Problem 1. Illustrate the operation of Radix sort on the following list of English words: 
nim, ait, dit, zug, ria, ama, neb, wen, pug, jud. Form a meaningful sentence using the words zug and ait.

Problem 2. The runtime for radix sort is given by $\theta(d(n + r))$, where $n$ is the length of the input array to be sorted, $d$, is the number of digits in each number and $r$ is the Radix. Suppose, we want to sort an array of 4294967296, 128-bit numbers. Find the number of digits, $d$ and compare radix sort with the runtime of Quicksort algorithm for the following two cases:

1. Radix of 4.
2. Radix of 16.

Which algorithm would you use for the two cases, respectively? Why?

Problem 3. We are given $n$ points in the unit circle, $p_i = (x_i, y_i)$, such that $0 < x_i^2 + y_i^2 \leq 1$ for $i = 1, 2, \ldots, n$. Suppose that the points are uniformly distributed; that is, the probability of finding a point in any region of the circle is proportional to the area of that region. Design an algorithm with an average-case running time of $\theta(n)$ to sort the $n$ points by their distances $d_i = \sqrt{x_i^2 + y_i^2}$ from the origin.