

E2. Numerical Sequence (hard version)

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

The only difference between the easy and the hard versions is the maximum value of k .

You are given an *infinite* sequence of form "112123123412345..." which consist of blocks of all consecutive positive integers written one after another. The first block consists of all numbers from 1 to 1, the second one — from 1 to 2, the third one — from 1 to 3, ..., the i -th block consists of all numbers from 1 to i .

So the first 56 elements of the sequence are "11212312341234512345612345671234567812345678912345678910". Elements of the sequence are numbered from one. For example, the 1-st element of the sequence is 1, the 3-rd element of the sequence is 2, the 20-th element of the sequence is 5, the 38-th element is 2, the 56-th element of the sequence is 0.

Your task is to answer q independent queries. In the i -th query you are given one integer k_i . Calculate the digit at the position k_i of the sequence.

Input

The first line of the input contains one integer q ($1 \leq q \leq 500$) — the number of queries.

The i -th of the following q lines contains one integer k_i ($1 \leq k_i \leq 10^{18}$) — the description of the corresponding query.

Output

Print q lines. In the i -th line print one digit x_i ($0 \leq x_i \leq 9$) — the answer to the query i , i.e. x_i should be equal to the element at the position k_i of the sequence.

Examples

input	Copy
5 1 3 20 38 56	
output	Copy
1 2 5 2 0	

input	Copy
4 2132 506 9999999999999999 100000000000000000	
output	Copy
8 2 4 1	

Note

Answers on queries from the first example are described in the problem statement.

Codeforces Round #587 (Div. 3)

Finished

Practice



→ Virtual participation

Virtual contest is a way to take part in past contest, as close as possible to participation on time. It is supported only ICPC mode for virtual contests. If you've seen these problems, a virtual contest is not for you - solve these problems in the archive. If you just want to solve some problem from a contest, a virtual contest is not for you - solve this problem in the archive. Never use someone else's code, read the tutorials or communicate with other person during a virtual contest.

Start virtual contest

→ Practice

You are registered for practice. You can solve problems unofficially. Results can be found in the contest status and in the bottom of standings.

→ Clone Contest to Mashup

You can clone this contest to a mashup.

Clone Contest

→ Submit?

Language: GNU G++11 5.1.0

Choose file: 选择文件 未选择任何文件

Submit

→ Problem tags

binary search math

No tag edit access

→ Contest materials

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- Announcement #2 (ru) ×
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