

All Tracks > Basic Programming > Recursion > > Problem

GCD Strings

Attempted by: 1461 / Accuracy: 48% / Maximum Score: 20 / ★★☆☆ 22 Votes

Tag(s): Easy, Math, Recursion



PROBLEM

EDITORIAL

MY SUBMISSIONS

Let P[0...N-1] be a binary string of length N. Then let's define $S^{\infty}(P)$ as an infinite string with $S^{\infty}[i] = P[i\%N] \ \forall \ i \geq 0$ (informally, $S^{\infty}(P)$ is the concatenation of P with itself an infinite number of times).

Define the **GCD-string** of two integers a, b, with $a \ge b$ to be a binary string of length a that satisfies the following:

- g(a,b) = 100...000 (1 followed by a-1 zeros) if a is divisible by b
- g(a,b) = First a characters of $S^{\infty}(g(b,a \ mod \ b))$ otherwise

We can define F(a,b) to be the value of the integer represented by the binary string g(a,b) in base-2. Given \mathcal{T} pairs of integers (x,y), compute $F(x,y) \mod 10^9 + 7$ for each pair.

Input Format:

The first line will contain the number of test cases T.

Each test case can be described with a single line containing two integers x, y.

Output Format:

Output T numbers, the answers to each problem.

Constraints

For all subtasks:

$$T \leq 10^4$$

$$1 \le y \le x$$

File 1 (70 pts)

File 2 (30 pts)

$$x < 10^9$$

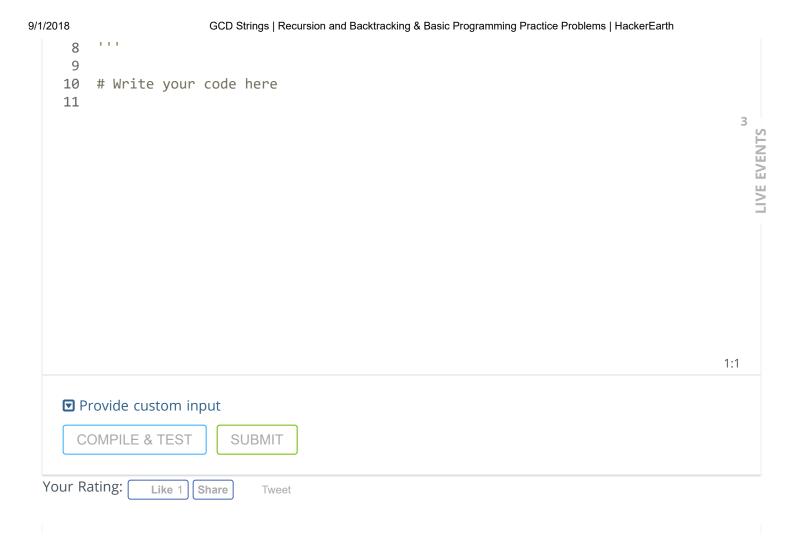
SAMPLE INPUT

September 1997

```
5
     3 1
     3 2
                                                                                                                    3
     5 2
     10 4
     100 3
     SAMPLE OUTPUT
     4
     5
     21
     546
     986497880
Explanation
The base 2 results for the first four samples are as follows
    1. 100
    2. 101
    3. 10101
    4. 1000100010
Time Limit:
                      2.0 sec(s) for each input file.
                      256 MB
Memory Limit:
Source Limit:
                      1024 KB
Marking Scheme:
                      Marks are awarded when all the testcases pass.
Allowed Languages: C, C++, C++14, Clojure, C#, D, Erlang, F#, Go, Groovy, Haskell, Java, Java 8, JavaScript(Rhino),
                      JavaScript(Node.js), Julia, Kotlin, Lisp, Lisp (SBCL), Lua, Objective-C, OCaml, Octave, Pascal, Perl, PHP,
                      Python, Python 3, R(RScript), Racket, Ruby, Rust, Scala, Swift, Swift-4.1, Visual Basic
```

CODE EDITOR

```
Enter your code or Upload your code as file.
                                               Save
                                                       Python 3 (python 3.5.2)
1
 2
    # Sample code to perform I/O:
 3
                                  # Reading input from STDIN
# Writing output to STDOUT
4
   name = input()
    print('Hi, %s.' % name)
 5
 6
    # Warning: Printing unwanted or ill-formatted data to output will cause the test
```



PROGRAMMERS WHO SOLVED THIS PROBLEM ALSO SOLVED

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