Task 1. Lychrel Threads

Available marks: 12

Consider this iteration sequence obtained from a starting natural number p_0:

$$p_{i+1} = p_i + \text{reverse}\,(p_i)$$

where

$\text{reverse}\,(n)$ is the number formed by reversing the decimal digits of n.

For most numbers after a few iterations p_i becomes a palindrome, that is, reads the same forward and backward when expressed in decimal notation. For example, the sequence starting with 69 goes like this:

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69,  165 (= 69 + 96),  726 (= 165 + 561), 1353 (= 726 + 627), 4884 (= 1353 + 3531)
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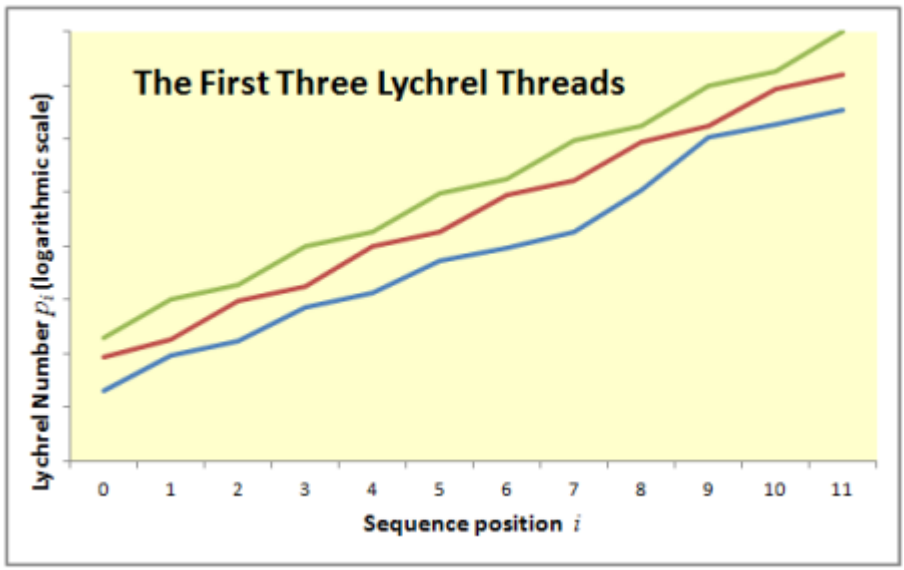
It stops after 4 iterations because 4884 is a palindrome.

However for some numbers the iteration sequence is thought to be infinite, that is, never produces a palindrome, though whether this is true remains a conjecture. Such values are called *Lychrel numbers*, a term coined by Wade VanLandingham as an approximate anagram of his girlfriend's name. For the purposes of this task, a Lychrel number is defined as one that has not produced a palindrome after 25 iterations.

Every element in the iteration sequence of a Lychrel number is also a Lychrel number. A *Lychrel thread* is any iteration sequence that starts with the smallest possible value, called the seed. A seed can never occur in any other sequence besides its own. Although there are a couple of dozen Lychrel numbers less than 2000, there are only three Lychrel threads.



The Task

Write a program that can display the first 12 elements of the three Lychrel threads that start with a Lychrel number less than 2000. You will probably need to use high-precision arithmetic to discriminate between Lychrels and non-Lychrels, as 25 iterations will produce numbers with up to 48 bits. Double-precision floating point arithmetic is sufficient.

Assessment

There is no test data for this task. When you believe you have completed it show the judges your output.

Marking Scheme

11 marks for showing the three threads, and one mark for guessing VanLandingham's girlfriend's name (write it down so other teams don't hear).

Reference: Lychrel number (Wikipedia), and p196.org.