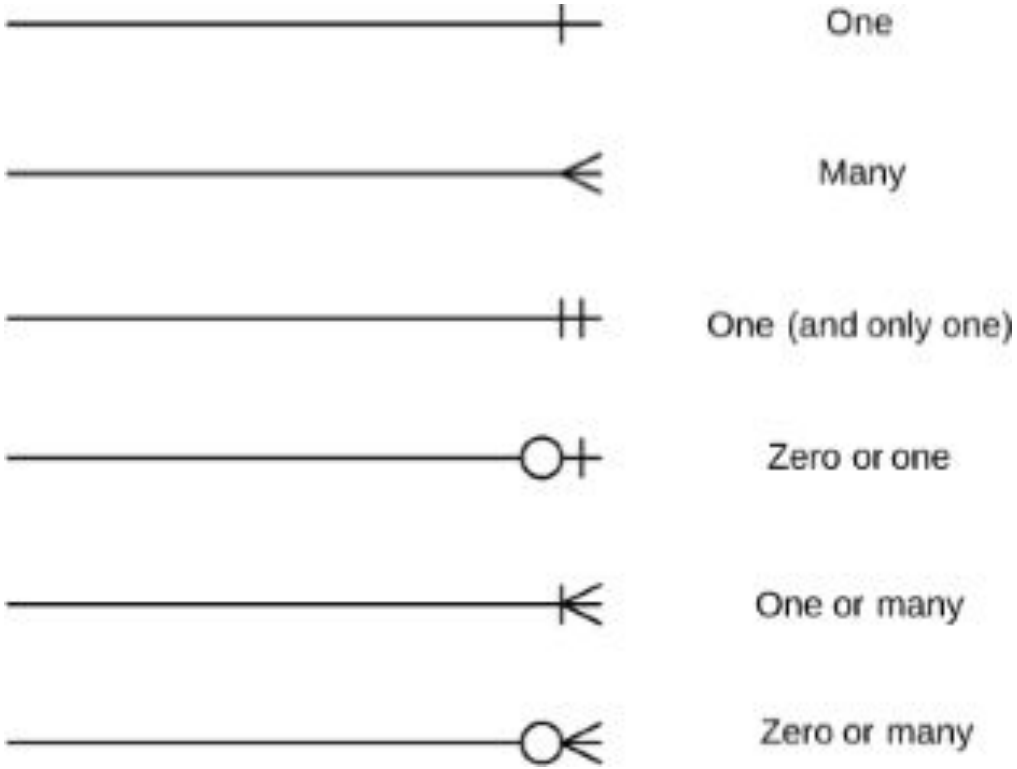
Module 2 - Lecture 3

SQL Keys, Joins, and Unions

REVIEW

- How do you order query results?
- How do you limit how many results we get back?
- What are aggregate functions?
- How do you get records into summary rows?

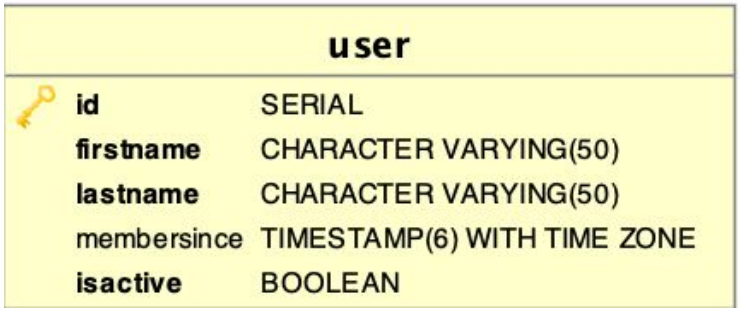
CARDINALITY AND ORDINALITY

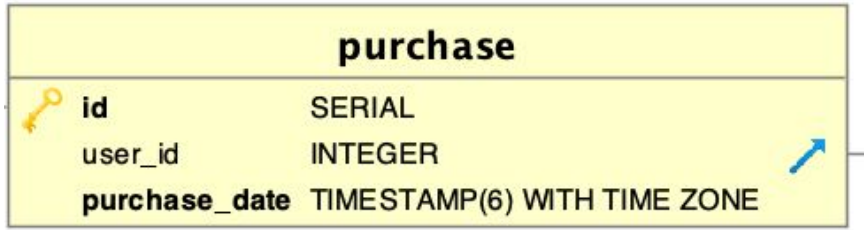


CARDINALITY AND ORDINALITY

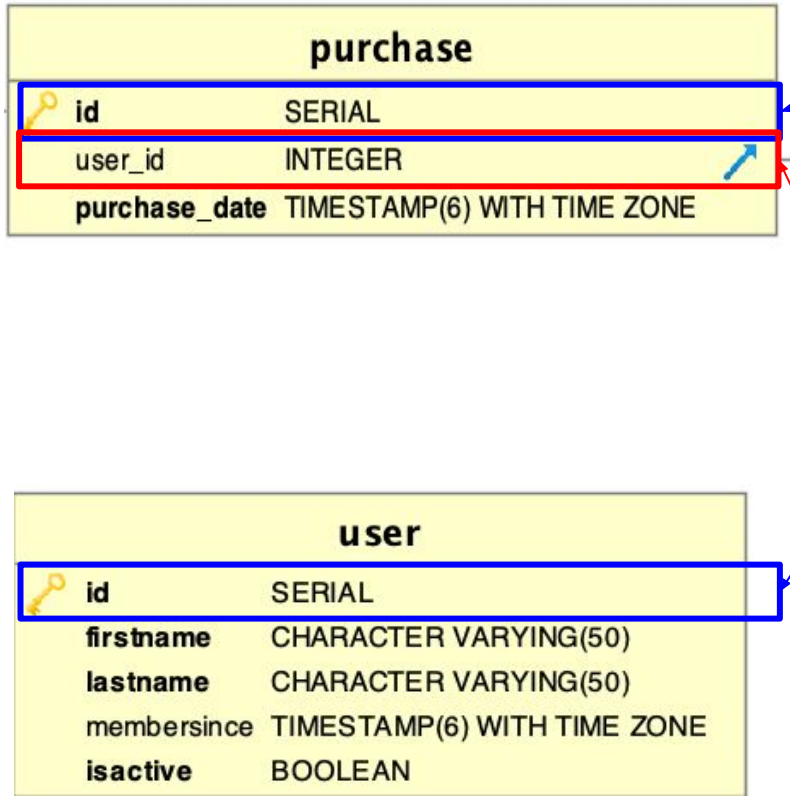
- **Cardinality** refers to the maximum number of times that an instance in one entity can be associated with instances in a related entity.
- **Ordinality** refers to the minimum number of times it must be associated. E.g. mandatory or optional.

- Example: How many purchases can a given user have?





KEYS



Primary Keys uniquely identify a row in a table.

Foreign Keys are a field in a table that uniquely identifies a row in another table.

PRIMARY KEYS

- Are a type of constraint
- Must be unique
- Cannot be null
- May contain one or many columns
- Are considered to be natural or surrogate.
    - A surrogate key is synthetic. It is purely created as an identifier and has no relationship to the table. A common surrogate key is an integer that increments from 1 onward.
- Only one is allowed per table

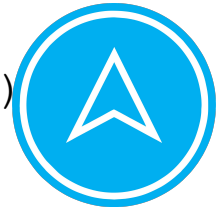
PRIMARY KEY SYNTAX

As a “column constraint”

```
CREATE TABLE purchase
(
  id integer PRIMARY KEY
);
```

As a “table constraint”

```
CREATE TABLE purchase
(
  id integer,
  CONSTRAINT pk_purchase_id PRIMARY KEY (column1)
);
```



FOREIGN KEYS

- Are another type of constraint.
- May contain one or many columns
- The data type of the foreign key column must match the data type of the column it references.
- Can have more than one foreign key per table.
- Must reference a primary or unique key in another table.
    - Maintains **referential integrity** between two related tables.

FOREIGN KEY SYNTAX

As a “column constraint”

```
CREATE TABLE purchase
(
  id integer PRIMARY KEY
  user_id integer REFERENCES “user” (id)
);
```

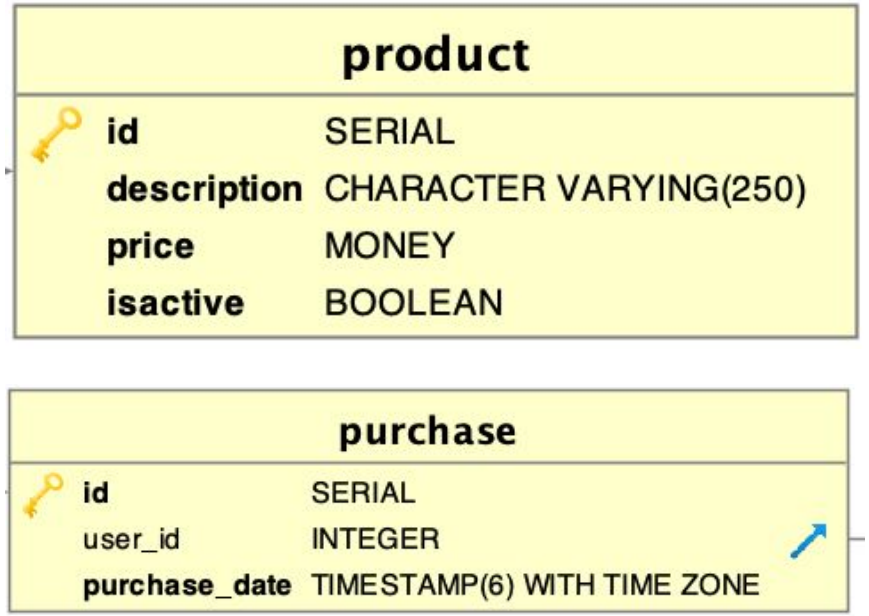
FOREIGN KEY SYNTAX

As a “table constraint”

```
    CREATE TABLE purchase
    (
      id integer PRIMARY KEY,
      user_id integer,
      CONSTRAINT fk_user_id FOREIGN KEY (user_id)
REFERENCES user (id)
    );
```

CARDINALITY (revisited)

- How many products can be included in a purchase?
- How many purchases can include a product?



JOINS

combine columns

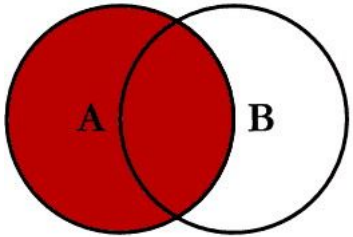
JOINS

SQL JOINs allow us to create queries that produce data from one or more tables.

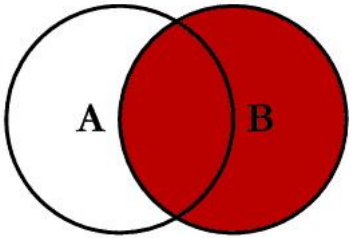
SYNTAX

```
 SELECT    table1.column, table2.column
 FROM      table1
[INNER JOIN | LEFT JOIN | RIGHT JOIN] table2
    ON table1.column = table2.column;
```

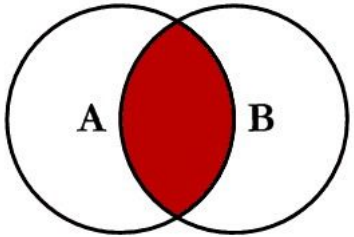
SQL JOINS



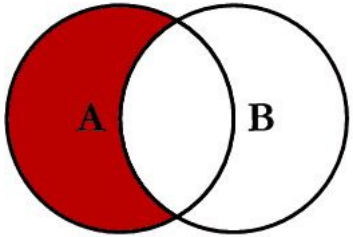

```
SELECT <select_list>
FROM TableA A
LEFT JOIN TableB B
ON A.Key = B.Key
```



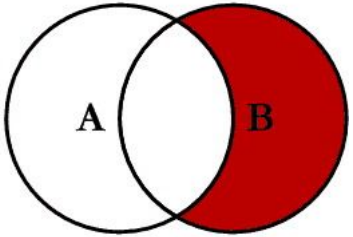

```
SELECT <select_list>
FROM TableA A
RIGHT JOIN TableB B
ON A.Key = B.Key
```



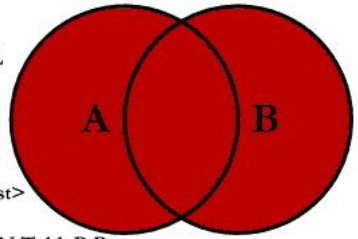

```
SELECT <select_list>
FROM TableA A
INNER JOIN TableB B
ON A.Key = B.Key
```



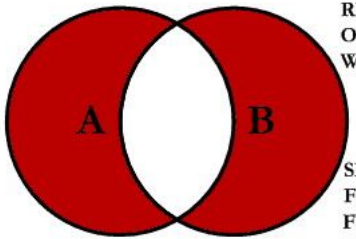

```
SELECT <select_list>
FROM TableA A
LEFT JOIN TableB B
ON A.Key = B.Key
WHERE B.Key IS NULL
```




```
SELECT <select_list>
FROM TableA A
RIGHT JOIN TableB B
ON A.Key = B.Key
WHERE A.Key IS NULL
```




```
SELECT <select_list>
FROM TableA A
FULL OUTER JOIN TableB B
ON A.Key = B.Key
```




```
SELECT <select_list>
FROM TableA A
FULL OUTER JOIN TableB B
ON A.Key = B.Key
WHERE A.Key IS NULL
OR B.Key IS NULL
```


UNIONS

combine rows

UNIONS

SQL UNIONs combine the results of two or more queries into a single result set.

- The number of columns involved must match exactly and the data types must be identical.
- The data types must be compatible with each other.
- The names of the columns do not need to match.
- Duplicate rows are removed by default. They can be included using UNION ALL.

SYNTAX

```
SELECT table1.column FROM table1 [WHERE] [...]
UNION [ALL]
SELECT table2.column FROM table2 [WHERE] [...];
```

QUESTIONS?