cs201 – sum 2020

Lab 3 – Floating Point (15 points)

For information on how to do this lab, see the page on "Floating Point Representation" in the Week 3 module.

Please submit the three C source code files, with your answers in comments OR in a separate text file, to the assignment folder for lab 3 by the due date.

Part A: Floating Point and Integers(10 points)

Download the labA.c file from the assignment folder. Compile and run the program. Answer the following questions either in the comments at the top of the file or in a separate text file:

1. Note that the for loop ends when the long and float values diverge. Explain why they diverge by answering the following:

   a) What is the last value that they match.

   b) What would be the next value.

   c) Work out floating point bit pattern for the last and next values.

2. Situation: you're working on a project that needs to generate a large amount of unique ID numbers. These numbers are positive integers. In order to maintain uniqueness, they are generated by incrementing a nextID variable. A programmer working on a project says the following:

   " If we use an int we can only get 2 x 10^9 positive integers. But if we use a float we can get up to 3 x 10^38 ID's! So why don't we just use a float for the ID values."

   How do you explain that this is not a good idea. Also, offer a better solution.

Part B: Comparing Floating Point (5 points)

Download the labB.c file from the assignment folder. In this file is a function called 'equals' that doesn't quite work with floating point values due to round off errors. There are two examples, one of which doesn't work. Do the following:

1. Why is the first example not working?

2. Fix the function 'equals' so that it works for both examples. We want the two numbers to be considered equal if they are equal in the first 3 decimals after the decimal point.

NOTE: There are several ways to do this. You can take the absolute value of the difference between a and b and compare it to a tolerance value. In other words, if

|a-b| < tol

is true, then we can say the values are 'equal'. The tolerance value should be just small enough to act as a 'cutoff' point for equality but no smaller.