**W1D1**

**Learn and Repeat**

**Pattern 1. “for all” and “there exists” pattern**

**Given an array A, if all elements of A are positive, return 1. Else return 0.**

**Algorithm 1. (Counting method)**

count = 0;

for (i = 0; i < n; i++)

if (A[i] > 0) count++;

(count == n)? true : false;

**check the condition. If true, increment the counter. If the counter value is n, return true. Else return false.**

**Algorithm 2. (Test the opposite condition method)**

for (i = 0; i < n; i++)

if (A[i] <= 0) return false;

return true;

**check the “opposite condition”. If true, return false. Return true outside the loop.**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Best case | Average case | Worst case |
| Algorithm 1 | O(n) | O(n) | O(n) |
| Algorithm 2 | O(1) | O(n) | O(n) |

**Lower bound of the problem**

**What is the minimum information required to conclude the problem statement in the affirmative? (This a very confusing idea for students with less exposure to logic.)**

You need to check all elements of A. Hence the lower bound of the problem is Ω(n).

Since the lower bound of the problem is equal to the **worst case time complexity** in Solution 1 (Solution 2), Solution 1 (Solution 2) is optimal.

(A[i] <= 0)

**Exercise 1**

An array is defined to be a **235 array** if the number of elements divisible by 2 plus the number of elements divisible by 3 plus the number of elements divisible by 5 plus the number of elements not divisible by 2, 3, or 5 is equal to the number of elements of the array.

Write a method named is123Array that returns 1 if its array argument is a 235 array, otherwise it returns 0.

**Note** : A number can be divisible by more than one number. For example, 10 is divisible by both 2 and 5.

**Algorithm 3. (Counting method)**

**235Array(A)**

**count=0;**

**For each element x in A do**

**If x mod 2 = 0 then count<- count+1**

**If x mod 3= 0 then count<- count+1**

**If x mod 5 = 0 then count<- count+1**

**If x mod 2 not = 0 AND If x mod 3 not = 0 AND If x mod 5 not = 0 then**

**count<- count+1**

**if count = length(A) then return 1**

**else return 0**

**Algorithm 4. (Test the opposite condition method)**

For i in input:

If ( i % 6==0 || i % 10 ==0 || i % 15 ==0) return 0;

End for

Return 1;

**Fill in the cells.**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Best case | Average case | Worst case |
| Algorithm 1 | O(n) | O(n) | O(n) |
| Algorithm 2 | O(1) | O(n) | O(n) |

**What is the lower bound of the problem?**

**Algo 3 - O(n)**

**Algo 4 - O(n)**