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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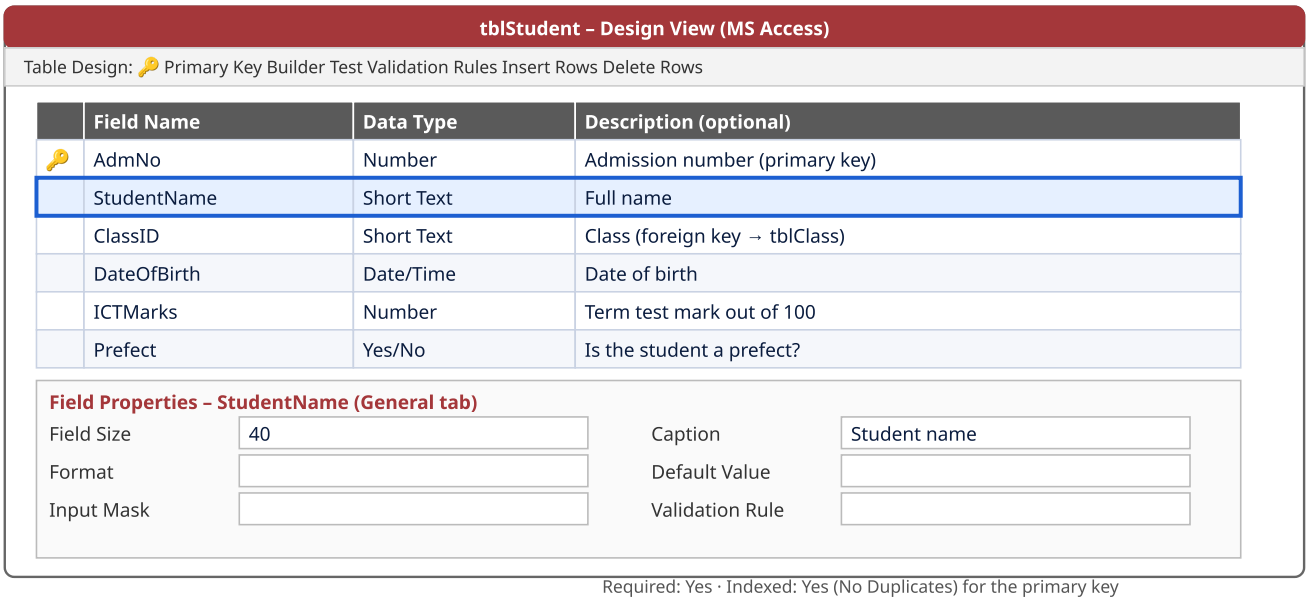


Figure 9.5: tblStudent in Access Design View – field names, data types, the primary key icon and field properties.

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

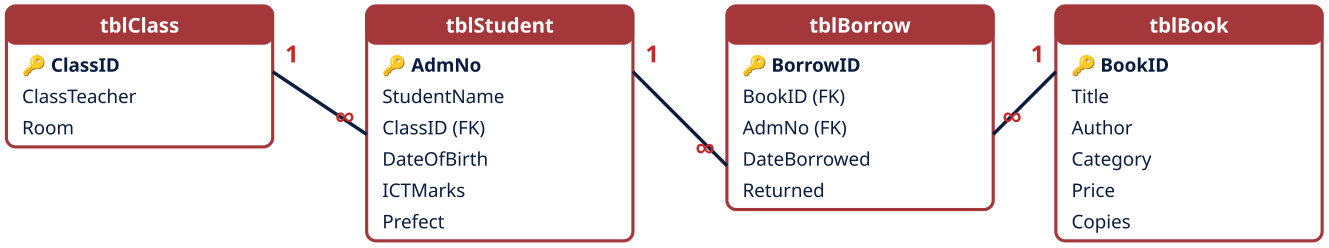
Foreign key	In table	Refers to PK of
ClassID	tblStudent	tblClass.ClassID
BookID	tblBorrow	tblBook.BookID
AdmNo	tblBorrow	tblStudent.AdmNo

> 💡 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)

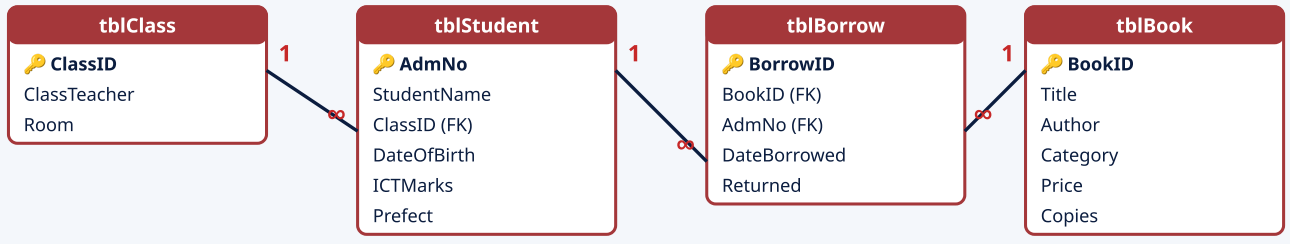
Field Size	40	Caption	Student name
Format		Default Value	
Input Mask		Validation Rule	

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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