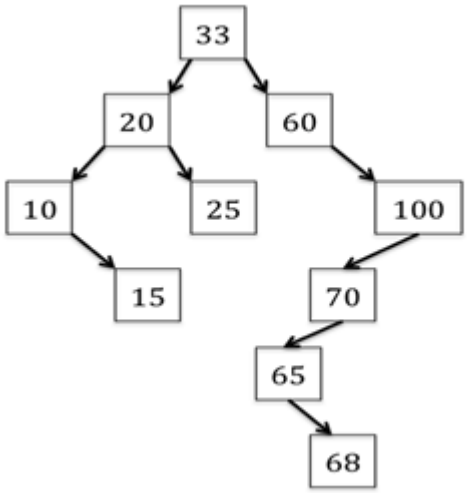
Which of the following is the result of adding the following values (in the order that they are given) to a Binary Search Tree.

50, 5, 45, 10, 62, 100, 81, 2

treeQ#1.pdf

Your Answer:
D

For the following **Binary Search Tree**, remove the node with the value 60 and show the resulting BST. You may use the following table to save time -- table_tree-2.doc



For the following **Binary Search Tree**, list the nodes as they are visited in a **pre-order, in-order, and post-order** traversal.

BST.pdf /BST.docx

Your Answer:
pre-order: node first, then left children, then right children

in-order: examine the left children, then the node, then finally the right children

post-order: examine left children, then right children, then the node

a: Read ***carefully*** and choose the***best*** answer . You will use answers only once.

The maximum path length from a node to a leaf node

Node height

Data structure used to implement a knowledgebase as in the "guess the animal game"

Binary Tree

A tree traversal that produces a reverse polish notation expression for an expression tree

Post-Order

Tree nodes that have the same parent

Siblings

A tree node that does not have a parent

Leaf

Correct Answer
Root node

Term that describes the path length from the root to a given node

Node Depth

ADT used when implementing an iterative in-order tree traversal iterator.

Stack

Number of leaves in a full binary tree of height *n*

2^n

Write a ***recursive*** function **sumTreeNodeHelper** that sums the elements of a binary search tree starting with the smallest element and adding elements ***in order*** up to the largest element and ***prints the running sum*** as each new value (ie. Node->val) is added to the sum (We're assuming double values are stored in the tree). ***You will not use an iterator***.

void sumTreeNodeHelper(struct BNode *node, double *sum)

{

printf(“ Running sum = %f\n”, *sum);

}

void sumTree(struct BSTree *tree, double *sum)

{

sumTreeNodeHelper(tree->root, sum);

}

/* Example use */

struct BSTree myTree;

int sum = 0;

/* Initialize and Add elements to the tree */

addTree(&myTree, 5);

addTree(&myTree, 1);

addTree(&myTree 10);

sumTree(&myTree, &sum);

printf(“ Final sum of tree values = %f\n”, sum);

…< /span>

The output of the above should be:

Running sum = 1

Running sum = 6

Running sum = 16

Final sum of tree values = 16

Question 5.pdf

This question is for getting order of recursive calls correctly w.r.t. to the sum and print. function pass *sum, which is a pointer here. void sumTreeNodeHelper(struct BNode *node, double *sum) { if(node!=0) { sumTreeNodeHelper(Node->left,sum); *sum = *sum + node->val; printf("Running sum = %f\n",*sum); sumTreeNodeHelper(node->right,sum); } } void sumTree(struct BSTree *tree, double *sum) { sumTreeNodeHelper(tree->root, sum); }

Add the following numbers to a heap (in tree form) in the order given. (Show steps for partial credit)

8, 22, 30, 14, 2, 6, 1

Your Answer:
8 -> 22

8 -> 22 & 30

8 -> 14 & 22 -> 30 is coming off 22

2 -> 8 & 22 -> 14 coming off 8 and 30 coming off 22

2-> 6 & 14 -> 8 coming off 6 and 22 & 30 coming off 14

1 -> 2 & 14 -> 6 & 8 coming off 2, 22 & 30 coming off 14

/ \

2 14

/\ / \

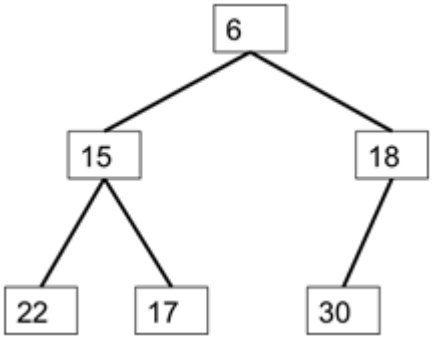
6 8 22 30

1. Assume the given array in the following represents a min-heap.

   treeQ#8.pdf

Your Answer:
c

Show the following heap (in graphical tree form) after a call to removeMin (please show all steps) . Use the table provided in Question #2.



Your Answer:
remove 6

15

/ \

17 18

/ /

22 30

Assuming that you are using an Open Addressing Hash Table with linear probing and that the hash function uniformly distributes keys. For each 'unfilled' position in the hash table below, fill in the probability (as a ratio ... e.g. 5/10) that the next hashed word will be assigned to that position. Note, the hash

function is unknown (and not necessary to answer this question).

Index	Table Value
0	
1	
2	Joe
3	Max
4	Jen
5	
6	
7	Helen
8	
9	Rick

What is the load factor of the table in the question above.

- 5.0
- 10
- 0.5
- 0.75
- none of the above

1. For this problem, you must implement the `hashTableAdd` and `hashTableContains` functions for an open address hash table with linear probing. Assume you have access to a hash function named `_HASH` that returns an integer value and assume that removals are not allowed in this hash table implementation. **You will find the openHashTable implementation attached with the question.**

Pseudocode.pdf

```
int _HASH ( TYPE newValue);


void openHashTableAdd (struct openHashTable * ht, TYPE newValue) {
```

```
}


/* returns 1 for true, 0 for false */
int openHashTableContains (struct openHashTable *ht, TYPE testValue) {
```

}

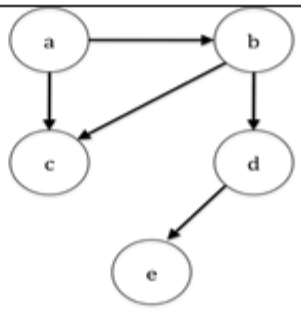
A Map ADT must be implemented with a HashTable.

- True
- False

Simulate the depth first search (DFS) reachability algorithm on the following graph starting at the node labeled a (space is given below). For this problem, **NODES MUST BE ADDED TO THE STACK/QUEUE IN CLOCKWISE** order starting at the node directly above. For example, if pushing the neighbors of node a onto a stack, we would push b then c, leaving c on the top of the stack. The generic DFS/BFS pseudocode is provided at the end of the exam. Note that in this version, we do not add neighbors to the stack/queue/pqueue if they have already been visited. Which of the following is the correct order in which

the nodes are marked ‘reachable’?

a. a, d, c, b, e
b. a, b, c, d, e
c. e, d, b, c, a
d. a, c, b, d, e
e. none of the above



D

Give the adjacency matrix representation of the graph shown in (12). Assume that any node is connected to itself.

	a	b	c	d	e
a					
b					
c					
d					
e					

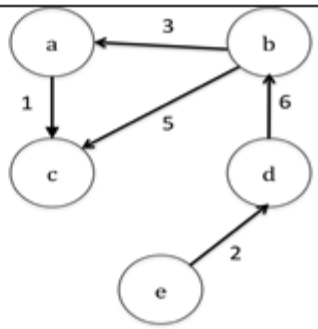
a b c d e a 1 1 1 0 0 b 0 1 1 1 0 c 0 0 1 0 0 d 0 0 0 1 1 e 0 0 0 0 1

What is the big-oh for the space requirements of adjacency matrix representation of a graph?

- O(V)
- O(E)
- $O(E^2)$
- $O(V^2)$
- O(V+E)
- None of the above

For the following graph, simulated Dijkstra’s algorithm, staring at node *e*. Which of the following represents the order that nodes will be marked ‘reached’ and the correct costs for those nodes.

a. e(0), d(2), b(6), c(5), a(3), c(1)
b. e(0), d(2), b(8), a(11), c(12)
c. e(0), d(2), b(8), a(11),c(13)
d. e(0), d(2), b(8), c(13), a(11)
e. none of the above



Your Answer:
B

Suppose you have a graph representing a maze that is infinite in size, but there is a finite path from the start to the finish. Which search, a DFS or a BFS, is ***guaranteed*** to find the path?

Your Answer:
BFS

Fill each black space with the letter from the right side that best matches. Letters may be used ONLY ONCE

Time for *finding* an element in a Dynamic Array implementation of a Sorted Bag

O(log n)

Data structure that implements the priority queue interface

heap

Subtrees that are guaranteed to already be heaps

leaves of a complete tree

A height-balanced binary search tree

avl tree

Data structure (not ADT) with O(n) search time

binary search tree

Correct Answer
linked list

Resolves collisions by storing them in a collection

priority queue

Correct Answer
hash table with chaining (or buckets)

ADT with the LIFO property

stack

Must have a load factor 1

linked list

Correct Answer
open address hash table

O(nlog n) in-place general–purpose sorting algorithm

tree sort with AVL Tree

Correct Answer
heap sort

Number of nodes in a full binary tree of height n

2^(n+1) - 1

An in-order traversal of this data structure produces elements in sorted order

open address hash table

Correct Answer
binary search tree

ADT used in Dijkstra's algorithm to implement a cost-first search

heap sort

Correct Answer
priority queue

Time complexity of finding a particular value in a Sorted Linked List

O(n)

Divide and conquer technique for quickly finding elements (similar to a phonebook search)

binary search tree

Correct Answer
binary search

ADT that associates a key with a value

stack

Correct Answer
Map or Dictionary