Easy Questions

1. What is the index of the first element in a zero-based indexed array?
A) 1
B) -1
C) 0
D) Depends on the language

Answer: C) 0

2. What is the time complexity of accessing an element at a known index in an array?
A) O(n)
B) O(log n)
C) O(1)
D) O(n log n)

Answer: C) O(1)

3. What will be the output of the following Python code?

```
arr = [10, 20, 30, 40]
print(arr[-1])
```

A) 10
B) 40
C) Error
D) None of the above

Answer: B) 40

4. How many elements can an array of size `n` store?
A) n-1
B) n
C) n+1
D) None of the above

Answer: B) n

5. What happens when an index outside the valid range is accessed in an array?
A) The program crashes
B) It returns None
C) It prints an error message and continues
D) The behavior depends on the language

Answer: D) The behavior depends on the language

Medium Questions

6. Which sorting algorithm has the best average-case time complexity for sorting an unsorted array?
A) Bubble Sort
B) Selection Sort
C) Merge Sort
D) Insertion Sort

Answer: C) Merge Sort

7. What is the output of the following Python code?

```
arr = [1, 2, 3, 4, 5]
arr.append(arr.pop(2))
print(arr)
```

A) [1, 2, 4, 5, 3]
B) [1, 2, 3, 4]
C) [1, 3, 4, 5, 2]
D) [1, 2, 3, 5, 4]

Answer: A) [1, 2, 4, 5, 3]

8. What is the worst-case time complexity of searching for an element in an unsorted array?
A) O(1)
B) O(log n)
C) O(n)
D) O(n log n)

Answer: C) O(n)

9. Which of the following operations can be performed in `O(1)` time on an unsorted array?
A) Searching for an element
B) Inserting an element at the end
C) Inserting an element at the beginning
D) Deleting an element at a specific index

Answer: B) Inserting an element at the end

10. Which data structure can efficiently store an array where insertions and deletions are frequent?
A) Queue
B) Stack
C) Linked List
D) Heap

Answer: C) Linked List

Hard Questions

11. Given an array where all elements appear twice except one, which appears once, what is the most efficient way to find that element?
A) Sort and find unique element
B) Use a hash table
C) Use XOR operation
D) Use two loops

Answer: C) Use XOR operation

12. What is the time complexity of finding the median of an unsorted array using the QuickSelect algorithm in the average case?
A) O(n)
B) O(n log n)
C) O(log n)
D) $O(n^2)$

Answer: A) O(n)

13. Given an array `arr[]` of `n` elements, how many subarrays can be formed?
A) n
B) n^2
C) n(n+1)/2
D) 2^n

Answer: C) n(n+1)/2

14. What is the best way to check if an array contains duplicates in O(n) time and O(1) space if elements are within a known range `[0, n-1]`?
A) Sorting and checking adjacent elements
B) Using a HashSet
C) Using the Floyd's cycle detection method
D) Modifying the original array

Answer: D) Modifying the original array

15. If an array represents a min-heap, what property does it satisfy?
A) Parent node is greater than both children
B) Parent node is smaller than both children
C) Parent node is equal to one of the children
D) The sum of children is always equal to the parent

Answer: B) Parent node is smaller than both children
