Solving Problems[1] in CLOJURE

Objectives

- Learn how to write idiomatic CLOJURE code by solving some Project Euler problems[2].

Instructions

For each of these problems, spend a few minutes with a classmate to outline a solution. Every few minutes, the instructor will give out a hint, and eventually show you the solution.

Problems

Problem 1 — Multiples of 3 and 5. If we list all the natural numbers below 10 that are multiples of 3 or 5, we get 3, 5, 6 and 9. The sum of these multiples is 23.

Find the sum of all the multiples of 3 or 5 below 2000.

Problem 14 — Longest Collatz Sequence The following iterative sequence is defined for the set of positive integers:

$$n \mapsto \begin{cases} n/2 & n \text{ is even} \\ 3n+1 & n \text{ is odd} \end{cases}$$

Using the rule above and starting with 13, we generate the following sequence:

$$13 \mapsto 40 \mapsto 20 \mapsto 10 \mapsto 5 \mapsto 16 \mapsto 8 \mapsto 4 \mapsto 2 \mapsto 1$$

It can be seen that this sequence (starting at 13 and finishing at 1) contains 10 terms. Although it has not been proved yet (Collatz Problem), it is thought that all starting numbers finish at 1.

Which starting number, under two million, produces the longest chain?

*Addendum: sometimes a chain coalesces into another one. Do **not** recompute any Collatz number that has already been computed!*

Problem 40 — Champernowne's constant An irrational decimal fraction is created by concatenating the positive integers:

$$0.12345678910111213141516171819202 1\ldots$$

It can be seen that the 12th digit of the fractional part is 1.

If d_n represents the nth digit of the fractional part, find the value of the following expression.

$$d_2 \times d_{20} \times d_{200} \times d_{2000} \times d_{20000} \times d_{200000} \times d_{2000000}$$

[1] The *Arrogant Worms* sing a song called *Malcom*, who solves his problems with a chainsaw. "... and he never has the same problem twice." Today we restrict our problem solving tools to programming languages.

[2] The text of these problems was stolen wholesale from . The ranges are changed so you don't actually have the solution for Project Euler, but by the end of this activity you will be able to do them very easily!