1. Which of the following best describes the objective function in an optimization problem?

* A. A constraint limiting the possible solution space
* B. A random variable that needs to be predicted
* C. A function that determines the cost of a solution
* D. A function we aim to maximize or minimize

2. What is the primary difference between a local optimum and a global optimum?

* A. The local optimum is always greater than the global optimum
* B. The local optimum pertains only to discrete optimization problems
* C. A local optimum is the best solution within a neighboring set of solutions, whereas a global optimum is the best overall
* D. A global optimum is a feasible solution, while a local optimum might not be

3. How does the gradient descent method primarily operate?

* A. By calculating the average of all data points
* B. By moving in the direction of the steepest ascent of the objective function
* C. By moving in random directions until a solution is found
* D. By moving in the direction of the steepest descent of the objective function

4. What is the primary purpose of constraints in an optimization problem?

* A. To define the objective function
* B. To limit and define the feasible region of solutions
* C. To determine the global optimum
* D. To increase the complexity of the problem

5. How can over-optimization or 'overfitting' manifest in a data science model?

* A. The model performs poorly on both training and test data
* B. The model is too simple to capture the patterns in the data
* C. The model performs exceptionally well on training data but poorly on new, unseen data
* D. The model requires fewer data to train

6. What is a potential drawback of using a genetic algorithm for optimization?

* A. It always finds the global optimum
* B. It can get stuck in a local optimum
* C. It requires a linear objective function
* D. It only works for discrete problems

7. How does simulated annealing differ from traditional hill-climbing optimization algorithms?

* A. It strictly moves towards better solutions
* B. It allows for occasional moves to worse solutions to avoid getting stuck in local optima
* C. It operates based on linear transformations
* D. It requires an initial solution provided by the user

8. Which of the following is a common application of optimization in business analysis?

* A. Sentiment analysis
* B. Data cleaning
* C. Supply chain management
* D. Natural language generation

9. How can a convex optimization problem be distinguished from a non-convex one?

* A. It has multiple objective functions
* B. It has no constraints
* C. Its objective function has a single global minimum and no local minima
* D. It always requires a discrete solution

10. Which of the following terms best describes the feasible set of solutions that satisfy all constraints of an optimization problem?

* A. Decision variables
* B. Feasible region
* C. Objective boundary
* D. Constraint boundary

11. What is the 'curse of dimensionality' in the context of optimization?

* A. The phenomenon where increasing the dimensionality leads to a decrease in data density
* B. The blessing of using multi-dimensional data
* C. The increase in solution speed with more dimensions
* D. The process of reducing data to a single dimension

12. How is the 'branch and bound' method different from a brute force approach in optimization?

* A. It examines every possible solution without any shortcuts
* B. It divides the problem into subproblems and solves each independently
* C. It eliminates regions of the solution space that don't contain an optimal solution
* D. It uses a linear approach to find the global maximum

13. Which of the following is NOT typically a reason for optimization in business?

* A. Maximizing profits
* B. Improving product quality
* C. Minimizing costs
* D. Increasing data storage needs

14. What mathematical tool can be used to ensure that an optimization problem’s constraints are met?

* A. Eigenvalues
* B. Lagrange multipliers
* C. Gaussian elimination
* D. Fourier transform

15. How can multi-objective optimization be distinguished from single-objective optimization?

* A. It focuses solely on maximizing profits.
* B. It involves optimizing two or more conflicting objectives simultaneously.
* C. It requires the use of genetic algorithms.
* D. It always has a unique solution.