G.C.E. O/L Grade 10 ICT · Lesson 9

9.1 Database Concepts, Features and Relational Databases

Every school keeps information about students, classes, marks and library books. A **database** is an **organised collection of related data** stored so that it can be easily **found, updated and used to get information**. In this note you will learn what a database is, its advantages and features, how a **manual** database compares with an **electronic** one, and the parts of a **relational database** – tables, records, fields and key fields.

1. What is a database?

Data are raw facts (e.g. 24103, Nethmi Fernando, 91). When data are organised and processed they give **information** (e.g. 'Nethmi has the highest ICT mark in 10B'). A **database** stores related data in an organised way so that information can be **elicited** (drawn out) quickly. Software used to create and manage a database is a **Database Management System (DBMS)** – e.g. **MS Access**, **LibreOffice Base**, MySQL, Oracle.

- School: student register, marks, attendance, library.
- Department for Registration of Persons: **NIC** (National Identity Card) records.
- Banks: customer accounts and transactions; hospitals: **e-channelling** appointments.
- Ministry of Education: **Grade 1 school admissions** and O/L results.

2. Advantages and features of a good database

Absence of redundancy
The same data is **not stored again and again** (e.g. the class teacher's name is stored once in tblClass, not in every student row).

Efficiency
Searching, sorting and calculating take **seconds** instead of hours.

Accuracy
Validation and data types reduce typing mistakes, so data is **correct**.

Consistency
Data stored once means **every report shows the same value** – no conflicting copies.

Security
Passwords, user permissions and **backups** protect data from unauthorised access and loss.

Validity
Validation rules accept only sensible data (e.g. ICT marks between 0 and 100).

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Simplicity
Data is organised in simple **tables**; forms make entry easy for any user.

Integrity
Links between tables stay correct – e.g. a student cannot be given a class that does not exist (**referential integrity**).

3. Manual and electronic databases

A **manual database** is kept on paper – e.g. the school **admission register**, a **library card file**, a teacher's mark book or a telephone directory. An **electronic database** is stored on a computer and managed by a DBMS.

Point	Manual (paper)	Electronic (DBMS)
Searching	Slow – turn pages or cards	Fast – queries, Find
Sorting	Rewrite the whole list	One click (Ascending/Descending)
Updating	Cross out and rewrite; untidy	Edit the field; neat
Redundancy	Same data copied in many books	Stored once, linked by keys
Space	Many files and cupboards	A disk or the cloud
Security / backup	Lost in fire, flood or termites	Passwords and backup copies
Cost / skills	Cheap, no training needed	Needs a computer, power and training
Similarity	Both store organised, related data about entities (students, books) for later use.	Both store organised, related data about entities (students, books) for later use.

4. Relational database: tables, records, fields and keys

A **relational database** stores data in **tables** (relations) that are **linked by common fields**. Our sample school database has four tables: **tblClass**, **tblStudent**, **tblBook** and **tblBorrow**.

tblStudent (table)

🔑 AdmNo	StudentName	ClassID	ICTMarks
24101	Amaya Perera	10A	82
24102	Kavindu Silva	10A	64
24103	Nethmi Fernando	10B	91
24104	Ashen Jayasinghe	10C	48
24105	Ayesha Fathima	10B	77

Field name
Field (column)
Record (row)
Primary key – unique for every student

4 fields and 5 records are shown. One record = one student; one field = one item of data.

Figure 9.1: Parts of a table – each column is a field, each row is a record, and AdmNo is the primary key.

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Table
Data about **one type of entity** in rows and columns, e.g. tblStudent.

Field
A **column** – one item of data about every record, e.g. StudentName. Its heading is the **field name**.

Record
A **row** – all the data about **one** student or book.

Key field
A field whose value is **unique** for every record, used to identify it – the **primary key** (e.g. AdmNo, NIC number).

💡 tblStudent has **10 records** and **6 fields**. Names like 'Amaya Perera' can repeat in a big school, so the **admission number** – not the name – is the key field.

NEW 2026 **2026 updates – cloud databases.** Many schools now keep simple data in the **cloud**: a **Google Sheet** with one row per student (used like a table, shared with teachers), **Airtable** (spreadsheet look, real field types and links) and **Google Firebase** (used by mobile apps). Cloud data is reachable from anywhere but needs a strong password and two-step verification.

NEW 2026 **Personal Data Protection Act No. 9 of 2022 (Sri Lanka).** Student names, NIC numbers, phone numbers and marks are **personal data**. Collect only what you need, keep it accurate and secure, use it only for its purpose, and keep regular **backups**.

Key Words

Database – An organised collection of related data.

DBMS – Software to create and manage databases, e.g. MS Access, LibreOffice Base.

Table – Rows and columns of data about one entity.

Field – A column; one item of data in every record.

Record – A row; all data about one item or person.

Primary key – A field with a unique value that identifies each record.

Redundancy – Unnecessary repetition of the same data.

Consistency – The same data has the same value everywhere.

Integrity – Data and links between tables remain correct and complete.

Validity – Data obeys the rules set for it (e.g. 0–100).

Relational database – A database of linked tables.

Manual database – A database kept on paper, e.g. a register or card file.

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Sample Q&A

1. Define a database.

> **Answer:** An organised collection of related data that can be easily searched, updated and used to obtain information.

2. Name two DBMS packages.

> **Answer:** MS Access and LibreOffice Base (also MySQL, Oracle).

3. Distinguish a field and a record.

> **Answer:** A field is a column (one data item, e.g. StudentName); a record is a row (all data about one student).

4. Why is AdmNo a better primary key than StudentName?

> **Answer:** AdmNo is unique for every student; names can repeat.

5. Give three advantages of an electronic database over a manual one.

> **Answer:** Faster searching and sorting; less redundancy; easier updating; less space; password security and backups.

6. What does 'absence of redundancy' mean?

> **Answer:** The same data is not stored more than once.

MCQ

1. An organised collection of related data is a…

A. Database
B. Word processor
C. Spreadsheet chart
D. Operating system

2. Which is a DBMS?

A. LibreOffice Draw
B. LibreOffice Writer
C. LibreOffice Base
D. LibreOffice Impress

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3. In a table, a column is called a…

A. Report
B. Query
C. Field
D. Record

4. All the data about one student in tblStudent is a…

A. Record
B. Field name
C. Field
D. Data type

5. tblStudent stores 10 students, each with 6 items of data. It has…

A. 6 records and 10 fields
B. 10 records and 6 fields
C. 10 fields only
D. 60 records only

6. The best primary key for a student table is…

A. Date of birth
B. Student name
C. Class
D. Admission number

7. A field whose value is unique and identifies each record is the…

A. Field size
B. Foreign key
C. Primary key
D. Caption

8. Storing the class teacher's name in every student row causes…

A. Data simplicity
B. Data redundancy
C. Data validity
D. Data security

9. A rule that accepts only ICT marks from 0 to 100 improves…

A. Validity
B. Redundancy
C. Portability
D. Simplicity

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10. Passwords, user permissions and backups mainly give…

A. Consistency only
B. Redundancy
C. Security
D. Simplicity

11. Which is a manual database?

A. An Access .accdb file
B. A Google Sheet
C. A Firebase app
D. A school admission register

12. A disadvantage of an electronic database compared with a manual one is that it…

A. needs a computer, electricity and training
B. cannot be sorted
C. takes many cupboards
D. is slow to search

13. A database of tables linked by common fields is a…

A. Presentation
B. Relational database
C. Flat file
D. Card file

14. A student cannot be given class '12Z' that does not exist in tblClass. This feature is…

A. Sorting
B. Field size
C. Redundancy
D. Referential integrity

15. Under Sri Lanka's Personal Data Protection Act 2022, a school should…

A. share NIC numbers on social media
B. collect only needed data and keep it secure
C. collect as much data as possible
D. never back up data

Structured Questions

1. (i) Define a database. (1 mark)
(ii) Give two examples of databases used in Sri Lanka. (2 marks) *(3 marks)*

> (i) An organised collection of related data. (ii) Any two: NIC records, school admissions, bank accounts, e-channelling, school library.

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2. Using Figure 9.1, label a field, a record and the primary key, and state how many records tblStudent has. (4 marks) *(4 marks)*

> Field – a column such as ICTMarks; record – a row such as 24103 Nethmi Fernando 10B 91; primary key – AdmNo; tblStudent has 10 records.

tblStudent (table)

🔑 AdmNo	StudentName	ClassID	ICTMarks
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Model answer

3. Explain four features of a good database. (4 marks) *(4 marks)*

> Any four: absence of redundancy – data stored once; accuracy – correct data; consistency – same value everywhere; security – passwords/backups; validity – validation rules; integrity – correct links; efficiency – fast; simplicity – easy tables.

4. Compare a manual library card file with an electronic library database. Give two differences and one similarity. (3 marks) *(3 marks)*

> Differences: electronic is faster to search/sort; electronic needs less space and can be backed up; manual needs no computer. Similarity: both store organised data about books.

5. A school keeps student marks in a shared Google Sheet. Give two risks and two good practices under the PDPA 2022. (4 marks) *(4 marks)*

> Risks: anyone with the link may see personal data; accidental deletion or editing. Good practices: share only with named teachers, use strong passwords/2-step verification, collect only needed fields, keep backups (version history).

Summary

- Database = organised collection of related data.
- DBMS: MS Access, LibreOffice Base, MySQL.
- Features: no redundancy, efficiency, accuracy, consistency.
- Also: security, validity, simplicity, integrity.
- Manual = paper register/card file; electronic = DBMS.
- Table = entity; field = column; record = row.

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- Primary key = unique field (AdmNo, NIC).
- 2026: cloud databases, PDPA 2022, backups.

MCQ answer key – 9.1

1. **A** – Database.
2. **C** – Base is the database program.
3. **C** – Column = field.
4. **A** – Row = record.
5. **B** – Rows = records, columns = fields.
6. **D** – Unique.
7. **C** – Primary key.
8. **B** – Repetition.
9. **A** – Validation.
10. **C** – Security.
11. **D** – Paper.
12. **A** – Needs resources.
13. **B** – Relational.
14. **D** – Integrity.
15. **B** – Data protection.

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