**Project 2 Permutations and Combinations**

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Part 1.

To implement k-permutations of n objects nPk

To implement k-combinations of n objects nCk

where n denotes the number of available objects and k is the number of available places

nPk is obtained by permuting each combination of nCk.

Input Output ( count, time taken in milli seconds)  
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10 10 0 3628800 691  
11 11 0 39916800 7481  
12 12 0 479001600 95347  
13 13 0 6227020800 1256244  
5 3 0 60 0  
50 3 0 117600 26  
5 2 1 10 0  
50 2 1 1225 4   
50 4 1 230300 20  
90 8 1 77515521435 2898376

The implementation uses O(n+2k) space andO(nCk\*n\*k!) time for permutation and O(nCk\*n) for combination

Pseudo Code:

count, n, k are declared as global variables

Function prototypes:

void visitPermutations(int \*A,int k)

//prints each permutation to stdout and increments count

visitCombination(int \*A,int n)

//prints each combination and increments count

int Combination(int \*A, int \*B, int \*C,int i,int k ,int v)

int Permute(int \*C,int\*B,i,v);

Combination(A,B,Ci,k,v)

//initial values: A ,B,C ,n, k,v

// A is initialised with zeroes

if(k=0 & v%1) visitCombinations(A);

if(k=0 & v%2=0)

copy non zero elements of A to B

permute(B,C) //C is an auxiliary array

else if i<k return count;

else

chose object i, place it in A[i]

combination(A,B,C,i-1,k-1,v)

deselect object i

combination(A,B,C,i-1,k,v)

Permutation(B,C,i,v)

//C is an auxiliary array ,B holds the current combination , i is size of B ,v is output indicator

//Output: returns the current count

if i=0 visitPermutations()

else

for k <- 1 to size of B do

place item B[i] in the available vacant spot of C

permute(C,i-1)

reset C[k] to zero

Project 2 Part 2:

To visit all permutation of non distinct objects

Requires the input array to be sorted and generates the next lexicographic order

The sorted array is taken as the initial permutation and is printed.

The next permutation is generated by the permute function.

The input takes the numbers from command line.

Retrospection:

It has taken a 3 days to complete the project.

The shortcomings were in Problem 1 was to reduce the extra space used.