



Database transactions ensure all operations complete successfully or none complete at all.

1 True



2 False



Correct!

ACID transactions guarantee atomicity - either the entire transaction succeeds and all changes are committed, or any failure causes the entire transaction to be rolled back, leaving the database in its original state.



Database indexes improve query performance by reducing the number of rows scanned.

1 True



2 False



Correct!

Indexes create additional data structures that allow the database to quickly locate specific rows without scanning entire tables, dramatically reducing query execution time for filtered operations.

How do delivery systems efficiently aggregate inventory across multiple warehouse locations?

- 1 Sum quantities from nearby warehouses
- 2 Average all warehouse quantities
- 3 Pick random warehouse inventory
- 4 Use only the largest warehouse

Incorrect.

Delivery systems query inventory from all warehouses within delivery range and sum the quantities to show total available items to customers, providing accurate availability without restricting to a single location.



Travel time estimation services provide more accurate delivery zones than simple distance calculations.

1 True



2 False




Correct!

Travel time services account for real-world factors like traffic, road conditions, and geographic barriers, providing more accurate delivery feasibility than straight-line distance calculations that ignore these constraints.



Which technique is MOST effective for preventing concurrent resource allocation conflicts?

- 1 Cache warming
- 2 Load balancing
- 3 Horizontal scaling
- 4 Atomic transactions 

 **Correct!**

Atomic transactions ensure that resource checks and allocations happen as an indivisible unit, preventing race conditions where multiple processes might allocate the same resource simultaneously.



All of the following improve database read performance EXCEPT:

1 Index optimization

2 Read replicas

3 Query caching

4 Write-ahead logging



Correct!

Write-ahead logging improves write durability and recovery but doesn't enhance read performance. Read replicas, caching, and indexes all directly improve read operations.



Which algorithm accounts for Earth's curvature when calculating geographic distances?

1 Binary search

2 Haversine formula



3 Manhattan distance

4 Euclidean distance



Correct!

The Haversine formula calculates great-circle distances between two points on a sphere, accounting for Earth's curvature, while Euclidean distance assumes a flat plane.



Two-phase filtering reduces external API calls by pre-screening candidates locally.

1 True



2 False



Correct!

Two-phase filtering first applies cheap local filters (like simple distance calculations) to reduce the candidate set before making expensive external API calls (like travel time estimation).

A system serves location-based queries across continents. Which partitioning strategy works best?

1 Geographic sharding



2 Hash partitioning

3 Round-robin distribution

4 Timestamp-based splitting



Correct!

Geographic sharding colocates related data by region, ensuring location-based queries typically access only local partitions rather than scanning globally distributed data.



Asynchronous read replicas can exhibit replication lag that affects data consistency.

1 True



2 False



Correct!

Asynchronous replication introduces delays between writes to the primary database and their propagation to read replicas, meaning replicas may serve stale data until synchronization completes.



What happens when cached inventory data becomes stale after concurrent orders?

1 Overselling inventory



2 Reduced latency

3 Better scalability

4 Improved performance



Correct!

Stale cached inventory data can show items as available when they've actually been ordered, leading to overselling situations where more items are sold than actually exist.



Which isolation level BEST prevents phantom reads in concurrent transactions?

1 Read Committed

2 Repeatable Read

3 Serializable



4 Read Uncommitted



Correct!

Serializable isolation provides the highest level of isolation, preventing phantom reads by ensuring transactions appear to execute in serial order, eliminating all concurrency anomalies.



When calculating delivery zones, which approach minimizes expensive distance calculations?

1 Real-time calculation

2 Database sorting

3 Linear scanning

4 Pre-computed radius filtering



 **Correct!**

Pre-computed radius filtering uses cheap distance approximations to eliminate obviously distant candidates before performing expensive precise calculations, reducing computational overhead.



Systems requiring strict consistency must sacrifice partition tolerance per CAP theorem.

1 True



2 False



Incorrect.

CAP theorem states you can choose any two of Consistency, Availability, and Partition tolerance. Systems can maintain consistency and partition tolerance while sacrificing availability during network partitions.



All of the following reduce external service calls EXCEPT:

1 Result caching

2 Local pre-filtering

3 Batch processing



4 Synchronous calls



 **Incorrect.**

Synchronous calls don't reduce the number of external service calls - they determine how calls are made. Local pre-filtering, caching, and batching all reduce the total number of external calls needed.