Learning Objectives:

- Learning Data Definition Language
- Implementing DDL commands on our database

1. Introduction:

In the last lab, we learned how to install **SQL Server** and created our first database. Today, we are going to learn about SQL Server and how to use it.

But what is SQL?

Structured Query Language (SQL) is a standard language for accessing and manipulating databases.

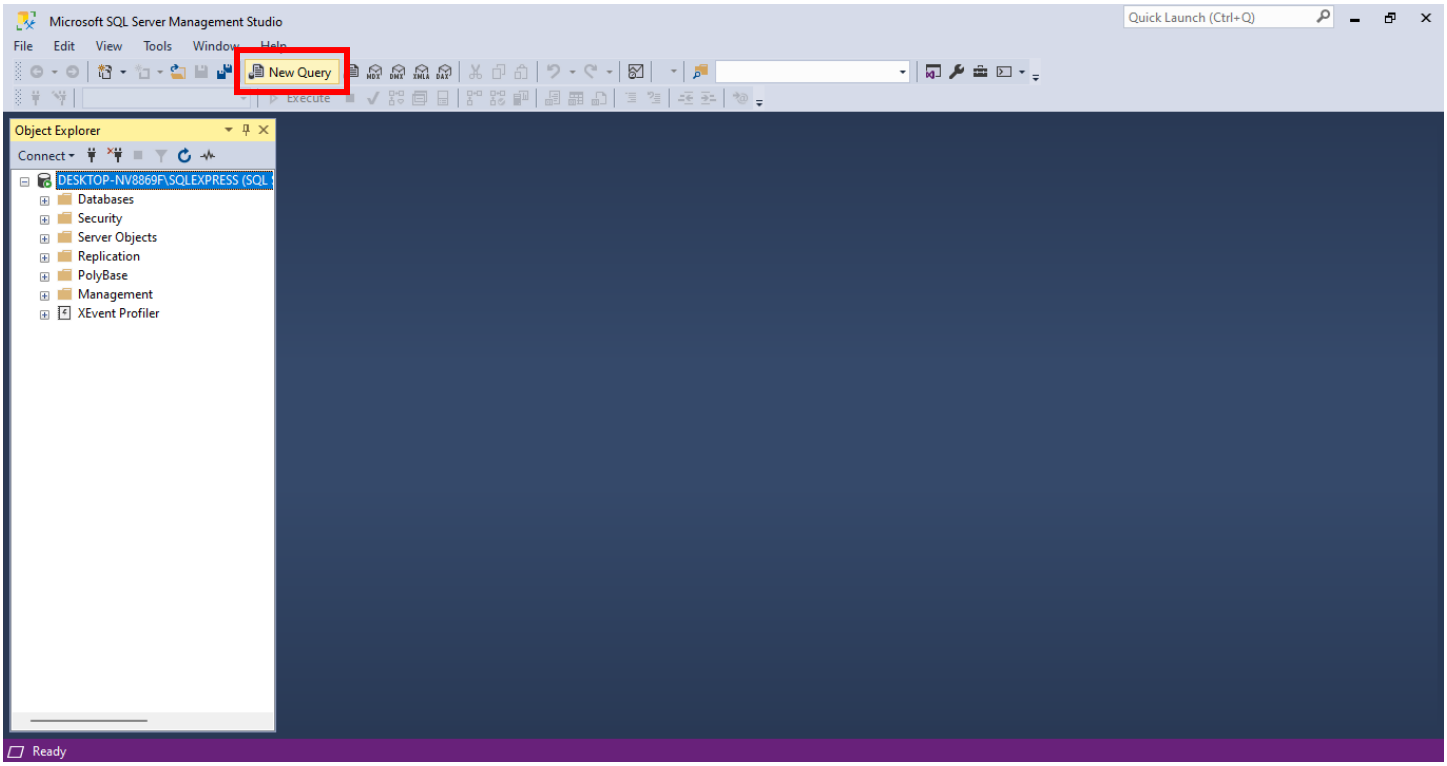
While ***Query*** is a request to databases to fetch (or retrieve) the information. It can also be called as those commands which we provide to access or modify the database.

2. SQL Server Components

Server components	**Description**
SQL Server Database Engine	SQL Server Database Engine includes the Database Engine, the core service **for storing, processing, and securing data**, Replication, full-text search, and tools for managing relational and XML data.
Analysis Services	Analysis Services includes the tools for **creating and managing online analytical processing (OLAP)** and data mining applications.
Reporting Services	Reporting Services includes **server and client components** for creating, managing, and deploying tabular, matrix, graphical, and free-form reports. Reporting Services is also an extensible platform that you can use to develop report applications.
Integration Services	Integration Services is a set of graphical tools and programmable objects for **moving, copying, and transforming** data.

Management tools	Description
SQL Server Management Studio	SQL Server Management Studio is an integrated environment to access, configure, manage, administer, and develop components of SQL Server. Management Studio lets developers and administrators of all skill levels use SQL Server. Internet Explorer 6 SP1 or a later version is required for Management Studio installation.
SQL Server Configuration Manager	SQL Server Configuration Manager provides basic configuration management for SQL Server services, server protocols, client protocols, and client aliases.
SQL Server Installation Centre	SQL Server Installation Centre is used for the installation of new Instances, Up gradating and updating the SQL Server.

We are familiar with this interface. Let us look into more details of it.



On clicking the highlighted button “New Query”, a screen will appear on the server. It is the **query editor.**

On the left side you will see databases named **Master**. You can see all the databases by opening the dropdown menu.

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On clicking any of the database, you'll see default tables in that database.

But you have to create your own database with your own registration number.

DDL commands:

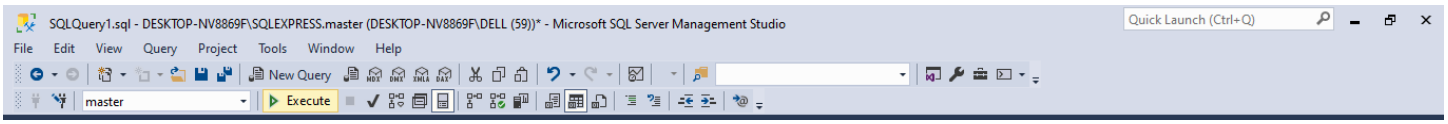
The queries to manage the database, tables and views come under the umbrella of **Data Definition Language**.

1- Create:

Write the following in query editor.

```
CREATE DATABASE TestDB_2021_SE_X          -- Creates a database with your registration number
```

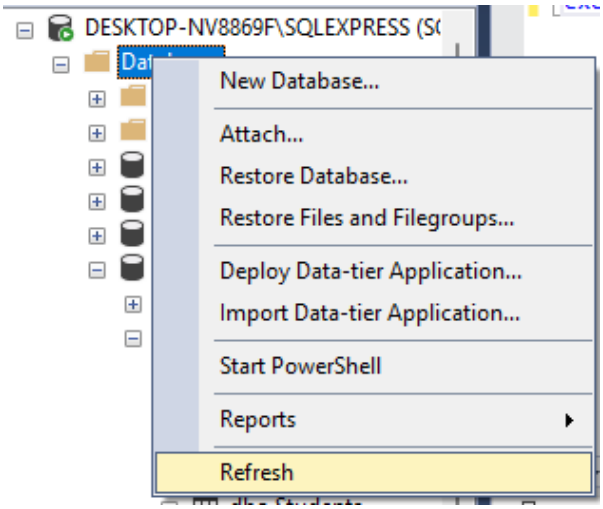
Run the query by pressing F5 key or using *Execute* button:



Remember…!! SQL is not case sensitive.

Are you able to see the database created…???

If no, then right click on Databases and Refresh the services again



We just created our first database. If we expand the database, we can see multiple options like, Database Diagrams, Tables, Views, etc.

By expanding the Tables, you can see there is currently no table in our database, so we have to create one in order to put our data into it.

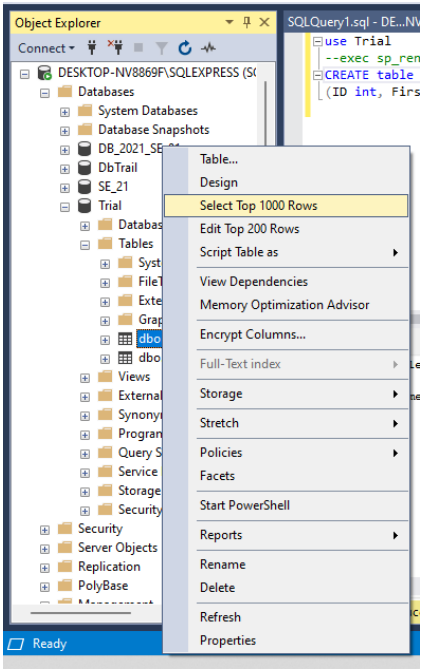
For this task, write the following into the Query editor.

Remember: *Once a query is executed, you should remove or hide it to avoid re-execution.*

To comment the previous queries, use the button  and to uncomment use this 

```
CREATE table TableName                    -- Creates a database with your registration number
(
ID int,
FirstName varchar(255),
LastName varchar(255),
Age int,
Gender varchar(255),
)
```

By executing the above query, you can now see a table in your database with the given table name. Right click on the table name and click *"Select Top 1000 Rows"*.



It will show the columns of your table.

Before moving further, let us look into Data Types of SQL server.

SQL Server Data Types

String types:

Data type	Description
char(n)	Fixed width character string
varchar(n)	Variable width character string

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varchar(max)	Variable width character string
text	Variable width character string
nchar	Fixed width Unicode string
nvarchar	Variable width Unicode string
nvarchar(max)	Variable width Unicode string
ntext	Variable width Unicode string
binary(n)	Fixed width binary string
varbinary	Variable width binary string
varbinary(max)	Variable width binary string
image	Variable width binary string

Numeric Data Types

Data type	Description
bit	Integer that can be 0, 1, or NULL
tinyint	Allows whole numbers from 0 to 255
smallint	Allows whole numbers between -32,768 and 32,767
int	Allows whole numbers between -2,147,483,648 and 2,147,483,647
bigint	Allows whole numbers between -9,223,372,036,854,775,808 and 9,223,372,036,854,775,807
decimal(p,s)	Fixed precision and scale numbers. Allows numbers from -10^38 +1 to 10^38 –1. The p parameter indicates the maximum total number of digits that can be stored (both to the left and to the right of the decimal point). p must be a value from 1 to 38. Default is 18. The s parameter indicates the maximum number of digits stored to the right of the decimal point. s must be a value from 0 to p. Default value is 0
numeric(p,s)	Fixed precision and scale numbers. Allows numbers from -10^38 +1 to 10^38 –1. The p parameter indicates the maximum total number of digits that can be stored (both to the left and to the right of the decimal point). p must be a value from 1 to 38. Default is 18. The s parameter indicates the maximum number of digits stored to the right of the decimal point. s must be a value from 0 to p. Default value is 0
smallmoney	Monetary data from -214,748.3648 to 214,748.3647

money	Monetary data from -922,337,203,685,477.5808 to 922,337,203,685,477.5807
float(n)	Floating precision number data from -1.79E + 308 to 1.79E + 308. The n parameter indicates whether the field should hold 4 or 8 bytes. float(24) holds a 4-byte field and float(53) holds an 8-byte field. Default value of n is 53.
real	Floating precision number data from -3.40E + 38 to 3.40E + 38

Date and Time Data Types

Data type	Description
datetime	From January 1, 1753 to December 31, 9999 with an accuracy of 3.33 milliseconds
datetime2	From January 1, 0001 to December 31, 9999 with an accuracy of 100 nanoseconds
smalldatetime	From January 1, 1900 to June 6, 2079 with an accuracy of 1 minute
date	Store a date only. From January 1, 0001 to December 31, 9999
time	Store a time only to an accuracy of 100 nanoseconds
datetimeoffset	The same as datetime2 with the addition of a time zone offset
timestamp	Stores a unique number that gets updated every time a row gets created or modified. The timestamp value is based upon an internal clock and does not correspond to real time. Each table may have only one timestamp variable.

Other Data Types

Data type	Description
sql_variant	Stores up to 8,000 bytes of data of various data types, except text, ntext, and timestamp
uniqueidentifier	Stores a globally unique identifier (GUID)
xml	Stores XML formatted data. Maximum 2GB
cursor	Stores a reference to a cursor used for database operations
table	Stores a result-set for later processing

2- Drop:

This query is used to remove a table from the database.

Syntax:

```
DROP TABLE tableName                    -- Deletes the table from database
```

This query is also used to delete an entire database

Syntax:

```
DROP DATABASE databaseName              -- Deletes the database
```

3- Alter:

For any change in the tables, we use Alter command.

Description	Query Syntax	Example
Add a column in table	ALTER Table tableName ADD columnName datatype	ALTER Table Student ADD GPA varchar(255)
Change datatype of column	ALTER Table tableName ALTER column columnName datatype	ALTER Table Students ALTER column GPA int
Remove column(s) from the table	ALTER Table tableName DROP column columnName	ALTER Table Students DROP column GPA

4- Truncate:

To remove the data from the tables we use *Truncate* command.

Syntax:

```
TRUNCATE Table tableName                --All the entries from your table will be removed
```

5- Rename

To change the name of a table we use *sp_rename* command, which is a **Stored Procedure**. Stored procedures are the functions of SQL server. And to execute the stored procedures we use *exec* before the command.

Syntax:

```
exec sp_rename tableName, new_tableName     --Table will be renamed to the new name
```

3. Lab Tasks

1. Create database of a **company** having following tables.

DEPARTMENT

Column Name	Data Type
department_id	int
name	nvarchar(50)
Manager	int
Manager_start_date	smalldatetime

EMPLOYEE

Column Name	Data Type
SSN	int
Bdate	smalldatetime
Fname	nvarchar(20)
Minit	nvarchar(1)
Lname	nvarchar(30)
Address	nvarchar(100)
Salary	smallmoney
Sex	bit
Department	int
Supervisor	int

PROJECT

Column Name	Data Type
project_id	int
name	nvarchar(50)
location	nvarchar(50)
controlling_department	int

DEPENDENT

Column Name	Data Type
Relationship	nvarchar(30)
Birth_date	smalldatetime
Sex	bit
Employee	int

2. Add a Column ***DependentName*** into Dependent table.
3. Change the datatype of ***Supervisor*** from int to varchar in the employee table.
4. Add a Table ***Stakeholders*** (Name, Id, ContractType) in the database.
5. Modify the ***location*** length in project table as 70.
6. Rename the table employee as ***emp***.
7. Delete entries from the table ***Stakeholders*** and then delete the whole table**.**

4. Home Assignment:

Create a database of a management system (e.g., Learning Management System, Hospital Management System etc.) considering all the possible tables in it.