Programming Project, Part I

General Description:
The programming project for this semester will be to implement and experiment with selection algorithms. You will analyse the running time using a combination of experiments and theoretical analysis. For this first part, you have to implement the basic $n^2$ selection algorithm based on selection sort. In part II, you will have to implement the recursive linear time algorithm covered in section 9.3 of our textbook.

Detailed Description:
Write a procedure for the selection algorithm based on selection sort. The algorithm goes as follows:

if $k \leq n/2$, then
  for $i := 1$ to $k$ do
    find the $i$th smallest element in the array by scanning the array from $i$ to $n$.
    exchange the found element into position $i$
  return $k$
else
  for $i := n$ downto $k$ do
    find the element of rank $i$ in the array by scanning the array from $1$ to $i$
    exchange the found element into position $i$
  return $k$

Perform some experiments with several randomly generated inputs of various sizes. Then, plot a curve of the running time of the algorithm versus input size, based on your experiments. This is supposed to be an estimate of the average case running time of the algorithm.
Since the average running time of the algorithm is supposed to be a quadratic equation, compute the quadratic equation that best fits your experiments. Assume \( k \leq n/2 \) and that the equation is of the form \( ak^2 + bkn + ck + dn + e \) and as design your experiments and data analysis to get your best estimate for the constants \( a, b, c, d \) and \( e \).

**Turn in:**

- A listing of your program
- Some sample runs illustrating the correctness of the selection procedure
- A report that explains how you made the analysis and the results.

Turn in by sending an e-mail to longpre@utep.edu. Please use the subject line “CSxxxx Program Assignment 1 submission”.

**Due date:** Oct 22. The penalty is 10% for each day late up to one week late. No homework accepted after one week.