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**MSCI 240 Fall 2018**

**Instructor: Dr Mark Hancock**

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**Homework 3**

**REVISED**

# Problem 1

public static int mystery (int n){

int sum = 0;

for(int i = 1; i < n; i \*= 2) {

for(int j = 0; j < n; j++) {

sum++;

}

}

return sum;

}

Line Number| T(n) value

2|1

3|

4|n

5|1

8|1

Answer:

b)

public static boolean isSorted (int [] a){

for(int i = 1; i < a.length-1; i++) {

if(a[i]>a[i+1]) {

return false;

}

}

return true;

}

Line Number| T(n) value

2|1

2| n-1

3|1

8/4|1

5|1

8/4|1



ii) The worst case is if the list was completely sorted. The for loop will run (n-1) times because if the list if fully sorted, the if statement will never result in “return false”. Then the for loop will end and have 1 statement which returns true. In this case it would be O(n)=(n-1) +1 = n

Prove T(n) (worst case)

Let C = C>0

# Problem 2

1. i) I would choose the O(1) as it is constant and will remain constant regardless of the input size. Thus, O(1) would scale better than O(n) which is linear.

ii) No, O(n) cannot be faster than O(1). The best case is if n=1 then it will be equivalent to O(1), but not better. Assuming that the range is {1,2,3,…n} (Refer to Figure 1.0)

iii) If the O(1) deals with a constant factor that is ridiculously large then it is better to go with the O(n) function meant for smaller input sizes. Even if in theory for arbitrarily large “n”, O(1) is faster than O(n) . However, if the constant in the O(1) algorithm is greater than and not equal to the n in O(n) then it is better to use O(n).

1. 88349456334173, 74 + 48logn, 98 + 17logn + 39n, 66 + 2nlogn, , 56n3+ 16n/27 +491logn, 60n2 + 84 + 532n, 842n + 36n!

# Figure 1.0

# Non-Acknowledgment of Receiving Assistance or Use of Others' Ideas

I received the following help, assistance, or any ideas from classmates, other knowledgeable people, books or non-course websites (please include a description of discussions with the TA or the instructor):

None

# Record of Giving Assistance to Others

I gave the following help, assistance, or ideas to the following classmates (please describe what assistance to whom was given by you):

None

# Declaration

I declare that except for the assistance noted above, assistance provided on the course website, and material provided by the instructor and/or TAs that this is my original work.

I have neither given nor received an electronic or printed version of any part of this code to/from anyone.

I declare that any program output submitted as part of the assignment was generated by the program code submitted and not altered in any way.



Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_