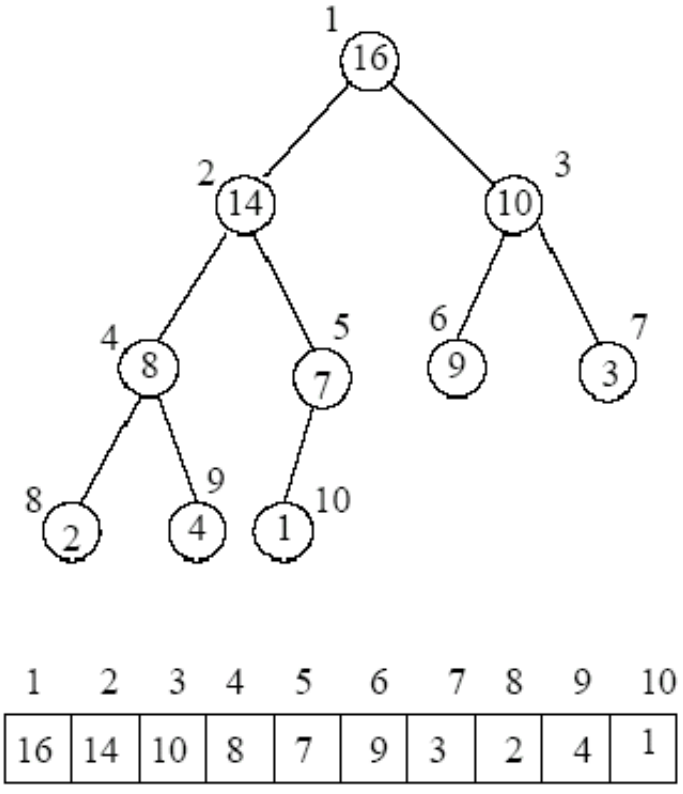
Priority Queue and Binary Heap

2. Array Representation of Binary Heap

- `length[A]`: the size of the array
- `heap-size[A]`: the number of items stored into the array A
- **Note:** `heap-size[A]` <= `length[A]`
- The root of the tree is at A[1], i.e., the indexing typically begins at index 1 (not 0). A[0] can be reserved for the variable heap-size[A].

Heap is *implemented* as an array, but its operations can be grasped more easily by looking at the binary tree representation. The mapping between the array representation and binary tree representation is unambiguous. The array representation can be achieved by traversing the binary tree in *level order*.



1	2	3	4	5	6	7	8	9	10
16	14	10	8	7	9	3	2	4	1

Figure 1: Binary tree and array representation for the MaxHeap containing elements (that has the priorities) [16,14,10,8,7,9,3,2,4,1].

2.1 Routines to access the array

Lets consider the *i*:th **node** in a Heap that has the value A[i]

`PARENT(i) = i/2`	Return the index of the father node
`LEFT(i) = 2i`	Return the index of the left child
`RIGHT(i) = 2i+1`	Return the index of the right child

Example 1: In Figure 1, node i=3 (`A[3]=10`) has father at index `PARENT(3) = 3/2 = 1` (`A[1] = 16`). In addition, its left and right children are at `LEFT(3) = 2*3 = 6` and `RIGHT(3) = 2*3 + 1 = 7` (`A[6] = 9` and `A[7] = 3`, respectively).

Previous Chapter: Introduction **Next Chapter:** MinHeap vs. MaxHeap

This document was last updated 30.5.2011. Please send your comments to Mikko Laakso, Ari Korhonen, and Ville Karavirta.