DAY 2:

Create queries:

```
-- Students table
CREATE TABLE Students (
    student_id INT PRIMARY KEY,
    student_name VARCHAR(50),
    student_age INT,
    student_grade_id INT,
    FOREIGN KEY (student_grade_id) REFERENCES Grades(grade_id)
);

-- Grades table
CREATE TABLE Grades (
    grade_id INT PRIMARY KEY,
    grade_name VARCHAR(10)
);

-- Courses table
CREATE TABLE Courses (
    course_id INT PRIMARY KEY,
    course_name VARCHAR(50)
);

-- Enrollments table
CREATE TABLE Enrollments (
    enrollment_id INT PRIMARY KEY,
    student_id INT,
    course_id INT,
    enrollment_date DATE,
    FOREIGN KEY (student_id) REFERENCES Students(student_id),
    FOREIGN KEY (course_id) REFERENCES Courses(course_id)
);
```

Insert queries:

```
-- Insert into Grades table
INSERT INTO Grades (grade_id, grade_name) VALUES
(1, 'A'),
(2, 'B'),
(3, 'C');

-- Insert into Courses table
INSERT INTO Courses (course_id, course_name) VALUES
(101, 'Math'),
```

(102, 'Science'),
(103, 'History');

-- Insert into Students table
INSERT INTO Students (student_id, student_name, student_age, student_grade_id) VALUES
(1, 'Alice', 17, 1),
(2, 'Bob', 16, 2),
(3, 'Charlie', 18, 1),
(4, 'David', 16, 2),
(5, 'Eve', 17, 1),
(6, 'Frank', 18, 3),
(7, 'Grace', 17, 2),
(8, 'Henry', 16, 1),
(9, 'Ivy', 18, 2),
(10, 'Jack', 17, 3);

-- Insert into Enrollments table
INSERT INTO Enrollments (enrollment_id, student_id, course_id, enrollment_date) VALUES
(1, 1, 101, '2023-09-01'),
(2, 1, 102, '2023-09-01'),
(3, 2, 102, '2023-09-01'),
(4, 3, 101, '2023-09-01'),
(5, 3, 103, '2023-09-01'),
(6, 4, 101, '2023-09-01'),
(7, 4, 102, '2023-09-01'),
(8, 5, 102, '2023-09-01'),
(9, 6, 101, '2023-09-01'),
(10, 7, 103, '2023-09-01');

Questions:

1. Find all students enrolled in the Math course.

Query

```
SELECT *
    FROM students
    WHERE student_id IN (
        SELECT student_id
        FROM enrollments
        WHERE course_id = (
            SELECT course_id
            FROM courses
            WHERE course_name='Math'
        )
```

);

Output

Data Output | Messages | Notifications

	student_id [PK] integer	student_name character varying (50)	student_age integer	student_grade_id integer
1	1	Alice	17	1
2	3	Charlie	18	1
3	4	David	16	2
4	6	Frank	18	3

2. List all courses taken by students named Bob.

Query

```
SELECT course_name
FROM Courses
WHERE course_id IN (
    SELECT e.course_id
    FROM Enrollments e
    WHERE e.student_id IN (
        SELECT s.student_id
        FROM Students s
        WHERE s.student_name = 'Bob'
    )
);
```

Output

Data Output | Messages | Notifications

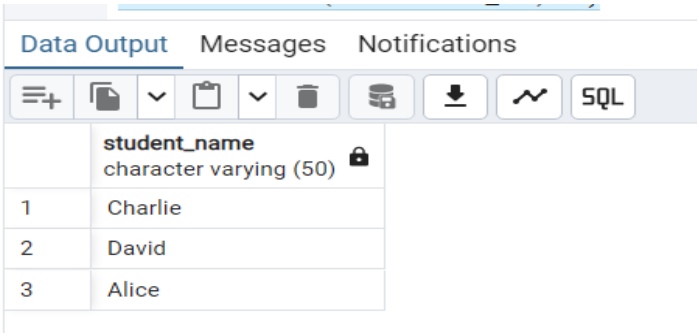
	course_name character varying (50)
1	Science

3. Find the names of students who are enrolled in more than one course.

Query

```
SELECT student_name
FROM Students
WHERE student_id IN (
   SELECT student_id
   FROM Enrollments
   GROUP BY student_id
   HAVING COUNT(course_id) > 1
);
```

Output



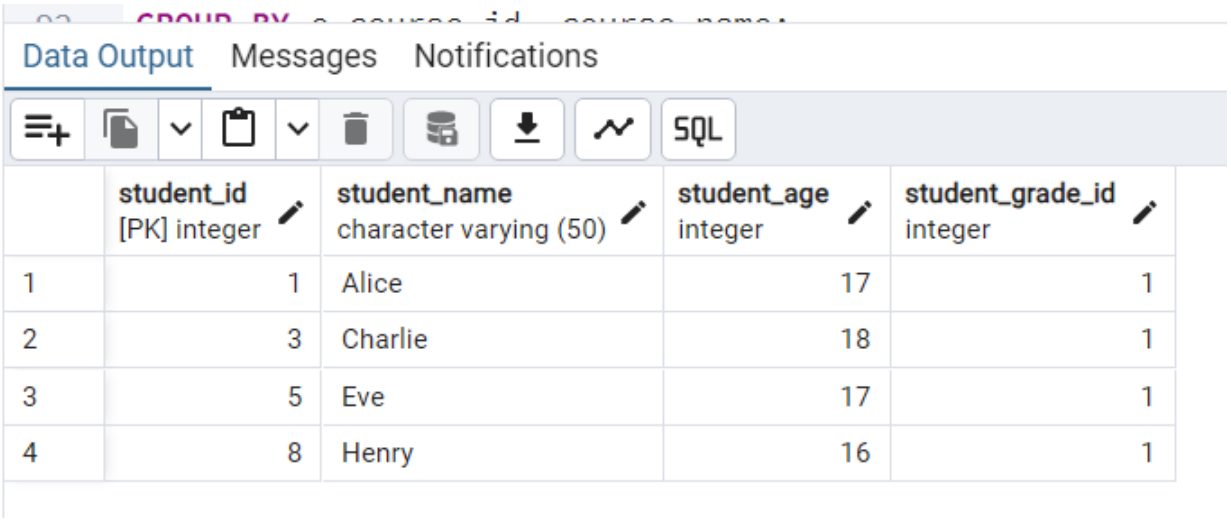
	student_name character varying (50)
1	Charlie
2	David
3	Alice

4. List all students who are in Grade A (grade_id = 1).

Query

```
SELECT *
FROM students
WHERE student_grade_id=1;
```

Output



Data Output | Messages | Notifications

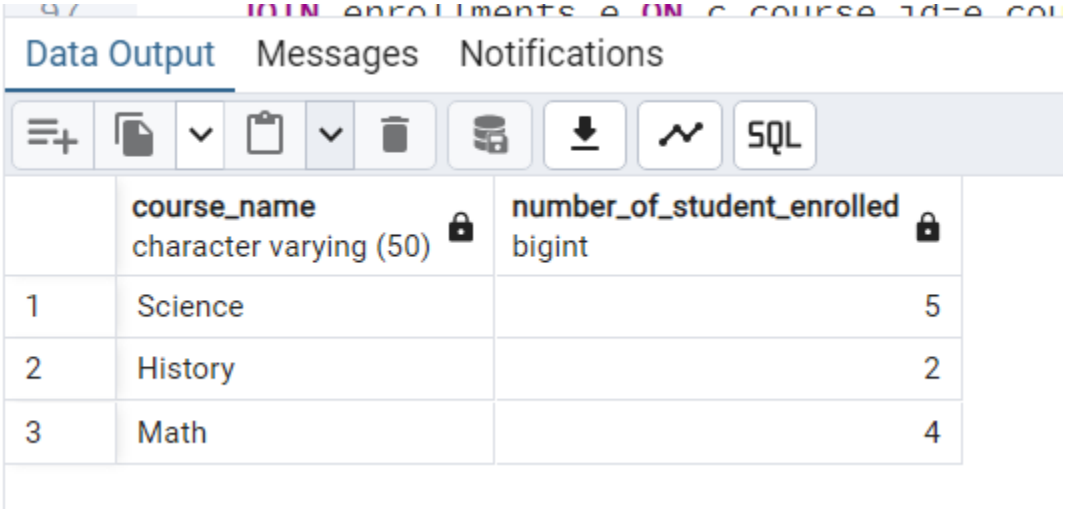
	student_id [PK] integer	student_name character varying (50)	student_age integer	student_grade_id integer
1	1	Alice	17	1
2	3	Charlie	18	1
3	5	Eve	17	1
4	8	Henry	16	1

5. Find the number of students enrolled in each course.

Query

```
SELECT course_name, (
   SELECT COUNT(*)
        FROM Enrollments e
        WHERE e.course_id = c.course_id
        ) AS number_of_student_enrolled
FROM Courses c;
```

Output



Data Output | Messages | Notifications

	course_name character varying (50)	number_of_student_enrolled bigint
1	Science	5
2	History	2
3	Math	4

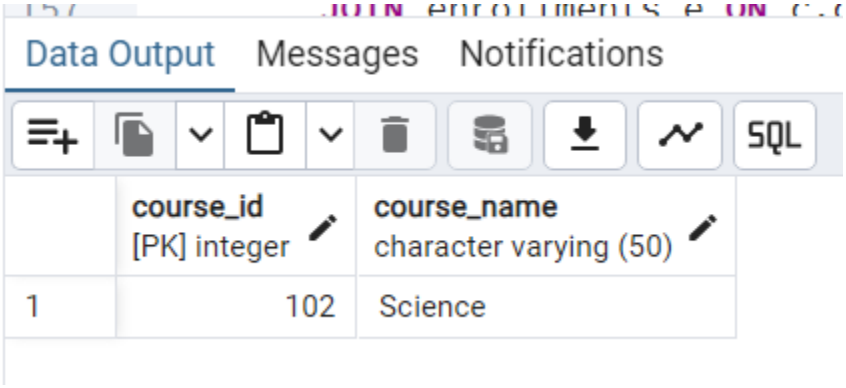
6. Retrieve the course with the highest number of enrollments.

Query

```
SELECT course_id, course_name
```

```
FROM Courses
WHERE course_id = (
    SELECT course_id
    FROM Enrollments
    GROUP BY course_id
    ORDER BY COUNT(student_id) DESC
    LIMIT 1
);
```

Output

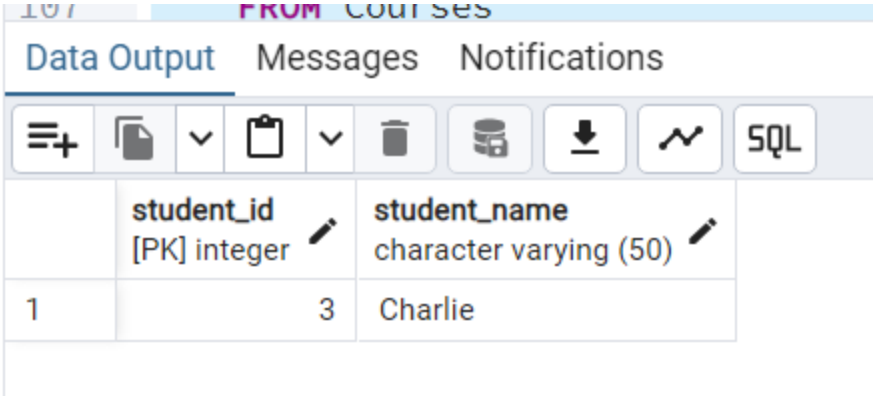


7. List students who are enrolled in all available courses.

Query

```
SELECT s.student_id, s.student_name
FROM Students s
WHERE (
    SELECT COUNT(DISTINCT course_id)
    FROM Courses
) = (
    SELECT COUNT(DISTINCT e.course_id)
    FROM Enrollments e
    WHERE e.student_id = s.student_id
);
```

Output

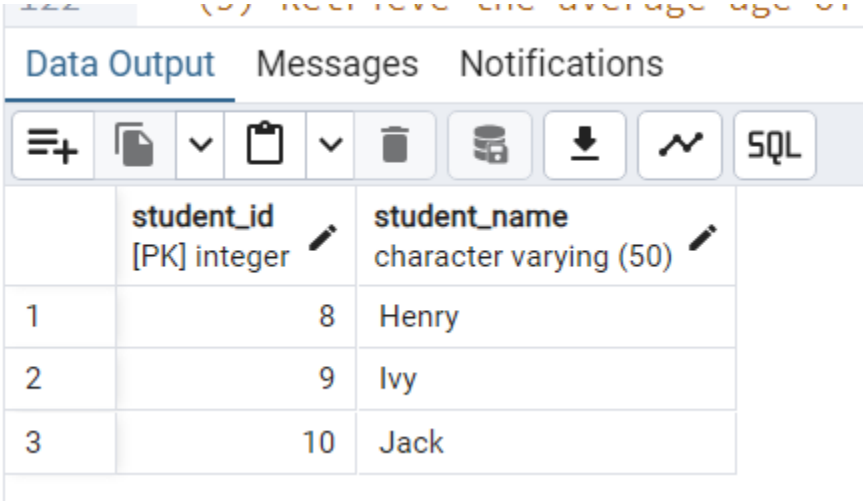


8. Find students who are not enrolled in any courses.

Query

```
SELECT student_id, student_name
FROM students
WHERE student_id NOT IN (
        SELECT DISTINCT student_id
        FROM enrollments
);
```

Output



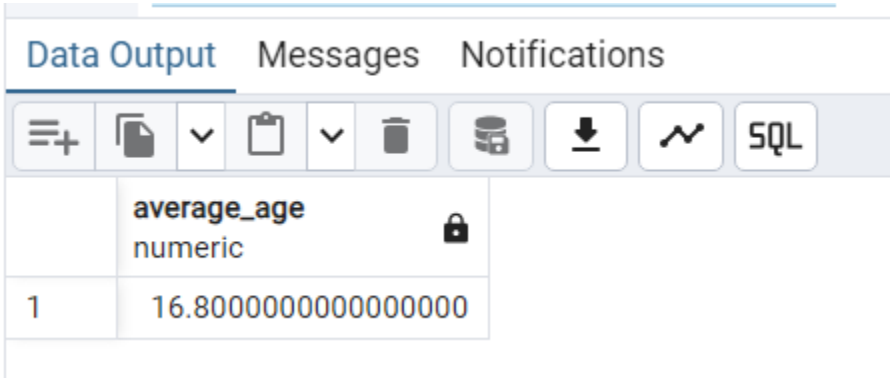
9. Retrieve the average age of students enrolled in the Science course.

Query

```
SELECT AVG(student_age) AS average_age
        FROM Students
        WHERE student_id IN (
```

```
    SELECT student_id
    FROM Enrollments
    WHERE course_id = (
        SELECT course_id
        FROM Courses
        WHERE course_name = 'Science'
    )
);
```

Output

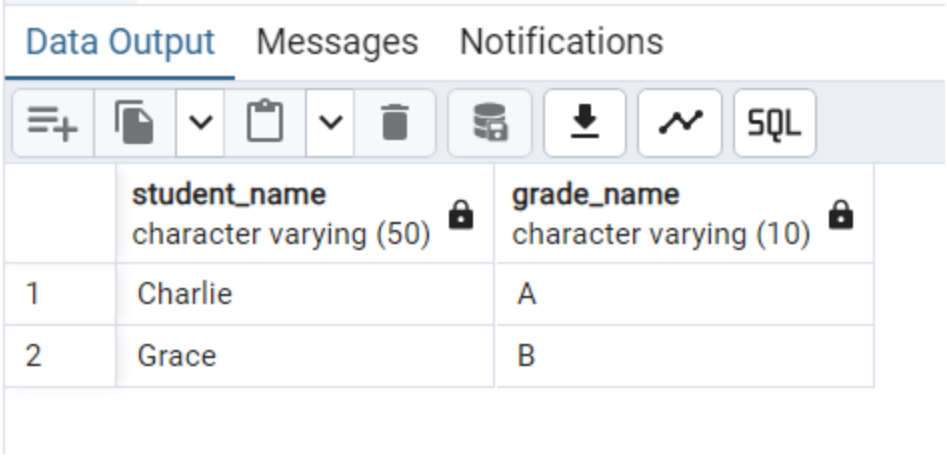


10. Find the grade of students enrolled in the History course.

Query

```
SELECT student_name, (
    SELECT grade_name
    FROM Grades
    WHERE grade_id = Students.student_grade_id
) AS grade_name
FROM Students
WHERE student_id IN (
    SELECT student_id
    FROM Enrollments
    WHERE course_id = (
        SELECT course_id
        FROM Courses
        WHERE course_name = 'History'
    )
);
```

Output



	student_name character varying (50)	grade_name character varying (10)
1	Charlie	A
2	Grace	B

Assignment:

Please design and create the necessary tables (`Books`, `Authors`, `Publishers`, `Customers`, `Orders`, `Book_Authors`, `Order_Items`) for an online bookstore database. Ensure each table includes appropriate columns, primary keys, and foreign keys where necessary. Consider the relationships between these tables and how they should be defined.

Conceptual Modeling:

1. **Identify Entities and Relationships:**
    - **Entities**:

        - Book (with attributes like `book_id`, `title`, `author`, `genre`, `publisher`, `publication_year`)
        - Author (with attributes like `author_id`, `author_name`, `birth_date`, `nationality`)
        - Publisher (with attributes like `publisher_id`, `publisher_name`, `country`)
        - Customer (with attributes like `customer_id`, `customer_name`, `email`, `address`)
        - Order (with attributes like `order_id`, `order_date`, `customer_id`, `total_amount`)
    - **Relationships**:
        - Books are written by Authors (`many-to-many` relationship)
        - Books are published by Publishers (`many-to-one` relationship)
        - Customers place Orders (`one-to-many` relationship)
        - Orders contain Books (`many-to-many` relationship)

2. **Conceptual Model Representation**:

    - Use an Entity-Relationship Diagram (ERD) to visually represent entities, attributes, and relationships.

Logical Schema Design:

1. **Translate Entities to Tables:**
    - **Tables**:
        - `Books` table (with columns: `book_id`, `title`, `genre`, `publisher_id`, `publication_year`)
        - `Authors` table (with columns: `author_id`, `author_name`, `birth_date`, `nationality`)
        - `Publishers` table (with columns: `publisher_id`, `publisher_name`, `country`)
        - `Customers` table (with columns: `customer_id`, `customer_name`, `email`, `address`)
        - `Orders` table (with columns: `order_id`, `order_date`, `customer_id`, `total_amount`)
        - `Book_Authors` table (to manage the `many-to-many` relationship between `Books` and `Authors`)
        - `Order_Items` table (to manage the `many-to-many` relationship between `Orders` and `Books`)
2. **Define Relationships and Constraints:**

- **Primary Keys**:
  - `book_id` in `Books`
  - `author_id` in `Authors`
  - `publisher_id` in `Publishers`
  - `customer_id` in `Customers`
  - `order_id` in `Orders`
- **Foreign Keys**:
  - `publisher_id` in `Books` references `publisher_id` in `Publishers`
  - `customer_id` in `Orders` references `customer_id` in `Customers`
  - `book_id` and `author_id` in `Book_Authors` reference `book_id` and `author_id` in `Books` and `Authors`, respectively
  - `order_id` and `book_id` in `Order_Items` reference `order_id` in `Orders` and `book_id` in `Books`, respectively

Table Creation

```
-- Create Authors table

CREATE TABLE Authors (

    author_id SERIAL PRIMARY KEY,

    author_name VARCHAR(100) NOT NULL,

    birth_date DATE,

    nationality VARCHAR(100)

);

-- Create Publishers table

CREATE TABLE Publishers (

    publisher_id SERIAL PRIMARY KEY,

    publisher_name VARCHAR(100) NOT NULL,

    country VARCHAR(100)

);

-- Create Customers table
```

```
CREATE TABLE Customers (
    customer_id SERIAL PRIMARY KEY,
    customer_name VARCHAR(100) NOT NULL,
    email VARCHAR(100),
    address TEXT
);
-- Create Books table
CREATE TABLE Books (
    book_id SERIAL PRIMARY KEY,
    title VARCHAR(255) NOT NULL,
    genre VARCHAR(100),
    publisher_id INT REFERENCES Publishers(publisher_id),
    publication_year INT
);
-- Create Orders table
CREATE TABLE Orders (
    order_id SERIAL PRIMARY KEY,
    order_date DATE NOT NULL,
    customer_id INT REFERENCES Customers(customer_id),
 total_amount NUMERIC(10, 2) NOT NULL
);
-- Create Book_Authors table
CREATE TABLE Book_Authors (
```

```
    book_id INT REFERENCES Books(book_id),
    author_id INT REFERENCES Authors(author_id),
    PRIMARY KEY (book_id, author_id)
);
-- Create Order_Items table
CREATE TABLE Order_Items (
    order_id INT REFERENCES Orders(order_id),
    book_id INT REFERENCES Books(book_id),
    PRIMARY KEY (order_id, book_id)
);
```

Schema