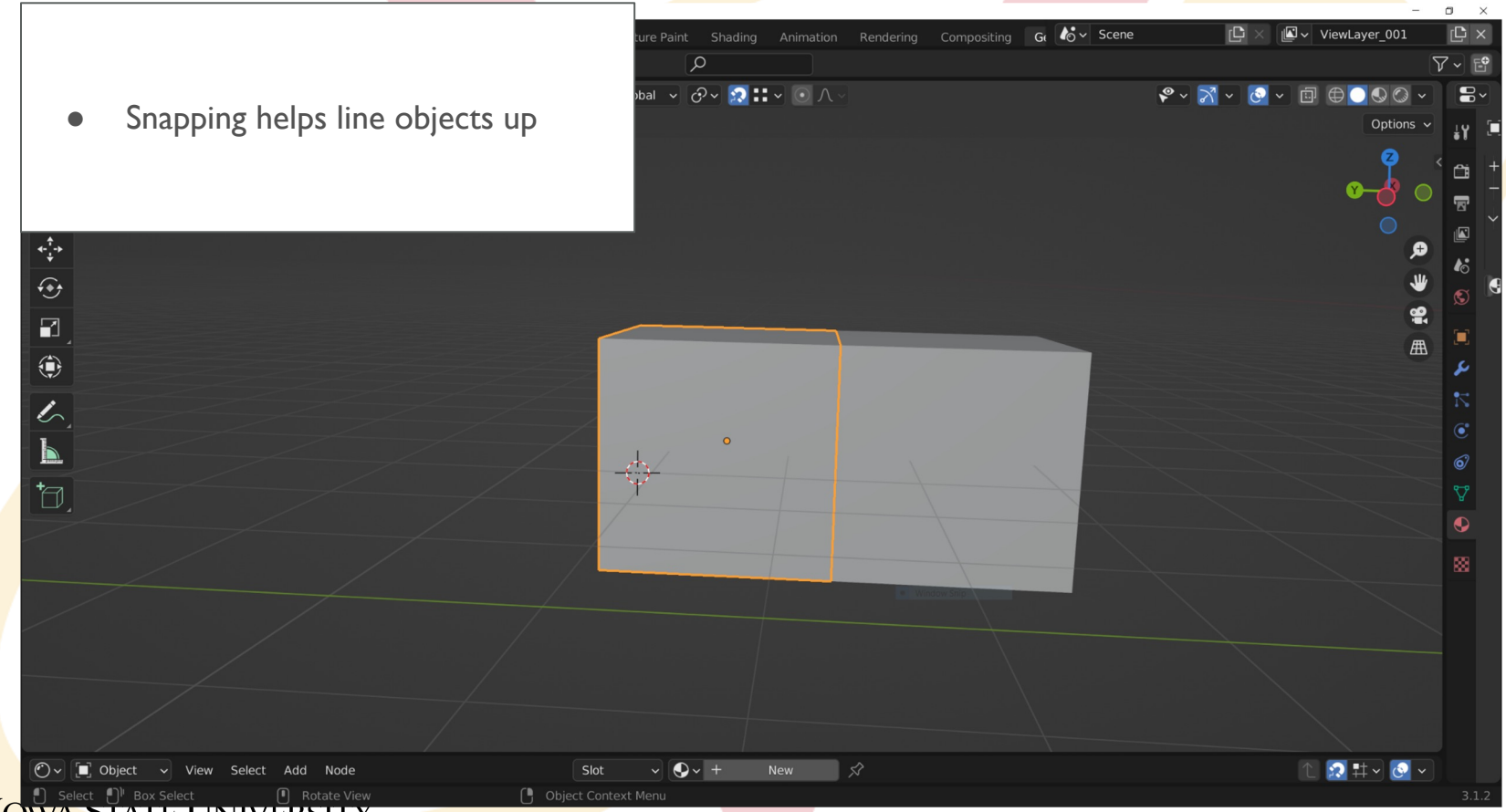
Snapping



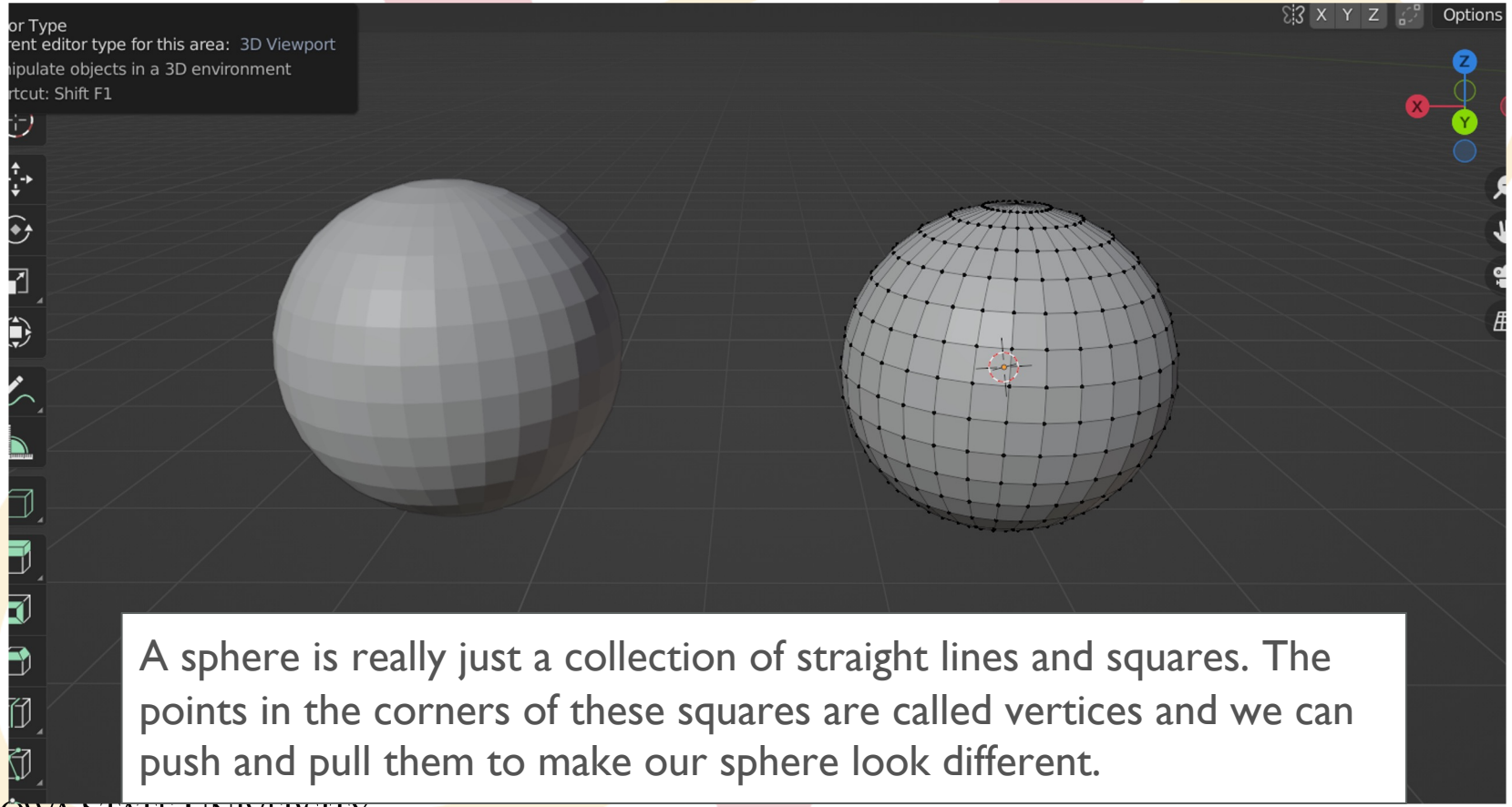
The magnet icon at the top of the screen provides different snapping settings.

Snapping

- Snapping helps line objects up

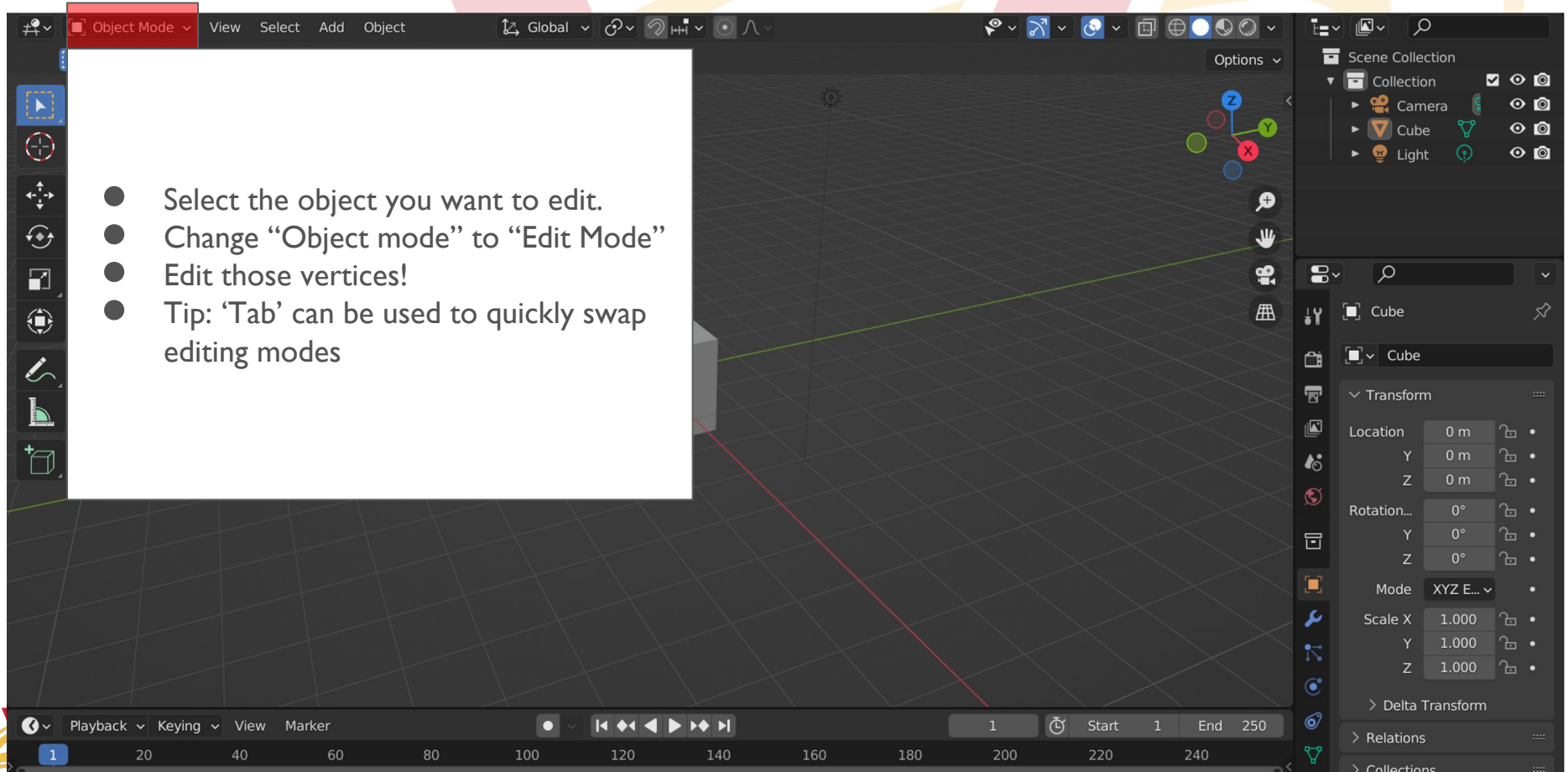


Modifying Vertices



A sphere is really just a collection of straight lines and squares. The points in the corners of these squares are called vertices and we can push and pull them to make our sphere look different.

Vertex Editing:



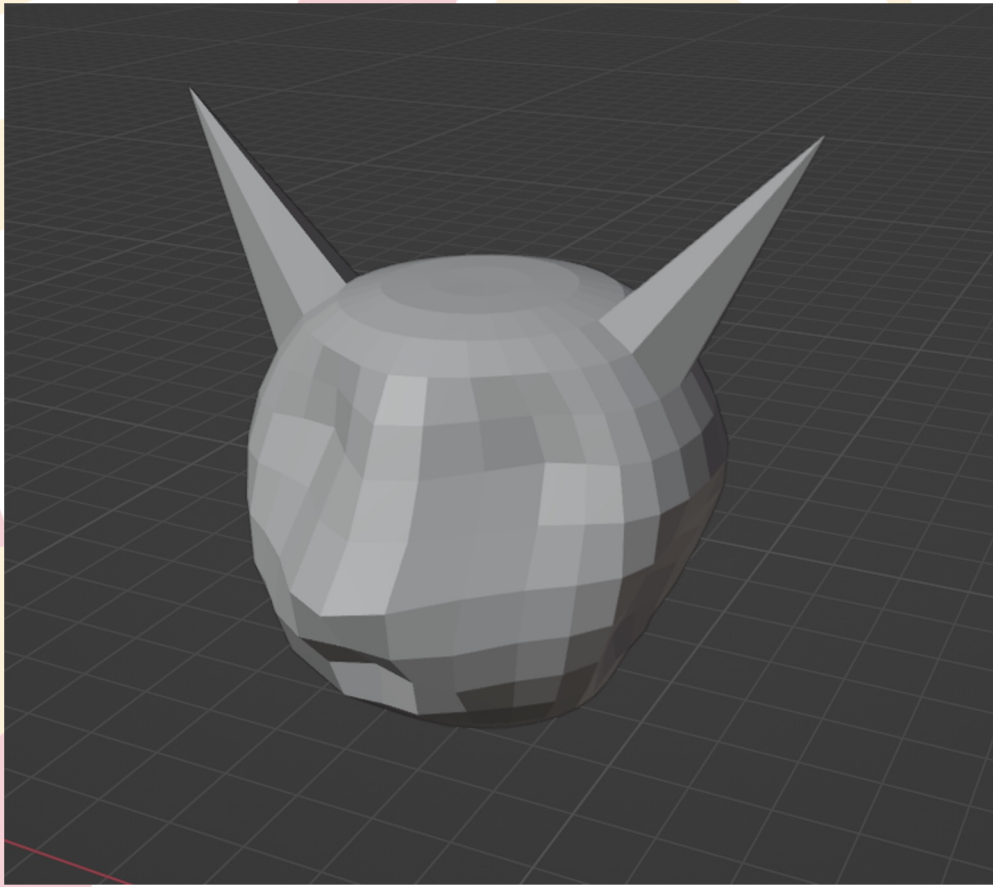
- Select the object you want to edit.
- Change “Object mode” to “Edit Mode”
- Edit those vertices!
- Tip: ‘Tab’ can be used to quickly swap editing modes

Break Time!

Vertex Mini Activity

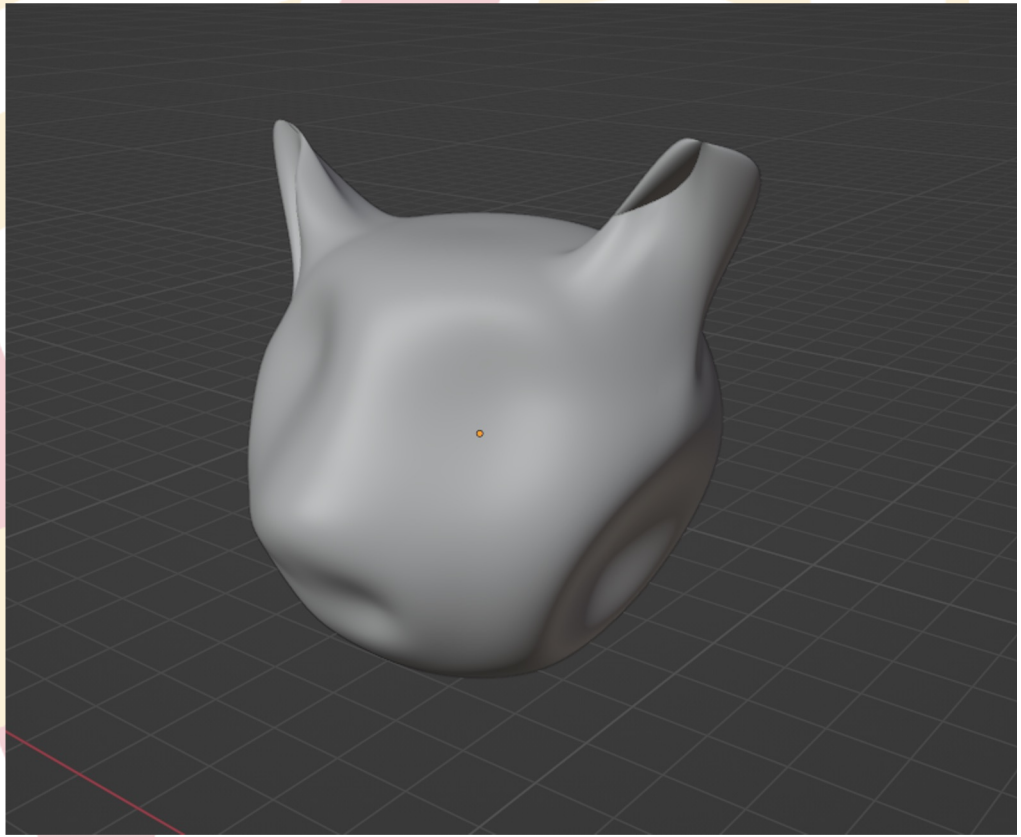
Mini Activity

- This cat face started out as just a sphere
- Edit a standard mesh shape into something fun
- Questions:
  - What happens if a vertex is deleted?
  - Can you add a vertex back once it is deleted?
  - What if you want more vertices?



Vertex Mini Activity (Bonus)

What if you wanted to smooth out your shape? How would you do that?



Today's Mini Creation

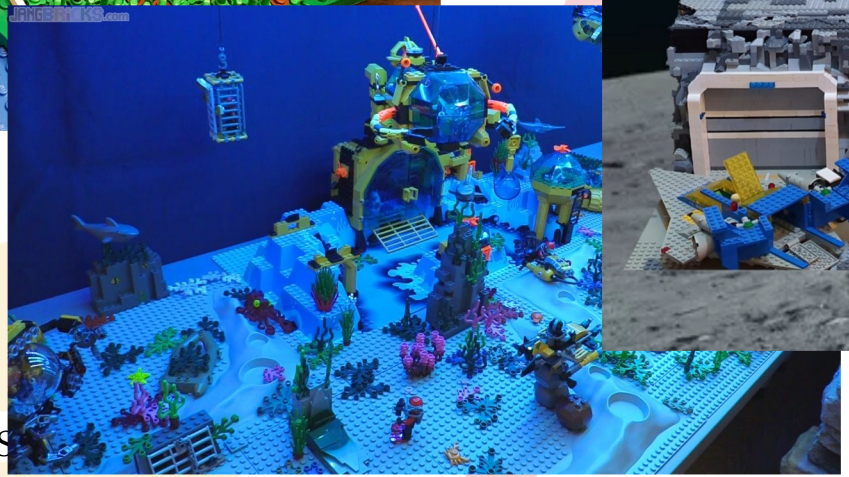
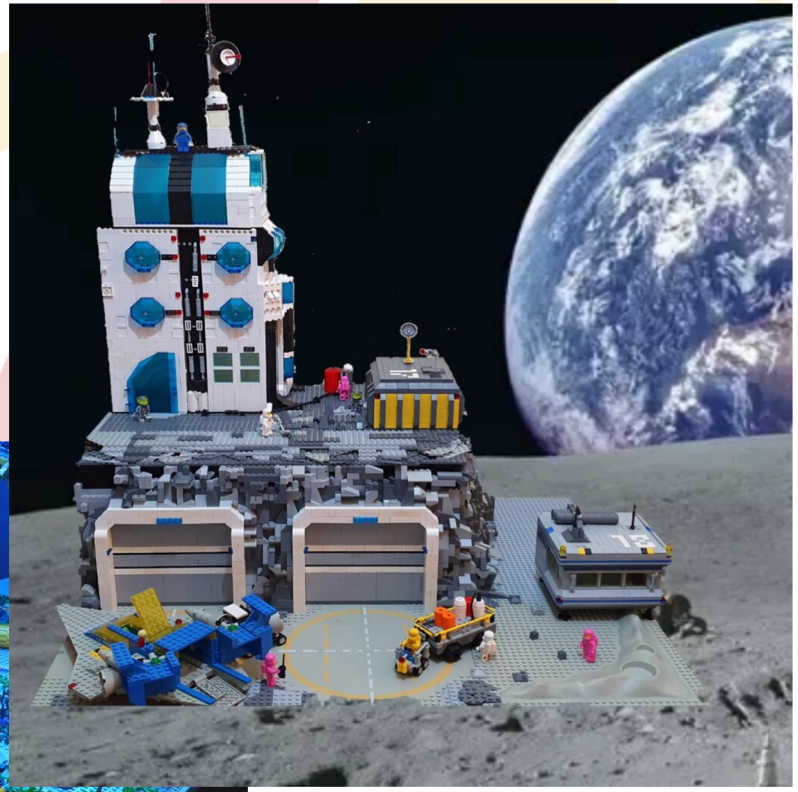
Stage I: 3 Objects

- Create a building
  - House
  - Shed
- Landscape/ground
- Yard feature
  - Wagon
  - Tree/bush

Stage II: 2 Objects

- Landscaping feature
  - Rocks
  - Walking path
- Details to building:
  - Door
  - Roof

Stage III: 2 Objects

- More details
  - Cow
  - Water well
- Details to building:
  - Windows
  - Chimney

Today's Mini Creation Inspiration