

See course website for instructions and due date.

1. Consider the B+tree shown in Figure 10.28 (p. 366) of the Cow Book. This tree has *order* = 2. The variables A, B, and C represent subtrees – unlike the subtrees rooted at I2 and I3, the details of these subtrees are not shown.

For questions that require modifying the index, answer it with respect to the *original* index shown in the figure, as opposed to the index that results from answering any preceding question. In addition, it is not necessary to draw the whole index. Instead, you need only draw the parts of the index that change. Be sure to use labels so it's clear what part you are referring to!)

- (a) To answer the range query: “get all records with search key between 50 and 92,” which nodes of the tree are examined?
- (b) Show the B+ tree that would result from inserting a record with search key 90.
- (c) Show the B+ tree that would result from deleting the record with search key 81.
- (d) Show the B+ tree that would result from deleting the record with search key 31.
- (e) What is the minimum number of deletions from subtree I3 that will trigger redistribution from I2 to I3?
- (f) Specify a range such that the insertion of a single record having a search key within that range would cause the tree to increase in height. (Identify the largest possible range you can.)
- (g) How many data entries might be in subtree A? Provide a *lower* and *upper* bound.