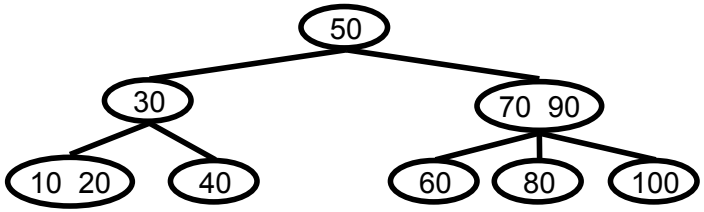
Insertion

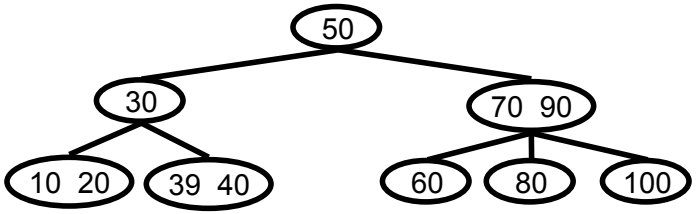
- Inserting into a 2-3 search tree
  - By example ...

Insertion



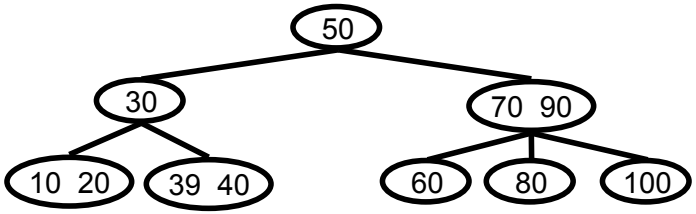
Insert 39

Insertion



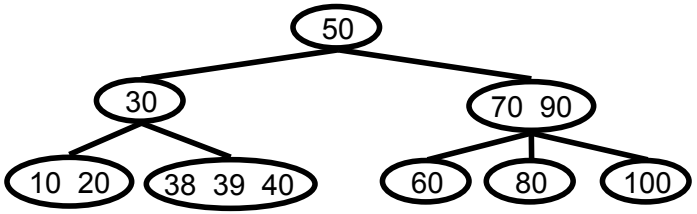
Done!

Insertion



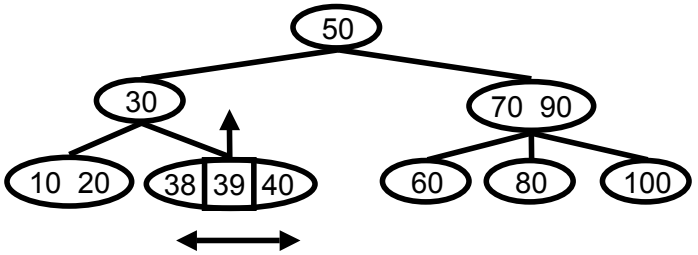
Insert 38

Insertion



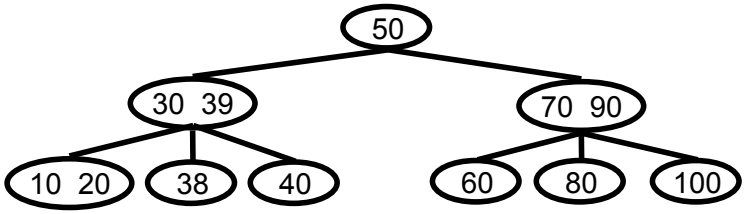
Insert 38

Insertion



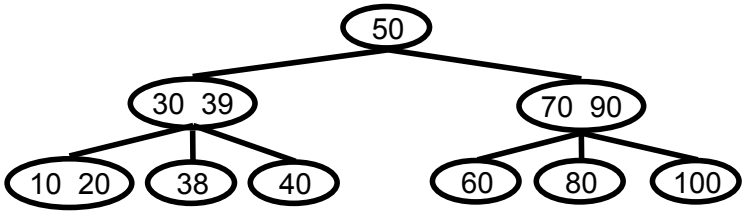
Push up, split apart

Insertion



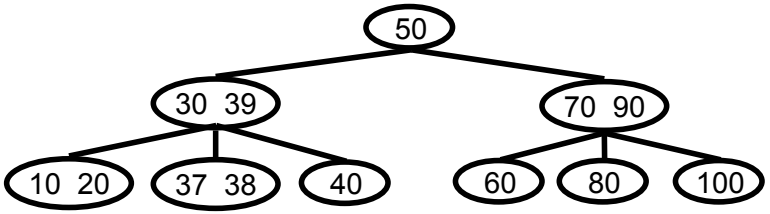
Done!

Insertion



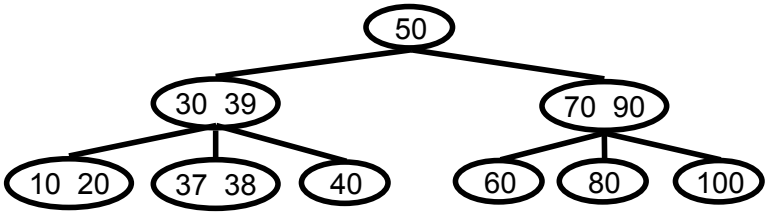
Insert 37

Insertion



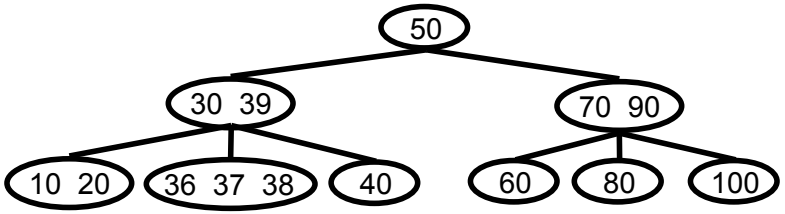
Done!

Insertion



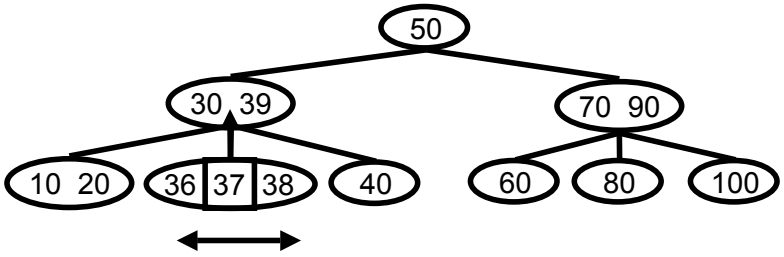
Insert 36

Insertion



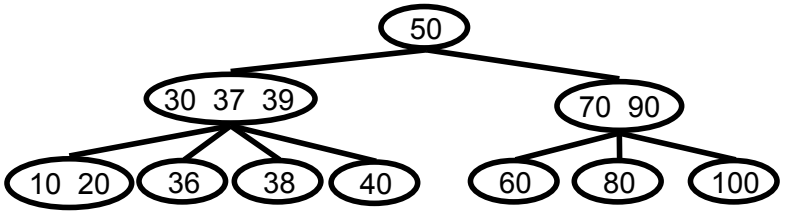
Insert 36

Insertion



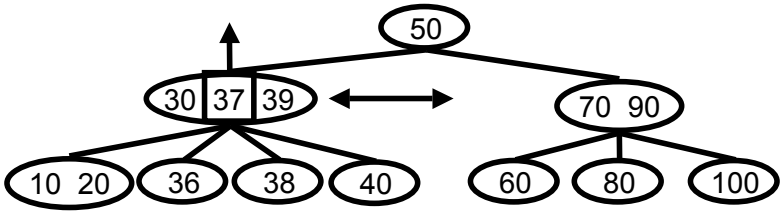
Push up, split apart

Insertion



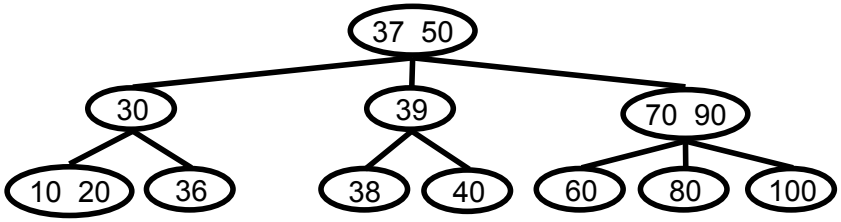
Need to go further up the tree to resolve overcrowding

Insertion



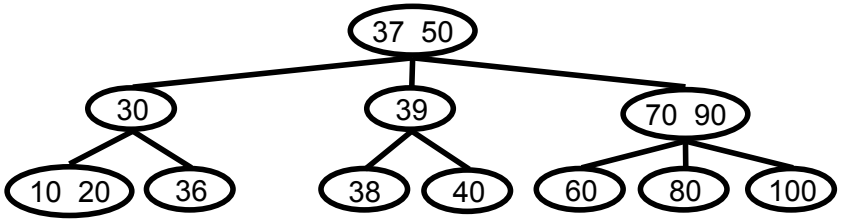
Push up, split apart

Insertion



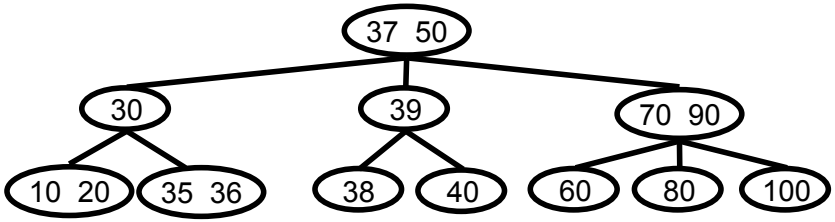
Done!

Insertion



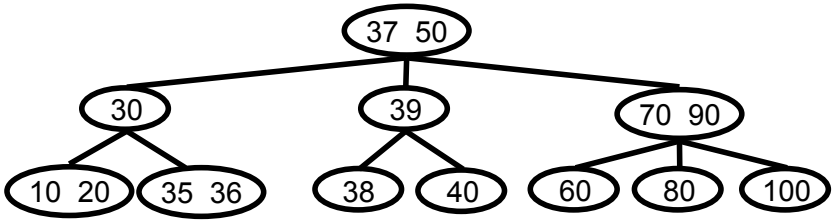
Insert 35

Insertion



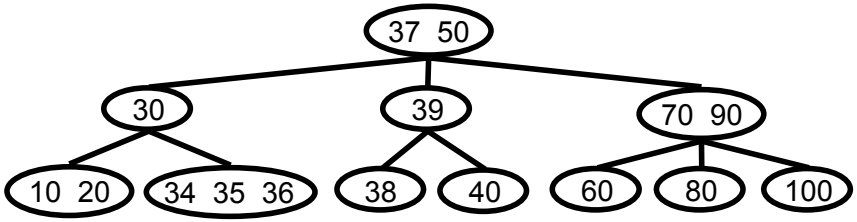
Insert 35

Insertion



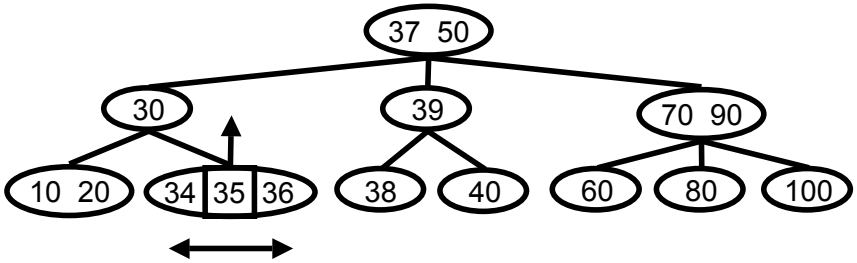
Insert 34

Insertion



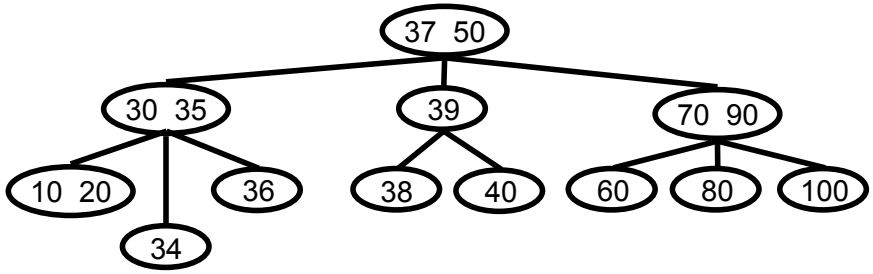
Insert 34

Insertion



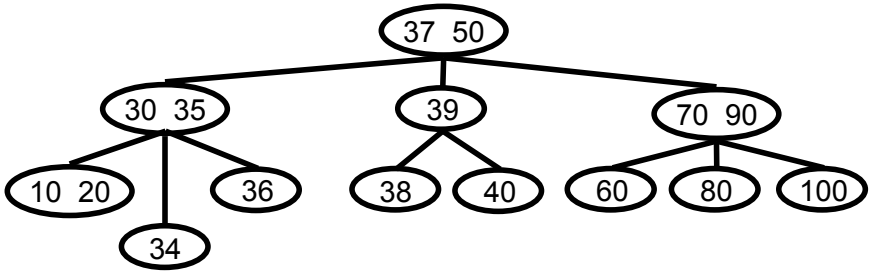
Push up, split apart

Insertion



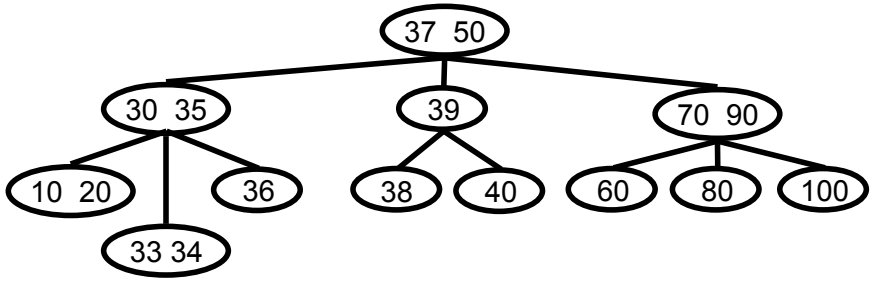
Done!

Insertion



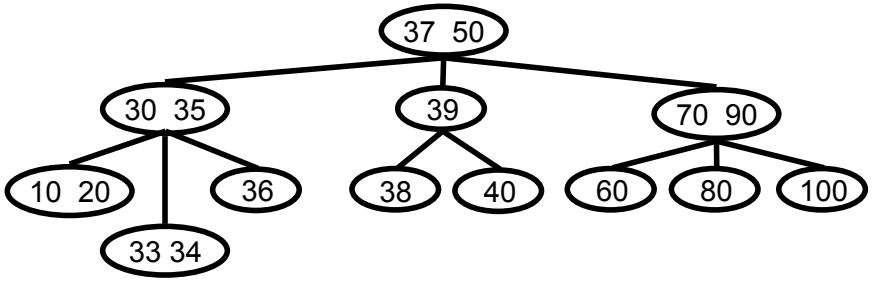
Insert 33

Insertion



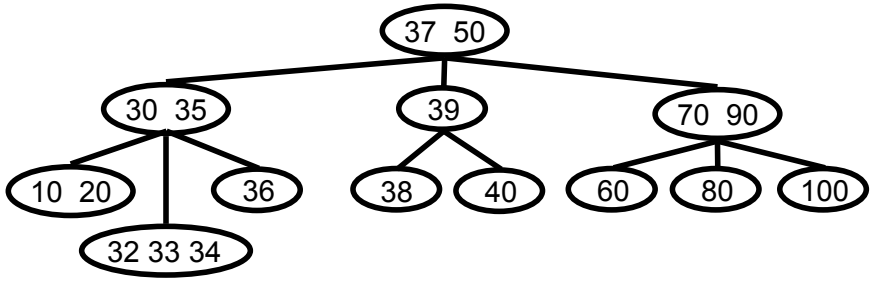
Done!

Insertion



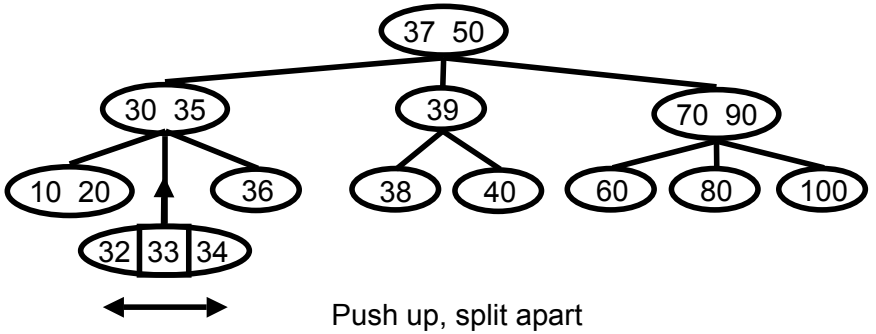
Insert 32

Insertion



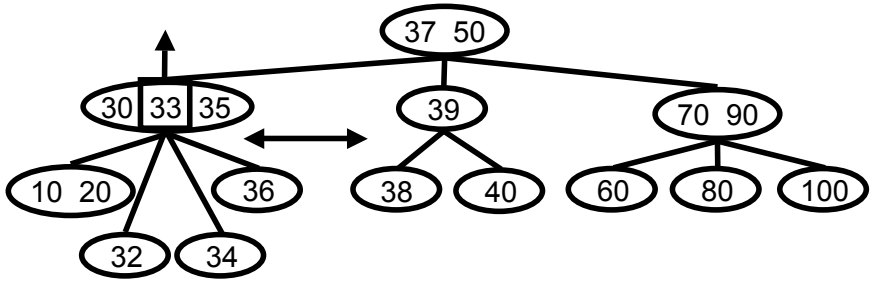
Insert 32

Insertion



Push up, split apart

Insertion

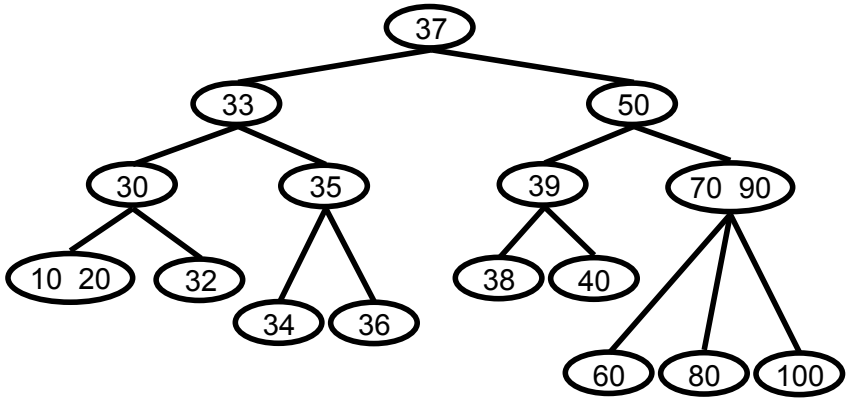


Push up, split apart

Insertion

- This finally ends up as ...

Insertion

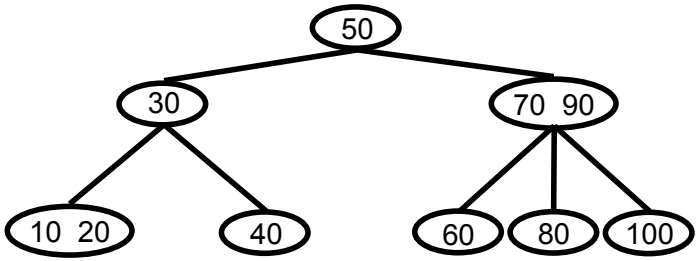


A new level is born!

Deletion

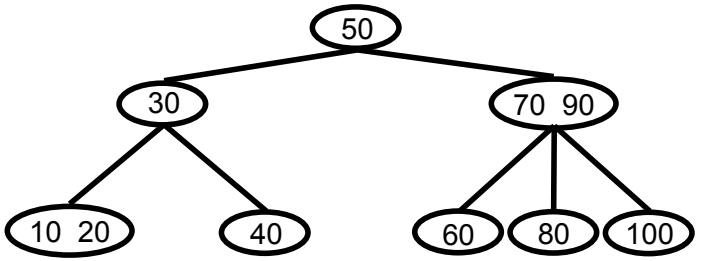
- For example:

Deletion



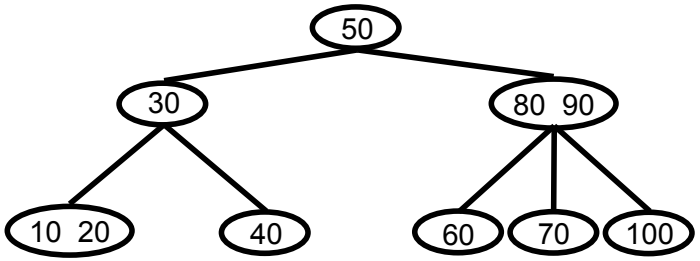
Original tree

Deletion



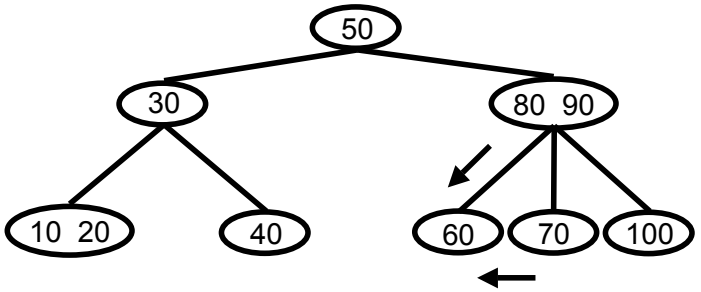
Delete 70

Deletion



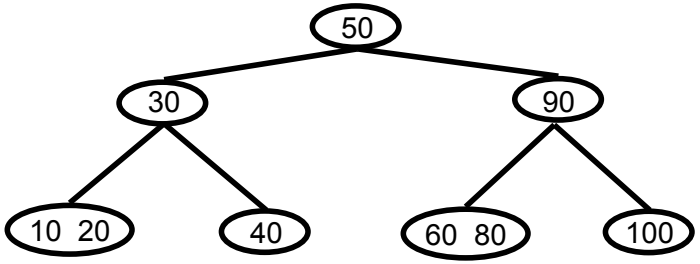
Swap with in-order successor

Deletion



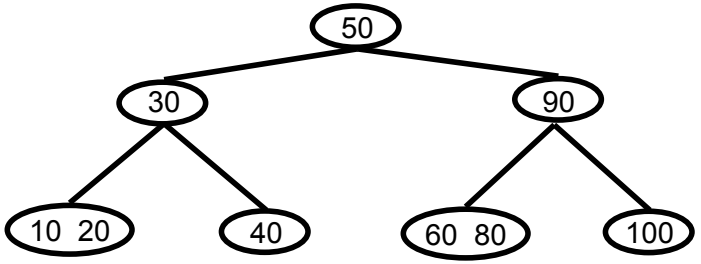
Merge and pull down

Deletion



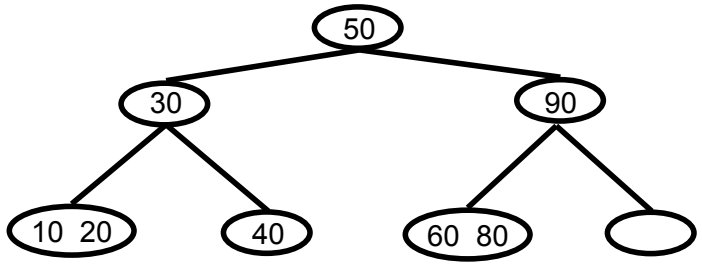
Done!

Deletion



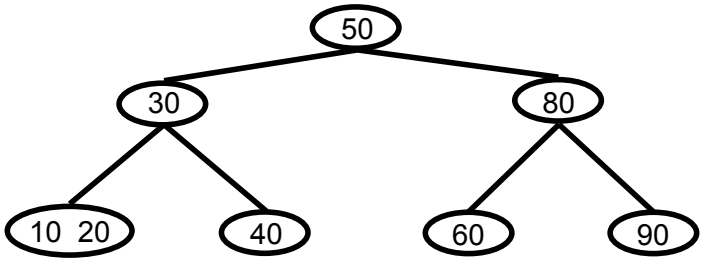
Delete 100

Deletion



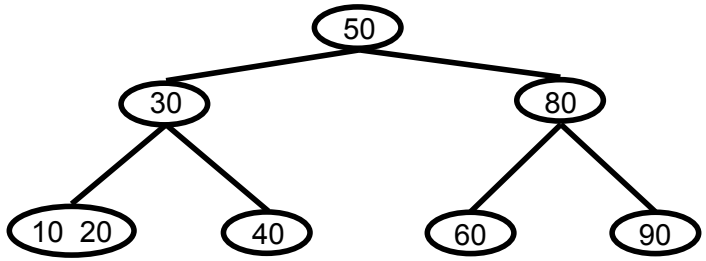
Redistribute

Deletion



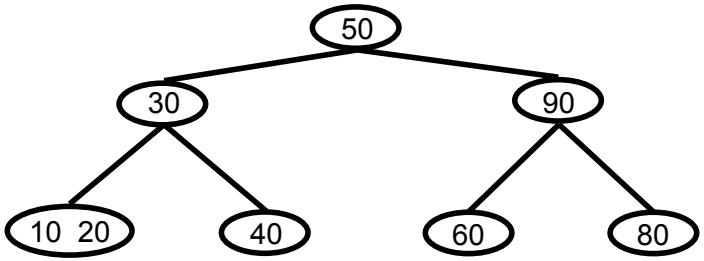
Done!

Deletion



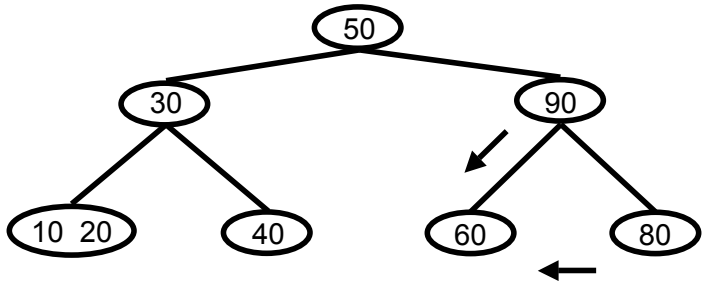
Delete 80

Deletion



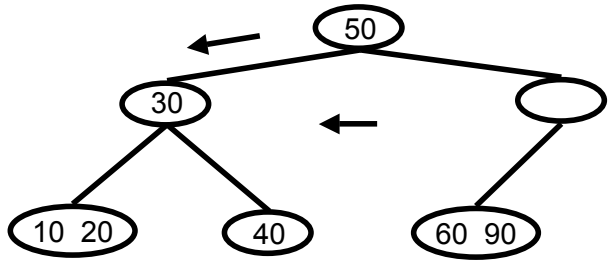
Swap with in-order successor

Deletion



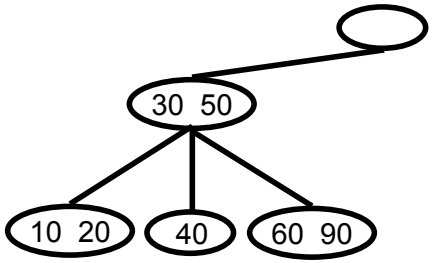
Merge and pull down

Deletion



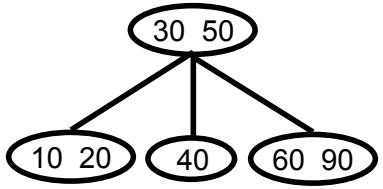
Merge and pull down

Deletion



Delete the root

Deletion



Done