# Computer Science Fundamentals

Computer Science · Practice Test · 18 Questions

**1. Which of the following sorting algorithms has an average-case time complexity of O(n log n)?**

A) Bubble Sort
B) Insertion Sort
C) Merge Sort
D) Selection Sort

**2. In terms of computability theory, what does the Halting Problem state?**

A) It is impossible to create a program that can predict if any given program will finish or run forever.
B) All problems can be solved by a Turing machine.
C) There exists a universal Turing machine that can simulate any other Turing machine.
D) The set of all decidable languages is countably infinite.

**3. What is the primary function of a compiler?**

A) To execute machine code directly.
B) To translate source code written in a high-level language into machine code.
C) To manage memory allocation for programs.
D) To provide a graphical user interface for software development.

**4. Which data structure follows the Last-In, First-Out (LIFO) principle?**

A) Queue
B) Linked List
C) Stack
D) Tree

**5. What is the purpose of Big O notation in algorithm analysis?**

A) To precisely measure the execution time of an algorithm in seconds.
B) To describe the upper bound of an algorithm's time or space complexity.
C) To determine the memory usage of a data structure.
D) To provide a definitive ranking of all known algorithms.

**6. In object-oriented programming, what is polymorphism?**

A) The ability to inherit properties from multiple parent classes.
B) The process of encapsulating data and methods within a class.
C) The ability of an object to take on many forms, typically through method overriding or overloading.
D) The creation of new classes based on existing ones.

**7. Which of these is a fundamental principle of relational database design?**

A) Data duplication is encouraged for faster retrieval.
B) Tables should be designed to minimize redundancy and improve data integrity.
C) All data should be stored in a single, large table.
D) Relationships between tables are defined using implicit links.

**8. What is the significance of the Church-Turing thesis?**

A) It proves that all computational problems are solvable.
B) It suggests that any function that can be computed by an algorithm can be computed by a Turing machine.
C) It defines the limits of artificial intelligence.
D) It states that only specific programming languages can achieve universal computation.

**9. What does the term 'binary search' refer to?**

A) A search algorithm that examines every other element in a list.
B) A search algorithm that requires the data to be sorted and divides the search interval in half at each step.
C) A search algorithm used exclusively for binary files.
D) A search algorithm with a worst-case time complexity of O(n).

**10. In computer architecture, what is the role of the Arithmetic Logic Unit (ALU)?**

A) To fetch instructions from memory.
B) To perform arithmetic and logical operations on data.
C) To manage the flow of data between the CPU and peripherals.
D) To store the results of computations.

**11. What is a hash table?**

A) A data structure that stores elements in a sorted order.
B) A data structure that uses a hash function to map keys to indices in an array.
C) A linear data structure where elements are accessed sequentially.
D) A tree-like structure used for hierarchical data storage.

**12. Which of the following is a characteristic of a dynamically typed programming language?**

A) Variable types are checked at compile time.
B) Variable types are checked at runtime.
C) All variables must be explicitly declared with a type.
D) Type errors are always caught before program execution.

**13. What is the primary goal of cryptographic hashing?**

A) To encrypt messages for secure communication.
B) To generate a unique, fixed-size fingerprint (hash) of data that is difficult to reverse.
C) To compress large files for efficient storage.
D) To provide a method for random number generation.

**14. What is a Turing machine?**

A) A physical computer with specific processing capabilities.
B) A theoretical model of computation that manipulates symbols on a tape according to a table of rules.
C) A type of algorithm used for sorting data.
D) A database management system.

**15. In the context of operating systems, what is a deadlock?**

A) A situation where a process terminates unexpectedly.
B) A state where two or more processes are unable to proceed because each is waiting for the other to release a resource.
C) A condition where the system runs out of memory.
D) A failure in the network connection.

**16. What is a 'stack overflow' error?**

A) An error that occurs when a program attempts to write more data to a buffer than it can hold.
B) An error that occurs when a recursive function calls itself too many times, exceeding the allocated stack memory.
C) An error indicating that a network connection has failed.
D) An error related to insufficient disk space.

**17. Which of the following is a fundamental principle of NoSQL databases?**

A) Strict adherence to the ACID properties.
B) Enforcement of rigid, predefined schemas.
C) Flexibility in data models and often distributed architecture.
D) Use of SQL as the primary query language.

**18. What is the Traveling Salesperson Problem (TSP)?**

A) A problem of finding the shortest path between two specific points in a network.
B) A problem of finding the shortest possible route that visits a set of cities exactly once and returns to the origin city.
C) A problem of optimizing resource allocation in a manufacturing process.
D) A problem related to scheduling tasks with dependencies.