1. In a class, there are 33 boys and 21 girls. The teacher wants to select 1 boy and 1 girl to represent the class for a function. In how many ways can the teacher make this selection?

Solution Here the teacher is to perform two operations:

(i) Selecting a boy from among the 33 boys and

(ii) Selecting a girl from among 21 girls.

The first of these can be done in 33 ways and second can be performed in 21 ways. By the fundamental principle of counting, the required number of ways is $33 \times 21 = 693$

Arrangements or Permutations

Distinctly ordered sets are called arrangements or permutations.

The number of permutations of n objects taken r at a time is given by:

$nPr = n! / (n – r)!$

where n = number of objects

r = number of positions

E.g:

There are 5 athletes in a race.

a) In how many different orders can the athletes finish the race?

Solution: 5.4.3.2.1 = 5! or 5P5

b) In how many ways 1^{st}, 2^{nd} and 3^{rd} position are possible?

Solution: 5.4.3 = 60 or 5P3

Combination

$nCr = nPr/r! = n! / (n-r)!r!$

Question: In how many ways 2 English books, 5 Hindi books, 2 Mathematics books and 5 Physics books can be arranged on a shelf so that all books of the same subjects are together.

Solution First we take books of a particular subject as one unit. Thus there are

4 units which can be arranged in 4! = 24 ways.

Now in each of arrangements, English books can be arranged in 2! ways, Hindi books in 5! ways, Mathematics books in 2! ways and Physics books in 5! ways. Thus the total number

of ways = 4! × 2! × 5! × 2! × 5! = (4.3.2.1) * (2.1) * (5.4.3.2.1) * (2.1) * (5.4.3.2.1) = 24*2*120*2*120.