# INTRODUCTION TO DATABASES AND QUERYING

# WHAT IS A DATABASE?

A database is an organized collection of data that can be accessed, managed, and updated.

## SOME EXAMPLES YOU HAVE PROBABLY ENCOUNTERED:

- A shopping site (like Amazon) that has data representing products, users, purchases, and so on.
- A video site (like Netflix or YouTube) that might keep track of what people watch, let them create favorites or lists to watch, and maybe even recommend things based on how they rate what they've watched.
- Something like a Wordpress blog or even Facebook that would store data for posts, comments, and so on.

## A FEW MORE TIDBITS...

 Storing data so it can be used later is called persisting data.

 Most databases provide intelligent ways to work with data to provide reports of all sorts and add and modify data as needed.

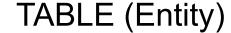
# SOME REASONS TO USE A DATABASE

- Easily support storing large number of records
- Central storage
- Support structured query syntax to retrieve data
- Enforces consistency and integrity of data
- Guarantee data type

### RELATIONAL DATABASES

 Relational databases allow data to be accessed and reassembled in many different ways by <u>Relating</u> the data rather than reassembling it.

 Real world problems are modeled into <u>Entities</u> such as users, posts comments, products, etc.



#### COLUMN (Attribute)





ROW — (Record or Instance)

ID	BRAND	MODEL	DESCRIPTION	PRICE
1453672	DELL	Vostro 5590	Great laptop.	679.00
1453673	APPLE	MacBook Pro	13" 2020 2 Thunderbold 3 Ports	1299.00

# DATABASE MANAGEMENT SYSTEMS (DBMS)

A DBMS helps manage a database. We will be working with a Relational Database Management System (RDBMS).

#### Provides for 4 basic functions:

- Data definition
- Data storage
- Data retrieval
- Administration

# COMMON DATABASE ENGINES

- Oracle
- SQL Server
- MS Access
- PostgreSQL
- DB2
- MySQL

# DATABASE COLUMNS

Each column in a database has a data type.

ANSI SQL (Structured Query Language):

The standard for SQL that is defined by ANSI (American National Standards Institute).

https://en.wikipedia.org/wiki/SQL#SQL data types

# DATABASE COLUMNS

#### ANSI SQL defines many common data types:..

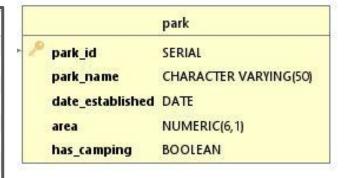
#### Examples:

- char, varchar, nvarchar
- int, decimal, bigint
- boolean/bit
- Datetime
- More info: <a href="https://www.w3resource.com/sql/data-type.php">https://www.w3resource.com/sql/data-type.php</a>
- Postgres Data Types: <a href="https://www.postgresql.org/docs/12/datatype-character.html">https://www.postgresql.org/docs/12/datatype-character.html</a>

# DATABASE TABLE EXAMPLE

#### Each table column has a name and data type.

* park_id	park_name	date_established	area	has_camping	
1	1 Acadia	1919-02-26	198.6 true		
2	2 American Samoa	1988-10-31	33.4 false		
3	3 Arches	1971-11-12	1-11-12 310.3 true		
4 4 Badlands		1978-11-10	982.4 true		
5	5 Big Bend	1944-06-12	3242.2 false		
6	6 Biscayne	1980-06-28	70	700.0 true	
7	7 Black Canyon of the Gunnison	1999-10-21	124.6 false 145.0 true		
8	8 Bryce Canyon	1928-02-25			
9	9 Canyonlands	1964-09-12	136	6.2 true	
10	10 Capitol Reef	1971-12-18	979	9.0 true	
11	11 Carlsbad Caverns	1930-05-14	189	9.3 true	
12	12 Channel Islands	1980-03-05	1009.9 true		



**SQL** stands for **structured query language** and is a **declarative programming language** to retrieve and update records from a database.

#### SQL consists of:

- Data definition language to define the data structures
- Data manipulation language to query and modify the data in a database
- Data control language to define access to a particular database

- The SELECT clause indicates what columns to get from a database table.
- The **FROM** clause indicates which table(s) to retrieve the data from.

```
SELECT city_name FROM city;
```

 If you want get all the columns in a table you can use \* for the column.

```
SELECT * FROM city;
```

- The SELECT clause indicates what columns to get from a database table.
- The FROM clause indicates which table(s) to retrieve the data from.
- The WHERE clause is used to filter the result set using one or more criteria rules.

```
SELECT city_name FROM city WHERE
state_abbreviation='DE';
```

- Conditional clauses in the WHERE clause can include
  - o =, <>, !=, >, >=, <, <=
  - O IN(values), NOT IN(values)
  - O BETWEEN value AND value
  - O IS NULL, IS NOT NULL
  - LIKE (with wildcard character)

# CASTING IN POSTGRESQL

- In PostgreSQL you can cast a field to a different type by using :: followed by the type to cast to.
- To cast a literal, you can add the type before the value followed by a space..

```
select * from the_table
where the_timestamp_column::date =
date '2015-07-15';
```

The **DISTINCT clause** indicates that duplicate values should not be included

 The AS clause establishes an alias for a particular column name

```
SELECT DISTINCT state_abbreviation AS state
FROM city;
```

# LET'S WRITE SOME QUERIES!!