



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”

Digital Product Design (DPD)  
Concept Design  
Marketing  
Engineering  
Manufacturing

VRAC

Free-Form Modeling  
Design and Modeling  
Rendering and Animation

Other Visualization Format  
Exchange/Conversion  
Post Processing

# Free-Form Design & Modeling CAD

Free-Form  
Modeling

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

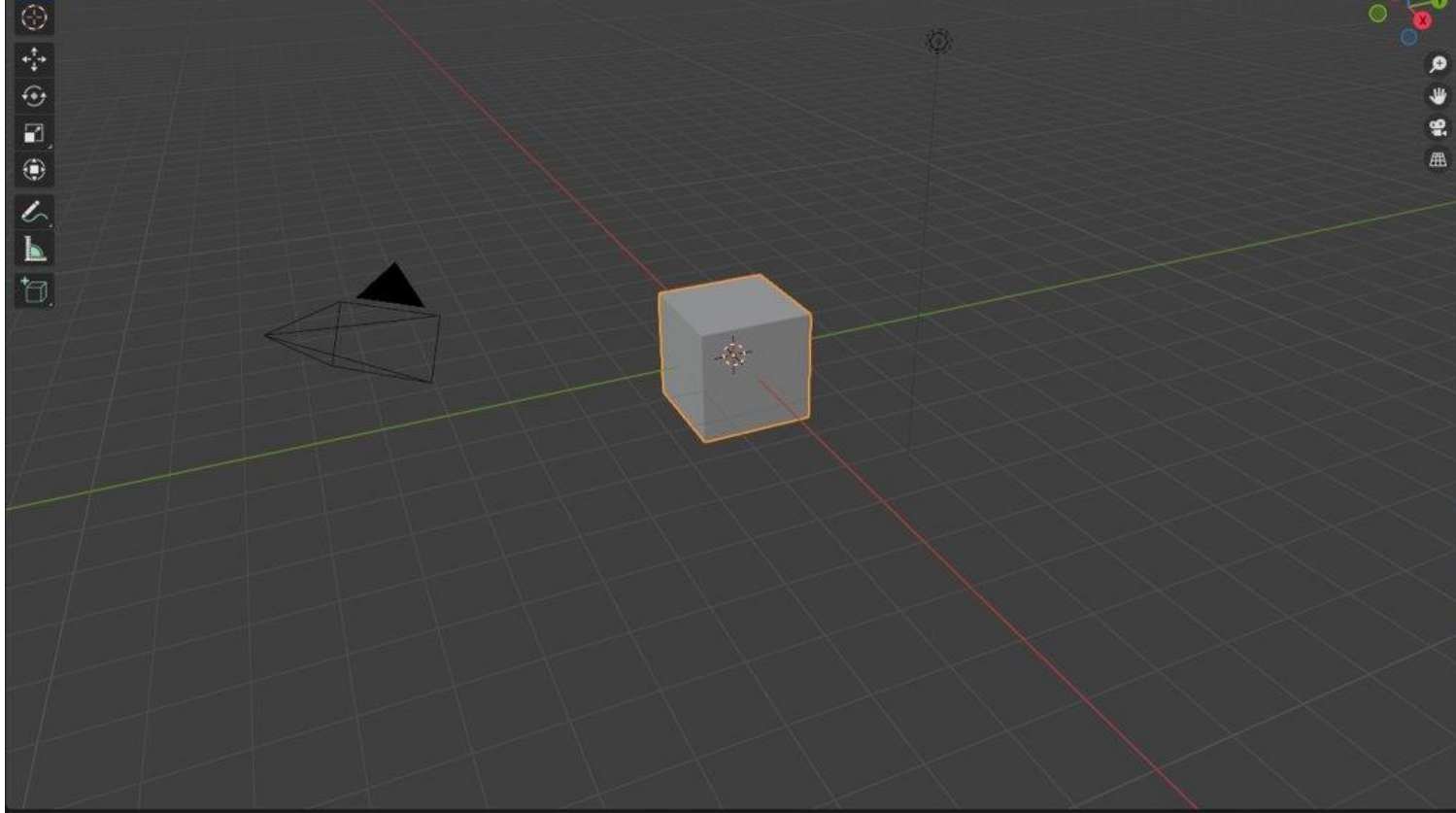
# “Other” Free-Form Modeling

Other  
Visualization  
Format

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



User Perspective  
(1) Collection | Cube



Scene Collection

- Collection
  - Camera
  - Cube
  - Light

Cube

Transform

|            |           |
|------------|-----------|
| Location X | 0 m       |
| Y          | 0 m       |
| Z          | 0 m       |
| Rotation X | 0°        |
| Y          | 0°        |
| Z          | 0°        |
| Mode       | XYZ Euler |
| Scale X    | 1.000     |
| Y          | 1.000     |
| Z          | 1.000     |

> Delta Transform

> Relations

> Collections

> Instancing

> Motion Paths

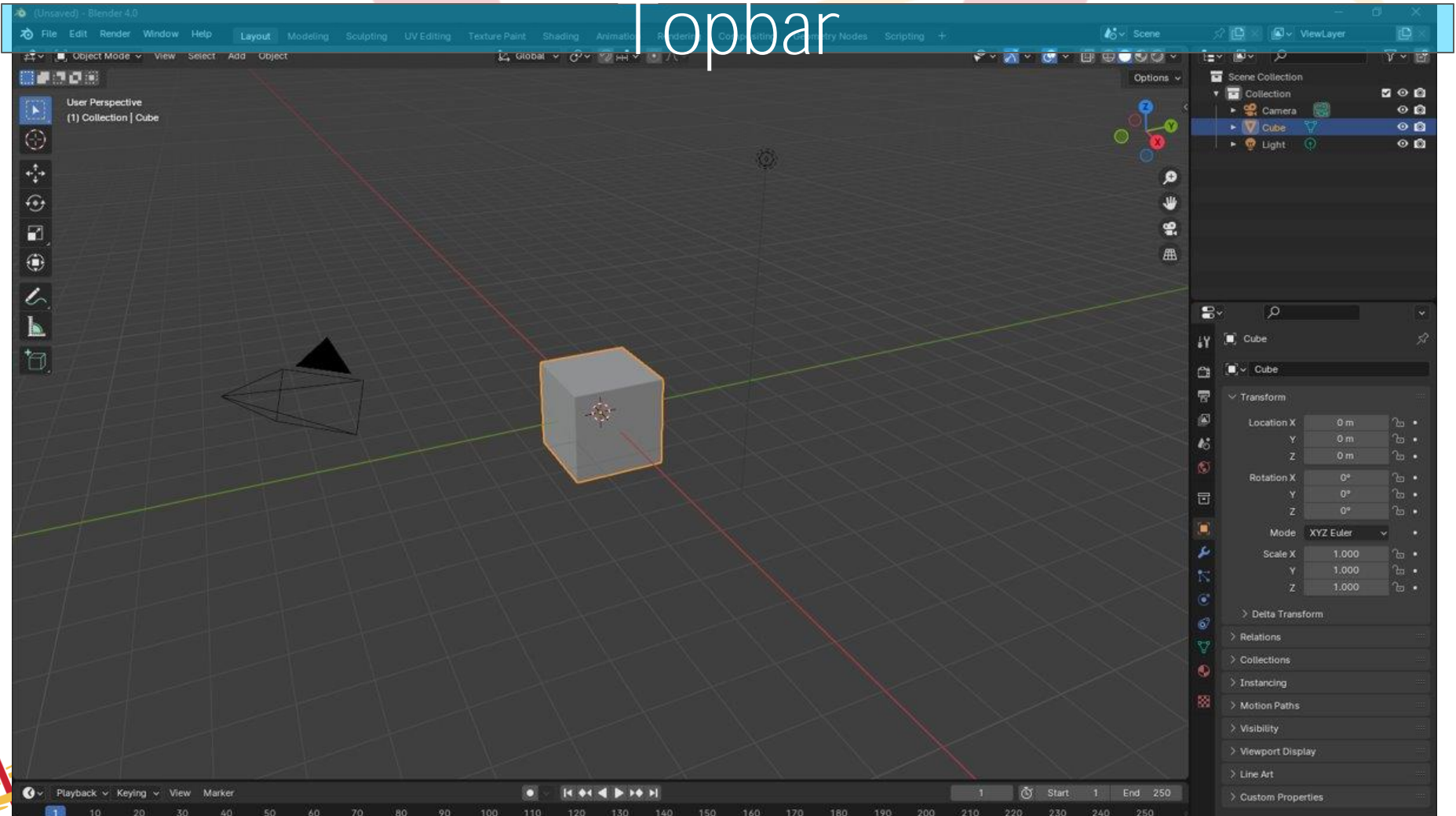
> Visibility

> Viewport Display

> Line Art

> Custom Properties

# Opbar





# Topbar



Workspaces:  
Predefined window views for different  
editing modes

# Topbar



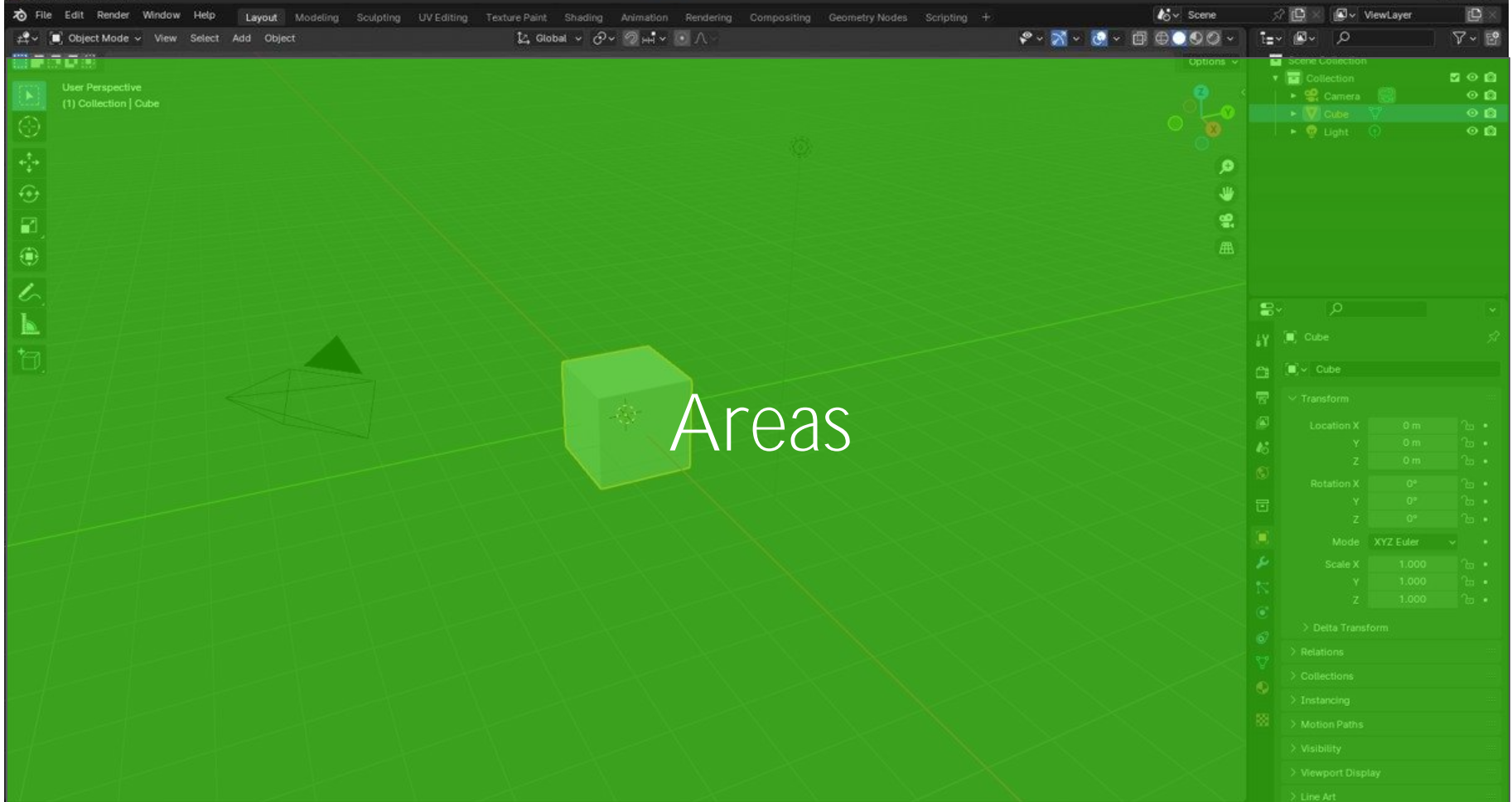
File Menu:  
All things related to  
making/saving files

- Create New Scene
- Save Current Scene
- Copy Scene

Edit Menu:  
All things related to  
editing files

- Undo/Redo
- History
- Preferences

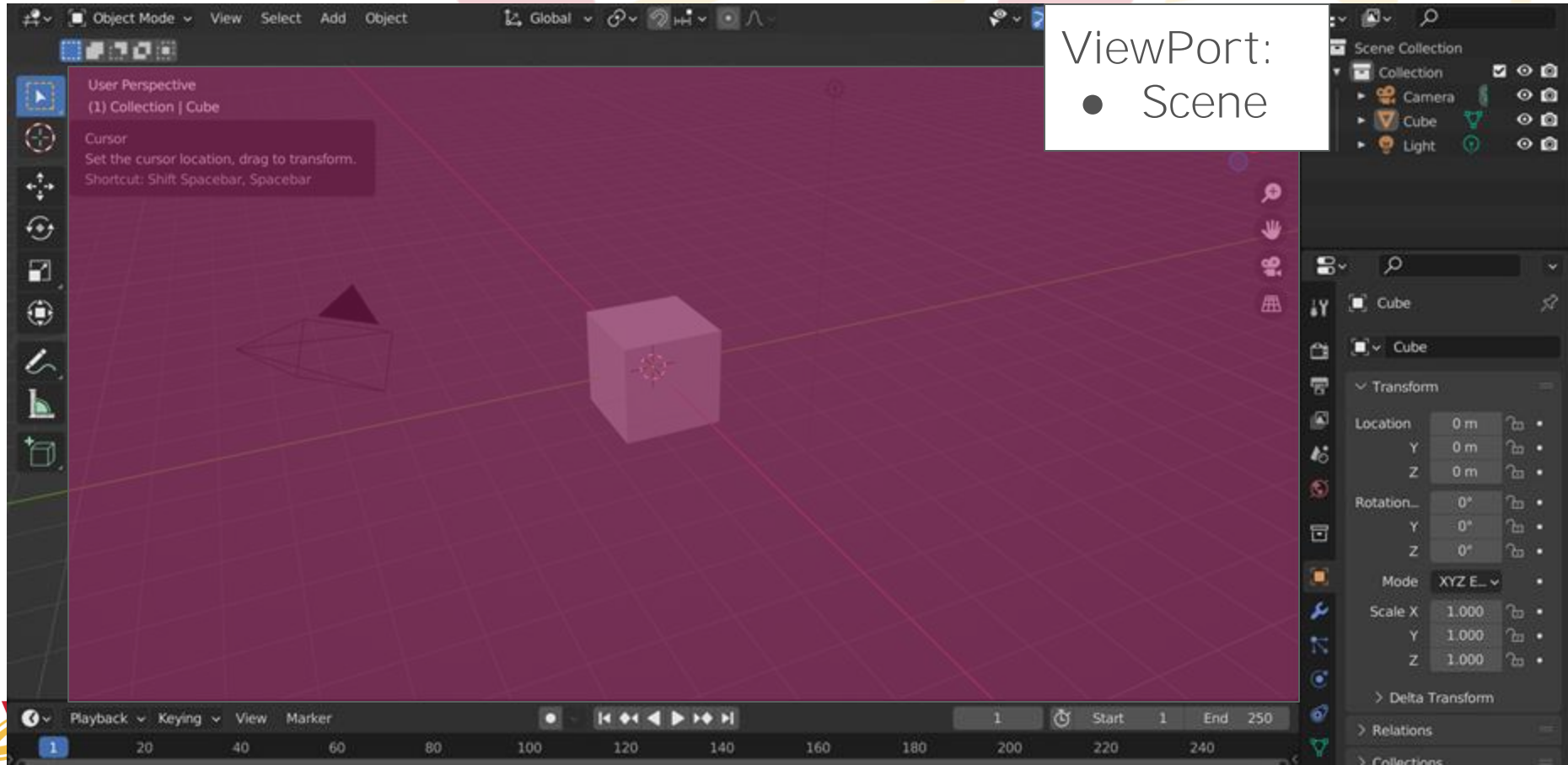
Render Window:  
Not important now,  
but will come back to  
this in session 3



Areas



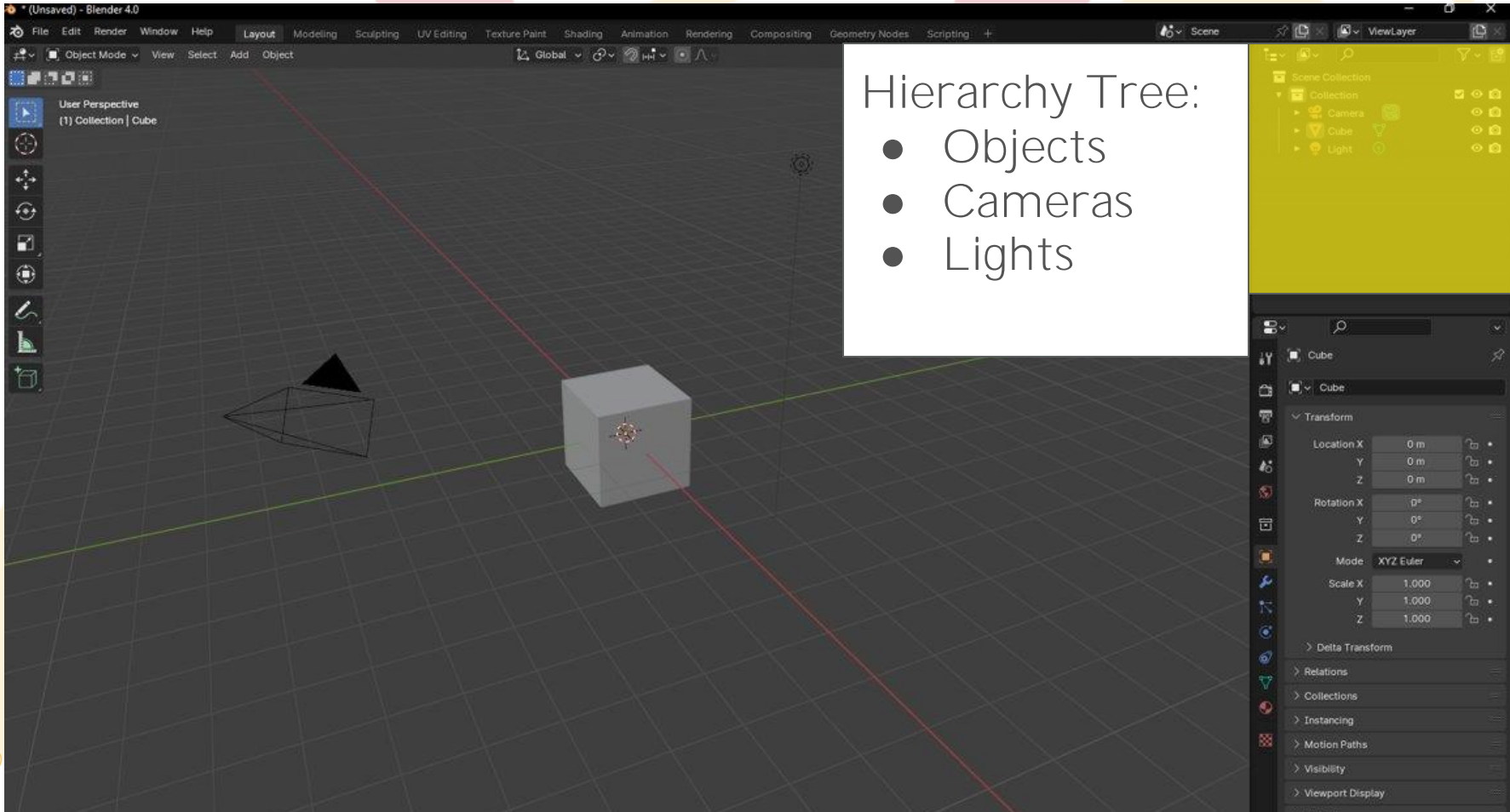
# Areas



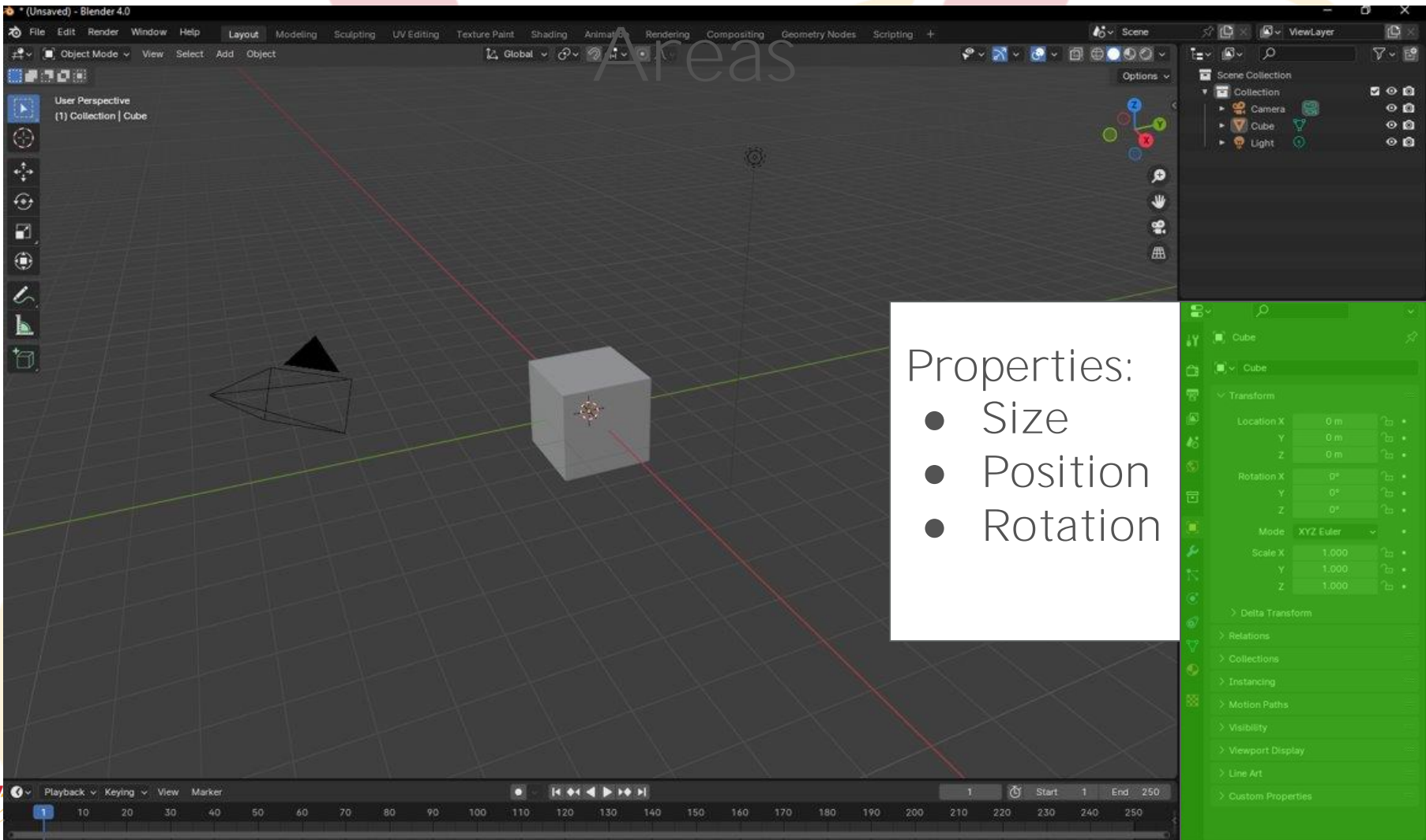
# Areas

## Hierarchy Tree:

- Objects
- Cameras
- Lights



# Areas



Properties:

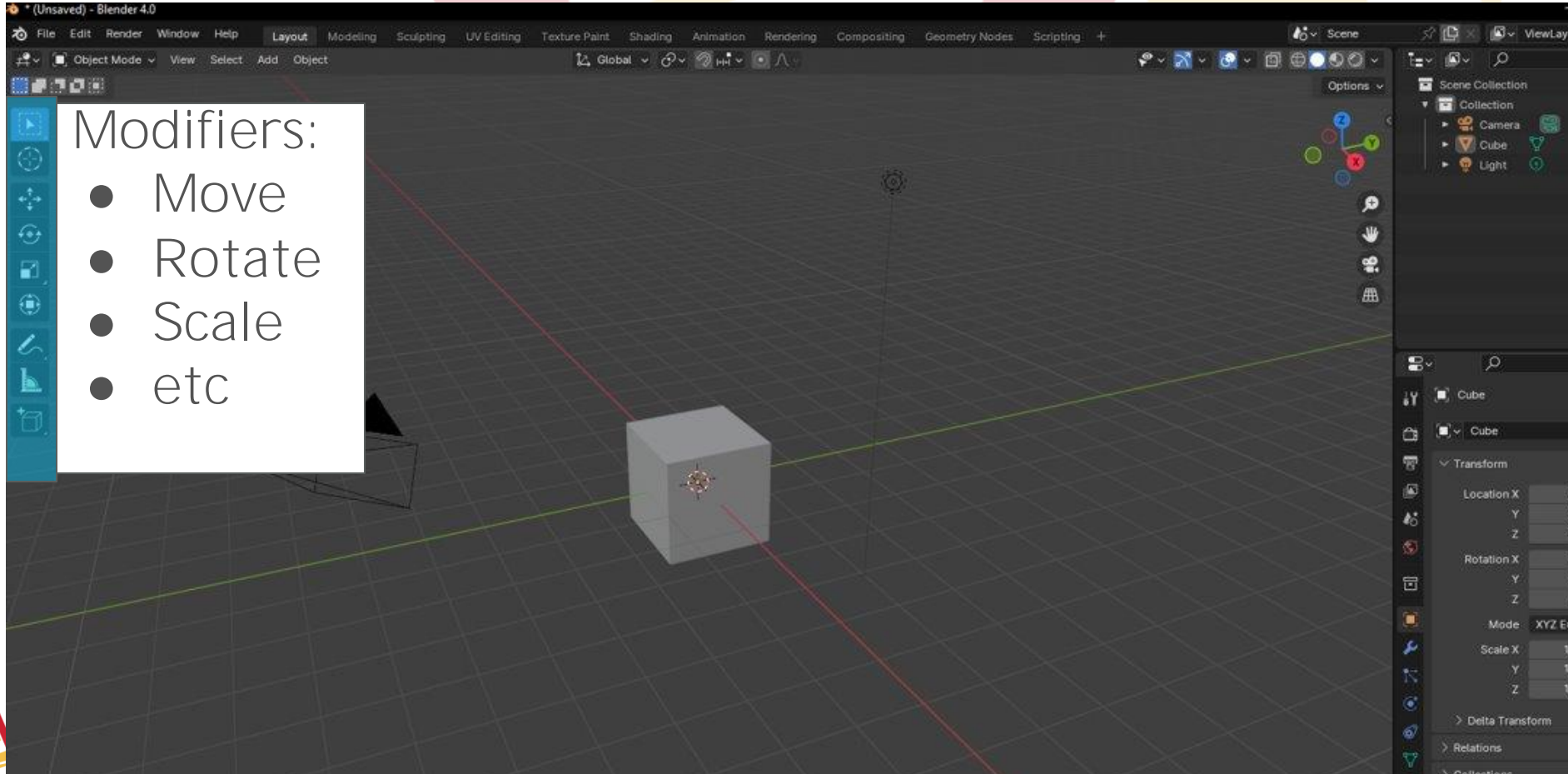
- Size
- Position
- Rotation



# Areas

## Modifiers:

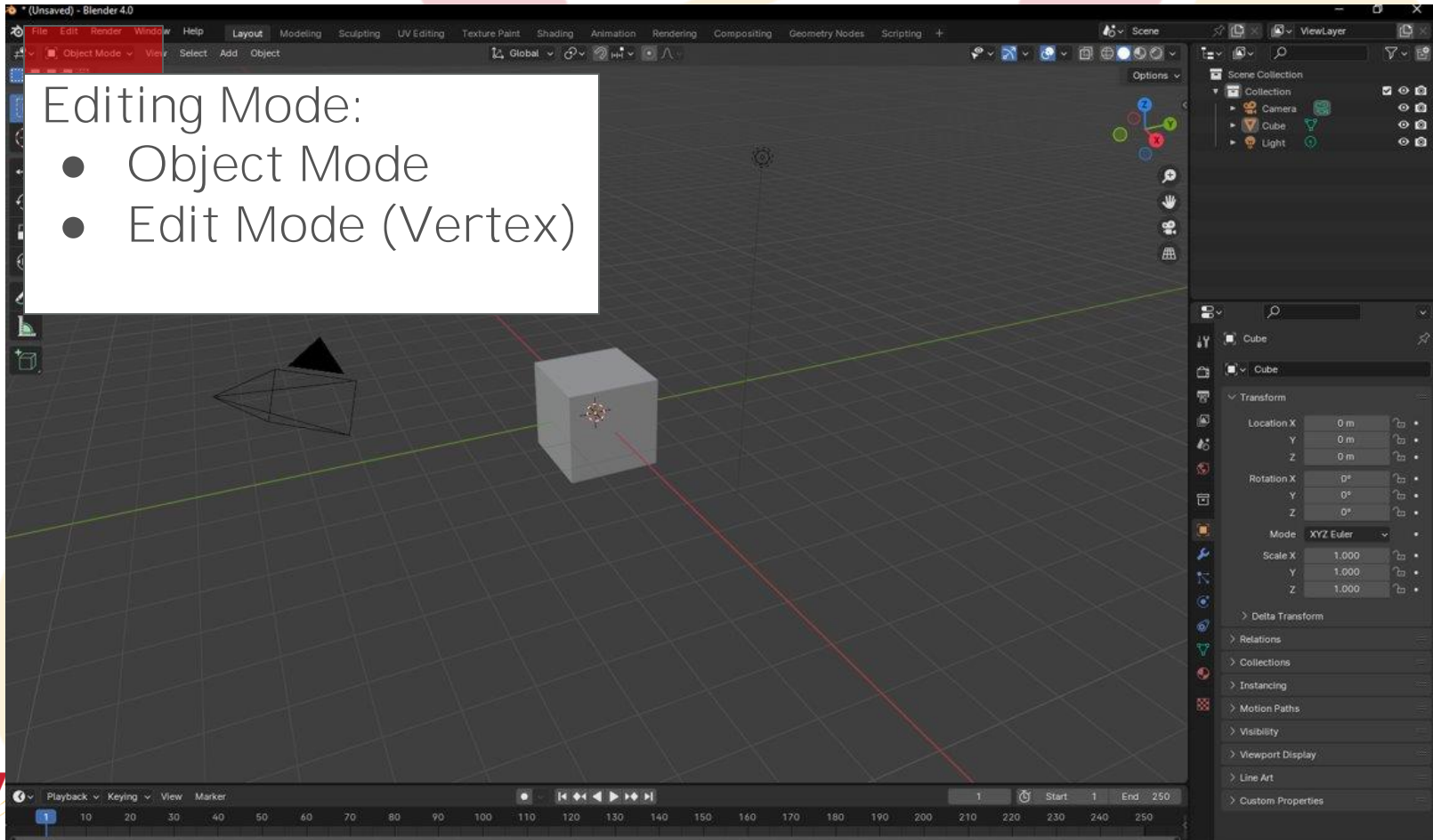
- Move
- Rotate
- Scale
- etc



# Areas

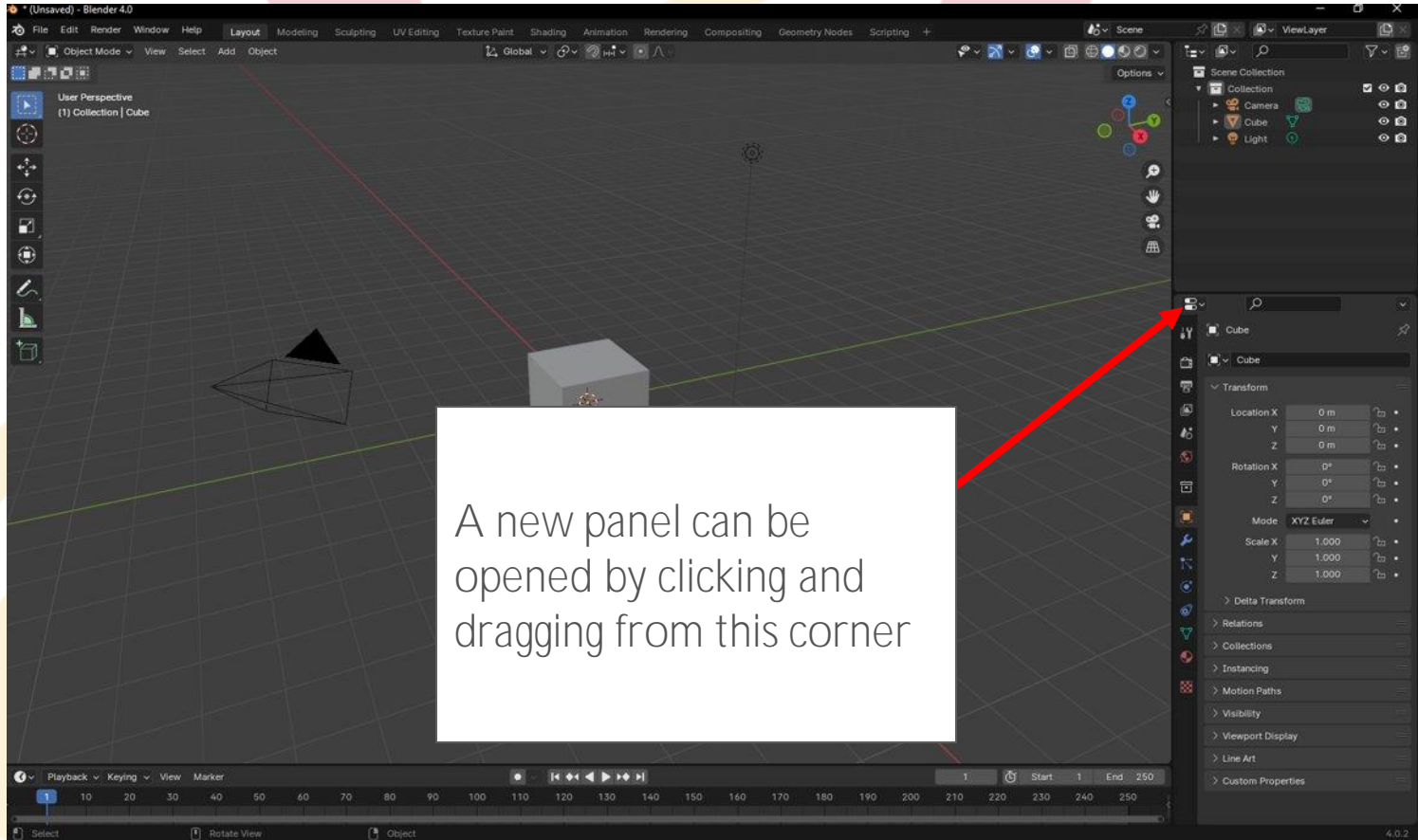
Editing Mode:

- Object Mode
- Edit Mode (Vertex)





# Blender Viewports



# Break Time!



# Moving Around in Blender

(Almost identical to Solidworks)

Orbit: Middle mouse click and drag

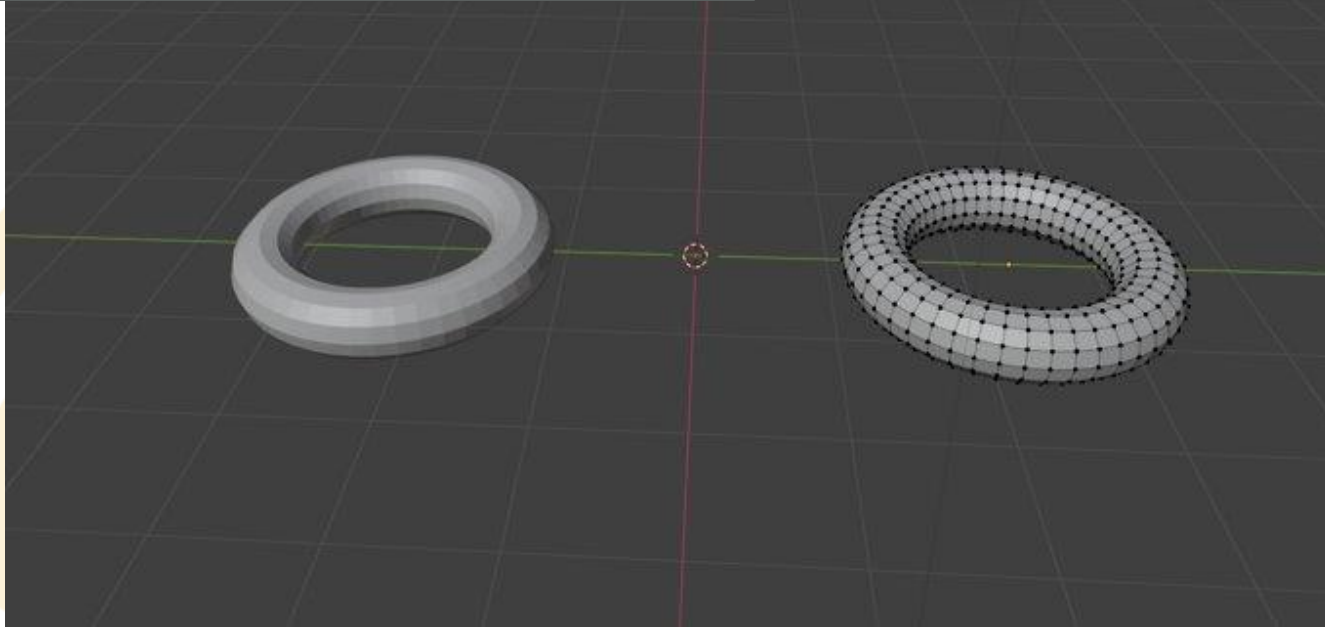
Traverse: Shift + Middle mouse click and drag

Zoom In/Out: Scroll middle mouse wheel

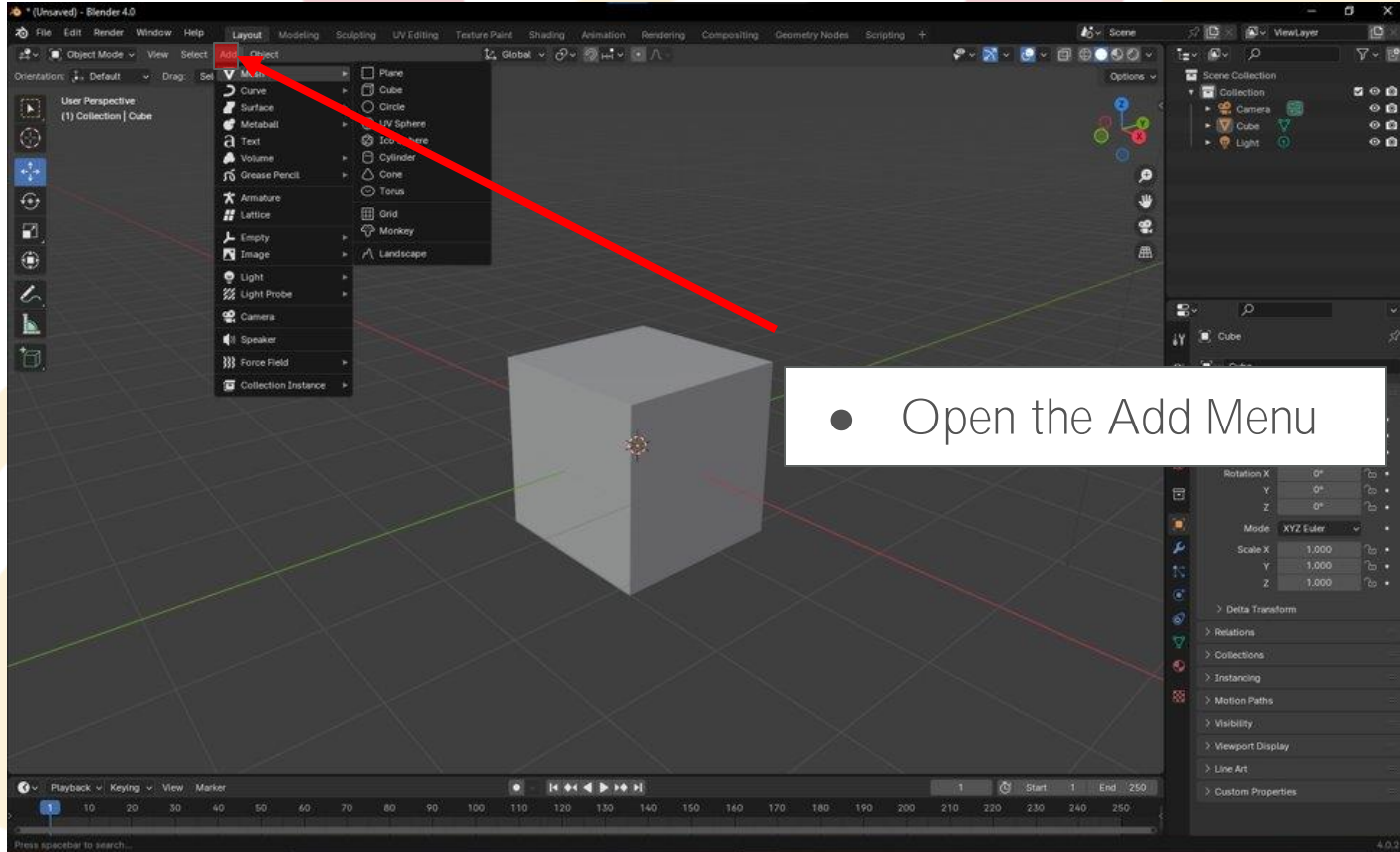
Select: Left mouse click and drag

# What is a Mesh?

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

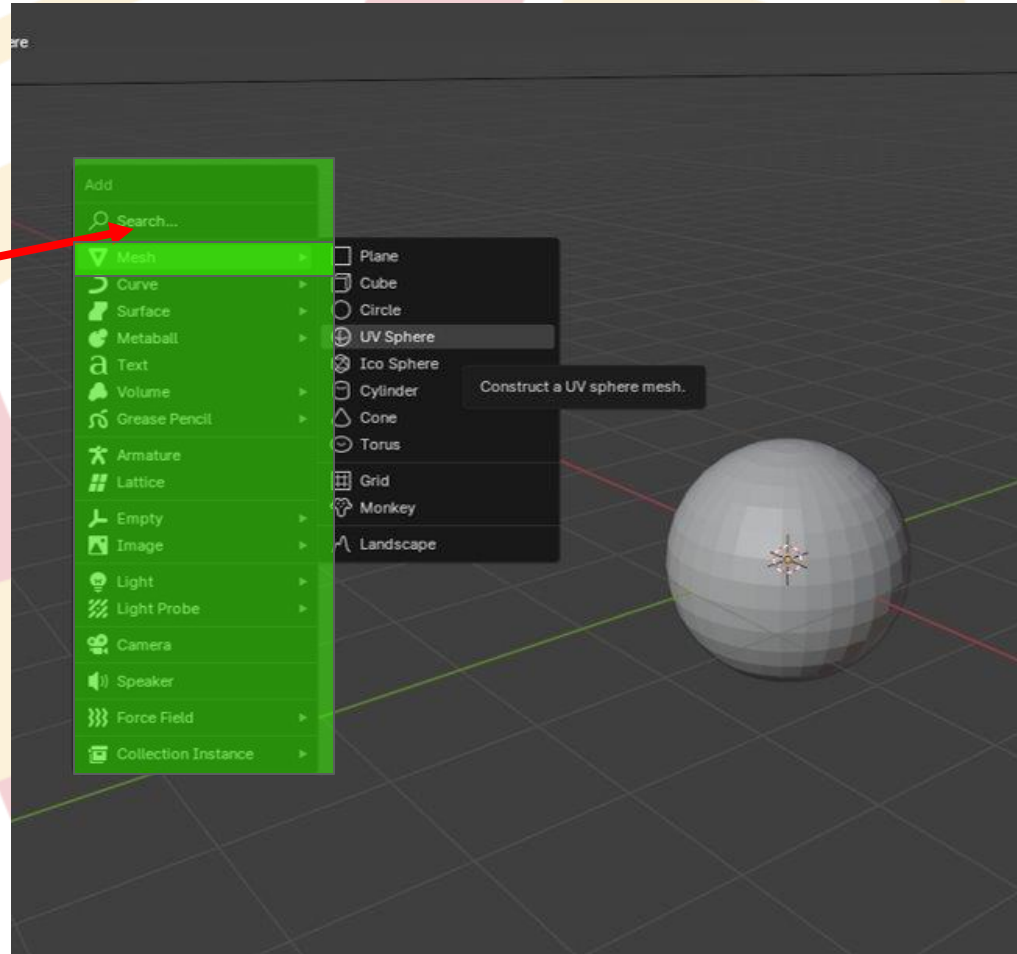


# Creating Your First Mesh



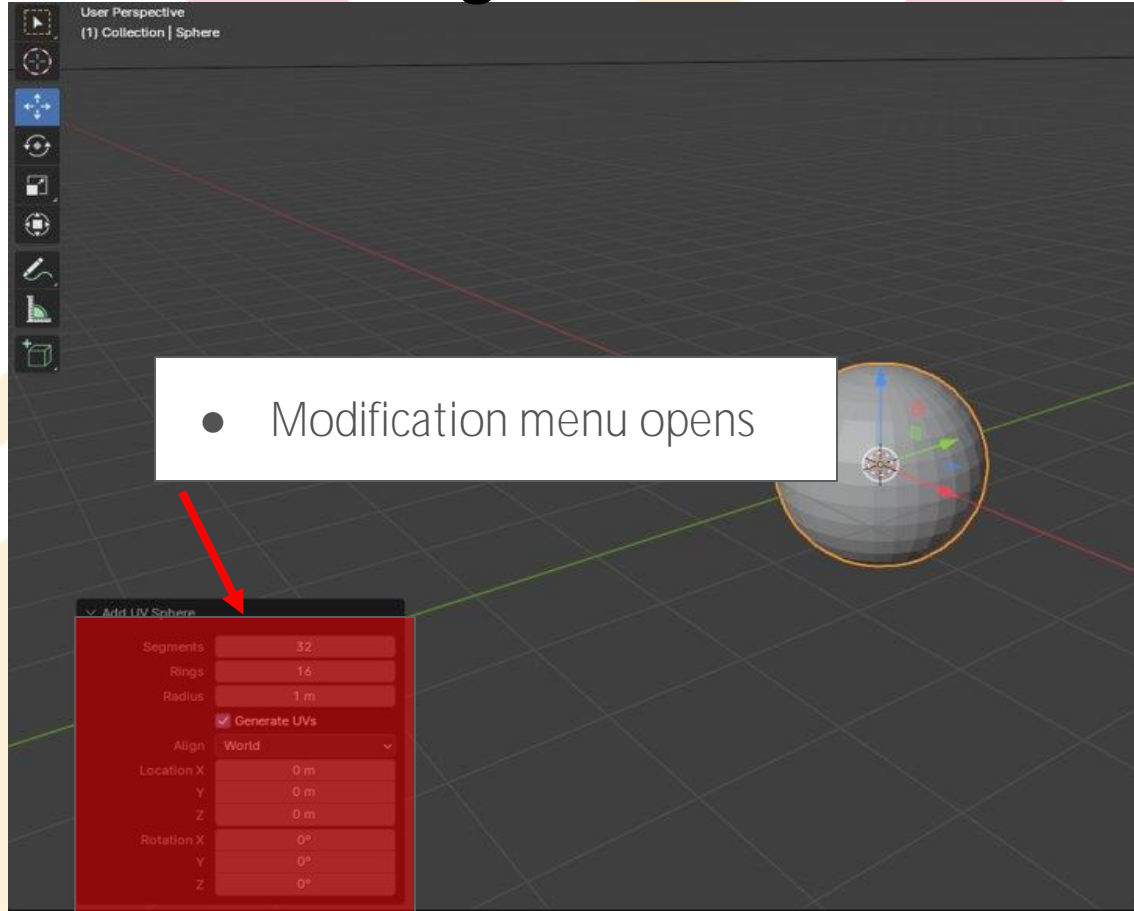
# Creating Your First Mesh

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



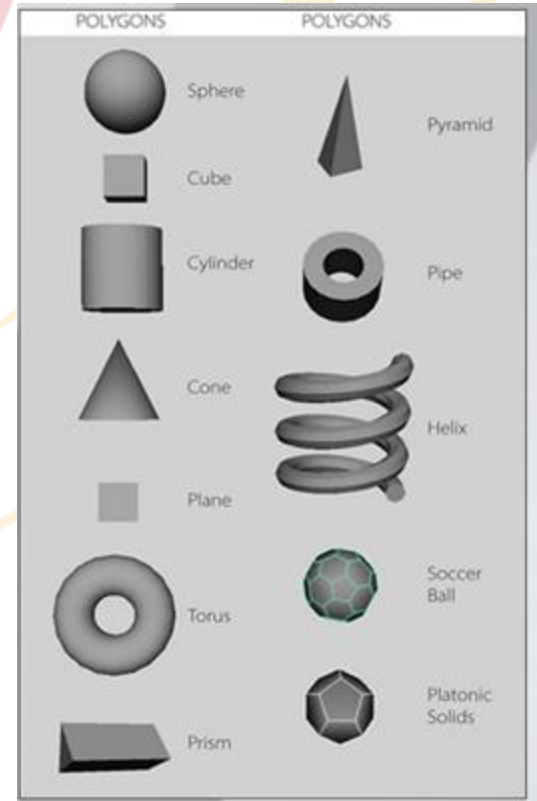


# Creating Your First Mesh



# Polygon Models: Primitive Types

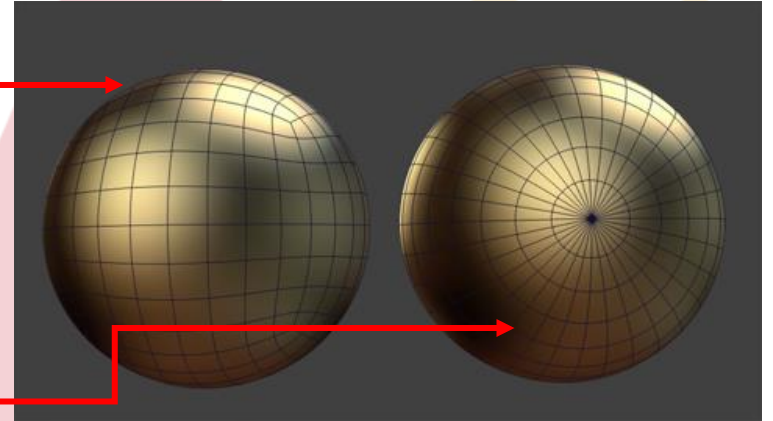
- Polygon Primitives Include: Sphere, cube, cylinder, cone, plane, torus (donut), prism, pyramide, pipe, helix, sphere, platonic solids.
- Hotkey: Shift + A (opens the add menu)





# Difference between NURBS & Polygons

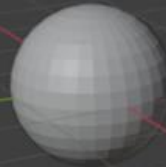
- NURBS (Non-Uniform Rational B-Spline Surface)
  - Less details for the same amount of curvature
  - Composed of curves rather than straight lines
  - Less flexible when it comes to modeling
- Polygons
  - This course deals almost entirely with Polygons
  - Used more frequently than NURBS
  - “Curves”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



# Areas

## Modifiers:

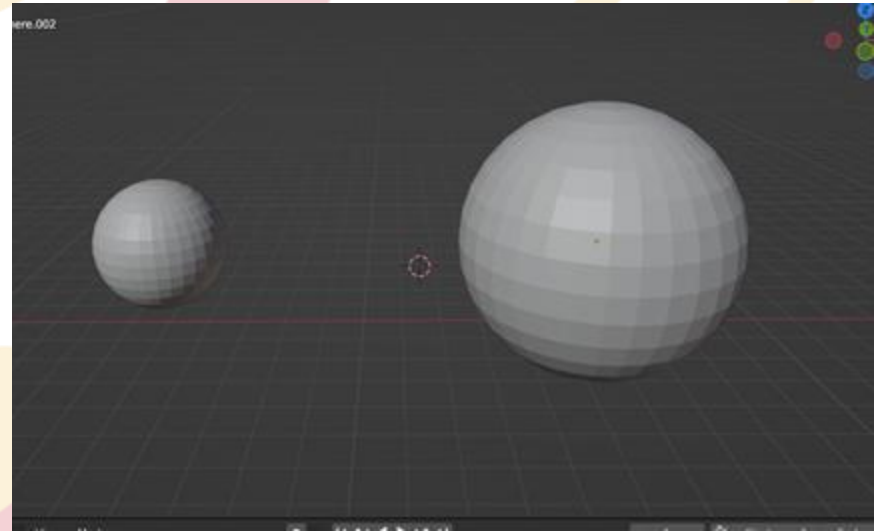
These tools will help you move, scale, rotate objects in the scene



# Modifying Your Mesh

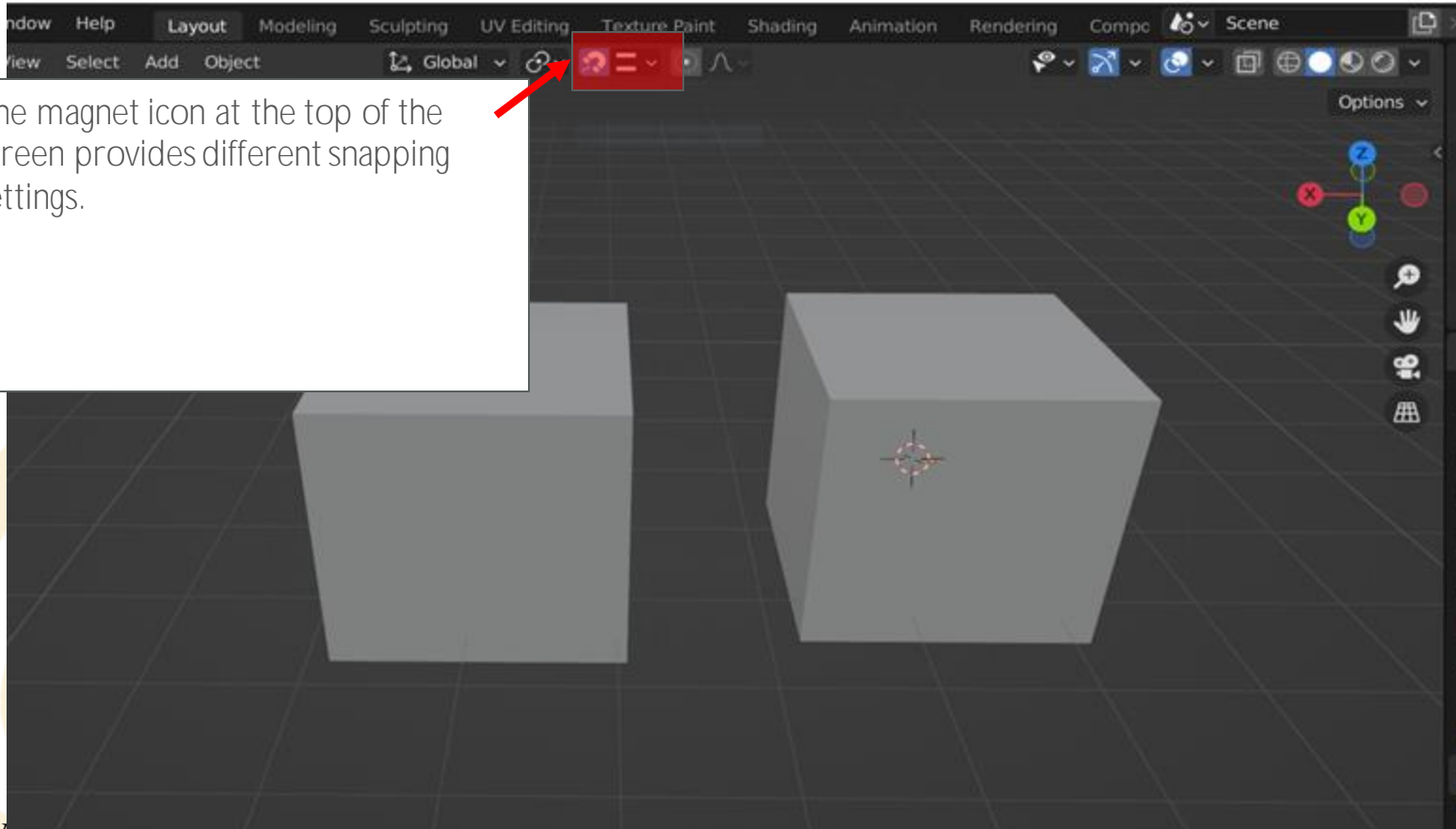
- Move:
  - Hotkey: G
- Scale:
  - Hotkey: S
- Rotate:
  - Hotkey: R
- Duplicate:
  - Hotkey: Shift + D
- Restrict Modification:
  - To move, scale, etc along specific axis:
  - Modifier followed by x/y/z (depending on axis you want to modify)

Scaling Example:



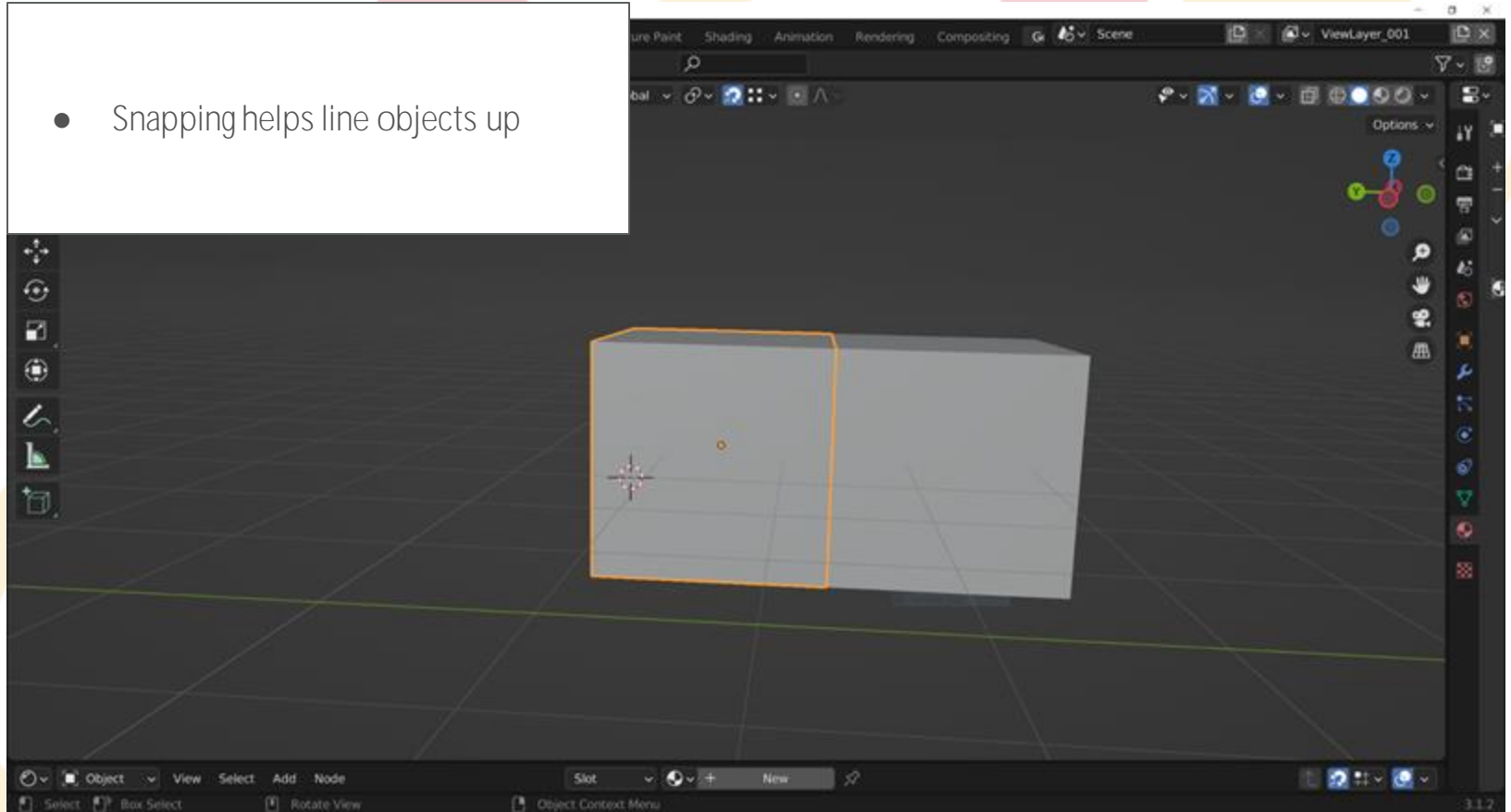
# Snapping

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

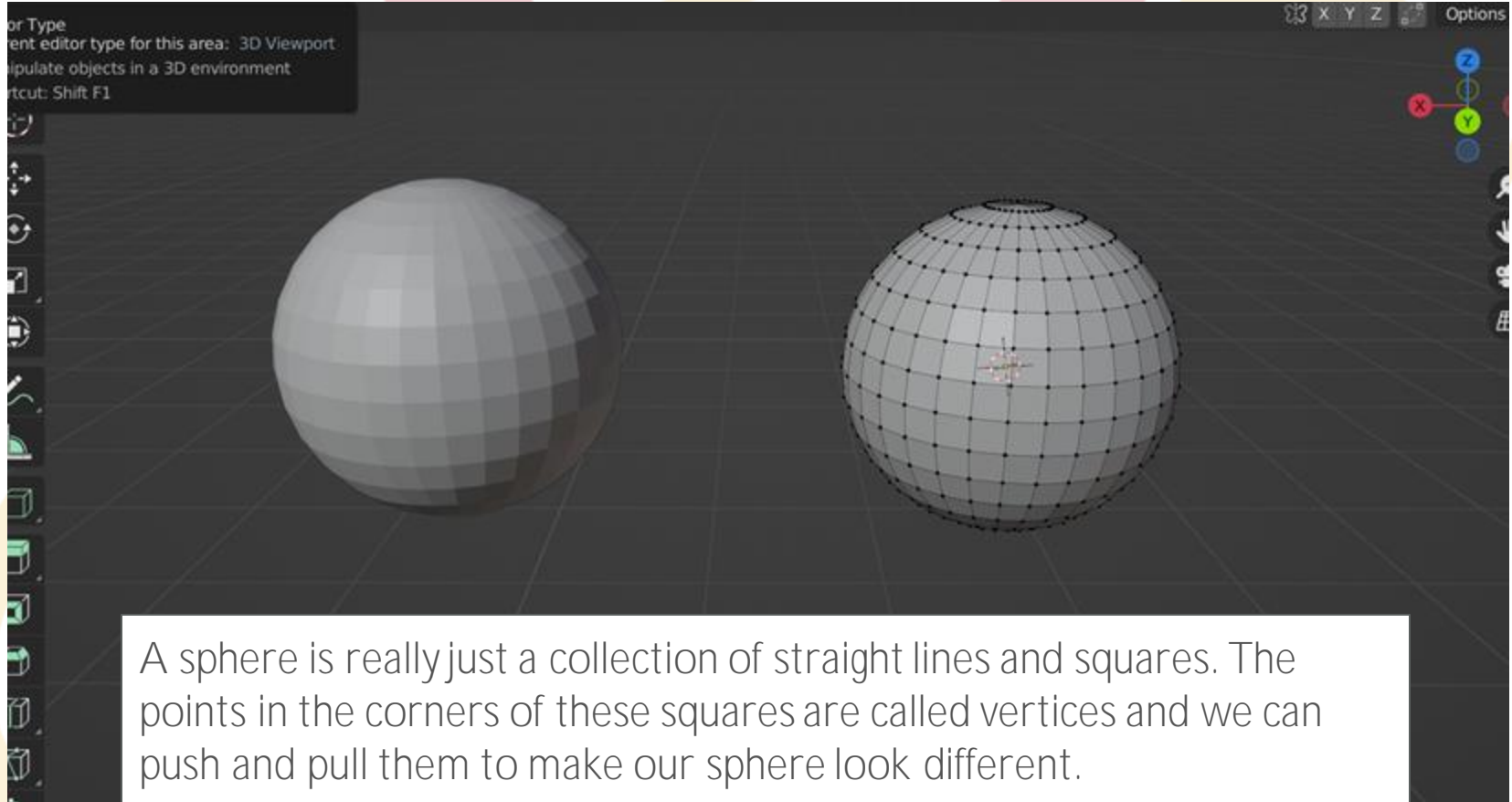


# Snapping

- Snapping helps line objects up

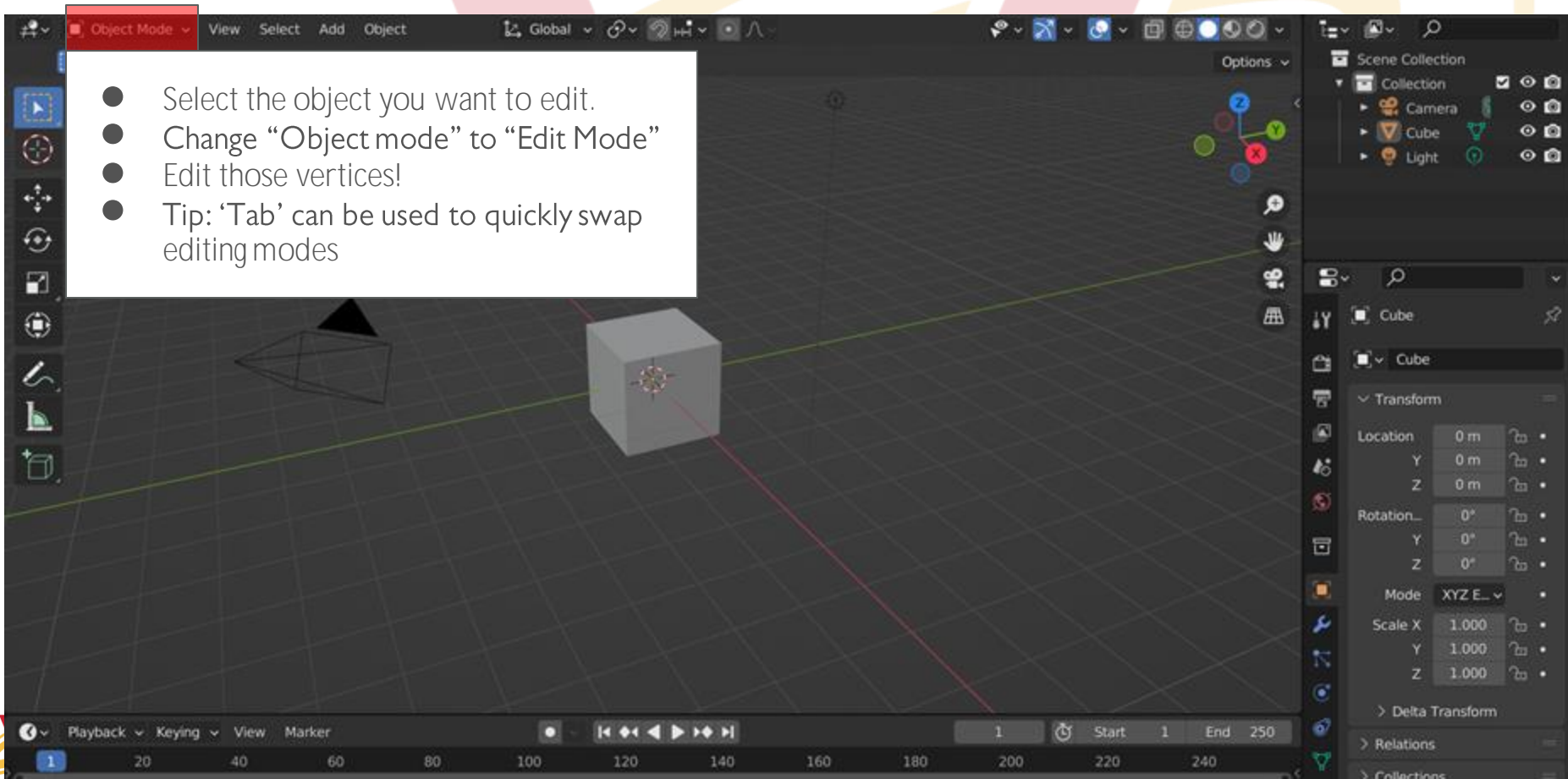


# Modifying Vertices



# 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!

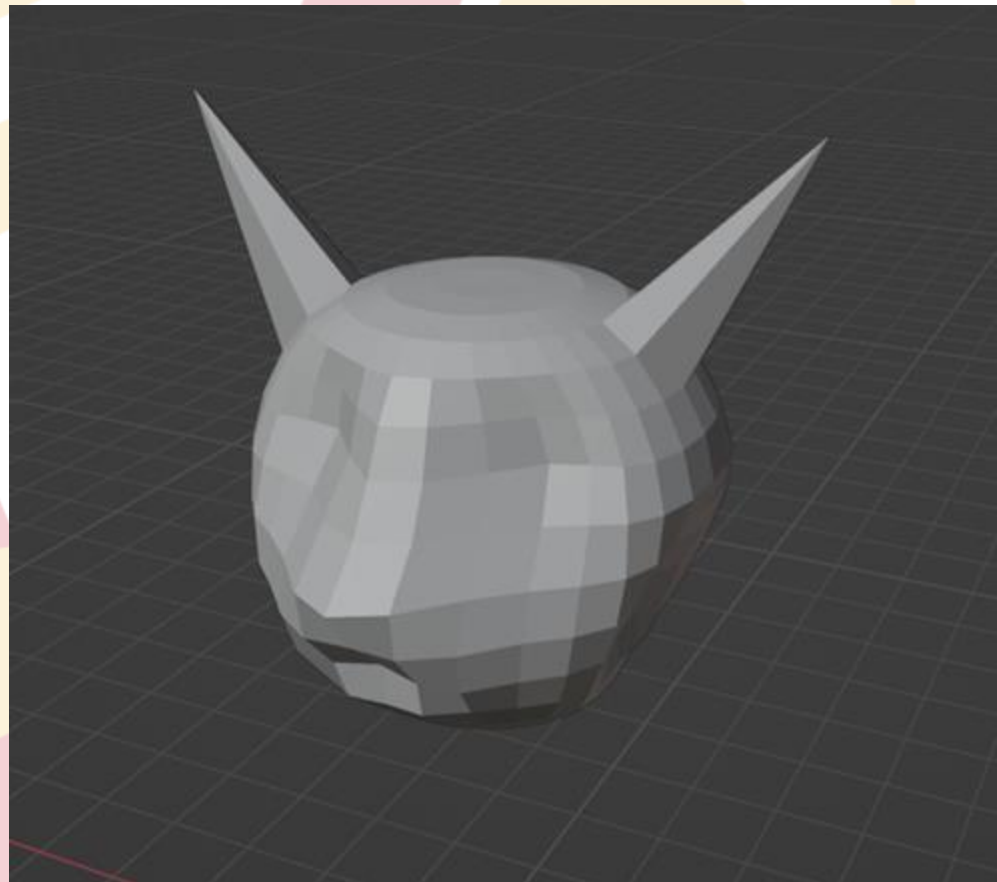




# Vertex Mini Activity

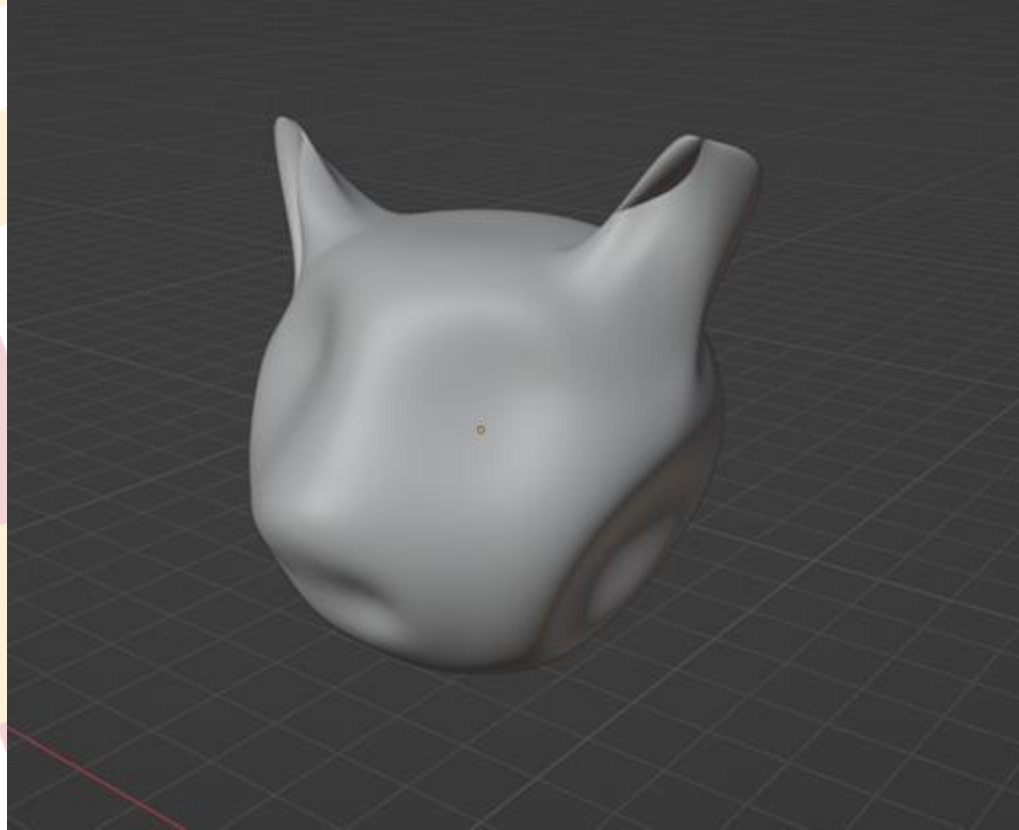
## Mini Activity

- 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 1: Design

- Make a quick sketch using the materials provided to design and environment with the objects below.
- Confirm design with instructor before modeling



## Stage II: 3 Objects

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



## Stage III: 2 Objects

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



## Stage IV: 2 Objects

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



# Today's Mini Creation Inspiration

