Tutorial 8

1. The mergesort algorithm is given as follows:

```
mergesort (A,i,j) {
      if (i == j)
            return
      m = (i + j)/2
      mergesort(A,i,m)
      mergesort(A,m + 1,j)
      merge(A,i,m,j)
}
```

Trace the steps of the algorithm on the following input array:

11	**29**	**28**	**23**	**20**	**14**	**5**	**3**	**15**	**16**

2. Write down a recurrence relation and use it to find the worst-case time complexity of the mergesort algorithm.

3. Write an algorithm that, given an array A consisting of a sorted subarray of size m followed by a sorted subarray of size n, merges them into A using an extra array B of size $min\{m, n\}$. What's the worst-case time complexity of the algorithm?

4. Bubblesort is another sorting algorithm. Its pseudocode is shown below.

```
bubblesort (A) {
      n = A.last
      for(i = 1 to n-1){
            for(j = n downto i+1){
                  if(A[j] < A[j-1]){
                        swap A[j] with A[j-1]
                  }
            }
      }
}
```

Trace the steps of the algorithm on the following input array:

11	**29**	**28**	**23**	**20**

5. What is the worst-case time complexity of bubblesort?