1. Use an example to show how $n$ integers in the range of 1 to $n^2$ can be sorted in $O(n)$ time. You are required to use $n = 20$ in your example.

2. Write a Java program to implement Counting Sort and write a driver to test it. Note: use random number generator to generate your input with $n = 10$, 50, and 100. Verify that the running time is $O(n)$.

3. Write a Java program to implement Bucket Sort and write a driver to test it. Note: use random number generator to generate your input with $n = 10$, 50, and 100. Verify that the running time is $O(n)$. 