WEEK 5

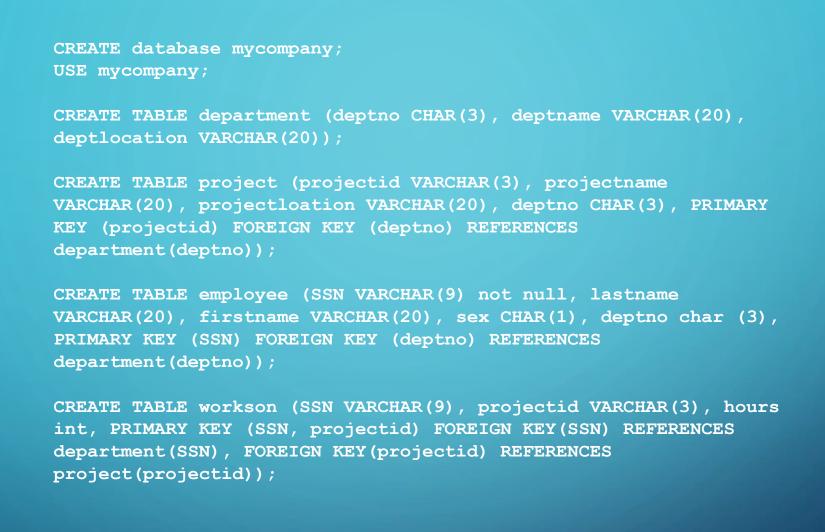SQL – IMPLEMENTING OUR CASE STUDY IN MYSQL

STUDENT OBJECTIVES

- Upon completion of this video, you should be able to:

  - Create tables

  - Insert data into tables

  - Query the tables by joining them together

  - Using SQL, implement a projection, selection, join, Cartesian product, union, intersection and difference.

  - Alter and drop tables

  - Create indices on tables

EXAMPLE – STEP 1→ CREATE YOUR DATABASE AND TABLES

- Connect to your virtual machine and let's set up the *employee, department, project, workson* database:

http://www.csd.uwo.ca/~lreid/cs3319/sqlscripts/

```
CREATE database mycompany;
USE mycompany;

CREATE TABLE department (deptno CHAR(3), deptname VARCHAR(20),
deptlocation VARCHAR(20));

CREATE TABLE project (projectid VARCHAR(3), projectname
VARCHAR(20), projectloation VARCHAR(20), deptno CHAR(3), PRIMARY
KEY (projectid) FOREIGN KEY (deptno) REFERENCES
department(deptno));

CREATE TABLE employee (SSN VARCHAR(9) not null, lastname
VARCHAR(20), firstname VARCHAR(20), sex CHAR(1), deptno char (3),
PRIMARY KEY (SSN) FOREIGN KEY (deptno) REFERENCES
department(deptno));

CREATE TABLE workson (SSN VARCHAR(9), projectid VARCHAR(3), hours
int, PRIMARY KEY (SSN, projectid) FOREIGN KEY(SSN) REFERENCES
department(SSN), FOREIGN KEY(projectid) REFERENCES
project(projectid));
```

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STEP 2: PUT SOME DATA INTO YOUR TABLES


```
mysql> insert into EMPLOYEE values ('34','Flanders','Ned','M', 'G6H');
insert into EMPLOYEE values ('222','Green','Rachel','F','SG7');
Query OK, 1 row affected (0.01 sec)

mysql> insert into EMPLOYEE values ('222','Green','Rachel','F','SG7');
insert into EMPLOYEE values ('111','Geller','Monica','F','G6H');Query OK, 1 row affected (0.01

mysql> insert into EMPLOYEE values ('333','Bing','Changler','M','S8P');
Query OK, 1 row affected (0.01 sec)

mysql> insert into EMPLOYEE values ('111','Geller','Monica','F','G6H');
Query OK, 1 row affected (0.00 sec)

mysql> select * from employee
    -> ;
ERROR 1146 (42S02): Table 'laurascompany.employee' doesn't exist
mysql> select * from EMPLOYEE;
+-----+----------+-----------+------+--------+
| SSN | lastname | firstname | sex  | deptno |
+-----+----------+-----------+------+--------+
| 111 | Geller   | Monica    | F    | G6H    |
| 222 | Green    | Rachel    | F    | SG7    |
| 245 | Simpson  | Homer     | M    | SG7    |
| 333 | Bing     | Changler  | M    | S8P    |
| 34  | Flanders | Ned       | M    | G6H    |
+-----+----------+-----------+------+--------+
5 rows in set (0.00 sec)

mysql>
```

```
mysql> select * from DEPARTMENT;
+--------+-------------------+-------------+
| deptno | deptname          | deptlocation |
+--------+-------------------+-------------+
| G6H    | Personnel         | London       |
| K9J    | InfoTech          | Toronto      |
| S8P    | Accounting        | London       |
| SG7    | Safety Department | Springy      |
+--------+-------------------+-------------+
4 rows in set (0.00 sec)

mysql>
```

```
mysql> create table PROJECT (projectid varchar(3) not null, projectname varchar(20), projectlocation varchar(20),deptno char(3), primary key (projectid));
Query OK, 0 rows affected (0.03 sec)

mysql> insert into PROJECT values ('P1','New Pay','Toronto','SG7');
Query OK, 1 row affected (0.01 sec)

mysql> insert into PROJECT values ('P33','GetThings','Hong Kong','G6H');
Query OK, 1 row affected (0.01 sec)

mysql> select * from project;
ERROR 1146 (42S02): Table 'laurascompany.project' doesn't exist
mysql> select * from PROJECT;
+-----------+-------------+-----------------+--------+
| projectid | projectname | projectlocation | deptno |
+-----------+-------------+-----------------+--------+
| P1        | New Pay     | Toronto         | SG7    |
| P33       | GetThings   | Hong Kong       | G6H    |
+-----------+-------------+-----------------+--------+
2 rows in set (0.00 sec)

mysql>
```

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```sql
USE mycompany;

INSERT INTO department values("G8H","Personnel","London");
INSERT INTO department values("K9J","InfoTech","Toronto");
INSERT INTO department values("S8P","Accounting","London");
INSERT INTO department values("SG7","Safety Department","Springy");


INSERT INTO employee values("111","Geller","Monica","F","G8H");
INSERT INTO employee values("222","Green","Rachel","F","SG7");
INSERT INTO employee values("245","Simpson","Homer","M","SG7");
INSERT INTO employee values("333","Bing","Changler","M","S8P");
INSERT INTO employee values("34","Flanders","Ned","M","G8H");


INSERT INTO project VALUES ("P1", "New Pay", "Toronto", "SG7");
INSERT INTO project VALUES ("P13", "Omega", "Toronto", "SG7");
INSERT INTO project VALUES ("P23", "Alpha", "Toronto", "SG7");
INSERT INTO project VALUES ("P33", "GetThings", "Hong Kong", "G8H");
INSERT INTO project VALUES ("P35", "Pi", "Springy", "SG7");
INSERT INTO project VALUES ("P43", "Delta", "London", "S8P");


INSERT INTO workson VALUES ("111","P35",10);
INSERT INTO workson VALUES ("222","P13",25);
INSERT INTO workson VALUES ("333","P35",34);
INSERT INTO workson VALUES ("34","P13",23);
INSERT INTO workson VALUES ("34","P35",20);
INSERT INTO workson VALUES ("34","P43",41);
```

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Projection:

SELECT attribute1, attribute2 FROM TABLEname;

e.g. SELECT firstname, lastname FROM employee;

```
+-----------+------------+
| lastname  | firstname  |
+-----------+------------+
| Geller    | Monica     |
| Green     | Rachel     |
| Simpson   | Homer      |
| Bing      | Changler   |
| Flanders  | Ned        |
+-----------+------------+
5 rows in set (0.00 sec)
```

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Question: What do you think:
SELECT DISTINCT lastname FROM employee;
does?

```
mysql> SELECT sex FROM employee;
+------+
| sex  |
+------+
| F    |
| F    |
| M    |
| M    |
| M    |
+------+
5 rows in set (0.00 sec)

mysql> SELECT DISTINCT sex FROM employee;
+------+
| sex  |
+------+
| F    |
| M    |
+------+
2 rows in set (0.00 sec)
```

Selection:

SELECT * FROM TABLEname WHERE condition; (* gives all fields)

e.g.

SELECT * FROM employee WHERE sex="F";

SELECT firstname, lastname FROM employee WHERE sex='F';

```
mysql> SELECT * FROM employee WHERE sex="F";
+-----+----------+-----------+------+--------+
| SSN | lastname | firstname | sex  | deptno |
+-----+----------+-----------+------+--------+
| 111 | Geller   | Monica    | F    | G8H    |
| 222 | Green    | Rachel    | F    | SG7    |
+-----+----------+-----------+------+--------+
2 rows in set (0.00 sec)

mysql> SELECT firstname,lastname FROM employee WHERE sex="F";
+-----------+----------+
| firstname | lastname |
+-----------+----------+
| Monica    | Geller   |
| Rachel    | Green    |
+-----------+----------+
2 rows in set (0.00 sec)
```

SELECT * FROM employee WHERE city IS NULL AND sex="F";

```
+------+----------+-----------+------+--------+------+
| SSN  | lastname | firstname | sex  | deptno | city |
+------+----------+-----------+------+--------+------+
| 111  | Geller   | Monica    | F    | G6H    | NULL |
| 222  | Green    | Rachel    | F    | SG7    | NULL |
+------+----------+-----------+------+--------+------+
2 rows in set (0.00 sec)
```

5 record(s) selected.

SELECT * FROM employee ORDER BY firstname;

```
+------+----------+-----------+------+--------+------+
| SSN  | lastname | firstname | sex  | deptno | city |
+------+----------+-----------+------+--------+------+
| 333  | Bing     | Changler  | M    | S8P    | NULL |
| 245  | Simpson  | Homer     | M    | SG7    | NULL |
| 111  | Geller   | Monica    | F    | G6H    | NULL |
| 34   | Flanders | Ned       | M    | G6H    | NULL |
| 222  | Green    | Rachel    | F    | SG7    | NULL |
+------+----------+-----------+------+--------+------+
5 rows in set (0.00 sec)
```

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SELECT COUNT(*) FROM employee;

```
+-----------+

| COUNT(*)  |

+-----------+

|         5 |

+-----------+
```

SELECT COUNT(sex) FROM employee;

```
+-------------+

| COUNT(sex)  |

+-------------+

|           5 |

+-------------+
```

SELECT COUNT(DISTINCT sex) FROM employee;

```
+----------------------+

| COUNT(DISTINCT sex)  |

+----------------------+

|                    2 |

+----------------------+

1 row in set (0.00 sec)
```

SELECT * FROM workson;

```
+-----+-----------+-------+
| SSN | projectid | hours |
+-----+-----------+-------+
| 111 | P35       |    10 |
| 222 | P13       |    25 |
| 333 | P35       |    34 |
| 34  | P13       |    23 |
| 34  | P35       |    20 |
| 34  | P43       |    41 |
+-----+-----------+-------+
6 rows in set (0.00 sec)
```

SELECT ssn FROM workson WHERE hours > 25;

```
+-----+
| ssn |
+-----+
| 333 |
| 34  |
+-----+
2 rows in set (0.00 sec)
```

SELECT * FROM workson WHERE projectid = 'P35' AND hours > 20;

```
+-----+-----------+-------+
| SSN | projectid | hours |
+-----+-----------+-------+
| 333 | P35       |    34 |
+-----+-----------+-------+
1 row in set (0.00 sec)
```

mysql>SELECT * FROM employee;

```
+-----+----------+-----------+------+--------+------+
| SSN | lastname | firstname | sex  | deptno | city |
+-----+----------+-----------+------+--------+------+
| 111 | Geller   | Monica    | F    | G6H    | NULL |
| 222 | Green    | Rachel    | F    | SG7    | NULL |
| 245 | Simpson  | Homer     | M    | SG7    | NULL |
| 333 | Bing     | Changler  | M    | S8P    | NULL |
| 34  | Flanders | Ned       | M    | G6H    | NULL |
+-----+----------+-----------+------+--------+------+
5 rows in set (0.00 sec)
```

mysql> SELECT COUNT(*) FROM employee;

```
+----------+
| COUNT(*) |
+----------+
|        5 |
+----------+
1 row in set (0.00 sec)
```

mysql> SELECT deptno, COUNT(*) FROM employee **GROUP BY** deptno;

```
+--------+----------+
| deptno | COUNT(*) |
+--------+----------+
| G6H    |        2 |
| S8P    |        1 |
| SG7    |        2 |
+--------+----------+
3 rows in set (0.00 sec)
```

CARTESIAN PRODUCT:

```
mysql> SELECT * FROM employee, department;
+-----+----------+-----------+------+--------+--------+------------------+-------------+
| SSN | lastname | firstname | sex  | deptno | deptno | deptname         | deptlocation |
+-----+----------+-----------+------+--------+--------+------------------+-------------+
| 111 | Geller   | Monica    | F    | G8H    | G8H    | Personnel        | London      |
| 111 | Geller   | Monica    | F    | G8H    | K9J    | InfoTech         | Toronto     |
| 111 | Geller   | Monica    | F    | G8H    | S8P    | Accounting       | London      |
| 111 | Geller   | Monica    | F    | G8H    | SG7    | Safety Department | Springy    |
| 222 | Green    | Rachel    | F    | SG7    | G8H    | Personnel        | London      |
| 222 | Green    | Rachel    | F    | SG7    | K9J    | InfoTech         | Toronto     |
| 222 | Green    | Rachel    | F    | SG7    | S8P    | Accounting       | London      |
| 222 | Green    | Rachel    | F    | SG7    | SG7    | Safety Department | Springy    |
| 245 | Simpson  | Homer     | M    | SG7    | G8H    | Personnel        | London      |
| 245 | Simpson  | Homer     | M    | SG7    | K9J    | InfoTech         | Toronto     |
| 245 | Simpson  | Homer     | M    | SG7    | S8P    | Accounting       | London      |
| 245 | Simpson  | Homer     | M    | SG7    | SG7    | Safety Department | Springy    |
| 333 | Bing     | Changler  | M    | S8P    | G8H    | Personnel        | London      |
| 333 | Bing     | Changler  | M    | S8P    | K9J    | InfoTech         | Toronto     |
| 333 | Bing     | Changler  | M    | S8P    | S8P    | Accounting       | London      |
| 333 | Bing     | Changler  | M    | S8P    | SG7    | Safety Department | Springy    |
| 34  | Flanders | Ned       | M    | G8H    | G8H    | Personnel        | London      |
| 34  | Flanders | Ned       | M    | G8H    | K9J    | InfoTech         | Toronto     |
| 34  | Flanders | Ned       | M    | G8H    | S8P    | Accounting       | London      |
| 34  | Flanders | Ned       | M    | G8H    | SG7    | Safety Department | Springy    |
+-----+----------+-----------+------+--------+--------+------------------+-------------+
20 rows in set (0.00 sec)
```

Joins:

```
mysql> SHOW TABLES;
+---------------------+
| TABLES_in_mycompany |
+---------------------+
| department          |
| employee            |
| project             |
| workson             |
+---------------------+
4 rows in set (0.00 sec)

mysql> SELECT * FROM employee;
+-----+----------+-----------+------+--------+
| SSN | lastname | firstname | sex  | deptno |
+-----+----------+-----------+------+--------+
| 111 | Geller   | Monica    | F    | G8H    |
| 222 | Green    | Rachel    | F    | SG7    |
| 245 | Simpson  | Homer     | M    | SG7    |
| 333 | Bing     | Changler  | M    | S8P    |
| 34  | Flanders | Ned       | M    | G8H    |
+-----+----------+-----------+------+--------+
5 rows in set (0.00 sec)
```

```
mysql> SELECT * FROM department;
+--------+------------------+--------------+
| deptno | deptname         | deptlocation |
+--------+------------------+--------------+
| G8H    | Personnel        | London       |
| K9J    | InfoTech         | Toronto      |
| S8P    | Accounting       | London       |
| SG7    | Safety Department | Springy     |
+--------+------------------+--------------+
4 rows in set (0.00 sec)

mysql> SELECT lastname FROM employee WHERE deptno = "SG7";
+----------+
| lastname |
+----------+
| Green    |
| Simpson  |
+----------+
2 rows in set (0.00 sec)

mysql> SELECT deptname FROM department;
+-------------------+
| deptname          |
+-------------------+
| Personnel         |
| InfoTech          |
| Accounting        |
| Safety Department |
+-------------------+
4 rows in set (0.00 sec)
```

```
mysql> SELECT deptname FROM department WHERE deptno="SG7";
+-------------------+
| deptname          |
+-------------------+
| Safety Department |
+-------------------+
1 row in set (0.00 sec)

mysql> SELECT lastname FROM employee WHERE deptno IN (SELECT deptno FROM department
    WHERE deptname="Safety Department");
+----------+
| lastname |
+----------+
| Green    |
| Simpson  |
+----------+
2 rows in set (0.00 sec)

mysql> SELECT lastname FROM employee, department WHERE
    employee.deptno=department.deptno and department.deptname="Safety Department";
+----------+
| lastname |
+----------+
| Green    |
| Simpson  |
+----------+
2 rows in set (0.00 sec)
```

```
mysql> SELECT * FROM employee RIGHT OUTER JOIN department ON
employee.deptno=department.deptno;
+------+----------+-----------+------+--------+--------+-------------------+--------------+
| SSN  | lastname | firstname | sex  | deptno | deptno | deptname          | deptlocation |
+------+----------+-----------+------+--------+--------+-------------------+--------------+
| 111  | Geller   | Monica    | F    | G8H    | G8H    | Personnel         | London       |
| 34   | Flanders | Ned       | M    | G8H    | G8H    | Personnel         | London       |
| NULL | NULL     | NULL      | NULL | NULL   | K9J    | InfoTech          | Toronto      |
| 333  | Bing     | Changler  | M    | S8P    | S8P    | Accounting        | London       |
| 222  | Green    | Rachel    | F    | SG7    | SG7    | Safety Department | Springy      |
| 245  | Simpson  | Homer     | M    | SG7    | SG7    | Safety Department | Springy      |
+------+----------+-----------+------+--------+--------+-------------------+--------------+
6 rows in set (0.00 sec)
```

NOTE: Full outer join would be: *SELECT * FROM EMPLOYEE FULL JOIN DEPARTMENT ON DEPARTMENT.DEPTNO = EMPLOYEE.DEPTNO*

UNION:

First, let's add a city column to the employee TABLE:

```
mysql> ALTER TABLE employee ADD city VARCHAR(20);
Query OK, 5 rows affected (0.18 sec)
Records: 5  Duplicates: 0  Warnings: 0mysql> SELECT * FROM employee;
+-----+----------+-----------+------+--------+------+
| SSN | lastname | firstname | sex  | deptno | city |
+-----+----------+-----------+------+--------+------+
| 111 | Geller   | Monica    | F    | G8H    | NULL |
| 222 | Green    | Rachel    | F    | SG7    | NULL |
| 245 | Simpson  | Homer     | M    | SG7    | NULL |
| 333 | Bing     | Changler  | M    | S8P    | NULL |
| 34  | Flanders | Ned       | M    | G8H    | NULL |
+-----+----------+-----------+------+--------+------+
5 rows in set (0.00 sec)

mysql> UPDATE employee SET city="Calgary" WHERE sex="F";
Query OK, 2 rows affected (0.00 sec)
Rows matched: 2  Changed: 2  Warnings: 0

mysql> UPDATE employee SET city="Halifax" WHERE sex="M";
Query OK, 3 rows affected (0.01 sec)
Rows matched: 3  Changed: 3  Warnings: 0
```

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```
mysql> SELECT * FROM department;
+--------+------------------+-------------+
| deptno | deptname         | deptlocation |
+--------+------------------+-------------+
| G8H    | Personnel        | London      |
| K9J    | InfoTech         | Toronto     |
| S8P    | Accounting       | London      |
| SG7    | Safety Department | Springy     |
+--------+------------------+-------------+
4 rows in set (0.00 sec)
```

mysql> SELECT deptlocation FROM department UNION (SELECT city FROM employee);

```
+-------------+
| deptlocation |
+-------------+
| London      |
| Toronto     |
| Springy     |
| Calgary     |
| Halifax     |
+-------------+
5 rows in set (0.00 sec)
```

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INTERSECTION:

```
mysql> SELECT deptlocation FROM department;
+-------------+
| deptlocation |
+-------------+
| London      |
| Toronto     |
| London      |
| Springy     |
+-------------+
4 rows in set (0.00 sec)

mysql> SELECT projectloation FROM project;
+---------------+
| projectloation |
+---------------+
| Toronto       |
| Toronto       |
| Toronto       |
| Hong Kong     |
| Springy       |
| London        |
+---------------+
6 rows in set (0.00 sec)

mysql> SELECT DISTINCT department.deptlocation FROM department JOIN
    project ON project.projectloation=department.deptlocation;
+--------------+
| deptlocation |
+--------------+
| Toronto      |
| Springy      |
| London       |
+--------------+
3 rows in set (0.00 sec)
```

DIFFERENCE:

```
mysql> SELECT deptlocation FROM department;
+-------------+
| deptlocation |
+-------------+
| London       |
| Toronto      |
| London       |
| Springy      |
+-------------+
4 rows in set (0.00 sec)

mysql> SELECT projectloation FROM project;
+---------------+
| projectloation |
+---------------+
| Toronto        |
| Toronto        |
| Toronto        |
| Hong Kong      |
| Springy        |
| London         |
+---------------+
6 rows in set (0.00 sec)

mysql> SELECT projectloation FROM project WHERE projectloation NOT IN (SELECT deptlocation FROM department);
+---------------+
| projectloation |
+---------------+
| Hong Kong      |
+---------------+
1 row in set (0.00 sec)
```

WILDCARDS/PATTERN MATCHING:

```
mysql> SELECT * FROM project WHERE projectloation LIKE '%on%';
+-----------+------------+---------------+--------+
| projectid | projectname | projectloation | deptno |
+-----------+------------+---------------+--------+
| P1        | New Pay    | Toronto       | SG7    |
| P13       | Omega      | Toronto       | SG7    |
| P23       | Alpha      | Toronto       | SG7    |
| P33       | GetThings  | Hong Kong     | G8H    |
| P43       | Delta      | London        | S8P    |
+-----------+------------+---------------+--------+
5 rows in set (0.00 sec)


mysql> SELECT * FROM project WHERE projectid LIKE 'P_3';
+-----------+------------+---------------+--------+
| projectid | projectname | projectloation | deptno |
+-----------+------------+---------------+--------+
| P13       | Omega      | Toronto       | SG7    |
| P23       | Alpha      | Toronto       | SG7    |
| P33       | GetThings  | Hong Kong     | G8H    |
| P43       | Delta      | London        | S8P    |
+-----------+------------+---------------+--------+
4 rows in set (0.00 sec)
```

UPDATING RECORDS

```
mysql> UPDATE employee SET city ="Montreal";
Query OK, 5 rows affected (0.01 sec)
Rows matched: 5  Changed: 5  Warnings: 0

mysql> SELECT * FROM employee;
+-----+----------+-----------+------+--------+----------+
| SSN | lastname | firstname | sex  | deptno | city     |
+-----+----------+-----------+------+--------+----------+
| 111 | Geller   | Monica    | F    | G8H    | Montreal |
| 222 | Green    | Rachel    | F    | SG7    | Montreal |
| 245 | Simpson  | Homer     | M    | SG7    | Montreal |
| 333 | Bing     | Changler  | M    | S8P    | Montreal |
| 34  | Flanders | Ned       | M    | G8H    | Montreal |
+-----+----------+-----------+------+--------+----------+
5 rows in set (0.00 sec)

mysql> UPDATE employee SET city="Abu Dhabi" WHERE sex="F";
Query OK, 2 rows affected (0.00 sec)
Rows matched: 2  Changed: 2  Warnings: 0

mysql> SELECT * FROM employee;
+-----+----------+-----------+------+--------+-----------+
| SSN | lastname | firstname | sex  | deptno | city      |
+-----+----------+-----------+------+--------+-----------+
| 111 | Geller   | Monica    | F    | G8H    | Abu Dhabi |
| 222 | Green    | Rachel    | F    | SG7    | Abu Dhabi |
| 245 | Simpson  | Homer     | M    | SG7    | Montreal  |
| 333 | Bing     | Changler  | M    | S8P    | Montreal  |
| 34  | Flanders | Ned       | M    | G8H    | Montreal  |
+-----+----------+-----------+------+--------+-----------+
5 rows in set (0.00 sec)
```

DELETING RECORDS:

```
mysql> SELECT * FROM employee;
+-----+----------+-----------+------+--------+-----------+
| SSN | lastname | firstname | sex  | deptno | city      |
+-----+----------+-----------+------+--------+-----------+
| 111 | Geller   | Monica    | F    | G8H    | Abu Dhabi |
| 222 | Green    | Rachel    | F    | SG7    | Abu Dhabi |
| 245 | Simpson  | Homer     | M    | SG7    | Montreal  |
| 333 | Bing     | Changler  | M    | S8P    | Montreal  |
| 34  | Flanders | Ned       | M    | G8H    | Montreal  |
+-----+----------+-----------+------+--------+-----------+
5 rows in set (0.00 sec)

mysql> DELETE FROM employee WHERE firstname LIKE "N%";
ERROR 1451 (23000): Cannot delete or update a parent row: a FOREIGN KEY
    constraint fails (`mycompany`.`workson`, CONSTRAINT `workson_ibfk_1` FOREIGN
    KEY (`SSN`) REFERENCES `employee` (`SSN`))
mysql> SELECT * FROM workson;
+-----+-----------+-------+
| SSN | projectid | hours |
+-----+-----------+-------+
| 222 | P13       |    25 |
| 333 | P35       |    34 |
| 34  | P13       |    23 |
| 34  | P35       |    20 |
| 34  | P43       |    41 |
+-----+-----------+-------+
5 rows in set (0.00 sec)

mysql> DELETE FROM employee WHERE firstname LIKE "M%";
Query OK, 1 row affected (0.02 sec)
```

STEP 4: ADDING, FIXING, DELETING TABLES

```
mysql> CREATE TABLE petowner (ownerid CHAR(3), firstname VARCHAR(20),
    lastname VARCHAR(20), PRIMARY KEY(ownerid));
Query OK, 0 rows affected (0.03 sec)
mysql> INSERT INTO petowner VALUES (222,"Peter","Griffin");
Query OK, 1 row affected (0.01 sec)
mysql> SELECT * FROM petowner;
+---------+-----------+----------+
| ownerid | firstname | lastname |
+---------+-----------+----------+
| 222     | Peter     | Griffin  |
+---------+-----------+----------+
1 row in set (0.00 sec)
mysql> ALTER TABLE petowner ADD address VARCHAR(30);
Query OK, 1 row affected (0.04 sec)
Records: 1  Duplicates: 0  Warnings: 0
mysql> SELECT * FROM petowner;
+---------+-----------+----------+---------+
| ownerid | firstname | lastname | address |
+---------+-----------+----------+---------+
| 222     | Peter     | Griffin  | NULL    |
+---------+-----------+----------+---------+
1 row in set (0.00 sec)
mysql> ALTER TABLE petowner DROP COLUMN address;
Query OK, 1 row affected (0.06 sec)
Records: 1  Duplicates: 0  Warnings: 0
mysql> DROP TABLE petowner;
Query OK, 0 rows affected (0.02 sec)
```

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STEP 5: BUILDING CONSTRAINTS – NOTE: CHECK CONSTRAINTS DON'T WORK IN MYSQL

db2 => **list TABLEs**

```
NAME          CREATOR  TYPE  CTIME
----------    ------   ----  ------------------------------
DEPARTMENT    LREID     T    1998-05-16-23.16.11.502134
EMPLOYEE      LREID     T    1998-05-16-23.14.20.406159
PROJECT       LREID     T    1998-05-16-23.31.01.967801
PROJEMP       LREID     T    1998-05-16-23.32.55.432516
```

4 record(s) selected.

db2 => **ALTER TABLE projemp ADD CONSTRAINT houry CHECK (hours > 0)**
DB20000I The SQL command completed successfully.
db2 => **SELECT * FROM projemp**

```
SSN    PROJECTID  HOURS
----   ---------- -----------
34     P35            20
34     P13            23
111    P35            10
333    P35            34
34     P43            41
222    P13            25
```

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6 record(s) selected.

db2 => **UPDATE projemp SET hours = 8 WHERE ssn='222'**
DB20000I The SQL command completed successfully.
db2 => **SELECT * FROM projemp**

```
SSN PROJECTID HOURS
--- --------- -----------
34  P35          20
34  P13          23
111 P35          10
333 P35          34
34  P43          41
222 P13          8
```

6 record(s) selected.

db2 => **UPDATE projemp SET hours = -3 WHERE ssn='222'**
DB21034E The command was processed as an SQL statement because it was not
a valid Command Line Processor command. During SQL processing it returned:
SQL0545N The requested operation is not allowed because a row does not satisfy
the check constraint "LREID.PROJEMP.HOURY". SQLSTATE=23513

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```
db2 => alter TABLE employee ADD CONSTRAINT deptvalid FOREIGN KEY(deptno) \
db2 (cont.) => REFERENCES department on delete set null
DB20000I The SQL command completed successfully.
db2 => SELECT * FROM employee

SSN LASTNAME  FIRSTNAME  SEX DEPTNO CITY
--- --------  ---------  --- ------ ----------
245 Simpson   Homer       M    SG7     Montreal
222 Green     Rachel      F    SG7     Abu Dhabi
333 Bing      Changler    M    S8P     Montreal
111 Geller    Monica      F    G6H     Abu Dhabi


4 record(s) selected.


db2 => SELECT * FROM department

DEPTNO DEPTNAME            LOCATION
------ ------------------- -----------
SG7    Safety Department   Springy
S8P    Accounting          London
G6H    Personnel           London
K9J    InfoTech             Toronto

4 record(s) selected.
```

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db2 => **DELETE FROM department WHERE deptno = 'G6H'**
DB20000l The SQL command completed successfully.
db2 => **SELECT * FROM employee**

```
SSN  LASTNAME  FIRSTNAME  SEX  DEPTNO  CITY
---  --------  ---------  ---  ------  ----------
245  Simpson   Homer       M   SG7     Montreal
222  Green     Rachel      F   SG7     Abu Dhabi
333  Bing      Changler    M   S8P     Montreal
111  Geller    Monica      F   -       Abu Dhabi
```

4 record(s) selected.

db2 => **SELECT lastname, firsname, deptname FROM department, employee **
db2 (cont.) => **WHERE department.deptno = employee.deptno**

```
LASTNAME  FIRSTNAME  DEPTNAME
--------  ---------  -------------------
Simpson   Homer      Safety Department
Green     Rachel     Safety Department
Bing      Changler   Accounting
```

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3 record(s) selected.

VIEWS

```
mysql> CREATE VIEW vdeptemp as SELECT firstname, lastname, deptname FROM department, employee WHERE
    department.deptno=employee.deptno;
Query OK, 0 rows affected (0.02 sec)

mysql> SELECT * FROM vdeptemp;
+-----------+----------+-------------------+
| firstname | lastname | deptname          |
+-----------+----------+-------------------+
| Rachel    | Green    | Safety Department |
| Homer     | Simpson  | Safety Department |
| Changler  | Bing     | Accounting        |
| Ned       | Flanders | Personnel         |
+-----------+----------+-------------------+
4 rows in set (0.01 sec)

mysql> SHOW TABLES;
+---------------------+
| TABLEs_in_mycompany |
+---------------------+
| department          |
| employee            |
| project             |
| vdeptemp            |
| workson             |
+---------------------+
5 rows in set (0.00 sec)
```

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STEP 6: BUILDING INDICES

NOTES:

- Indices are used to find a row quickly, without an index MySQL starts at the first first row and just searches row by row.

- On a TABLE of 1000 rows, an index will make it 100 times faster!

- Most MySQL indexes are stored in B+ trees.

- You can choose between B+ tree index or Hash index in mysql

- Normally you create an index at the time of table creation: In MySQL if you put *PRIMARY KEY(fieldname)* when you create a table, you automatically create a primary clustered index on that key.

- To CREATE an index use this command:
  ALTER TABLE tablename add index (columnname);

- To show the indices on a TABLE use this command:
  SHOW INDEX FROM tablename;

EXAMPLE

```
mysql> SHOW COLUMNS IN employee;
+-----------+-------------+------+-----+---------+-------+
| Field     | Type        | Null | Key | Default | Extra |
+-----------+-------------+------+-----+---------+-------+
| SSN       | VARCHAR(9)  | NO   | PRI | NULL    |       |
| lastname  | VARCHAR(20) | YES  |     | NULL    |       |
| firstname | VARCHAR(20) | YES  |     | NULL    |       |
| sex       | CHAR(1)     | YES  |     | NULL    |       |
| deptno    | CHAR(3)     | YES  | MUL | NULL    |       |
| city      | VARCHAR(20) | YES  |     | NULL    |       |
+-----------+-------------+------+-----+---------+-------+
6 rows in set (0.00 sec)


mysql> SHOW INDEX FROM employee;
+----------+------------+----------+--------------+-------------+-----------+-------------+----------+--------+------+------------+---------+---------------+
| TABLE    | Non_unique | Key_name | Seq_in_index | Column_name | Collation | Cardinality | Sub_part | Packed | Null | Index_type | Comment | Index_comment |
+----------+------------+----------+--------------+-------------+-----------+-------------+----------+--------+------+------------+---------+---------------+
| employee |          0 | PRIMARY  |            1 | SSN         | A         |           4 |     NULL | NULL   |      | BTREE      |         |               |
| employee |          1 | deptno   |            1 | deptno      | A         |           4 |     NULL | NULL   | YES  | BTREE      |         |               |
+----------+------------+----------+--------------+-------------+-----------+-------------+----------+--------+------+------------+---------+---------------+
2 rows in set (0.00 sec)

mysql> ALTER TABLE employee ADD INDEX(lastname);
Query OK, 0 rows affected (0.08 sec)
Records: 0  Duplicates: 0  Warnings: 0


mysql> SHOW INDEX FROM employee;
+----------+------------+----------+--------------+-------------+-----------+-------------+----------+--------+------+------------+---------+---------------+
| TABLE    | Non_unique | Key_name | Seq_in_index | Column_name | Collation | Cardinality | Sub_part | Packed | Null | Index_type | Comment | Index_comment |
+----------+------------+----------+--------------+-------------+-----------+-------------+----------+--------+------+------------+---------+---------------+
| employee |          0 | PRIMARY  |            1 | SSN         | A         |           4 |     NULL | NULL   |      | BTREE      |         |               |
| employee |          1 | deptno   |            1 | deptno      | A         |           4 |     NULL | NULL   | YES  | BTREE      |         |               |
| employee |          1 | lastname |            1 | lastname    | A         |           4 |     NULL | NULL   | YES  | BTREE      |         |               |
+----------+------------+----------+--------------+-------------+-----------+-------------+----------+--------+------+------------+---------+---------------+
3 rows in set (0.00 sec)
```