Astral permutations

This time we get to help little Damian to pursue his passions – astronomy and big numbers. Damian has spotted n planets on the night sky. Astral trajectory of planet i can be described by number a_i. Our little boy will observe the sky for n days, each planet will be observed exactly once, and each day exactly one planet will be observe. Damian knows that observing planet i on day j would reward him with $(a_i)^j \pmod{10^9 + 9}$ points of joy. Help your friend and select a permutation of planets to observer each day in order to maximize his joy.

Conditions

- $1 \leq n \leq 20$
- $1 \leq a_i < 10^9 + 9$

Input

n
$a_1, ..., a_n$

Output

The first line of output should contain the maximum joy he can achieve.

Scoring

Subtask	Constraints	Points
1	$n < 10$	40
2	no additional constraints	60

Example

Input	Output
5 2 3 4 5 6	8476
3 917234537 118245325 642336341	2349922315
6 2 2 2 2 2 2	126