Goals

- SQL: Data Definition Language
  - CREATE
  - ALTER
  - DROP
- SQL: Data Manipulation Language
  - INSERT
  - DELETE
  - UPDATE
  - SELECT
SQL DDL and DML

- SQL statements can be divided into two categories:
  - **Data definition language (DDL)** statements
    - Used for creating and modifying tables, views, and other structures
    - CREATE, DROP, ALTER
  - **Data manipulation language (DML)** statements.
    - Used for queries and data modification
    - INSERT, DELETE, UPDATE, SELECT

Creating Tables

```
CREATE TABLE table_name(
    column_name1 column_type1 [constraints1],
    ...
) 

[CONSTRAINT constraint_name] table_constraint
```

Table constraints:
- NULL/NOT NULL
- PRIMARY KEY (columns)
- UNIQUE (columns)
- CHECK (conditions)
- FOREIGN KEY (local_columns) REFERENCES foreign_table (foreign_columns) [ON DELETE action_d ON UPDATE action_u]

Specify surrogate key in SQL Server:
```
column_name int_type IDENTITY (seed, increment)
```

Specify surrogate key in MySQL:
```
column_name int_type AUTO_INCREMENT
```
CREATE TABLE Example

- CREATE TABLE Students
  (StudentNumber integer NOT NULL,
   StudentLastName varchar(18) NOT NULL,
   StudentFirstName varchar(18) NOT NULL,
   Email varchar(50),
   PhoneNumber char(18),
   MajorDepartmentName char(18),

   CONSTRAINT PK_Students PRIMARY KEY (StudentNumber),
   CONSTRAINT U_Email UNIQUE (Email),
   CONSTRAINT FK_Dept FOREIGN KEY(MajorDepartmentName)
    REFERENCES DEPARTMENTS(DepartmentName)
    ON DELETE NO ACTION ON UPDATE CASCADE
  )

Modifying Tables

- ALTER TABLE table_name clause

Clauses: – some are DBMS specific!
- ADD COLUMN column_name column_type [constraints]
- DROP COLUMN column_name
- ALTER COLUMN / MODIFY
- ADD CONSTRAINT constraint
- DROP CONSTRAINT constraint_name
ALTER TABLE Examples

- ALTER TABLE Students ADD COLUMN BirthDate datetime NULL
- ALTER TABLE Students DROP COLUMN BirthDate
- ALTER TABLE Student ADD CONSTRAINT FK_Department
  FOREIGN KEY (MajorDepartmentName)
  REFERENCES Departments (DepartmentName)
  ON DELETE NO ACTION
  ON UPDATE CASCADE

Removing Tables

- DROP TABLE table_name

  DROP TABLE Departments;

- If there are constraints dependent on table:
  - Remove constraints
  - Drop table

  ALTER TABLE Students
  DROP CONSTRAINT FK_Department;

  DROP TABLE Departments;
SQL DDL and DML

- **Data definition language (DDL) statements**
  - Used for creating and modifying tables, views, and other structures
  - CREATE, ALTER, DROP

- **Data manipulation language (DML) statements.**
  - Used for queries and data modification
  - INSERT, DELETE, UPDATE, SELECT

SQL DML

- **Data manipulation language (DML) statements.**
  - Used for queries and data modification
  - INSERT
  - DELETE
  - UPDATE
  - SELECT
**INSERT Statement**

**INSERT INTO table_name (column_list) VALUES (data_values)**
**INSERT INTO table_name (column_list) select_statement**

**INSERT command:**

```
INSERT INTO Students (StudentNumber, StudentLastName, StudentFirstName)
VALUES (190, 'Smith', 'John');
```

**Bulk INSERT:**

```
INSERT INTO Students VALUES(190, 'Smith', 'John', 'jsmith@usna.edu', '410-431-3456')
```

**UPDATE Statement**

**UPDATE table_name**
**SET column_name1 = expression1 [,column_name2 = expression2,...] [WHERE search_condition]**

**UPDATE command:**

```
UPDATE Students
SET PhoneNumber = '410-123-4567'
WHERE StudentNumber = 673;
```

**BULK UPDATE command:**

```
UPDATE Students
SET PhoneNumber = '410-123-4567'
WHERE StudentLastName = 'Doe';
```

<table>
<thead>
<tr>
<th>Student Number</th>
<th>Student LastName</th>
<th>Student FirstName</th>
<th>Email</th>
<th>PhoneNumber</th>
</tr>
</thead>
<tbody>
<tr>
<td>190</td>
<td>Smith</td>
<td>John</td>
<td><a href="mailto:jsmith@usna.edu">jsmith@usna.edu</a></td>
<td>410-431-3456</td>
</tr>
<tr>
<td>673</td>
<td>Doe</td>
<td>Jane</td>
<td><a href="mailto:jdoe@usna.edu">jdoe@usna.edu</a></td>
<td></td>
</tr>
<tr>
<td>312</td>
<td>Doe</td>
<td>Bob</td>
<td><a href="mailto:bred@usna.edu">bred@usna.edu</a></td>
<td>443-451-7865</td>
</tr>
</tbody>
</table>
DELETE Statement

DELETE FROM table_name
[WHERE search_condition ]

- DELETE command:
  DELETE FROM Students
  WHERE StudentNumber = 190;
  If you omit the WHERE clause, you will delete every row in the table!!!

- Another example:
  DELETE FROM Departments
  WHERE DepartmentName = 'ComSci'

Integrity constraints?!
- If Foreign Key constraint in Students referencing Departments:
  - if ON DELETE No ACTION, department cannot be deleted as long as there are students in that department
  - If ON DELETE CASCADE, all students from a department are deleted when department is deleted

SELECT Statement

- SELECT [DISTINCT] column_name(s) | aggregate_expr
  FROM table_name(s)
  WHERE conditions
  GROUP BY grouping_columns
  HAVING group_conditions
  ORDER BY column_name(s) [ASC/DESC]