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HW 7

Part I

1. Create Index(StartDate, EndDate); If we were every querying on EndDate alone this would be bad, but since we are always querying on startDate or both Dates, this index will work well.
2. For the first two common queries, we can use the primary key index on studentID. For the next two common queries, Create Index(Grade);
3. Create Index(Grade), we already have an index on className
4. Create Index (Elo) This will help with first query finding Elo >=2050. Create Index (WhitePlayer) on Games table. This will help find players in Games table by pID.
5. Both have PK indexes already on their respective joined tables. None
6. Create Index (CardNum) from CheckedOut this will help for query where CardNum = a number. Also helps for fast natural join for Patrons and CheckedOut.
7. Create Index (ISBN), This is the foreign key on the Inventory table. This will make the join quicker.

Part 2

1. **Table #2 Part 1**
    a. 4096 bytes / 15 bytes in the tuple = 273 rows can be placed in the first leaf node.
    b. 4096 / 14 (Primary key int & primary key varchar(10)) = 292 keys could be in inner node.
    c. Since 292 Keys can fit in an inner node, we can point to 293 child nodes. Since we have 273 rows max per leave node -> (293 Child Nodes) * (273 Rows) = 79,989 is the max # or rows for a tree height of 1.

d. Since leave nodes need to be at least half full and trees need to be perfectly balanced at minimum we must have 2 leaf nodes, both at half capacity. 137 rows need to be in each leave node for these nodes to be at least half full. Then, since we need two leave nodes -> (137 Rows) * (2 Leaves) = 274 is the minimum # of rows for a tree of height 1.

e. Grades take up one byte, but in our secondary indexes the Leaf nodes hold Idx_key + PK. This means that each entry will take up 15 bytes. This means a leaf node can hold 273 entries.

2. Rows occupy 128 bytes

a. With 48 rows we can have 3 leave nodes maximum. 48 * 128 = 6144 bytes. Because each leave has to be at least half full, we can have a minimum of 2048 bytes in each leaf. 2048 bytes * 3 Leaves = 6144 bytes

b. 128 bytes * 48 rows = 6144. Not all these bytes will fit on one page (4096) and a leave has to be half full, so 2048 bytes will be in the 2nd leave.