

Question 1: In Python, which built-in data structure preserves insertion order as of CPython 3.7+?

- a) dict
- b) set
- c) list
- d) tuple

Question 2: Which algorithmic paradigm is typically used to solve the knapsack problem exactly (pseudo-polynomial time)?

- a) Greedy only
- b) Dynamic programming (DP)
- c) Sorting only
- d) Random guessing

Question 3: A single-page application (SPA) shows a blank page on initial load due to a JS error. Which debugging step is most helpful?

- a) Open browser devtools console, reproduce error, inspect stack trace and network requests to find missing resources or syntax/runtime errors.
- b) Delete the site and restart domain registrar.
- c) Add more advertisements.
- d) Increase image sizes.

Question 4: Which ML concept describes using a small labeled set and a large unlabeled set to improve learning?

- a) Supervised learning only
- b) Semi-supervised learning
- c) Unsupervised clustering only
- d) Reinforcement learning only

Question 5: Which HTTP method is designed for partial updates of a resource?

- a) POST only
- b) PATCH
- c) DELETE
- d) OPTIONS

Question 6: Which of the following is a time complexity of inserting an element into a Python list at the beginning?

- a) $O(1)$ amortized
- b) $O(n)$ due to shifting elements
- c) $O(\log n)$
- d) $O(n \log n)$

Question 7: A company wants to reduce insider threat risk. Which policy/mechanism is MOST effective?

- a) Principle of least privilege, role-based access, logging/monitoring, and separation of duties.
- b) Give everyone admin rights to simplify support.
- c) Remove all logging.
- d) Publish passwords in internal wiki.

Question 8: Which data structure is best for efficiently supporting range minimum queries (RMQ) on a static array?

- a) Segment tree or Sparse Table (depending on queries)
- b) Linked list only
- c) Hash set only
- d) Array of strings

Question 9: In neural networks, which loss function suits multi-class classification with softmax activation?

- a) Mean squared error always
- b) Categorical cross-entropy (softmax + cross-entropy)
- c) Hinge loss only for regression
- d) Cosine similarity only

Question 10: Which HTTP status code indicates the server understood the request but refuses to authorize it?

- a) 401 Unauthorized
- b) 403 Forbidden
- c) 200 OK
- d) 302 Found

Question 11: Which of these is a not recommended practice for secure password storage?

- a) Store salted hashes using a slow KDF (bcrypt, Argon2)
- b) Store plaintext passwords in DB
- c) Use pepper plus salt where appropriate
- d) Enforce strong password policies

Question 12: Which graph algorithm is used to detect cycles in a directed graph?

- a) Topological sort / DFS with recursion stack marker
- b) Binary search
- c) Breadth-first search
- d) Dijkstra's algorithm only

Question 13: A function using recursion hits maximum recursion depth in Python for $n=10^5$. Which approach should you apply?

- a) Convert recursion to iterative approach (use explicit stack or iterative DP) or increase recursion limit carefully if safe.
- b) Use more recursion to compensate.
- c) Decrease input size only in production.
- d) Replace Python with C++.

Question 14: Which regularization penalizes absolute value of weights and can produce sparse solutions?

- a) L2 (ridge) regularization
- b) L1 (lasso) regularization
- c) Dropout only
- d) Batch normalization only

Question 15: In RESTful API design, which status code indicates the request is well-formed but needs authentication?

- a) 200 OK
- b) 401 Unauthorized (often used for missing/invalid auth)
- c) 418 I'm a teapot
- d) 204 No Content

Question 16: Which data structure supports FIFO behaviour?

- a) Stack
- b) Queue
- c) Set
- d) Tree

Question 17: A text-classification pipeline has poor performance because of many out-of-vocabulary (OOV) tokens. Which is a good remedy?

- a) Use subword tokenization techniques (BPE/WordPiece) or pre-trained embeddings to handle OOVs.
- b) Remove all punctuation only.
- c) Increase font size.
- d) Use random labels.

Question 18: Which technique is used to prevent SQL injection vulnerabilities?

- a) Parameterized queries / prepared statements and input validation/escaping
- b) Rely on client-side validation only
- c) Use inline HTML comments to hide SQL
- d) Use file uploads instead of SQL

Question 19: Which tree traversal order yields sorted order for a BST (binary search tree)?

- a) Pre-order
- b) Post-order
- c) In-order
- d) Level-order

Question 20: Which of the following is a key idea behind gradient descent optimization?

- a) Move parameters in direction opposite to the gradient of loss to reduce loss iteratively.
- b) Increase learning rate to infinity.
- c) Randomly perturb weights only.
- d) Use no math and pick parameters heuristically.

Question 21: A stakeholder demands explanations for an ML decision affecting loan approvals. Which approach helps explain individual predictions?

- a) Use model-agnostic explanation methods (LIME, SHAP) or use interpretable models and feature importance reporting.
- b) Provide no explanation and refuse.
- c) Delete all logs.
- d) Hide model behind a paywall.

Question 22: Which algorithm is optimal for single-source shortest path with non-negative weights?

- a) Bellman-Ford only
- b) Dijkstra's algorithm
- c) Floyd-Warshall only
- d) Kruskal's algorithm

Question 23: Which HTTP header is commonly used to pass bearer tokens for API auth?

- a) `Authorization: Bearer <token>`
- b) `X-Server-Timeout`
- c) `User-Agent`
- d) `Accept-Language`

Question 24: Which of the following is an advantage of using vectorized operations in NumPy/Pandas?

- a) Faster execution by leveraging C-level loops and avoiding Python-level loops (better performance)
- b) Slower than pure Python loops always
- c) Requires no memory
- d) Only works on strings

Question 25: A developer needs to store secrets for an app in deployment. Which is the recommended best practice?

- a) Use secure secret management (vaults, environment variables provided by platform, not hard-coded in source).
- b) Commit them to version control for convenience.
- c) Email secrets to team.
- d) Store them in client-side JS.

Question 26: Which data structure is best for implementing adjacency lists in sparse graphs?

- a) 2D matrix (adjacency matrix) always best for sparse graphs
- b) Dictionary of lists (hash map of neighbor lists)
- c) Single array with no mapping
- d) String concatenation of nodes

Question 27: Which ML algorithm is tree-based ensemble that fits residuals sequentially?

- a) Random Forest
- b) Gradient Boosting Machines
- c) KNN classifier
- d) Naive Bayes

Question 28: Which web vulnerability does Content Security Policy (CSP) primarily mitigate?

- a) Cross-site scripting (XSS) by restricting allowed sources of scripts/styles
- b) SQL injection on server side
- c) Buffer overflows in client CPU
- d) DNS spoofing

Question 29: You have to choose between an array and linked list for frequent random access and frequent inserts in middle. Which is best compromise?

- a) Array is best for random access, linked list for insertions. For both needs, consider advanced structures (balanced trees, skip lists)
- b) Only use stack.
- c) Choose file system.
- d) Use print statements.

Question 30: Which activation function outputs values in range (0,1) and often used in output layer for binary classification?

- a) ReLU
- b) Sigmoid (logistic)
- c) Tanh
- d) Softmax only

Question 31: Which HTTP method should be used to retrieve a resource without side effects?

- a) POST
- b) GET (safe and idempotent)
- c) PUT
- d) DELETE

Question 32: A site's time-to-first-byte is high due to heavy server-side computation. Which approach improves perceived performance?

- a) Cache computed results, use asynchronous/background processing for heavy tasks, and serve lightweight responses quickly.
- b) Increase CSS file size.
- c) Delete caching layers always.
- d) Add more images to each page.

Question 33: Which data structure supports efficient min-heap operations?

- a) Binary heap (array representation)
- b) Singly linked list only
- c) Plain text file
- d) Hash set only

Question 34: Which evaluation metric is used for regression problems?

- a) Accuracy
- b) Mean Squared Error (MSE) or Root MSE (RMSE)
- c) Precision and recall only
- d) BLEU score only

Question 35: During an intrusion, logs are being wiped. What is a proactive measure to detect and respond to such tampering?

- a) Use remote logging/centralized SIEM with immutable storage and alerts, and preserve forensic evidence.
- b) Keep logs only locally.
- c) Turn off logging to avoid detection.
- d) Use paper logs only.

Question 36: Which algorithm can be used to detect communities (clusters) in large graphs?

- a) k-means only
- b) Louvain method or spectral clustering
- c) Bubble sort
- d) Binary search

Question 37: Which principle helps you choose HTTPS over HTTP for all pages requiring login?

- a) Encrypt traffic to protect credentials and session cookies; TLS ensures confidentiality and integrity.
- b) HTTP is always safer.
- c) HTTPS increases vulnerability.
- d) Use FTP instead.

Question 38: An image dataset contains mostly daytime images, model fails on night images. What is best long-term solution?

- a) Collect more diverse training data covering night scenes, augment data, or use domain adaptation techniques.
- b) Only deploy in daylight.
- c) Blur images to remove differences.
- d) Use smaller images always.

Question 39: Which sorting algorithm is in-place and uses average $O(n \log n)$ time but not stable by default?

- a) Quick sort
- b) Merge sort
- c) Counting sort
- d) Radix sort

Question 40: Which of the following best describes Cross-Validation (k-fold)?

- a) Split dataset into k parts, train on k-1, validate on remaining, repeat k times, average performance.
- b) Use same dataset for training and only one holdout.
- c) No training at all.
- d) Random guessing.

Question 41: You must design token-based stateless authentication for REST APIs. Which approach is typical?

- a) Use JWTs (JSON Web Tokens) with secure signing, short expiry, and refresh token strategy; store secrets securely.
- b) Store credentials in plain cookies without signature.
- c) Use GET parameters to pass passwords.
- d) Hard-code credentials in client.

Question 42: Which complexity describes best-case of binary search?

- a) Best case $O(1)$, average/worst $O(\log n)$
- b) $O(n^2)$ always
- c) $O(n)$ always
- d) $O(n \log n)$

Question 43: Which is a common cause of Cross-Site Scripting (XSS) vulnerabilities?

- a) Lack of proper output encoding/escaping
- b) Unsanitized user input being directly inserted into HTML pages
- c) Use of HTTPS strictly
- d) Minification of JS files

Question 44: You have tabular data with many categorical variables and missing values — which model often performs robustly?

- a) Gradient boosting decision trees (e.g., XGBoost, LightGBM) handle categorical encoding and missingness well with preprocessing.
- b) Convolutional neural networks always best.
- c) k-means clustering only.
- d) SIFT feature extractor.

Question 45: Which cryptographic approach guarantees message integrity and origin authentication together?

- a) Plain hash only
- b) Digital signature (private key signing + public verification)
- c) Steganography only
- d) Symmetric encryption without MAC

Question 46: Which graph algorithm finds minimum spanning tree in a connected weighted undirected graph?

- a) Dijkstra
- b) Kruskal or Prim's algorithm
- c) Bellman-Ford
- d) Floyd-Warshall

Question 47: Your API experiences bursty traffic causing DB overload. Which strategy helps handle bursts?

- a) Use rate limiting, queuing, autoscaling, read replicas and caching layers (Redis) to smooth bursts.
- b) Accept all traffic and let DB crash.
- c) Remove caching and logging.
- d) Throttle all traffic to zero.

Question 48: Which technique can help visualize high-dimensional data in 2D?

- a) PCA for linear reduction or t-SNE / UMAP for non-linear visualization
- b) Printing raw feature vectors directly
- c) Sorting features alphabetically
- d) Use audio representation

Question 49: Which of the following is an example of two-factor authentication (2FA)?

- a) Password only
- b) Password + a code from authenticator app (something you know + something you have)
- c) Username only
- d) Password stored in plaintext

Question 50: A sorting algorithm returns correct result for all small test cases you tried, but no proof of correctness exists. Which is best practice?

- a) Attempt to prove correctness, test extensively including edge cases, and analyze complexity before relying in production.
- b) Ship immediately if small tests pass.
- c) Assume it's correct because tests passed.
- d) Ignore algorithm analysis.

Question 51: Which neural network layer normalisation technique can speed up training by reducing internal covariate shift?

- a) Batch Normalization
- b) Sorting layer
- c) Max pooling only
- d) Activation clipping only

Question 52: Which HTTP header controls whether responses can be cached by intermediate proxies?

- a) Cache-Control
- b) Content-Length only
- c) X-Powered-By
- d) Set-Cookie only

Question 53: A dataset contains personally identifiable info (PII). Which step is necessary before sharing externally?

- a) De-identify/anonymize PII before sharing, with legal/ethical approvals.
- b) Share raw data to accelerate research.
- c) Publish dataset with full identifiers.
- d) Only publish in social media.

Question 54: Which algorithm performs nearest-neighbor search based on distance to labeled examples?

- a) k-NN (k-nearest neighbors)
- b) Naive Bayes only
- c) Decision trees only
- d) PCA

Question 55: Which DB index structure is commonly used for range queries in databases?

- a) Hash index only (not good for ranges)
- b) B-tree / B+ tree index
- c) Randomized linked lists
- d) Unindexed text files

Question 56: Your model shows lower accuracy for a minority group. Which is a principled step?

- a) Investigate dataset balance, features that correlate with protected attributes, evaluate fairness metrics, collect more representative data, and consider fairness-aware reweighting or constraints.
- b) Remove minority group from evaluation.
- c) Lower the bar for that group in production.
- d) Hide results.

Question 57: Which web protocol is designed for asynchronous, full-duplex communication between client and server?

- a) HTTP/1.1 only (no persistent full-duplex)
- b) WebSockets (full-duplex over single TCP connection)
- c) FTP only
- d) SMTP only

Question 58: Two microservices need to maintain a cross-service transaction. Which pattern helps ensure data consistency?

- a) Use distributed transactions where available or implement eventually-consistent saga pattern with compensating actions
- b) Write data to local files only
- c) Avoid interaction entirely
- d) Use client-side only caching

Question 59: Which metric indicates how well a classifier separates classes across thresholds (threshold-independent)?

- a) Accuracy only
- b) ROC AUC (Area Under ROC Curve)
- c) Confusion matrix alone
- d) Number of features

Question 60: Which of the following is not a principle of secure software development lifecycle (SSDLC)?

- a) Threat modeling and security requirements design
- b) Security testing and code review
- c) Hard-code credentials in source for convenience
- d) Patch management and monitoring