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Media Engineering and Technology
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Data Bases II, Spring 2017
## Practice Assignment 2

Part One: Practical Problems

Exercise 2-1

A B+tree index is created for indexing a certain column in a table. Considering that the tree is of order 2 (i.e., n = 2, each index node can hold n keys and n + 1 pointer), show in steps the resulting tree of inserting values $\{12, 8, 1, 23, 5, 7, 2, 28, 9, 18, 24, 40, 48\}$ in order.

Exercise 2-2

Execute the following operations on following B+tree. Describe the changes for operations that modify the tree.
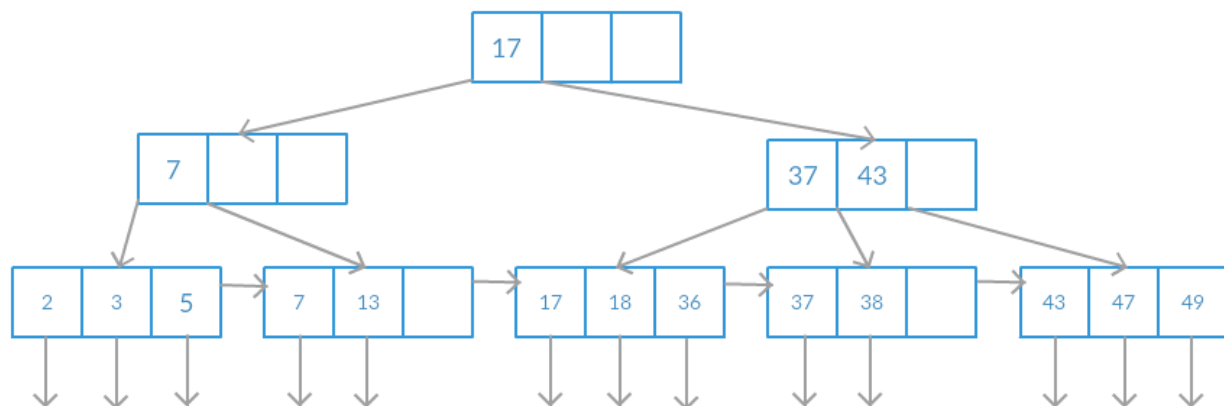
a) Lookup the record with key 41.
b) Lookup the record with key 38.
c) Lookup all records in the range 20 to 45.
d) Lookup all records with keys less than 30.
e) Lookup all records with keys greater than 30.
f) Insert a record with key 1.
g) Insert records with keys 14 through 16.

For animated algorithm visualizations:
https://www.cs.usfca.edu/~galles/visualization/BPlusTree.html

Part Two: Textbook Questions

Exercise 2-3

When duplicate keys are allowed in a B+tree, there are some necessary modifications to the algorithms for lookup and insertion. Describe them.

Exercise 2-4

If we use the 3-key, 4-pointer nodes (n = 3), how many different B+trees are there when the data file has the following numbers of records:

a) 6
b) 10
c) 15

Exercise 2-5

Suppose our B+ tree blocks/nodes are 4096 bytes, where our keys are integers of 4 bytes, and pointers are 8 bytes. If there is no header information kept on the blocks, what is the maximum number of keys that can fit in one block?

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