**Name : ID:**

* Jana Mahmoud Abdalla 231001245
* Alaa Khaled El Habibi 231002125
* Mariam Wassem 231001582

**1️⃣ Modelling Authors ↔ Research (Many-to-Many)**

To model a **many-to-many relationship** between Authors and Research, we use a **cross-reference table** (junction table).

**Tables and Keys:**

**Authors**

* author\_id (Primary Key)
* name
* affiliation

**Research**

* research\_id (Primary Key)
* title
* field
* publication\_year
* citations

**Author\_Research** (Cross-reference Table)

* author\_id (Foreign Key → Authors.author\_id)
* research\_id (Foreign Key → Research.research\_id)
* **Primary Key:** (author\_id, research\_id)

This table links each author to one or more research papers, and each research paper to one or more authors.

**2️⃣ Query: List All Authors in “Immunology” with Total Citations for 2023**

SELECT

a.author\_id,

a.name,

SUM(r.citations) AS total\_citations\_2023

FROM

Authors a

JOIN

Author\_Research ar ON a.author\_id = ar.author\_id

JOIN

Research r ON ar.research\_id = r.research\_id

WHERE

r.field = 'Immunology'

AND r.publication\_year = 2023

GROUP BY

a.author\_id, a.name

ORDER BY

total\_citations\_2023 DESC;

**Explanation:**

* Filters research papers in the **Immunology** field published in 2023.
* Joins authors through the Author\_Research table.
* Calculates the **sum of citations** per author.
* Orders authors by total citations in descending order.

**3️⃣ Updating Research.citations When a New Citation is Recorded**

**Preferred Approach: Application Logic**

* Update the citation count from the application.
* Advantages:
  + More control and flexibility
  + Easier to validate, log, or handle errors
  + Can integrate with external systems or APIs (e.g., citation databases)

**Alternative: Database Trigger**

* If citations are stored in a separate Citations table, a **trigger** can automatically update the count.

Example Trigger:

CREATE TRIGGER update\_citation\_count

AFTER INSERT ON Citations

FOR EACH ROW

BEGIN

UPDATE Research

SET citations = citations + 1

WHERE research\_id = NEW.research\_id;

END;

Generally, **application-level logic** is preferred for better clarity and control.