

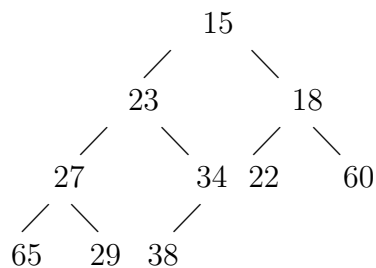
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February 6, 2007

Data Structure

SOLVE EXACTLY THREE OUT OF THE FOLLOWING FIVE PROBLEMS:

- 1) Show the result of the following heap after insert 17.



- 2) Show the result of the heap obtained in (1) after deleting the root.
2. Suppose $T(N)$ is the average running time for the quicksort of the data of size N .
Find a closed formula for $T(N)$
3. Sort 3, 24, 25, 9, 2, 16, 15, 3, 5 using quick sort with medium of three partitioning and a cut off of 3.
4. Give an algorithm to find a minimum spanning tree, suppose the undirected graph is represented by an adjacency list.

5. The following pseudocode is applied to the adjacent list of the graph H with the adjacency list given on the next page.

```
counter = 0;
assign ( $A$ );

void assign (Vertex  $v$ )
/* 1 */      {vertex  $w$ ;
/* 2 */       $v.num=counter +1$ ;
/* 3 */       $v.visited = true$ ;
/* 4 */      for each  $w$  adjacent to  $v$ 
/* 5 */      if (!  $w.visited$ )
/* 6 */          { $w.parent = v$ ;
/* 7 */          assign ( $w$ );
                }
            }
}
```

a) What is the result?

The adjacency list of the graph H:

$A \longrightarrow C \longrightarrow D$

$B \longrightarrow C \longrightarrow D \longrightarrow G$

$C \longrightarrow A \longrightarrow B \longrightarrow G$

$D \longrightarrow A \longrightarrow B$

$E \longrightarrow F \longrightarrow G$

$F \longrightarrow E \longrightarrow G$

$G \longrightarrow B \longrightarrow C \longrightarrow E \longrightarrow F$

b) What is the running time if the adjacency list has N nodes?