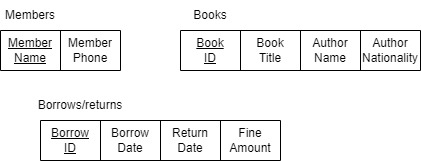
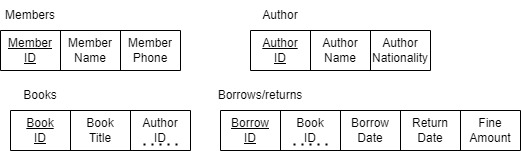
The current table Contains an unsorted and big table with several entities that have relations, the first step would be to try and divide the table into several tables with appropriate primary keys.



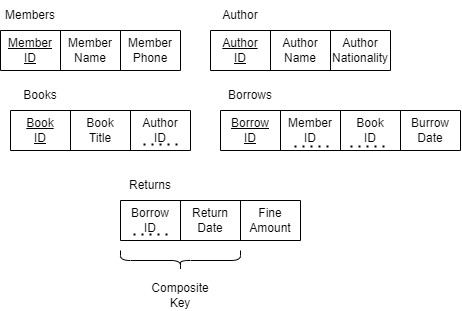
The three main entities would be Members, Books and Borrow transactions those can be separated further, the tables would look like this:



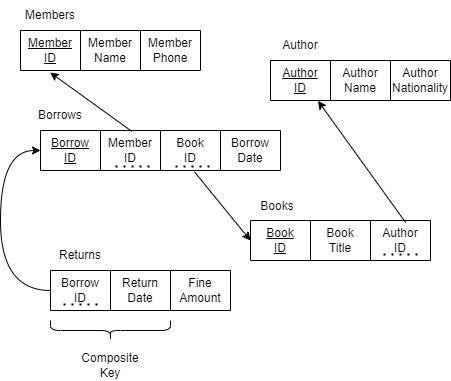
As can be seen, we now a clearer table relation but there are missing elements as appropriate primary keys and foreign keys, we can easily fix this by adding a Member\_ID column as a primary key to the members column and separating the book table into two tables, Book and Author:



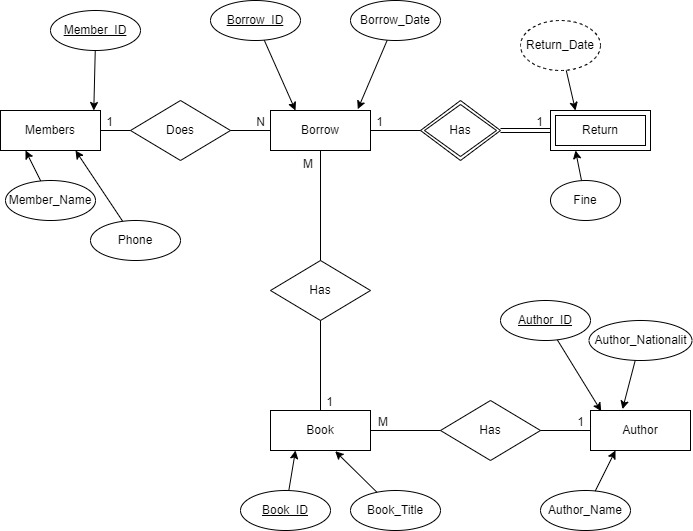
With adding the foreign keys and appropriate primary keys we got the above tables which can be further divided into smaller tables, we can divide the Borrows/Returns table further; this would result into Borrow and Return tables which the tables would also need the member ID to associate the borrowing with a member:



The final step would be to map the tables with appropriate relations and this would look as follows:



These steps would ensure that the Table has undergone Normalization and that the rules of 1NF, 2NF and 3NF have been applied to the original unsorted table, we can now easily create an Entity Relation Digram (ERD) from the current mapping, which is illustrated as:



Having all the above we can move towards creating the database in MSSQL:

Create Database Library;

USE Library;

Create Table Author(

Author\_ID VarChar(50) Primary key not null,

Author\_Name Varchar(60) Not null,

Author\_Nationality Varchar(20)

);

Create Table Book(

Book\_ID VarChar(50) Primary key not null,

Book\_Title VarChar(50) not null,

);

Alter Table Book

ADD Author\_ID VarChar(50) references Author(Author\_ID);

Create Table Members(

Member\_ID VarChar(50) Primary key not null,

Member\_Name VarChar(50) not null,

Member\_Phone VarChar(50)

);

Create Table Borrow(

Borrow\_ID VarChar(50) Primary key not null,

Borrow\_Date Date not null

);

Alter Table Borrow

ADD Member\_ID VarChar(50) references Members(Member\_ID);

Alter Table Borrow

ADD Book\_ID VarChar(50) references Book(Book\_ID);

Create Table Returns(

Retrun\_Date Date,

Fine\_Amount Dec

);

Alter Table Returns

ADD Borrow\_ID VarChar(50) references Borrow(Borrow\_ID);

Insert Into Author (Author\_ID, Author\_Name,Author\_Nationality)

Values

('1','Ramez Elmasri','USA'),

('2', 'Joel Grus', 'USA'),

('3','Mark Lutz','UK');

Insert Into Members (Member\_ID, Member\_Name, Member\_Phone)

Values

('1','Ali Hassan','9876543210'),

('2', 'Fatima Noor', '9871234560');

Insert Into Book (Book\_ID, Book\_Title, Author\_ID )

Values

('B101','Database Systems', '1'),

('B205','Data Science','2'),

('B305','Python Basics','3');

Insert Into Borrow ( Borrow\_ID, Member\_ID, Book\_ID, Borrow\_Date)

Values

('201','1','B101','2025-01-10'),

('202','2','B205','2025-01-12'),

('203','1','B305','2025-01-10');

Insert Into Returns (Borrow\_ID,Retrun\_Date,Fine\_Amount)

Values

('201','2025-01-20','0'),

('202','2025-01-25','5'),

('203','2025-01-22','2');