Exercise walk-through

3.2
SQL queries and transactions

International Baccalaureate · IB Diploma · Computer Science · HL

Why a relational database?

Flat-file problem	**Relational fix**
redundancy: data stored many times	each fact stored once
inconsistency: copies disagree	one copy, nothing to disagree
hard to search and combine	SQL joins tables
no control of who sees what	accounts and permissions

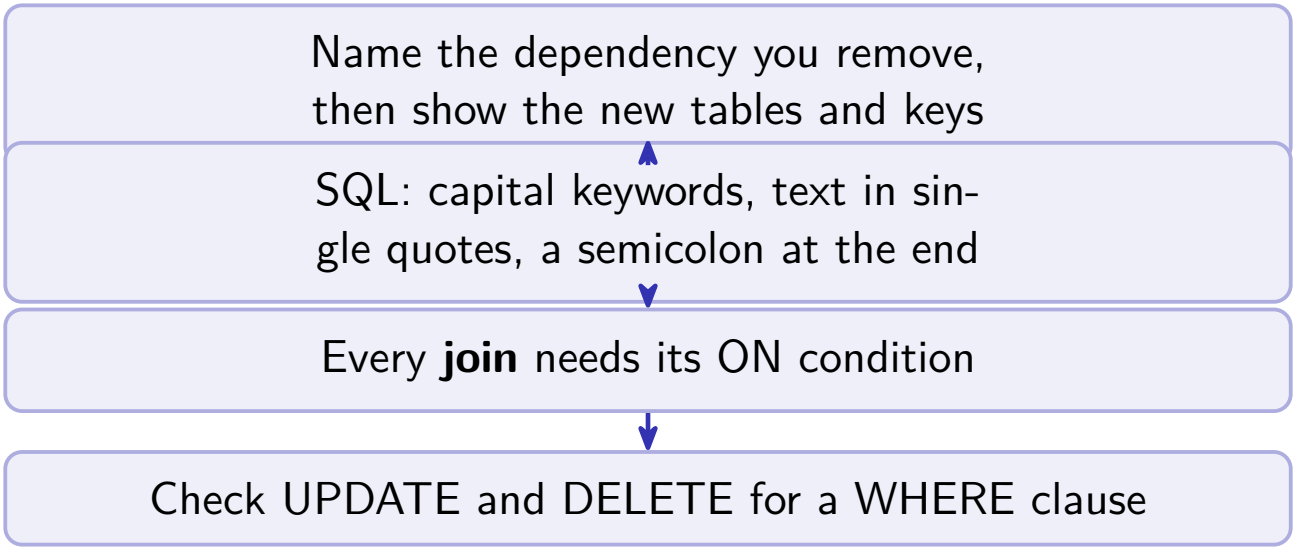
Practice

Your turn

Try these:

A. Explain why students and books need a Loan table.
B. Normalise (booking_id, room, room_capacity, date).
C. Write SQL for the titles of all books by Austen.
D. Explain atomicity with a bank transfer.

Check yourself



Exercises 2.1·2.3

2.1 Write a query to list the names of students in year 12. [2]

2.2 Write a query to list book titles that start with the letter H, in alphabetical order. [3]

2.3 State the result of `SELECT title FROM Book WHERE book_id <> 11;`. [1]

Exercises 2.1·2.3

2.1 Write a query to list the names of students in year 12. [2]

2.1

```
SELECT name FROM Student
WHERE year_group = 12;
```

2.2 Write a query to list book titles that start with the letter H, in alphabetical order. [3]

2.2

```
SELECT title FROM Book
WHERE title LIKE 'H%'
ORDER BY title;
```

2.3 State the result of `SELECT title FROM Book WHERE book_id <> 11;`. [1]

2.3

- **Dune, Holes**

Exercises 2.4·3.1

2.4 Write a statement to add the book 13, 'Wonder', by Palacio. [2]

3.1 Which clause filters **groups** after `GROUP BY`? [1]

- ☐ **A** `WHERE`
- **B** `HAVING`
- **C** `ORDER BY`
- **D** `SELECT`

Exercises 2.4·3.1

2.4 Write a statement to add the book 13, 'Wonder', by Palacio. [2]

2.4

- `INSERT INTO Book (book_id, title, author)`
- `VALUES (13, 'Wonder', 'Palacio');`

3.1 Which clause filters **groups** after `GROUP BY`? [1]

- ☐ **A** `WHERE`
- **B** `HAVING`
- **C** `ORDER BY`
- **D** `SELECT`

3.1 B

- `WHERE` filters rows before grouping

Exercises 3.2·3.3

3.2 What does `DELETE FROM Loan;` do? [1]

- ☐ **A** deletes the Loan table's design
- ☐ **B** deletes every row of Loan
- ☐ **C** deletes nothing without `WHERE`
- ☐ **D** deletes the last row

3.3 Which ACID property ensures a committed change survives a power cut? [1]

- ☐ **A** atomicity
- ☐ **B** consistency
- ☐ **C** isolation
- ☐ **D** durability

Exercises 3.2·3.3

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3.2 B

- no `WHERE`, so every row

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3.3 D

- durability

Exercise 3.4 (a)

3.4 Use the Student, Book and Loan tables.

(a) Write a query to list the title of every book borrowed by Ana. [4]

Exercise 3.4 (a)

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(a) Write a query to list the title of every book borrowed by Ana. [4]

(a) One answer:

```
SELECT Book.title
FROM Loan
JOIN Student ON Loan.student_id = Student.student_id
JOIN Book ON Loan.book_id = Book.book_id
WHERE Student.name = 'Ana';
```

- selects `Book.title`
- joins Loan to Student on `student_id`
- joins Loan to Book on `book_id`
- `WHERE` name is `'Ana'`

Exercise 3.4 (b)

3.4 Use the Student, Book and Loan tables.

(b) State the output of your query. [1]

Exercise 3.4 (b)

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(b)

- **Dune, Holes**

Exercise 3.4 (c)

3.4 Use the Student, Book and Loan tables.

(c) Book 10 is returned. Write a statement to remove its loan record. [2]

Exercise 3.4 (c)

3.4 Use the Student, Book and Loan tables.

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(c)

- `DELETE FROM Loan`
- `WHERE book_id = 10;` (or `loan_id = 100`)

Exercise 3.4 (d)

3.4 Use the Student, Book and Loan tables.

(d) Chen moves to year 12. Write a statement to record this. [2]

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(d)

- `UPDATE Student SET year_group = 12`
- `WHERE student_id = 3;`

Exercise 3.4 (e)

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(e) A transfer between two library accounts is processed as a transaction. Explain why atomicity matters. [2]

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(e) A transfer between two library accounts is processed as a transaction. Explain why atomicity matters. [2]

(e)

- both the withdrawal and the deposit must happen, or neither
- if the system fails part-way, the transaction is rolled back, so no money is lost or created