

SQL: DATA DEFINITION LANGUAGE

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Database Schemas in SQL

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- SQL is primarily a query language, for getting information from a database.
 - ▣ **Data manipulation language (DML)**
- But SQL also includes a *data-definition* component for describing database schemas.
 - ▣ **Data definition language (DDL)**

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Creating (Declaring) a Relation

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- Simplest form is:


```
CREATE TABLE <name> (
    <list of elements>
);
```
- To delete a relation:


```
DROP TABLE <name>;
```

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Elements of Table Declarations

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- Most basic element: an attribute and its type.
- The most common types are:
 - ▣ INT or INTEGER (synonyms).
 - ▣ REAL or FLOAT (synonyms).
 - ▣ CHAR(*n*) = fixed-length string of *n* characters.
 - ▣ VARCHAR(*n*) = variable-length string of up to *n* characters.

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Example: Create Table

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```
CREATE TABLE Sells (
    bar      CHAR(20),
    beer     VARCHAR(20),
    price    REAL
);
```

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SQL Values

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- Integers and reals are represented as you would expect.
- Strings are too, except they require single quotes.
 - ▣ Two single quotes = real quote, e.g., 'Joe' 's Bar'.
- Any value can be NULL
 - ▣ Unless attribute has NOT NULL constraint
 - ▣ E.g., price REAL not null,

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Dates and Times

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- DATE and TIME are types in SQL.
- The form of a date value is:
 - DATE 'yyyy-mm-dd'
 - ▣ **Example:** DATE '2007-09-30' for Sept. 30, 2007.

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Times as Values

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- The form of a time value is:
 - TIME 'hh:mm:ss'
 with an optional decimal point and fractions of a second following.
 - ▣ **Example:** TIME '15:30:02.5' = two and a half seconds after 3:30PM.

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Declaring Keys

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- An attribute or list of attributes may be declared PRIMARY KEY or UNIQUE.
- Either says that no two tuples of the relation may agree in all the attribute(s) on the list.

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Our Running Example

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Beers(name, manf)
 Bars(name, addr, license)
 Drinkers(name, addr, phone)
 Likes(drinker, beer)
 Sells(bar, beer, price)
 Frequent(drinker, bar)

- Underline = *key* (tuples cannot have the same value in all key attributes).

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Declaring Single-Attribute Keys

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- Place PRIMARY KEY or UNIQUE after the type in the declaration of the attribute.

- Example:

```
CREATE TABLE Beers (
    name  CHAR(20) UNIQUE,
    manf  CHAR(20)
);
```

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Declaring Multiattribute Keys

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- A key declaration can also be another element in the list of elements of a CREATE TABLE statement.
- This form is essential if the key consists of more than one attribute.
 - May be used even for one-attribute keys.

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Example: Multiattribute Key

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- The bar and beer together are the key for Sells:

```
CREATE TABLE Sells (  
    bar      CHAR(20),  
    beer     VARCHAR(20),  
    price    REAL,  
    PRIMARY KEY (bar, beer)  
);
```

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PRIMARY KEY vs. UNIQUE

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1. There can be only one PRIMARY KEY for a relation, but several UNIQUE attributes.
2. No attribute of a PRIMARY KEY can ever be NULL in any tuple. But attributes declared UNIQUE may have NULL's, and there may be several tuples with NULL.

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