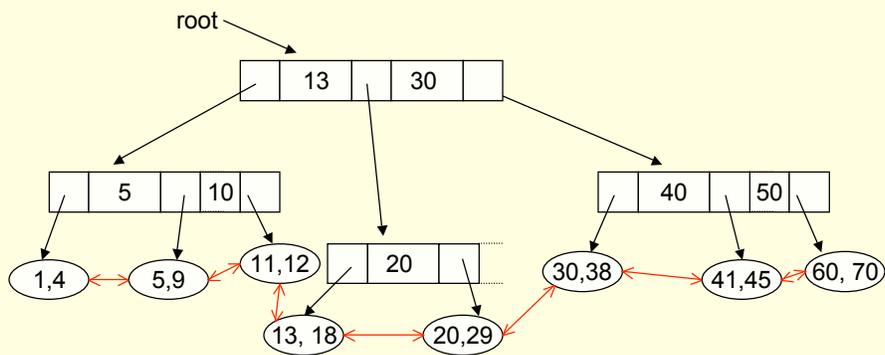


COS 597A:
Principles of
Database and Information Systems

B+-tree insert and delete
Example

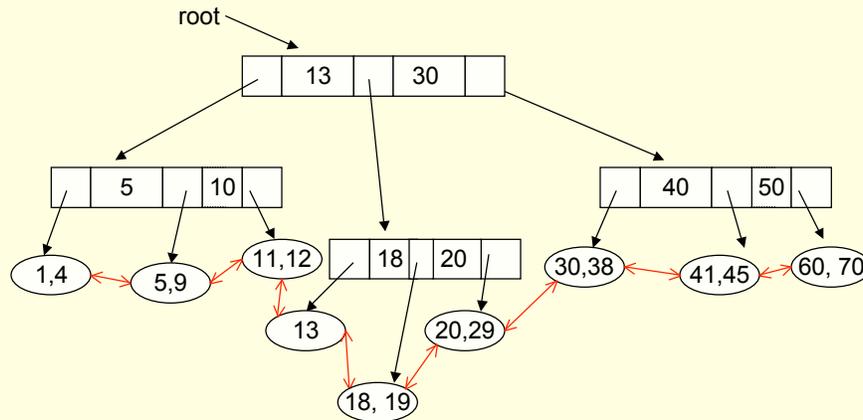
1

Starting configuration
B+ tree of order d=1



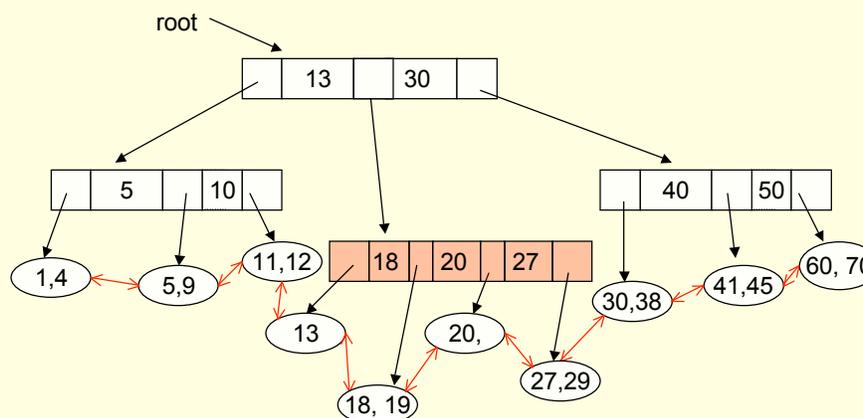
2

Insert 19: split leaf; expand parent with key 18



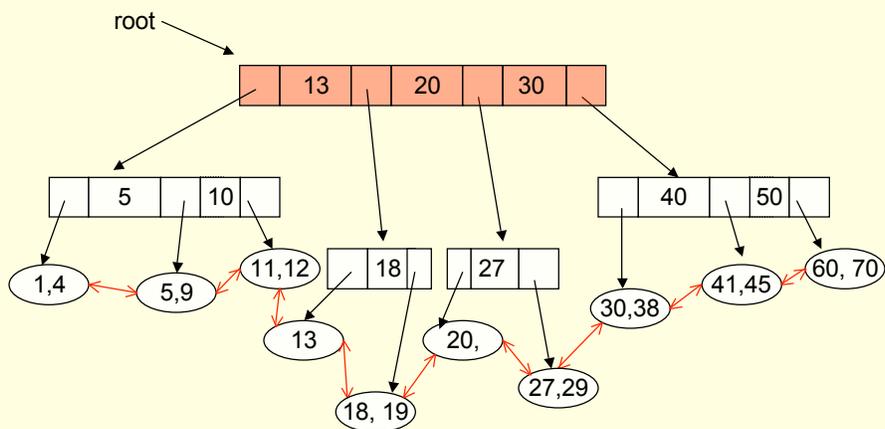
3

Insert 27 split leaf; expand parent with key 27 => too full



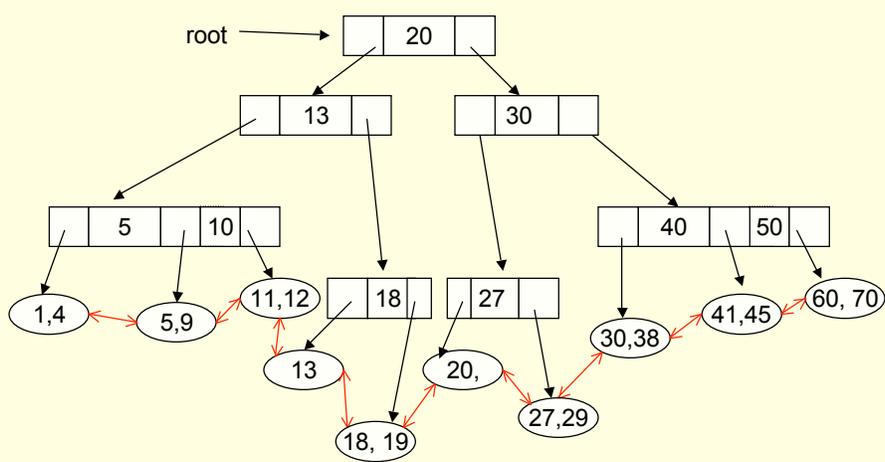
4

Insert 27
 split leaf; split parent;
 expand grandparent with key 20 => too full



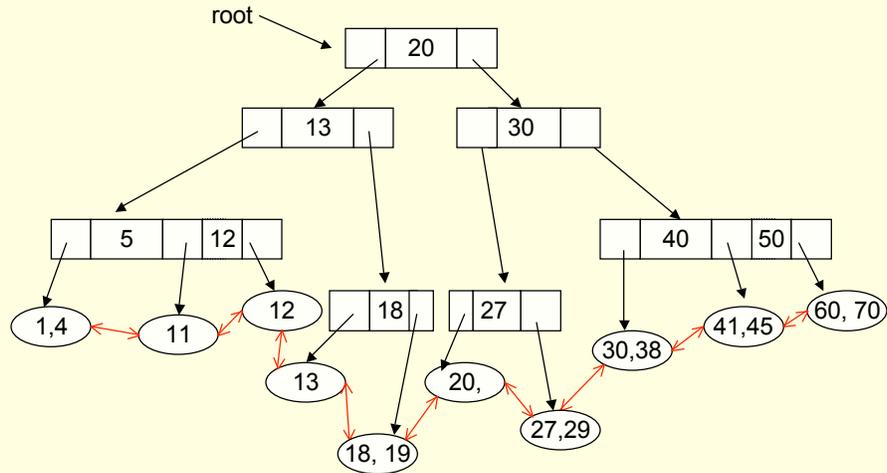
5

Insert 27
 split leaf; split parent; split grandparent
 new root with key 20



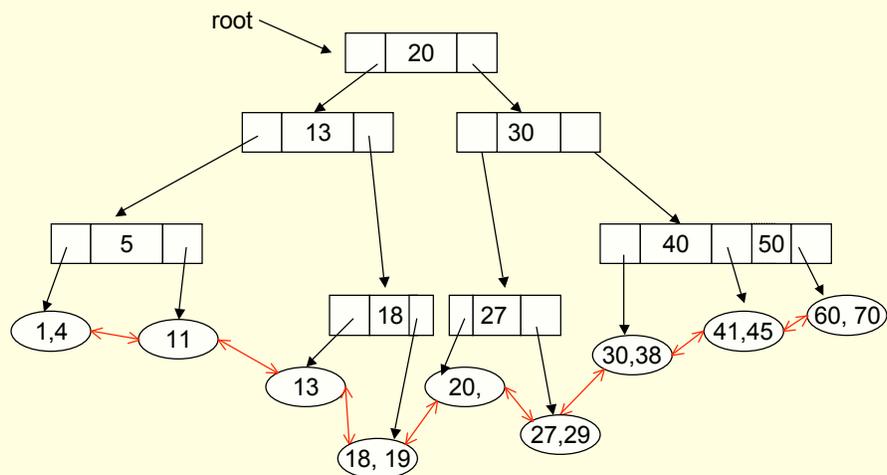
6

Delete 5, then 9 redistribute from right sibling



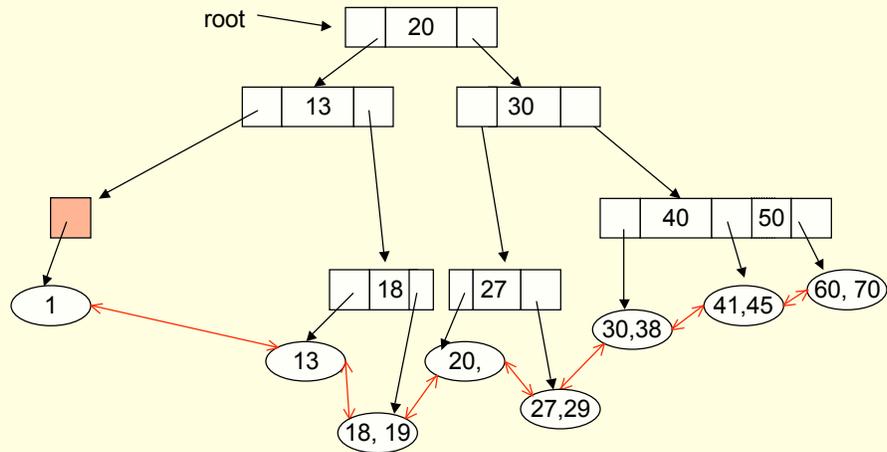
7

Delete 12 merge leaves, delete key from parent



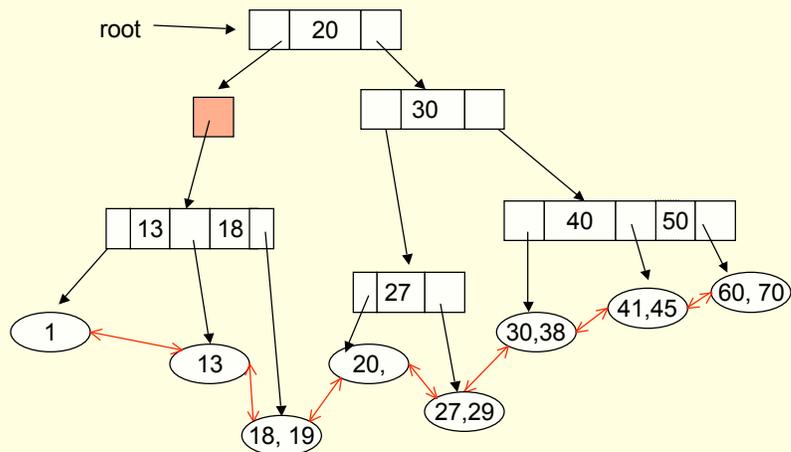
8

Delete 4, then 11
 merge leaves, delete key from parent
 =>parent not full enough



9

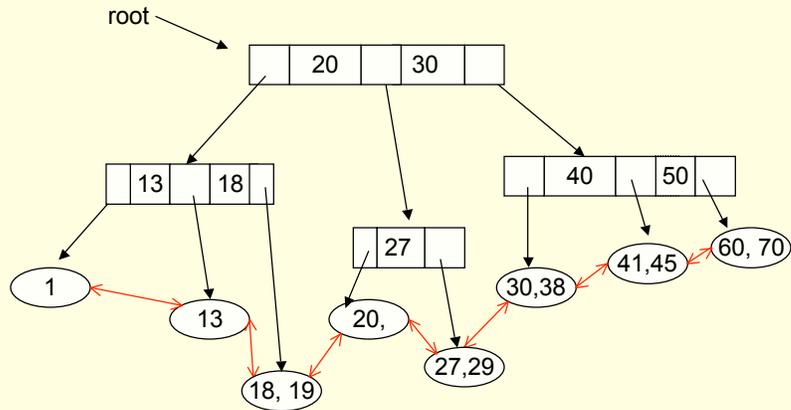
Delete 4, then 11
 merge leaves, merge parent, bringing down key 13
 =>grandparent not full enough



10

Delete 4, then 11

merge leaves; merge parent, bringing down key 13
merge grandparent, bring down key 20,
remove root



11