Section 5: Hashing & Sorting

0. Sorting Hat

Suppose we sort an array of numbers, but it turns out every element of the array is the same, e.g.,{17, 17, 17, ..., 17}. (So, in hindsight, the sorting is useless.)

a) What is the asymptotic running time of **insertion** sort in this case?

b) What is the asymptotic running time of **selection** sort in this case?

c) What is the asymptotic running time of **merge** sort in this case?

d) What is the asymptotic running time of **quick** sort in this case?

1. Another Sort of Sorting…

Given an array of integers as such: {11, 13, 55, 67, 79, 10, 8, 6, 4, 2}. Please answer the following questions:

a) What is the asymptotic running time of insertion sort for this array?

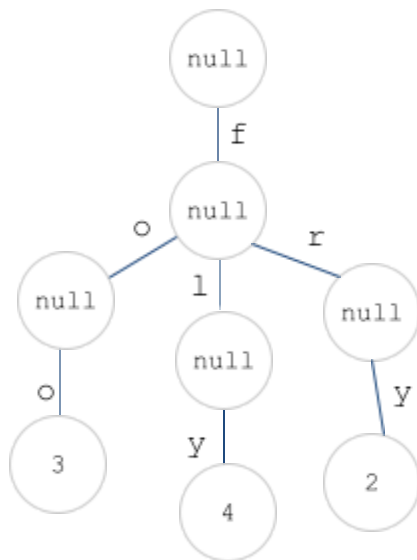b) What is the asymptotic running time of **selection** sort in this case?

c) What is the asymptotic running time of **merge** sort in this case?

d) What is the asymptotic running time of **quick** sort in this case (<u>assuming that we choose the leftmost element as the pivot each time</u>)?

Tries

1. Let's give it a Trie!

For the Trie below, please perform the following operations.

(for parts a and b, modify the trie above)

    a) insert("food", 5)

    b) delete("foo")

    c)what does the call to find("fry") return?

d) List all key-value pairs in the final trie.

2. Let's Trie to be Old School!

Text on nine keys (T9)'s objective is to make it easier to type text messages with 9 keys. It allows words to be entered by a single keypress for each letter in which several letters are associated with each key. It combines the groups of letters on each phone key with a fast-access dictionary of words. It looks up in the dictionary all words corresponding to the sequence of keypresses and orders them by frequency of use.

So for example, the input '1554' could be the words *book*, *cook*, or *cool*. Describe how you would implement a T9 dictionary for a mobile phone.

ABC	DEF	GHI
1	2	3
JKL	MNO	PQR
4	5	6
STU	VWX	YZ
7	8	9
*	0	#

T9 example