

**Problem 9.3 Deranged Derangements**

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Overview: Print out the  $k$ -th lexicographical derangement of the first  $n$  letters.

Description: MyFace (*MyFace makes the world a better place!*), the fastest growing online social network, is rolling out a new version of their online social networking website interface. As per tradition, every feature must be placed in a different location on the web page than in the previous version for maximum customer confusion. There is a certain number  $n$  of features, up to 26, conveniently labeled A, B, C, D, etc. From these features, there are a finite number of rearrangements, specifically called derangements, that can be made.

Derangements are permutations of a sequence where each letter in the permutation is not in the same location as in the starting sequence. For example, the derangements of ABCD in lexicographical (alphabetical) order are BADC, BCDA, BDAC, CADB, CDAB, CDBA, DABC, DCAB, and DCBA. ACBD is not a derangement because the A is in the same location as the A in ABCD. Your task is to find the  $k$ -th lexicographical (in alphabetical order) derangement of MyFace features. The future look of MyFace depends on you, so be careful!

Time Allocation: 1 second

Input: The first line contains an integer  $n$ , indicating that the starting sequence is the first  $n$  uppercase letters in alphabetical order. The second line contains the integer  $k$ .

Output: The output should contain a single string of  $n$  uppercase letters representing the  $k$ -th lexicographical derangement of the starting sequence. Indexing begins at 1 (the first derangement has  $k$  equal to 1; the second derangement has  $k$  equal to 2, etc.)

The output is to be formatted exactly like the sample output given below.

Assumptions:  $n$  will be an integer between 2 and 26, inclusive.  
 $k$  will be an integer between 1 and 100,000, inclusive.  
There will be at least  $k$  valid derangements for the given  $n$ .  
All input will be valid.

Sample Input #1: 4  
6

Sample Output #1: CDBA

Sample Input #2: 9  
333

Sample Output #2: BAECGHDIF