

MTH 111 Final Project
Fall 2020

Use the directions below and the measurements obtained from the first part of the project to perform the indicated calculations.

1. Take a stick (yard stick, or any other kind of movable rod that can be physically measured with a ruler) and standing it up in the sunshine on flat ground. Record the following information:
 - The time of day
 - Measure the length of the shadow from base to tip
2. Find a tree, a telephone pole or a large building that is too tall to physically measure with a ruler without special equipment. You may need to measure the shadow with twine (something that doesn't stretch too much) or mark the distance with your shoe length and measure the shoes to get the conversion. At the same time of day as the above measurement (preferably the same day, or not many days later):
 - Measure the length of the shadow

Use the information from 1 and 2 to calculate:

- a. **Find the height of the tree. (similar triangles)**
 - b. **Find the angle of the sun. (trigonometry)**
3. Find a building with a slanted roof (a house or a garage should do).
 - Take a picture of the building so that you can see the angle of the slanted section such as shown. Take the picture edge on so that the wall supporting the roof is directly facing you and not at an angle.
 - Measure the base of building supporting the roof.
 - a. **Find the slope of the roof and express that slope as a percent. (equations of lines)**
 - b. **Find the angle of the slant. (trigonometry)**
 - c. **Find the height of building. (similar polygons)**
 4. Find three traffic signs.
 - One of signs should be a stop sign
 - Measure the length of one edge of the sign
 - Measure the width across from edge to edge (the "diameter")
 - Measure any two other signs of different shapes (for instance, a yield sign is an equilateral triangle, so measure one edge; or a speed limit sign is a rectangle so measure length and width, etc. Most residential neighbors have things like speed limit sign, pedestrian crossing signs, stop signs, etc. Freeways also have mile marker signs every 1/10 to every 1 mile. Railroad track signs are circular, if you know where any are.
 - a. **Find the area of each sign. (geometry)**



- b. Find the size of each angle of the sign. (you may assume the polygons are regular in most cases) (geometry)**
 - c. Identify the shapes. (geometry)**
5. Find a large building that is roughly box-shaped (a rectangular solid). Find the size of the length and width of the building (for instance, using your feet end-to-end, or some other method). For the height, count the number of floors. The typical height of a story is about 14 feet, so you can use that to estimate the height.
 - a. Find the volume contained by the building. (geometry)**
 - b. If the lateral surfaces of the building were to be covered with glass windows, find the area of glass needed. (geometry)**
6. Find a coffee mug.
 - Measure the height of the mug.
 - Measure the diameter of the mug.
 - a. Find the volume of liquid the cup can hold. (geometry)**
 - b. Convert the amount of liquid into i) cubic inches, ii) cubic centimeters, iii) liters, iv) ounces. (unit conversion)**
 - c. Compare your values to unit conversion ratios you find online. Are they the same?**
7. Find at least two other geometric solids in the world. They can be things in your home or outdoors. Pyramidal shaped buildings (such as the Rock-n-Roll Hall of Fame), or a grain silo (can be of various shapes, but often are cylindrical) or a water tower. Take pictures of these objects so that all the relevant dimensions are clearly visible in the image. You may need to place a scaling object next to the image if you are not able to measure any of the dimensions yourself. If you have one reliable dimension, we can get the others from the image. If you have none, then we can obtain only relative sizes, which will not be enough to obtain the volume.
 - a. For each of the objects you found, find the volume. (geometry)**
 - b. For each of the objects you found, find the exposed surface area. (Note: for some objects you may skip the bottom base, but you should include exposed tops.) (geometry)**
8. Find an object—it can be two- or three-dimensional—that we did not discuss in the geometry chapter. Take a picture of it. As with the other objects, you need to identify at least one measurement in the image so that we can obtain estimates of the others from the image. Use Google or another search engine to try to identify the name of the shape (it may fall into a class of shape like a prism or a cylinder, for instance). You'll need to identify the formula for the area (if two-dimensional), or the volume (if it's three dimensional). See Chapter 12 if you are not sure what we will be and won't be discussing in the geometry section.
 - a. What is the geometric name of the object you found?**
 - b. Find the volume and surface area of the object. Identify and formulas used.**
 - c. Write a paragraph describing something about the shape you found interesting.**