



IE220

Introduction to Database Systems

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Basic SQL

SQL

- **SQL (*Structured Query Language*):** SQL is a structured query language which uses in relational databases.
- Its first name is SEQUEL. Then the first SQL version was published by ANSI in 1986.
- SQL is commonly used database language. It includes the statements for data definition, query and update process.



Data Definition in SQL

- In SQL, database and its items can be defined as CREATE.
 - CREATE SCHEMA
 - CREATE DATABASE
 - CREATE TABLE
 - CREATE VIEW
 - ...

Schema & Catalog

- **Schema** is a statement to define authorization of schema items. Schema items are some concepts such as tables, constraints, reports, field names, and other constraints.

`CREATE SCHEMA COMPANY AUTHORIZATION 'FYucel';`

- We can use the schema names to define authorization of a database item.
- **Catalog** is a collection of schemas.

Creating New Database

- To create new database in SQL

```
CREATE DATABASE TrialDB;
```

- To use the any database

```
USE TrialDB;
```

Creating a New SQL Table

- To define a new entity and its attributes, a new table is created:

CREATE TABLE Orders

```
(  OrderID      VARCHAR(10)  NOT NULL,  
   CustomerID  VARCHAR(10)  NOT NULL,  
   Barcode     VARCHAR(15) NOT NULL,  
   Date        DATETIME   NOT NULL,  
   Status      CHAR,  
   Quantity    INT,  
   PRIMARY KEY (OrderID),  
   FOREIGN KEY (CustomerID) REFERENCES Customers(CustomerID),  
   FOREIGN KEY (Barcode) REFERENCES Products(Barcode)  
);
```

MS SQL Data Types

Data Type	Explanation	Maximum Length	Stored Data
char(n)	Fixed-length character array	8,000 characters	Defined length
varchar(n)	Variable-length character array	8,000 characters	2 byte + character count
varchar(max)	Variable-length character array	1,073,741,824 characters	2 byte + character count
text	Variable-length text	2GB text data	4 byte + character count
nchar	Fixed-length Unicode character array	4,000 character	Defined length × 2
nvarchar	Variable-length Unicode character array	4,000 character	
nvarchar(max)	Variable-length Unicode character array	536,870,912 character	
ntext	Variable-length Unicode text	2GB text data	
binary(n)	Fixed-length binary character array	8,000 byte	
varbinary	Variable-length binary character array	8,000 byte	
varbinary(max)	Variable-length binary character array	2GB	
image	Variable-length binary character array	2GB	

MS SQL Data Types

Data Type Syntax	Maximum Size	Explanation
BIT	Integer that can be 0, 1, or NULL.	
TINYINT	0 to 255	
SMALLINT	-32768 to 32767	
INT	-2,147,483,648 to 2,147,483,647	
BIGINT	-9,223,372,036,854,775,808 to 9,223,372,036,854,775,807	
DECIMAL(<i>m</i> , <i>d</i>)	<i>m</i> defaults to 18, if not specified. <i>d</i> defaults to 0, if not specified.	Where <i>m</i> is the total digits and <i>d</i> is the number of digits after the decimal.
DEC(<i>m</i> , <i>d</i>)	<i>m</i> defaults to 18, if not specified. <i>d</i> defaults to 0, if not specified.	Where <i>m</i> is the total digits and <i>d</i> is the number of digits after the decimal. This is a synonym for the DECIMAL datatype.
NUMERIC(<i>m</i> , <i>d</i>)	<i>m</i> defaults to 18, if not specified. <i>d</i> defaults to 0, if not specified.	Where <i>m</i> is the total digits and <i>d</i> is the number of digits after the decimal. This is a synonym for the DECIMAL datatype.
FLOAT(<i>n</i>)	Floating point number. <i>n</i> defaults to 53, if not specified.	Where <i>n</i> is the number of number of bits to store in scientific notation.
REAL	Equivalent to FLOAT(24)	
SMALLMONEY	- 214,748.3648 to 214,748.3647	
MONEY	-922,337,203,685,477.5808 to 922,337,203,685,477.5807	

MS SQL Data Types

Data Type Syntax	Maximum Size	Explanation (if applicable)
DATE	Values range from '0001-01-01' to '9999-12-31'.	Displayed as 'YYYY-MM-DD'
DATETIME	Date values range from '1753-01-01 00:00:00' to '9999-12-31 23:59:59'. Time values range from '00:00:00' to '23:59:59.997'	Displayed as 'YYYY-MM-DD hh:mm:ss[.mmm]'
DATETIME2(<i>fractional seconds precision</i>)	Date values range from '0001-01-01' to '9999-12-31'. Time values range from '00:00:00' to '23:59:59.9999999'.	Displayed as 'YYYY-MM-DD hh:mm:ss[.fractional seconds]'
SMALLDATETIME	Date values range from '1900-01-01' to '2079-06-06'. Time values range from '00:00:00' to '23:59:59'.	Displayed as 'YYYY-MM-DD hh:mm:ss'
TIME	Values range from '00:00:00.0000000' to '23:59:59.9999999'	Displayed as 'YYYY-MM-DD hh:mm:ss[.nnnnnnn]'
DATETIMEOFFSET(<i>fractional seconds precision</i>)	Date values range from '0001-01-01' to '9999-12-31'. Time values range from '00:00:00' to '23:59:59.9999999'. Time zone offset range from -14:00 to +14:00.	Displayed as 'YYYY-MM-DD hh:mm:ss[.nnnnnnn]' [{+ -}hh:mm]

Definition of A New SQL Field Name

- To define a new SQL field name

```
CREATE DOMAIN LIRA AS DECIMAL(10,2)
```

```
CHECK (LIRA > 0,00 AND LIRA < 500000,00);
```

Deleting a Database or a Table

- To delete a database entirely

`DROP DATABASE TrialDB`

- To delete a table entirely

`DROP TABLE Products`

- To empty a table

`TRUNCATE TABLE Products`

Changing Fields

- To add new field to a table

```
ALTER TABLE Products  
ADD Price DECIMAL(10,2);
```

- To delete a field from a table

```
ALTER TABLE Products  
DROP COLUMN Price;
```

- To update a field in a table

```
ALTER TABLE Products  
ALTER COLUMN Price MONEY;
```