

Put your *name* and *section number* on your solution and (if more than one sheet) staple.

Assume that you have a sorted list of n (distinct) elements, where you know that exactly one pair of elements has been exchanged. For example, in the list 1, 2, 3, 9, 5, 6, 7, 8, 4, 10 the pair 4 and 9 were exchanged. We will count comparisons and exchanges for several sorting algorithms.

State what situation gives the case you are analyzing. For example, you might say that the worst case occurs when the elements are in reverse order (which cannot happen here). Make all of your analyses as exact as possible. Show your work. If two answers are essentially the same, you can say something like “this part is like Part x ” and move on. You can also say “we did this in class,” state the answer, and move on.

1. Bubble sort.
 - (a) Comparisons.
 - (i) What is the best case?
 - (ii) What is the worst case?
 - (iii) What is the average case?
 - (b) Exchanges.
 - (i) What is the best case?
 - (ii) What is the worst case?
 - (iii) What is the average case?

2. “Modified” bubble sort. (See slides on Quadratic Sorting Algorithms for the pseudo code.)
 - (a) Comparisons.
 - (i) What is the best case?
 - (ii) What is the worst case?
 - (iii) CHALLENGE PROBLEM (not part of your grade): What is the average case?
 - (b) Exchanges.
 - (i) What is the best case?
 - (ii) What is the worst case?
 - (iii) What is the average case?

3. Insertion sort with sentinel. Comparisons.
 - (a) (i) What is the best case?
 - (ii) What is the worst case?
 - (iii) What is the average case?

4. (a) Design an efficient algorithm to sort a list of n sorted elements, where exactly one pair of elements has been exchanged. Minimize the (worst case) number of comparisons.
 - (b) Comparisons.
 - (i) What is the best case?
 - (ii) What is the worst case?
 - (iii) CHALLENGE PROBLEM (not part of your grade): What is the average case?