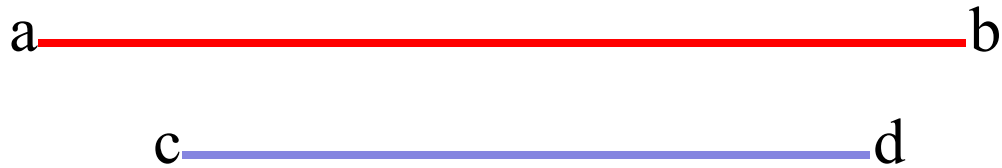


Interval Heaps

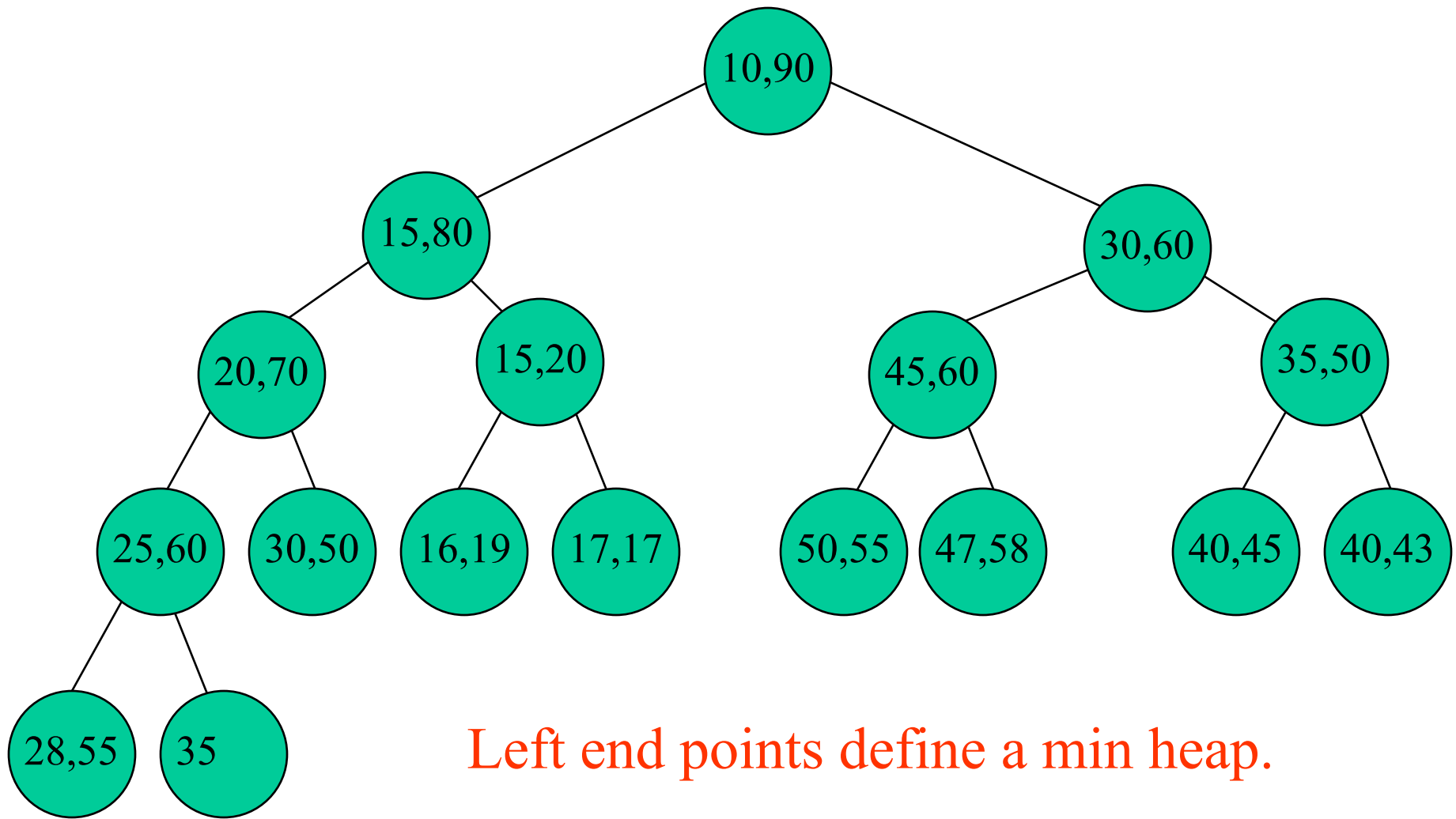
- Complete binary tree.
- Each node (except possibly last one) has 2 elements.
- Last node has 1 or 2 elements.
- Let a and b be the elements in a node P , $a \leq b$.
- $[a, b]$ is the interval represented by P .
- The interval represented by a node that has just one element a is $[a, a]$.
- The interval $[c, d]$ is contained in interval $[a, b]$ iff $a \leq c \leq d \leq b$.
- In an interval heap each node's (except for root) interval is contained in that of its parent.

Interval

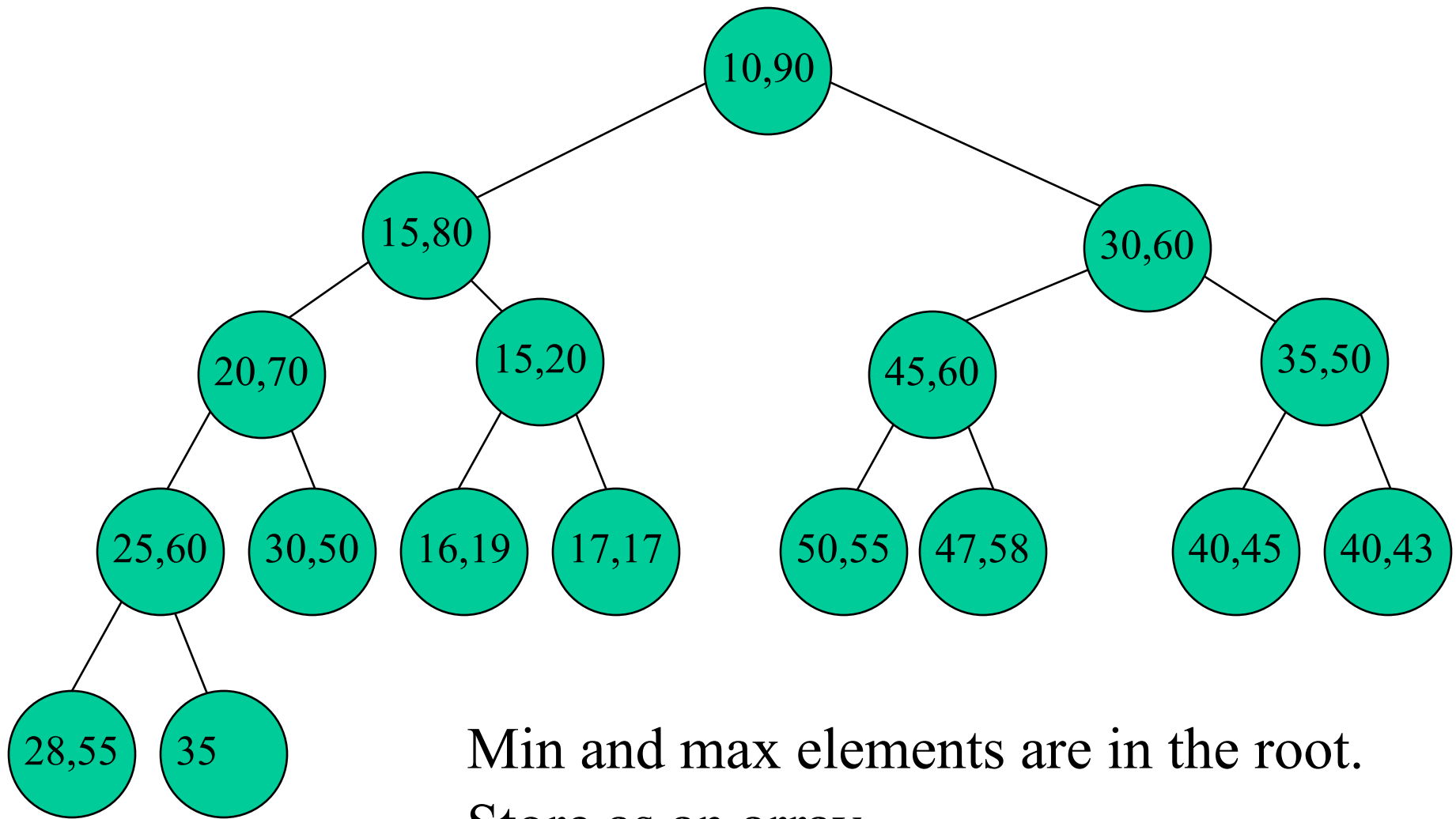


- $[c, d]$ is contained in $[a, b]$
- $a \leq c$
- $d \leq b$

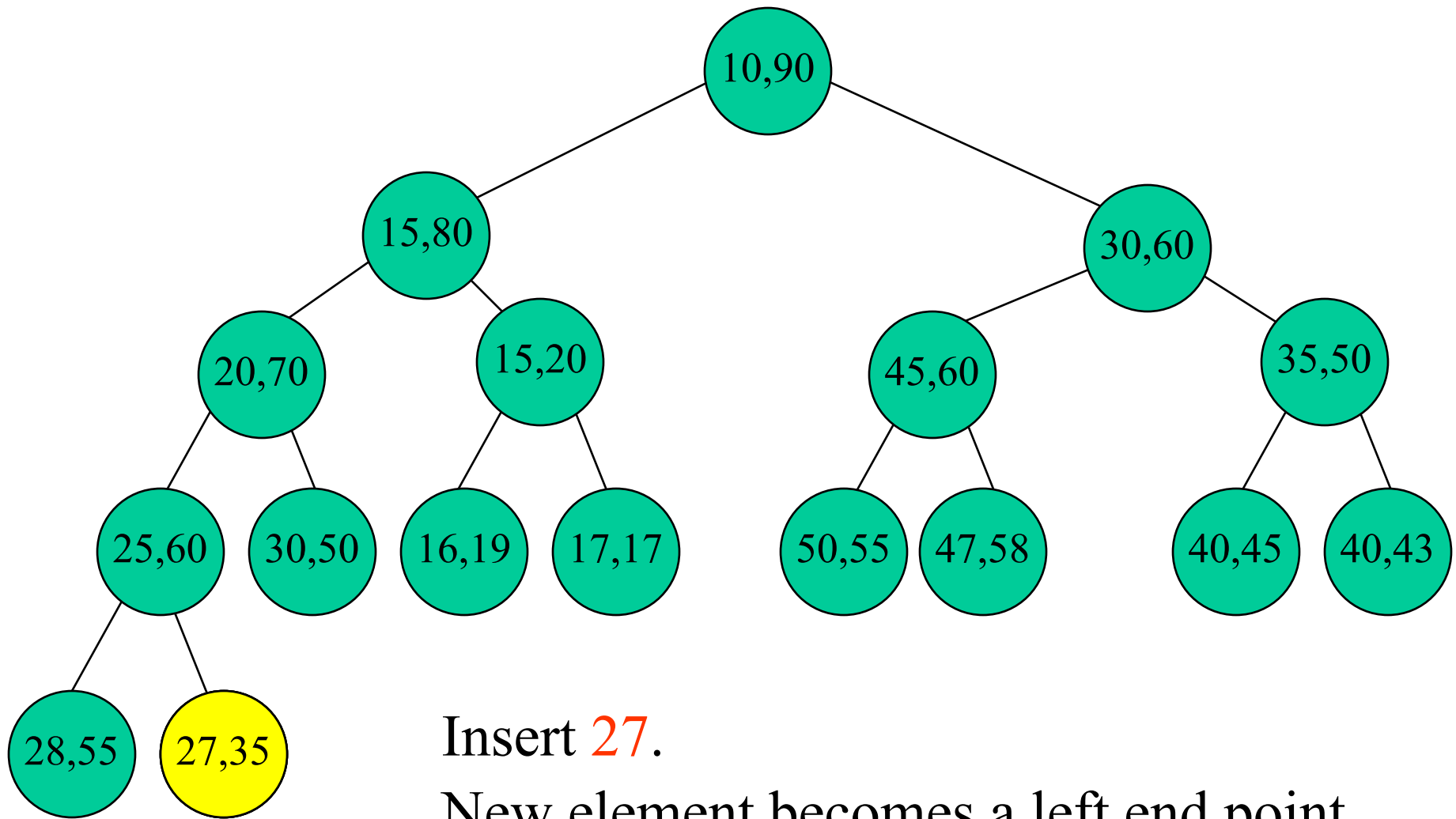
Example Interval Heap



Example Interval Heap



Insert An Element

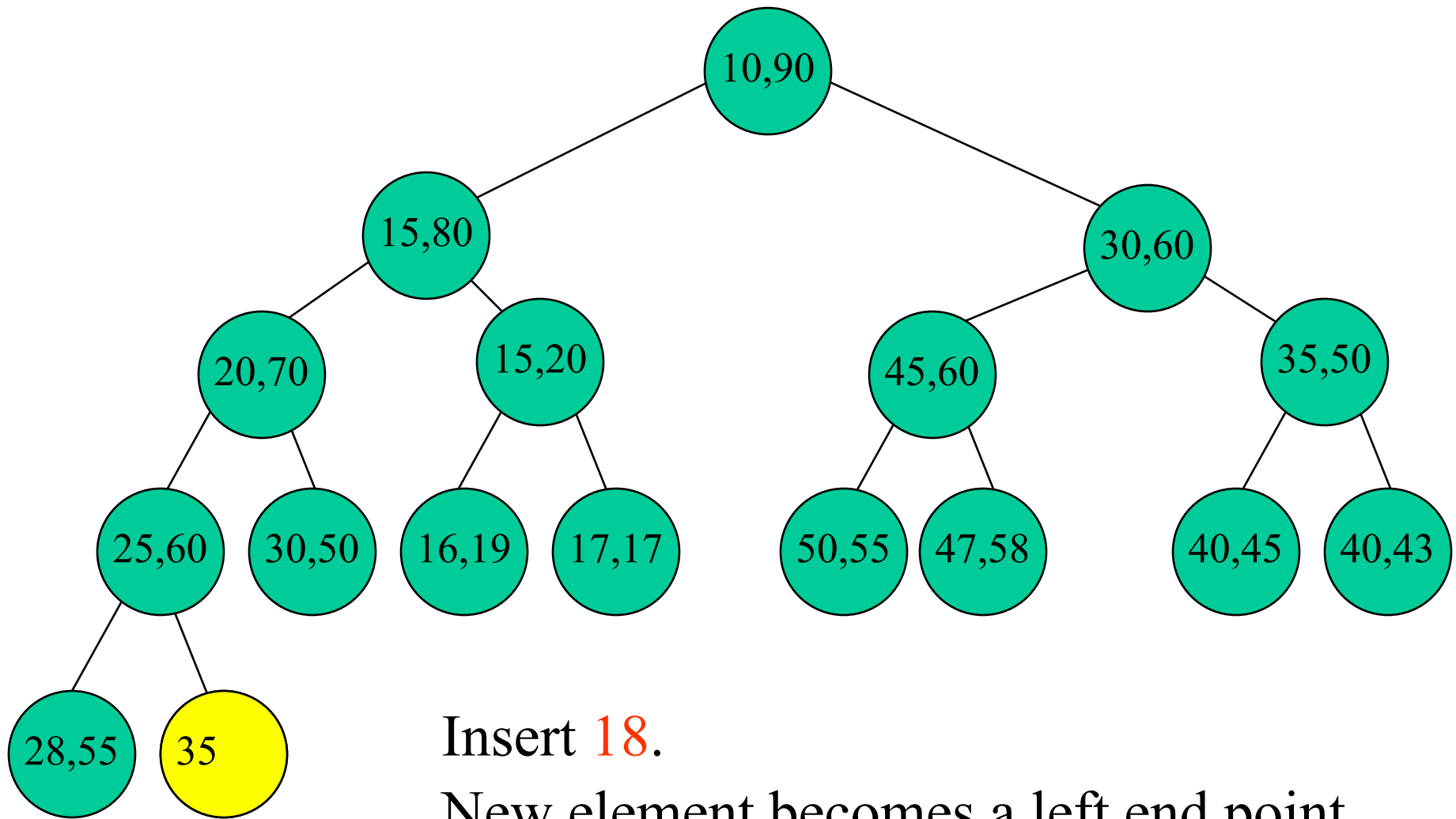


Insert **27**.

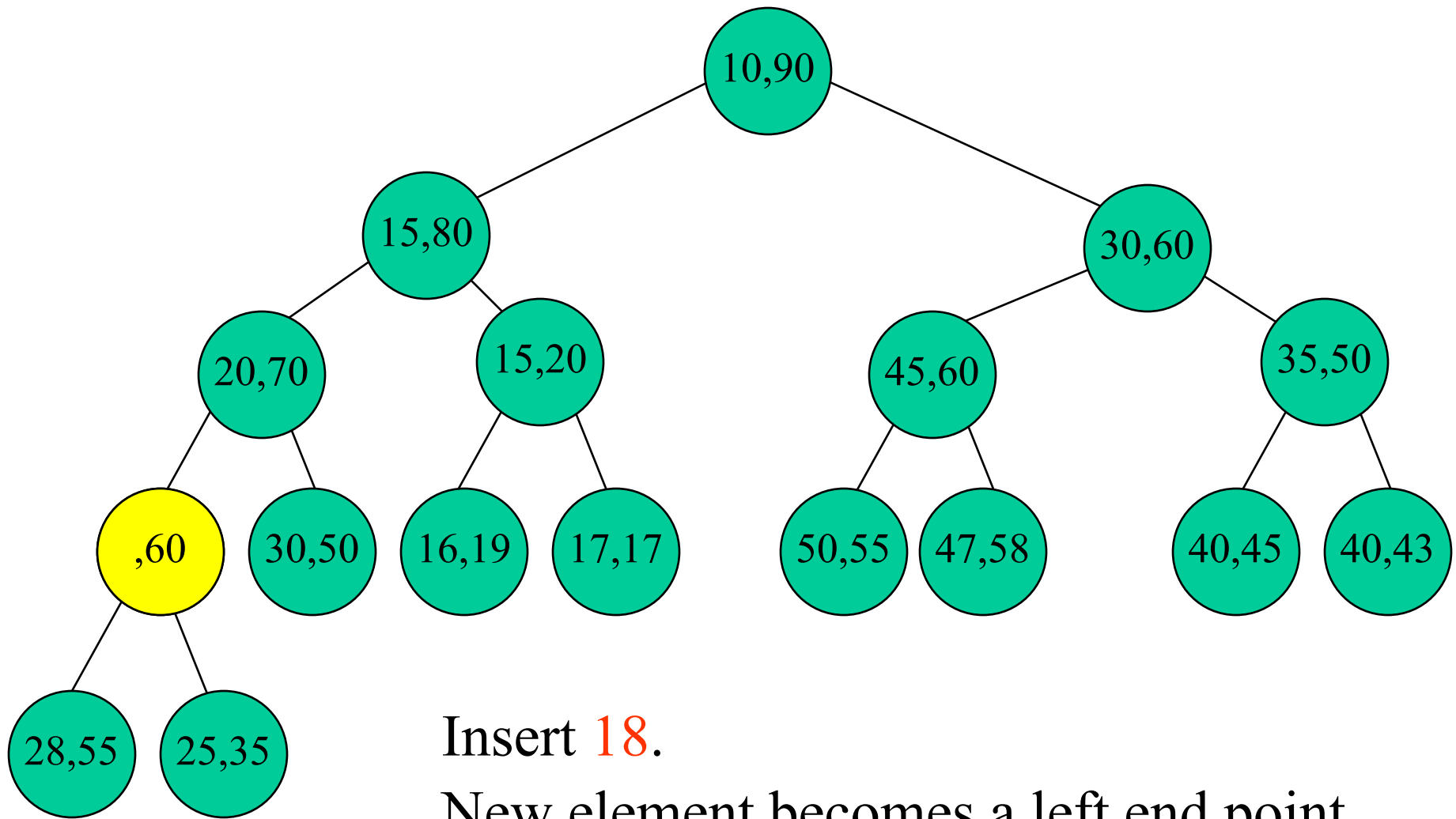
New element becomes a left end point.

Insert new element into min heap.

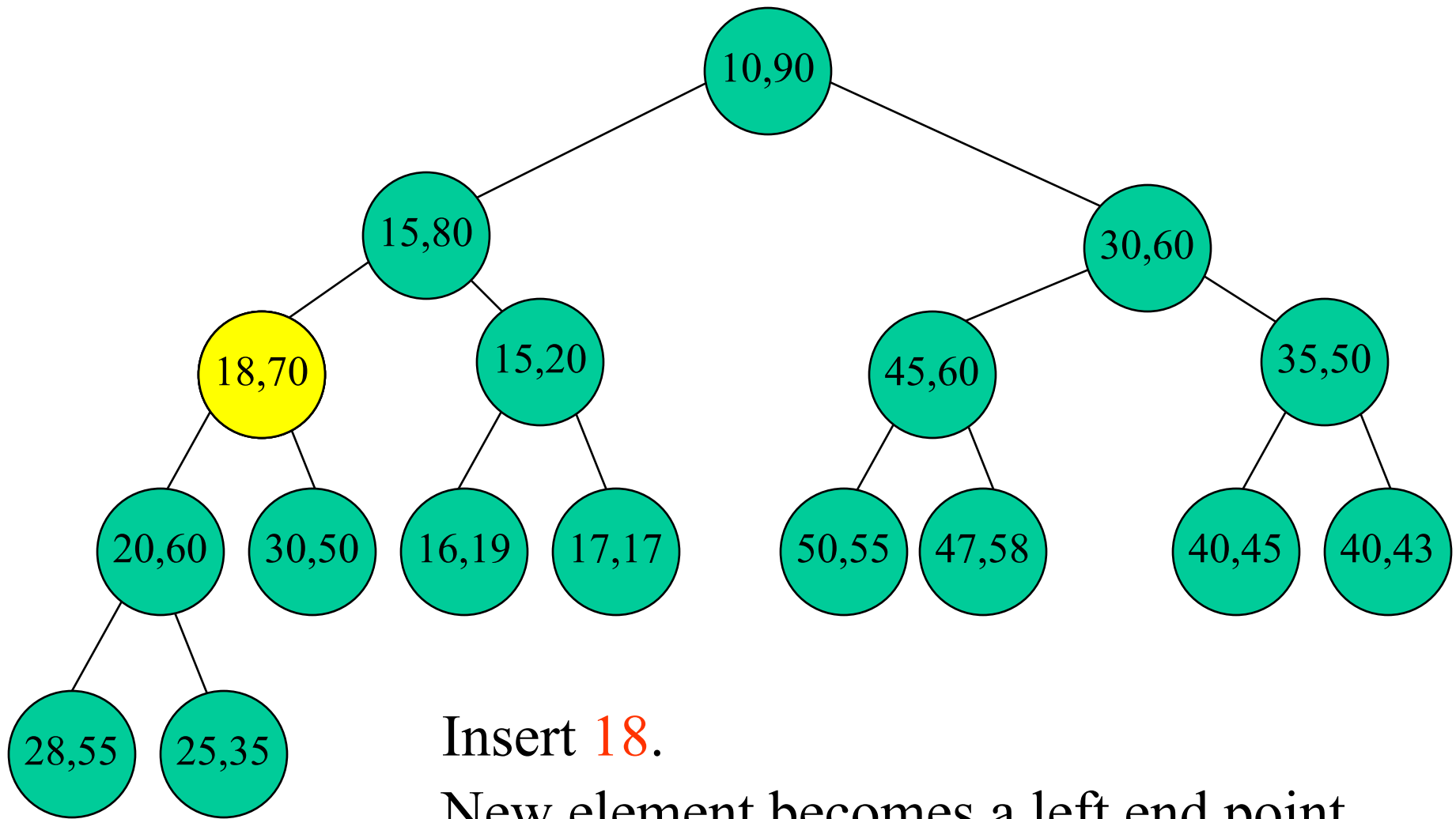
Another Insert



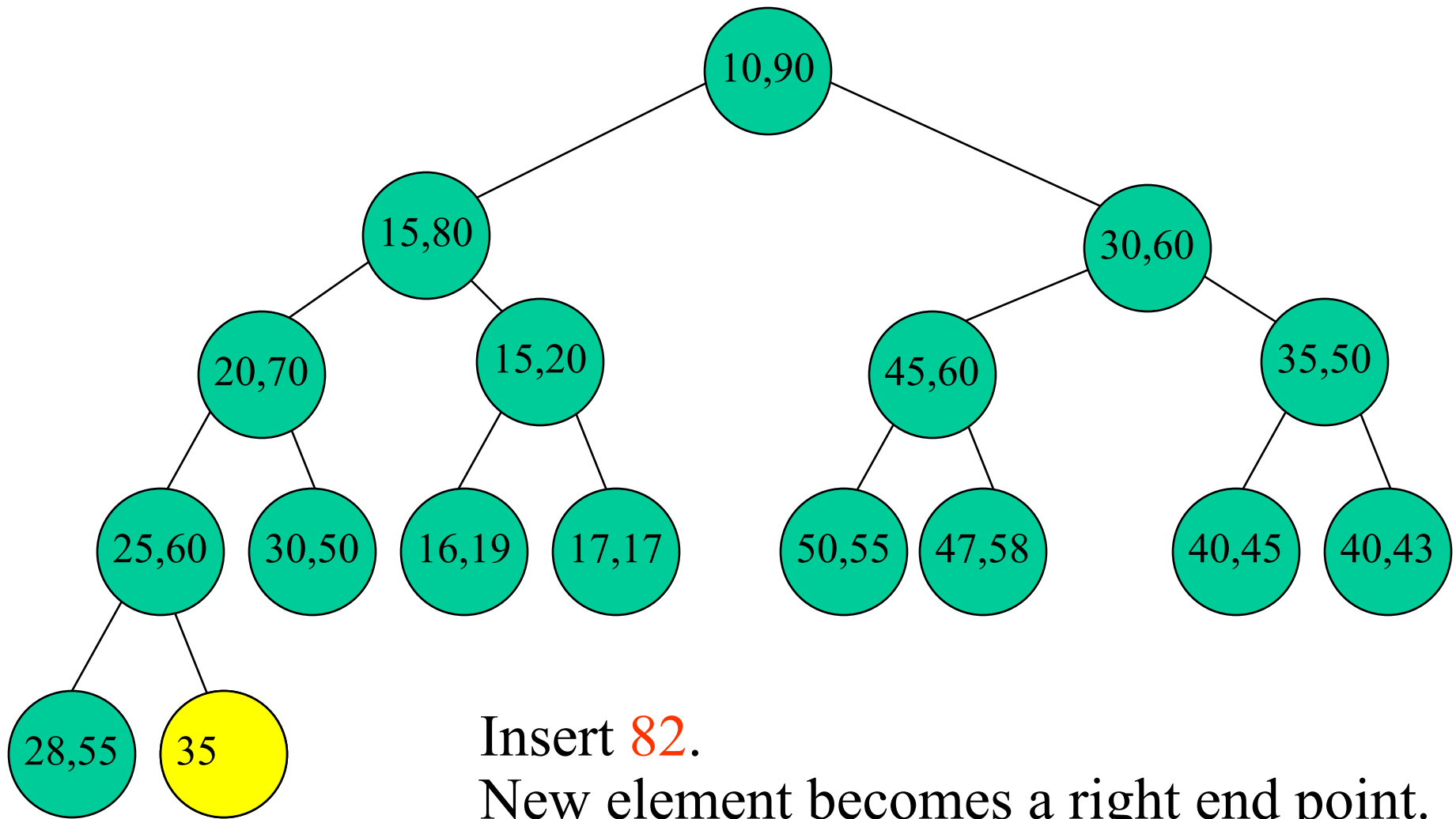
Another Insert



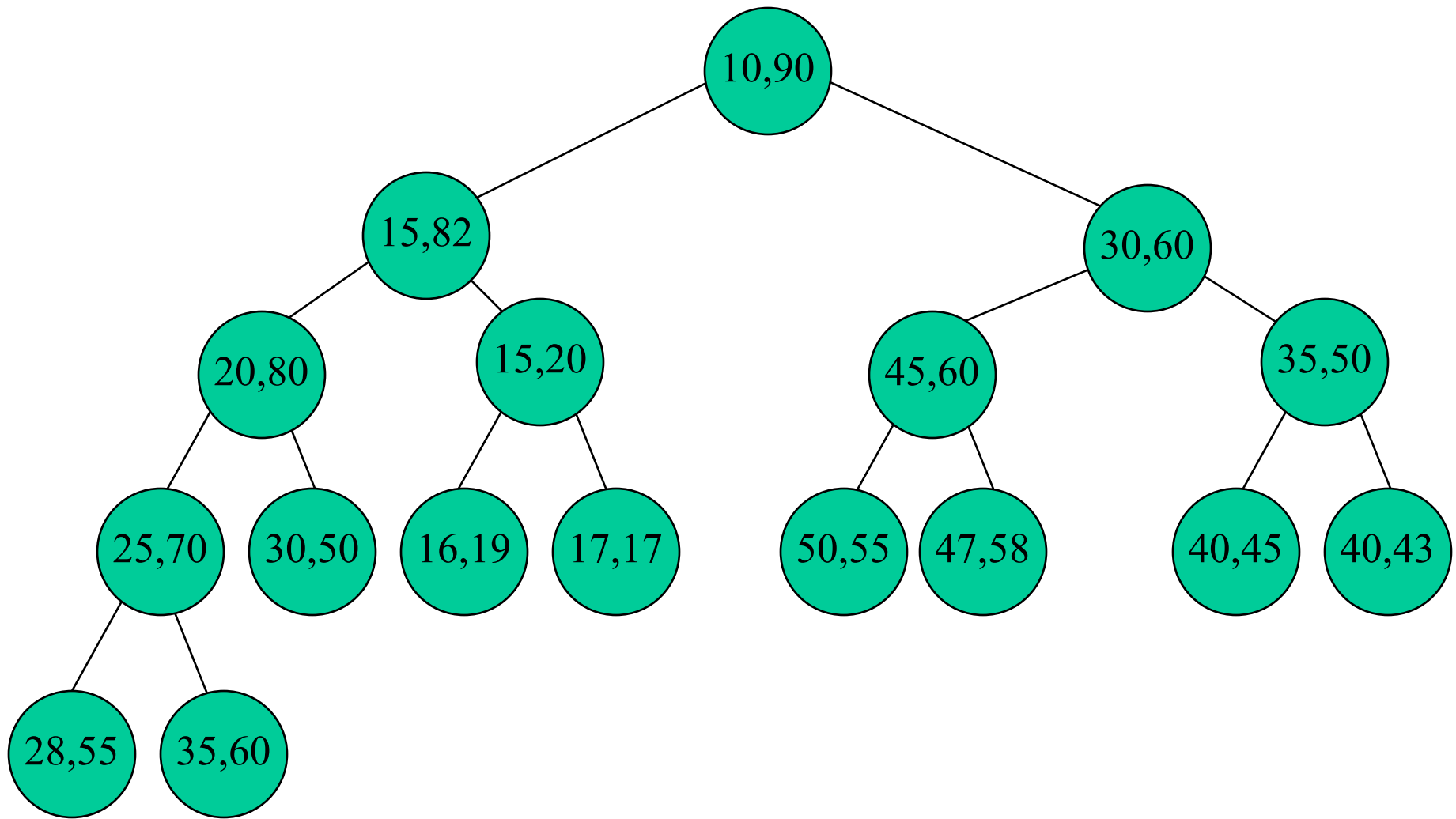
Another Insert



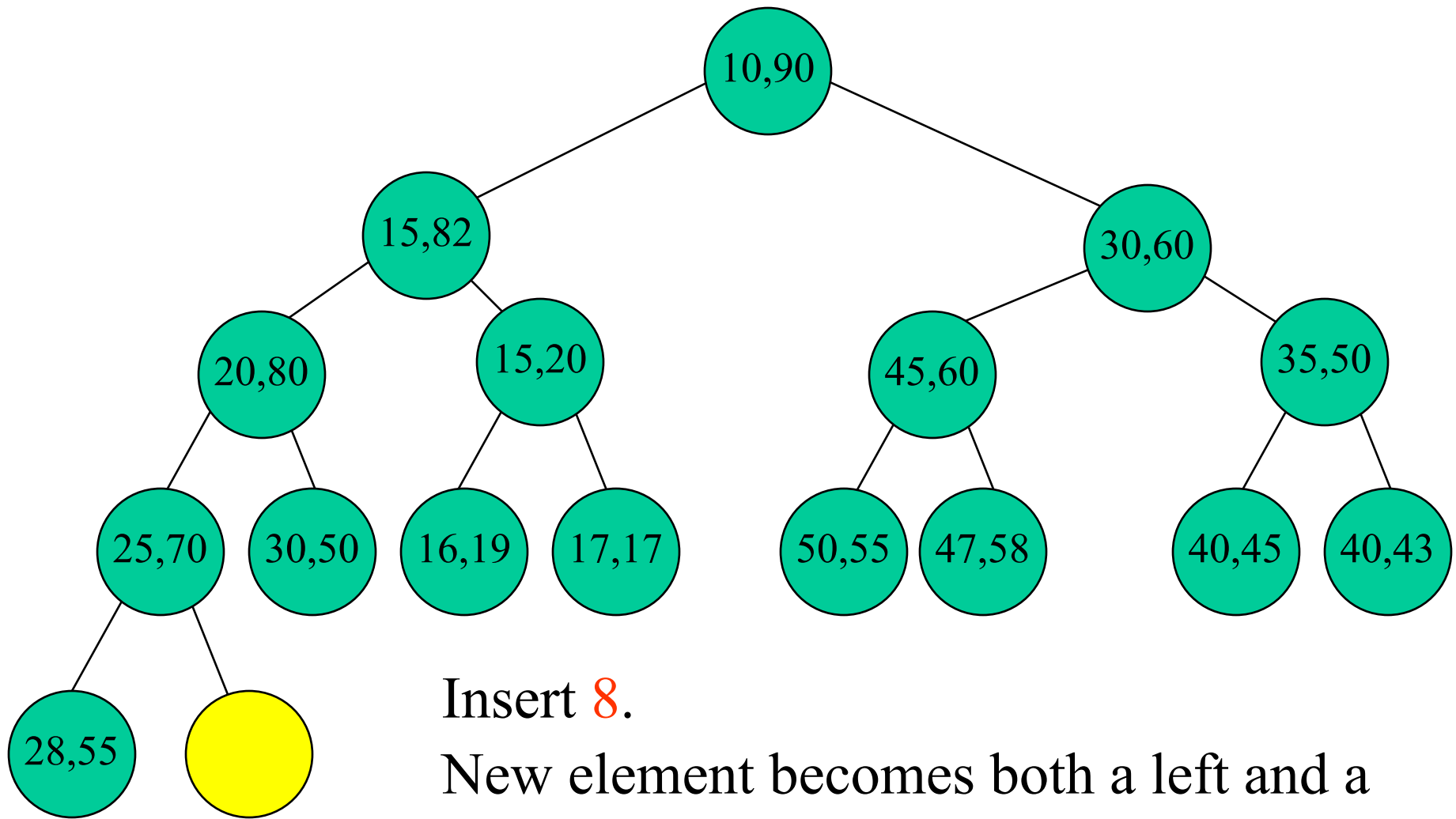
Yet Another Insert



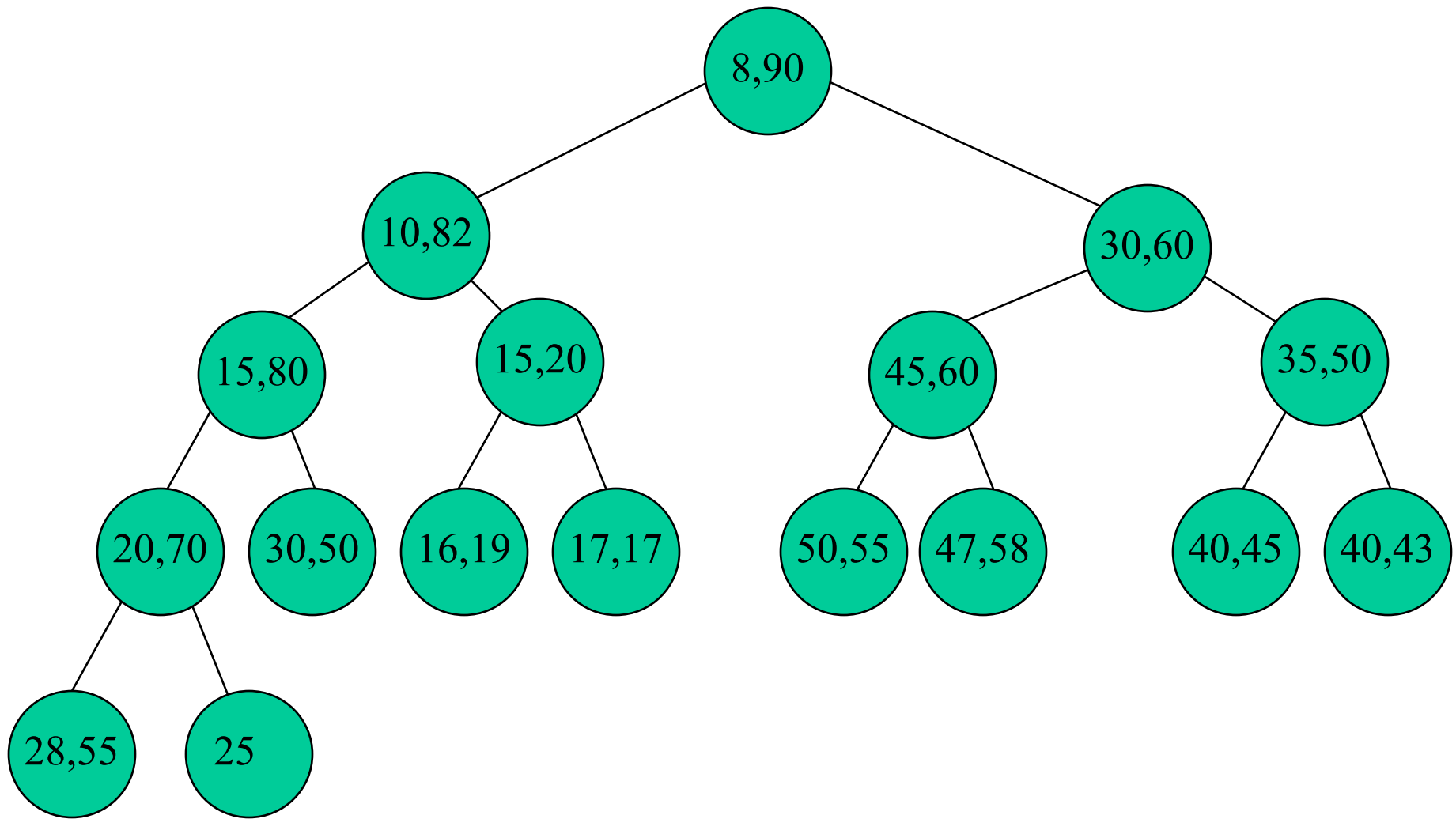
After 82 Inserted



One More Insert Example



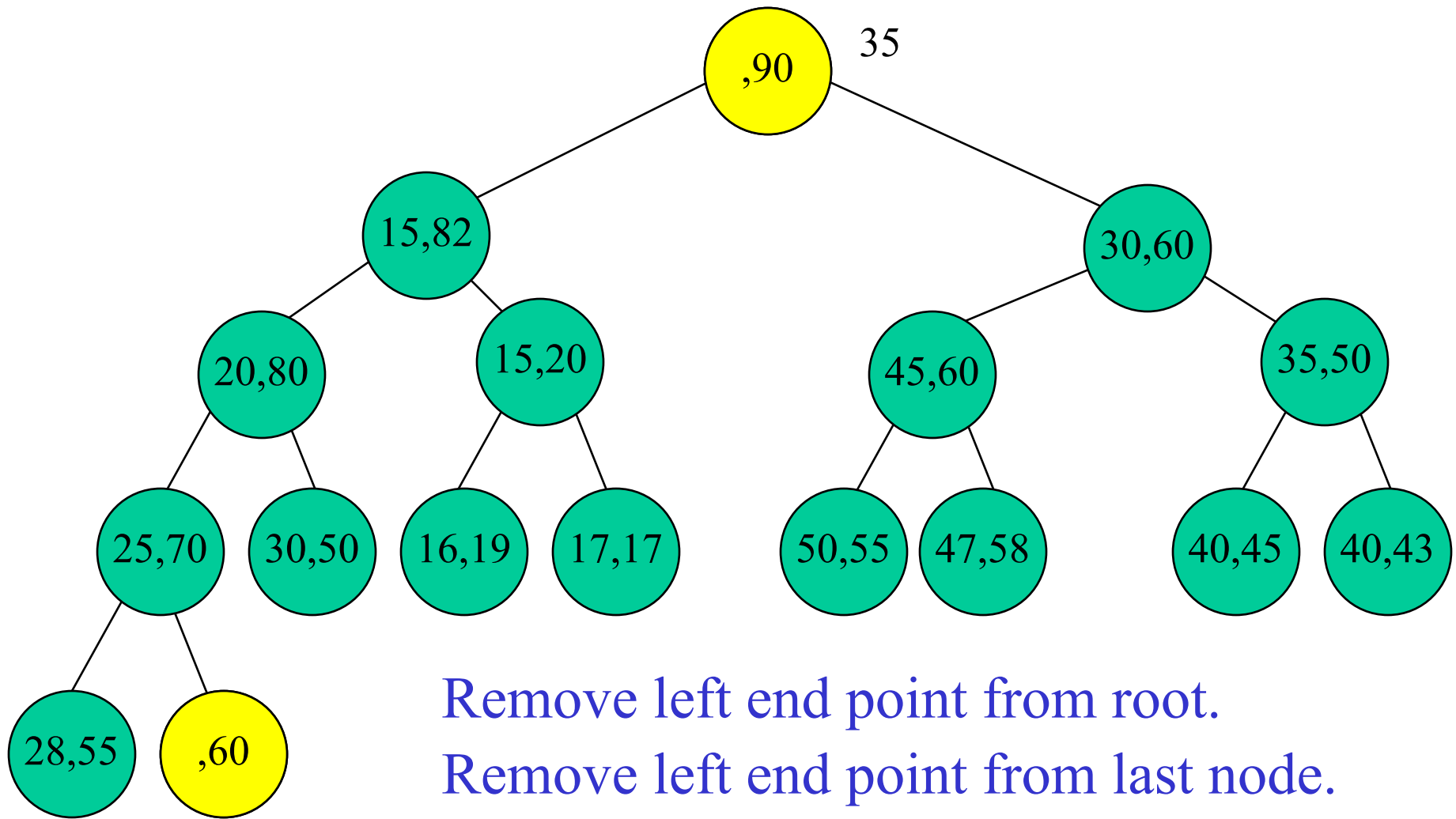
After 8 Is Inserted



Remove Min Element

- $n = 0 \Rightarrow$ fail.
- $n = 1 \Rightarrow$ heap becomes empty.
- $n = 2 \Rightarrow$ only one node, take out left end point.
- $n > 2 \Rightarrow$ not as simple.

Remove Min Element Example



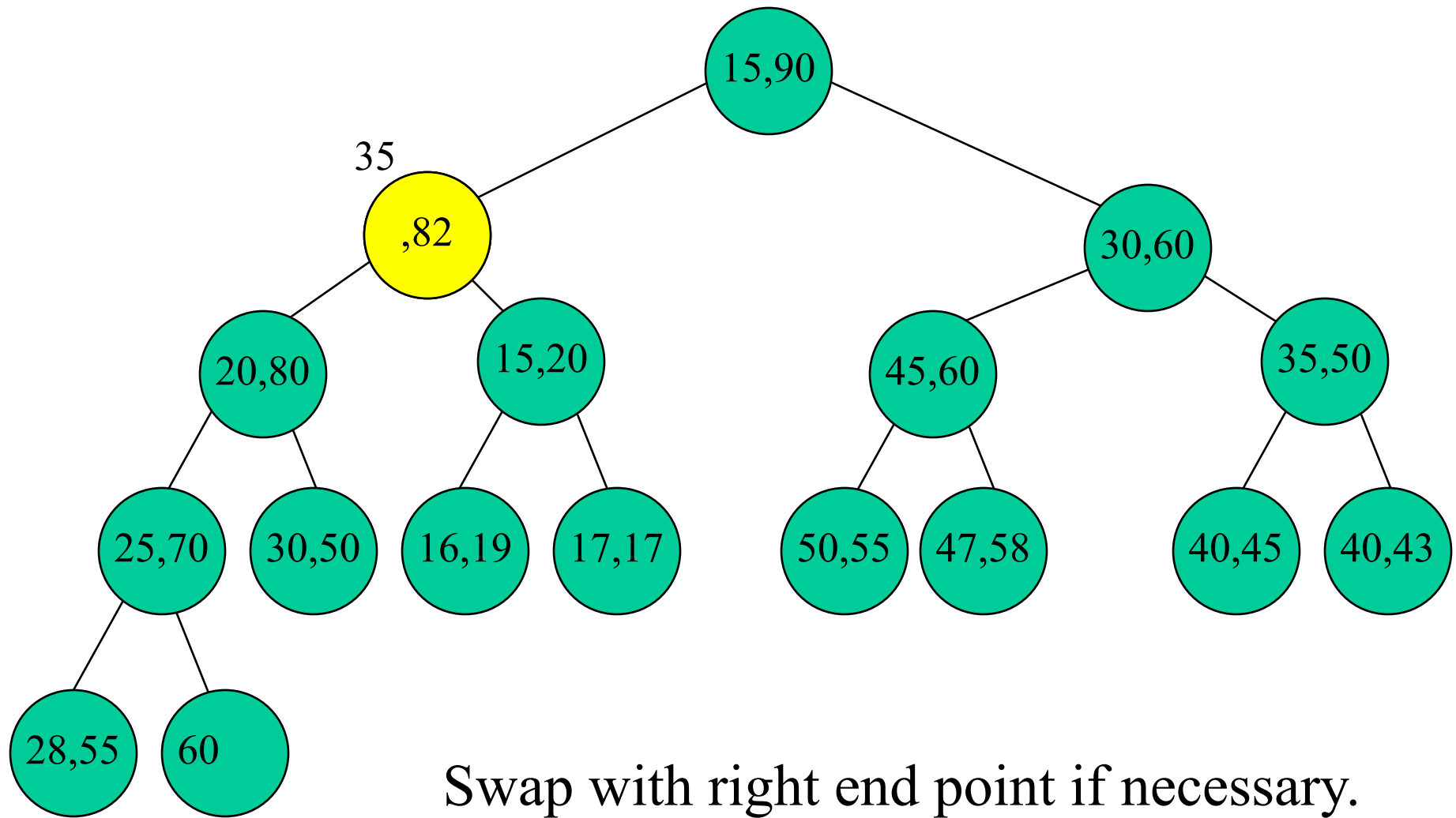
Remove left end point from root.

Remove left end point from last node.

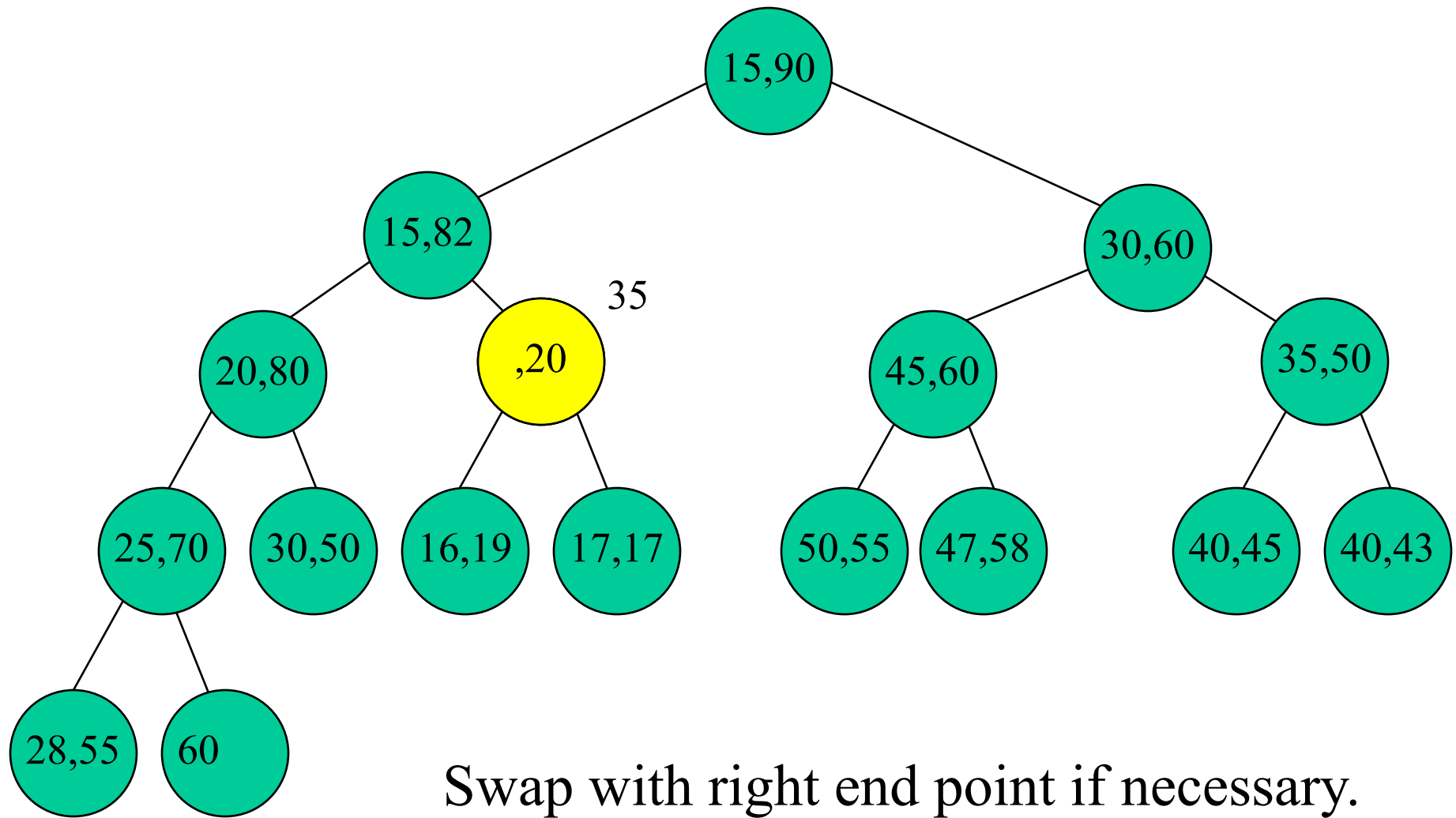
Delete last node if now empty.

Reinsert into min heap, begin at root.

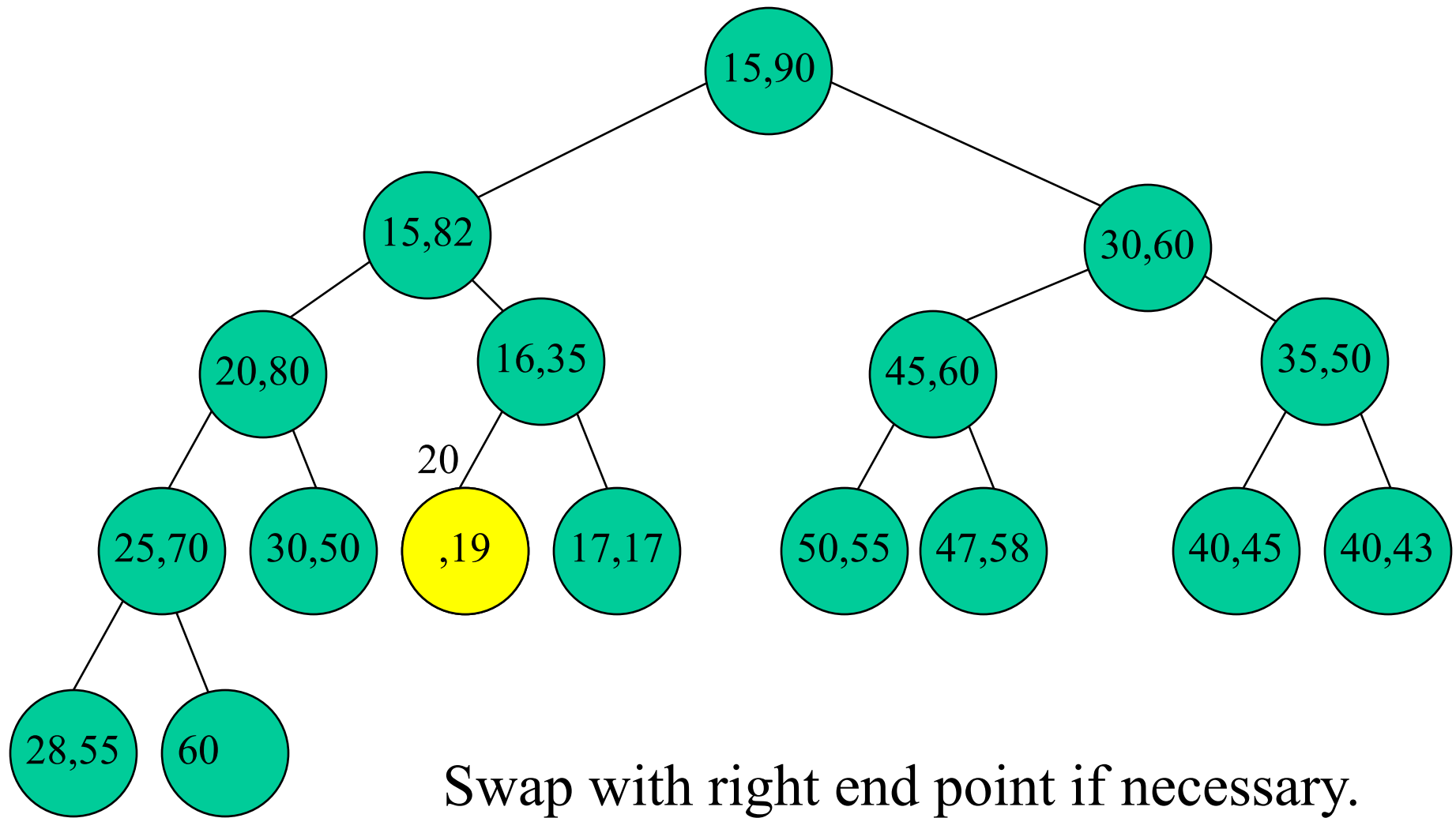
Remove Min Element Example



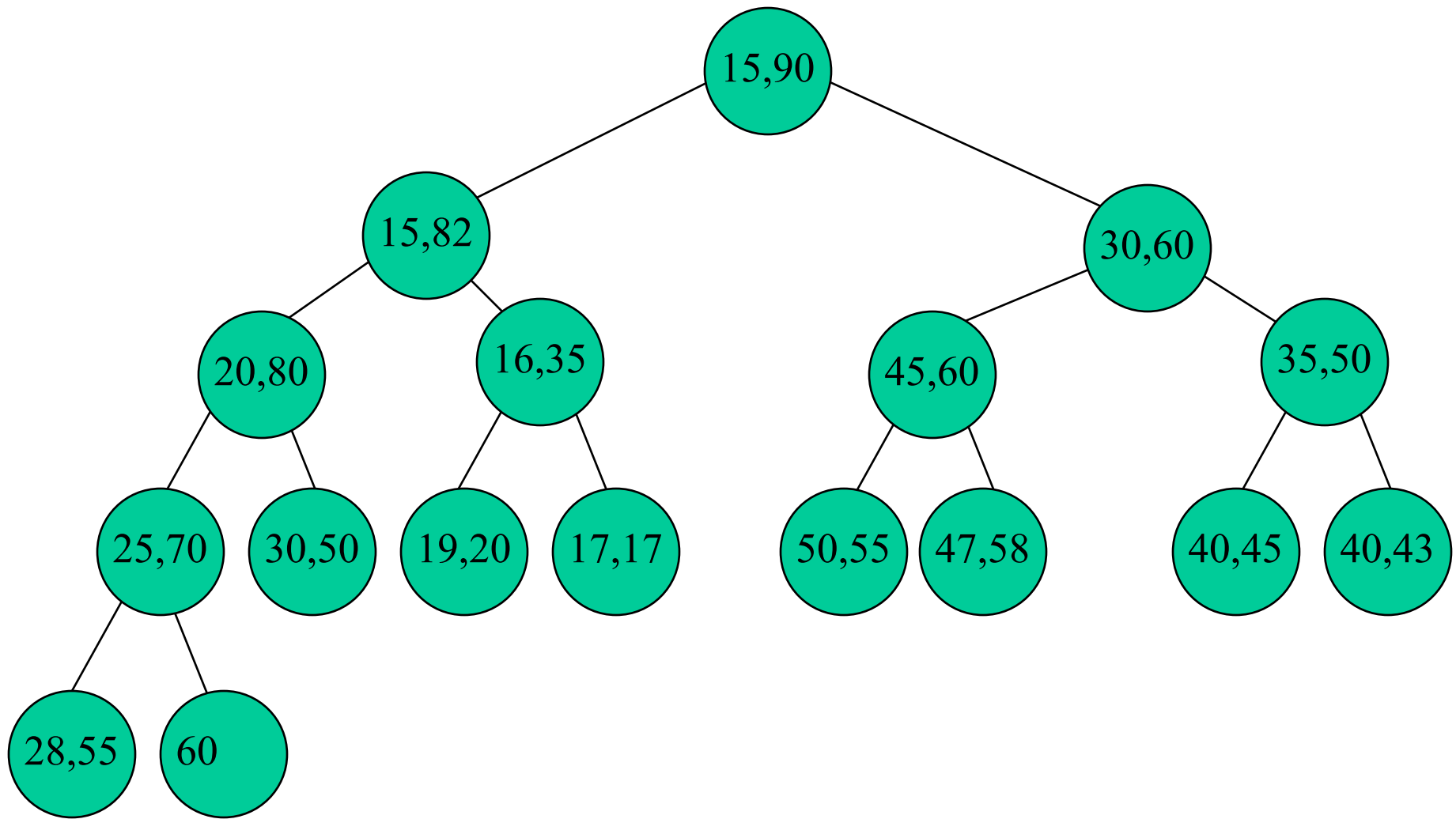
Remove Min Element Example



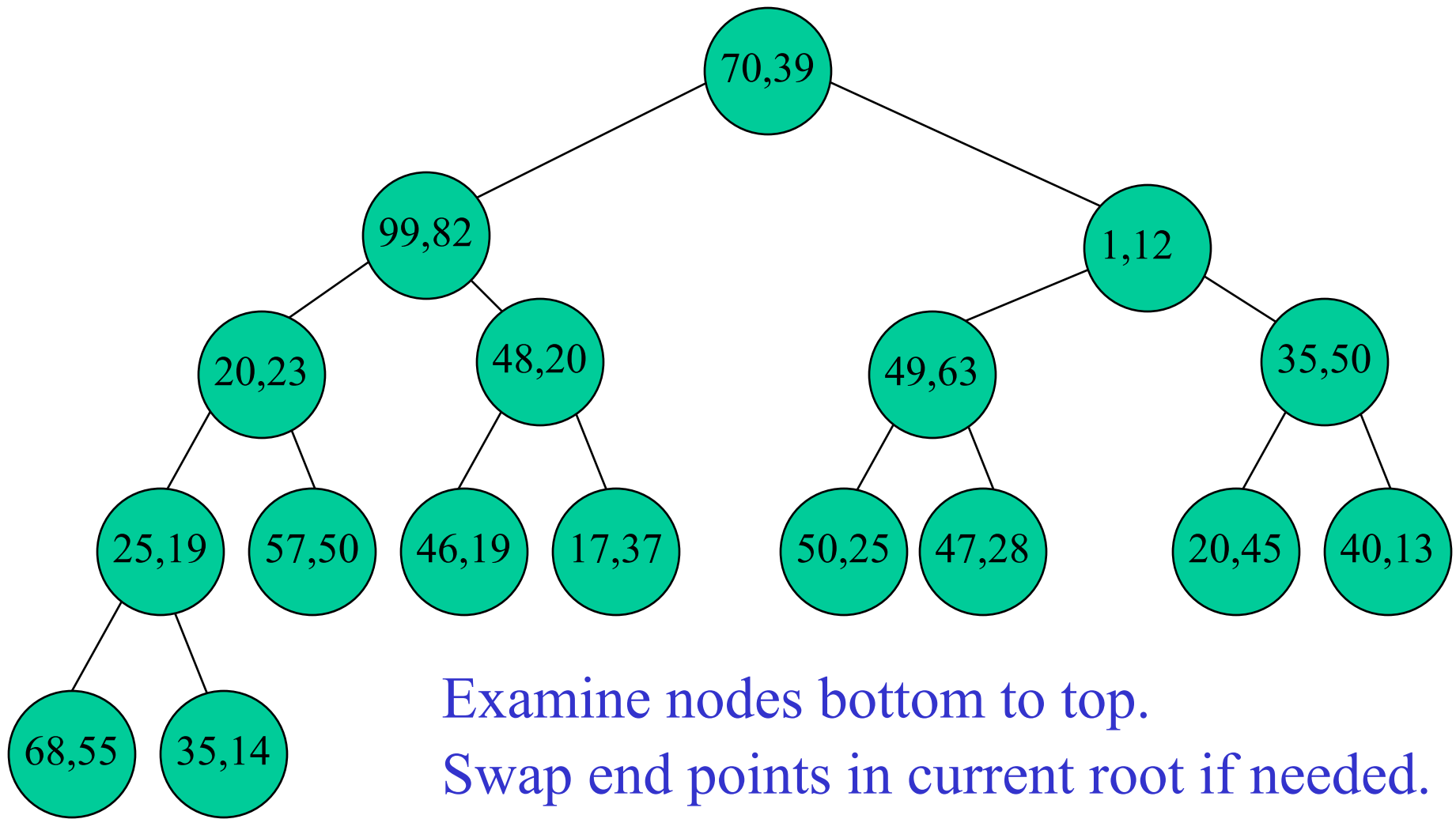
Remove Min Element Example



Remove Min Element Example



Initialize



Examine nodes bottom to top.

Swap end points in current root if needed.

Reinsert left end point into min heap.

Reinsert right end point into max heap.