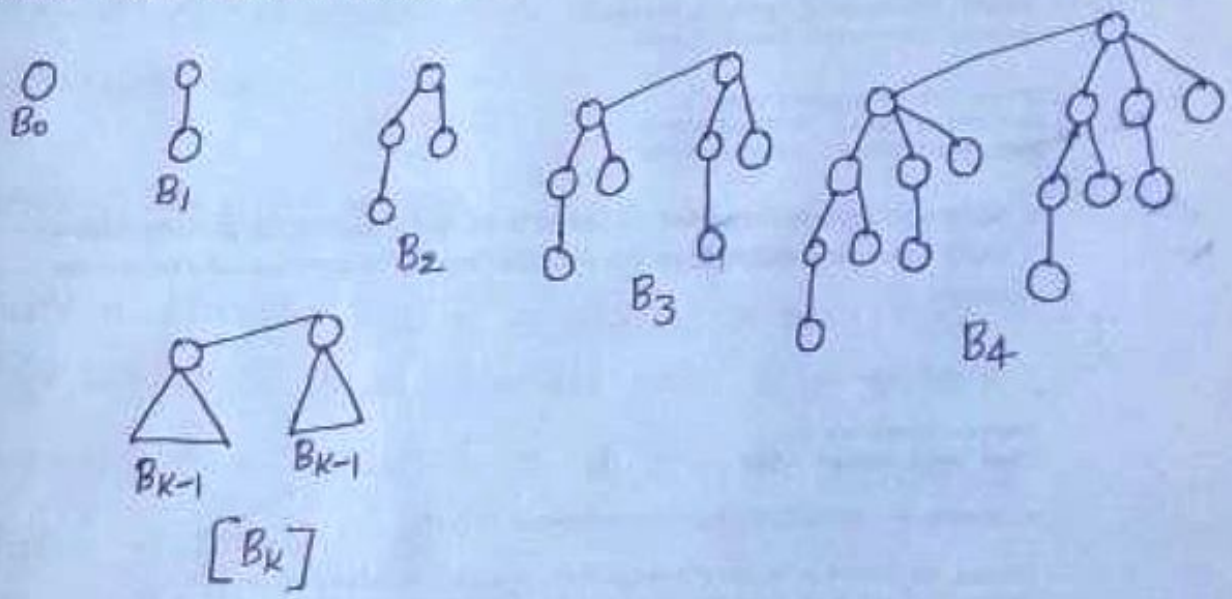
Binomial Heap

→ Binomial Heap is a collection of Binomial Tree.
→ The Binomial Tree B_k is an ordered tree defined recursively.
→ The Binomial Tree B_0 consist of a single node.
→ The Binomial Tree B_k consist of two Binomial Tree B_{k-1} that are linked together.



Properties of Binomial Tree (B_k)

1. There are 2^k nodes.
2. The height of the tree is k.
3. There are exactly ^kC_i nodes at depth i for $i = 0, 1, 2 \dots k$.
4. The root has degree k, which is greater than that of any other node.
5. If i the children of the root are numbered from left to right by $k-1, k-2, \dots 0$ child i is the root of a subtree B_i.

Binomial Tree:- Binomial Tree B_k is an ordered tree defined recursively.
- The Binomial tree B_0 consist node.
- The Binomial Tree B_k consist two Binomial Tree B_{k-1} and B_{k-1} are linked together.

Properties of Binomial Heap

→ No two binomial trees in the collection have the same size.

→ Each node in the collection has a key.

→ Each binomial tree in the collection satisfies the heap order property.

→ Roots of the binomial trees are connected and are in increasing order.

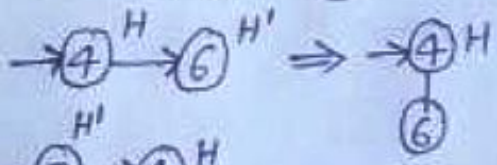
→ **Binomial Heap creation:**

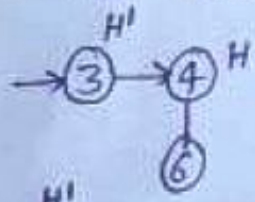
① Create a binomial heap H' containing new element.

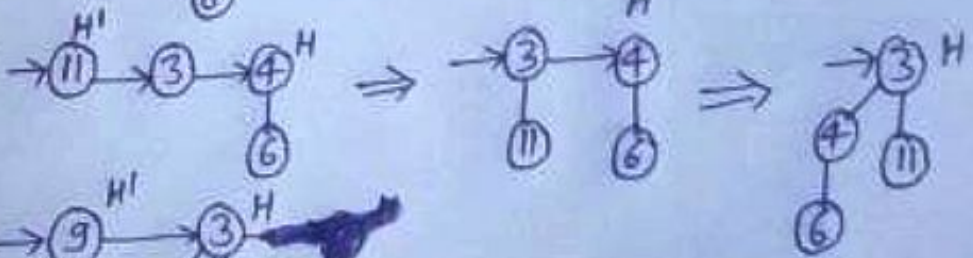
② Apply union of two binomial min heap H and H'.

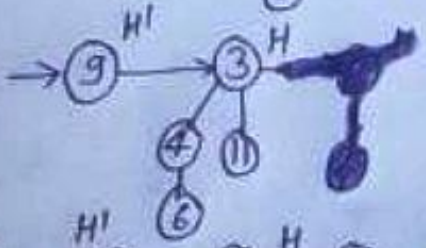
Given array: 4, 6, 3, 11, 9, 5, 14, 10, 21, 7, 13, 20, 2

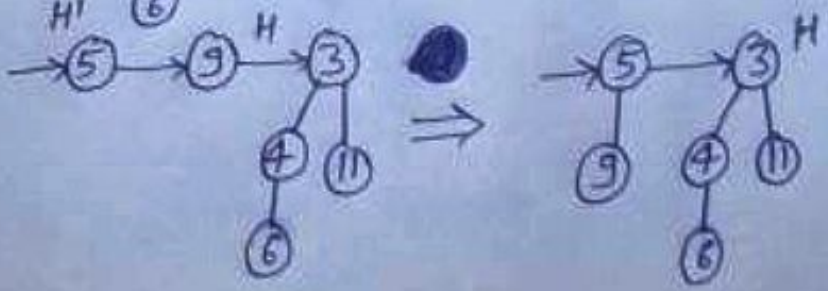
Step-1 H Empty (4) H'

Step-2 

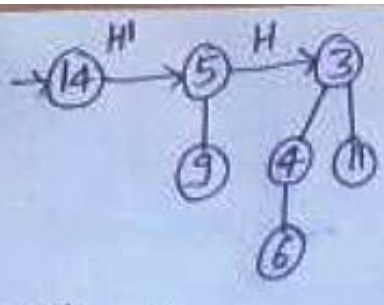
Step-3 

Step-4 

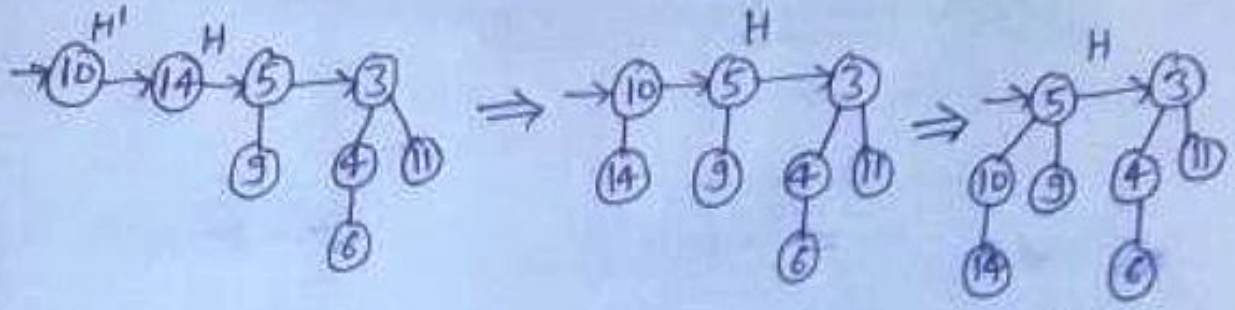
Step-5 

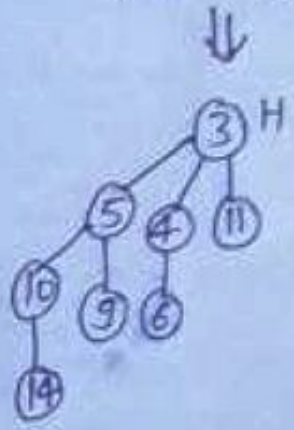
Step-6 

Step-7

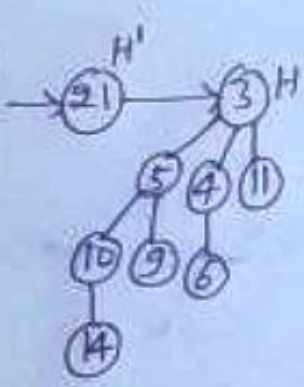


Step-8

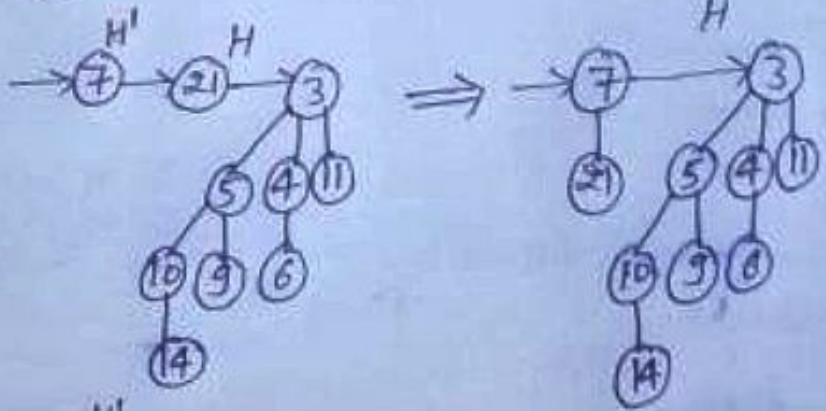




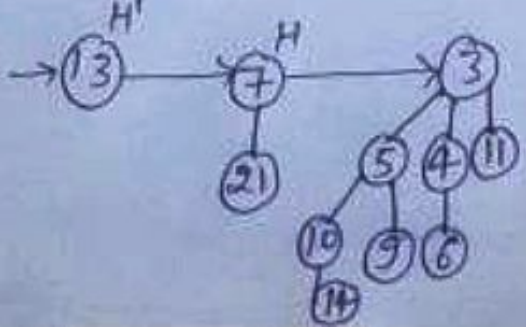
Step-9



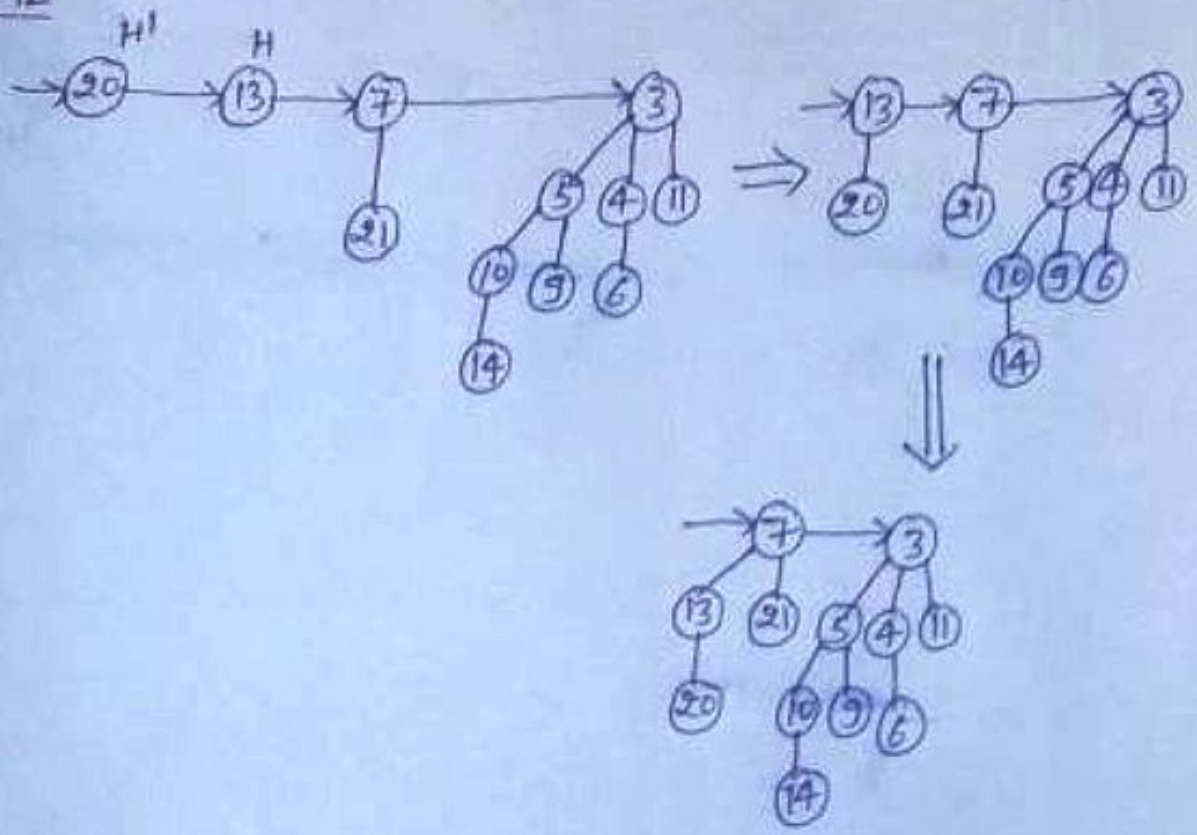
Step-10



Step-11



Step-12



Step-13