Goals

- SQL: Data Definition Language
  - CREATE
  - ALTER
  - DROP
- SQL: Data Manipulation Language
  - INSERT
  - DELETE
  - UPDATE
  - SELECT – already done
**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

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

- Bulk INSERT:
  INSERT INTO Students (StudentNumber, StudentLastName, StudentFirstName, Email, PhoneNumber)
  SELECT *
  FROM Second_Class_Students;

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>StudentNumber</th>
<th>StudentLastName</th>
<th>StudentFirstName</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]