Due: Monday September 28, beginning of tutorial.

This assignment is worth 10% of final grade

1. Write down the first two initials of your first name followed by the first two initials of your last name. For example, for my name Allan Borodin, I would be writing albo. Encode this shortened name (e.g. albo) as a decimal number by encoding 'a' as 01, 'b' as 02, ..., 'z' as 26. (From the classlist, I believe everyone has at least two letters in their first and last names.)

2. Let ID denote the encoded version of your shortened name. That is, ID is a 7 or 8 digit decimal number. (Given the class list I believe this is a unique identifier for every student in the class.) How many possible values can there be for an ID assuming that every name is possible?

3. Now we want to introduce an an example of an important idea (maybe a great idea) called hashing. Let $h(ID) = ID$ mod 173. By "mod p", I mean divide by p and take the remainder. For example, using my ID, we would get 1120215 mod 173 = 40 since 1120215 = (6475 * 173) + 40. That is, my ID is being hashed or mapped onto a much smaller number (i.e. a number between 0 and 172). We will be discussing why hashing is a very useful idea.

4. We have approximately 20 students (each having a well defined ID) and 173 possible hash values. How likely do you think it is that there will be two students with the same hashed value? I am not (necessarily) asking for a detailed probabilistic analysis, just your intuitive explanation of how likely this is. Explain any assumptions you are making in estimating the likelihood of two students having the same hashed value.

5. Give the binary representation for your individual $h(ID)$. In the case of my hashed ID of 40 (in decimal notation), the binary representation would be "101000".

6. Let $m = h(ID)$ be your hashed ID. Represent (approximately) the fractional number $m + \frac{1}{m}$ in the 12 digit decimal floating point representation discussed in class. Namely, there is one sign "digit", 3 decimal exponent digits (using bias 500) and 8 decimal significant digits.