Computing

Lesson 4: Linear Search

Algorithms

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Task 1 - Searching shuffled cards

Linear search for a card

Follow the instructions below, filling in the table each time you perform a linear search. You can turn over one card at a time.

- Take ten cards and choose a card to search for.
- Shuffle the cards thoroughly.
- Place six of the ten cards face down in a single row without looking at them.
- Perform a linear search for your chosen card and fill in the table.

Task 1 - Searching shuffled cards

Run 1: What card are you searching for?

	Card at that position	Card found?
Position 1		
Position 1		
Position 1		
Position 1		
Position 1		
Position 1		

Task 1 - Searching shuffled cards

Run 2: What card are you searching for?

	Card at that position	Card found?
Position 1		
Position 1		
Position 1		
Position 1		
Position 1		
Position 1		

Task 1 - Searching shuffled cards

Run 3: What card are you searching for?

	Card at that position	Card found?
Position 1		
Position 1		
Position 1		
Position 1		
Position 1		
Position 1		

Task 1 - Searching shuffled cards

How many cards did you have to look at in order to work out that it wasn't in the set of cards?

Task 2 - Carrying out a linear search - Part 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

Task 2 - Carrying out a linear search - Part 1

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

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.**

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.**

Task 2 - Carrying out a linear search - Part 2

Best- and worst-case scenarios

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 on the list.

Task 2 - Carrying out a linear search - Part 2

The **worst-case scenario** occurs 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 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

Task 2 - Carrying out a linear search - Part 2

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

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

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

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

Task 2 - Carrying out a linear search - Part 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 to 5 so that the instructions are in the correct sequence, and fill in the missing information.

Task 2 - Carrying out a linear search - Part 3

Step number	Instruction
	Compare the item at the current position to the search item.
	Otherwise, go to the next item on the list.
	Take a list of data and an item that is being searched for (the search item).
	Repeat steps _____ starting from the _____ item in the list, until you find the search item or the _____ of the list is reached.
	If the item at the current position is equal to the search item, stop searching.

Task 3 - Create a flow chart for a linear search

Using the instructions below, create a flow chart.

1. Take a list of data and an item that is being searched for (the search item).

2. Repeat steps a–c, starting from the first item in the list, until you find the search item, or until the end of the list is reached:

    A. Compare the item at the current position to the search item.
    B. If the item at the current position is **equal to** the search item, stop searching.
    C. Otherwise, go to the next item in the list.