Permutation: (Selection and Arrangement):

The number of permutations of n different things taken r at a time =

nPr = n!/(n-r)!

7P3 = 7!/(7-3)!

= 7!/4!

= 7 x 6 x 5

7P3 = 7x6x5

7 ways x 6 ways x 5 ways  (7P3)

Or

7C3 and  3 ways x 2 ways x 1 way

Permutation = Combination and arrangement

The number of permutations of n different things taken all at a time =nPn

n!/0!

=n!

Important : n different things can be arranged in a straight line in n! ways. (If there is no other condition)

Example : 6 boys and 6 girls are to be arranged in a straight line:

1. No condition : 12!
2. There is a boy at one end and a girl at the other end.

6C1 x 6C1 x 2! X 10!

= 6 x 6 x 2 x 10!

1. All the boys are together:

We will consider all the boys as one unit.

BBBBBB and 6 girls

= 7! ways x 6! (the boys can get rearranged among themselves in 6! ways)

1. No 2 girls are together:

Mistake : This is not the same as boys and girls are alternate.

Mistake : Total-all girls are together.

\*B\*B\*B\*B\*B\*B\*

One Example:

GBGBGBBGBGBG

6! Ways x 7 ways x 6 x 5 x 4 x 3 x 2

= 6! X 7x6x5x4x3x2

Or 6! X 7P6

Or 6! X 7!

1. Boys and Girls are alternate:

6 boys can be arranged in 6! Ways

6 girls can be arranged in 6! Ways

And then the boys and girls can interchange their positions : 2!

6! X 6! X 2!

BGBGBGBGBGBG or

GBGBGBGBGBGB

One very important application of permutation is the formation of numbers using given digits:

Important to note :

1. Please check if repetition of digits is allowed or not
2. 0 as a digit can never occupy the first place from the left of the number
3. Whenever 0 or any other digit behaving like 0 is also a part of the main condition, that part has to be separately calculated.

Example : 4 digit numbers are to be formed using the digits 0 to 6 without repetition.

1. No condition:

6 ways x 6 ways x 5 ways x 4 ways

= 36 x 20 = 720 numbers

1. Odd numbers:

Last digit is 1,3,5 (3 ways)

5 ways x 5 ways x 4 ways x 3 ways (1/3/5)

= 300 numbers

1. Even numbers:

Last digit is 0,2,4,6

1. Last digit is 0

6 ways x 5 ways x 4 ways x 1 way (0)

= 120 numbers

1. Last digit is 2/4/6 (3 ways)

5 ways x 5 ways x 4 ways x 3 ways

= 300 numbers

Even numbers = 120+300 = 420