Computing

Lesson 11: Algorithms Review
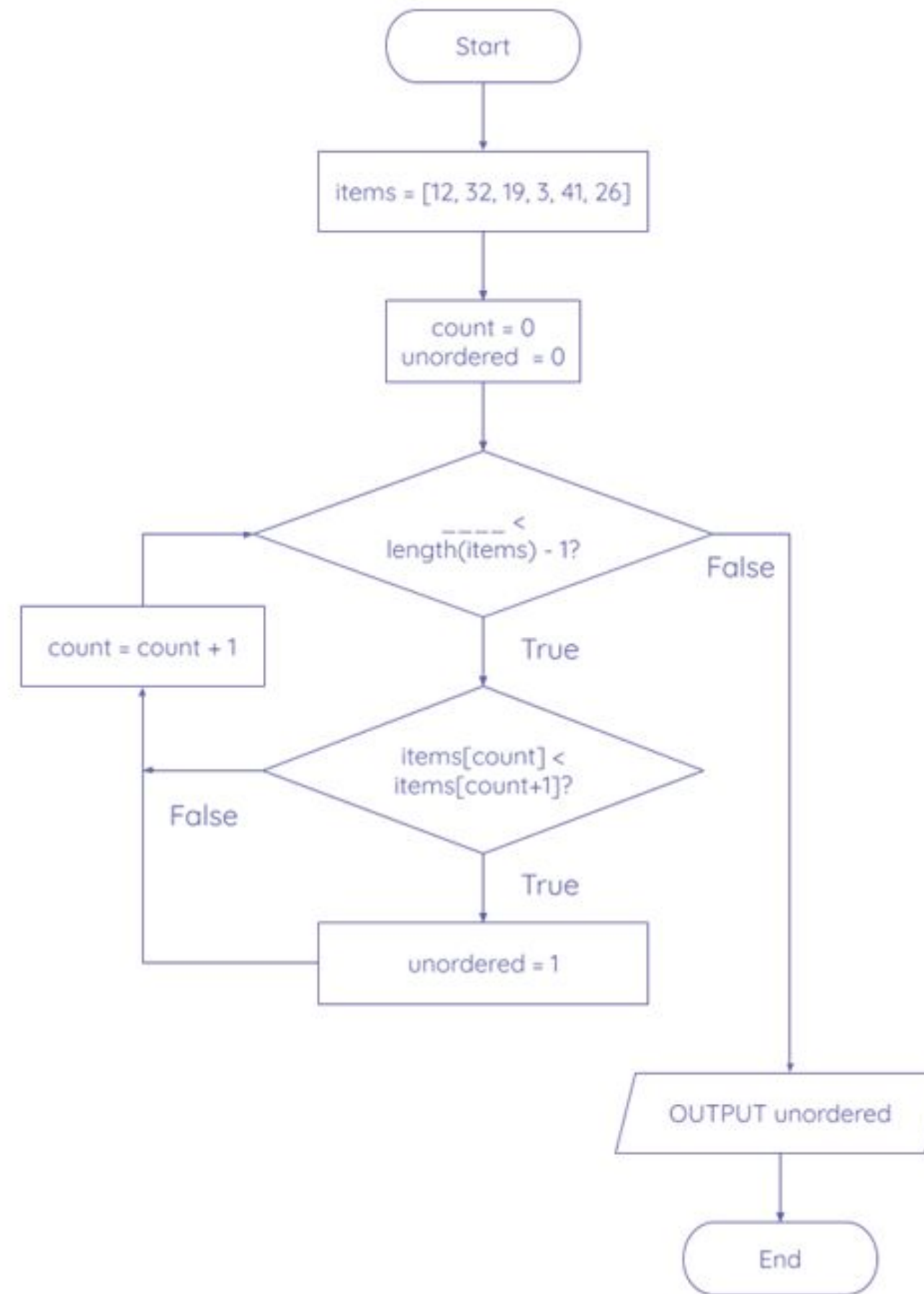
Algorithms

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Task 1 - Counting unordered items

Items that are out of order

The purpose of the flow chart is to count the number of pairs of items that are not in the right order. The items should be ordered from the lowest value to the highest. Analyse the flow chart and answer the questions that follow.

Task 1 - Counting unordered items

What is the missing part of the first condition?

Why is the first condition based on length(items) - 1?

Task 1 - Counting unordered items

There are two errors in the flow chart. Fix the errors by listing the correct statements below. State the type of error each one is and explain your reasoning for each correction.

1.

2.

Task 2 - Searching and sorting - part 1

Song names

Idris has been collecting information about songs that were popular 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

Task 2 - Searching and sorting - part 1

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

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

Task 2 - Searching and sorting - part 1

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.

Task 2 - Searching and sorting - part 1

Pass   **Data**

	Shallow	Location	Sunflower	Giant	Wow.	Senorita	Bad Guy
1	Location	Shallow	Giant	Sunflower	Senorita	Bad Guy	Wow.
2							
3							
4							
5							
6	Bad Guy	Giant	Location	Senorita	Shallow	Sunflower	Wow.

Task 2 - Searching and sorting - part 1

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.

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.

Task 2 - Searching and sorting - part 1

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

Task 2 - Searching and sorting - part 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 been done for you.

Task 2 - Searching and sorting - part 2

Giant	Bad Guy	Senorita	Location	Sunflower	Wow.	Shallow

Task 2 - Searching and sorting - part 3

Comparing bubble sort and merge sort

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 been done for you.

Task 2 - Searching and sorting - part 3

Describe how a bubble sort works.

Describe how a merge sort works.

Task 2 - Searching and sorting - part 3

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

Task 3 - Reviewing insertion sort

Native trees

Eliza has been given a list of trees that are common in the UK and wants to record which ones she can find in the town she lives in. To make this easier, Eliza wants to put the tree species into ascending order first.

A sample of data is shown in Figure 2.

Elm	Rowan	Birch	Fir	Oak	Beech	Yew	Ash

Figure 1

Task 3 - Reviewing insertion sort

Carry out an insertion sort on the data shown in **Figure 2** by filling in the table below. Each row should show what the list of trees will look like after an additional pass of the algorithm, with the sorted sublist clearly indicated with a coloured or shaded background.

Task 3 - Reviewing insertion sort

Pass	Data							
	Elm	Rowan	Birch	Fir	Oak	Beech	Yew	Ash
1	**Elm**	**Rowan**	Birch	Fir	Oak	Beech	Yew	Ash
2	**Birch**	**Elm**	**Rowan**	Fir	Oak	Beech	Yew	Ash

Task 3 - Reviewing insertion sort

Describe how an insertion sort works.