16/11/2017 HackerRank

















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Square-Ten Tree



Problem

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The square-ten tree decomposition of an array is defined as follows:

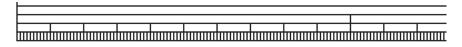
- The lowest (0^{th}) level of the square-ten tree consists of single array elements in their natural order.
- The k^{th} level (starting from 1) of the square-ten tree consists of subsequent array subsegments of length $10^{2^{k-1}}$ in their natural order. Thus, the 1^{st} level contains subsegments of length $10^{2^{k-1}} = 100$, the 3^{rd} level contains subsegments of length $10^{2^{3-1}} = 1000$, the 3^{rd} level contains subsegments of length $10^{2^{3-1}} = 10000$, etc.

In other words, every k^{th} level (for every $k \ge 1$) of square-ten tree consists of array subsegments indexed as:

$$\left[1,\ 10^{2^{k-1}}\right], \left[10^{2^{k-1}}+1,\ 2\cdot 10^{2^{k-1}}\right], \ldots, \left[i\cdot 10^{2^{k-1}}+1,\ (i+1)\cdot 10^{2^{k-1}}\right], \ldots$$

Level 0 consists of array subsegments indexed as $[1, 1], [2, 2], \ldots, [i, i], \ldots$

The image below depicts the bottom-left corner (i.e., the first 128 array elements) of the table representing a square-ten tree. The levels are numbered from bottom to top:



Task

Given the borders of array subsegment [L,R], find its decomposition into a minimal number of nodes of a square-ten tree. In other words, you must find a subsegment sequence $[l_1,r_1],[l_2,r_2],\ldots,[l_m,r_m]$ such as $l_{i+1}=r_i+1$ for every $1 \le i < m$, $l_1=L$, $r_m=R$, where every $[l_i,r_i]$ belongs to any of the square-ten tree levels and m is minimal amongst all such variants.

Input Format

The first line contains a single integer denoting L. The second line contains a single integer denoting R.

Constraints

- $1 \le L \le R \le 10^{10^6}$
- The numbers in input do not contain leading zeroes.

Output Format

As soon as array indices are too large, you should find a sequence of m square-ten tree level numbers, s_1, s_2, \ldots, s_m , meaning that subsegment $[l_i, r_i]$ belongs to the s_i^{th} level of the square-ten tree.

Print this sequence in the following compressed format:

- ullet On the first line, print the value of $oldsymbol{n}$ (i.e., the compressed sequence block count).
- For each of the n subsequent lines, print 2 space-separated integers, t_i and c_i ($t_i \ge 0$, $c_i \ge 1$), meaning that the number t_i appears consequently c_i times in sequence s. Blocks should be listed in the order they appear in the sequence. In other words, $s_1, s_2, \ldots, s_{c_1}$ should be equal to t_1 , $s_{c_1+1}, s_{c_1+2}, \ldots, s_{c_1+c_2}$ should be equal to t_2 , etc.

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   Thus \sum_{i=1}^n c_i = m must be true and t_i \neq t_{i+1} must be true for every 1 \leq i < n. All numbers should be printed without leading zeroes.
   Sample Input 0
      10
```

Sample Output 0

1 1 1

Explanation 0

Segment [1, 10] belongs to level 1 of the square-ten tree.

```
f ⊌ in
Submissions: 567
Max Score:60
Difficulty: Hard
Rate This Challenge:
More
```

Run Code

Submit Code

```
Current Buffer (saved locally, editable) & 🗘
                                                                                          C++
                                                                                                                            Ö
1 ▼ #include <cmath>
2 #include <cstdio>
3
   #include <vector>
   #include <iostream>
   #include <algorithm>
   using namespace std;
6
7
8
9 ▼ int main() {
10 ▼
        /* Enter your code here. Read input from STDIN. Print output to STDOUT */
11
12
   }
13
                                                                                                                   Line: 1 Col: 1
```

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1 Upload Code as File

Test against custom input