Software issues:
If you feel there are mistakes in this assignment, check Piazza for corrections, and report them to us if they have not been made.

Assignment

An index is a data structure that makes finding data faster. They are sorted in ascending order and hold a field value and a pointer to the record the index relates to. Figure 14.1 (below) illustrates an index for a table with the Name column as the primary key. One way to implement an index is using the b tree data structure. However, there are many different types of data structures such as arrays, hash tables/dictionaries, objects, lists, graphs, and different types of trees.
1. Given Data File Table 1, with the customerNumber column as the primary key, illustrate how an index would be stored using an array (one dimensional). At a minimum the length of the array should be the number of rows shown in the table. Your illustration should be similar to the one in Figure 14.1, except you will replace the following figure with your array and use Data File Table 1. Make sure you label your index with numbers. An array index starts with the zero.
Figure 14.1
Primary index on the ordering key field of the file shown in Figure 13.7.
2. The following row is inserted into Data File Table 1.

<table>
<thead>
<tr>
<th>customerNumber</th>
<th>customerName</th>
<th>contactLastName</th>
<th>contactFirstName</th>
<th>phone</th>
<th>addressLine1</th>
</tr>
</thead>
<tbody>
<tr>
<td>142</td>
<td>La Corne D’abondance, Co.</td>
<td>Betrand</td>
<td>Marie</td>
<td>(1) 42.34.2555</td>
<td>265, boulevard Charonne</td>
</tr>
</tbody>
</table>

Draw an array to illustrate the index with this new row. **Remember**, the data must be sorted.
3. Given that the row with customerNumber 142 was inserted into Data File Table 1, list the steps you followed to insert the new row into your array. Your list should consist of things such as adding more elements to the array, moving data from one index in the array to another index, inserting information into a particular index, and/or creating a new array.

4. Given Data File Table 1, with the customerNumber column as the primary key, illustrate how an index would be stored using a hash table/dictionary. Your illustration should be similar to the illustration you drew in question 1, except you should draw a hash table. **Do not include the row inserted in question 3.**
5. The following row is inserted into Data File Table 1:

<table>
<thead>
<tr>
<th>customerNumber</th>
<th>customerName</th>
<th>contactLastName</th>
<th>contactFirstName</th>
<th>phone</th>
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<tbody>
<tr>
<td>142</td>
<td>La Corne D'abondance, Co.</td>
<td>Betrand</td>
<td>Marie</td>
<td>(1) 42.34.2555</td>
<td>265, boulevard Charonne</td>
</tr>
</tbody>
</table>

Draw a hash table to illustrate the index with this new row. **Hash tables are not sorted.**
6. Given that the row with customerNumber 142 was inserted into Data File Table 1, list the steps you followed to insert the new row into your hash table. Your list should consist of things such as creating a key for the row, and storing column names and their values in the hash table.
7. Which data structure, the array or the hash table is better to use for indexing? Your answer to this question should compare inserting and retrieving information into both data structures, and the design decisions made. Design decisions are how you chose to represent the data structure as an index. For example, how you stored the pointer to the data in the array and hash table.

**Getting Help**

If you have trouble, please post a question on Piazza before contacting me. Before posing a question, please check if this question has been asked before. This will reduce post clutter and reduce our burden. Repeat questions will be ignored by the instructors.

Piazza allows anyone to respond. So if you see a question that you think you can respond to, please do so, as that will reduce our burden and help you "teach" your fellow students.

Good luck!