G.C.E. O/L Grade 10 ICT

Lesson 9: Databases

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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**).

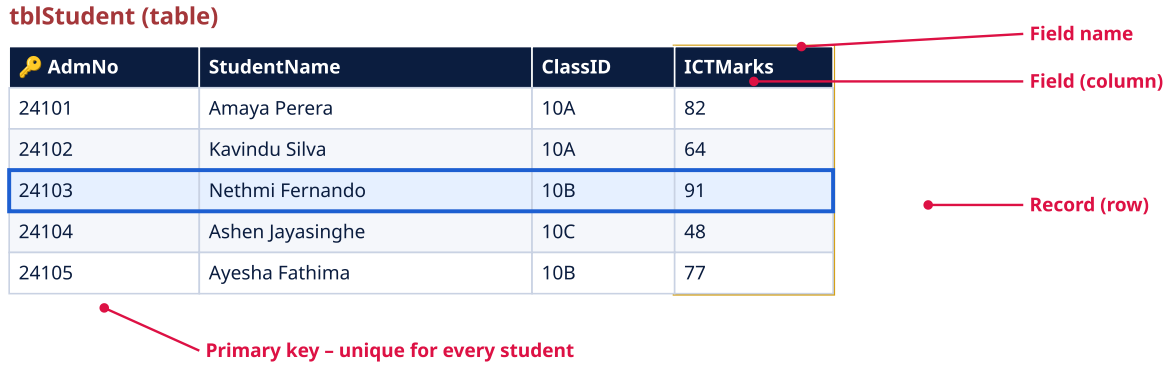
3. Manual and electronic databases

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**.



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

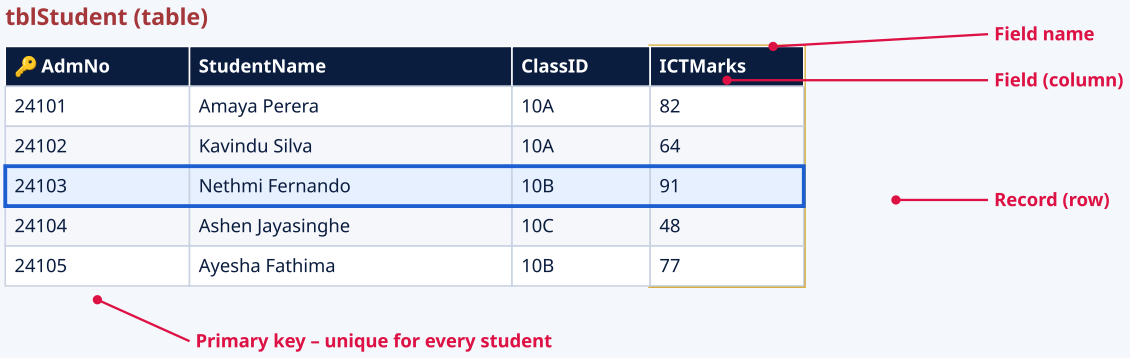
1. (i) Define a database. (1 mark)
(ii) Give two examples of databases used in Sri Lanka. (2 marks) *(3 marks)*

> (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.



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

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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9.2 Creating a Simple Database Table: Fields, Data Types and Field Size

Before you open a DBMS, plan the table on paper. Decide the **purpose**, the **field names**, a **unique field** (primary key), the **data type** of each field and its **field size**. A good plan saves time and stops mistakes. In this note we plan a single table, **tblBook**, for the school library.

1. Steps to design a table

- **Purpose** – what information is needed? (e.g. 'Which books are in the library, their price and number of copies?')
- **Field names** – short, meaningful, no spaces is best: BookID, Title, Author, Category, Price, Copies.
- **Unique field** – choose the primary key: BookID (accession number) – no two books share it.
- **Data type** – the kind of data each field holds.
- **Field size** – the maximum length (text) or range (number).
- **Sample data** – test the plan with a few real records.

2. Data types

Data type (Access)	LibreOffice Base	Stores	School example
Short Text	Text [VARCHAR]	Letters, or numbers not used in calculations – up to 255 characters	StudentName, ClassID, phone number
Long Text (Memo)	Memo [LONGVARCHAR]	Long text – remarks, descriptions	Teacher's remarks
Number	Integer / Decimal	Numbers used in calculations	ICTMarks, Copies, Room
Date/Time	Date	Dates and times	DateOfBirth, DateBorrowed
Currency	Decimal (Currency format)	Money values (Rs.)	Book Price, facility fee
Yes/No	Yes/No [BOOLEAN]	Only two values: Yes/No, True/False	Prefect, Returned
AutoNumber	Integer + AutoValue	A number added automatically (1, 2, 3 ...), unique	BorrowID

💡 A **telephone number** (e.g. 0712345678) or **NIC number** (e.g. 200912345678) is stored as **Short Text** – we never add phone numbers, and a leading 0 must be kept.

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3. Field size

For **Short Text**, the field size is the **maximum number of characters** (1–255; default 255). For **Number**, it is the kind of number: **Byte** (0–255), **Integer** (−32,768 to 32,767), **Long Integer** (about ±2.1 billion), **Single/Double** (decimals). A small, suitable size saves space and stops wrong data – e.g. ClassID size 3 accepts '10A' but not '10A-Science'.

4. The plan for tblBook

Field name	Data type	Field size	Description
BookID	Short Text	4	Accession number, e.g. B001 (primary key)
Title	Short Text	60	Book title
Author	Short Text	40	Author
Category	Short Text	15	Novel, Reference …
Price	Currency	Rs.	Price in rupees
Copies	Number	Integer	Copies in the library

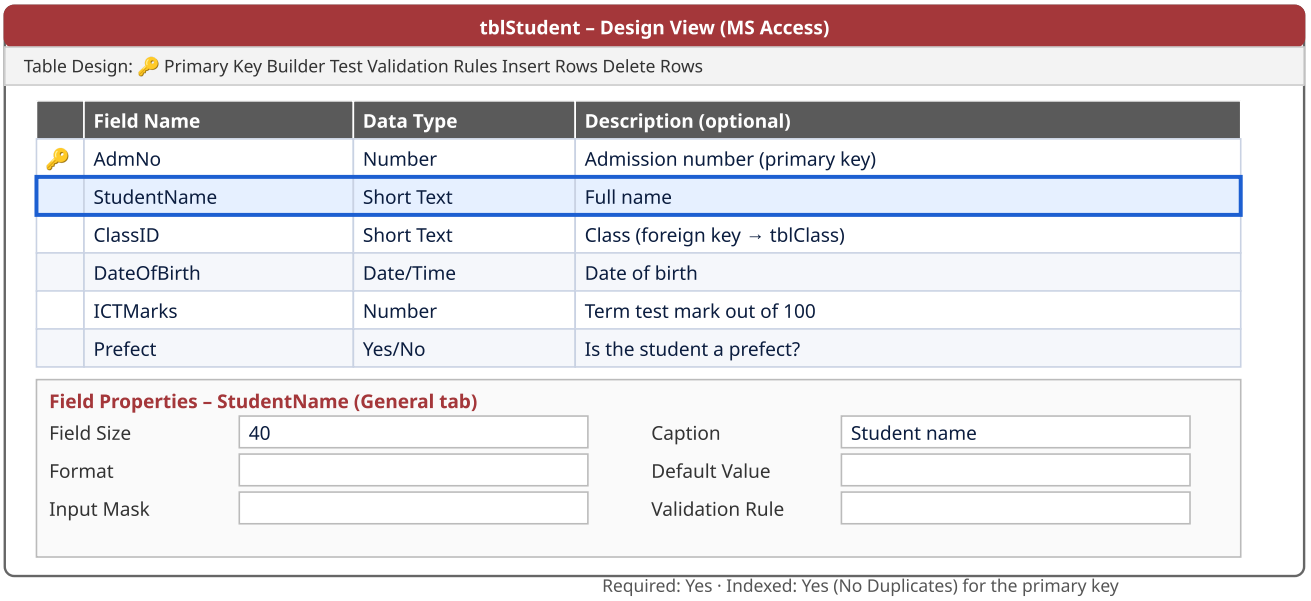


Figure 9.2: The plan typed into Access Design View (tblStudent). Each field has a name, a data type and properties such as Field Size.

💡 Sample record: **B001 | Madol Doova | Martin Wickramasinghe | Novel | Rs. 750 | 3**. Check: does every value fit its type and size? 'Madol Doova' has 11 characters ≤ 60 ✔.

NEW 2026 **2026: AI as a helper, not a replacement.** You can ask an AI chatbot to suggest fields and data types for a 'school sports meet' table, but **you must check** every suggestion (e.g. it may make a phone number a Number field) and **never paste real student personal data** into a public AI tool.

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Key Words

Field name – The name given to a field, e.g. StudentName.

Data type – The kind of data a field can hold.

Short Text – Text up to 255 characters; also numbers not calculated.

Long Text – Long text such as remarks (Memo).

Number – Numeric data used in calculations.

Currency – Money values.

Date/Time – Dates and times.

Yes/No – Only two possible values.

AutoNumber – A unique number given automatically to each new record.

Field size – Maximum length or numeric range of a field.

Unique field – A field with no repeated values; the primary key.

Purpose – What information the table must give.

Sample Q&A

1. List the steps in planning a table.

> **Answer:** Purpose, field names, unique field (primary key), data types, field sizes, sample data.

2. Which data type is used for a book's price?

> **Answer:** Currency.

3. Why is a phone number stored as Short Text?

> **Answer:** It is not used in calculations and the leading 0 must be kept.

4. Give a field suitable for Yes/No.

> **Answer:** Prefect, Returned, FeesPaid.

5. What is field size for a Short Text field?

> **Answer:** The maximum number of characters (1–255).

6. What does AutoNumber do?

> **Answer:** Gives every new record a unique number automatically.

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MCQ

1. The best data type for StudentName is...

A. Number
B. Short Text
C. Yes/No
D. Currency

2. The best data type for ICTMarks is...

A. Short Text
B. Long Text
C. Yes/No
D. Number

3. Book price in rupees should be...

A. Currency
B. Yes/No
C. Date/Time
D. AutoNumber

4. A 'Prefect' field with only Yes or No uses...

A. Short Text
B. Yes/No
C. Long Text
D. Number

5. DateOfBirth should be...

A. Date/Time
B. Currency
C. Short Text
D. Number

6. A mobile number such as 0712345678 should be stored as...

A. AutoNumber
B. Currency
C. Short Text
D. Number

7. A field that numbers new loans 1, 2, 3... automatically is...

A. AutoNumber
B. Yes/No
C. Date/Time
D. Number

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8. A teacher's long remarks about a student need...

A. Currency
B. Yes/No
C. Short Text size 3
D. Long Text

9. The maximum field size of a Short Text field in Access is...

A. 50
B. 255
C. 100
D. 65535

10. ClassID values are like '10A'. A suitable field size is...

A. 3
B. 1
C. 255
D. Long Integer

11. The Number field size that holds 0 to 255 only is...

A. Long Integer
B. Integer
C. Byte
D. Double

12. The first step in planning a table is to decide its...

A. report colour
B. password
C. purpose
D. font

13. Which field is the unique field in tblBook?

A. Author
B. BookID
C. Price
D. Category

14. In LibreOffice Base, the equivalent of Access 'Short Text' is...

A. BOOLEAN
B. DATE
C. INTEGER
D. Text [VARCHAR]

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15. When using an AI chatbot to suggest table fields, you should…

A. accept all suggestions
B. paste the full student register
C. check every suggestion and not paste real personal data
D. let it set the passwords

Structured Questions

1. Plan a table tblStudent: give five field names with a suitable data type for each. (5 marks) *(5 marks)*

AdmNo – Number; StudentName – Short Text; ClassID – Short Text; DateOfBirth – Date/Time; ICTMarks – Number (or Prefect – Yes/No).

tblStudent – Design View (MS Access)

Table Design: 🔑 Primary Key Builder Test Validation Rules Insert Rows Delete Rows

	Field Name	Data Type	Description (optional)
🔑	AdmNo	Number	Admission number (primary key)
	StudentName	Short Text	Full name
	ClassID	Short Text	Class (foreign key → tblClass)
	DateOfBirth	Date/Time	Date of birth
	ICTMarks	Number	Term test mark out of 100
	Prefect	Yes/No	Is the student a prefect?

Field Properties – StudentName (General tab)

Field Size	40	Caption	Student name
Format		Default Value	
Input Mask		Validation Rule	

Required: Yes · Indexed: Yes (No Duplicates) for the primary key

Model answer

2. (i) What is field size? (1 mark)
(ii) Suggest a field size for ClassID and for StudentName. (2 marks) *(3 marks)*

(i) The maximum length/range of data a field can hold. (ii) ClassID – 3; StudentName – 40.

3. Explain why NIC number should not be a Number field. (2 marks) *(2 marks)*

It is not used in calculations, old NICs contain the letter V/X (e.g. 951234567V), and leading zeros must be kept – so Short Text.

4. Name the data types for: (a) Price (b) Returned (c) BorrowID (d) DateBorrowed. (4 marks) *(4 marks)*

(a) Currency (b) Yes/No (c) AutoNumber (d) Date/Time.

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5. State three steps to plan a single table before using a DBMS. (3 marks) *(3 marks)*

> Decide the purpose; choose field names and the unique field; choose data types and field sizes (and test with sample data).

Summary

- Plan on paper first: purpose, fields, key, types, sizes.
- Short Text ≤ 255 chars; Long Text for remarks.
- Number for calculations; Currency for money.
- Date/Time for dates; Yes/No for two values.
- AutoNumber gives unique numbers automatically.
- Phone and NIC numbers → Short Text.
- Field size: text length or Byte/Integer/Long Integer.
- Check AI suggestions; never share real personal data.

MCQ answer key – 9.2

1. **B** – Text.
2. **D** – Calculated.
3. **A** – Money.
4. **B** – Two values.
5. **A** – Dates.
6. **C** – Keep leading 0.
7. **A** – Auto.
8. **D** – Memo.
9. **B** – 255 characters.
10. **A** – 3 characters.
11. **C** – Byte.
12. **C** – Purpose first.
13. **B** – Accession number.
14. **D** – VARCHAR.
15. **C** – Responsible AI.

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9.3 Converting a Manual Database to an Electronic Database

Many school libraries still use **book cards** in a wooden drawer, and every class has a paper **student register**. Converting these to an electronic database makes searching, sorting and reporting fast. In this note you will turn the **headings** on a card or register into **fields**, each **card or line** into a **record**, and choose the right **data type and field size** for every field.

1. From card to record

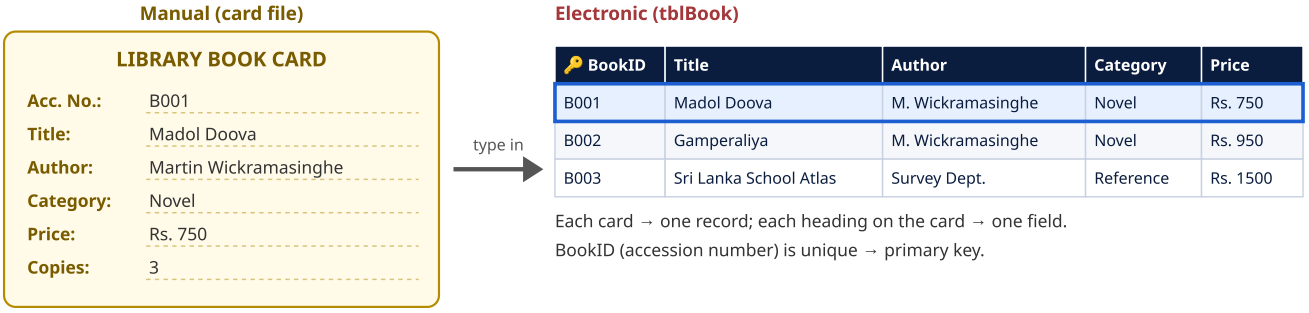


Figure 9.3: A library book card becomes one record in tblBook. Each heading on the card becomes a field.

Manual	Electronic
The card drawer / register book	A **table** (tblBook / tblStudent)
A heading printed on the card / a column of the register	A **field**
One card / one line of the register	One **record**
Accession number / admission number	The **primary key**

2. Steps to convert

- **Study** the cards/register – list every heading.
- **Choose fields** – keep useful headings; split combined ones (e.g. 'Class & Teacher' → ClassID and ClassTeacher in another table).
- **Name** each field clearly (no spaces: DateOfBirth).
- **Choose data types and field sizes** by looking at the longest real value.
- **Set the primary key** (accession or admission number).
- **Enter** the records, then **check** them against the cards (verification).
- Keep the paper copy until the electronic data is checked and **backed up**.

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3. Example 1: library book card → tblBook

Card heading	Field name	Data type	Field size
Acc. No.	BookID	Short Text	4
Title	Title	Short Text	60
Author	Author	Short Text	40
Category	Category	Short Text	15
Price	Price	Currency	Rs.
Copies	Copies	Number	Integer

Card **B001** becomes the record **B001 | Madol Doova | Martin Wickramasinghe | Novel | 750 | 3**. After all 8 cards are typed, tblBook has **8 records**.

4. Example 2: class student register → tblStudent

Register column	Field name	Data type	Field size / format
Adm. No.	AdmNo	Number	Long Integer
Name of student	StudentName	Short Text	40
Class	ClassID	Short Text	3
Date of birth	DateOfBirth	Date/Time	Short Date
ICT mark (Term 1)	ICTMarks	Number	Integer
Prefect (✔)	Prefect	Yes/No	Yes/No

💡 A register line like **'24103 – Nethmi Fernando – 10B – 25.01.2010 – 91 – ✔'** becomes one record. The tick (✔) becomes **Yes** in a Yes/No field. Dates are typed in one format (dd/mm/yyyy).

5. Common problems when converting

Different spellings
'M. Wickramasinghe' and 'Martin Wickramasinghe' – choose one standard form.

Missing data
A card with no price – check with the librarian before typing.

Duplicates
Two cards with the same accession number – the primary key will refuse the second one.

Typing errors
Use **verification** (proof-read or double entry) and **validation** rules.

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NEW 2026 **2026: scan, then check.** Phone apps (e.g. Google Lens) can read text from a register photo and paste it into a sheet, and AI tools can tidy it into columns. These save typing but **make mistakes** with handwriting and Sinhala/Tamil names – a person must **verify** every record. Store the photos securely (PDPA 2022) and delete copies you no longer need.

Key Words

Conversion – Changing a paper database into an electronic one.

Card file – A manual database with one card per item.

Register – A book with one line per person, e.g. admission register.

Accession number – A unique number given to each library book.

Field – A heading on the card becomes a field.

Record – One card or register line becomes a record.

Data entry – Typing the records into the table or form.

Verification – Checking typed data against the original.

Validation – Automatic checks that data is sensible.

Duplicate – The same record entered twice.

Standard form – One agreed way of writing a value.

Backup – A safe copy of the data.

Sample Q&A

1. What does each card in a card file become?

> **Answer:** A record in the table.

2. What do the headings on a card become?

> **Answer:** Fields (field names).

3. Which register column is the best primary key?

> **Answer:** Admission number – unique for each student.

4. Distinguish verification and validation.

> **Answer:** Verification checks typed data against the original; validation is an automatic check that data is sensible.

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5. How is a tick (✔) in a register stored?

> **Answer:** As Yes in a Yes/No field.

6. Why keep the paper copy for a while?

> **Answer:** Until the electronic data is checked and backed up.

MCQ

1. When converting a card file, each card becomes a…

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

2. The heading 'Author' on a book card becomes a…

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

3. The whole card drawer becomes a…

A. Table
B. Field
C. Record
D. Key

4. The best primary key for library books is the…

A. Category
B. Accession number
C. Author
D. Title

5. The library in this note has 8 book cards, each with 6 headings. After typing them all, tblBook has…

A. 6 records
B. 48 records
C. 8 records
D. 1 record

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6. The register column 'Date of birth' should be…

A. Short Text
B. Yes/No
C. Number
D. Date/Time

7. A tick (✔) in a 'Prefect' column becomes…

A. the letter V
B. a Long Text
C. Yes in a Yes/No field
D. a Number 1000

8. Checking typed records against the original cards is…

A. Sorting
B. Validation
C. Formatting
D. Verification

9. A rule that stops a price below 0 is…

A. Verification
B. Validation
C. Redundancy
D. Backup

10. Two cards have accession number B001. When typed, the second one…

A. is refused by the primary key
B. is saved twice
C. replaces the first
D. becomes B002 automatically

11. 'M. Wickramasinghe' and 'Martin Wickramasinghe' for the same author should be…

A. kept both
B. written in one standard form
C. deleted
D. stored in Long Text

12. The heading 'Class & Teacher' on a register is best…

A. removed
B. kept as one field
C. split into ClassID and ClassTeacher
D. made the primary key

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13. A suitable field size for Title (longest title 22 characters) is...

A. 60
B. 10
C. Byte
D. 3

14. Text read from a register photo by an AI/scan app should be...

A. posted online
B. trusted fully
C. used without a key
D. verified by a person

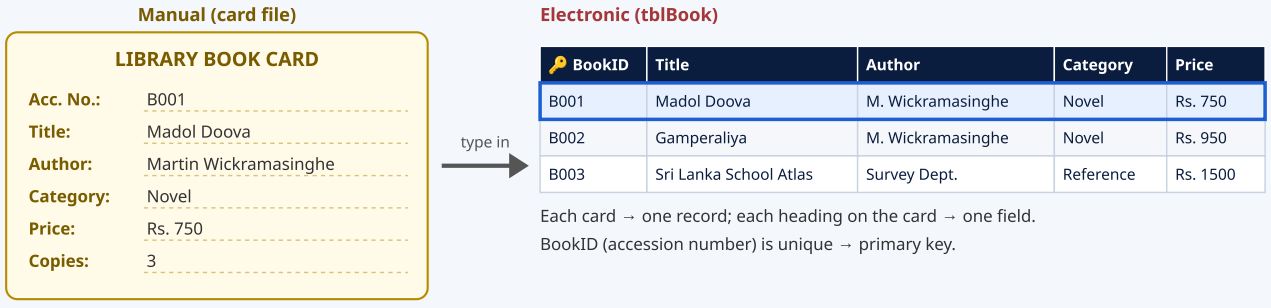
15. The paper register should be kept until the electronic data is...

A. shared on WhatsApp
B. checked and backed up
C. sorted once
D. printed in colour

Structured Questions

1. A library card shows: Acc. No., Title, Author, Category, Price, Copies. Write the field name, data type and field size for each. (6 marks) *(6 marks)*

BookID – Short Text – 4; Title – Short Text – 60; Author – Short Text – 40; Category – Short Text – 15; Price – Currency – Rs.; Copies – Number – Integer.



Model answer

2. List four steps to convert a class register into an electronic database. (4 marks) *(4 marks)*

Study the columns; choose and name fields; choose data types/sizes and set AdmNo as primary key; enter the records and verify them (then back up).

3. (i) What is verification? (1 mark)
(ii) Give one method. (1 mark) *(2 marks)*

(i) Checking that entered data matches the original. (ii) Proof-reading or double entry.

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4. Give two problems that may occur while converting a card file and how to solve each. (4 marks) *(4 marks)*

> Any two: different spellings – use a standard form; missing data – check with the librarian; duplicate accession numbers – primary key refuses, investigate; typing errors – verification/validation.

5. Write the register line '24103 – Nethmi Fernando – 10B – 25.01.2010 – 91 – ✔' as a record of tblStudent with field names. (3 marks) *(3 marks)*

> AdmNo 24103; StudentName Nethmi Fernando; ClassID 10B; DateOfBirth 25/01/2010; ICTMarks 91; Prefect Yes.

Summary

- Card/register line → record; heading → field.
- Card drawer / register → table.
- Accession / admission number → primary key.
- Choose data types and sizes from real values.
- Split combined headings; one fact per field.
- Use a standard form for names and dates.
- Verify typed data; validation catches nonsense.
- 2026: scan/AI help, but a person checks; back up.

MCQ answer key – 9.3

1. **A** – Card = record.
2. **C** – Heading = field.
3. **A** – Table.
4. **B** – Unique.
5. **C** – 8 books.
6. **D** – Date.
7. **C** – Yes/No.
8. **D** – Verification.
9. **B** – Validation rule.
10. **A** – No duplicate keys.
11. **B** – Consistency.
12. **C** – One fact per field.
13. **A** – Room to grow.
14. **D** – Check.
15. **B** – Safety.

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G.C.E. O/L Grade 10 ICT · Lesson 9

9.4 Relational Database Design: Primary Key, Foreign Key and Relationships

If we typed the class teacher's name and room into every student record, the same data would be repeated many times. A **relational design** stores each kind of data in its own table and **links the tables** with keys. In this note you will learn the **primary key**, the **foreign key**, and the three kinds of **relationship** – mainly **one-to-many** – using our school's **Class–Student** and **Book–Borrow–Student** tables.

1. Why split data into tables?

In one big table, 'Mrs. N. Perera, Room 12' would be typed for all 4 students of 10A. If the teacher changes, 4 records must be edited – a missed one makes the data **inconsistent**. In a relational design, the teacher is stored **once** in tblClass, and each student only stores **ClassID**.

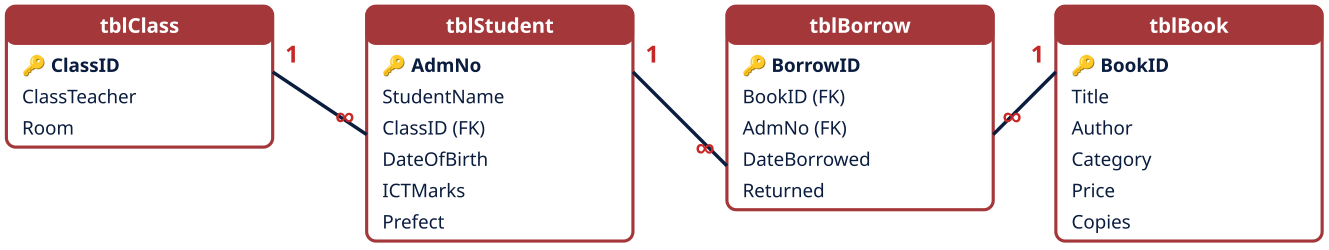
2. Primary key and foreign key

Primary key (PK)
A field (or fields) whose value is **unique and not empty** for every record of a table. tblClass → ClassID; tblStudent → AdmNo; tblBook → BookID; tblBorrow → BorrowID.

Foreign key (FK)
A field in one table that holds the **primary key value of another table**, creating the link. ClassID in tblStudent; BookID and AdmNo in tblBorrow.

Composite key
A primary key made of **two or more fields** together (e.g. AdmNo + SubjectID in a marks table).

Rule
A FK value must **match an existing PK value** (or be empty). This is **referential integrity**.



1 = one side (primary key) ∞ = many side (foreign key) – Enforce Referential Integrity is ticked
One class has many students · one student has many loans · one book has many loans

Figure 9.4: Relationships in the school database. The '1' end is the primary key; the '∞' (many) end is the foreign key.

3. Types of relationships

Type	Meaning	Example

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One-to-many (1–∞)	One record in table A matches **many** in table B; each B matches only one A	One class – many students; one student – many loans
One-to-one (1–1)	One record matches exactly one record	One student – one school ID card; one school – one principal
Many-to-many (∞–∞)	Many A match many B; built with a **link (junction) table** and two 1–∞ relationships	Students and books: tblBorrow links them

4. One-to-many in our data

ClassID (PK in tblClass)	Class teacher	Number of students (FK matches in tblStudent)
10A	Mrs. N. Perera	4
10B	Mr. S. Kumara	3
10C	Mrs. F. Rizwan	3
11A	Mr. R. Silva	0

💡 **11A has 0 students** – that is allowed: the 'many' side can be zero. But a student with ClassID '12Z' is **not** allowed, because 12Z is not in tblClass. Book **B001** was borrowed **2 times**, so one book has many loans.

5. Many-to-many: Book – Borrow – Student

A student can borrow many books and a book can be borrowed by many students, so Student–Book is **many-to-many**. A DBMS cannot link them directly; we add **tblBorrow** with two foreign keys (BookID, AdmNo). Now Book 1–∞ Borrow and Student 1–∞ Borrow. Student 24101 has **2** loans and 24103 has **2**.

NEW 2026 **2026: real Sri Lankan systems are relational.** The **NIC** number links a citizen to records in banks, the Department of Motor Traffic and elections; a hospital **e-channelling** system links Doctor 1–∞ Session 1–∞ Appointment; **school admission** systems link Applicant 1–∞ Application. Good keys keep these huge systems accurate.

Key Words

Primary key – Unique, non-empty field identifying each record.

Foreign key – A field holding the primary key of another table.

Composite key – A primary key made of two or more fields.

Relationship – A link between two tables through common fields.

One-to-many – One record in A matches many in B.

One-to-one – One record matches exactly one record.

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Many-to-many – Many records match many; needs a link table.

Link table – A table with two FKs that breaks a many-to-many, e.g. tblBorrow.

Referential integrity – Every FK value matches an existing PK value.

Entity – A thing we store data about – student, class, book.

ER diagram – A drawing of tables (entities) and their relationships.

Inconsistency – Copies of the same data having different values.

Sample Q&A

1. Define a foreign key.

> **Answer:** A field in one table that holds the primary key value of another table, linking them.

2. Name the PK and FK that link tblClass and tblStudent.

> **Answer:** PK: ClassID in tblClass; FK: ClassID in tblStudent.

3. What type of relationship is Class–Student?

> **Answer:** One-to-many: one class has many students.

4. How is a many-to-many relationship built?

> **Answer:** With a link table holding the two foreign keys, giving two one-to-many relationships.

5. Give an example of a one-to-one relationship.

> **Answer:** One student – one school ID card (or school – principal).

6. Why not store the class teacher in tblStudent?

> **Answer:** It would be repeated for every student (redundancy) and could become inconsistent.

MCQ

1. A field that links to the primary key of another table is a…

A. Foreign key
B. Caption
C. Primary key
D. AutoNumber

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2. In tblStudent, ClassID is a…

A. Primary key
B. Foreign key
C. Yes/No field
D. Composite key

3. The primary key of tblBorrow is…

A. BookID
B. DateBorrowed
C. BorrowID
D. AdmNo

4. tblBorrow has how many foreign keys?

A. 0
B. 4
C. 2
D. 1

5. One class has many students. This is…

A. Many-to-many
B. One-to-one
C. No relationship
D. One-to-many

6. How many students are in class 10A in the sample data?

A. 2
B. 10
C. 4
D. 5

7. Class 11A has 0 students in tblStudent. This is…

A. a duplicate key
B. a one-to-one error
C. a referential integrity error
D. allowed – the many side can be zero

8. Adding a student with ClassID '12Z' (not in tblClass) is refused because of…

A. Referential integrity
B. Data redundancy
C. Sorting
D. Field size

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9. Students and books (a student borrows many books, a book is borrowed by many students) is…

A. None
B. Many-to-many
C. One-to-one
D. One-to-many

10. A many-to-many relationship is created using…

A. a link table with two foreign keys
B. a report
C. one big table
D. two primary keys in one field

11. One school has one principal. This is…

A. One-to-many
B. Many-to-one only
C. Many-to-many
D. One-to-one

12. In Figure 9.4, the '∞' symbol is at the side of the…

A. AutoNumber only
B. primary key
C. foreign key
D. report

13. Book B001 appears in tblBorrow…

A. 2 times
B. 0 times
C. 5 times
D. 4 times

14. A primary key made of AdmNo + SubjectID is a…

A. AutoNumber
B. Composite key
C. Caption
D. Foreign key

15. In an e-channelling system, one doctor has many appointment sessions. The FK DoctorID is in the…

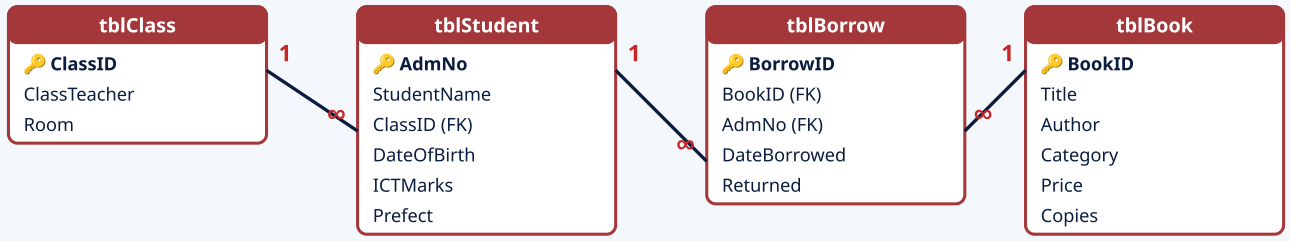
A. Report header
B. Session table
C. Hospital logo
D. Doctor table only

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Structured Questions

1. Using Figure 9.4, name the primary key of each table and the foreign keys. (5 marks) *(5 marks)*

PKs: tblClass ClassID, tblStudent AdmNo, tblBook BookID, tblBorrow BorrowID. FKs: ClassID in tblStudent; BookID and AdmNo in tblBorrow.



1 = one side (primary key) ∞ = many side (foreign key) – Enforce Referential Integrity is ticked
One class has many students · one student has many loans · one book has many loans

Model answer

2. (i) Define a one-to-many relationship. (1 mark)
(ii) Give two examples from a school. (2 marks) *(3 marks)*

(i) One record in one table matches many records in another. (ii) Class–Student; Student–Borrow; Book–Borrow; Teacher–Class.

3. Explain why Student–Book is many-to-many and how tblBorrow solves it. (3 marks) *(3 marks)*

A student can borrow many books and a book can be borrowed by many students. tblBorrow holds BookID and AdmNo as FKs, giving Book 1–∞ Borrow and Student 1–∞ Borrow.

4. Using the sample data, how many students does each class have? Which class shows that the 'many' side can be zero? (3 marks) *(3 marks)*

10A – 4, 10B – 3, 10C – 3, 11A – 0; 11A has zero students.

5. State referential integrity and give one example of data it rejects. (2 marks) *(2 marks)*

Every foreign key value must match an existing primary key value. Example: a loan for BookID B099 or a student in class 12Z.

Summary

- Relational design: one table per entity, linked by keys.
- PK = unique, not empty (ClassID, AdmNo, BookID).
- FK = another table's PK (ClassID in tblStudent).

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- 1–∞: one class, many students (most common).
- 1–1: school – principal; ∞–∞ needs a link table.
- tblBorrow links Student and Book (two FKs).
- Referential integrity: FK must match a PK.
- NIC, e-channelling, admissions use keys.

MCQ answer key – 9.4

1. **A** – FK.
2. **B** – Links to tblClass.
3. **C** – AutoNumber PK.
4. **C** – BookID and AdmNo.
5. **D** – 1–∞.
6. **C** – Count FK = 10A.
7. **D** – Zero is fine.
8. **A** – FK must match a PK.
9. **B** – ∞–∞.
10. **A** – Junction table.
11. **D** – 1–1.
12. **C** – Many = FK side.
13. **A** – Count.
14. **B** – Two fields.
15. **B** – Many side holds the FK.

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G.C.E. O/L Grade 10 ICT · Lesson 9

9.5 Creating a Relational Database Using a DBMS (MS Access and LibreOffice Base)

Now we build the school database on the computer. You will **create a database file**, make the **tables in Design View**, set the **primary keys**, identify the **foreign keys**, and join the tables in the **Relationships window** with **Enforce Referential Integrity**. Steps are given for **MS Access** and **LibreOffice Base**.

1. Create a new database

Step	MS Access	LibreOffice Base
Start	File › New › **Blank database**	**Database Wizard** › Create a new database (HSQLDB/Firebird embedded)
Name and save	Type **SchoolDB** › Create (saved as **SchoolDB.accdb**)	Finish › save as **SchoolDB.odb**
Objects	Navigation Pane: Tables, Queries, Forms, Reports	Left pane: Tables, Queries, Forms, Reports

💡 Unlike Word or Excel, a database is **saved when you create it**, and every record is saved automatically when you move to the next one.

2. Create tables in Design View

- Access: **Create › Table Design**. Base: **Tables › Create Table in Design View**.
- Type each **Field Name**, choose its **Data Type**, add a **Description**.
- Set **Field Properties** at the bottom: Field Size, Format, Caption, Default Value, Validation Rule (e.g. **Between 0 And 100**), Required.
- Switch to **Datasheet View** to type records.

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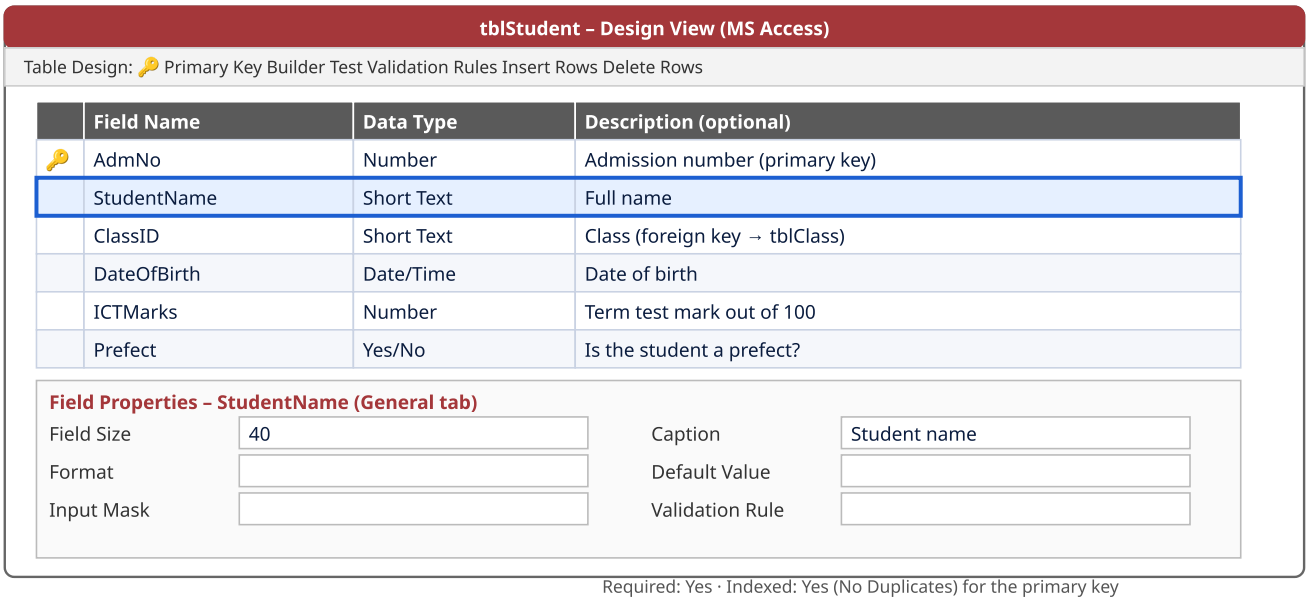


Figure 9.5: tblStudent in Access Design View – field names, data types, the primary key icon and field properties.

3. Set the primary key

Select the field row (e.g. **AdmNo**) and click **Table Design › Primary Key** (key icon) in Access, or right-click › **Primary Key** in Base. A key symbol appears. Access sets **Indexed: Yes (No Duplicates)**, so a repeated or empty AdmNo is refused. Save the table as **tblStudent**. Make all 4 tables: tblClass, tblStudent, tblBook and tblBorrow.

4. Identify foreign keys

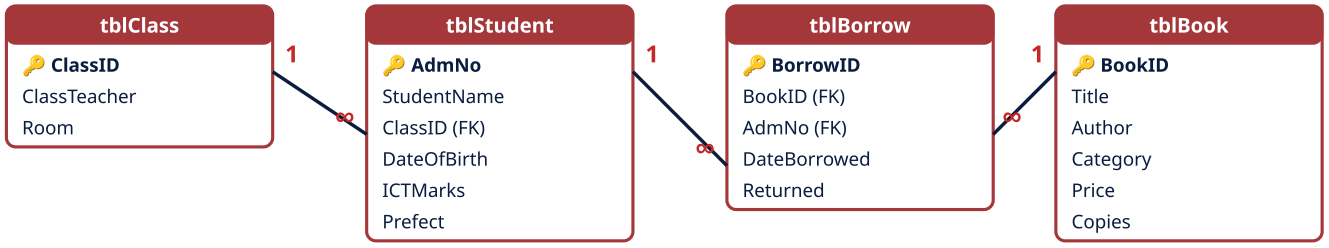
Foreign key	In table	Refers to PK of
ClassID	tblStudent	tblClass.ClassID
BookID	tblBorrow	tblBook.BookID
AdmNo	tblBorrow	tblStudent.AdmNo

> 💡 A foreign key must have the **same data type and size** as the primary key it refers to (ClassID Short Text 3 ↔ ClassID Short Text 3). An **AutoNumber** PK is matched by a **Number (Long Integer)** FK.

5. Create relationships

- Close all tables. Access: **Database Tools › Relationships**. Base: **Tools › Relationships**.
- **Add** (Show Table) tblClass, tblStudent, tblBook and tblBorrow.
- **Drag** the PK (tblClass.ClassID) onto the FK (tblStudent.ClassID).
- In Edit Relationships tick **Enforce Referential Integrity** › **Create**. The line shows **1** and **∞**.
- Repeat for BookID and AdmNo into tblBorrow – 3 relationships in total. Save the layout.

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1 = one side (primary key) ∞ = many side (foreign key) – Enforce Referential Integrity is ticked

One class has many students · one student has many loans · one book has many loans

Figure 9.6: The finished Relationships window with referential integrity enforced (1 – ∞).

Enforce Referential Integrity
Stops FK values with no matching PK, and stops deleting a class that still has students.

Cascade Update
If a PK value changes (10A → 10-A), all matching FKs change too.

Cascade Delete
Deleting a PK record also deletes its related records – use carefully!

Enter data in order
Fill the '1' tables first (tblClass, tblBook), then tblStudent, then tblBorrow.

NEW 2026 **2026: back up and protect the file.** Access: **File › Save As › Back Up Database** (SchoolDB_2026-11-03.accdb); **File › Info › Encrypt with Password**. Base: copy the .odb file to a USB drive or cloud. Keep one backup **off-site**. Cloud alternatives such as **Airtable** or **Firebase** keep version history automatically but still need strong passwords (PDPA 2022).

Key Words

Blank database – Access option to start a new empty database file.

.accdb – File extension of an MS Access database.

.odb – File extension of a LibreOffice Base database.

Design View – View for defining fields, data types and properties.

Datasheet View – View that shows records in rows and columns.

Field Properties – Settings of a field: size, format, validation rule…

Validation Rule – A condition data must meet, e.g. Between 0 And 100.

Relationships window – Where tables are joined by dragging PK to FK.

Enforce Referential Integrity – Option that makes every FK match a PK.

Cascade Update – Changing a PK updates matching FKs.

Cascade Delete – Deleting a PK record deletes related records.

Navigation Pane – Access panel listing tables, queries, forms and reports.

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Sample Q&A

1. How do you create a new database in Access?

> **Answer:** File › New › Blank database, type a name, Create.

2. How is a primary key set?

> **Answer:** Select the field in Design View and click Primary Key (key icon).

3. How do you open the Relationships window?

> **Answer:** Access: Database Tools › Relationships; Base: Tools › Relationships.

4. What does Enforce Referential Integrity do?

> **Answer:** Rejects FK values that do not match a PK and stops deleting PK records that have related records.

5. Which tables should be filled first?

> **Answer:** The 'one' side tables – tblClass and tblBook – then tblStudent, then tblBorrow.

6. What data type must an FK have when the PK is AutoNumber?

> **Answer:** Number (Long Integer).

MCQ

1. The file extension of an MS Access database is...

A. .pptx
B. .xlsx
C. .odb
D. .accdb

2. The file extension of a LibreOffice Base database is...

A. .ods
B. .odt
C. .odb
D. .accdb

3. Field names and data types are defined in...

A. Design View
B. Datasheet View
C. Form View
D. Print Preview

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4. Records are typed in a table in…

A. Design View
B. Datasheet View
C. Report Design
D. Relationships window

5. In Access, the Relationships window is on the… tab.

A. Database Tools
B. Home
C. External Data
D. Create

6. To create a relationship you drag…

A. a form onto a report
B. a table onto the Recycle Bin
C. the PK onto the matching FK
D. any two fields

7. The option that stops a loan for a book that does not exist is…

A. Cascade Delete
B. Field Size
C. Enforce Referential Integrity
D. Caption

8. With referential integrity, deleting class 10A that still has students is…

A. allowed
B. turned into a query
C. saved twice
D. refused

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

A. >100
B. <>0
C. Between 0 And 100
D. Like "0*"

10. BorrowID is AutoNumber. A FK that refers to it should be…

A. Number (Long Integer)
B. Yes/No
C. Short Text
D. AutoNumber

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11. In the school database, how many relationships are created?

A. 2
B. 3
C. 4
D. 6

12. Which table should be filled before tblStudent?

A. tblBorrow
B. tblClass
C. No table
D. rptMarks

13. 'Cascade Delete Related Records' means deleting a class also…

A. deletes its students
B. adds a backup
C. changes the PK type
D. prints a report

14. In Access, a primary key field automatically gets…

A. Format: Currency
B. Field size 1
C. Data type: Yes/No
D. Indexed: Yes (No Duplicates)

15. A safe habit for a school database file is to…

A. email it to everyone
B. back it up regularly and keep a copy off-site
C. never close it
D. remove the password

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Structured Questions

1. List the steps to create tblStudent with AdmNo as the primary key in MS Access. (4 marks) *(4 marks)*

Create › Table Design; type field names and choose data types/field sizes; select AdmNo › Primary Key; save as tblStudent (then Datasheet View to enter data).

tblStudent – Design View (MS Access)

Table Design: 🔑 Primary Key Builder Test Validation Rules Insert Rows Delete Rows

	Field Name	Data Type	Description (optional)
🔑	AdmNo	Number	Admission number (primary key)
	StudentName	Short Text	Full name
	ClassID	Short Text	Class (foreign key → tblClass)
	DateOfBirth	Date/Time	Date of birth
	ICTMarks	Number	Term test mark out of 100
	Prefect	Yes/No	Is the student a prefect?

Field Properties – StudentName (General tab)

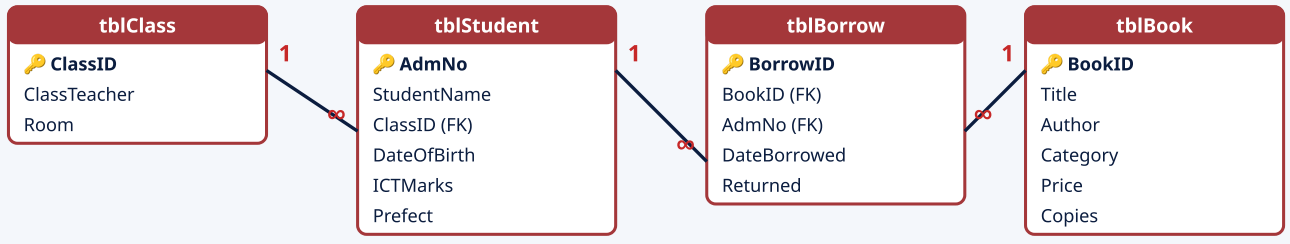
Field Size	40	Caption	Student name
Format		Default Value	
Input Mask		Validation Rule	

Required: Yes · Indexed: Yes (No Duplicates) for the primary key

Model answer

2. Explain how to create the relationship between tblClass and tblStudent with referential integrity. (4 marks) *(4 marks)*

Database Tools › Relationships; add both tables; drag tblClass.ClassID onto tblStudent.ClassID; tick Enforce Referential Integrity › Create (1–∞ line appears).



1 = one side (primary key) ∞ = many side (foreign key) – Enforce Referential Integrity is ticked

One class has many students · one student has many loans · one book has many loans

Model answer

3. (i) What is a validation rule? (1 mark)
(ii) Write one for ICTMarks. (1 mark) *(2 marks)*

(i) A condition that entered data must satisfy. (ii) Between 0 And 100 (or >=0 And <=100).

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4. Give two effects of ticking Enforce Referential Integrity. (2 marks) *(2 marks)*

> A FK value with no matching PK is refused; a PK record with related records cannot be deleted (unless Cascade Delete).

5. Compare MS Access and LibreOffice Base: give the file extension of each and one similarity. (3 marks) *(3 marks)*

> Access – .accdb; Base – .odb (free, open source). Both have tables, queries, forms, reports, Design View and a Relationships window.

Summary

- Access: Blank database → .accdb; Base: Wizard → .odb.
- Design View: field names, data types, properties.
- Datasheet View: type and view records.
- Primary Key button sets the unique field.
- FK has the same type/size as its PK.
- Relationships window: drag PK onto FK.
- Tick Enforce Referential Integrity (1–∞).
- Back up and password-protect the database.

MCQ answer key – 9.5

1. **D** – Access.
2. **C** – Base.
3. **A** – Design View.
4. **B** – Datasheet.
5. **A** – Database Tools.
6. **C** – PK → FK.
7. **C** – Integrity.
8. **D** – Protects data.
9. **C** – Between.
10. **A** – Long Integer.
11. **B** – Class–Student, Book–Borrow, Student–Borrow.
12. **B** – One side first.
13. **A** – Careful!
14. **D** – No duplicates.
15. **B** – Backup.

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G.C.E. O/L Grade 10 ICT · Lesson 9

9.6 Database Forms: Design, Properties and Controls

Typing into a datasheet with many columns is tiring and easy to get wrong. A **form** shows **one record at a time** in a neat layout, with labels, text boxes and buttons, so anyone – the librarian, a class teacher – can **enter, view, update and delete** data easily. In this note you will create forms with the **Form Wizard** and **Design View**, set **form properties** and add **controls** and **buttons**.

1. What is a form?

A form is a **user-friendly screen** linked (bound) to a table or query. Changes made in a form are **saved in the table** – the form itself stores no data. Forms make entry faster and safer, can hide fields users should not change, and can look like the paper card the staff already know.

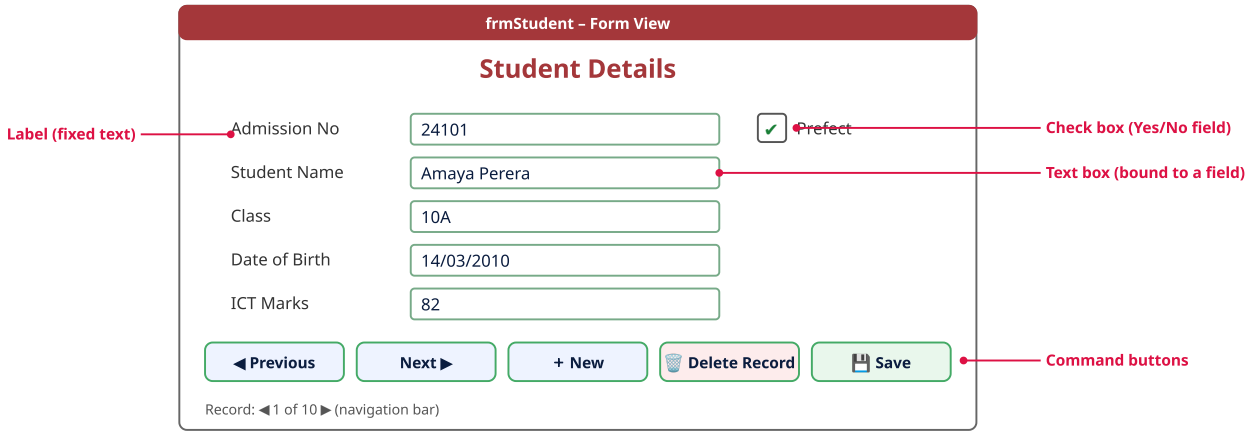


Figure 9.7: A student form (frmStudent) with labels, text boxes, a check box and command buttons.

2. Creating a form

Method	MS Access	LibreOffice Base
Quick form	Select tblStudent › **Create › Form**	–
Form Wizard	**Create › Form Wizard** › choose table and fields › layout (Columnar, Tabular, Datasheet, Justified) › title › Finish	**Forms › Use Wizard to Create Form** › fields › arrangement › name › Finish
Design View	**Create › Form Design** › Property Sheet › Record Source = tblStudent › Add Existing Fields	**Forms › Create Form in Design View** › Form Properties › Data › Content

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3. Controls on a form

Label
Fixed text such as a title 'Student Details' or 'Admission No'. Not linked to data.

Text box
Shows and edits the value of a field (a **bound** control).

Check box
For a Yes/No field such as Prefect.

Combo box / List box
Choose a value from a list, e.g. ClassID from tblClass – prevents wrong classes.

Command button
Runs an action: **Next Record, Previous Record, Add (New) Record, Delete Record, Save Record, Close Form**. Access uses the **Command Button Wizard** (Record Navigation / Record Operations).

Image / logo
The school crest in the form header.

4. Form properties

Property (Property Sheet)	Use
Record Source	The table or query the form is bound to
Caption	Text on the form's title bar
Default View	Single Form, Continuous Forms or Datasheet
Allow Edits / Allow Deletions / Allow Additions	Yes/No – control what users may change
Navigation Buttons	Show or hide the record navigation bar
Back Color, Font, Picture	Appearance of the form and controls

5. Viewing and updating data

- Open in **Form View**; use **Next ▶ / ◀ Previous** or the navigation bar 'Record 1 of 10'.
- **Update**: click in a text box, change the value (e.g. ICTMarks 64 → 68); it is saved when you move to another record.
- **Add**: click **New** – a blank record appears.
- **Delete**: go to the record › **Delete Record** › confirm. Deleting cannot be undone!
- **Find** (Ctrl+F) searches for a value, e.g. a student's name.

> 💡 Use **Layout View** (Access) to resize controls while seeing real data; use **Design View** for full control of sections (Form Header, Detail, Form Footer).

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NEW 2026 **2026: online forms feed databases. Google Forms** (responses go into a Google Sheet), **Microsoft Forms** and **Airtable** forms let parents or students submit data from a phone – used for sports meet entries or school admission enquiries. Ask only for needed data, explain why it is collected (PDPA 2022), and never collect passwords or full bank details.

Key Words

Form – A screen to enter, view and edit one record at a time.	**Form Wizard** – Step-by-step tool that builds a form.
Form View – View used to work with data in a form.	**Control** – Any object on a form: label, text box, button...
Label – A control showing fixed text.	**Text box** – A control showing a field's value.
Bound control – A control linked to a field.	**Command button** – A button that runs an action, e.g. Next Record.
Combo box – Drop-down list to pick a value.	**Record Source** – Property naming the table/query behind a form.
Property Sheet – Panel to set properties of the form and controls.	**Navigation bar** – Bar to move between records: Record 1 of 10.

Sample Q&A

1. What is a form?

> **Answer:** A screen bound to a table/query for entering, viewing and editing records one at a time.

2. Where is data typed in a form stored?

> **Answer:** In the table the form is bound to.

3. Distinguish a label and a text box.

> **Answer:** A label shows fixed text; a text box shows/edits a field value.

4. Name three command buttons.

> **Answer:** Next Record, Previous Record, Delete Record (also New, Save, Close).

5. Which property links a form to tblStudent?

> **Answer:** Record Source.

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6. Give two advantages of a form over a datasheet.

> **Answer:** Shows one record clearly; easier and safer entry; can hide fields; buttons and combo boxes.

MCQ

1. A database object that shows one record at a time for entering data is a...

A. Relationship
B. Query
C. Report
D. Form

2. Data typed into a form is saved in...

A. a report
B. the table it is bound to
C. the form only
D. the Recycle Bin

3. The fixed text 'Student Details' on a form is a...

A. Text box
B. Combo box
C. Label
D. Check box

4. The control that shows a student's name from the table is a...

A. Text box
B. Label
C. Image
D. Line

5. A Yes/No field such as Prefect is best shown with a...

A. Text box size 255
B. Check box
C. Label
D. Image

6. To choose ClassID from a drop-down list, use a...

A. Label
B. Line
C. Combo box
D. Page break

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7. The button that shows the record after the current one is…

A. Next Record
B. Close Form
C. Delete Record
D. Previous Record

8. The Command Button Wizard category containing 'Delete Record' is…

A. Form Operations
B. Record Operations
C. Report Operations
D. Record Navigation

9. In Access, the Form Wizard is on the… tab.

A. Create
B. Database Tools
C. File
D. Home

10. The form property that names the table behind it is…

A. Default View
B. Back Color
C. Record Source
D. Caption

11. The text on a form's title bar is set by…

A. Validation Rule
B. Record Source
C. Field Size
D. Caption

12. frmStudent shows 'Record: 1 of 10'. This means the table has…

A. 10 forms
B. 10 fields
C. 10 records
D. 1 record

13. Setting 'Allow Deletions' to No on a form…

A. hides the title
B. stops users deleting records from the form
C. adds a backup
D. deletes all records

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14. In LibreOffice Base, a form is created with…

A. Create › Form Wizard
B. Insert › Chart
C. Format › Columns
D. Use Wizard to Create Form

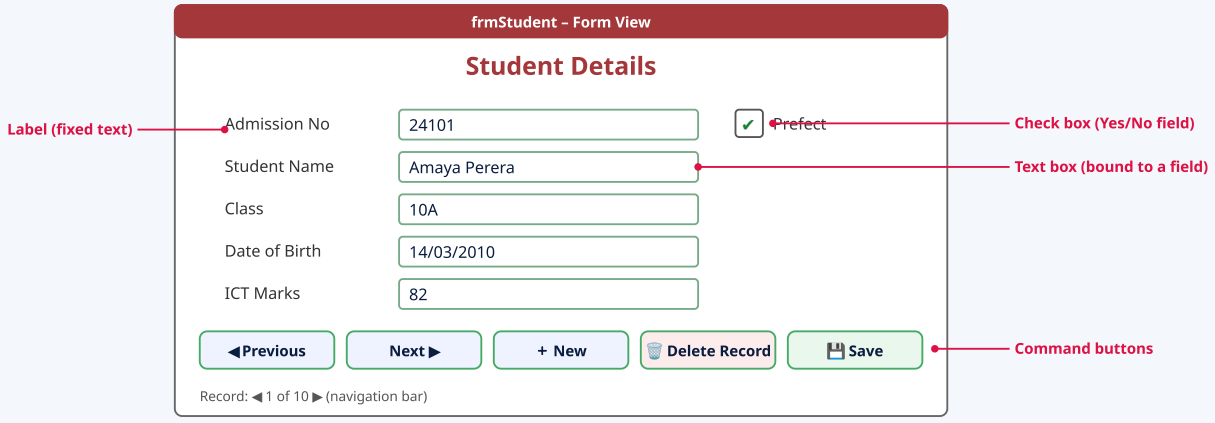
15. A Google Form for sports meet entries should…

A. ask only for needed data
B. ask for bank PINs
C. be public with all answers
D. ask for passwords

Structured Questions

1. Using Figure 9.7, name four types of controls on the form and the purpose of each. (4 marks) *(4 marks)*

> Label – fixed text (Admission No); text box – shows/edits a field (24101); check box – Yes/No field (Prefect); command button – runs an action (Next, Delete Record).



Model answer

2. List the steps to create a form for tblBook using the Form Wizard. (3 marks) *(3 marks)*

> Create › Form Wizard; select tblBook and move the fields across; choose a layout (Columnar); give a title (frmBook) › Finish.

3. Explain how to change Kavindu Silva's ICT mark from 64 to 68 using frmStudent. (2 marks) *(2 marks)*

> Find the record (Next or Ctrl+F 'Kavindu'), click in the ICTMarks text box, type 68 and move to another record (or Save) – the table is updated.

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4. Give three form properties and what each controls. (3 marks) *(3 marks)*

> Record Source – table/query; Caption – title bar text; Default View – single/continuous; Allow Edits/Deletions/Additions; Navigation Buttons; Back Color.

5. Give two advantages of using a form instead of the datasheet for data entry by a librarian. (2 marks) *(2 marks)*

> One record clearly at a time; combo boxes/buttons reduce errors; can hide or lock fields; looks like the familiar card.

Summary

- Form = one record at a time; data saved in the table.
- Create: Form, Form Wizard, Form Design.
- Label = fixed text; text box = field value.
- Check box for Yes/No; combo box for a list.
- Buttons: Next, Previous, New, Delete Record, Save.
- Properties: Record Source, Caption, Allow Edits.
- Form View to view/update; deletion cannot be undone.
- 2026: Google/Microsoft Forms; collect only needed data.

MCQ answer key – 9.6

1. **D** – Form.
2. **B** – Tables store data.
3. **C** – Label.
4. **A** – Bound text box.
5. **B** – Tick.
6. **C** – Combo.
7. **A** – Next.
8. **B** – Record Operations.
9. **A** – Create.
10. **C** – Record Source.
11. **D** – Caption.
12. **C** – Records.
13. **B** – Protection.
14. **D** – Base wording.
15. **A** – PDPA.

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G.C.E. O/L Grade 10 ICT · Lesson 9

9.7 Database Queries: Criteria and Sorting

A **query** asks the database a question, such as 'Which students scored 75 or more in ICT?' and shows only the matching records, in the order you want. In this note you will build queries in **Query Design** (no code needed) by choosing **fields**, typing **criteria** with = > < >= <= <>, **Like**, **Between**, **And/Or**, and **sorting** ascending or descending. Every result below comes from our school database.

1. Creating a query in Design View

- Access: **Create › Query Design** › add **tblStudent**. Base: **Queries › Create Query in Design View**.
- **Double-click** (or drag) fields into the grid: AdmNo, StudentName, ICTMarks.
- Type the condition in the **Criteria** row; choose **Sort**; tick/untick **Show**.
- Click **Run (!)** to see the result in Datasheet View; save as **qryHighICT**.

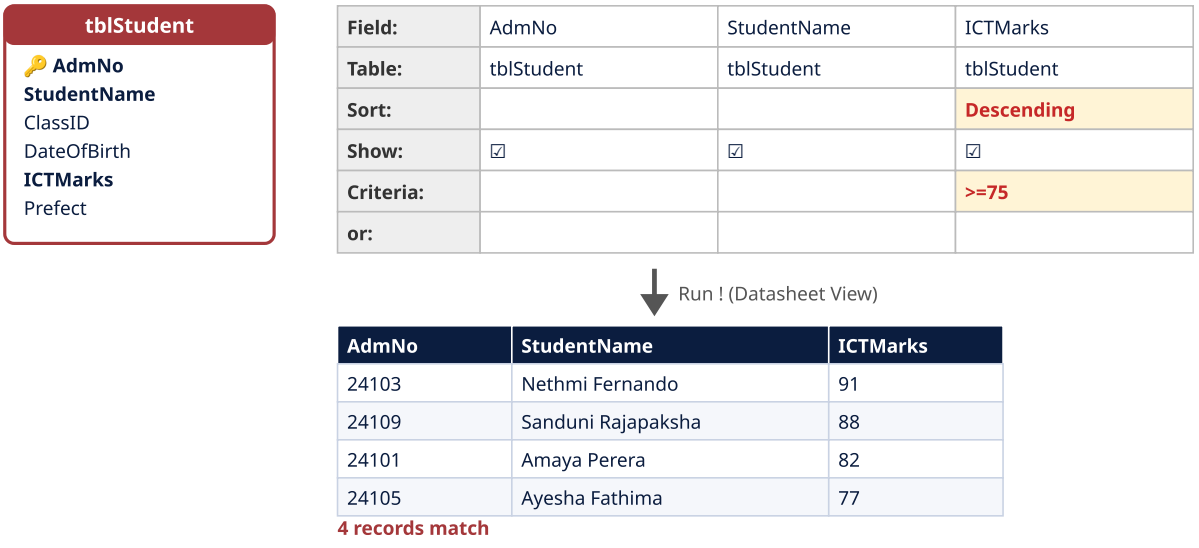


Figure 9.8: Query Design grid for qryHighICT (ICTMarks >= 75, sorted Descending) and its result.

Grid row	Meaning
Field	The field to use
Table	Table it comes from
Sort	Ascending (A→Z, 0→9) / Descending (Z→A, 9→0)
Show	Tick to display the field in the result
Criteria	Condition records must meet
or	An alternative condition (OR)

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2. Comparison operators

Operator	Meaning	Example
=	equal to	"10A" (text in quotes)
>	greater than	>70
<	less than	<50
>=	greater than or equal	>=75
<=	less than or equal	<=1000
<>	not equal	<>"Novel"

Query qryHighICT – criteria ICTMarks >=75, sorted Descending: **4** students.

AdmNo	StudentName	ICTMarks
24103	Nethmi Fernando	91
24109	Sanduni Rajapaksha	88
24101	Amaya Perera	82
24105	Ayesha Fathima	77

Query qry10A – criteria ClassID "10A", sorted by StudentName Ascending: **4** students (Amaya Perera, Arun Kumar, Kavindu Silva, Sanduni Rajapaksha).

StudentName	ClassID	ICTMarks
Amaya Perera	10A	82
Arun Kumar	10A	55
Kavindu Silva	10A	64
Sanduni Rajapaksha	10A	88

Query qryFail – ICTMarks <50, sorted Ascending: Tharindu Bandara, Ashen Jayasinghe.

StudentName	ICTMarks
Tharindu Bandara	39
Ashen Jayasinghe	48

Text and dates: text goes in quotes ("10A"); Access dates go between # (<#2010-06-01#). Query qryBorn finds 4 students born before 1 June 2010.

StudentName	DateOfBirth

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Nethmi Fernando	25/01/2010
Dilini Wickramasinghe	11/02/2010
Amaya Perera	14/03/2010
Ayesha Fathima	30/05/2010

3. Like and Between

Like "A*" finds names starting with A (* = any characters, ? = one character). Result (4): Amaya Perera, Arun Kumar, Ashen Jayasinghe, Ayesha Fathima.

AdmNo	StudentName
24101	Amaya Perera
24106	Arun Kumar
24104	Ashen Jayasinghe
24105	Ayesha Fathima

Between 600 And 1000 on Price includes both ends (600 and 1000). 4 books, sorted by Price Ascending:

BookID	Title	Price
B005	Amba Yaluwo	600
B001	Madol Doova	750
B002	Gamperaliya	950
B008	Atlas of Asia	990

4. And / Or

AND – same Criteria row
Both must be true: ClassID "10B" AND ICTMarks >70 → Nethmi Fernando, Ayesha Fathima (2).

OR – different rows
Either may be true: ClassID "10C" on Criteria, Prefect Yes on the 'or' row → 5 students.

StudentName	ClassID	ICTMarks
Nethmi Fernando	10B	91
Ayesha Fathima	10B	77

StudentName	ClassID	Prefect
Amaya Perera	10A	Yes
Ashen Jayasinghe	10C	No

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Dilini Wickramasinghe	10C	Yes
Malith Herath	10C	No
Nethmi Fernando	10B	Yes

Not equal: Category <>"Novel" gives 5 books.

Title	Category
Atlas of Asia	Reference
Birds of Sri Lanka	Science
Python for Beginners	Computing
Sri Lanka School Atlas	Reference
The Story of Sigiriya	History

Yes/No criteria: Returned = No lists the books not yet returned (4 loans).

BorrowID	BookID	AdmNo
2	B005	24103
3	B004	24101
5	B001	24105
6	B006	24109

> 💡 AND makes a result **smaller** (both conditions); OR makes it **larger** (either condition). Always check the result count!

5. Extra (not required for O/L): SQL SELECT

Behind every Query Design is **SQL** (Structured Query Language). In Access click **View › SQL View** to see it:

SQL (extra)	Meaning
SELECT AdmNo, StudentName, ICTMarks	fields to show
FROM tblStudent	the table
WHERE ICTMarks >= 75	criteria
ORDER BY ICTMarks DESC;	sort (ASC/DESC)

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NEW 2026 **2026: ask the data in plain words – then check.** Google Sheets, Airtable and Access add-ins with **AI assistants** can turn ‘show 10B students above 70’ into a query or SQL. AI can misread a condition (> vs >=), so open the **Design grid**, check the criteria and the **record count** yourself. Sri Lankan systems like **e-channelling** run millions of such queries daily (doctor = X AND date = today).

Key Words

Query – A question that selects records and fields from tables.	**Query Design** – Grid view to build a query without code.
Criteria – Conditions that records must meet.	**Run (!)** – Button that executes the query.
Ascending – Sort A→Z, smallest→largest, oldest→newest.	**Descending** – Sort Z→A, largest→smallest.
Show – Grid tick box: display the field in the result.	**Like** – Pattern match with wildcards * and ?.
Between ... And ... – Range including both ends.	**AND** – Both conditions true – same Criteria row.
OR – Either condition true – different rows.	**SQL** – Structured Query Language behind queries (extra).

Sample Q&A

1. What is a query?

> **Answer:** A request that selects specific fields and records from tables, optionally sorted.

2. Write criteria for ICT marks 75 or more.

> **Answer:** >=75

3. Write criteria for names starting with A.

> **Answer:** Like "A*"

4. How is AND entered in the grid?

> **Answer:** Both conditions on the same Criteria row.

5. How is OR entered?

> **Answer:** Conditions on different rows (Criteria and 'or').

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6. What does unticking Show do?

> **Answer:** The field is used for criteria/sort but not displayed.

MCQ

1. A query that lists ICTMarks >= 75 from tblStudent returns how many records?

A. 4
B. 10
C. 3
D. 5

2. In qryHighICT sorted Descending, the first student is...

A. Tharindu Bandara
B. Ayesha Fathima
C. Sanduni Rajapaksha
D. Nethmi Fernando

3. Criteria for marks less than 50 is...

A. <>50
B. <50
C. <=50
D. >50

4. qryFail (ICTMarks <50, Ascending) lists...

A. Tharindu Bandara, Ashen Jayasinghe, Arun Kumar
B. Tharindu Bandara
C. Tharindu Bandara, Ashen Jayasinghe
D. Ashen Jayasinghe, Tharindu Bandara

5. The operator meaning 'not equal to' is...

A. <>
B. !=
C. ><
D. =<

6. Like "A*" on StudentName returns how many students?

A. 1
B. 4
C. 5
D. 3

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7. In Like, the wildcard for any number of characters is…

A. ?
B. &
C. *
D. #

8. Price Between 600 And 1000 – is a book of Rs. 600 included?

A. Only if sorted
B. No
C. Only in SQL
D. Yes – both ends are included

9. ClassID "10B" AND ICTMarks >70 gives…

A. Nethmi Fernando, Ayesha Fathima
B. Nethmi Fernando
C. Tharindu Bandara
D. Nethmi Fernando, Ayesha Fathima, Tharindu Bandara

10. To combine conditions with AND in Query Design, type them…

A. on the same Criteria row
B. on different rows
C. in the Sort row
D. in the Table row

11. ClassID "10C" OR Prefect = Yes returns how many students?

A. 2
B. 7
C. 5
D. 3

12. Sorting names Z → A is…

A. Grouping
B. Filtering by form
C. Descending
D. Ascending

13. To use a field for criteria but hide it from the result, you…

A. set it as PK
B. untick Show
C. delete the field
D. sort it

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14. Returned = No on tblBorrow lists how many loans?

A. 0
B. 7
C. 3
D. 4

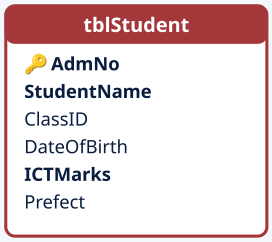
15. (SQL extra) In SELECT … FROM tblStudent WHERE ICTMarks >= 75 ORDER BY ICTMarks DESC, the criteria part is…

A. ORDER BY ICTMarks DESC
B. WHERE ICTMarks >= 75
C. SELECT AdmNo
D. FROM tblStudent

Structured Questions

1. Using the query grid in Figure 9.8: (i) name the table, (ii) give the criteria, (iii) state the sort order, (iv) write the result. (4 marks) *(4 marks)*

(i) tblStudent (ii) ICTMarks >=75 (iii) ICTMarks Descending (iv) Nethmi Fernando, Sanduni Rajapaksha, Amaya Perera, Ayesha Fathima.



Field:	AdmNo	StudentName	ICTMarks
Table:	tblStudent	tblStudent	tblStudent
Sort:			Descending
Show:	☑	☑	☑
Criteria:			>=75
or:			

Run ! (Datasheet View)

AdmNo	StudentName	ICTMarks
24103	Nethmi Fernando	91
24109	Sanduni Rajapaksha	88
24101	Amaya Perera	82
24105	Ayesha Fathima	77

4 records match

Model answer

2. Write the criteria for: (i) class 10A, (ii) names beginning with A, (iii) price from 600 to 1000, (iv) category not Novel. (4 marks) *(4 marks)*

(i) "10A" (ii) Like "A*" (iii) Between 600 And 1000 (iv) <>"Novel"

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3. Find the 10B students with ICTMarks >70. Show how AND is entered and give the result. (3 marks) *(3 marks)*

> ClassID criteria "10B" and ICTMarks criteria >70 on the same row. Result: Nethmi Fernando, Ayesha Fathima.

4. Explain the difference between AND and OR criteria with an example. (2 marks) *(2 marks)*

> AND – both true, same row (10B AND >70 → 2); OR – either true, different rows (10C OR Prefect → 5).

5. List the students with ICTMarks <50 sorted Ascending, and suggest one use of this query for the teacher. (2 marks) *(2 marks)*

> Tharindu Bandara, Ashen Jayasinghe; to arrange extra classes for them.

Summary

- A query selects fields and records; Run (!) shows the result.
- Grid rows: Field, Table, Sort, Show, Criteria, or.
- Operators: = > < >= <= <>.
- Text in quotes "10A"; dates in #...#.
- Like "A*": * any characters, ? one.
- Between 600 And 1000 includes both ends.
- AND same row (fewer); OR different rows (more).
- Sort Ascending/Descending; SQL SELECT is behind it (extra).

MCQ answer key – 9.7

1. **A** – Nethmi Fernando, Sanduni Rajapaksha, Amaya Perera, Ayesha Fathima.
2. **D** – Highest first.
3. **B** – Less than.
4. **C** – Ascending: lowest first.
5. **A** – Access uses <>.
6. **B** – Amaya Perera, Arun Kumar, Ashen Jayasinghe, Ayesha Fathima
7. **C** – Star.
8. **D** – Amba Yaluwo Rs. 600 is in the result.
9. **A** – Tharindu has 39.
10. **A** – Same row.
11. **C** – Amaya Perera, Ashen Jayasinghe, Dilini Wickramasinghe, Malith Herath, Nethmi Fernando
12. **C** – Descending.
13. **B** – Show box.
14. **D** – Not yet returned.
15. **B** – WHERE.

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9.8 Database Reports: Report Wizard, Grouping and Printing

A **report** presents data from a table or query in a **formatted, printable** layout – a class mark list, a list of overdue library books, or a sports-meet results sheet. Reports can **group** records (by class), **sort** them (by name) and calculate **totals and averages**. In this note you will create reports with the **Report Wizard**, add grouping and sorting, check **Print Preview** and **print**.

1. Form vs report

Form	Report
On screen, for entering and editing	Mainly for printing and presenting
Usually one record at a time	Many records, grouped and summarised
Data can be changed	Data is read-only

2. Report Wizard

- Access: **Create › Report Wizard**. Base: **Reports › Use Wizard to Create Report**.
- **Step 1 – fields**: choose tblStudent (or a query) and move ClassID, AdmNo, StudentName, ICTMarks.
- **Step 2 – grouping**: add a group level on **ClassID**.
- **Step 3 – sorting**: sort by **StudentName Ascending**; **Summary Options** › tick **Avg** for ICTMarks.
- **Step 4 – layout**: Stepped / Block / Outline, Portrait or Landscape.
- **Step 5 – title**: 'ICT Marks by Class – Term 2, 2026' › Finish (opens in Print Preview).

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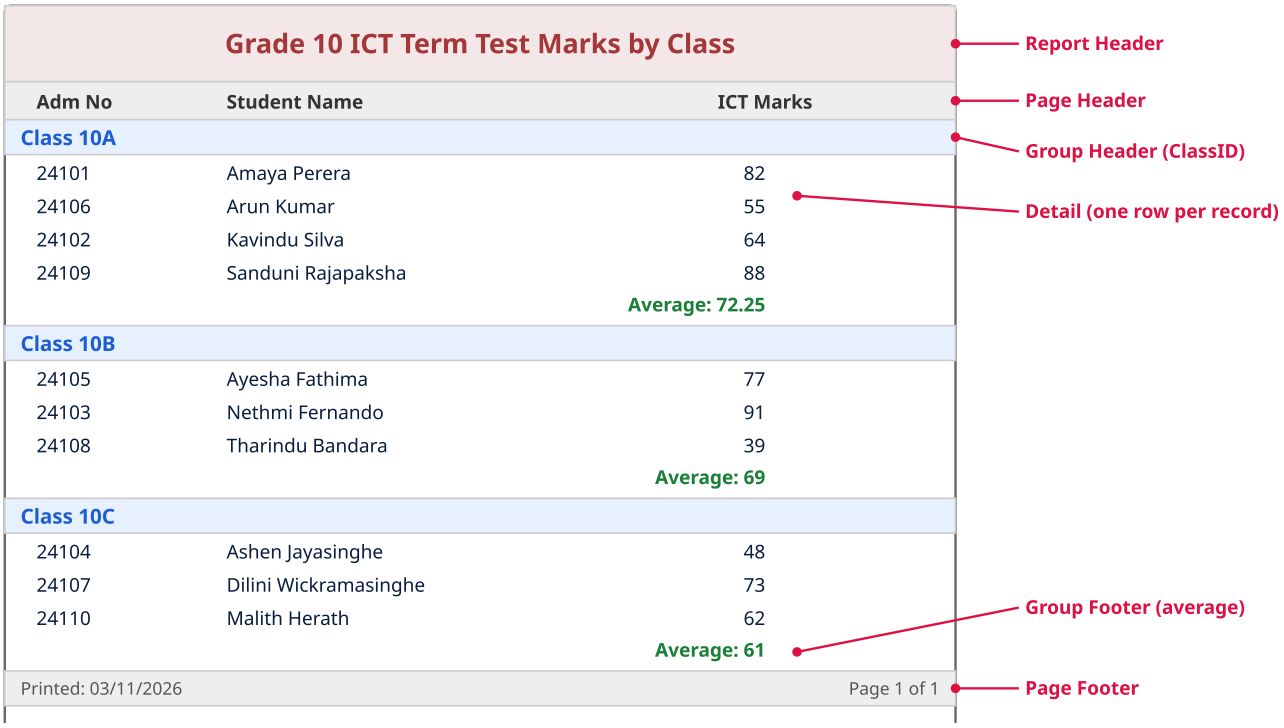


Figure 9.9: Report grouped by ClassID, sorted by StudentName, with the class average in each group footer.

3. Report sections

Report Header
Once at the start: school name, crest, title.

Page Header
Top of every page: column headings.

Group Header
Start of each group: 'ClassID 10A'.

Detail
One line per record.

Group Footer
End of a group: =Avg([ICTMarks]), =Count(*).

Page / Report Footer
Page numbers, date (=Now()); grand totals at the end.

4. The result

ClassID (group)	Students	First name (sorted A→Z)	Average ICT
10A	4	Amaya Perera	72.25
10B	3	Ayesha Fathima	69
10C	3	Ashen Jayasinghe	61

💡 A report always shows the **current** data: if Kavindu's mark is changed in the form, re-open the report and the 10A average changes. Base a report on a **query** to print only some records (e.g. Returned = No for an overdue list).

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5. Print Preview and printing

- **Print Preview** shows exactly how pages will print – zoom, one/two pages, next page.
- **Page Setup**: margins, Portrait/Landscape, paper size (A4).
- Fix columns cut off at the edge in **Layout/Design View** before printing.
- **Print** (Ctrl+P): choose printer, pages and copies. Or **Export › PDF** to share electronically.

> NEW 2026 **2026: dashboards and responsible sharing.** Schools now use **Looker Studio** (with Google Sheets) or Airtable interfaces as live, auto-updating reports. A marks report contains **personal data** – under **PDPA 2022** share it only with the class teacher and parents concerned, do not post it in a public WhatsApp group, and remove NIC/phone numbers that are not needed. AI tools can summarise a report, but a teacher must check the numbers.

Key Words

Report – Formatted, printable output of table or query data.	**Report Wizard** – Step-by-step tool that builds a report.
Grouping – Collecting records with the same value, e.g. ClassID.	**Sorting** – Arranging records in order within a report.
Summary Options – Wizard option for Sum, Avg, Min, Max.	**Report Header** – Section printed once at the start.
Page Header – Section at the top of every page.	**Detail** – Section printed once for each record.
Group Footer – Section at the end of each group, for subtotals.	**Print Preview** – Shows how the report will look on paper.
Page Setup – Margins, orientation and paper size.	**Layout** – Arrangement: Stepped, Block, Outline.

Sample Q&A

1. What is a report?

> **Answer:** A formatted, printable presentation of data from a table or query.

2. Give one difference between a form and a report.

> **Answer:** A form is for entering/editing on screen; a report is read-only for printing.

3. Where is the class average shown?

> **Answer:** In the Group Footer (=Avg([ICTMarks])).

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4. Which section repeats column headings on each page?

> **Answer:** Page Header.

5. Why use Print Preview?

> **Answer:** To check the layout before printing and save paper.

6. How do you print only overdue loans?

> **Answer:** Base the report on a query with Returned = No.

MCQ

1. The database object mainly used to print data is a…

A. Table
B. Relationship
C. Report
D. Form

2. In Access, the Report Wizard is on the… tab.

A. Create
B. Database Tools
C. Review
D. Home

3. In Figure 9.9 the report is grouped by…

A. ICTMarks
B. StudentName
C. AdmNo
D. ClassID

4. Within each class the students are sorted by…

A. DateOfBirth
B. StudentName Ascending
C. ICTMarks Descending
D. AdmNo Descending

5. The average ICT mark of class 10A in the report is…

A. 72
B. 72.25
C. 69
D. 61

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6. The average ICT mark of class 10B is…

A. 69
B. 61
C. 77
D. 72.25

7. The class average is placed in the…

A. Page Header
B. Report Header
C. Group Footer
D. Detail

8. The section printed once for every record is…

A. Report Header
B. Group Footer
C. Page Footer
D. Detail

9. The school name and title printed once at the top is in the…

A. Report Header
B. Group Header
C. Page Footer
D. Detail

10. The Report Wizard option to calculate Avg is…

A. Layout
B. Show Table
C. Page Setup
D. Summary Options

11. How many groups does the report in Figure 9.9 contain?

A. 4
B. 3
C. 10
D. 1

12. The first student listed in group 10C is…

A. Amaya Perera
B. Dilini Wickramasinghe
C. Ashen Jayasinghe
D. Malith Herath

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13. Before printing, the layout should be checked in…

A. Datasheet View
B. Print Preview
C. Relationships window
D. SQL View

14. Margins and Landscape orientation are set in…

A. Form Wizard
B. Query Design
C. Page Setup
D. Field Properties

15. A class marks report should be shared…

A. only with the teacher and parents concerned
B. in a public WhatsApp group
C. on the school Facebook page
D. with NIC numbers added

Structured Questions

1. Using Figure 9.9: (i) which field is used for grouping? (ii) what is the sort order? (iii) give the average of each class. (4 marks) *(4 marks)*

(i) ClassID (ii) StudentName Ascending (iii) 10A – 72.25, 10B – 69, 10C – 61.

Grade 10 ICT Term Test Marks by Class — Report Header

Adm No	Student Name	ICT Marks
Class 10A		— Page Header / Group Header (ClassID)
24101	Amaya Perera	82 — Detail (one row per record)
24106	Arun Kumar	55
24102	Kavindu Silva	64
24109	Sanduni Rajapaksha	88
		Average: 72.25
Class 10B		
24105	Ayesha Fathima	77
24103	Nethmi Fernando	91
24108	Tharindu Bandara	39
		Average: 69
Class 10C		
24104	Ashen Jayasinghe	48
24107	Dilini Wickramasinghe	73
24110	Malith Herath	62
		Average: 61 — Group Footer (average)

Printed: 03/11/2026 Page 1 of 1 — Page Footer

Model answer

2. List the steps of the Report Wizard to create this report. (4 marks) *(4 marks)*

> Create › Report Wizard; select tblStudent fields; group by ClassID; sort by StudentName, Summary Options Avg ICTMarks; choose layout/orientation; title › Finish.

3. Name four report sections and what each contains. (4 marks) *(4 marks)*

> Report Header – title/school name; Page Header – column headings; Group Header – ClassID; Detail – each student; Group Footer – average; Page Footer – page number.

4. Give two differences between a form and a report. (2 marks) *(2 marks)*

> Form – entry/editing on screen, one record; report – printing/presenting, many records grouped and summarised, read-only.

5. The librarian wants a printed list of books not yet returned. Explain how. (2 marks) *(2 marks)*

> Create a query on tblBorrow with Returned = No (4 loans), make a report from it with the Report Wizard, check Print Preview and print.

Summary

- Report = formatted, printable, read-only output.
- Create › Report Wizard (Base: Use Wizard to Create Report).
- Wizard: fields → grouping → sorting/summary → layout → title.
- Group by ClassID; sort by StudentName.
- Sections: Report/Page/Group Header, Detail, Footers.
- Group Footer: =Avg([ICTMarks]) → 72.25, 69, 61.
- Print Preview and Page Setup before printing.
- Share personal data reports responsibly (PDPA 2022).

MCQ answer key – 9.8

1. **C** – Report.
2. **A** – Create.
3. **D** – Group by class.
4. **B** – A→Z.
5. **B** – (82+55+64+88)/4.
6. **A** – (77+91+39)/3.
7. **C** – Group Footer.
8. **D** – Detail.
9. **A** – Report Header.
10. **D** – Summary Options.
11. **B** – Class 11A has no students.

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12. **C** – Alphabetical.
13. **B** – Preview.
14. **C** – Page Setup.
15. **A** – PDPA 2022.

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