Data Structures

Sorting Technique – Heap Sort

Team Emertxe

Introduction

Basic Terminology

Heap:

They are complete or Absolute Complete Binary Tree

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Binary Tree :

A tree whose elements have at most 2 children is called a binary tree.

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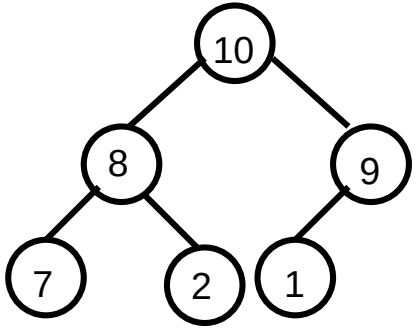

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They are complete or Absolute Complete Binary Tree

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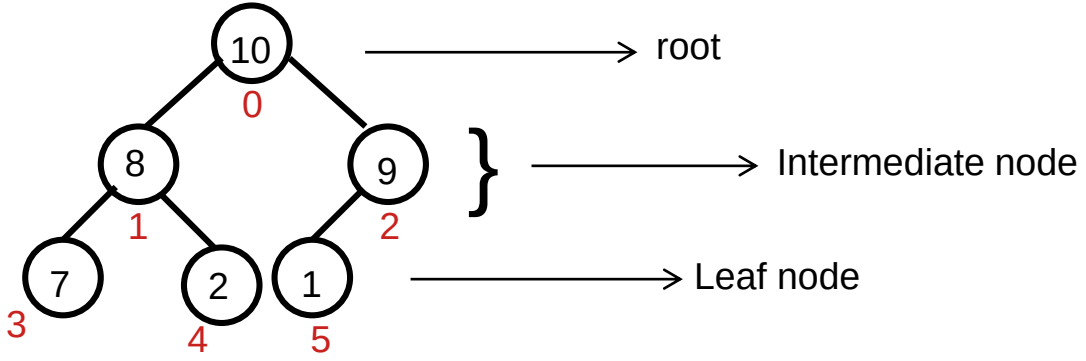

Basic Terminology

Complete Binary Tree (CBT) / Absolute Complete Binary tree (ACBT):

A complete binary tree is a binary tree in which every level is completely filled
All the nodes except the leaf node have 2 children or every level is filled
from left to right,but it is not completely filled.

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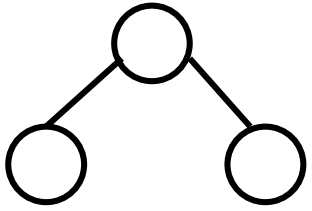
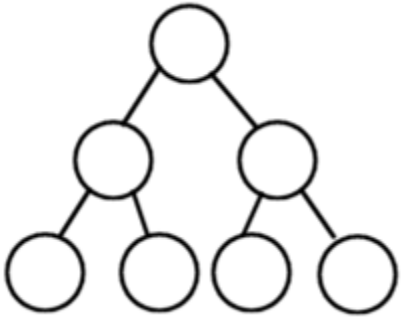
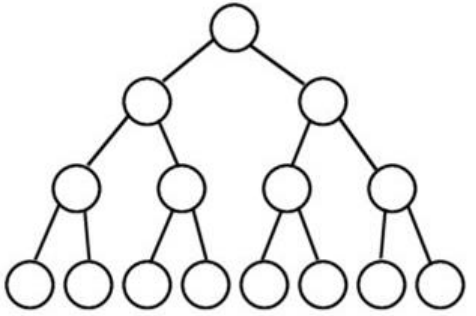
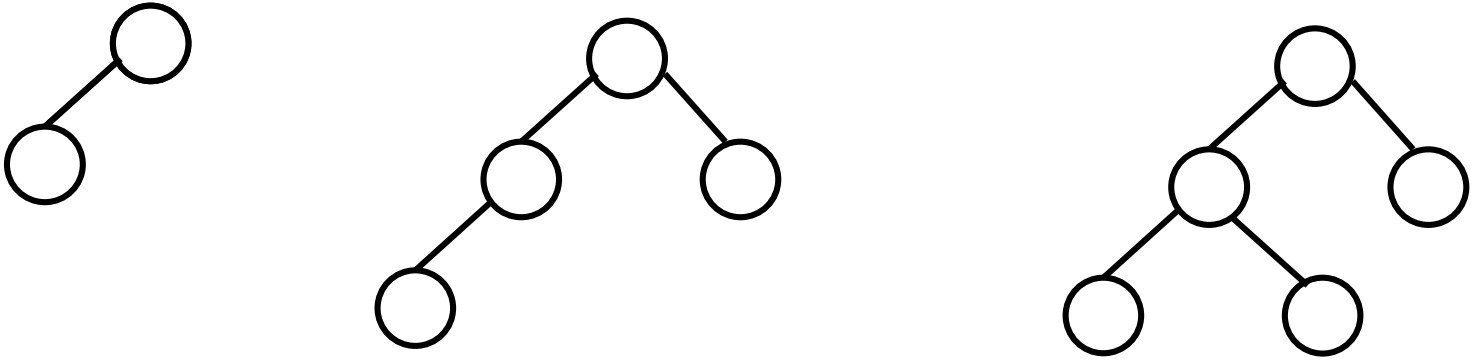






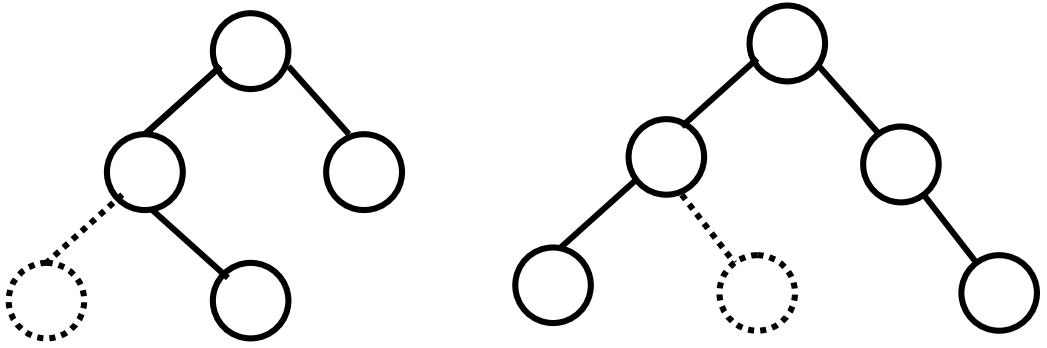
Basic Terminology

Complete Binary Tree (CBT) / Absolute Complete Binary tree (ACBT)**:**



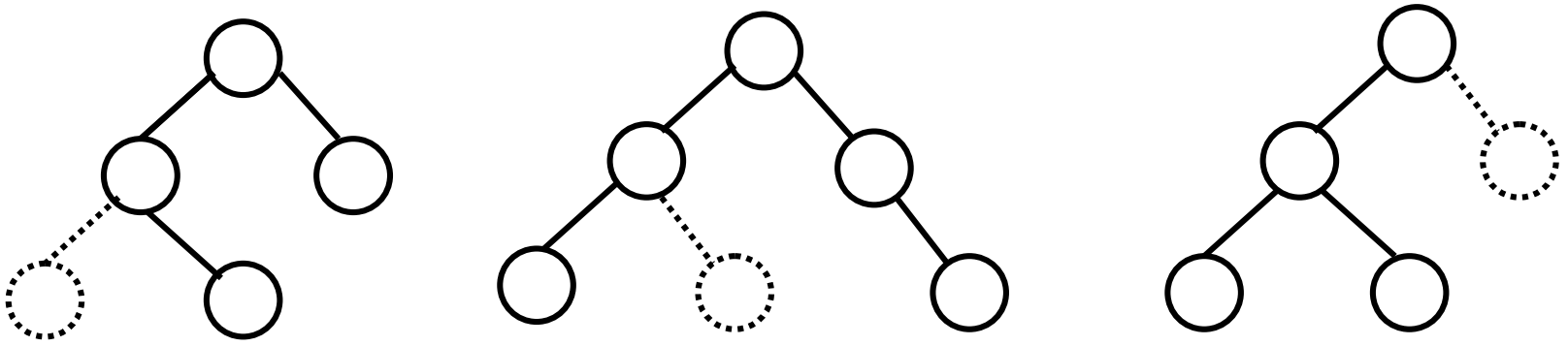
Basic Terminology

Not CBT /ACBT:



Basic Terminology

Not CBT /ACBT:



Basic Terminology

Types of Heap

- Max Heap
- Min Heap

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Max Heap

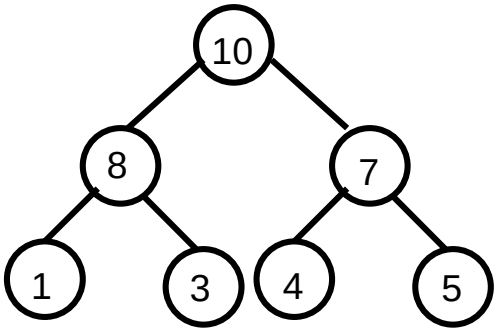
A CBT/ACBT where items are stored in a special order such that value in a root node is greater than the values in all other nodes.

Min Heap

A CBT/ACBT where items are stored in a special order such that value in a root node is smaller than the values in all other nodes.

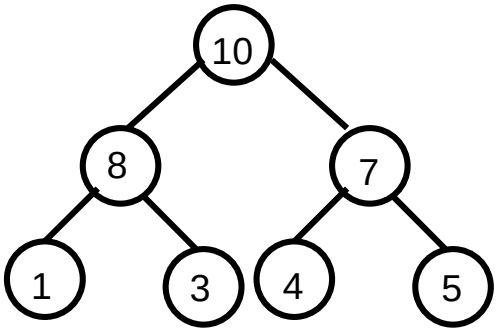
Basic Terminology

Max Heap

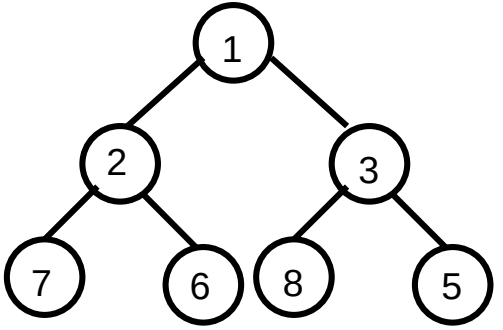


Basic Terminology

Max Heap

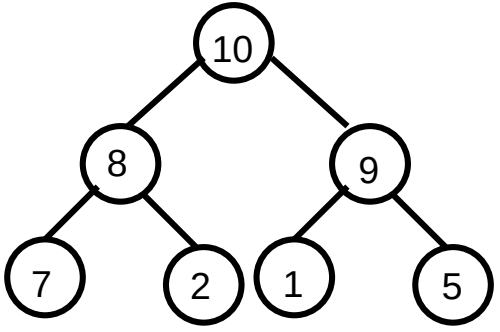


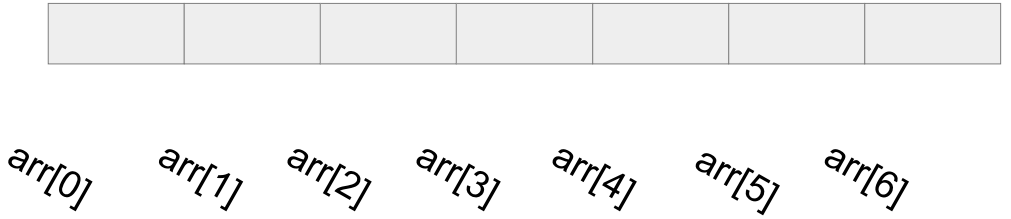
Min Heap



Basic Terminology

Representation of Heap





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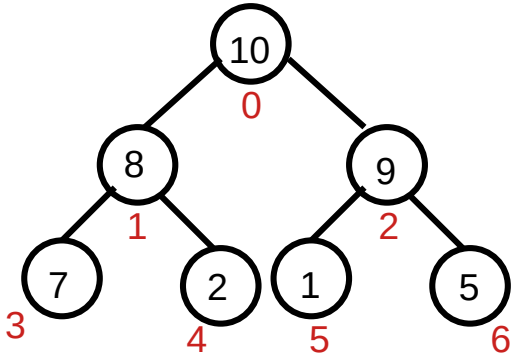

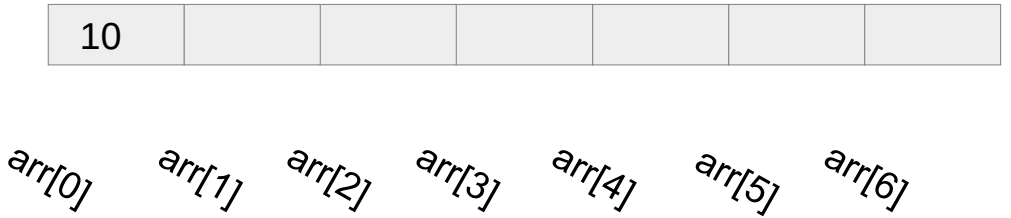

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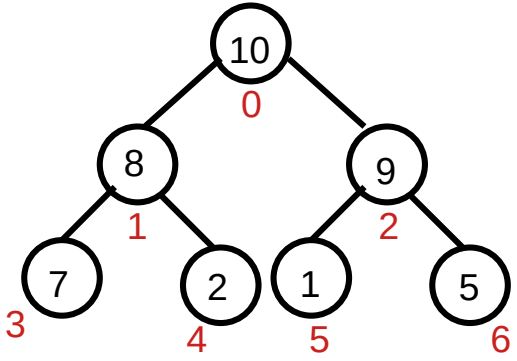
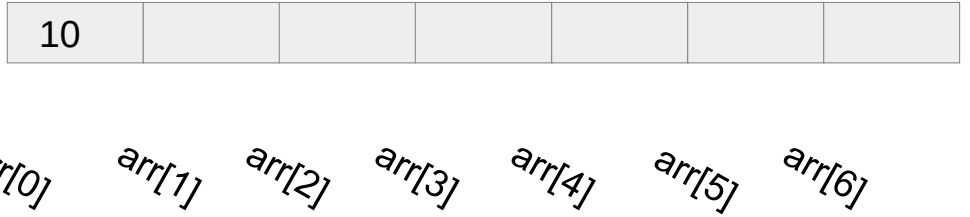


$L_C(i) = 2*i+1$

$R_C(i) = 2*i+2$



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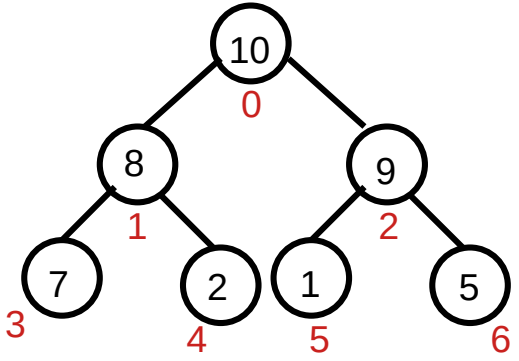

$L_C(i) = 2*i+1$ $R_C(i) = 2*i+2$

i = 0 $L_C(0) = 2*0+1 = 1$

10	8					
arr[0]	arr[1]	arr[2]	arr[3]	arr[4]	arr[5]	arr[6]

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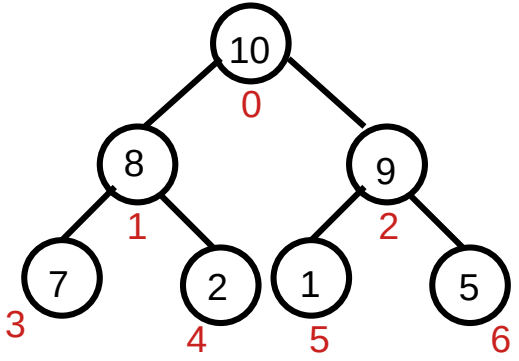
Representation of Heap



$L_C(i) = 2*i+1$ $R_C(i) = 2*i+2$

i = 0 $L_C(0) = 2*0+1 = 1$ $R_C(0) = 2*0+2 = 2$

10	8	9				
arr[0]	arr[1]	arr[2]	arr[3]	arr[4]	arr[5]	arr[6]

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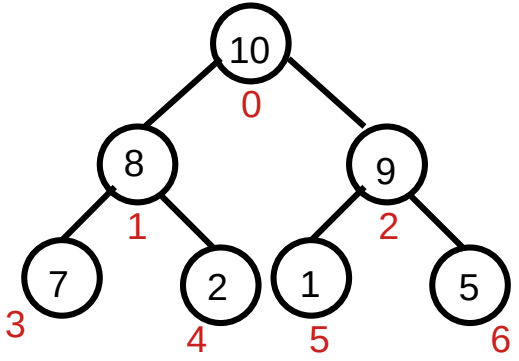
Representation of Heap



$L_C(i) = 2*i+1$ $R_C(i) = 2*i+2$

i = 0 $L_C(0) = 2*0+1 = 1$ $R_C(0) = 2*0+2 = 2$

i = 1 $L_C(1) = 2*1+1 = 3$

10	8	9	7			
arr[0]	arr[1]	arr[2]	arr[3]	arr[4]	arr[5]	arr[6]

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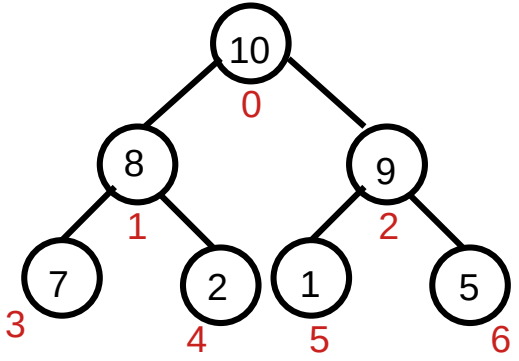
Representation of Heap



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i = 1 $L_C(1) = 2*1+1 = 3$ $R_C(1) = 2*1+2 = 4$

10	8	9	7	2		
arr[0]	arr[1]	arr[2]	arr[3]	arr[4]	arr[5]	arr[6]

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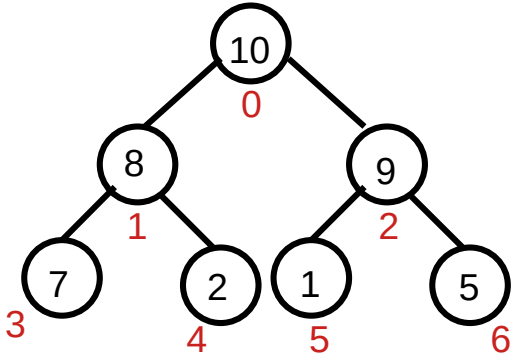
Representation of Heap



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i = 1 $L_C(1) = 2*1+1 = 3$ $R_C(1) = 2*1+2 = 4$

i = 2 $L_C(2) = 2*2+1 = 5$

10	8	9	7	2	1	
arr[0]	arr[1]	arr[2]	arr[3]	arr[4]	arr[5]	arr[6]

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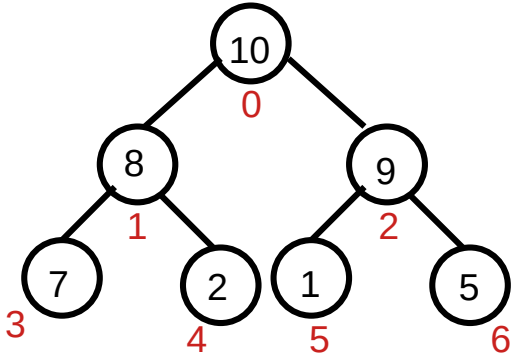

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i = 1	$L_C(1) = 2*1+1 = 3$	$R_C(1) = 2*1+2 = 4$
i = 2	$L_C(2) = 2*2+1 = 5$	$R_C(2) = 2*2+2 = 6$

10	8	9	7	2	1	5
arr[0]	arr[1]	arr[2]	arr[3]	arr[4]	arr[5]	arr[6]

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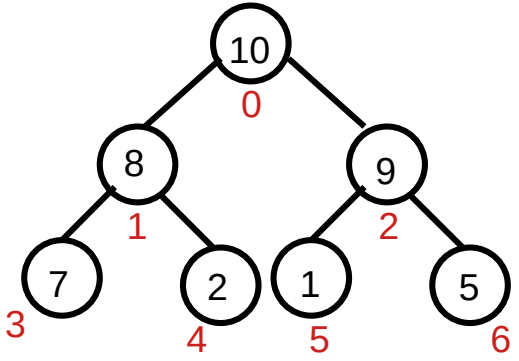

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i = 2	$L_C(2) = 2*2+1 = 5$	$R_C(2) = 2*2+2 = 6$

10	8	9	7	2	1	5
arr[0]	arr[1]	arr[2]	arr[3]	arr[4]	arr[5]	arr[6]

Heap Sort