Experiment 1.1

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EASY - LEVEL

1. **Problem Title:** Author-Book Relationship Using Joins and Basic SQL Operations.
2. **Procedure (Step-by-Step):** Design two tables — one for storing author details and the other for book details.
   a. Ensure a foreign key relationship from the book to its respective author.
   b. Insert at least three records in each table.
   c. Perform an INNER JOIN to link each book with its author using the common author ID.
   d. Select the book title, author name, and author's country.
3. **Sample Output Description:** When the join is performed, we get a list where each book title is shown along with its author's name and their country.
4. **SQL Commands:**

   Create the database and use it:

```
create database ADBMS;
use ADBMS;
```

   a. Create tables TBL_Author and TBL_Books:

```sql
create table TBL_Author(
    AuthorId Int primary key,
    AuthorName varchar(max), -- max keyword 255 is the size
    Country varchar(max)
)

create table TBL_Books(
    BookId Int primary key,
    BookTitle varchar(max),
    AuthorId Int
    Foreign key (AuthorId) references TBL_Author(AuthorId),
)
```

b. Insert the values in the tables:

```sql
INSERT INTO TBL_Author (AuthorId, AuthorName, Country) VALUES
(1, 'George Orwell', 'United Kingdom'),
(2, 'Haruki Murakami', 'Japan'),
(3, 'Chinua Achebe', 'Nigeria'),
(4, 'J.K. Rowling', 'United Kingdom'),
(5, 'Gabriel García Márquez', 'Colombia'),
(6, 'Mark Twain', 'United States');

INSERT INTO TBL_Books (BookId, BookTitle, AuthorId) VALUES
(101, '1984', 1),
(102, 'Kafka on the Shore', 2),
(103, 'Things Fall Apart', 3),
(104, 'Harry Potter and the Sorcerer"s Stone', 4),
(105, 'One Hundred Years of Solitude', 5),
(106, 'Adventures of Huckleberry Finn', 6);
```

c. Selecting the book title, author name, and author's country:

```sql
---- Query for Join ----
SELECT
BookTitle AS "Book Name",
AuthorName AS "Author Name",
Country FROM
TBL_AUTHOR AS A INNER JOIN
TBL_BOOKS AS B ON
A.AuthorId = B.AuthorId;
```

5. **Output:**

Results | Messages

	Book Name	Author Name	Country
1	1984	George Orwell	United Kingdom
2	Kafka on the Shore	Haruki Murakami	Japan
3	Things Fall Apart	Chinua Achebe	Nigeria
4	Harry Potter and the Sorcerer"s Stone	J.K. Rowling	United Kingdom
5	One Hundred Years of Solitude	Gabriel García Márquez	Colombia
6	Adventures of Huckleberry Finn	Mark Twain	United States

6. **Learning Outcome:**

a. I learnt how to create and manage relational databases using SQL.
b. I learnt how to define primary and foreign key constraints to link tables.
c. I learnt how to insert multiple records into SQL tables efficiently.
d. I learnt how to use INNER JOIN to retrieve combined data from related tables.

MEDIUM - LEVEL

1. **Problem Title:** Course Subquery and Access Control.

Procedure (Step-by-Step):

a. Design normalized tables for departments and the courses they offer, maintaining a foreign key relationship.
b. Insert five departments and at least ten courses across those departments.
c. Use a subquery to count the number of courses under each department.
d. Filter and retrieve only those departments that offer more than two courses.
e. Grant SELECT-only access on the courses table to a specific user.

3. **Sample Output Description:** The result shows the names of departments which are associated with more than two courses in the system.
4. **SQL Commands:**

a. Create the tables.

```sql
-- Create Department Table
CREATE TABLE Department (
    DeptId INT PRIMARY KEY,
    DeptName VARCHAR(100)
);

-- Create Course Table
CREATE TABLE Course (
    CourseId INT PRIMARY KEY,
    CourseName VARCHAR(100),
    DeptId INT,
    FOREIGN KEY (DeptId) REFERENCES Department(DeptId)
);
```

b. Insert the values:

```sql
INSERT INTO Department VALUES
(1, 'Computer Science'),
(2, 'Physics'),
(3, 'Mathematics'),
(4, 'Chemistry'),
(5, 'Biology');

-- Insert Courses
INSERT INTO Course VALUES
(101, 'Data Structures', 1),
(102, 'Operating Systems', 1),
(103, 'Quantum Mechanics', 2),
(104, 'Electromagnetism', 2),
(105, 'Linear Algebra', 3),
(106, 'Calculus', 3),
(107, 'Organic Chemistry', 4),
(108, 'Physical Chemistry', 4),
(109, 'Genetics', 5),
(110, 'Computer Networks', 1),
(111, 'Linux/Unix systems', 1),
(112, 'Matrix', 3),
(113, 'Space Physics', 2);
```

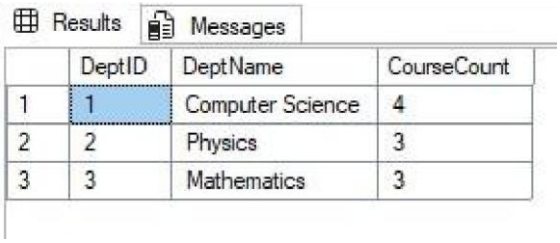
c. Use a subquery to count the number of courses under each department.

```sql
---- Query to count number of courses under each department
SELECT
    DeptID,
    DeptName,
    (SELECT COUNT(*)
     FROM Course
     WHERE Course.DeptId = Department.DeptId) AS CourseCount
FROM Department
where (SELECT COUNT(*)
     FROM Course
     WHERE Course.DeptId = Department.DeptId) > 2;
```

d. Grant SELECT-only access on the courses table to a specific user.

```
create login test_login with password = 'Test@123';
create user test_user for login test_login;
execute as user = 'test_user';
grant select on Course to test_user;
```

5. **Output:**



Results | Messages

	DeptID	DeptName	CourseCount
1	1	Computer Science	4
2	2	Physics	3
3	3	Mathematics	3

6. **Learning Outcomes:**

a. Learned to design normalized database schemas using primary and foreign keys to maintain referential integrity between related entities.
b. Developed proficiency in inserting and managing structured data across relational tables.
c. Mastered the use of **correlated subqueries** to dynamically count related records for each row in a parent table.
d. Applied **scalar subqueries** within SELECT and WHERE clauses to filter and compute aggregated results per row context.
e. Gained practical experience in implementing **user-level access control**, using GRANT to assign SELECT-only privileges and EXECUTE AS with REVERT to switch and restore user contexts securely.