Carrying out a linear search - Solution

Task 1 . Searching for a city

Angela has created a program that stores all of the cities that customers of a travel shop visited last year.

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

| Moscow | Sydney | Beijing | Athens | Mumbai | Tokyo | Prague |
| --- | --- | --- | --- | --- | --- | --- |

**Figure 1**

**List** the cities that will be compared to the city “Athens” when performing a linear search on the data shown in **Figure 1**.

| Moscow, Sydney, Beijing, Athens |
| --- |

**State** the number of comparisons that will be made when performing a linear search for the city “Mumbai” on the data shown in **Figure 1**.

| 5 (Moscow, Sydney, Beijing, Athens, Mumbai) |
| --- |

**State** the number of comparisons that will be made when performing a linear search for the city “Berlin” on the data shown in **Figure 1**.

| 7 (Moscow, Sydney, Beijing, Athens, Mumbai, Tokyo, Prague) |
| --- |

Task 2 . Best and worst-case scenario

The performance of an algorithm relates to the number of steps it takes to complete. For linear search, this depends on the number of comparisons that need to be made.

The **best-case scenario** occurs when the item you are looking for results in the **smallest possible number of comparisons**. In the case of linear search, this happens when the item you are looking for is the very first one in the list.

The **worst-case scenario** takes place when the item you are looking for results in the **greatest possible number of comparisons**. With linear search, this happens when the item you are looking for is the very last one in the list or it isn’t in the list at all.

Another sample of data is shown in **Figure 2**.

| Dublin | Cairo | La Paz | Seoul | New York | London | Paris |
| --- | --- | --- | --- | --- | --- | --- |

**Figure 2**

Which city would you search for to incur the **best-case** scenario in **Figure 2**?

| Dublin |
| --- |

How many comparisons would need to be made in the **best-case** scenario in **Figure 2**?

| 1 |
| --- |

Which city could you search for to incur the **worst-case** scenario in **Figure 2**?

| Paris |
| --- |

How many comparisons would need to be made in the **worst-case** scenario in **Figure 2**?

| 7 |
| --- |

Task 3 . Linear search algorithm

The steps for performing a linear search are written out below but they have been mixed up. Some of the instructions are also incomplete.

Number the steps from 1-5 so that the instructions are in the correct sequence and fill in the missing information.

| **Step number** | **Instruction** |
| --- | --- |
| 3 | Compare the item at the current position to the search item. |
| 5 | Otherwise, go to the next item in the list. |
| 1 | Take a list of data and an item that is being searched for (the search item) |
| 2 | Repeat steps 3-5 starting from the first item in the list, until you find the search item or until the end of the list is reached. |
| 4 | If the item at the current position is equal to the search item, then stop searching. |

Explorer Task .

Using the instructions from the previous task, try writing a linear search in Python.

| 1  2  3  4  5  6  7  8  9  10 | def linear\_search(items, search\_item):  // Initialise the variables  index = -1  current = 0  found = False  // Repeat while the end of the list has not been reached  // and the search item has not been found  while current < len(items) and found == False:  // Compare the current item to the item you are searching for  if items[current] == search\_item:  index = current  found = True  // Proceed to the next item in the list  current = current + 1  return index |
| --- | --- |

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