



## D2. Removal of a Sequence (Hard Version)

time limit per test: 2 seconds

memory limit per test: 512 megabytes



This is the hard version of the problem. The difference between the versions is the constraint on  $x$ ; in this version,  $x \leq 10^{12}$ .

Polycarp has a sequence of all natural numbers from 1 to  $10^{12}$ . He decides to modify this sequence by performing the following action  $x$  times:

- Simultaneously remove all numbers at positions  $y, 2 \cdot y, 3 \cdot y, \dots, m \cdot y \leq n$ , where  $n$  is the length of the current sequence.

After that, Polycarp wants to find the  $k$ -th number in the remaining sequence or determine that the length of the resulting sequence is less than  $k$ .

Help Polycarp solve this problem!

Consider an example. Let  $x = 2, y = 3, k = 5$ , then:

### Educational Codeforces Round 184 (Rated for Div. 2)

比赛进行中

00:18:09

Contestant



### → 提交?

语言: [GNU G++20 13.2 \(64 bit, v\)](#)

选择文件: [选择文件](#) 未选择文件

提交

### → 提交历史

#	提交时间	判题状态
<a href="#">348973172</a>	Nov/14/2025 19:06	Time limit exceeded on test 1

1 2 3 4 5 6 7 8 9 10 11 12 ...

1 2 ~~3~~ 4 5 ~~6~~ 7 8 ~~9~~ 10 11 ~~12~~ ...

1 2 ~~3~~ ~~4~~ 5 ~~6~~ 7 ~~8~~ ~~9~~ 10 11 ~~12~~ ...

The numbers crossed out with a red line were removed after the first operation, and the numbers crossed out with a blue line were removed after the second operation. Thus, the number at position  $k = 5$  is the number 10.

DeepL 翻译



\*\*这是问题的困难版本。两个版本的区别在于对  $x$  的限制；在这个版本中， $x \leq 10^{12}$  \*\*。

波利卡普有一个从 1 到  $10^{12}$  的所有自然数序列。他决定通过执行以下操作  $x$  次来修改这个序列：

- 同时删除位于  $y$ ， $2 \cdot y$ ， $3 \cdot y$ ， $\dots$ ， $m \cdot y \leq n$  位置的所有数字，其中  $n$  是当前序列的长度。

之后，波利卡普想要找出剩余序列中  $k$  /th 的数字，或者确定结果序列的长度小于  $k$ 。

帮助波利卡普解决这个问题！

请看一个例子。设  $x = 2$ ， $y = 3$ ， $k = 5$ ，那么：

1 2 3 4 5 6 7 8 9 10 11 12 ...

1 2 ~~3~~ 4 5 ~~6~~ 7 8 ~~9~~ 10 11 ~~12~~ ...

1 2 ~~3~~ ~~4~~ 5 ~~6~~ 7 ~~8~~ ~~9~~ 10 11 ~~12~~ ...

第一次操作后删除了用红线划出的数字，第二次操作后删除了用蓝线划出的数字。因此，位置  $k = 5$  的数字就是 10。



## Input

Each test contains multiple test cases. The first line contains the number of test cases  $t$  ( $1 \leq t \leq 10$ ). The description of the test cases follows.

The only line of each test case contains three integers  $x, y, k$  ( $1 \leq x, y, k \leq 10^{12}$ ).

DeepL 翻译



## 输入

每个测试包含多个测试用例。第一行包含测试用例的数量  $t$  ( $1 \leq t \leq 10$ )。测试用例说明如下。

每个测试用例的唯一一行包含三个整数  $x, y, k$  ( $1 \leq x, y, k \leq 10^{12}$ ) ( $1 \leq x, y, k \leq 10^{12}$ ).



## Output

For each test case, output a positive integer that is at the  $k$ -th position in the resulting sequence, or  $-1$  if the length of the resulting sequence is less than  $k$ .

DeepL 翻译



## 输出

针对每个测试用例，输出结果序列中位于  $k$  th位置的正整数，如果结果序列的长度小于  $k$ ，则输出  $-1$ 。

## Example

### input

Copy

```
6
2 3 5
2 5 1
20 2 1000000000000
175 10 28
1000000000 998244353 1999999999
1 1 1
```

### output

Copy

```
10
1
-1
2339030304
4672518823
-1
```

GNU G++20 13.2 (64 bit, winlibs) ▼



1

▶ 自定义测试数据(自动保存)



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