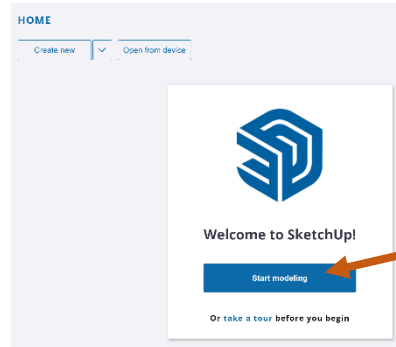



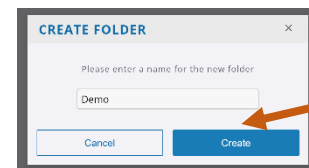
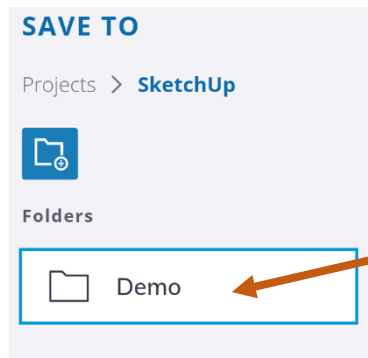
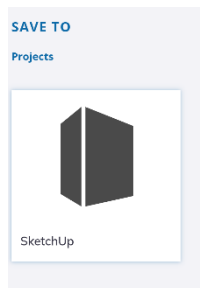
Creating 3D Models using SketchUp Online

Setting up a SketchUp Project

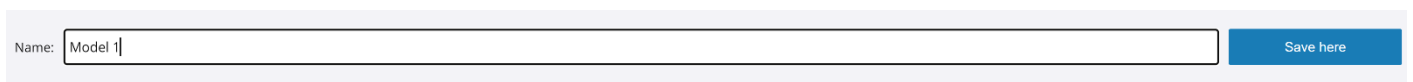
1. Go to <https://www.SketchUp.com/products/SketchUp-for-web>
2. Click on **Start Modeling**. Click **Create a Trimble ID**. Accept any terms and conditions.



3. Go to the **Model Preferences** bar (3-bar button on the upper left) 
4. Click **Save As** → save to **SketchUp** → click on the folder icon and name it **Demo**.

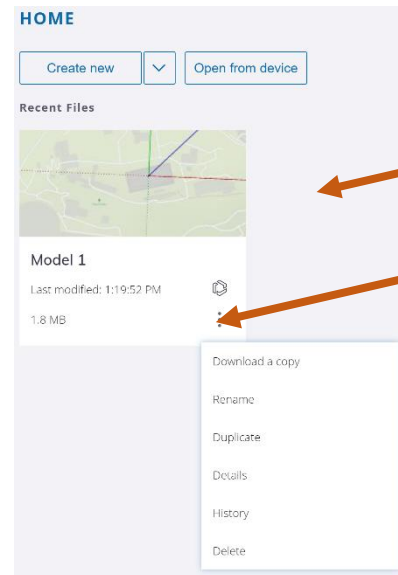


5. Once the folder appears, click on it. Name the model **Model 1**. Click **Save Here**.



6. SketchUp will revert back to the workspace and you will see your document's name appear on the top left-hand corner (it should say **Model 1**).

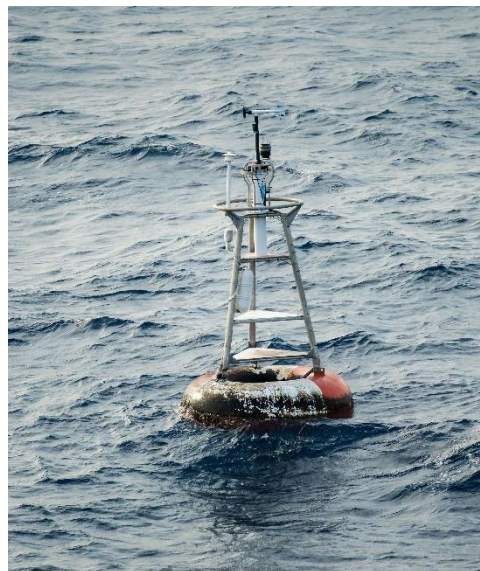
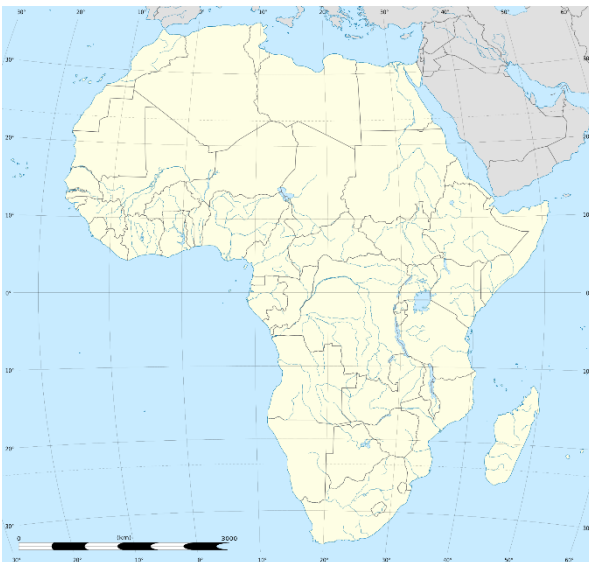
7. Go back to the **Model Preferences** bar. Click **Home**. You are now looking at your cloud space. Here, you can see and manage all of your .skp files. For example, if you click on the 3-button bar on **Model 1**, you'll see a variety of options like deleting, making copies, etc.
8. Click on the gray space. Now, double click on **Model 1** and you will reopen it.



Creating a model in accurate 3D space

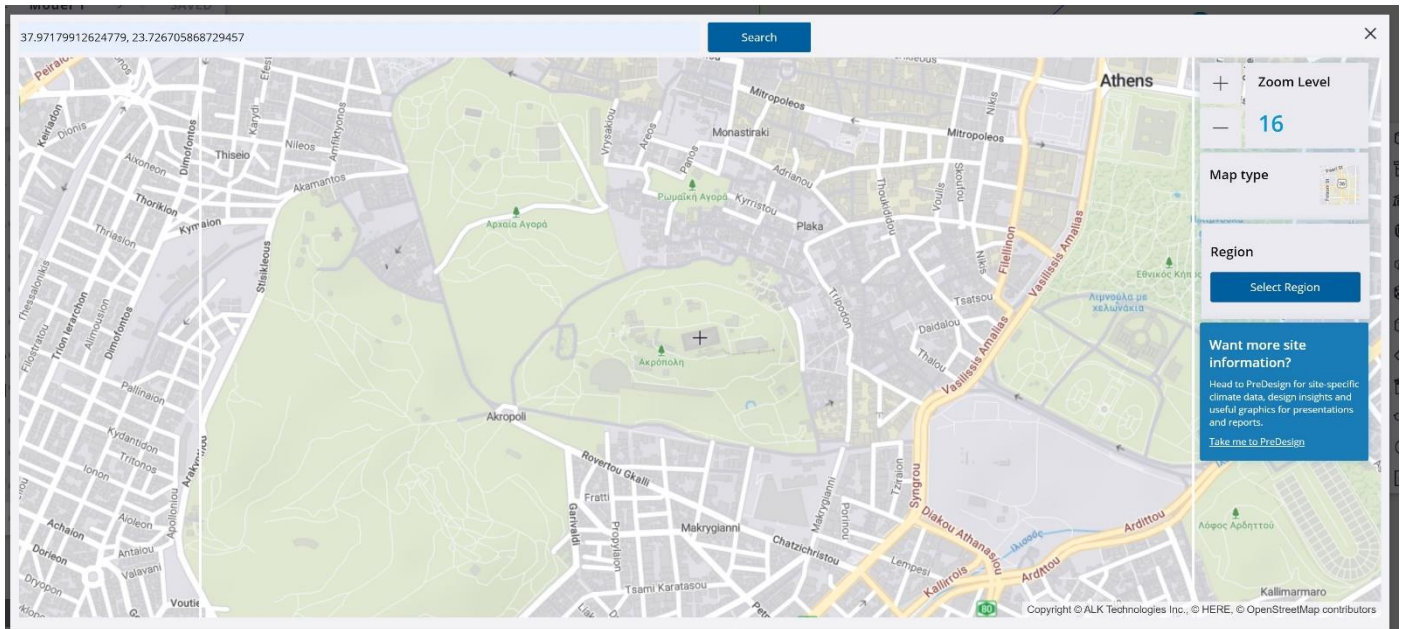
In this section, you're going to learn how to place your model in a specific geographic location.

SketchUp doesn't work like ArcGIS or Google Maps. The models you create are not tied to any specific location unless you tell the program to do otherwise. This means that you could create a model and import it into Google Earth, and it would automatically be placed at Null Island (this is at 0,0, where the Prime Meridian and Equator intersect).

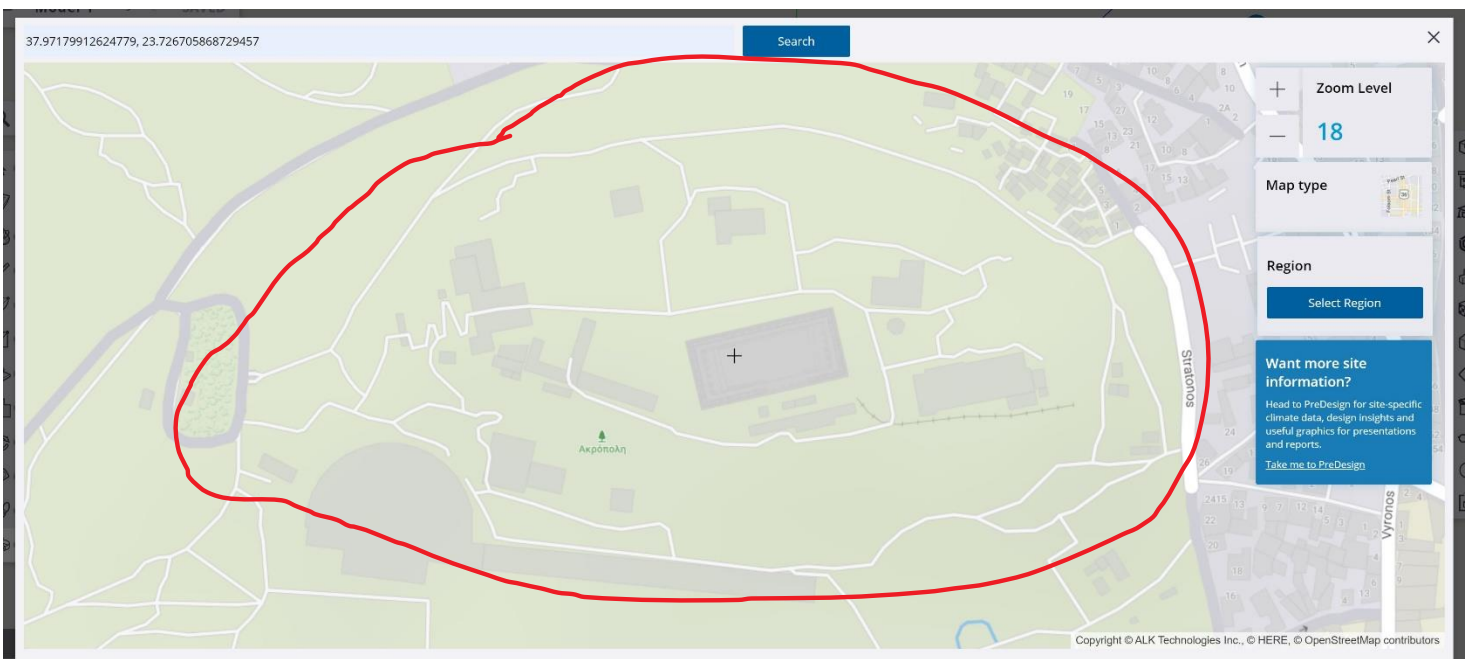


9. Go to **Model Preferences** and click on **Add Location**.

10. A map appears. In the address search bar, enter these coordinates: 37.97179912624779, 23.726705868729457 and click **search**. The map should zoom to a new location.



11. SketchUp is going to crop out this area of the map and add it to your project, so we want to make sure your map is properly aligned and zoomed in for our purposes. On the right-hand side, change the **Zoom Level** to 18.
12. Click **Select Region**. Now you can change the extent of the imagery. Move the edges of the rectangle and try to match your map against the image below. It doesn't need to be perfect. Just make sure the features I have outlined are not cut off.

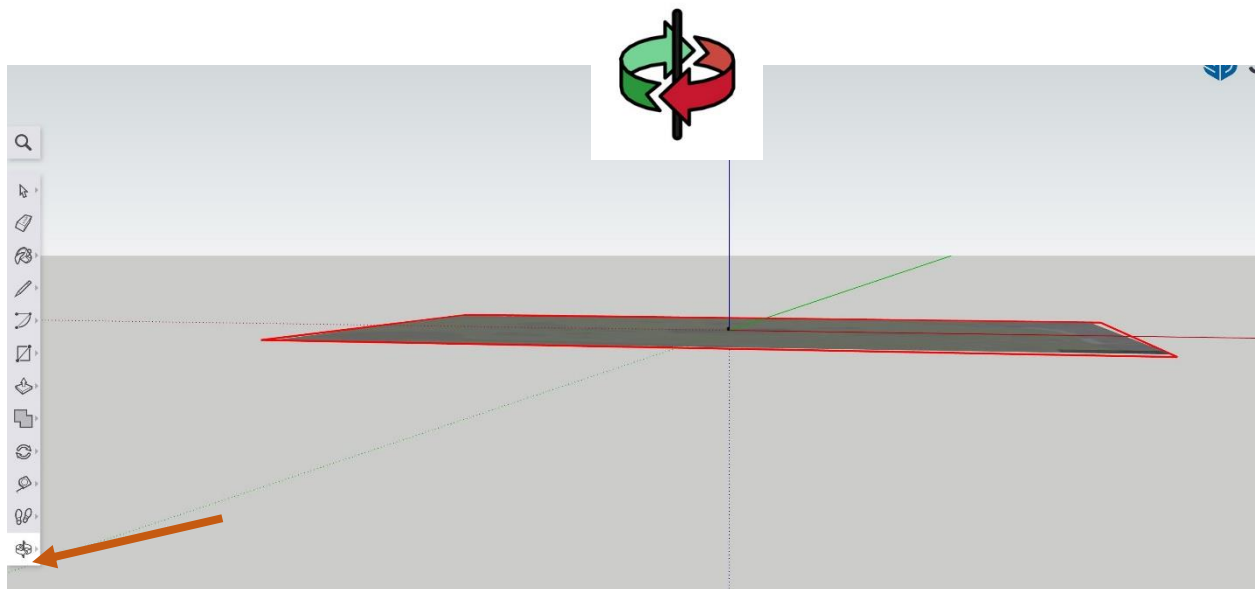


13. Now, click Import. You will see the map appear on your SketchUp screen.

Orbiting your Model

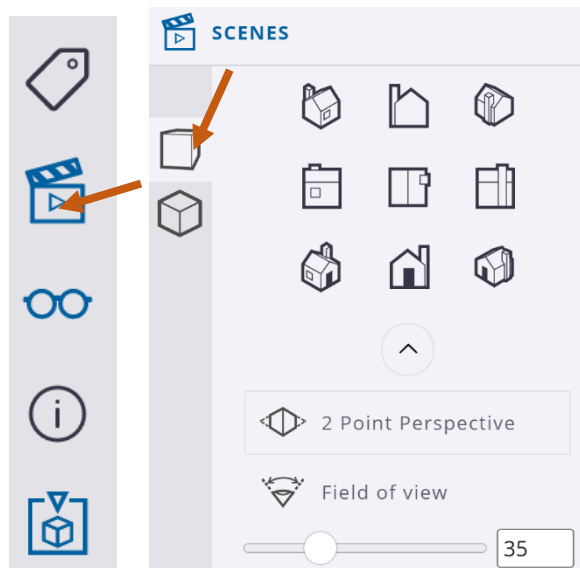
You are looking at your model in a bird's eye perspective, meaning it looks like you are flying towards it. To build features, it's easier to begin top-down and then move around as needed. We're going to review here two different options: manual movements with **Camera Control** and automatic with **Scenes**.

14. Click on the **Camera Control** button on the left-hand corner. Note that there are a few options embedded under Camera Control. SketchUp will likely default to the **Orbit button** but still check to make sure your cursor changes to this tool:

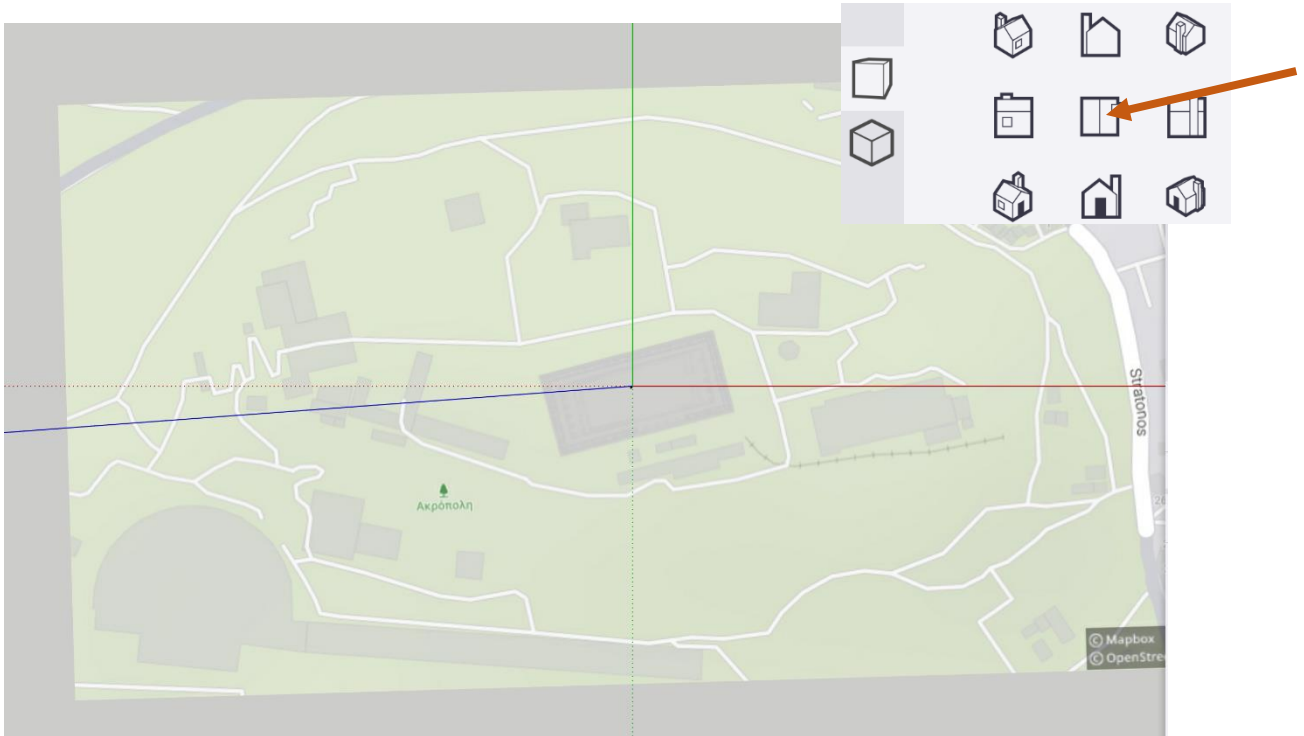


15. Now drag your cursor so that your image looks top-down.

16. Here's another way to do this. On the right-hand side of the screen, click on the **Scenes** button. Click on the **Perspective** menu and choose one of the houses. You will see the map image shift depending on what you click.



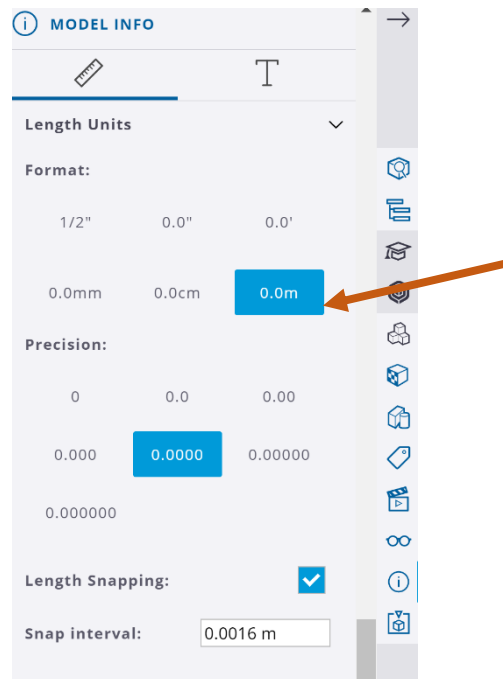
17. Whichever method you choose, shift your model to a top-down perspective. Hint: you can easily get here by clicking on the **center house perspective**.



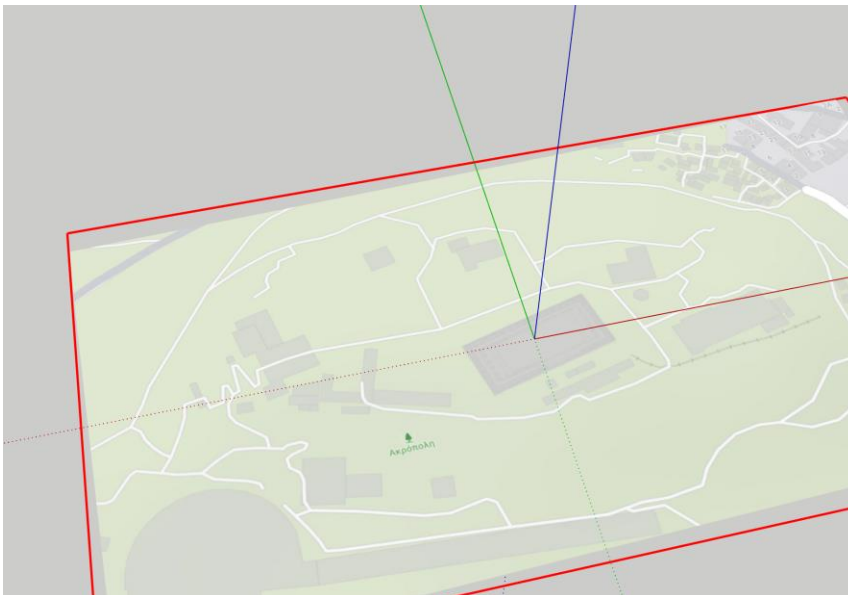
Creating a Structure

You are going to use the rectangle tool to create the outline of the temple.

18. We need to change the units. On the right-hand side of the screen, click **Model Info**. Choose 0.0m as your format, which means lengths will be shown in meters.

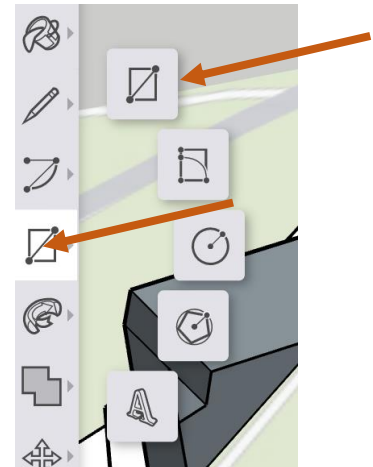


19. Zoom into the area of the map where you see the largest structure.



20. Choose the **rectangle tool** on the left-hand side of the screen.

21. Click on one corner of the structure.

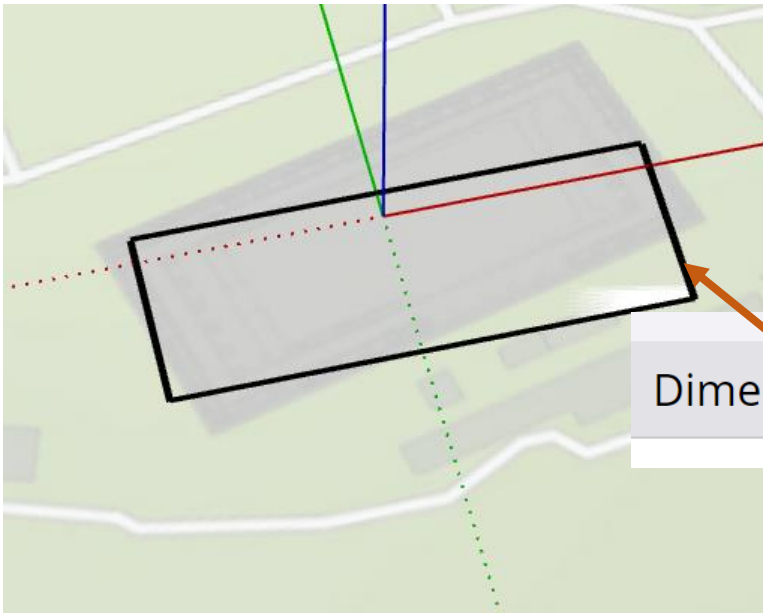


22. Move your cursor and pay attention to the lower right-hand corner, where the **Distance** box is. Notice that the dimensions are shown and they change as you move.

23. **Without clicking anything** type the following number **WITH the comma** and then hit **enter on your keyboard**. FYI: you won't see any numbers appear as you type. That's ok.

69.5, 25.905

24. If you do this properly, a rectangle with those exact dimensions will appear. You will see the dimensions reflected in the **Dimensions Toolbar** (lower right-hand corner).

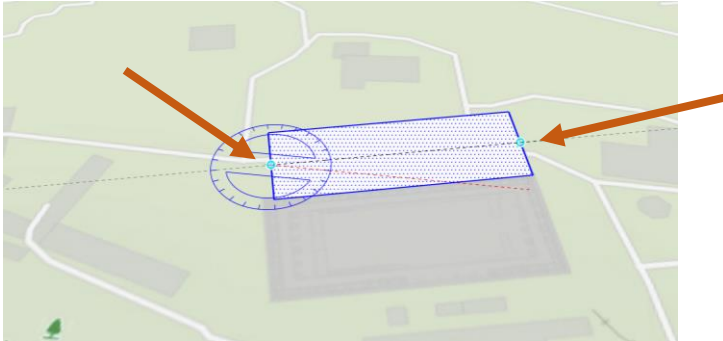


Dimensions 69.5, 25.905

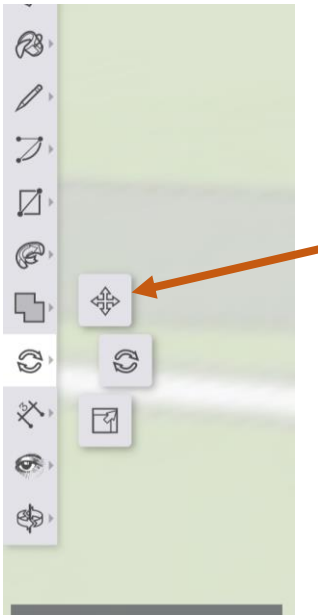
25. You need to rotate it to align with the footprint of the building. Click on the **rotate tool** on the left-hand side.



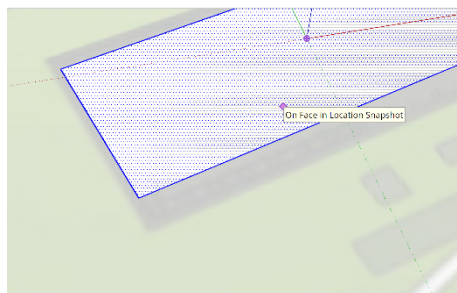
26. Look at the picture below. The arrows below are pointing to little circles. That's your target. Click on the middle of the left-hand side of the temple. Click on the opposite side. Now drag. Your temple should rotate.



27. Click on the same tool where you got the **Rotate** from and choose the **move** object button.



28. Now, click and drag the temple to line up as best you can. FYI: your temple is going to be smaller than the footprint because we are not modeling the staircases today.

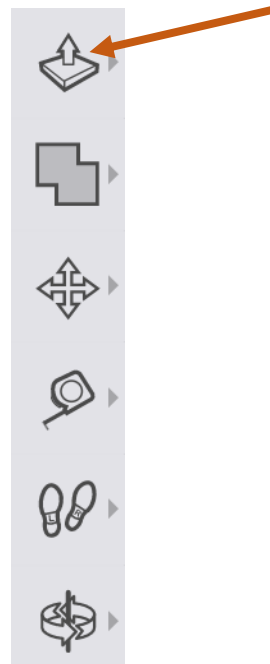


29. Now click again on the temple and drag upward. Type **40** and hit enter.

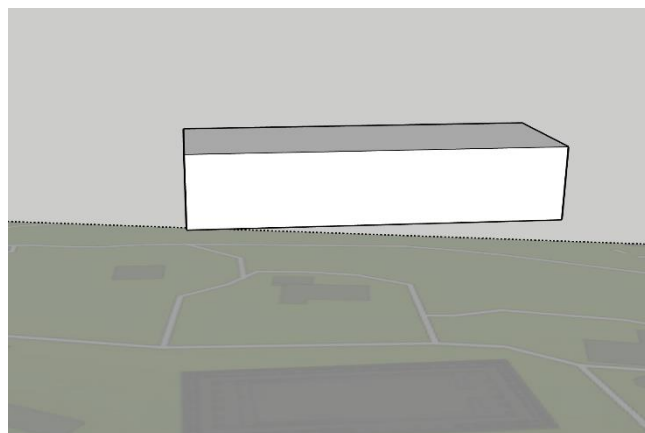


30. If you rotate your view, you should see that the temple footprint is now hovering above the map. This is because the temple is going to eventually sit on top of a hill that is 40 m high.

31. Click on the **Push/Pull** tool on the left-hand side of your screen. Your cursor should change and now look like the **Push/Pull** tool.



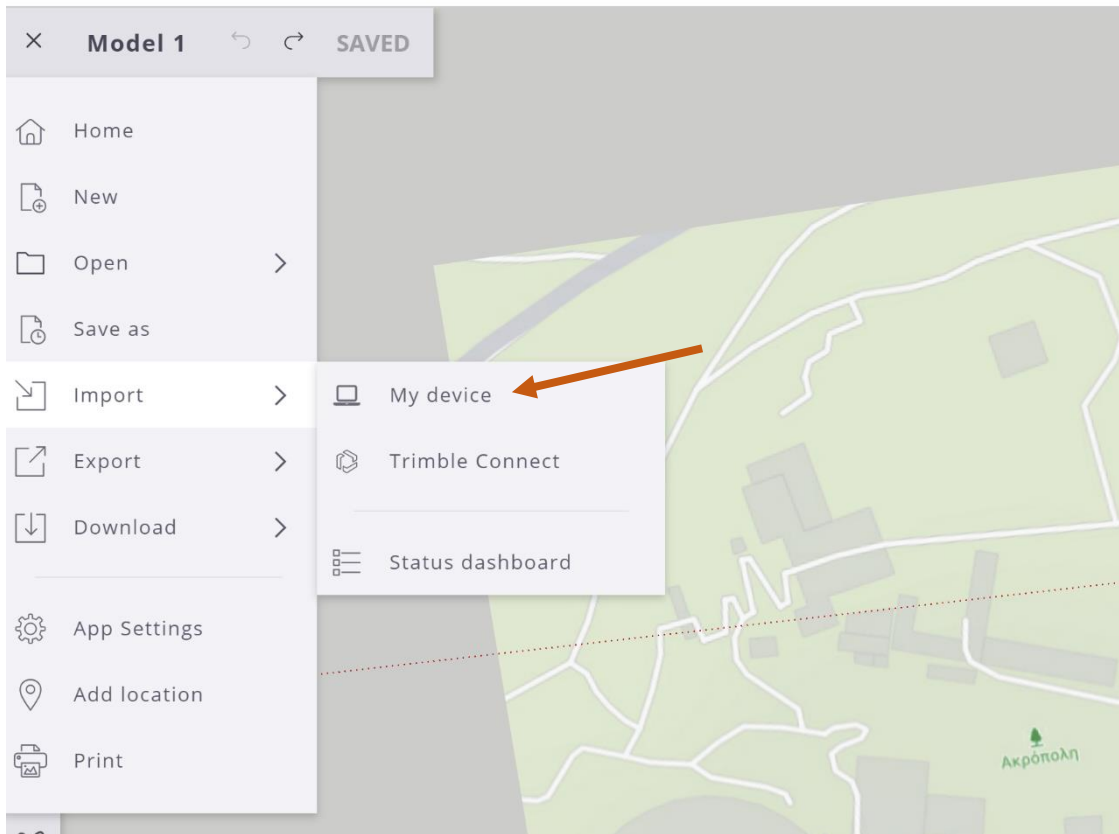
32. Click on the temple and drag your mouse. Notice that the **Push/Pull** tool makes the temple 3D. Now, type 13.625 and hit **enter**. You should have a 3D rectangle that is 13.625 m high and is floating 40 m above the surface.



Importing a Model

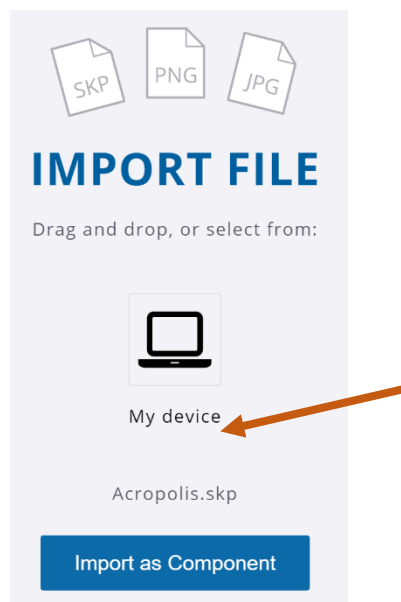
We are looking at the acropolis in Athens. This is an elevated area upon which Greeks built their sanctuary. I have created a model of the acropolis for you and you will be using the **Push/Pull** tool to extrude the topography.

33. From the **Home** menu, choose **Import**. Choose to import from your device. Navigate to **Acropolis.skp** and click OK. This is the file you downloaded before you began.



35. Choose **My Device** and navigate to where you saved **Acropolis**. Select the model and click **OK**.

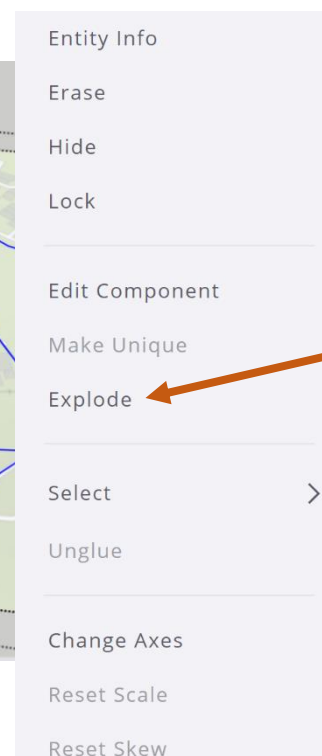
36. Click **Import as Component**.



37. A polygonal outline of the acropolis should appear. *Note:* the image below doesn't show the temple. Yours should.



38. The model was saved as one component, meaning that all of the polygons are connected to each other. We need to separate each polygon. Click on the model and you will notice that the polygons are all highlighted in blue. Right click and choose **Unlock** and then **Explode**. There should be blue dots in the polygons.



Extruding (Changing Heights) of a Terrain Model.

39. Double click on the large area of the acropolis. Right click and select **explode**. Your whole acropolis should be selected with blue lines and dots.
40. Click on the **Push/Pull** tool on the left-hand side of your screen. Your cursor should change and now look like the **Push/Pull** tool.



41. Hover it over the largest area of the acropolis. Click **once** and **drag**. Notice that the polygon will become 3D, same as when you did the temple. As you do so, keep an eye on the lower right-hand corner of your screen, where it says **Distance**. You will see the height of the polygon change based on you dragging it up or down.



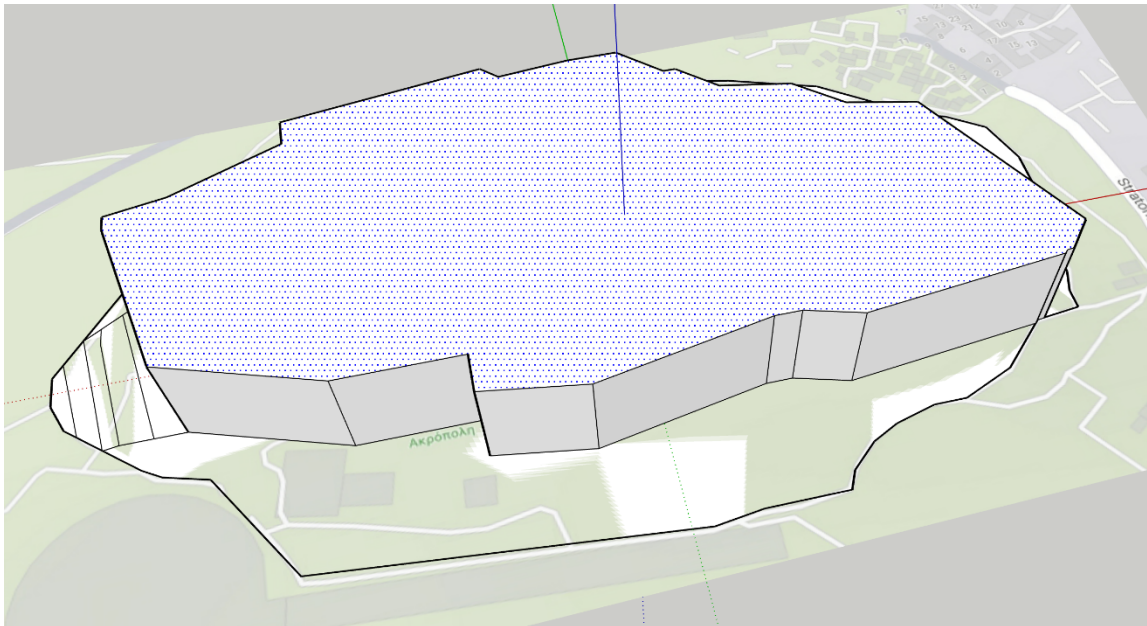
42. Now, using your keyboard, type 40 (you don't need to click anywhere before doing so). The **Distance** should now say 40. Hit **Enter**.

FYI: you should now understand why you made the temple float 40 meters in the air!

43. Click on the **Orbit** tool.



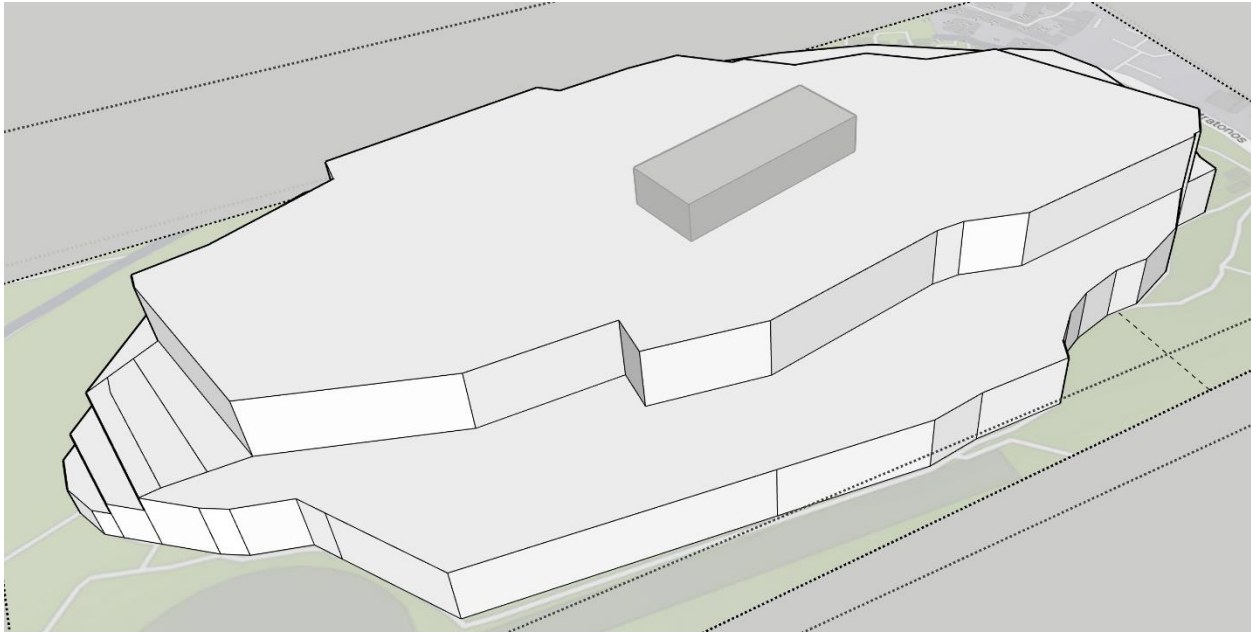
44. Pan so that you can see your model from the side (see demo pic below). You should see that there is a clear height difference between that section of the acropolis and the others. This is because we haven't pulled them up yet. **FYI: the image below doesn't show the temple, but yours should!)**.



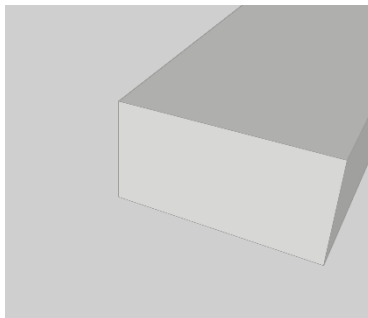
45. You will repeat this process based on the heights listed below. I recommend turning and zooming in so you can make sure you are clicking on the right polygon. Remember: click on the **Push/Pull** tool. **Click** on the polygon. **Drag up** slightly to indicate you want to pull up. Next, type the number. Hit **Enter** on your keyboard.



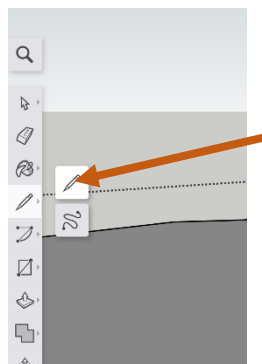
46. Your model should look like this:



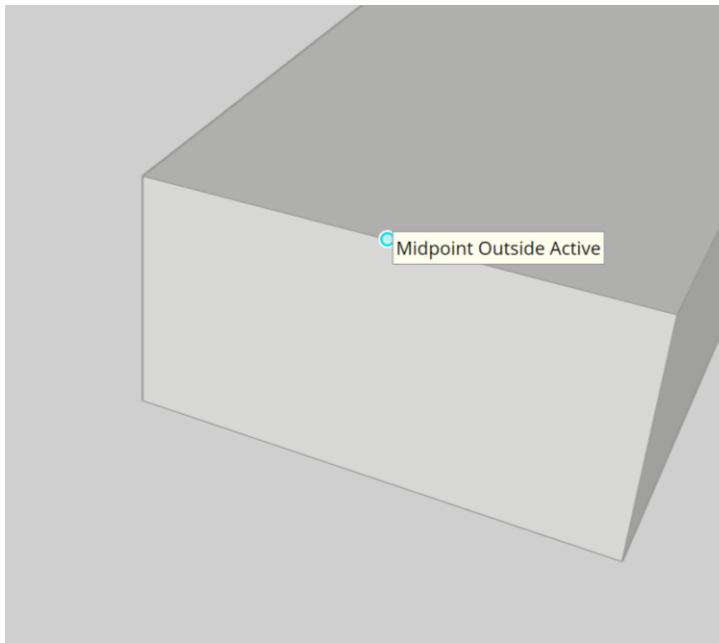
47. Now, zoom in so you are looking at the short edge of one side of the temple:



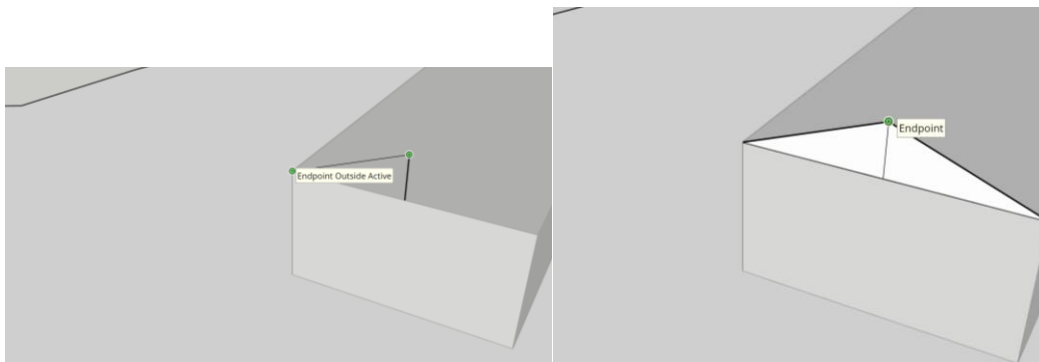
48. On the left-hand menu, choose **Draw a Line**.



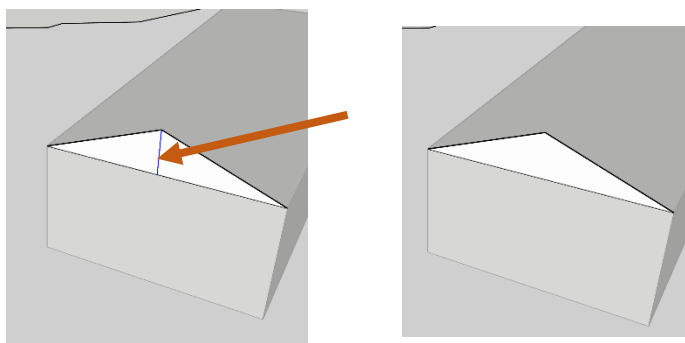
49. Hover your cursor so that it's over the line. You will see that it snaps (like in GIS) and will tell you when it's in the center. You want it to say **Midpoint Outside Active**. This means you are situated in the middle of line.



50. Click and drag up. Just like we've done before, type 4.995 and hit enter. You will see a line appear. Now, drag your cursor and connect to the outside corner. Keep going until you have a triangle. Make sure you use those guides that appear.



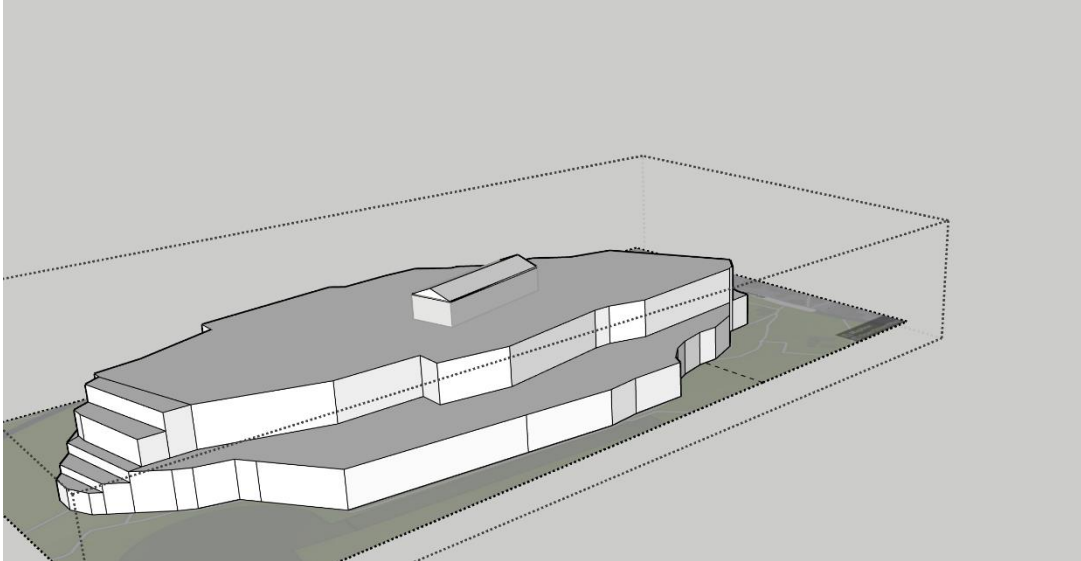
51. **Revert back to the arrow tool.** Click on the center line (the first one you made in the triangle). It should highlight blue. **Make sure it's just the median line and not the polygon you have highlighted.** Hit delete on your keyboard. It should disappear.



52. **Go back to the push/pull tool.**

53. **Click on the triangle. Drag back** so you are going to the other end of the temple. Now, type 69.50 (the length of the Parthenon).

54. **Your model should look like this:**



55. Rotate around your model and make sure everything looks ok. If your roof does not align with the temple base, just use the push/pull tool to adjust.

FYI: If you hadn't deleted the median line of the triangle before pulling, SketchUp would have treated this as two separate polygons and you would need to pull them separately.

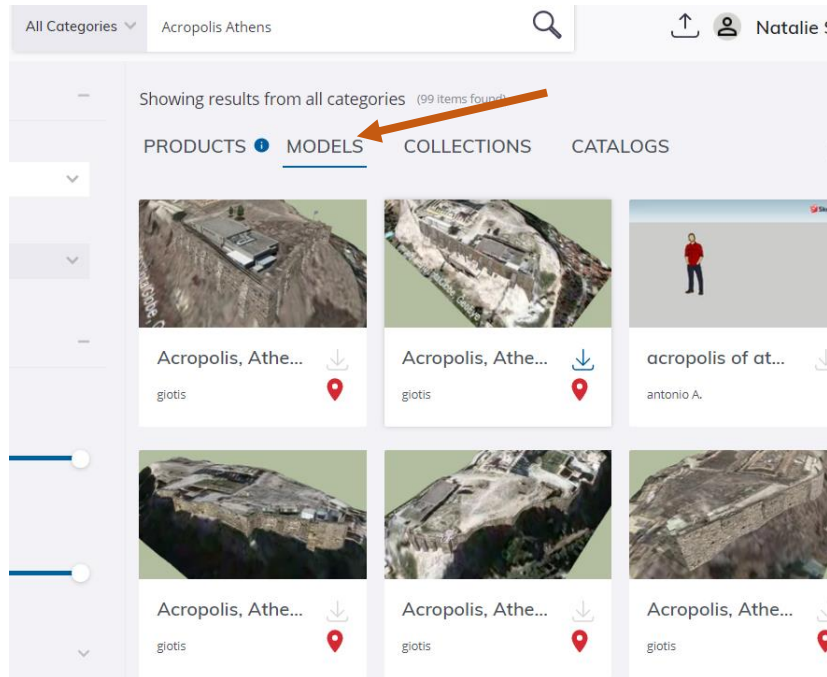
56. When you have finished your model, go to the **Home button** and choose **Download → SKP**. This will save your model on your computer. Upload it to the assignment on Canvas.

57. Now, go to the **Home** button. Create a new document called **Acropolis Comparison**.

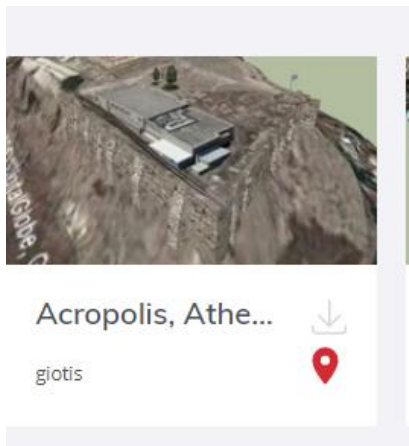
58. On the right-hand side of the screen, open the 3D warehouse.



59. In the search bar, type **Acropolis Athens**. When the search is complete, click on **Models**.



60. Choose a model. You can pick any one you want, but make sure it is an architectural model (one showing buildings, not just objects or terrain). Click on the download button and say OK when warned about model size.



61. It might take a moment for your model to appear. When it's there, zoom into and around the model.

62. Try looking at a few other models and also try searching specifically for one of the Parthenon.

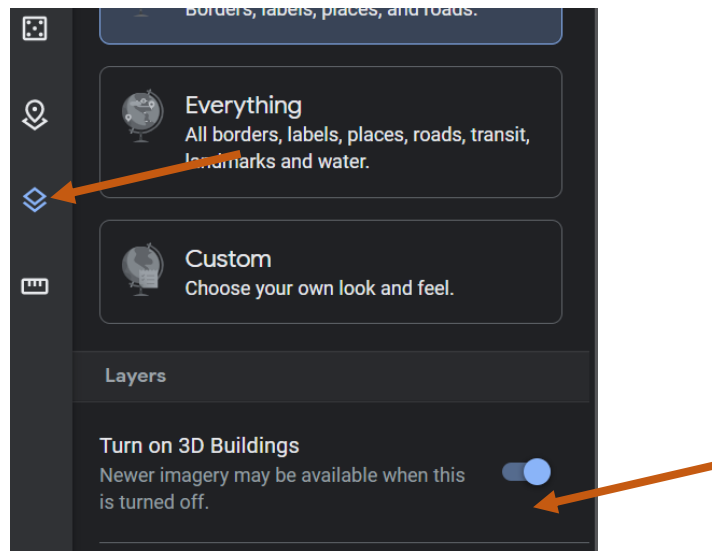
63. Answer the following questions:

- What are some different styles or approaches of 3D modeling that you observed in the SketchUp warehouse?

- b. How are designers integrating real photography into their models?**
- c. Before using these models as a scholarly resource, what sorts of information do you need to know?**

64. Now, go to <https://earth.google.com/web/>

65. On the left-hand side of the toolbar, make sure that 3D buildings are turned on:



66. Search for Acropolis, Athens, Greece.

67. Zoom into the Parthenon and take a look at the model.

68. Now, browse some of these resources about the acropolis and learn about its history. Yes, I am saying you can use Wikipedia + it's because these two articles were edited by my students and I have vetted the work.

- i. https://en.wikipedia.org/wiki/Acropolis_of_Athens
- ii. <https://www.theacropolismuseum.gr/en/>
- iii. <https://www.brown.edu/news/2021-09-03/acropolis#:~:text=PROVIDENCE%2C%20R.I.%20%5BBrown%20University%5D,the%20public%20in%20March%202021>
- iv. <https://en.wikipedia.org/wiki/Parthenon>

69. Answer: Thinking back to the various skillsets you have acquired this semester, how could you utilize the SketchUp warehouse models and/or Google Earth to explore three specific questions about the Acropolis and Parthenon's history? Your questions should engage with different periods of history and/or stakeholders. Remember – this is an ancient site but also a tourist attraction and major cultural monument.