

Contest Duration: 2025-07-05(Sat) 22:00 (<http://www.timeanddate.com/worldclock/fixedtime.html?iso=20250705T2100&p1=248>) - 2025-07-05(Sat) 23:40 (<http://www.timeanddate.com/worldclock/fixedtime.html?iso=20250705T2240&p1=248>) (local time) (100 minutes)

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## E - Reverse $2^i$

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Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 450 points

### Problem Statement

You are given a permutation  $P = (P_0, P_1, \dots, P_{2^N-1})$  of  $(1, 2, 3, \dots, 2^N)$ .

You can perform the following operation any number of times (possibly zero):

- Choose non-negative integers  $a, b$  satisfying  $0 \leq a \times 2^b < (a+1) \times 2^b \leq 2^N$ , and reverse  $P_{a \times 2^b}, P_{a \times 2^b+1}, \dots, P_{(a+1) \times 2^b-1}$ . Here, reversing  $P_{a \times 2^b}, P_{a \times 2^b+1}, \dots, P_{(a+1) \times 2^b-1}$  means simultaneously replacing  $P_{a \times 2^b}, P_{a \times 2^b+1}, \dots, P_{(a+1) \times 2^b-1}$  with  $P_{(a+1) \times 2^b-1}, P_{(a+1) \times 2^b-2}, \dots, P_{a \times 2^b}$ .

Find the lexicographically smallest permutation  $P$  that can be obtained by repeating the operation.

You are given  $T$  test cases, so find the answer for each.

### Constraints

- $1 \leq T \leq 10^5$
- $1 \leq N \leq 18$
- $P$  is a permutation of  $(1, 2, 3, \dots, 2^N)$ .
- For each input file, the sum of  $2^N$  over all test cases is at most  $3 \times 10^5$ .
- All input values are integers.

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# Input

The input is given from standard input in the following format:

```
T
case1
case2
⋮
caseT
```

case<sub>*i*</sub> represents the *i*-th test case and is given in the following format:

```
N
P0 P1 ... P2N-1
```

# Output

Output *T* lines. The *i*-th line ( $1 \leq i \leq T$ ) should contain the answer to the *i*-th test case.

## Sample Input 1

Copy

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

Copy

## Sample Output 1

Copy

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

Copy

In the first test case, when no operation is performed on  $P$ ,  $P = (1, 2)$ . This is the lexicographically smallest permutation. Thus, the answer is  $(1, 2)$ .

In the second test case, when we perform the operation with  $a = 1, b = 1$ ,  $P$  becomes  $(1, 3, 2, 4)$ . No matter how many operations we perform on  $P$ , we cannot obtain a permutation lexicographically smaller than  $(1, 3, 2, 4)$ . Thus, the answer is  $(1, 3, 2, 4)$ .

In the third test case, by performing operations in the following order, we can obtain  $P = (1, 4, 2, 3)$ :

- Perform the operation with  $a = 0, b = 1$ .  $P$  becomes  $(3, 2, 4, 1)$ .
- Perform the operation with  $a = 0, b = 2$ .  $P$  becomes  $(1, 4, 2, 3)$ .

No matter how many operations we perform on  $P$ , we cannot obtain a permutation lexicographically smaller than  $(1, 4, 2, 3)$ . Thus, the answer is  $(1, 4, 2, 3)$ .

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