

1(a). Linear search and binary search are two different algorithms which can be used for searching arrays.

When comparing linear and binary search it is possible to look at the best, worst and average number of items in the array that need to be checked to find the item being searched for. Assume every item in the array is equally likely to be searched for.

Complete the table below

	Worst Case number of searches	Average Case	Best Case
Binary Search		$\log_2(n)-1$	
Linear Search		$n/2$	

[4]

(b). As the size of an array increases the average number of checks grows logarithmically. State what is meant by logarithmic growth.

----- [1]

(c). Assuming an array is sorted give a situation when a linear search would perform better than a binary search.

----- [1]

2. A game developer is storing the number of pets a player has in a 1-dimensional array. At each timer interval, the array is searched, using a linear search, to check if any pets' hunger or bored values are greater than 90%. If they are, an alert is displayed to the user.

(i) State the complexity of searching the pets in Big-O notation.

-----[1]

- (ii) A given computer takes 4 milliseconds (ms) to search an array of 20 pets. Calculate an estimate of how long the computer will take to search an array of 100 pets.

Show your working.

-----[2]

END OF QUESTION PAPER

Question			Answer/Indicative content				Marks	Guidance
1	a			Worst Case	Average Case	Best Case	4	For 4 marks – 1 mark for each correct entry.
			Binary Search	log2(n)		1		
			Linear Search	n		1		
	b		- As x (or the size of the array) increases, the rate at which y (or the number of checks needed) increases more slowly (1). - The inverse of exponential growth (1). - The rate of increase is a logarithmic function of the size of the array (1).				1	For 1 mark.
	c		- If the array is very small. (1) - If the item being searched for is very close to the start of the array. (1)				1	For 1 mark.
			Total				6	
2		i	O(n)				1 AO1.1 (1)	Examiner’s Comment: Most candidates scored well for this section.
		ii	1 mark per bullet to max 2 20(ms) ... showing working				2 AO1.2 (1) AO2.1 (1)	 <