

Power Swapper

Problem

In a parallel universe, people are crazy about using numbers that are powers of two, and they have defined an exciting sorting strategy for permutations of the numbers from 1 to 2^N . They have defined a swapping operation in the following way:

- A range of numbers to be swapped is valid if and only if it is a range of adjacent numbers of size 2^k , and its starting position (position of the first element in the range) is a multiple of 2^k (where positions are 0-indexed).
- A valid swap operation of *size-k* is defined by swapping two distinct, valid ranges of numbers, each of size 2^k .

To sort the given permutation, you are allowed to use at most one swap operation of each size k , for k in $[0, N)$. Also, note that swapping a range with itself is not allowed.

For example, given the permutation $[3, 6, 1, 2, 7, 8, 5, 4]$ (a permutation of the numbers from 1 to 2^3), the permutation can be sorted as follows:

- $[3, 6, 1, 2, 7, 8, 5, 4]$: make a *size-2* swap of the ranges $[3, 6, 1, 2]$ and $[7, 8, 5, 4]$.
- $[7, 8, 5, 4, 3, 6, 1, 2]$: make a *size-0* swap of $[5]$ and $[3]$.
- $[7, 8, 3, 4, 5, 6, 1, 2]$: make a *size-1* swap of $[7, 8]$ and $[1, 2]$.
- $[1, 2, 3, 4, 5, 6, 7, 8]$: done.

The previous steps used every swap size (0, 1, and 2) at most once. Also, notice that all the swaps were valid because both ranges for each size k started at indices that were multiples of 2^k .

Count how many ways there are to sort the given permutation by using the rules above. A way is an ordered sequence of swaps, and two ways are the same only if the sequences are identical.

Input

The first line of the input gives the number of test cases, T . T test cases follow. The first line of each test case contains a single integer N . The following line contains 2^N space-separated integers: a permutation of the numbers 1, 2, ..., 2^N .

Output

For each test case, output one line containing "Case #x: y", where x is the test case number (starting from 1) and y is the number of ways to sort the given permutation using the rules above.

Limits

Memory limit: 1 GB.

$1 \leq T \leq 200$.

Small dataset

Time limit: 60 seconds.

$1 \leq N \leq 4$.

Large dataset

Time limit: 120 seconds.

$1 \leq N \leq 12$.

Sample

Sample Input

```
4
1
2 1
2
1 4 3 2
3
7 8 5 6 1 2 4 3
2
4 3 2 1
```

Sample Output

```
Case #1: 1
Case #2: 3
Case #3: 6
Case #4: 0
```