Lab 4: Selection

Implement the randomized (divide and conquer) selection algorithm described in section 2.4 in the book that returns the k-th smallest value in an array of n integers.

Your code should input n and k as command line parameters. Next generate an array of n random integers in the range [0,n−1]. You should generate these n integers independently so that you can have duplicate values in the array.

Your code should return the k-th smallest value in the array. Note that k ranges from 1 to n, i.e., k=1 means return the smallest value, k=10 means returns the 10-th smallest value, and so on.

Print out the k-th smallest value in the array, followed by the original array, and the sorted array. For example, on the array [5, 8, 9, 5, 0, 0, 1, 7, 6, 9] the output for k=3 should be:
select 1
array [5, 8, 9, 5, 0, 0, 1, 7, 6, 9]
sorted array [0, 0, 1, 5, 5, 6, 7, 8, 9, 9]
That is, the 3rd smallest value is 1, as we can see from the sorted array.

Test you code on larger n and k values. Note that for sorting you can use the inbuilt Python sort function. It is just for testing your output.

You will find the Python **numpy** module very useful for this assignment. For example, you can use numpy.random.randint to generate random integers.