CSE 444: Homework 2

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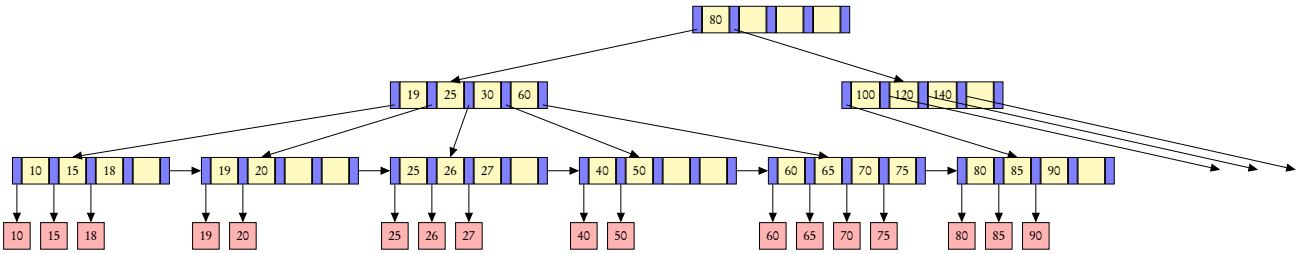
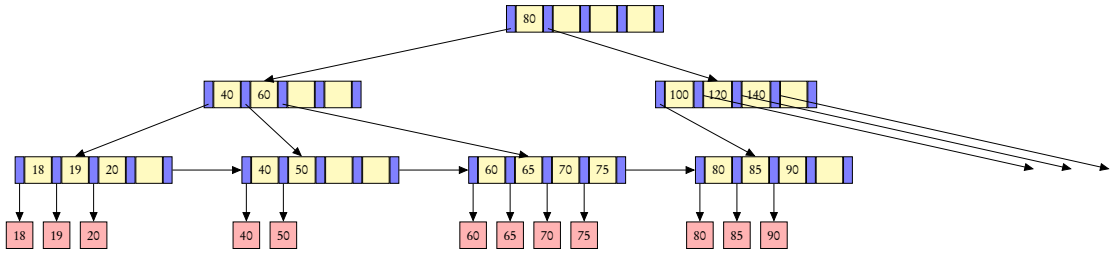
1 B+ Trees

1. See below



2. See below



3.

- We need to look up 4 pages: 3 pages of index files, 1 page which contains the key 40
- Same as above, 4 pages
- We need to look up 4 pages to get to the key 60, and then we can keep reading from the page until crossing to the next page with key 90 so **5** pages in total.
- We need to look up 4 pages to get to the key 60, and then we can keep reading until the end of the page. Then we need to go the next **index** file to find key 80, then read from the pointed data file until 90 is read. So **6** pages in total.

2 Operator algorithms

1.

- Cost $= B(R) + T(R) \cdot B(S) = 100 + 1000 \cdot 80 = 80100$
- Cost $= B(R) + B(R) \cdot B(S) = 100 + 100 \cdot 80 = 8100$

2. The algorithm with the least cost would be block-nested-looped. The cost is

$$\text{Cost} = B(R) + \frac{B(R) \cdot B(S)}{M-1} = 100 + \frac{100 \cdot 80}{10-1} = \frac{8900}{9}$$

3. The index-based nested loop join will iterate over R, for each tuple in R, fetch the corresponding tuples from S. If we assume there is exactly one match for every tuple in S, then for every tuple in R we make 1 disk access of S. So the total cost is $B(R) + T(R) * 1 = B(R) + T(R)$