National University of Computer and Emerging Sciences

Lab Manual

for

Data Structure

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Lab Manual 06

Objectives:

After performing this lab, students shall be able to revise:

- ✔ Recursion

Problem 1

A palindrome is a string that reads the same both forward and backward. For example, the string "madam" is a palindrome. Write a program that uses a recursive function to check whether a string is a palindrome. Your program must contain a value-returning recursive function that returns true if the string is a palindrome and false otherwise. Do not use any global variables; use the appropriate parameters.

Problem 2

Write a recursive method that for a positive integer returns a string with commas in the appropriate places, for example, putCommas(1234567) returns the string "1,234,567."

Problem 3

Write a recursive method void print01(int k); that prints all 0/1 strings of length k. For example, if k=1, the program should print 0 and 1. If k=2, it should print 00, 01, 10 and 11, etc

Problem 4

Given an array,check whether the array is in sorted order with recursion.

Problem 5

Find the number of ways r different things can be chosen from a set of n items, where r and n are nonnegative integers and r<= n. Suppose C(n, r) denotes the number of ways r different things can be chosen from a set of n items. Then C(n, r) is given by the following formula:

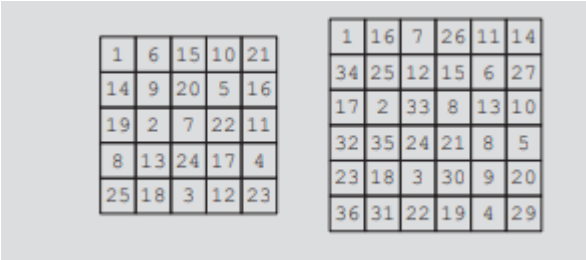
$$C(n,r) = \frac{n!}{r!\,(n-r)!}$$

where the exclamation point denotes the factorial function. Moreover, C(n, 0)=C(n, n) =1. It is also known that C(n, r)=C(n – 1, r – 1) + C(n – 1, r).

a) Write a recursive algorithm to determine C(n, r). Identify the base case(s) and the general case(s).
b) Using your recursive algorithm, determine C(5, 3) and C(9, 4).

Problem 6

Given an initial board position, determine a sequence of moves by a knight that visits every square of the chessboard exactly once. For example, for a 5*5 and 6*6 square board, the sequence of moves are shown in figure given below



1	6	15	10	21
14	9	20	5	16
19	2	7	22	11
8	13	24	17	4
25	18	3	12	23

1	16	7	26	11	14
34	25	12	15	6	27
17	2	33	8	13	10
32	35	24	21	8	5
23	18	3	30	9	20
36	31	22	19	4	29

A knight moves by jumping two positions either vertically or horizontally and one position in the perpendicular direction. Write a recursive program that takes as input an initial board position and determines a sequence of moves by a knight that visits each square of the board exactly once.