Revision practice

International Baccalaureate · IB Diploma · Computer Science · HL

Original open focus revision; complete specification coverage remains unfinished.

1 Computing systems, networks and requirements

- authentication
- authorization

■ Question 1

Which question concerns authorization?

- Who are you?
- May this user edit this record?
- What colour is the login screen?

Available marks: 2.

Worked answer

May this user edit this record?

- Separate authentication from authorization. Authentication checks identity; authorization determines permitted actions. A threat model connects a valuable asset, a possible attack and an appropriate control.

■ Question 2

A 40 million bit file transfers at 5 million bits per second. Find ideal time.

Available marks: 4.

Worked answer

8 s

- Appropriate relation; consistent substitution; correct result; meaningful unit and interpretation.

Bandwidth is not actual end-to-end throughput. Encryption does not by itself ensure correct authorization or remove every security risk.

2 Networks: latency, throughput and layered delivery

- throughput
- latency

exercises.lol exercises.com.cn

Question 1

Why can completion exceed file-size divided by link rate?

- Overhead, queueing and other delays
- Bits have no size
- All networks transmit instantly

Available marks: 2.

Worked answer

Overhead, queueing and other delays

- Transmission time depends on data size and rate. Total delay may also include propagation, processing and queueing. Encryption protects content under its assumptions but does not remove congestion or every metadata exposure.

Question 2

A 12 megabit file crosses a 3 megabit/s link. Calculate ideal transmission time.

Available marks: 4.

Worked answer

4 s

- Appropriate relation; consistent substitution; correct result; meaningful unit and interpretation.

A megabyte is eight megabits before considering overhead. A faster rated link does not guarantee low latency or secure endpoints.

3 Relational databases: a key and a relationship

- primary key
- foreign key

Question 1

Which design helps avoid duplicated customer-address updates?

- Separate customers and orders linked by keys
- Repeat the address in every order without a rule
- Use names as guaranteed unique identifiers

Available marks: 2.

Worked answer

Separate customers and orders linked by keys

- A join combines rows according to a specified condition. The result count depends on relationship cardinality and filters. A foreign key constraint enforces a relationship rule; it does not automatically encrypt personal data.

■ Question 2

Three customers have 1, 3 and 2 orders. How many rows does the customer-order inner join return?

Available marks: 4.

Worked answer

6 rows

- Appropriate relation; consistent substitution; correct result; meaningful unit and interpretation.

A primary key need not be a person name. A join is not a simple concatenation of tables. Use parameterized queries for untrusted input rather than building SQL from raw strings.

4 Data models and responsible machine learning

- primary key
- data leakage

■ Question 1

Why keep test data separate from training data?

- To assess generalization to unseen cases
- To guarantee causation
- To make all predictions correct

Available marks: 2.

Worked answer

To assess generalization to unseen cases

- A primary key uniquely identifies a record; a foreign key relates records. In prediction, leakage can expose information unavailable at the real decision time. Accuracy alone may hide an unbalanced target distribution.

■ Question 2

A model makes 72 correct predictions out of 80. Find accuracy percentage.

Available marks: 4.

Worked answer

90 %

- Appropriate relation; consistent substitution; correct result; meaningful unit and interpretation.

High accuracy is not evidence of fairness or causal understanding. A database primary key is not simply whichever field looks important.

exercises.lol exercises.com.cn

5 Algorithms, traces and correctness evidence

- algorithm
- boundary test

■ Question 1

What must hold before applying ordinary binary search to a list?

- The list is ordered under the comparison rule
- Every value is different
- The list contains exactly ten items

Available marks: 2.

Worked answer

The list is ordered under the comparison rule

- State input conditions and expected outputs. Use boundary cases, empty collections where allowed, duplicates and invalid values. Distinguish a wrong algorithm from a wrong implementation or an incomplete requirement.

■ Question 2

A linear search scans all 14 items without a match. How many item comparisons occur?

Available marks: 4.

Worked answer

14 comparisons

- Appropriate relation; consistent substitution; correct result; meaningful unit and interpretation.

A successful sample test does not prove correctness for all valid inputs. Do not import Cambridge-specific pseudocode syntax into an IB course without a course source.

6 Objects: state, behaviour and an interface

- encapsulation
- instance

■ Question 1

What should prevent an invalid state change?

- An operation that checks and preserves the invariant
- Making every field publicly writable
- Assuming no user makes an error

Available marks: 2.

exercises.lol exercises.com.cn

Worked answer

An operation that checks and preserves the invariant

- A method call acts on a particular instance. State changes should satisfy preconditions and postconditions. Polymorphism lets code use a common interface with different implementations when the contract is respected.

■ Question 2

An instance starts at 12 units, adds 8 and removes 3. Find its final value.

Available marks: 4.

Worked answer

17 units

- Appropriate relation; consistent substitution; correct result; meaningful unit and interpretation.

A class is not the same thing as one instance. Inheritance is not automatically better than composition. Merely hiding a field does not prove that all operations preserve valid state.

7 Abstract data types: an operation contract

- stack
- queue

■ Question 1

Which structure models an ordinary arrival-order waiting line?

- Queue
- Stack
- An unordered choice with no contract

Available marks: 2.

Worked answer

Queue

- Choose the structure for the required access pattern. Complexity depends on implementation and assumptions: removing the first item from a shifting array differs from advancing a head pointer in a queue.

■ Question 2

A queue starts empty, receives 7 items and removes 4. Find the number remaining.

Available marks: 4.

Worked answer

3 items

exercises.lol exercises.com.cn

- Appropriate relation; consistent substitution; correct result; meaningful unit and interpretation.

An ADT is not a specific memory layout. A queue does not sort by priority unless its contract defines a priority queue.

8 Computing case analysis: evaluate a proposed system

- throughput
- acceptance test

■ Question 1

Which statement best supports a technical recommendation?

- A mechanism tied to a scenario requirement and a measurable acceptance test
- A popular architecture name without scenario evidence
- A throughput measurement claimed to prove every performance property

Available marks: 2.

Worked answer

A mechanism tied to a scenario requirement and a measurable acceptance test

- A recommendation should connect a requirement to a mechanism and an observable test. For example, a concurrency problem requires a strategy that prevents conflicting updates, plus tests demonstrating the invariant. A claim about faster response requires comparable workload measurements rather than only a complexity label. Evaluate alternatives under the same stated conditions.

■ Question 2

A fictional system successfully processes 210 requests in 30 s. Calculate throughput.

Available marks: 4.

Worked answer

7 requests/s

- Appropriate relation; consistent substitution; correct result; meaningful unit and interpretation.

Throughput is not response time. A strong recommendation states the conditions in which it is expected to work and the evidence that could disconfirm it. Current official CS case-study requirements must be checked against the applicable assessment version.

exercises.lol exercises.com.cn