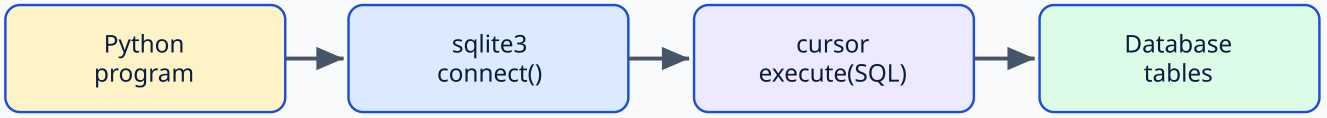
Grade 13 A/L ICT · Lesson 9

9.12 Python and Databases: Connect, Add, Modify, Delete, Retrieve

Syllabus 9.12. A program can **connect** to a database and run SQL to **add**, **modify**, **delete** and **retrieve** records. Python's built-in **sqlite3** module needs no server: connect() opens the database, a **cursor** runs SQL with execute(), commit() saves changes and close() disconnects.

1. Steps

Python program and a database



INSERT, UPDATE, DELETE need commit(); SELECT rows come back as tuples.

Python program talking to a database

- **Connect**: con = sqlite3.connect("school.db").
- **Cursor**: cur = con.cursor() runs SQL statements.
- **Add / modify / delete**: INSERT, UPDATE, DELETE then con.commit().
- **Retrieve**: SELECT and loop over the rows; then con.close().

🐍 Python with an SQLite database

```
import sqlite3
con = sqlite3.connect(":memory:")       # connect
cur = con.cursor()
cur.execute("CREATE TABLE Student (ID TEXT PRIMARY KEY, Name TEXT, Mark INTEGER)")
rows = [("S001", "Nimal", 78), ("S002", "Kamala", 45), ("S003", "Sunil", 88)]
cur.executemany("INSERT INTO Student VALUES (?, ?, ?)", rows)       # add
cur.execute("UPDATE Student SET Mark = 50 WHERE ID = ?", ("S002",))  # modify
cur.execute("DELETE FROM Student WHERE ID = ?", ("S003",))           # delete
con.commit()
for row in cur.execute("SELECT Name, Mark FROM Student ORDER BY Name"):  # retrieve
    print(row)
con.close()
```

▶ Output

```
('Kamala', 50)
('Nimal', 78)
```

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🧮 **Worked example: Why are only Kamala 50 and Nimal 78 printed?**
Three rows are inserted. UPDATE changes S002's mark from 45 to **50**; DELETE removes S003 (Sunil). SELECT … ORDER BY Name returns the two rows left in name order.

💡 Use ? placeholders, never string joining, to put values into SQL – this stops SQL injection.

🚀 **Beyond the syllabus (2026 update)** *Not required for the exam – read for interest.* Web apps in 2026 often use an ORM such as SQLAlchemy or Django, which writes this SQL for you, but the same connect–execute–commit idea lies underneath.

Key Words

Database connection – Link between a program and a database.	**sqlite3** – Built-in Python module for SQLite databases.
connect() – Function that opens a database connection.	**Cursor** – Object that executes SQL and holds results.
execute() – Method that runs one SQL statement.	**commit()** – Method that saves changes permanently.
INSERT – SQL command that adds a record.	**UPDATE** – SQL command that modifies records.
DELETE – SQL command that removes records.	**SELECT** – SQL command that retrieves records.
Placeholder – The ? mark that safely takes a value in SQL.	**SQL injection** – Attack that inserts harmful SQL through input.

Sample Q&A

1. Four operations from Python?

> **Answer:** Add, modify, delete, retrieve.

2. Role of a cursor?

> **Answer:** It executes SQL and returns rows.

3. Why commit()?

> **Answer:** Changes are not saved until commit.

4. Kamala's mark after UPDATE?

> **Answer:** 50.

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5. How many rows does SELECT return?

> **Answer:** 2.

6. Why use ? placeholders?

> **Answer:** Safety against SQL injection.

MCQ

1. Python's built-in module for SQLite is

A. sqlite3
B. mysql
C. os
D. csv
E. pandas

2. Which object runs SQL statements?

A. connection string
B. cursor
C. print
D. table
E. commit

3. Changes are saved permanently by

A. commit()
B. cursor()
C. execute()
D. fetch()
E. close() only

4. After the program, Kamala's mark is

A. 88
B. 45
C. 0
D. 50
E. 78

5. Which record is removed by DELETE?

A. S003 Sunil
B. none
C. S002 Kamala
D. all records
E. S001 Nimal

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6. The first row printed is

A. ('S001', 'Nimal')
B. ('Sunil', 88)
C. ('Kamala', 45)
D. ('Nimal', 78)
E. ('Kamala', 50)

7. Retrieving records uses

A. UPDATE
B. INSERT
C. DELETE
D. SELECT
E. DROP

8. ? placeholders mainly protect against

A. overflow
B. syntax colouring
C. slow disks
D. viruses in files
E. SQL injection

9. Which term means: “Link between a program and a database”?

A. UPDATE
B. commit()
C. Database connection
D. Placeholder
E. connect()

10. Which term means: “Built-in Python module for SQLite databases”?

A. Cursor
B. sqlite3
C. SQL injection
D. INSERT
E. DELETE

11. Which term means: “Function that opens a database connection”?

A. SELECT
B. execute()
C. connect()
D. UPDATE
E. Database connection

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12. Which term means: “Object that executes SQL and holds results”?

A. commit()
B. Placeholder
C. DELETE
D. sqlite3
E. Cursor

13. Which term means: “Method that runs one SQL statement”?

A. SELECT
B. execute()
C. INSERT
D. SQL injection
E. connect()

14. Which term means: “Method that saves changes permanently”?

A. Database connection
B. commit()
C. UPDATE
D. Placeholder
E. Cursor

15. Which term means: “SQL command that adds a record”?

A. sqlite3
B. execute()
C. DELETE
D. INSERT
E. SQL injection

16. Which term means: “SQL command that modifies records”?

A. UPDATE
B. commit()
C. SELECT
D. Database connection
E. connect()

17. Which term means: “SQL command that removes records”?

A. sqlite3
B. INSERT
C. DELETE
D. Cursor
E. Placeholder

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18. Which term means: “SQL command that retrieves records”?

A. SQL injection
B. UPDATE
C. connect()
D. execute()
E. SELECT

19. Which term means: “The ? mark that safely takes a value in SQL”?

A. commit()
B. Database connection
C. Placeholder
D. Cursor
E. DELETE

20. Which term means: “Attack that inserts harmful SQL through input”?

A. SELECT
B. execute()
C. sqlite3
D. SQL injection
E. INSERT

Structured Questions

1. List the steps to use a database from Python. *(5 marks)*

> connect; cursor; execute; commit; close.

2. Write code to insert a student and display all students. *(4 marks)*

> execute INSERT with ?; commit; for row in SELECT; print.

3. Explain why the program prints two rows only. *(4 marks)*

> Three inserted; one deleted; one updated; order.

4. Explain the purpose of commit() and close(). *(2 marks)*

> commit saves; close frees the connection.

5. What is SQL injection and how is it prevented? *(2 marks)*

> Harmful input in SQL; use placeholders.

Summary

- connect() opens the database.

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- A cursor executes SQL.
- INSERT, UPDATE, DELETE change data.
- SELECT retrieves rows.
- commit() saves; use ? for safety.

MCQ answer key – 9.12

1. **A** – sqlite3.
2. **B** – Cursor.
3. **A** – Commit.
4. **D** – UPDATE.
5. **A** – WHERE ID = S003.
6. **E** – ORDER BY Name.
7. **D** – SELECT.
8. **E** – Injection.
9. **C** – Database connection – Link between a program and a database.
10. **B** – sqlite3 – Built-in Python module for SQLite databases.
11. **C** – connect() – Function that opens a database connection.
12. **E** – Cursor – Object that executes SQL and holds results.
13. **B** – execute() – Method that runs one SQL statement.
14. **B** – commit() – Method that saves changes permanently.
15. **D** – INSERT – SQL command that adds a record.
16. **A** – UPDATE – SQL command that modifies records.
17. **C** – DELETE – SQL command that removes records.
18. **E** – SELECT – SQL command that retrieves records.
19. **C** – Placeholder – The ? mark that safely takes a value in SQL.
20. **D** – SQL injection – Attack that inserts harmful SQL through input.

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