Searching and sorting songs - Solution

Task 1 . Song names

Idris has been collecting information about popular songs in the UK during 2019. Idris now wants to organise the song names in ascending order to make searching for a song easier.

A sample of the data is shown in **Figure 1**.

| Shallow | Location | Sunflower | Giant | Wow. | Senorita | Bad guy |
| --- | --- | --- | --- | --- | --- | --- |

**Figure 1**

Can you use linear search to find if a particular song is in the data sample in **Figure 1**? Justify your answer.

| You can use a linear search to search for a song on the data in figure 1 as a linear search works on both ordered and unordered data. |
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Can you use binary search to find a song in the data sample in **Figure 1**? Justify your answer.

| A binary search cannot be applied to the data in figure 1 as the data must be ordered for a binary search to work. |
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Carry out a bubble sort on the data shown in **Figure 1** by filling in the table below. Each row should show one pass of the algorithm and any swaps that have been made.

The original data and the first and last pass have been filled in for you.

| **pass** | **data** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Shallow | Location | Sunflower | Giant | Wow. | Senorita | Bad guy |
| 1 | Location | Shallow | Giant | Sunflower | Senorita | Bad guy | Wow. |
| 2 | Location | Giant | Shallow | Senorita | Bad guy | Sunflower | Wow. |
| 3 | Giant | Location | Senorita | Bad guy | Shallow | Sunflower | Wow. |
| 4 | Giant | Location | Bad guy | Senorita | Shallow | Sunflower | Wow. |
| 5 | Giant | Bad guy | Location | Senorita | Shallow | Sunflower | Wow. |
| 6 | Bad guy | Giant | Location | Senorita | Shallow | Sunflower | Wow. |

**List** the songs that will be compared to the song “Shallow” when performing a binary search on the data from pass 6 in the table above.

| Senorita, Sunflower, Shallow |
| --- |

**List** the songs that will be compared to the song “I don’t care” when performing a binary search on the data from pass 6 in the table above.

| Senorita, Giant, Location |
| --- |

**Explain** whether linear search or binary search would be the most preferential algorithm to use when searching for a song from the data in pass 6 of the table above.

| A binary search is usually faster at searching for an item in a list of ordered data than linear search as it halves the number of items to search for with each comparison, whilst in the worst-case scenario of linear search every item in the list is compared to the search item. |
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Task 2 . Merging songs

Perform a merge sort on the data shown in **Figure 1** by filling in the table below. A single row should show each pair of lists that have been merged together.

The first stages of splitting each item into a list of its own has already been done for you.

| Senorita |  | Location |  | Sunflower |  | Bad guy |  | Giant |  | Wow. |  | Shallow |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |

| Location | Senorita |  | Bad guy | Sunflower |  | Giant | Wow. |  | Shallow |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |

| Bad guy | Location | Senorita | Sunflower |  | Giant | Shallow | Wow. |
| --- | --- | --- | --- | --- | --- | --- | --- |

| Bad guy | Giant | Location | Senorita | Shallow | Sunflower | Wow. |
| --- | --- | --- | --- | --- | --- | --- |

Task 3 . Comparing bubble sort and merge sort

**Describe** how a bubble sort works.

| A bubble sort repeatedly passes over a list whilst the list is unordered, swapping elements that are in the wrong order until the entire list is sorted. |
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**Describe** how a merge sort works.

| A merge sort splits a list repeatedly until each element is in a list of its own. Then these individual lists are merged, one pair at a time, into new ordered lists until all the lists have been merged. |
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Explorer .

**Explain** one advantage of using a merge sort to order data compared to bubble sort.

| Merge sort is faster than bubble sort at sorting large lists. Merge sort is also faster at sorting lists that are more unordered. |
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