

Date: 03-02-2022 Exp. 4 Permutation and Combination

**Aim:**

To find the permutations and combinations using procedures.

Tool Used:

Assembler - MASM 611

Algorithm:

1. Factorial :

1. Move the number whose factorial is to be calculated to CX.

2. Initialise AX and BX.

3. While $BX < CX$, increment BX, multiply with AX.

4. Return the factorial of the number

2. Calculate $(n-r)$.

3. Calculate n factorial , Calculate r factorial , Calculate n-r factorial

4. For permutations, divide n factorial by n-r factorial

5. For combinations, divide permutations by r factorial

Program:

.*****
;

; ALP TO FIND nCr

; Max. n=8 (as 9! > 16-bit)

.*****
;

assume cs:code,ds:data

data segment

org 1000h

n equ 05h

r equ 04h

tepp dw ? ; for r!

temp dw ? ; stores (n-r)!

npr dw ?

ncr dw ?

data ends

code segment

start:

mov ax,data

mov ds,ax

xor ax,ax

xor dx,dx; cleared to be used for 16-bit division


```
mov bx,n-r
cmp bx,01h
jnz lp1
mov temp,01h
jmp lp3
lp1: call fact
mov temp,ax
xor ax,ax
lp3:
mov bx,r
cmp bx,01h
jnz lp4
mov tepp,01h
jmp lp2
lp4:
call fact
mov tepp,ax
xor ax,ax
lp2:mov bx,n
call fact
mov bx,temp
div bx ; (dx|ax)/bx, quo-ax
mov npr,ax
```

```
xor ax,ax  
mov ax,npr  
mov bx,tepp  
div bx  
mov ncr,ax  
hlt
```

```
fact proc  
    mov cx,00h  
    mov cx,bx  
    dec cx  
    mov ax, bx  
proc_lp:  dec bx  
    mul bx  
    loop proc_lp
```

```
ret  
fact endp  
code ends  
  
end start
```

Sample Input:**N=5****R=4****N-R=1****Sample Output:****nPr=120 (Hexa Decimal 78)****nCr = 5****Manual Verification:****Permutation and Combination Calculator**

Total Amount in a Set (n)	<input type="text" value="5"/>
Amount in each Sub-Set (r)	<input type="text" value="4"/>
<div><div>Calculate </div><div>Clear</div></div>	

Result

Permutations, ${}_nP_r = \frac{5!}{(5-4)!} = 120$

Combinations, ${}_nC_r = \frac{5!}{4! \times (5-4)!} = 5$

Decimal to Hexadecimal converter

From

To

Decimal

Hexadecimal

Enter decimal number

120

10

= Convert

✕ Reset

↔ Swap

Hex number

78

16

Register/ Memory Contents for I/O:

```

-u
0065:0043 F7F3      DIU    BX
0065:0045 A30410     MOV    [1004],AX
0065:0048 33C0      XOR    AX,AX
0065:004A A10410     MOV    AX,[1004]
0065:004D 8B1E0010   MOV    BX,[1000]
0065:0051 F7F3      DIU    BX
0065:0053 A30610     MOV    [1006],AX
0065:0056 F4        HLT
0065:0057 B90000     MOV    CX,0000
0065:005A 8BCB      MOV    CX,BX
0065:005C 49        DEC    CX
0065:005D 8BC3      MOV    AX,BX
0065:005F 4B        DEC    BX
0065:0060 F7E3      MUL    BX
0065:0062 E2FB      LOOP   005F
005F
  
```

Snapshot of the Output:

```
-g 0056
AX=0005 BX=0018 CX=0000 DX=0000 SP=0000 BP=0000 SI=0000 DI=0000
DS=0764 ES=0754 SS=0763 CS=0865 IP=0056  NU UP EI PL ZR NA PE NC
0865:0056 F4          HLT
-d 0764:1000 1006
0764:1000 18 00 01 00 78 00 05          ....X..
```

Result:

The permutation of two number 5 & 4 is calculated to be 78(In hexadecimal).The Combination of two number 5 & 4 is calculated to be 05(In hexadecimal).

Hence, the result of all the operations were obtained and verified manually.