

Brute Force - Algorithm Design Technique

- it is a problem-solving approach that tries all possible solutions and selects the correct or best one.
- It is also called:
 - Exhaustive Search
 - Generate-and-Test
 - Naïve Approach
- Brute force works in three main steps:
 - Generate all possible candidate solutions
 - Test each candidate
 - Select the valid or optimal one
- No shortcuts. No optimization tricks.
- Where Brute Force is Used
 - Brute force is commonly used in:
 - Searching problems
 - Sorting (basic sorts)
 - Combinatorial problems
 - String matching
 - Optimization problems
- When to Use Brute Force
 - Use brute force when:
 - Input size is small
 - Constraints are small
 - You need a quick baseline solution
 - No optimized solution is known
 - You are verifying correctness
- How to Improve a Brute Force Algorithm
 - After writing brute force:
 - Identify repeated computations
 - Remove unnecessary comparisons
 - Use better data structures
 - Use pruning
 - Apply dynamic programming
 - Use divide-and-conquer

Divide and Conquer - Algorithm Design Technique

- Divide and Conquer is an algorithm design technique that divides a problem into smaller subproblems, solves them recursively, and then combines their solutions to solve the original problem.

- Every Divide and Conquer algorithm follows:
 1. Divide
 - Break the problem into smaller subproblems.
 2. Conquer
 - Solve the subproblems recursively.
 3. Combine
 - Merge the solutions of subproblems.
- Uses recursion
- Subproblems are independent
- Reduces problem size each step
- Often improves time complexity
- Advantages
 - Efficient for large inputs
 - Reduces time complexity
 - Structured problem solving
 - Easy to parallelize
- Disadvantages
 - Uses recursion (stack space)
 - Extra memory (like Merge Sort)
 - Not always better (depends on problem)
- When to Use Divide & Conquer
 - Use when:
 - Problem can be broken into independent subproblems
 - Subproblems are similar to original
 - Solution can be combined efficiently
 - Large input size