COMS 3101 - Fall 2013
Homework 2

- Due by start of class (Monday 4pm).
- See submission instructions.

1.
   a) Type 'help switch' and read about switch-case statements.
   b) Create a script named 'hw2a'. Give a brief but concrete example when switch-case statements should be preferred to if-elseif statements. Use block comments to enter your answer in the script.
   c) Your script should contain code that solves the following problem:
      A user hard codes two variables, N and C (both positive integers).
      Write a switch-case statement where C is the switch-expression.
      If C = 1, you should output all the prime factors of N.
      If C = 2, you should output the largest prime number less than N.
      If C = 3, you should output the smallest prime number greater than N.
      If C > 3, you should display an error message of your choice.

      For example, if N = 6, then:
      C =1 ➔ 2,3
      C =2 ➔ 5
      C =3 ➔ 7
      You can read about 'prime factors' on wikipedia for example.

2.
   a) Write a function named 'hw2b' which has 4 input parameters {numR, numC, C, THR} and outputs one parameter {T}. Your function should do the following:
   b) Create a random matrix M of size numR x numC (the elements of M are random values between 0 and 1)
   c) Multiply each element in M by the constant C and compute the floor. For example, if M(1,1) * C = 2.3 then the floor would be 2. You should initialize a new matrix M2 which holds the new (floored) values.

d) Suppose M2 represents a directed graph. If M2(i,j) = K > 0, then there exists a directed edge from i to j and the length of this edge is K (if K = 0, there is no edge). For every edge, whose length is at least THR, print the word 'edge' followed by the vertices of the edge and its length.
e) The function should return the total length of all edges (whose length is at least THR) in the graph in the variable T.

3.

a) Write a function named 'hw2c' which has two input parameters {M, N} and one output parameter T. We shall assume that each element of M should be an integer in the range [0,N] and tha M is a square matrix.
b) Use an if-end statement to check whether the assumptions about M are satisfied. If they are not, display an error message of your choice, set T to -1 and terminate the function (hint use the keyword return).
c) Each element M(i,j) represents the cost of travelling from location i to location j. Use an if-end statement to check whether for all k, M(k,k) = 0. If it is not, display an error message of your choice, set T to -1 and terminate the function (in other words, the cost to travel from i to i should be zero).
d) Assuming the conditions in parts (b) & (c) have been satisfied, find the triple of locations {i, j ,k} with the shortest distance between them. That is, the value V = M(i,j) + M(j,k) should be the minimum among all triples {i,j,k} one could try. Set T to the triple of indices you found.
   Note: break ties arbitrarily.
   Note: an inefficient solution is acceptable for part (d).