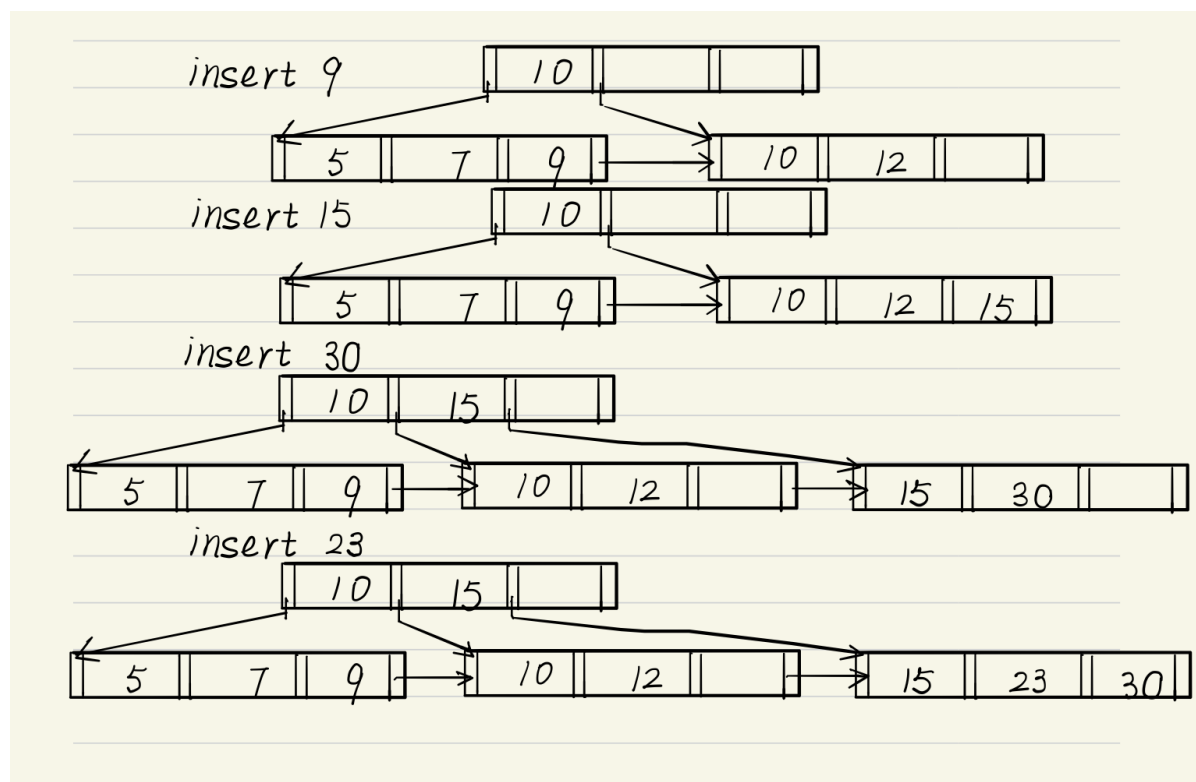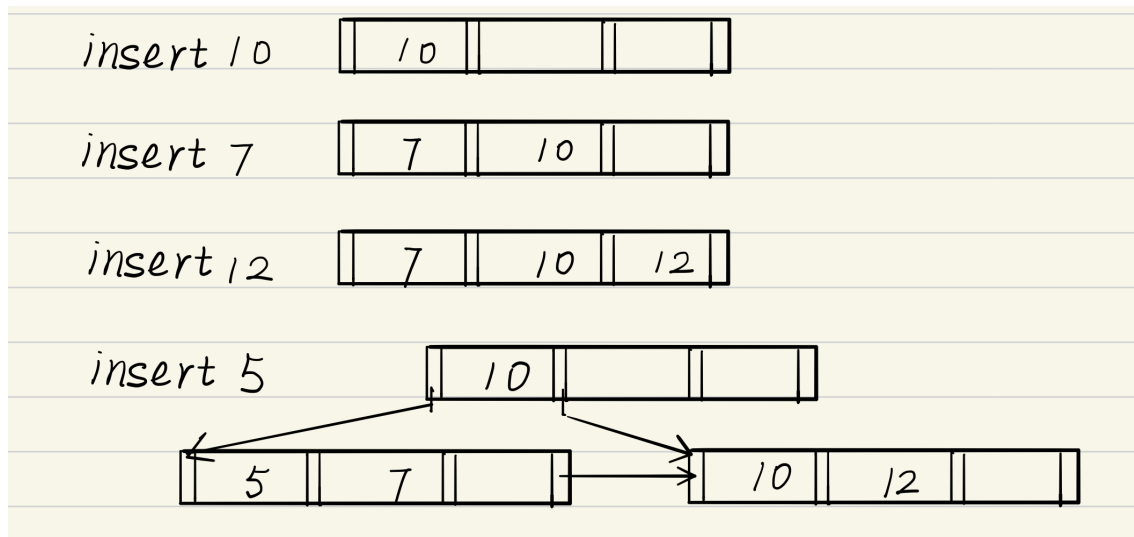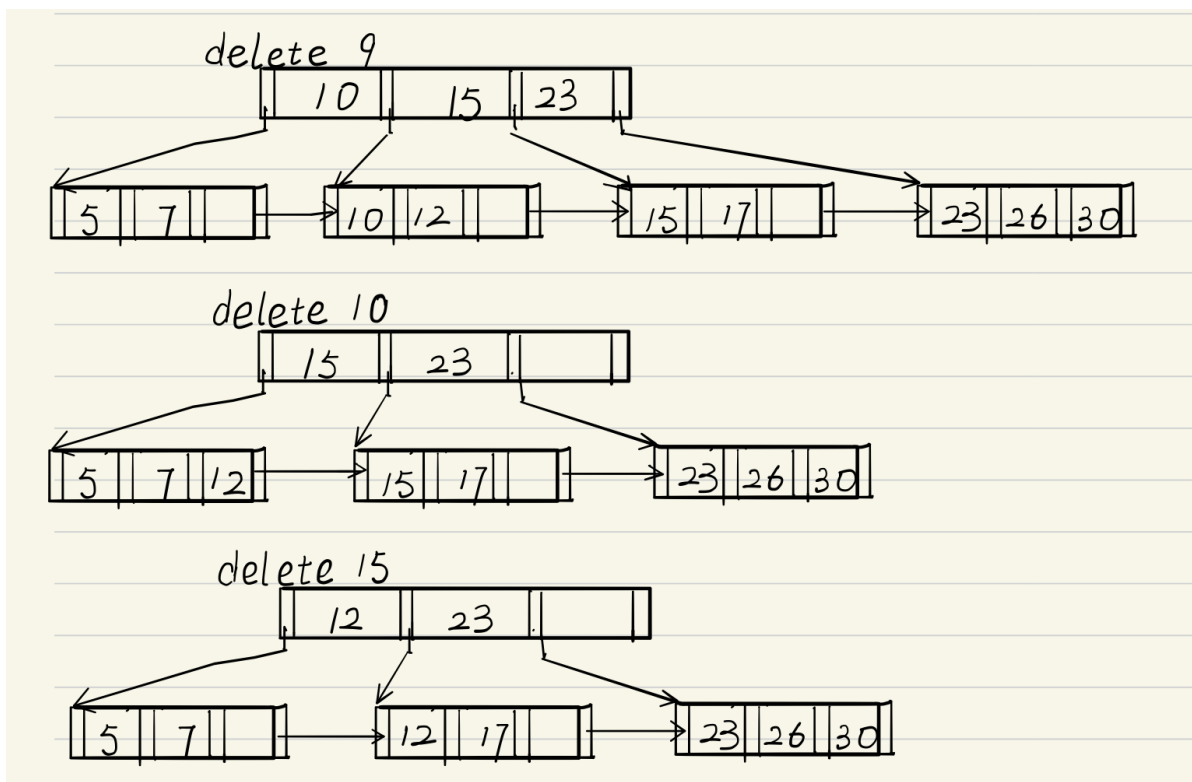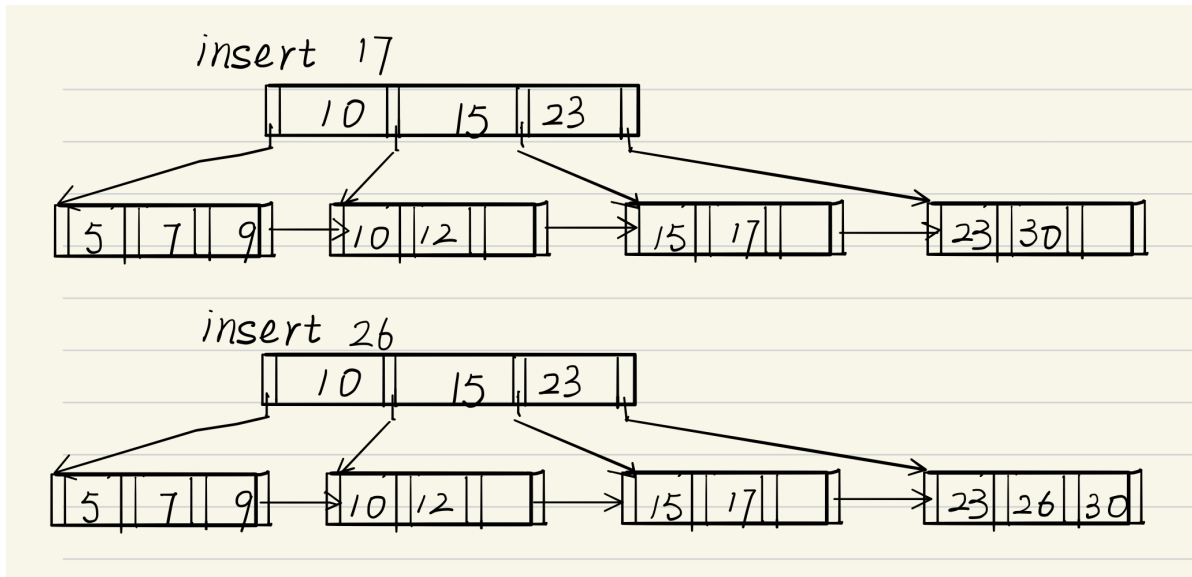# Assignments-Quiz B+-tree

1.Please construct a B+-tree from an empty tree.Each node can hold four pointers.

- The sequential values to be inserted are:10, 7, 12, 5, 9, 15, 30, 23, 17, 26.

- Then delete 9, 10, 15, respectively.

- Please give out the B+ trees after the insertion and deletion

insert 10 | 10 | | |

insert 7 | 7 | 10 | |

insert 12 | 7 | 10 | 12 |

insert 5 | 10 | | |
     | 5 | 7 | | → | 10 | 12 | |

insert 9 | 10 | | |
     | 5 | 7 | 9 | → | 10 | 12 | |

insert 15 | 10 | | |
     | 5 | 7 | 9 | → | 10 | 12 | 15 |

insert 30 | 10 | 15 | |
     | 5 | 7 | 9 | → | 10 | 12 | | → | 15 | 30 | |

insert 23 | 10 | 15 | |
     | 5 | 7 | 9 | → | 10 | 12 | | → | 15 | 23 | 30 |

insert 17

```
              [ 10 | 15 | 23 ]
         /        /      \        \
[5|7|9]→[10|12]→[15|17]→[23|30]
```

insert 26

```
              [ 10 | 15 | 23 ]
         /        /      \        \
[5|7|9]→[10|12]→[15|17]→[23|26|30]
```

delete 9

```
              [ 10 | 15 | 23 ]
         /        /      \        \
[5|7]→[10|12]→[15|17]→[23|26|30]
```

delete 10

```
           [ 15 | 23 |  ]
        /       /        \
[5|7|12]→[15|17]→[23|26|30]
```

delete 15

```
           [ 12 | 23 |  ]
        /       /        \
[5|7]→[12|17]→[23|26|30]
```

2.Compare: B+-tree and B-tree.

(1) All internal and leaf nodes have data pointers in B-tree, but in B+-tree, only leaf nodes have data pointers.

(2) For quering, in B-tree, sometimes possible to find search-key value before reaching leaf node, but in B+-tree, only reaching leaf node can you find a search-key value.

(3) For updatding, insertion and deletion in B-tree are more complicated than in B+-tree.

(4) For depth, B-tree' s non-leaf nodes are larger, so fan-out is reduced. Thus B-tree typically have greater depth than B+-tree.

(5)For function of leaf nodes, in B tree, the leaf node cannot store using linked list, in B+ tree, leaf node data are ordered in a sequential linked list.

(6)For redundant key, B-tree doesn' t store redundant search key, but B+-tree stores redundant search key.