

## EXPERIMENT 1

### Create a table with constraints

1. **NOT NULL Constraint:** NOT NULL ensures that no NULL values are allowed in the columns.
2. **UNIQUE Constraint:** UNIQUE ensures all values in columns are different (no duplicates allowed).
3. **PRIMARY KEY Constraint:** PRIMARY KEY uniquely identifies each row and implies NOT NULL + UNIQUE.
4. **FOREIGN KEY Constraint:** A **FOREIGN KEY** is a column (or set of columns) in one table that references the primary key in another table to enforce referential integrity.
5. **CHECK Constraint:** CHECK enforces logical rules (e.g., quantity must be between 1 and 999).
6. **DEFAULT Constraint:** DEFAULT automatically sets a value if none is given (e.g., today's date).
7. **CREATE INDEX Constraint:** INDEX improves query performance on large tables, especially for searching/sorting.

### Source code:

```
CREATE TABLE departments (  
    dept_id INT PRIMARY KEY,  
    dept_name VARCHAR(100) UNIQUE NOT NULL);
```

### Source code:

```
CREATE TABLE employees (  
    emp_id INT PRIMARY KEY,  
    first_name VARCHAR(50) NOT NULL,  
    last_name VARCHAR(50) NOT NULL,  
    email VARCHAR(100) UNIQUE NOT NULL,  
    hire_date DATE DEFAULT CURRENT_DATE,  
    salary DECIMAL(10,2) CHECK (salary >= 30000),  
    dept_id INT, CONSTRAINT fk_department FOREIGN KEY (dept_id)  
    REFERENCES departments(dept_id));
```

### Source code:

```
CREATE INDEX idx_lastname ON employees(last_name);
```

## EXPERIMENT 2

### Implementation of SQL Commands

1. **Insert values with a single entry:** Adds one row of data into a table using the INSERT INTO statement.
2. **Insert values with multiple entries:** Adds multiple rows at once using a single INSERT INTO statement with multiple value sets.
3. **ALTER Table Structure:** Modifies the structure of an existing table, such as adding or removing columns.
4. **VIEW Table structure:** Displays the schema of a table using commands like DESCRIBE or SHOW COLUMNS.
5. **UPDATE table:** Changes existing data in one or more rows using the UPDATE statement with a WHERE clause.
6. **DELETE Rows in table:** Removes specific rows from a table using the DELETE FROM statement with a WHERE clause.
7. **DROP table:** Permanently deletes an entire table and all its data from the database.

### Source code:

```
CREATE TABLE products (  
    product_id INT PRIMARY KEY,  
    product_name VARCHAR(100) NOT NULL,  
    price DECIMAL(10, 2) NOT NULL,  
    quantity INT NOT NULL);  
INSERT INTO products (product_id, product_name, price, quantity)  
VALUES (101, 'Wireless Mouse', 25.99, 100);  
INSERT INTO products (product_id, product_name, price, quantity) VALUES  
(102, 'USB Keyboard', 19.99, 150);  
INSERT INTO products (product_id, product_name, price, quantity) VALUES  
(103, 'HDMI Cable', 9.99, 200);  
INSERT INTO products (product_id, product_name, price, quantity) VALUES  
(104, 'Laptop Stand', 34.50, 75);  
INSERT ALL  
    INTO products (product_id, product_name, price, quantity) VALUES  
(201, 'Gaming Mouse', 45.99, 80)  
    INTO products (product_id, product_name, price, quantity) VALUES  
(202, 'Mechanical Keyboard', 89.99, 60)  
    INTO products (product_id, product_name, price, quantity) VALUES  
(203, 'Webcam HD', 59.49, 120)  
SELECT * FROM dual;
```

**Source code:**

```
ALTER TABLE products  
ADD category VARCHAR2(50);
```

**Source code:**

```
ALTER TABLE products  
RENAME COLUMN quantity TO stock_available;
```

**Source code:**

```
ALTER TABLE products  
DROP COLUMN CATEGORY;
```

**Source code:**

```
CREATE VIEW product_summary AS  
SELECT products_id,product_name,price  
FROM products  
WHERE price > 50;
```

**Source code:**

```
UPDATE products  
SET price=100  
WHERE product_id=101;
```

**Source code:**

```
DELETE FROM products  
WHERE products_id=103;
```

**Source code:**

```
DROP TABLE products;
```

## EXPERIMENT 3

### Aggregate Function

1. **MIN()**: Returns the smallest value in a column.
2. **MAX()**: Returns the largest value in a column.
3. **COUNT()**: Returns the number of rows that match a specified condition.
4. **SUM()**: Calculates the total sum of a numeric column.
5. **AVG()**: Computes the average value of a numeric column.

### SourceCode:

```
CREATE TABLE fruits (  
    product_id INT PRIMARY KEY,  
    product_name VARCHAR2(100) NOT NULL,  
    price NUMBER(10,2) NOT NULL,  
    quantity INT NOT NULL);  
  
INSERT INTO fruits (product_id, product_name, price, quantity) VALUES  
(101, 'Apple', 0.99, 100);  
INSERT INTO fruits (product_id, product_name, price, quantity) VALUES  
(102, 'Banana', 0.59, 150);  
INSERT INTO fruits (product_id, product_name, price, quantity) VALUES  
(103, 'Orange', 1.25, 200);  
INSERT INTO fruits (product_id, product_name, price, quantity) VALUES  
(104, 'Mango', 2.50, 75);  
INSERT INTO fruits (product_id, product_name, price, quantity) VALUES  
(201, 'Grapes', 3.00, 80);  
INSERT INTO fruits (product_id, product_name, price, quantity) VALUES  
(202, 'Pineapple', 2.99, 60);  
INSERT INTO fruits (product_id, product_name, price, quantity) VALUES  
(203, 'Watermelon', 5.49, 120);  
SELECT COUNT(*) AS total_fruits  
FROM fruits;
```

### SourceCode:

```
SELECT SUM(quantity) AS total_quantity  
FROM fruits;
```

### SourceCode:

```
SELECT AVG(price) AS avg_price  
FROM fruits;
```

**SourceCode:**

```
SELECT MAX(price) AS max_price,  
MIN(price) AS min_price  
FROM fruits;
```

## EXPERIMENT 4

1. **GROUP BY:** Organizes rows into groups based on one or more columns, often used with aggregate functions.
2. **ORDER BY:** Sorts the result set of a query by one or more columns in ascending (ASC) or descending (DESC) order.

### Source code:

```
CREATE TABLE sales (  
    sale_id INT PRIMARY KEY,  
    product_name VARCHAR2(100) NOT NULL,  
    category VARCHAR2(50),  
    quantity_sold INT NOT NULL,  
    sale_amount NUMBER(10,2) NOT NULL);  
INSERT INTO sales (sale_id, product_name, category,  
quantity_sold, sale_amount) VALUES (1, 'Apple', 'Fruit', 50, 49.50);  
INSERT INTO sales (sale_id, product_name, category,  
quantity_sold, sale_amount) VALUES (2, 'Banana', 'Fruit', 30, 17.70);  
INSERT INTO sales (sale_id, product_name, category,  
quantity_sold, sale_amount) VALUES (3, 'Orange', 'Fruit', 40, 50.00);  
INSERT INTO sales (sale_id, product_name, category,  
quantity_sold, sale_amount) VALUES (4, 'Mango', 'Fruit', 20, 50.00);  
INSERT INTO sales (sale_id, product_name, category,  
quantity_sold, sale_amount) VALUES (5, 'Soap', 'Grocery', 15, 45.00);  
INSERT INTO sales (sale_id, product_name, category,  
quantity_sold, sale_amount) VALUES (6, 'Shampoo', 'Grocery', 10,  
60.00);  
INSERT INTO sales (sale_id, product_name, category,  
quantity_sold, sale_amount) VALUES (7, 'Notebook', 'Stationery', 25,  
75.00);  
INSERT INTO sales (sale_id, product_name, category,  
quantity_sold, sale_amount) VALUES (8, 'Pen', 'Stationery', 50,  
25.00);
```

### Source code:

```
SELECT category, SUM(quantity_sold) AS total_quantity, SUM(sale_amount) AS  
total_sales  
FROM sales GROUP BY category;
```

**Source code:**

```
SELECT product_name, category, quantity_sold, sale_amount  
FROM sales  
ORDER BY sale_amount DESC;
```

**Source code:**

```
SELECT product_name, category, quantity_sold, sale_amount  
FROM sales  
ORDER BY category ASC, sale_amount DESC;
```

**Source code:**

```
SELECT category, SUM(quantity_sold) AS total_quantity, SUM(sale_amount) AS  
total_sales  
FROM sales  
GROUP BY category  
ORDER BY total_sales DESC;
```

## EXPERIMENT 5

1. **Ascending: ASC** sorts query results from lowest to highest. 2.

**Descending: DESC** sorts from highest to lowest based on the specified column.

### Source code:

```
CREATE TABLE planets (  
    planet_id INT PRIMARY KEY,  
    planet_name VARCHAR2(50) NOT NULL,  
    distance_from_sun NUMBER(10,2),  
    diameter NUMBER(10,2));  
  
INSERT INTO planets (planet_id, planet_name, distance_from_sun,  
diameter) VALUES (1, 'Mercury', 57.9, 4879);  
INSERT INTO planets (planet_id, planet_name, distance_from_sun,  
diameter) VALUES (2, 'Venus', 108.2, 12104);  
INSERT INTO planets (planet_id, planet_name, distance_from_sun,  
diameter) VALUES (3, 'Earth', 149.6, 12756);  
INSERT INTO planets (planet_id, planet_name, distance_from_sun,  
diameter) VALUES (4, 'Mars', 227.9, 6792);  
INSERT INTO planets (planet_id, planet_name, distance_from_sun,  
diameter) VALUES (5, 'Jupiter', 778.3, 142984);  
INSERT INTO planets (planet_id, planet_name, distance_from_sun,  
diameter) VALUES (6, 'Saturn', 1427.0, 120536);  
INSERT INTO planets (planet_id, planet_name, distance_from_sun,  
diameter) VALUES (7, 'Uranus', 2871.0, 51118);  
INSERT INTO planets (planet_id, planet_name, distance_from_sun,  
diameter) VALUES (8, 'Neptune', 4497.1, 49528);
```

### Source code:

```
Select * from planets;  
SELECT planet_name, distance_from_sun, diameter  
FROM planets  
ORDER BY distance_from_sun ASC;
```

### Source code:

```
SELECT planet_name, distance_from_sun, diameter  
FROM planets  
ORDER BY diameter DESC;
```



## EXPERIMENT 6

### SQL Operators

1. **LIKE**: Filters results based on pattern matching using % (any characters) and \_ (single character).
2. **BETWEEN**: Checks if a value lies within a specified inclusive range.
3. **OR**: Returns results if **any** of the given conditions are true. **Source code:**

```
CREATE TABLE Suppliers(SupplierID INT PRIMARY KEY,SupplierName
VARCHAR(100) NOT NULL,City VARCHAR(50));
CREATE SEQUENCE Suppliers_seq START WITH 1 INCREMENT BY 1;
CREATE OR REPLACE TRIGGER Suppliers_on_insert
BEFORE INSERT ON Suppliers
FOR EACH ROW
BEGIN
    SELECT Suppliers_seq.nextval
    INTO :new.SupplierID
    FROM dual;
END;
CREATE TABLE Products (ProductID INT PRIMARY KEY,ProductName
VARCHAR(100) NOT NULL,Category VARCHAR(50),Price NUMBER(10,
2),StockQuantity INT,SupplierID INT,FOREIGN KEY(SupplierID) REFERENCES
Suppliers(SupplierID));
CREATE SEQUENCE Products_seq
START WITH 1
INCREMENT BY 1;
CREATE OR REPLACE TRIGGER Products_on_insert
BEFORE INSERT ON Products
FOR EACH ROW
BEGIN
    SELECT Products_seq.nextval
    INTO :new.ProductID
    FROM dual;
END;
INSERT INTO Suppliers (SupplierName, City) VALUES ('ToolMaster Pro', 'New
York');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Eastern Lumber
Co.', 'Boston');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Quick Fasteners
```

```

Ltd.', 'Miami');
INSERT INTO Suppliers (SupplierName, City) VALUES ('PowerHouse
Electric', 'Chicago');
INSERT INTO Suppliers (SupplierName, City) VALUES ('The Metal
Works', 'Seattle');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Apex Safety
Gear', 'Dallas');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Prime Plumbing
Supply', 'Phoenix');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Global
Adhesives', 'Denver');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Brick & Mortar
Co.', 'Atlanta');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Precision
Measuring', 'Houston');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Super Wrench
Group', 'New York');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Cedar Creek
Wood', 'Boston');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Volta
Electrical', 'Miami');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Ironclad
Hardware', 'Chicago');
INSERT INTO Suppliers (SupplierName, City) VALUES ('AquaFlow
Plumbing', 'Seattle');
INSERT INTO Suppliers (SupplierName, City) VALUES ('SureGrip
Fasteners', 'Dallas');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Bright Light
Solutions', 'Phoenix');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Durable Paint
Co.', 'Denver');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Contractor
Essentials', 'Atlanta');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Home Fix
Depot', 'Houston');
INSERT INTO Products (ProductName, Category, Price,
StockQuantity, SupplierID) VALUES ('Hammer Pro Titanium', 'Tool',
39.99, 150, 1); INSERT INTO Products (ProductName, Category, Price,
StockQuantity, SupplierID) VALUES ('1/4 inch Hex Bolts', 'Fastener',
5.25, 500, 3);
INSERT INTO Products (ProductName, Category, Price, StockQuantity,
SupplierID) VALUES ('LED Flood Light', 'Electrical', 48.50, 120, 4); INSERT INTO

```

```

Products (ProductName, Category, Price, StockQuantity, SupplierID) VALUES
('Red Cedar 4x4 Post', 'Wood', 18.75, 80, 12); INSERT INTO Products
(ProductName, Category, Price, StockQuantity, SupplierID) VALUES
('Adjustable Wrench 12"', 'Tool', 22.00, 120, 11); INSERT INTO Products
(ProductName, Category, Price, StockQuantity, SupplierID) VALUES ('Hex Head
Screws Zinc', 'Fastener', 6.00, 450, 16); INSERT INTO Products (ProductName,
Category, Price, StockQuantity, SupplierID) VALUES ('Copper Wire Spool 12g',
'Electrical', 75.99, 100, 13); INSERT INTO Products (ProductName, Category,
Price, StockQuantity, SupplierID) VALUES ('Oak Plywood 3/4"', 'Wood', 65.00, 50,
12); INSERT INTO Products (ProductName, Category, Price, StockQuantity,
SupplierID) VALUES ('Drill Bit Set (50pcs)', 'Tool', 59.99, 80, 1); INSERT INTO
Products (ProductName, Category, Price, StockQuantity, SupplierID) VALUES
('Masonry Nails (Bulk)', 'Fastener', 12.50, 600, 3); INSERT INTO Products
(ProductName, Category, Price, StockQuantity, SupplierID) VALUES ('White
Outlet Cover', 'Electrical', 2.99, 750, 13); INSERT INTO Products (ProductName,
Category, Price, StockQuantity, SupplierID) VALUES ('Pressure Treated Pine',
'Wood', 6.80, 200, 5); INSERT INTO Products (ProductName, Category, Price,
StockQuantity, SupplierID) VALUES ('Safety Goggles Anti-Fog', 'Safety', 10.99,
250, 6); INSERT INTO Products (ProductName, Category, Price, StockQuantity,
SupplierID) VALUES ('Aluminum Sheet Metal', 'Metal', 88.00, 40, 5); INSERT
INTO Products (ProductName, Category, Price, StockQuantity, SupplierID)
VALUES ('Magnetic Screwdriver Set', 'Tool', 14.50, 180, 11); INSERT INTO Products
(ProductName, Category, Price, StockQuantity, SupplierID) VALUES ('Teflon
Tape 1/2"', 'Plumbing', 1.99, 900, 7); INSERT INTO Products (ProductName,
Category, Price, StockQuantity, SupplierID) VALUES ('PVC Pipe Connector 1"',
'Plumbing', 4.50, 320, 15); INSERT INTO Products (ProductName, Category,
Price, StockQuantity, SupplierID) VALUES ('Heavy Duty Glue Stick', 'Adhesive',
3.75, 400, 8); INSERT INTO Products (ProductName, Category, Price,
StockQuantity, SupplierID) VALUES ('Laser Measure Pro 60m', 'Measuring',
120.00, 30, 10); INSERT INTO Products (ProductName, Category, Price,
StockQuantity, SupplierID) VALUES ('Galvanized Steel Pipe', 'Plumbing', 55.00,
60, 15); SELECT ProductName, Price, Category FROM Products WHERE
ProductName LIKE '%Pro%';
SELECT ProductName, Price FROM Products WHERE Price BETWEEN 10.00
AND 50.00;
SELECT SupplierName, City FROM Suppliers WHERE City = 'New York' OR City
= 'Chicago';

```

## EXPERIMENT 7

### SQL Joins

1. **INNER JOIN**: Returns rows with matching values in both tables.
2. **LEFT JOIN**: Returns all rows from the left table and matched rows from the right.
3. **RIGHT JOIN**: Returns all rows from the right table and matched rows from the left.
4. **OUTER JOIN**: Returns all rows when there is a match in one of the tables.
5. **LEFT JOIN excluding INNER JOIN**: Returns unmatched rows from the left table only.
6. **RIGHT JOIN excluding INNER JOIN**: Returns unmatched rows from the right table only.
7. **OUTER JOIN excluding INNER JOIN**: Returns unmatched rows from both tables.

#### Source code:

```
SELECT P.ProductName, S.SupplierName FROM Products P INNER JOIN  
Suppliers S ON P.SupplierID = S.SupplierID;
```

#### Source code:

```
SELECT P.ProductName, S.SupplierName FROM Products P LEFT JOIN  
Suppliers S ON P.SupplierID = S.SupplierID;
```

#### Source code:

```
SELECT P.ProductName, S.SupplierName, S.City FROM Products P RIGHT  
JOIN Suppliers S ON P.SupplierID = S.SupplierID;
```

#### Source code:

```
SELECT P.ProductName, S.SupplierName, S.City FROM Products P LEFT JOIN  
Suppliers S ON P.SupplierID = S.SupplierID UNION ALL SELECT  
P.ProductName, S.SupplierName, S.City FROM Products P RIGHT JOIN  
Suppliers S ON P.SupplierID = S.SupplierID WHERE P.SupplierID IS NULL;
```

#### Source code:

```
SELECT P.ProductName, S.SupplierName FROM Products P LEFT JOIN
```

```
Suppliers S ON P.SupplierID = S.SupplierID WHERE S.SupplierID IS NULL;  
SELECT S.SupplierName, S.City, P.ProductName FROM Products P RIGHT  
JOIN Suppliers S ON P.SupplierID = S.SupplierID WHERE P.SupplierID IS  
NULL;
```

**Source code:**

```
SELECT P.ProductName, S.SupplierName, S.City FROM Products P LEFT JOIN  
Suppliers S ON P.SupplierID = S.SupplierID WHERE S.SupplierID IS NULL  
UNION ALL SELECT P.ProductName, S.SupplierName, S.City FROM Products P  
RIGHT JOIN Suppliers S ON P.SupplierID = S.SupplierID WHERE P.SupplierID  
IS NULL;
```

## EXPERIMENT 8

### Normal Forms

1. **1NF (First Normal Form)**: Eliminates repeating groups; ensures atomic values in each column.
2. **2NF (Second Normal Form)**: Removes partial dependencies; every non-key attribute fully depends on the primary key.
3. **3NF**: Non-key columns depend only on the whole primary key — not on other non-key columns.

### Source code:1NF

```
CREATE TABLE student_1nf (  
    student_id INT,  
    student_name VARCHAR(50),  
    subject VARCHAR(50));  
INSERT INTO student_1nf VALUES (1, 'Alice', 'Math');  
INSERT INTO student_1nf VALUES (1, 'Alice', 'Science');  
INSERT INTO student_1nf VALUES (2, 'Bob', 'English');  
INSERT INTO student_1nf VALUES (2, 'Bob', 'History');  
SELECT * FROM student_1nf;
```

### Source code:2NF:

```
CREATE TABLE Students2 (  
    student_id INT PRIMARY KEY,  
    student_name VARCHAR2(50));  
CREATE TABLE Courses2 (  
    course_id INT PRIMARY KEY,  
    course_name VARCHAR2(50),  
    instructor_name VARCHAR2(50));  
CREATE TABLE Enrollments2 (  
    student_id INT,  
    course_id INT,  
    PRIMARY KEY (student_id, course_id),  
    FOREIGN KEY (student_id) REFERENCES  
Students2(student_id), FOREIGN KEY (course_id) REFERENCES  
Courses2(course_id)); INSERT INTO Students2 VALUES (1, 'Alice');  
INSERT INTO Students2 VALUES (2, 'Bob');  
INSERT INTO Students2 VALUES (3, 'Charlie');  
INSERT INTO Courses2 VALUES (101, 'Database Systems', 'Dr. Smith');
```

```

INSERT INTO Courses2 VALUES (102, 'Operating Systems', 'Prof.
Brown'); INSERT INTO Courses2 VALUES (103, 'Networks', 'Dr. Green');
INSERT INTO Enrollments2 VALUES (1, 101);
INSERT INTO Enrollments2 VALUES (1, 102);
INSERT INTO Enrollments2 VALUES (2, 103);
INSERT INTO Enrollments2 VALUES (3, 101);
COMMIT;
SELECT
    s.student_id,
    s.student_name,
    c.course_id,
    c.course_name,
    c.instructor_name
FROM Enrollments2 e
JOIN Students2 s ON e.student_id = s.student_id
JOIN Courses2 c ON e.course_id = c.course_id
ORDER BY s.student_id, c.course_id;

```

**Source code: 3NF**

```

CREATE TABLE Students3 (
    student_id INT PRIMARY KEY,
    student_name VARCHAR2(50));
CREATE TABLE Instructors3 (
    instructor_id INT PRIMARY KEY,
    instructor_name VARCHAR2(50));
CREATE TABLE Courses3 (
    course_id INT PRIMARY KEY,
    course_name VARCHAR2(50),
    instructor_id INT,
    FOREIGN KEY (instructor_id) REFERENCES
Instructors3(instructor_id)); CREATE TABLE Enrollments3 (
    student_id INT,
    course_id INT,
    PRIMARY KEY (student_id, course_id),
    FOREIGN KEY (student_id) REFERENCES
Students3(student_id), FOREIGN KEY (course_id) REFERENCES
Courses3(course_id)); INSERT INTO Students3 VALUES (1, 'Alice');
INSERT INTO Students3 VALUES (2, 'Bob');
INSERT INTO Students3 VALUES (3, 'Charlie');
INSERT INTO Instructors3 VALUES (201, 'Dr. Smith');
INSERT INTO Instructors3 VALUES (202, 'Prof. Brown');
INSERT INTO Instructors3 VALUES (203, 'Dr. Green');

```

```
INSERT INTO Courses3 VALUES (101, 'Database Systems', 201);
INSERT INTO Courses3 VALUES (102, 'Operating Systems',
202); INSERT INTO Courses3 VALUES (103, 'Networks', 203);
INSERT INTO Enrollments3 VALUES (1, 101);
INSERT INTO Enrollments3 VALUES (1, 102);
INSERT INTO Enrollments3 VALUES (2, 103);
INSERT INTO Enrollments3 VALUES (3, 101);
COMMIT;
SELECT
    s.student_id,
    s.student_name,
    c.course_id,
    c.course_name,
    i.instructor_name
FROM Enrollments3 e
JOIN Students3 s ON e.student_id = s.student_id
JOIN Courses3 c ON e.course_id = c.course_id
JOIN Instructors3 i ON c.instructor_id = i.instructor_id
ORDER BY s.student_id, c.course_id;
```



## EXPERIMENT 9

**Nested Queries:** A query within another SQL query, used to perform intermediate filtering or calculations.

**Source code:**

```
CREATE TABLE department ( dept_id INT PRIMARY KEY, dept_name
VARCHAR(50));
CREATE SEQUENCE dept_seq START WITH 1 INCREMENT BY
1; CREATE OR REPLACE TRIGGER dept_on_insert
BEFORE INSERT ON department
FOR EACH ROW
BEGIN
SELECT dept_seq.nextval INTO :new.dept_id FROM dual;
END;
CREATE TABLE employee (emp_id INT PRIMARY KEY,emp_name
VARCHAR(50),salary NUMBER(10,2), dept_id INT, FOREIGN KEY (dept_id)
REFERENCES department(dept_id));
CREATE SEQUENCE emp_seq START WITH 1 INCREMENT BY 1;
CREATE OR REPLACE TRIGGER emp_on_insert
BEFORE INSERT ON employee
FOR EACH ROW
BEGIN
    SELECT emp_seq.nextval INTO :new.emp_id FROM dual;
END;
INSERT INTO employee (emp_name, salary, dept_id) VALUES ('Alice', 50000,
(SELECT dept_id FROM department WHERE dept_name = 'HR')); INSERT
INTO employee (emp_name, salary, dept_id) VALUES ('Bob', 60000, (SELECT
dept_id FROM department WHERE dept_name = 'HR')); INSERT INTO
employee (emp_name, salary, dept_id) VALUES ('Charlie', 55000, (SELECT
dept_id FROM department WHERE dept_name = 'HR')); INSERT INTO
employee (emp_name, salary, dept_id) VALUES ('David', 80000, (SELECT
dept_id FROM department WHERE dept_name = 'IT')); INSERT INTO
employee (emp_name, salary, dept_id) VALUES ('Eve', 90000, (SELECT
dept_id FROM department WHERE dept_name = 'IT')); INSERT INTO
employee (emp_name, salary, dept_id) VALUES ('Frank', 85000, (SELECT
dept_id FROM department WHERE dept_name = 'IT')); INSERT INTO
employee (emp_name, salary, dept_id) VALUES ('Grace', 70000, (SELECT
dept_id FROM department WHERE dept_name = 'Finance'));
```

```

INSERT INTO employee (emp_name, salary, dept_id) VALUES ('Hannah',
75000, (SELECT dept_id FROM department WHERE dept_name = 'Finance'));
INSERT INTO employee (emp_name, salary, dept_id) VALUES ('Irene', 45000,
(SELECT dept_id FROM department WHERE dept_name = 'HR')); INSERT
INTO employee (emp_name, salary, dept_id) VALUES ('Jack', 100000, (SELECT
dept_id FROM department WHERE dept_name = 'IT')); INSERT INTO
employee (emp_name, salary, dept_id) VALUES ('Kelly', 68000, (SELECT
dept_id FROM department WHERE dept_name = 'Finance')); INSERT INTO
employee (emp_name, salary, dept_id) VALUES ('Liam', 62000, (SELECT
dept_id FROM department WHERE dept_name = 'HR')); INSERT INTO
employee (emp_name, salary, dept_id) VALUES ('Mia', 95000, (SELECT
dept_id FROM department WHERE dept_name = 'IT')); COMMIT;
SELECT emp_name, salary, dept_id
FROM employee
WHERE salary > ALL (
    SELECT salary
    FROM employee e_hr
    WHERE e_hr.dept_id = (
        SELECT dept_id FROM department WHERE dept_name = 'HR'));
SELECT emp_name, salary
FROM employee
WHERE dept_id NOT IN (
    SELECT dept_id
    FROM department
    WHERE dept_name = 'IT');
SELECT e.emp_name, e.salary, d_avg.Finance_Avg_Salary
FROM employee e
CROSS JOIN (
    SELECT AVG(salary) AS Finance_Avg_Salary
    FROM employee
    WHERE dept_id = (SELECT dept_id FROM department WHERE dept_name
= 'Finance')) d_avg;

```

## EXPERIMENT 10

### SQL WILD CARD CHARACTERS

1. %: Represents **zero or more characters** in a string.
2. \_: Represents **exactly one character**.

#### Source code:

```
CREATE TABLE Employees_WC (  
    emp_id INT PRIMARY KEY,  
    emp_name VARCHAR2(50),  
    department VARCHAR2(50));  
  
INSERT INTO Employees_WC VALUES (1, 'Alice Johnson', 'HR');  
INSERT INTO Employees_WC VALUES (2, 'Bob Smith', 'Finance');  
INSERT INTO Employees_WC VALUES (3, 'Charlie Brown', 'IT');  
INSERT INTO Employees_WC VALUES (4, 'Alicia Keys', 'HR');  
INSERT INTO Employees_WC VALUES (5, 'Albert King', 'Sales');  
INSERT INTO Employees_WC VALUES (6, 'Bobby Ray', 'Finance');  
COMMIT;  
  
SELECT * FROM Employees_WC  
WHERE emp_name LIKE 'Al%';  
SELECT * FROM Employees_WC  
WHERE emp_name LIKE '%son';  
SELECT * FROM Employees_WC  
WHERE emp_name LIKE '%ob%';  
SELECT * FROM Employees_WC  
WHERE emp_name LIKE '_l%';  
SELECT * FROM Employees_WC  
WHERE department LIKE 'F%';
```

## EXPERIMENT 11

**SELECT with Comparison Operator:** Retrieves rows that meet specific conditions using operators like =, >, <, >=, <=, <>.

**Source code:**

```
SELECT SupplierName, City FROM Suppliers WHERE SupplierID = 5; SELECT  
SupplierName, SupplierID FROM Suppliers WHERE SupplierID > 15; SELECT  
SupplierName, SupplierID FROM Suppliers WHERE SupplierID < 4; SELECT  
SupplierName, SupplierID FROM Suppliers WHERE SupplierID >= 10; SELECT  
SupplierName, SupplierID FROM Suppliers WHERE SupplierID <= 6; SELECT  
SupplierName, City FROM Suppliers WHERE City <> 'New York';
```

## EXPERIMENT 12

### Working on Local Host XAMPP Server

1. **Server Variables in XAMPP:** Provide environment and request details via PHP's `$_SERVER` array.

### OUTPUT:

Login information

User name: 

Use text field

 11239AD66

Host name: 

Local

 localhost

Password: 

Use text field

Strength: Strong

Re-type:

Authentication plugin: Native MySQL authentication

Generate password: 

Generate

 KzvBIVPTyETeoC.3m

Database for user account

☒ Create database with same name and grant all privileges.  
☒ Grant all privileges on wildcard name (username, %).

Global privileges: ☒ Check all

Note: MySQL privilege names are expressed in English.

☒ Data

☒ SELECT  
☒ INSERT  
☒ UPDATE  
☒ DELETE  
☒ FILE

☒ Structure

☒ CREATE  
☒ ALTER  
☒ INDEX  
☒ DROP  
☒ CREATE TEMPORARY TABLES  
☒ SHOW VIEW  
☒ CREATE ROUTINE  
☒ ALTER ROUTINE  
☒ EXECUTE  
☒ CREATE VIEW  
☒ EVENT  
☒ TRIGGER

☒ Administration

☒ GRANT  
☒ SUPER  
☒ PROCESS  
☒ RELOAD  
☒ SHUTDOWN  
☒ SHOW DATABASES  
☒ LOCK TABLES  
☒ REFERENCES  
☒ REPLICATION CLIENT  
☒ REPLICATION SLAVE  
☒ CREATE USER

Resource limits

Note: Setting these options to 0 (zero) removes the limit.

MAX QUERIES PER HOUR  
0

MAX UPDATES PER HOUR  
0

MAX CONNECTIONS PER HOUR  
0

MAX USER CONNECTIONS  
0

SSL

☒ REQUIRE NONE  
☐ REQUIRE SSL  
☐ REQUIRE X509  
☐ SPECIFIED

REQUIRE CIPHER

REQUIRE ISSUER

REQUIRE SUBJECT

Create user

## 2. Hierarchical User Access in XAMPP: Assign different privileges to MySQL users to control database access levels.

### OUTPUT:

✓ You have added a new user.

```
CREATE USER '11239A066'@'localhost' IDENTIFIED WITH mysql_native_password BY '11239A066'; GRANT ALL PRIVILEGES ON *.* TO '11239A066'@'localhost' WITH GRANT OPTION; ALTER USER '11239A066'@'localhost' REQUIRE NONE WITH MAX_QUERIES_PER_HOUR 0 MAX_CONNECTIONS_PER_HOUR 0 MAX_UPDATES_PER_HOUR 0 MAX_USER_CONNECTIONS 0; CREATE DATABASE IF NOT EXISTS '11239A066'; GRANT ALL PRIVILEGES ON '11239A066'.* TO '11239A066'@'localhost'; GRANT ALL PRIVILEGES ON '11239A066'.* TO '11239A066'@'localhost';
```

Edit info Edit Create PHP code

Global Database Change password Login information

Edit privileges: User account '11239A066'@'localhost'

Global privileges ☒ Check all

Note: MySQL privilege names are expressed in English.

<input type="checkbox"/> Data	<input type="checkbox"/> Structure	<input type="checkbox"/> Administration	<input type="checkbox"/> Resource limits
<input checked="" type="checkbox"/> SELECT <input checked="" type="checkbox"/> INSERT <input checked="" type="checkbox"/> UPDATE <input checked="" type="checkbox"/> DELETE <input checked="" type="checkbox"/> FILE	<input checked="" type="checkbox"/> CREATE <input checked="" type="checkbox"/> ALTER <input checked="" type="checkbox"/> INDEX <input checked="" type="checkbox"/> DROP <input checked="" type="checkbox"/> CREATE TEMPORARY TABLES <input checked="" type="checkbox"/> SHOW VIEW <input checked="" type="checkbox"/> CREATE ROUTINE <input checked="" type="checkbox"/> ALTER ROUTINE <input checked="" type="checkbox"/> EXECUTE <input checked="" type="checkbox"/> CREATE VIEW <input checked="" type="checkbox"/> EVENT <input checked="" type="checkbox"/> TRIGGER	<input checked="" type="checkbox"/> GRANT <input checked="" type="checkbox"/> SUPER <input checked="" type="checkbox"/> PROXY <input checked="" type="checkbox"/> RELOAD <input checked="" type="checkbox"/> SHUTDOWN <input checked="" type="checkbox"/> LOCK TABLES <input checked="" type="checkbox"/> REFERENCES <input checked="" type="checkbox"/> REPLICATION CLIENT <input checked="" type="checkbox"/> REPLICATION SLAVE <input checked="" type="checkbox"/> CREATE USER	Note: Setting these options to 0 (zero) removes the limit. MAX_QUERIES_PER_HOUR 0 MAX_UPDATES_PER_HOUR 0 MAX_CONNECTIONS_PER_HOUR 0 MAX_USER_CONNECTIONS 0

☐ SSL

☒ REQUIRE NONE  
☐ REQUIRE SSL  
☐ REQUIRE X509  
☐ REQUIRE DSS

REQUIRE CIPHER

REQUIRE ISSUER

REQUIRE SUBJECT

Update user privileges