Counting

Derangement

Learn how to solve this *type* of problems, not just this problem.

Tip: Always write down intermediate steps.

(1) Derive the derangement formula D_n.

(2) Library MAS has m bookshelves for books of m different categories. Each bookshelf has n books. Joe, the librarian, needs to re-arrange these books. Books of the same category still need to be put on the same bookshelf, but their order can change. How many different arrangement plans are there that:

(i) no book is put on the same bookshelf as before?

(ii) no book is put on it original position?

(iii) no book is on the same bookshelf, and no book is at the relative position in the new bookshelf as it was before

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