

CS150A Quiz #3

B+ Trees

Q1: Suppose that all nodes in our B+ tree have an order of 1605. What's the MAXIMUM number of records we can index with a B+ tree of height 4?

Assume our B+ trees are laid out as in lecture.

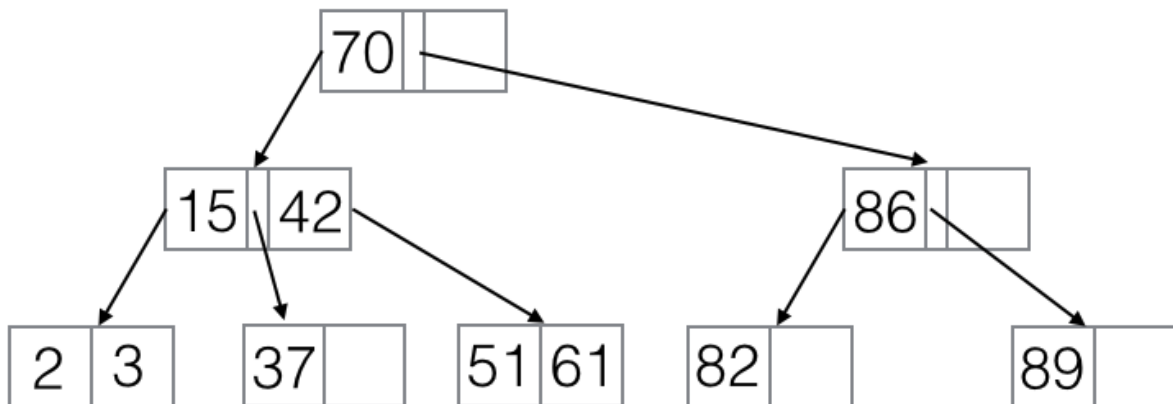
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Q2: We want to bulk-load a B+ tree, and we reduce the fill-factor of this bulk load. Which of the following applies, in general?

Check all that apply.

- ☐ The bulk loading operation is faster
- ☐ We consume more disk space
- ☐ A sequence of many consecutive record lookups is faster
- ☐ A sequence of many consecutive insertions requires fewer disk writes

Figure A



Q3: We insert the key 55 into the B+ tree in figure A. How many I/Os (page reads and writes) does this operation take? Assume we require zero page reads and one page write to create a new page from scratch. Also assume that we do no key redistribution. Exclude disk I/Os done to data pages. Finally, assume we have 20 pages of memory available for caching pages in memory after reading them.

Q4: After performing the insert in Q3, what's the maximum number of keys we can insert into the B+ tree in figure A without splitting the ROOT?

Buffer Management

Supposed we have a buffer pool size of 4 pages, and the following access pattern:

A P P L E S A N D B A N A N A S A N D O R A N G E S

Assume that pages are unpinned immediately (ignore pinning).

Q5: What is the number of cache hits if we use an LRU replacement policy? Assume we are starting from a cold (empty) cache.

Q6: What is the number of cache hits if we use an MRU replacement policy? Assume we are starting from a cold (empty) cache.

Q7: What is the number of cache hits if we use a CLOCK replacement policy? Assume we are starting from a cold (empty) cache.

Q8: What is the number of set reference bits at the end of Q6?