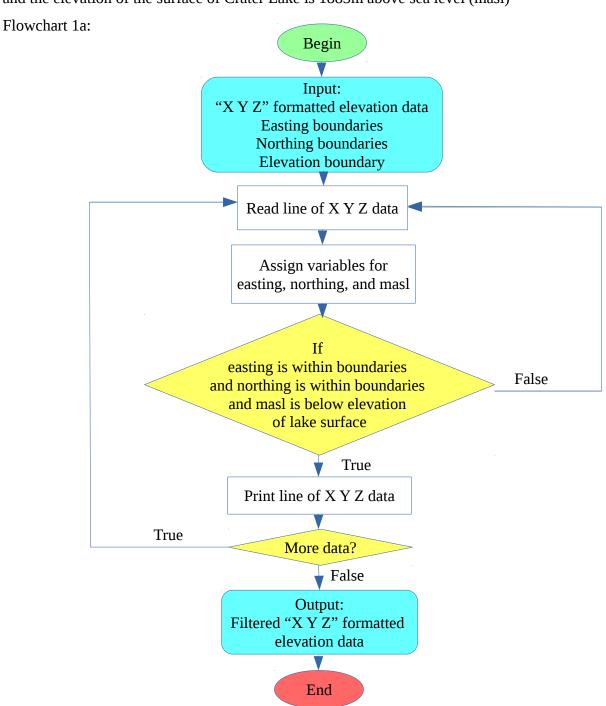
Problem 1a: perl xyz_lake_filter.pl bathymetry2.dem.xyz > filtered_crater_lake_data.xyz

Create a data file that encompasses the boundaries of Crater Lake and provides depth information for areas under the water in X Y Z format where X is easting, Y is Northing, and Z is the elevation of locations under water. The base data is downloaded in a dem format and converted to xyz format using the provided dem.xyz.pl script. A filter script is required to reduce this data to only the points within Crater Lake. The given boundaries are Easting 568000 to 577500 and Northing 4750500 to 4758500 and the elevation of the surface of Crater Lake is 1883m above sea level (masl)



Problem 1b: perl xyz_lake_vol.pl filtered_crater_lake_data.xyz > xyz_lake_vol.out Using the filtered data, calculate the surface area of the lake, the volume of water in the lake, and the maximum depth of the lake. Begin Flowchart 1b: Input: "X Y Z" formatted elevation data Variable for spatial resolution of data Variable for Crater Lake water elevation Initialize max depth and total volume Calculate area for each point $Ap = (spatial resolution)^2$ Read line of X Y Z data Assign variables for easting, northing, and masl Add to counter for number of points of elevation within Crater Lake Find depth of data point D = lake elevation - maslCalculate volume for data point Vp = Ap * DAdd Vp to total volume False If masl > max depth True Assign $\max depth = \max l$ True More Data? False Calculate surface area As = number of points * ApOutput: Print surface area, total volume, and max depth

End

Code output:

I found surface area of Crater Lake to be 52874100 m² or 52.8741 km²

I found the volume of Crater Lake to be 17624727900 m³ or 17.6247279 km³

I found the greatest depth in Crater Lake to be 585 m

Discussion:

These values seem to be in agreement with to known values for the Crater Lake surface area and volume with values of 53.35 km² and volume of 18.7 km³. The values from this code, with significant figures, would be around 52.9 km² for the surface area and 17.6 km³ for the volume of the lake. The under-estimation for these values is likely due to the coarse spatial resolution of the data being used in this problem.