Mathematical Foundations for Computer Applications

Circular Arrangements

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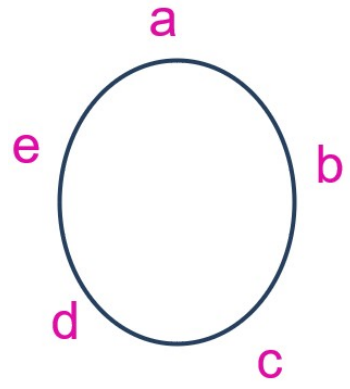
Circular Arrangements

- Circular arrangements are permutations in which objects are arranged in a circle.

- Consider arranging 5 objects (a, b, c, d, e) around a circular table. The arrangements



abcde

bcdea

cdeab

deabc

eabcd

are different in a line, but are **identical** around a circle.

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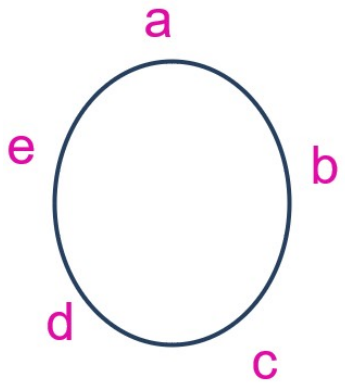
To calculate the number of ways in which n objects can be arranged in a circle, we arbitrarily fix the position of one object, so the remaining (n-1) objects can be arranged as if they were on a straight line in (n-1)! ways.

i.e. the number of arrangements in a circle =(n-1)!



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Eg 1. At a dinner party 6 men and 6 women sit at a round table. In how many ways can they sit if:

a) there are no restrictions

- **(12 – 1)!=11!**

b) men and women alternate

- **(6 – 1)! x 6! = 5! x 6!**

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c) Ted and Carol must sit together

- Solution :**(TC) x other 10 =2! x 10!**

d) Bob, Ted and Carol must sit together

- Solution :**(BTC) x other 9 =3! x 9!**

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e) Neither Bob nor Carol can sit next to Ted.

- **Seat 2 of the other 9 people next to Ted in (9 x 8) ways or $^{9}P_{2}$**
- **Then sit the remaining 9 people (including Bob and Carol) in 9! ways**

•Ways = (9 x 8) x 9! Or $^{9}P_{2}$ x 9!

THANK YOU

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