Exercise 1: Computational Complexity

1.PrefixAverages1 uses two loops whilst PrefixAverages2 uses one loop. The second one computes the sum of elements by adding a new element to the current sum whereas the first one computes it in a separate loop starting from the first element every time.

2.Time complexity:

PrefixAverages1: O().

PrefixAverages2: O(n).

PrefixAverages2 is more effective algorithm.

Algorithm 4.1. PrefixAverages1(X)

1) Let A = an empty 1-D numerical array of size n // n

2) For i = 0 to n-1 // 2n + 2

3) Let s = X[0] // n

4) For j = 1 to n-1 // n \* (2n)

5) If j ≤ i Then //n\*(n-1)

6) Let s = s + X[j] //n\*(n-1)

7) End If

8) End For

9) Let A[i] = s /(i+1)// 3n

10) End For

T(n) = n + 2n + 2 + n + 2n^2 + n^2 – n + n^2 – n + 3n =

= 4n^2 + 5n + 2;

Algorithm 4.2. PrefixAverages2(X)

1) Let A = an empty 1-D numerical array of size n // n

2) Let s = 0 // 1

3) For i = 0 to n-1 // 2n + 2

4) Let s = s + X[i] // 2n

5) Let A[i] = s / (i+1) //3n

6) End For

T(n) = n + 1 + 2n + 2 + 2n + 3n = 8n + 3;

Exercise 2: Implementation

