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a) The all elements in A also exist in A', though they may be in a different order

b) Loop Invariant 1) The subarray A[j...n] consists of elements of A[j...n] from before the loop, possibly in a different order
2) A[j] is the smallest of those elements

Initialization: Must hold, because there is only one element and it is the very last element in the array

Maintenance: (1) holds because at each step, we replace A[j] with A[j-1], and we're only adding the previous element and possibly swapping two values. (2) since the loop invariant states that A[j] is the smallest of A[j...n] and A[j-1] becomes the smallest of A[j] and A[j-1]

Termination: When the loop terminates, j=i, which implies the A[i] is the smallest element of the subarray A[i...n] and contains the original elements in the same order

c) Loop Invariant: At the beginning of each iteration, A[1...i-1] consists of sorted elements, all of which are less than or equal to the ones in A[i...n]

Initialization: Array is empty initially

Maintenance: Inner loop invariant states that at each iteration, A[i] becomes the smallest element of A[i...n], while the rest get shuffled around. At the end of the loop, A[i] < A[k], for i<k

Termination: At termination, i=n, where n is the length of the array. If we substitute I for n in the loop invariant, we can state the A[1...n] consists of the original elements, but they are sorted. At termination, this is the entire array, so the whole array is sorted.

d) $\theta(n^2)$, which is the same as Insertion Sort

e)

i. If every other element is out of order, such as [1, 3, 2, 4]

ii. There is no permutation where Insertion Sort takes $\theta(n^2)$, but Bubble Sort takes $\theta(n)$