Queries vs. Updates

- Queries – statements that do not change the data
- Updates
  - Create, delete, and change tables
  - Create, delete, and change data in the tables

SQL

- Data Definition Language (DDL)
  - CREATE, DROP, ALTER
- Data Manipulation Language (DML)
  - SELECT, INSERT, DELETE, UPDATE
- Data Control Language (DCL)
  - GRANT, REVOKE
  - COMMIT, ROLLBACK, SAVEPOINT

Create a Table

```sql
create table table_name (
    column_name column_type,
    column_name column_type,
    ...
    column_name column_type
);```

Create the Products Table

```sql
create table products (
    id integer,
    category char(3),
    description varchar(4096),
    price decimal(10,2)
);```

Delete a Table

```sql
drop table table_name;
```

MySQL only:

```sql
drop table if exists table_name;
```
Naming Conventions

- Use plural form for table names
- Use singular form for column names
- Use underscore to concatenate multiple words, e.g. `employee_id`
- Do not use mixed cases in names (e.g. `ArtistName`) because many DBMS treat names as case-insensitive

Data Type

- Determines the storage required for a field
- Common data types
  - String types
  - Numeric types
  - Date and time types
  - Other types

String Types

- `char(n)`
  - Fixed-length strings
  - Max length n
- `varchar(n)`
  - Variable-length strings
  - Max length n
- `text`
  - For articles, essays, ...

Numeric Types

- `integer`, `int`
- `smallint`, `bigint`, `long`, ...
- `real`
- `float`, `double`, ...
- `decimal(m,n)`
- `numeric(m,n)`
- `boolean`, `bool`

Date and Time Types

- `date` - YYYY-MM-DD
- `time` - HH:MM:SS
- `datetime` - YYYY-MM-DD HH:MM:SS
- `timestamp` - YYYY-MM-DD HH:MM:SS

MySQL Storage Engines

- `MyISAM`
  - Default
  - Does not support transactions and some integrity constraints
- `InnoDB`
  - Supports transactions and integrity constraints
  - Memory, BDB, NDB, ...

```sql
create table products (
    id integer,
    category char(3),
    description varchar(4096),
    price decimal(10,2)
) Engine=InnoDB;
```
Data Integrity Constraints

- **Not NULL**
- **Default**
- **Unique**
- **Primary key**
  - Unique + Not NULL
  - Only one primary key per table
- **Check**

Column Constraint Syntax

```sql
create table products (
    id integer primary key,
    category char(3) not null,
    description varchar(4096) default 'Some product',
    price decimal(10,2) not null check(price > 0)
);
```

Table Constraint Syntax

```sql
create table products (
    id integer,
    category char(3) not null,
    description varchar(4096) default 'Some product',
    price decimal(10,2) not null,
    primary key (id),
    check (price > 0)
);
```

Named Constraints

```sql
create table products (
    id integer,
    category char(3) not null,
    description varchar(4096) default 'Some product',
    price decimal(10,2) not null,
    constraint products_pk primary key (id),
    constraint products_price_gt0 check (price > 0)
);
```

Foreign Key Constraints

```sql
create table order_details (
    order_id integer not null references orders(id),
    product_id integer not null,
    quantity integer not null check(quantity>0),
    foreign key (product_id) references products(id),
    primary key (order_id, product_id)
);
```

Foreign Key Constraint Example

```sql
create table order_details (
    order_id integer not null references orders(id),
    product_id integer not null,
    quantity integer not null check(quantity>0),
    foreign key (product_id) references products(id),
    primary key (order_id, product_id)
);
```
Modify a Table

```sql
alter table table_name operation;
```

- Common operations
  - Add, remove, rename, retype columns
  - Add, remove constraints
- Exactly what operation are supported depends on the DBMS

Alter Table Example

Split the address column in the customers table into four columns:
- street,
- city,
- state,
- zip

Populate Tables with Data

```sql
insert into table values (value1, value2, ...);
insert into table (field, ...) values (value, ...);
```

Example: insert the following data into the Products table:
- WD 500G Hard drive for $100.00
- Nvidia 7600GS video card for $104.99

Insert the Results of a Query

```sql
insert into table select_query;
insert into table (field, ...) select_query;
```

Delete Data

```sql
delete from table [where condition(s)];
```

Examples:
- Delete the product with id=2
- Delete all CPU products
- Delete all products

Update Data

```sql
update table set field=value [, ...] where condition(s);
```

Examples:
- Change the price of Intel Core 2 Duo to $149.99
- Change the last name of Jane from DOE to Doe
- Raise the price of all CPU products by 10%
Summary

- Remember what can be done
  - Create, alter, drop tables
    - Data types
    - Data integrity constraints
  - Insert, update, delete data
- Look up DBMS manual for the syntax