Heap, Priority Queue

A queue which fifo works on not the basis of the order of insertion but the priority associated with each element.

Lets say x,b,s are inserted into a queue, then the order in which they will be removed are x, b and s

But if there is an priority associated with the elements. ( higher the value , higher the priority)

(x,2) ,(s,7), (b,3) Then the order of removal is s,b,x.

Operations allowed are:

Insert element

Access

Remove

What data structure used are :

Array and List :

Binary Search Tree:

Inser: O(logN)

Access: O(logN)

Remove: O(logn)

Binary Heap:

insert: O(logN)

access: O(1)

remove:O(logN)

Binary Heap :

Heap Property: relates to the value,

Shape property: relates to the

Minimum Heap: Smallest value is the root , ie The value is les

Maximum heap: Max value is the root,

We generally use an array

Heapify : positioning an element in the right location in the heap

Shift up and shift down:

Heap Sort Is Not stable sort

Heap sort space complexity o(1)

Array practice questions;

Remove an element at an index;

Questions: when happens when an item is duplicated , how is that affects the result ?

Problems:

1. Implement a priority Queue , using just array ( not heap ) unordered
2. Implement a Priority Queue , using just an array ( not heap ) ordered
3. Implement a Priority Queue , using heap
4. Implement a Priority queue , using heap
5. Use binary search tree to implement a priority queue
6. Implement a min heap with generics
7. Implement a max heap with generics
8. Convert a min heap to max heap
9. Find the maximum element in a min heap
10. Find the k largest elements in the stream
11. Find the hight of the heap of a given array elements; <https://practice.geeksforgeeks.org/problems/height-of-heap/0>
12. [https://practice 13469.geeksforgeeks.org/problems/does-array-represent-heap/0](https://practice.geeksforgeeks.org/problems/does-array-represent-heap/0)
13. <https://practice.geeksforgeeks.org/problems/sum-of-elements-between-k1th-and-k2th-smallest-elements/0> : A fantastic problem , I got myself into trouble.
14. Write a heap ( min or max) that don’t accept duplicates.
15. Can you create a heap (min) which holds element unique in each level of binary tree.

PriorityQueue in java do have iterator but the order is not what you expect.

Math practice: find the log base 2 value of a number.

How to deal with a situation when duplicates are allowed in priority queue.

How do you deal with binary heap when there are duplicates, and you remove a duplicate.