TIC2001 Data Structure and Algorithm Quiz 1
Name: _____ Student#: A_____

Question 1 (6 marks)

What is the time complexity of the function f in each of the following boxes in terms of n for n > 0? Give your answer in the Big O notation. The function "doOhOne()" has a time complexity of O(1).

```
void f(n) {
      for (int i = 0; i < 1000000; i++)
            for (int j = n; j > n / 2; j--)
                  doOhOne();
}
```

Time complexity =

O(n)

```
int f(n) {
      if (n<=1)
            return 0;
      else
            return f(1) + f(n - 1);
}
```

Time complexity =

O(n)

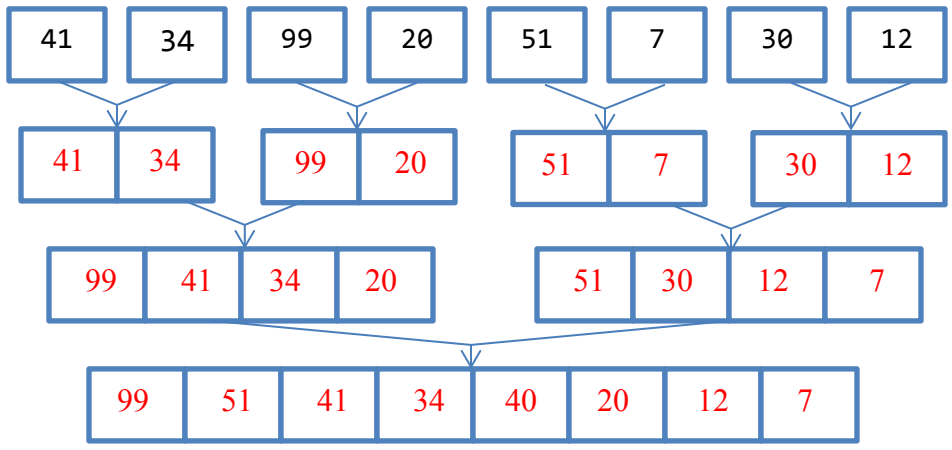
```
void f(n) {
      for (int i = 0; i < n; i++)
            for (int j = 1; j <= n; j *= 2)
                  doOhOne();
}
```

Time complexity =

O(n log n)

Question 2 (4 marks)

Perform a merge sort for the array [41, 34, 99, 20, 51, 7, 30, 12] according to **descending** order. Show the steps.



Question 3 (10 marks)

Given a hash table with size m = 13 buckets. And the hash function h(string) = the square of the number of characters. For example:

$$h(\text{“hat”}) = 3 \times 3 = 9.$$

With i equals to the number of collisions, perform hashing with **linear** probing for the key x with the probing,

$$(\, h(x) + i \,) \bmod m.$$

Commands:

insert(“cat”)

insert(“wolf”)

insert(“hippo”)

insert(“fish”)

insert(“mango”)

insert(“airplane”)

insert(“cow);

insert(“bat”)

delete(“mango”)

delete(“wolf”)

insert(“dog”)

Index	Hash Table Contents				
0	Null	~~mango~~	deleted	dog	
1	Null	airplane			
2	Null				
3	Null	~~wolf~~	deleted		
4	Null	fish			
5	Null				
6	Null				
7	Null				
8	Null				
9	Null	cat			
10	Null	cow			
11	Null	bat			
12	Null	hippo			

Note that it is not chaining. The space on the “right” of “Null” is just for your “replacement” of the contents.