COL100 Lab
Week 9

Q1. **Matrix Multiply.** Write a program that reads three integers m, n, k from standard input. It then reads two matrices (of integers) A, B of sizes m x k and k x n from standard input. The program should print the matrix C (= A * B) which is the product of A and B on its standard output. Print each row of matrix C in one line, separated by spaces. Maximum sizes of m, n, k may be 1024.

Q2. **Mini Sudoku checker.** In the mini Sudoku game, you are given a 4x4 grid with numbers filled in some of the squares and some others empty. The objective is to fill in the empty squares such that (a) all the rows contain all the numbers 1, 2, 3, 4 and there is no repetition (b) all the columns contain all the numbers 1, 2, 3, 4 and there is no repetition (c) all the four 2x2 squares (in the four corners of the big 4x4 grid) contain all the numbers 1, 2, 3, 4 and there is no repetition. You can play 4x4 Sudoku game here to get more familiar with it: http://1sudoku.com/play/sudoku-kids-free/sudoku-4x4/?n=2

Your program should take a completed Sudoku as its input (16 integers) and check if the solution is correct and satisfy all the rules (a), (b) and (c) given above. It should print "Correct solution" if the given solution is correct else it should print "Incorrect solution".

Q3. **Bubble sort.** The bubble sort algorithm to sort an array in ascending order is given below.

(i) Start from the beginning of the array and compare the first two elements.
(ii) If the two elements are not in ascending order then swap the elements.
(iii) Repeat step (ii) with the second and third element and then with third and fourth elements, and so on, till you reach the end of the array.
(iv) Repeat steps (i) to (iii) until there are no more swaps of adjacent elements made.

Write a program to read an array of integers and then sort them using the bubble sort algorithm given above. Print the sorted array to standard output at the end of the program.

Q4. **Value of Pi.** Write a program which has three functions (a) my_sqrt which takes a double variable as its input and computes its square root and returns it as a double. You may use binary search done in the class to compute the square root, (b) my_factorial which takes an integer N as its input and returns N! (N factorial), a double as its output, (c) my_power which takes an integer N and a double d as its inputs and returns a double d^N as its output.

Use the above three functions for computing the value of pi using 10 terms of Ramanujam's formula.

Q5. **Challenge question: Mini Sudoku Solver.** Write a C program to solve the 4x4 Sudoku problem. Your program should take 16 integers as its input. It should treat zeros in the input as blanks. Your program should try to solve the given Sudoku puzzle and print the answer when a solution can be found else it should print an error message saying that no solution could be found. Note: your program must always find a solution if there is a solution for the given input puzzle.