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Assignment 1

Exercise

Consider the following three program fragments (a), (b), and (c).

- (a) `sum = 0;`
 `for (int i = 0; i < n ; i++) {`
 `sum++;`
 `}`
- (b) `sum = 0;`
 `for (int i = 0; i < 2*n ; i++) {`
 `sum++;`
 `}`
- (c) `sum = 0; i=n*n;`
 `while (i > 1) {`
 `sum++;`
 `i= i/2;`
 `}`

We denote by $T_a(n), T_b(n), T_c(n)$ the running time of the three fragments.

1. Give Θ evaluations for $T_a(n), T_b(n), T_c(n)$.

$$T_a(n) = \Theta(n)$$

$$T_b(n) = \Theta(2^n)$$

$$T_c(n) = \Theta(\log(n))$$

2. Is $T_b(n) = O(T_a(n))$? Answer YES or NO and justify your answer.

No, rather $T_a(n) = O(T_b(n))$ because in asymptotic notation, 2^n is always greater than n .

3. Is $T_c(n) = \Theta(T_a(n))$? Answer YES or NO and justify your answer.

No, because 2^n grows faster than $\log(n)$, thus it is more correct to say $T_c(n) = \Omega(T_a(n))$.

Algorithm Description

First the interface prompts the user for a set of values to initialize a sequence. The variable n represents the size of the array. The method that creates the array takes the values input by the user and splits them into sub strings with commas. The next few methods include a variable that holds each value and compares it to the next to ensure they are in consecutive order. Each element of the array is initialized at the value of 1. The computation of the max sub sequence value starts with a nested for-loop that traverses the array and increments each time. As the first variable is traversing the array and the sum is greater than 0, another number is added. Finally, the maximum value is determined by the variable length of the array being less than the original length of the sequence but being the largest set of combined values in the sequence.