Assignment 3.1 (L) Individual Loops

Inspect the following loops and discuss the preconditions that have to hold, such that the assertion $i = n$ is satisfied. In particular, discuss the results for positive and negative inputs, respectively.

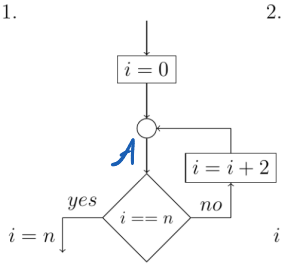
Loop_invariants_intro

A ≡ true

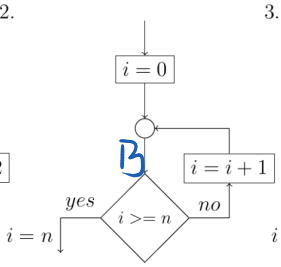
B ≡ i ≤ n

C ≡ i ≤ n ∧ n mod i = 2

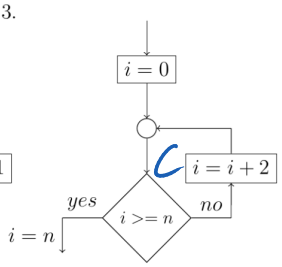
1.

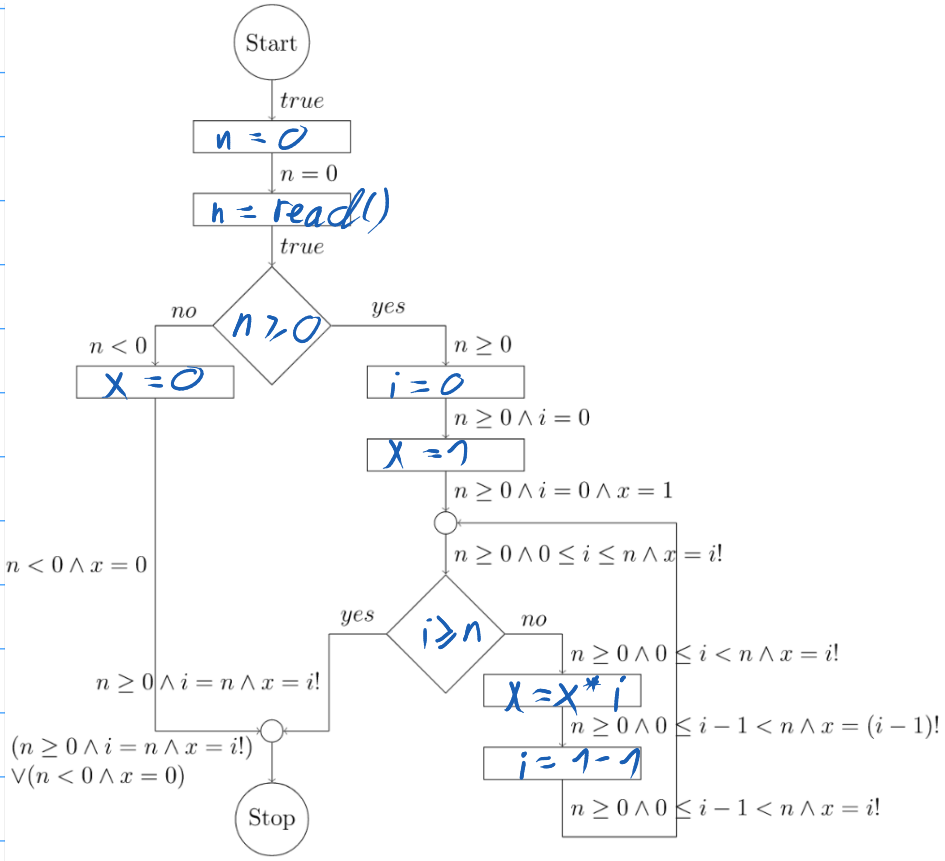


2.

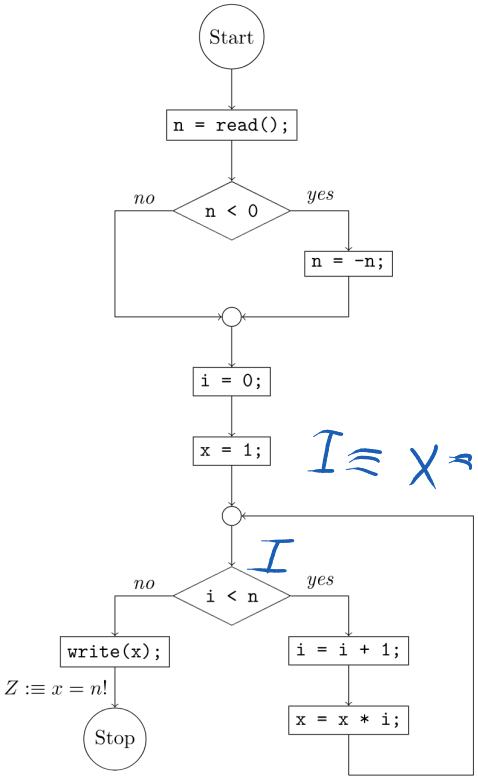


3.





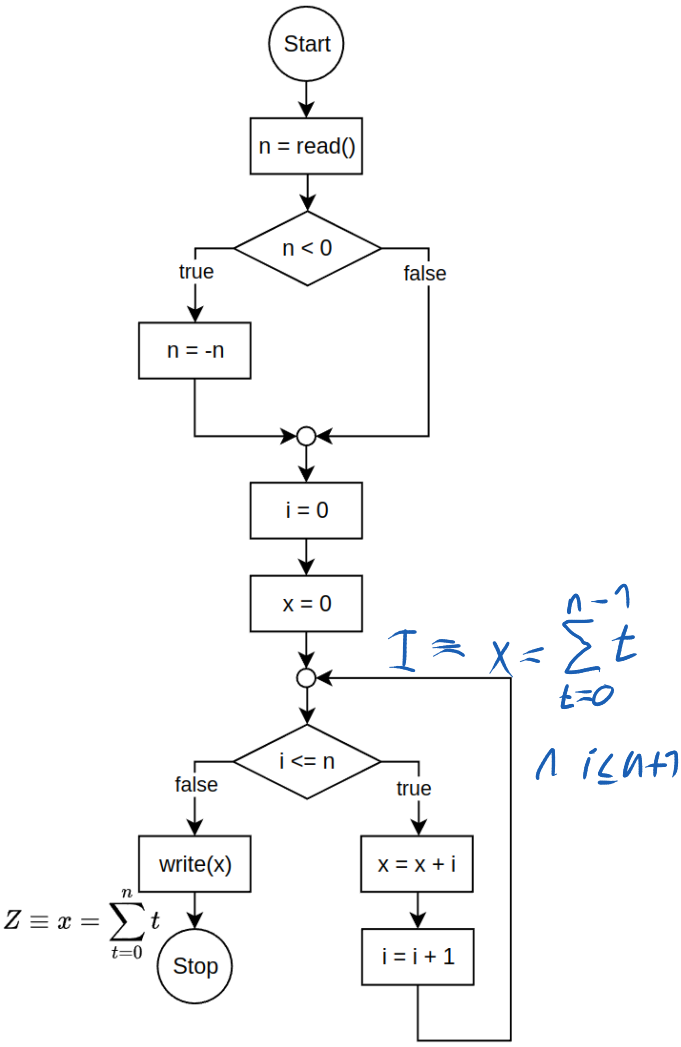
factorial



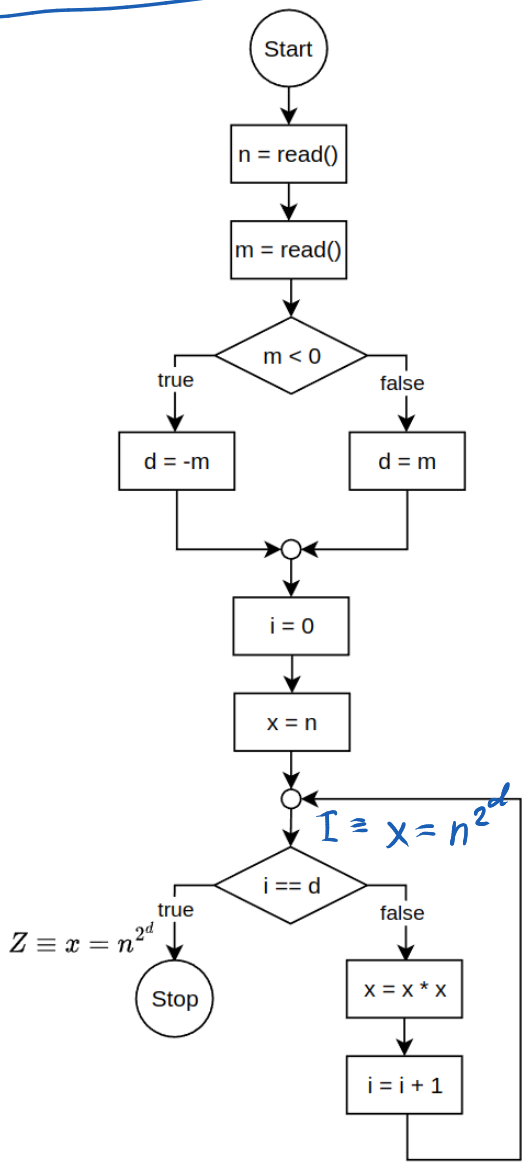
$I \equiv x = i! \wedge i \leq n$

I

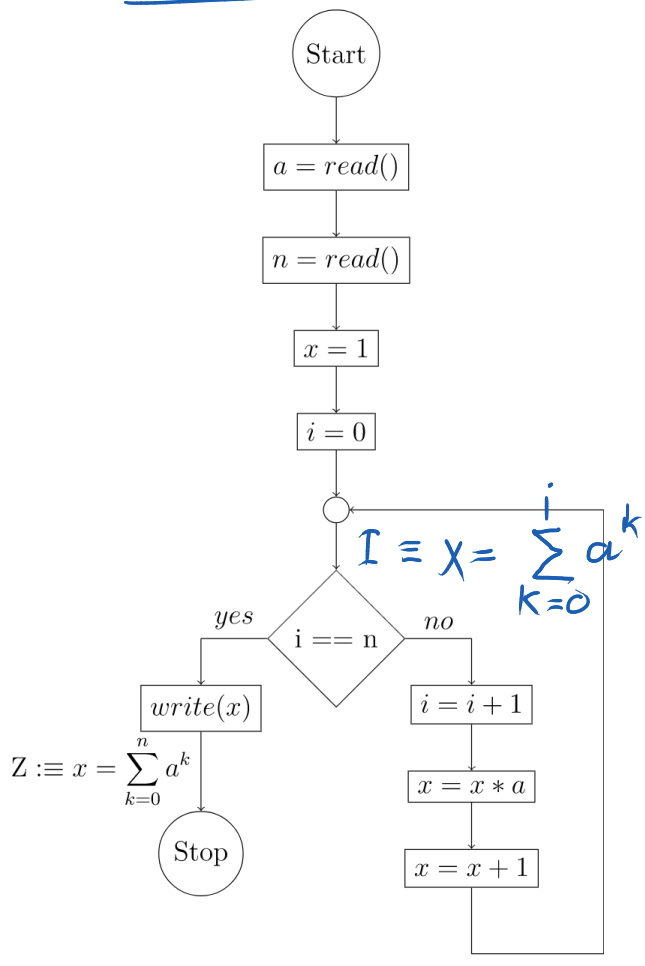
simple_sum



double_power



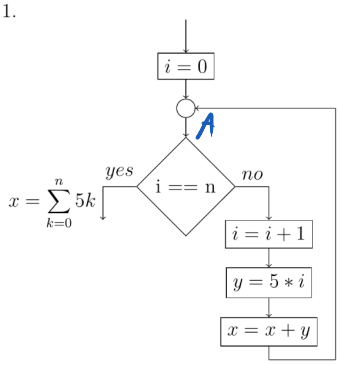
power_sum



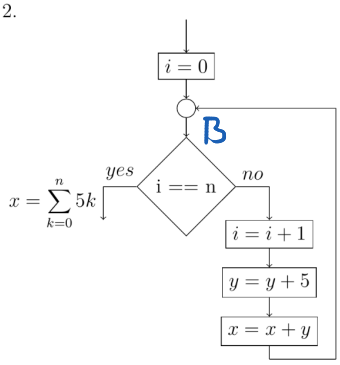
Assignment 3.2 (L) Y?

Consider these control flow graph fragments (assume x and y to be 0 initially):

1.

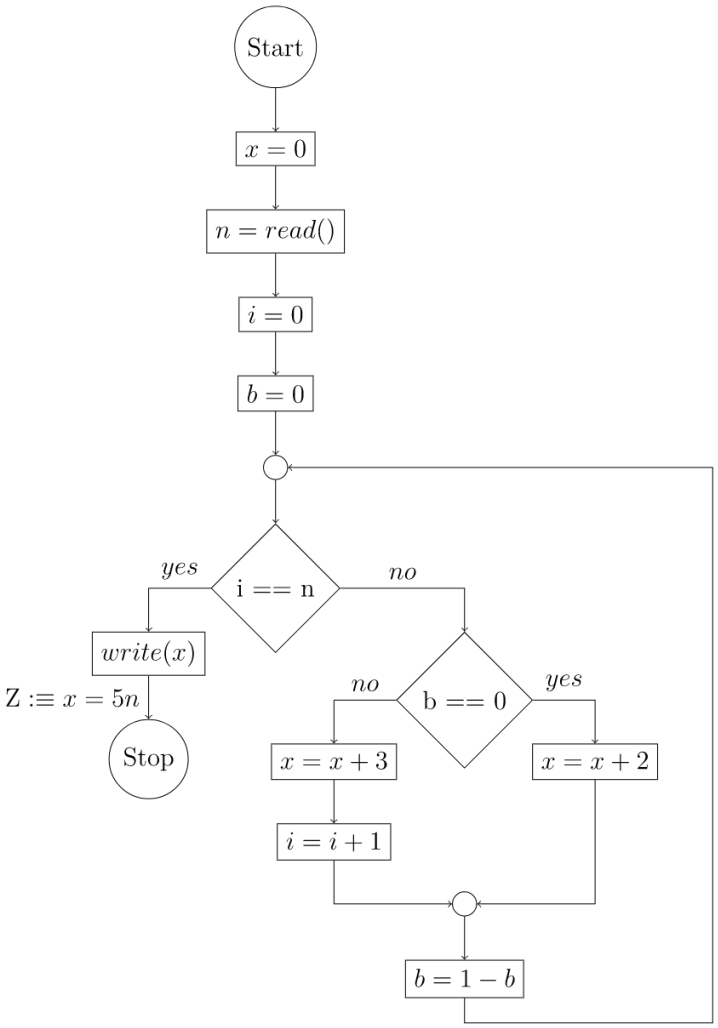


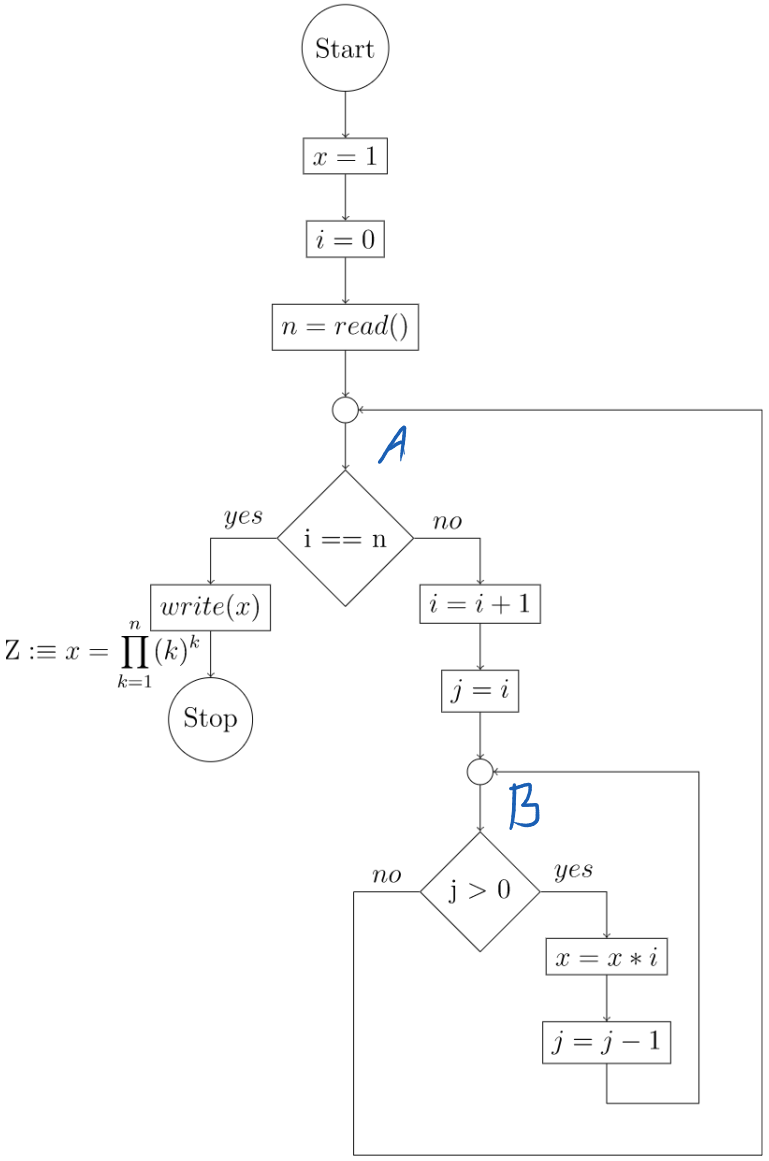
2.



$A \equiv x = \sum_{k=0}^{i} 5k$

$B \equiv x = \sum_{k=0}^{i} 5k \wedge y = 5i$





$I \equiv (x = 5i + 2b) \wedge (b = 1 \vee b = 0) \wedge (i = n \Rightarrow b = 0)$

taken from Artemis WO 4501

$A \equiv X = \prod_{k=1}^{i} k^k \wedge i \geq 0$

$B \equiv X = i^{i-j} \cdot \prod_{k=1}^{i-1} k^k \wedge i \geq 0 \wedge j \geq 0$