CS2106, Optional Challenge 1

Weight: 4 stars (3 stars == 1 impress point)

This assignment is optional and unrelated to your marks. If interested, please submit your solutions through LumiNUS (`Files` → `Optional Challenges ("Impress" points)` → `Submissions`) by February 12th, 23:59. Name your file as oc1_E012345A.zip, where E012345A stands for your NUSNET ID.

The **Very Cool Numbers** (VCNs) are a famous integer sequence from early number theory, in which every number in the sequence is the sum of the previous four numbers in the sequence. More formally:

`VCN [n] = VCN[n-1] + VCN[n-2] + VCN[n-3] + VCN[n-4],` for $n \geq 4$,

with the following initial numbers:

`VCN[0] = 2, VCN[1] = 1, VCN[2] = 0, VCN[3] = 6.`

a) Write a program in x86_64 assembly language that recursively computes 42nd Very Cool Number (VCN[42]) and stores it into register RAX. (**1 star**)
b) Write a program in x86_64 assembly language that recursively computes 42nd Very Cool Number (VCN[42]), and stores it into register RAX. You are not allowed to use registers BP/EBP/RBP in your program. These registers play the role of the frame pointer on Intel architectures. (**2 stars**)
c) Compare the two implementations in terms of performance (across one million runs of the programs) and explain your observations. (**1 star**)

The submission files should include: two text files with the assembly code, and one pdf file explaining your findings. Your programs will be tested on one of the lab machines.