

University of Birmingham

*MSc Computer Science*

**Data Structures – MSc Assignment (Collections)**

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**Question 1:**

An online estate agent sells **properties of different prices**. Customers choose a **range of prices and obtain a list** of all properties in that range. How would you store the collection of property data?

My answer: *TreeMap* – ordered

Reasons why I believe treemap would be best suited here:

**Ordered**: TreeMaps are SortedMaps hence they provide an order, which would be useful in this regard as the price needs to be ordered. This can not be done through HashMaps, hence here it would be best to use a treeMap.

Using a set in this case would not make sense as you need to map the prices of a property onto actual properties. Hence, we disregard sets.

**Question 2:**

You are a quiz show producer, and have received a **large list of 10,000,000 potential contestants with 100,000 specialist subjects**. You want to send an invitation to one candidate from each subject. (This will be a long-running series.) How could you use a collection to achieve this **efficiently**?

My answer: *HashMaps* – doesn’t need to be sorted

The reason why I believe HashMaps would be better suited here is due to their not being a need for an order. The contestants will be notified, but not depending on the alphabetic name, hence, a HashMaps would be better.

This is because TreeMap guarantee O(log n) look up and insertion time, whereas HashMaps provide this in a O(1) time.

Furthermore, there would not be a need for a set in this case as we need to be able to map the contestants to a specialist subject, hence a map is needed in that regard. As storing them in separate lists would need more memory and space.

**Question 3:**

How would you store a contact phone number for each of the employees in a large company?

My answer: again, a *HashMap*.

The reasoning on why I believe hashmaps would be better in this situation is because the employees do not need to be ordered in this company. What is important is search time, as if the company would like to contact someone, they would like to relatively quickly search through the list of employees, and as stated above, HashMap provide look up time of O(1), whereas the TreeMap has a look up time of O(log n).

However, a TreeMap may be used by the company if ordering would be needed, but as the question provided did not specify this, with the knowledge I have, I believe a TreeMap is better.

**Question 4:**

Scrabble is a game where players win points by making words from the letters they have been given. All words must appear in the official “Scrabble dictionary”. How would you store this dictionary for the convenience of online Scrabble players?

My answer: *HashSet.*

Here I believe a set is needed as opposed to a Map. As there is only a need to build a dictionary, “Scrabble dictionary”, which will be used by all players. The words which the players make are checked against this dictionary, hence the action that will be performed is to look up a certain word, from this I can deduce that it is important to have a quick look up time.

From this, I can conclude that a Map is not needed, but in this regard, a HashSet would be best suited. This is because HashSet again has a O(1) look up time, whereas TreeSets have a look up time of O(log n).

Also, as order of the words do not matter for the dictionary, as we only check to see if the word the player has made exists in the dictionary, we do not need to use a TreeMap .