Due at the start of class, Apr 2, 2012.

**Problem 1.** Write a Ruby program to print out the following pattern (the pattern shown is when the input is 5). Provide a screen shot listing your code and output.
You need to test your program with different input values.

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**Problem 2.** Write a ruby program to print out the following pattern (again this is the pattern output when the input is 5). Provide a screen shot with your code and output. You need to test your program with different input values.

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**Problem 3.** Permutation Cipher is an encryption method, where a certain permutation or rearrangement is applied on a string to generate the encrypted string. The string to be encrypted is first divided into blocks of size $m$, and then a permutation of the numbers $[1 \ldots m]$ is applied to the string. For example, let the block size be 4, and the permutation be $[4 \ 2 \ 1 \ 3]$. Now a string “ABC DPQRS” will be encrypted as “DBAC SQPR”.

(a) Will the knowledge of frequency of character occurrences be helpful in breaking a permutation cipher? Explain why or why not.

(b) Consider a permutation cipher of block size 5 and a permutation pattern $[3 \ 5 \ 2 \ 1 \ 4]$. What would be the encrypted form of the string: “A BLACK BOOK”?

**Problem 4.** Write a Ruby program which takes in as input an integer, and returns whether the integer is a prime number or not. Provide a screen shot with your code and output.

**Problem 5.** Write a short description about the *Babbage Engine*. 