Assignment No. 5
Assignment Title: Linear time sorting

Part A:
An array **A** of **n** elements ($\mathbf{e_1}$, $\mathbf{e_2}$, ..., $\mathbf{e_n}$) and and two integers **j** and **k** (**1<j<k<n**) are given. For each element $\mathbf{e_i}$ in **A**, we know and $\mathbf{j \leq e_i \leq k}$.

Your **first task** is to write a function that takes the number of elements as input and generates such an array of n elements and returns it.

Hint: You can use in-built random functions (rand() and srand() in C) see link

Part B:
Your **second task** is to write a fucntion that takes the randomly generated array from part A and sorts the array in linear time (i.e. in O(n)) and prints the sorted values.

Hint: Check the topics covered in the DAA theory webpage.

Part C:
Consider a situation when there is no constraints on the value of **j** and **k** except for **j<k**, and **n << (k – j)**. You can assume that the elements of the array A is distributed uniformly randomly.
With this assumption, your third task is to sort the array in (expected) linear time using linear amount of memory.

Hint: If you divide the interval k-j into n (nearly) equal sub-intervals, then you can expect that each sub-interval will contain exactly one element of the array, since the elements are distributed uniformly randomly.