CS 201 Section 1 Homework 1 – due 6pm, Wednesday, January 12, 2000

1.a. The following prefixes are used to refer to different powers of 10 under the SI system of units widely used in the sciences. For example "milli" (abbreviated "m") means 10^{-3}, so "10 milliseconds" means $10 \times 10^{-3} = 10^{-2}$ seconds. Give the appropriate power of 10 corresponding to each abbreviation.

kilo (k)
giga (G)
tera (T)
pico (p)
nano (n)
mega (M)
micro (μ)
peta (P)

b. Frequencies are measured in Hertz; 1 Hertz = 1 second^{-1}. If a certain machine has a clock frequency of 200MHz (MHz = MegaHerz), what is its cycle time?

c. In certain situations, e.g., talking about memory capacity, computer people often slightly pervert the definitions of kilo (k) and Mega (M), to refer to 2^{10} and 2^{20}, respectively. For example, "32 Megabytes" is usually taken to mean $32 \times 2^{20} = 2^{25}$ bytes. In percentage terms, how much larger is this than the "correct" value based on the standard SI definition?

2. Do Tanenbaum Exercise 1.2.

3. Do Tanenbaum Exercise 1.12. Don't try to be too precise.

4. Do Tanenbaum Exercise 2.1.

5. Do Tanenbaum Exercise 2.3.

6. Suppose we have a program that spends 75% of its time doing multiplication when run on our current computer. We want to speed it up by running it on a new computer that does multiplies more quickly (but is otherwise identical to our current one). Using Amdahl's law, answer these questions:

a. If we want our program to run twice as fast, how much faster must the new computer do multiplies?

b. What if we want it to run ten times as fast?