Practical 1

Aim: Do data preprocessing on data obtained from databases imported from external sources..

Theory:

What is data preprocessing?

Data preprocessing, a component of data preparation, describes any type of processing performed on raw data to prepare it for another data processing procedure. It has traditionally been an important preliminary step for the data mining process. More recently, data preprocessing techniques have been adapted for training machine learning models and AI models and for running inferences against them.

Data preprocessing transforms the data into a format that is more easily and effectively processed in data mining, machine learning and other data science tasks. The techniques are generally used at the earliest stages of the machine learning and AI development pipeline to ensure accurate results.

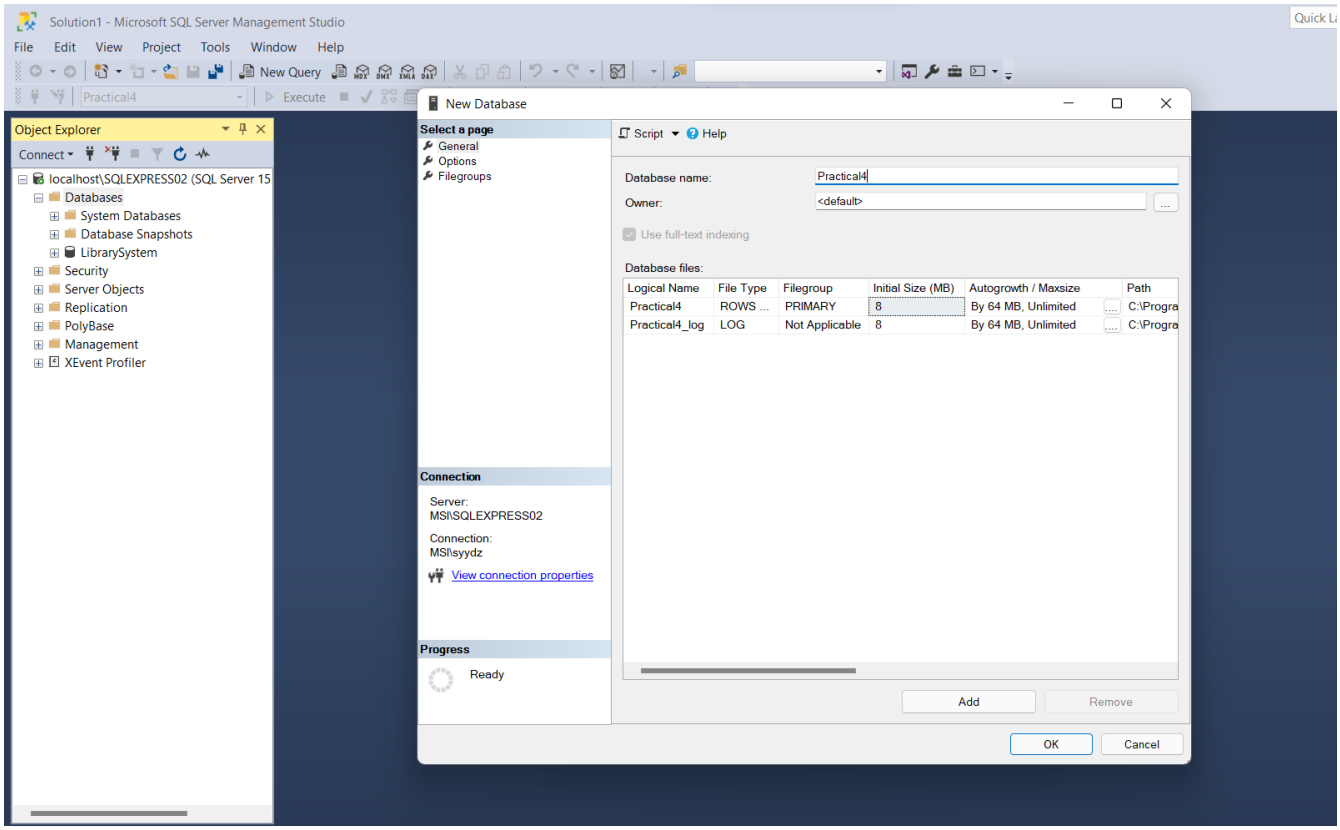
There are several different tools and methods used for preprocessing data, including the following:

- sampling, which selects a representative subset from a large population of data;
- transformation, which manipulates raw data to produce a single input;
- denoising, which removes noise from data;
- imputation, which synthesizes statistically relevant data for missing values;
- normalization, which organizes data for more efficient access; and
- feature extraction, which pulls out a relevant feature subset that is significant in a particular context.
- pulls out a relevant feature subset that is significant in a particular context.

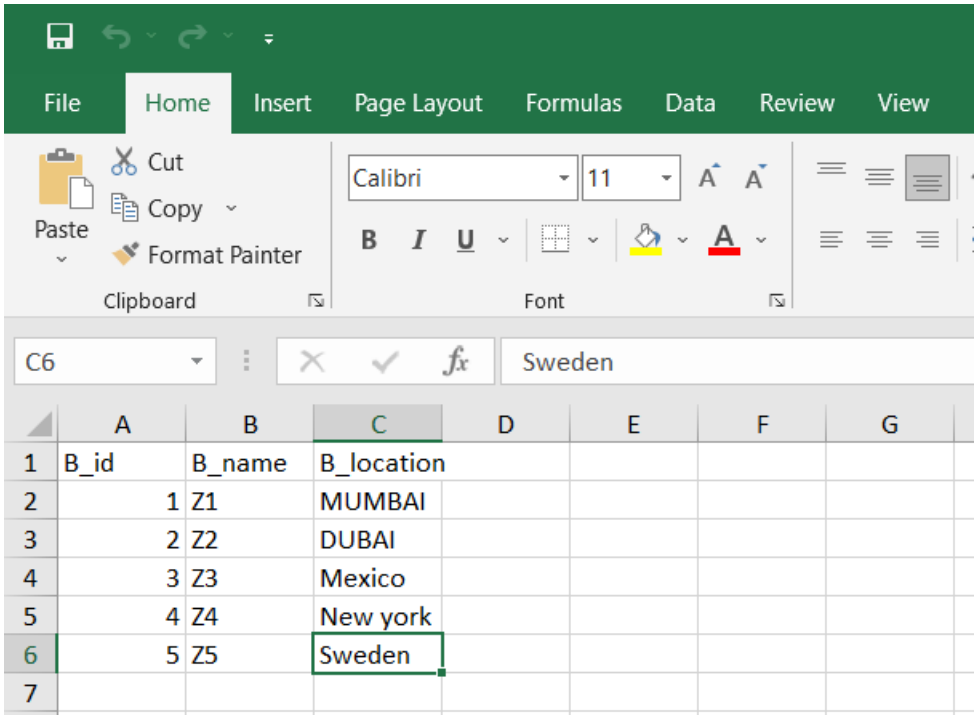
#Steps:

1) Start Microsoft SQL server

2) Right Click On Databases > New Database > Give Database Name > Click Ok

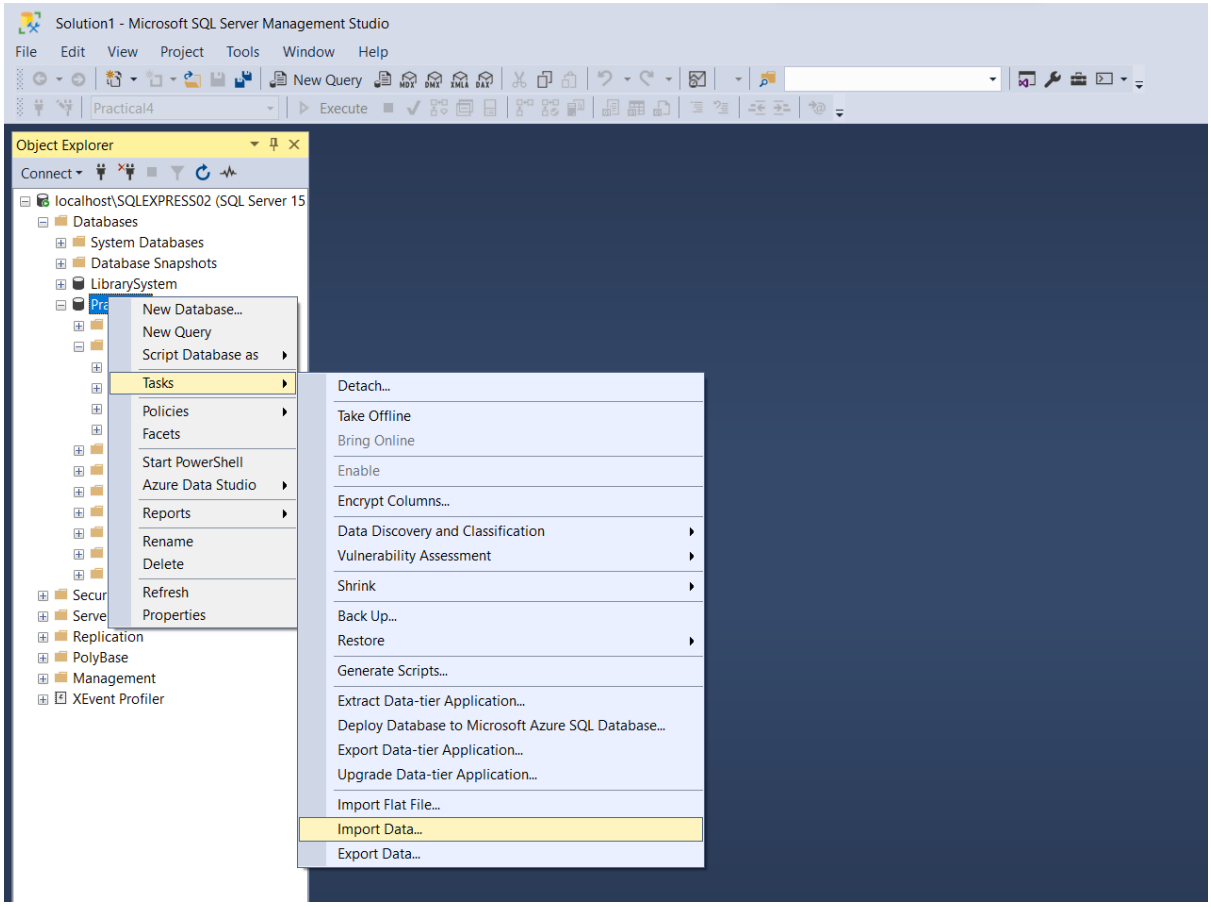


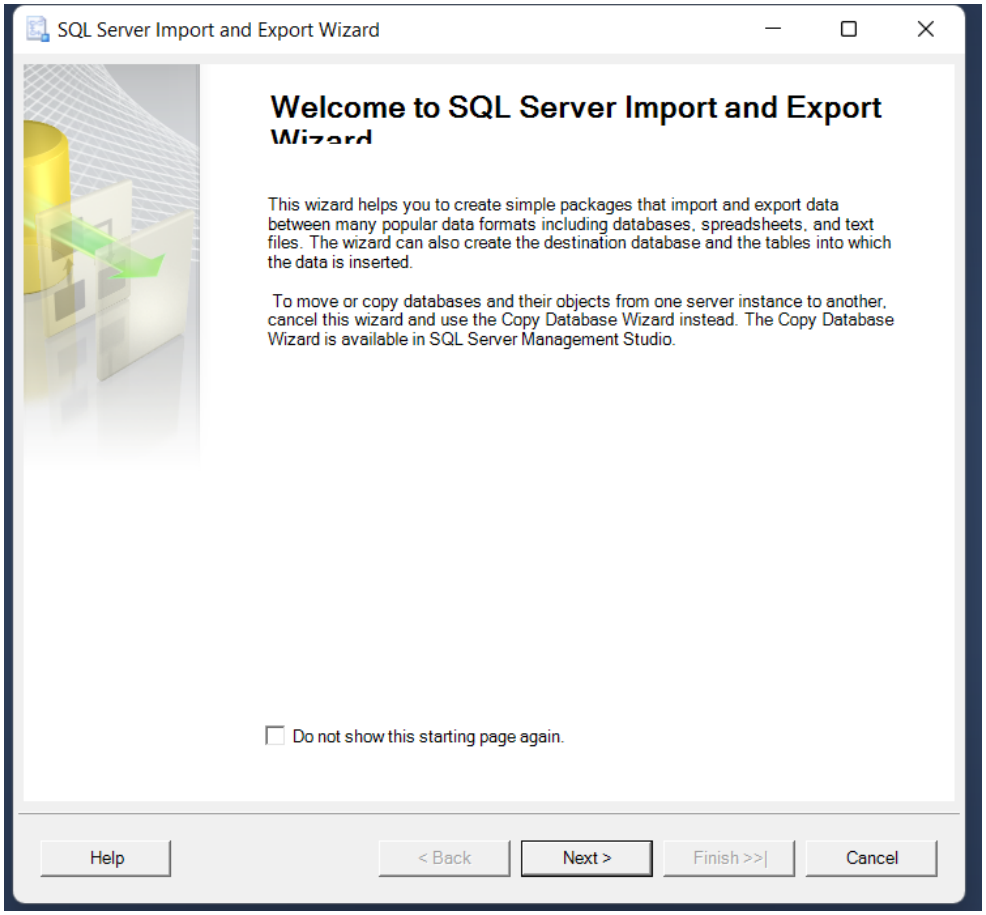
3) Create a new Microsoft Excel 97-2003 Worksheet (.xls) with columns Branch id, Branch name, Branch location and enter some data into rows.



	A	B	C	D	E	F	G
1	B_id	B_name	B_location				
2	1	Z1	MUMBAI				
3	2	Z2	DUBAI				
4	3	Z3	Mexico				
5	4	Z4	New york				
6	5	Z5	Sweden				
7							

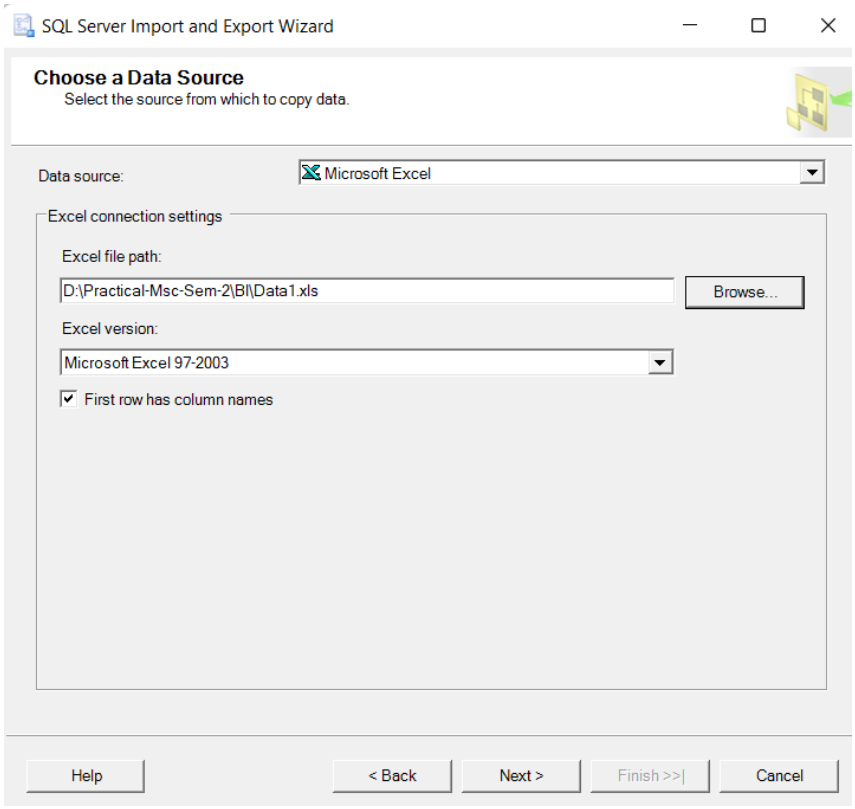
4) Right Click On Practical4 > Tasks > Select: Import Data

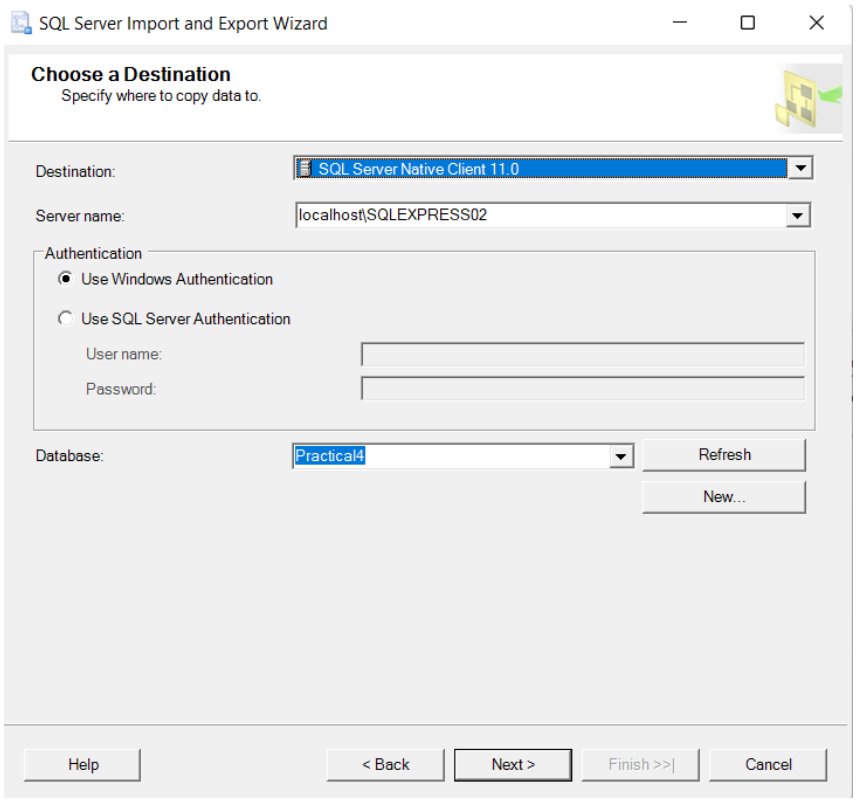


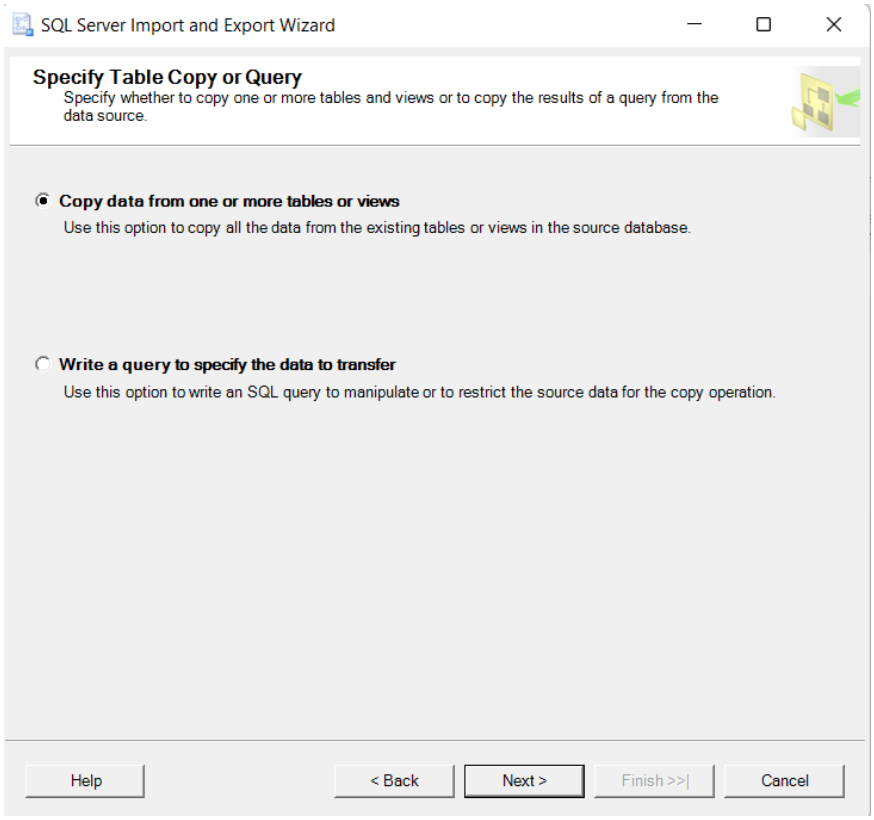


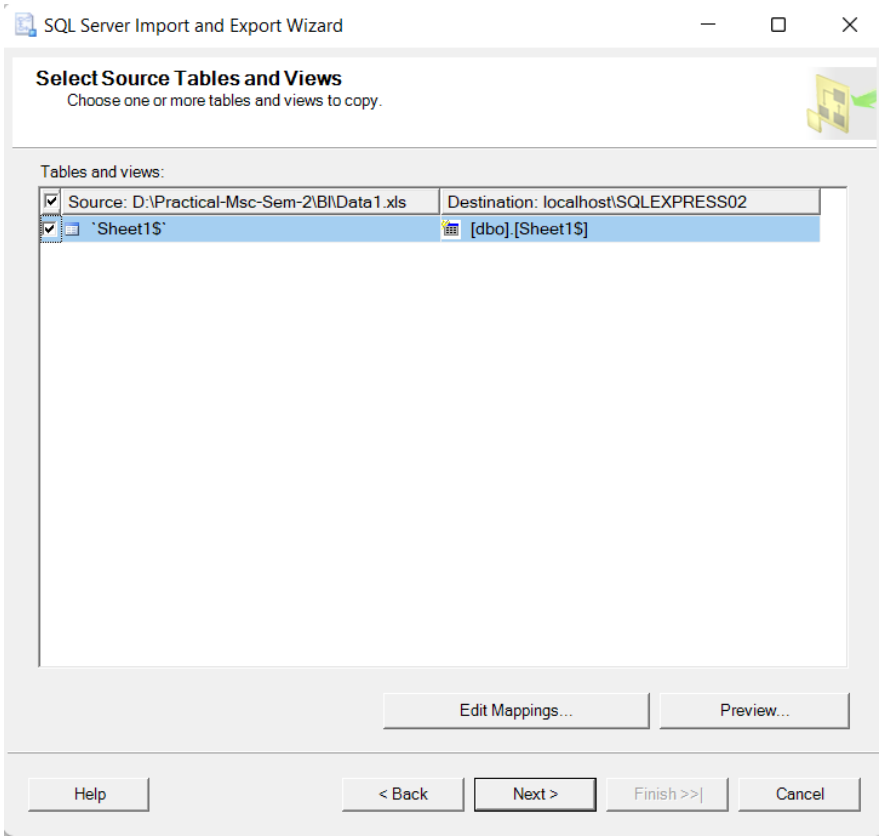
5) Click on Next > Select Data Source as: Microsoft Excel > Give Excel File Path > Select Destination as: SQL Server Native Client 11.0 > Click Next > Select Sheet 1 > Click Next > Click Finish > Close the window after successful execution.

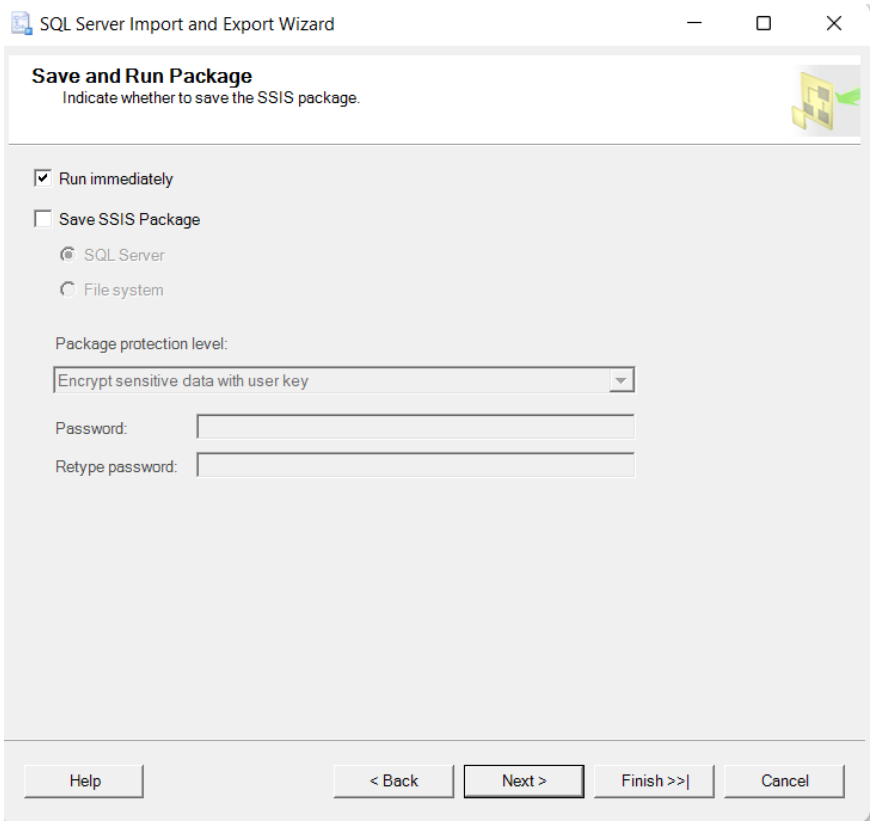
Note: Close the excel file before using it as Source File

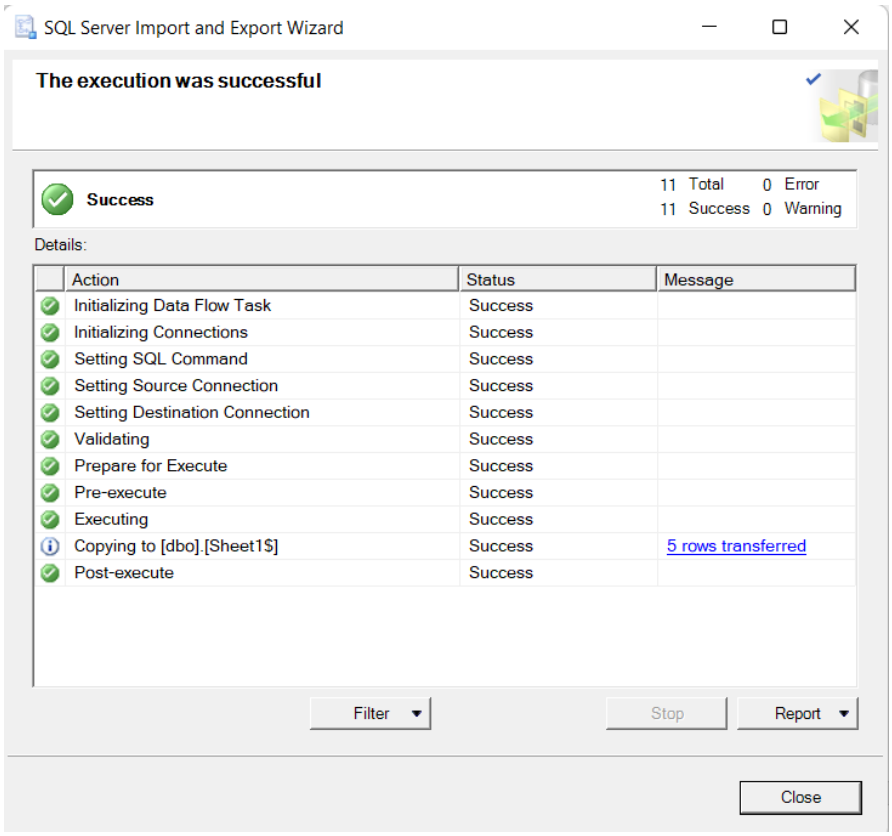

SQL Server Import and Export Wizard
Choose a Data Source
Select the source from which to copy data.
Data source:
Microsoft Excel
Excel connection settings
Excel file path:
D:\Practical-Msc-Sem-2\BI\Data1.xls
Browse...
Excel version:
Microsoft Excel 97-2003
First row has column names
Help
< Back
Next >
Finish >>|
Cancel


SQL Server Import and Export Wizard
Choose a Destination
Specify where to copy data to.
Destination:
SQL Server Native Client 11.0
Server name:
localhost\SQLEXPRESS02
Authentication
Use Windows Authentication
Use SQL Server Authentication
User name:
Password:
Database:
Practical4
Refresh
New...
Help
< Back
Next >
Finish >>|
Cancel

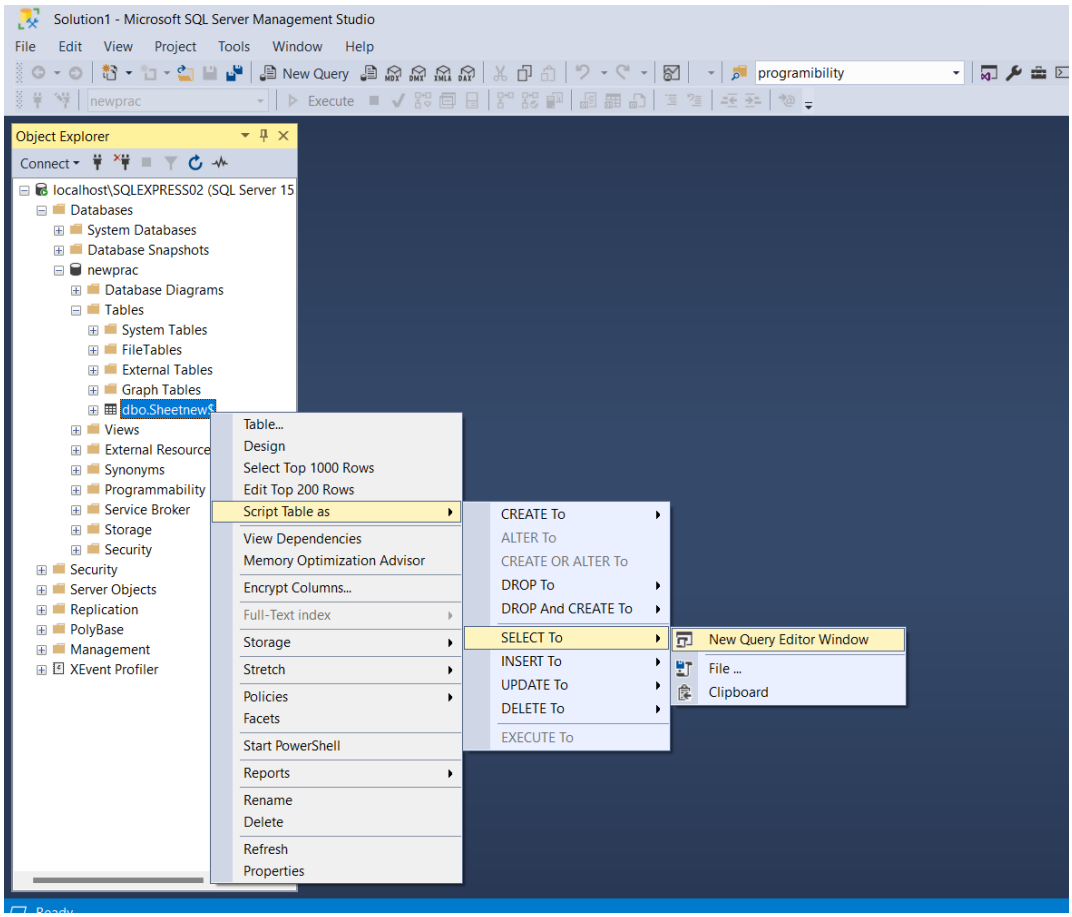

SQL Server Import and Export Wizard
Specify Table Copy or Query
Specify whether to copy one or more tables and views or to copy the results of a query from the data source.
Copy data from one or more tables or views
Use this option to copy all the data from the existing tables or views in the source database.
Write a query to specify the data to transfer
Use this option to write an SQL query to manipulate or to restrict the source data for the copy operation.
Help
< Back
Next >
Finish >>|
Cancel

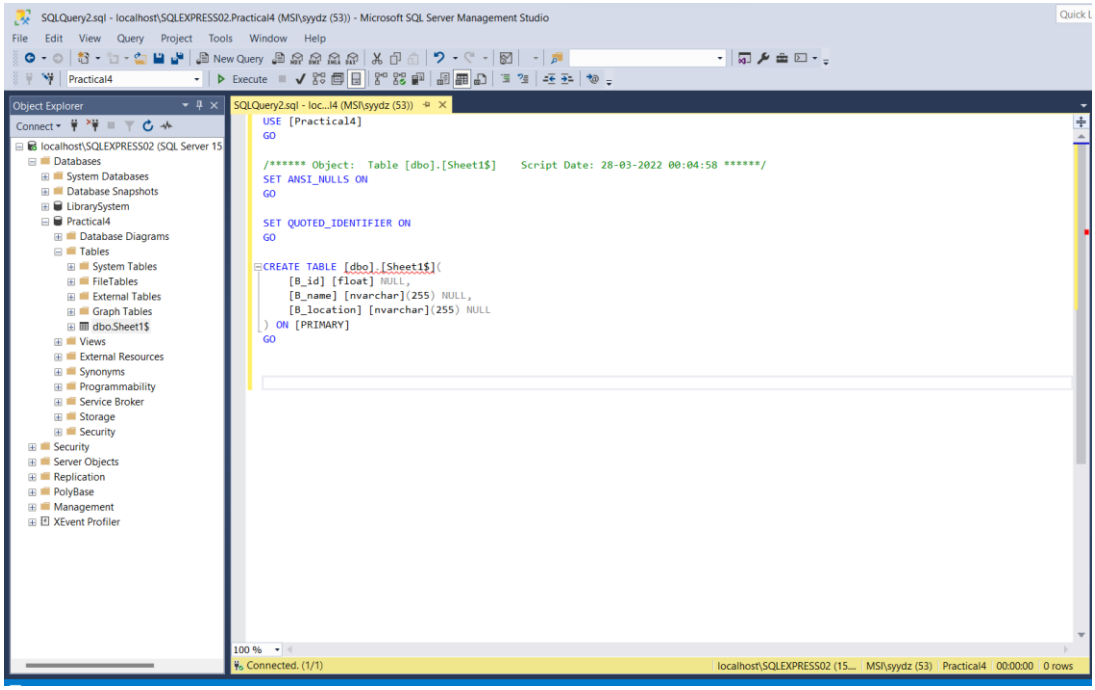

SQL Server Import and Export Wizard
Select Source Tables and Views
Choose one or more tables and views to copy.
Tables and views:
Source: D:\Practical-Msc-Sem-2\BI\Data1.xls
Destination: localhost\SQLEXPRESS02
`Sheet1$`
[dbo].[Sheet1$]
Edit Mappings...
Preview...
Help
< Back
Next >
Finish >>|
Cancel


SQL Server Import and Export Wizard
Save and Run Package
Indicate whether to save the SSIS package.
Run immediately
Save SSIS Package
SQL Server
File system
Package protection level:
Encrypt sensitive data with user key
Password:
Retype password:
Help
< Back
Next >
Finish >>|
Cancel

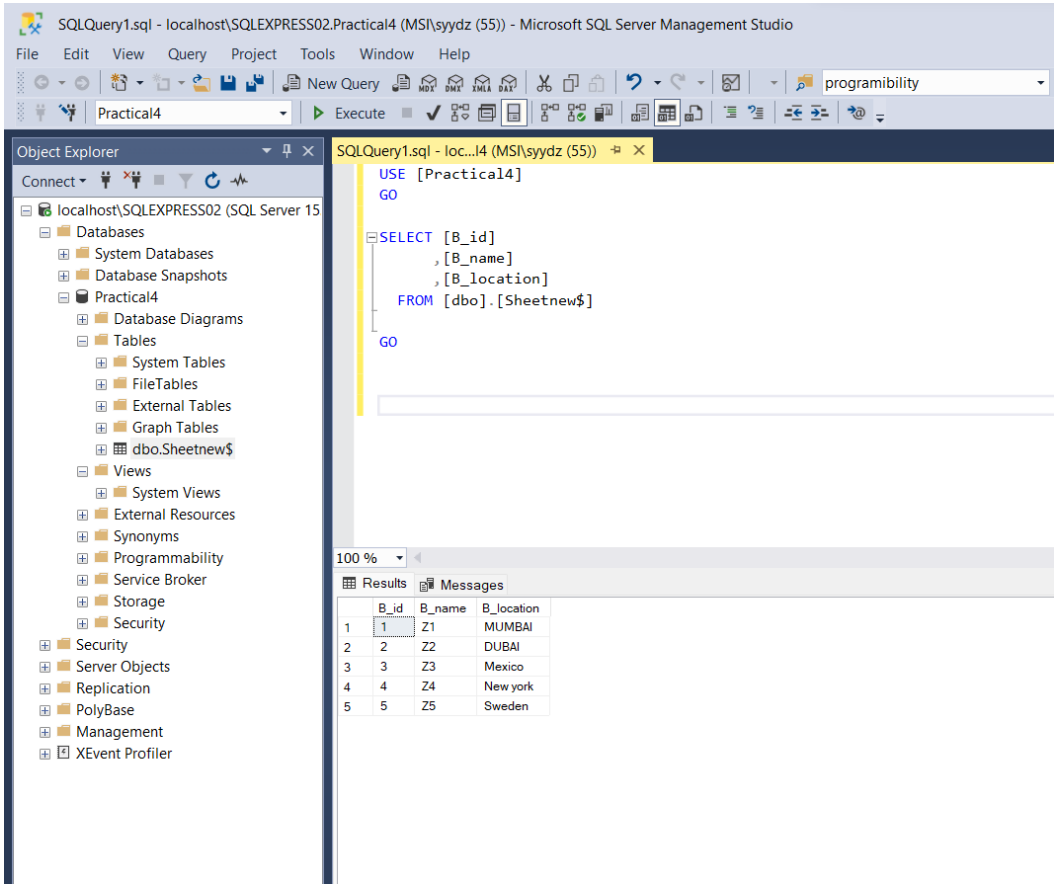

SQL Server Import and Export Wizard
The execution was successful
Success
11 Total 0 Error
11 Success 0 Warning
Details:
Action
Status
Message
Initializing Data Flow Task
Success
Initializing Connections
Success
Setting SQL Command
Success
Setting Source Connection
Success
Setting Destination Connection
Success
Validating
Success
Prepare for Execute
Success
Pre-execute
Success
Executing
Success
Copying to [dbo].[Sheet1$]
Success
5 rows transferred
Post-execute
Success
Filter
Stop
Report
Close

6) Now expand the Tables Section > Right Click on dbo.Sheet$1 > Script table as > Select To > Click on New Query Editor Window.





7) Click on Execute



Conclusion: Data pre-processing on imported data from external sources implemented Successfully

Practical 2

Aim: Develop an application to implement defining subject areas, design of fact and

dimension tables, data marts

Theory:

Fact Table

A Fact Table is a central table in a star schema of a data warehouse. It is an important concept required for Data Warehousing and BI . A fact table stores quantitative information for analysis and is often denormalized. A fact table works with dimension tables and it holds the data to be analyzed and a dimension table stores data about the ways in which the data can be analyzed.

Thus, a fact table consists of two types of columns. The foreign keys column allows to join with dimension tables and the measure columns contain the data that is being analyzed.

A dimension table is a table in a star schema of a data warehouse. A dimension table stores attributes, or dimensions, that describe the objects in a fact table.

Dimension Table

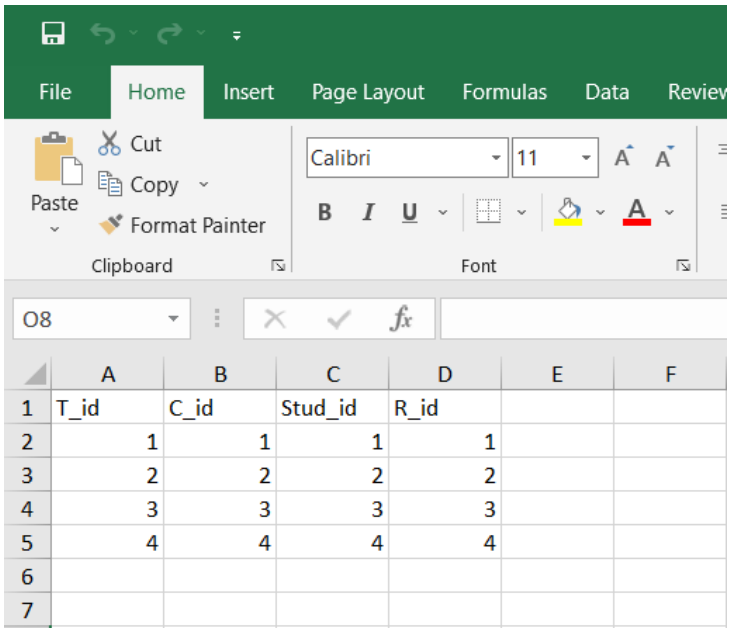
In data warehousing, a dimension is a collection of reference information about a measurable event. These events are known as facts and are stored in a fact table. Dimensions categorize and describe data warehouse facts and measures in ways that support meaningful answers to business questions. They form the very core of dimensional modeling.

Data Mart

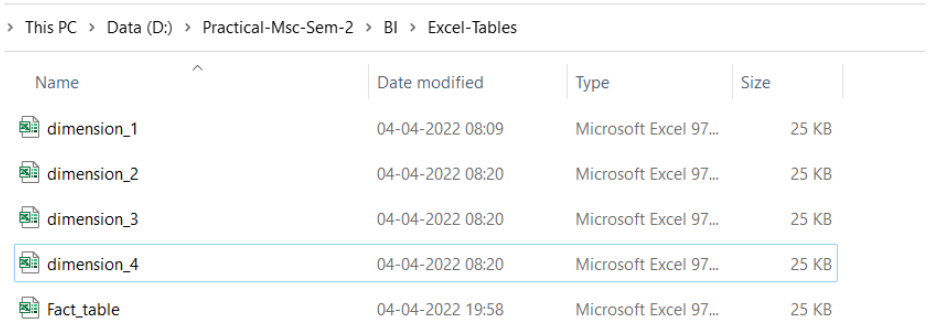
A data mart is a simple form of data warehouse focused on a single subject or line of business. With a data mart, teams can access data and gain insights faster, because they don’t have to spend time searching within a more complex data warehouse or manually aggregating data from different sources.

#Steps:

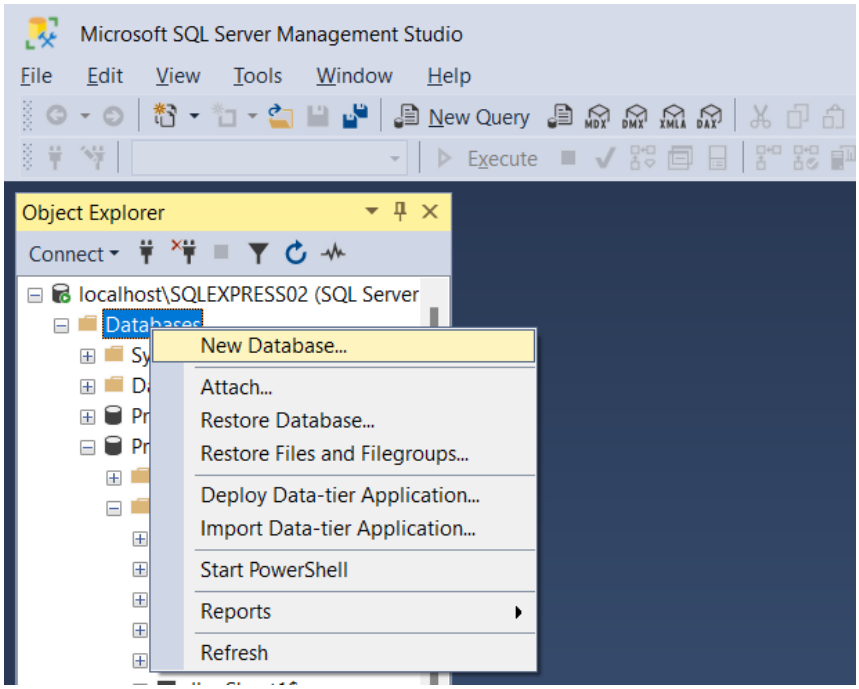
1) Create fact and dimensions tables in excel(.xls) (Change sheet name for every sheet)



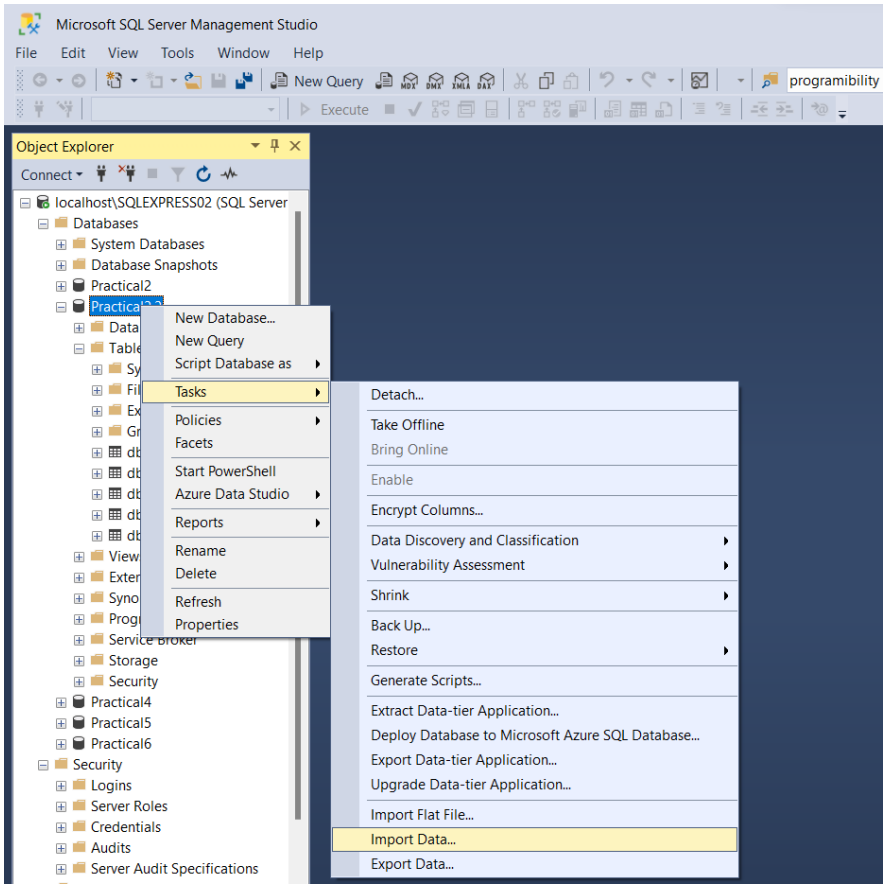
	A	B	C	D	E	F
1	T_id	C_id	Stud_id	R_id		
2	1	1	1	1		
3	2	2	2	2		
4	3	3	3	3		
5	4	4	4	4		
6						
7						

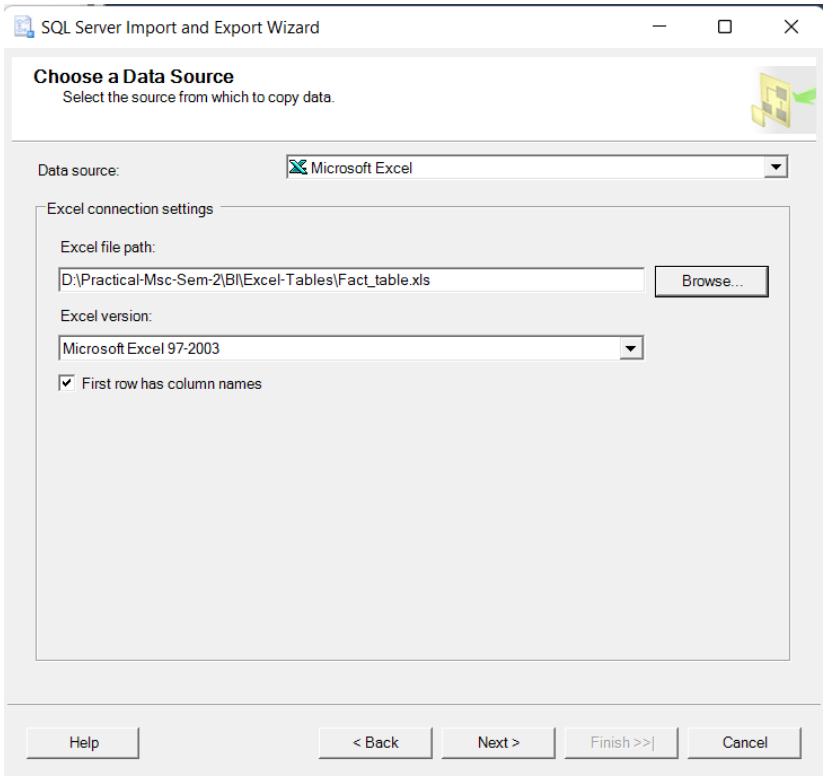


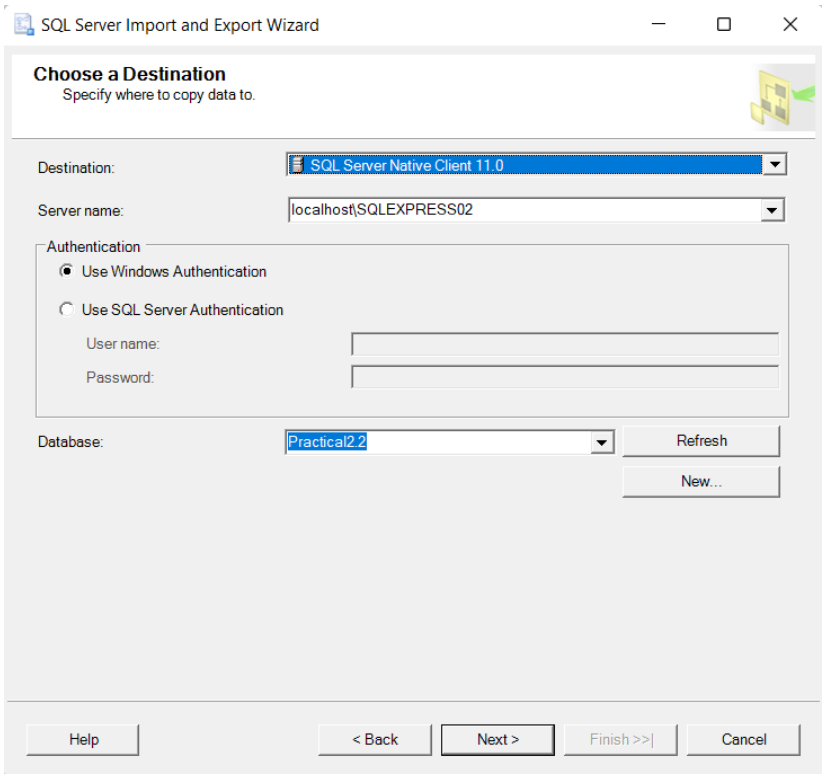
2) Create new database.



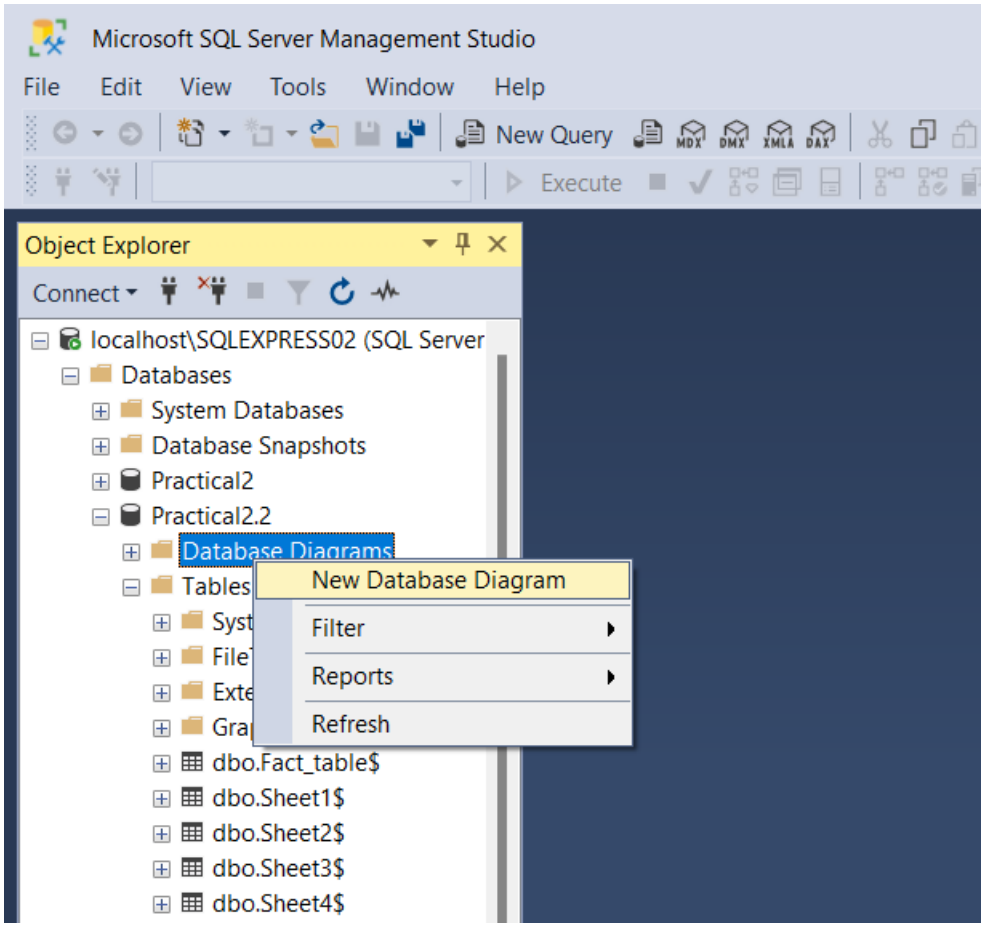
3) Import excel files > Choose data source > Choose destination source >Finish

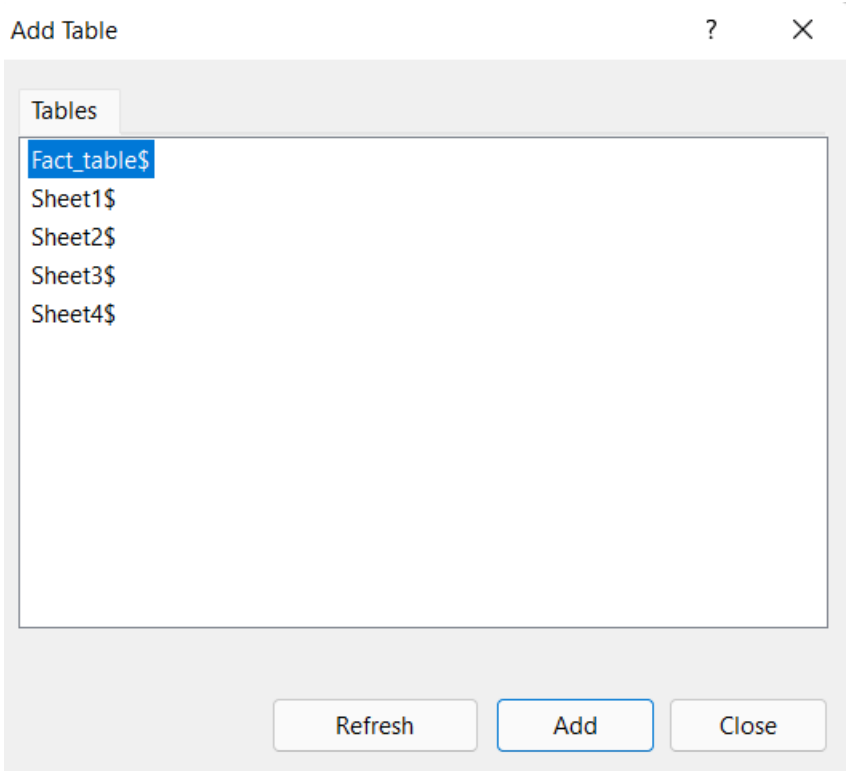




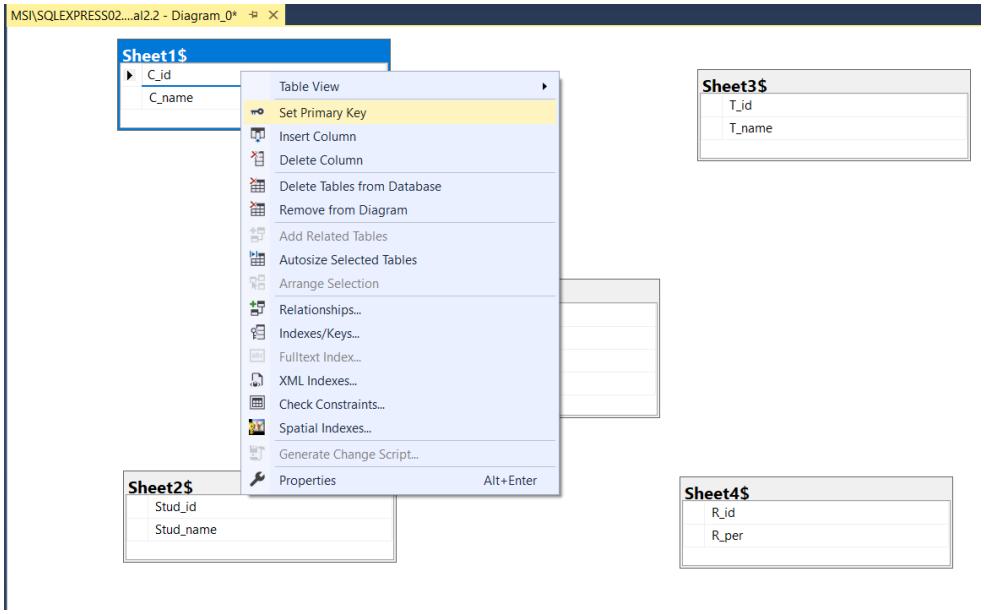


4) Create database diagrams

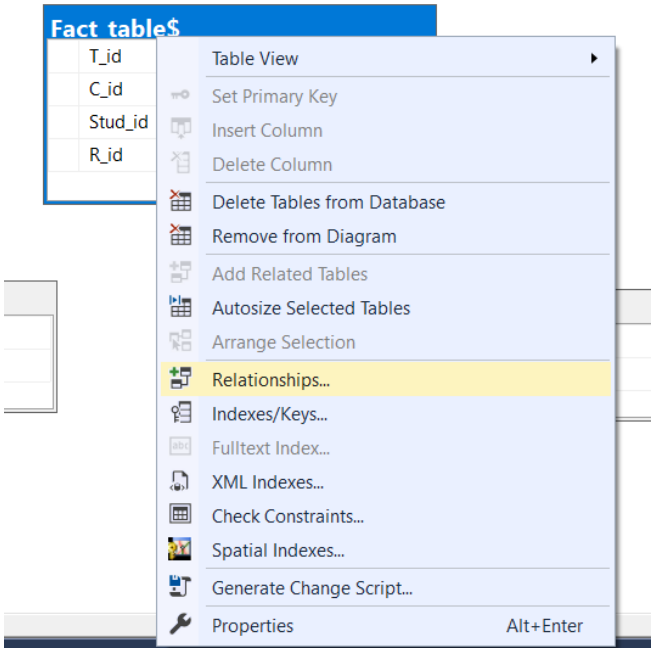


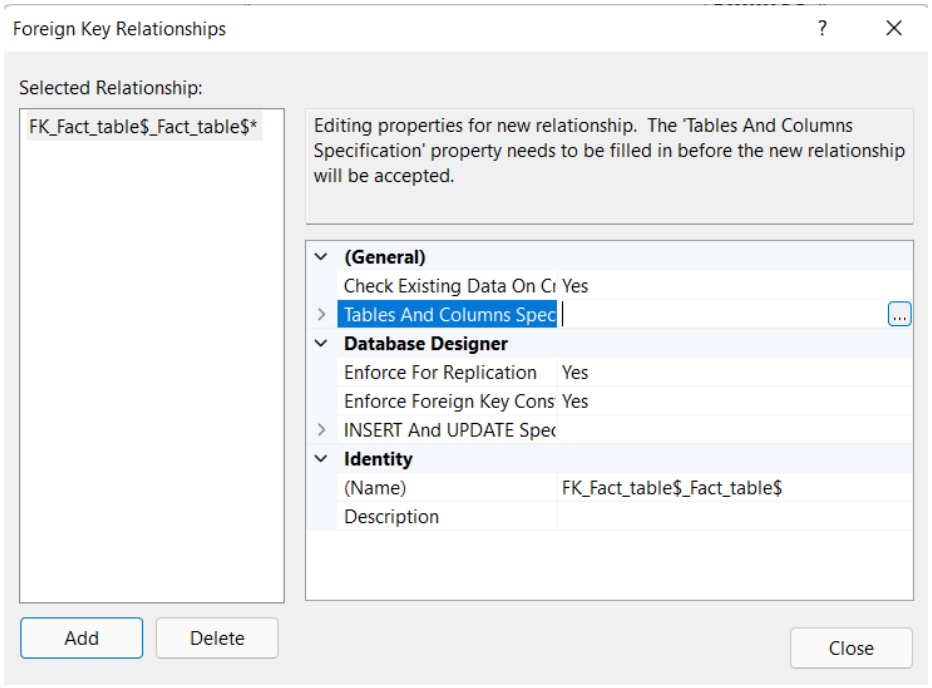


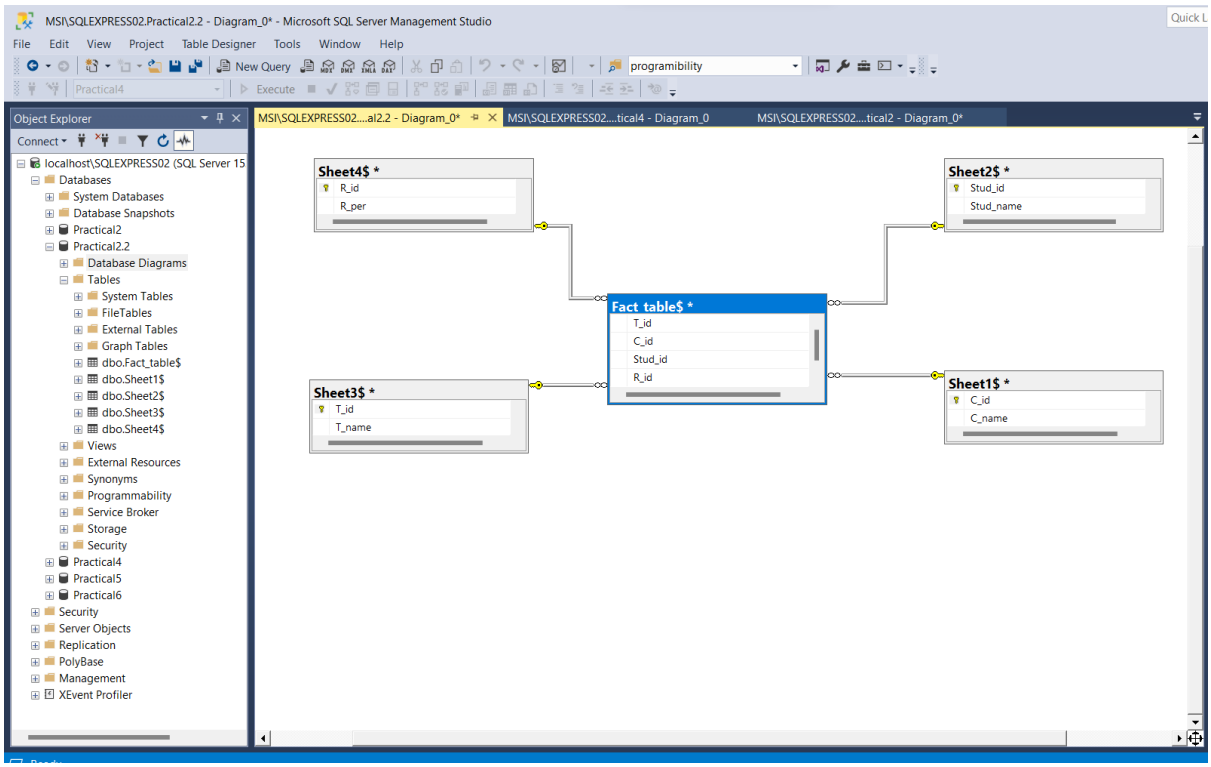
5) Set primary keys

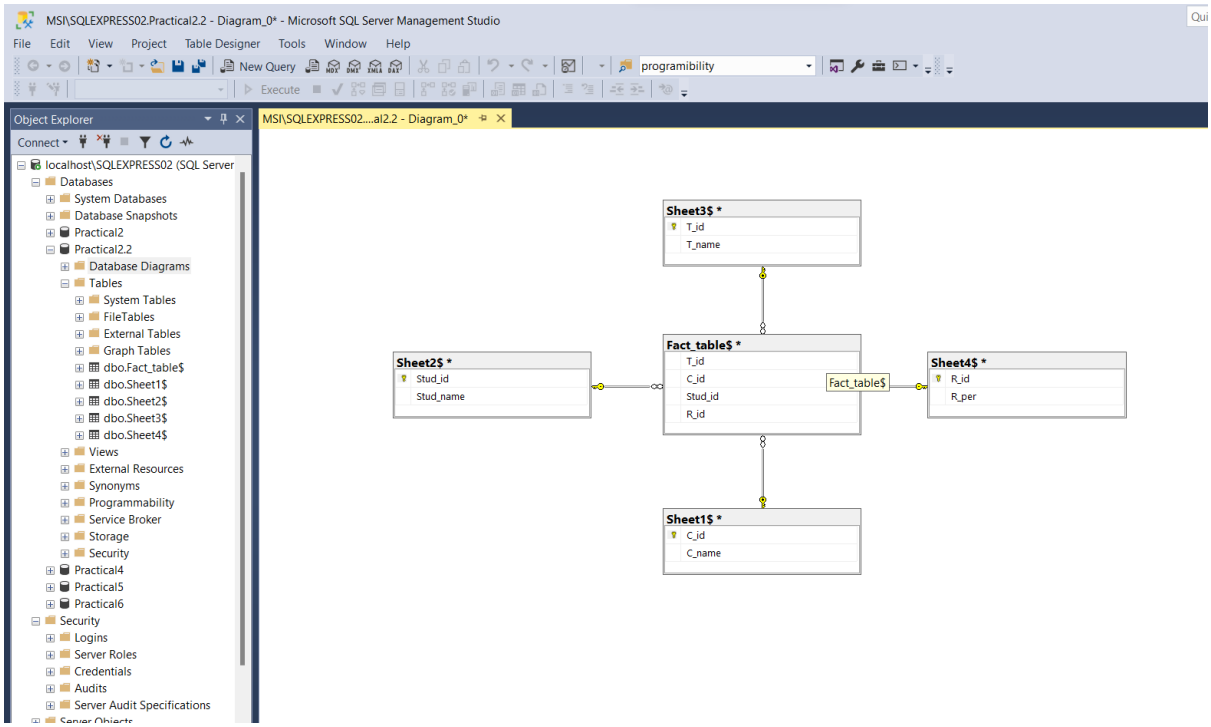


6) Create relationships for fact table




Foreign Key Relationships
Selected Relationship:
FK_Fact_table$_Fact_table$*
Editing properties for new relationship. The 'Tables And Columns Specification' property needs to be filled in before the new relationship will be accepted.
(General)
Check Existing Data On Cr Yes
Tables And Columns Spec
Database Designer
Enforce For Replication Yes
Enforce Foreign Key Cons Yes
INSERT And UPDATE Spec
Identity
(Name) FK_Fact_table$_Fact_table$
Description
Add
Delete
Close


MSI\SQLEXPRESS02.Practical2.2 - Diagram_0* - Microsoft SQL Server Management Studio
File Edit View Project Table Designer Tools Window Help
New Query
programability
Execute
Object Explorer
Connect
localhost\SQLEXPRESS02 (SQL Server 15
Databases
System Databases
Database Snapshots
Practical2
Practical2.2
Database Diagrams
Tables
System Tables
FileTables
External Tables
Graph Tables
dbo.Fact_table$
dbo.Sheet1$
dbo.Sheet2$
dbo.Sheet3$
dbo.Sheet4$
Views
External Resources
Synonyms
Programmability
Service Broker
Storage
Security
Practical4
Practical5
Practical6
Security
Server Objects
Replication
PolyBase
Management
XEvent Profiler
Sheet4$ *
R_id
R_per
Sheet2$ *
Stud_id
Stud_name
Fact table$ *
T_id
C_id
Stud_id
R_id
Sheet3$ *
T_id
T_name
Sheet1$ *
C_id
C_name



Conclusion: Successfully Implemented fact, dimension table and data marts in MS SQL.

Practical 3

Aim: Develop an application to implement OLAP, roll-up, drill-down, slice, and dice

operations.

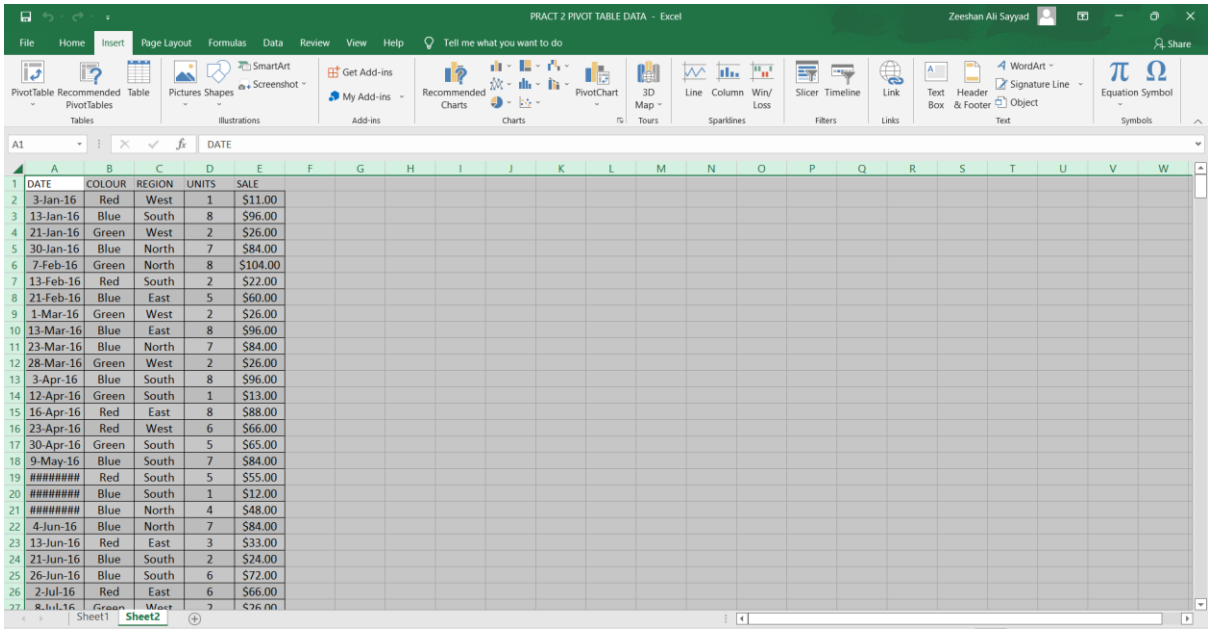
Theory:

A pivot table is a statistics tool that summarizes and reorganizes selected columns and rows of data in a spreadsheet or database table to obtain a desired report. The tool does not actually change the spreadsheet or database itself, it simply “pivots” or turns the data to view it from different perspectives.

Pivot tables are especially useful with large amounts of data that would be time-consuming to calculate by hand. A few data processing functions a pivot table can perform include identifying sums, averages, ranges or outliers. The table then arranges this information in a simple, meaningful layout that draws attention to key values.

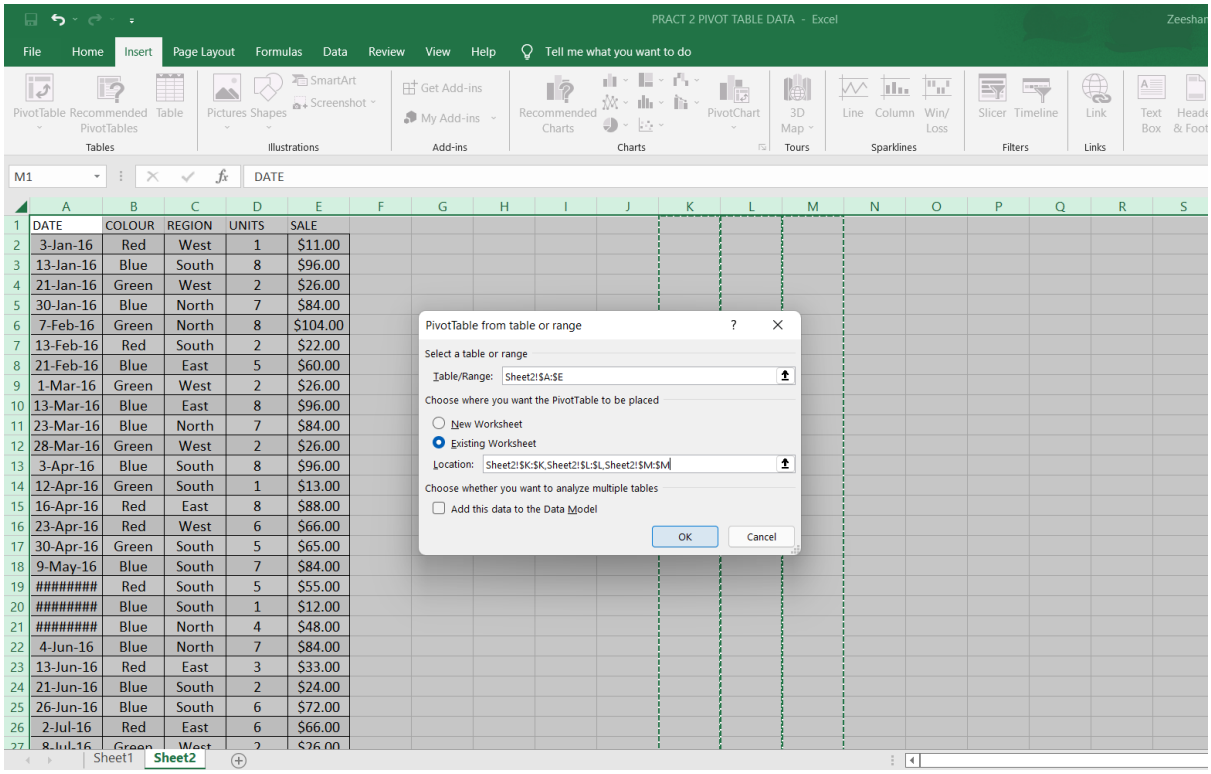
Steps:

1) Select source data in excel sheet.

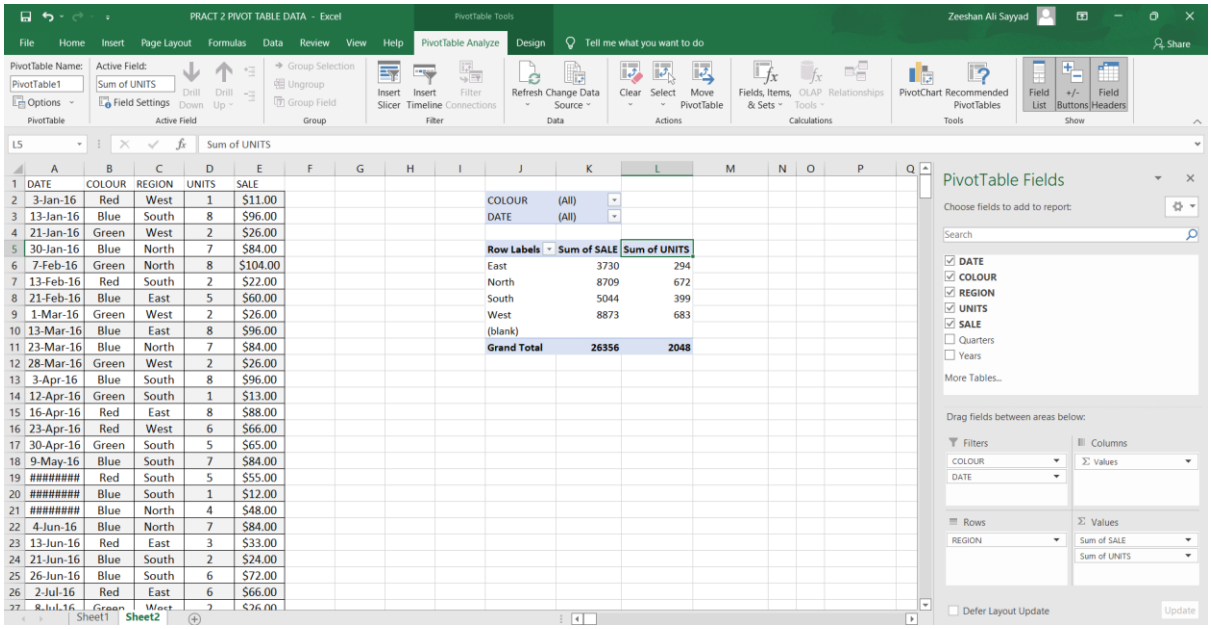


DATE	COLOUR	REGION	UNITS	SALE
3-Jan-16	Red	West	1	$11.00
13-Jan-16	Blue	South	8	$96.00
21-Jan-16	Green	West	2	$26.00
30-Jan-16	Blue	North	7	$84.00
7-Feb-16	Green	North	8	$104.00
13-Feb-16	Red	South	2	$22.00
21-Feb-16	Blue	East	5	$60.00
1-Mar-16	Green	West	2	$26.00
13-Mar-16	Blue	East	8	$96.00
23-Mar-16	Blue	North	7	$84.00
28-Mar-16	Green	West	2	$26.00
3-Apr-16	Blue	South	8	$96.00
12-Apr-16	Green	South	1	$13.00
16-Apr-16	Red	East	8	$88.00
23-Apr-16	Red	West	6	$66.00
30-Apr-16	Green	South	5	$65.00
9-May-16	Blue	South	7	$84.00
########	Red	South	5	$55.00
########	Blue	South	1	$12.00
########	Blue	North	4	$48.00
4-Jun-16	Blue	North	7	$84.00
13-Jun-16	Red	East	3	$33.00
21-Jun-16	Blue	South	2	$24.00
26-Jun-16	Blue	South	6	$72.00
2-Jul-16	Red	East	6	$66.00

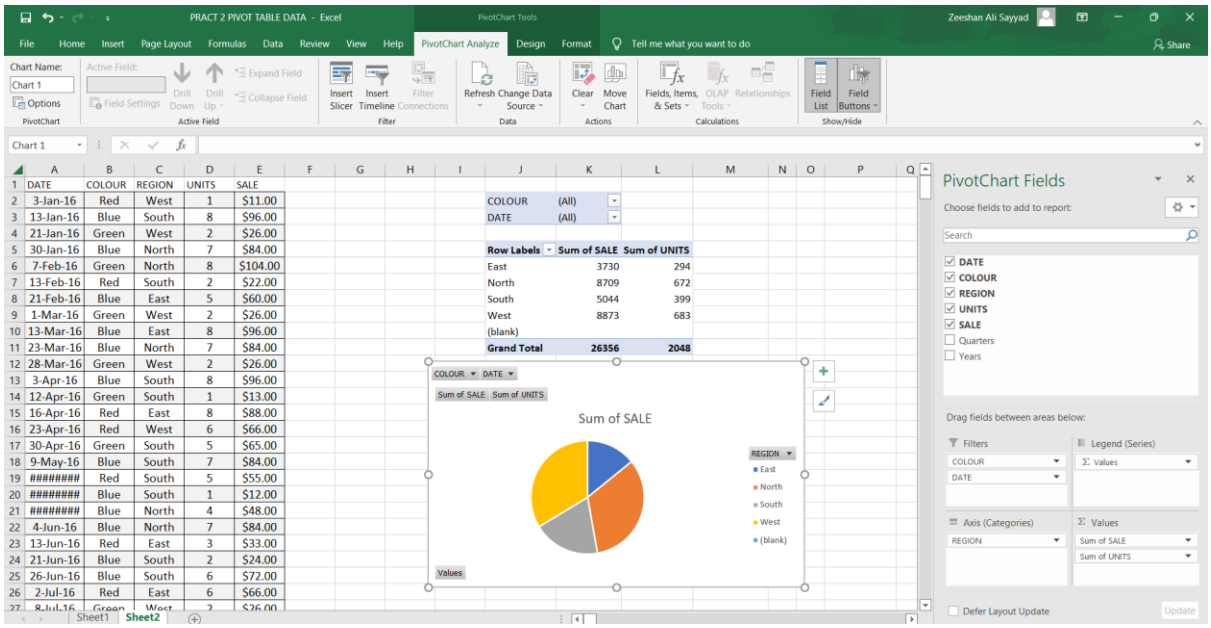
2) Click on Insert tab > Pivot Table > Select source and location > Click Ok



3) Now Drop PivotTable Fields into Filters, Columns, Rows, Values Respectively.



4) Insert Pie Chart or Bar graph.



DATE	COLOUR	REGION	UNITS	SALE
3-Jan-16	Red	West	1	$11.00
13-Jan-16	Blue	South	8	$96.00
21-Jan-16	Green	West	2	$26.00
30-Jan-16	Blue	North	7	$84.00
7-Feb-16	Green	North	8	$104.00
13-Feb-16	Red	South	2	$22.00
21-Feb-16	Blue	East	5	$60.00
1-Mar-16	Green	West	2	$26.00
13-Mar-16	Blue	East	8	$96.00
23-Mar-16	Blue	North	7	$84.00
28-Mar-16	Green	West	2	$26.00
3-Apr-16	Blue	South	8	$96.00
12-Apr-16	Green	South	1	$13.00
16-Apr-16	Red	East	8	$88.00
23-Apr-16	Red	West	6	$66.00
30-Apr-16	Green	South	5	$65.00
9-May-16	Blue	South	7	$84.00
########	Red	South	5	$55.00
########	Blue	South	1	$12.00
########	Blue	North	4	$48.00
4-Jun-16	Blue	North	7	$84.00
13-Jun-16	Red	East	3	$33.00
21-Jun-16	Blue	South	2	$24.00
26-Jun-16	Blue	South	6	$72.00
2-Jul-16	Red	East	6	$66.00

COLOUR	(All)
DATE	(All)

Row Labels	Sum of SALE	Sum of UNITS
East	3730	294
North	8709	672
South	5044	399
West	8873	683
(blank)		
Grand Total	26356	2048

Conclusion: Pivot table implemented successfully.

Practical 4

Aim: Develop an application to construct a multidimensional data.

Theory:

What is Multi-Dimensional Data Model?

A multidimensional model views data in the form of a data-cube. A data cube enables data to be modeled and viewed in multiple dimensions. It is defined by dimensions and facts.

The dimensions are the perspectives or entities concerning which an organization keeps records. For example, a shop may create a sales data warehouse to keep records of the store's sales for the dimension time, item, and location. These dimensions allow the save to keep track of things, for example, monthly sales of items and the locations at which the items were sold. Each dimension has a table related to it, called a dimensional table, which describes the dimension further. For example, a dimensional table for an item may contain the attributes item_name, brand, and type.

A multidimensional data model is organized around a central theme, for example, sales. This theme is represented by a fact table. Facts are numerical measures. The fact table contains the names of the facts or measures of the related dimensional tables.

#Steps:

1) Create new database.

```
CREATE TABLE DIM_customer
  (
     custid VARCHAR(6),
     fname VARCHAR(30),
     mname VARCHAR(30),
     ltname VARCHAR(30),
     city VARCHAR(15),
     mobileno VARCHAR(10),
     occupation VARCHAR(10),
     dob DATE
  )
CREATE TABLE DIM_branch
  (
   bid VARCHAR(6),
   bname VARCHAR(30),
```

```
    bcity VARCHAR(30),
   )
 CREATE TABLE DIM_account
   (
     acnumber VARCHAR(6),
     custid  VARCHAR(6),
     bid VARCHAR(6),
     opening_balance VARCHAR(7),
     aod DATE,
     atype VARCHAR(10),
     astatus VARCHAR(10)
    )
CREATE TABLE DIM_trandetails
    (
     tnumber VARCHAR(6),
     acnumber VARCHAR(6),
     dot DATE,
     medium_of_transaction VARCHAR(20),
     transaction_type VARCHAR(20),
     transaction_amount VARCHAR(7)

    )
CREATE TABLE DIM_loan
   (
    loan_id VARCHAR(10),
    custid VARCHAR(6),
    bid VARCHAR(6),
    loan_amount VARCHAR(7)
    )
  CREATE TABLE FACT_BANK
   (
```

custid VARCHAR(6),

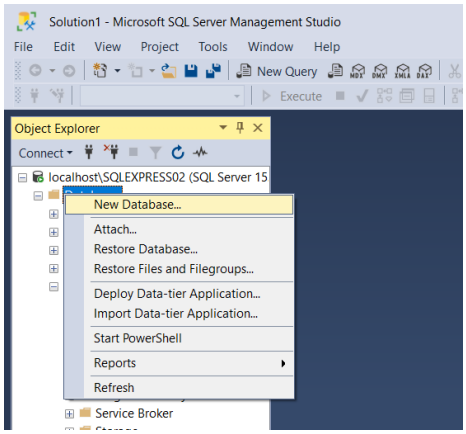
bid VARCHAR(6),

acnumber VARCHAR(6),

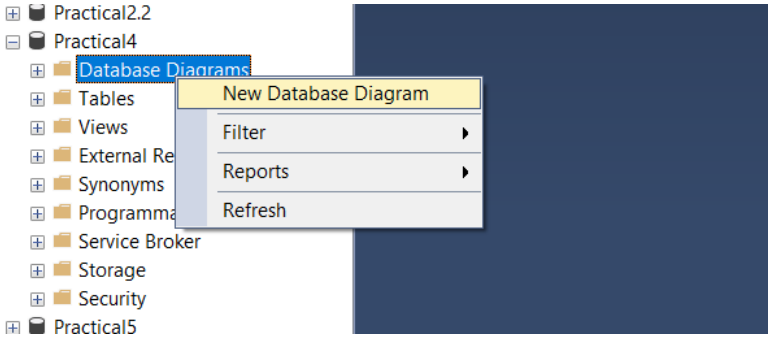
tnumber VARCHAR(6),

loan_id VARCHAR(10)

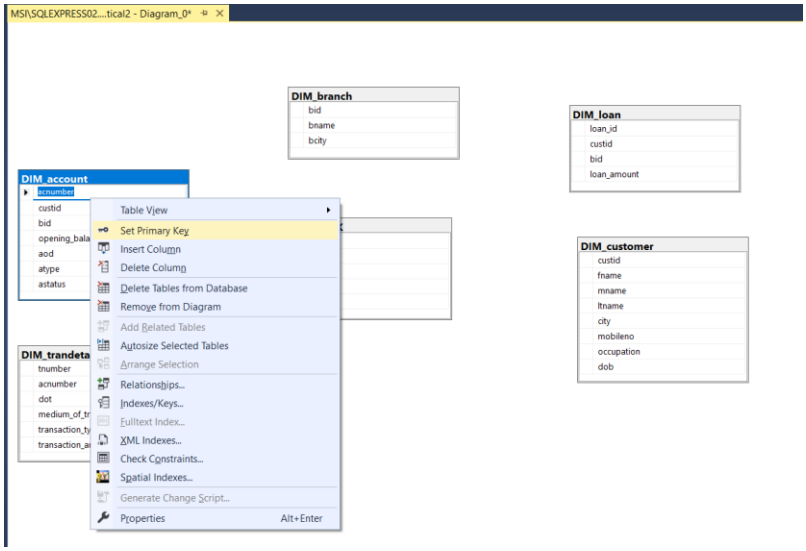
)



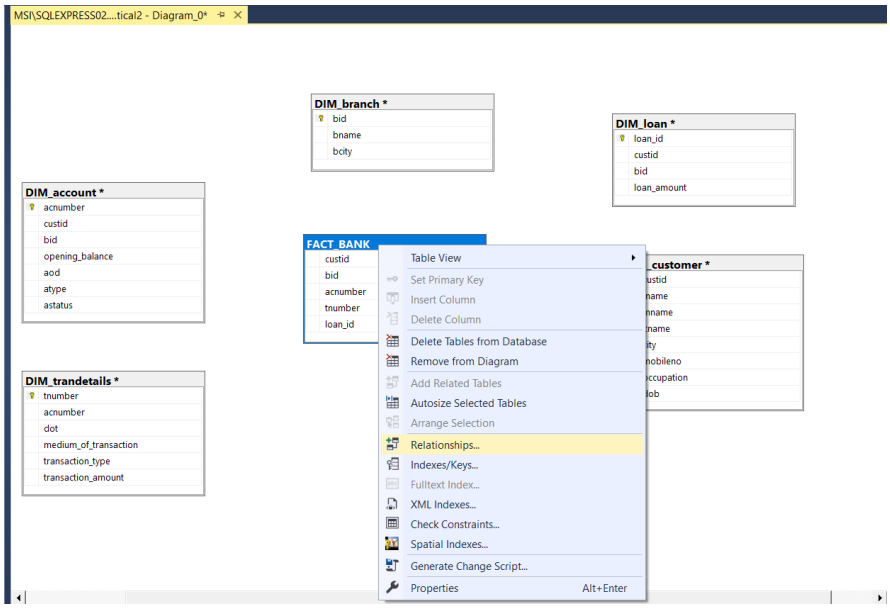
2) Create database diagram.

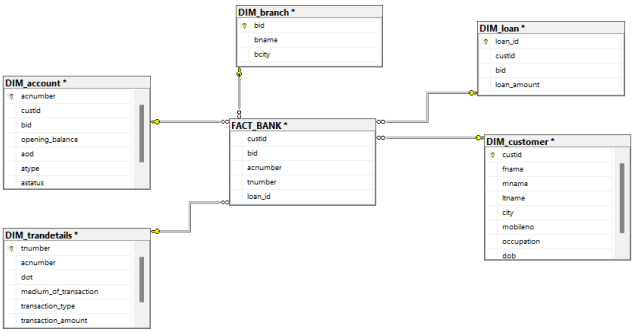


3) Set primary key for each table:

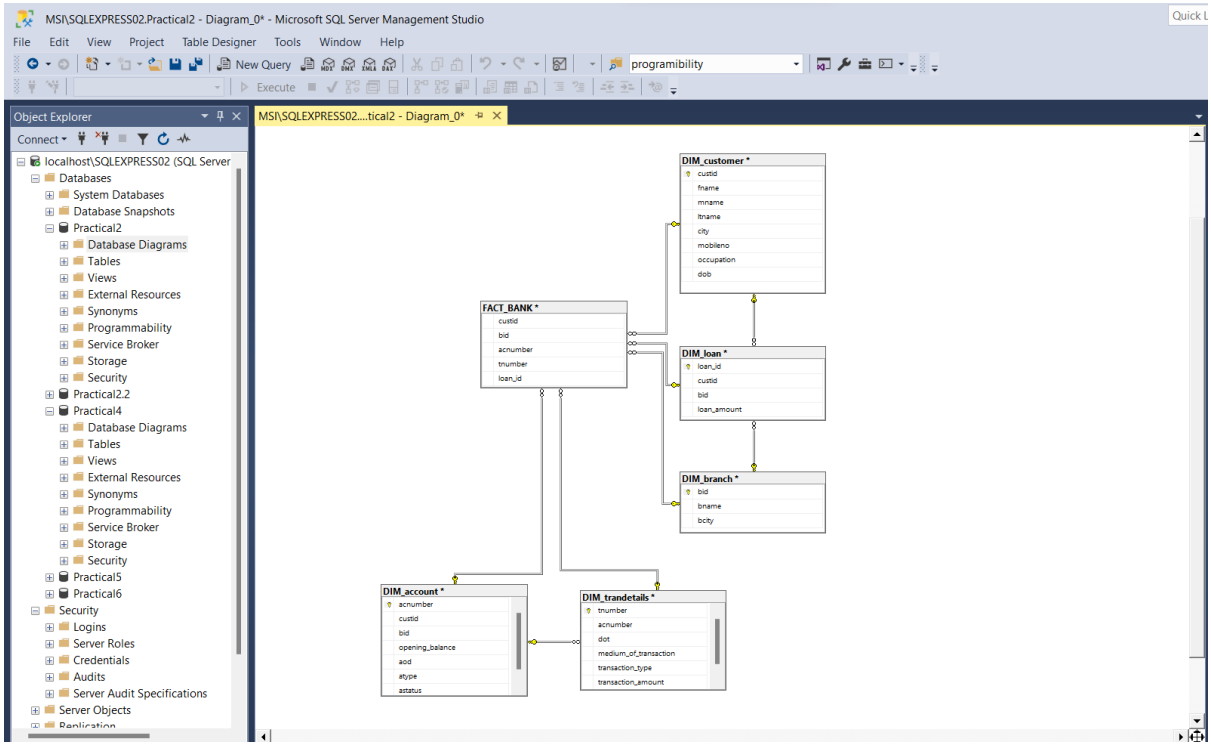


4)Set Relationships for fact table.





5) Set relationships of dimensional table with each other.



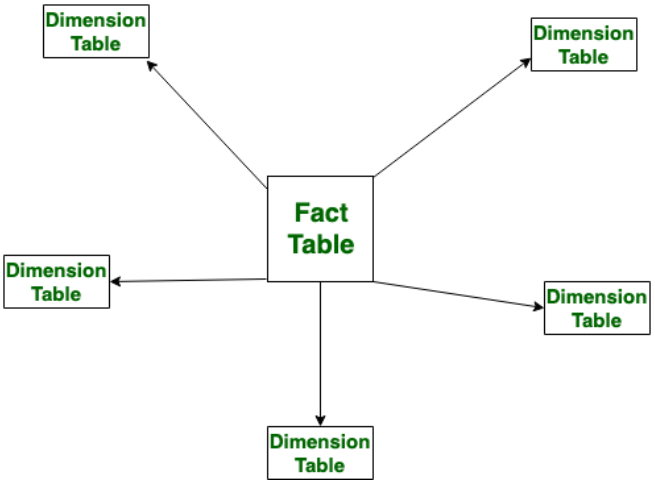
Conclusion: Multidimensional data constructed successfully.

Practical 5

Aim: Design and create cube by identifying measures and dimensions for star schema.

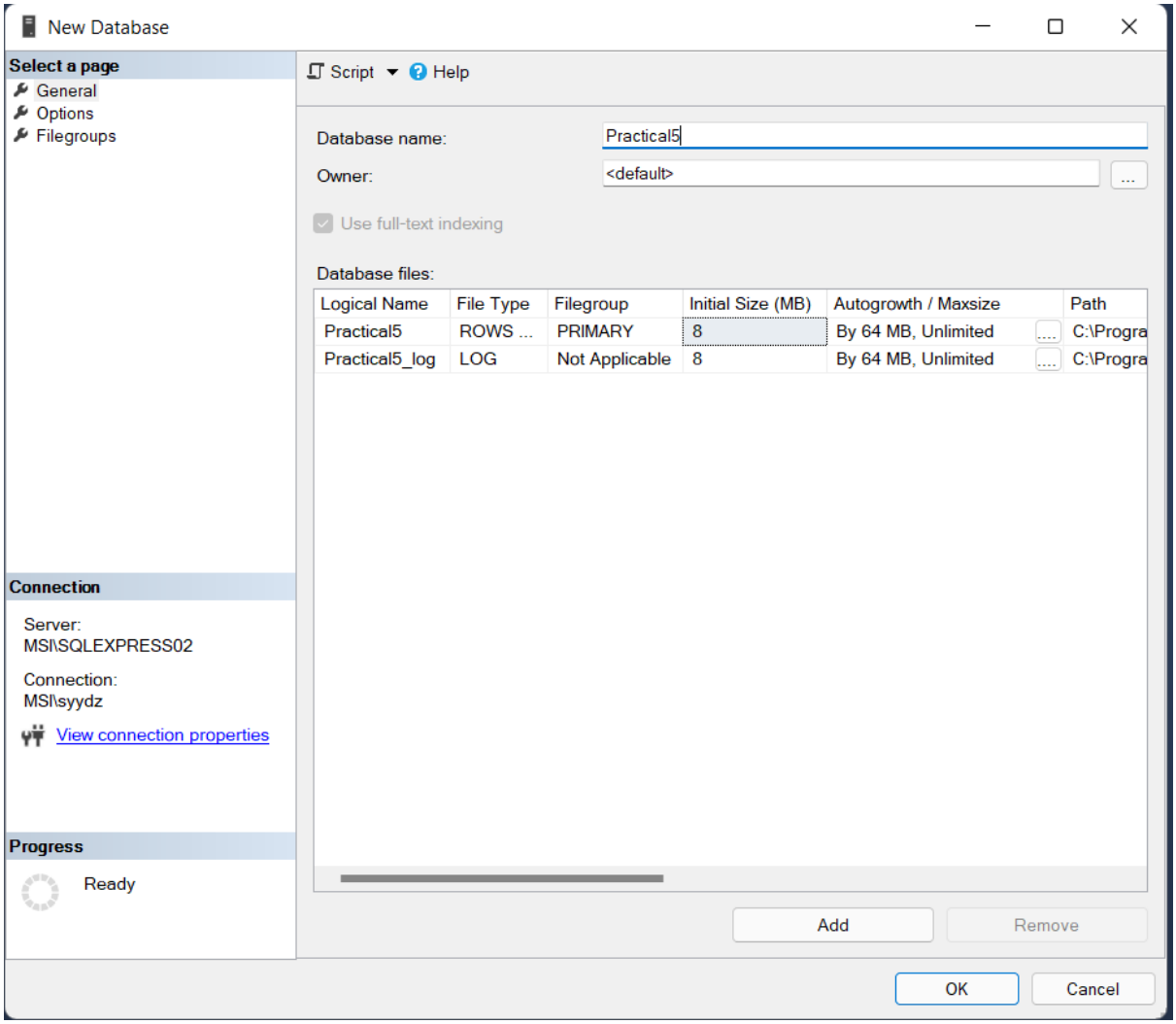
Theory:

Star Schema:
Star schema is the type of multidimensional model which is used for data warehouse. In star schema, the fact tables and the dimension tables are contained. In this schema fewer foreign-key join is used. This schema forms a star with fact table and dimension tables.

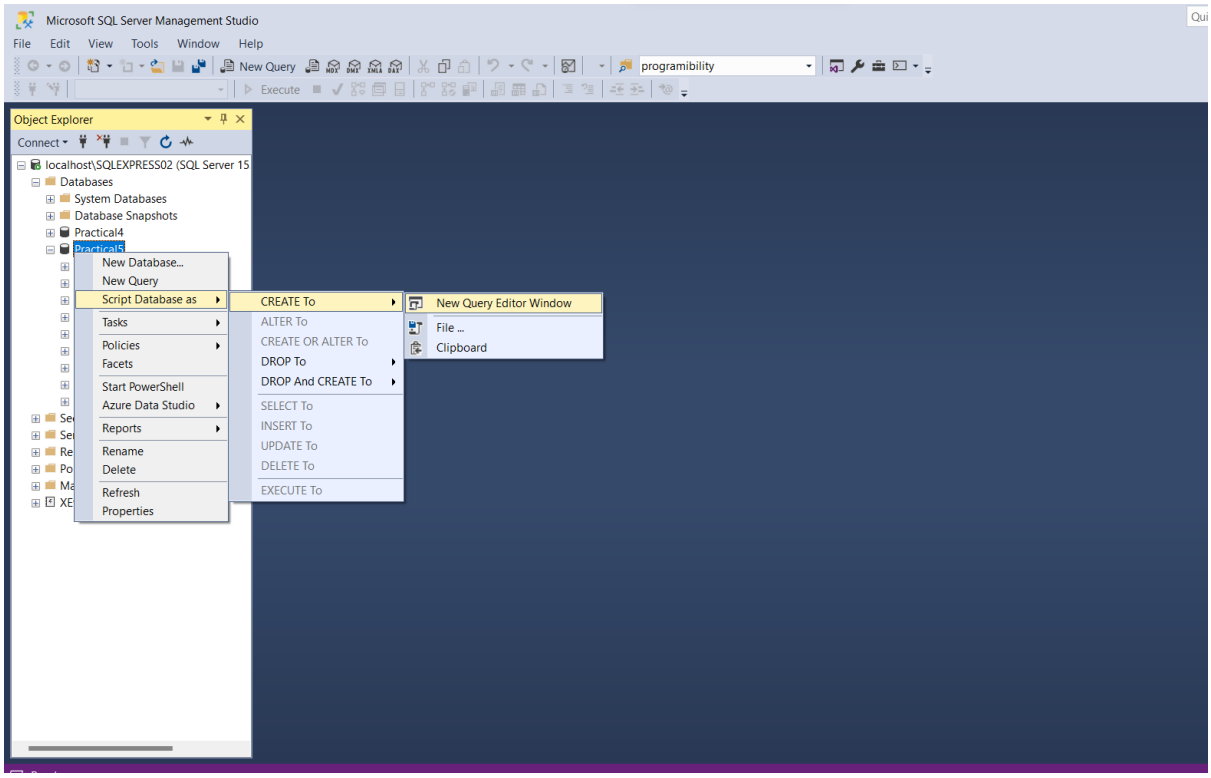


#Steps

1) Create New Database



2) Right Click on Database > Script Database as > Create to > Select: New Query Editor Window.

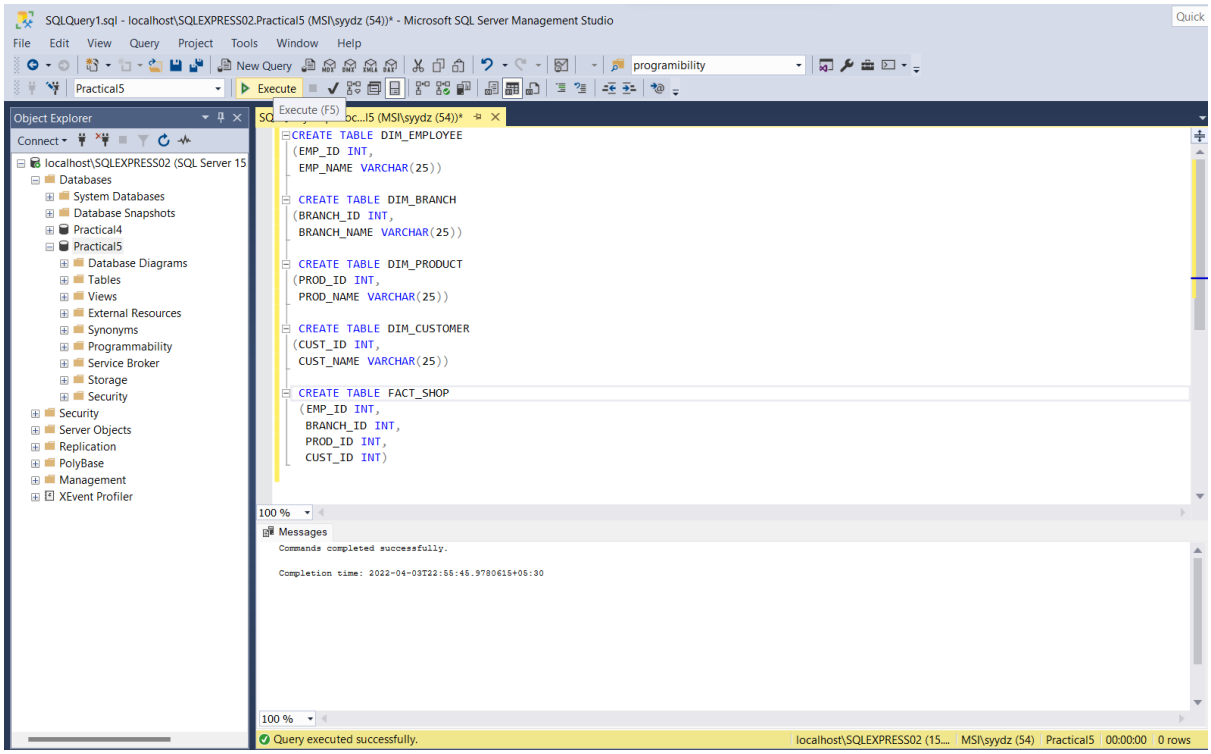


3) Remove pre-written queries

4) Create tables:

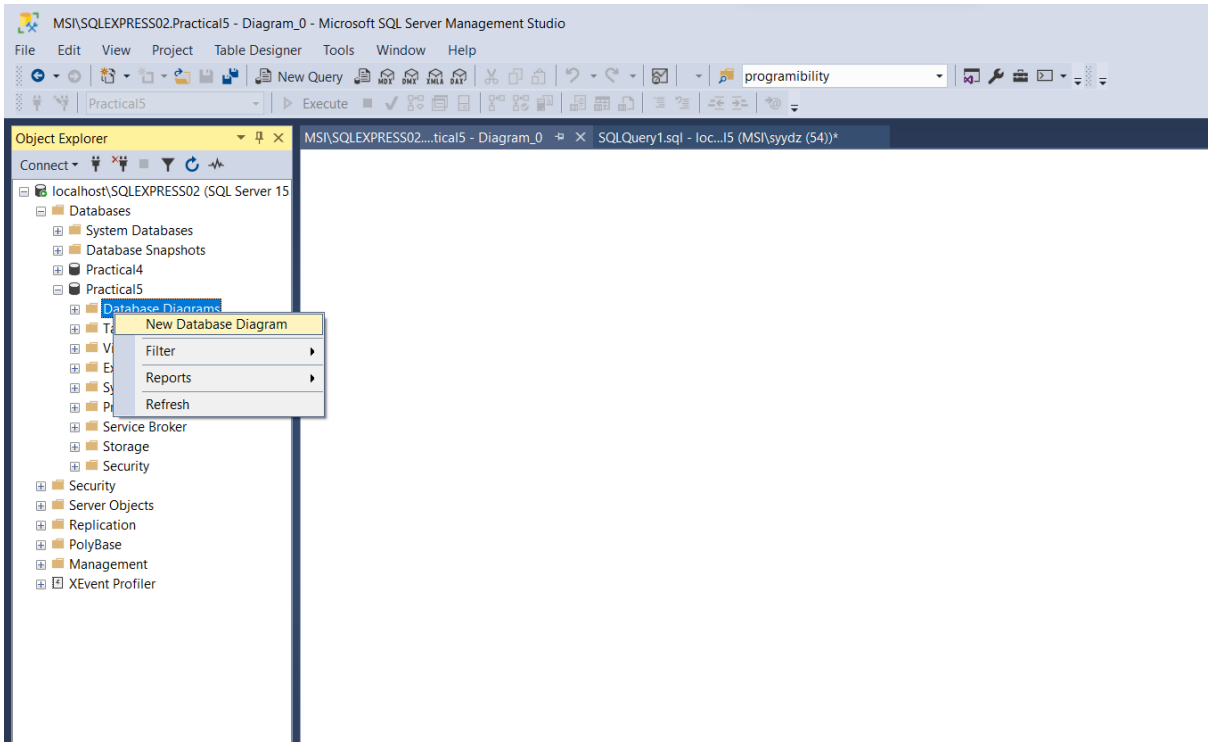
```
CREATE TABLE DIM_EMPLOYEE
(EMP_ID INT,
 EMP_NAME VARCHAR(25))
 CREATE TABLE DIM_BRANCH
(BRANCH_ID INT,
 BRANCH_NAME VARCHAR(25))
 CREATE TABLE DIM_PRODUCT
(PROD_ID INT,
 PROD_NAME VARCHAR(25))
 CREATE TABLE DIM_CUSTOMER
(CUST_ID INT,
 CUST_NAME VARCHAR(25))
 CREATE TABLE FACT_SHOP
 (EMP_ID INT,
  BRANCH_ID INT,
  PROD_ID INT,
  CUST_ID INT)
```

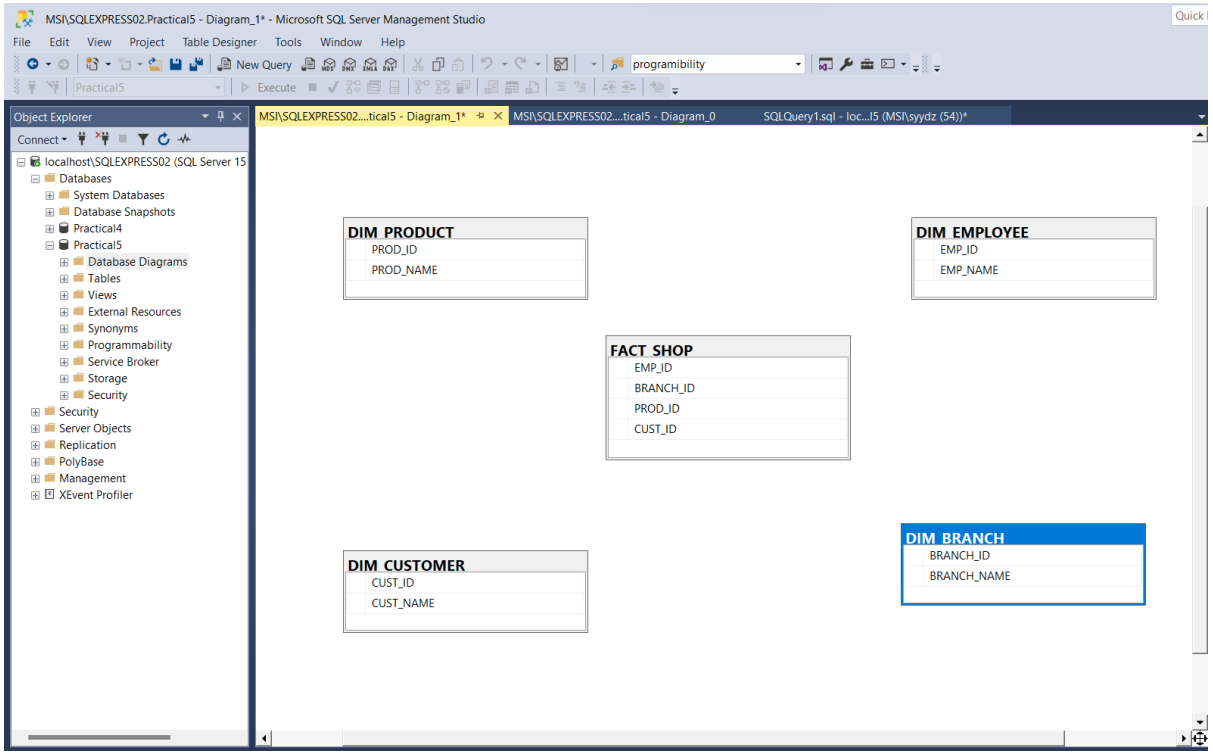
4) Execute queries



6) Create Database diagrams:

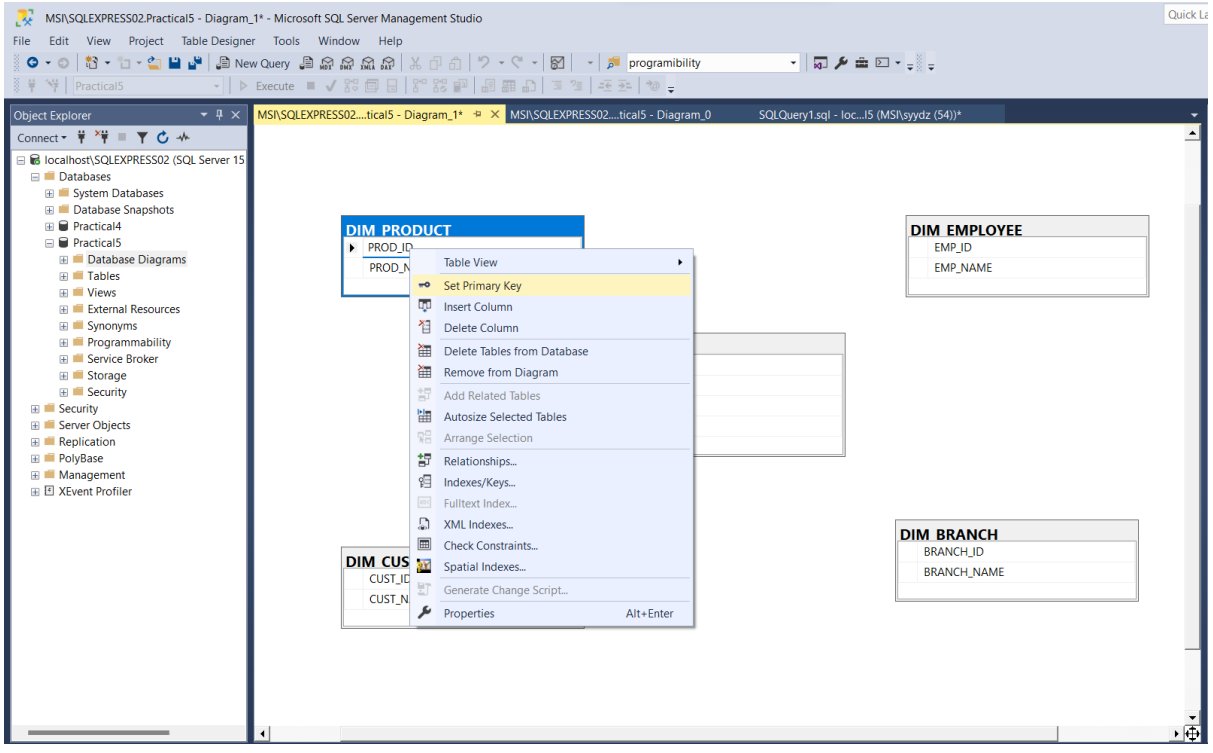
Right Click On Database Diagrams > New Database Diagram





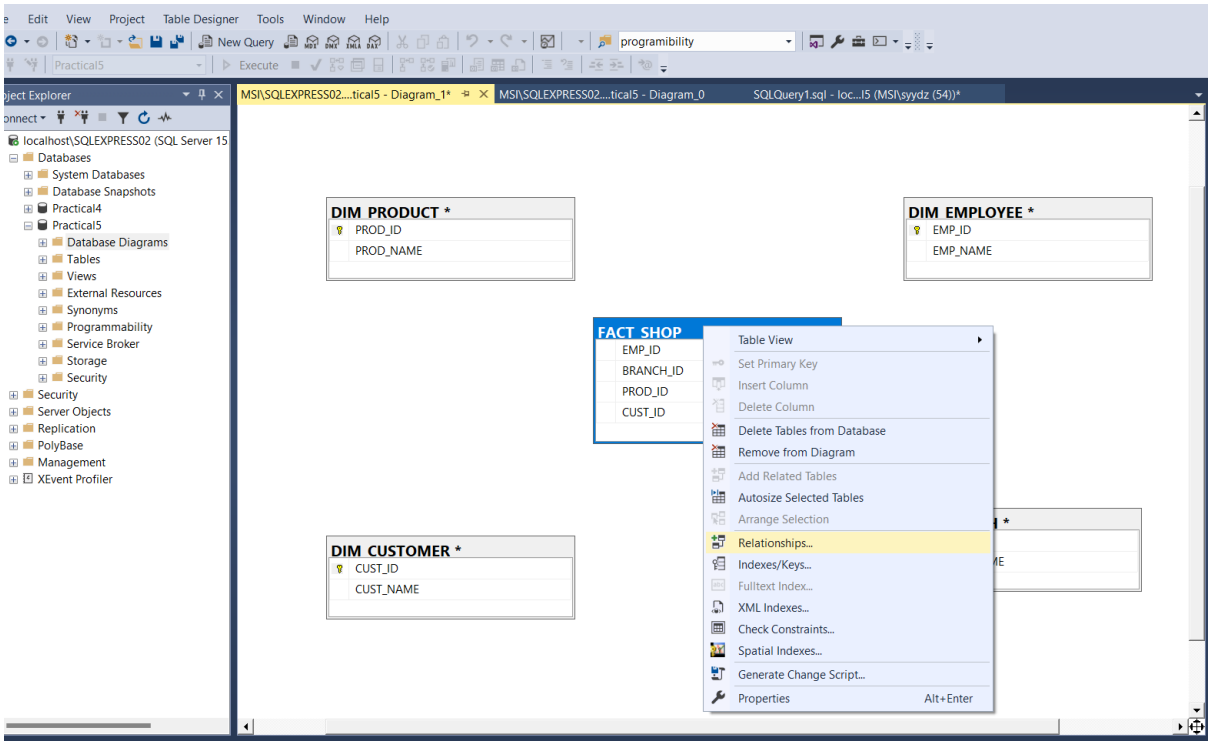
7) Set primary keys :

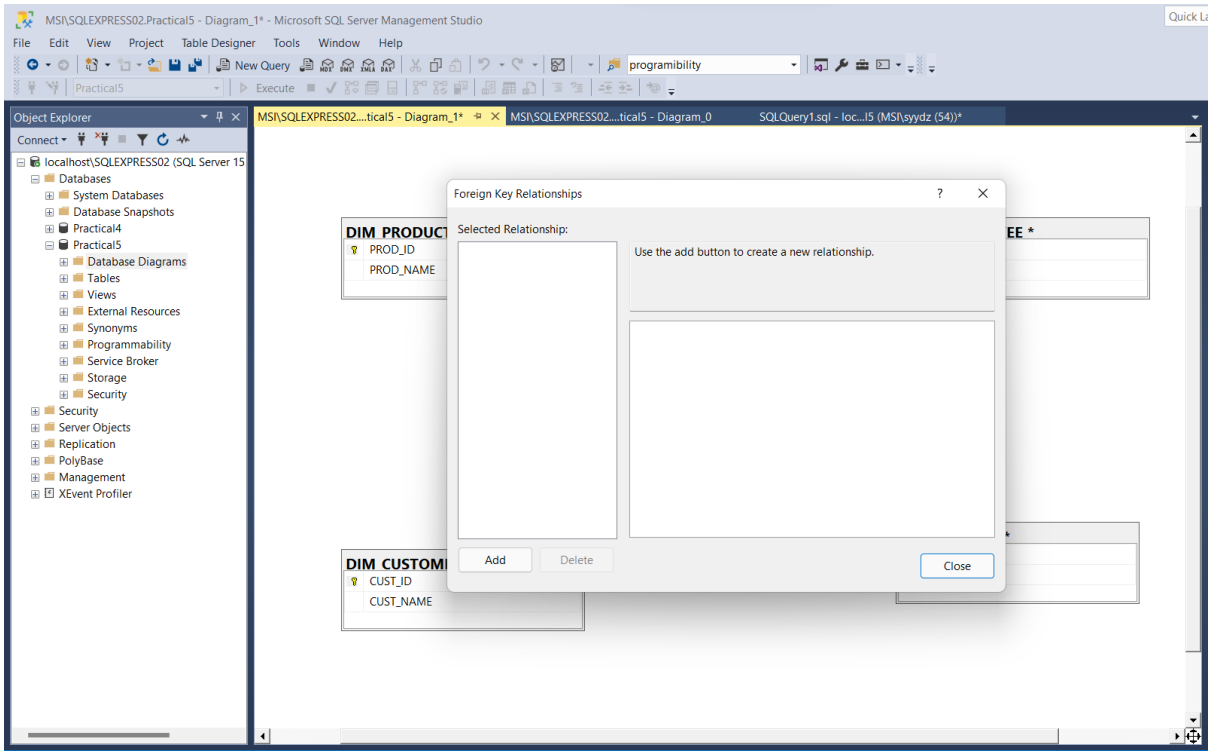
PROD_ID, EMP_ID, CUST_ID, BRANCH_ID



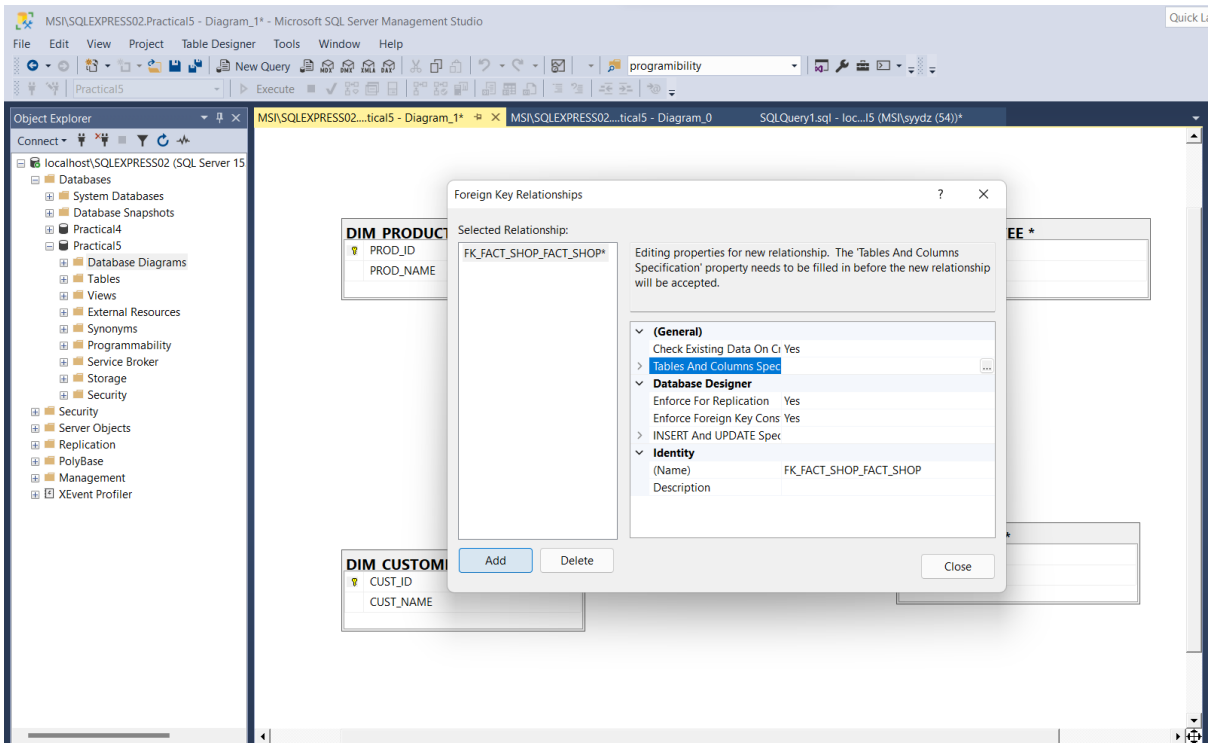
8) Create Relationships:

Right Click on Fact Shop table > Select Relationships > Add relations.

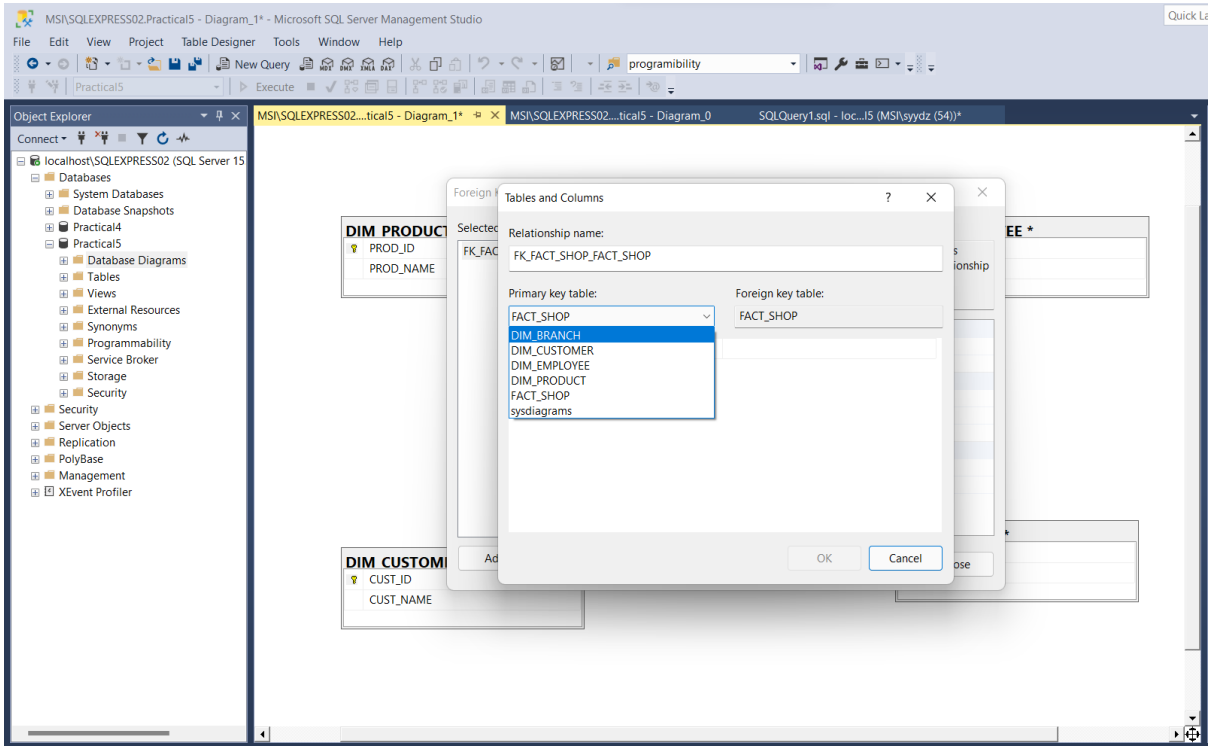


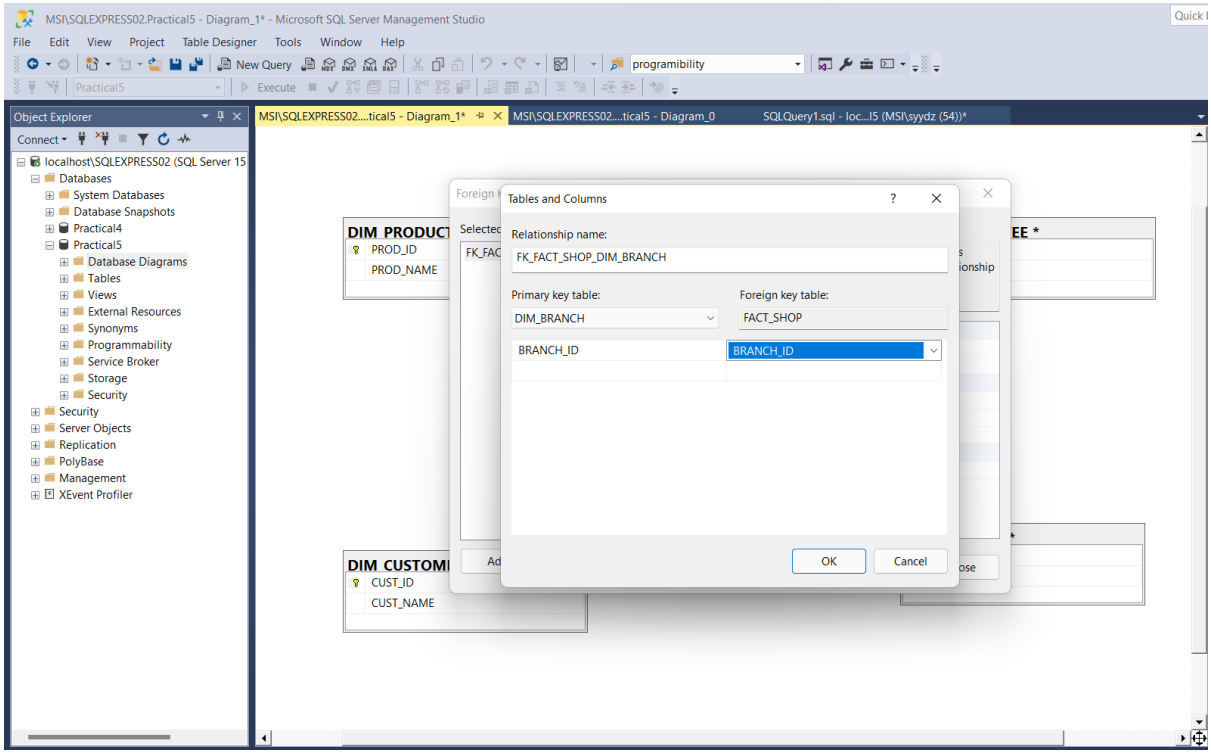


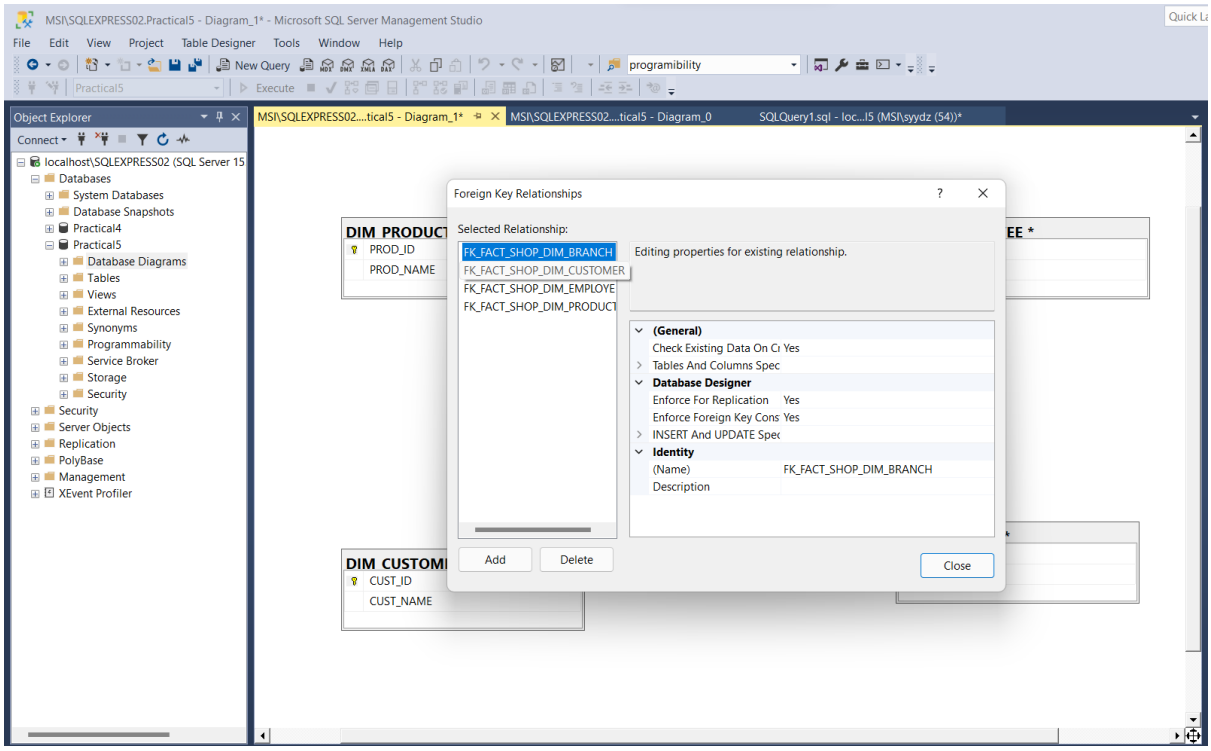
8) Click on Tables And Columns Sec(Expand …)



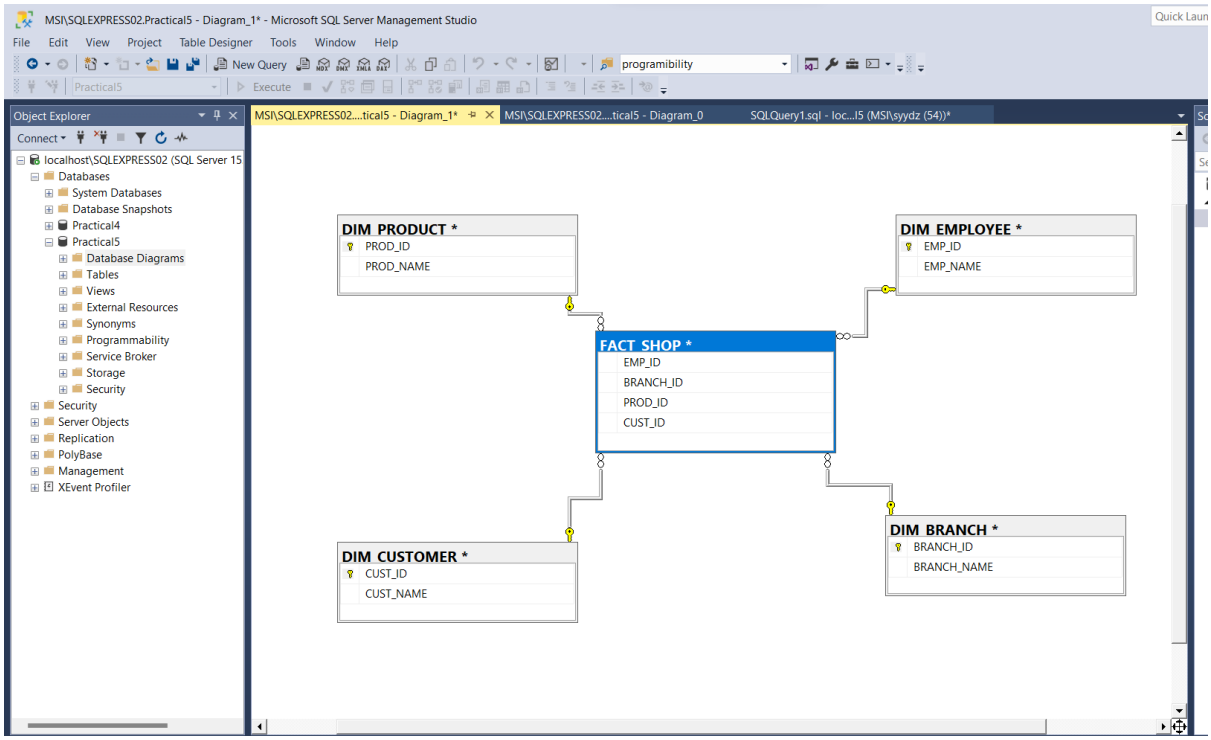
9) Select Primary key tables for every relation

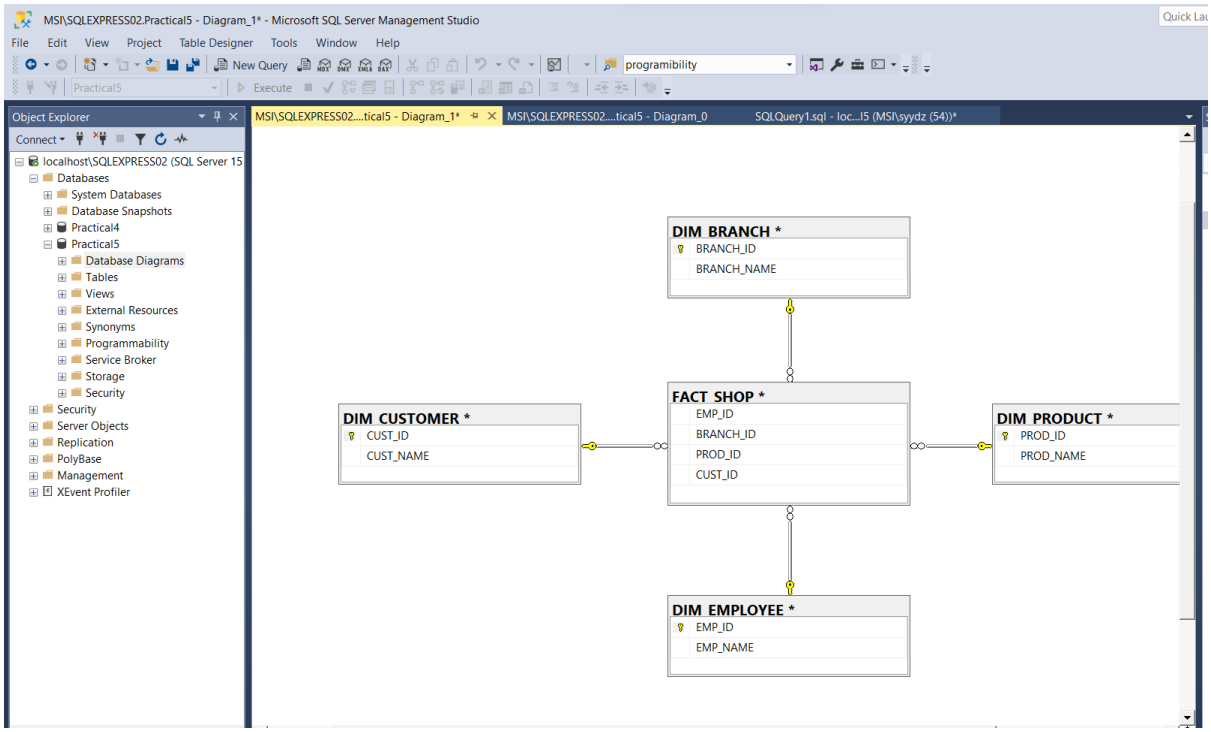






10) Close Relationships window





Conclusion: Star schema executed successfully.

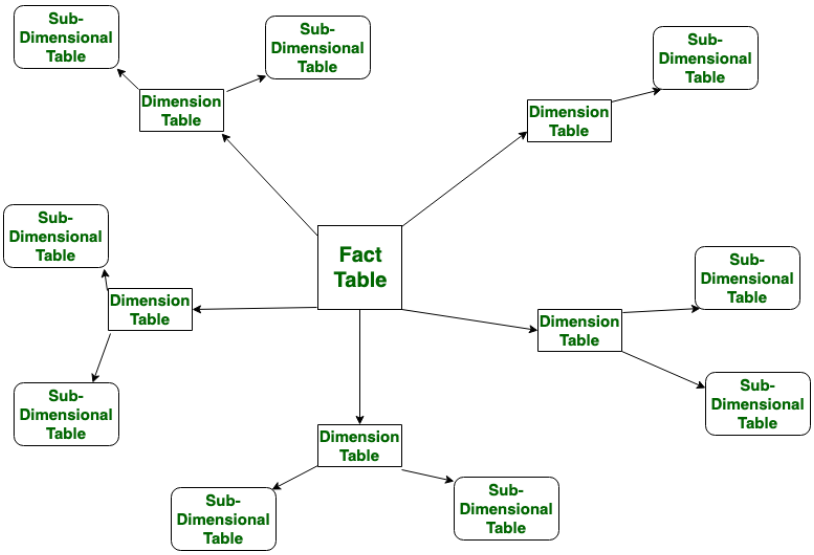
Practical 6

Aim: Design and create cube by identifying measures and dimensions for snow flake schema.

Theory:

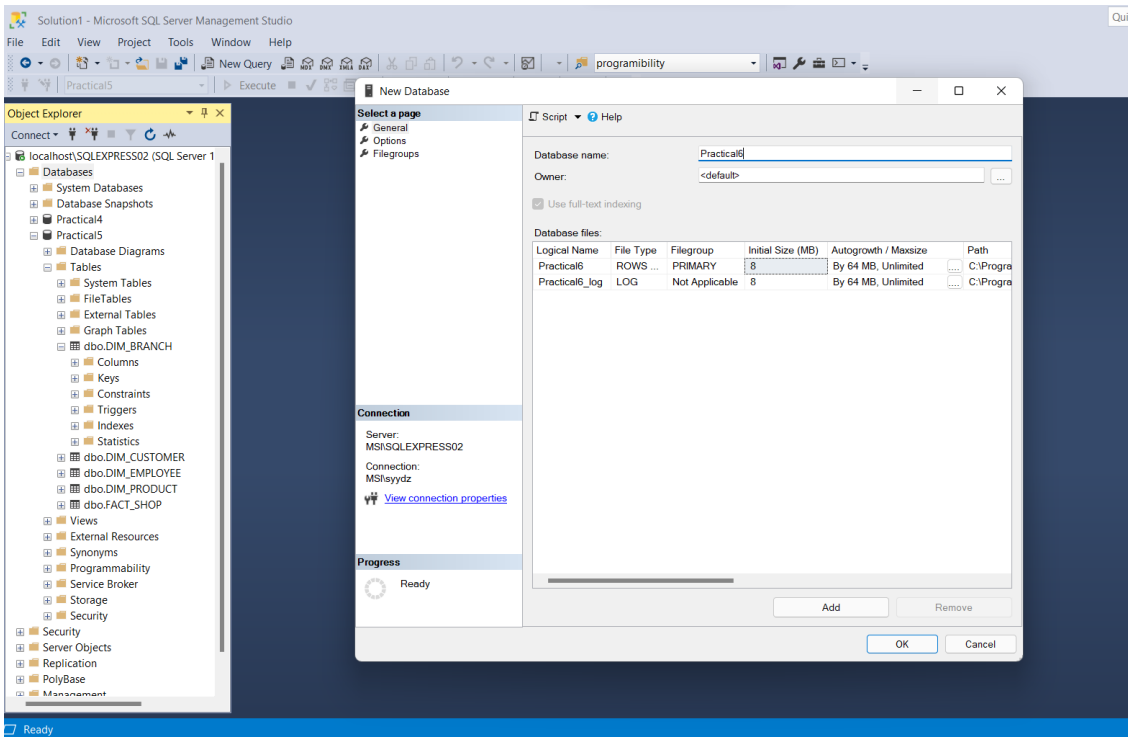
Snowflake Schema:

Snowflake Schema is also the type of multidimensional model which is used for data warehouse. In snowflake schema, The fact tables, dimension tables as well as sub dimension tables are contained. This schema forms a snowflake with fact tables, dimension tables as well as sub-dimension tables.

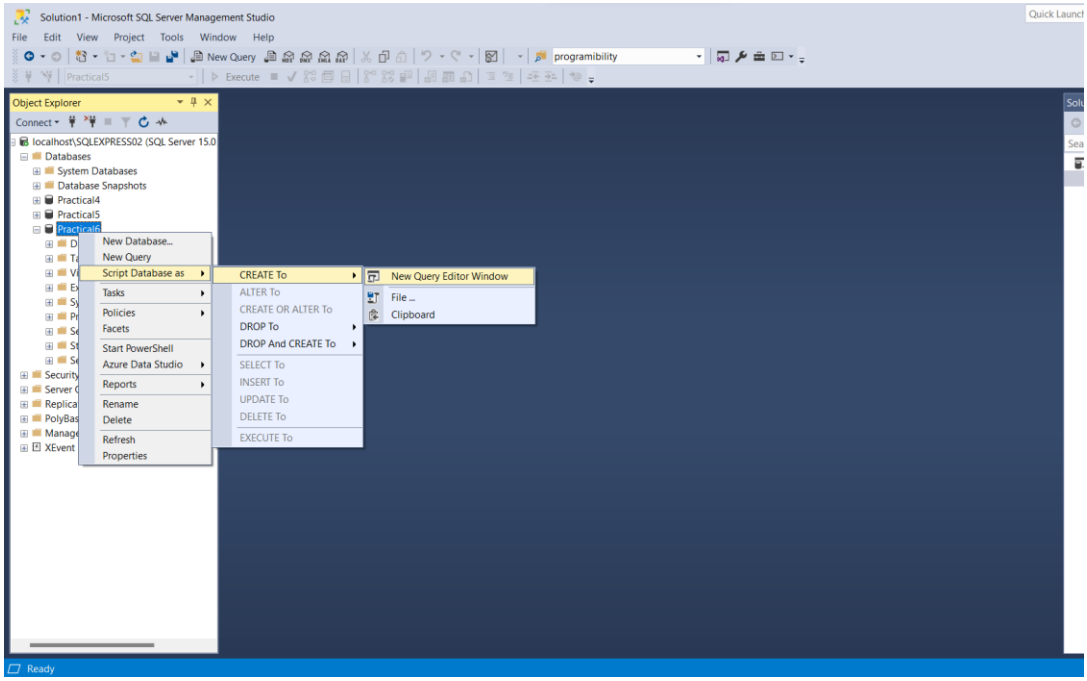


Steps:

1) Create database.



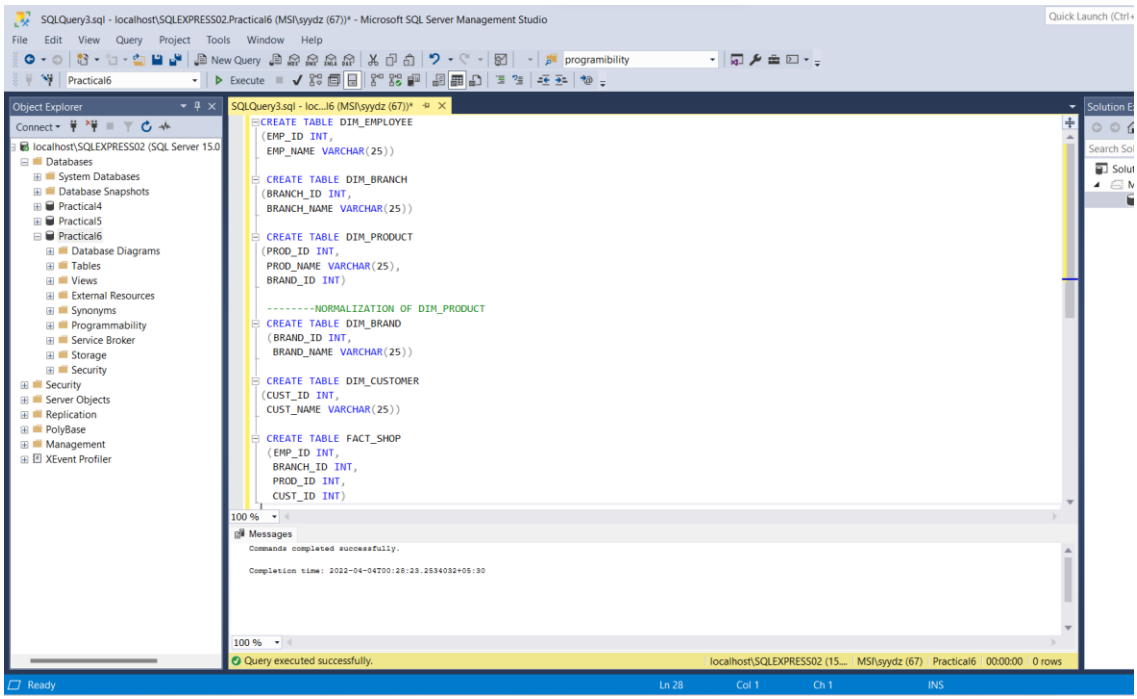
2) Script Database as > Create To > New Query Window



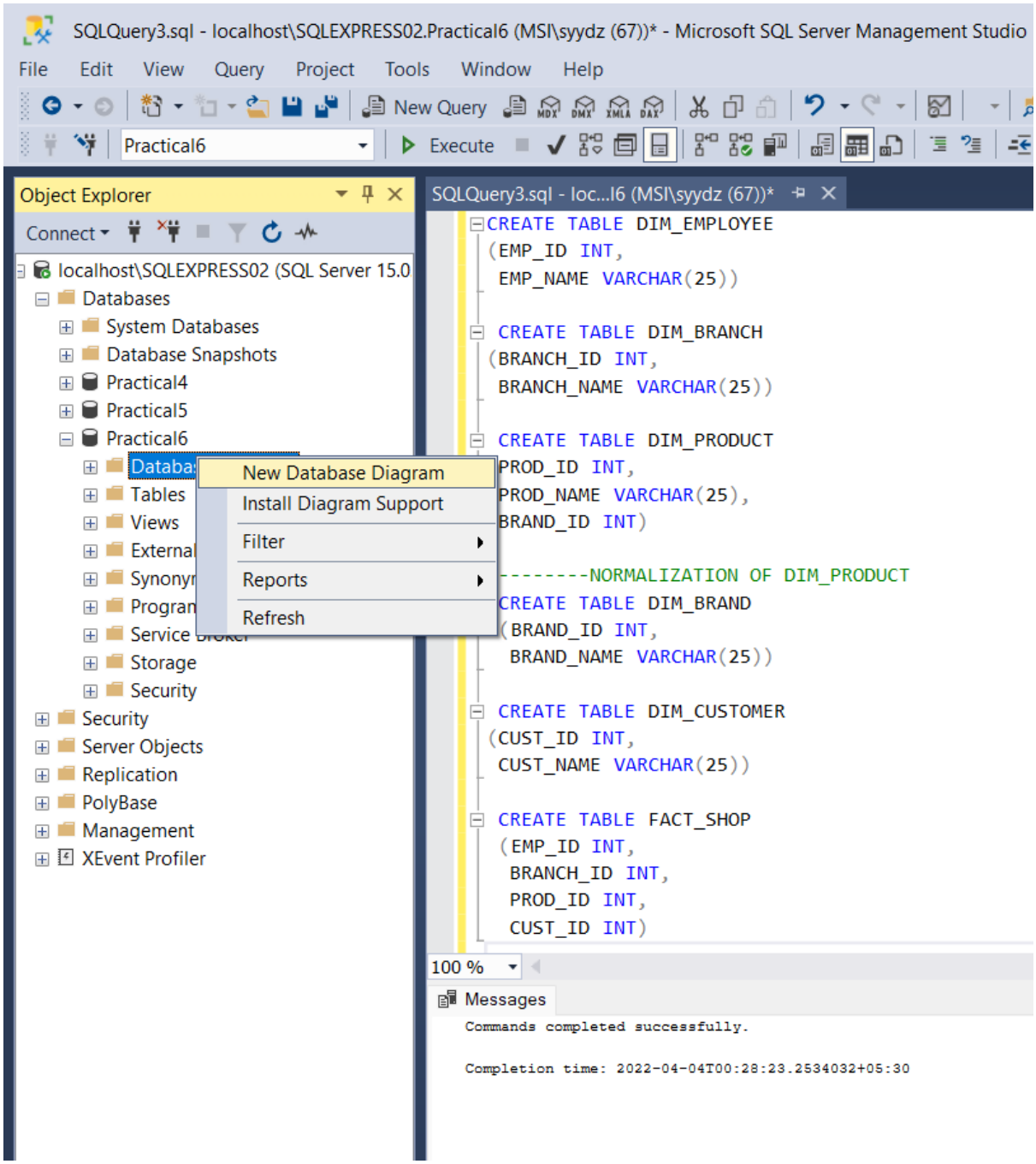
3) Create tables:

```
CREATE TABLE DIM_EMPLOYEE
(EMP_ID INT,
 EMP_NAME VARCHAR(25))
 CREATE TABLE DIM_BRANCH
(BRANCH_ID INT,
 BRANCH_NAME VARCHAR(25))
 CREATE TABLE DIM_PRODUCT
(PROD_ID INT,
 PROD_NAME VARCHAR(25),
 BRAND_ID INT)
CREATE TABLE DIM_BRAND
 (BRAND_ID INT,
  BRAND_NAME VARCHAR(25))
 CREATE TABLE DIM_CUSTOMER
(CUST_ID INT,
 CUST_NAME VARCHAR(25))
 CREATE TABLE FACT_SHOP
 (EMP_ID INT,
  BRANCH_ID INT,
  PROD_ID INT,
```

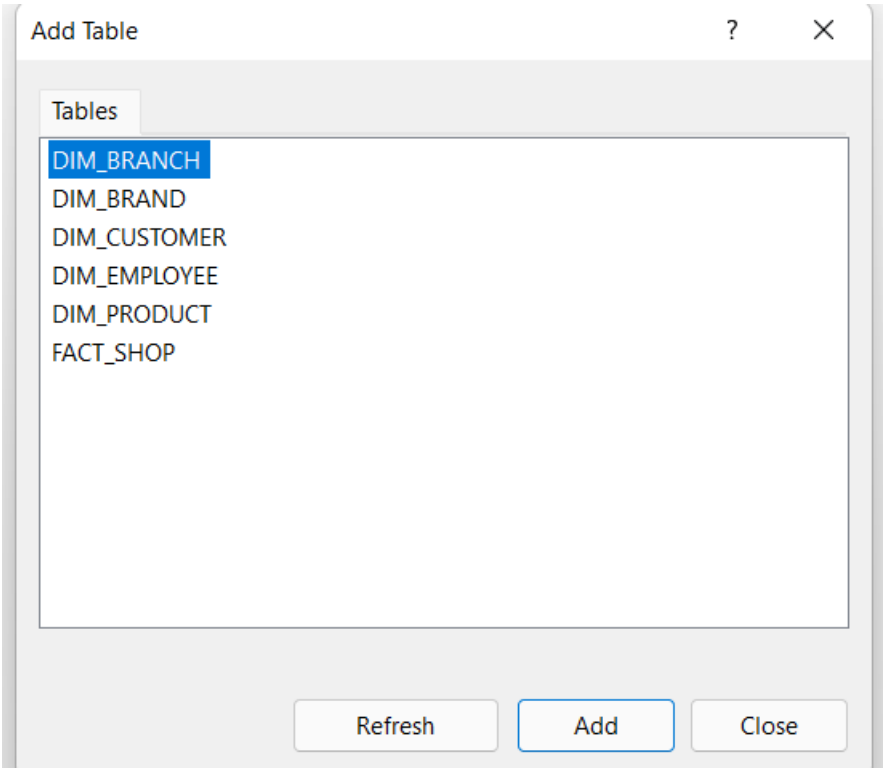
CUST_ID INT)



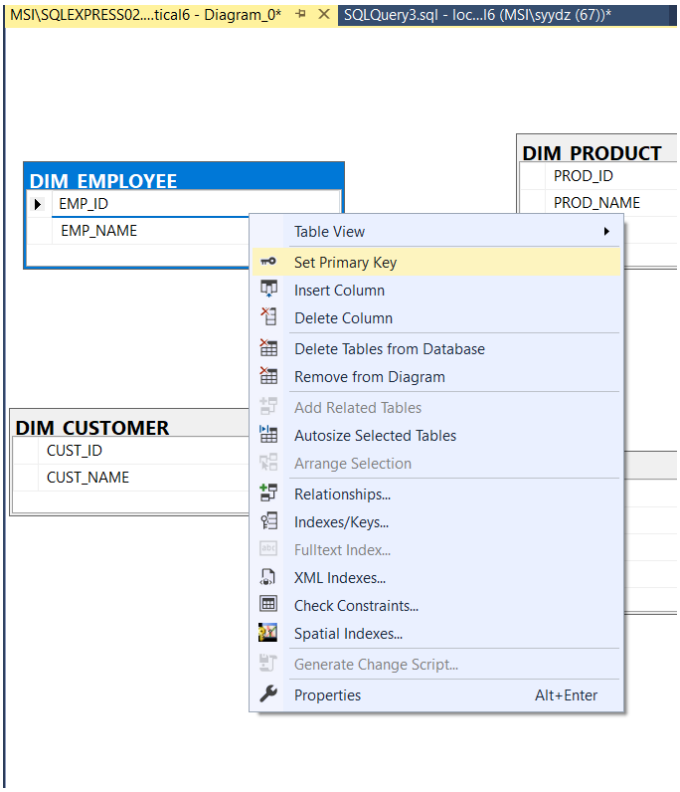
4) Create New database diagram


SQLQuery3.sql - localhost\SQLEXPRESS02.Practical6 (MSI\syydz (67))* - Microsoft SQL Server Management Studio
File Edit View Query Project Tools Window Help
New Query
Practical6
Execute
Object Explorer
Connect
localhost\SQLEXPRESS02 (SQL Server 15.0
Databases
System Databases
Database Snapshots
Practical4
Practical5
Practical6
Tables
Views
Storage
Security
Security
Server Objects
Replication
PolyBase
Management
XEvent Profiler
New Database Diagram
Install Diagram Support
Filter
Reports
Refresh
SQLQuery3.sql - loc...l6 (MSI\syydz (67))*
CREATE TABLE DIM_EMPLOYEE
(EMP_ID INT,
EMP_NAME VARCHAR(25))
CREATE TABLE DIM_BRANCH
(BRANCH_ID INT,
BRANCH_NAME VARCHAR(25))
CREATE TABLE DIM_PRODUCT
PROD_ID INT,
PROD_NAME VARCHAR(25),
BRAND_ID INT)
--------NORMALIZATION OF DIM_PRODUCT
CREATE TABLE DIM_BRAND
(BRAND_ID INT,
BRAND_NAME VARCHAR(25))
CREATE TABLE DIM_CUSTOMER
(CUST_ID INT,
CUST_NAME VARCHAR(25))
CREATE TABLE FACT_SHOP
(EMP_ID INT,
BRANCH_ID INT,
PROD_ID INT,
CUST_ID INT)
100 %
Messages
Commands completed successfully.
Completion time: 2022-04-04T00:28:23.2534032+05:30

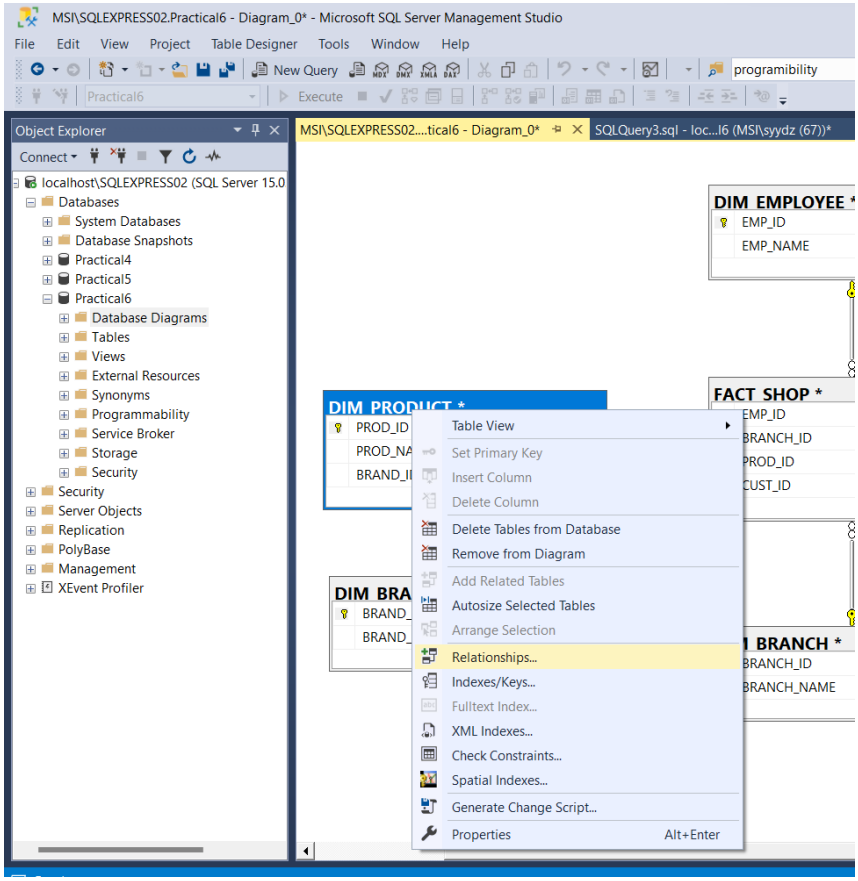
5) Add tables



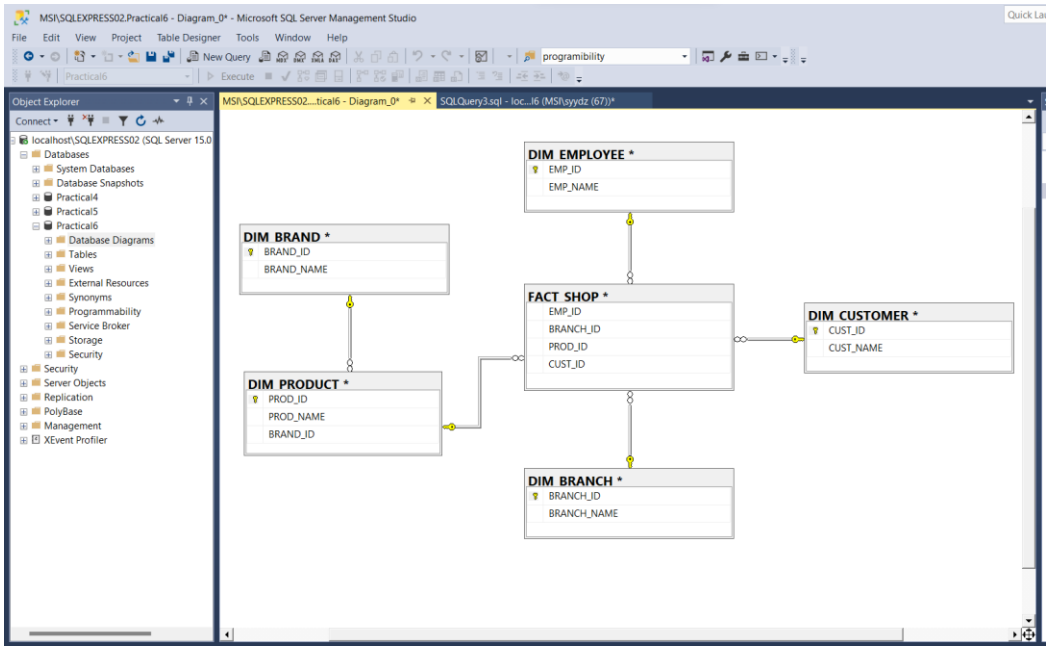
6) Set Primary key for all tables:



7) Add relationship of tables with fact shop.



8) Add relationship of product and brand .



Conclusion: Snowflake schema implemented successfully.

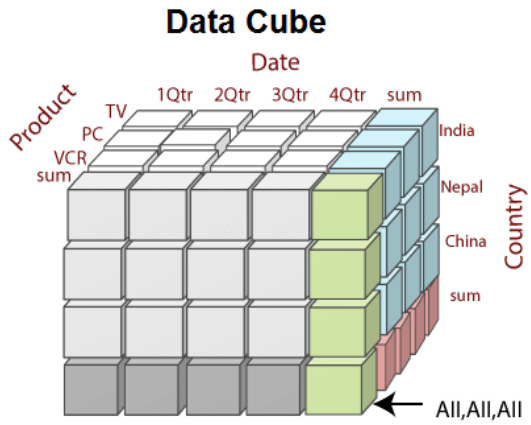
Practical 7

Aim: Create and uses excel pivot table report based on data cube operations.

Theory:

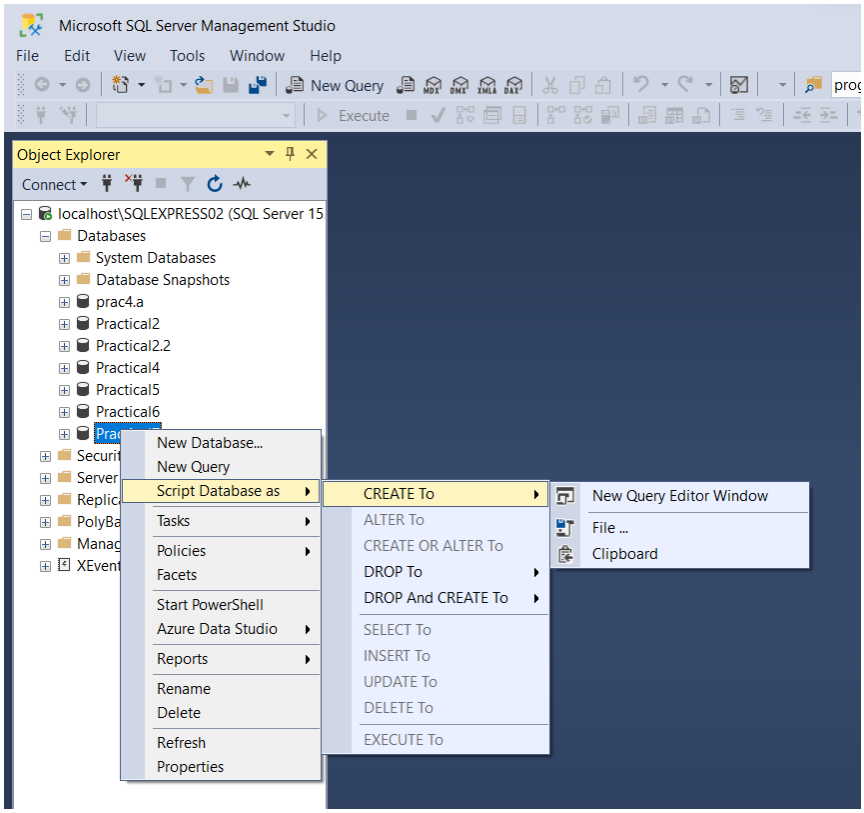
What is Data Cube?

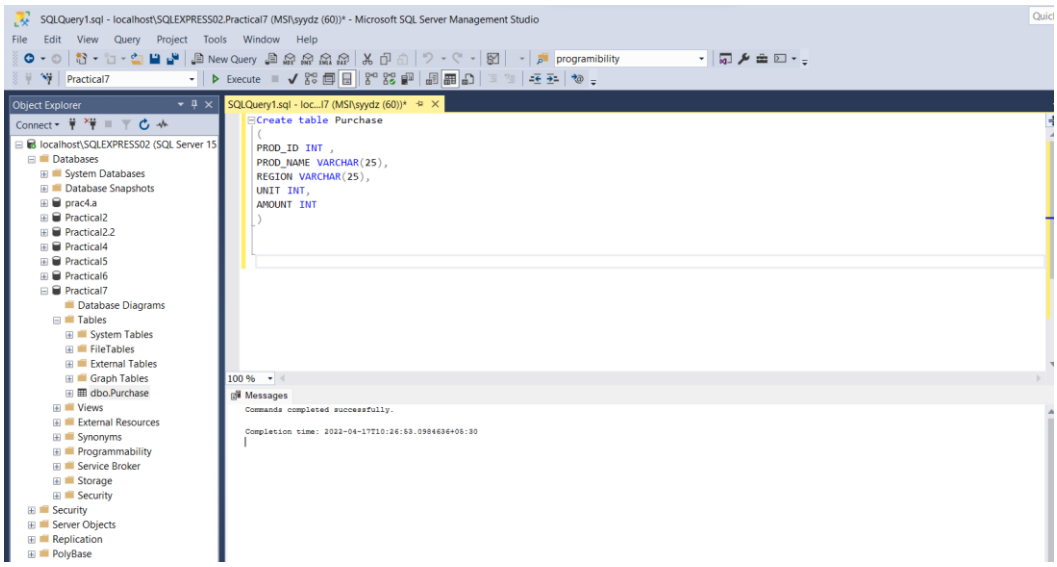
When data is grouped or combined in multidimensional matrices called Data Cubes. The data cube method has a few alternative names or a few variants, such as "Multidimensional databases," "materialized views," and "OLAP (On-Line Analytical Processing)."

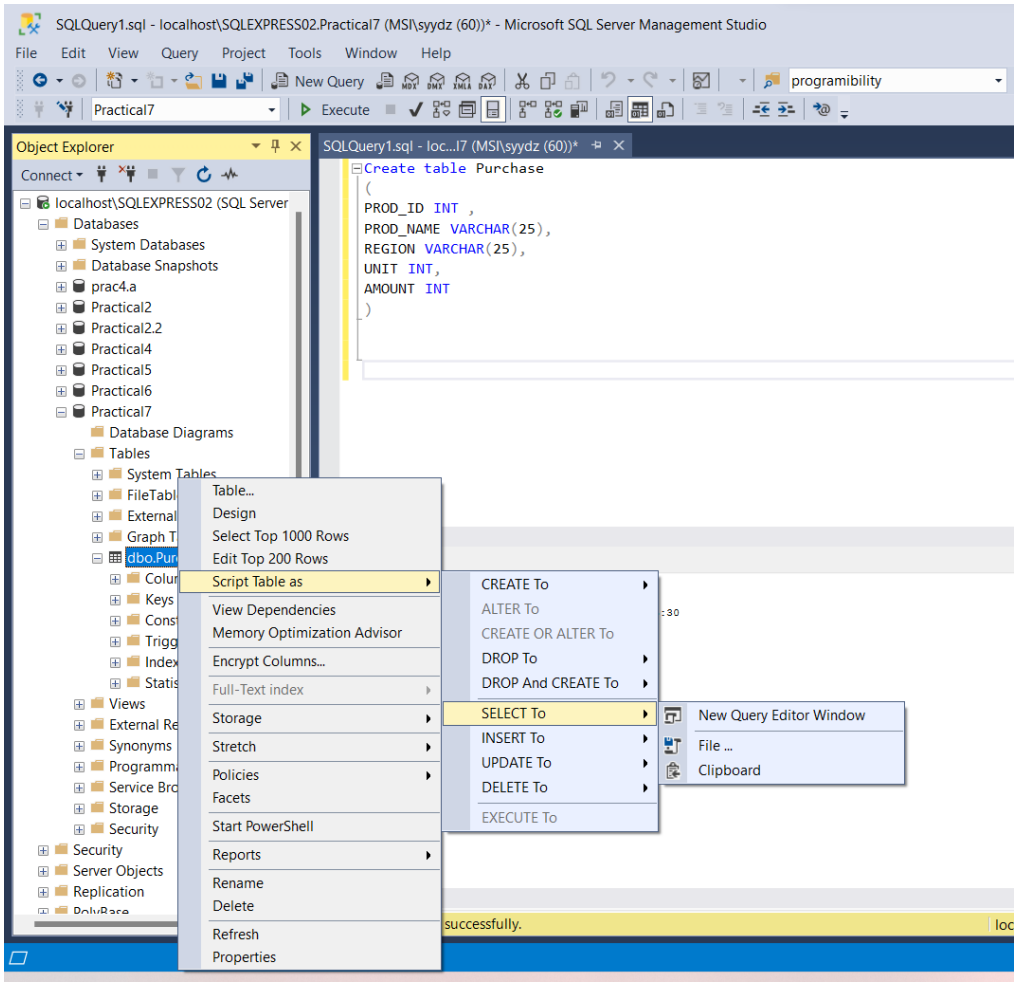


Steps:

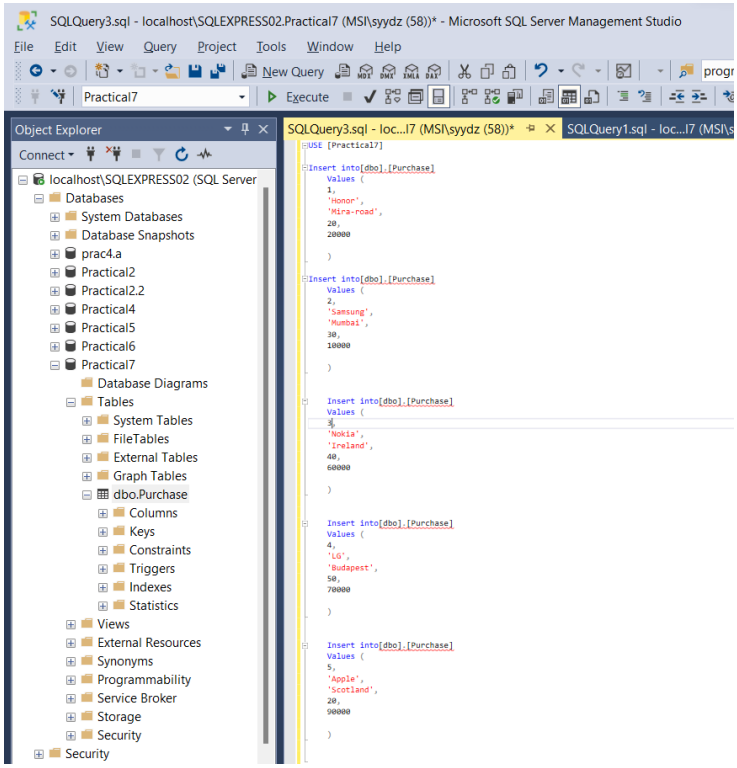
1) Create new database

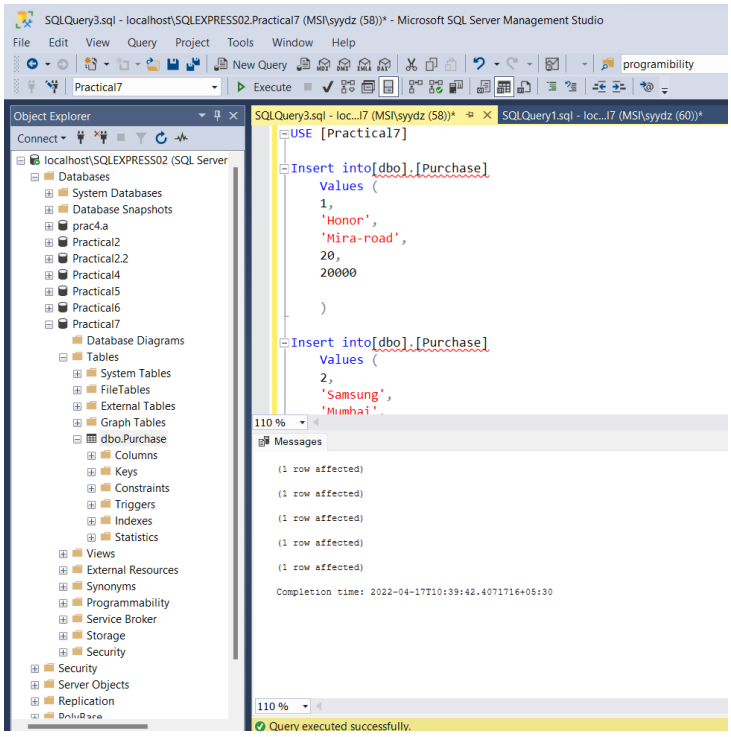



SQLQuery1.sql - localhost\SQLEXPRESS02.Practical7 (MSI\syydz (60))* - Microsoft SQL Server Management Studio
File Edit View Query Project Tools Window Help
New Query
programability
Practical7
Execute
Object Explorer
Connect
localhost\SQLEXPRESS02 (SQL Server 15
Databases
System Databases
Database Snapshots
prac4.a
Practical2
Practical2.2
Practical4
Practical5
Practical6
Practical7
Database Diagrams
Tables
System Tables
FileTables
External Tables
Graph Tables
dbo.Purchase
Views
External Resources
Synonyms
Programmability
Service Broker
Storage
Security
Security
Server Objects
Replication
PolyBase
SQLQuery1.sql - loc...I7 (MSI\syydz (60))*
Create table Purchase
(
PROD_ID INT ,
PROD_NAME VARCHAR(25),
REGION VARCHAR(25),
UNIT INT,
AMOUNT INT
)
100 %
Messages
Commands completed successfully.
Completion time: 2022-04-17T10:26:53.0984636+05:30

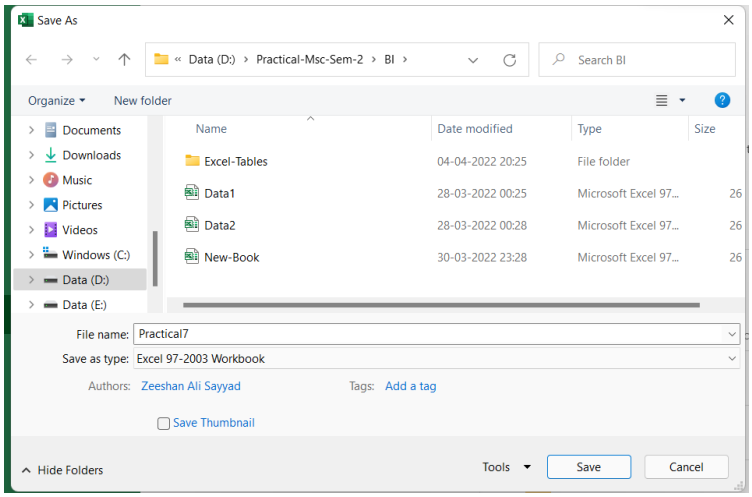

SQLQuery1.sql - localhost\SQLEXPRESS02.Practical7 (MSI\syydz (60))* - Microsoft SQL Server Management Studio
File Edit View Query Project Tools Window Help
New Query
programability
Practical7
Execute
Object Explorer
Connect
localhost\SQLEXPRESS02 (SQL Server
Databases
System Databases
Database Snapshots
prac4.a
Practical2
Practical2.2
Practical4
Practical5
Practical6
Practical7
Database Diagrams
Tables
System Tables
Views
Security
Server Objects
Replication
SQLQuery1.sql - loc...I7 (MSI\syydz (60))*
Create table Purchase
(
PROD_ID INT ,
PROD_NAME VARCHAR(25),
REGION VARCHAR(25),
UNIT INT,
AMOUNT INT
)
Table...
Design
Select Top 1000 Rows
Edit Top 200 Rows
Script Table as
View Dependencies
Memory Optimization Advisor
Encrypt Columns...
Full-Text index
Storage
Stretch
Policies
Facets
Start PowerShell
Reports
Rename
Delete
Refresh
Properties
CREATE To
ALTER To
CREATE OR ALTER To
DROP To
DROP And CREATE To
SELECT To
INSERT To
UPDATE To
DELETE To
EXECUTE To
New Query Editor Window
File ...
Clipboard
successfully.

2) Insert data in table

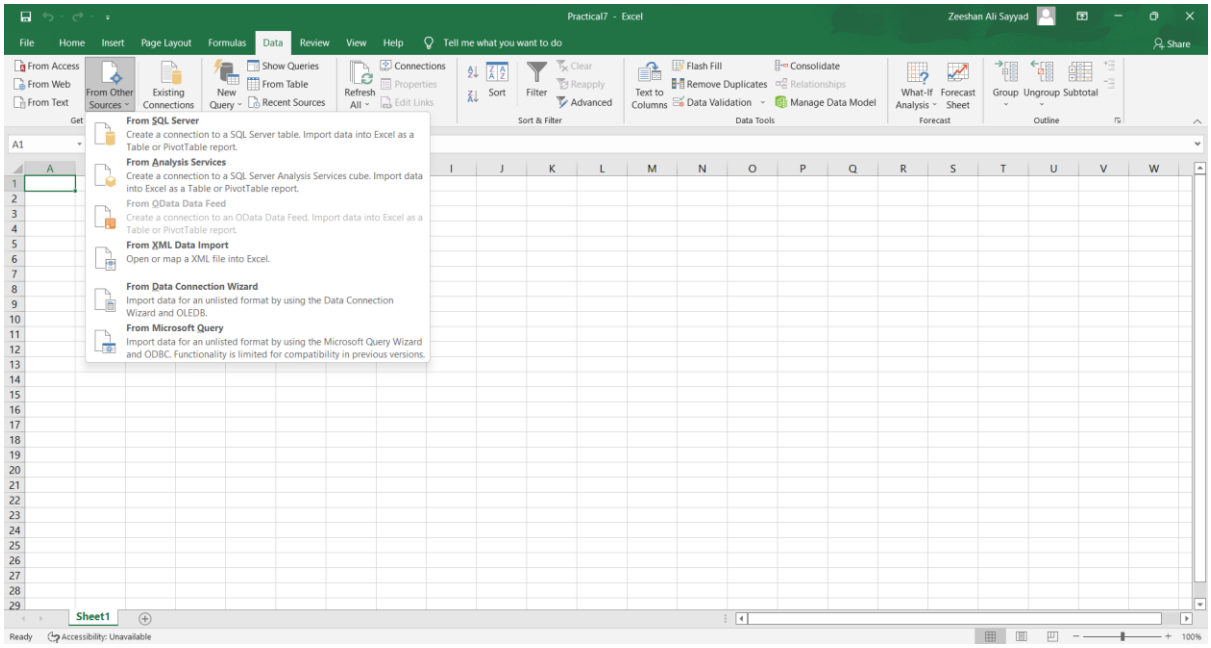




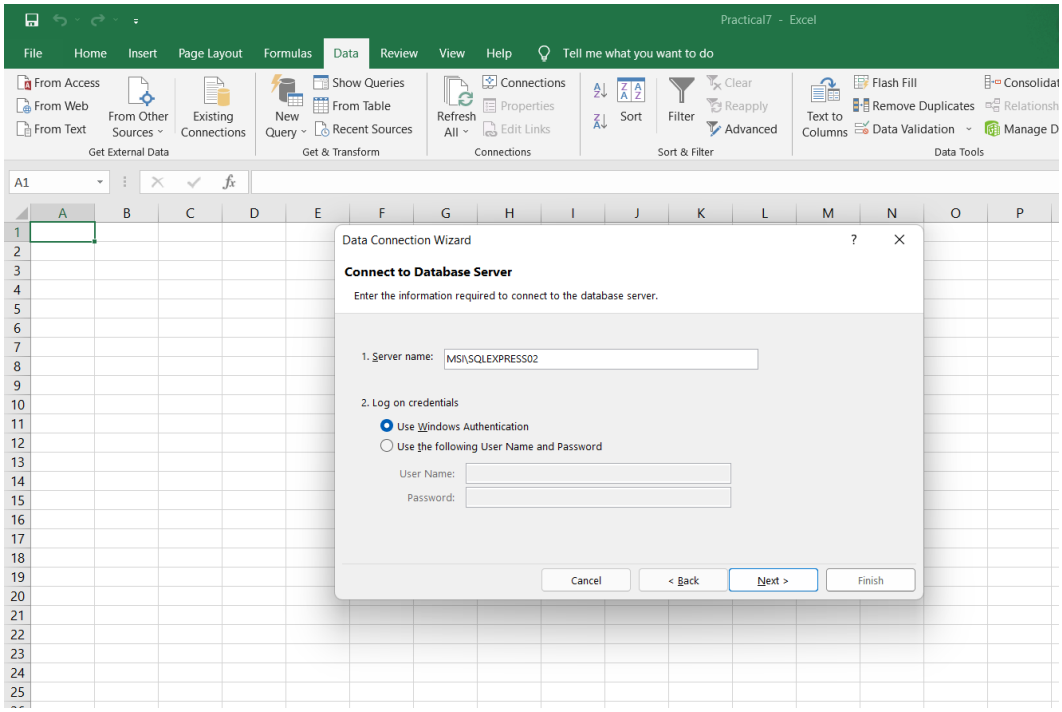
3) Create a new Excel File



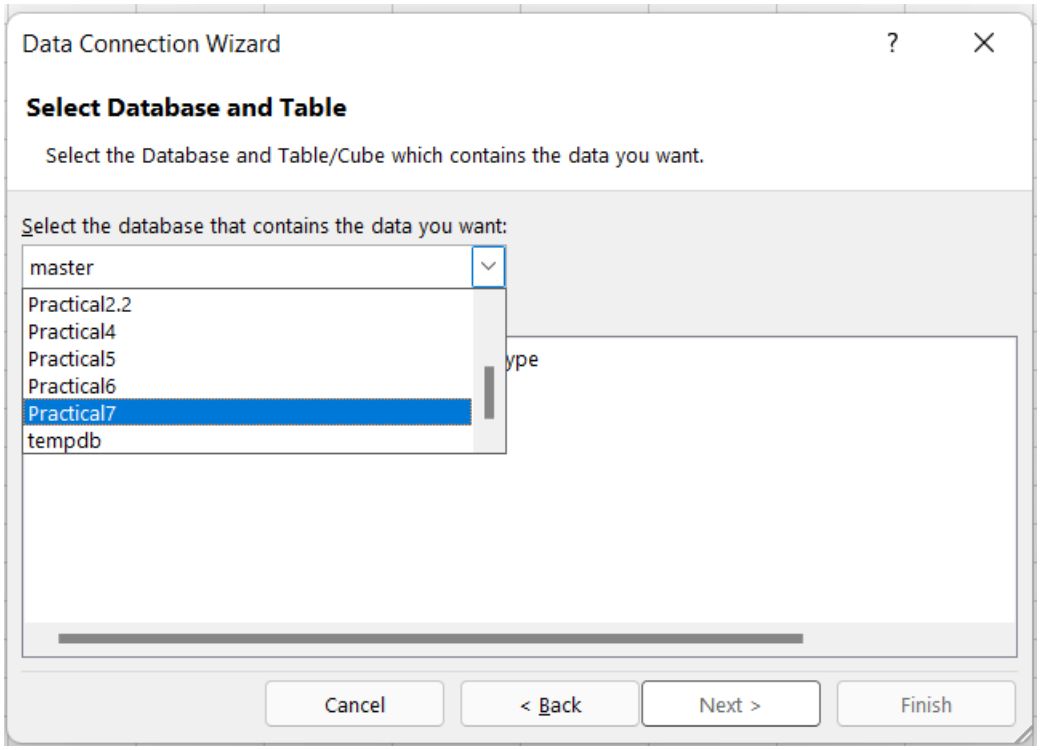
4) Go to Data > From Other Sources> Click on From SQL Server



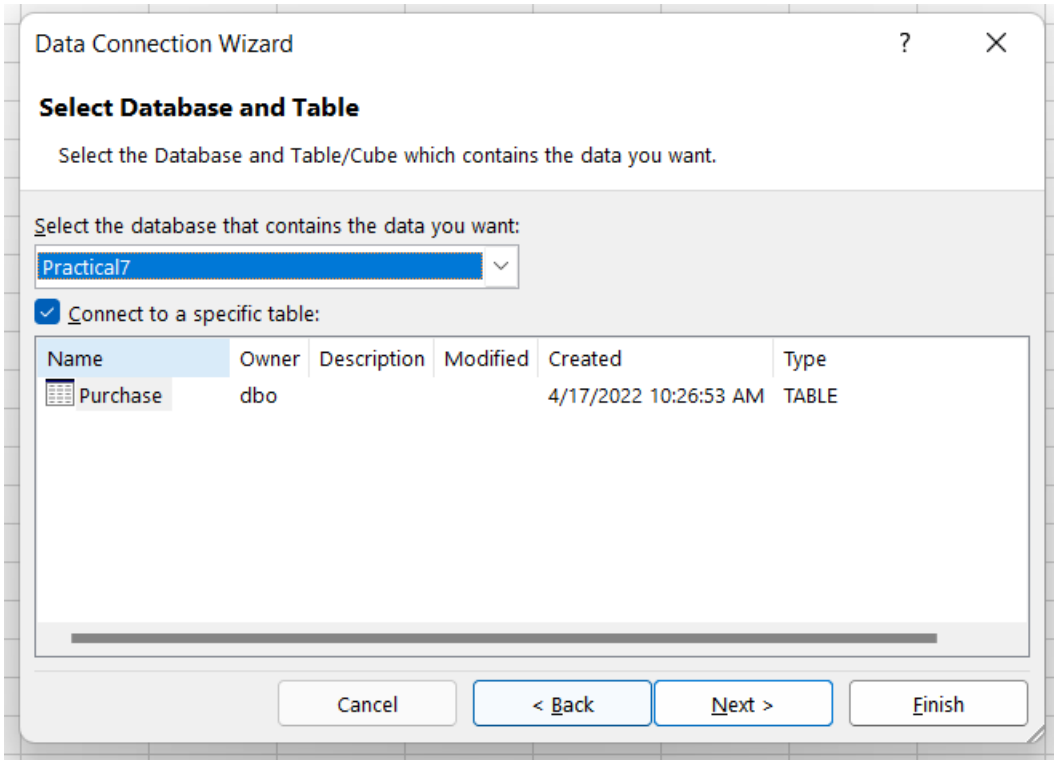
5) Connect to database using server name.



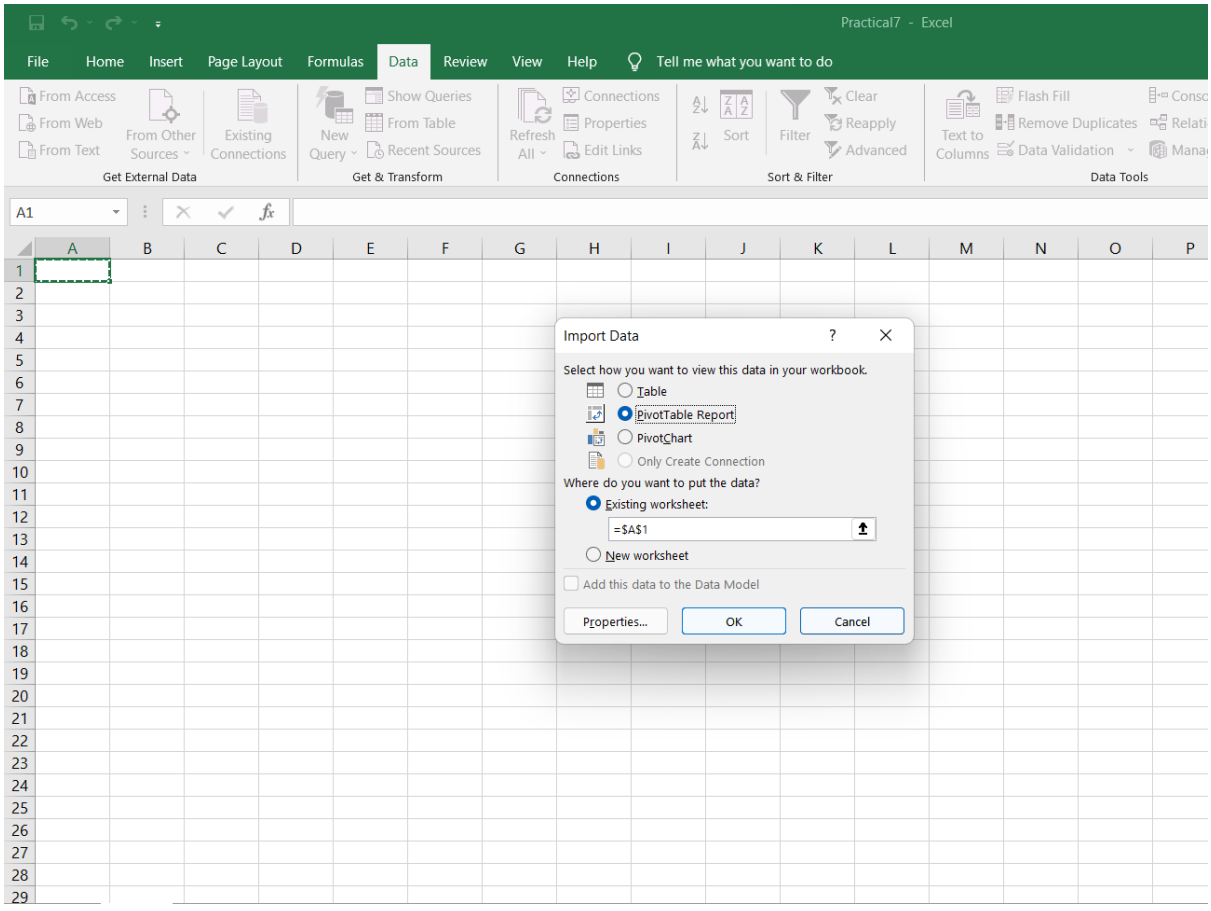
6) Select database and table we want to connect to.

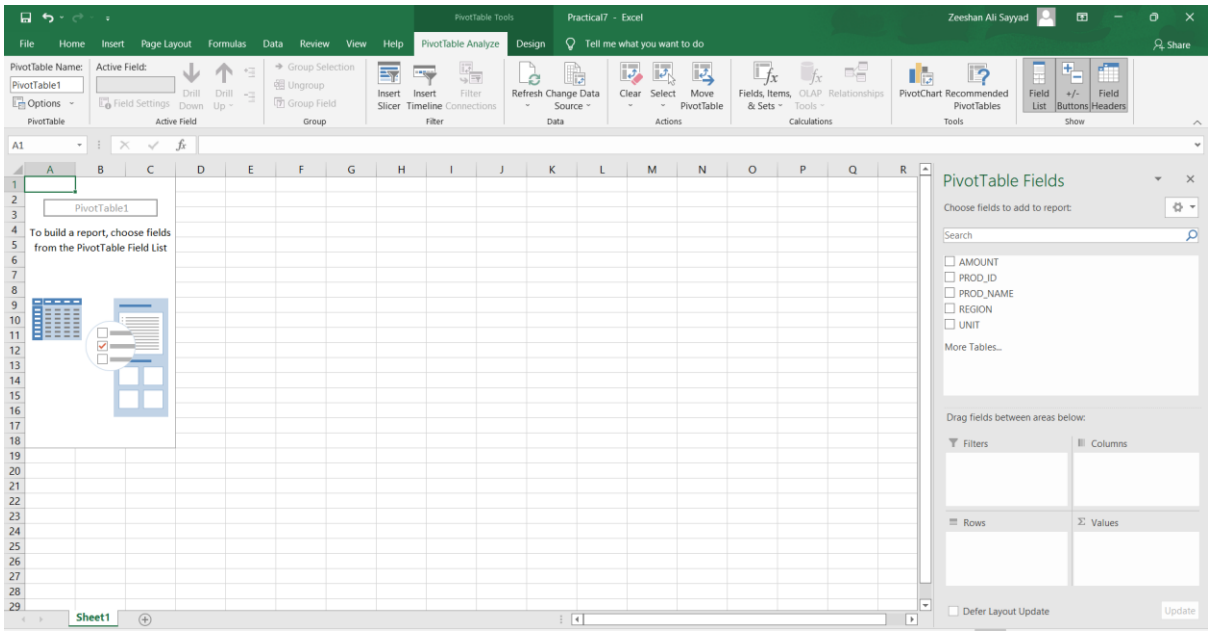


7) Click on Next.

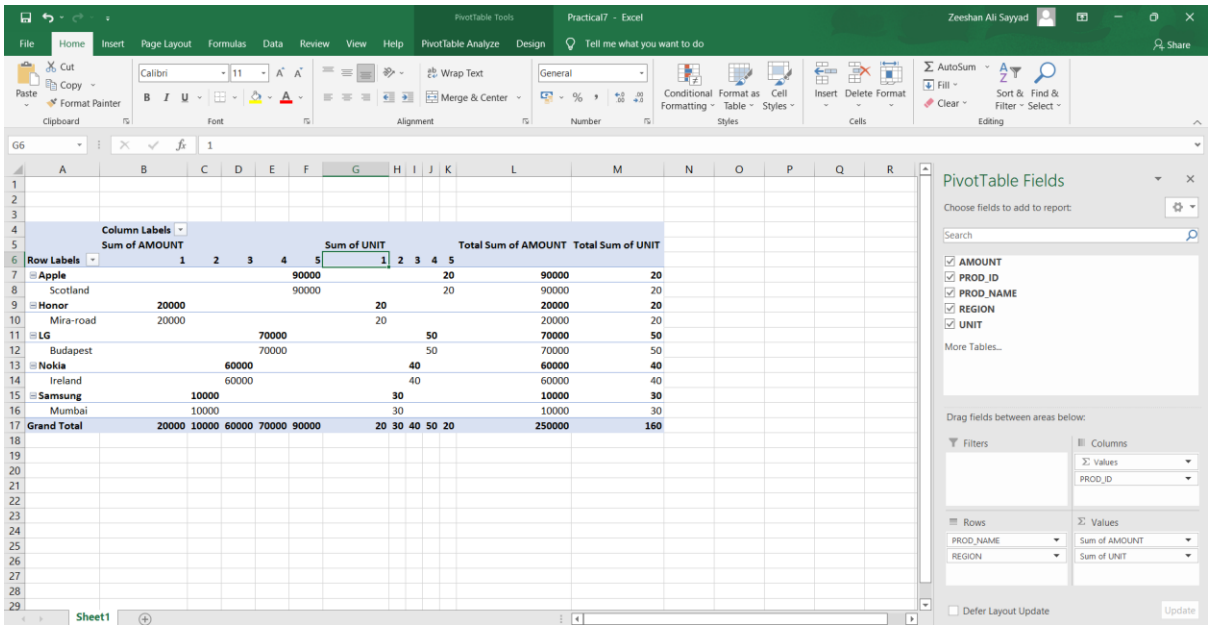


8) Select PivotTable report





9) Arrange fields PivotTable Fields respectively.



Row Labels	Column Labels / Sum of AMOUNT 1	2	3	4	5	Sum of UNIT 1	2	3	4	5	Total Sum of AMOUNT	Total Sum of UNIT
Apple				90000					20		90000	20
Scotland				90000					20		90000	20
Honor	20000					20					20000	20
Mira-road	20000					20					20000	20
LG			70000					50			70000	50
Budapest			70000					50			70000	50
Nokia		60000					40				60000	40
Ireland		60000					40				60000	40
Samsung	10000					30					10000	30
Mumbai	10000					30					10000	30
Grand Total	20000	10000	60000	70000	90000	20	30	40	50	20	250000	160

Conclusion: Successfully implemented pivot table report based on data cube operations

Practical 8

Aim: Prerequisites for Database applications.

Queries:

Creating employee table:

```
SQL>create table employee(
    empid number(3) primary key,
    empname varchar2(25),
    age number(3));
```

Creating client table:

```
SQL>create table client(
    clientid number(3) primary key,
    clientname varchar(25),
    location varchar2(20));
```

Creating project table:

```
SQL>create table project(
   projid number(5) primary key,
   empid number(3),
   projname varchar2(25),
   clientid number(3));
```

Inserting records in table employee:

```
SQL>insert into employee values(1,'Vardhan',22);
SQL>insert into employee values(2,'Khushi',30);
SQL>insert into employee values(3,'Simran',40);
SQL>insert into employee values(4,'Chetan',20);
SQL>insert into employee values(5,'Swati',27);
SQL>insert into employee values(10,'Vedant',33);
SQL>insert into employee values(15,'Gauri',35);
SQL>insert into employee values(16,'ABC',36);
SQL>insert into employee values(17,'PQR',37);
```

Inserting records in table client:

```
SQL>insert into client values(33,'will','mumbai');
SQL>insert into client values(34,'jones','bangalore');
SQL>insert into client values(35,'deep','kolkata');
SQL>insert into client values(36,'smith','delhi');
SQL>insert into client values(37,'marin','mumbai');
SQL>insert into client values(38,'jason','mumbai');
```

Inserting records in table project:

```
SQL>insert into project values(111,1,'abc',33);
SQL>insert into project values(222,2,'def',34);
SQL>insert into project values(333,3,'xyz',35);
SQL>insert into project values(444,4,'pqr',36);
```

SQL>insert into project values(555,5,'mnq',37);
SQL>insert into project values(666,6,'efg',38);
SQL>insert into project values(777,7,'lmn',39);
SQL>insert into project values(888,8,'ppd',40);

```
SQL> desc employee;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 EMPID                                     NOT NULL NUMBER(3)
 EMPNAME                                            VARCHAR2(25)
 AGE                                                NUMBER(3)
```

```
SQL> desc client;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 CLIENTID                                  NOT NULL NUMBER(3)
 CLIENTNAME                                         VARCHAR2(25)
 LOCATION                                           VARCHAR2(20)
```

```
SQL> desc project;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 PROJID                                    NOT NULL NUMBER(5)
 EMPID                                              NUMBER(3)
 PROJNAME                                           VARCHAR2(25)
 CLIENTID                                           NUMBER(3)
```

```
SQL> select * from employee;

     EMPID EMPNAME                          AGE
---------- ------------------------- ----------
         1 Vardhan                           22
         2 Khushi                            30
         3 Simran                            40
         4 Chetan                            20
         5 Swati                             27
```

```
SQL> select * from client;

  CLIENTID CLIENTNAME                 LOCATION
---------- ------------------------- --------------------
        33 will                      mumbai
        34 jones                     bangalore
        35 deep                      kolkata
        36 smith                     delhi
        37 marin                     mumbai
        38 jason                     mumbai
```

```
SQL> insert into project values(111,1,'abc',33);

1 row created.
```

```
SQL> select * from project;

    PROJID      EMPID PROJNAME                       CLIENTID
---------- ---------- ------------------------- ----------
       111          1 abc                               33
       222          2 def                               34
       333          3 xyz                               35
       444          4 pqr                               36
       555          5 mnq                               37
       666          6 efg                               38
       777          7 lmn                               39
       888          8 ppd                               40

8 rows selected.
```

```
SQL> select employee.empid,employee.empname,project.clientid
  2  from employee
  3  INNER JOIN
  4  project
  5  ON employee.empid=project.empid;

     EMPID EMPNAME                     CLIENTID
---------- ------------------------- ----------
         1 Vardhan                           33
         2 Khushi                            34
         3 Simran                            35
         4 Chetan                            36
         5 Swati                             37
```

```
SQL> select employee.empid,employee.empname,project.clientid
  2  from employee
  3  FULL JOIN
  4  project
  5  ON employee.empid=project.empid;

     EMPID EMPNAME                     CLIENTID
---------- ------------------------- ----------
         1 Vardhan                           33
         2 Khushi                            34
         3 Simran                            35
         4 Chetan                            36
         5 Swati                             37
                                             38
                                             39
                                             40

8 rows selected.
```

```
SQL> select employee.empid, employee.empname,project.clientid
  2  from employee
  3  LEFT JOIN
  4  project
  5  ON employee.empid=project.empid;

     EMPID EMPNAME                     CLIENTID
---------- ------------------------- ----------
         1 Vardhan                           33
         2 Khushi                            34
         3 Simran                            35
         4 Chetan                            36
         5 Swati                             37
```

```
SQL> select employee.empid, employee.empname,project.clientid
  2  from employee
  3  RIGHT JOIN
  4  project
  5  ON employee.empid=project.empid;

     EMPID EMPNAME                     CLIENTID
---------- ------------------------- ----------
         1 Vardhan                           33
         2 Khushi                            34
         3 Simran                            35
         4 Chetan                            36
         5 Swati                             37
                                             40
                                             38
                                             39

8 rows selected.
```

Transactions

```
SQL> set transaction read write;

Transaction set.

SQL> UPDATE EMPLOYEE
  2  SET EMPID = 201
  3  WHERE EMPID = 1;

1 row updated.

SQL> commit;

Commit complete.
```

```
SQL> insert into employee values(16,'ABC',36);

1 row created.

SQL> insert into employee values(17,'PQR',37);

1 row created.
```

Savepoint

```
SQL> savepoint s1;

Savepoint created.

SQL> insert into employee values(6,'ABC',20);

1 row created.
```

Rollback

```
SQL> rollback to s1;

Rollback complete.

SQL> select * from employee;

     EMPID EMPNAME                         AGE
---------- ------------------------- ----------
       201 Vardhan                          22
         2 Khushi                           30
         3 Simran                           40
         4 Chetan                           20
         5 Swati                            27
```

Wild cards

```
SQL> select * from employee
  2  where empname like '%an';

     EMPID EMPNAME                         AGE
---------- ------------------------- ----------
       201 Vardhan                          22
         3 Simran                           40
         4 Chetan                           20
```

```
SQL> select * from employee
  2  where empname like 'Khu%';

     EMPID EMPNAME                         AGE
---------- ------------------------- ----------
         2 Khushi                           30
```

```
SQL> select * from employee
  2  where empname like'%ar%';

     EMPID EMPNAME                         AGE
---------- ------------------------ ----------
       201 Vardhan                          22
```

Distinct

```
SQL> insert into employee values(6,'ABC',20);

1 row created.

SQL> insert into employee values(7,'ABC',22);

1 row created.

SQL> select distinct age from employee;

       AGE
----------
        22
        30
        20
        40
        27
```