# Problem D. Dichromatic Trees

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| Input file: | dichromatic.in |
| Output file: | dichromatic.out |
| Time limit: | 20 seconds |
| Memory limit: | 512 megabytes |

Dichromatic trees, currently better known as red-black trees, is a data structure for ordered set originally invented by Rudolf Bayer in 1972 and later improved by Leonidas Guibas and Robert Sedgewick.

Red-black tree is a binary rooted tree where each vertex is colored either red or black. Each vertex can have a left child and a right child. The following conditions are satisfied:

- Children of the red vertex are black.
- Consider path from the root to any position where the child of some vertex is missing. Any such path must contain the same number of black vertices. This number is called the *black height* of the tree.

Given $n$ and $h$ find the number of red-black trees with $n$ vertices that have black height at most $h$. Note that trees that have the same structure but differ by vertex coloring are considered different. Output the answer modulo 258 280 327.

## Input

The input file contains $k$ test cases. All test cases in one input file share the same $h$.

The first line of the input file contains two integers: $k$ and $h$ ($1 \le k \le 131\,072$, $0 \le h \le 16$). The second line contains $k$ integers: $n_1, n_2, \ldots, n_k$ ($1 \le n_i \le 131\,072$).

## Output

Output $k$ numbers, for each $i$ from 1 to $k$ output the number of red-black trees with $n_i$ vertices that have black height at most $h$.

## Examples

| dichromatic.in | dichromatic.out |
|---|---|
| 10 2<br>1 2 3 4 5 6 7 8 9 10 | 2 2 3 8 14 20 34 56 90 164 |