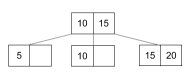
CS 186 - Fall 2024

Exam Prep Section 3

B+ Trees

1 B+ Trees

Given the following (degree *d* = 1) B+ tree:



1. Draw what the tree looks like after adding 2, 6, and 12 in that order.

For the following questions, consider the tree directly after 2, 6, and 12 have been added.

(b) What is the maximum number of inserts we can do without changing the height of the tree?

(c) What is the minimum number of inserts we can do that will change the height of the tree?

2 More B+ Trees

Consider the following schema:

CREATE TABLE FineWines (

name CHAR(20) NOT NULL,

years\_aged INTEGER NOT NULL,

price INTEGER NOT NULL

);

Suppose that we have built an index over <years aged, price>, and suppose this index is two levels deep (in addition to the root node), and data is stored by *list of references* in separate data pages, each of which can hold hundreds of records.

(a) SELECT \* FROM FineWines

WHERE years\_aged = 5

AND price = 100

What is the worst case number of page I/Os to execute this query on an unclustered index if there is 1 matching record? 2 matching records? 3 matching records?

(b) What is the worst case number of page accesses to execute this query on a clustered index if there is 1 matching record? 2 matching records? 3 matching records?

(c) SELECT \* FROM FineWines

WHERE price = 100

What is the worst case number of page I/Os to execute this query if there are 150 data pages?

(d) DELETE FROM FineWines

WHERE years\_aged = 1

AND price = 5

Suppose this query deletes exactly one record. How many page I/Os are needed to execute this query? (Assume no tree rebalancing is required.)