

# LIBRARY DATABASE



## Introduction

A Library Management Database is a structured system designed to efficiently manage and organize data related to a library's operations. It serves as the backbone for storing, retrieving, and managing essential information, supporting activities like book cataloguing, member tracking, and transaction processing.

Libraries handle a diverse range of data, including books, authors, members, and the borrowing or returning of books. This data is interconnected: a single book is linked to an author, multiple books can be borrowed by a member, and each transaction records the lending details.

The Library Management Database provides the following functionalities:

Cataloguing books and maintaining information such as titles, authors, and publication years.

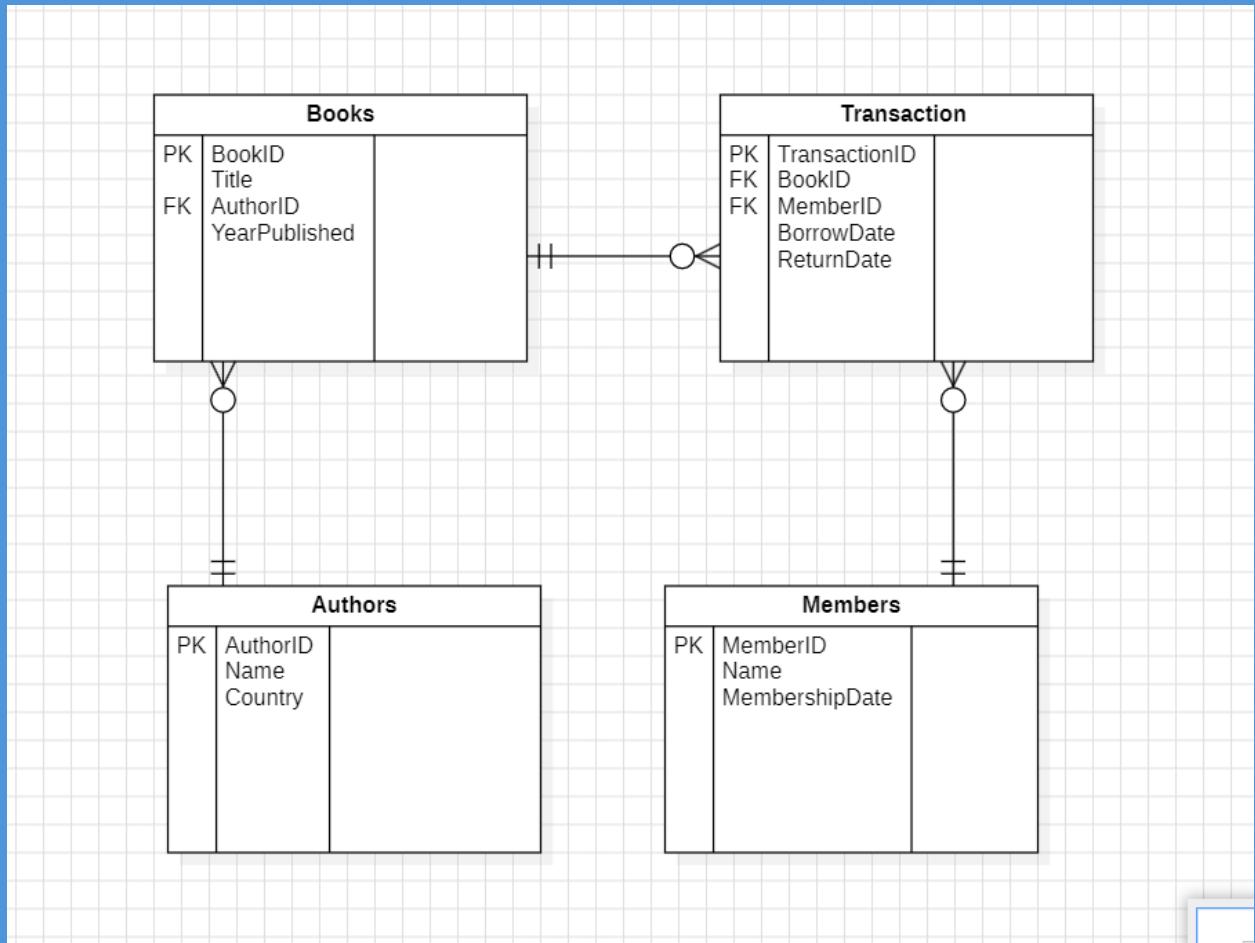
Tracking members and their memberships, ensuring proper record-keeping.

Managing borrow and return transactions for seamless operations.

Ensuring data integrity through relational connections between entities like books, members, and transactions.

By adopting this database, libraries can automate processes, reduce manual errors, and provide users with an improved experience through accurate and accessible information.

# ER Diagram



# Database Design

Database – Library

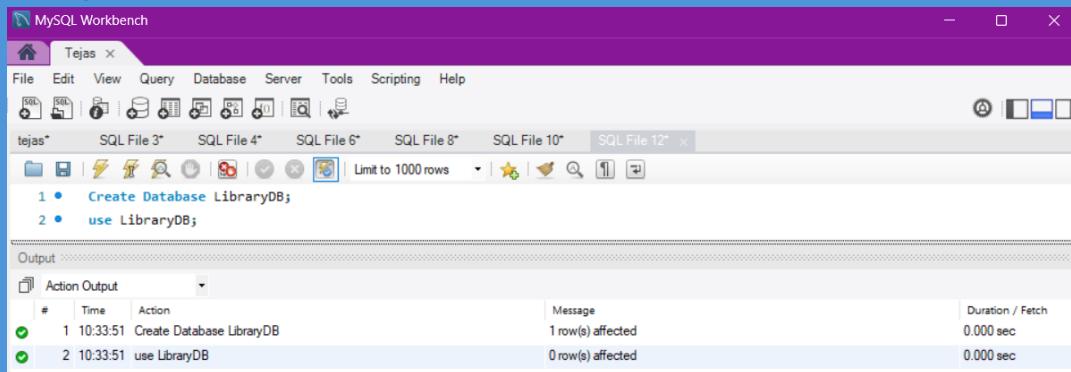
## Tables

- ☰ BOOKS
- ☰ AUTHORS
- ☰ MEMBERS
- ☰ TRANSACTIONS

# Data Definition Language (DDL)

## 1) Creating Database Also Creating Tables and Describing it.

- Creating Database &
- Using Database



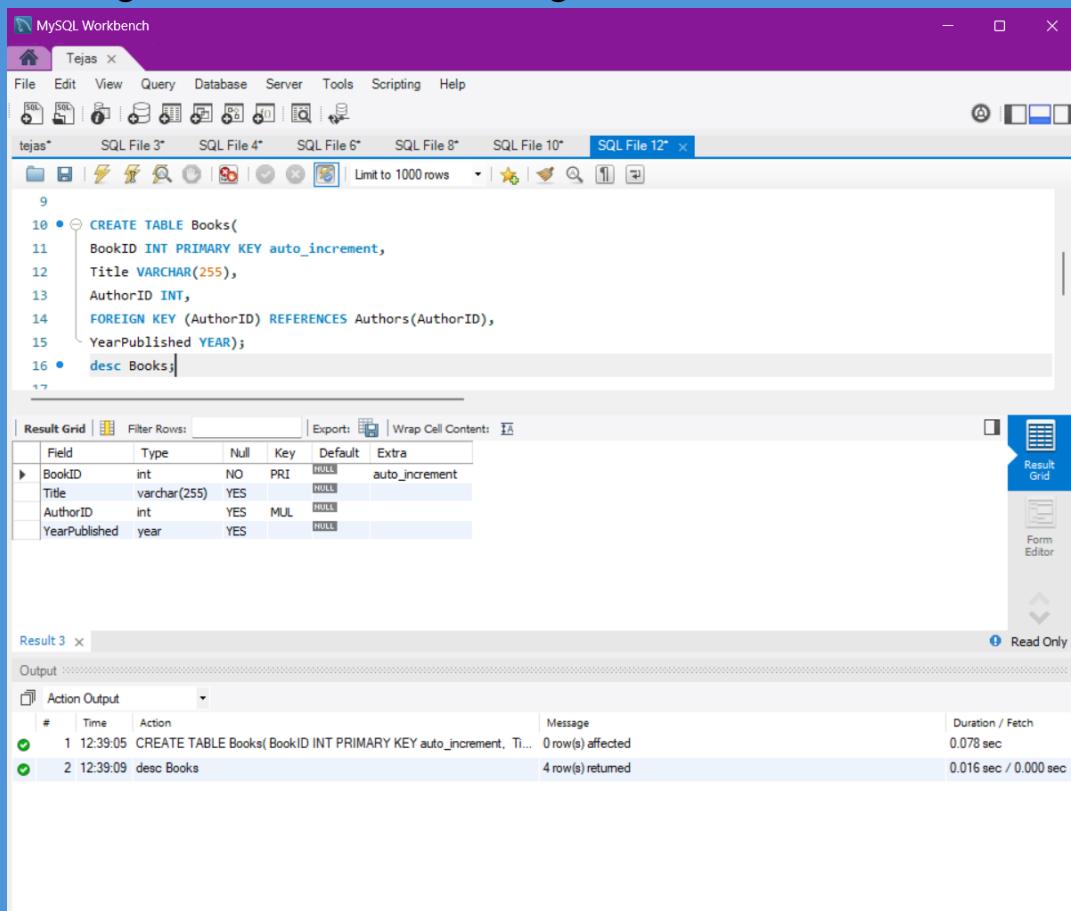
The screenshot shows the MySQL Workbench interface. In the SQL editor tab, the following commands are run:

```
1 • Create Database LibraryDB;
2 • use LibraryDB;
```

The Output pane shows the results of these commands:

#	Time	Action	Message	Duration / Fetch
1	10:33:51	Create Database LibraryDB	1 row(s) affected	0.000 sec
2	10:33:51	use LibraryDB	0 row(s) affected	0.000 sec

- Creating Table Books and Describing it.



The screenshot shows the MySQL Workbench interface. In the SQL editor tab, the following command is run to create the 'Books' table:

```
10 • CREATE TABLE Books(
    BookID INT PRIMARY KEY auto_increment,
    Title VARCHAR(255),
    AuthorID INT,
    FOREIGN KEY (AuthorID) REFERENCES Authors(AuthorID),
    YearPublished YEAR);
11 • desc Books;
```

The Result Grid pane displays the table structure:

Field	Type	Null	Key	Default	Extra
BookID	int	NO	PRI	NULL	auto_increment
Title	varchar(255)	YES		NULL	
AuthorID	int	YES	MUL	NULL	
YearPublished	year	YES		NULL	

The Output pane shows the results of the 'desc Books' command:

#	Time	Action	Message	Duration / Fetch
1	12:39:05	CREATE TABLE Books( BookID INT PRIMARY KEY auto_increment, Ti...	0 row(s) affected	0.078 sec
2	12:39:09	desc Books	4 row(s) returned	0.016 sec / 0.000 sec

➤ Creating Table Authors and Describing it.

The screenshot shows the MySQL Workbench interface with the database 'Tejas' selected. In the SQL editor tab, the following SQL code is run:

```
3
4 • CREATE TABLE Authors (
5   AuthorID INT PRIMARY KEY auto_increment,
6   Name VARCHAR(255),
7   Country VARCHAR(100);
8 • desc Authors;
9
```

The Result Grid displays the table structure:

Field	Type	Null	Key	Default	Extra
AuthorID	int	NO	PRI	HULL	auto_increment
Name	varchar(255)	YES		HULL	
Country	varchar(100)	YES		HULL	

The Output pane shows the execution log:

Action	Time	Message	Duration / Fetch
CREATE TABLE Authors ( AuthorID INT PRIMARY KEY auto_increme...	1 12:37:14	0 row(s) affected	0.047 sec
desc Authors	2 12:38:00	3 row(s) returned	0.000 sec / 0.000 sec

➤ Creating Table Members and Describing it.

The screenshot shows the MySQL Workbench interface with the database 'Tejas' selected. In the SQL editor tab, the following SQL code is run:

```
18 • CREATE TABLE Members (
19   MemberID INT PRIMARY KEY auto_increment,
20   Name VARCHAR(255),
21   MembershipDate DATE;
22 • desc Members;
23
```

The Result Grid displays the table structure:

Field	Type	Null	Key	Default	Extra
MemberID	int	NO	PRI	HULL	auto_increment
Name	varchar(255)	YES		HULL	
MembershipDate	date	YES		HULL	

The Output pane shows the execution log:

Action	Time	Message	Duration / Fetch
CREATE TABLE Members ( MemberID INT PRIMARY KEY auto_increme...	1 12:40:27	0 row(s) affected	0.047 sec
desc Members	2 12:40:30	3 row(s) returned	0.000 sec / 0.000 sec

➤ Creating Table Transactions and Describing it.

The screenshot shows the MySQL Workbench interface. In the main query editor window, the following SQL code is run:

```

23
24 • CREATE TABLE Transactions (
25     TransactionID INT PRIMARY KEY auto_increment,
26     BookID INT,
27     MemberID INT,
28     FOREIGN KEY (BookID) REFERENCES Books(BookID),
29     FOREIGN KEY (MemberID) REFERENCES Members(MemberID),
30     BorrowDate DATE,
31     ReturnDate DATE);
32 • desc Transactions;

```

Below the code, the 'Result Grid' pane displays the table structure:

Field	Type	Null	Key	Default	Extra
TransactionID	int	NO	PRI	HULL	auto_increment
BookID	int	YES	MUL	HULL	
MemberID	int	YES	MUL	HULL	
BorrowDate	date	YES		HULL	
ReturnDate	date	YES		HULL	

The 'Output' pane shows the execution log:

#	Time	Action	Message	Duration / Fetch
1	12:42:10	CREATE TABLE Transactions ( TransactionID INT PRIMARY KEY auto_...)	0 row(s) affected	0.079 sec
2	12:42:13	desc Transactions	5 row(s) returned	0.000 sec / 0.000 sec

### i} Alter Commands

- Alter Table Modify

The screenshot shows the MySQL Workbench interface. In the main query editor window, the following SQL code is run:

```

34 • Alter table Books modify Title char;

```

The 'Output' pane shows the execution log:

#	Time	Action	Message	Duration / Fetch
1	13:29:02	Altertable Books modify Title char	0 row(s) affected Records: 0 Duplicates: 0 Warnings: 0	0.031 sec

- Alter Table Add column

The screenshot shows the MySQL Workbench interface. In the main query editor window, the following SQL code is run:

```

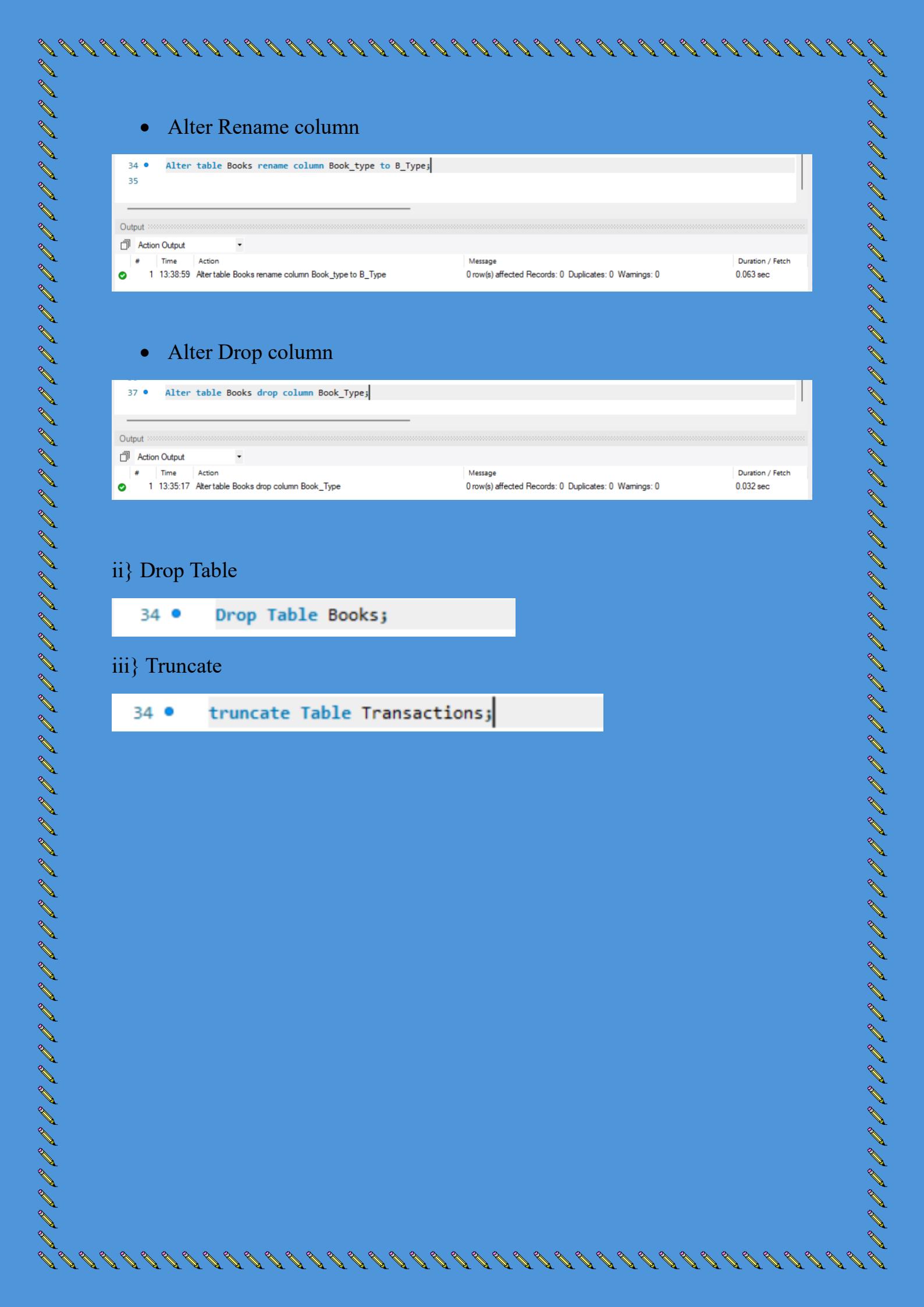
34 • Alter table Books add Book_type varchar(255);
35

```

The 'Output' pane shows the execution log:

#	Time	Action	Message	Duration / Fetch
1	13:35:51	Altertable Books add Book_type varchar(255)	0 row(s) affected Records: 0 Duplicates: 0 Warnings: 0	0.047 sec

- Alter Rename column



```
34 • Alter table Books rename column Book_type to B_Type;
35
```

Output:

Action Output
# Time Action

Message: 0 row(s) affected Records: 0 Duplicates: 0 Warnings: 0 Duration / Fetch: 0.063 sec

1 13:38:59 Alter table Books rename column Book\_type to B\_Type

- Alter Drop column

```
37 • Alter table Books drop column Book_Type;
```

Output:

Action Output
# Time Action

Message: 0 row(s) affected Records: 0 Duplicates: 0 Warnings: 0 Duration / Fetch: 0.032 sec

1 13:35:17 Alter table Books drop column Book\_Type

ii} Drop Table

```
34 • Drop Table Books;
```

iii} Truncate

```
34 • truncate Table Transactions;
```

# Data Manipulation Language (DML)

i} Using `INSERT INTO` command to insert data into tables here we are Inserting into Authors Table.

The screenshot shows a database interface with a code editor and an output window. The code editor contains the following SQL script:

```
35 •    INSERT INTO Authors (Name, Country) VALUES
36      ('Harper Lee', 'United States'),
37      ('George Orwell', 'United Kingdom'),
38      ('Jane Austen', 'United Kingdom'),
39      ('F. Scott Fitzgerald', 'United States'),
40      ('Herman Melville', 'United States'),
41      ('Leo Tolstoy', 'Russia'),
42      ('J.D. Salinger', 'United States'),
43      ('Fyodor Dostoevsky', 'Russia'),
44      ('J.R.R. Tolkien', 'United Kingdom'),
45      ('Aldous Huxley', 'United Kingdom'),
46      ('Charlotte Bronte', 'United Kingdom'),
47      ('Emily Bronte', 'United Kingdom'),
48      ('Homer', 'Ancient Greece'),
49      ('Victor Hugo', 'France'),
50      ('Miguel de Cervantes', 'Spain'),
51      ('Dante Alighieri', 'Italy'),
52      ('Mary Shelley', 'United Kingdom'),
53      ('Bram Stoker', 'Ireland'),
54      ('Oscar Wilde', 'Ireland'),
```

The output window shows the results of the execution:

Action Output	#	Time	Action	Message	Duration / Fetch
1	14:14:07		INSERT INTO Authors (Name, Country) VALUES ('Harper Lee', 'United Sta...')	25 row(s) affected Records: 25 Duplicates: 0 Warnings: 0	0.031 sec

ii} Using Update Command with set and Where Clause

The screenshot shows a database interface with a code editor and an output window. The code editor contains the following SQL script:

```
62 •    update Authors Set Name = "Sanjeev Khan" where AuthorID = 25;
```

The output window shows the results of the execution:

Action Output	#	Time	Action	Message	Duration / Fetch
1	14:23:47		update Authors Set Name = "Sanjeev Khan" where AuthorID = 25	1 row(s) affected Rows matched: 1 Changed: 1 Warnings: 0	0.016 sec

iii} Using Delete From Command with Where Clause

The screenshot shows a database interface with a code editor and an output window. The code editor contains the following SQL script:

```
64 •    delete from Authors where Name = "Sanjeev Khan";
```

The output window shows the results of the execution:

Action Output	#	Time	Action	Message	Duration / Fetch
1	14:27:39		delete from Authors where Name = "Sanjeev Khan"	1 row(s) affected	0.016 sec

# Data Query Language (DQL)

## i} Select Command.

“Select\*from Table\_name” to display all records.

The screenshot shows a database interface with a query editor at the top containing the SQL command:

```
66 • select * from Authors;
```

Below the query is a result grid displaying 16 rows of data from the Authors table:

AuthorID	Name	Country
1	Harper Lee	United States
2	George Orwell	United Kingdom
3	Jane Austen	United Kingdom
4	F. Scott Fitzgerald	United States
5	Herman Melville	United States
6	Leo Tolstoy	Russia
7	J.D. Salinger	United States
8	Fyodor Dostoevsky	Russia
9	J.R.R. Tolkien	United Kingdom
10	Aldous Huxley	United Kingdom
11	Charlotte Bronte	United Kingdom
12	Emily Bronte	United Kingdom
13	Homer	Ancient Greece
14	Victor Hugo	France
15	Miguel de Cervantes	Spain
16	Dante Alighieri	Italy

At the bottom, the output pane shows the execution details:

Action Output	#	Time	Action	Message	Duration / Fetch
1	14:31:36		select * from Authors LIMIT 0, 1000	49 row(s) returned	0.000 sec / 0.000 sec

## ii} Select Command With Where Clause.

The screenshot shows a database interface with a query editor at the top containing the SQL command:

```
69 • select * from Authors where Country = "Russia";
```

Below the query is a result grid displaying 2 rows of data from the Authors table:

AuthorID	Name	Country
6	Leo Tolstoy	Russia
8	Fyodor Dostoevsky	Russia

At the bottom, the output pane shows the execution details:

Action Output	#	Time	Action	Message	Duration / Fetch
1	14:36:06		select * from Authors where Country = "Russia" LIMIT 0, 1000	4 row(s) returned	0.000 sec / 0.000 sec

iii} “Show” Command.

To Display All Tables

The screenshot shows the MySQL Workbench interface. In the SQL editor pane, the command `show tables;` is entered. The results are displayed in a Result Grid, showing four tables: authors, books, members, and transactions. Below the grid, the Output pane shows the action log with one entry: "1 15:06:33 show tables". The message area indicates "4 row(s) returned" and the duration is "0.000 sec / 0.000 sec".

```
76 • show tables;
77
78
```

Result Grid | Filter Rows: Export: Wrap Cell Content: □

Tables_in_librarydb
authors
books
members
transactions

Output

Action Output
# Time Action
1 15:06:33 show tables

Message: 4 row(s) returned Duration / Fetch: 0.000 sec / 0.000 sec

To Display All Database

The screenshot shows the MySQL Workbench interface. In the SQL editor pane, the command `show databases;` is entered. The results are displayed in a Result Grid, listing several databases: batch3to5, cars, college, information\_schema, librarydb, and mysql. Below the grid, the Output pane shows the action log with one entry: "1 15:11:16 show databases". The message area indicates "8 row(s) returned" and the duration is "0.000 sec / 0.000 sec". A "Read Only" status indicator is visible on the right.

```
76 • show databases;
77
78
```

Result Grid | Filter Rows: Export: Wrap Cell Content: □

Database
batch3to5
cars
college
information_schema
librarydb
mysql

Output

Action Output
# Time Action
1 15:11:16 show databases

Message: 8 row(s) returned Duration / Fetch: 0.000 sec / 0.000 sec

# LIKE Query

- Using “%”

```
79 •   select * from Authors where Name like '%c%';
80
81
```

Result Grid | Filter Rows: Edit: Export/Import: Wrap Cell Content: Result Grid Form Editor

AuthorID	Name	Country
4	F. Scott Fitzgerald	United States
11	Charlotte Bronte	United Kingdom
14	Victor Hugo	France
15	Miguel de Cervantes	Spain
19	Oscar Wilde	Ireland
20	Charles Dickens	United Kingdom

Authors 15 x Apply Revert

Action Output:

#	Time	Action	Message	Duration / Fetch
1	15:15:59	select * from Authors where Name like "%c%" LIMIT 0, 1000	16 row(s) returned	0.000 sec / 0.000 sec

- Using “\_”

```
79 •   select * from Authors where Name like 'Victor _ugo';
80
81
```

Result Grid | Filter Rows: Edit: Export/Import: Wrap Cell Content: Result Grid Form Editor

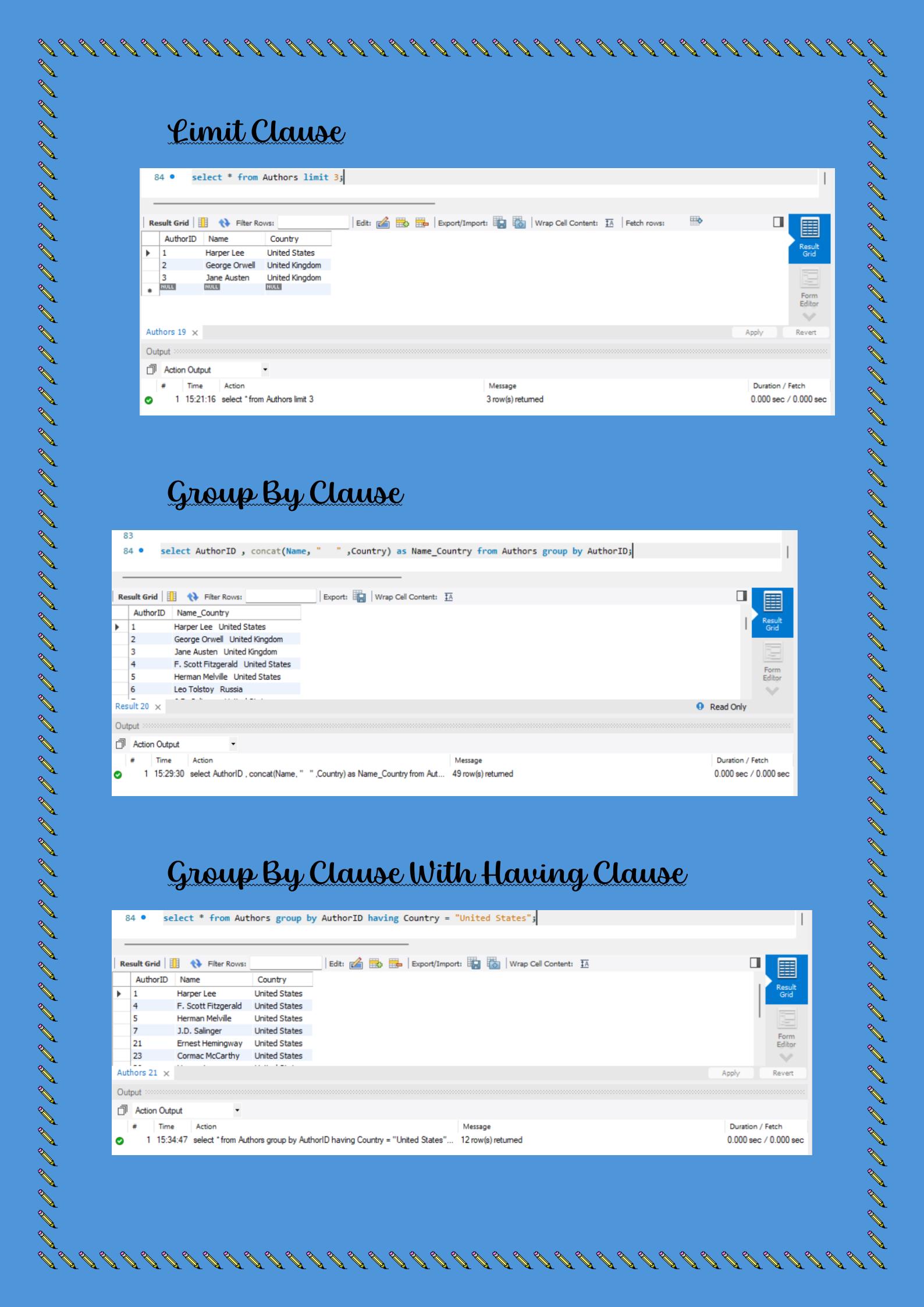
AuthorID	Name	Country
14	Victor Hugo	France
39	Victor Hugo	France
*	NULL	NULL

Authors 17 x Apply Revert

Action Output:

#	Time	Action	Message	Duration / Fetch
1	15:17:59	select * from Authors where Name like 'Victor _ugo' LIMIT 0, 1000	2 row(s) returned	0.000 sec / 0.000 sec

## Limit Clause



```
84 • select * from Authors limit 3;
```

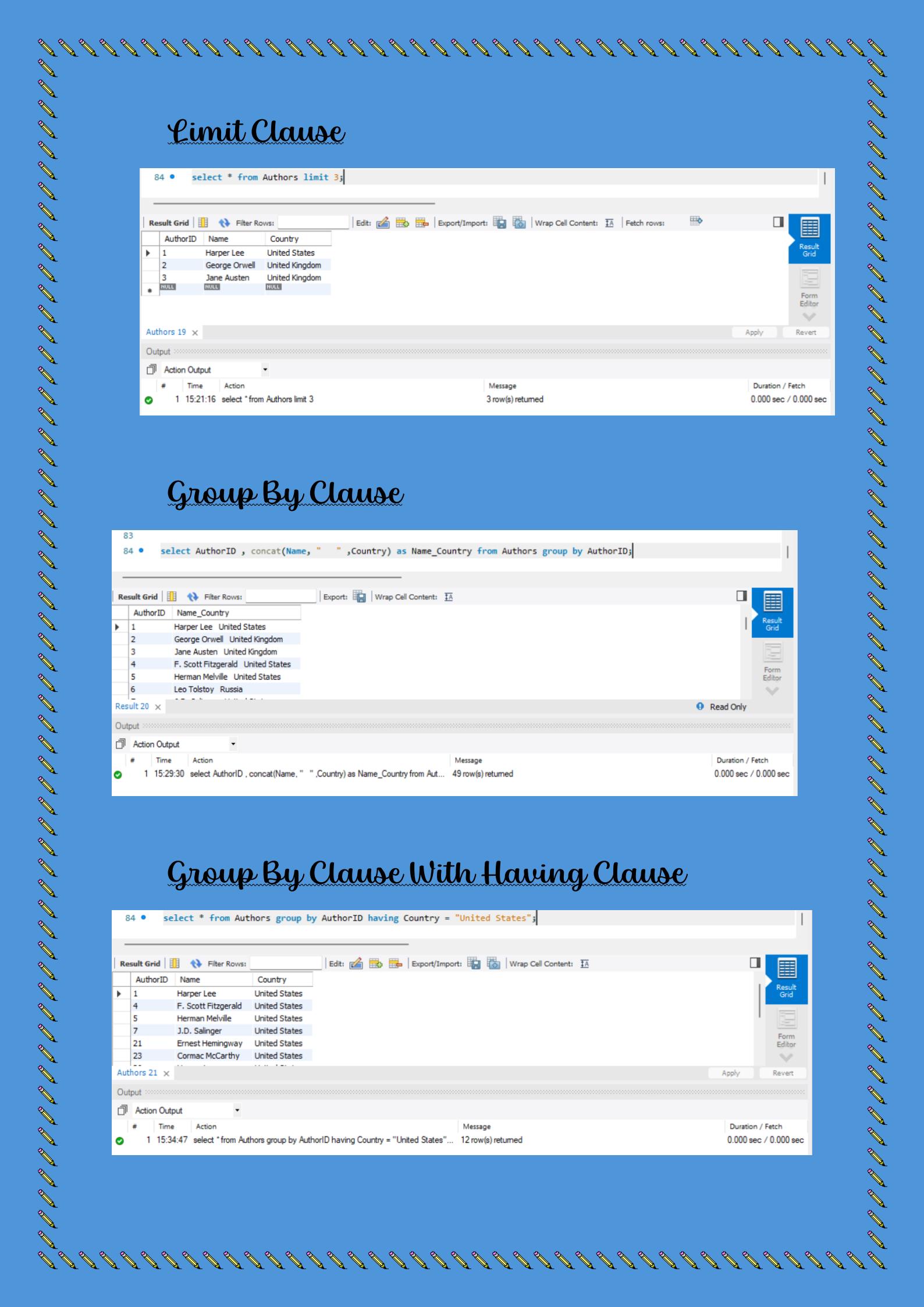
Result Grid | Filter Rows: | Edit: | Export/Import: | Wrap Cell Content: | Fetch rows: | Result Grid | Form Editor |

AuthorID	Name	Country
1	Harper Lee	United States
2	George Orwell	United Kingdom
3	Jane Austen	United Kingdom
*	NULL	NULL

Authors 19 x | Apply | Revert | Output | Action Output | # Time Action | Message | Duration / Fetch |

#	Time	Action	Message	Duration / Fetch
1	15:21:16	select *from Authors limit 3	3 row(s) returned	0.000 sec / 0.000 sec

## Group By Clause



```
83  
84 • select AuthorID , concat(Name, " ", Country) as Name_Country from Authors group by AuthorID;
```

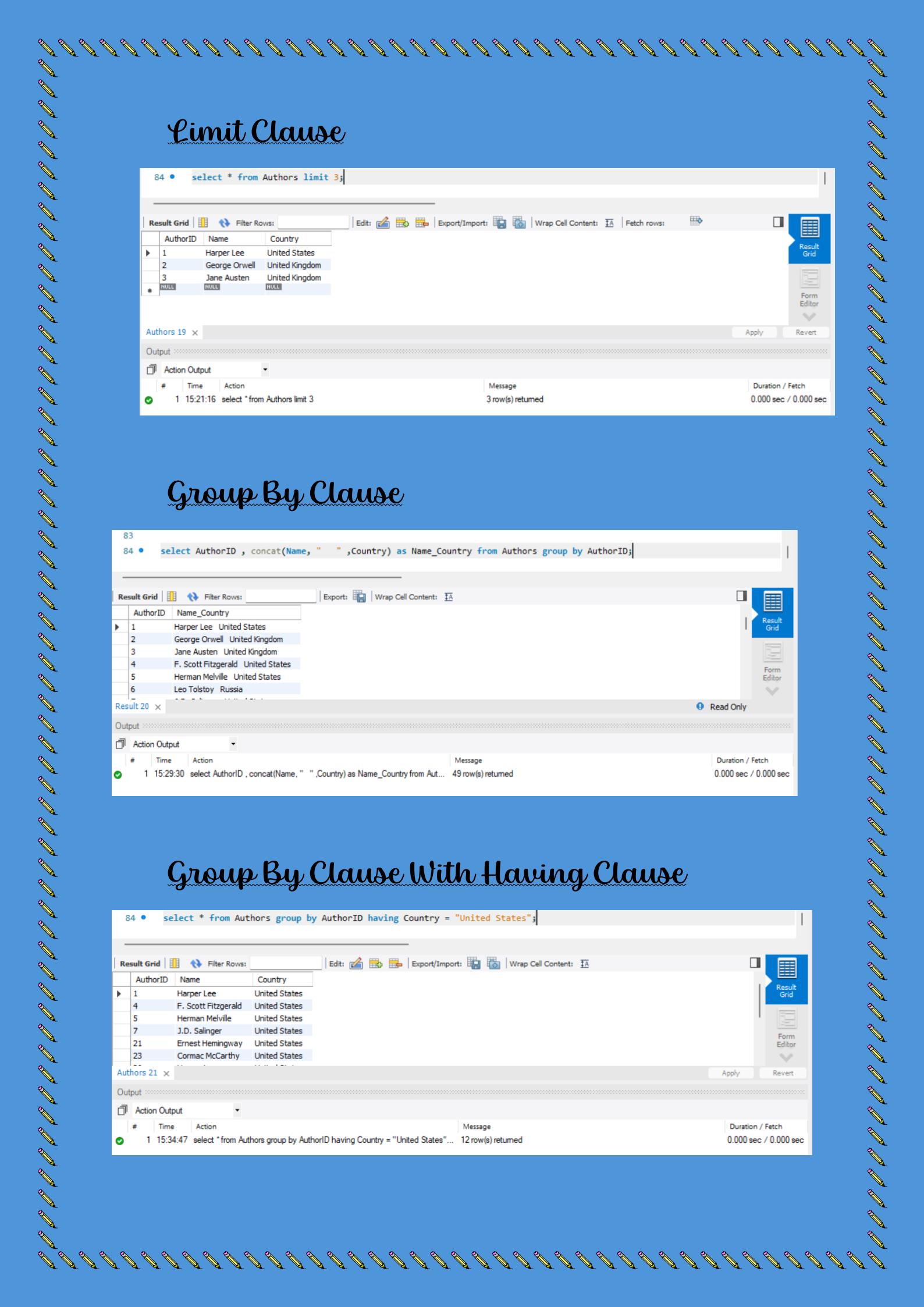
Result Grid | Filter Rows: | Export: | Wrap Cell Content: | Result Grid | Form Editor |

AuthorID	Name_Country
1	Harper Lee United States
2	George Orwell United Kingdom
3	Jane Austen United Kingdom
4	F. Scott Fitzgerald United States
5	Herman Melville United States
6	Leo Tolstoy Russia

Result 20 x | Read Only | Output | Action Output | # Time Action | Message | Duration / Fetch |

#	Time	Action	Message	Duration / Fetch
1	15:29:30	select AuthorID , concat(Name, " ", Country) as Name_Country from Aut... 49 row(s) returned		0.000 sec / 0.000 sec

## Group By Clause With Having Clause



```
84 • select * from Authors group by AuthorID having Country = "United States";
```

Result Grid | Filter Rows: | Edit: | Export/Import: | Wrap Cell Content: | Result Grid | Form Editor |

AuthorID	Name	Country
1	Harper Lee	United States
4	F. Scott Fitzgerald	United States
5	Herman Melville	United States
7	J.D. Salinger	United States
21	Ernest Hemingway	United States
23	Cormac McCarthy	United States

Authors 21 x | Apply | Revert | Output | Action Output | # Time Action | Message | Duration / Fetch |

#	Time	Action	Message	Duration / Fetch
1	15:34:47	select *from Authors group by AuthorID having Country = "United States"... 12 row(s) returned		0.000 sec / 0.000 sec

## Order By Clause

- Order By ASC & DESC  
By default It is in Ascending order.

84 • `select * from Authors order by country;`

Result Grid | Filter Rows: | Edit: | Export/Import: | Wrap Cell Content: | Result Grid | Form Editor | Apply | Revert

AuthorID	Name	Country
50	Khaled Hosseini	Afghanistan
13	Homer	Ancient Greece
38	Homer	Ancient Greece
22	Paulo Coelho	Brazil
47	Paulo Coelho	Brazil
49	Yann Martel	Canada

Authors 22 ×

Action Output

#	Time	Action
1	16:04:43	select * from Authors order by country LIMIT 0, 1000

Message: 49 row(s) returned Duration / Fetch: 0.000 sec / 0.000 sec

84 • `select * from Authors order by country desc;`

Result Grid | Filter Rows: | Edit: | Export/Import: | Wrap Cell Content: | Result Grid | Form Editor | Apply | Revert

AuthorID	Name	Country
1	Harper Lee	United States
21	Ernest Hemingway	United States
46	Ernest Hemingway	United States
4	F. Scott Fitzgerald	United States
5	Herman Melville	United States
23	Cormac McCarthy	United States
7	J.D. Salinger	United States
48	Cormac McCarthy	United States

Authors 24 ×

Action Output

#	Time	Action
1	16:06:55	select * from Authors order by country desc LIMIT 0, 1000

Message: 49 row(s) returned Duration / Fetch: 0.000 sec / 0.000 sec

# Built in Function

## A} Concat Function

```
90 • select concat(AuthorID , " " , Name) as NameID from Authors;
91
```

Result Grid | Filter Rows: Export: Wrap Cell Content: Result Grid Form Editor Field Types Read Only

NameID
1 Harper Lee
2 George Orwell
3 Jane Austen
4 F. Scott Fitzgerald
5 Herman Melville
6 Leo Tolstoy
7 J.D. Salinger
8 Fyodor Dostoevsky
9 J.R.R. Tolkien
10 Aldous Huxley

Output Action Output # Time Action Message Duration / Fetch  
1 16:12:37 select concat(AuthorID , " " , Name) as NameID from Authors LIMIT 0, 1... 49 row(s) returned 0.000 sec / 0.000 sec

## B} Lower Function

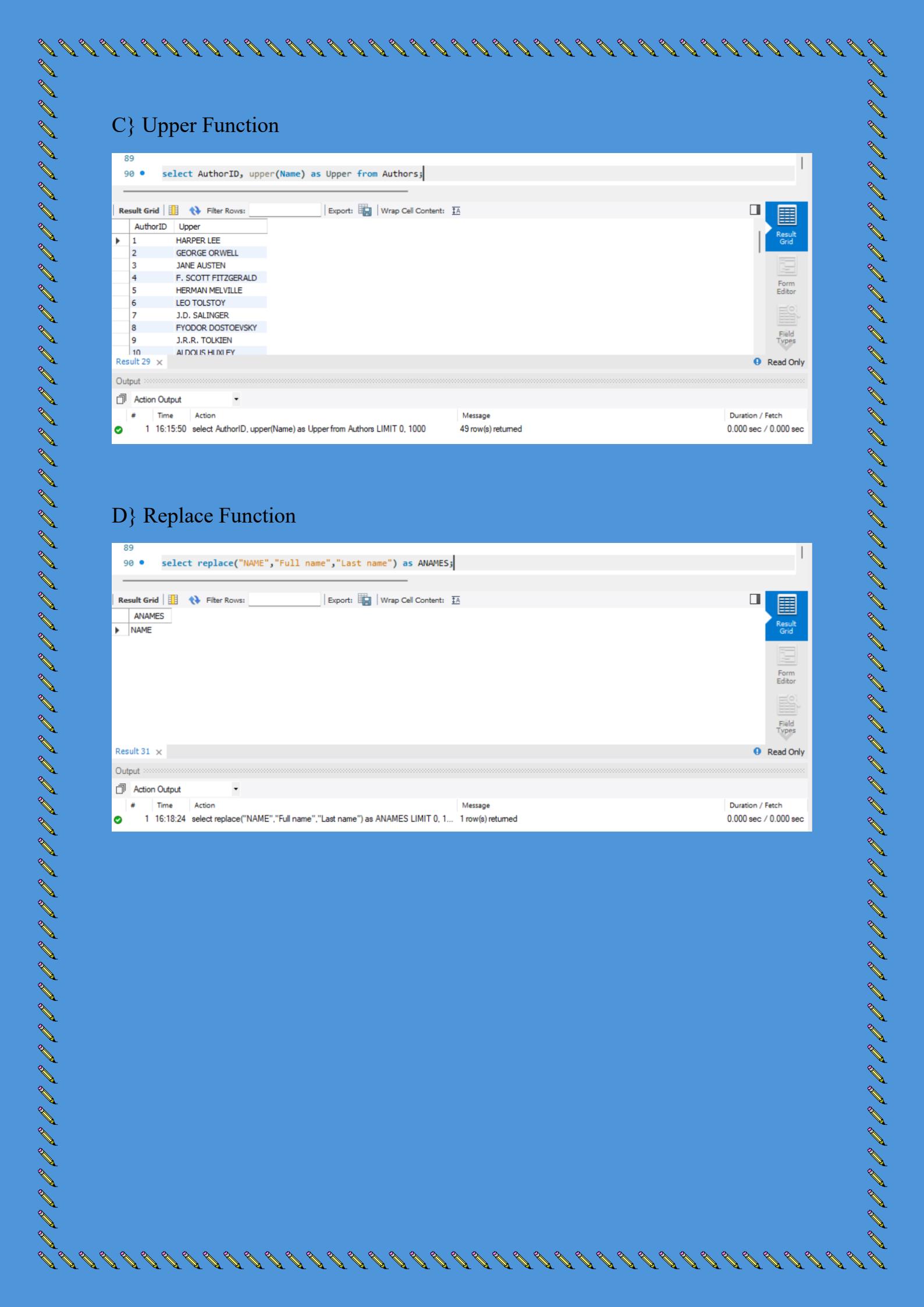
```
89
90 • select AuthorID, lower(Name) as Lower from Authors;
```

Result Grid | Filter Rows: Export: Wrap Cell Content: Result Grid Form Editor Field Types Read Only

AuthorID	Lower
1	harper lee
2	george orwell
3	jane austen
4	f. scott fitzgerald
5	herman melville
6	leo tolstoy
7	j.d. salinger
8	fyodor dostoevsky
9	j.r.r. tolkien
10	aldous huxley

Output Action Output # Time Action Message Duration / Fetch  
1 16:14:51 select AuthorID, lower(Name) as Lower from Authors LIMIT 0, 1000 49 row(s) returned 0.000 sec / 0.000 sec

## C} Upper Function

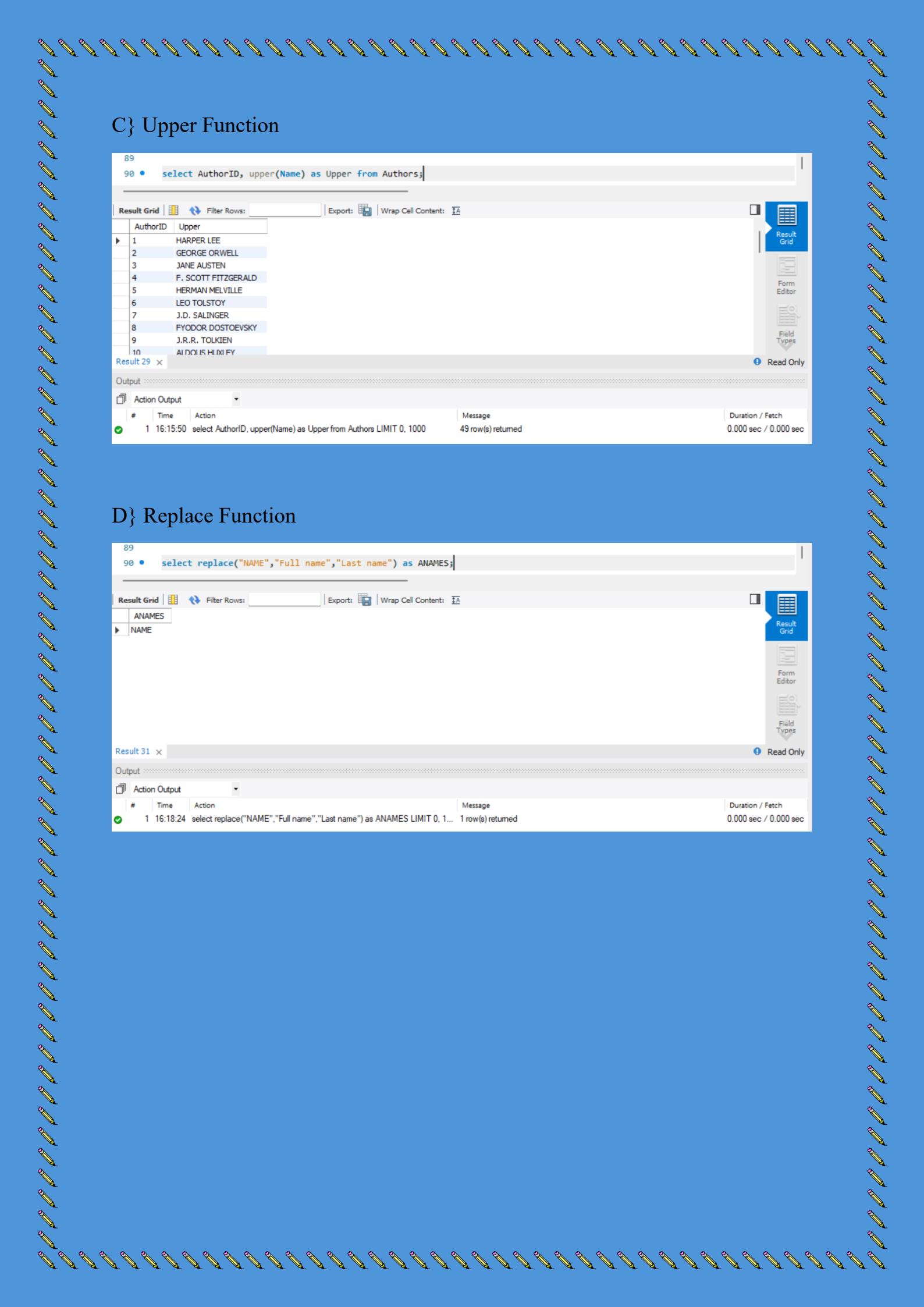


```
89
90 • select AuthorID, upper(Name) as Upper from Authors;
```

Result Grid | Filter Rows: Export: Wrap Cell Content: Result Grid  
AuthorID | Upper  
1 HARPER LEE  
2 GEORGE ORWELL  
3 JANE AUSTEN  
4 F. SCOTT FITZGERALD  
5 HERMAN MELVILLE  
6 LEO TOLSTOY  
7 J.D. SALINGER  
8 FYODOR DOSTOEVSKY  
9 J.R.R. TOLKIEN  
10 AI DOI IS HI XI FY  
Result 29 × Read Only

Output: Action Output # Time Action Message Duration / Fetch  
1 16:15:50 select AuthorID, upper(Name) as Upper from Authors LIMIT 0, 1000 49 row(s) returned 0.000 sec / 0.000 sec

## D} Replace Function



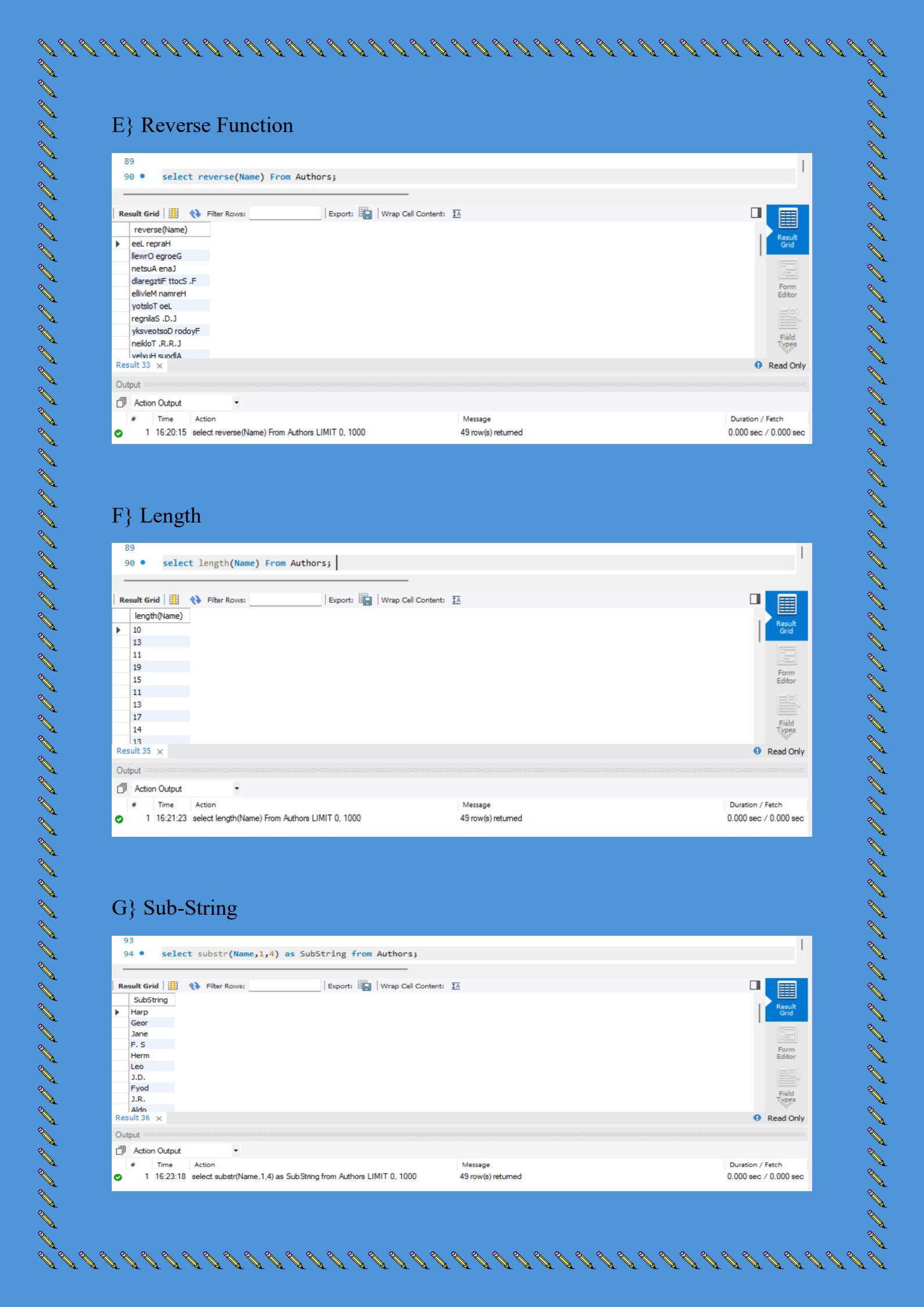
```
89
90 • select replace("NAME","Full name","Last name") as ANAMES;
```

Result Grid | Filter Rows: Export: Wrap Cell Content: Result Grid  
ANAMES  
NAME

Result 31 × Read Only

Output: Action Output # Time Action Message Duration / Fetch  
1 16:18:24 select replace("NAME","Full name","Last name") as ANAMES LIMIT 0, 1... 1 row(s) returned 0.000 sec / 0.000 sec

## E} Reverse Function

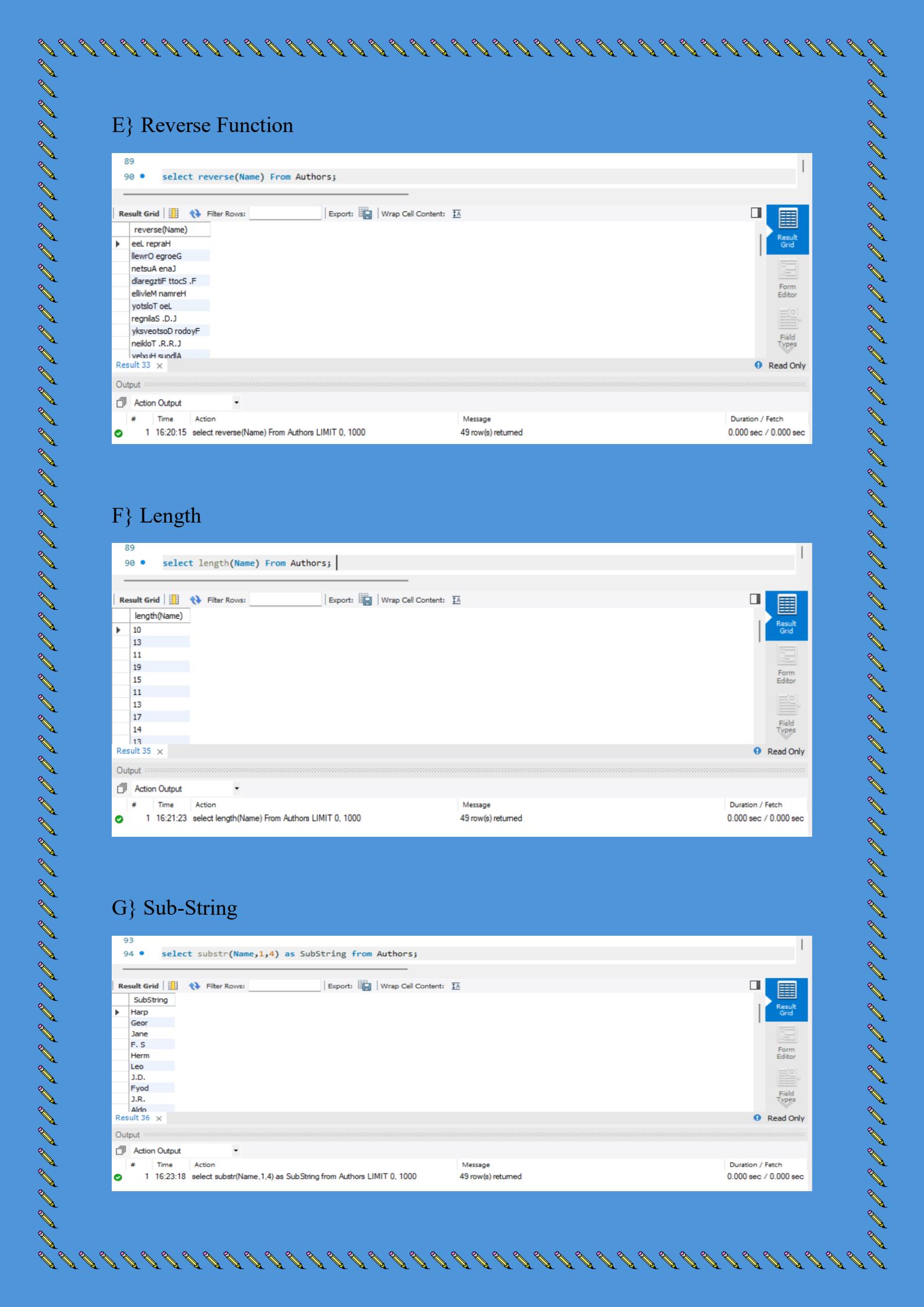


```
89
90 • select reverse(Name) From Authors;
```

Result Grid | Filter Rows: Export: Wrap Cell Content: Result Grid  
reverse(Name)  
eeL rephA  
llewO egroeG  
netsuA enaJ  
dlaregzbF ttocS .F  
ellivleM namreH  
yotsloT oel.  
regnilaS .D.J  
yksveotsD rodoYF  
neidkT .R.R.J  
velvih sunrlA  
Result 33 ×

Output  
Action Output # Time Action Message Duration / Fetch  
1 16:20:15 select reverse(Name) From Authors LIMIT 0, 1000 49 row(s) returned 0.000 sec / 0.000 sec

## F} Length

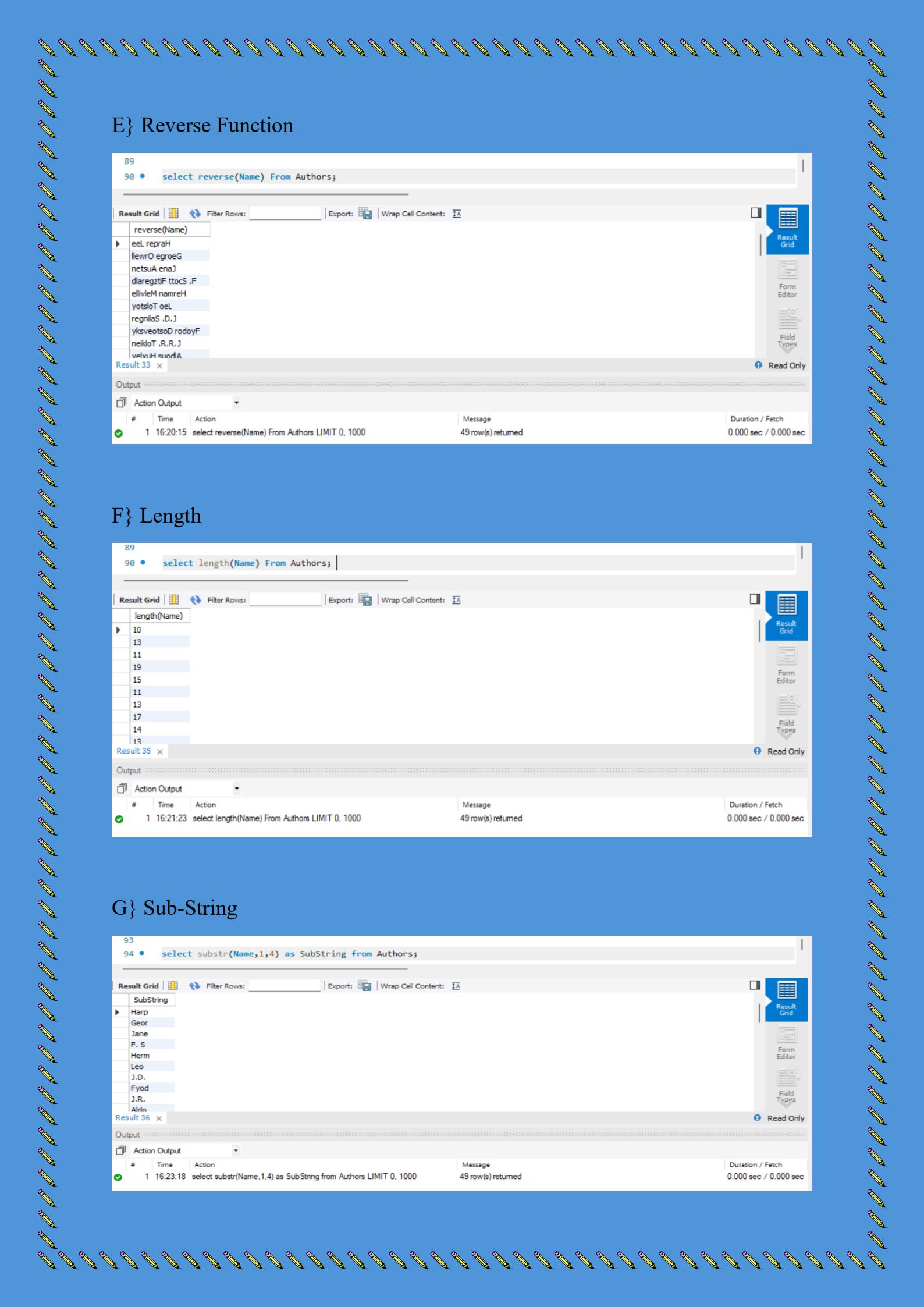


```
89
90 • select length(Name) From Authors;
```

Result Grid | Filter Rows: Export: Wrap Cell Content: Result Grid  
length(Name)  
10  
13  
11  
19  
15  
11  
13  
17  
14  
13  
Result 35 ×

Output  
Action Output # Time Action Message Duration / Fetch  
1 16:21:23 select length(Name) From Authors LIMIT 0, 1000 49 row(s) returned 0.000 sec / 0.000 sec

## G} Sub-String



```
93
94 • select substr(Name,1,4) as SubString from Authors;
```

Result Grid | Filter Rows: Export: Wrap Cell Content: Result Grid  
SubString  
Harp  
Geor  
Jane  
F. S  
Herm  
Leo  
J.D.  
Fyod  
J.R.  
Aldo  
Result 36 ×

Output  
Action Output # Time Action Message Duration / Fetch  
1 16:23:18 select substr(Name,1,4) as SubString from Authors LIMIT 0, 1000 49 row(s) returned 0.000 sec / 0.000 sec

## Union Operations

```
206 •  Select BookID , Title From Books where YearPublished = 2000
207      union
208      Select Country , AuthorID from Authors where country = "Russia";
```

Result Grid		Filter Rows:	Export:	Wrap Cell Content:
BookID	Title			
► 105	The Odyssey			
106	The Iliad			
Russia	6			
Russia	8			
Russia	31			
Russia	33			

## SUBQUERIES

### i} Single Row Subquery

```
215 •  SELECT Name
216     FROM Members
217     WHERE MemberID = (
218         SELECT MemberID
219         FROM Transactions
220         WHERE BorrowDate = (SELECT MAX(BorrowDate) FROM Transactions)
221     );
222
```

Result Grid		Filter Rows:	Export:	Wrap Cell Content:
Name				
► Tony Stark				

Members 64 ×		Read Only
Output		
Action Output		
#	Time	Action
1	18:04:01	SELECT Name FROM Members WHERE MemberID = ( SELECT Me... 1 row(s) returned
		Message Duration / Fetch 0.016 sec / 0.000 sec

## ii} Multi Row Subquery

{here “1984” is a title of a book}

```
227 •  SELECT Title
228   FROM Books
229   WHERE BookID IN (
230     SELECT BookID
231     FROM Transactions
232     WHERE MemberID IN (
233       SELECT MemberID
234       FROM Members
235       WHERE MembershipDate BETWEEN '2023-01-01' AND '2023-12-31'
236     )
237   );
```

Result Grid | Filter Rows: Export: Wrap Cell Content: Result Grid Form Editor Read Only

Title
1984
Pride and Prejudice
The Great Gatsby
Moby Dick
War and Peace

Books 65 x

Output:

Action Output	#	Time	Action	Message	Duration / Fetch
1 18:04:59 SELECT Title FROM Books WHERE BookID IN ( SELECT BookID ... 13 row(s) returned	1	18:04:59	SELECT Title FROM Books WHERE BookID IN ( SELECT BookID ... 13 row(s) returned	13 row(s) returned	0.000 sec / 0.000 sec
2 18:05:51 EXPLAIN SELECT Title FROM Books WHERE BookID IN ( SELECT ... OK	2	18:05:51	EXPLAIN SELECT Title FROM Books WHERE BookID IN ( SELECT ... OK	OK	0.000 sec
3 18:05:51 EXPLAIN FORMAT=JSON SELECT Title FROM Books WHERE BookI... OK	3	18:05:51	EXPLAIN FORMAT=JSON SELECT Title FROM Books WHERE BookI... OK	OK	0.000 sec

## iii} Multi Columns Subquery

```
244 •  SELECT b.Title, m.Name, t.BorrowDate
245   FROM Books b
246   JOIN Transactions t ON b.BookID = t.BookID
247   JOIN Members m ON t.MemberID = m.MemberID
248   WHERE (t.BookID, t.MemberID) IN (
249     SELECT BookID, MemberID
250     FROM Transactions
251     WHERE BorrowDate BETWEEN '2024-01-01' AND '2024-12-31'
252   );
```

Result Grid | Filter Rows: Export: Wrap Cell Content: Result Grid Form Editor Read Only

Title	Name	BorrowDate
A Tale of Two Cities	Quentin Tarantino	2024-01-10
The Old Man and the Sea	Rachel Green	2024-02-15
The Road	Steve Rogers	2024-03-01
Frankenstein	Tony Stark	2024-04-01

Result 67 x

Output:

Action Output	#	Time	Action	Message	Duration / Fetch
1 18:08:51 SELECT b.Title, m.Name, t.BorrowDate FROM Books b JOIN Transactio... 4 row(s) returned	1	18:08:51	SELECT b.Title, m.Name, t.BorrowDate FROM Books b JOIN Transactio... 4 row(s) returned	4 row(s) returned	0.015 sec / 0.000 sec

# Joins

## i} Inner Join

```
258 •  SELECT b.Title, m.Name AS MemberName, t.BorrowDate  
259   FROM Books b  
260   INNER JOIN Transactions t ON b.BookID = t.BookID  
261   INNER JOIN Members m ON t.MemberID = m.MemberID;  
262
```

The screenshot shows a database interface with a query editor and a results grid. The query is an inner join selecting book titles, member names, and borrow dates. The results grid displays 20 rows of data where each book is associated with exactly one member and one borrow date. The output pane shows one action message indicating 20 rows returned.

Title	MemberName	BorrowDate
To Kill a Mockingbird	Alice Johnson	2023-01-20
1984	Bob Smith	2023-01-25
Pride and Prejudice	Charlie Brown	2023-02-10
The Great Gatsby	Diana Prince	2023-03-01
Moby Dick	Evan Peters	2023-04-05
War and Peace	Fiona Gallagher	2023-04-15
The Catcher in the Rye	George Michael	2023-05-10
Crime and Punishment	Hannah Montana	2023-06-01
The Hobbit	Ian Somerhalder	2023-06-15
The Lord of the Rings	Julia Roberts	2023-07-01
Anna Karenina	Kevin Hart	2023-08-10
Jane Eyre	Linda McCartney	2023-09-05
The Odyssey	Michael Jordan	2023-10-10
Les Misérables	Nina Dobrev	2023-11-01
The Divine Comedy	Oscar Isaac	2023-11-20

Result 69 x Read Only

Output

Action Output

#	Time	Action	Message	Duration / Fetch
1	18:13:30	SELECT b.Title, m.Name AS MemberName, t.BorrowDate FROM Books ...	20 row(s) returned	0.000 sec / 0.000 sec

## ii} Left Outer Join

```
266 •  SELECT b.Title, m.Name AS MemberName, t.BorrowDate  
267   FROM Books b  
268   LEFT JOIN Transactions t ON b.BookID = t.BookID  
269   LEFT JOIN Members m ON t.MemberID = m.MemberID;
```

The screenshot shows a database interface with a query editor and a results grid. The query is a left outer join selecting book titles, member names, and borrow dates. The results grid displays 30 rows of data, including 10 rows where a book has no associated member or borrow date. The output pane shows two action messages: one for the initial query and another for the second part of the join.

Title	MemberName	BorrowDate
War and Peace	Fiona Gallagher	2023-04-15
The Catcher in the Rye	George Michael	2023-05-10
Crime and Punishment	Hannah Montana	2023-06-01
The Hobbit	Ian Somerhalder	2023-06-15
The Lord of the Rings	Julia Roberts	2023-07-01
Anna Karenina	Kevin Hart	2023-08-10
Brave New World	HULL	HULL
Jane Eyre	Linda McCartney	2023-09-05
Wuthering Heights	HULL	HULL
The Odyssey	Michael Jordan	2023-10-10
The Iliad	HULL	HULL
Les Misérables	Nina Dobrev	2023-11-01
Don Quixote	HULL	HULL
The Divine Comedy	Oscar Isaac	2023-11-20
Frankenstein	Tony Stark	2024-04-01

Result 70 x Read Only

Output

Action Output

#	Time	Action	Message	Duration / Fetch
1	18:13:30	SELECT b.Title, m.Name AS MemberName, t.BorrowDate FROM Books ...	20 row(s) returned	0.000 sec / 0.000 sec
2	18:14:21	SELECT b.Title, m.Name AS MemberName, t.BorrowDate FROM Books ...	30 row(s) returned	0.016 sec / 0.000 sec

### iii} Right Outer Join

```
273 •  SELECT b.Title, m.Name AS MemberName, t.BorrowDate  
274   FROM Books b  
275   RIGHT JOIN Transactions t ON b.BookID = t.BookID  
276   RIGHT JOIN Members m ON t.MemberID = m.MemberID;  
277  
278
```

The screenshot shows a database interface with a results grid and an output pane. The results grid displays 20 rows of data from the Right Outer Join query. The output pane shows the query executed at 18:15:46 and 20 rows returned.

Title	MemberName	BorrowDate
War and Peace	Fiona Gallagher	2023-04-15
The Catcher in the Rye	George Michael	2023-05-10
Crime and Punishment	Hannah Montana	2023-06-01
The Hobbit	Ian Somerhalder	2023-06-15
The Lord of the Rings	Julia Roberts	2023-07-01
Anna Karenina	Kevin Hart	2023-08-10
Jane Eyre	Linda McCartney	2023-09-05
The Odyssey	Michael Jordan	2023-10-10
Les Misérables	Nina Dobrev	2023-11-01
The Divine Comedy	Oscar Isaac	2023-11-20
The Brothers Karamazov	Penelope Cruz	2023-12-01
A Tale of Two Cities	Quentin Tarantino	2024-01-10
The Old Man and the ...	Rachel Green	2024-02-15
The Road	Steve Rogers	2024-03-01
Frankenstein	Tony Stark	2024-04-01

Result 72 ×

Action Output

#	Time	Action	Message	Duration / Fetch
1	18:15:46	SELECT b.Title, m.Name AS MemberName, t.BorrowDate FROM Books ...	20 row(s) returned	0.000 sec / 0.000 sec

### iv} Full Join

```
281 •  SELECT b.Title, m.Name AS MemberName, t.BorrowDate  
282   FROM Books b  
283   LEFT JOIN Transactions t ON b.BookID = t.BookID  
284   LEFT JOIN Members m ON t.MemberID = m.MemberID  
285   UNION  
286   SELECT b.Title, m.Name AS MemberName, t.BorrowDate  
287   FROM Books b  
288   RIGHT JOIN Transactions t ON b.BookID = t.BookID  
289   RIGHT JOIN Members m ON t.MemberID = m.MemberID;  
290  
291
```

The screenshot shows a database interface with a results grid and an output pane. The results grid displays 20 rows of data from the Full Join query. The output pane shows the query executed at 18:15:46 and 20 rows returned.

Title	MemberName	BorrowDate
1984	Bob Smith	2023-01-25
Pride and Prejudice	Charlie Brown	2023-02-10
The Great Gatsby	Diana Prince	2023-03-01
Moby Dick	Evan Peters	2023-04-05
War and Peace	Fiona Gallagher	2023-04-15
The Catcher in the Rye	George Michael	2023-05-10
Crime and Punishment	Hannah Montana	2023-06-01
The Hobbit	Ian Somerhalder	2023-06-15
The Lord of the Rings	Julia Roberts	2023-07-01
Anna Karenina	Kevin Hart	2023-08-10
Brave New World	NULL	NULL
Jane Eyre	Linda McCartney	2023-09-05
Wuthering Heights	NULL	NULL
The Odyssey	Michael Jordan	2023-10-10
The Iliad	NULL	NULL
Les Misérables	Nina Dobrev	2023-11-01
Don Quixote	NULL	NULL
The Divine Comedy	Oscar Isaac	2023-11-20

Result 73 ×

Action Output

#	Time	Action	Message	Duration / Fetch
1	18:15:46	SELECT b.Title, m.Name AS MemberName, t.BorrowDate FROM Books ...	20 row(s) returned	0.000 sec / 0.000 sec

# Views

```
293 • CREATE VIEW BorrowedBooks AS
294     SELECT b.Title, m.Name AS MemberName, t.BorrowDate, t.ReturnDate
295     FROM Books b
296     INNER JOIN Transactions t ON b.BookID = t.BookID
297     INNER JOIN Members m ON t.MemberID = m.MemberID;
298
299
300
```

## Output

#	Time	Action	Message	Duration / Fetch
2	18:17:41	SELECT b.Title, m.Name AS MemberName, t.BorrowDate, t.ReturnDate FROM Books b INNER JOIN Transactions t ON b.BookID = t.BookID INNER JOIN Members m ON t.MemberID = m.MemberID;	30 row(s) returned	0.000 sec / 0.000 sec
3	18:20:56	CREATE VIEW BorrowedBooks AS SELECT b.Title, m.Name AS MemberName, t.BorrowDate, t.ReturnDate FROM Books b INNER JOIN Transactions t ON b.BookID = t.BookID INNER JOIN Members m ON t.MemberID = m.MemberID;	0 row(s) affected	0.046 sec

```
299
300 • select * From BorrowedBooks;
301
```

Result Grid			
Title	MemberName	BorrowDate	ReturnDate
To Kill a Mockingbird	Alice Johnson	2023-01-20	2023-02-20
1984	Bob Smith	2023-01-25	2023-02-25
Pride and Prejudice	Charlie Brown	2023-02-10	2023-03-10
The Great Gatsby	Diana Prince	2023-03-01	2023-03-31
Moby Dick	Evan Peters	2023-04-05	2023-05-05
War and Peace	Fiona Gallagher	2023-04-15	2023-05-15
The Catcher in the Rye	George Michael	2023-05-10	NULL
Crime and Punishment	Hannah Montana	2023-06-01	NULL
The Hobbit	Ian Somerhalder	2023-06-15	2023-07-15
The Lord of the Rings	Julia Roberts	2023-07-01	2023-08-01
Anne Karenina	Kevin Hart	2023-08-10	2023-09-10
Jane Eyre	Linda McCartney	2023-09-05	2023-10-05
The Odyssey	Michael Jordan	2023-10-10	2023-11-10
Les Misérables	Nina Dobrev	2023-11-01	NULL
Total Rows: 24		2023-11-01	2023-12-01



## Output

#	Time	Action	Message	Duration / Fetch
3	18:20:56	CREATE VIEW BorrowedBooks AS SELECT b.Title, m.Name AS MemberName, t.BorrowDate, t.ReturnDate FROM Books b INNER JOIN Transactions t ON b.BookID = t.BookID INNER JOIN Members m ON t.MemberID = m.MemberID;	0 row(s) affected	0.046 sec
4	18:22:12	select * From BorrowedBooks LIMIT 0, 1000	20 row(s) returned	0.000 sec / 0.000 sec