COS126: General Computer Science	**Spring 1996**
Problem Set # 1	
Handed out:Feb. 6, 1996	*Due: Feb. 14, 1996*

The purpose of this assignment is to get you familiarized with the basic control structures of the C language: **if-else, for, while**. In this assignment whenever we say "number," we mean a positive integer.

A number m is a *divisor* of another number n if there is a number c such that $n = m \cdot c$. Note that 1 is a divisor of every integer. A *prime number* is a number that has no divisors other than itself and 1. Some prime numbers are $2, 3, 5, 11, 29, 31 \ldots$.

The assignment

Your goal is to write a program that takes a number from the user as input, and prints out whether or not it is a prime number. Make sure that if the program is given a negative integer, then it tells the user that the input is incorrect.

Turn in the following.

1. A program that performs as described above, and uses **for** loops but no **while** loops.
2. A version of the program that uses **while** but no **for** loops.
3. For a positive integer m, let p_m denote the number of prime numbers less than m. Modify either of your above programs so that it takes a number m as input, and outputs p_m. (*Hint: You should only need to add a* **for** *loop to the program.*) Use your program to compute p_m for the following values of m, and write these values by hand on your hardcopy submission: (a) $m = 1000$ (b) $m = 5000$ (c) $m = 10000$.

Submission: Put the three programs that you write in three separate files: (1) `usefor.c` with the program using **for** loops; (2) `usewhile.c` with the program using **while** loops; and (3) `count.c` with the program to compute p_m. To electronically submit the three programs, type

`/u/cs126/bin/submit 1 usefor.c usewhile.c count.c`.

Programs must be electronically submitted by **10pm on Wednesday, February 14, 1996.** Hardcopy must be turned in during lecture the next morning. Remember to use the official cover sheet for the hardcopy you submit.

Challenge for the bored:

A famous result in number theory says that

$$\lim_{m \to \infty} p_m \approx \frac{m}{\log_e m}.$$

Use the above program to verify this result for $m = 100,000$ and $m = 1000,000$.