

In one of my posts on C Programming, I showed, how to calculate the [Factorial of a number](#).

In this post we will use that program, and extend it to calculate the Combination nC_r and the Permutation nP_r .

If you haven't read the post on factorial calculation, then you can check it out [here](#).

Now, a combination is defined as:

$${}^nC_r = \frac{n!}{r!(n-r)!}$$

and the Permutation is defined as:

$${}^nP_r = \frac{n!}{(n-r)!}$$

So we will have the user enter their choice, and then prompt the user to enter the r and n and then return the answer based on their choice.

The program is pretty simple and can be written as shown below.

PROGRAM:

```

/*****
****PERMUTATION AND COMBINATION****
*****/
#include<stdio.h>

/*Function that calculates the factorial of a given integer n */
double factorial(int n){
    int i;
    double fact=1;
    for(i=n;i>=1;i--){
        fact=fact*i;
    }
    return fact;
}

int main(){
    int n,r,choice;
    printf("\n\nType 1 for Permutation and \n2 for Combination\n");
    scanf("%d",&choice);
    if(choice==1){
        printf("Enter n and r for nPr\n");
        scanf("%d %d",&n,&r);
        if(r>n){
            printf("Sorry! r should be smaller than n\n");
            return 0;
        }
        printf("The permutation (%dP%d)= %f\n",n,r,factorial(n)/factorial(n-r));
    }else if(choice==2){
        printf("Enter n and r for nCr\n");
        scanf("%d %d",&n,&r);
        if(r>n){
            printf("r should be smaller than n\n");
            return 0;
        }
        printf("The combination (%dC%d)= %f\n",n,r,factorial(n)/(factorial(n-r)*factorial(r)));
    }
    else{
        printf("\nPlease enter a valid choice!\n");
    }
}

```

As one can see, the program is pretty much self-explanatory.

OUTPUT:

Some sample outputs have been attached below:

```
Type 1 for Permutation and  
2 for Combination  
2  
Enter n and r for nCr  
5  
4  
The combination (5C4)= 5.000000
```

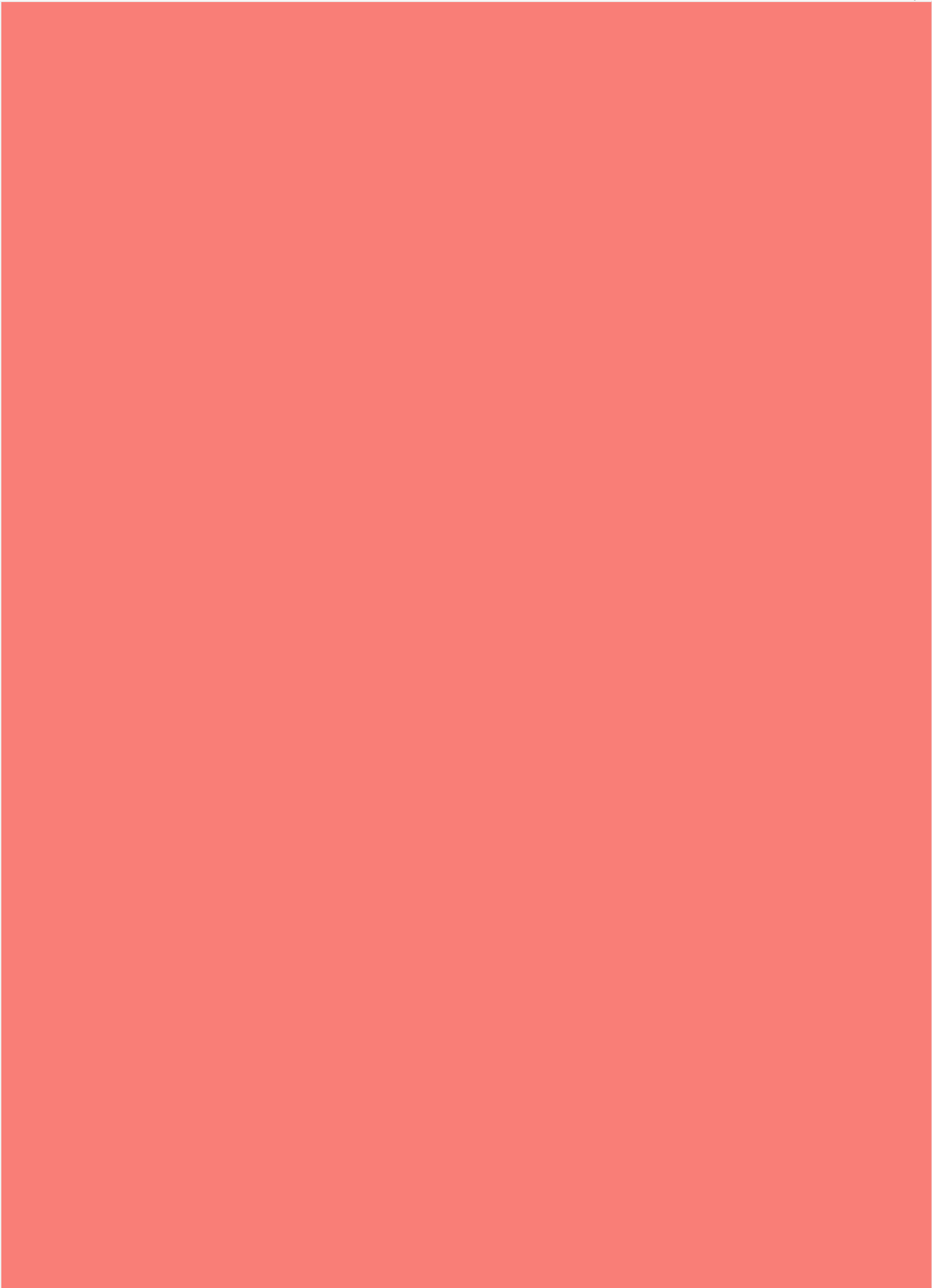
```
Type 1 for Permutation and  
2 for Combination  
1  
Enter n and r for nPr  
6  
4  
The permutation (6P4)= 30.000000  
-----
```

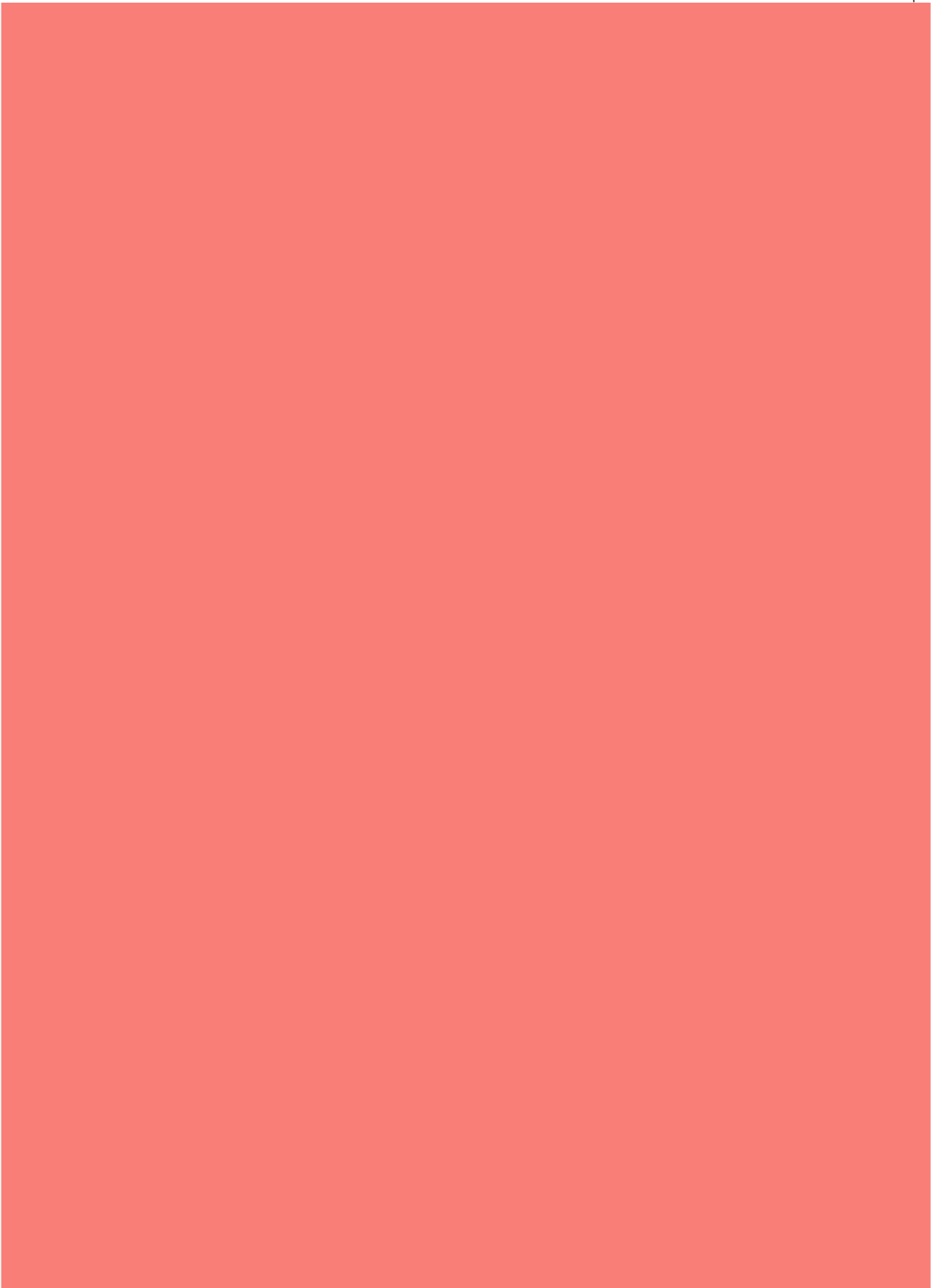


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