

Data Structure MCQ - Complexity

This section focuses on the "Complexity" of the Data Structure. These Multiple Choice Questions (mcq) should be practiced to improve the Data Structure skills required for various interviews (campus interview, walk-in interview, company interview), placement, entrance exam and other competitive examinations.

1. Which of the following case does not exist in complexity theory?

- A. Best case
- B. Worst case
- C. Average case
- D. Null case

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Ans : D

Explanation: Null case does not exist in complexity Theory.

2. What is the time, space complexity of following code:

```
int a = 0, b = 0;
for (i = 0; i < N; i++)
{
    a = a + rand();
}
for (j = 0; j < M; j++)
{
    b = b + rand();
}
```

- A. $O(N * M)$ time, $O(1)$ space
- B. $O(N + M)$ time, $O(N + M)$ space
- C. $O(N + M)$ time, $O(1)$ space
- D. $O(N * M)$ time, $O(N + M)$ space

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Ans : C

Explanation: The first loop is $O(N)$ and the second loop is $O(M)$. Since we don't know which is bigger, we say this is $O(N + M)$. This can also be written as $O(\max(N, M))$.

Since there is no additional space being utilized, the space complexity is constant / $O(1)$.

3. The complexity of linear search algorithm is

- A. $O(n)$
- B. $O(\log n)$
- C. $O(n^2)$
- D. $O(n \log n)$

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Ans : A

Explanation: The worst case complexity of linear search is $O(n)$.

4. What is the time complexity of following code:

```
int a = 0;
for (i = 0; i < N; i++)
{
    for (j = N; j > i; j--)
    {
        a = a + i + j;
    }
}
```

- A. $O(N)$
- B. $O(N \cdot \log(N))$
- C. $O(N \cdot \text{Sqrt}(N))$
- D. $O(N^2)$

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Ans : D

Explanation: $= N + (N - 1) + (N - 2) + \dots 1 + 0$

$= N \cdot (N + 1) / 2$

$= 1/2 \cdot N^2 + 1/2 \cdot N$

$O(N^2)$ times.

5. The Worst case occur in linear search algorithm when

- A. Item is somewhere in the middle of the array
- B. Item is not in the array at all
- C. Item is the last element in the array
- D. Item is the last element in the array or is not there at all

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Ans : D

Explanation: The Worst case occurs in linear search algorithm when Item is the last element in the array or is not there at all.

6. What is the time complexity of following code:

```
int i, j, k = 0;
for (i = n / 2; i <= n; i++)
{
    for (j = 2; j <= n; j = j * 2)
    {
        k = k + n / 2;
    }
}
```

- A. $O(n)$
- B. $O(n \log n)$
- C. $O(n^2)$
- D. $O(n^2 \log n)$

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Ans : B

Explanation: Let's take the examples here.

for $n = 16$, $j = 2, 4, 8, 16$

for $n = 32$, $j = 2, 4, 8, 16, 32$

So, j would run for $O(\log n)$ steps.

i runs for $n/2$ steps.

So, total steps = $O(n/2 * \log(n)) = O(n \log n)$

7. The worst case occurs in quick sort when

- A. Pivot is the median of the array
- B. Pivot is the smallest element
- C. Pivot is the middle element
- D. None of the mentioned

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Ans : B

Explanation: This happens when the pivot is the smallest (or the largest) element. Then one of the partitions is empty, and we repeat recursively the procedure for $N-1$ elements.

8. What does it mean when we say that an algorithm X is asymptotically more efficient than Y?

- A. X will always be a better choice for small inputs
- B. X will always be a better choice for large inputs
- C. Y will always be a better choice for small inputs
- D. X will always be a better choice for all inputs

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Ans : B

Explanation: An algorithm X is said to be asymptotically better than Y if X takes smaller time than y for all input sizes n larger than a value n_0 where $n_0 > 0$.

9. The complexity of Fibonacci series is

- A. $O(2n)$
- B. $O(\log n)$
- C. $O(n^2)$
- D. $O(n \log n)$

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Ans : A

Explanation: Fibonacci is $f(n) = f(n-1) + f(n-2)$, $f(0) = 0$, $f(1) = 1$. Let $g(n) = 2^n$. Now prove inductively that $f(n) \geq g(n)$.

10. What is the time complexity of following code:

```
int a = 0, i = N;
while (i > 0)
{
    a += i;
    i /= 2;
}
```

- A. $O(N)$
- B. $O(\text{Sqrt}(N))$
- C. $O(N / 2)$
- D. $O(\log N)$

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Ans : D

Explanation: We have to find the smallest x such that $N / 2^x \leq \log(N)$.

11. What is the time complexity of following code:

```
int a = 0, i = N;
while (i > 0)
{
    a += i;
    i /= 2;
}
```

- A. $O(N)$
- B. $O(\sqrt{N})$
- C. $O(N / 2)$
- D. $O(\log N)$

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Ans : D

Explanation: We have to find the smallest x such that $N / 2^x \leq \log(N)$.

12. The complexity of Binary search algorithm is

- A. $O(n)$
- B. $O(\log n)$
- C. $O(n^2)$
- D. $O(n \log n)$

[View Answer](#)

Ans : B

Explanation: The complexity of binary search is $O(\log n)$.

13. The complexity of merge sort algorithm is

- A. $O(n)$
- B. $O(\log n)$
- C. $O(n^2)$
- D. $O(n \log n)$

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Ans : D

Explanation: The worst case complexity for merge sort is $O(n \log n)$.

14. The complexity of Bubble sort algorithm is

- A. $O(n)$
- B. $O(\log n)$
- C. $O(n^2)$
- D. $O(n \log n)$

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Ans : C

Explanation: The worst case complexity for Bubble sort is $O(n^2)$ and best case is $O(n)$.

15. The worst case complexity for insertion sort is

- A. $O(n)$
- B. $O(\log n)$
- C. $O(n^2)$
- D. $O(n \log n)$

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Ans : C

Explanation: In worst case n th comparison are required to insert the n th element into correct position.

16. The worst case complexity of quick sort is

- A. $O(n)$
- B. $O(\log n)$
- C. $O(n^2)$
- D. $O(n \log n)$

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Ans : C

Explanation: The worst case complexity of quick sort is $O(n^2)$.

17. To measure Time complexity of an algorithm Big O notation is used which:

- A. describes limiting behaviour of the function
- B. characterises a function based on growth of function
- C. upper bound on growth rate of the function
- D. all of the mentioned

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Ans : D

Explanation: Big O notation describes limiting behaviour, and also gives upper bound on growth rate of a function.

18. If for an algorithm time complexity is given by $O(1)$ then complexity of it is:

- A. constant
- B. polynomial
- C. exponential
- D. none of the mentioned

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Ans : A

Explanation: The growth rate of that function will be constant.

19. If for an algorithm time complexity is given by $O(\log_2 n)$ then complexity will:

- A. constant
- B. polynomial
- C. exponential
- D. none of the mentioned

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Ans : D

Explanation: The growth rate of that function will be logarithmic therefore complexity will be logarithmic.

20. If for an algorithm time complexity is given by $O(n)$ then complexity of it is:

- A. constant
- B. linear
- C. exponential

D. none of the mentioned

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Ans : B

Explanation: The growth rate of that function will be linear.

21. if for an algorithm time complexity is given by $O(n^2)$ then complexity will:

- A. constant
- B. quadratic
- C. exponential
- D. none of the mentioned

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Ans : B

Explanation: The growth rate of that function will be quadratic therefore complexity will be quadratic..

22. If for an algorithm time complexity is given by $O((3/2)^n)$ then complexity will:

- A. constant
- B. quadratic
- C. exponential
- D. none of the mentioned

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Ans : C

Explanation: The growth rate of that function will be exponential therefore complexity will be exponential.

23. the time complexity of binary search is given by:

- A. constant
- B. quadratic
- C. exponential
- D. none of the mentioned

[View Answer](#)

Ans : D

Explanation: It is $O(\log 2n)$, therefore complexity will be logarithmic.

24. The time complexity of linear search is given by:

- A. $O(\log 2n)$
- B. $O(1)$
- C. exponential
- D. none of the mentioned

View Answer

Ans : D

Explanation: It is $O(n)$, therefore complexity will be linear.

25. Which algorithm is better for sorting between bubble sort and quicksort?

- A. bubble sort
- B. quick sort
- C. both are equally good
- D. none of the mentioned

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Ans : B

Explanation: Running time of quicksort is logarithmic whereas for bubble sort it is quadratic

26. State true or false

Time complexity of binary search algorithm is constant

- A. True
- B. False

View Answer

Ans : B

Explanation: It is $O(\log 2n)$, therefore complexity will be logarithmic.

27. Two main measures for the efficiency of an algorithm are

- A. Time and space
- B. Processor and memory
- C. Complexity and capacity

D. Data and space

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Ans : A

Explanation:None

28. Which is the best data structure for round robin algorithm for CPU scheduling?

- A. Stack implemented using queues
- B. Doubly linked list
- C. Circular queue
- D. Queue implemented using stacks

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Ans : C

Explanation:None

29. Which algorithm is having highest space complexity?

- A. Bubble sort
- B. Insertion Sort
- C. Quick Sort
- D. Merge Sort

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Ans : D

Explanation:None

30. If the array is already sorted, then the running time for merge sort is: ?

- A. $O(1)$
- B. $O(n \cdot \log n)$
- C. $O(n)$
- D. $O(n^2)$

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Ans : B

Explanation:None