Exercise 1: Bubblesort

The following pseudocode describes the BUBBLESORT algorithm which takes as input an Array $A$ of length $n$.

Algorithm 1 BUBBLESORT($A[0, \ldots, n-1]$)

for $i = 0$ to $n-2$ do
  for $j = 0$ to $n-2$ do
      swap($A[j], A[j+1]$)

(a) Assume BUBBLESORT runs on input $A = [27, 8, 19, 5, 23, 12]$. Give $A$ after the end of each iteration of the outer for-loop.

(b) Give an upper and a lower bound for the (worst-case) runtime of BUBBLESORT as a function of $n$. Explain your answer.

Exercise 2: Insertion Sort

The following pseudocode describes the INSERTIONSORT algorithm which takes as input an Array $A$ of length $n$.

Algorithm 2 INSERTIONSORT($A[0, \ldots, n-1]$)

for $i = 0$ to $n-2$ do
  pos = $i + 1$
    swap($A[pos], A[pos - 1]$)
    pos = pos - 1

(a) Assume INSERTIONSORT runs on input $A = [27, 8, 19, 5, 23, 12]$. Give $A$ after the end of each iteration of the for-loop.

(b) Give an upper and a lower bound for the (worst-case) runtime of INSERTIONSORT as a function of $n$. Explain your answer.