

Review – Procedural Programming, Objects, Classes

Write a Java program to solve the following problem. ([Problem 14](#) from Project Euler)

The following iterative sequence is defined for the set of positive integers:

$$\begin{aligned} n &\rightarrow n/2 \text{ (} n \text{ is even)} \\ n &\rightarrow 3n + 1 \text{ (} n \text{ is odd)} \end{aligned}$$

Using the rule above and starting with 13, we generate the following sequence: 13 → 40 → 20 → 10 → 5 → 16 → 8 → 4 → 2 → 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 one million, produces the longest chain?

Key Elements in Constructing Programs

- understand the problem first
 - try an example by hand
 - look up unfamiliar terms
- break complex tasks down into pieces
 - incremental development – it's OK not to solve the whole problem at once
 - use functions to help manage complexity

Key Elements in Constructing Programs

- use of fundamental constructs
 - values → variables
 - set values → assignment statements
 - algorithm – what's the main thing a task requires?
 - series of steps
 - repeat something → loop
 - make a choice / different things happen in different circumstances → conditional (if statement)
- handling things you don't know how to do or don't want to focus on right away
 - for functionality – placeholder functions, hardcoded values
 - for language syntax or complex algorithms
 - use pseudocode to focus on the algorithm structure (series of steps, repetition, choice)
 - outline the big picture first

Key Elements in Constructing Programs

- testing and debugging
- optimizing and improving
 - get it right, then make it better