Problem 1. Let n be a perfect square, so $n = k^2$. Assume that you have a list where the last k values are all 1's, the next to last k values are all 2's, the next k values are all 3's, etc. The first k values are all k's.

(a) Write a summation, in terms of k, for the number of transpositions. (Two values that are equal are not transposed.)

(b) Simplify the summation.

(c) What is this in terms of n.

(d) What is the (exact) high order term.

Problem 2. Assume that you have a list where the last value is 1, the next two values from the end are both 2's, the next three values from the end are all 3's, etc. The first k values are all k's. So $n = \sum_{i=1}^{k} i = k(k+1)/2$.

(a) Write a summation, in terms of k, for the number of transpositions.

(b) Simplify the summation. If you get stuck, for part credit, do as much as you can, and then use Wolfram Alpha to simplify the summation.

(c) What is the (exact) high order term (in terms of k).

(d) What is the (exact) high order term in terms of n.

Problem 3. Give a quadratic algorithm to count the number of transpositions in a list of size n. Write the pseudo code. Briefly and informally justify the correctness of your algorithm.