



Romanian Master of Informatics

2nd Edition, Bucharest, 16th -19th of October 2014

Hypercube

The N -hypercube is an directed acyclical graph with 2^N nodes tagged with numbers from 0 to $2^N - 1$ so that there is an arc from node x to node y if and only if $x < y$ and a non-negative integer p exists such that $x \wedge y = 2^p$ ($\wedge$ operator stands for bitwise xor) .

Task

Given N , M and K , three positive integers, you are to compute:

- The minimum label i of a node belonging to the N -hypercube that has an arc from i to M .
- The minimum label j of a node belonging to the N -hypercube that has an arc from M to j .
- The number of paths of length K (having K arcs) found in the N -hypercube. Because this number may be quite large, you are to compute the number **modulo 100003**.

Input data

The first line of the input file `hypercube.in` contains three numbers N , M and K , each separated by one space.

Output data

The first line of the output file `hypercube.out` must contain a single number, the answer for task a. The second line must contain a single number, the answer for task b. The third line must contain a single number, the answer for task c.

Limits and constraints

- $2 \leq K \leq N \leq 100,000$
- $1 \leq M \leq 100,000,000$
- For any given number M , there is at least one arc leaving node M and one arc reaching node M .
- The answer for task c must be computed **modulo 100003**.
- $\wedge$ operator stands for bitwise xor.
- Solving task a correctly will grant you 10% of the total problem score.
- Solving task b correctly will grant you 10% of the total problem score.
- Solving task c correctly will grant you 80% of the total problem score.
- Time limit: 0.2 seconds
- Memory limit: 128 MB



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Example

hypercube.in	hypercube.out
4 3 2	2 7 48