

Tutorial 3: June 8

1. Let $0 < \epsilon < 1$. Suppose that we have an array A of n items such that the first $n - n^\epsilon$ items are sorted. Describe an $O(n)$ time algorithm to sort A .
2. Give the best-case, worst-case, best-case expected and worst-case expected running time of the following function. You can assume that the shuffle operation requires $O(n)$ time and produces each permutation of A with equal probability.

```
function BOGO( $A$ )
  SHUFFLE( $A$ )
  if  $A$  is sorted then
    return  $A$ 
  else
    return BOGO( $A$ )
  end if
end function
```

3. We have an array A of n non-negative integers such that each integer is less than k . Give an $O(n + k)$ time preprocessing algorithm such that queries of the form “how many integers are there in A that are in the range $[a, b]$?” can be answered in $O(1)$ time. Note that a and b are not fixed; they are parameters given to the query algorithm.