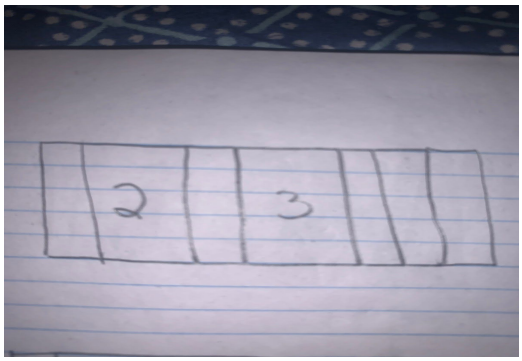
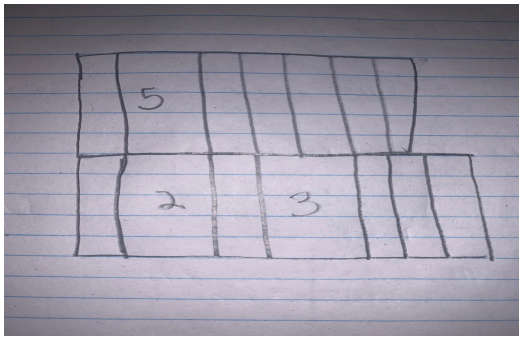
Yeury Galva Liriano
Homework 3

Question 14.3)

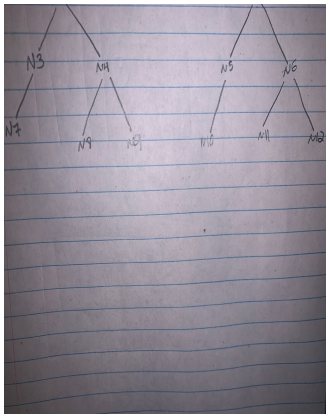
- Note that a non-root node is not allowed to have less than n/2 values. So, in this case, a non-root node is allowed 2 to 3 keys values only.
- The first two key values (2,3) are simply added to the root node.

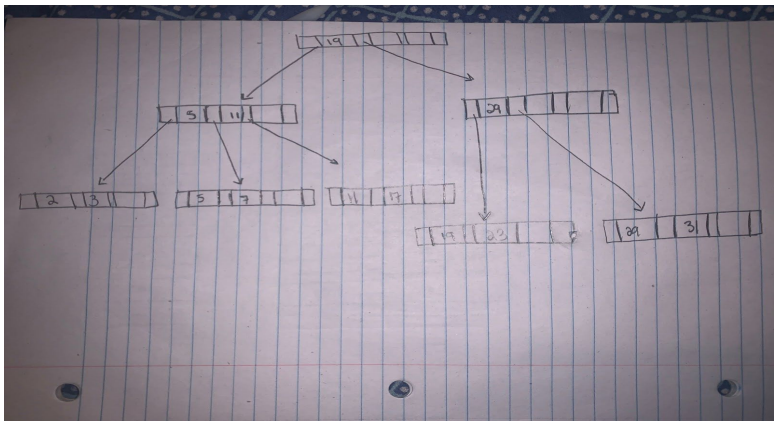


- Next, when key value 5 is inserted in the tree;
- Root node now contains key value 5, and its first pointer points to a lead node.
- The inserted leaf node contains the key values 2 and 3.

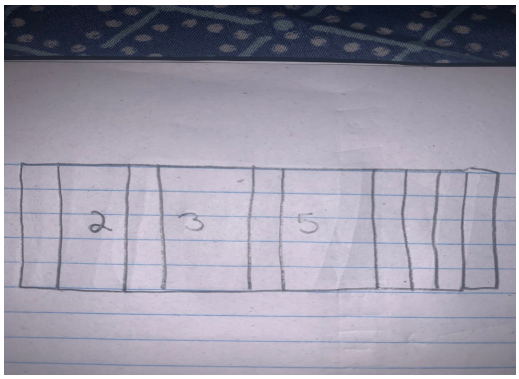


- As more key values are inserted, more leaf nodes are added as per requirement.
- The final B+ tree constructed with given key values when the number of pointers in one node in four is given below.

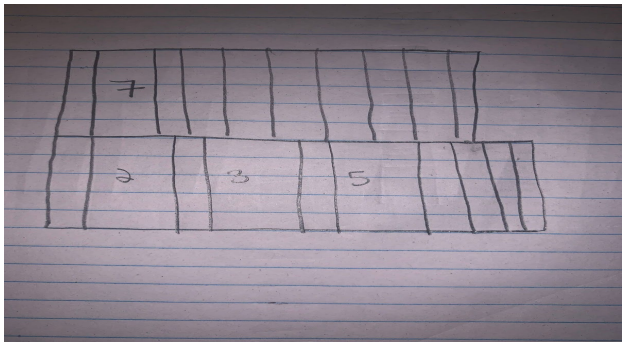




- Here, number of pointers in one node is six, so a non-root node is allowed 3 to 5 key values.
- The first three key values (2,3,5) are simply added to the root node

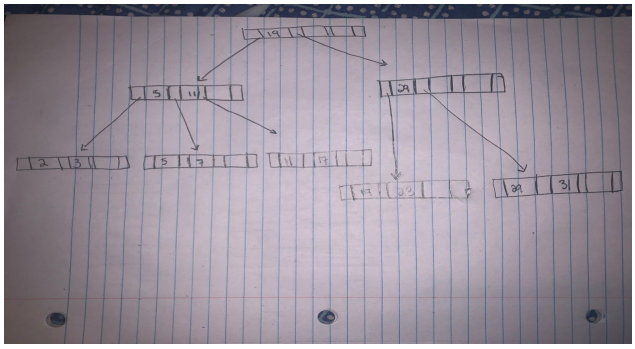


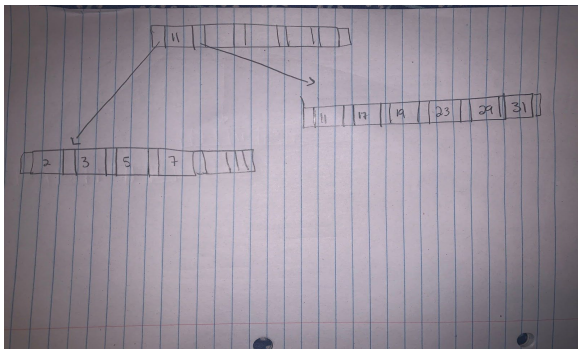
- Next, when key value is 7 is inserted in the tree;
- root node now contains key value 7, and its first pointer points to a lead nofe
- The inserted lead node contains the key value 2, 3 and 5



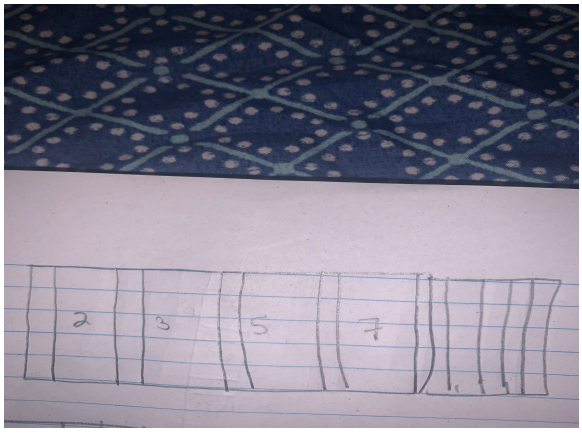
- As more key values are inserted, more lead nodes are added as per requirement.
- The final B+ tree constructed with given key values when the number of pointers is one node in six is given below.

- The picture to the right is the continuation of the picture to the left

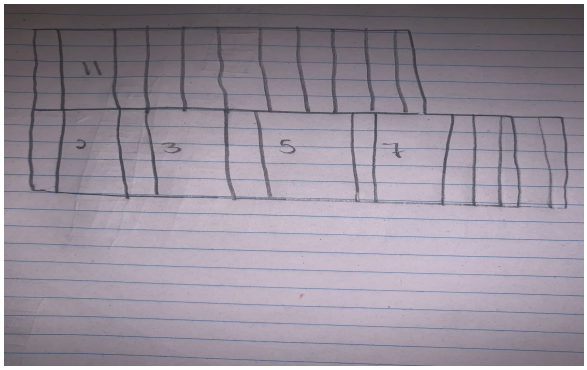




- Here, the number of points in one node is eight, so a non-root node is allowed 4 to 7 key values.
- The first four key values (2,3,5 and 7) are simply added to the root node.

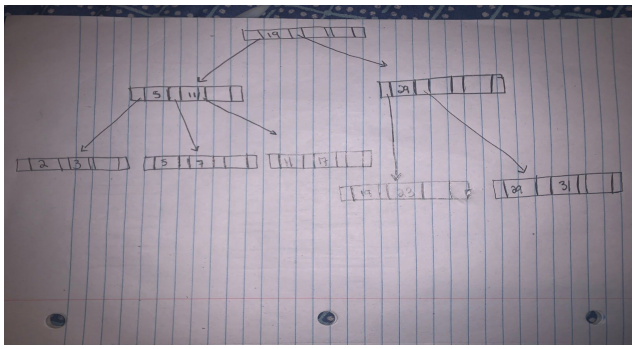


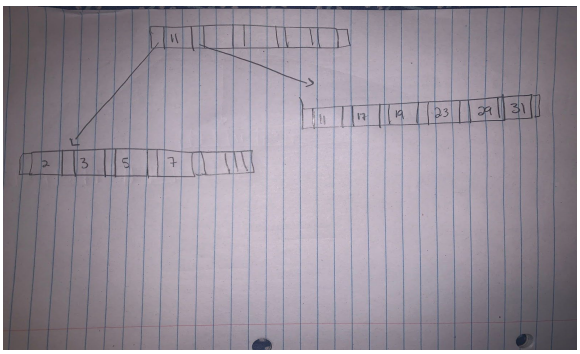
- Next, when key value 11 is inserted in the tree;
- Root node now cotains key value 11, and its first pointer points to a lead node
- The inserted leaf node contains the key values 2, 3, 5 and 7

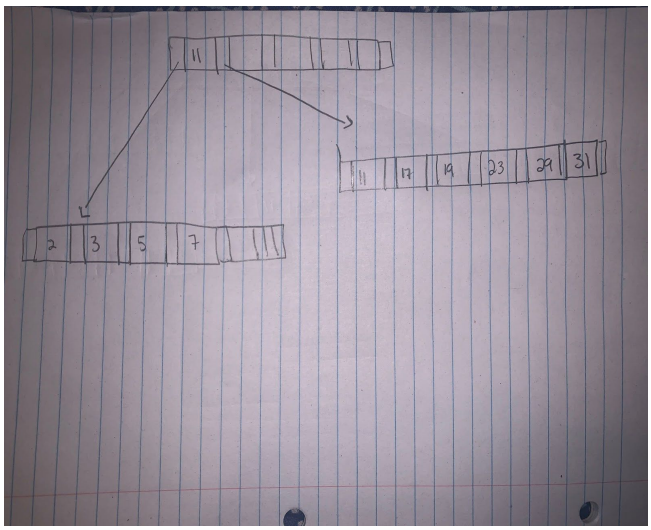


- As more key values are inserted, more leafs nodes are added as per requirement
- The final B+ tree constructed with given key values when the number of pointers in one node is eight is given below,

Order is from left to right and last down!





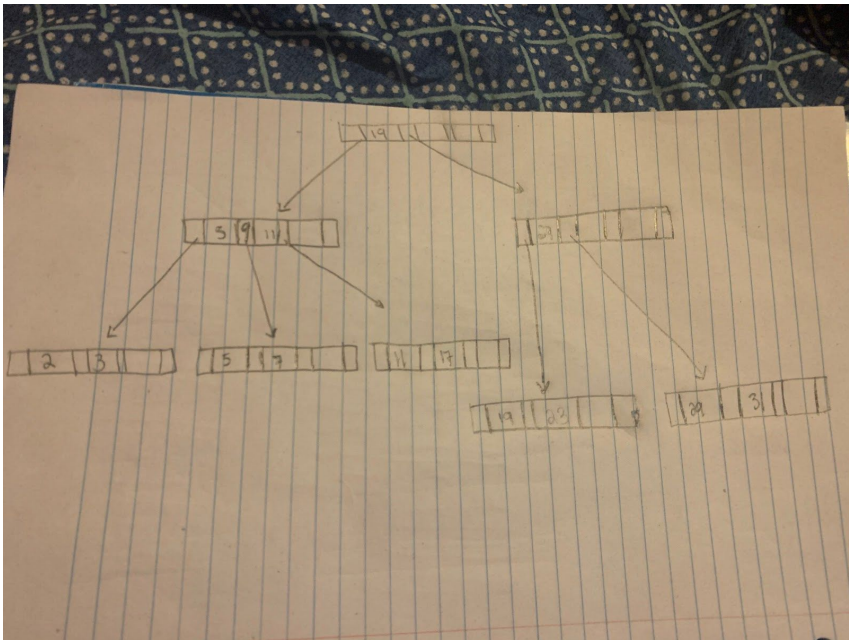


Question 14.4)

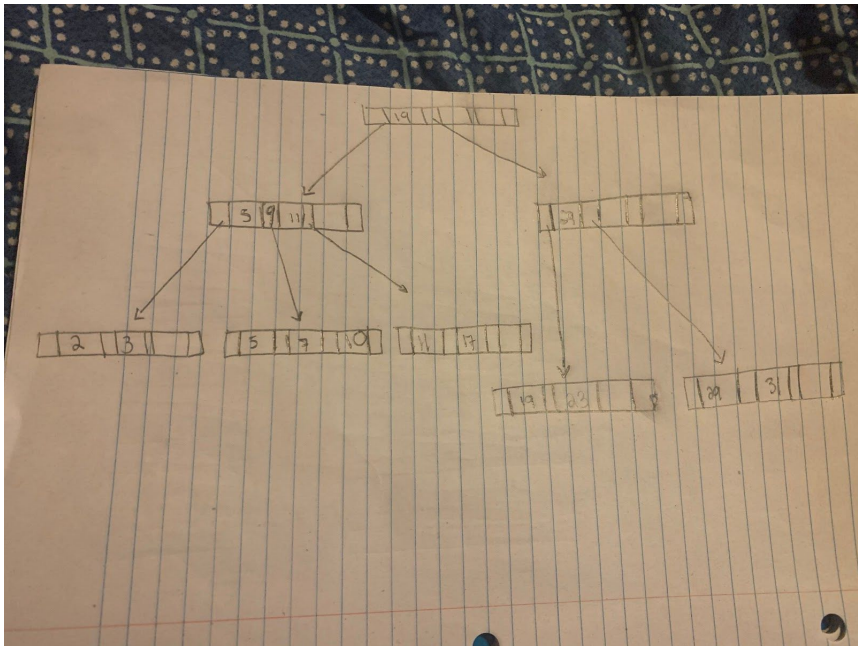
- all the steps of each insertion and deletion for each tree are shown below:

Max degree of 4)

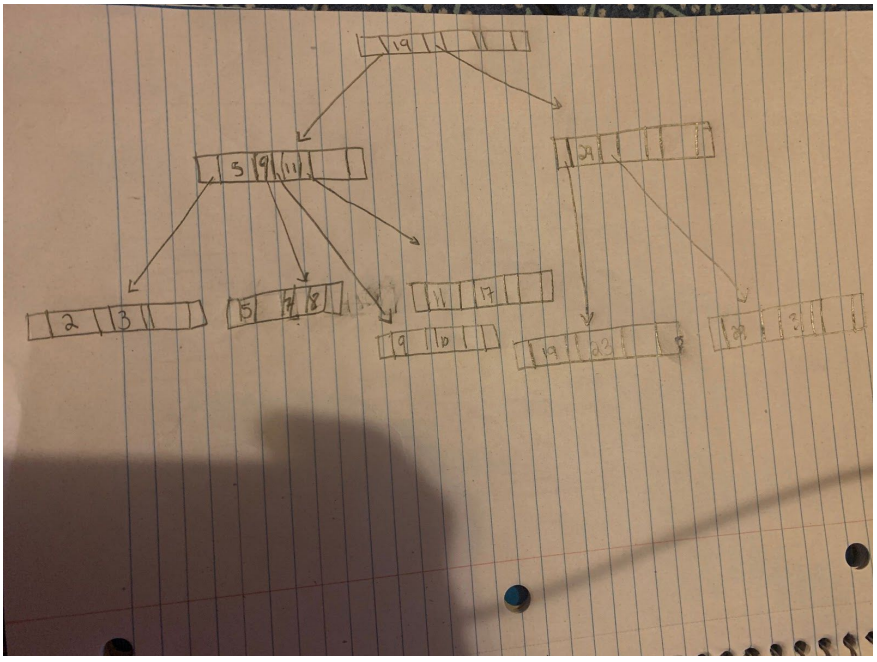
a. Insert 9.



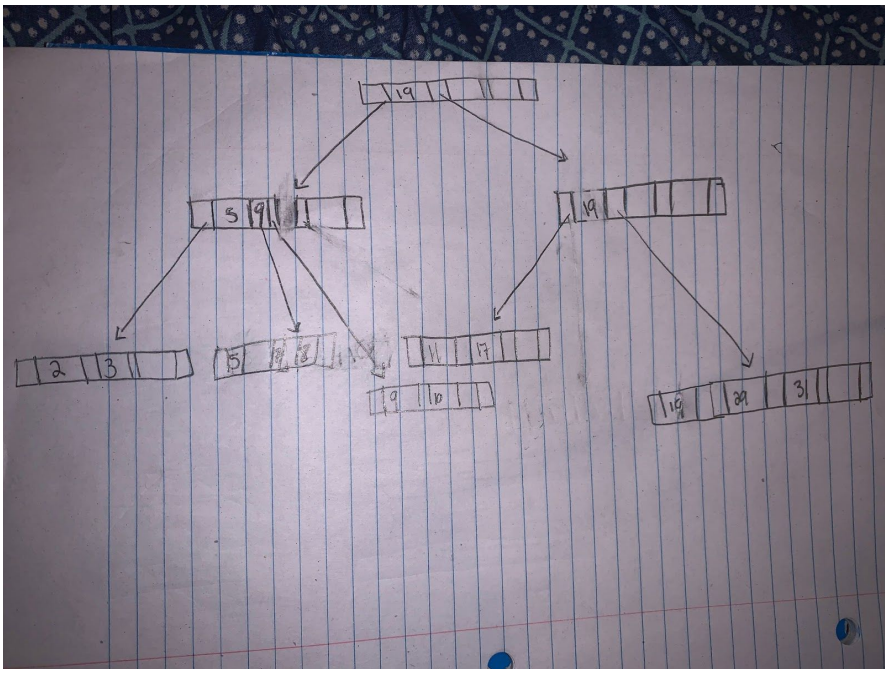
b. Insert 10.



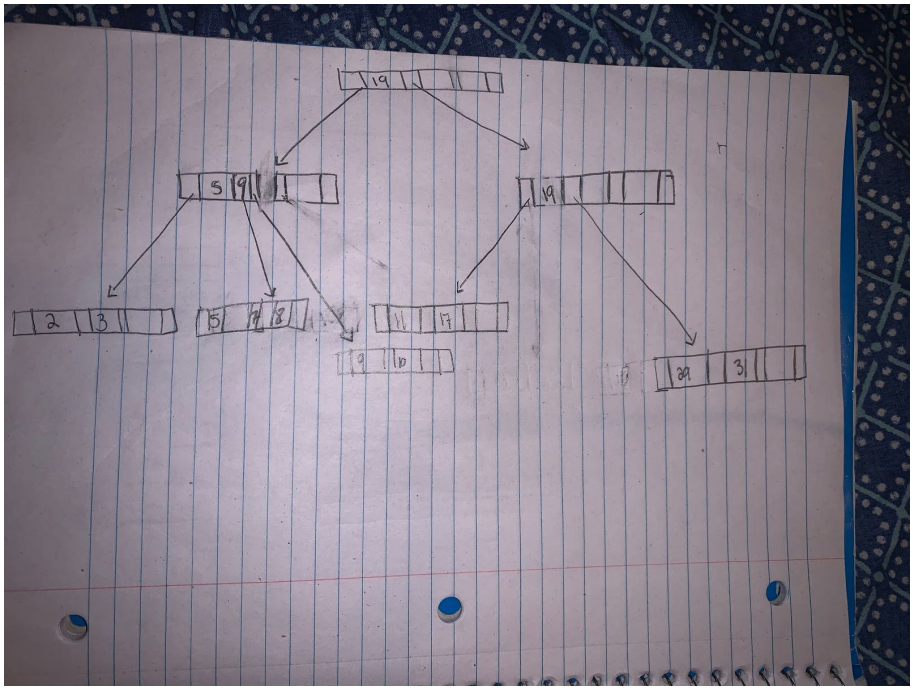
c. Insert 8.



d. Delete 23.

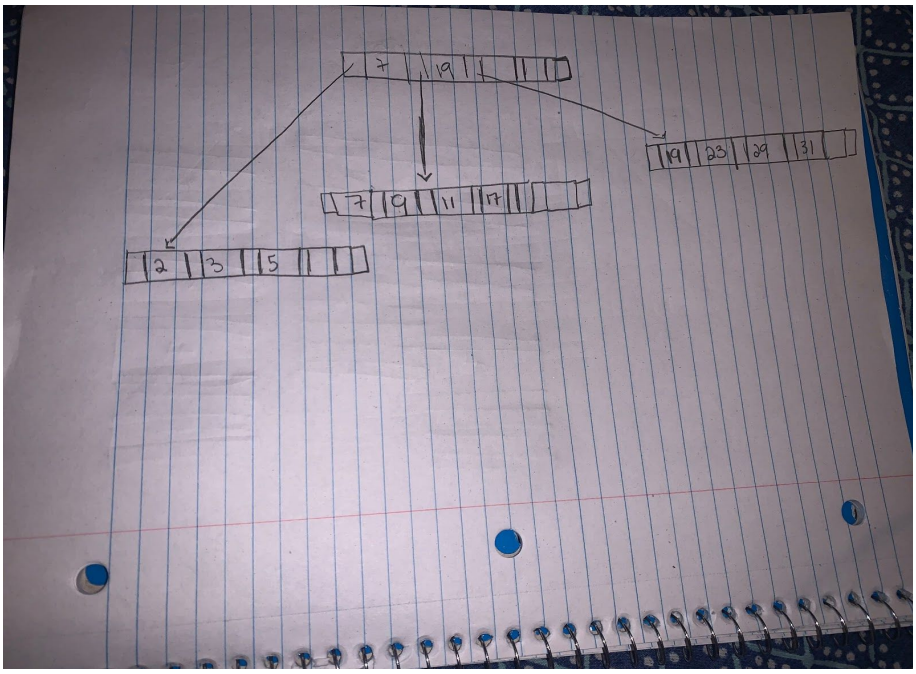


e. Delete 19.

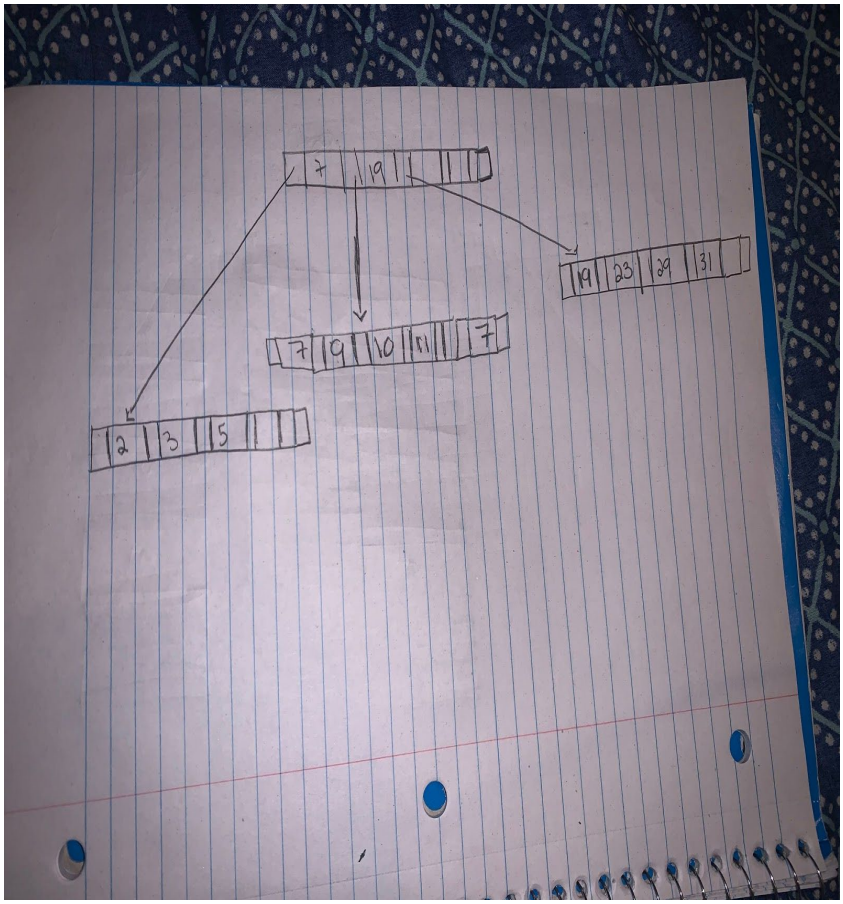


Max degree of 6)

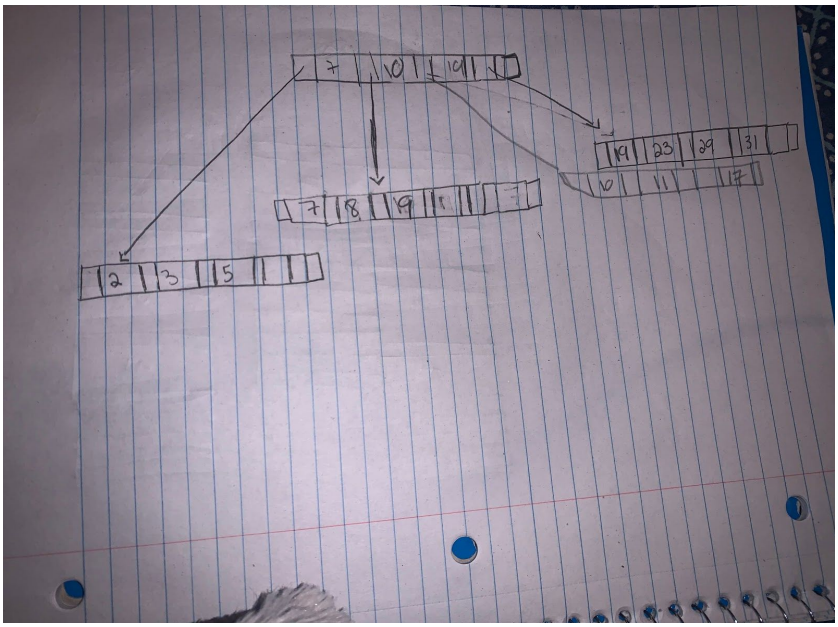
a. Insert 9.



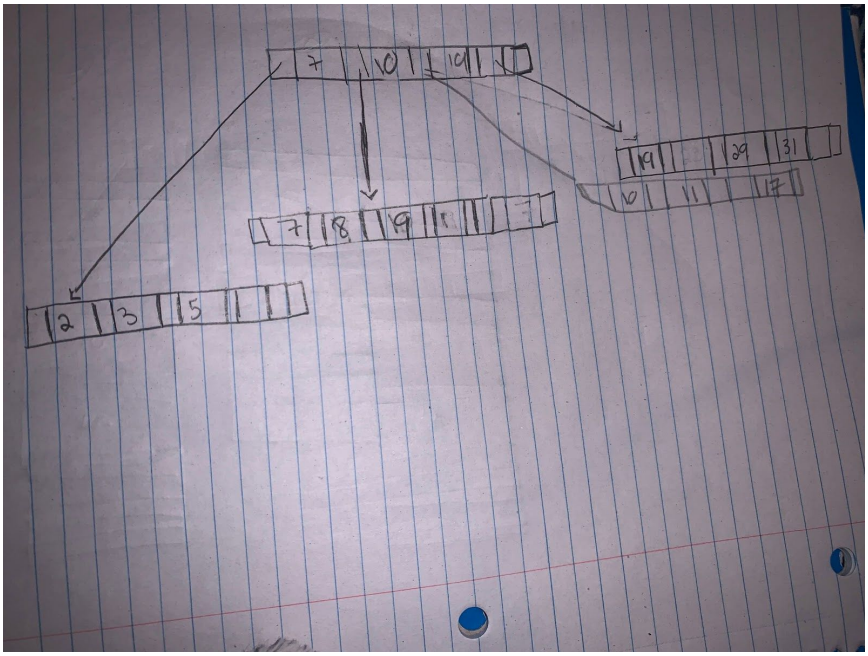
b. Insert 10.



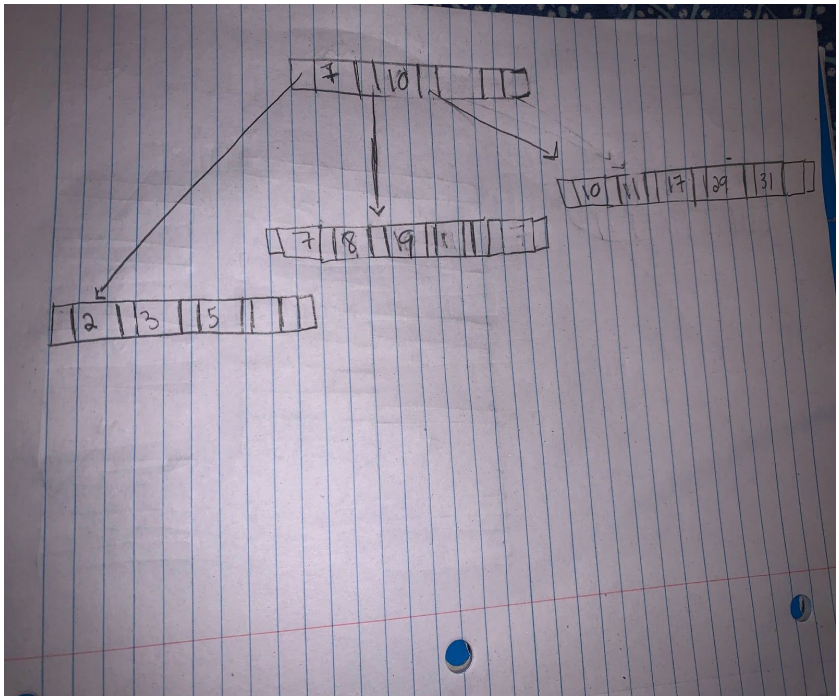
c. Insert 8.



d. Delete 23.

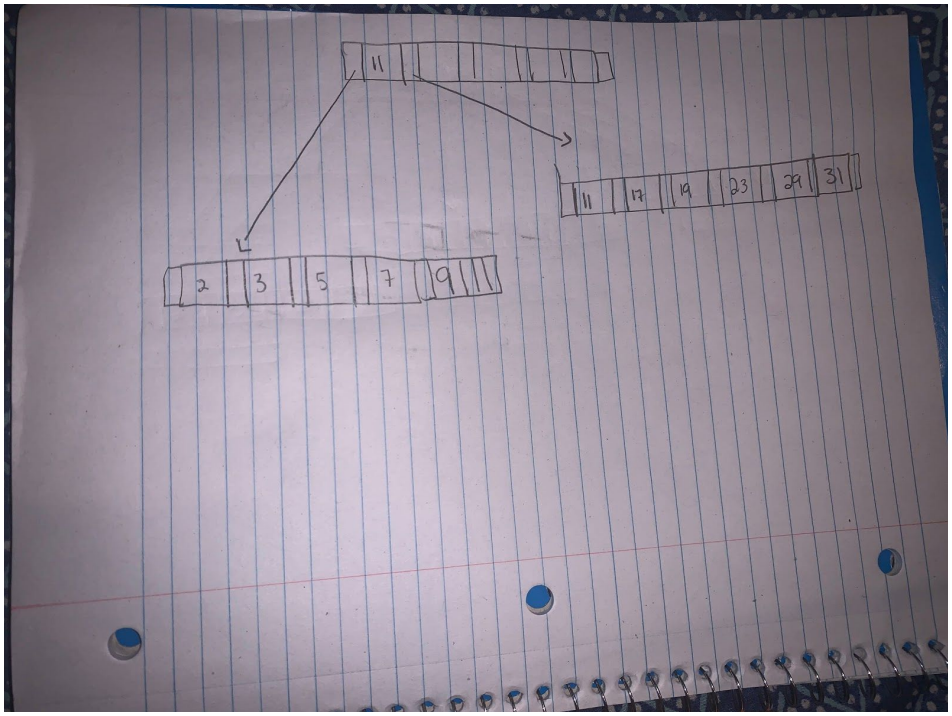


e. Delete 19.

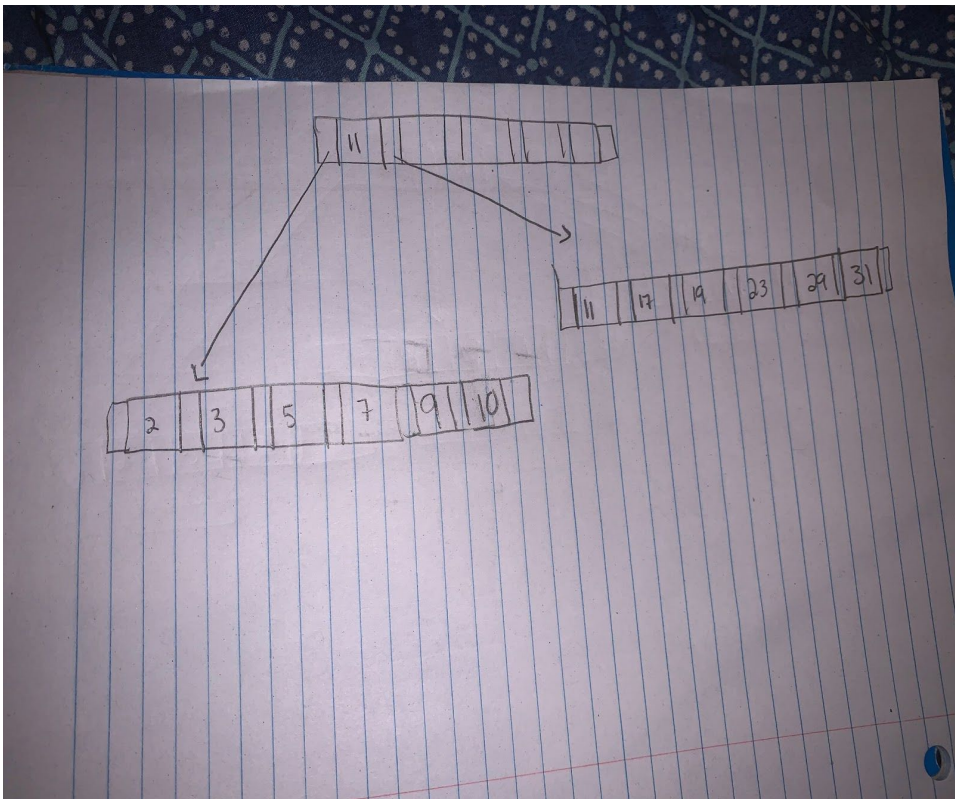


Max degree of 8)

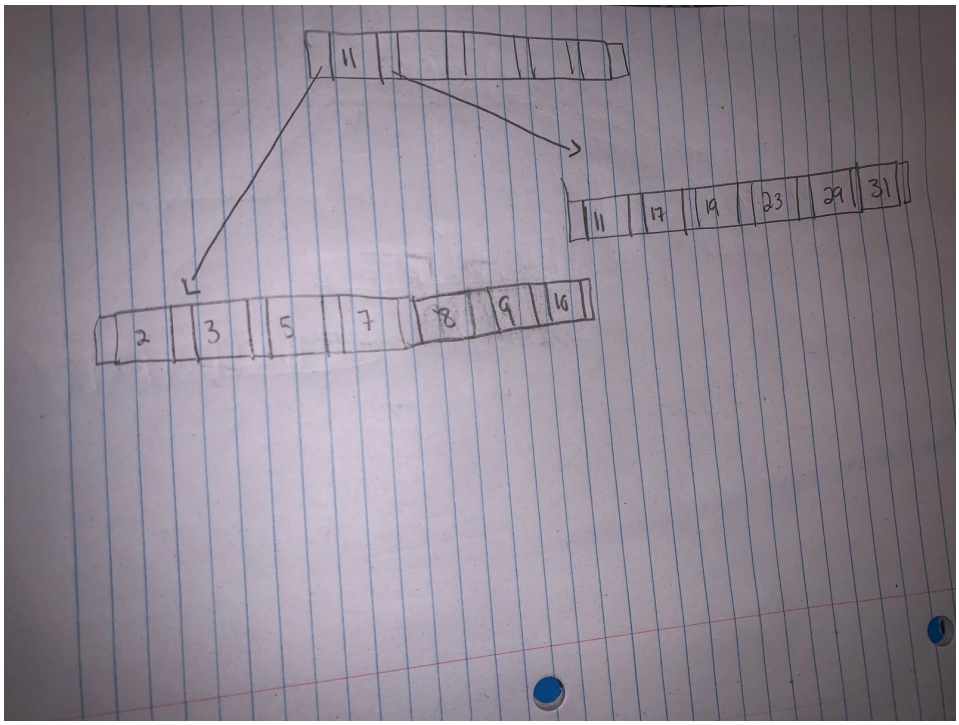
a. Insert 9.



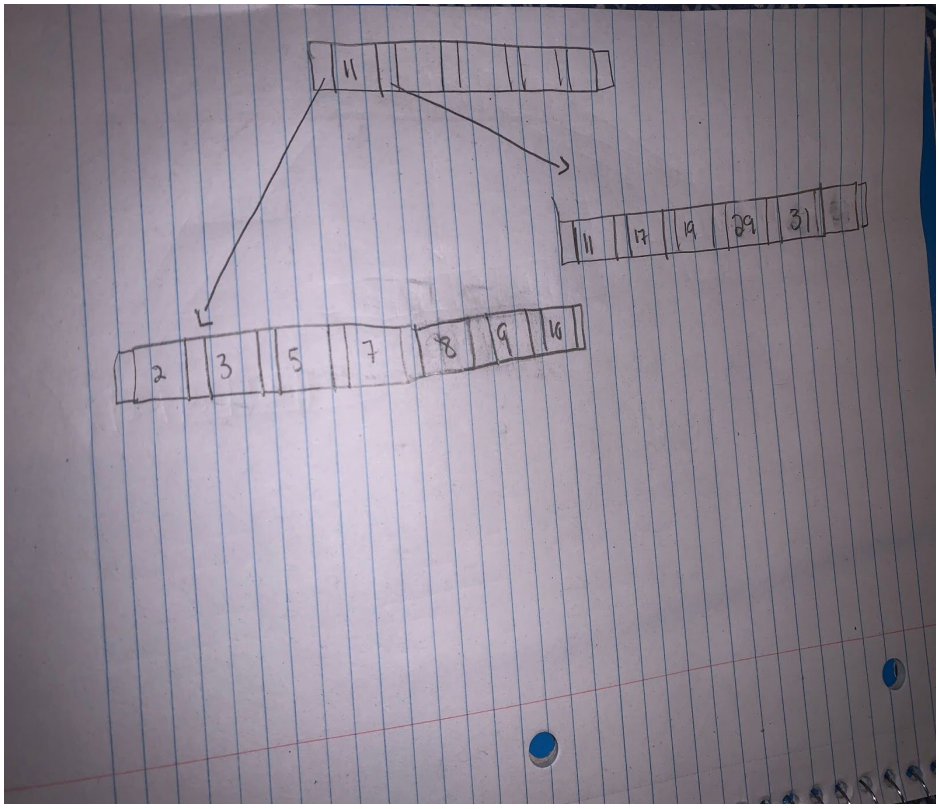
b. Insert 10.



c. Insert 8.



d. Delete 23.



e. Delete 19.