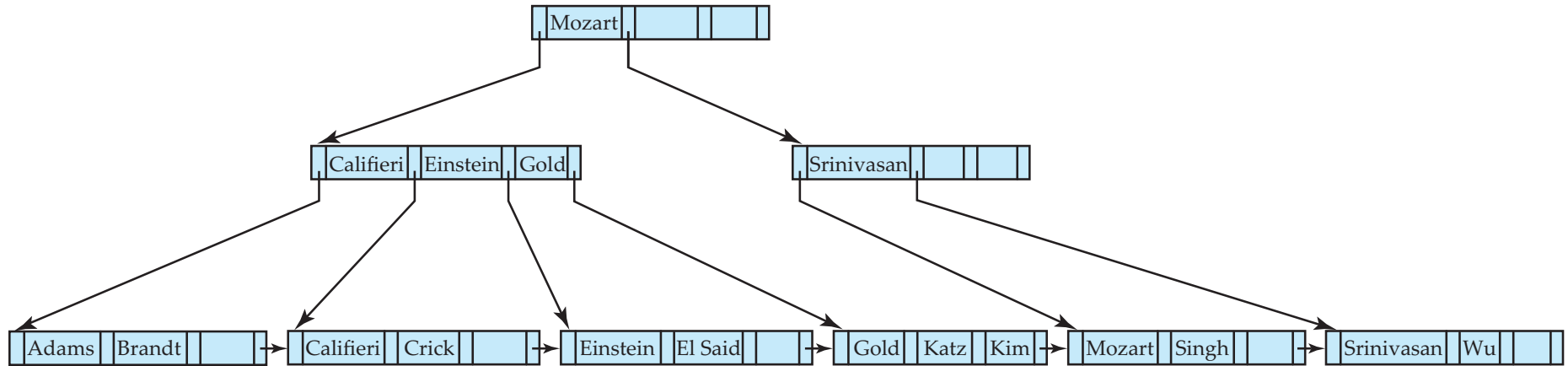


Database Development and Design (CPT201)

Tutorial 2

Dr. Wei Wang
Department of Computing

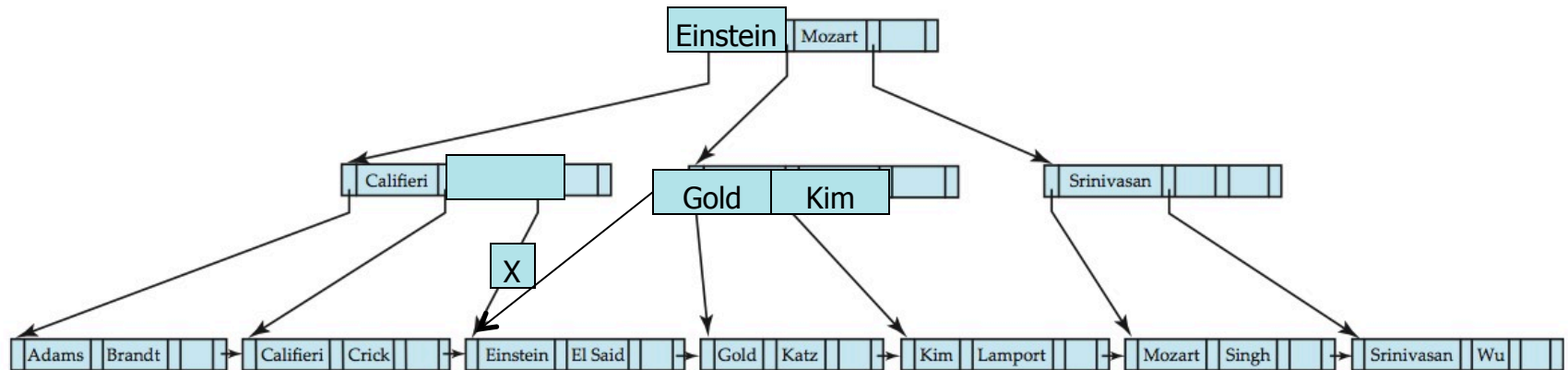
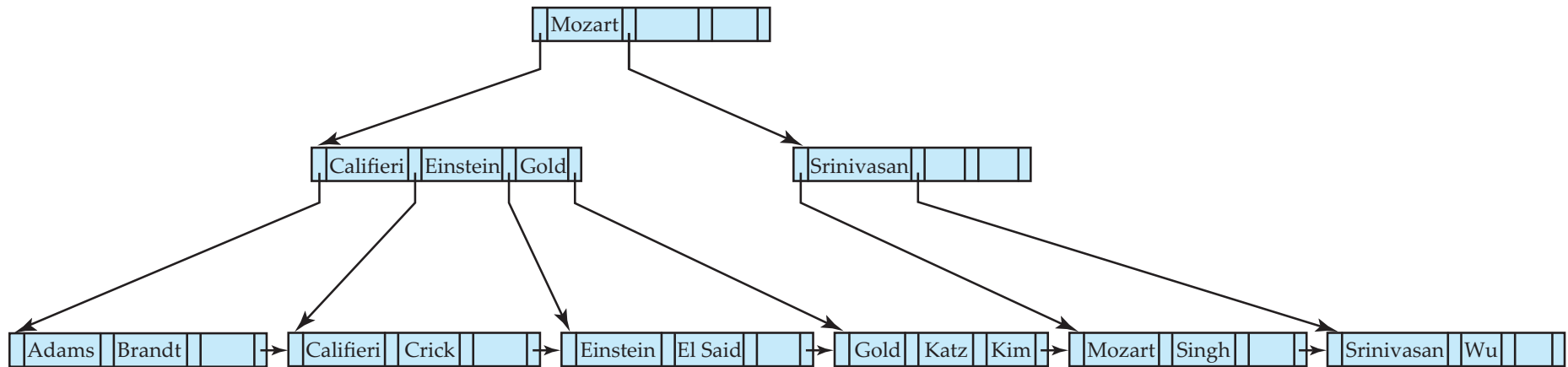
Q1



Question:

What will happen after insertion of “Lampport”?

Q1 Answers

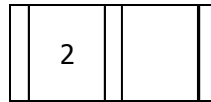


Q2

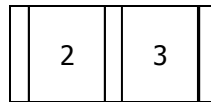
- Construct a B+ tree for the following set of key values for $n=3$.
 - (2, 3, 5, 7, 11, 13, 17)

Q2 Answers

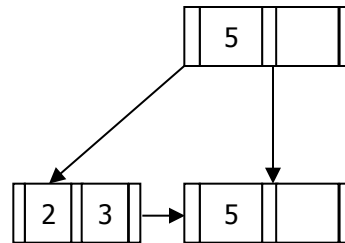
1. Insert 2



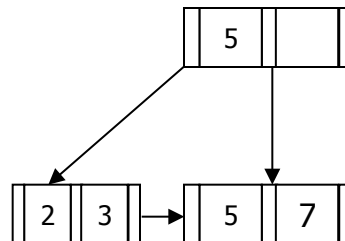
2. Insert 3



3. Insert 5

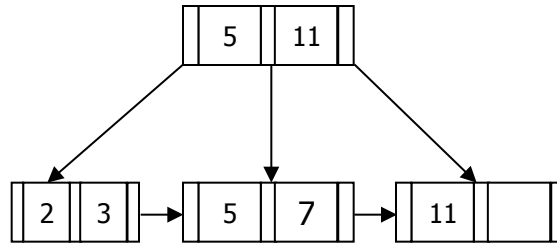


4. Insert 7

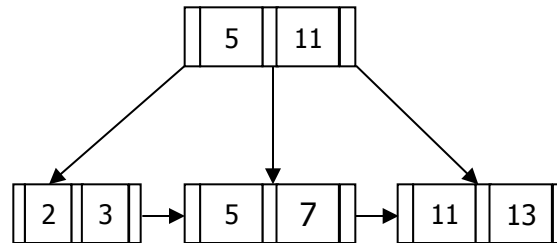


Q2 Answers cont'd

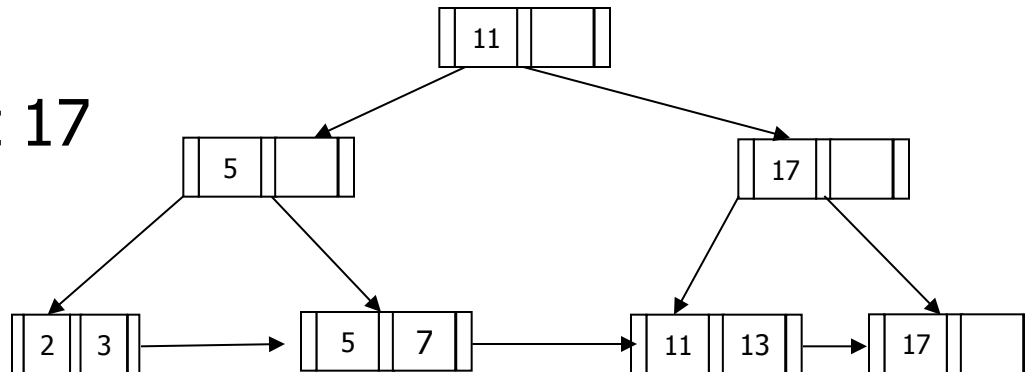
5. Insert 11



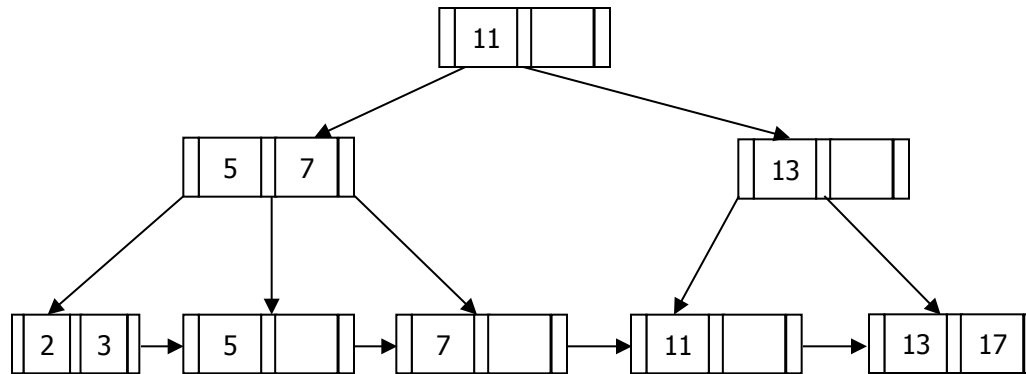
6. Insert 13



7. Insert 17



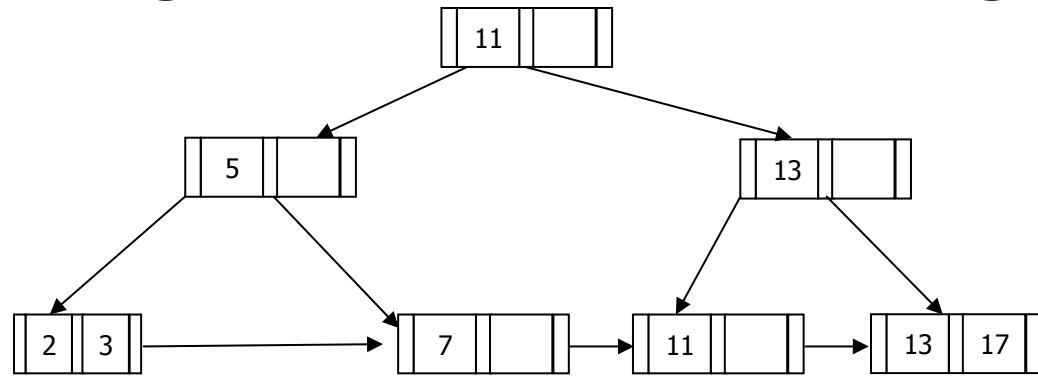
Q3



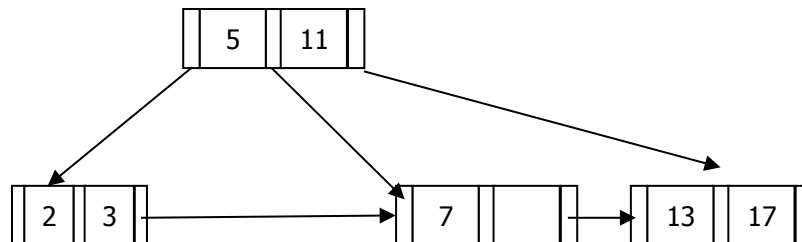
- Initial tree shown above
- (1). Delete 5, then delete 11 from the above figure, what does the tree look like?
- (2). With the initial tree, delete 11 from the above figure, what does the tree look like?

Q3 Answer

- (1) Delete 5: merge with either left or right sibling.

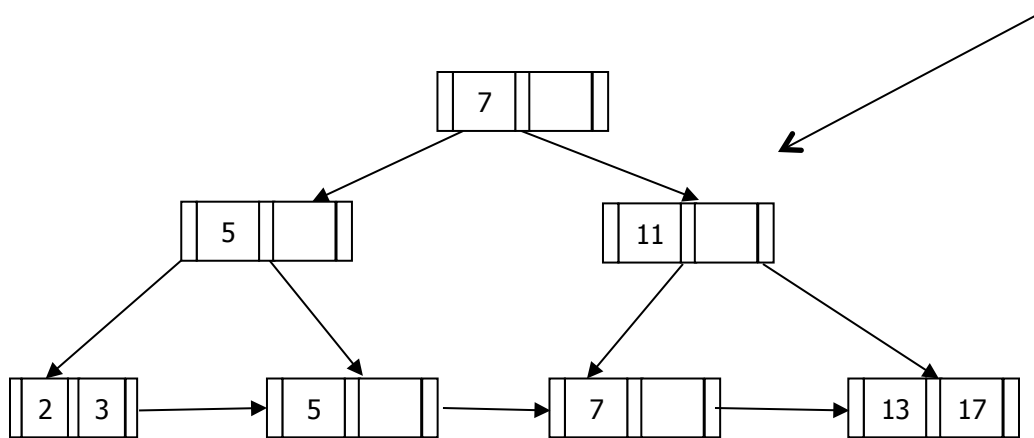
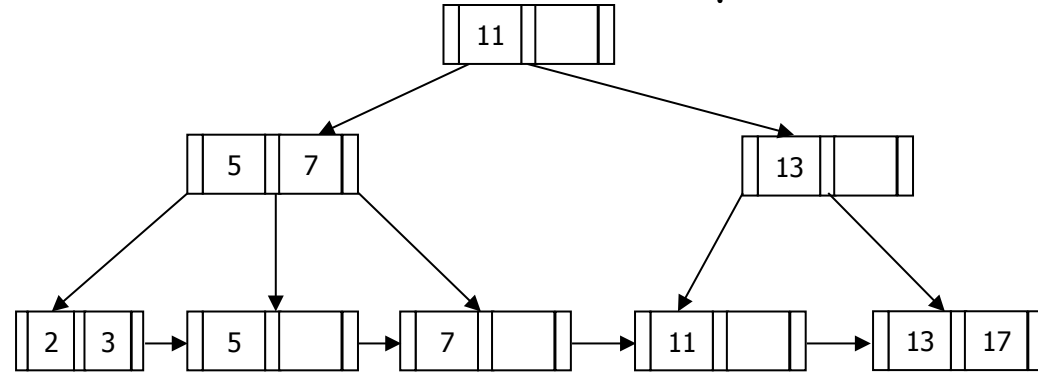


- (1) Then delete 11: merge sibling at leaf and then merge again at non-leaf.



Q3 Answer cont'd

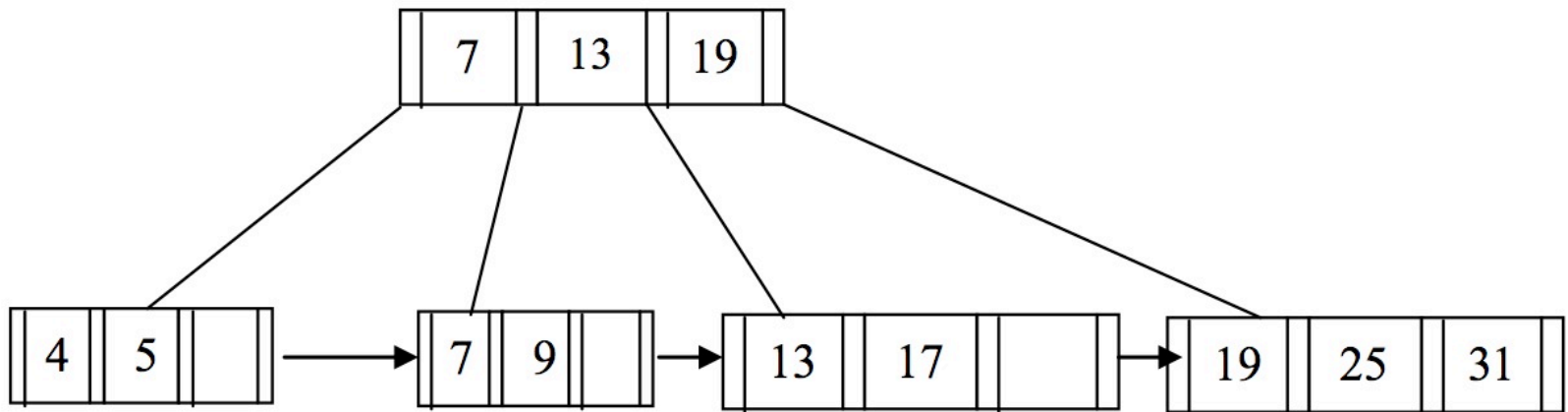
- (2) Delete 11: merge sibling at leaf and then redistribute pointer at non-leaf.



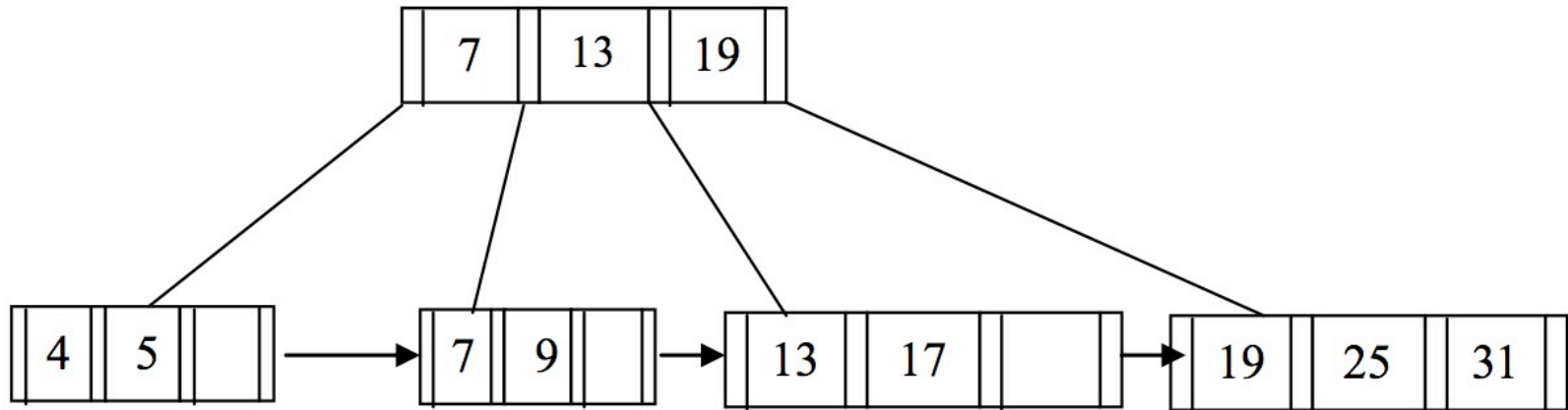
- Note redistribute pointer at the leaf also solves the problem.

Q4

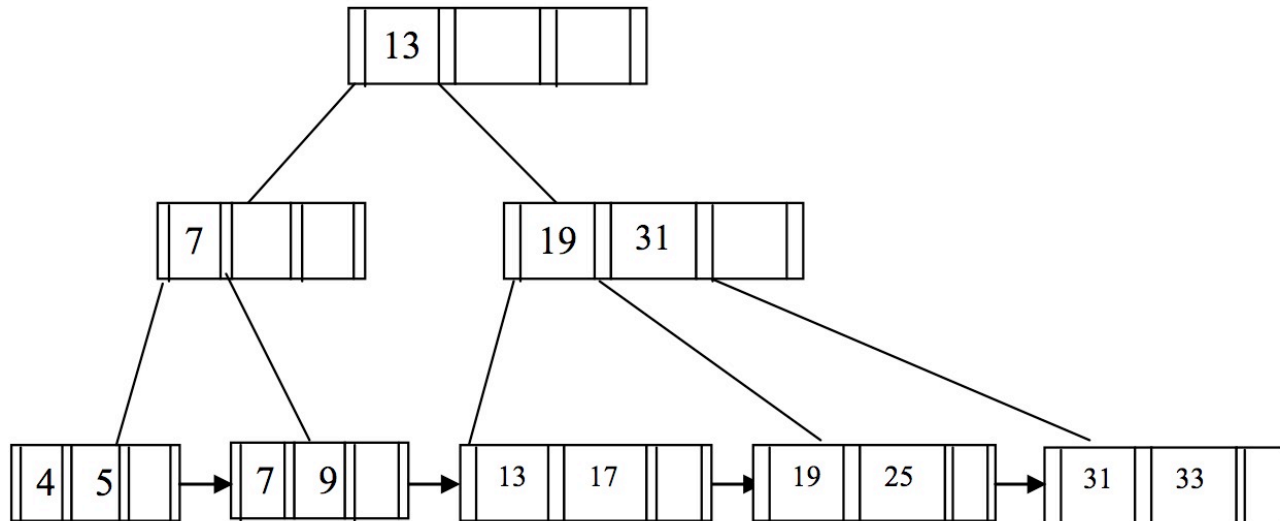
- Consider the following B+ tree. The number of pointers that fits in one node is 4.
- Draw the trees after each of the following update operations is performed (Subsequent operations are performed based on the previous ones).
 - 1. Insert 33
 - 2. Insert 11
 - 3. Delete 25



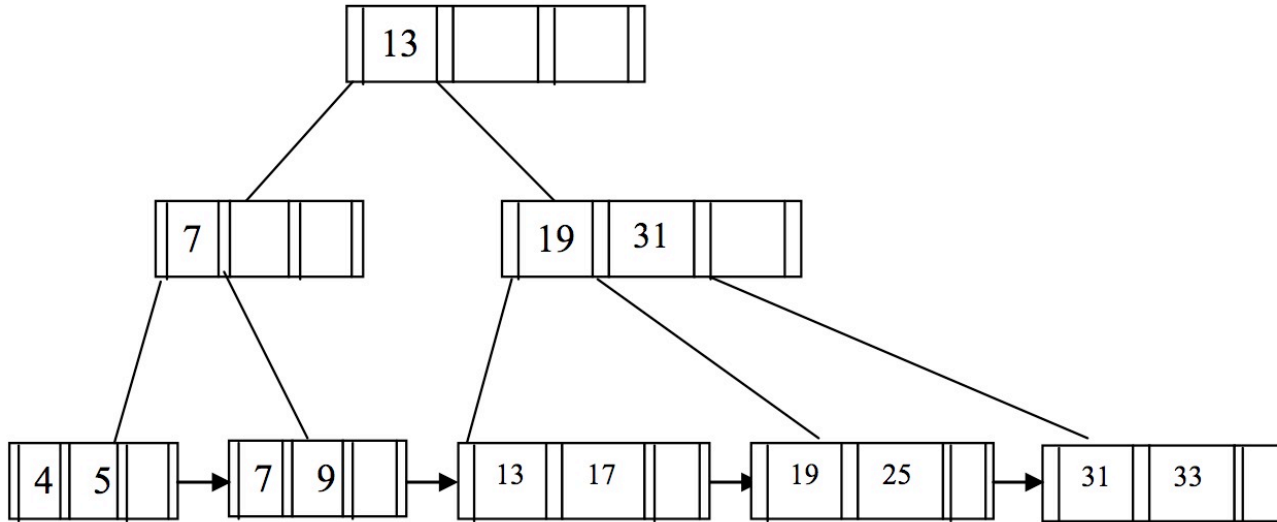
Q4 Answers



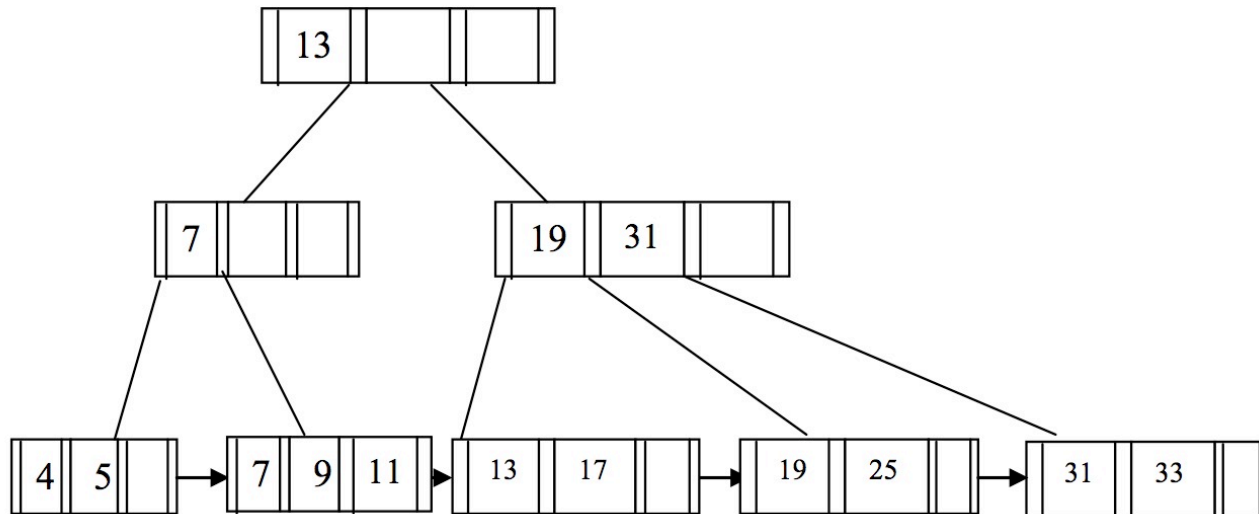
■ Insert 33



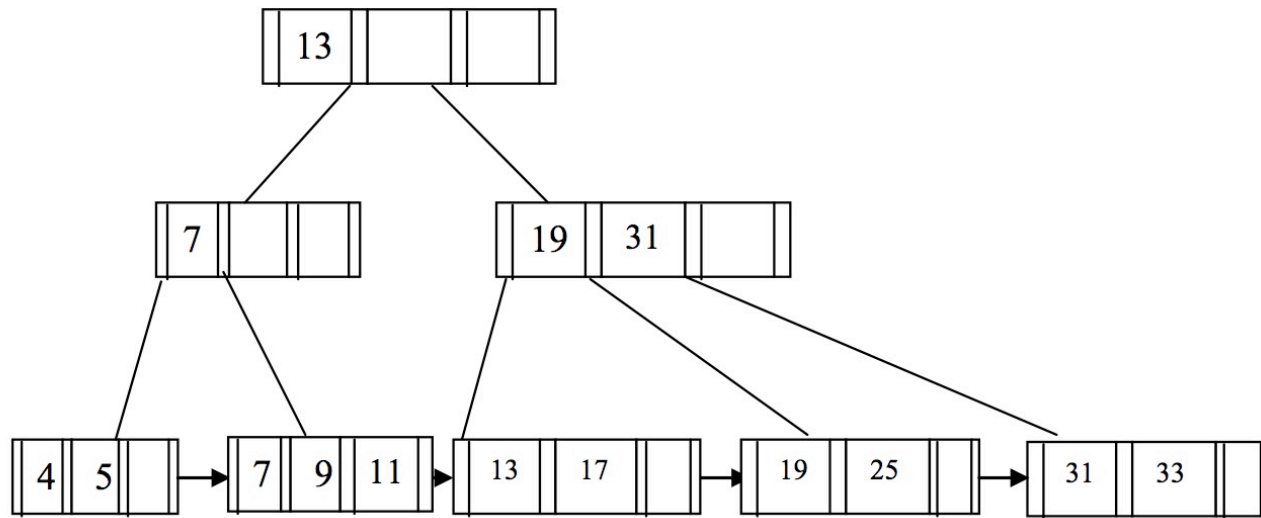
Q4 Answers cont'd



■ Insert 11

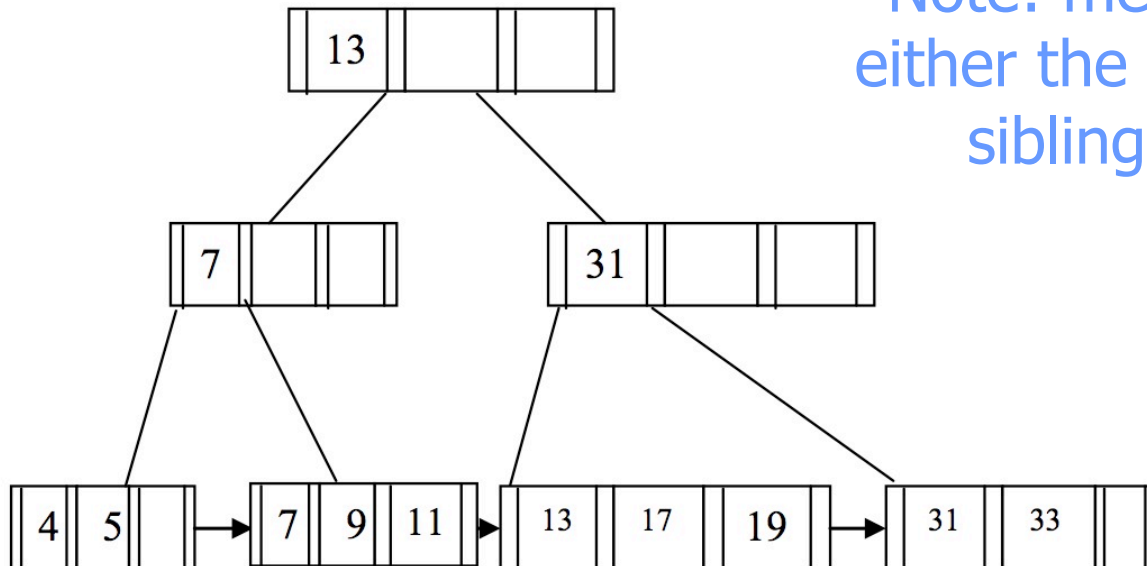


Q4 Answers cont'd



- Delete 25

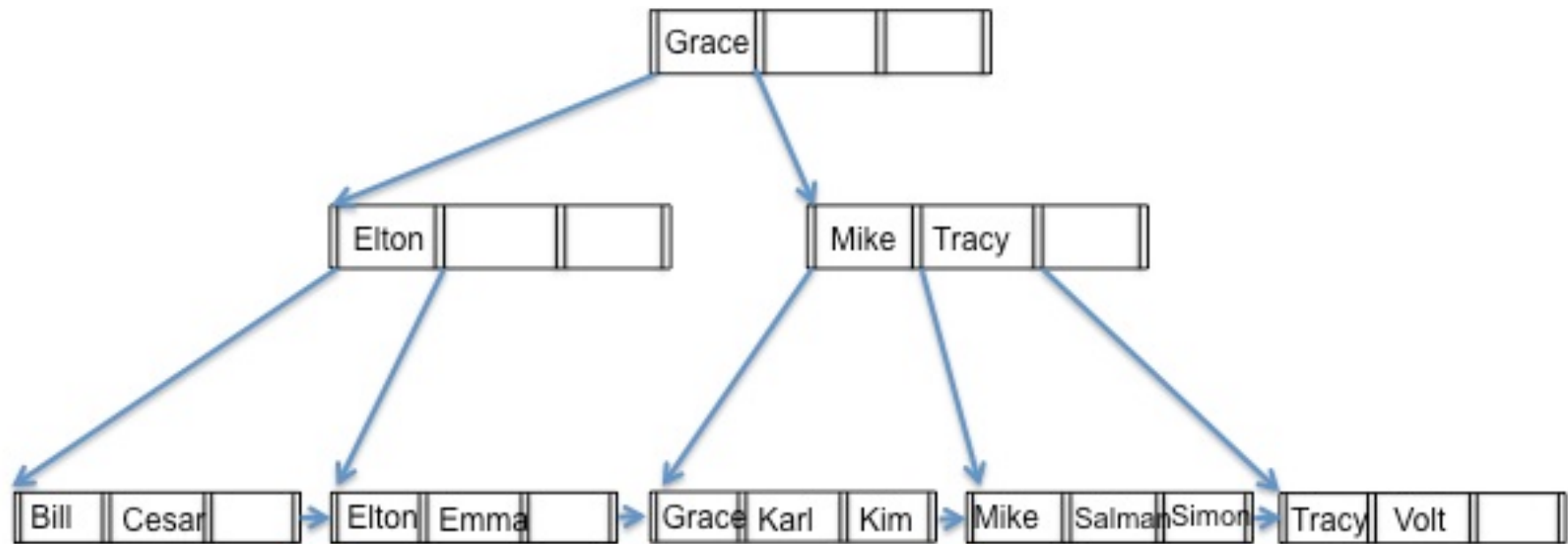
Note: merging with either the left or right sibling is fine.



Q5

- Consider the B+ tree with $N=4$ (the number of pointers can be stored in one node) below, which is created on names of some people.
 - 1. Briefly describe how to locate the record with the search key value of "Simon".
 - 2. Draw the B+ tree after inserting a search key "Grace".
 - 3. Draw the B+ tree after deleting a search key "Messi".
 - 4. Draw the B+ tree after inserting a search key "Yan".
 - 5. Based on the previous result, draw the B+ tree after inserting a search key "Sophie".
 - 6. Based on the previous result, draw the B+ tree after deleting search key "Bill".

Q5 cont'd



Q5 Answer

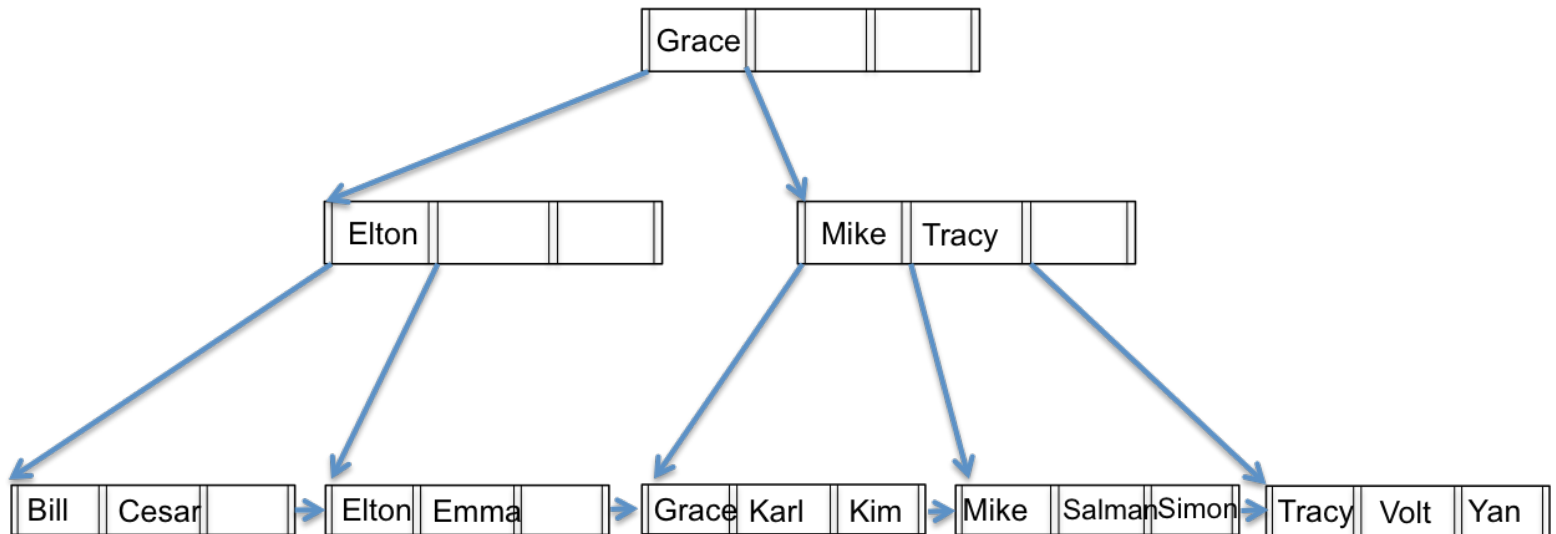
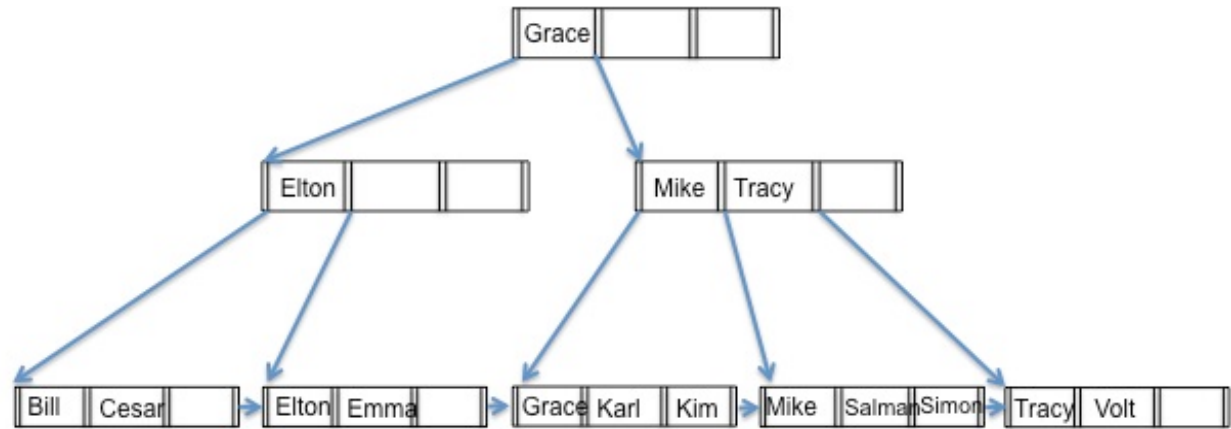
■ 1

- (1) start from the root of the B+ tree, Simon is larger than all keys in the root (which contains just Grace), so follow the last non-none pointer;
- (2) go to node "Mike Tracy", Simon is smaller than Tracy, so follow the pointer to the left of Tracy;
- (3) go to node "Mike Salma Simon", search sequentially and find Simon;
- (4) follow the pointer to the left of Simon and retrieve the records.

- 2. insert 'Grace': the search key is already in the B+tree, so no action is needed.
- 3. delete 'Messi': the search key doesn't exist, so no operation is needed.

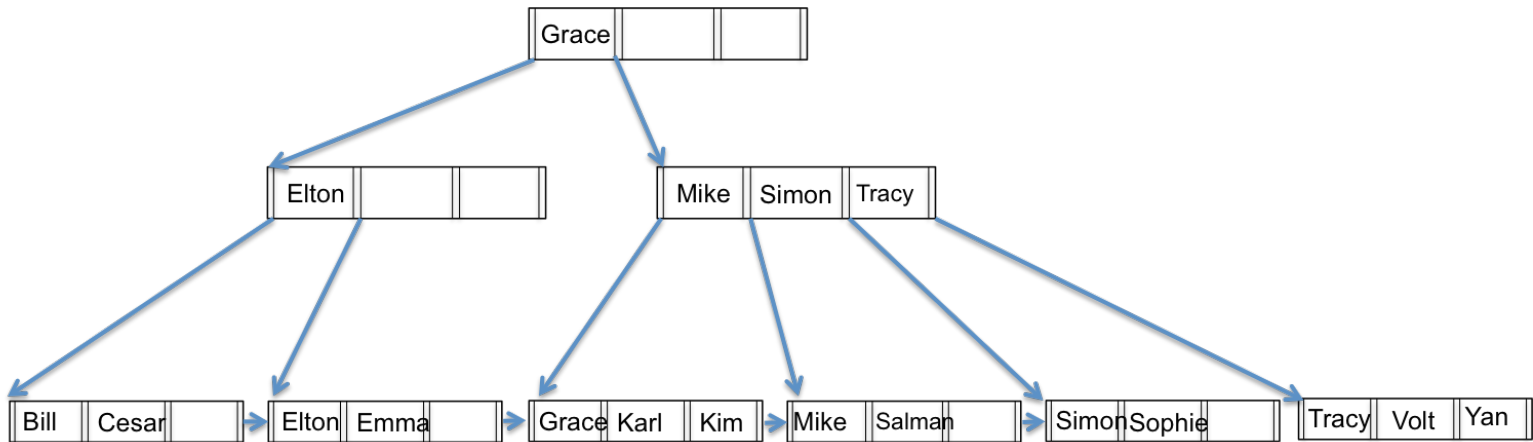
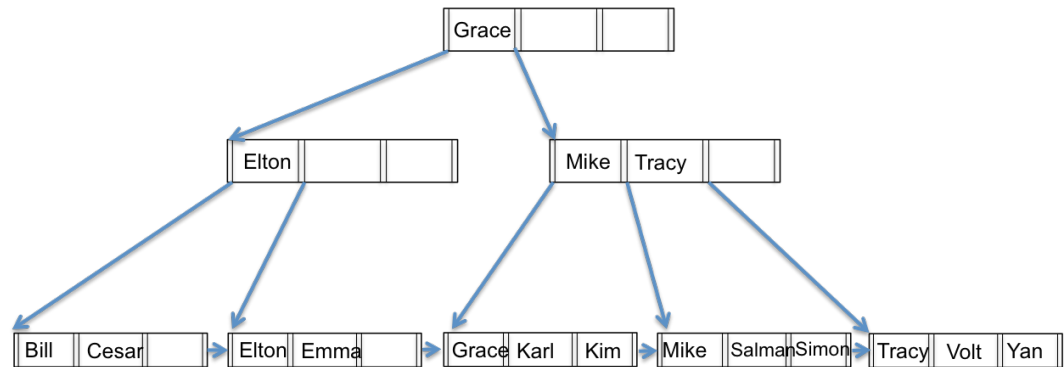
Q5 Answer cont'd

- 4 insert 'Yan'



Q5 Answer cont'd

■ 5. insert 'Sophie'



Q5 Answer cont'd

■ 6. Delete 'Bill'

