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Lab 01
Introduction SQL Server
Data Types – DDL – DML

Outlines

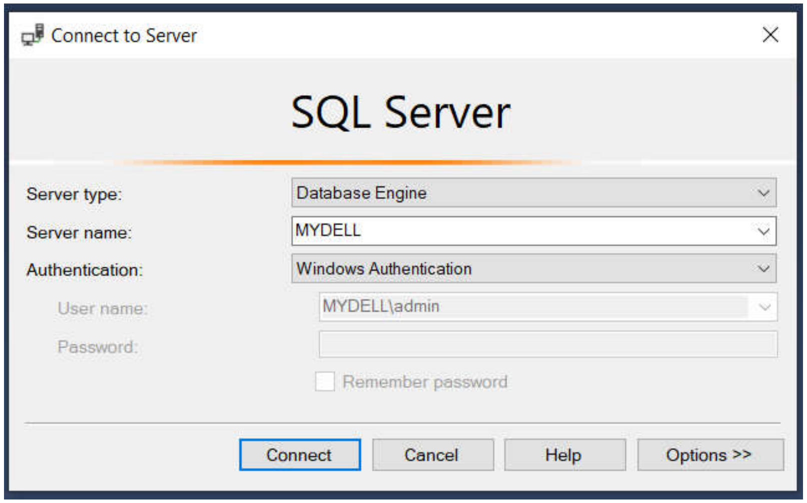
- Data types
- DDL
  - Create table
  - Alter table
  - Drop table
- DML
  - Insert
  - Update
  - Delete

Install

- SQL Server [Database + Services]
- SSMS [SQL Server Management Studio]

Run SSMS

- Microsoft SQL Server Management Studio



Connect to Server

SQL Server

Server type: Database Engine

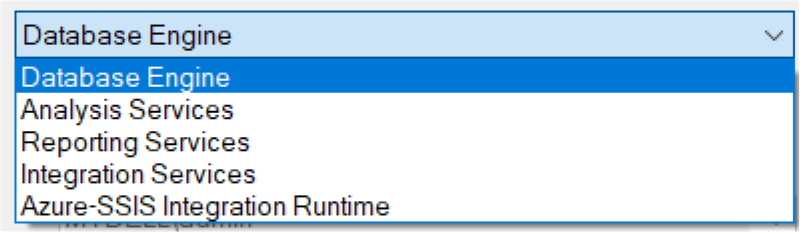
Server name: MYDELL

Authentication: Windows Authentication

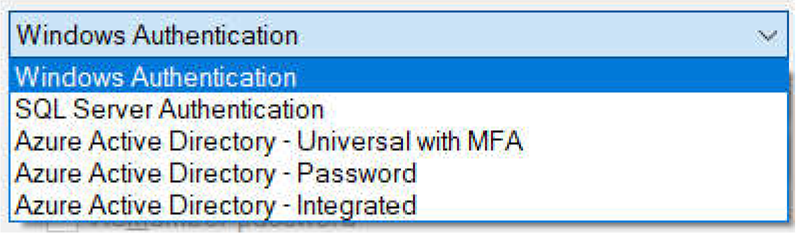
User name: MYDELL\admin

Password:

□ Remember password

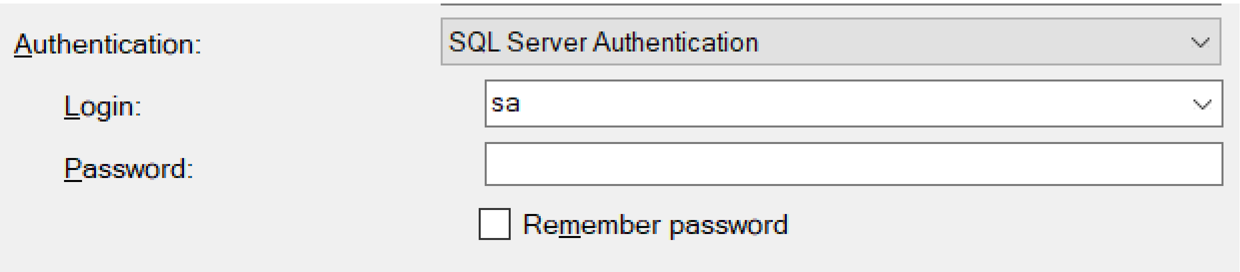


Database Engine



Windows Authentication

Windows Authentication
SQL Server Authentication
Azure Active Directory - Universal with MFA
Azure Active Directory - Password
Azure Active Directory - Integrated



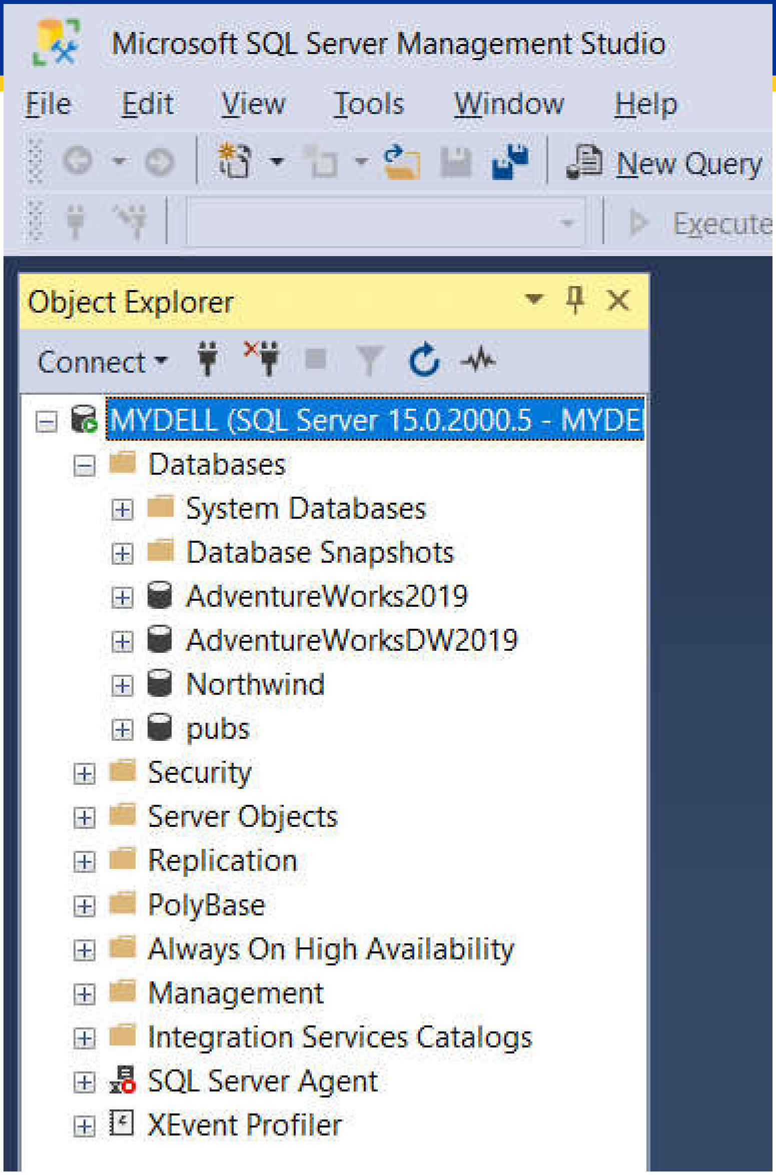
Authentication: SQL Server Authentication

Login: sa

Password:

□ Remember password

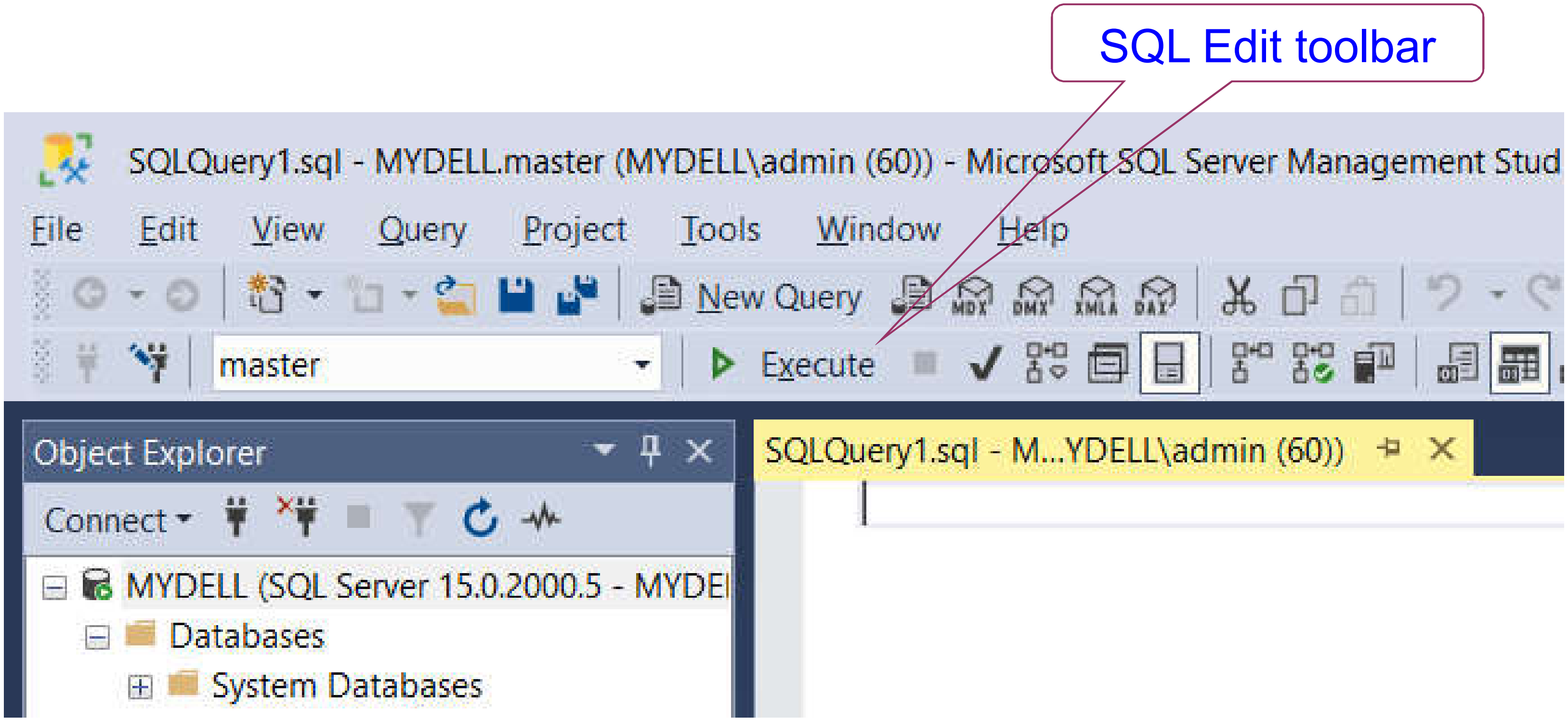
- About SSMS



Microsoft SQL Server Management Studio
File Edit View Tools Window Help
New Query
Execute
Object Explorer
Connect
MYDELL (SQL Server 15.0.2000.5 - MYDE
Databases
System Databases
Database Snapshots
AdventureWorks2019
AdventureWorksDW2019
Northwind
pubs
Security
Server Objects
Replication
PolyBase
Always On High Availability
Management
Integration Services Catalogs
SQL Server Agent
XEvent Profiler

Using T-SQL

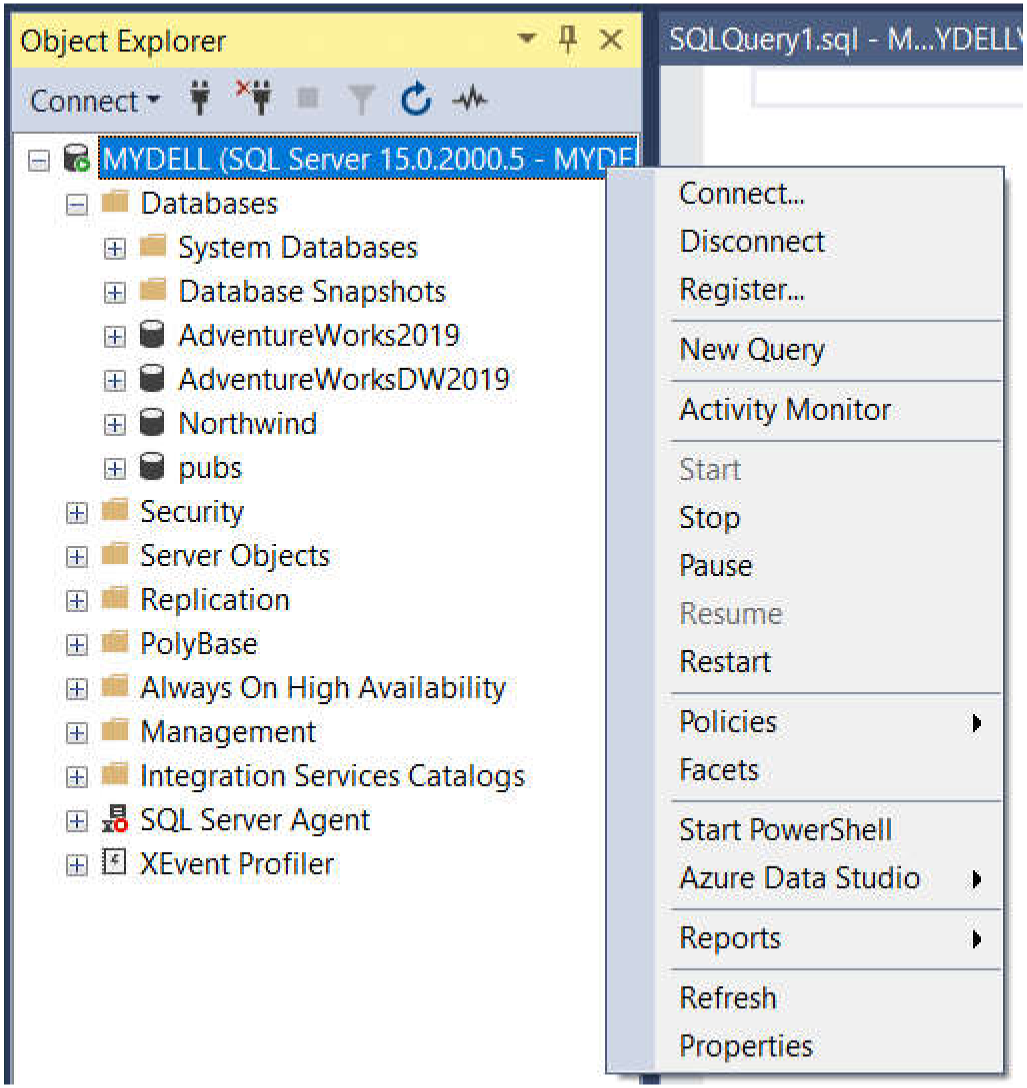
- File → New → Query with Current Connection
- Or click New Query



SQL Edit toolbar

SQLQuery1.sql - MYDELL.master (MYDELL\admin (60)) - Microsoft SQL Server Management Stud
File
Edit
View
Query
Project
Tools
Window
Help
New Query
MDX
DMX
XMLA
DAX
master
Execute
Object Explorer
Connect
MYDELL (SQL Server 15.0.2000.5 - MYDEI
Databases
System Databases
SQLQuery1.sql - M...YDELL\admin (60))

SQL Editor Toolbar (1)



- **Connect**
  Opens the **Connect to Server** dialog box. Use this dialog box to establish a connection to a server.
- **Disconnect**
  Disconnects the current Query Editor from the server.
- **Change Connection**
  Opens the **Connect to Server** dialog box. Use this dialog box to establish a connection to a different server.
- **New Query with Current Connection**
  Opens a new Query Editor window and uses the connection information from the current Query Editor window.
- **Available Databases**
  Change the connection to a different database on the same server.

SQL Editor Toolbar (2)

- **Execute**
  Executes the selected code or, if no code is selected, executes all the code in the Query Editor.
- **Debug**
  Enables the Transact-SQL debugger. This debugger supports debugging actions such as setting breakpoints, watching variables, and stepping through code.
- **Cancel Executing Query**
  Sends a cancellation request to the server. Some queries cannot be canceled immediately, but must wait for a suitable cancellation condition. When transactions are canceled, delays might occur while transactions are rolled back.
- **Parse**
  Check the syntax of the selected code. If no code is selected, checks the syntax of the all code in the Query Editor window.

Data types (1)

- Integer

Name	Bytes	Range
bigint	8	-2^{63} (-9,223,372,036,854,775,808) to $2^{63} - 1$ (9,223,372,036,854,775,807)
int	4	-2^{31} (-2,147,483,648) to $2^{31} - 1$ (2,147,483,647)
smallint	2	-2^{15} (-32,768) to $2^{15} - 1$ (32,767)
tinyint	1	0 to 255

Data types (2)

- Exact numeric

Name	Bytes	Range
decimal[p[,s]]	5 – 17	$- 10^{38} +1$ to $10^{38} - 1$.
numeric[p[,s]]	5 – 17	$- 10^{38} +1$ to $10^{38} - 1$.

p (precision)
The maximum total number of decimal digits that can be stored, both to the left and to the right of the decimal point. The precision must be a value from 1 through the maximum precision of 38. The default precision is 18.

***s* (scale)**
The maximum number of decimal digits that can be stored to the right of the decimal point. Scale must be a value from 0 through *p*. Scale can be specified only if precision is specified. The default scale is 0; therefore, 0 <= *s* <= *p*. Maximum storage sizes vary, based on the precision.

Data types (3)

- Appropiate numeric

Name	Bytes	Range
Float[(n)]	n	- 1.79E^{+308} to -2.23E^{-308}, 0 and 2.23E^{-308} to 1.79E^{+308}
real	4	- 3.40E $^{+ 38}$ to -1.18E $^{- 38}$, 0 and 1.18E $^{- 38}$ to 3.40E $^{+ 38}$

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Data types (4)

- Monetary

Name	Bytes	Range
Money	8	-922,337,203,685,477.5808 to 922,337,203,685,477.5807
smallmoney	4	- 214,748.3648 to 214,748.3647

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Data types (5)

- Date and Time

Name	Bytes	Range
datetime	8	January 1, 1753, to December 31, 9999
smalldatetime	4	January 1, 1900, to June 6, 2079

Data types (6)

- Characters

Name	Bytes	Comments
char[(n)]	0-8000	non-Unicode
varchar[(n)]	0-8000	non-Unicode
varchar(max)	0-2 GB	non-Unicode, 16 bytes pointer on row, preferred over text data type
text	0-2 GB	non-Unicode, 16 bytes pointer or in row, obsolete, varchar(max) prefered

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Data types (7)

- Characters (contd.)

Name	Bytes	Comments
nchar[(n)]	0-8000	max 4000 unicode characters
nvarchar[(n)]	0-8000	max 4000 unicode characters
nvarchar(max)	0-2 GB	16 bytes pointer or in row, preferred over ntext data type
ntext	0-2 GB	16 bytes pointer, obsolete, nvarchar(max) prefered

Data types (8)

- Binary

Name	Bytes	Comments
binary[(n)]	0-8000	
varbinary[(n)]	0-8000	
varbinary(max)	0-2 GB	16 bytes pointer or in row, preferred over image data type

Data types (9)

- Image

Name	Bytes	Comments
Image	0-2GB	16 bytes pointer, obsolete, varbinary(max) prefered

- Global identifier

Name	Bytes	Comments
uniqueidentifier	16	

- XML

Name	Bytes	Comments
xml	0-2GB	16 bytes pointer

Practice

- Create Database company
- Create Tables: Department – Employee
- Insert Data

Database

```
CREATE DATABASE Company ON  PRIMARY
    ( NAME = 'Company',
    FILENAME = 'C:\DATA\Company.mdf' ,
    SIZE =3072KB,
    MAXSIZE = UNLIMITED,
    FILEGROWTH = 1024KB )
 LOG ON
    ( NAME = 'Company_log',
    FILENAME = 'C:\DATA\Company_log.ldf' ,
    SIZE = 1024KB ,
    MAXSIZE = 2048KB ,
    FILEGROWTH = 10%);
GO

-- DROP DATABASE Company;
-- GO
```

Syntax

- Create

  Create table <tabName>

  (<FieldName> <DataType (length)> Null| Not Null

  [<FieldName> <DataType (length)> …);

- Alter

  Alter table <tabName>

  Add Constraint <conName> [Constraint Type];

- Drop

  Drop table <tabName>;

Practice: Create table

- Department

```
CREATE TABLE Department(
    DName varchar(15) NOT NULL,
    DNumber numeric(4, 0) NOT NULL,
    MgrSsn char(9) NULL,
    MgrStartdate datetime NULL);
GO
```

Practice: Create table

- Employee

```
CREATE TABLE Employee(
    FName varchar(15) NOT NULL,
    MInit varchar(1) NULL,
    LName varchar(15) NOT NULL,
    SSN char(9) NOT NULL,
    BDate datetime NULL,
    Address varchar(30) NULL,
    Sex char(1) NULL,
    Salary numeric(10, 2) NULL,
    SuperSSN char(9) NULL,
    DNo numeric(4, 0) NULL);
GO
```

Practice: Create Primary Key

- Department

```
ALTER TABLE Department
   ADD Constraint pk_Dept PRIMARY KEY (DNumber);
GO
```

- Employee

```
ALTER TABLE Employee
   ADD Constraint pk_Emp PRIMARY KEY (SSN);
GO
```

Practice: Create Foreign Key

- Department

```
ALTER TABLE Department
    ADD constraint fk_DeptMgrssn FOREIGN KEY(Mgrssn)
    REFERENCES Employee(SSN);
GO
```

- Employee

```
ALTER TABLE Employee
    ADD Constraint fk_EmpDNo FOREIGN KEY(DNo) REFERENCES
    Department(DNumber);
GO
ALTER TABLE Employee
    ADD Constraint fk_EmpSuperSSN FOREIGN KEY(SuperSSN)
    REFERENCES Employee(SSN);
```

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Practice: Insert Data

- Department

```
INSERT INTO Department
   VALUES ('Research', 5, Null, '22-MAY-1978');
GO
INSERT INTO Department
   VALUES ('Administration', 4, Null, '01-JAN-1985');
GO
INSERT INTO Department
   VALUES ('Headquarters', 1, Null, '19-JUN-1971');
GO
```

Practice: Insert Data (2)

- Employee

```
INSERT INTO Employee
    VALUES ('James', 'E', 'Borg', '888665555', '10-NOV-1927',
    'Houston,TX', 'M', 55000, null, 1);
GO
INSERT INTO Employee
    VALUES ('Franklin', 'T', 'Wong', '333445555', '08-DEC-1945',
    'Houston,TX', 'M', 40000, '888665555', null, 5);
GO
INSERT INTO Employee
    VALUES ('Jennifer', 'S', 'Wallace', '987654321', '20-JUN-1931',
    'Bellaire,TX', 'F', 43000, '888665555', null, 4);
GO
…
```

Practice: Insert Data (3)

- Employee

```
INSERT INTO Employee
     VALUES ('John', 'B', 'Smith', '123456789', '09-Jan-1955', 'Houston,TX', 'M', 30000,
     '333445555', 5)
GO
INSERT INTO Employee
     VALUES ('Alicia', 'J', 'Zelaya', '999887777', '19-JUL-1958', 'Spring,TX', 'F', 25000,
     '987654321', 4)
GO
INSERT INTO Employee
     VALUES ('Ramesh', 'K', 'Narayan', '666884444', '15-SEP-1952', 'Humble,TX', 'M', 38000,
     '333445555', 5)
GO
INSERT INTO Employee
     VALUES ('Joyce', 'A', 'English', '453453453', '31-JUL-1962', 'Houston, TX', 'F', 25000,
     '333445555', 5)
GO
INSERT INTO Employee
     VALUES ('Ahmad', 'V', 'Jabbar', '987987987', '29-MAR-1959', 'Houston,TX', 'M', 25000,
     '987654321', 4)
GO
```

Practice: Update date

- Employee

```
UPDATE Department
   SET MgrSsn = '333445555'
   WHERE DNumber = 5;
GO
UPDATE Employee
   SET MgrSsn = '987654321'
   WHERE DNumber = 4;
GO
UPDATE Employee
   SET MgrSsn = '888665555'
   WHERE DNumber = 1;
GO
```

Practice: Query Data

- Department

  Select * from Department

- Employee

  Select * from Employee

Practice: Delete Table

- Guide:
  - Delete Foreign key constraints
  - Delete tables

- Delete Foreign Key:

```
ALTER TABLE Employee Drop Constraint FK_EmpDNo;
GO
ALTER TABLE Employee Drop Constraint FK_EmpSuperSSN;
GO

ALTER TABLE Department Drop Constraint FK_DeptMgrssn;
GO
```

Practice: Delete Table (2)

- Delete Table

```
Drop Table Employee;
Go

Drop Table Department;
Go
```

DML

- Insert
- Update
- Delete

Insert

Insert into *table_name* [*(column_list)*]
    Values (*value_list*);

Example

```
INSERT INTO Department
    VALUES (5, 'Research', '333445555', '22-MAY-78');
```

Or

```
INSERT INTO Department (DNumber, DName)
    VALUES (5, 'Research');
```

Update

Update *table_name*

Set *column_name* = *value*

[Where <*condition*>];

Example

Update Department

Set MgrSSN = '333445555‘

Where DNumber = 5;

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Delete

Delete from *table_name*
    [Where <*condition*>]

Example

Delete from Department;

Or

Delete from Department
    Where DNumber = 5;

Q & A