Problem 1

A priority queue containing characters is implemented using a min-heap and stored as an array. The capacity of the array used is 10 elements and the first 7 locations are occupied (indexes 0 through 6).

1) Only one of the following arrays represents a min-heap. Which one?

2) For the valid array representation of this min-heap, show the array after each of the following operations is performed (each operation should be modifying the array resulting from the previous step).

index	0	1	2	3	4	5	6	7	8	9
value	'b'	'k'	'g'	'e'	'p'	'z'	'j'			

index	0	1	2	3	4	5	6	7	8	9
value	'b'	'e'	'g'	'k'	'p'	'z'	'j'			

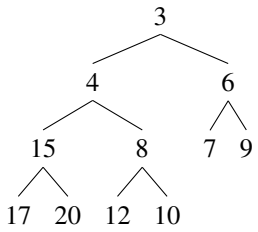
index	0	1	2	3	4	5	6	7	8	9
value	'b'	'e'	'p'	'k'	'g'	'z'	'j'			

Assume that the name of the priority queue is `pq`.

1. `pq.enqueue('d');`
2. `pq.dequeue();`
3. `pq.enqueue('h');`
4. `pq.enqueue('f');`
5. `pq.dequeue();`
6. `pq.dequeue();`

Problem 2

Given the following max-heap, show the final state of the heap after executing the following operations: `enqueue(5)`, `dequeue()`, `enqueue(2)`, `dequeue()`.



Problem 3

Enter the following nodes into an AVL tree: 45, 55, 100, 0, 60, 85, 12, 3, 98, 20, 30, 75. For each node that triggers a rotation, state what node it is and show the tree after the necessary rotation.

Problem 4

Consider the implementation of a tree where each node can have arbitrary many children. In the data structure used for storing the tree the children of a given node are organized in a singly lined list using the `sibling` field and the parent has `firstChild` field. Nodes are storing integer values. The declaration of a `Node` class is as follows:

```
class Node {
  int data;
  Node firstChild;
  Node sibling;
}
```

Draw the tree that is represented by the following nodes.