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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

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#	提交时间	判题状态
348973172	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 , $2 \cdot y$, $3 \cdot y$, ..., $m \cdot y \leq n$ 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 ($1 \leq x, y, k \leq 10^{12}$) ($1 \leq x, y, k \leq 10^{12}$)。

M↓ Copy Check

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)



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► 自定义测试数据(自动保存)



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