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Counting

## Derangement



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

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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

(Ref: 2528)