Binary search

1. Binary search is a searching algorithm that works efficiently on what type of data?
   a) Any data type
   b) Unordered data
   c) Ordered data
   d) Text data only

2. What is the basic idea behind the binary search algorithm?
   a) It compares the search item with every element in the list.
   b) It repeatedly halves the data until the item is found or shown not to be in the list
   c) It starts at the middle of the list and moves outwards.
   d) It prioritizes elements at the beginning of the list.

3. Describe the steps involved in performing a binary search on this sorted list to find the number 67.
   9, 18, 21, 29, 35, 41, 49, 55, 67, 73, 78, 82, 89, 90

4. Explain why binary search is more efficient than a linear search for finding an element in a large sorted list.

5. What is a disadvantage of a binary search?

ANSWERS

1. **C.** Ordered data. The data MUST be sorted before a binary search can be performed.

2. B. In a binary search the data at the mid point is compared to the search term. If this is not the search term, half the list is discarded, depending on whether the search term is bigger or smaller to the mid point. This process is repeated until the search term is found or there are no more items to search….it is not in the list.

3. 9, 18, 21, 29, 35, 41, 49, 55, 67, 73, 78, 82, 89, 90
    The length of the list is 14 so the value in the middle (49 – in position 7) is looked at and compared to the search item 67. 67 is not 49 and is greater than 49 so the values to the left of 49 are discarded. The new sub list is 49,55,67,73,78,82,89,90. The mid point of this list is 73. 73 is not 67 and is greater than 67 so the right hand side of the list is discarded. The new list is 49,55,67,73. The mid point is 55. This is less than the search term 67 so the new list is 67,73. 67 is now found.

4. Binary search is much faster than linear search for large sorted lists because it uses a divide-and-conquer strategy, reducing the search area by half with each step. Consequently, binary search can quickly narrow down the target in a large list, making far fewer comparisons than linear search.

5. A disadvantage of binary search is that it requires the data to be sorted beforehand, which can be inefficient if the list changes frequently and needs repeated sorting. Additionally, binary search is more complex to program and understand than a simple linear search, especially for those new to programming or algorithms.