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1-Set Null : **SET NULL** in a database is a rule used with **foreign keys**. It tells the database what to do **when a referenced (parent) record is deleted or updated**.

What does SET NULL mean?

When you define a foreign key with **ON DELETE SET NULL** or **ON UPDATE SET NULL**, it means: If the referenced row changes or is deleted, the foreign key value in the child table will be set to **NULL** instead of deleting the child row or blocking the action.

Important rules

1. Foreign key column must allow NULL

- SET NULL does **not delete child rows**
- Used when child data can exist **without** the parent

When should you use SET NULL?

Use **SET NULL** when:

- The child record is still meaningful without the parent
- You want to keep historical data
- You don't want automatic deletion (CASCADE)

Comparison with other options

Rule	Behavior
CASCADE	Deletes or updates child rows
SET NULL	Sets foreign key to NULL
SET DEFAULT	Sets foreign key to a default value
NO ACTION / RESTRICT	Prevents delete/update

2-Set Default: is related to **default values** for columns and **what happens when data is inserted or when a referenced row is deleted/updated**.

1 DEFAULT value for a column:

A **DEFAULT** value is automatically used **when no value is provided** during an INSERT.

2 SET DEFAULT in FOREIGN KEY constraints

SET DEFAULT is used with **ON DELETE** or **ON UPDATE** in **foreign keys**.

Meaning

When the **parent row** is deleted or updated, the **child row's foreign key column is set to its DEFAULT value**, not deleted.

What happens?

- If a **Library** row is deleted
- All related **Books.Library_ID** will be set to **0** (the DEFAULT)

 Important:

- The foreign key column **must have a DEFAULT value**
- That default value **must exist in the parent table** (e.g., Library_ID = 0)

3 Comparison with other options

Option	Meaning
CASCADE	Deletes/updates child rows
SET NULL	Sets foreign key to NULL

SET DEFAULT	Sets foreign key to its DEFAULT value
NO ACTION	Prevents delete/update

4 When to use SET DEFAULT

✓ Use SET DEFAULT when:

- You want to keep child records
- But assign them to a **default or “unknown” parent**
- Example: Unassigned Library, General Department

Simple summary

- **DEFAULT** → automatic value when inserting
- **SET DEFAULT** → assigns default value when parent row is deleted or updated
- Requires a valid default value

If you want, I can also show:

- SET DEFAULT vs SET NULL
- A real **Library Management System** example
- SQL Server–specific behavior

3-No action : In a **database**, **NO ACTION** is a rule used with **foreign key constraints** to control what happens when a related record in a **parent table** is **updated or deleted**

What does NO ACTION mean?

NO ACTION means:

Do nothing automatically, but do not allow the operation if it breaks referential integrity.

So:

- If a **parent row** is being **deleted or updated**
- And there are **related rows in the child table**
- The database will **reject the operation** ❌

Important note (SQL Server)

In **SQL Server**:

- **NO ACTION** and **RESTRICT** behave the **same**
- The check happens **at the end of the statement**

When should you use NO ACTION?

Use **NO ACTION** when:

- You want **manual control**
- You don't want accidental deletes
- You want to **force the user to delete child records first**

4-Cascade: In databases, **CASCADE** is a rule used with **foreign keys** to automatically apply changes from a **parent table** to related records in a **child table**.

It helps maintain **referential integrity**.

What does CASCADE mean?

CASCADE means that when an action happens in the parent table, the **same action is automatically applied** to the related rows in the child table.

Types of CASCADE

1 ON DELETE CASCADE

When a row in the **parent table** is deleted, all related rows in the **child table** are **automatically deleted**.

2 ON UPDATE CASCADE

When the **primary key value** in the parent table is updated, the related **foreign key values** in the child table are **updated automatically**.

Why use CASCADE?

- ✓ Prevents **orphan records**
- ✓ Keeps data **consistent**
- ✓ Reduces manual delete/update work

Option	Meaning
CASCADE	Apply the same action automatically
SET NULL	Set foreign key to NULL
SET DEFAULT	Set foreign key to default value
NO ACTION / RESTRICT	Prevent the action

CASCADE = parent change → child changes automatically