Indexable Min PQ

Into & Live Coding

Let’s talk about it

- Indexable Min Priority Queue
  - Each word describes a different part of the data structure.

Indexable Min Priority Queue

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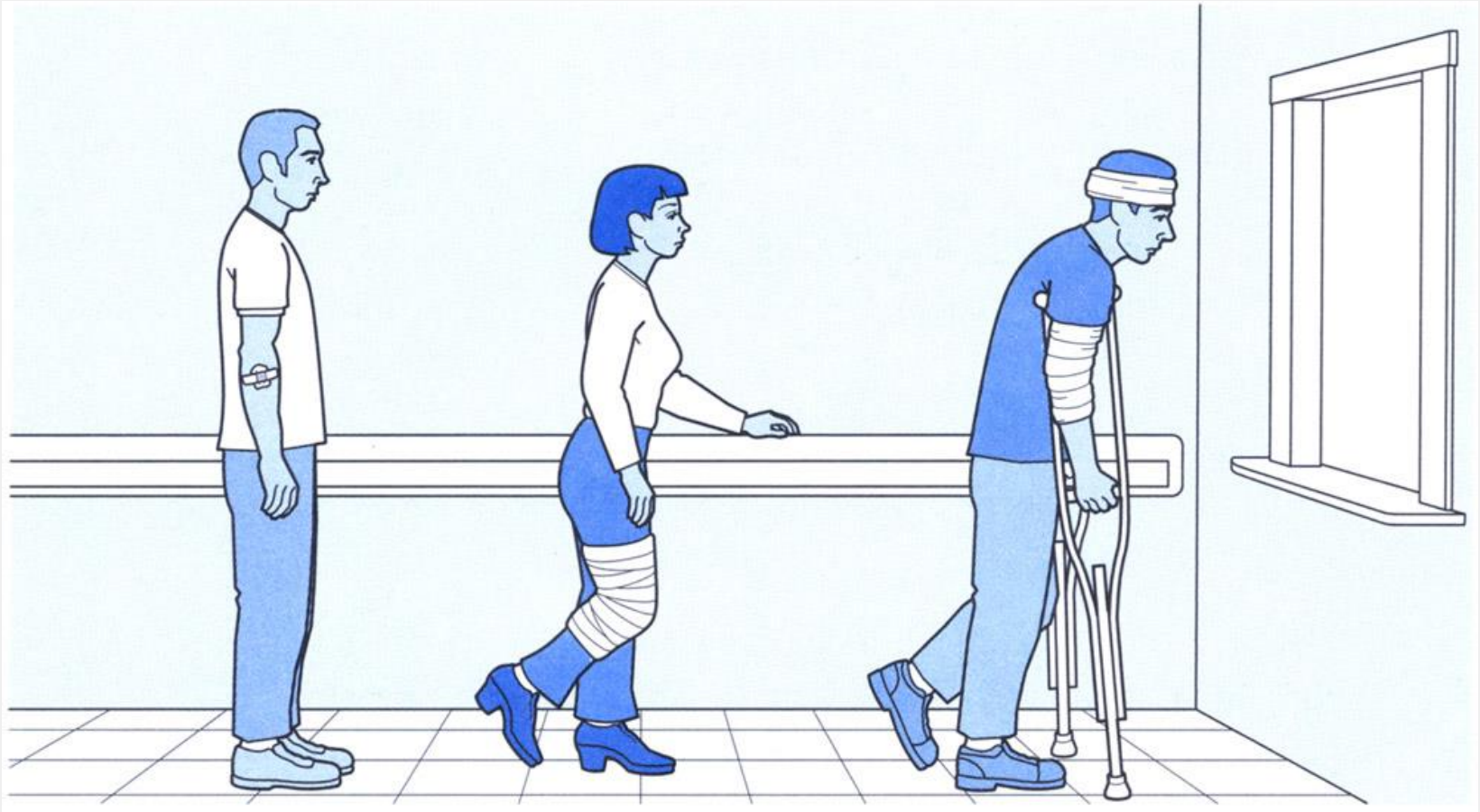

Indexable Min Priority Queue

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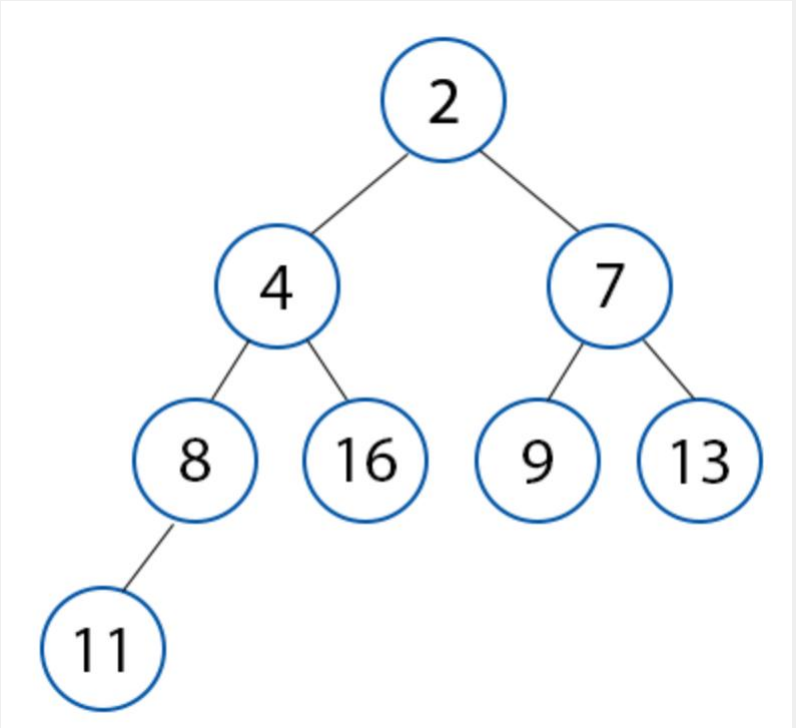
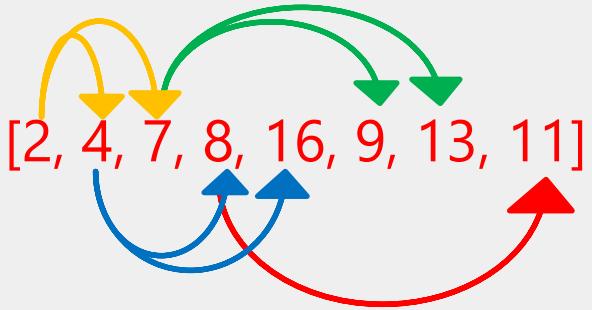
Min Heap

- Every parent node is less than or equal to the value of its children nodes.
- The minimum value is always the root node.

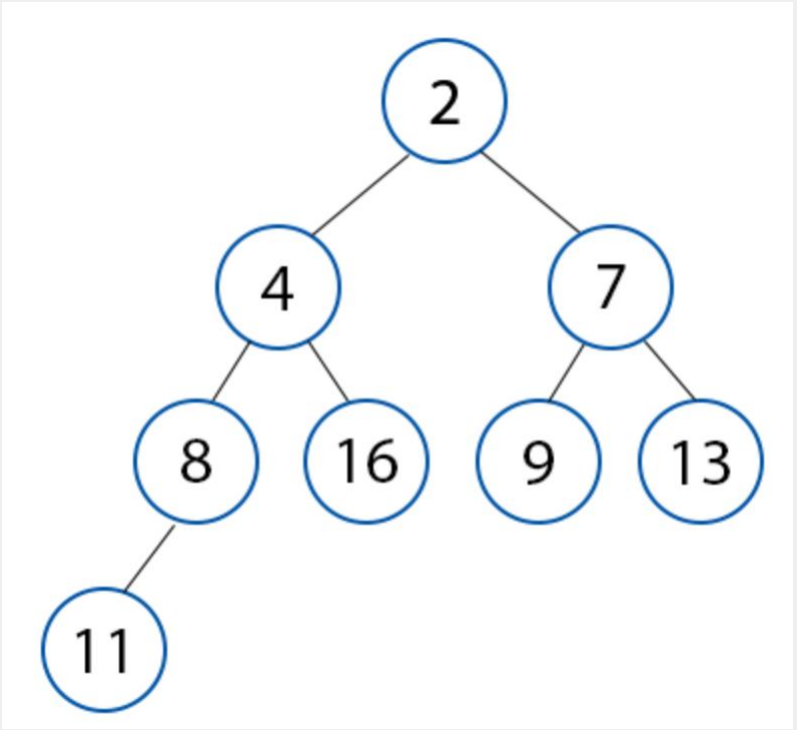


Representing Trees in Arrays



If X is an index of this array,
AND THIS ARRAY IS 1-BASED (starts at index 1):

Left child of X is 2*X
Right child of X is 2*X + 1
Parent of X is (int) X/2



Supported Operations

- `void insert(int index, Key key)`
- `boolean contains(int index)`
- `int minIndex()`
- `Key minKey()`
- `void deleteMin()`
- `Key delete(int index)`

Use Helper Functions

```
private void swim(int k) {
    while (k > 1 && greater(k/2, k)) {
        exch(k, k/2);
        k = k/2;
    }
}
private void sink(int k) {
    while (2*k <= n) {
        int j = 2*k;
        if (j < n && greater(j, j+1)) j++;
        if (!greater(k, j)) break;
        exch(k, j);
        k = j;
    }
}
```