Math 370 Fall 98

Quiz 1

Numerical Analysis

Name: _____

Date: _____ Friday September 4
Time Begun: _____ Ron Buckmire
Time Ended: _____

Topic: Machine Representation of Numbers

The idea behind this quiz is for you to indicate your understanding of how computers represent numbers in memory, and the effects of these representations on numerical calculations.

Instructions:

1. Once you open the quiz, you have as much time as you need to complete it, but record your start time and end time at the top of this sheet.
2. You may use the book or any of your class notes. You must work alone.
3. If you use your own paper, please staple it to the quiz before coming to class. If you don't have a stapler, buy one.
4. After completing the quiz, sign the pledge below stating on your honor that you have adhered to these rules.
5. Your solutions must have enough details such that an impartial observer can read your work and determine HOW you came up with your solution.
6. Relax and enjoy...
7. This quiz is due on Wednesday September 9, in class. NO LATE QUIZZES WILL BE ACCEPTED.

Pledge: I, _____, pledge my honor as a human being and Occidental student, that I have followed all the rules above to the letter and in spirit.

---

1. In a vain attempt to prevent Microsoft© from taking over the world, Machines de Buckmire International (MBI) is coming out with the Edsel, which uses brand-new 8-bit technology to represent floating-point numbers. It uses a 1-bit sign indicator, a 2-bit characteristic and a 5-bit mantissa. Here is the definition:

$$fl(x) = (-1)^s \times 16^{c-2} \times q$$

where the normalization is the the mantissa must be non-zero.

a. What is the largest normalized positive number MBI's Edsel can hold in memory?

b. What is the smallest normalized positive number MBI's Edsel can hold in memory?

c. Write down the generic decimal machine number representation of numbers the Edsel can hold (e.g. $d_1 d_2 d_3 \ldots d_k \times 10^n$) in memory. (In other words, how many decimal digits of accuracy does the Edsel provide?)

d. Show that the following bit of memory in the Edsel would represent the number -12.5.

1	11	11001

e. Find the relative error that the Edsel would have representing the number -12.25 in memory