

Advanced High School Computer Science

Computer Science · Practice Test · 25 Questions

1. In Big O notation, what is the worst-case time complexity of the Quicksort algorithm?

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

2. Which logic gate implements the Boolean function $F = A \text{ XOR } B$?

- A) The output is 1 if and only if A and B are both 0
- B) The output is 1 if and only if A and B are both 1
- C) The output is 1 if A and B are different
- D) The output is 0 if A and B are different

3. What is the primary purpose of a translation lookaside buffer (TLB) in a CPU?

- A) To cache frequently accessed main memory addresses
- B) To store the results of complex floating-point calculations
- C) To cache virtual-to-physical address translations
- D) To provide a high-speed interface for peripheral devices

4. In a binary max-heap, where is the largest element always located?

- A) At the last leaf node
- B) At the root node
- C) In the middle of the array
- D) At the deepest level of the tree

5. Which of the following sorting algorithms is considered 'stable'?

- A) Heapsort
- B) Quicksort
- C) Merge Sort
- D) Selection Sort

6. What is the result of the two's complement representation of -5 using 8 bits?

- A) 11111011
- B) 00000101
- C) 10000101
- D) 11111010

7. Which networking protocol is connectionless and does not guarantee packet delivery?

- A) TCP
- B) UDP
- C) HTTP
- D) FTP

8. In the context of database management, what does ACID stand for?

- A) Atomicity, Consistency, Isolation, Durability
- B) Array, Class, Integrity, Database
- C) Access, Control, Index, Data
- D) Algorithm, Computation, Input, Design

9. What is the theoretical maximum throughput of a 10Gbps Ethernet connection in bits per second?

- A) 1,000,000,000 bps
- B) 10,000,000,000 bps
- C) 100,000,000 bps
- D) 10,240,000,000 bps

10. Which architectural style separates the application logic from the presentation layer and the data source?

- A) Microservices
- B) Monolithic
- C) MVC (Model-View-Controller)
- D) Serverless

11. Which data structure uses the 'First-In-First-Out' (FIFO) principle?

- A) Stack
- B) Queue
- C) Linked List
- D) Hash Table

12. In Python, what is the result of the expression `5 // 2`?

- A) 2.5
- B) 2
- C) 3
- D) 2.0

13. What does a parity bit added to a byte of data serve to detect?

- A) Data corruption or transmission errors
- B) Encryption failure
- C) Memory overflow
- D) Address bus conflicts

14. Which of these is a non-deterministic polynomial-time hard (NP-hard) problem?

- A) Searching an array
- B) The Traveling Salesperson Problem
- C) Bubble sort
- D) Binary tree traversal

15. Which layer of the OSI model is responsible for routing and logical addressing?

- A) Data Link Layer
- B) Transport Layer
- C) Network Layer
- D) Physical Layer

16. What is the main function of the program counter (PC) in a CPU?

- A) To store the result of the last arithmetic operation
- B) To hold the address of the next instruction to be executed
- C) To track the number of active processes
- D) To manage the input/output interrupts

17. Which programming paradigm uses pure functions and avoids shared state or mutable data?

- A) Object-Oriented Programming
- B) Procedural Programming
- C) Functional Programming
- D) Imperative Programming

18. What is the primary function of a hashing algorithm like SHA-256?

- A) To compress large files into smaller sizes
- B) To create a fixed-size unique signature for input data
- C) To encrypt data so it can be decrypted with a key
- D) To identify the author of a piece of software

19. In a graph, what is the term for a path that visits every vertex exactly once?

- A) Eulerian path
- B) Hamiltonian path
- C) Bipartite path
- D) Spanning tree

20. What is the time complexity of searching for an element in a balanced binary search tree with n nodes?

- A) $O(n)$
- B) $O(1)$
- C) $O(n \log n)$
- D) $O(\log n)$

21. Which CSS property is used to change the text color of an element?

- A) text-style
- B) font-color
- C) color
- D) background-color

22. Which of these describes a 'race condition' in multithreaded programming?

- A) Two threads competing for CPU time
- B) System behavior depending on the sequence or timing of uncontrollable events
- C) A thread waiting indefinitely for a resource held by another
- D) A thread attempting to access memory outside its allocation

23. In discrete mathematics, what is the result of $A \text{ AND } (\text{NOT } A)$ for any proposition A?

- A) 1 (True)
- B) 0 (False)
- C) A
- D) NOT A

24. Which storage device uses non-volatile memory and has no moving parts?

- A) Hard Disk Drive (HDD)
- B) Solid State Drive (SSD)
- C) Magnetic Tape
- D) Optical Disc

25. What is the purpose of the 'break' statement in a loop?

- A) To skip the current iteration and move to the next
- B) To terminate the execution of the loop entirely
- C) To pause the loop until a key is pressed
- D) To restart the loop from the beginning