EDULiTO

Unit 2.1

Algorithms

Topic Test

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Topic Test - Unit 2.1 Algorithms

1 (a) Match each word to the correct definition. [4]

1 **Algorithm**	**A** This involves filtering out (or ignoring) the characteristics that we don't need in order to concentrate on those that we do.
2 **Decompose**	**B** It involves breaking down a complex problem or system into smaller parts that are more manageable and easier to understand.
3 **Abstraction**	**C** This is a list of rules to follow in order to solve a problem. The steps need to be in the right order.

(b) What is meant by the term Algorithmic Thinking? [2]

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(c) Why is algorithmic thinking used in programming? [1]

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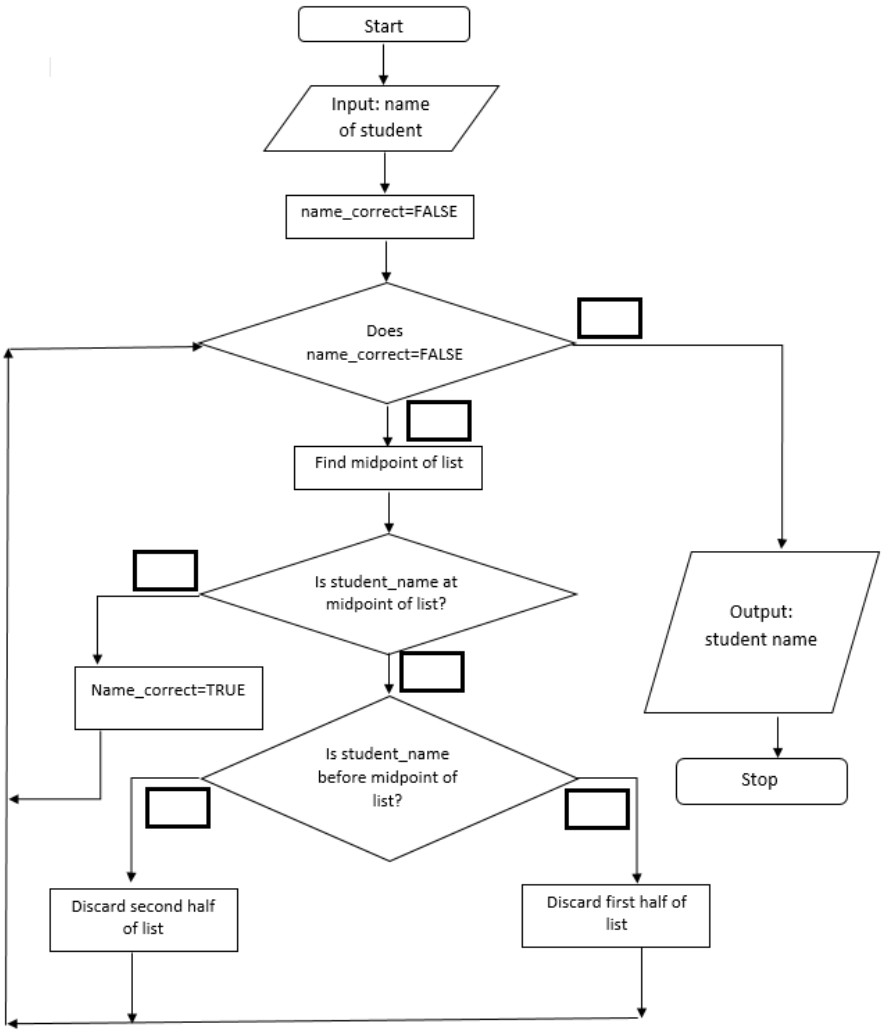
2. (a) Use the list of words to complete this document. [7]

faster linear number match splits tries binary

A …….. search starts at the beginning of the sequence of information and tries to find a……. Once it has found a match it stops.

Another type of search is called a **……** search. This type of search …… the parts of the list being searched into two with each check. This makes it ……than a linear search. For example, if you were playing a number guessing game and had to guess a …….. between 1 and 10, it would not take more than 3 ……, if you always choose the middle number each time and you were told whether the number was higher or lower.

2 (b) This is an example of a binary search. It can be used to search for a particular student name. Complete the algorithm by adding **T** for True and **F** for FALSE to the empty boxes. [6]



2 (c) What is a linear search? [3]

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2 (d) Using pseudocode or a flow chart, write an algorithm for a linear search in the space provided below. [4]

3 There are some gaps in the bubble sort below. Complete the gaps using the words shown. [6]

stop next swap last repeat first

1. Look at the …….. number in the list.
2. Compare the current number with the next number.
3. Is the next number smaller than the current number? If so,

   ……the two numbers around. If not, do not swap.
4. Move to the …….. number along in the list and make this the current number.
5. Repeat from step 2 until the …….. number in the list has been reached.
6. If any numbers were swapped, …….. again from step 1.
7. If the end of the list is reached without any swaps being made, then the list is ordered and the algorithm can ……..

4 (a) Explain the meaning of **merge sort**. [3]

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(b) Give an advantage and a disadvantage of **merge sort** over a bubble or insertion sort. [2]

Advantage……

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Disadvantage……

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5 (a) What is an insertion sort algorithm? [2]

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(b) Is the insertion sort quicker or slower than the bubble sort? [1]

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6. (a) Use pseudocode to create to produce an algorithm that asks for the length of a rectangle and the width of a rectangle. The algorithm then calculates the area of the rectangle and displays a message "the area of the rectangle is" and displays the area of the rectangle. Include comments to explain what each line of code does. [8]

6(b) Use pseudocode to produce an algorithm that asks the person to enter a number between 1 and 20. If the number is greater or equal to 10 then display a message "The number is equal or higher than 10". However, if the number is less than 10 it should display the message **"The number is less than 10".** [5]

7(a) Produce a flow chart that inputs a random number and inputs the number that you want to guess. The flowchart then compares the number you have guessed with the random number and if they are the same you get a message to say "Correct", but if you guess incorrectly the algorithm uses an indefinite loop to allow the person to keep on guessing until they get the number right. [5]

7(c) If you wanted to give the person no more than three guesses, what would you need to add to the flowchart? [3]

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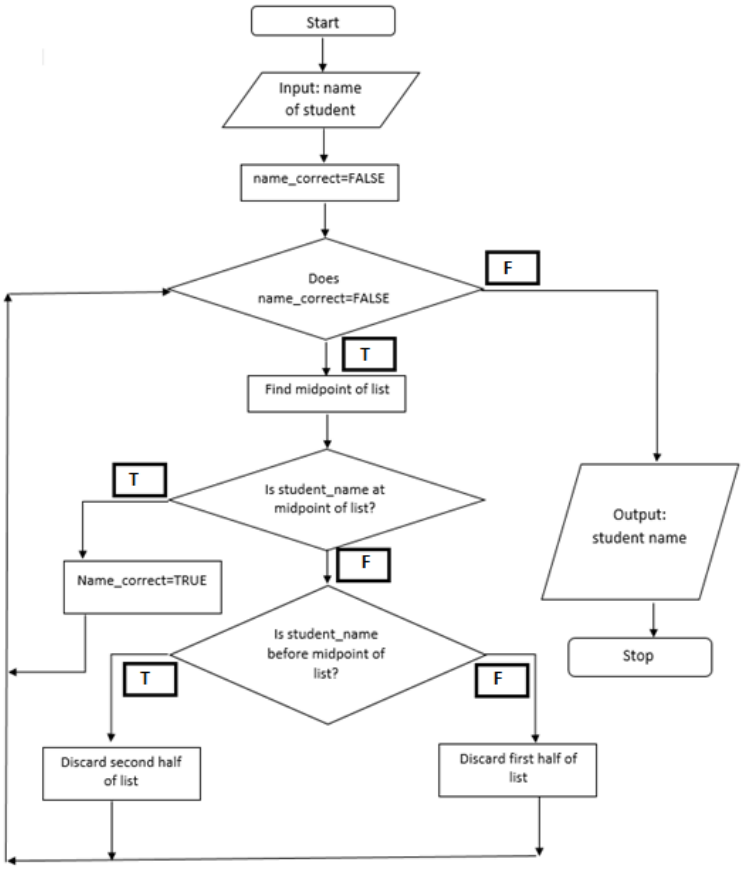
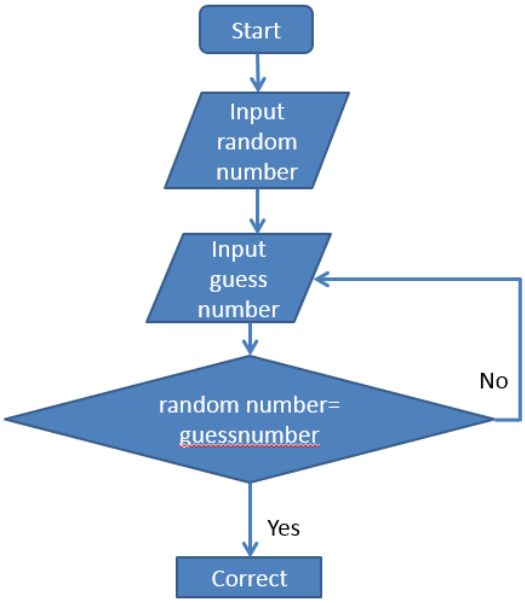
Topic Test - Algorithms **- Mark Scheme**			
Question Number	**Answer**	**Additional Guidance**	**Mark**
1 a	1-C; 2-B; 3-A		**4**
1 b	Algorithmic thinking is a way of finding a solution to a problem [1] through the clear definition of the steps needed.[1]		**2**
1 c	It is possible to use algorithmic thinking to: • produce solutions that can be automated [1] • remove the need for human intervention. [1]	Max 1	**1**
2 a	A **linear** search starts at the beginning of the sequence of information and tries to find a **match**. Once it has found a match it stops. Another type of search is called a **binary** search**.** This type of search **splits** the parts of the list being searched into two with each check. This makes it **faster** than a linear search. For example, if you were playing a number guessing game and had to guess a **number** between 1 and 10, it would not take more than 3 **tries**, if you always choose the middle number each time and you were told whether the number was higher or lower.		**7**

2 b			**6**
2 c	A linear search is a sequential search. [1] It starts at the beginning of the list and moves through the items one by one [1], until it finds a matching value or reaches the end without finding one [1].		**3**
2 d	Algorithm includes: Selection: Compare item with the data you are looking for [1] If they are the same then stop [1] If they are not the same move on to next item [1] Loop: Repeat steps above [1]		**4**
3	1 first 3 swap 4 next 5 last 6 repeat 7 stop	1 mark for each correct answer	**7**
4 a	The merge sort repeatedly divides [1] a list into two smaller lists [1] until the size of the list becomes one [1] The individual lists are then merged.[1] Max 3 marks	1 mark for divide and conquer algorithm.	**3**
4 b	Advantage – more efficient [1] and faster [1] than bubble or insertion sort. Max 1		**2**

	Disadvantage – complex to code [1]		
5 a	Examines each item in turn [1] Inserts it in the correct position within the list. [1]		**2**
5 b	Quicker [1]		**1**

6 a	length = input ("Please enter the length")[1] //Ask the user for the length of the rectangle. [1]
	width = input ("Please enter the width")[1] //Ask the user for the width of the rectangle. [1]
	area = length * width [1] //Find the area by multiplying the length by the width. [1]
	print ("The area of the square is: "+ area)[1] //output the area. [1]
		Any appropriate comment accepted	**8**

6 b	number=input("Enter a number between 1 and 20")[1] if number >=10 then [1] print ("The number is equal or higher than 10") [1] else: [1] print ("The number is less than 10") [1]	Allow answer using structured English	**5**
7 a	Appropriate use of a sequence. [1] Appropriate use of selection: Appropriate condition [1] If true [1] If false [1] Loop [1] e.g.  		**5**
7 b	Variable – that records the number of guesses. [1] A new condition (selection) to see whether three guesses had been reached. [1] A process box that increments eg count=count+1. [1]		**3**