

# Lab 3B

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## Problem 1: Course Offerings

There are  $N$  types of courses offered by Sheldon's college and a student is allowed to take only  $M$  courses out of them. Missy wonders how many different combinations of courses can be chosen. Sheldon solved this problem with ease. Could you help Missy in doing the same.

### Input Format:

- A single line containing 2 integers  $N$  and  $M$ , where  $N$  is number of courses offered and  $M$  is number of courses that a student can take.

### Constraints:

- $1 \leq n \leq 20$
- $0 \leq m \leq n$

### Output Format:

- A single integer 'ans' (the number of possible combinations).

**Note: For computations, we advise you to use variables of long long data type.**

### Example:

[Copy](#)**Input:**

3 2

**Output:**

3

**Explanation:**

Lets say courses are  $C_1, C_2$  and  $C_3$ . We could choose  $C_1, C_2$  or  $C_2, C_3$  or  $C_1, C_3$ .

**Input:**

16 5

**Output:**

4368

## Problem 2: Beautiful Permutation

Sam, a researcher at IIIT, has discovered an intriguing class of permutations he calls "Beautiful Permutation". A permutation of integers is considered "beautiful" if it satisfies following specific conditions:

0. **Distinct Numbers Condition:** Firstly a permutation of  $n$  contains  $n$  distinct integers from 0 to  $n-1$ .

1. **Adjacent Difference Condition:** There are no two adjacent elements in the permutation whose absolute difference is exactly 1.

2. **Sum Condition:** For every  $i$ -th element from the start and the  $i$ -th element from the end of the permutation, their sum must be less than a given number  $K$ .

Your task is to write a function that checks if a given permutation meets these conditions and determines whether it is a "beautiful" number or not

### Input Format:

- The first line contains two integers  $N$  and  $K$ :
  - $N$  is the number of integers in the permutation.
  - $K$  is the maximum allowable sum for the  $i$ -th element from the start and the  $i$ -th element from the end.
- The second line contains  $N$  integers, which represent the permutation of numbers.

### Output Format:

- Output "YES" if the permutation is beautiful according to the conditions.
- Output "NO" if the permutation is not beautiful according to the conditions.

### Constraints:

- The permutation will contain exactly  $N$  integers, and each integer will be distinct.
- $N$  is non-negative, meaning the permutation may be empty
- each element is in the range  $(0 - 1e5)$

## Example:

**Input:**

5 10  
3 0 2 4 1

**Output:**

YES

## Explanation:

1. **Adjacent Difference Condition** : Check adjacent pairs:

- $|3 - 0| = 3$
- $|0 - 2| = 2$
- $|2 - 4| = 2$
- $|4 - 1| = 3$

None of these differences are 1, so the condition is satisfied.

2. **Sum Condition**: Check pairs of elements from the start and end:

- $3 \text{ (first)} + 1 \text{ (last)} = 4 < 10$
- $0 \text{ (second)} + 5 = 4 \text{ (fourth)} = 4 < 10$
- 2 (middle element) does not have a pair

All sums are less than K, so this condition is satisfied.

Thus, the permutation meets both conditions, so the output is "YES".

**Input:**

5 10  
4 1 3 5 100

**Output:**

NO

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## Problem 3: Finding Leaders

A leader is an element that is greater than all the elements to its right side. The rightmost

element is always a leader.

Now given an array, Bob wants to list down all the leaders of the array. Please help him do so.

### Input Format:

First line contains a single integer  $n$ , the number of elements in the array. Second line contains  $n$  space separated integers

### Output Format:

Output a single line containing the leaders of the array. Please do so in left to right order.

### Constraints:

- $1 \leq n \leq 100$
- $1 \leq a_i \leq 100$  for  $i$  in range from 1 to  $n$

### Examples:

6	Copy
Input: 16 17 4 3 5 2	
Output: 17 5 2	

5	Copy
Input: 1 2 3 4 5	
Output: 5	

## Submission Guidelines

- Do not rename any files given in the handout. Only write the code in the specified C files in the respective directories.