# Moudule-3

**1. Which property does the 0/1 knapsack problem NOT have?**

* overlapping subproblems
* optimal substructure
* Fractional solutions
* Non-polynomial time complexity in worst-case scenarios

**2. What real-world problem can be modeled using the knapsack paradigm?**

* Scheduling tasks on multiple processors
* Predicting stock market movements
* Packing a truck with different weighted boxes to maximize value
* Finding the shortest route in a city

**3. How does memoization help in the knapsack problem?**

* By reducing redundant calculations
* By ensuring global optimization
* By providing better initialization values
* By improving backtracking speed

**4. Which of the following is a limitation of the greedy approach to the knapsack problem?**

* It cannot handle negative weights
* It does not always provide the optimal solution for 0/1 knapsack
* It requires sorting of the items
* It cannot solve the fractional knapsack problem

**5. What role does the "value-to-weight" ratio play in the fractional knapsack problem?**

* It determines the priority in which items are picked
* It adjusts the total capacity of the knapsack
* It sets the maximum number of items that can be chosen
* It dictates the splitting ratio for fractional items

**6. Which of the following is true regarding the knapsack problem?**

* The decision problem is in P, while the optimization problem is in NP
* Both decision and optimization problems are in P
* The decision problem is NP-complete, while the optimization problem is in P
* The decision problem is NP-complete, and the optimization problem is NP-hard

**7. How can the knapsack problem be applied in data compression?**

* By selecting which bits to compress
* By choosing which data files to store
* By determining the compression ratio
* By deciding on which algorithms to apply based on data type

**8. Which of the following methods can guarantee the optimal solution for the 0/1 knapsack problem?**

* Greedy algorithm
* Dynamic programming
* Simulated annealing
* Genetic algorithms

**9. What limitation does the dynamic programming solution of the knapsack problem have?**

* It cannot solve instances with large weight limits
* It cannot solve the fractional knapsack problem
* It requires items to be sorted by value
* It does not guarantee an optimal solution

**10. How is the concept of "bound" used in the branch and bound solution of the knapsack problem?**

* To limit the number of items
* To set a threshold for the total weight
* To provide an upper limit on the value of solutions
* To define the size of the knapsack

**11.Which of the following best describes the importance of constraints in optimization problems?**

* Constraints merely complicate the optimization process.
* Constraints define the boundaries of the feasible region for decision variables.
* Constraints are optional and can often be ignored.
* Constraints enhance the solution quality but are not necessary.

**12.How are constraints typically represented in linear programming problems?**

* As quadratic equations
* As linear inequalities or equalities
* Using logarithmic functions
* As constraints are not relevant in linear programming

**13.What kind of constraint requires that either one condition or another, but not both, must be satisfied?**

* Absolute constraint
* XOR constraint
* Disjunction constraint
* Nonlinear constraint

**14.Which of the following is a real-world example of a capacity constraint?**

* The total number of products manufactured cannot exceed the factory's production capability.
* Accompany must achieve a minimum profit of $1 million.
* Each customer can buy at most 3 units of a product.
* The sum of decision variables must be even.

**15.How do time constraints impact scheduling problems in operations research?**

* Time constraints are mostly ignored in scheduling problems.
* They specify deadlines or durations within which tasks must be completed.
* They only define the optimal order of tasks.
* Time constraints are used to increase the complexity of the problem unnecessarily.