

Handshake

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Counting

In combinatorics there are two types of counting problems.

For example, in how many ways can **3** balls of different colors be arranged ? Let us consider 3 balls of colors red (***R***) , blue (***B***) and green (***G***) respectively.

Possible different arrangements of 3 balls are :

- RGB
- RBG
- BRG
- BGR
- GBR
- GRB

Total count is 6 and it is given by **3!**. Or for ***N*** balls it's ***N!***.

Counting number of selections (Combinations)

Let us count the number of ways of selecting ***r*** items out of ***n*** distinguishable items :

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

Counting number of arrangements (Permutations)

Let us count the number of ways of selecting ***r*** items out of ***n*** distinguishable items and then arranging them in some order.:

$${}^nP_r = {}^nC_r * (r!)$$

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

Methods for calculating ***{}^nC_r*** :

```
int nCr(int n,int r){
    int res = 1 ;
    r = min(r,n-r) ; // nCr = nC(n-r)
    for(int i=r;i>=1;i--){
        res = res * n ;
        res /= i ;
        n -- ;
    }
    return res ;
}
```

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```
}  
// this code works properly for small size input
```

we can also use following recurrence to build up the dynamic programming for repeated queries.

$$F_{n,r} = F_{n-1,r-1} + F_{n-1,r}$$

Related challenge for **Counting**

Sherlock and Pairs



Success Rate: 71.84% Max Score: 30 Difficulty:

Solve Challenge