

CS504 PROJECT

Principles of Data Management and Mining

LIBRARY

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Database Design

The scope of the project and identifying the entities and their relationships:

The project's scope include the creation and execution of a library management system, encompassing the administration of library resources, catalogs, genres, writers, authorship connections, patrons, and personnel. The system's objectives are to assist member activities such material borrowing and reservations, track and organize library resources more easily, and oversee the personnel in charge of running the library.

Entities:

Material

Attributes: Material_ID (Primary Key) , Title, Publication_Date, Catalog_ID (Foreign Key), Genre_ID

Catalog

Attributes: Catalog_ID (Primary Key), Name, Location

Genre

Attributes: Genre_ID (Primary Key), Name, Description

Borrow

Attributes: Borrow_ID (Primary Key), Material_ID (Foreign Key), Member_ID (Foreign Key), Staff_ID (Foreign Key), Borrow_Date, Due_Date, Return_Date

Author

Attributes: Author_ID (Primary Key), Name, Birth_Date, Nationality

Member

Attributes: Member_ID (Primary Key), Name, Contact_Info, Join_Date

Staff

Attributes: Staff_ID (Primary Key), Name, Contact_Info, Job_Title, Hire_Date

Relationships:

Material and Catalog (Belongs to): A material's location in the library is indicated by the Catalog_ID attribute, which links it to a catalog. It has **N:1** relationship. **Material has total participation and catalog has partial participation.**

Material and Genre (Belongs to): A material is associated with a certain genre by virtue of the Genre_ID attribute, which classifies it according to that genre It has **N:1** relationship. **Material has total participation and Genre has partial participation.**

Material and Borrow (Borrowing Activity): The Material is referenced by the Material_ID attribute, while Borrow denotes the borrowing of materials by members. It has **N:1** relationship. **Material has total participation and Borrow has partial participation.**

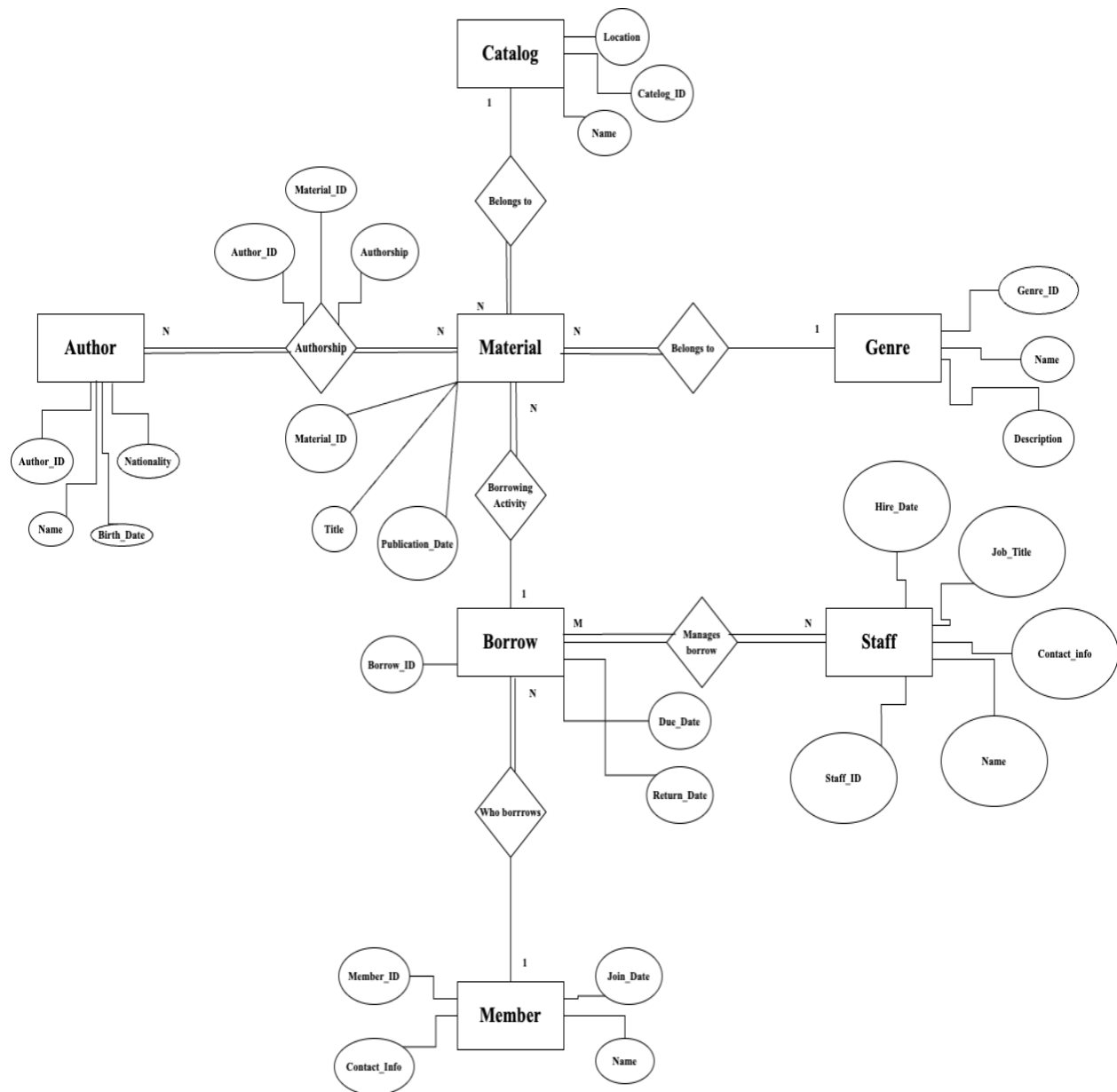
Borrow and Member (Who Borrows): The Member_ID property, which identifies which member borrowed the content, is also used by Borrow to refer to the Member. It has **N:1** relationship. **Borrow has total participation and Member has partial participation.**

Borrow and Staff (Manages Borrow): The Staff_ID property in the Borrow entity provides a reference to the Staff member in charge of handling the borrowing transaction. **It has N:M relationship. Borrow and Staff has total participation.**

Material and Author (Authorship): Authorship links the Author entity to the Author_ID, establishing a linkage between writers and the content they have produced. **It has M:N relationship. Material and Author has total participation.**

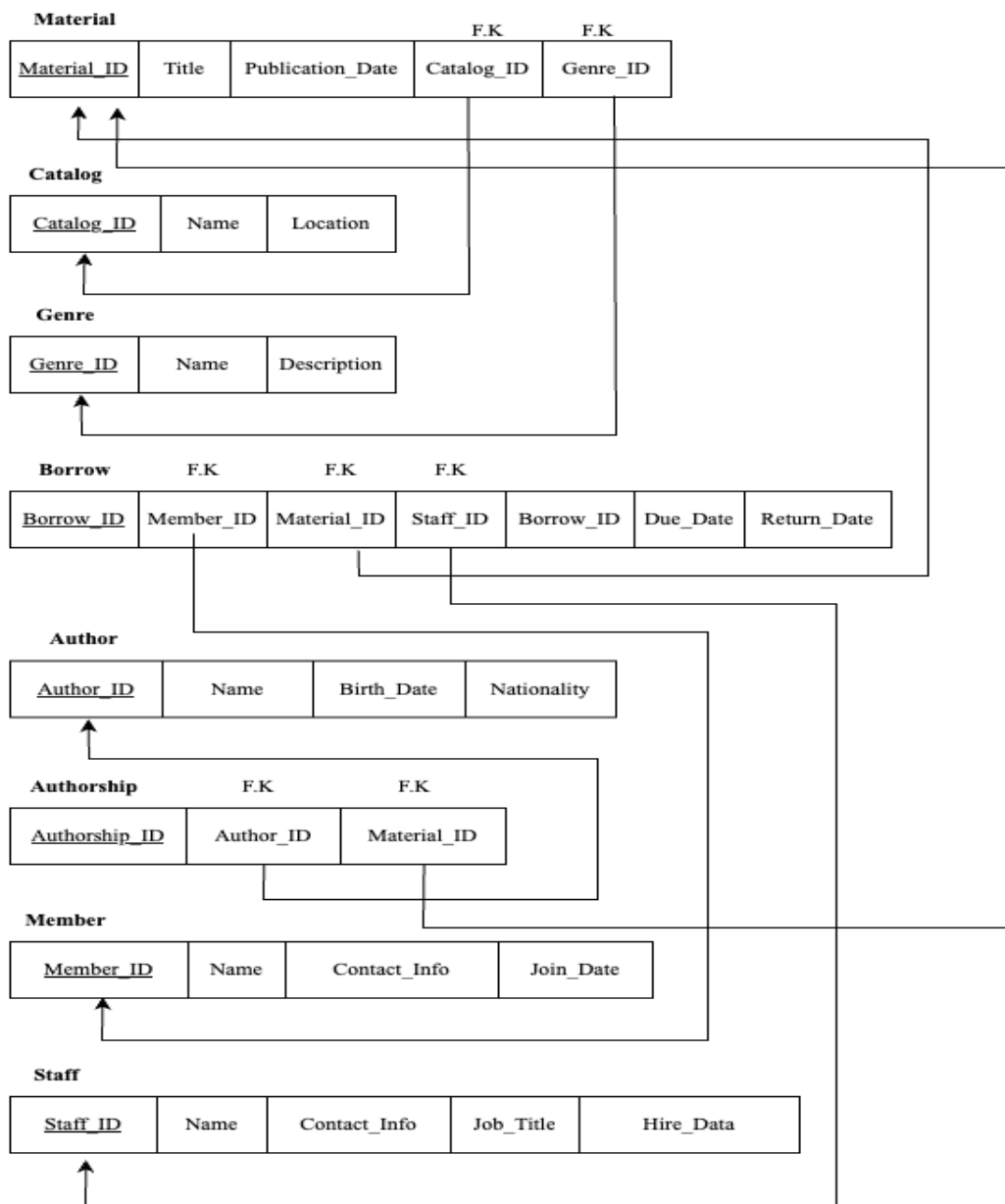
The goal of this library management system is to oversee the whole lifetime of the resources in the library, including their authorship, availability, classification, and member interactions. Additionally, it records the personnel of the library and their responsibilities for overseeing its resources.

Entity-Relationship (ER) diagram to represent the database schema:



To maintain data integrity and efficient system functioning, this library management system applies a number of participation restrictions to the connections between entities. In important interactions like "Material and Catalog," "Material and Genre," "Material and Borrow," and "Borrow and Member," Total participation is mandated to make sure that every instance of one entity is completely connected to another. Moreover, the link between "Authorship and Material" ensures total participation from both parties, ensuring that every material has an author, and every author has written materials. The limitations on involvement aid in the thorough administration of the library's resources and staff relations.

Relational Schema diagram to represent the database schema:



Database Implementation

My choice for project implementation is MySQL Workbench. Initially, a schema known as Library was made. Next, MySQL code was written to construct tables, put data into the tables, and run some sample queries to change the tables, join the tables, and so on.

```
1 • Create database library;  
2 show databases;  
3  
4 use library;  
5
```

Creating tables Material, Catalog, Genre, Borrow, Author, Authorship, Member, Staff

```
5  
6 CREATE TABLE Material (  
7     Material_ID INT PRIMARY KEY,  
8     Title VARCHAR(255) NOT NULL,  
9     Publication_Date DATE,  
10    Catalog_ID INT,  
11    Genre_ID INT,  
12    FOREIGN KEY (Catalog_ID) REFERENCES Catalog(Catalog_ID),  
13    FOREIGN KEY (Genre_ID) REFERENCES Genre(Genre_ID)  
14 );  
15  
16 CREATE TABLE Catalog (  
17     Catalog_ID INT PRIMARY KEY,  
18     Name VARCHAR(255) NOT NULL,  
19     Location VARCHAR(255) NOT NULL  
20 );  
21  
22 CREATE TABLE Genre (  
23     Genre_ID INT PRIMARY KEY,  
24     Name VARCHAR(255) NOT NULL,  
25     Description TEXT  
26 );  
27  
28 CREATE TABLE Borrow (  
29     Borrow_ID INT PRIMARY KEY,  
30     Material_ID INT,  
31     Member_ID INT,  
32     Staff_ID INT,  
33     Borrow_Date DATE,  
34     Due_Date DATE,  
35     Return_Date DATE,  
36     FOREIGN KEY (Material_ID) REFERENCES Material(Material_ID),  
37     FOREIGN KEY (Member_ID) REFERENCES Member(Member_ID),  
38     FOREIGN KEY (Staff_ID) REFERENCES Staff(Staff_ID)  
39 );  
40
```

```
40
41
42 CREATE TABLE Author (
43     Author_ID INT PRIMARY KEY,
44     Name VARCHAR(255) NOT NULL,
45     Birth_Date DATE,
46     Nationality VARCHAR(255)
47 );
48
49 CREATE TABLE Authorship (
50     Authorship_ID INT PRIMARY KEY,
51     Author_ID INT,
52     Material_ID INT,
53     FOREIGN KEY (Author_ID) REFERENCES Author(Author_ID),
54     FOREIGN KEY (Material_ID) REFERENCES Material(Material_ID)
55 );
56
57 CREATE TABLE Member (
58     Member_ID INT PRIMARY KEY,
59     Name VARCHAR(255) NOT NULL,
60     Contact_Info VARCHAR(255) NOT NULL,
61     Join_Date DATE
62 );
63
64 CREATE TABLE Staff (
65     Staff_ID INT PRIMARY KEY,
66     Name VARCHAR(255) NOT NULL,
67     Contact_Info VARCHAR(255) NOT NULL,
68     Job_Title VARCHAR(255),
69     Hire_Date DATE
70 );
71
72 show tables;
73
74
```

Tables in library

Tables_in_libra...	
Author	
Authorship	
Borrow	
Catalog	
Genre	
Material	
Member	
Staff	

Inserting data into the tables:

80

```
81 • INSERT INTO Catalog (Catalog_ID, Name, Location) VALUES
82     (1, 'Books', 'A1.1'),
83     (2, 'Magazines', 'B2.1'),
84     (3, 'E-Books', 'C3.1'),
85     (4, 'Audiobooks', 'D4.1'),
86     (5, 'Journals', 'E5.1'),
87     (6, 'Newspaper', 'F6.1'),
88     (7, 'Maps', 'G7.1'),
89     (8, 'Novels', 'H8.1'),
90     (9, 'Sheet Music', 'I9.1'),
91     (10, 'Educational', 'J10.1');
92
```

97

```
98 • INSERT INTO Genre (Genre_ID, Name, Description) VALUES
99     (1, 'General Fiction', 'Literary works with a focus on character and plot development, exploring various themes and human experiences. '),
100    (2, 'Mystery & Thriller', 'Suspenseful stories centered around crime, investigation, or espionage with an emphasis on tension and excitement. '),
101    (3, 'Science Fiction & Fantasy', 'Imaginative works that explore alternate realities, futuristic concepts, and magical or supernatural elements. '),
102    (4, 'Horror & Suspense', 'Stories designed to evoke fear, unease, or dread, often featuring supernatural or psychological elements. '),
103    (5, 'Dystopian & Apocalyptic', 'Depictions of societies in decline or collapse, often exploring themes of political and social oppression or environmental disaster. '),
104    (6, 'Classics', 'Enduring works of literature that have stood the test of time, often featuring rich language and complex themes. '),
105    (7, 'Historical Fiction', 'Fictional stories set in the past, often based on real historical events or figures, and exploring the customs and experiences of that time. '),
106    (8, 'Epic Poetry & Mythology', 'Ancient or traditional stories and poems, often featuring heroes, gods, and mythical creatures, and exploring cultural values and beliefs');
107
```



```
111
112 ● INSERT INTO Material (Material_ID, Title, Publication_Date, Catalog_ID, Genre_ID) VALUES
113 (1, 'The Catcher in the Rye', '1951-07-16', 1, 1),
114 (2, 'To Kill a Mockingbird', '1960-07-11', 2, 1),
115 (3, 'The Da Vinci Code', '2003-04-01', 3, 2),
116 (4, 'The Hobbit', '1937-09-21', 4, 3),
117 (5, 'The Shining', '1977-01-28', 5, 4),
118 (6, 'Pride and Prejudice', '1813-01-28', 1, 1),
119 (7, 'The Great Gatsby', '1925-04-10', 2, 1),
120 (8, 'Moby Dick', '1851-10-18', 3, 1),
121 (9, 'Crime and Punishment', '1866-01-01', 4, 1),
122 (10, 'The Hitchhiker's Guide to the Galaxy', '1979-10-12', 5, 3),
123 (11, '1984', '1949-06-08', 1, 5),
124 (12, 'Animal Farm', '1945-08-17', 2, 5),
125 (13, 'The Haunting of Hill House', '1959-10-17', 3, 4),
126 (14, 'Brave New World', '1932-08-01', 4, 5),
127 (15, 'The Chronicles of Narnia: The Lion the Witch and the Wardrobe', '1950-10-16', 5, 3),
128 (16, 'The Adventures of Huckleberry Finn', '1884-12-10', 6, 1),
129 (17, 'The Catch-22', '1961-10-11', 7, 1),
130 (18, 'The Picture of Dorian Gray', '1890-07-01', 8, 1),
131 (19, 'The Call of Cthulhu', '1928-02-01', 9, 4),
132 (20, 'Harry Potter and the Philosopher's Stone', '1997-06-26', 10, 3),
133 (21, 'Frankenstein', '1818-01-01', 6, 4),
134 (22, 'A Tale of Two Cities', '1859-04-30', 7, 1),
135 (23, 'The Iliad', '1750-01-01', 8, 6),
136 (24, 'The Odyssey', '1725-01-01', 9, 6),
137 (25, 'The Brothers Karamazov', '1880-01-01', 10, 1),
138 (26, 'The Divine Comedy', '1320-01-01', 6, 6),
139 (27, 'The Grapes of Wrath', '1939-04-14', 7, 1),
140 (28, 'The Old Man and the Sea', '1952-09-01', 8, 1),
141 (29, 'The Count of Monte Cristo', '1844-01-01', 9, 1),
142 (30, 'A Midsummer Night's Dream', '1596-01-01', 10, 7),
143 (31, 'The Tricky Book', '1888-01-01', 10, 7);
144
```

```
147 |
148 ● INSERT INTO Author (Author_ID, Name, Birth_Date, Nationality) VALUES
149 (1, 'Jane Austen', '1775-12-16', 'British'),
150 (2, 'Ernest Hemingway', '1899-07-21', 'American'),
151 (3, 'George Orwell', '1903-06-25', 'British'),
152 (4, 'Scott Fitzgerald', '1896-09-24', 'American'),
153 (5, 'J.K. Rowling', '1965-07-31', 'British'),
154 (6, 'Mark Twain', '1835-11-30', 'American'),
155 (7, 'Leo Tolstoy', '1828-09-09', 'Russian'),
156 (8, 'Virginia Woolf', '1882-01-25', 'British'),
157 (9, 'Gabriel Márquez', '1927-03-06', 'Colombian'),
158 (10, 'Charles Dickens', '1812-02-07', 'British'),
159 (11, 'Harper Lee', '1926-04-28', 'American'),
160 (12, 'Oscar Wilde', '1854-10-16', 'Irish'),
161 (13, 'William Shakespeare', '1564-04-26', 'British'),
162 (14, 'Franz Kafka', '1883-07-03', 'Czech'),
163 (15, 'James Joyce', '1882-02-02', 'Irish'),
164 (16, 'J.R.R. Tolkien', '1892-01-03', 'British'),
165 (17, 'Emily Brontë', '1818-07-30', 'British'),
166 (18, 'Toni Morrison', '1931-02-18', 'American'),
167 (19, 'Fyodor Dostoevsky', '1821-11-11', 'Russian'),
168 (20, 'Lucas Piki', '1847-10-16', 'British');
169
```

1 / 1

```
172 ● INSERT INTO Authorship (Authorship_ID, Author_ID, Material_ID) VALUES
173     (1, 1, 1),
174     (2, 2, 2),
175     (3, 3, 3),
176     (4, 4, 4),
177     (5, 5, 5),
178     (6, 6, 6),
179     (7, 7, 7),
180     (8, 8, 8),
181     (9, 9, 9),
182     (10, 10, 10),
183     (11, 11, 11),
184     (12, 12, 12),
185     (13, 13, 13),
186     (14, 14, 14),
187     (15, 15, 15),
188     (16, 16, 16),
189     (17, 17, 17),
190     (18, 18, 18),
191     (19, 19, 19),
192     (20, 20, 20),
193     (21, 1, 21),
194     (22, 2, 22),
195     (23, 3, 22),
196     (24, 3, 23),
197     (25, 4, 24),
198     (26, 5, 25),
199     (27, 6, 26),
200     (28, 7, 27),
201     (29, 8, 28),
202     (30, 19, 28),
203     (31, 9, 29),
204     (32, 10, 30),
205     (33, 8, 30),
206     (34, 2, 29);
```

207

```
208 • INSERT INTO Borrow (Borrow_ID, Material_ID, Member_ID, Staff_ID, Borrow_Date, Due_Date, Return_Date) VALUES
209 (1, 1, 1, 1, '2018-09-12', '2018-10-03', '2018-09-30'),
210 (2, 2, 2, 1, '2018-10-15', '2018-11-05', '2018-10-29'),
211 (3, 3, 3, 1, '2018-12-20', '2019-01-10', '2019-01-08'),
212 (4, 4, 4, 1, '2019-03-11', '2019-04-01', '2019-03-27'),
213 (5, 5, 5, 1, '2019-04-20', '2019-05-11', '2019-05-05'),
214 (6, 6, 6, 1, '2019-07-05', '2019-07-26', '2019-07-21'),
215 (7, 7, 7, 1, '2019-09-10', '2019-10-01', '2019-09-25'),
216 (8, 8, 8, 1, '2019-11-08', '2019-11-29', '2019-11-20'),
217 (9, 9, 9, 1, '2020-01-15', '2020-02-05', '2020-02-03'),
218 (10, 10, 10, 1, '2020-03-12', '2020-04-02', '2020-03-28'),
219 (11, 1, 11, 2, '2020-05-14', '2020-06-04', '2020-05-28'),
220 (12, 2, 12, 2, '2020-07-21', '2020-08-11', '2020-08-02'),
221 (13, 3, 13, 2, '2020-09-25', '2020-10-16', '2020-10-15'),
222 (14, 4, 1, 2, '2020-11-08', '2020-11-29', '2020-11-24'),
223 (15, 5, 2, 2, '2021-01-03', '2021-01-24', '2021-01-19'),
224 (16, 6, 3, 2, '2021-02-18', '2021-03-11', '2021-03-12'),
225 (17, 17, 4, 2, '2021-04-27', '2021-05-18', '2021-05-20'),
226 (18, 18, 5, 2, '2021-06-13', '2021-07-04', '2021-06-28'),
227 (19, 19, 6, 2, '2021-08-15', '2021-09-05', '2021-09-03'),
228 (20, 20, 7, 2, '2021-10-21', '2021-11-11', NULL),
229 (21, 21, 1, 3, '2021-11-29', '2021-12-20', NULL),
230 (22, 22, 2, 3, '2022-01-10', '2022-01-31', '2022-01-25'),
231 (23, 23, 3, 3, '2022-02-07', '2022-02-28', '2022-02-23'),
232 (24, 24, 4, 3, '2022-03-11', '2022-04-01', '2022-03-28'),
233 (25, 25, 5, 3, '2022-04-28', '2022-05-19', '2022-05-18'),
234 (26, 26, 6, 3, '2022-06-22', '2022-07-13', '2022-07-08'),
235 (27, 27, 7, 3, '2022-08-04', '2022-08-25', '2022-08-23'),
236 (28, 28, 8, 3, '2022-09-13', '2022-10-04', '2022-09-28'),
```









250






```
251 • INSERT INTO Member (Member_ID, Name, Contact_Info, Join_Date) VALUES
252     (1, 'Alice Johnson', 'alice.johnson@email.com', '2018-01-10'),
253     (2, 'Bob Smith', 'bob.smith@email.com', '2018-03-15'),
254     (3, 'Carol Brown', 'carol.brown@email.com', '2018-06-20'),
255     (4, 'David Williams', 'david.williams@email.com', '2018-09-18'),
256     (5, 'Emily Miller', 'emily.miller@email.com', '2019-02-12'),
257     (6, 'Frank Davis', 'frank.davis@email.com', '2019-05-25'),
258     (7, 'Grace Wilson', 'grace.wilson@email.com', '2019-08-15'),
259     (8, 'Harry Garcia', 'harry.garcia@email.com', '2019-11-27'),
260     (9, 'Isla Thomas', 'isla.thomas@email.com', '2020-03-04'),
261     (10, 'Jack Martinez', 'jack.martinez@email.com', '2020-07-01'),
262     (11, 'Kate Anderson', 'kate.anderson@email.com', '2020-09-30'),
263     (12, 'Luke Jackson', 'luke.jackson@email.com', '2021-01-18'),
264     (13, 'Mia White', 'mia.white@email.com', '2021-04-27'),
265     (14, 'Noah Harris', 'noah.harris@email.com', '2021-07-13'),
266     (15, 'Olivia Clark', 'olivia.clark@email.com', '2021-10-05'),
267     (16, 'Peter Lewis', 'peter.lewis@email.com', '2021-12-01'),
268     (17, 'Quinn Hall', 'quinn.hall@email.com', '2022-02-28'),
269     (18, 'Rachel Young', 'rachel.young@email.com', '2022-06-17'),
270     (19, 'Sam Walker', 'sam.walker@email.com', '2022-09-25'),
271     (20, 'Tiffany Allen', 'tiffany.allen@email.com', '2022-12-10');
272
```



275



```
276 • INSERT INTO Staff (Staff_ID, Name, Contact_Info, Job_Title, Hire_Date) VALUES
277     (1, 'Amy Green', 'amy.green@email.com', 'Librarian', '2017-06-01'),
278     (2, 'Brian Taylor', 'brian.taylor@email.com', 'Library Assistant', '2018-11-15'),
279     (3, 'Christine King', 'chris.king@email.com', 'Library Assistant', '2019-05-20'),
280     (4, 'Daniel Wright', 'dan.wright@email.com', 'Library Technician', '2020-02-01');
281
```

Tables with Data:

Result Grid   Filter Rows: <input type="text" value="Search"/> Edit:    Export/Import:  					
Staff_ID	Name	Contact_Info	Job_Title	Hire_Date	
1	Amy Green	amy.green@email.com	Librarian	2017-06-01	
2	Brian Taylor	brian.taylor@email.com	Library Assistant	2018-11-15	
3	Christine King	chris.king@email.com	Library Assistant	2019-05-20	
4	Daniel Wright	dan.wright@email.com	Library Technician	2020-02-01	
NULL	NULL	NULL	NULL	NULL	






Result Grid   Filter Rows: <input type="text" value="Search"/> Edit:   					
Member_ID	Name	Contact_Info	Join_Date		
1	Alice Johnson	alice.johnson@email.com	2018-01-10		
2	Bob Smith	bob.smith@email.com	2018-03-15		
3	Carol Brown	carol.brown@email.com	2018-06-20		
4	David Williams	david.williams@email.com	2018-09-18		
5	Emily Miller	emily.miller@email.com	2019-02-12		
6	Frank Davis	frank.davis@email.com	2019-05-25		
7	Grace Wilson	grace.wilson@email.com	2019-08-15		
8	Harry Garcia	harry.garcia@email.com	2019-11-27		
9	Isla Thomas	isla.thomas@email.com	2020-03-04		
10	Jack Martinez	jack.martinez@email.com	2020-07-01		
11	Kate Anderson	kate.anderson@email.com	2020-09-30		
12	Luke Jackson	luke.jackson@email.com	2021-01-18		
13	Mia White	mia.white@email.com	2021-04-27		
14	Noah Harris	noah.harris@email.com	2021-07-13		
15	Olivia Clark	olivia.clark@email.com	2021-10-05		
16	Peter Lewis	peter.lewis@email.com	2021-12-01		
17	Quinn Hall	quinn.hall@email.com	2022-02-28		
18	Rachel Young	rachel.young@email.com	2022-06-17		
19	Sam Walker	sam.walker@email.com	2022-09-25		
20	Tiffany Allen	tiffany.allen@email.com	2022-12-10		
NULL	NULL	NULL	NULL		



Result Grid   Filter Rows: <input type="text" value="Search"/>			
	Authorship_ID	Author_ID	Material_ID
	1	1	1
	2	2	2
	3	3	3
	4	4	4
	5	5	5
	6	6	6
	7	7	7
	8	8	8
	9	9	9
	10	10	10
	11	11	11
	12	12	12
	13	13	13
	14	14	14
	15	15	15
	16	16	16
	17	17	17
	18	18	18
	19	19	19
	20	20	20
	21	1	21
	22	2	22
	23	3	22
	24	3	23
	25	4	24
	26	5	25
	27	6	26
	28	7	27
	29	8	28
	30	19	28
	31	9	29
	32	10	30
	33	8	30
	34	2	29
	NULL	NULL	NULL






Result Grid   Filter Rows: <input type="text" value="Search"/>				
	Author_ID	Name	Birth_Date	Nationality
	1	Jane Austen	1775-12-16	British
	2	Ernest Hemingway	1899-07-21	American
	3	George Orwell	1903-06-25	British
	4	Scott Fitzgerald	1896-09-24	American
	5	J.K. Rowling	1965-07-31	British
	6	Mark Twain	1835-11-30	American
	7	Leo Tolstoy	1828-09-09	Russian
	8	Virginia Woolf	1882-01-25	British
	9	Gabriel Márquez	1927-03-06	Colombian
	10	Charles Dickens	1812-02-07	British
	11	Harper Lee	1926-04-28	American
	12	Oscar Wilde	1854-10-16	Irish
	13	William Shakesp...	1564-04-26	British
	14	Franz Kafka	1883-07-03	Czech
	15	James Joyce	1882-02-02	Irish
	16	J.R.R. Tolkien	1892-01-03	British
	17	Emily Brontë	1818-07-30	British
	18	Toni Morrison	1931-02-18	American
	19	Fyodor Dostoevsky	1821-11-11	Russian
	20	Lucas Piki	1847-10-16	British
	NULL	NULL	NULL	NULL

Result Grid							
Filter Rows: <input type="text" value="Search"/>							
Edit: <input type="text" value="Export/"/>							
Borrow_ID	Material_ID	Member_ID	Staff_ID	Borrow_Date	Due_Date	Return_Date	
1	1	1	1	2018-09-12	2018-10-03	2018-09-30	
2	2	2	1	2018-10-15	2018-11-05	2018-10-29	
3	3	3	1	2018-12-20	2019-01-10	2019-01-08	
4	4	4	1	2019-03-11	2019-04-01	2019-03-27	
5	5	5	1	2019-04-20	2019-05-11	2019-05-05	
6	6	6	1	2019-07-05	2019-07-26	2019-07-21	
7	7	7	1	2019-09-10	2019-10-01	2019-09-25	
8	8	8	1	2019-11-08	2019-11-29	2019-11-20	
9	9	9	1	2020-01-15	2020-02-05	2020-02-03	
10	10	10	1	2020-03-12	2020-04-02	2020-03-28	
11	1	11	2	2020-05-14	2020-06-04	2020-05-28	
12	2	12	2	2020-07-21	2020-08-11	2020-08-02	
13	3	13	2	2020-09-25	2020-10-16	2020-10-15	
14	4	1	2	2020-11-08	2020-11-29	2020-11-24	
15	5	2	2	2021-01-03	2021-01-24	2021-01-19	
16	6	3	2	2021-02-18	2021-03-11	2021-03-12	
17	17	4	2	2021-04-27	2021-05-18	2021-05-20	
18	18	5	2	2021-06-13	2021-07-04	2021-06-28	
19	19	6	2	2021-08-15	2021-09-05	2021-09-03	
20	20	7	2	2021-10-21	2021-11-11	NULL	
21	21	1	3	2021-11-29	2021-12-20	NULL	
22	22	2	3	2022-01-10	2022-01-31	2022-01-25	
23	23	3	3	2022-02-07	2022-02-28	2022-02-23	
24	24	4	3	2022-03-11	2022-04-01	2022-03-28	
25	25	5	3	2022-04-28	2022-05-19	2022-05-18	
26	26	6	3	2022-06-22	2022-07-13	2022-07-08	
27	27	7	3	2022-08-04	2022-08-25	2022-08-23	
28	28	8	3	2022-09-13	2022-10-04	2022-09-28	
29	29	9	3	2022-10-16	2022-11-06	2022-11-05	
30	30	8	3	2022-11-21	2022-12-12	2022-12-05	
31	1	9	4	2022-12-28	2023-01-18	NULL	
32	2	1	4	2023-01-23	2023-02-13	NULL	
33	3	10	4	2023-02-02	2023-02-23	2023-02-17	
34	4	11	4	2023-03-01	2023-03-22	NULL	
35	5	12	4	2023-03-10	2023-03-31	NULL	
36	6	13	4	2023-03-15	2023-04-05	NULL	
37	7	17	4	2023-03-25	2023-04-15	NULL	
38	8	8	4	2023-03-30	2023-04-20	NULL	
39	9	9	4	2023-03-26	2023-04-16	NULL	
40	10	20	4	2023-03-28	2023-04-18	NULL	
NULL	NULL	NULL	NULL	NULL	NULL	NULL	

Borrow 24

Result Grid   Filter Rows: <input type="text" value="Search"/>				Edit:   		Export
Genre_ID	Name	Description				
1	General Fiction	Literary works with a focus on character and plo...				
2	Mystery & Thriller	Suspenseful stories centered around crime, inv...				
3	Science Fiction & Fantasy	Imaginative works that explore alternate realitie...				
4	Horror & Suspense	Stories designed to evoke fear, unease, or drea...				
5	Dystopian & Apocalyptic	Depictions of societies in decline or collapse, oft...				
6	Classics	Enduring works of literature that have stood the...				
7	Historical Fiction	Fictional stories set in the past, often based on r...				
8	Epic Poetry & Mythology	Ancient or traditional stories and poems, often f...				
NULL	NULL	NULL				

Result Grid   Filter Rows: <input type="text" value=""/>			
Catalog_ID	Name	Location	
1	Books	A1.1	
2	Magazines	B2.1	
3	E-Books	C3.1	
4	Audiobooks	D4.1	
5	Journals	E5.1	
6	Newspaper	F6.1	
7	Maps	G7.1	
8	Novels	H8.1	
9	Sheet Music	I9.1	
10	Educational	J10.1	
NULL	NULL	NULL	

Result Grid   Filter Rows: <input type="text" value="Search"/>						Edit:   		Export/Imp
Material_ID	Title	Publication_Da...	Catalog_ID	Genre_ID				
1	The Catcher in the Rye	1951-07-16	1	1				
2	To Kill a Mockingbird	1960-07-11	2	1				
3	The Da Vinci Code	2003-04-01	3	2				
4	The Hobbit	1937-09-21	4	3				
5	The Shining	1977-01-28	5	4				
6	Pride and Prejudice	1813-01-28	1	1				
7	The Great Gatsby	1925-04-10	2	1				
8	Moby Dick	1851-10-18	3	1				
9	Crime and Punishment	1866-01-01	4	1				
10	The Hitchhiker's Guide to the Galaxy	1979-10-12	5	3				
11	1984	1949-06-08	1	5				
12	Animal Farm	1945-08-17	2	5				
13	The Haunting of Hill House	1959-10-17	3	4				
14	Brave New World	1932-08-01	4	5				
15	The Chronicles of Narnia: The Lion...	1950-10-16	5	3				
16	The Adventures of Huckleberry Finn	1884-12-10	6	1				
17	The Catch-22	1961-10-11	7	1				
18	The Picture of Dorian Gray	1890-07-01	8	1				
19	The Call of Cthulhu	1928-02-01	9	4				
20	Harry Potter and the Philosopher's...	1997-06-26	10	3				
21	Frankenstein	1818-01-01	6	4				
22	A Tale of Two Cities	1859-04-30	7	1				
23	The Iliad	1750-01-01	8	6				
24	The Odyssey	1725-01-01	9	6				
25	The Brothers Karamazov	1880-01-01	10	1				
26	The Divine Comedy	1320-01-01	6	6				
27	The Grapes of Wrath	1939-04-14	7	1				
28	The Old Man and the Sea	1952-09-01	8	1				
29	The Count of Monte Cristo	1844-01-01	9	1				
30	A Midsummer Night's Dream	1596-01-01	10	7				
31	The Tricky Book	1888-01-01	10	7				
NULL	NULL	NULL	NULL	NULL				

Queries/Updates

1. Which materials are currently available in the library? If a material is borrowed and not returned, it's not considered as available.

Code

```
287
288 • select material_ID, Title
289      From Material
290     where material_ID not in (select material_ID from borrow where return_date is null);
291
```

Output




Result Grid   Filter Rows: <input type="text" value="Search"/> Export			
	material_ID	Title	
<input type="checkbox"/>	3	The Da Vinci Code	
<input type="checkbox"/>	11	1984	
<input type="checkbox"/>	12	Animal Farm	
<input type="checkbox"/>	13	The Haunting of Hill House	
<input type="checkbox"/>	14	Brave New World	
<input type="checkbox"/>	15	The Chronicles of Narnia: The Lion the Witch an...	
<input type="checkbox"/>	16	The Adventures of Huckleberry Finn	
<input type="checkbox"/>	17	The Catch-22	
<input type="checkbox"/>	18	The Picture of Dorian Gray	
<input type="checkbox"/>	19	The Call of Cthulhu	
<input type="checkbox"/>	22	A Tale of Two Cities	
<input type="checkbox"/>	23	The Iliad	
<input type="checkbox"/>	24	The Odyssey	
<input type="checkbox"/>	25	The Brothers Karamazov	
<input type="checkbox"/>	26	The Divine Comedy	
<input type="checkbox"/>	27	The Grapes of Wrath	
<input type="checkbox"/>	28	The Old Man and the Sea	
<input type="checkbox"/>	29	The Count of Monte Cristo	
<input type="checkbox"/>	30	A Midsummer Night's Dream	
<input type="checkbox"/>	31	The Tricky Book	

2. Which materials are currently overdue? Suppose today is 04/01/2023 and show the borrow date and due date of each material.

Code

```
293 • SELECT M.Material_ID, M.Title, B.Borrow_Date, B.Due_Date, B.Return_Date
294 FROM Material M
295 INNER JOIN Borrow B ON M.Material_ID = B.Material_ID
296 WHERE B.Return_Date IS NULL AND B.Due_Date < '2023-04-01';
297
```

Output



Result Grid   Filter Rows: <input type="text" value="Search"/> Export: 						
	Material_ID	Title	Borrow_Date	Due_Date	Return_Date	
	20	Harry Potter and the Philosopher's Stone	2021-10-21	2021-11-11	NULL	
	21	Frankenstein	2021-11-29	2021-12-20	NULL	
	1	The Catcher in the Rye	2022-12-28	2023-01-18	NULL	
	2	To Kill a Mockingbird	2023-01-23	2023-02-13	NULL	
	4	The Hobbit	2023-03-01	2023-03-22	NULL	
	5	The Shining	2023-03-10	2023-03-31	NULL	

3. What are the top 10 most borrowed materials in the library? Show the title of each material and order them based on their available counts.

Code

```
299 • SELECT M.Title, COUNT(B.Material_ID) AS BorrowedCount
300 FROM Material M
301 LEFT JOIN Borrow B ON M.Material_ID = B.Material_ID
302 WHERE B.Return_Date IS not NULL
303 GROUP BY M.Material_ID
304 ORDER BY BorrowedCount DESC
305 LIMIT 10;
306
```

Output


Result Grid   Filter Rows: <input type="text" value="Search"/>		
	Title	BorrowedCount
<input type="checkbox"/>	The Da Vinci Code	3
<input type="checkbox"/>	The Catcher in the Rye	2
<input type="checkbox"/>	To Kill a Mockingbird	2
<input type="checkbox"/>	The Hobbit	2
<input type="checkbox"/>	The Shining	2
<input type="checkbox"/>	Pride and Prejudice	2
<input type="checkbox"/>	The Great Gatsby	1
<input type="checkbox"/>	Moby Dick	1
<input type="checkbox"/>	Crime and Punishment	1
<input type="checkbox"/>	The Hitchhiker's Guide to the Galaxy	1

4. How many materials has the author Lucas Piki written?

Code

```
307  
308 ● SELECT COUNT(*) AS TotalMaterials  
309 FROM Authorship A  
310 INNER JOIN Author Au ON A.Author_ID = Au.Author_ID  
311 WHERE Au.Name = 'Lucas Piki';  
312
```

Output


Result Grid 	
Total...	
1	

5. How many materials were written by two or more authors?

Code

```
314 ● SELECT COUNT(distinct Material_ID) AS TotalMaterials
315 FROM Authorship
316 where Material_id in(
317 select Material_ID
318 FROM Authorship
319 GROUP BY Material_ID
320 HAVING COUNT(distinct Author_ID) >= 2
321 );
322
```

Output



Result Grid 	
Total...	
4	

6. What are the most popular genres in the library ranked by the total number of borrowed times of each genre?

Code

```
323
324 ● SELECT G.Name AS Genre, COUNT(B.Borrow_ID) AS BorrowedCount
325 FROM Genre G
326 LEFT JOIN Material M ON G.Genre_ID = M.Genre_ID
327 LEFT JOIN Borrow B ON M.Material_ID = B.Material_ID
328 GROUP BY G.Name
329 ORDER BY BorrowedCount DESC;
330
```

Output



Result Grid   Filter Rows: <input type="text" value="Search"/>			
	Genre	BorrowedCount	
	General Fiction	22	
	Science Fiction & Fantasy	6	
	Horror & Suspense	5	
	Mystery & Thriller	3	
	Classics	3	
	Historical Fiction	1	
	Dystopian & Apocalyptic	0	
	Epic Poetry & Mythology	0	

7. How many materials had been borrowed from 09/2020-10/2020?

Code

```
331
332 • SELECT COUNT(*) AS BorrowedMaterials
333 FROM Borrow
334 WHERE Borrow_Date >= '2020-09-01' AND Borrow_Date < '2020-11-01';
335
```

Output

Result Grid  	
	BorrowedMateri...
	1

8. How do you update the “Harry Potter and the Philosopher's Stone” when it is returned on 04/01/2023?

Code

```

336 • UPDATE Borrow
337 SET Return_Date = '2023-04-01'
338 WHERE Material_ID = (SELECT Material_ID FROM Material WHERE Title = 'Harry Potter and the Philosopher's Stone');
339 • SELECT * FROM borrow;
340

```

Output

Result Grid							
Filter Rows:		Search		Edit:		Export/Import:	
Borrow_ID	Material_ID	Member_ID	Staff_ID	Borrow_Date	Due_Date	Return_Date	
1	1	1	1	2018-09-12	2018-10-03	2018-09-30	
2	2	2	1	2018-10-15	2018-11-05	2018-10-29	
3	3	3	1	2018-12-20	2019-01-10	2019-01-08	
4	4	4	1	2019-03-11	2019-04-01	2019-03-27	
5	5	5	1	2019-04-20	2019-05-11	2019-05-05	
6	6	6	1	2019-07-05	2019-07-26	2019-07-21	
7	7	7	1	2019-09-10	2019-10-01	2019-09-25	
8	8	8	1	2019-11-08	2019-11-29	2019-11-20	
9	9	9	1	2020-01-15	2020-02-05	2020-02-03	
10	10	10	1	2020-03-12	2020-04-02	2020-03-28	
11	1	11	2	2020-05-14	2020-06-04	2020-05-28	
12	2	12	2	2020-07-21	2020-08-11	2020-08-02	
13	3	13	2	2020-09-25	2020-10-16	2020-10-15	
14	4	1	2	2020-11-08	2020-11-29	2020-11-24	
15	5	2	2	2021-01-03	2021-01-24	2021-01-19	
16	6	3	2	2021-02-18	2021-03-11	2021-03-12	
17	17	4	2	2021-04-27	2021-05-18	2021-05-20	
18	18	5	2	2021-06-13	2021-07-04	2021-06-28	
19	19	6	2	2021-08-15	2021-09-05	2021-09-03	
20	20	7	2	2021-10-21	2021-11-11	2023-04-01	
21	21	1	3	2021-11-29	2021-12-20	NULL	
22	22	2	3	2022-01-10	2022-01-31	2022-01-25	
23	23	3	3	2022-02-07	2022-02-28	2022-02-23	
24	24	4	3	2022-03-11	2022-04-01	2022-03-28	
25	25	5	3	2022-04-28	2022-05-19	2022-05-18	
26	26	6	3	2022-06-22	2022-07-13	2022-07-08	
27	27	7	3	2022-08-04	2022-08-25	2022-08-23	
28	28	8	3	2022-09-13	2022-10-04	2022-09-28	
29	29	9	3	2022-10-16	2022-11-06	2022-11-05	

9. How do you delete the member Emily Miller and all her related records from the database?

Code

```
341
342 • DELETE FROM Borrow WHERE Member_ID = (SELECT Member_ID FROM Member WHERE Name = 'Emily Miller');
343
344 • DELETE FROM Member WHERE Name = 'Emily Miller';
345
346 • SELECT * FROM borrow WHERE member_id = 5;
347
```

Output

66

14:57:12

U 1 row(s) affected

Rows matched: 1

Changed: 1

Warnings: 0

Result Grid

Filter Rows:

Search

Edit:

Export

Borrow_ID	Material_ID	Member_ID	Staff_ID	Borrow_Date	Due_Date	Return_Date
NULL	NULL	NULL	NULL	NULL	NULL	NULL

10. How do you add the following material to the database?

Title: New book

Date: 2020-08-01

Catalog: E-Books

Genre: Mystery & Thriller

Author: Lucas Luke

Code

```
348 • INSERT INTO Author (author_ID, Name)
349     VALUES (100, 'Lucas Luke');
350 • INSERT INTO Material (material_ID, Title, Publication_Date, Catalog_ID, Genre_ID)
351     VALUES (101, 'New Book', '2020-08-01', 3, 2);
352 • INSERT INTO Authorship (authorship_ID, author_ID, Material_ID)
353     VALUES (102, 100, 101);
354
355 • select * from author;
356 • select * from material;
357 • select * from authorship;
```

Output

Result Grid   Filter Rows: <input type="text" value="Search"/>				
	Author_ID	Name	Birth_Date	Nationality
	1	Jane Austen	1775-12-16	British
	2	Ernest Hemingway	1899-07-21	American
	3	George Orwell	1903-06-25	British
	4	Scott Fitzgerald	1896-09-24	American
	5	J.K. Rowling	1965-07-31	British
	6	Mark Twain	1835-11-30	American
	7	Leo Tolstoy	1828-09-09	Russian
	8	Virginia Woolf	1882-01-25	British
	9	Gabriel Márquez	1927-03-06	Colombian
	10	Charles Dickens	1812-02-07	British
	11	Harper Lee	1926-04-28	American
	12	Oscar Wilde	1854-10-16	Irish
	13	William Shakesp...	1564-04-26	British
	14	Franz Kafka	1883-07-03	Czech
	15	James Joyce	1882-02-02	Irish
	16	J.R.R. Tolkien	1892-01-03	British
	17	Emily Brontë	1818-07-30	British
	18	Toni Morrison	1931-02-18	American
	19	Fyodor Dostoevsky	1821-11-11	Russian
	20	Lucas Piki	1847-10-16	British
	100	Lucas Luke	NULL	NULL
	NULL	NULL	NULL	NULL

Material_ID	Title	Publication_Da...	Catalog_ID	Genre_ID	
1	The Catcher in the Rye	1951-07-16	1	1	
2	To Kill a Mockingbird	1960-07-11	2	1	
3	The Da Vinci Code	2003-04-01	3	2	
4	The Hobbit	1937-09-21	4	3	
5	The Shining	1977-01-28	5	4	
6	Pride and Prejudice	1813-01-28	1	1	
7	The Great Gatsby	1925-04-10	2	1	
8	Moby Dick	1851-10-18	3	1	
9	Crime and Punishment	1866-01-01	4	1	
10	The Hitchhiker's Guide to the Galaxy	1979-10-12	5	3	
11	1984	1949-06-08	1	5	
12	Animal Farm	1945-08-17	2	5	
13	The Haunting of Hill House	1959-10-17	3	4	
14	Brave New World	1932-08-01	4	5	
15	The Chronicles of Narnia: The Lion...	1950-10-16	5	3	
16	The Adventures of Huckleberry Finn	1884-12-10	6	1	
17	The Catch-22	1961-10-11	7	1	
18	The Picture of Dorian Gray	1890-07-01	8	1	
19	The Call of Cthulhu	1928-02-01	9	4	
20	Harry Potter and the Philosopher's...	1997-06-26	10	3	
21	Frankenstein	1818-01-01	6	4	
22	A Tale of Two Cities	1859-04-30	7	1	
23	The Iliad	1750-01-01	8	6	
24	The Odyssey	1725-01-01	9	6	
25	The Brothers Karamazov	1880-01-01	10	1	
26	The Divine Comedy	1320-01-01	6	6	
27	The Grapes of Wrath	1939-04-14	7	1	
28	The Old Man and the Sea	1952-09-01	8	1	
29	The Count of Monte Cristo	1844-01-01	9	1	
30	A Midsummer Night's Dream	1596-01-01	10	7	
31	The Tricky Book	1888-01-01	10	7	
101	New Book	2020-08-01	3	2	
20000	20000	20000	20000	20000	

Result Grid   Filter Rows: Search

	Authorship_ID	Author_ID	Material_ID	
<input type="checkbox"/>	4	4	4	
<input type="checkbox"/>	5	5	5	
<input type="checkbox"/>	6	6	6	
<input type="checkbox"/>	7	7	7	
<input type="checkbox"/>	8	8	8	
<input type="checkbox"/>	9	9	9	
<input type="checkbox"/>	10	10	10	
<input type="checkbox"/>	11	11	11	
<input type="checkbox"/>	12	12	12	
<input type="checkbox"/>	13	13	13	
<input type="checkbox"/>	14	14	14	
<input type="checkbox"/>	15	15	15	
<input type="checkbox"/>	16	16	16	
<input type="checkbox"/>	17	17	17	
<input type="checkbox"/>	18	18	18	
<input type="checkbox"/>	19	19	19	
<input type="checkbox"/>	20	20	20	
<input type="checkbox"/>	21	1	21	
<input type="checkbox"/>	22	2	22	
<input type="checkbox"/>	23	3	22	
<input type="checkbox"/>	24	3	23	
<input type="checkbox"/>	25	4	24	
<input type="checkbox"/>	26	5	25	
<input type="checkbox"/>	27	6	26	
<input type="checkbox"/>	28	7	27	
<input type="checkbox"/>	29	8	28	
<input type="checkbox"/>	30	19	28	
<input type="checkbox"/>	31	9	29	
<input type="checkbox"/>	32	10	30	
<input type="checkbox"/>	33	8	30	
<input type="checkbox"/>	34	2	29	
<input type="checkbox"/>	102	100	101	
<input type="checkbox"/>	NULL	NULL	NULL	

Design

Extending the existing database system to incorporate the following features.

To add functionality to the current database system, such as daily staff alerts on late items and automated membership deactivation/reactivation depending on overdue incidents.

1. Alert staff about overdue materials on a daily-basis?

To begin, create an alerts table.

Set Up a Daily Task is the Second Step

SQL query in the third phase for locating overdue materials

Notifying Staff is the Fourth Step

Notify the relevant staff person via email for every past-due item in the result set. After notifications are sent, indicate that the relevant records have been alerted.

```
361 ● ○ CREATE TABLE Alerts (
362         Alert_ID INT AUTO_INCREMENT PRIMARY KEY,
363         Material_ID INT,
364         Member_ID INT,
365         Alert_Date DATE,
366         Message TEXT,
367         Is_Notified BOOLEAN DEFAULT FALSE
368     );
369
370 ● INSERT INTO Alerts (Material_ID, Member_ID, Alert_Date, Message)
371     SELECT Material_ID, Member_ID, CURDATE(), 'Material is overdue'
372     FROM Borrow
373     WHERE Return_Date IS NULL AND Due_Date < CURDATE();
374
375 ● SELECT * FROM Alerts
376     WHERE NOT Is_Notified;
```

2. **Automatically deactivate the membership based on the member's overdue occurrence (\geq three times). And reactivate the membership once the member pays the overdue fee.**

First, fill in the Member Table with fields.

The second step is to Set Off Overdue Material Return Trigger

The third step is to Pay to Reactivate Your Membership

The fourth step is to Adjust the Borrowing Procedure

The essential ideas for implementing these functionalities are outlined in these phases.

```
381 ● ALTER TABLE Member
382     ADD Overdue_Count INT DEFAULT 0,
383     ADD Is_Active BOOLEAN DEFAULT TRUE;
384
```

This trigger is employed to automatically determine how many overdue instances a member with material borrowed has; if the count is three or more, the membership is canceled by setting the Active column of the Membership database to 0. After the user pays the past-due amount, the staff can manually revive the membership by changing the Active column to 1.

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