COMP2521 Revision Trivia 3

Question

Consider the following text and pattern:

Text:

```
A A A B C A A B A A B A A B A C A A B A
```

Pattern:

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A A B A A B A C A
```

Search for the pattern in the text using the Knuth-Morris-Pratt algorithm. How many comparisons are made in total?

Question

Suppose there was an empty hash table of size $N = 7$, which uses the hash function $h(x) = x \% 7$. Insert these elements into the hash table in the given order, using linear probing to resolve collisions:

15, 10, 8, 5, 18, 3, 7

Question

a) What is the best case time complexity for searching for an item in a hash table that has *N* items?

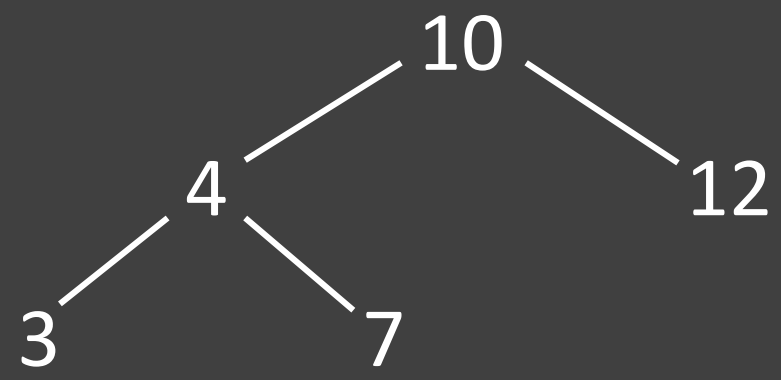
b) What would be the worst case time complexity?

Question

Suppose you are given two sorting programs. You are told that one of them is selection sort and the other is insertion sort, but you are not told which one is which. Describe a test you could run to distinguish them.

Question

Show the result of inserting an 8 in the following AVL tree.



Question

Suppose we used an ordered singly linked list to implement a priority queue.

What would be the time complexity of the enqueue and dequeue operations?

How does this compare to using a heap?

Question

Suppose we had an empty hash table of size 11 that uses separate chaining, and the hash function h(x) = x % 11. Insert these elements into the table:

9, 17, 16, 5, 25, 20, 18, 11, 10, 3, 14

Which index(es) contain the longest chain, and what is their length?

Question

Marc learned in COMP2521 that insertion sort and quick sort have an average time complexity of $O(n^2)$ and $O(n \log n)$ respectively. However, when he used them to sort random arrays of size 10, he found that insertion sort was consistently faster than quick sort. Does this contradict what he has been taught? Why or why not?

Question

Construct the failure function for this pattern:

A E D A E A E D A A

Question

Consider the following text and pattern:

Text:

E C B A A E D D A E D B A A E D C E A

Pattern:

E D B A A E D

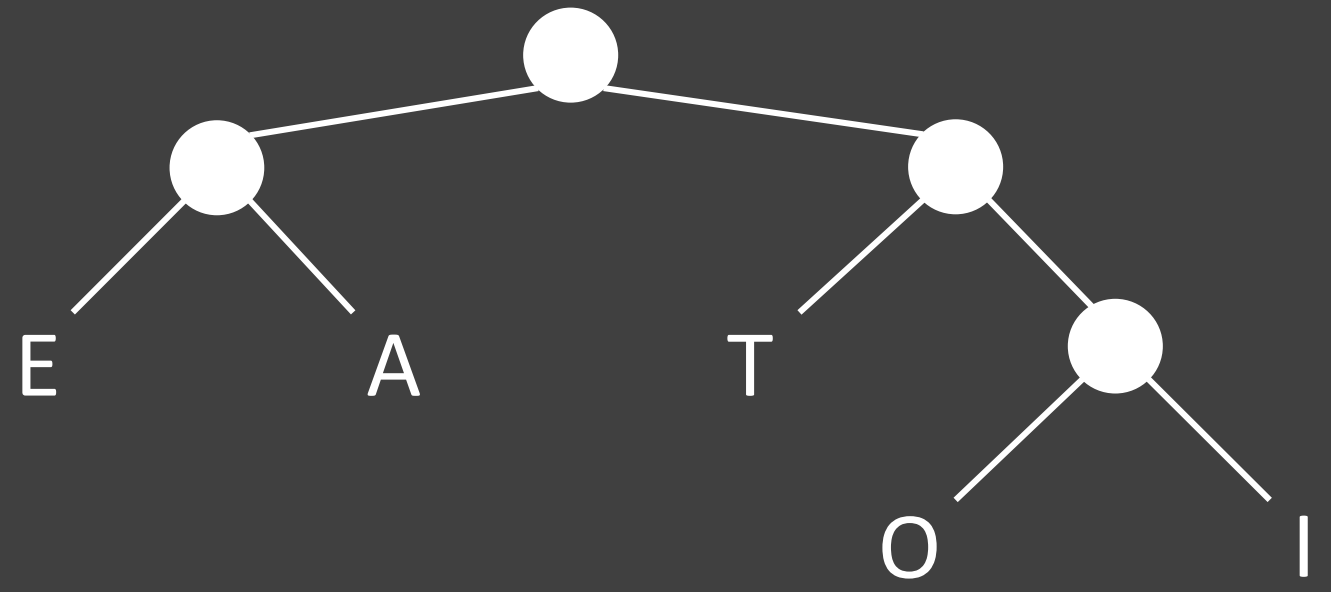
Search for the pattern in the text using the Boyer-Moore algorithm. How many comparisons are made in total?

Question

Generally, more efficient algorithms tend to use more space than less efficient algorithms. This is known as the space-time tradeoff. With reference to two of the algorithms discussed in the course, give an example of this.

Question

Suppose after running the Huffman coding algorithm, you obtain this Huffman tree:



Show the Huffman code table.

Question

Show how the following numbers after each iteration of sorting with an LSD (least-significant digit) radix sort, with a radix of 10.

4123, 5123, 4321, 4132, 1999

Question

a) What is the minimum height of a binary tree with 8 nodes? Draw a possible 8-node tree with this height.

b) What is the maximum height of a binary tree with 8 nodes? Draw a possible 8-node tree with this height.

Question

Perform a DFS on this graph starting at vertex 0, and list the vertices as they are visited. If a vertex has multiple neighbours, visit the neighbour with the smaller vertex number first.