

Forever Young

Time limit: 1 second

My birthday is coming up. Alas, I am getting old and would like to feel young again. Fortunately, I have come up with an excellent way of feeling younger: if I write my age as a number in an appropriately chosen base b , then it appears to be smaller. For instance, suppose my age in base 10 is 32. Written in base 16 it is only 20!

However, I cannot choose an arbitrary base when doing this. If my age written in base b contains digits other than 0 to 9, then it will be obvious that I am cheating, which defeats the purpose. In addition, if my age written in base b is too small then it would again be obvious that I am cheating.

Given my age y and a lower bound l on how small I want my age to appear, find the largest base b such that y written in base b contains only decimal digits, and is at least l when interpreted as a number in base 10.

Input

The input consists of a single line containing two base 10 integers y ($10 \leq y \leq 10^{18}$ — yes, I am very old) and l ($10 \leq l \leq y$).

Output

Display the largest base b as described above.

Sample Input 1

Sample Output 1

32 20	16
-------	----

Sample Input 2

Sample Output 2

2016 100	42
----------	----

Submission guidelines: You need to submit three files (you don't need to zip them).

- (1) Write one page document (upload pdf version of the doc) describing your algorithm or pseudocode. You should describe ***why and how*** your algorithm design should be ***efficient*** (the corresponding program should run fast).
- (2) One program file – actual C/C++, Java, or Python code file.
- (3) A screenshot of your program execution.

Make sure your code finishes its execution within 1 seconds for the largest possible input. You will only obtain a maximum of 80% of the score of your program runs slower than 1 seconds.

Hints are provided below. If you want to challenge yourself, try to solve the problem without reading hints first.

Hints: The problem is an application of **Binary Search technique**.

Assume that the input is 32 20. This means that the given age is $y = 32$ and the new age must be at least $l = 20$ in the base b (this is the magical base we want to find out) when interpreted as number in base 10. We need to find the largest b as the answer.

Now, the given age 32 is in base 10. The same age (which is 32 now) would be 10 in base 32, right? Should the magical base b be then in between 10 and 32? The answer **16 is in between 10 and 32**, isn't it?