ALRIGHT!

SQL TUTORIAL

PostgreSQL

ZERO TO HERO

Section - 1

- What is database?
- Database vs DBMS
- DBMS vs RDBMS
- Other available databases
- SQL vs PostgreSQL

What is a Database?

What is a Database?

An organised collection of data.
A method to manipulate and access the data.

Unorganized

Organized

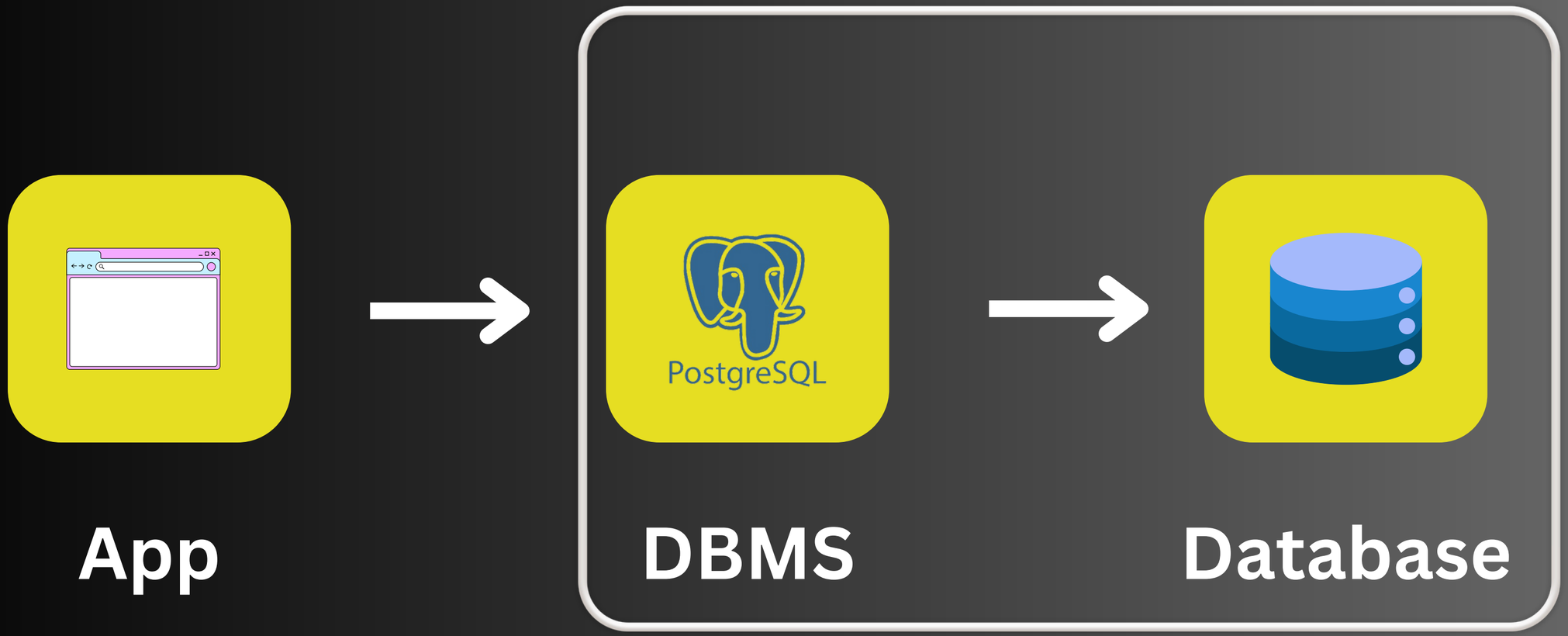
Firstname	Lastname	City	Contact
Paul	Philips	London	39899829
Raju	Sharma	Ranchi	90890288
Keto	Leri	Tokyo	50505005
Sham	Sha	Delhi	602020

Database
vs
DBMS

App

Database

App DBMS Database



PostGresql, MySQL, Oracle etc

What is RDBMS?

What is RDBMS?

A type of database system that stores data in structured tables (using rows and columns) and uses SQL for managing and querying data.

Some Other Databases are:

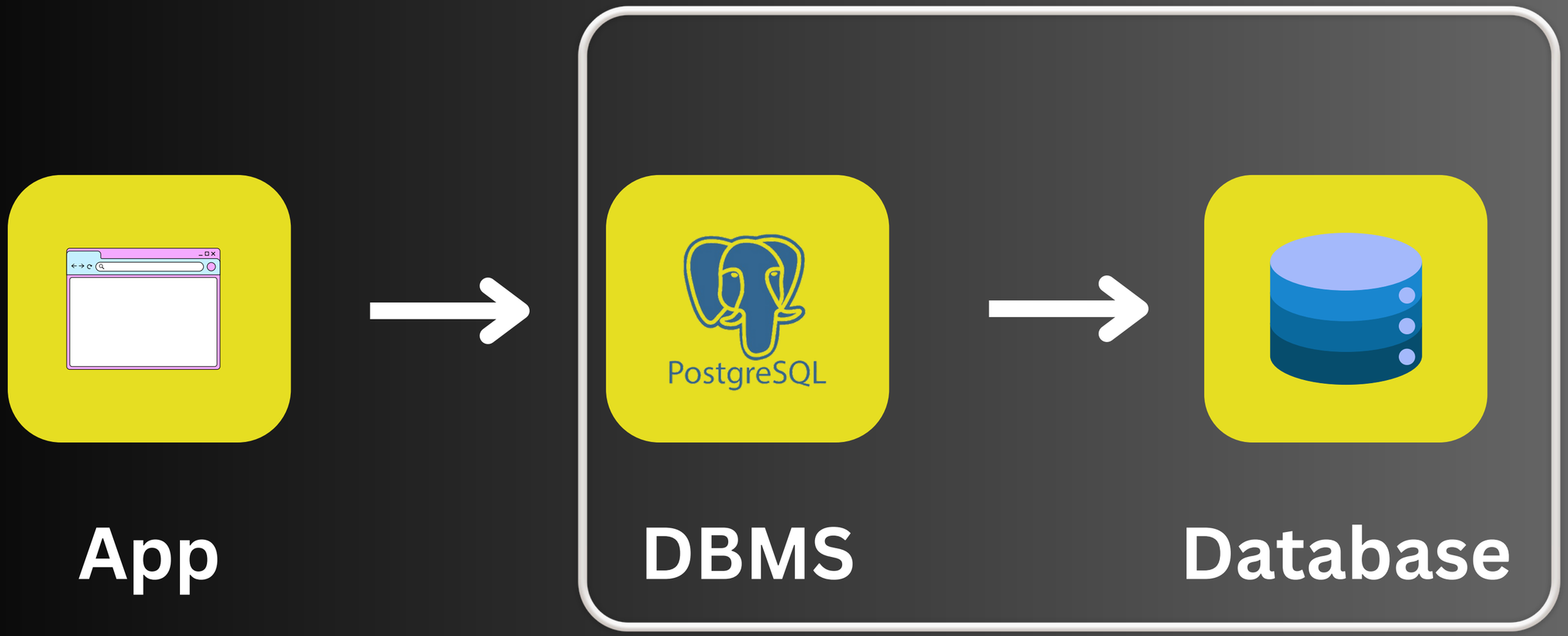
- MongoDB
- Oracle
- MySQL
- SQLite
- PostgreSQL
- MaxDB
- Firebird
- Redis

SQL vs PostgreSQL

SQL

Structured Query Language
Which is used to talk to our databases.

Example: `SELECT * FROM person_db;`



PostGresql, MySQL, Oracle etc

Installation

Database vs Schema vs Table

Section - 2

- Database
  - Creating, connect, listing, droping
- CRUD
  - Create - New collection
    - Inserting data
  - Read - How to read data
  - Update data
  - Delete data

Databases

List down existing databases

- `SELECT datname FROM pg_database;`
- `\l`
-

Some Important Queries in starting

- \l - list all databases
- \q - quit
- \c db_name - connect to database
- \dt - list all tables
- \d tb_name - desc a table
- \d+ tb_name- list all column
- \! cls. - list all column

Creating a new Database

```
CREATE DATABASE <db_name>;
```

Change a Database

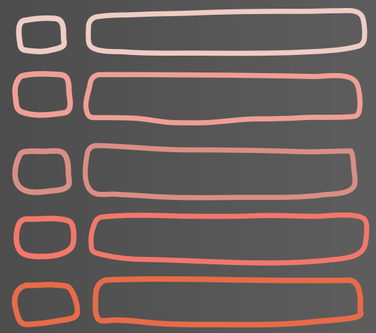
```
\c <db_name>;
```

Deleting a Database

```
DROP DATABASE <db_name>;
```

CRUD

- CREATE
- READ
- UPDATE
- DELETE



CREATING Tables

Table

A table is a collection of related data held in a table format within a database.

id	name	city
101	Raju	Delhi
102	Sham	Mumbai
103	Paul	Chennai
104	Alex	Pune

Creating a new Table

```
CREATE TABLE person (
   id INT,
   name VARCHAR(100),
   city VARCHAR(100)
);
```

```
CREATE TABLE person (id INT, name VARCHAR(100), city
VARCHAR(50))
```

Checking your table

```
\d TABLE_NAME
```

INSERTING Data

Adding data into a Table

```
INSERT INTO person(id, name, city)
VALUES (101, ‘Raju’, ‘Delhi’);

INSERT INTO students VALUES (101, "Rahul")
```

READING DATA

Reading data from a Table

```
SELECT * FROM <table_name>

SELECT <column_name> from students
```

UPDATING DATA

Modify/Update data from a Table

```
UPDATE person
  SET city='London'
  WHERE id=2;
```

DELETING DATA

DELETE data from a Table

```
DELETE FROM students
  WHERE name='Raju';
```

WHERE

```sql
SELECT * FROM students
WHERE
name='Raju';
```

```sql
SELECT * FROM students WHERE name='Raju';
```

```sql
UPDATE students SET contact=12345 WHERE id=104;

DELETE FROM students WHERE id=104;
```

Section - 3

- Datatypes

- Constraint
  - Primary Key
  - NOT NULL
  - Default
  - Serial
  - Unique

DataTypes

An attribute that specifies the type of data in a column of our database - table.

Most widely used are

- Numeric - INT DOUBLE FLOAT DECIMAL
- String - VARCHAR
- Date - DATE
- Boolean - BOOLEAN

DATAYPES

What will happen when we store values like 15.35?

DATAYPES

Digits after decimal

```
DECIMAL(5,2)
```

Total digit

DECIMAL(5,2) DATAYPES

Example: 155.38

119.12 ✅

28.15 ✅

1150.15 ❌

Constraint

A constraint in PostgreSQL is a rule applied to a column.

Primary Key 

- The PRIMARY KEY constraint uniquely identifies each record in a table.
- Primary keys must contain UNIQUE values, and cannot contain NULL values.
- A table can have only ONE primary key.

NOT NULL

```sql
CREATE TABLE customers
(
    id INT NOT NULL,
    name VARCHAR(100) NOT NULL
);
```

DEFAULT Value

```sql
CREATE TABLE customers
(
    acc_no INT PRIMARY KEY,
    name VARCHAR(100) NOT NULL,
    acc_type VARCHAR(50) NOT NULL DEFAULT 'Savings'
);
```

acc_no	name	acc_type
101	Raju	Savings
102	Sham	Savings
103	Paul	Current
104	Alex	Savings

AUTO_INCREMENT

```sql
CREATE TABLE employees (
    id SERIAL PRIMARY KEY,
    firstname VARCHAR(50),
    lastname VARCHAR(50)
);
```

TASK 1:
Creating New Table

emp_id	fname	lname	email	dept	salary	hire_date
1	Raj	Sharma	raj.sharma@example.com	IT	50000	2020-01-15
2	Priya	Singh	priya.singh@example.com	HR	45000	2019-03-22
3	Arjun	Verma	arjun.verma@example.com	IT	55000	2021-06-01
4	Suman	Patel	suman.patel@example.com	Finance	60000	2018-07-30
5	Kavita	Rao	kavita.rao@example.com	HR	47000	2020-11-10
6	Amit	Gupta	amit.gupta@example.com	Marketing	52000	2020-09-25
7	Neha	Desai	neha.desai@example.com	IT	48000	2019-05-18
8	Rahul	Kumar	rahul.kumar@example.com	IT	53000	2021-02-14
9	Anjali	Mehta	anjali.mehta@example.com	Finance	61000	2018-12-03
10	Vijay	Nair	vijay.nair@example.com	Marketing	50000	2020-04-19

```sql
CREATE TABLE employees (
    emp_id SERIAL PRIMARY KEY,
    fname VARCHAR(50) NOT NULL,
    lname VARCHAR(50) NOT NULL,
    email VARCHAR(100) NOT NULL UNIQUE,
    dept VARCHAR(50),
    salary DECIMAL(10,2) DEFAULT 30000.00,
    hire_date DATE NOT NULL DEFAULT CURRENT_DATE
);
```

```
INSERT INTO employees (emp_id, fname, lname, email, dept, salary, hire_date)
    VALUES
(1, 'Raj', 'Sharma', 'raj.sharma@example.com', 'IT', 50000.00, '2020-01-15'),
(2, 'Priya', 'Singh', 'priya.singh@example.com', 'HR', 45000.00, '2019-03-22'),
(3, 'Arjun', 'Verma', 'arjun.verma@example.com', 'IT', 55000.00, '2021-06-01'),
(4, 'Suman', 'Patel', 'suman.patel@example.com', 'Finance', 60000.00, '2018-07-30'),
(5, 'Kavita', 'Rao', 'kavita.rao@example.com', 'HR', 47000.00, '2020-11-10'),
(6, 'Amit', 'Gupta', 'amit.gupta@example.com', 'Marketing', 52000.00, '2020-09-25'),
(7, 'Neha', 'Desai', 'neha.desai@example.com', 'IT', 48000.00, '2019-05-18'),
(8, 'Rahul', 'Kumar', 'rahul.kumar@example.com', 'IT', 53000.00, '2021-02-14'),
(9, 'Anjali', 'Mehta', 'anjali.mehta@example.com', 'Finance', 61000.00, '2018-12-03'),
(10, 'Vijay', 'Nair', 'vijay.nair@example.com', 'Marketing', 50000.00, '2020-04-19');
```

Section - 4

Clauses

- Where
- Distinct
- Order By
- Limit
- Like

Relational Operators

Find employees whose salary is more than 65000

We have relational operators

Operators	Meaning
<	Less than
>	Greater than
<=	Less than or equal to
>=	Greater than or equal to
==	Equal to
!=	Not equal to

=

```
SELECT * FROM employees
WHERE salary > 65000;
```

Logical Operators

AND

OR

Condition 1 **AND** Condition 2

When both the conditions are true

salary=25000 **AND** dept=Loan

Condition 1 **OR** Condition 2

When either of the condition is true

salary=65000 **OR** desig='Lead'

IN, NOT IN

Find employees From following department

- IT
- Finance
- HR

```
SELECT * FROM employees
WHERE dept = 'IT'
OR dept = 'HR'
OR dept = 'Finance';
```

```
SELECT * FROM employees
WHERE dept IN ('IT', 'HR', 'Finance');
```

BETWEEN

Find employees whose salary is more than 40000 and Less than 65000

>40000

<65000

```
SELECT * FROM employees
WHERE
salary >=40000 AND salary <=65000;
```

```
SELECT * FROM employees
WHERE
salary BETWEEN 40000 AND 65000;
```

DISTINCT

```
SELECT DISTINCT fname FROM employees;
```

ORDER BY

```
SELECT * FROM employees ORDER BY fname;
```

LIMIT

```sql
SELECT * FROM employees LIMIT 3;
```

LIKE

```
Select * FROM employees
        WHERE dept LIKE "%Acc%";
```

- Starts with 'A': LIKE 'A%'
- Ends with 'A': LIKE '%A'
- Contains 'A': LIKE '%A%'
- Second character is 'A': LIKE '_A%'
- Case-insensitive contains 'john': ILIKE '%john%'

Section - 5

- How to find total no. of employees?
- Employee with Max salary
- Average salary of employees

- COUNT
- SUM
- AVG
- MIN
- MAX

COUNT

```
SELECT COUNT(*) FROM employees;
```

MAX & MIN

```
SELECT MAX(age) FROM employees;
SELECT MIN(age) FROM employees;
```

```
SELECT emp_id, fname, salary FROM employees
  WHERE
salary = (SELECT MAX(salary) FROM employees);
```

SUM & AVG

```
SELECT SUM(salary) FROM employees;
SELECT AVG(salary) FROM employees;
```

GROUP BY

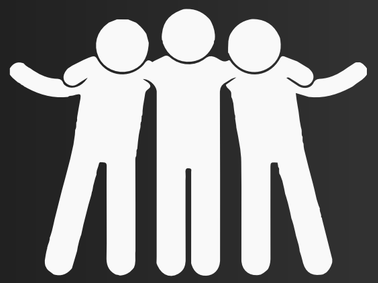
No. of employees in each department

dept	count
Marketing	2
Finance	2
IT	4
HR	2

HR

Finance

Marketing



IT

Deposit

```sql
SELECT dept FROM employees GROUP BY dept;

SELECT dept, COUNT(fname) FROM employees GROUP
BY dept;
```

Section - 6

String Functions

- CONCAT, CONCAT_WS
- SUBSTR
- LEFT, RIGHT
- LENGTH
- UPPER, LOWER
- TRIM, LTRIM, RTRIM
- REPLACE
- POSITION

CONCAT

```
CONCAT(first_col, sec_col)
CONCAT(first_word, sec_word, ...)
```

CONCAT_WS

```
CONCAT_WS('-', fname, lname)
```

SUBSTRING

```
SELECT SUBSTRING('Hey Buddy', 1, 4);
```

SUBSTRING

```
SELECT SUBSTRING('Hey Buddy', 1, 4);
                          1   4
```

Result: Hey

REPLACE

Hey Buddy

Hey → Hello

Hello Buddy

```
REPLACE(str, from_str, to_str)
```

```
REPLACE('Hey Buddy', 'Hey', 'Hello')
```

REVERSE

```
SELECT REVERSE('Hello World');
```

LENGTH

```
Select LENGTH('Hello World');
```

UPPER & LOWER

```
SELECT UPPER('Hello World');

SELECT LOWER('Hello World');
```

Other Functions

```
SELECT LEFT('Abcdefghij', 3);
SELECT RIGHT('Abcdefghij', 4);

SELECT TRIM('  Alright!  ');
SELECT POSITION('OM' in ‘Thomas’);
```

Exercise

Task 1:

1:Raj:Sharma:IT

Task2:

1:Raju Sharma:IT:50000

Task3

4:Suman:FINANCE

Task4

I1 Raju

H2 Priya

Exercise

DISTINCT, ORDER BY, LIKE and LIMIT

1: Find Different type of departments in database?

2: Display records with High-low salary

3: How to see only top 3 records from a table?

4: Show records where first name start with letter 'A'

5: Show records where length of the lname is 4 characters

Exercise

COUNT, GROUP BY, MIN, MAX and SUM and AVG

1: Find Total no. of employees in database?

2: Find no. of employees in each department.

3: Find lowest salary paying

4: Find highest salary paying

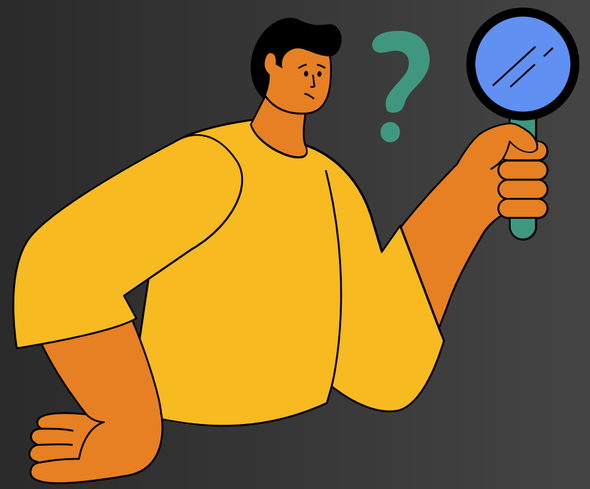
5: Find total salary paying in Loan department?

6: Average salary paying in each department

Section - 7

ALTERING Tables

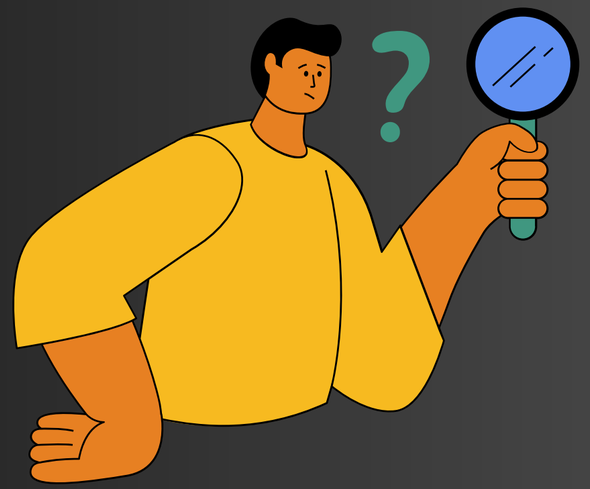
How to add or remove a column?



```sql
ALTER TABLE contacts
ADD COLUMN city VARCHAR(50);
```

```
ALTER TABLE contacts
DROP COLUMN city;
```

How to rename a column or table name?



How to rename a column?

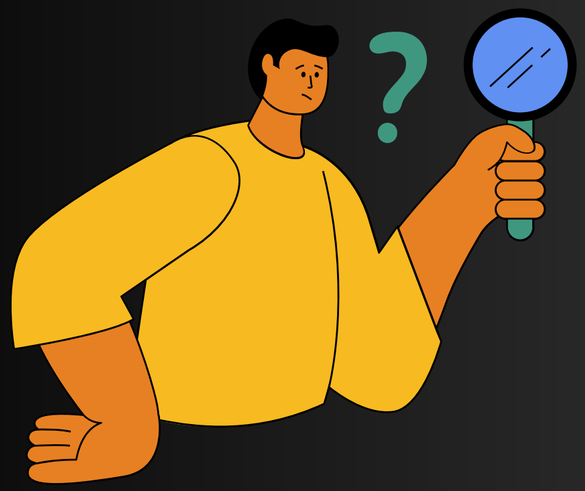
```
ALTER TABLE contacts
RENAME COLUMN name TO full_name;
```

How to rename a table name?

```
ALTER TABLE contacts
RENAME TO mycontacts;
```

```
RENAME TABLE contacts TO mycontacts;
```

How to modify a column?



Ex: Changing datatype
or adding Default values etc

How to add DEFAULT value to a column?

```
ALTER TABLE person
ALTER COLUMN fname
SET DATA TYPE VARCHAR(200);
```

```
ALTER TABLE person
ALTER COLUMN fname
SET DEFAULT 'unknown';
```

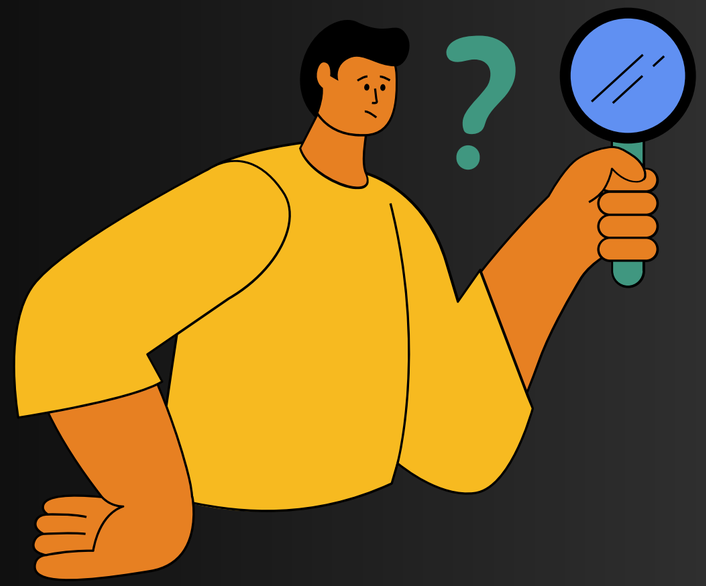
How to set NOT NULL?

```
ALTER TABLE person
ALTER COLUMN fname
SET NOT NULL;
```

CHECK

CONSTRAINT

We want to make sure phone no. is atleast 10 digits...

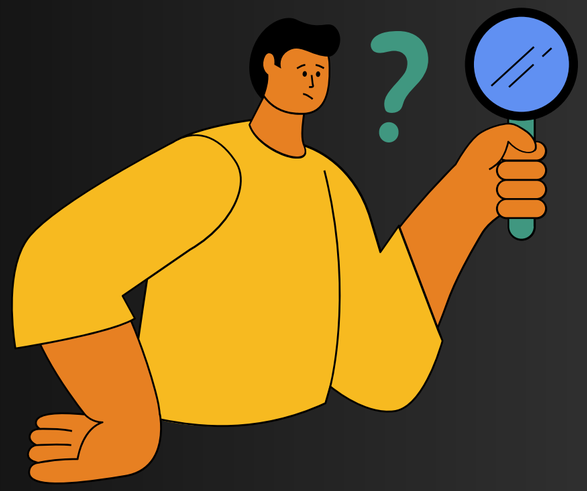


```sql
CREATE TABLE contacts(
    name VARCHAR(50),
    mob VARCHAR(15) UNIQUE CHECK (LENGTH(mob) >= 10)
);
```

NAMED CONSTRAINT

```sql
CREATE TABLE contacts(
    name VARCHAR(50),
    mob VARCHAR(15) UNIQUE,
    CONSTRAINT mob_no_less_than_10digits CHECK (LENGTH(mob) >= 10)
);
```

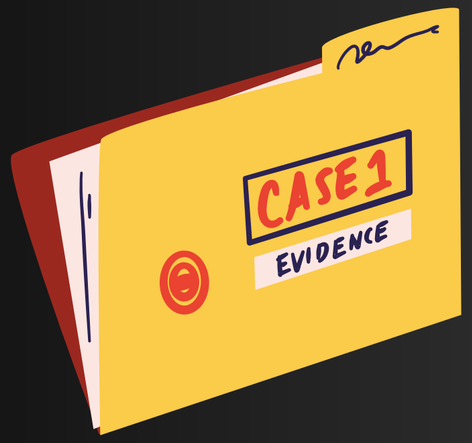
How to Add or Drop Constraints?



```
ALTER TABLE contacts
DROP CONSTRAINT mob_no_less_than_10digits;
```

```
ALTER TABLE contacts
ADD CONSTRAINT mob_not_null CHECK (mob != null);
```

Additional Topcis



CASE

fname	salary	Salary Category
Raju	37000	Low Salary
Sham	32000	Low Salary
Baburao	25000	Low Salary
Paul	45000	Low Salary
Alex	35000	Low Salary
Rick	65000	Higher Salary
Leena	25000	Low Salary
John	75000	Higher Salary
Alex	40000	Low Salary

```sql
select fname, salary,
CASE
    WHEN salary >= 50000 THEN 'High'
    ELSE 'Low'
END AS sal_cat
FROM
    employees;
```

```sql
SELECT fname, salary,
CASE
    WHEN salary >= 50000 THEN 'High'
    WHEN salary >= 40000 AND
        salary <50000 THEN 'Mid'
    ELSE 'Low'
END AS sal_cat
FROM
    employees;
```

Task

fname	salary	bonus
Raj	50000.00	5000
Priya	45000.00	4500
Arjun	55000.00	5500
Suman	60000.00	6000
Kavita	47000.00	4700
Amit	52000.00	5200
Neha	48000.00	4800
Rahul	53000.00	5300
Anjali	61000.00	6100
Vijay	50000.00	5000

```sql
SELECT fname, salary,
CASE
    WHEN salary > 0 THEN Round(salary*.10)
END AS bonus
FROM
    employees;
```

Task

bonus	count
High	2
Mid	5
Low	3

```sql
SELECT
CASE
    WHEN salary > 55000 THEN 'High'
    WHEN salary BETWEEN 50000 AND 55000 THEN 'Mid'
    ELSE 'Low'
END AS bonus,
    COUNT(emp_id)
FROM
    employees
GROUP BY
    CASE
    WHEN salary > 55000 THEN 'High'
    WHEN salary BETWEEN 50000 AND 55000 THEN 'Mid'
    ELSE 'Low'
END;
```

IS NULL

IS NULL

```
SELECT * FROM employees
WHERE fname IS NULL;
```

NOT LIKE

IS NULL

```
SELECT * FROM employees
WHERE fname NOT LIKE 'A%';
```

SECTION - 8

RElATIONSHIP

Employees

Salary

Attendance

Employees

offices

requests

task

Types of Relationship

- One to One
- One to Many
- Many to Many

1:1

Employees

emp_id	name	dept
101	Raju	IT
102	Sham	Finance

Employee Details

emp_id	addr	City	phone	title
101	CP	Delhi	909090909	Manager
102	Bhandup	Mumbai	902020200	Accountant

1:MANY

Employees

emp_id	name	dept
101	Raju	IT
102	Sham	Finance

Employee Task

emp_id	task_no	task_detail
101	TS-1	Opening account for Ram
102	TS-2	Closing account for Neru
101	TS-3	Loan senction

Many : Many

Books

Authors

Book A

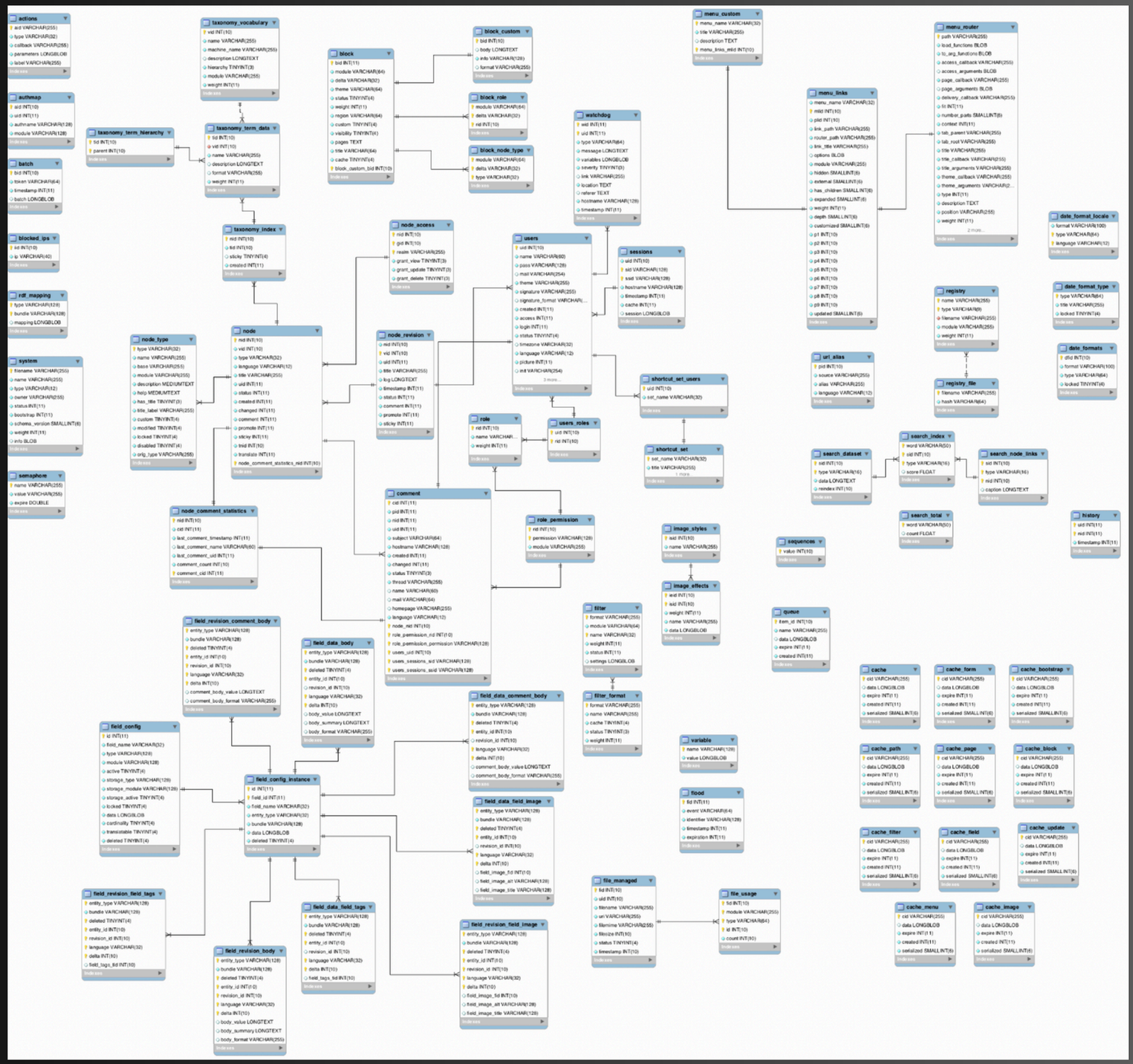
Author A

Author B

Book B

Book C

Book D


actions
aid VARCHAR(255)
type VARCHAR(32)
callback VARCHAR(255)
parameters LONGBLOB
label VARCHAR(255)
Indexes
authmap
aid INT(10)
uid INT(11)
authname VARCHAR(128)
module VARCHAR(128)
batch
bid INT(10)
token VARCHAR(64)
timestamp INT(11)
batch LONGBLOB
blocked_ips
id INT(10)
ip VARCHAR(40)
cache_rdf_mapping
type VARCHAR(128)
bundle VARCHAR(128)
mapping LONGBLOB
system
filename VARCHAR(255)
name VARCHAR(255)
type VARCHAR(12)
owner VARCHAR(255)
status INT(11)
bootstrap INT(11)
schema_version SMALLINT(6)
weight INT(11)
info BLOB
semaphore
name VARCHAR(255)
value VARCHAR(255)
expire DOUBLE
taxonomy_vocabulary
vid INT(10)
name VARCHAR(255)
machine_name VARCHAR(255)
description LONGTEXT
hierarchy TINYINT(3)
module VARCHAR(255)
weight INT(11)
taxonomy_term_hierarchy
tid INT(10)
parent INT(10)
taxonomy_term_data
tid INT(10)
vid INT(10)
name VARCHAR(255)
description LONGTEXT
format VARCHAR(255)
weight INT(11)
taxonomy_index
nid INT(10)
tid INT(10)
sticky TINYINT(4)
created INT(11)
node_type
type VARCHAR(32)
name VARCHAR(255)
base VARCHAR(255)
module VARCHAR(255)
description MEDIUMTEXT
help MEDIUMTEXT
has_title TINYINT(3)
title_label VARCHAR(255)
custom TINYINT(4)
modified TINYINT(4)
locked TINYINT(4)
disabled TINYINT(4)
orig_type VARCHAR(255)
node
nid INT(10)
vid INT(10)
type VARCHAR(32)
language VARCHAR(12)
title VARCHAR(255)
uid INT(11)
status INT(11)
created INT(11)
changed INT(11)
comment INT(11)
promote INT(11)
sticky INT(11)
tnid INT(10)
translate INT(11)
node_comment_statistics_nid INT(10)
node_comment_statistics
nid INT(10)
cid INT(11)
last_comment_timestamp INT(11)
last_comment_name VARCHAR(60)
last_comment_uid INT(11)
comment_count INT(10)
comment_cid INT(11)
field_revision_comment_body
entity_type VARCHAR(128)
bundle VARCHAR(128)
deleted TINYINT(4)
entity_id INT(10)
revision_id INT(10)
language VARCHAR(32)
delta INT(10)
comment_body_value LONGTEXT
comment_body_format VARCHAR(255)
field_config
id INT(11)
field_name VARCHAR(32)
type VARCHAR(128)
module VARCHAR(128)
active TINYINT(4)
storage_type VARCHAR(128)
storage_module VARCHAR(128)
storage_active TINYINT(4)
locked TINYINT(4)
data LONGBLOB
cardinality TINYINT(4)
translatable TINYINT(4)
deleted TINYINT(4)
field_revision_field_tags
entity_type VARCHAR(128)
bundle VARCHAR(128)
deleted TINYINT(4)
entity_id INT(10)
revision_id INT(10)
language VARCHAR(32)
delta INT(10)
field_tags_tid INT(10)
field_revision_body
entity_type VARCHAR(128)
bundle VARCHAR(128)
deleted TINYINT(4)
entity_id INT(10)
revision_id INT(10)
language VARCHAR(32)
delta INT(10)
body_value LONGTEXT
body_summary LONGTEXT
body_format VARCHAR(255)
field_config_instance
id INT(11)
field_id INT(11)
field_name VARCHAR(32)
entity_type VARCHAR(32)
bundle VARCHAR(128)
data LONGBLOB
deleted TINYINT(4)
field_data_field_tags
entity_type VARCHAR(128)
bundle VARCHAR(128)
deleted TINYINT(4)
entity_id INT(10)
revision_id INT(10)
language VARCHAR(32)
delta INT(10)
field_tags_tid INT(10)
field_data_body
entity_type VARCHAR(128)
bundle VARCHAR(128)
deleted TINYINT(4)
entity_id INT(10)
revision_id INT(10)
language VARCHAR(32)
delta INT(10)
body_value LONGTEXT
body_summary LONGTEXT
body_format VARCHAR(255)
block
bid INT(11)
module VARCHAR(64)
delta VARCHAR(32)
theme VARCHAR(64)
status TINYINT(4)
weight INT(11)
region VARCHAR(64)
custom TINYINT(4)
visibility TINYINT(4)
pages TEXT
title VARCHAR(64)
cache TINYINT(4)
block_custom_bid INT(10)
block_custom
bid INT(10)
body LONGTEXT
info VARCHAR(128)
format VARCHAR(255)
block_role
module VARCHAR(64)
delta VARCHAR(32)
rid INT(10)
block_node_type
module VARCHAR(64)
delta VARCHAR(32)
type VARCHAR(32)
node_access
nid INT(10)
gid INT(10)
realm VARCHAR(255)
grant_view TINYINT(3)
grant_update TINYINT(3)
grant_delete TINYINT(3)
node_revision
nid INT(10)
vid INT(10)
uid INT(11)
title VARCHAR(255)
log LONGTEXT
timestamp INT(11)
status INT(11)
comment INT(11)
promote INT(11)
sticky INT(11)
comment
cid INT(11)
pid INT(11)
nid INT(11)
uid INT(11)
subject VARCHAR(64)
hostname VARCHAR(128)
created INT(11)
changed INT(11)
status TINYINT(3)
thread VARCHAR(255)
name VARCHAR(60)
mail VARCHAR(64)
homepage VARCHAR(255)
language VARCHAR(12)
node_nid INT(10)
role_permission_rid INT(10)
role_permission_permission VARCHAR(128)
users_uid INT(10)
users_sessions_sid VARCHAR(128)
users_sessions_ssid VARCHAR(128)
field_data_comment_body
entity_type VARCHAR(128)
bundle VARCHAR(128)
deleted TINYINT(4)
entity_id INT(10)
revision_id INT(10)
language VARCHAR(32)
delta INT(10)
comment_body_value LONGTEXT
comment_body_format VARCHAR(255)
field_data_field_image
entity_type VARCHAR(128)
bundle VARCHAR(128)
deleted TINYINT(4)
entity_id INT(10)
revision_id INT(10)
language VARCHAR(32)
delta INT(10)
field_image_fid INT(10)
field_image_alt VARCHAR(128)
field_image_title VARCHAR(128)
field_revision_field_image
entity_type VARCHAR(128)
bundle VARCHAR(128)
deleted TINYINT(4)
entity_id INT(10)
revision_id INT(10)
language VARCHAR(32)
delta INT(10)
field_image_fid INT(10)
field_image_alt VARCHAR(128)
field_image_title VARCHAR(128)
users
uid INT(10)
name VARCHAR(60)
pass VARCHAR(128)
mail VARCHAR(254)
theme VARCHAR(255)
signature VARCHAR(255)
signature_format VARCHAR(...
created INT(11)
access INT(11)
login INT(11)
status TINYINT(4)
timezone VARCHAR(32)
language VARCHAR(12)
picture INT(11)
init VARCHAR(254)
3 more...
role
rid INT(10)
name VARCHAR...
weight INT(11)
users_roles
uid INT(10)
rid INT(10)
role_permission
rid INT(10)
permission VARCHAR(128)
module VARCHAR(255)
watchdog
wid INT(11)
uid INT(11)
type VARCHAR(64)
message LONGTEXT
variables LONGBLOB
severity TINYINT(3)
link VARCHAR(255)
location TEXT
referer TEXT
hostname VARCHAR(128)
timestamp INT(11)
sessions
uid INT(10)
sid VARCHAR(128)
ssid VARCHAR(128)
hostname VARCHAR(128)
timestamp INT(11)
cache INT(11)
session LONGBLOB
shortcut_set_users
uid INT(10)
set_name VARCHAR(32)
shortcut_set
set_name VARCHAR(32)
title VARCHAR(255)
1 more...
image_styles
isid INT(10)
name VARCHAR(255)
image_effects
ieid INT(10)
isid INT(10)
weight INT(11)
name VARCHAR(255)
data LONGBLOB
filter
format VARCHAR(255)
module VARCHAR(64)
name VARCHAR(32)
weight INT(11)
status INT(11)
settings LONGBLOB
filter_format
format VARCHAR(255)
name VARCHAR(255)
cache TINYINT(4)
status TINYINT(3)
weight INT(11)
variable
name VARCHAR(128)
value LONGBLOB
flood
fid INT(11)
event VARCHAR(64)
identifier VARCHAR(128)
timestamp INT(11)
expiration INT(11)
file_managed
fid INT(10)
uid INT(10)
filename VARCHAR(255)
uri VARCHAR(255)
filemime VARCHAR(255)
filesize INT(10)
status TINYINT(4)
timestamp INT(10)
file_usage
fid INT(10)
module VARCHAR(255)
type VARCHAR(64)
id INT(10)
count INT(10)
menu_custom
menu_name VARCHAR(32)
title VARCHAR(255)
description TEXT
menu_links_mlid INT(10)
menu_links
menu_name VARCHAR(32)
mlid INT(10)
plid INT(10)
link_path VARCHAR(255)
router_path VARCHAR(255)
link_title VARCHAR(255)
options BLOB
module VARCHAR(255)
hidden SMALLINT(6)
external SMALLINT(6)
has_children SMALLINT(6)
expanded SMALLINT(6)
weight INT(11)
depth SMALLINT(6)
customized SMALLINT(6)
p1 INT(10)
p2 INT(10)
p3 INT(10)
p4 INT(10)
p5 INT(10)
p6 INT(10)
p7 INT(10)
p8 INT(10)
p9 INT(10)
updated SMALLINT(6)
menu_router
path VARCHAR(255)
load_functions BLOB
to_arg_functions BLOB
access_callback VARCHAR(255)
access_arguments BLOB
page_callback VARCHAR(255)
page_arguments BLOB
delivery_callback VARCHAR(255)
fit INT(11)
number_parts SMALLINT(6)
context INT(11)
tab_parent VARCHAR(255)
tab_root VARCHAR(255)
title VARCHAR(255)
title_callback VARCHAR(255)
title_arguments VARCHAR(255)
theme_callback VARCHAR(255)
theme_arguments VARCHAR(2...
type INT(11)
description TEXT
position VARCHAR(255)
weight INT(11)
2 more...
url_alias
pid INT(10)
source VARCHAR(255)
alias VARCHAR(255)
language VARCHAR(12)
search_dataset
sid INT(10)
type VARCHAR(16)
data LONGTEXT
reindex INT(10)
search_index
word VARCHAR(50)
sid INT(10)
type VARCHAR(16)
score FLOAT
search_node_links
sid INT(10)
type VARCHAR(16)
nid INT(10)
caption LONGTEXT
search_total
word VARCHAR(50)
count FLOAT
sequences
value INT(10)
queue
item_id INT(10)
name VARCHAR(255)
data LONGBLOB
expire INT(11)
created INT(11)
registry
name VARCHAR(255)
type VARCHAR(9)
filename VARCHAR(255)
module VARCHAR(255)
weight INT(11)
registry_file
filename VARCHAR(255)
hash VARCHAR(64)
date_format_locale
format VARCHAR(100)
type VARCHAR(64)
language VARCHAR(12)
date_format_type
type VARCHAR(64)
title VARCHAR(255)
locked TINYINT(4)
date_formats
dfid INT(10)
format VARCHAR(100)
type VARCHAR(64)
locked TINYINT(4)
history
uid INT(11)
nid INT(11)
timestamp INT(11)
cache
cid VARCHAR(255)
data LONGBLOB
expire INT(11)
created INT(11)
serialized SMALLINT(6)
cache_form
cid VARCHAR(255)
data LONGBLOB
expire INT(11)
created INT(11)
serialized SMALLINT(6)
cache_bootstrap
cid VARCHAR(255)
data LONGBLOB
expire INT(11)
created INT(11)
serialized SMALLINT(6)
cache_path
cid VARCHAR(255)
data LONGBLOB
expire INT(11)
created INT(11)
serialized SMALLINT(6)
cache_page
cid VARCHAR(255)
data LONGBLOB
expire INT(11)
created INT(11)
serialized SMALLINT(6)
cache_block
cid VARCHAR(255)
data LONGBLOB
expire INT(11)
created INT(11)
serialized SMALLINT(6)
cache_filter
cid VARCHAR(255)
data LONGBLOB
expire INT(11)
created INT(11)
serialized SMALLINT(6)
cache_field
cid VARCHAR(255)
data LONGBLOB
expire INT(11)
created INT(11)
serialized SMALLINT(6)
cache_update
cid VARCHAR(255)
data LONGBLOB
expire INT(11)
created INT(11)
serialized SMALLINT(6)
cache_menu
cid VARCHAR(255)
data LONGBLOB
expire INT(11)
created INT(11)
serialized SMALLINT(6)
cache_image
cid VARCHAR(255)
data LONGBLOB
expire INT(11)
created INT(11)
serialized SMALLINT(6)

Let's Understand a Use-Case of 1:Many


STORE

Suppose we need to store the following data

- customer name
- customer email
- order date
- order price

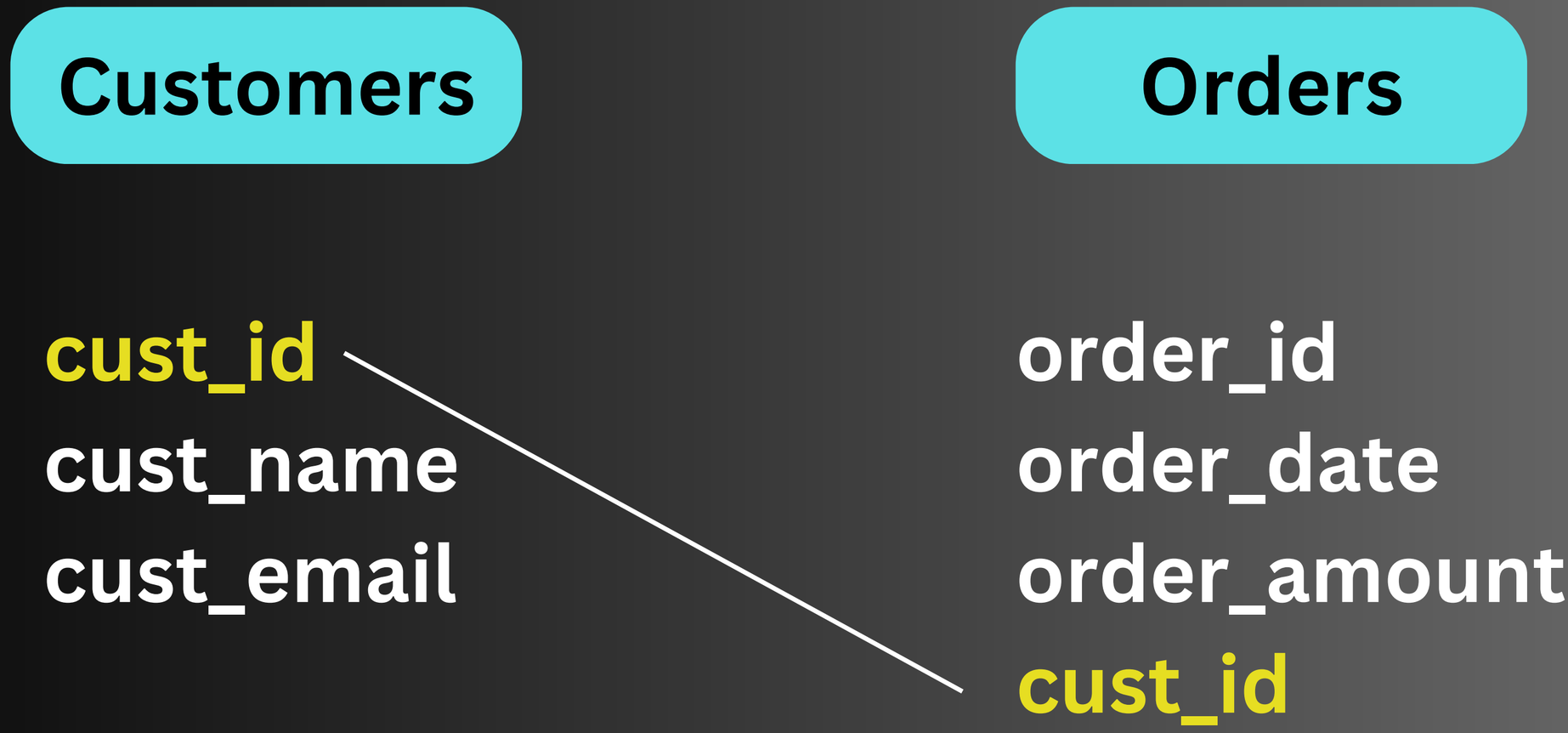
cust_name	email	order_daate	amount
Raju	raju@email.com	2023-05-15	200
Sham	sham@email.com	2023-04-28	500
Raju	raju@email.com	2023-05-14	1000
Baburao	babu@email.com	NULL	NULL
Sham	sham@email.com	2023-03-15	800

Customers

cust_id
cust_name
cust_email

Orders

order_id
order_date
order_amount


Customers
cust_id
cust_name
cust_email
Orders
order_id
order_date
order_amount
cust_id

Customers

cust_id	name	email
101	Raju	raju@email.com
102	Sham	sham@email.com
103	Baburao	babu@email.com

Orders

order_id	date	amount	cust_id
ord-1	2023-05-15	200	**101**
ord-2	2023-04-28	500	**102**
ord-3	2023-05-14	1000	**101**

Foreign Key

Customers

cust_id	name	email
101	Raju	raju@email.com
102	Sham	sham@email.com
103	Baburao	babu@email.com

Orders

order_id	date	amount	cust_id
ord-1	2023-05-15	200	**101**
ord-2	2023-04-28	500	**102**
ord-3	2023-05-14	1000	**101**

Primary Key

Customers

cust_id	name	email
101	Raju	raju@email.com
102	Sham	sham@email.com
103	Baburao	babu@email.com

Foreign Key

Primary Key

Orders

order_id	date	amount	cust_id
ord-1	2023-05-15	200	**101**
ord-2	2023-04-28	500	**102**
ord-3	2023-05-14	1000	**101**

Let's work practically with Foreign Key..

Customers

```
CREATE TABLE customers (
        cust_id SERIAL PRIMARY KEY,
        cust_name VARCHAR(100) NOT NULL
);
```

Orders

```
CREATE TABLE orders (
        ord_id SERIAL PRIMARY KEY,
        ord_date DATE NOT NULL,
        price NUMERIC NOT NULL,
        cust_id INTEGER NOT NULL,
        FOREIGN KEY (cust_id) REFERENCES
        customers (cust_id)
);
```

Customers

```
INSERT INTO customers (cust_name)
VALUES
   ('Raju'), ('Sham'), ('Paul'), ('Alex');
```

Orders

```
INSERT INTO orders (ord_date, cust_id, price)
VALUES
   ('2024-01-01', 1, 250.00),
   ('2024-01-15', 1, 300.00),
   ('2024-02-01', 2, 150.00),
   ('2024-03-01', 3, 450.00),
   ('2024-04-04', 2, 550.00);
```

JOINS

JOIN operation is used to combine rows from two or more tables based on a related column between them.

Primary Key

Customers

cust_id	name	email
101	Raju	raju@email.com
102	Sham	sham@email.com
103	Baburao	babu@email.com

Primary Key

Foreign Key

Orders

order_id	date	amount	cust_id
ord-1	2023-05-15	200	**101**
ord-2	2023-04-28	500	**102**
ord-3	2023-05-14	1000	**101**

Types of Join

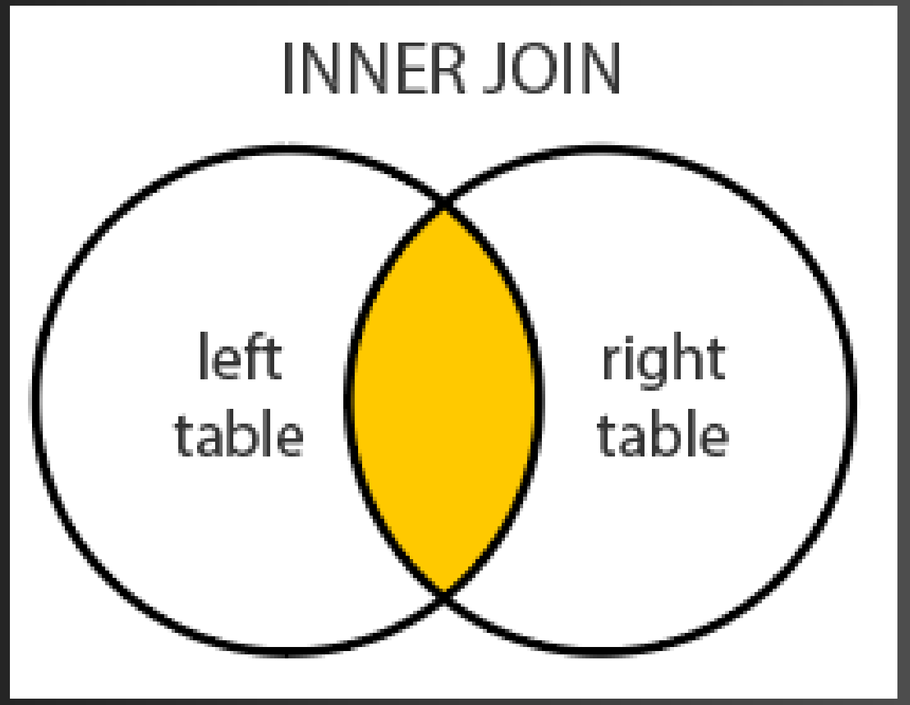
- Cross Join
- Inner Join
- Left Join
- Right Join

Cross Join

Every row from one table is combined with every row from another table.

Inner Join

Returns only the rows where there is a match between the specified columns in both the left (or first) and right (or second) tables.


INNER JOIN
left
table
right
table

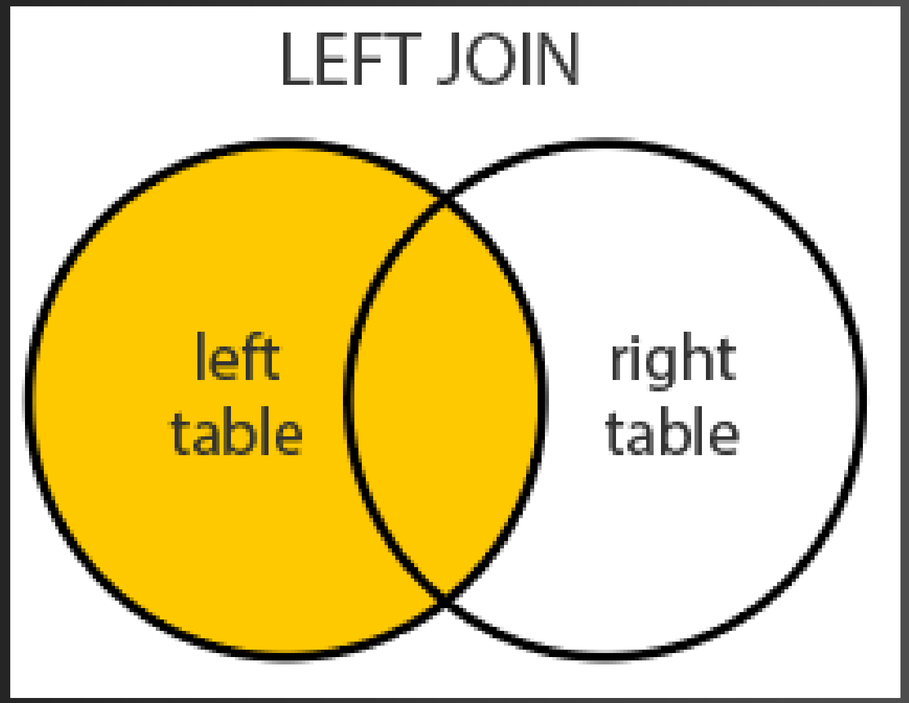
```sql
SELECT * FROM customers
 INNER JOIN orders
ON orders.cust_id=customers.cust_id;
```

Inner Join with Group By

```
SELECT name FROM customers
    INNER JOIN orders
    ON orders.cust_id=customers.cust_id
GROUP BY name;
```

Left Join

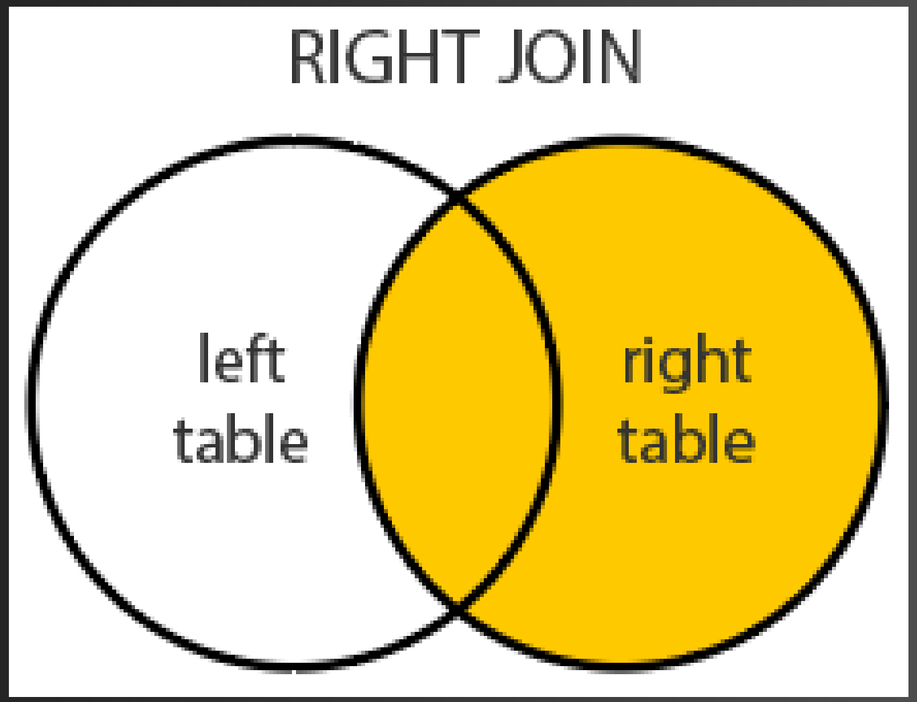
Returns all rows from the left (or first) table and the matching rows from the right (or second) table.


LEFT JOIN
left
table
right
table

```sql
SELECT * FROM customers
    LEFT JOIN orders
    ON orders.cust_id=customers.cust_id;
```

Right Join

Returns all rows from the right (or second) table and the matching rows from the left (or first) table.


RIGHT JOIN
left
table
right
table

```sql
SELECT * FROM customers
    RIGHT JOIN orders
    ON orders.cust_id=customers.cust_id;
```

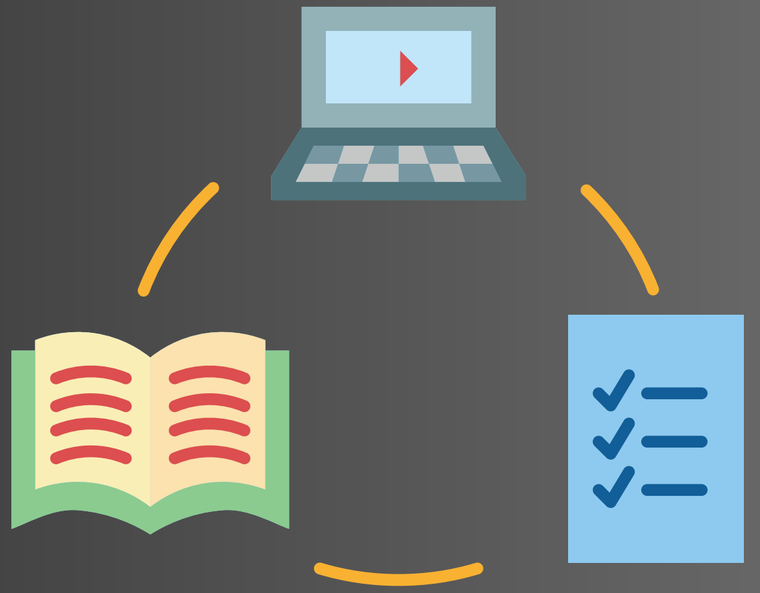
Many : Many

Let's Understand a Use-Case of

Many : Many

Students

Courses



Student A

Course A

Course B

Course C

Course A

Student A

Student B

Student C

students

- id
- student_name

courses

- id
- course_name
- fees

students

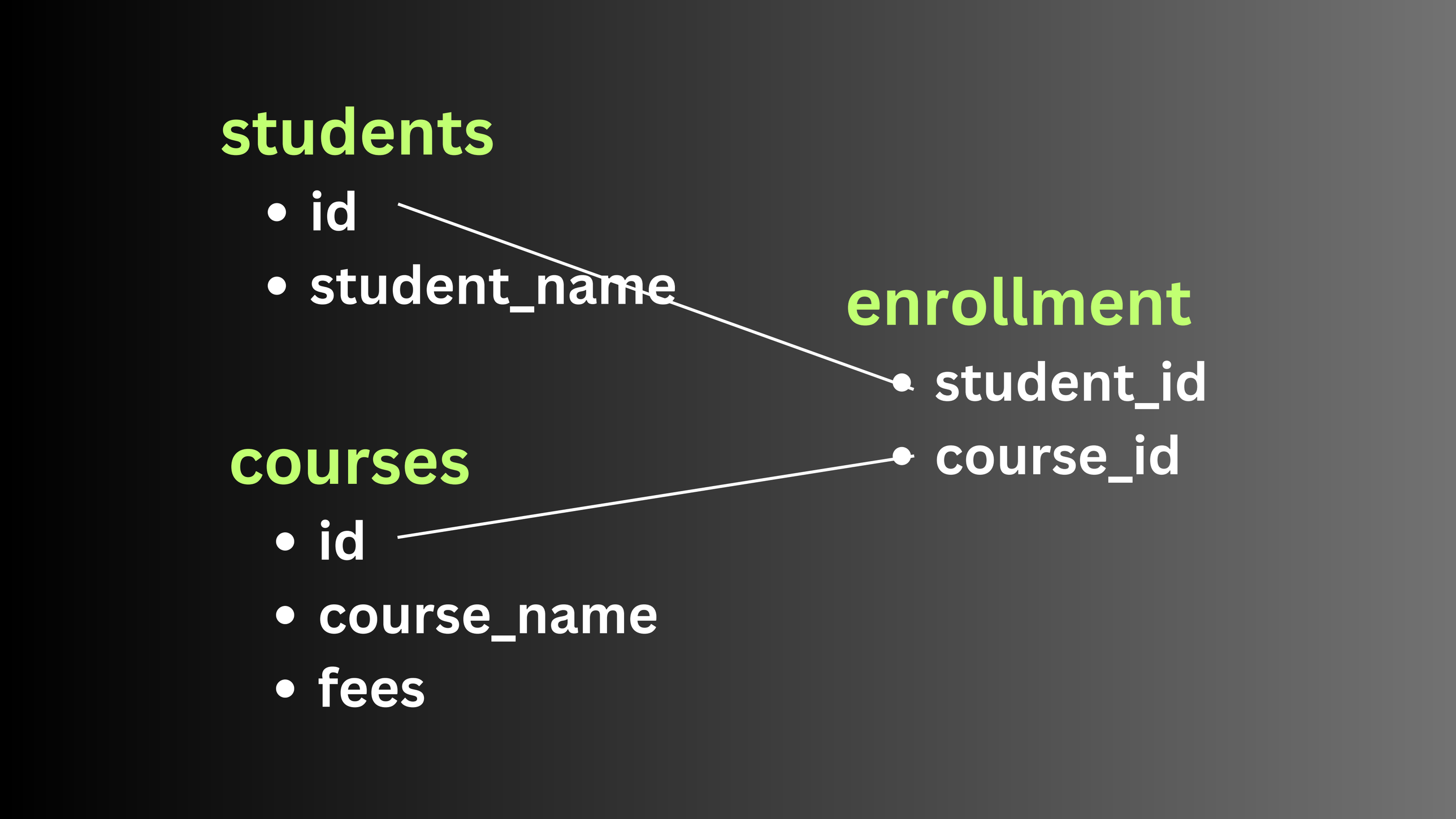
- id
- student_name

courses

- id
- course_name
- fees

student_course

- student_id
- course_id

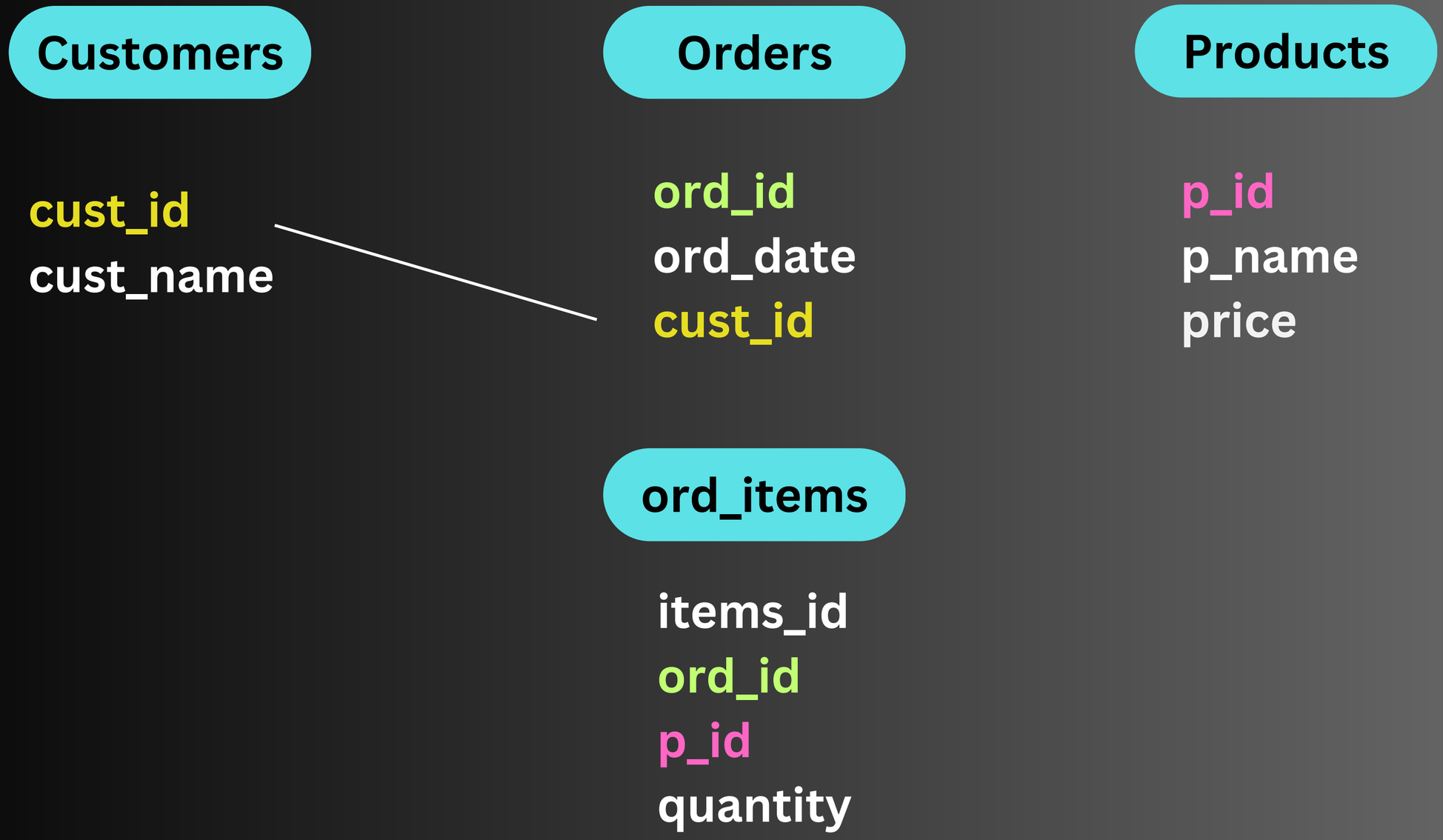

students
id
student_name
courses
id
course_name
fees
enrollment
student_id
course_id

TASK

Create a one-to-many and many-to-many relationship in a shopping store context using four tables:

- customers
- orders
- products
- order_items

Include a price column in the products table and display the relationship between customers and their orders, along with the details of the products in each order.


Customers
cust_id
cust_name
Orders
ord_id
ord_date
cust_id
Products
p_id
p_name
price
ord_items
items_id
ord_id
p_id
quantity

End Result

cust_name	ord_id	ord_date	p_name	quantity	price	total_price
Sham	4	2024-04-04	Keyboard	1	800.00	800.00
Raju	1	2024-01-01	Laptop	1	55000.00	55000.00
Raju	1	2024-01-01	Cable	2	250.00	500.00
Sham	2	2024-02-01	Laptop	1	55000.00	55000.00
Paul	3	2024-03-01	Mouse	1	500	500
Paul	3	2024-03-01	Cable	3	250.00	750.00
Sham	4	2024-04-04	Keyboard	1	800.00	800.00

VIEWS

```sql
CREATE view billing_info AS
SELECT
    c.cust_name,
    o.ord_id,
    o.ord_date,
    p.p_name,
    oi.quantity,
    p.price,
    (oi.quantity * p.price) AS total_price
FROM
    customers c
JOIN
    orders o ON c.cust_id = o.cust_id
JOIN
    order_items oi ON o.ord_id = oi.ord_id
JOIN
    products p ON oi.p_id = p.p_id;
```

HAVING Clause

```sql
SELECT
    p_name,
    SUM(total_price) as Amount
FROM billing_info
    GROUP BY p_name
    HAVING SUM(total_price) > 1500;
```

GROUP BY ROLLUP

```sql
SELECT
    COALESCE(p_name, 'Total'),
    SUM(total_price) as Amount
FROM billing_info
    GROUP BY
    ROLLUP(p_name) ORDER BY amount;
```

3	Keyboard	1600.00
4	Laptop	110000.00
5	Total	113350.00

STORED Routine

STORED Routine

An SQL statement or a set of SQL Statement that can be stored on database server which can be call no. of times.

Types of STORED Routine

- STORED Procedure
- User defined Functions

STORED Procedure

STORED PROCEDURE

Set of SQL statements and procedural logic that can perform operations such as inserting, updating, deleting, and querying data.

```
CREATE OR REPLACE PROCEDURE procedure_name (parameter_name parameter_type, ...)
LANGUAGE plpgsql
AS $$
BEGIN
    -- procedural code here
END;
$$;
```

```
CREATE OR REPLACE PROCEDURE update_emp_salary(
    p_employee_id INT,
    p_new_salary NUMERIC
)
LANGUAGE plpgsql
AS $$
BEGIN
    UPDATE employees
    SET salary = p_new_salary
    WHERE emp_id = p_employee_id;
END;
$$;
```

```
CREATE OR REPLACE PROCEDURE add_employee(
    p_fname VARCHAR,
    p_lname VARCHAR,
    p_email VARCHAR,
    p_dept VARCHAR,
    p_salary NUMERIC
)
LANGUAGE plpgsql
AS $$
BEGIN
    INSERT INTO employees (fname, lname, email, dept, salary)
    VALUES (p_fname, p_lname, p_email, p_dept, p_salary);
END;
$$;
```

USER DEFINED FUNCTIONS

custom function created by the user
to perform specific operations and
return a value.

```sql
CREATE OR REPLACE FUNCTION function_name(parameters)
RETURNS return_type AS $$
BEGIN
    -- Function body (SQL statements)
    RETURN some_value;  -- For scalar functions
END;
$$ LANGUAGE plpgsql;
```

Find name of the employees in each department having maximum salary.

```
CREATE OR REPLACE FUNCTION dept_max_sal_emp1(dept_name VARCHAR)
RETURNS TABLE(emp_id INT, fname VARCHAR, salary NUMERIC)
AS $$
BEGIN
   RETURN QUERY
   SELECT
      e.emp_id,  e.fname, e.salary
   FROM
      employees e
   WHERE
      e.dept = dept_name
      AND e.salary = (
         SELECT MAX(emp.salary)
         FROM employees emp
         WHERE emp.dept = dept_name
      );
END;
$$ LANGUAGE plpgsql;
```

WINDOW FUNCTIONS

Window functions, also known as analytic functions allow you to perform calculations across a set of rows related to the current row.

Defined by an **OVER()** clause.

Benefits of Window Functions

- **Advanced Analytics:** They enable complex calculations like running totals, moving averages, rank calculations, and cumulative distributions.

- **Non-Aggregating:** Unlike aggregate functions, window functions do not collapse rows. This means you can calculate aggregates while retaining individual row details.

- **Flexibility:** They can be used in various clauses of SQL, such as SELECT, ORDER BY, and HAVING, providing a lot of flexibility in writing queries.

- ROW_NUMBER()
- RANK()
- DENSE_RANK()
- LAG()
- LEAD()

```sql
select fname, dept, salary,
    ROW_NUMBER()
    OVER(PARTITION BY dept ORDER BY salary DESC)
        AS row_num
    from employees;
```

CTE

Common Table Expression

CTE (Common Table Expression) is a temporary result set that you can define within a query to simplify complex SQL statements.

```sql
WITH cte_name (optional_column_list) AS (
    -- CTE query definition
    SELECT ...
)
-- Main query referencing the CTE
SELECT ...
FROM cte_name
WHERE ...;
```

Use Cases - 1

- We want to calculate the average salary per department and then find all employees whose salary is above the average salary of their department.

emp_id	fname	dept	salary	avg_salary
101	Raju	Loan	37000	34000.0000
102	Sham	Cash	32000	28500.0000
106	Rick	Account	65000	55000.0000
109	Alex	Loan	40000	34000.0000

```sql
WITH AvgSal AS (
    SELECT
        dept,  AVG(salary) AS avg_salary     FROM   employees
    GROUP BY
        dept
)

SELECT
    e.emp_id,     e.fname,     e.dept,     e.salary,
    a.avg_salary
FROM
    employees e
JOIN
    AvgSal a ON e.dept = a.dept
WHERE
    e.salary > a.avg_salary;
```

Use Cases - 2

- We want to find the highest-paid employee in each department.

emp_id	fname	lname	desig	dept	salary
102	Sham	Mohan	Cashier	Cash	32000
105	Alex	Watt	Associate	Deposit	35000
106	Rick	Watt	Manager	Account	65000
108	John	Paul	Manager	IT	75000
109	Alex	Watt	Probation	Loan	40000

```
WITH HighestPaid AS (
    SELECT
        dept,
        MAX(salary) AS max_salary
    FROM
        employees
    GROUP BY
        dept
)
SELECT
    e.emp_id,
    e.fname,
    e.lname,
    e.desig,
    e.dept,
    e.salary
FROM
    employees e
JOIN
    HighestPaid h ON e.dept = h.dept AND e.salary = h.max_salary;
```

Points:

- Once CTE has been created it can only be used once. It will not be persisted.

TRIGGERS

Triggers are special procedures in a database that automatically execute predefined actions in response to certain events on a specified table or view.

```
CREATE TRIGGER trigger_name
{ BEFORE | AFTER | INSTEAD OF } { INSERT | UPDATE | DELETE | TRUNCATE }
ON table_name
FOR EACH { ROW | STATEMENT }
EXECUTE FUNCTION trigger_function_name();
```

```sql
CREATE OR REPLACE FUNCTION trigger_function_name()
RETURNS TRIGGER AS $$
BEGIN
    -- Trigger logic here
    RETURN NEW;
END;
$$ LANGUAGE plpgsql;
```

Use Case

Create a Trigger so that
If we insert/update negative salary in a table,
it will be triggered and set it to 0.

Step 2: Create the Trigger Function

sql Copy code

```sql
CREATE OR REPLACE FUNCTION check_salary()
RETURNS TRIGGER AS $$
BEGIN
    IF NEW.salary < 0 THEN
        NEW.salary := 0;
    END IF;
    RETURN NEW;
END;
$$ LANGUAGE plpgsql;
```

Step 3: Create the Trigger

sql Copy code

```sql
CREATE TRIGGER before_insert_salary
BEFORE INSERT ON employees
FOR EACH ROW
EXECUTE FUNCTION check_salary();
```

CASCADE ON DELETE

Primary Key

Customers

cust_id	name	email
101	Raju	raju@email.com
102	Sham	sham@email.com
103	Baburao	babu@email.com

Primary Key

Foreign Key

Orders

order_id	date	amount	cust_id
ord-1	2023-05-15	200	**101**
ord-2	2023-04-28	500	**102**
ord-3	2023-05-14	1000	**101**

```sql
CREATE TABLE orders(
    ord_id INT AUTO_INCREMENT PRIMARY KEY,
    date DATE,
    amount DECIMAL(10, 2),
    cust_id INT,
    FOREIGN KEY (cust_id) REFERENCES customers(cust_id) ON DELETE CASCADE
)
```