ADVANCED DATABASE TASK 1

INTRODUCTION

The effective management of library has to do with a lot of tasks which include but are not limited to fines, loans, item, repayment. Etc. Actually this can be handled using database management system (DBMS) to improve the level of accuracy and data consistency. To do this it is important to streamline the overall processes of managing the data of a library which include books, DVD, as well as journal etc. As a database developer, I am tasked with the designing of a new database to store the information of members, their loan history, item collected and overdue payment. Etc. To do this task, the system should be designed in such a way that it is able to track the status of the item in order to know if the item is available, lost or removed. The system should also be designed to handle logins as well as member information even after a member decides to leave. In this task, the major goal is to design database that is quite efficient and one which can be relied on to meet the needs of the library. Ensuring data integrity to avoid system downtimes will help to prevent losing critical data. Being able to identify the entities and their relationship and to define the data attributes with their respective data types for each entity will enable me to analyse library's requirements and breaking down the information into discrete data elements. When designing this database, it is necessary to consider a database schema where all the necessary information of the members is being stored. To achieve this goal, I will need to consider the specific requirements of the library and create a database design that is flexible, scalable, and easy to maintain.

Design and normalization of the proposed database into 3NF

To determine if the proposed database is in 3NF, it is important to note that each of the table that was designed has a primary key, and non-key attributes that are dependent only on the primary key. For example, the Member table has attributes that are dependent on the MemberId, which is the primary key. This is also applicable to the Item table which has attributes that are dependent on the ItemId, which is the primary key. Establishing a many-to-many relationship between members and items, you will see that the Loan table has foreign keys that reference the Member and Item tables. The Overdue table also has foreign keys that reference the Member and Item tables, respectively. Finally, the Repayment table has a foreign key that references the Overdue table to track the repayment of overdue amounts associated with specific overdue. Also, there are no transitive dependencies. From the above illustration, the code used for this task is in 3NF.

DATABASE DESIGN DECISION.

The code used in this task creates a database named "LibraryManagementSystem" and defines five tables which include Member, Item, Loan, Overdue, and Repayment. I shall be explaining this one after the other.

1. Member Table: I shall be designing the “Member table” to store information about the library's members. Each member will be linked and associated by a unique ‘MemberId’ and login details which include the username and password. The members name which includes the “Username”, “Password”, to store login details, “FirstName”, “MiddleName”, and “LastName” columns store the member's name, while the “Address1” and “Address2” columns store their address. The Dateofbirth column will stores the member's date of birth, while the EmailAddress and ContactNumber columns will also store their contact information. The MembershipEndDate column stores the date on which the member's membership expires.

2. Item Table: Designing the item table will store information about the items in the library. Each item is associated by a special ItemId. In this context, the “ItemTitle” column will store the title of the item, while the “ItemType” column stores the type of item like book, CD, DVD, journal. The Author column will help to store the name of the author of the item listed above while the “YearOfPublication” column stores the year in which the item was published by the author. The Status column stores the status of the item to know if the item is available, lost or removed. while the ISBN column stores the International Standard Book Number of the item. The ItemAddedDate column stores the date on which the item was added to the library's collection.

3. Loan Table: The information about the loans collected and paid by the members shall be stored on the loan table. Similarly, like other tables, each loan is identified by a unique LoanId. The MemberId column will reference the Member table to associate the loan with a specific member. The ItemId column references the Item table to associate the loan with a specific item. The ItemBorrowedDate column stores the date on which the item was borrowed, The ItemDueDate will store the information on the due date it was returned. The ItemReturnedDate column stores the date on which the item was returned. The OverdueRate column stores the rate at which overdue fees are charged to members who fails to meet the deadline of the return date.

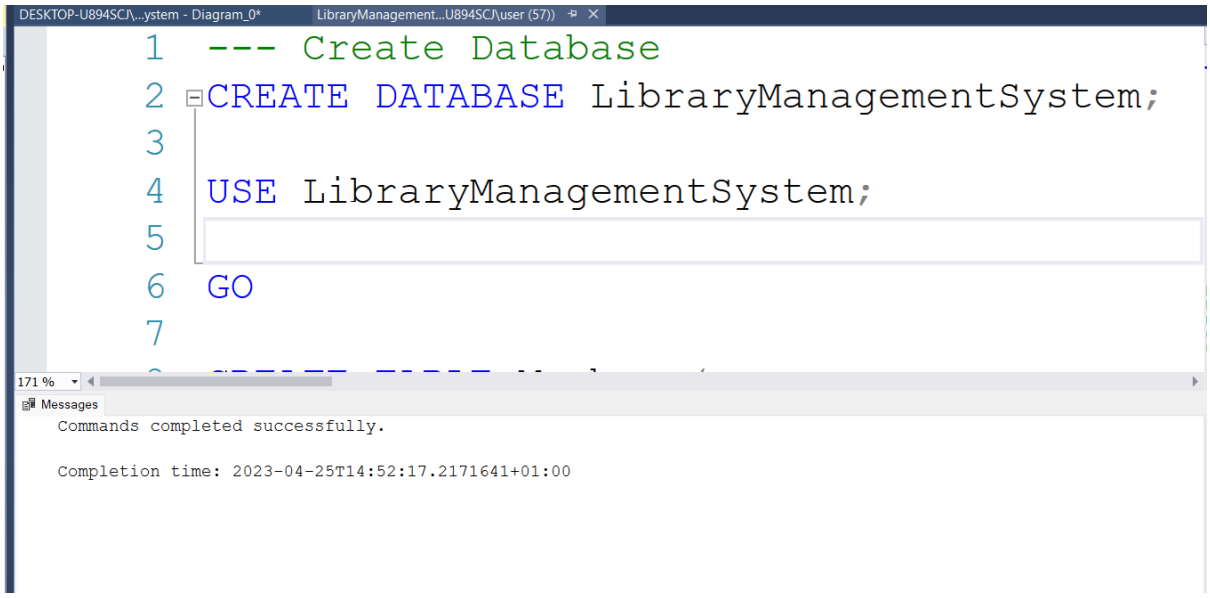
4. Overdue Table: Each overdue item is identified by a special OverdueId. The MemberId column will reference the Member table to associate the overdue item with a specific member. The ItemId column will also reference the Item table to associate the overdue item with a specific item. The date and time in which the item became overdue will be stored on the “OverdueDateTime” column. while the OverdueTotalAmount column stores the total amount of overdue fees associated with the item.

5. Repayment Table: A table shall be designed to enable members make payment for their overdue item. Each repayment made is identified by a unique “RepaymentId”. The OverdueId column references the Overdue table to associate the repayment with a specific overdue item. The RepaymentDateTime column stores the date and time on which the repayment was made by the member. while the RepaymentAmount column stores the amount of the repayment. The PaymentMethod column stores the method of payment that was used. This could be cash or card.

IMPLEMENTATION OF THE DESIGN USING T-SQL STATEMENT

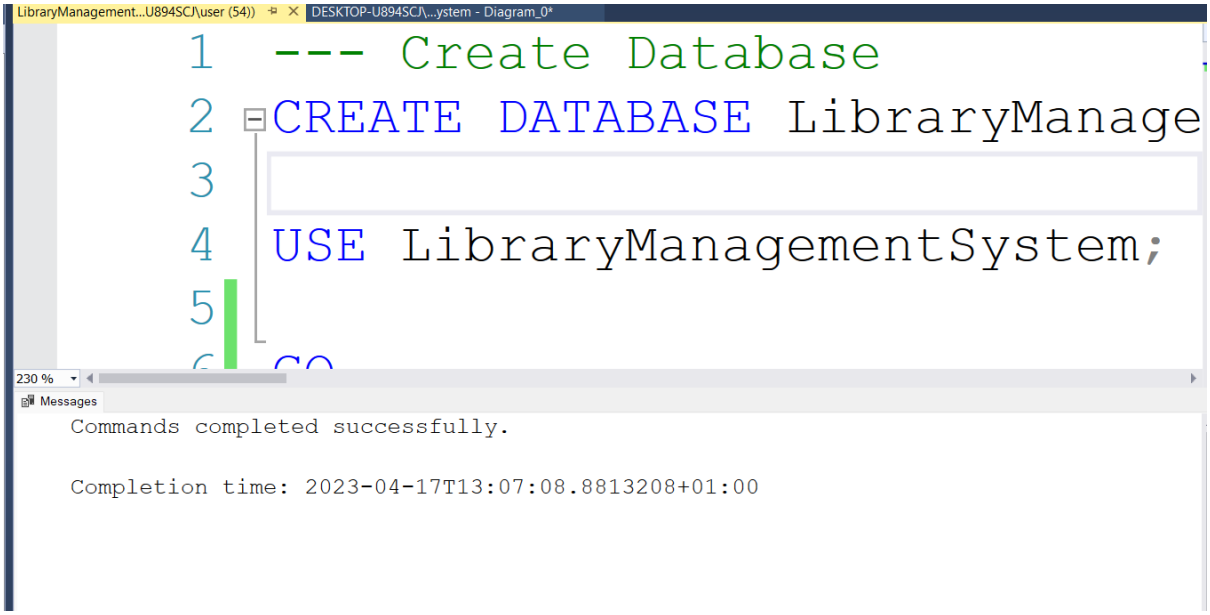
The execution of any database design has to do with creating a new database in Microsoft SQL Server Management Studio and defining the tables and relationships that was obtained based on the design. The database design used in this task includes five tables: Member, Item, Loan, Overdue, and Repayment along with their respective fields and primary keys. The steps involve in creating this database are listed below showing that the command was successfully completed along with the screenshot.

1. Create The Database using the CREATE DATABASE Statement below.

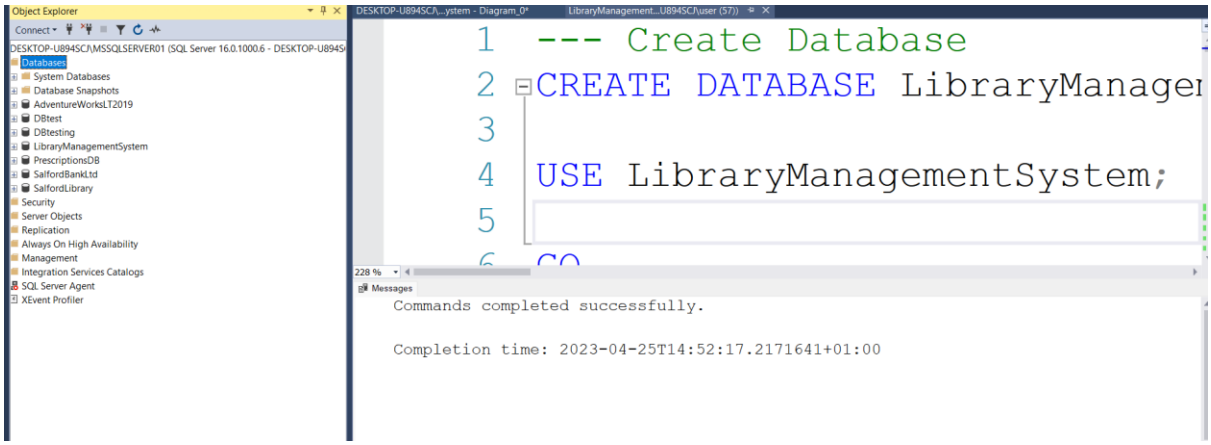


The statement "CREATE DATABASE Library Management System" was used to create a database with the name "LibraryManagementSystem". Upon creation, this database can now be used to store and manage data related to a library management system, such as information about books, borrowers, loans, etc.

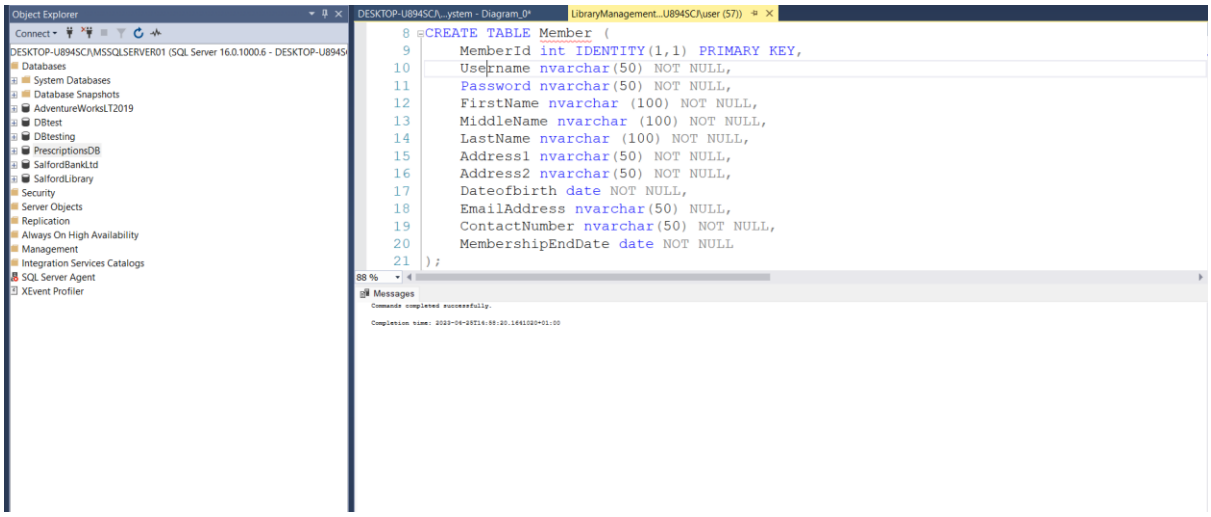
2. Use the Database



To select a particular database to work with in a SQL server, I shall use The SQL statement "USE" In this scenario, the statement "USE LibraryManagementSystem" is used to select the specific database "LibraryManagementSystem" that was created earlier using the "CREATE DATABASE" statement. Once this statement has been executed, any subsequent SQL statements will be executed within the context of the "LibraryManagementSystem" database,

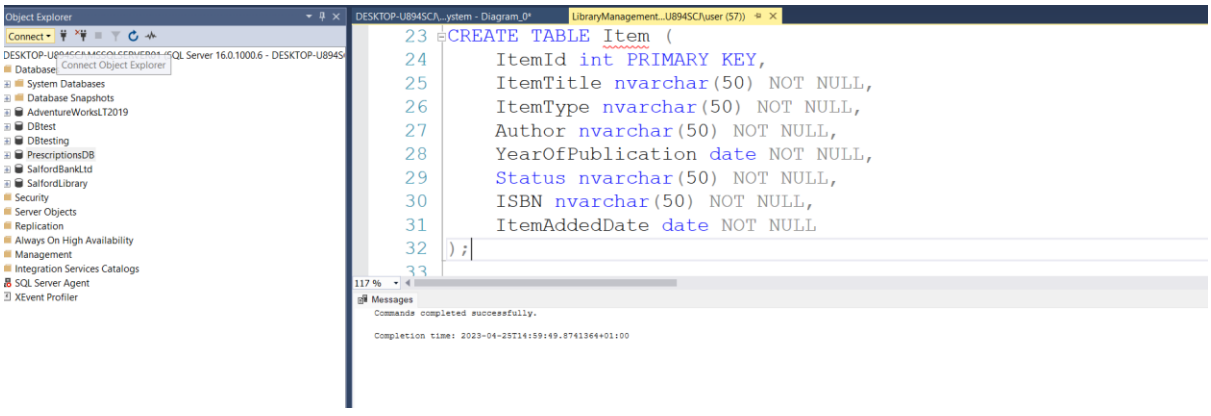


3. Create The Member Table



After the above command has been successfully executed, I shall be creating the “member table”. In this case, the statement "CREATE TABLE Member" is used to create a table named "Member" with several columns, which are MemberId, FirstName, MiddleName, LastName, Address1, Address2, Dateofbirth, EmailAddress, ContactNumber, and MembershipEndDate. The primary key constraint is applied to the MemberId column, which will ensure that each row in the table has a special MemberId value. The “NOT NULL” constraint is applied to several columns, which means that these columns cannot contain null values. The NULL constraint is applied only to the EmailAddress column, which means that this column can contain null values.

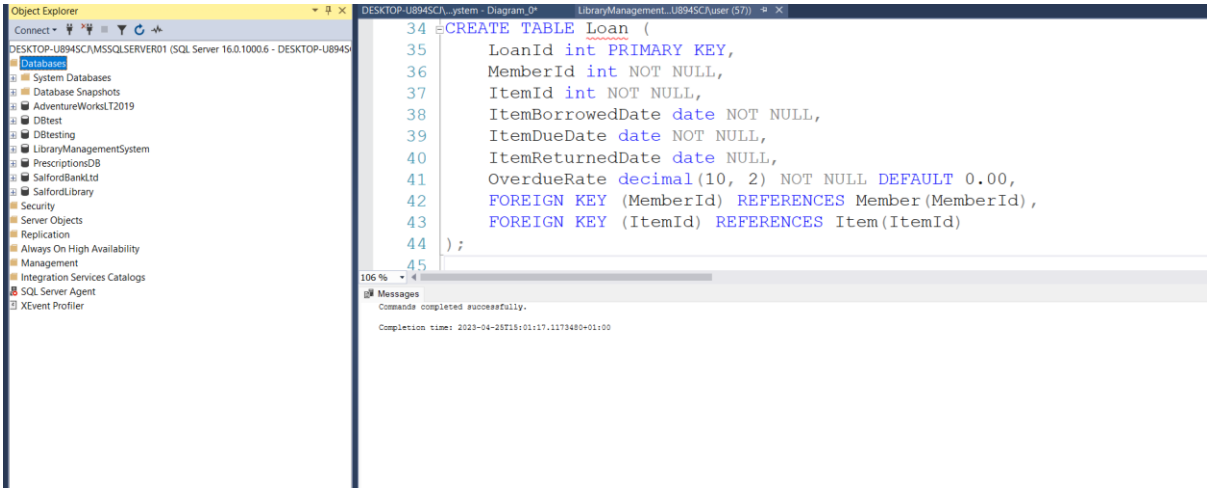
4. Create the Item Table



The Item table shall be created using the SQL statement above. In this case, the statement "CREATE TABLE Item" is used to create a table named "Item" which are made up of different columns, including ItemId, ItemTitle, ItemType, Author, YearOfPublication, Status, ISBN, and ItemAddedDate. The primary key constraint is

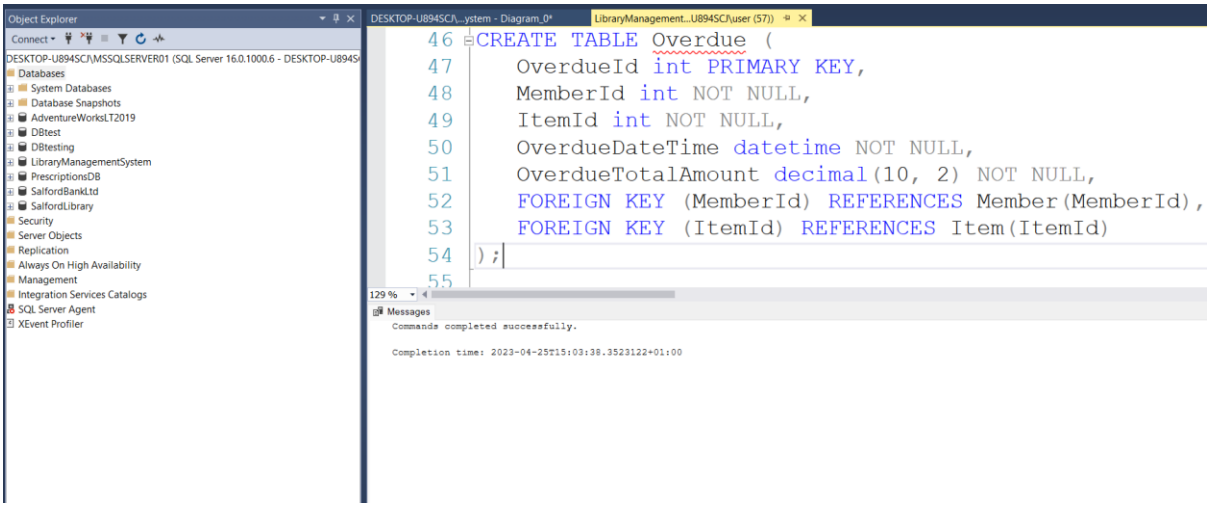
applied to the ItemId column as seen above. The “NOT NULL” constraint is applied to all columns. This simply means that these columns cannot contain null values.

5. Create the Loan Table



A table shall be created for the “loan” using the SQL the statement "CREATE TABLE Loan" which consists of several columns, including LoanId, MemberId, ItemId, ItemBorrowedDate, ItemReturnedDate, ItemDueDate, and OverdueRate. The primary key constraint is applied to the LoanId column, which ensures that each row in the table has a unique LoanId value. The “Itemreturneddate” column is NULL VALUES. While the rest column is “NOT NULL” which ensures that these columns cannot contain null values.

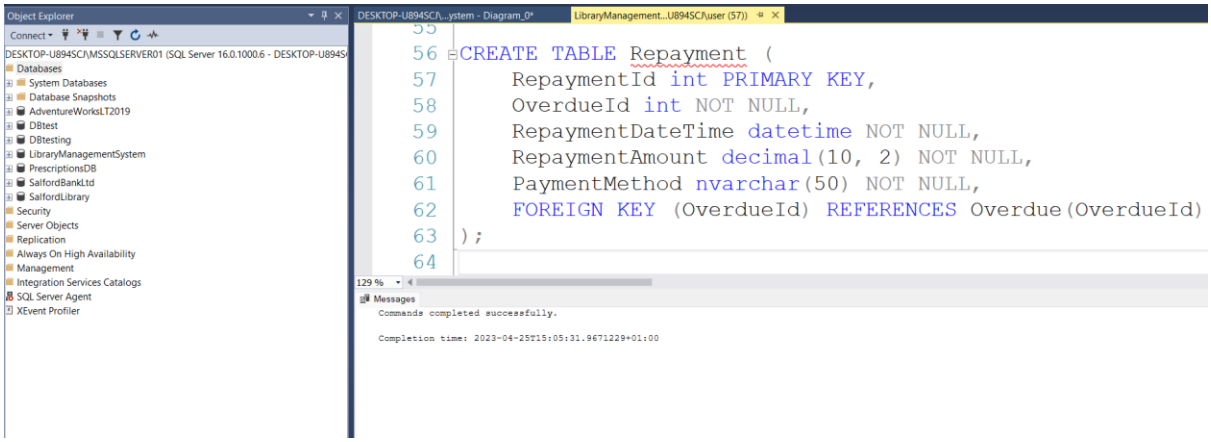
6. Create Overdue Table



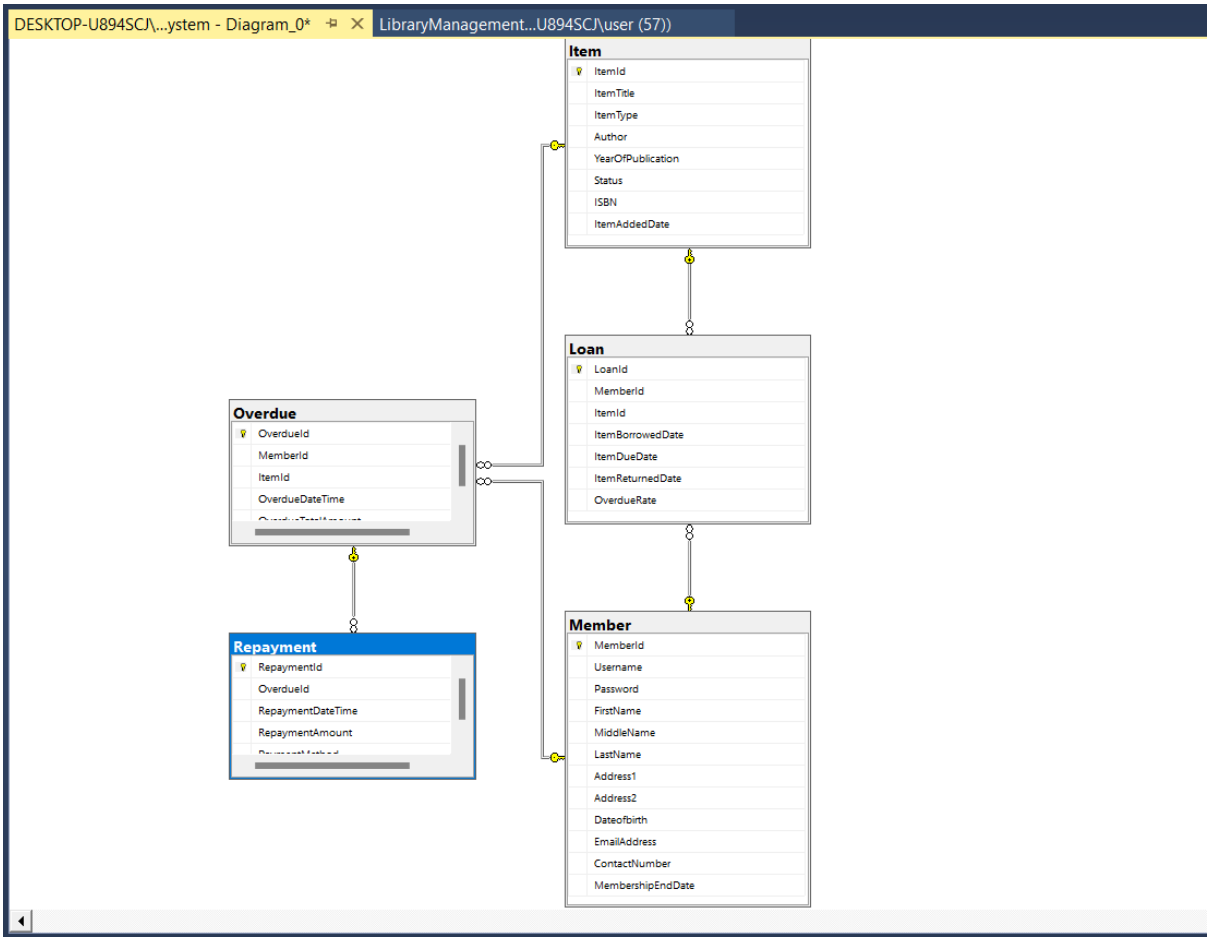
After executing the loan table command, the overdue table shall be created. The statement "CREATE TABLE Overdue" is used to create a table named "Overdue"

with several columns, including OverdueId, MemberId, ItemId, OverdueDateTime, and OverdueTotalAmount. The primary key constraint is applied to the OverdueId column, which ensures that each row in the table has a perculiar OverdueId value. The NOT NULL constraint is applied to several columns, which ensures that these columns cannot contain null values.

7. Create Repayment Table



The repayment table shall be created using The SQL statement "CREATE TABLE Repayment" This table consist of several columns, including RepaymentId, OverdueId, RepaymentDateTime, RepaymentAmount, and PaymentMethod. The primary key constraint is applied to the RepaymentId column, which ensures that each row in the table has a unique RepaymentId value for members. The NOT NULL constraint is applied to several columns, which ensures that these columns cannot contain null values.



Each of the table shown above is defined with appropriate data types of right constraints, and the appropriate foreign key relationships to ensure data integrity. By implementing this design, the library can effectively manage its members, items, and loans, while also tracking any overdue items and associated fees.

COLUMN(S) OF PRIMARY KEYS AND FOREIGN KEYS

In this task, the primary keys and foreign keys used for this database design are listed below.

- Primary keys Columns:
    - Member table: MemberId
    - Item table: ItemId
    - Loan table: LoanId
    - Overdue table: OverdueId
    - Repayment table: RepaymentId
- Foreign keys Columns:
    - Loan table: MemberId (references Member table MemberId)

- Loan table: ItemId (references Item table ItemId)
- Overdue table: MemberId (references Member table MemberId)
- Overdue table: ItemId (references Item table ItemId)
- Repayment table: OverdueId (references Overdue table OverdueId)

DATA TYPE USED FOR EACH COLUMN

This shall be summarised in a tabular form.

1. **MEMBER TABLE**:

Columns	DATA TYPES	JUSTIFICATIONS
MemberId (PK)	Int (IDENTITY (1,1))	The columns can store whole number of values that are unique for each member.
UserName	Nvarchar (50)	It allows storing Unicode characters and has a variable length.
Password	Nvarchar (50)	It allows storing Unicode characters and has a variable length.
FirstName	Nvarchar (100)	The data stored in this column does not exceed a certain limit
MiddleName	Nvarchar (100)	This is set to ensure that the data stored in this column does not exceed a certain limit.
LastName	Nvarchar (100)	maximum length of 100 characters. This is set to ensure

		that the data stored in this column does not exceed a certain limit.
Address1	Nvarchar (50)	with a maximum length of 50 characters" is set to ensure that the data in this column does not exceed certain limit.
Address2	Nvarchar (50)	a maximum length of 50 characters" is set to ensure that the data in this column does not exceed certain limit.
Dateofbirth	Date	store date values in the format of YYYY-MM-DD. Using a date data type for the Dateofbirth column allows for efficient storage and manipulation of date values.
ContactNumber	Nvarchar (50)	The maximum length of 50 characters is set to ensure that the data stored in this column does not exceed a certain limit.
EmailAddress	Nvarchar (50)	The maximum length of 50 characters is set to ensure that the data stored in this column does not exceed a certain limit.
MembershipEndDate	Date	A date data type used to store the end date of the member's membership.

2. ITEM TABLE

COLUMNS	**DATA TYPES**	**JUSTIFICATIONS**
ItemId (PK)	Int	Allows for storing whole numbers that uniquely define items in the library system. INT is used as the data type because it's a whole number.
Item Title	Nvarchar (50)	To store title of an item. Its set 50 to allow for longer item titles.
Item Type	Nvarchar (50)	It’s set 50 to allow for longer character type. It

		allows for storing text data representing
Author	Nvarchar (50)	A string data type to store the author of an item. It will allow for sorting text data representing the name of the authors
Year of Publication	Date	Allows for storing the year of publication of each item in the library system. It represents a calendar date (year, month and day)
Status	Nvarchar (50)	Using this data type for the status column allows for storing a short description of the current status of each item in the library system
ISBN	Nvarchar (50)	The International Standard Book Number (ISBN) is a unique identifier for books and related materials. It contains 13 digits The ISBN can contain both numbers and letters, making it suitable for storing as a string data type in SQL.
Item Added Date	Date	Date data type ensures that the ItemAddedDate column only stores valid date values, and any invalid date values will result in an error when inserted into the table.

3. LOAN TABLE

COLUMNS	DATA TYPE	JUSTIFICATION

LoanId (PK)	Int	INT is used as the data type because it's a whole number.
MemberId	Int (Not Null)	data type is appropriate because the values will be whole numbers.
ItemId	Int (Not Null)	The int data type is appropriate because the values will be whole numbers.
Itemborroweddate	Date (Not Null)	The date data type is appropriate because it stores only the date without the time.
ItemDueDate	Date (Not Null)	The date data type is appropriate because it stores only the date without the time.
ItemReturnedDate.	Date (Null)	The date data type is appropriate because it stores only the date without the time, and the NULL value is allowed because the item may not have been returned yet.
Overdue rate	Decimal 10, 2) (NOT NULL DEFAULT 0.00)	it allows for storing decimal values, such as interest rates, with high precision and accuracy. The DEFAULT constraint ensures that the value is set to 0.00 by default if not explicitly specified.

4. OVERDUE TABLE

Columns	**DATA TYPE**	**JUSTIFICATION**

OverdueId (Pk)	Int	data type is appropriate because the values will be whole numbers, and the PRIMARY KEY constraint ensures that each record has a unique value.
MemberId	Int (Not Null)	the values will be whole numbers.
ItemId	Int (Not Null)	The int data type is appropriate because the values will be whole numbers.
OverdueDateTime	DateTime (Not Null)	The datetime data type is appropriate because it allows for storing both date and time information.
OverdueTotalAmount	decimal (10, 2) (NOT NULL):	The decimal data type is appropriate because it allows for storing decimal values, such as money, with high precision and accuracy.

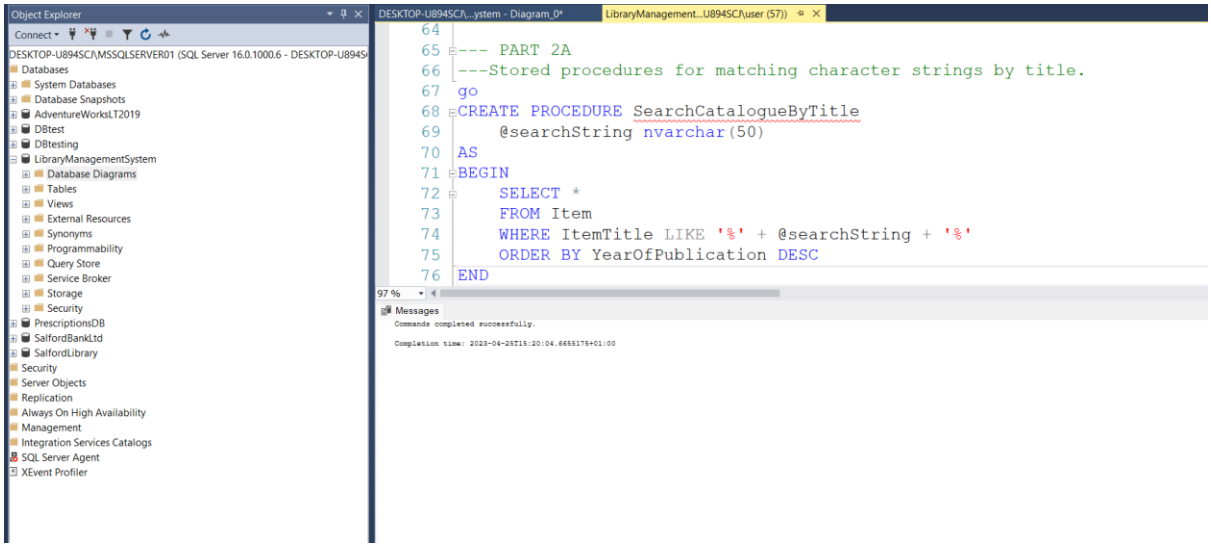
5. REPAYMENT TABLE

COLUMNS	**DATA TYPE**	**JUSTIFICATION**
RepaymentId (pk)	Int	The int data type is appropriate because the values will be whole numbers, and the PRIMARY KEY constraint ensures that each record has a unique value.

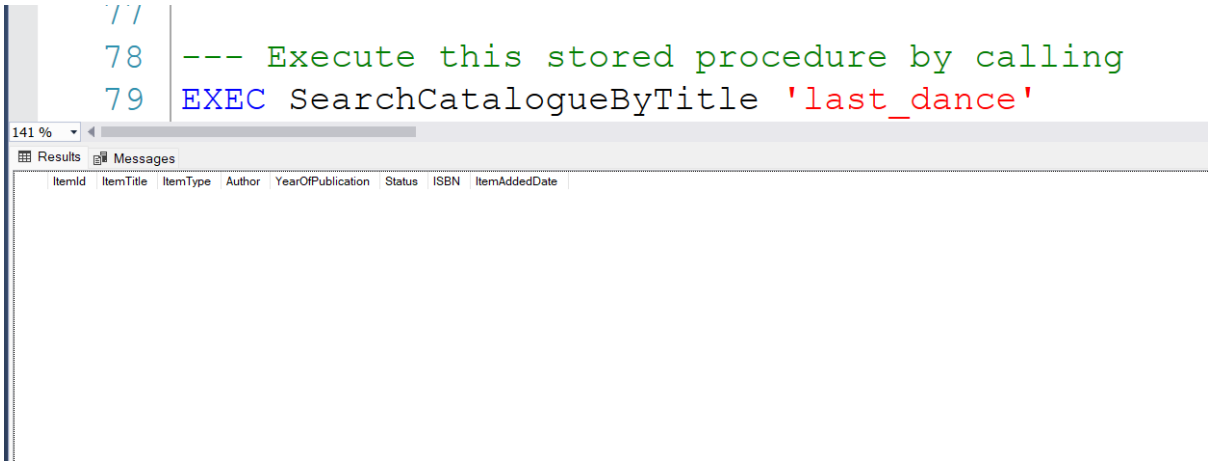
OverdueId	Int (Not Null)	The int data type is appropriate because the values will be whole numbers.
RepaymentDateTime	DateTime (Not Null)	The datetime data type is appropriate because it allows for storing both date and time information.
RepaymentAmount	Decimal (10, 2) (NOT NULL)	The decimal data type is appropriate because it allows for storing decimal values, such as money, with high precision and accuracy.
PaymentMethod	Nvarchar (50) (NOT NULL)	The method used for making the repayment (e.g., cash, credit card, etc.). The nvarchar data type is appropriate because it allows for storing string values of variable length up to 50 characters.

PART 2A

This stored procedure for matching characters strings by title usually takes a search string as input. It will return all items from the Item table whose ‘ItemTitle’ column contains the search string. The ‘ORDER BY’ clause will then sort the results obtained by the ‘YearOfPublication’ column in descending order, which means the most recent publications among the item will appear first.



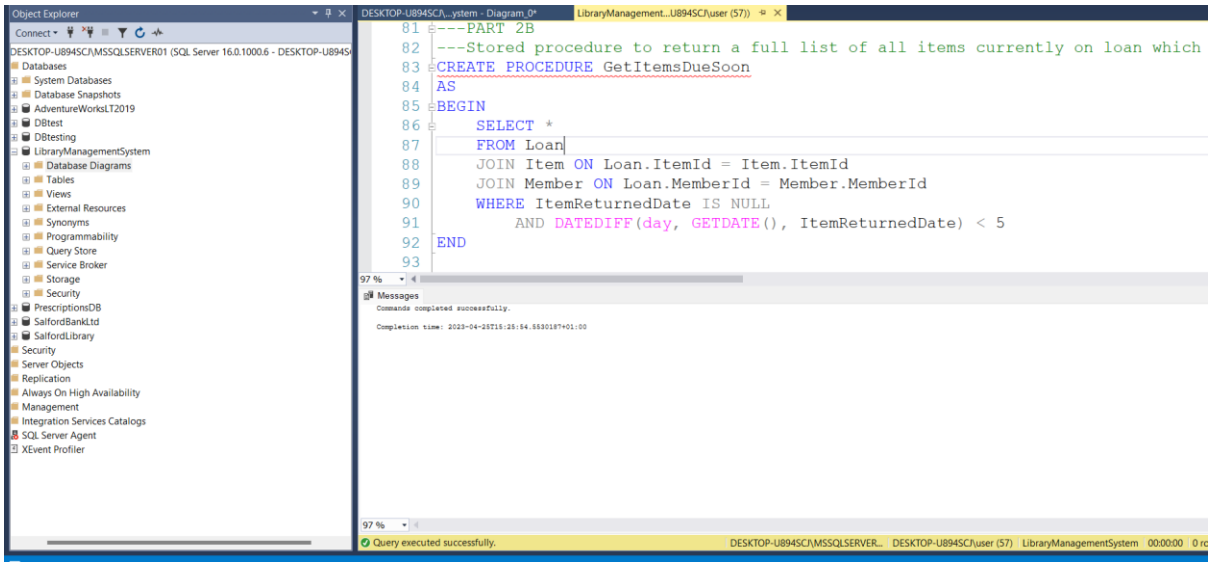
Executing the below code will return all items that have "Last Dance” in the title, sorted with the most recent publications first.



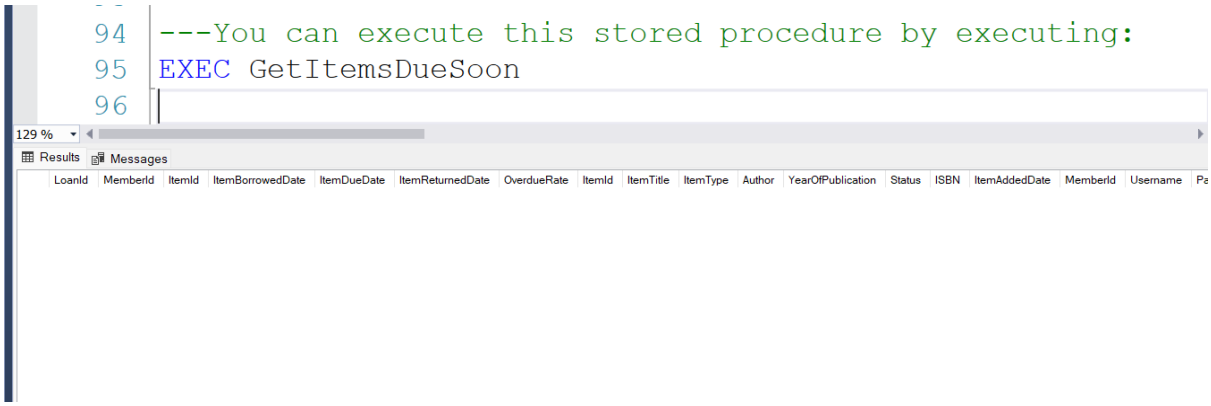
PART 2B

Here, the” ItemReturnedDate is NULL”. Therefore, this stored procedure will retrieve all loan records from the ‘Loan table’ that are not yet returned as well as the corresponding item and member information from the ‘Item’ and ‘Member’ tables using JOINs. A filter to return only those loans whose due date is less than five days

from the current date is applied which is achieved using the ‘DATEDIFF’ function to calculate the difference in days between the current date ‘(GETDATE ())’ and the due date ‘(ItemDueDate)’.



This will return a list of all items currently on loan which have a due date of less than five days from the current date.



PART 2C

The code below is a stored procedure to inserts a new into the "Member" table in the database. The stored procedure takes parameters which include the details of the new member such as member ID, username, password, first name, middle name, last name, address, date of birth, email address, contact number, and membership end date. These parameters are used to insert a new row into the "Member" table using the INSERT statement. This stored procedure can be executed by passing in the required parameters, as this will automatically insert a new member into the database.

```sql
--- PART 2C
--- Stored procedures or user-defined functions to Insert a new member into the database
GO
CREATE PROCEDURE InsertNewMember
    @Username nvarchar(50),
    @Password nvarchar(50),
    @FirstName nvarchar(100),
    @MiddleName nvarchar(100),
    @LastName nvarchar(100),
    @Address1 nvarchar(50),
    @Address2 nvarchar(50),
    @DateOfBirth date,
    @EmailAddress nvarchar(50),
    @ContactNumber nvarchar(50),
    @MembershipEndDate date
AS
BEGIN
    INSERT INTO Member (Username, Password, FirstName, MiddleName, LastName, Address1, Address2, DateOfBirth, EmailAddress, ContactNur
    VALUES (@Username, @Password, @FirstName, @MiddleName, @LastName, @Address1, @Address2, @DateOfBirth, @EmailAddress, @ContactNumbe
END;
```

For example, this stored procedure takes the appropriate parameters as listed above for the new member's information and inserts a new row into the ‘Member table’.

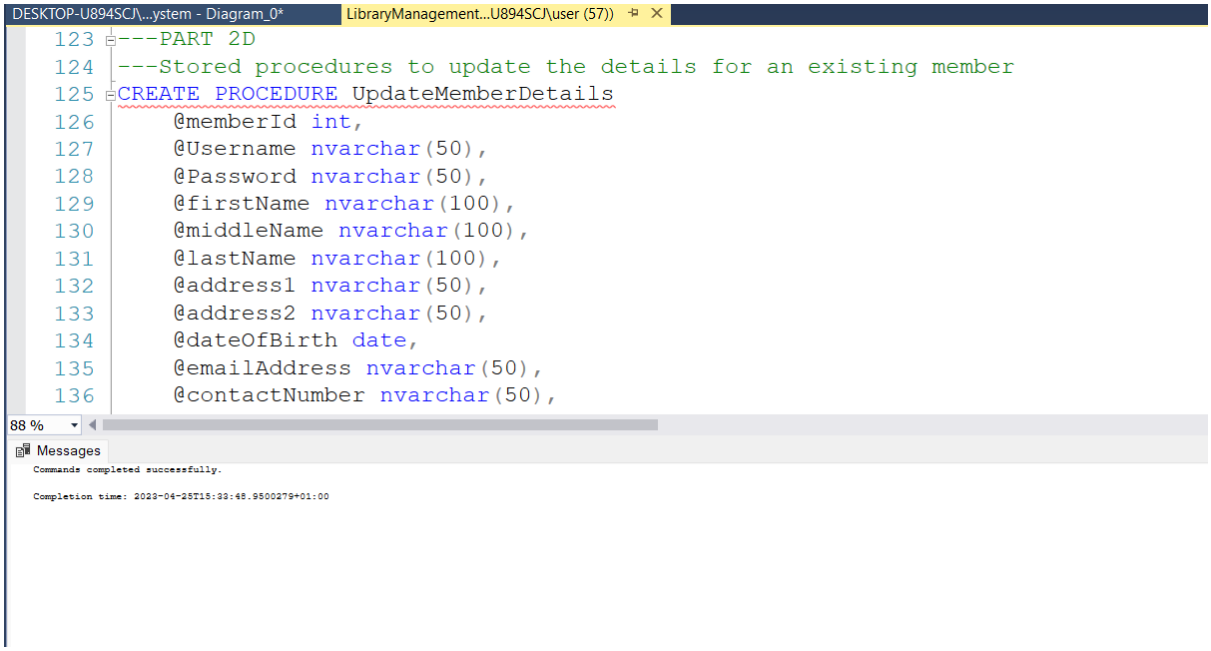
```sql
--- Execute this stored procedure of the above code by calling
EXEC InsertNewMember 'jdoe', 'mypassword', 'John', 'F', 'Donald',
```

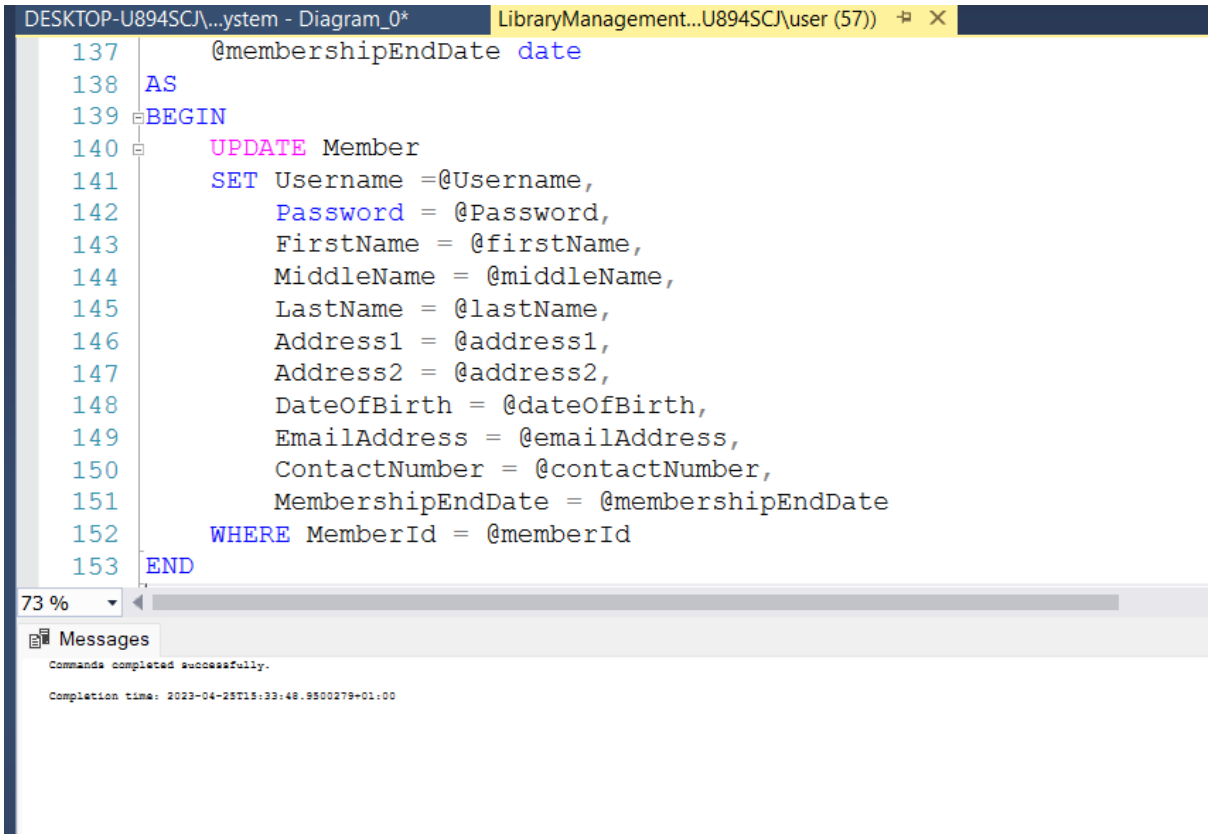
```
(1 row affected)

Completion time: 2023-04-25T15:36:10.9243504+01:00
```

This will insert a new member with the specified information into the ‘Member’ table.

PART 2D

The stored procedure to update the details of an existing member will take the members ID and set the values for specific field to the corresponding input parameter values and update all the input parameters of the member by performing an update operation on the member table. This allow for efficient update of members which are subject to change.





For example, executing input parameters for the updated member information and updates the corresponding row in the ‘Member’ table based on the member's ID as shown below.

```
155
156 --- Execute this stored procedure by calling
157 EXEC UpdateMemberDetails 1234, 'new_username', 'new_password', 'Jude', '
158
159
```

106 %

Messages

```
(0 rows affected)

Completion time: 2023-04-25T15:39:45.0424855+01:00
```

QUESTION 3

DESKTOP-U894SCJ\...ystem - Diagram_0* | LibraryManagement...U894SCJ\user (57))

```
158
159
160 --- QUESTION 3
161 ---A view showing all previous and currentloans including details of the item borrowed, borrowed date, due date and any associated
162 CREATE VIEW LoanHistory AS
163 SELECT TOP 100 PERCENT
164     Member.FirstName + ' ' + Member.LastName AS MemberName,
165     Item.ItemTitle,
166     Item.Author,
167     Loan.ItemBorrowedDate,
168     Loan.ItemReturnedDate,
169     Loan.OverdueRate,
170     CASE
171         WHEN Loan.ItemReturnedDate IS NULL AND Loan.ItemReturnedDate < GETDATE() THEN DATEDIFF(day, Loan.ItemDueDate, GETDATE()) *
172         ELSE 0
173     END AS Fine
174 FROM Loan
175 INNER JOIN Member ON Loan.MemberId = Member.MemberId
176 INNER JOIN Item ON Loan.ItemId = Item.ItemId
177 ORDER BY MemberName, Loan.ItemBorrowedDate DESC;
178
```

60 %

Messages

```
Commands completed successfully.

Completion time: 2023-04-25T15:43:45.9603552+01:00
```

To create a view that will show the current and past loans, it will include the members full name, item title, author, borrowed date, returned date and any associated fines connected with it. The fine column will sum up the fine amount based on the

overdue rate and the number of days that have exceeded past the due date. This view will join the Loan, Member, and Item tables together to retrieve the necessary information for each loan linked to a specific member.

You can query this updated view using the code below.

```
179 ---You can query this updated view using the same query as before:
180 SELECT * FROM LoanHistory
181
```

106 %

Results | Messages

MemberName	ItemTitle	Author	ItemBorrowedDate	ItemReturnedDate	OverdueRate	Fine

QUESTION 4

DESKTOP-U894SCJ\...ystem - Diagram_0* | LibraryManagement...U894SCJ\user (57))

```
182 ---QUESTION 4
183 --- Create a trigger so that the current status of an item automatically updates to Available when
184 CREATE TRIGGER trLoan_Returned
185 ON Loan
186 AFTER UPDATE
187 AS
188 BEGIN
189     IF UPDATE(ItemReturnedDate)
190     BEGIN
191         UPDATE Item
192         SET Status = 'Available'
193         FROM Item
194         INNER JOIN inserted ON Item.ItemId = inserted.ItemId
195         WHERE inserted.ItemReturnedDate IS NULL
196     END
197 END
```

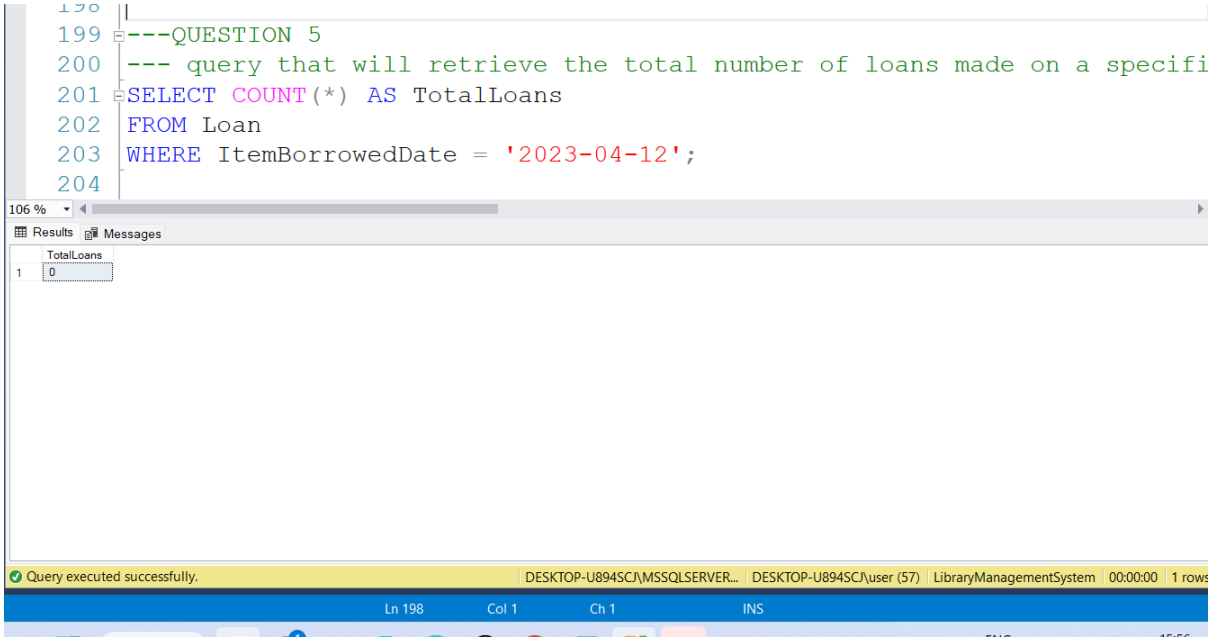
80 %

Messages

```
Commands completed successfully.

Completion time: 2023-04-25T15:52:09.1947242+01:00
```

To automatically updates an item to show that the status is available when returned, it is necessary I create a trigger. By so doing, the trigger that was created will fire after an update on the loan table to check if the itemreturneddate column has been updated. If it has, the trigger will then set the status table to available for the actual item that was returned using the update statement and join clause as shown above. In a situation, whereby the status has additional states, it trigger will need to be modified to the current states.

QUESTION 5



To identify the total number of loans made on a particular date, applying the COUNT () function will returns the number of rows that meets the conditions. This will give you the sum up of loans being made on a particular date. From the above code, the date used was 2023-04-12 which can be replaced depending on the date you want to view.

QUESTION 6

Insert Data into Member Table

```
226 INSERT INTO Member (Username, Password, FirstName, MiddleName, LastName, Address
227 VALUES('Jude_Oseme', 'Password111', 'Jude', 'Isioma', 'Oseme', '245 lloyd St', '
228     ('Jackson_Paul', 'Password222', 'Jackson', 'Daniel', 'Paul', '112 Hulme St',
229     ('Mary_John', 'Password123', 'Mary', 'Hannah', 'John', '225 Morrison st', 'A
230     ('Mart_Luth', 'Password348', 'Martins', 'James', 'Luther','205 Bridge Close'
231     ('thomas_jefferson', 'democracy2', 'Thomas', 'Bob', 'Jefferson', '234 Montic
232     ('george_Kenneth', 'Manchester1', 'George', 'Karim', 'Kenneth', '1 London St
233     ('Mercy_David', 'Password002', 'Mercy', 'Halim', 'David', 'John Lester Court
234     ('John_Stone',  'Chelsea004', 'John', 'Don', 'Stone', 'Eddie Colman Courts',
235     ('Jim_Iyke', 'Password011', 'Jim', 'clinton', 'ikye', '39 Robertson Road', '
236     ('Robert_Clay', 'United05', 'Robert', 'Andrew', 'Clay', '85 Salford drive',
237
238     SELECT * From Member
```

97 %

Results | Messages

	MemberId	Username	Password	FirstName	MiddleName	LastName	Address1	Address2	Dateofbirth	EmailAddress	ContactNumber	MembershipEndDate
1	1	jdoe	mypassword	John	F	Donald	145 LLoyd St		1992-03-01	johndonald@email.com	133-428-6830	2024-06-20
2	2	Jude_Oseme	Password111	Jude	Isioma	Oseme	245 lloyd St	Apt 10	1990-05-05	jude.oseme@gmail.com	+234-8356	2023-06-30
3	3	Jackson_Paul	Password222	Jackson	Daniel	Paul	112 Hulme St	Suite 6	1996-03-20	jackson.paul@gmail.com	+44-6336	2024-08-25
4	4	Mary_John	Password123	Mary	Hannah	John	225 Morrison st	Apt 2	2000-02-15	Mary.john@gmail.com	+888-2567	2023-09-10
5	5	Mart_Luth	Password348	Martins	James	Luther	205 Bridge Close	Flat 1	2000-07-09	Martins.Luther@gmail.com	+809-445	2023-04-09
6	6	thomas_jefferson	democracy2	Thomas	Bob	Jefferson	234 Monticello Ave	Apt 6	1993-04-13	tjefferson@usa.gov	+447-1776	2025-09-10
7	7	george_Kenneth	Manchester1	George	Karim	Kenneth	1 London Street	Suite 2	1974-02-22	GeorgeKen@usa.gov	555-1776	2024-02-22
8	8	Mercy_David	Password002	Mercy	Halim	David	John Lester Court	Flat 10	1994-01-01	Mercy.David@yahoo.com	+234- 369	2026-03-07
9	9	John_Stone	Chelsea004	John	Don	Stone	Eddie Colman Courts	Apt 6	1993-02-02	Johnstone@gmail.com	+234-345	2023-05-20
10	10	Jim_Iyke	Password011	Jim	clinton	ikye	39 Robertson Road	Suite 1	1989-03-02	Jimiyke@yahoo.com	+447-062	2023-07-15
11	11	Robert_Clay	United05	Robert	Andrew	Clay	85 Salford drive	Flat 3	1999-09-06	RobertClay@gmail.com	+777-093	2023-06-07

The above screenshot of code is an SQL query that inserts data into the "Member" table of a database. The "INSERT INTO" statement is used to add a new row of data to a table, while the "VALUES" keyword indicates the values to be inserted. In this context, 10 different members with information ranging from username, password, name, address, date of birth, email address, contact number, and membership end date is being inserted into the "Member" table. Each of the value entered is separated with commas and enclosed with a parenthesis. The SELECT statement will extract all the data from the table for viewing or for further analysis.

Insert Data into Item Table

```
--- Insert data into the Item table
INSERT INTO Item (ItemId, ItemTitle, ItemType, Author, YearOfPublication, Status, ISBN, ItemAddedDa
VALUES
    (1, 'Last Dance', 'Book', 'Mark Smith', '1975-04-10', 'Available', '3252259870165', '2022-01-1(
    (2, 'The Great Mystery', 'Book', 'H. Arnold Lugard', '1966-10-11', 'Lost', '6348235798835', '2(
    (3, 'Music for the Soul', 'Book', 'Stella Maris ', '1995-04-28', 'Available', '9235443278564',
    (4, 'Africa Colonization', 'Book', 'Jim  Peter', '1982-07-09', 'Overdue', '7348862155432', '202
    (5, 'Digital Industralization', 'Journal', 'Jones David', '1999-09-07','OnLoan', '6231773856249
    (6, 'Love Birds', 'DVD', 'Marie Sally', '2006-07-12', 'Lost', '6774552371689', '2022-08-11'),
    (7, 'The Physics fundamentals', 'Journal', 'Ramsey Mark', '1983-09-03', 'Lost', '2318799068345
    (8, 'Data world', 'DVD', 'Luggard Smith', '1970-10-11', 'Available', '2239067354332', '2023-03-
    (9, 'Engineering Mathematics','Book', 'Richard Kent', '1999-05-09', 'On Loan', '6330933380567',
    (10, 'The Secrets of  Success', 'DVD', 'Alex Ramos', '2005-06-18', 'Removed', '4632891425648',

    SELECT * From Item
```

80 %

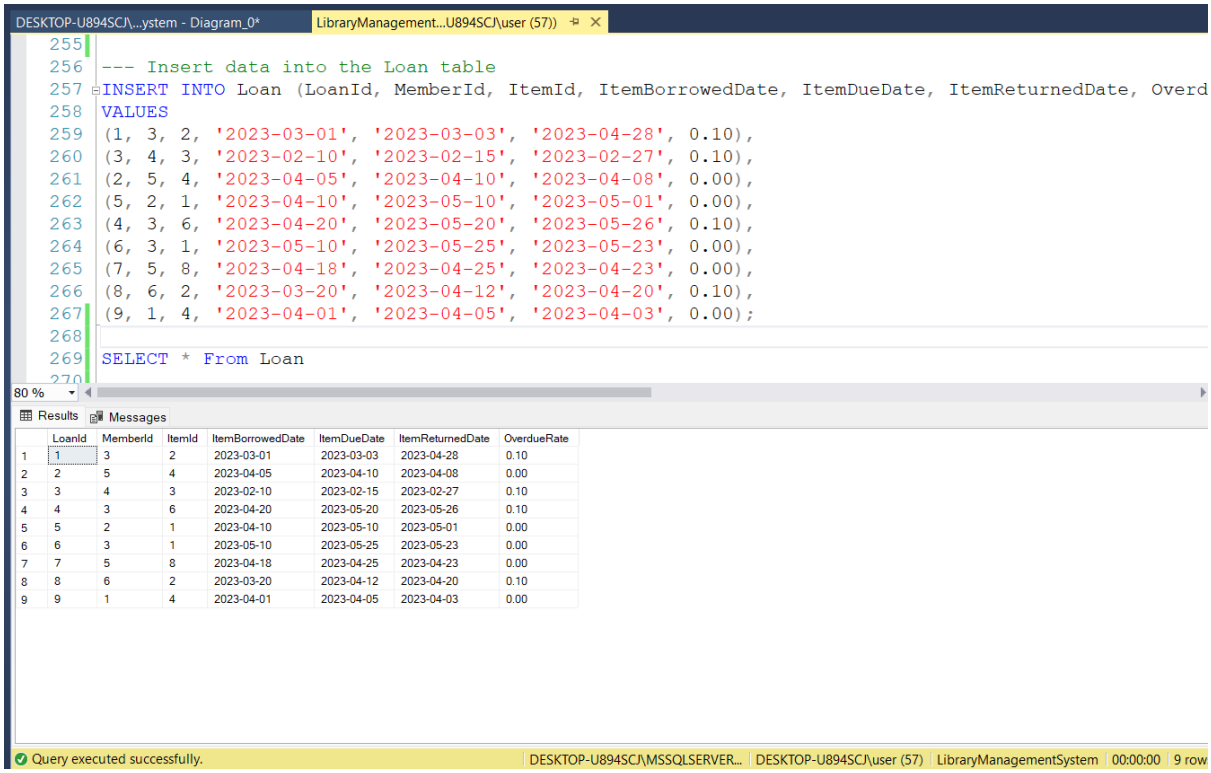
Results | Messages

	ItemId	ItemTitle	ItemType	Author	YearOfPublication	Status	ISBN	ItemAddedDate
1	1	Last Dance	Book	Mark Smith	1975-04-10	Available	3252259870165	2022-01-10
2	2	The Great Mystery	Book	H. Arnold Lugard	1966-10-11	Lost	6348235798835	2023-03-09
3	3	Music for the Soul	Book	Stella Maris	1995-04-28	Available	9235443278564	2023-05-02
4	4	Africa Colonization	Book	Jim Peter	1982-07-09	Overdue	7348862155432	2021-08-08
5	5	Digital Industralization	Journal	Jones David	1999-09-07	OnLoan	6231773856249	2023-01-05
6	6	Love Birds	DVD	Marie Sally	2006-07-12	Lost	6774552371689	2022-08-11
7	7	The Physics fundamentals	Journal	Ramsey Mark	1983-09-03	Lost	2318799068345	2023-02-13
8	8	Data world	DVD	Luggard Smith	1970-10-11	Available	2239067354332	2023-03-05
9	9	Engineering Mathematics	Book	Richard Kent	1999-05-09	On Loan	6330933380567	2023-09-05
10	10	The Secrets of Success	DVD	Alex Ramos	2005-06-18	Removed	4632891425648	2023-02-05

Query executed successfully. | DESKTOP-U894SCJ\MSSQLSERVER... | DESKTOP-U894SCJ\user (57) | LibraryManagementSystem | 00:00:00 | 10 rows

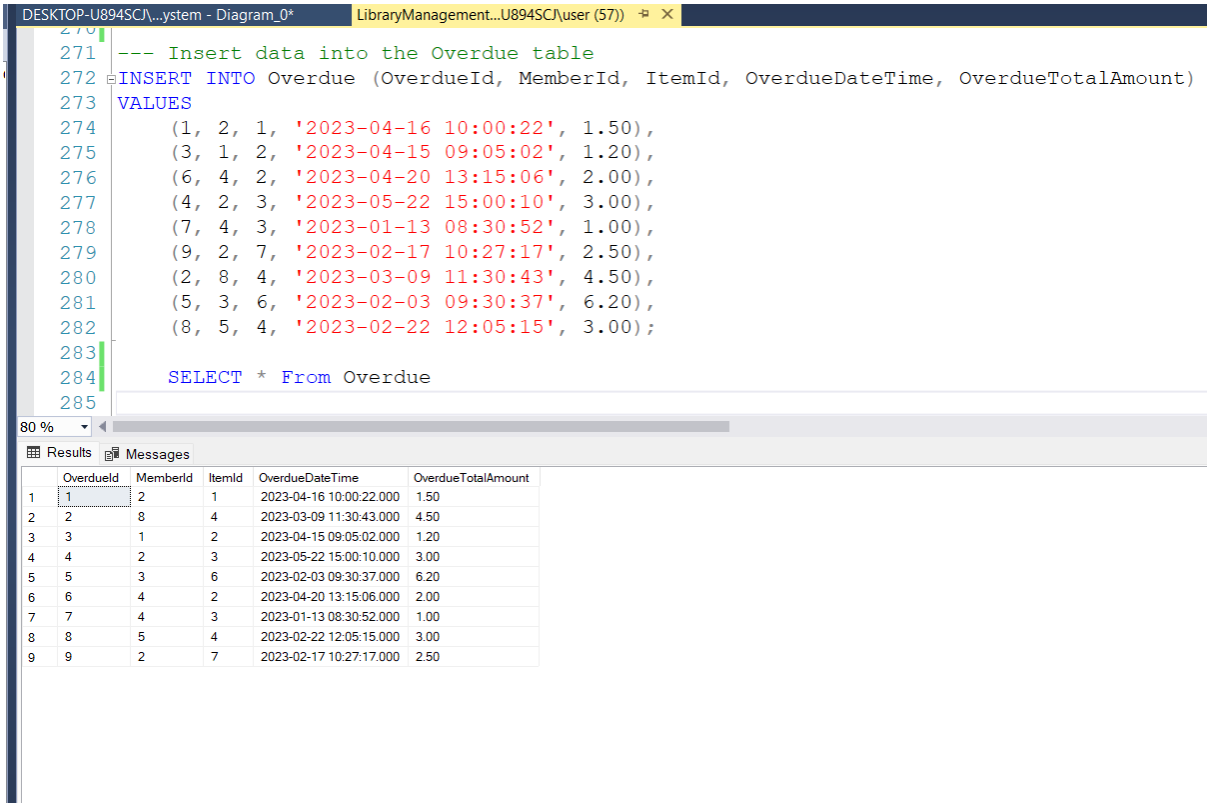
The above SQL command is used to insert data into the "Item" table of a library management system. It shows the different items in the library such as DVD, books, journal. In this case, 10 rows of data were inserted consisting of information such as the item Id, title type, author, year of publication and its current status in the library. The "ItemAddedDate" column is also included, which represents the date on which the item was added to the library's collection. When executed, it will display the items along with the respective information in different columns as shown above.

Insert Data into Loan Table



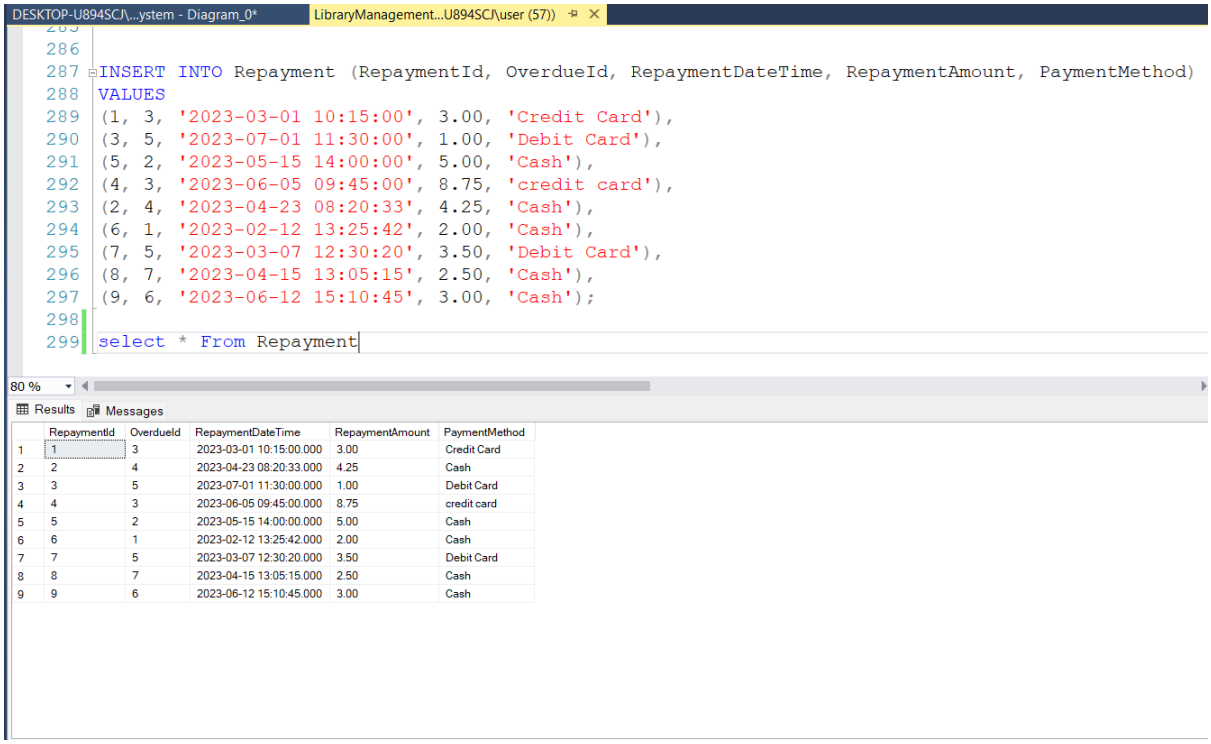
The SQL query above will insert data into the loan table. The loan table contains information about the loan being made by members. As shown above, it contains all the necessary information that is peculiar to a particular member such as the member ID, item ID, item borrowed date, item due date, item returned date, and overdue rate. SELECT statement retrieves all the data from the table for viewing or further analysis.

Insert Data into Overdue Table



The SQL query above inserts data into the overdue table by storing information's about the overdue items borrowed by the members. The query inserts 9 rows of data into the table, each representing a separate instance of an overdue item. The Select statement will display the resulting details of overdue date of each member.

Insert Data into Repayment Table



The Repayment table is being updated by this SQL statement. The repayments that members made for their past-due items are detailed in the table. Nine rows are inserted into the table by the statement, each row denoting a single repayment made by a member. The data being entered are the repayment ID, the overdue ID for which the repayment is made, the repayment date and time, the repayment amount, and the payment method.

DATA INTERGRITY AND CONCURRENCY

Data integrity and concurrency is an integral part that must be considered in any database system. This is because Data integrity always ensures accuracy, consistency as well as the validity of the different data stored. Concurrency simply means that different users can have access to the data and modify it if they wish to without any conflicts or difficulties. Data integrity can be achieved by applying constraints such as NOT NULL, FOREIGN KEY. By so doing, these constraints will help to prevent data invalidity from being entered into the database, thereby ensuring the accuracy and consistency of the data. Also implementing a data backup and recovery plan to will always ensure that data can be recovered in the event of hardware failure or data corruption which could be caused by any virus. There should be a regular backup stored in a secure location to ensure data availability and prevent data loss. To ensure concurrency, implement locking mechanisms will help to prevent multiple users from modifying the same data at the same time depending on what the system requires, using optimistic or pessimistic locking mechanisms will help to ensure that. Multiple users may read the data simultaneously with optimistic

locking, but only one user may edit the data at once. The data is locked using pessimistic locking as soon as it is accessed, preventing any further access or modification by other users until the lock is released. Implementing transaction management is crucial for preserving the integrity and consistency of data. Transactions group multiple database operations into a single unit of work, ensuring that either all the operations are completed successfully or none of them are. This helps to prevent data inconsistencies and ensures that the database always remains in a consistent state.

DATABASE SECURITY

The following are some advice and guidance on database security that the client should consider:

1. Authentication: The client should ensure to use strong authentication mechanisms to prevent unauthorized access to the database. The use of strong passwords, two-factor authentication, and biometric authentication is highly considered as it will help to enhance database security.
2. Authorization: Implementing authorization policies that limit access to the database to authorized users only. Authorization will ensure that users are assigned specific role with predefined access rights.
3. Encryption: Data are sensitive material and as such, it should be encrypted to prevent unauthorized access or data theft. The client can use techniques such as database encryption, SSL/TLS encryption etc to safeguard the data.
4. Regular Backups: There should be a constant regular backup as these are essential in case of data loss or corruption. The client should implement a backup strategy that includes regular backups of the database as well as the transaction logs.
5. Regular Updates and Patches: The client should regularly update the database management system and apply security patches to prevent vulnerabilities that could be exploited by attackers.
6. Employee Training: Employee training is critical in enhancing database security. The client should provide regular training to employees on database security best practices, including password hygiene, social engineering attacks, and data protection policies.

DATABASE BACKUP

There are scenarios where system failure is likely to occur. Applying Database backup is essential to ensure data are well preserves and available in case of system failures, data corruption, or accidental deletion. To ensure that the library's data is always protected, regular backups should be scheduled, and the backups should be stored in a secure location to prevent data loss due to unforeseen circumstances such as fire or flood.

There are three main types of backups:

1. Full Back up: This is a well detailed and a comprehensive type of backup. it provides a complete snapshot of the database.
2. Differential Backup: This is the fastest type of backup as it takes a very minimal space compared to the full back up. It involves backing up only the data that has changed since the last full backup.
3. Transaction Log Backup: A transaction log backup involves backing up the log of all changes made to the database since the last backup. This type of backup allows for point-in-time recovery and can be used to recover to a specific point in time.

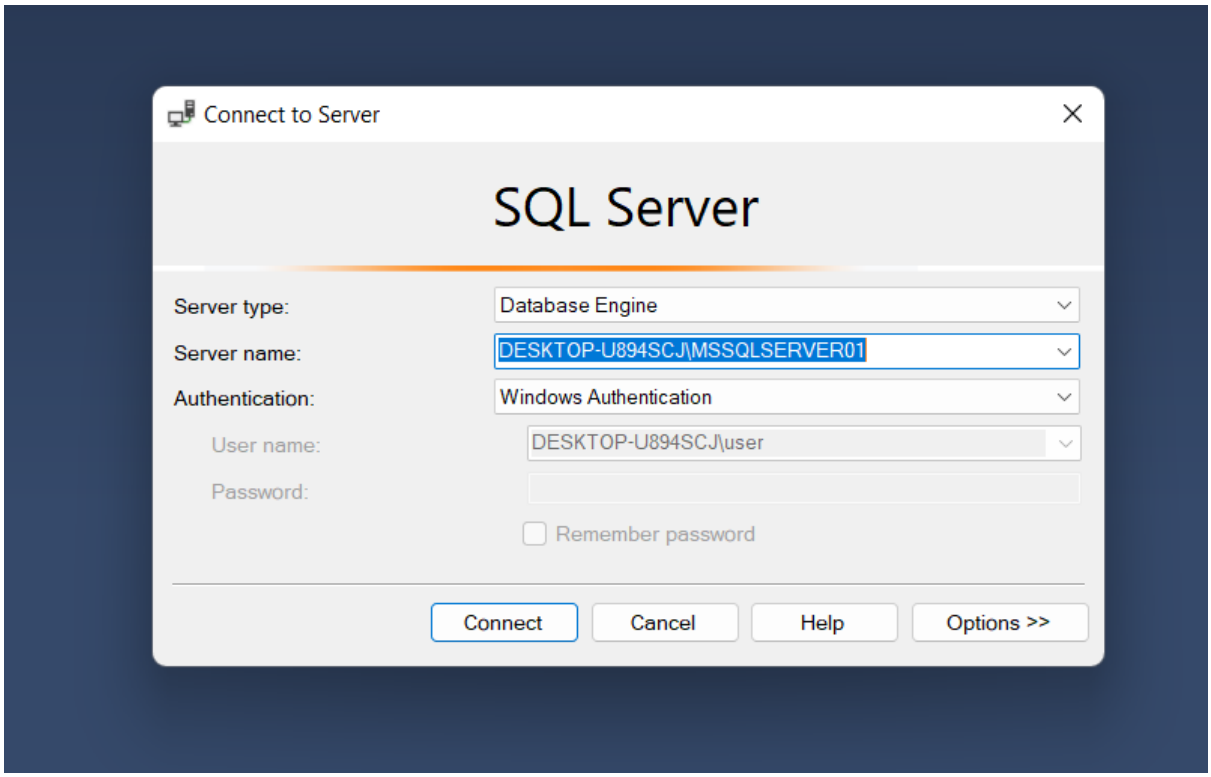
In addition to regular backups, ensure that the restore process are tested to check if it’s working properly in case of any disaster. Also, ensure that the backups are being stored in a secure location like a cloud-based storage solution.

ADVANCE DATABASE

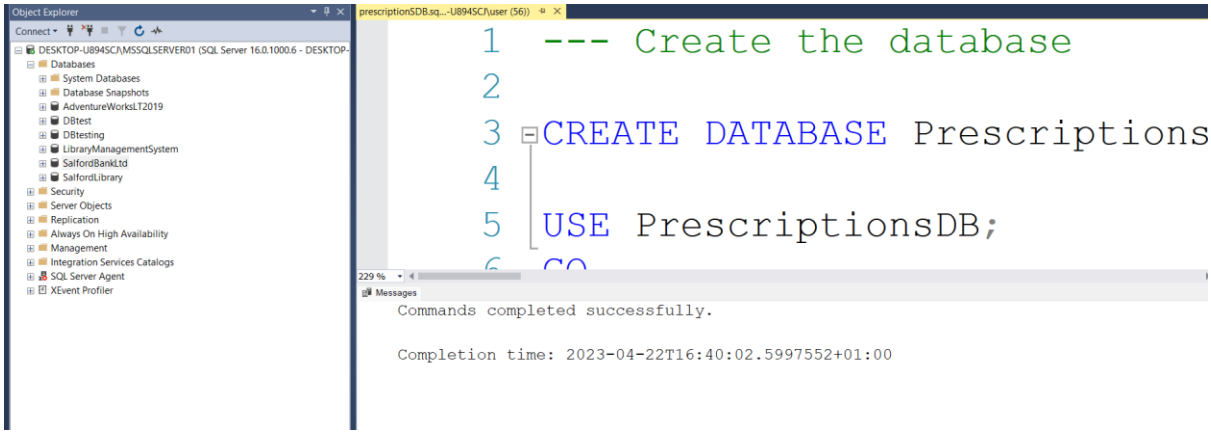
TASK 2

INTRODUCTION

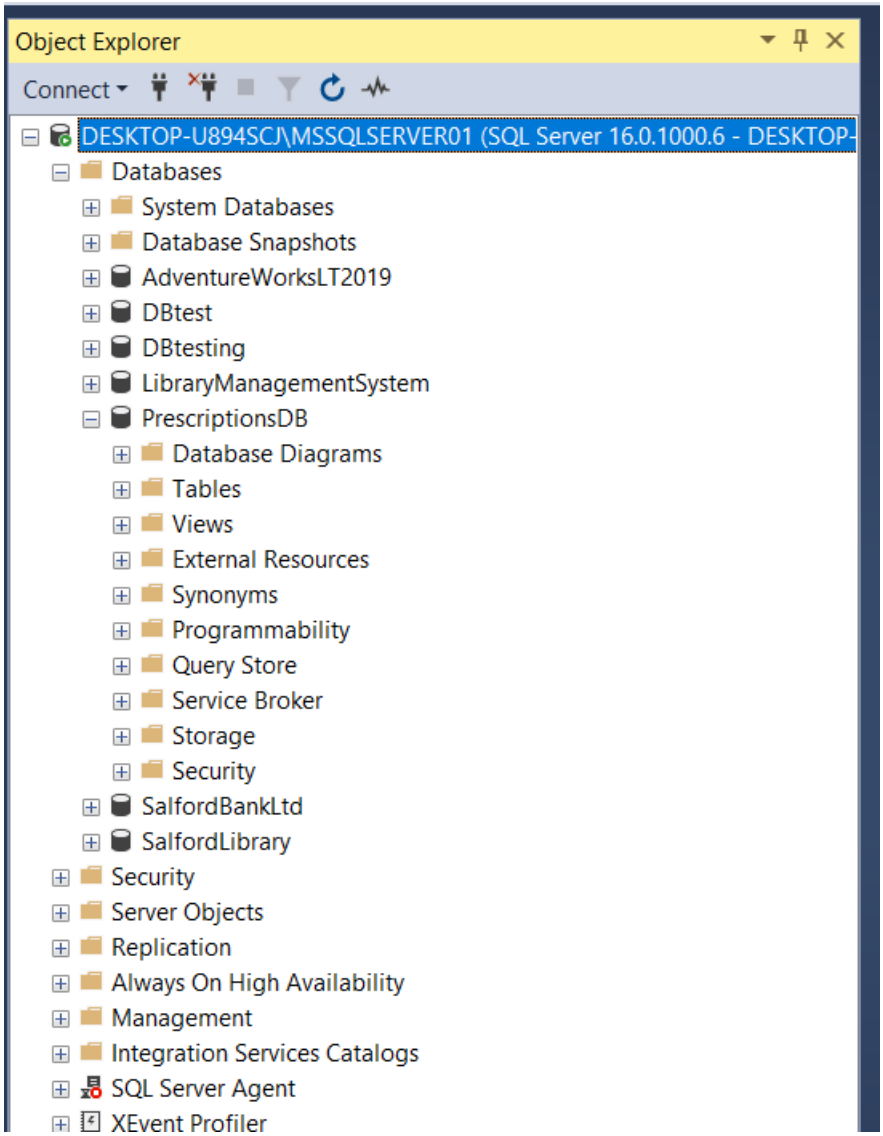
As a database consultant working for a pharmaceutical company, I am being tasked with the responsibility to analyse a prescribing data in other to understand the different varieties of medications being prescribed, the institution prescribing the medications, as well as the quantities prescribed. The major reason why most pharmaceutical companies depend on prescribing data is to gain clarity on the market environment, consumer demands as well as client's requirements. A thorough analysis of this data can provide useful information to the companies that will enable them to make a well data driven decision which will have a positive impact in their business strategies. Exploring this data will certainly be a useful tool to companies to enable them identify trends, potential customers and sales strategy effectively. Analysing the data can help in the area of quantities prescribed which can help pharmaceutical companies identify patterns in the use of their drugs. This information will help to ensure that drugs are not being abused but rather used appropriately for safety concern. To tackle this task, connect to the Microsoft SQL server, where the server's name of my device will be connected.



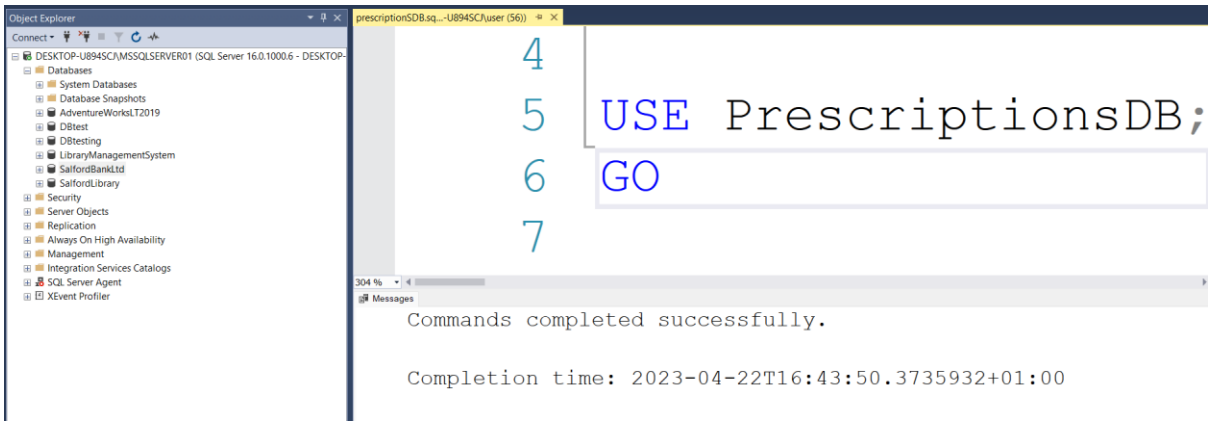
Proceed to create the database for this task. Create the database using the CREATE DATABASE statement. The database created shall be called "PrescriptionsDB".



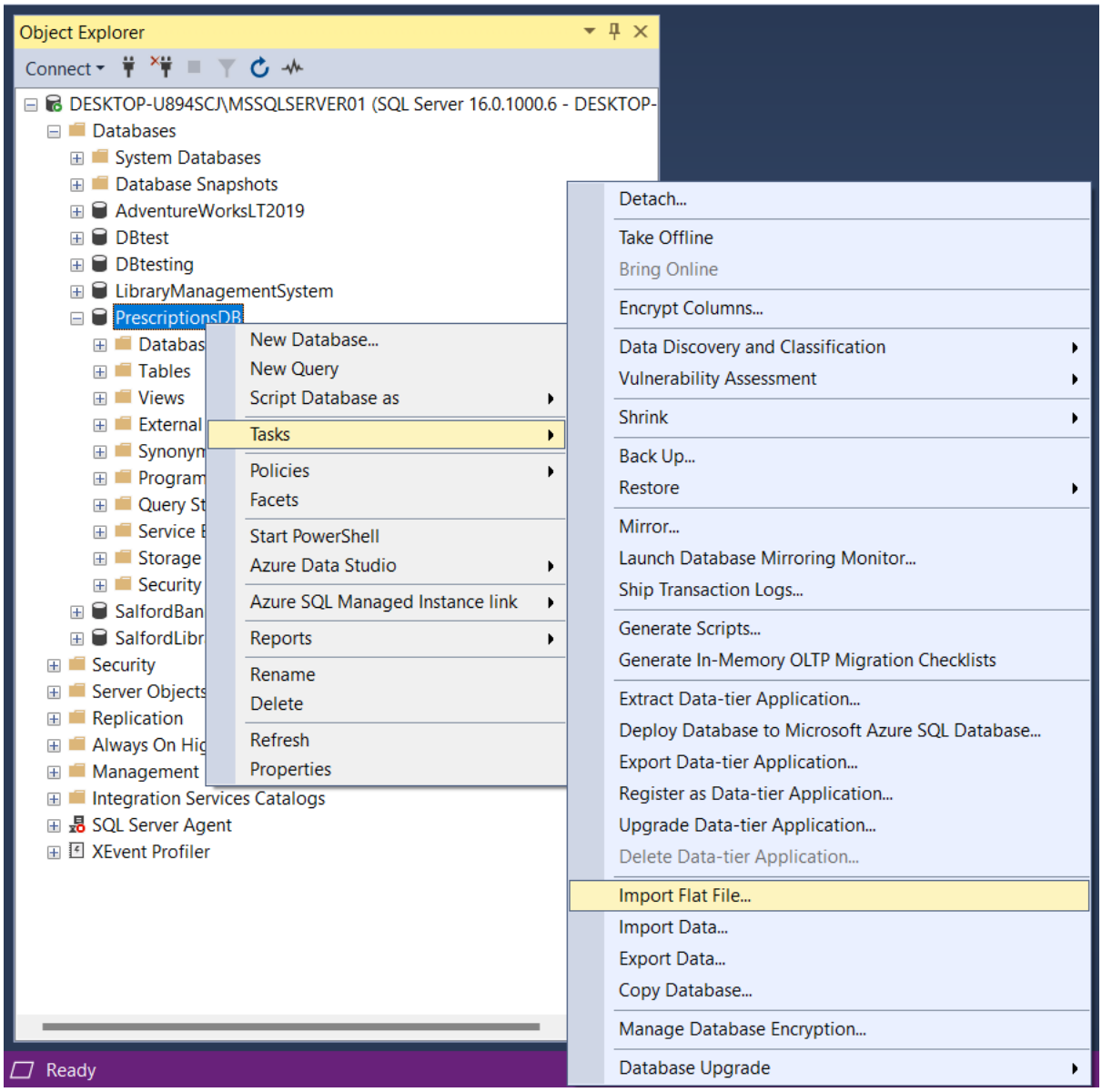
Check to see if it has been successfully created by refreshing the object explorer and clicking the plus sign next to the databases to expand. The below screenshot shows that it has been successfully created as the database name “PrescriptionsDB” appears.



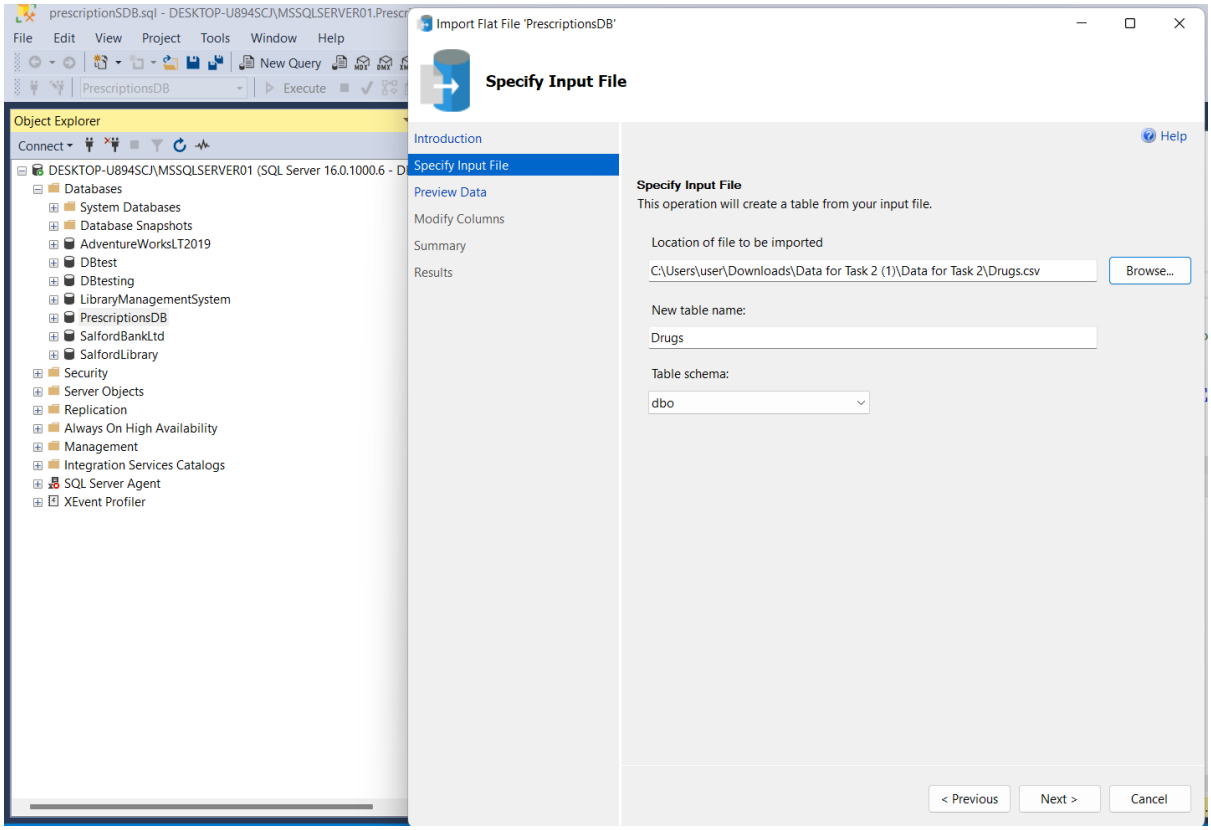
Use the below command for the newly created PrescriptionsDB database.



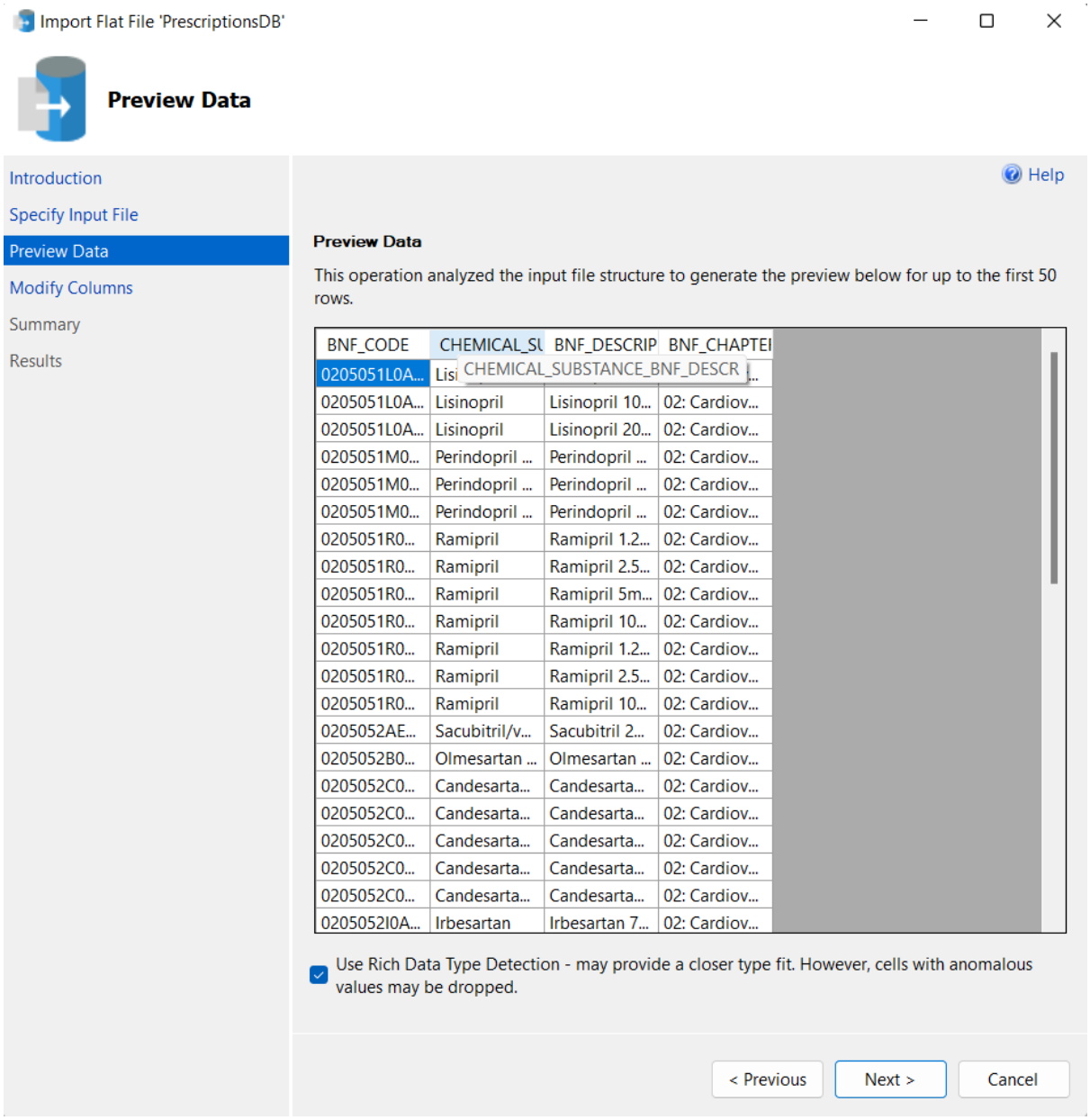
Import the three data from the csv file provided table. To do this, right click on the newly database created, navigate to the task and select import flat file. Click on browse and navigate to where the csv file was saved.



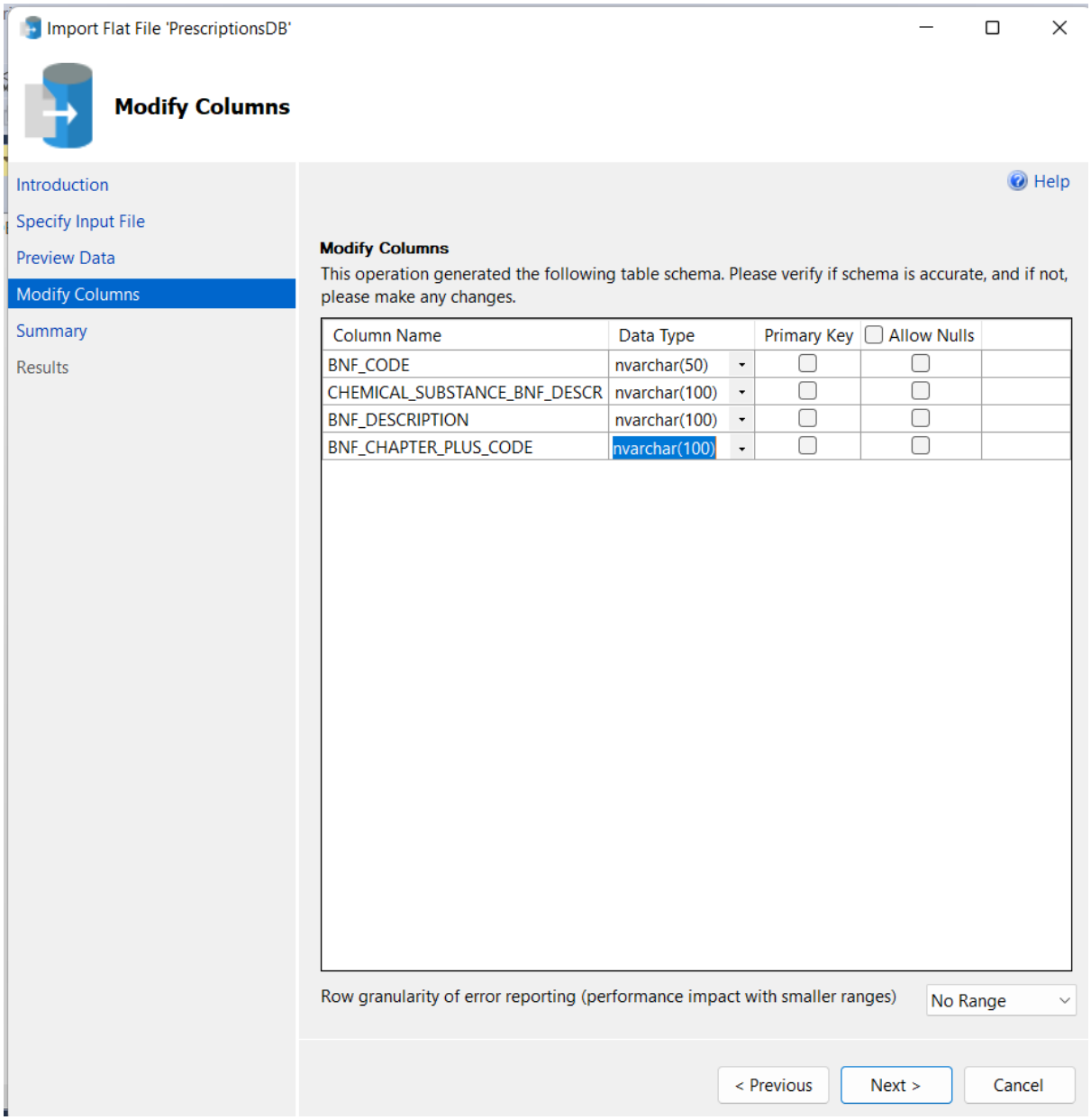
After clicking on the import flat file, in the window that opens click on Browse and then navigate to where you have saved the csv file downloaded from Blackboard. The three files that shall be imported are drugs, medical_practice, and prescriptions. The below screenshot shows that the drug table was uploaded.



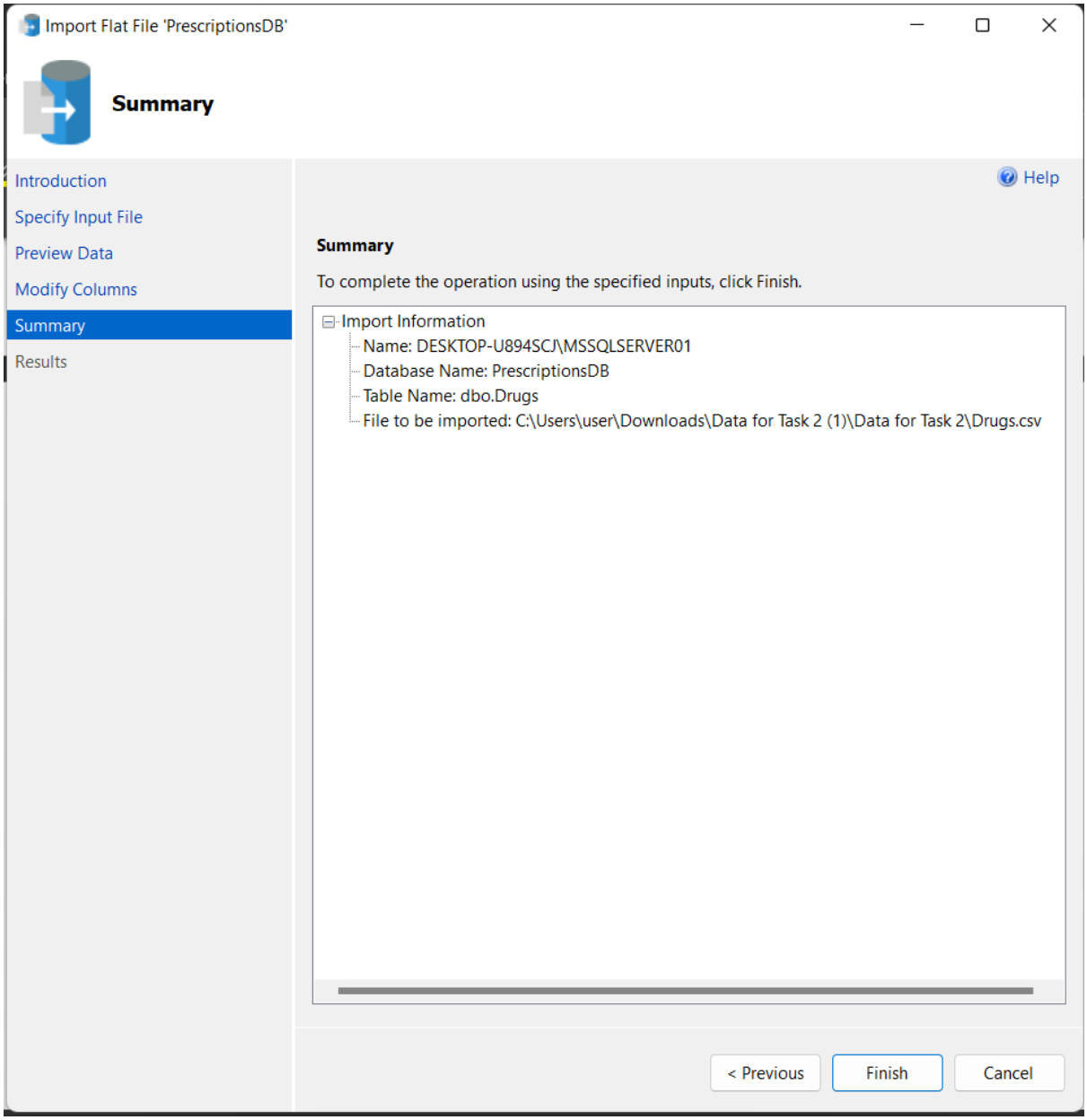
Once you have selected the file, click next to preview the file.

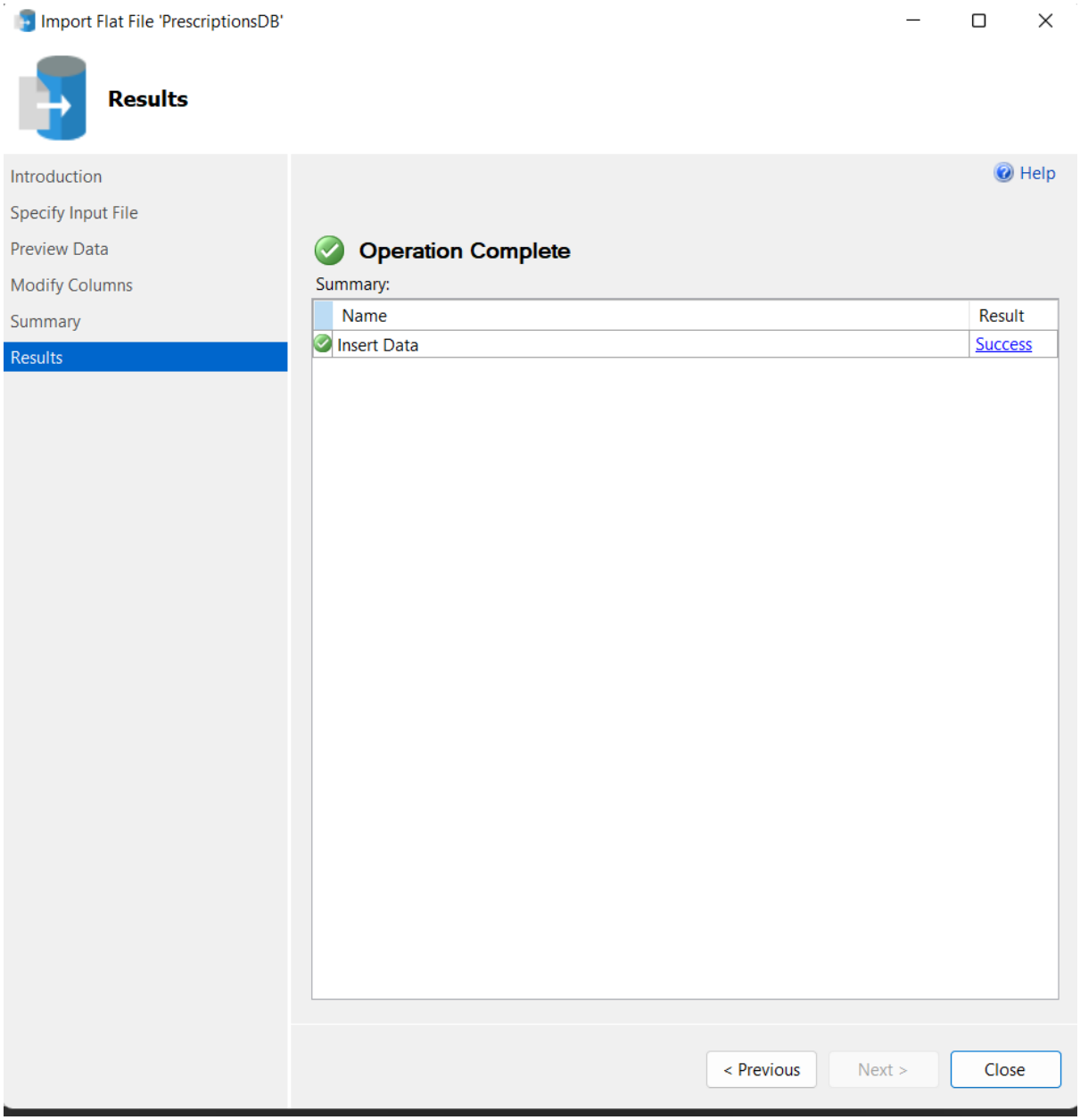


Leave ‘Use Rich Data Type Detection’ ticked and click Next again. This will take you to where you will see the Column name, data type, primary key, and allow nulls.



For the drug table, the following changes should be made for the data type. The columns are: BNF_CODE should have a data type of Nvarchar (50) while CHEMICAL_SUBSTANCE_BNF_DESCR, BNF_DESCRIPTION, BNF_CHAPTER_PLUS_CODE should have a data type of Nvarchar (100)

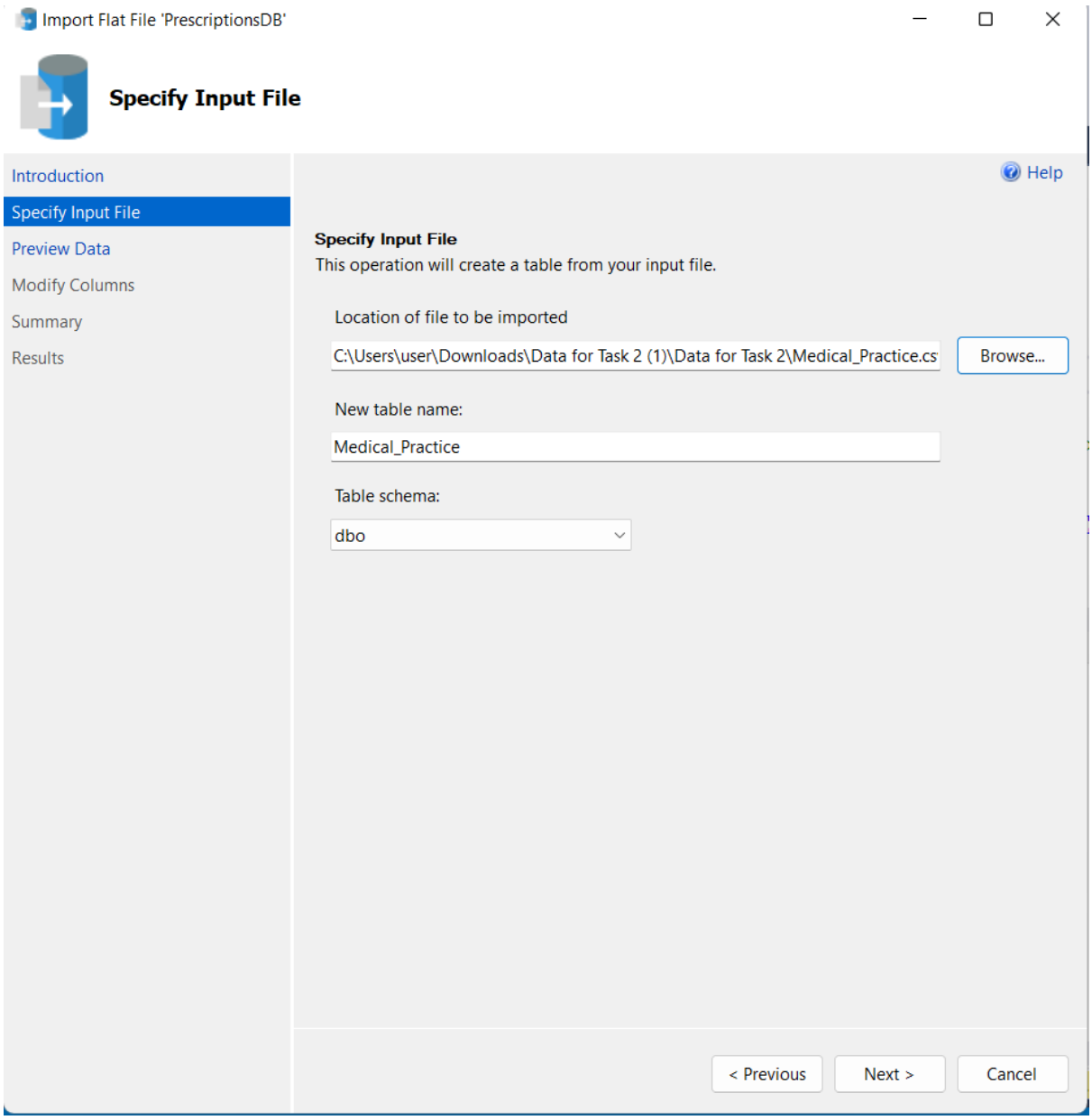

Import Flat File 'PrescriptionsDB'
Summary
Introduction
Specify Input File
Preview Data
Modify Columns
Summary
Results
Help
Summary
To complete the operation using the specified inputs, click Finish.
Import Information
Name: DESKTOP-U894SCJ\MSSQLSERVER01
Database Name: PrescriptionsDB
Table Name: dbo.Drugs
File to be imported: C:\Users\user\Downloads\Data for Task 2 (1)\Data for Task 2\Drugs.csv
< Previous
Finish
Cancel



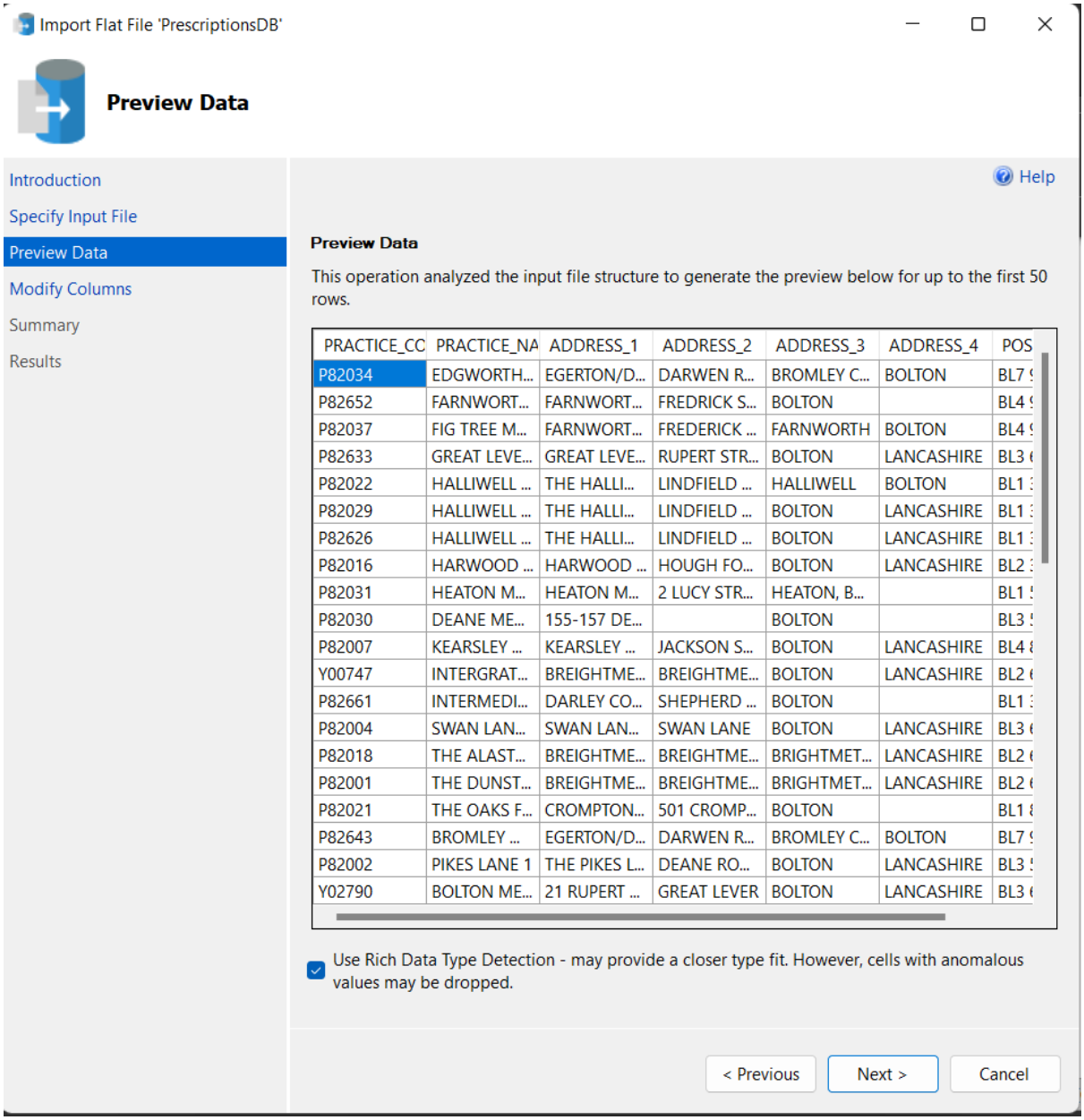
The above table shows that the data for drugs table has been uploaded successfully.

For medical_practice

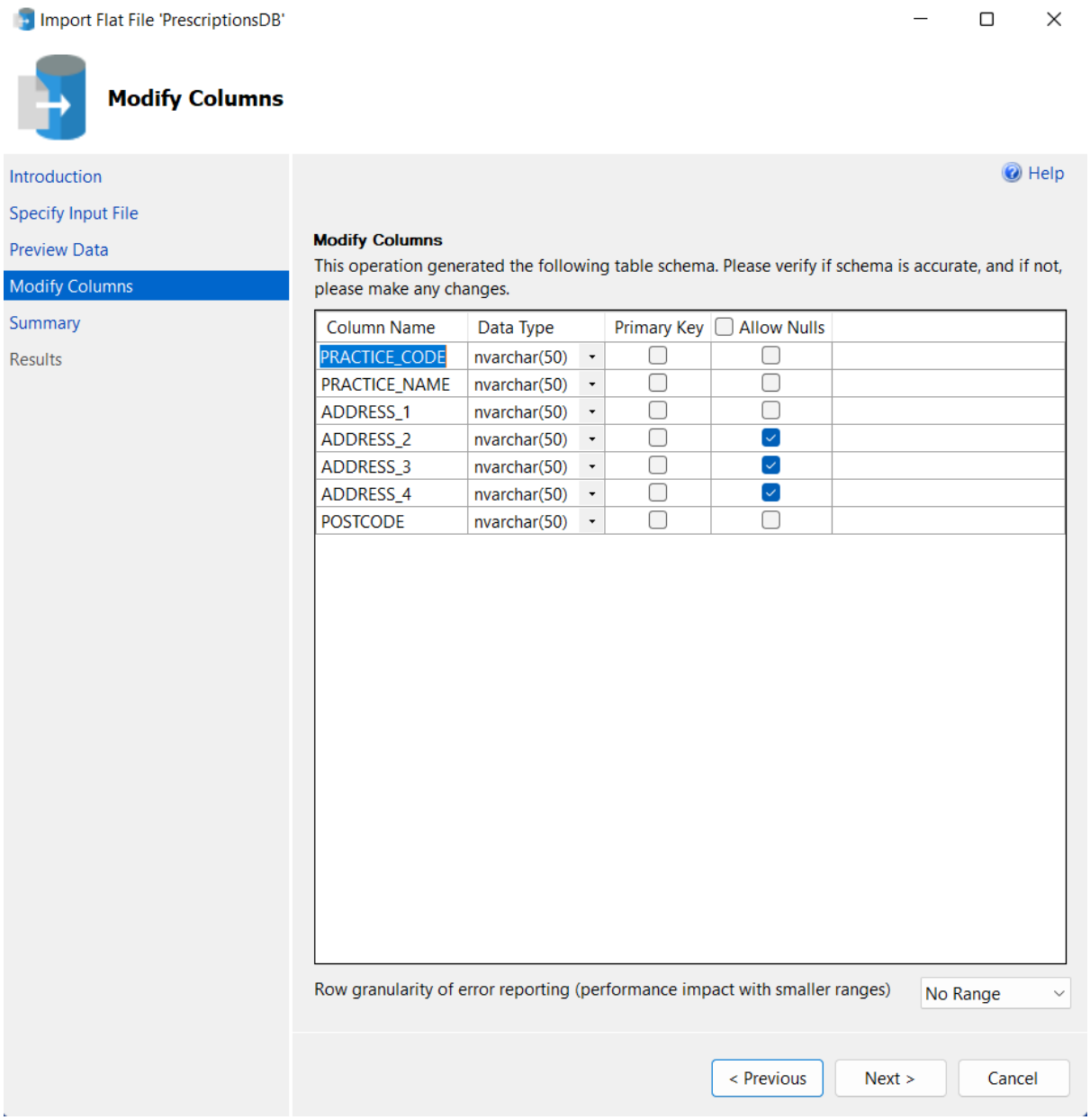
right click on the newly database created, navigate to the task and select import flat file. Click on browse and navigate to where the csv file was saved.



Once you have selected the file, click next to preview the file.

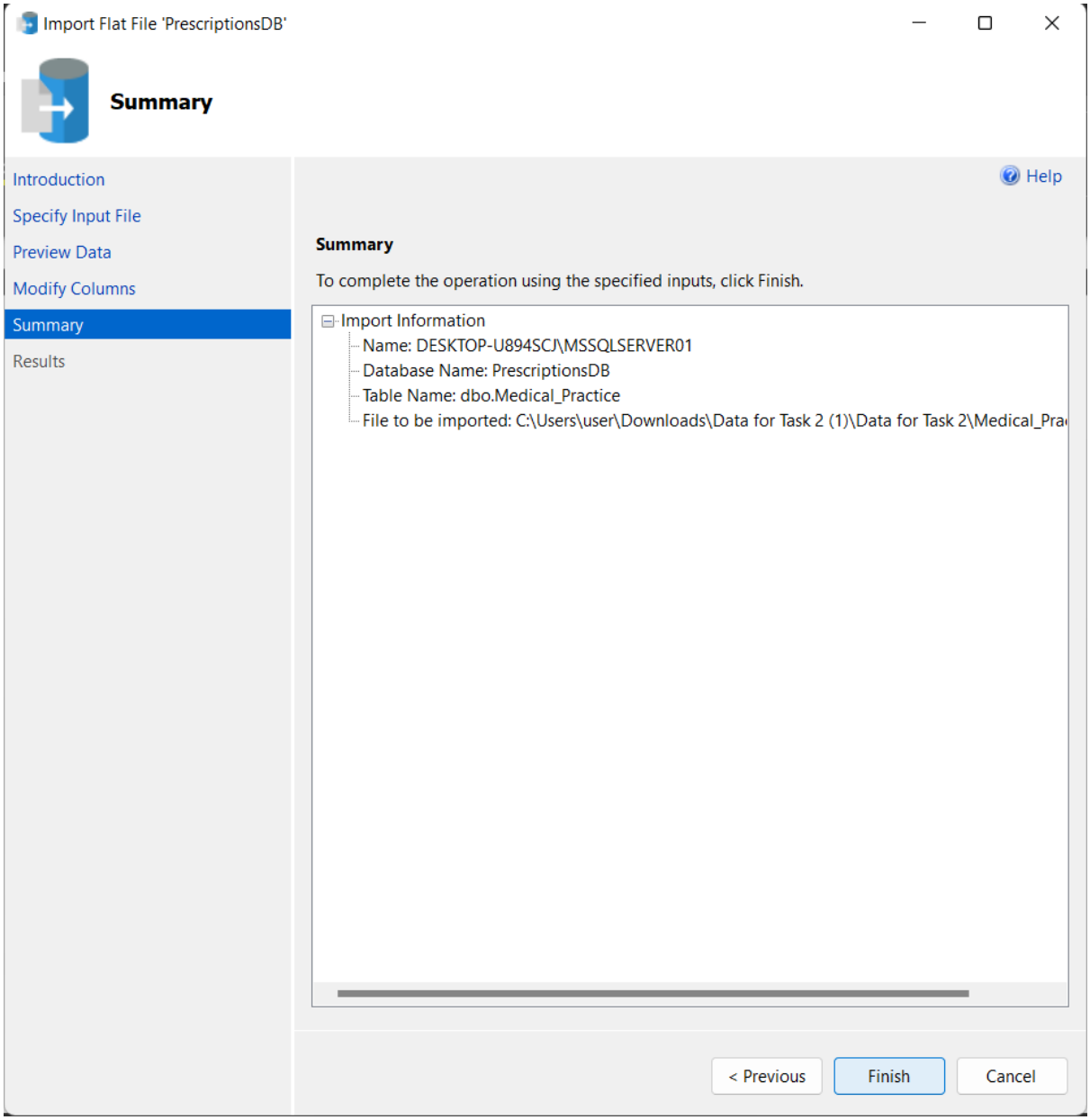


Leave ‘Use Rich Data Type Detection’ ticked and click Next again. This will take you to where you will see the Column name, data type, primary key, and allow nulls.

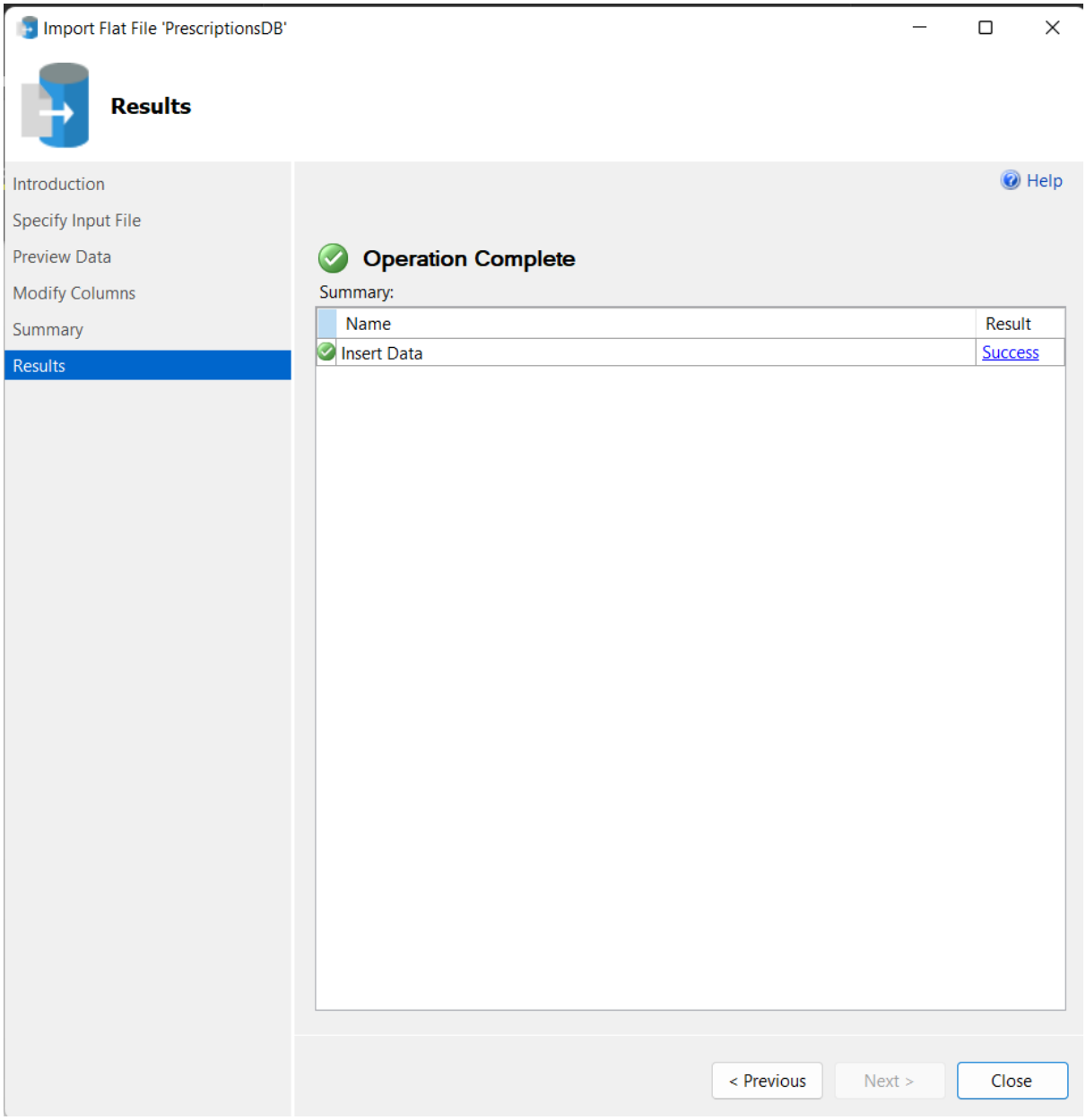


From the above screenshots, all the columns have the same data type which is Nvarchar (50). They are listed below.

practice_code, practice_name, address_1, address_2, address_3, address_4, postcode. Click on allow nulls for address_2, address_3, address_4, postcode

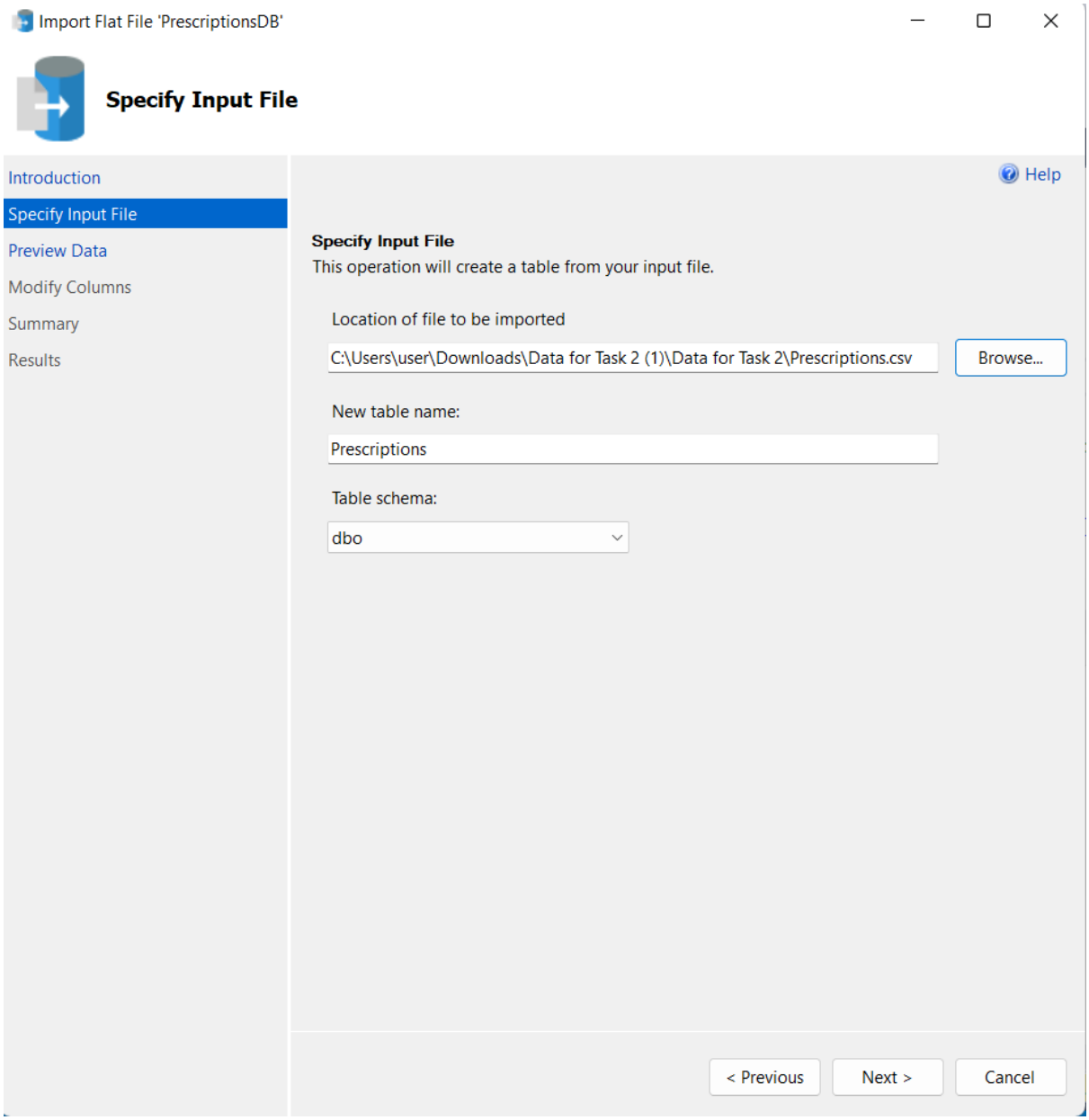


After that click on Next to indicates that the file has been uploaded successfully as shown below.

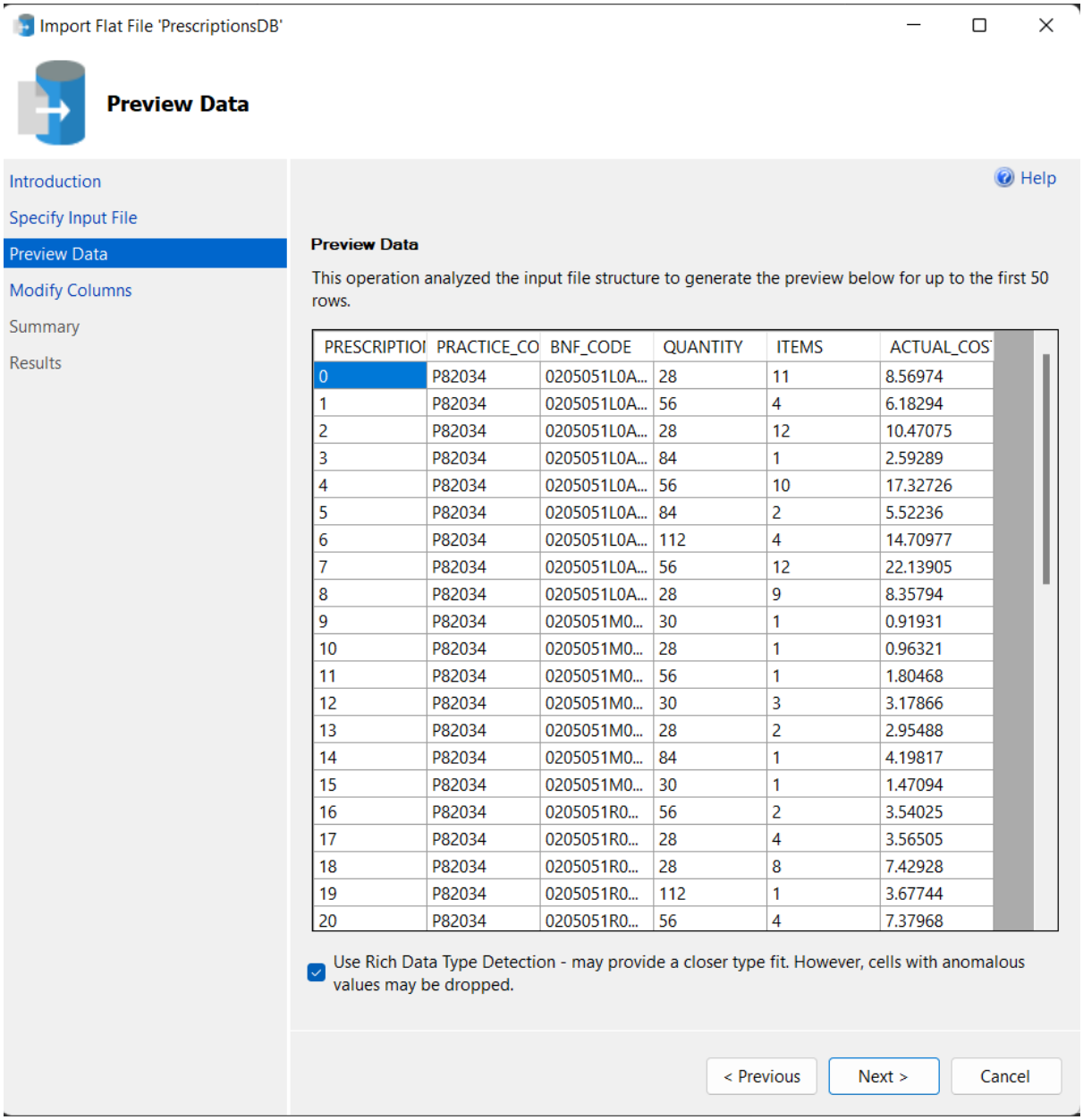


For prescription

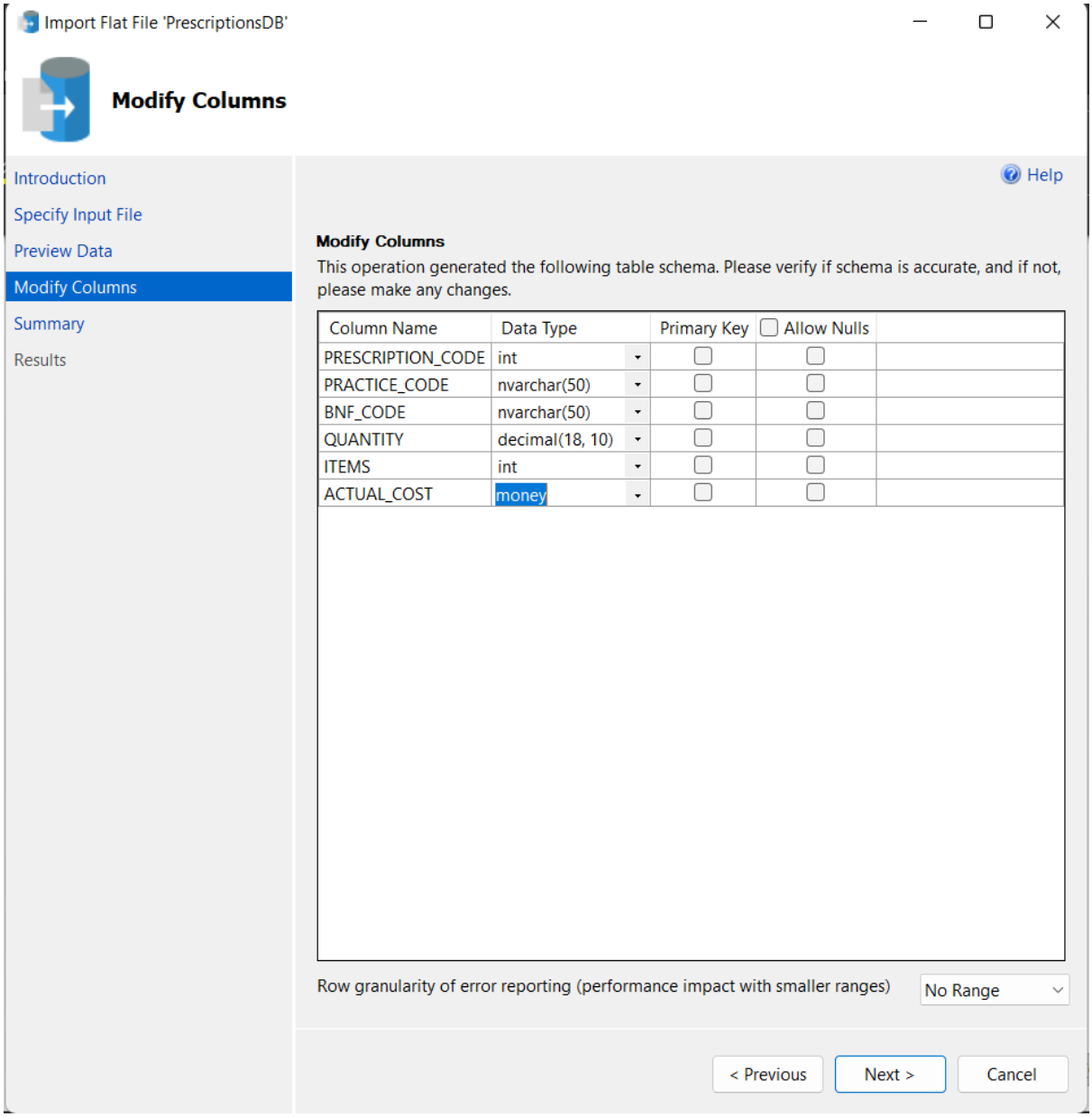
Similarly, the same process should be applied for prescription table. Right click on the newly database created, navigate to the task and select import flat file. Click on browse and navigate to where the csv file was saved.



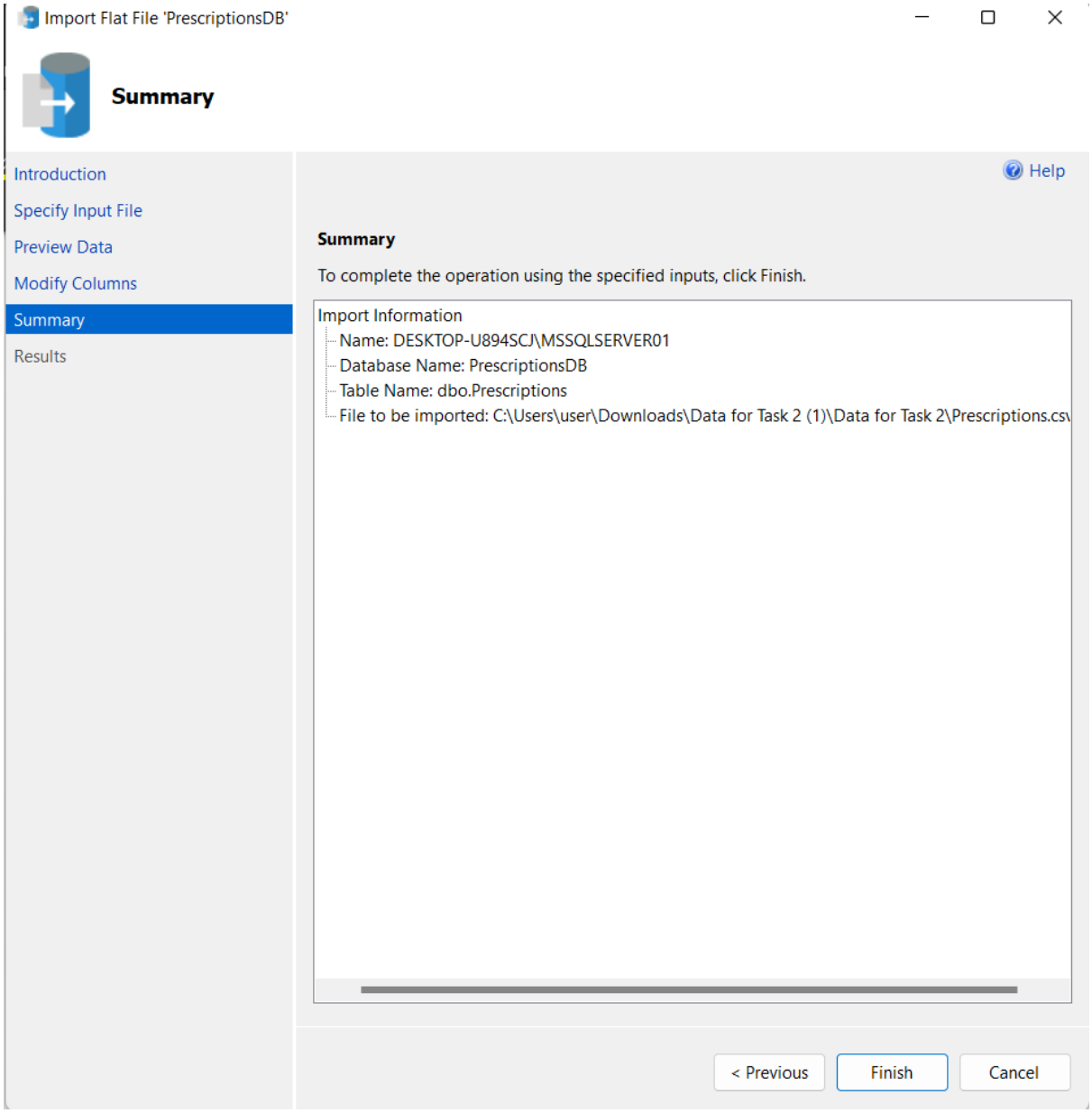
Click next to preview the file.

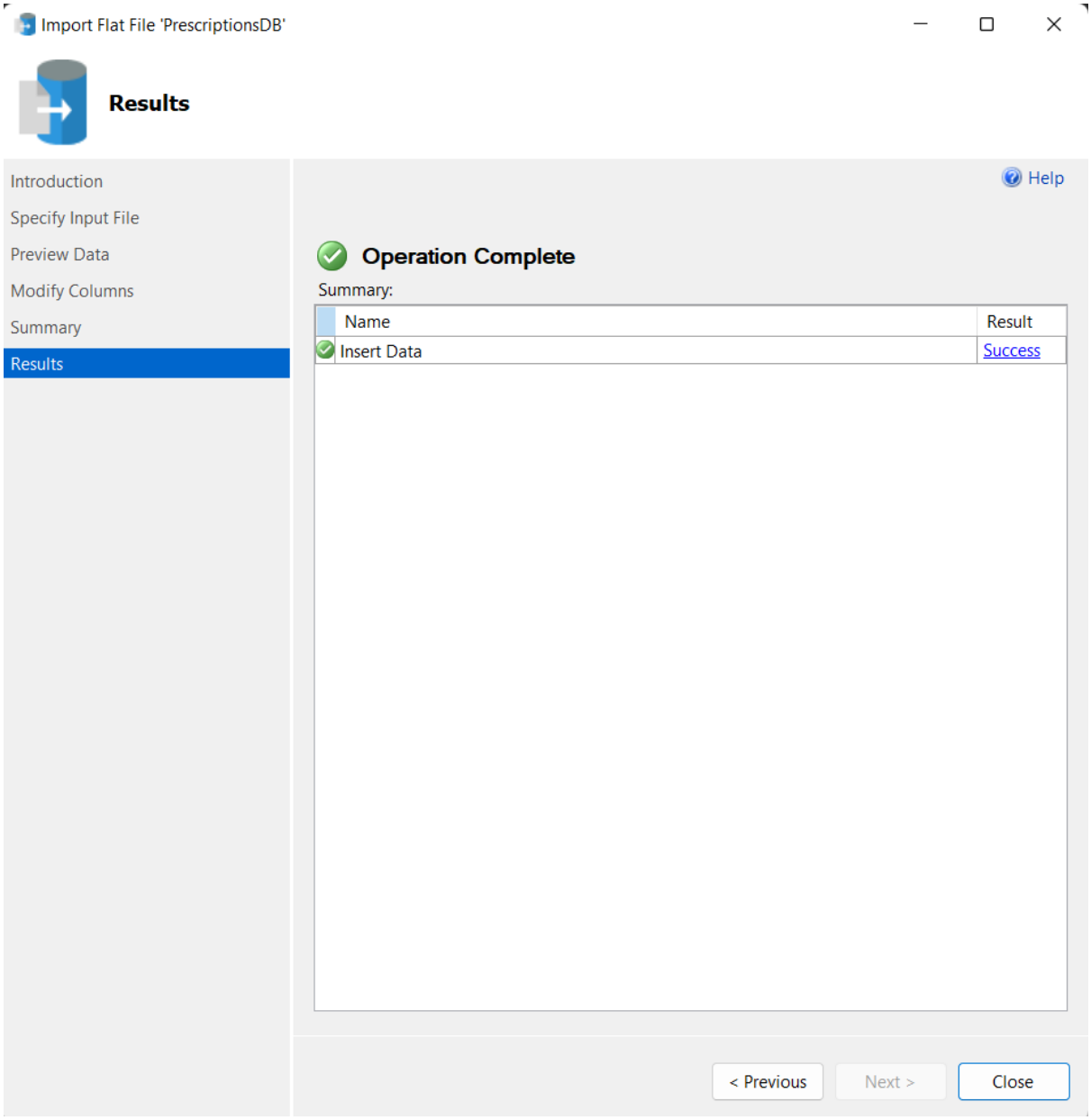


Leave ‘Use Rich Data Type Detection’ ticked and click Next again. This will take you to where you will see the Column name, data type, primary key, and allow nulls.

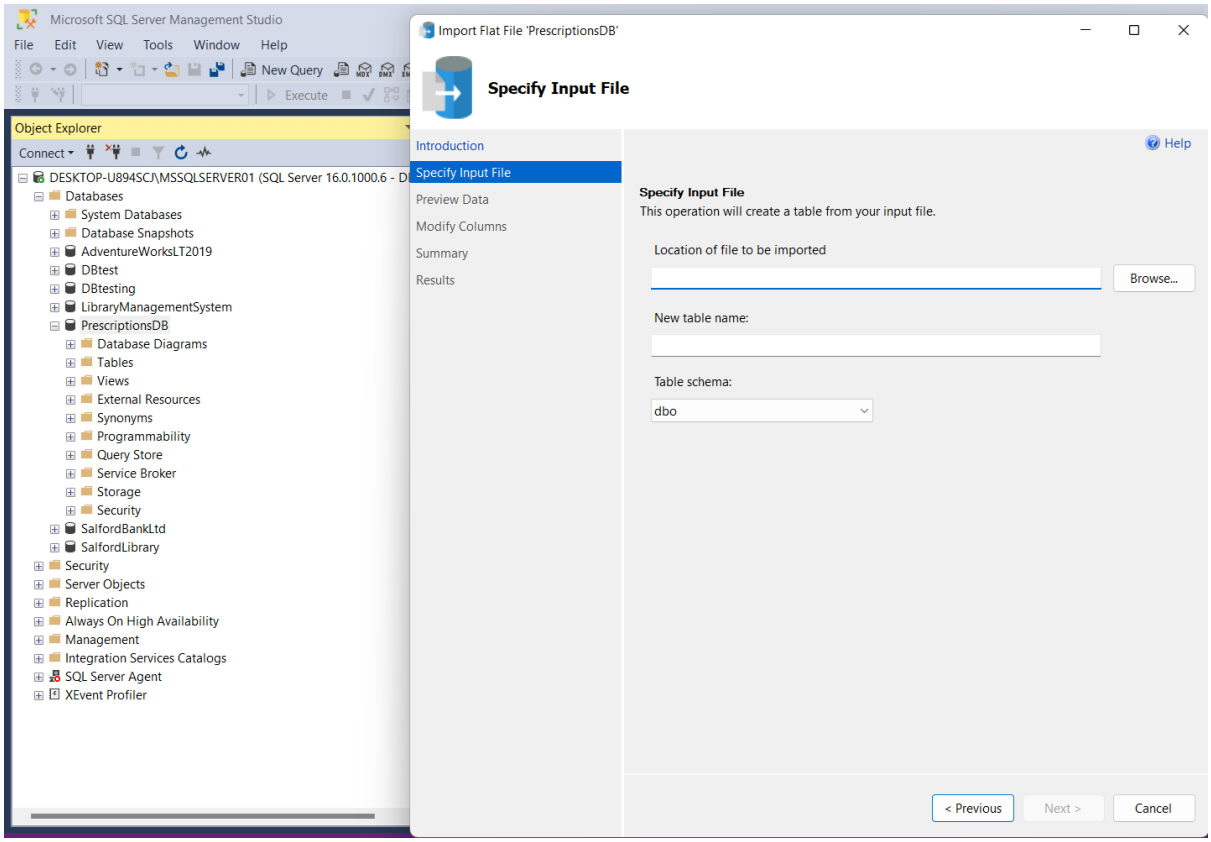


The screenshot above shows the changes that was made for the data type.


Import Flat File 'PrescriptionsDB'
Summary
Introduction
Specify Input File
Preview Data
Modify Columns
Summary
Results
Help
Summary
To complete the operation using the specified inputs, click Finish.
Import Information
Name: DESKTOP-U894SCJ\MSSQLSERVER01
Database Name: PrescriptionsDB
Table Name: dbo.Prescriptions
File to be imported: C:\Users\user\Downloads\Data for Task 2 (1)\Data for Task 2\Prescriptions.csv
< Previous
Finish
Cancel


Import Flat File 'PrescriptionsDB'
Results
Introduction
Specify Input File
Preview Data
Modify Columns
Summary
Results
Help
Operation Complete
Summary:
Name
Result
Insert Data
Success
< Previous
Next >
Close

.




```
7
8  -- -- add primary key constraint to Medical_Practice table
9  ALTER TABLE Medical_Practice
10 ADD CONSTRAINT PK_Medical_Practice PRIMARY KEY (practice_code);
11
```

117 %

Messages

```
Commands completed successfully.

Completion time: 2023-04-22T16:57:19.2239546+01:00
```

```
11
12  -- add primary key constraint to Drugs table
13  ALTER TABLE Drugs
14  ADD CONSTRAINT PK_Drugs PRIMARY KEY (BNF_CODE)
```

156 %

Messages

```
Commands completed successfully.

Completion time: 2023-04-22T17:00:40.4767940+01:00
```

```
16  -- add primary key constraint to Prescriptions table
17  ALTER TABLE Prescriptions
18  ADD CONSTRAINT PK_Prescriptions PRIMARY KEY (PRESCRIPTION_CODE);
19
20  -- add foreign key constraint for PRACTICE_CODE
```

117 %

Messages

```
Commands completed successfully.

Completion time: 2023-04-22T17:02:18.5053274+01:00
```

```
20  foreign key constraint for PRACTICE_CODE
21  ABLE Prescriptions
22  STRAINT FK_Prescriptions_Medical_Practice
23   KEY (PRACTICE_CODE) REFERENCES Medical_Practice(practice_code);
24
```

117 %

Messages

```
Commands completed successfully.

Completion time: 2023-04-22T17:02:57.9650958+01:00
```

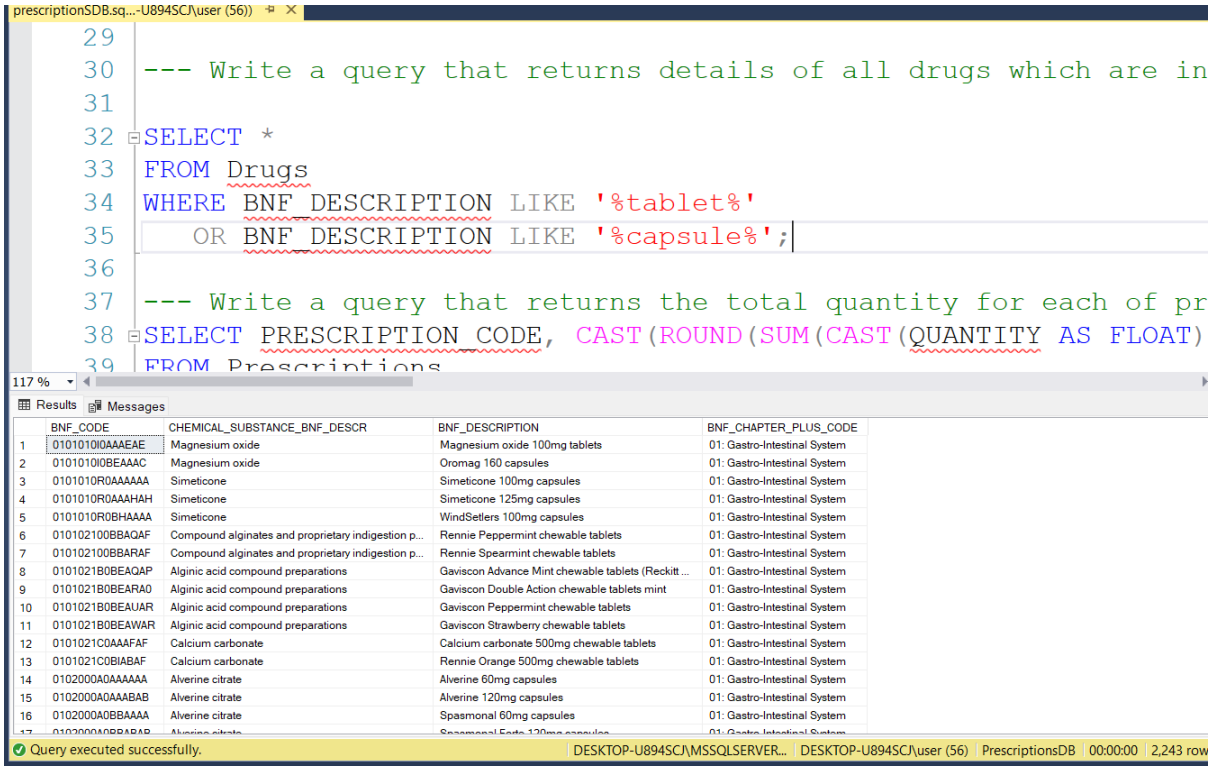
```
25  --- add foreign key constraint for BNF_CODE
26  ALTER TABLE Prescriptions
27  ADD CONSTRAINT FK_Prescriptions_Drugs
28  FOREIGN KEY (BNF_CODE) REFERENCES Drugs(BNF_CODE);
29
```

117 %

Messages

```
Commands completed successfully.

Completion time: 2023-04-22T17:05:16.8675537+01:00
```

2. Write a query that returns details of all drugs which are in the form of tablets or capsules. You can assume that all drugs in this form will have one of these words in the BNF_DESCRIPTION column.



The screenshot shown above is a SQL statement that can be used to return the details of all drugs either in the form of tablets or capsules. This query can also be applied in database management system to extract only the relevant data from a large dataset. However, in this context, it would return all records in the "Drugs" table where the BNF_DESCRIPTION column contains the specified keywords, such as drug names that come in tablet or capsule form. This can be done by using wildcard characters (%) and the LIKE operator to search for the specified word (tablets and capsules). The % character will match any string of zero or more characters. The OR operator is used to retrieve rows that contain either of these words. This query will return all columns from the Drugs table for any matching rows. If you only need to retrieve specific columns, you can replace the * with a comma-separated list of column names.

3
Write a query that returns the total quantity for each of prescriptions – this is given by the number of items multiplied by the quantity. Some of the quantities are not integer values and your client has asked you to round the result to the nearest integer value.

```
36
37  --- Write a query that returns the total quantity for each of prescriptions
38  SELECT PRESCRIPTION_CODE, CAST(ROUND(SUM(CAST(QUANTITY AS FLOAT) * CAST(ITEMS AS
39  FROM Prescriptions
40  GROUP BY PRESCRIPTION_CODE;
41
```

97 %

Results | Messages

	PRESCRIPTION_CODE	total_quantity
1	0	308
2	1	224
3	2	336
4	3	84
5	4	560
6	5	168
7	6	448
8	7	672
9	8	252
10	9	30
11	10	28
12	11	56
13	12	90
14	13	56
15	14	84
16	15	30

Query executed successfully. DESKTOP-U894SCJ\MSSQLSERVER... DESKTOP-U894SCJ\user (56) PrescriptionsDB 00:00:00 116,815 rows

This query above is used to calculate the total quantity of medication being prescribed for each of the prescriptions in the table known as “Prescription”. To do this, it will cast the “QUANTITY” and the “ITEMS” using the “CAST FUNCTION” columns to Float points numbers. After this has been done, it can now be multiplied together which will give room for non-integer values to be joined. The result obtained will then be rounded to the nearest integer using the function known as “ROUND FUNCTION”. Finally, it will cast the rounded total quantity to an integer using another function known as the “CAST FUNCTION” and returns it with the PRESCRIPTION_CODE column using the “GROUP BY CLAUSE” which will then show the resulting output. By executing this query, a summary of the total quantities of the medication prescribed for each prescription can be obtained as shown in the resulting output.

4. Write a query that returns a list of the distinct chemical substances which appear in the Drugs table (the chemical substance is listed in the CHEMICAL_SUBSTANCE_BNF_DESCR column

```sql
---Write a query that returns a list of the distinct chemical substances which appear in the Drugs
SELECT DISTINCT CHEMICAL_SUBSTANCE_BNF_DESCR
FROM Drugs;
```

Results | Messages

	CHEMICAL_SUBSTANCE_BNF_DESCR
1	Sulpiride
2	Almotriptan
3	Hydrocortisone sodium phosphate
4	Loprazolam mesilate
5	Trimethoprim
6	Potassium permanganate
7	Discharge Solidifying Agents
8	Phased formulations of ethinylestradiol
9	Hydrocortisone acetate
10	Beclometasone dipropionate (Systemic)
11	Terbutaline sulphate
12	Antazoline
13	Ivermectin
14	Co-tenidone (Atenolol/chlortalidone)
15	Formoterol/glycopyrronium/budesonide
16	Amisulpride

Query executed successfully. DESKTOP-U894SCJ\MSSQLSERVER... DESKTOP-U894SCJ\user (56) PrescriptionsDB 00:00:00 925 rows

The query above is a SQL statement that can be used to retrieve a list of distinct chemical substances that appear in the “DRUGS” table. The keyword is Distinct which will be used to execute two commands which are to returns only the unique value of the “CHEMICAL_SUBSTANCE_BNF_DESCR column and remove any duplicate values. By executing this query, we can have a summary of the list of all the distinct chemical substances that are appears in the drugs table. The resulting output of this query will provide a simple and effective way to extract relevant information from the database.

5. Write a query that returns the number of prescriptions for each BNF_CHAPTER_PLUS_CODE, along with the average cost for that chapter code, and the minimum and maximum prescription costs for that chapter code.

```sql
---Write a query that returns the number of prescriptions for eachBNF_CHAPTER_PLUS_CODE,
SELECT d.BNF_CHAPTER_PLUS_CODE,
       COUNT(p.PRESCRIPTION_CODE) AS num_prescriptions,
       AVG(p.ACTUAL_COST) AS avg_cost,
       MIN(p.ACTUAL_COST) AS min_cost,
       MAX(p.ACTUAL_COST) AS max_cost
FROM Prescriptions p
INNER JOIN Drugs d ON p.BNF_CODE = d.BNF_CODE
GROUP BY d.BNF_CHAPTER_PLUS_CODE;
```

The multi-part identifier "d.BNF_CHAPTER_PLUS_CODE" could not be bound.

Results | Messages

	BNF_CHAPTER_PLUS_CODE	num_prescriptions	avg_cost	min_cost	max_cost
1	11: Eye	2676	21.4403	1.34	434.7997
2	13: Skin	5692	22.2507	0.4864	1402.4766
3	21: Appliances	5856	38.3528	0.2057	2552.9234
4	20: Dressings	1014	40.2214	0.2181	2599.1877
5	19: Other Drugs and Preparations	338	32.2498	0.4331	1193.3481
6	02: Cardiovascular System	19186	35.9956	0.1311	11094.7521
7	05: Infections	4657	21.2474	0.1966	1262.2079
8	23: Stoma Appliances	1697	82.2616	1.5894	882.5271
9	08: Malignant Disease and Immunosuppression	754	54.9382	0.29	2197.1551
10	22: Incontinence Appliances	535	42.8654	2.8703	538.8857
11	01: Gastro-Intestinal System	8777	35.1252	0.1405	2777.6906
12	10: Musculoskeletal and Joint Diseases	3634	16.2459	0.2713	1476.6376
13	09: Nutrition and Blood	7944	41.8156	0.1405	4250.4384
14	12: Ear, Nose and Oropharynx	1274	23.6805	1.6766	315.7777
15	07: Obstetrics, Gynaecology and Urinary-Tract Dis...	3999	25.4563	0.1498	803.4917
16	03: Respiratory System	7057	75.873	0.1498	4161.8103

Query executed successfully. DESKTOP-U894SCJ\MSSQLSERVER... DESKTOP-U894SCJ\user (56) PrescriptionsDB 00:00:00 20 rows

This code above is used to retrieve aggregate statistics on medication prescriptions in the "Prescriptions" and "Drugs" tables. The “Prescription” and “Drugs” table is being joined together by a clause known as “INNER JOIN” based on the matching value in the “BNF_CODE” column. The resulting data will be grouped by "BNF_CHAPTER_PLUS_CODE" column in the "Drugs" table and applies several aggregate functions to the "ACTUAL_COST" column in the "Prescriptions" table, including COUNT, AVG, MIN, and MAX. By executing this query, a summary of medication prescriptions grouped by the BNF chapter code in the "Drugs" table, along with various statistics on the costs of those prescriptions can be obtained as shown above.

6. Write a query that returns the most expensive prescription prescribed by each practice, sorted in descending order by prescription cost (the ACTUAL_COST column in the prescription table.) Return only those rows where the most expensive prescription is more than £4000. You should include the practice name in your result.

```
--- Write a query that returns the most expensive prescription prescribed by each practi
---sorted in descending order by prescription cost (the ACTUAL_COST column in the prescri
---Return only those rows where the most expensive prescriptionis more than £4000.
---You should include the practice name in your result

SELECT medical_practice.practice_name, MAX(Prescriptions.ACTUAL_COST) AS max_cost
FROM Prescriptions
INNER JOIN medical_practice ON Prescriptions.PRACTICE_CODE = medical_practice.practice_c
GROUP BY medical_practice.practice_name
HAVING MAX(Prescriptions.ACTUAL_COST) > 4000
ORDER BY max_cost DESC;
```

88 %

Results | Messages

	practice_name	max_cost
1	UNSWORTH GROUP PRACTICE	21570.9208
2	BROMLEY MEADOWS SURGERY	11031.5885
3	KILDONAN HOUSE	8659.596
4	KEARSLEY MEDICAL CENTRE	7313.581
5	BOLTON COMMUNITY PRACTICE	6069.7747
6	HARWOOD MEDICAL CENTRE	4626.9594
7	MANDALAY MEDICAL CENTRE	4377.6525
8	CROMPTON VIEW SURGERY	4250.4384
9	DALEFIELD SURGERY	4031.9573

Query executed successfully. | DESKTOP-U894SCJ\MSSQLSERVER... | DESKTOP-U894SCJ\user (56) | PrescriptionsDB | 00:00:00 | 9 rows

This code is a SQL query. It joins the Prescriptions and “MEDICAL_PRACTICE” tables on the “PRACTICE_CODE” column and groups the result by the “PRACTICE_CODE” column. The “MAX” function is used to calculate the maximum “ACTUAL_COST” for each group used to retrieve the name of medical practices and the maximum actual cost of prescriptions associated with each practice. The query uses the INNER JOIN clause to join the "Prescriptions" and "medical_practice" tables based on a matching value in the "PRACTICE_CODE" column. The HAVING clause filters the results to only include groups with a maximum actual cost greater than 4000. The ORDER BY clause sorts the results

in descending order of maximum actual cost. By executing this query, we can identify medical practices that have prescribed medications with high costs. This information can be used to investigate prescribing patterns and identify opportunities for cost savings. Additionally, this query can provide insights into the effectiveness of cost-control measures implemented by medical practices.

7. ADDITIONAL FIVE QUERIES

1. Query to find the average cost of prescription for each BNF chapter.

```
68  ---Five additional Queries
69  ---Query to find the average cost of prescriptions for each BNF chapter:
70  SELECT Drugs.BNF_CHAPTER_PLUS_CODE, AVG(Prescriptions.ACTUAL_COST) AS avg_cost
71  FROM Drugs
72  INNER JOIN Prescriptions ON Drugs.BNF_CODE = Prescriptions.BNF_CODE
73  GROUP BY Drugs.BNF_CHAPTER_PLUS_CODE
74  ORDER BY avg_cost DESC;
75
76  ---Query to find all drugs that have been prescribed by a specific practice:
```

88 %

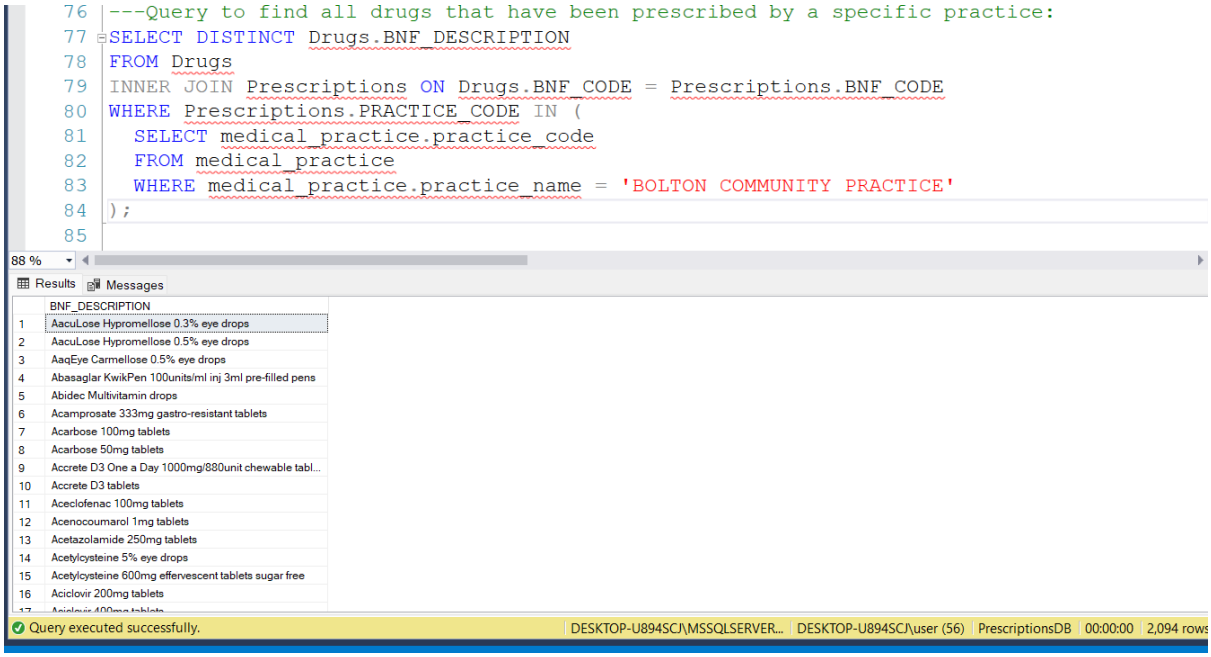
Results | Messages

	BNF_CHAPTER_PLUS_CODE	avg_cost
1	14: Immunological Products and Vaccines	1049.5574
2	23: Stoma Appliances	82.2616
3	03: Respiratory System	75.873
4	06: Endocrine System	61.1661
5	08: Malignant Disease and Immunosuppression	54.9382
6	22: Incontinence Appliances	42.8654
7	09: Nutrition and Blood	41.8156
8	20: Dressings	40.2214
9	21: Appliances	38.3528
10	02: Cardiovascular System	35.9956
11	15: Anaesthesia	35.6672
12	01: Gastro-Intestinal System	35.1252
13	19: Other Drugs and Preparations	32.2498
14	04: Central Nervous System	28.3994
15	07: Obstetrics, Gynaecology and Urinary-Tract Dis...	25.4563
16	12: Ear, Nose and Oropharynx	23.6805

Query executed successfully. | DESKTOP-U894SCJ\MSSQLSERVER... | DESKTOP-U894SCJ\user (56) | PrescriptionsDB | 00:00:00 | 20 rows

This query above can be used to calculate the average cost of medications prescribed for each BNF chapter code. The “DRUGS” and “PRESCRIPTION” table are being joined together using based on a matching value in the “BNF_CODE” column using the clause known as “INNER CLAUSE”. The query then groups the result by the “BNF_CHAPTER_PLUS_CODE” column in the Drugs table and uses the AVG function to calculate the average “ACTUAL_COST” for each group. The result is sorted in descending order by the average cost using the “ORDER BY CLAUSE”. Executing this code, it will enable us to identify the BNF chapter codes that are related to only the highest average cost of prescriptions. Cost effectiveness of the medication of the different categories can be identify.

2. Query to find all drugs that have been prescribed by a specific practice:



```
76  ---Query to find all drugs that have been prescribed by a specific practice:
77  SELECT DISTINCT Drugs.BNF_DESCRIPTION
78  FROM Drugs
79  INNER JOIN Prescriptions ON Drugs.BNF_CODE = Prescriptions.BNF_CODE
80  WHERE Prescriptions.PRACTICE_CODE IN (
81    SELECT medical_practice.practice_code
82    FROM medical_practice
83    WHERE medical_practice.practice_name = 'BOLTON COMMUNITY PRACTICE'
84  );
85
```

88 %

Results | Messages

	BNF_DESCRIPTION
1	AacuLose Hypromellose 0.3% eye drops
2	AacuLose Hypromellose 0.5% eye drops
3	AaqEye Carmellose 0.5% eye drops
4	Abasaglar KwikPen 100units/ml inj 3ml pre-filled pens
5	Abidec Multivitamin drops
6	Acamprosate 333mg gastro-resistant tablets
7	Acarbose 100mg tablets
8	Acarbose 50mg tablets
9	Accrete D3 One a Day 1000mg/880unit chewable tabl...
10	Accrete D3 tablets
11	Aceclofenac 100mg tablets
12	Acenocoumarol 1mg tablets
13	Acetazolamide 250mg tablets
14	Acetylcysteine 5% eye drops
15	Acetylcysteine 600mg effervescent tablets sugar free
16	Aciclovir 200mg tablets

Query executed successfully. DESKTOP-U894SCJ\MSSQLSERVER... DESKTOP-U894SCJ\user (56) PrescriptionsDB 00:00:00 2,094 rows

This code is a SQL query used to retrieve a list of distinct medication names linked with prescriptions issued by the "BOLTON COMMUNITY PRACTICE". A clause known as “INNER JOIN “ joins the “DRUGS and “PRESCRIPTIONS” table together. The resulting data is filtered by selecting only prescriptions issued by the "BOLTON COMMUNITY PRACTICE". The query then filters the result to only include rows where the PRACTICE_CODE column in the Prescriptions table matches any of the practice codes returned by a subquery that retrieves the code for a specific practice. The DISTINCT keyword is used to remove duplicates, and the SELECT statement retrieves the BNF_DESCRIPTION column. By executing this query, we can identify the distinct medication names prescribed by the "BOLTON COMMUNITY PRACTICE" and gain insights into prescribing patterns for this medical practice.

3.

Query using the ROUND function to round a numerical column to a specific number of decimal places:

```
87  ---Query using the ROUND function to round a numerical column to a specific number of de
88  SELECT BNF_DESCRIPTION, ROUND(AVG(actual_cost), 2) AS avg_cost
89  FROM prescriptions
90  INNER JOIN drugs ON prescriptions.bnf_code = drugs.bnf_code
91  GROUP BY BNF_DESCRIPTION
92  ORDER BY avg_cost DESC;
```

88 %

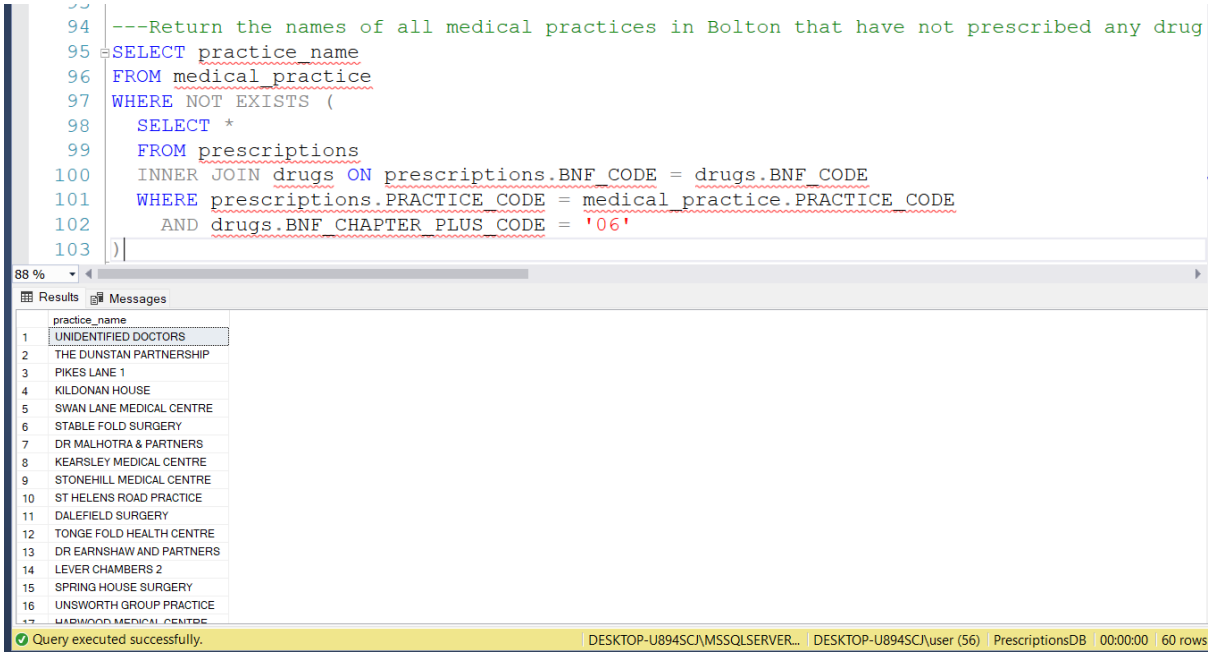
Results | Messages

	BNF_DESCRIPTION	avg_cost
1	Supemtek Quadrivalent vaccine (recombinant) inj ...	5255.41
2	MSUD express15 oral powder 25g sachets	2962.87
3	Stiripentol 500mg oral powder sachets	2765.62
4	Mepilex Transfer dressing 15cm x 20cm	2599.19
5	Adjuvanted quadrivalent flu vacc (SA, inact) inj 0.5...	2576.68
6	Elemental 028 Extra powder (3 flavours)	2277.03
7	Calshake powder 90g sachets chocolate	2074.46
8	Norditropin NordiFlex 15mg/1.5ml inj pf pens	1950.54
9	Imipramine 25mg/5ml oral solution sugar free	1869.94
10	Phenobarbital 15mg/5ml oral liquid	1822.81
11	Flucelvax Tetra vacc inj 0.5ml pre-filled syringes	1817.81
12	Influenza vaccine (surface antigen, inact) inj 0.5ml ...	1801.75
13	Lanreotide 120mg/0.5ml inj pre-filled syringes	1752.14
14	Fluad Tetra vaccine inj 0.5ml pre-filled syringes	1675.62
15	Fentanyl 200microgram lozenges	1652.50
16	Influvac sub-unit Tetra vacc inj 0.5ml pre-filled syri...	1578.04

Query executed successfully. | DESKTOP-U894SCJ\MSSQLSERVER... | DESKTOP-U894SCJ\user (56) | PrescriptionsDB | 00:00:00 | 6,148 rows

This code is a SQL query that extract the details of medication names from the "DRUGS" table using the “BNF_CODE” and calculates the average actual cost of prescriptions for each medication. The ROUND function is used to round the resulting average cost values to two decimal places and orders the result by the average cost in descending order using the “ORDER BY” clause. The query uses the INNER JOIN clause to join the "DRUGS" and "PRESCRIPTIONS" tables based on a matching value in the "BNF_CODE" column. It then applies the AVG aggregate function to the "ACTUAL_COST" column in the "PRESCRIPTION" table and groups the resulting data by the "BNF_DESCRIPTION" column in the "DRUGS" table. By executing this query, we can identify the medications that have the highest average cost per prescription.

4. query to Return the names of all medical practices in Bolton that have not prescribed any drug in the "06: Endocrine system" BNF chapter code:



```
---Return the names of all medical practices in Bolton that have not prescribed any drug
SELECT practice_name
FROM medical_practice
WHERE NOT EXISTS (
  SELECT *
  FROM prescriptions
  INNER JOIN drugs ON prescriptions.BNF_CODE = drugs.BNF_CODE
  WHERE prescriptions.PRACTICE_CODE = medical_practice.PRACTICE_CODE
    AND drugs.BNF_CHAPTER_PLUS_CODE = '06'
)
```

88 %

Results | Messages

	practice_name
1	UNIDENTIFIED DOCTORS
2	THE DUNSTAN PARTNERSHIP
3	PIKES LANE 1
4	KILDONAN HOUSE
5	SWAN LANE MEDICAL CENTRE
6	STABLE FOLD SURGERY
7	DR MALHOTRA & PARTNERS
8	KEARSLEY MEDICAL CENTRE
9	STONEHILL MEDICAL CENTRE
10	ST HELENS ROAD PRACTICE
11	DALEFIELD SURGERY
12	TONGE FOLD HEALTH CENTRE
13	DR EARNSHAW AND PARTNERS
14	LEVER CHAMBERS 2
15	SPRING HOUSE SURGERY
16	UNSWORTH GROUP PRACTICE

Query executed successfully. | DESKTOP-U894SCJ\MSSQLSERVER... | DESKTOP-U894SCJ\user (56) | PrescriptionsDB | 00:00:00 | 60 rows

This code is a SQL query that retrieves the names of medical practices that have not prescribed any medication belonging to the BNF chapter “06”. The query uses a subquery with the NOT EXISTS operator to identify all prescription records that match a specific condition: the BNF code of the prescribed medication belongs to the BNF chapter 06, and the prescription is associated with a medical practice based on the matching "PRACTICE_CODE" values. The outer query then retrieves the "practice_name" from the "medical_practice" table for all practices that do not have

any matching prescription records in the subquery. By executing this query, we can identify medical practices that have not prescribed any medications belonging to the BNF chapter 06, which includes medications for the treatment of endocrine disorders. This information can be used to identify potential gaps in patient care, evaluate prescribing patterns for different medical practices, and inform decision-making around drug formularies and treatment guidelines.

1. Query to get the average cost of prescriptions for each medical practice in the Medical_Practice table, ordered by the average cost in ascending order:

```
105 --- Query to get the average cost of prescriptions for each medical practice in the Medi
106 SELECT
107     practice_name,
108     AVG(ACTUAL_COST) AS avg_cost
109 FROM
110     Medical_Practice
111     JOIN Prescriptions ON Medical_Practice.practice_code = Prescriptions.practice_code
112 GROUP BY
113     practice_name
114 HAVING
115     AVG(ACTUAL_COST) < 10
116 ORDER BY
117     avg_cost ASC;
```

Results | Messages

	practice_name	avg_cost
1	BOLTON HOSPICE	1.8888
2	NEURO-REHAB SERVICE	2.562
3	TURTON PCN HUB	9.5266
4	UNIDENTIFIED DOCTORS	9.9915

This code is a SQL query that retrieves the average cost of prescriptions for each medical practice in the Medical_Practice table and orders the results by the average cost in ascending order. The query joins the Medical_Practice and Prescriptions tables on the matching "practice_code" values and calculates the average cost of all prescriptions associated with each medical practice using the AVG function. The HAVING clause is used to filter the results by only including medical practices whose average prescription cost is less than 10.

By executing this query, we can identify the medical practices with the lowest average prescription costs. This information can be useful for evaluating the efficiency of medical practices, identifying cost-saving opportunities, and informing decision-making around drug formularies and treatment guidelines. However, it's important to note that the results of this query may be affected by factors such as differences in patient populations and prescribing patterns, so further analysis may

be necessary to fully understand the underlying causes of differences in prescription costs between medical practices.