Answer on Question #50620 – Math – Combinatorics | Number Theory

Question

There are 5 students of department A and 5 of department B. How many arrangements are possible around a circular table where 2 students of department B will not sit beside?

I solve this like this.

Students of department B can sit at the middle of 2 students of department A. So there are 5 empty places between the students of department A. So in this 5 place 5 students of department B can sit in 5! Ways.

And the students of department A can change their position in (5-1)! =4! ways.

So in total it is 5!*4! That's it. My question is we know in circular permutation its (n-1)! So i do (5-1)! for department A students. Why it is not done for department B students. They also in a circle. Please explain

Solution

We know in circular permutation there are (n-1)! different arrangements, but at first we should choose A or B department $(n-1)!$

At second we should count not only circular permutation, but relative position of department A from department B (we have n positions for the first student of department A):

$$n(n-1)! = n!$$

The total number of different arrangements is $n!\,(n-1)!$

Example. When $n = 2$ there is $(2-1)! = 1$ arrangement in circular permutation for department A and $(2-1)! = 1$ arrangement in circular permutation for department B. Nevertheless, relative position of department A from department B gives 2 arrangements. So,

$$2!\,(2-1)! = 2.$$