Sorting Strings

1. Briefly describe least significant digit radix sort in your own words.

   ....

   ....

   ....

   ....

2. Briefly describe maximum significant digit radix sort in your own words.

   ....

   ....

   ....

   ....

3. Suppose we need to sort a large set of short, fixed-length strings. Would maximum significant digit radix sort or least significant digit radix sort be a better choice to sort such a set of strings? Why?

   ....

   ....

   ....

   ....

4. A colleague suggests to use least significant digit radix sort to sort a set of strings. However, they suggest making a slight change: once there are only 3 letters left, cut off to insertion sort for the remaining sort. Why is this a bad idea?

   ....

   ....

   ....

   ....

5. Describe how you would apply the ideas found in maximum significant digit radix sort and least significant digit radix sort to sort a set of integers instead.

   ....

   ....

   ....

   ....

Tries

6. Describe an R-way trie in your own words.

. . . .

. . . .

. . . .

. . . .

7. Insert the following strings into an R-way trie.

   - go

   - going

   - gone

   - height

   - hey

   - home

   - hound

   - house

8. Why are tries usually faster at searching for strings than hash tables are?

. . . .

. . . .

. . . .

. . . .

9. In class, we discussed associating a value to a particular node in a trie. This effectively creates a mapping from a key to a value. However, suppose we wanted to only store information about set membership (i.e. the word is in the trie or not). How would you change the trie data structure to be able to store this information? Note: be careful to support words that are substrings of each other (e.g. going and go).

. . . .

. . . .

. . . .

. . . .

10. One of the drawbacks of an R-way search trie is that each node stores links for every letter in the alphabet, whether they are used or not. Describe a method to modify an R-way search trie to achieve space savings at each node without introducing any complex insertion and traversal.

   ....

   ....

   ....

   ....

11. Describe how you would apply the ideas found within trie search to search for an integer in a large set of them.

   ....

   ....

   ....

   ....

12. A set of words have been inserted into an R-way trie. Given a string prefix, how can you find all words in the trie that begin with the given prefix?

   ....

   ....

   ....

   ....

13. Suppose you are given two strings, a and b. Design a method to quickly determine whether a is a substring of b or b is a substring of a.

   ....

   ....

   ....

   ....

14. Least significant digit radix sort and maximum significant digit radix sort are two ways to break the $O(n \log_2 n)$ lower bound for sorting strings or integers. Apply the ideas found in these algorithms to R-way tries. In other words, describe a method to sort integers or strings using an R-way trie.

   ....

   ....

   ....

   ....