Viva La Revolution!!

The goal of this project is to help you become more familiar with the details of volumes and calculus. You will get to work with the partner of your choice.

Your goal is to find out if the volume of a 500mL bottle of water is really 500mL. You are to use Calculus to prove the truth of the labels!

**Rotation:** You and your partner will use an ARROWHEAD 500mL plastic water bottle AND a second shape of your choice (glasses/cups/vases). You will find the radius of the object at regular intervals. I’d suggest you do this measuring by taking a digital picture of your glass and superimposing an axis on it (using Geometer’s Sketchpad, WinPlot or Geogebra). Use the center of the glass as the $x$-axis. Once you have the radii at regular intervals, plot these points in your calculator (or in a computer program) and find an appropriate equation (or series of equations) that represents the boundary of your glass. Now that you have the equations, you can easily find the volume using the Disk method for volumes of rotation. Be sure to compare this approximate volume to the actual volume of the object, and discuss any differences there may be. The more levels of complexity in your object, the more points you will earn on the project. You should also use the points plotted to approximate the volume using Riemann Sums, AND find the real volume using calculus and water displacement. You are expected to have at least 5 rectangles for each part of the piece-wise function defining your object.

**Project Expectations:** You are expected to accurately approximate the volume of your shape using Riemann Sums. You are also expected to find the real volume using calculus and compare the two results. Most of this project should be completed in class, so be sure to bring laptops, calculators, cups, etc. to class daily. Also, discuss the error in the Riemann Sum approximate versus the Calculus result.

**Grading:** If you just do the minimum suggested, you should expect to earn a B. The quality of the presentation or additional research, writing or math will help you to earn a high B or A on the project. Typing the project will also help improve your grade. Decorating and getting creative will raise grades up to a third of a letter grade (eg, A- to A). Doing more math on the project will potentially raise your grade up a full letter (eg, B to A). “More Math” could mean: finding area, surface area, creating a related rate problem from the scenario, using left/right sums in addition to midpoint, etc. Accurate math counts for more points than creative decoration.