RELATIONAL DATABASES

CONSTRAINTS

OBJECTIVES

- LEARN ABOUT ‘CONSTRAINTS’ AS THEY RELATE TO DATA INTEGRITY.
- KNOW WHEN IT IS POSSIBLE TO DEFINE A CONSTRAINT AT THE COLUMN LEVEL AND WHEN IT IS POSSIBLE AT THE TABLE LEVEL.
- KNOW WHAT DATA INTEGRITY RULES ARE ENFORCED BY NOT NULL AND UNIQUE CONSTRAINTS.

CONSTRAINTS

- A CONSTRAINT IS A DATABASE RULE..
- CONSTRAINTS PREVENT THE DELETION OF A TABLE IF THERE ARE DEPENDENCIES FROM OTHER TABLES.
- CONSTRAINTS ENFORCE RULES ON THE DATA WHENEVER A ROW IS INSERTED, UPDATED, OR DELETED FROM A TABLE.

CONSTRAINTS

- THERE ARE SEVERAL DIFFERENT TYPES OF CONSTRAINTS:
  - PRIMARY KEY
  - UNIQUE KEY
  - NOT NULL
  - FOREIGN KEY
  - CHECK CONSTRAINT

RULES FOR CONSTRAINTS

- CONSTRAINTS THAT REFER TO MORE THAN ONE COLUMN MUST BE DEFINED AT THE TABLE LEVEL.
- THE NOT NULL CONSTRAINT CAN BE DEFINED ONLY AT THE COLUMN LEVEL.
- UNIQUE, PRIMARY, FOREIGN KEY, AND CHECK CONSTRAINTS CAN BE DEFINED AT EITHER LEVEL.

PRIMARY KEY CONSTRAINT

- A COLUMN OR SET OF COLUMNS THAT UNIQUELY IDENTIFIES EACH ROW IN THE TABLE
    - A PRIMARY KEY MUST CONTAIN UNIQUE VALUES, IF IT IS MULTIPLE COLUMNS THE COMBINATION OF VALUES MUST BE UNIQUE.
    - A PRIMARY KEY CANNOT CONTAIN NULL VALUES.
    - A TABLE HAS ONLY ONE PRIMARY KEY.
- THE DATA TYPE OF THE PRIMARY KEY IS USUALLY INT, ENSURE THE RANGE IS LARGE ENOUGH TO DEAL WITH THE NUMBER OF POSSIBLE ROWS THAT THE TABLE MAY HAVE.
- A PRIMARY KEY COLUMN OFTEN HAS THE AUTO_INCREMENT ATTRIBUTE THAT GENERATES A UNIQUE SEQUENCE FOR THE KEY AUTOMATICALLY FOR EACH NEW ROW ADDED.

NOT NULL CONSTRAINT

- A COLUMN DEFINED WITH A NOT NULL CONSTRAINT REQUIRES THAT FOR EVERY ROW ENTERED INTO THE TABLE, A VALUE MUST EXIST FOR THAT COLUMN.
- A COLUMN CAN ONLY HAVE ONE NOT NULL CONSTRAINT
- A DEFAULT VALUE IS OFTEN USED ON A COLUMN WITH A NOT NULL CONSTRAINT.
- BEST PRACTICE IS TO HAVE NOT NULL ON ALL COLUMNS UNLESS YOU HAVE A BUSINESS REASON NOT TO DO SO.

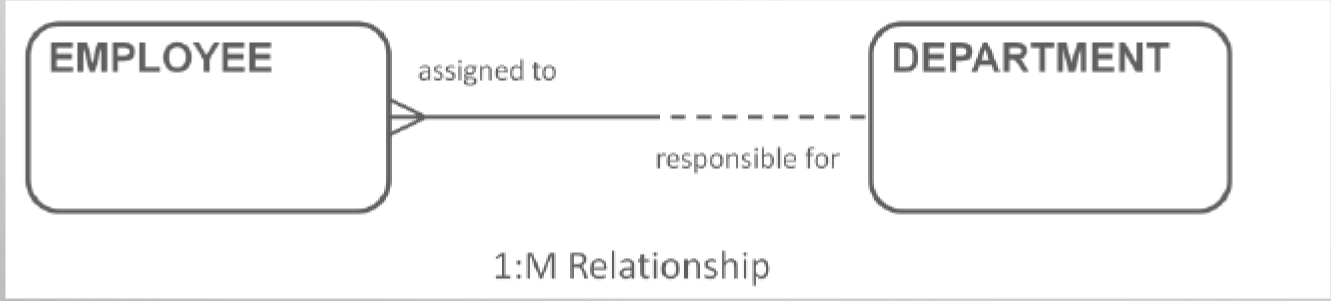
UNIQUE CONSTRAINT

- A UNIQUE CONSTRAINT REQUIRES THAT EVERY VALUE IN A COLUMN OR SET OF COLUMNS (COMPOSITE) BE UNIQUE; NO TWO ROWS CAN HAVE THE SAME VALUES.

- UNIQUE KEY CONSTRAINT ALLOWS NULL’S UNLESS THE COLUMN ALSO HAS A NOT NULL CONSTRAINT.

FOREIGN KEY CONSTRAINT

- A FOREIGN KEY IS A FIELD IN A TABLE THAT MATCHES A PRIMARY KEY VALUE IN ANOTHER TABLE.
- THIS ENFORCES REFERENTIAL INTEGRITY.
- IN THIS RELATIONSHIP THE DEPARTMENT IS THE PARENT ENTITY, THE EMPLOYEE IS THE CHILD ENTITY. THE CHILD FOREIGN KEY REFERS TO THE PARENT PRIMARY KEY.



1:M Relationship

FOREIGN KEY CONSTRAINT

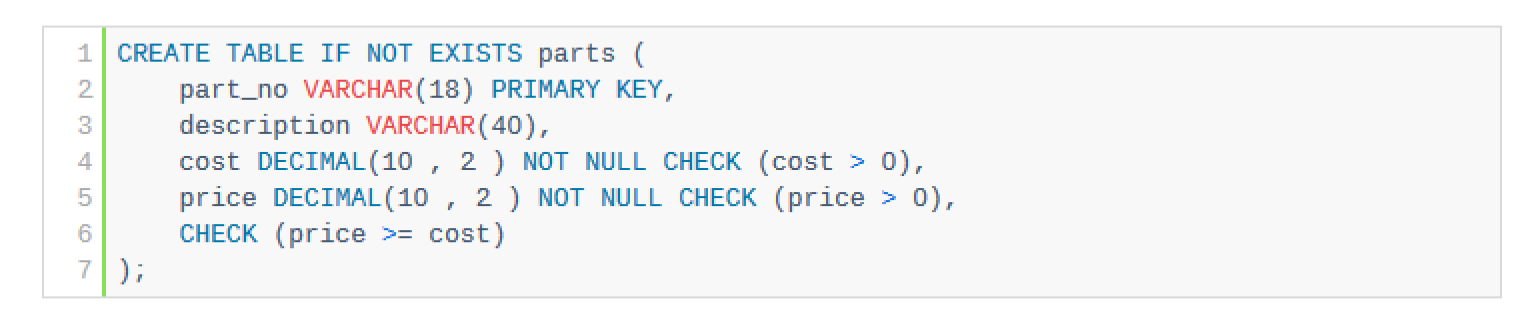
- A FOREIGN KEY CAN BE A COLUMN OR SET OF COLUMNS.
- A TABLE MAY HAVE MORE THAN ONE FOREIGN KEY, EACH FOREIGN KEY IN THE CHILD TABLE REFERS TO A DIFFERENT PARENT TABLE.
- A ROW CONTAINING A FOREIGN KEY IN THE CHILD TABLE MUST REFER TO A VALUE OF THE PRIMARY KEY IN THE PARENT TABLE.
- EACH EMPLOYEE THAT HAS A VALUE IN THE DEPARTMENT FOREIGN KEY COLUMN MUST MATCH A DEPARTMENT PRIMARY KEY VALUE.

FOREIGN KEY CONSTRAINT

- FOREIGN KEYS HELP TO MAINTAIN THE CONSISTENCY AND INTEGRITY OF THE DATA AUTOMATICALLY. FOR EXAMPLE YOU CANNOT CREATE A NEW EMPLOYEE RECORD FOR A NON EXISTENT DEPARTMENT.
- YOU CAN SET UP A CASCADE ON DELETE ACTION FOR THE DEPARTMENT_NUM FOREIGN KEY SO THAT WHEN YOU DELETE A DEPARTMENT FROM THE DEPARTMENTS TABLE, ALL THE ASSOCIATED EMPLOYEES ARE DELETED! OR USE ON DELETE SET NULL, THE FOREIGN KEY VALUES IN THE CHILD TABLE WILL BE SET TO NULL INSTEAD.
- YOU CAN ALSO DEFINE A CASCADE ON UPDATE ACTION.
- IF YOU DO NOT SET ON DELETE OPTION, MYSQL WILL REJECT A DELETE REQUEST TO A PARENT TABLE.

CHECK CONSTRAINT

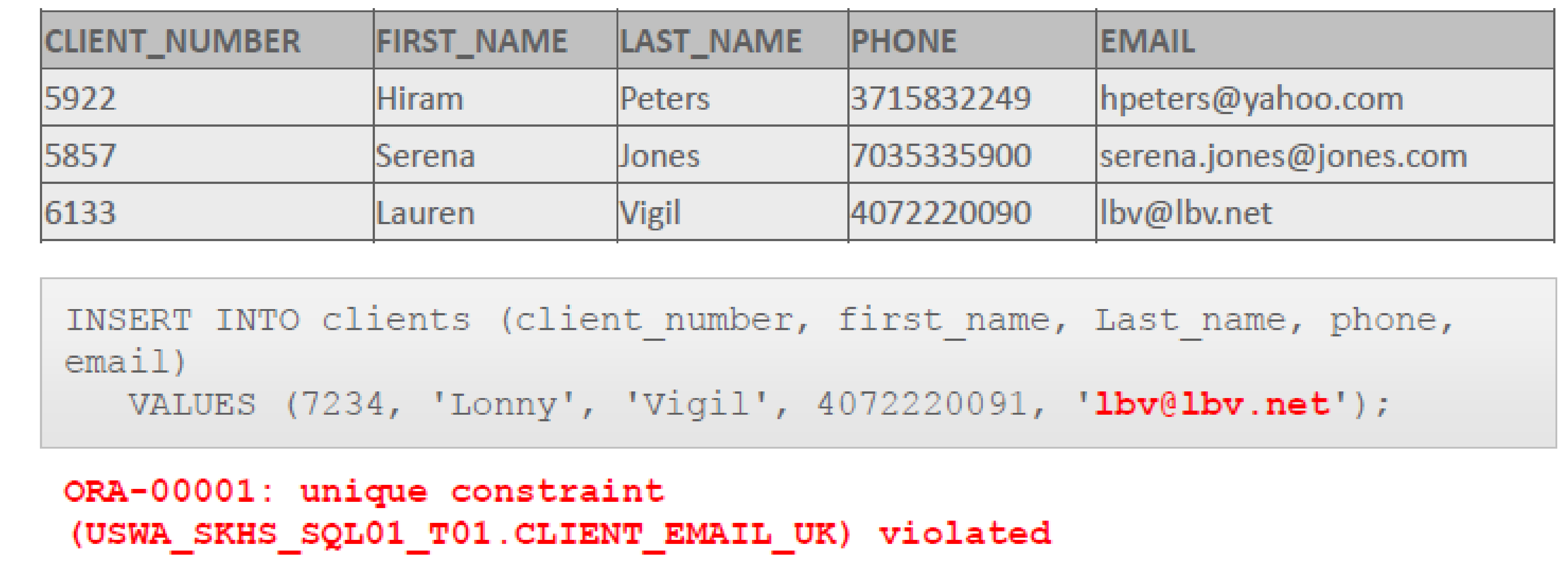
- SQL PROVIDES CHECK CONSTRAINTS THAT SPECIFY A VALUE IN A CERTAIN COLUMN MUST SATISFY A BOOLEAN EXPRESSION:



```
CREATE TABLE IF NOT EXISTS parts (
    part_no VARCHAR(18) PRIMARY KEY,
    description VARCHAR(40),
    cost DECIMAL(10 , 2 ) NOT NULL CHECK (cost > 0),
    price DECIMAL(10 , 2 ) NOT NULL CHECK (price > 0),
    CHECK (price >= cost)
);
```

- MYSQL DOES NOT SUPPORT CHECK CONSTRAINTS, INSTEAD YOU HAVE TO CREATE A STORED PROCEDURE AND THEN USE TWO TRIGGERS TO IMPLEMENT CHECK CONSTRAINTS IN MYSQL.

CONSTRAINTS

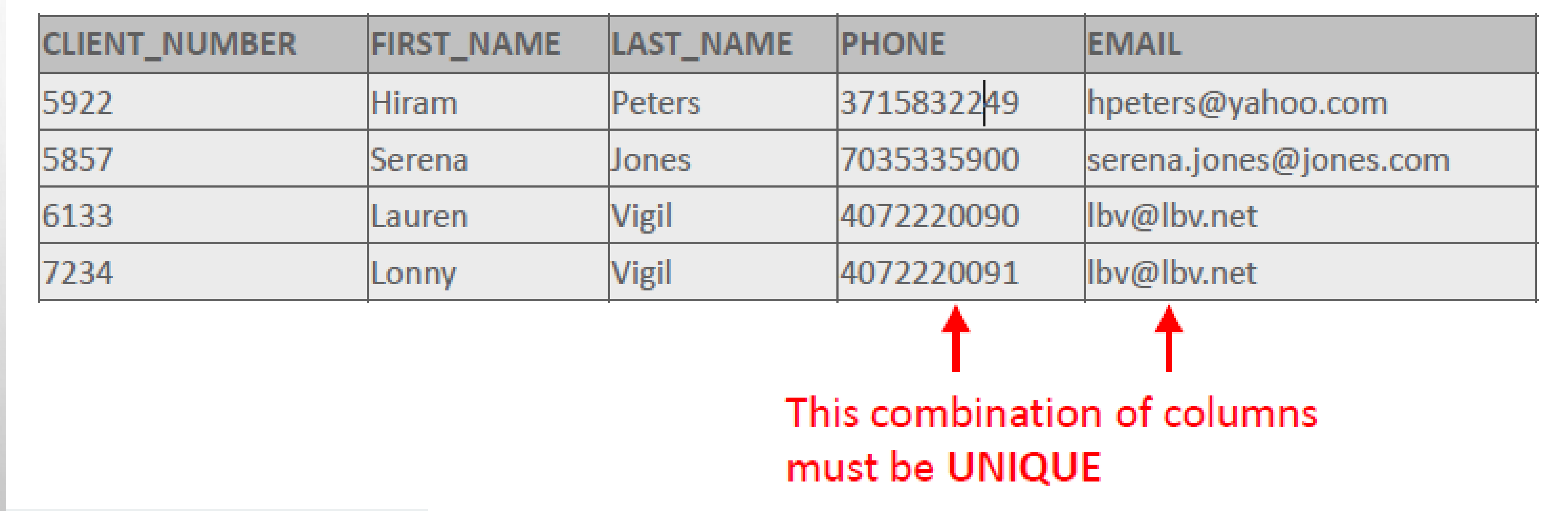


CLIENT_NUMBER	FIRST_NAME	LAST_NAME	PHONE	EMAIL
5922	Hiram	Peters	3715832249	hpeters@yahoo.com
5857	Serena	Jones	7035335900	serena.jones@jones.com
6133	Lauren	Vigil	4072220090	lbv@lbv.net

```
INSERT INTO clients (client_number, first_name, Last_name, phone,
email)
   VALUES (7234, 'Lonny', 'Vigil', 4072220091, 'lbv@lbv.net');
```

```
ORA-00001: unique constraint
(USWA_SKHS_SQL01_T01.CLIENT_EMAIL_UK) violated
```

CONSTRAINTS



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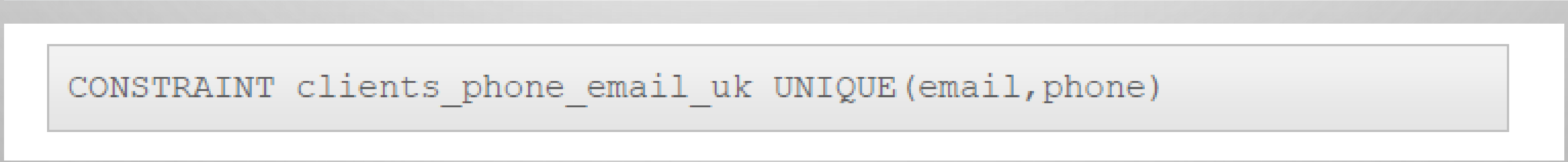
7234	Lonny	Vigil	4072220091	lbv@lbv.net

This combination of columns
must be **UNIQUE**



```
CONSTRAINT clients_phone_email_uk UNIQUE(email,phone)
```

CONSTRAINTS

- WE CAN DEFINE OUR CONSTRAINTS IN OUR CREATE TABLE OR USING THE ALTER TABLE STATEMENT.
- THERE ARE TWO PLACES WE CAN DEFINE CONSTRAINTS IN THE CREATE TABLE STATEMENT,
  - AT THE COLUMN LEVEL NEXT TO THE COLUMN NAME AND THE DATA TYPE. THE COLUMN LEVEL REFERS TO WHERE THE COLUMNS ARE DEFINED.
  - AT THE TABLE LEVEL AFTER ALL THE COLUMN NAMES ARE LISTED. THE TABLE LEVEL REFERS TO THE LAST LINE IN THE STATEMENT BELOW THE LIST OF COLUMNS.