# 3D with GSU ~ Prisms and Pyramids

Use **Zoom** (scroll or Z) 🔍 or , **Orbit** (O) 🔄, and **Pan** (O + shift) ✋ tools to reposition your screen.

❖ **Build a Prism**

1. Draw any regular polygon with radius 2m from the origin.

2. Select Push/Pull ⬆️. Hover the cursor over the face of the regular polygon, click and drag upward to create a prism.

3. Type 3m ENTER ↵ designate the height to be 3 meters.

❖ **Build a Pyramid**

1. Draw any regular polygon with radius 2m from the origin.

2. Select Tape Measure 📏. Click on the origin, drag upward, and unclick.

3. Type 3m ENTER↵ to indicate the location of the apex (top) of the pyramid.

4. Select Line ✏️. Click on a vertex, move to the apex and click to draw an edge. Continue by moving to an adjacent vertex. Click and you will have created the first face of the pyramid.

5. Continue drawing lines from the vertices to the apex until your pyramid is complete.
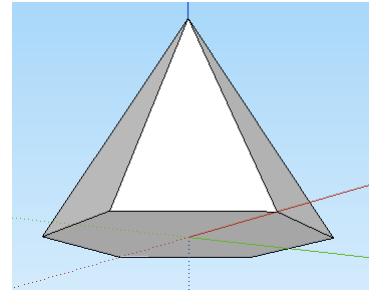
❖ **Build a Cone**

1. Draw a circle ⚪ of radius 2m along the green and red axis.

2. Select Line ✏️ and draw a line 3m long from the center of the circle along the blue axis.

3. Draw a second line from the endpoint of the last line to the side of the circle.

4. Connect a third line to the center forming a right triangle.

5. Select the Select tool ▸ and click on the bounding edge of the circle.

6. Select Follow Me 🔄 and click on the triangle. Your cone should automatically appear.

7. Orbit 🔄 to view the bottom and notice it is missing.

8. Use Circle ⚪ to recreate it.

Note: In order to draw the circle in the correct plane, move the curser around the screen until it appears blue. Hold the *shift* key down, then you can draw the circular base of the cone in the correct plane.
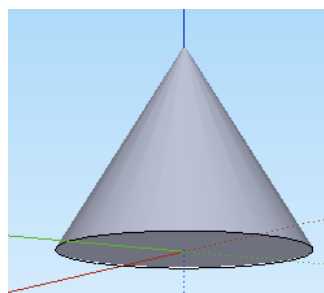
❖ **Build a Simple House**

1. Select Rectangle 🔲. Draw a rectangle from the origin and type 2m,4m ENTER↵.

2. Select Push/Pull 👆. Hover the cursor over the face of the regular polygon, click and drag upward to create a prism.

3. Type 2m ENTER↵ designating the height to be 2 meters

4. Select Line ✏️. Draw a line on the top of the prism from one midpoint to the other the long way.
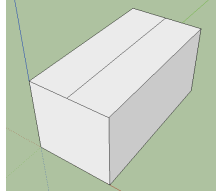


5. Select Move/Copy ✴️. Hover over the line you just drew (it will change to blue). Click on it and drag it upward.

6. Type 1m ENTER ↵. Designating the height of the roof to be 1 meter tall.

7. Select Rectangle 🔲. Draw a rectangle on the front face of the house to represent the door.

8. Now draw a rectangle on each of the other vertical faces to represent windows. Use Orbit 🔄 to help view the other faces.

9. Use the Select tool ▸ and click on one of the rectangles just created then press **delete.**

10. Continue to delete the other rectangles you created.

11. Select Paint Bucket 🪣. Select roofing material and click on each face of the roof. Next select a brick and cladding material and paint the sides of the house.
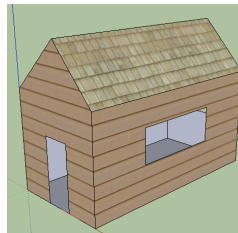


The house you just created is **very** simple. There are many details we did not pay attention to in this 3D model. If you are ready for more of a challenge, try using offset 🌀 to draw a soffit on your roof. You could also experiment with Push/Pull 👆 when drawing the doors and windows.

❖ **Height and Slant Height to find Volume and Surface Area**

Use to the figure to the right when completing these steps
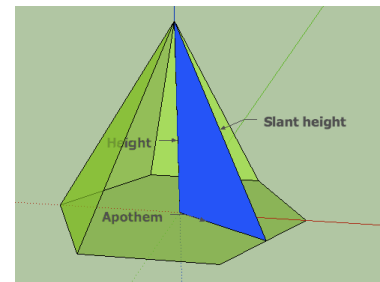
1. <u>Paint the Pyramid:</u> Select Paint Bucket 🪣.  Choose a light green color and set the opacity to 50%.  To paint the entire pyramid, hold Shift and click on a face of the pyramid.  (On a PC you paint first, select In Model 🏠 in the Materials window, and then Edit to change the opacity.)

2. <u>Hide Some Faces:</u> Select the Select tool ⬚.  Click on a triangular face of the pyramid to select it, then hide the face by selecting Hide from the Edit menu.  Hide two more faces and their slanted edges to reveal the interior.

3. <u>Draw the Altitude:</u> Select Line ✏️.  Click on the apex of the pyramid, moving along the blue axis, and then click on the center of the base.  This is the altitude.

4. <u>Draw the Apothem:</u> Select Line ✏️ to draw a line from the center of the base to the midpoint of one of the sides creating an apothem. Notice that when you hover near the midpoint GSU identifies its exact location.

5. <u>Draw the Altitude of a Lateral Face (Slant Height):</u> Select Line ✏️ to draw a line from the endpoint of the apothem to the apex of the pyramid, creating the altitude of the lateral face.  This step is complete if there is a right triangle filled in with a grey color.

6. <u>Paint the Right Triangle:</u> Select Paint Bucket 🪣 and choose a dark blue color to paint the right triangle.

7. <u>Name the Segments of the Pyramid:</u> Select Text 🔤.  Click on the apothem, move the text box to a desired location, and type in *apothem*.  Click in open space to set the text. Use the Text tool to label the two altitudes whose lengths are the height and slant height of the pyramid (see **fig. 3**).

Students will easily notice the difference between height and slant height with this model.  Students can find the lengths of the apothem and the slant height by hand, using trigonometry, special right triangles and the Pythagorean theorem to help.  Answers can be checked with GSU using the steps below.

8. <u>Finding Lengths of Segments:</u> Select Dimension 📐.  Click on one endpoint of the apothem, then on the other endpoint, pause for one second, and then click again to display the length of the apothem. Similarly, display the slant height and height.

9. <u>Show Hidden Faces:</u> Under the Edit menu select Unhide > All, to show all previously hidden geometry (see **fig. 4**).

Students can now use this information to find the Volume and Surface Area using formulas!