Badge Progress (Details)

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Bead Ornaments ⚑

by idlecool

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There are N colors of beads. You have b_i beads of the ith color. You want to make an ornament by joining all the beads together. You create the ornament by using the following algorithm:

- Step #1 Arrange all the beads in any order such that beads of the same color are placed together.

- Step #2 The ornament initially consists of only the first bead from the arrangement.

- Step #3 For each subsequent bead in order, join it to a bead of the same color in the ornament. If there is no bead of the same color, it can be joined to any bead in the ornament.

All beads are distinct, even if they have the same color. How many different ornaments can be formed by following the above algorithm? Two ornaments are considered different if two beads are joined by a thread in one configuration, but not in the other.

Update/clarification

Think of the bead formation as a tree and not as a straight line. Any number of beads can be connected to a bead.

Input Format

The first line contains the number of test cases T. T test cases follow. Each test case contains N on the first line - the number of colors of beads. The next line contains N integers, where the ith integer b_i denotes the number of beads of the ith color.

Constraints

- $1 <= T <= 20$

- $1 <= N <= 10$

- $1 <= b_i <= 30$

Output Format

Output T lines, one for each test case. All answers should be output modulo 1000000007.

Sample Input

```
5
2
2 1
2
2 2
1
4
2
3 1
5
1 1 1 1 1
```

Sample Output

```
2
4
16
9
125
```

Explanation

Testcase 1:

Let us label the beads A1,A2 and B1. Initially, they can be arranged in 4 ways - "A1,A2,B1", "A2,A1,B1", "B1,A1,A2", and "B1,A2,A1".

For each of the first two arrangements, an ornament can be formed in 2 ways (A1-A2-B1 or B1-A1-A2 from the first one and A2-A1-B1 or B1-A2-A1 from the second one).

For each of the last two arrangements, an ornament can be formed in 1 way.

However, of the total 6 possible ornaments, there are only 2 unique ones : A1 - A2 - B1, and A2 - A1 - B1.

Testcase 2:

The possible unique ornaments are A1 - A2 - B1 - B2, A1 - A2 - B2 - B1, A2 - A1 - B1 - B2, and A2 - A1 - B2 - B1.

Testcase 3:

For the third test-case, it might be easier to see there are only 2 types of graphs on 4 vertices: the path or the star. It's not hard to see that there are 12 paths and 4 stars (explanation courtesy: zlangley)

Testcase 5:

For the fifth test-case, a lot of people claimed that the total number of possible ways is $5!/2 = 60$. But that is wrong. The correct answer is 125. Here's the hint: Once again, you've to think of it as a tree.

So one possible arrangement can be:

A is a root node and has two edges (A-B and A-C). Now, think of B as a sub-root node with two edges (B-D and B-E). Similarly, you can figure out the other possible bead arrangements. This will lead you to the correct answer.

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Submissions:513

Max Score:70
Difficulty: Advanced

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```java
1  import java.io.*;
2  import java.util.*;
3  import java.text.*;
4  import java.math.*;
5  import java.util.regex.*;
6
7  public class Solution {
8
9      public static void main(String[] args) {
10         /* Enter your code here. Read input from STDIN. Print output to STDOUT. Your class should be named Solution. */
11     }
12 }
```

Line: 1 Col: 1

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