DBMS ASSIGNMENT 3

SQL DDL and updates

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A. Write SQL update queries to perform the following.

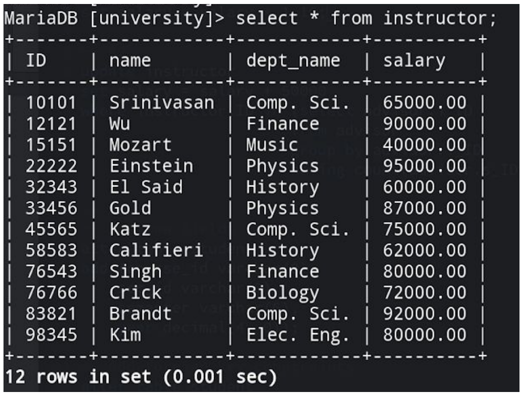
1. Give a 10% hike to all instructors.

Query:

```
update instructor
set salary = salary * 1.10;
```

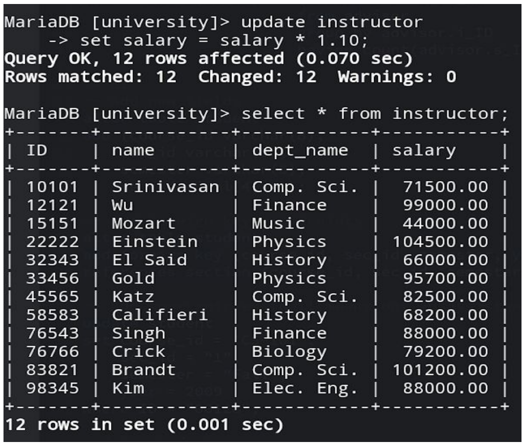
Result:

(Before)



```
MariaDB [university]> select * from instructor;
+-------+------------+------------+----------+
| ID    | name       | dept_name  | salary   |
+-------+------------+------------+----------+
| 10101 | Srinivasan | Comp. Sci. | 65000.00 |
| 12121 | Wu         | Finance    | 90000.00 |
| 15151 | Mozart     | Music      | 40000.00 |
| 22222 | Einstein   | Physics    | 95000.00 |
| 32343 | El Said    | History    | 60000.00 |
| 33456 | Gold       | Physics    | 87000.00 |
| 45565 | Katz       | Comp. Sci. | 75000.00 |
| 58583 | Califieri  | History    | 62000.00 |
| 76543 | Singh      | Finance    | 80000.00 |
| 76766 | Crick      | Biology    | 72000.00 |
| 83821 | Brandt     | Comp. Sci. | 92000.00 |
| 98345 | Kim        | Elec. Eng. | 80000.00 |
+-------+------------+------------+----------+
12 rows in set (0.001 sec)
```

(After)



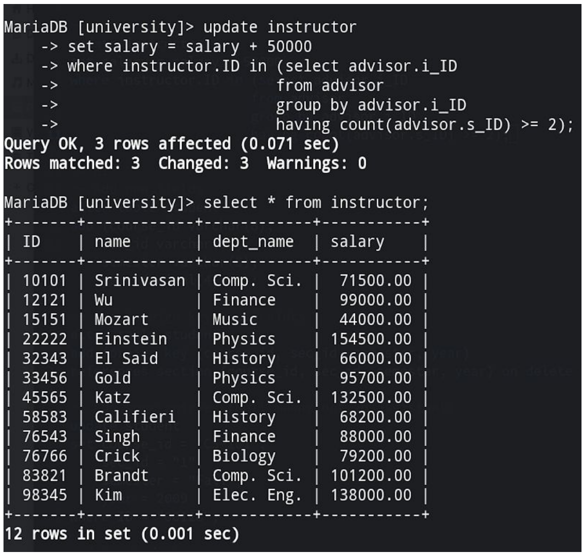
```
MariaDB [university]> update instructor
    -> set salary = salary * 1.10;
Query OK, 12 rows affected (0.070 sec)
Rows matched: 12  Changed: 12  Warnings: 0

MariaDB [university]> select * from instructor;
+-------+------------+------------+-----------+
| ID    | name       | dept_name  | salary    |
+-------+------------+------------+-----------+
| 10101 | Srinivasan | Comp. Sci. |  71500.00 |
| 12121 | Wu         | Finance    |  99000.00 |
| 15151 | Mozart     | Music      |  44000.00 |
| 22222 | Einstein   | Physics    | 104500.00 |
| 32343 | El Said    | History    |  66000.00 |
| 33456 | Gold       | Physics    |  95700.00 |
| 45565 | Katz       | Comp. Sci. |  82500.00 |
| 58583 | Califieri  | History    |  68200.00 |
| 76543 | Singh      | Finance    |  88000.00 |
| 76766 | Crick      | Biology    |  79200.00 |
| 83821 | Brandt     | Comp. Sci. | 101200.00 |
| 98345 | Kim        | Elec. Eng. |  88000.00 |
+-------+------------+------------+-----------+
12 rows in set (0.001 sec)
```

2. For all instructors who are advisors of at least 2 students, increase their salary by 50000.

Query:

```
update instructor
set salary = salary + 50000
where instructor.ID in (select advisor.i_ID
                  from advisor
                  group by advisor.i_ID
                  having count(advisor.s_ID) >= 2);
```

Result:
(After)



```
MariaDB [university]> update instructor
    -> set salary = salary + 50000
    -> where instructor.ID in (select advisor.i_ID
    ->                          from advisor
    ->                          group by advisor.i_ID
    ->                          having count(advisor.s_ID) >= 2);
Query OK, 3 rows affected (0.071 sec)
Rows matched: 3  Changed: 3  Warnings: 0

MariaDB [university]> select * from instructor;
+-------+------------+------------+-----------+
| ID    | name       | dept_name  | salary    |
+-------+------------+------------+-----------+
| 10101 | Srinivasan | Comp. Sci. |  71500.00 |
| 12121 | Wu         | Finance    |  99000.00 |
| 15151 | Mozart     | Music      |  44000.00 |
| 22222 | Einstein   | Physics    | 154500.00 |
| 32343 | El Said    | History    |  66000.00 |
| 33456 | Gold       | Physics    |  95700.00 |
| 45565 | Katz       | Comp. Sci. | 132500.00 |
| 58583 | Califieri  | History    |  68200.00 |
| 76543 | Singh      | Finance    |  88000.00 |
| 76766 | Crick      | Biology    |  79200.00 |
| 83821 | Brandt     | Comp. Sci. | 101200.00 |
| 98345 | Kim        | Elec. Eng. | 138000.00 |
+-------+------------+------------+-----------+
12 rows in set (0.001 sec)
```

B. Write the DDL and DML statements for the following.

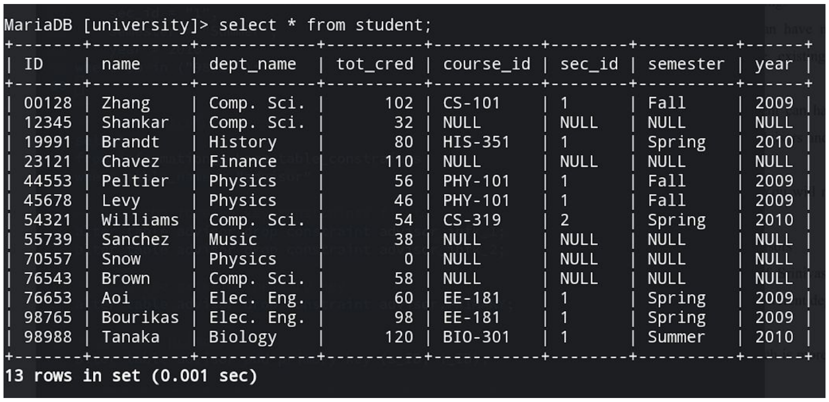
1. Each offering of a course (i.e. a section) can have many Teaching assistants; each teaching assistant is a student. Extend the existing schema(Add/Alter tables) to accommodate this requirement.

Query:

```
-- Add new fields
alter table student
add (course_id varchar(8),
          sec_id varchar(8),
          semester varchar(6),
          year decimal(4, 0));
-- Add foreign key constraints
alter table student
add foreign key (course_id, sec_id, semester, year)
references section (course_id, sec_id, semester, year) on delete set null;

-- Update the existing student records to assign some of them as teaching assistants
update student
set course_id = 'CS-101',
          sec_id = "1",
          semester = "Fall",
          year = 2009
where ID = "00128";
```

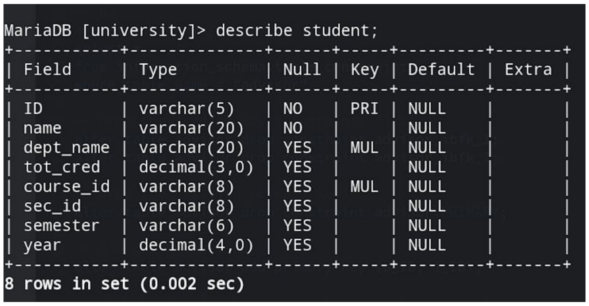
```
update student
set course_id = 'CS-319',
        sec_id = "2",
        semester = "Spring",
        year = 2010
where ID = "54321";

update student
set course_id = 'HIS-351',
        sec_id = "1",
        semester = "Spring",
        year = 2010
where ID = "19991";

update student
set course_id = 'PHY-101',
        sec_id = "1",
        semester = "Fall",
        year = 2009
where ID in ("44553", "45678");

update student
set course_id = 'EE-181',
        sec_id = "1",
        semester = "Spring",
        year = 2009
where ID in ("76653", "98765");



update student
set course_id = 'BIO-301',
        sec_id = "1",
        semester = "Summer",
        year = 2010
where ID in ("98988");
```

Result:
(After updating records)



```
MariaDB [university]> select * from student;
+-------+----------+------------+----------+-----------+--------+----------+------+
| ID    | name     | dept_name  | tot_cred | course_id | sec_id | semester | year |
+-------+----------+------------+----------+-----------+--------+----------+------+
| 00128 | Zhang    | Comp. Sci. |      102 | CS-101    | 1      | Fall     | 2009 |
| 12345 | Shankar  | Comp. Sci. |       32 | NULL      | NULL   | NULL     | NULL |
| 19991 | Brandt   | History    |       80 | HIS-351   | 1      | Spring   | 2010 |
| 23121 | Chavez   | Finance    |      110 | NULL      | NULL   | NULL     | NULL |
| 44553 | Peltier  | Physics    |       56 | PHY-101   | 1      | Fall     | 2009 |
| 45678 | Levy     | Physics    |       46 | PHY-101   | 1      | Fall     | 2009 |
| 54321 | Williams | Comp. Sci. |       54 | CS-319    | 2      | Spring   | 2010 |
| 55739 | Sanchez  | Music      |       38 | NULL      | NULL   | NULL     | NULL |
| 70557 | Snow     | Physics    |        0 | NULL      | NULL   | NULL     | NULL |
| 76543 | Brown    | Comp. Sci. |       58 | NULL      | NULL   | NULL     | NULL |
| 76653 | Aoi      | Elec. Eng. |       60 | EE-181    | 1      | Spring   | 2009 |
| 98765 | Bourikas | Elec. Eng. |       98 | EE-181    | 1      | Spring   | 2009 |
| 98988 | Tanaka   | Biology    |      120 | BIO-301   | 1      | Summer   | 2010 |
+-------+----------+------------+----------+-----------+--------+----------+------+
13 rows in set (0.001 sec)
```

(New Schema)



```
MariaDB [university]> describe student;
+-----------+--------------+------+-----+---------+-------+
| Field     | Type         | Null | Key | Default | Extra |
+-----------+--------------+------+-----+---------+-------+
| ID        | varchar(5)   | NO   | PRI | NULL    |       |
| name      | varchar(20)  | NO   |     | NULL    |       |
| dept_name | varchar(20)  | YES  | MUL | NULL    |       |
| tot_cred  | decimal(3,0) | YES  |     | NULL    |       |
| course_id | varchar(8)   | YES  | MUL | NULL    |       |
| sec_id    | varchar(8)   | YES  |     | NULL    |       |
| semester  | varchar(6)   | YES  |     | NULL    |       |
| year      | decimal(4,0) | YES  |     | NULL    |       |
+-----------+--------------+------+-----+---------+-------+
8 rows in set (0.002 sec)
```

2. According to the existing schema, one student can have only one advisor. Alter the schema to allow a student to have multiple advisors and make sure that you are able to insert multiple advisors for a student.

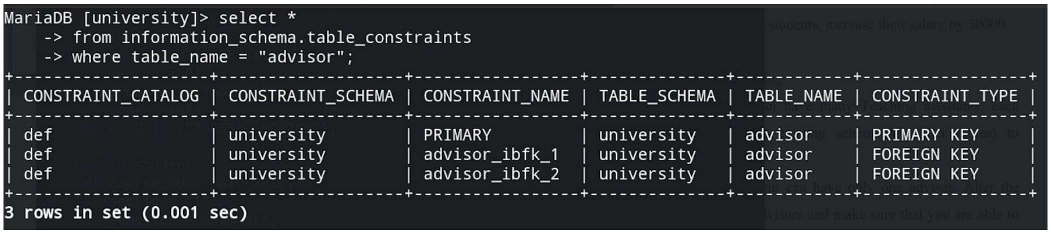
Query:

```
-- Get the default constraint names
select *
from information_schema.table_constraints
where table_name = "advisor";

-- Drop the foreign key constraints first
alter table advisor drop constraint advisor_ibfk_1;
alter table advisor drop constraint advisor_ibfk_2;

-- Drop the existing primary key
alter table advisor drop constraint advisor.PRIMARY;

-- Add new primary key
alter table advisor add primary key (s_ID, i_ID);
```

```
-- Add the foreign key constraints to the new again
alter table advisor add foreign key (s_ID) references student (ID);
alter table advisor add foreign key (i_ID) references instructor (ID);

-- Insert records for verification
insert into instructor values ("11111", "Ashok", "Elec. Eng.", "80000.00");

insert into advisor values ("12345", "22222"),
                              ("12345", "76766"),
                              ("76653", "45565"),
                              ("76653", "10101"),
                              ("12345", "98345"),
                              ("76653", "76766"),
                              ("12345", "11111"),
                              ("45678", "10101"),
                              ("45678", "11111");
```

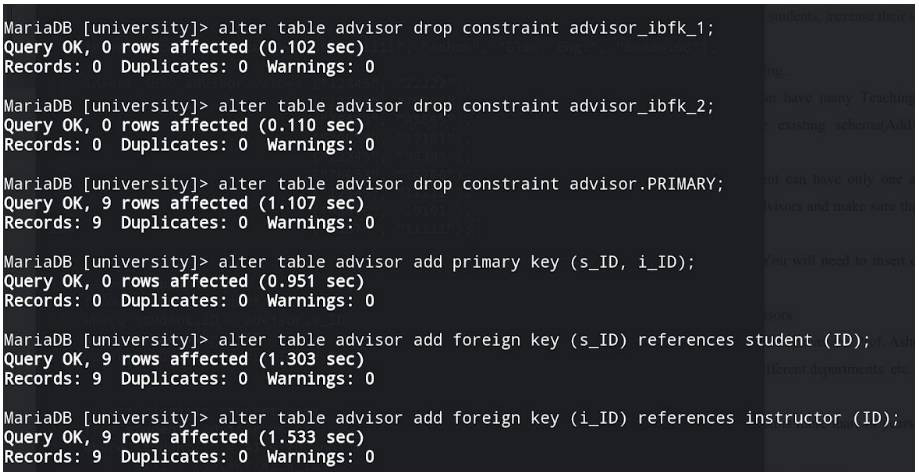
Result:

(Constraint names)



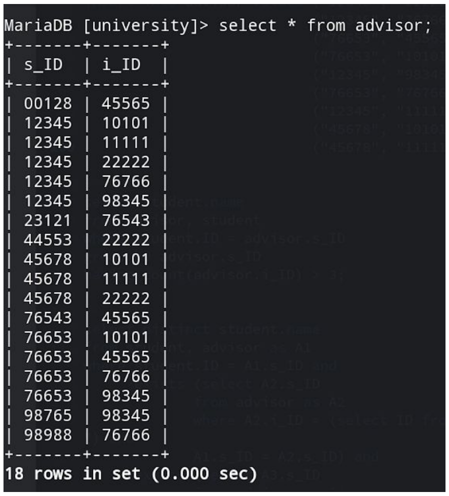
```
MariaDB [university]> select *
    -> from information_schema.table_constraints
    -> where table_name = "advisor";
+--------------------+-------------------+-----------------+--------------+------------+-----------------+
| CONSTRAINT_CATALOG | CONSTRAINT_SCHEMA | CONSTRAINT_NAME | TABLE_SCHEMA | TABLE_NAME | CONSTRAINT_TYPE |
+--------------------+-------------------+-----------------+--------------+------------+-----------------+
| def                | university        | PRIMARY         | university   | advisor    | PRIMARY KEY     |
| def                | university        | advisor_ibfk_1  | university   | advisor    | FOREIGN KEY     |
| def                | university        | advisor_ibfk_2  | university   | advisor    | FOREIGN KEY     |
+--------------------+-------------------+-----------------+--------------+------------+-----------------+
3 rows in set (0.001 sec)
```

(Altering the constraints)



```
MariaDB [university]> alter table advisor drop constraint advisor_ibfk_1;
Query OK, 0 rows affected (0.102 sec)
Records: 0  Duplicates: 0  Warnings: 0

MariaDB [university]> alter table advisor drop constraint advisor_ibfk_2;
Query OK, 0 rows affected (0.110 sec)
Records: 0  Duplicates: 0  Warnings: 0

MariaDB [university]> alter table advisor drop constraint advisor.PRIMARY;
Query OK, 9 rows affected (1.107 sec)
Records: 9  Duplicates: 0  Warnings: 0

MariaDB [university]> alter table advisor add primary key (s_ID, i_ID);
Query OK, 0 rows affected (0.951 sec)
Records: 0  Duplicates: 0  Warnings: 0

MariaDB [university]> alter table advisor add foreign key (s_ID) references student (ID);
Query OK, 9 rows affected (1.303 sec)
Records: 9  Duplicates: 0  Warnings: 0

MariaDB [university]> alter table advisor add foreign key (i_ID) references instructor (ID);
Query OK, 9 rows affected (1.533 sec)
Records: 9  Duplicates: 0  Warnings: 0
```

(Verify the result)



```
MariaDB [university]> select * from advisor;
+-------+-------+
| s_ID  | i_ID  |
+-------+-------+
| 00128 | 45565 |
| 12345 | 10101 |
| 12345 | 11111 |
| 12345 | 22222 |
| 12345 | 76766 |
| 12345 | 98345 |
| 23121 | 76543 |
| 44553 | 22222 |
| 45678 | 10101 |
| 45678 | 11111 |
| 45678 | 22222 |
| 76543 | 45565 |
| 76653 | 10101 |
| 76653 | 45565 |
| 76653 | 76766 |
| 76653 | 98345 |
| 98765 | 98345 |
| 98988 | 76766 |
+-------+-------+
18 rows in set (0.000 sec)
```

(For the following question the results depends on the data updated or inserted previously)

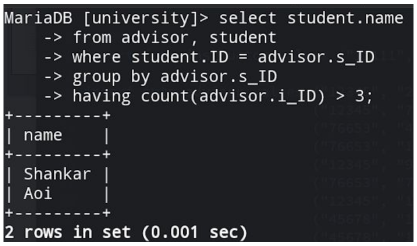
3. Write SQL queries on the modified schema. You will need to insert data to ensure the query results are not empty.

● Find all students who have more than 3 advisors

Query:

select student.name
from advisor, student
where student.ID = advisor.s_ID
group by advisor.s_ID
having count(advisor.i_ID) > 3;

Result:



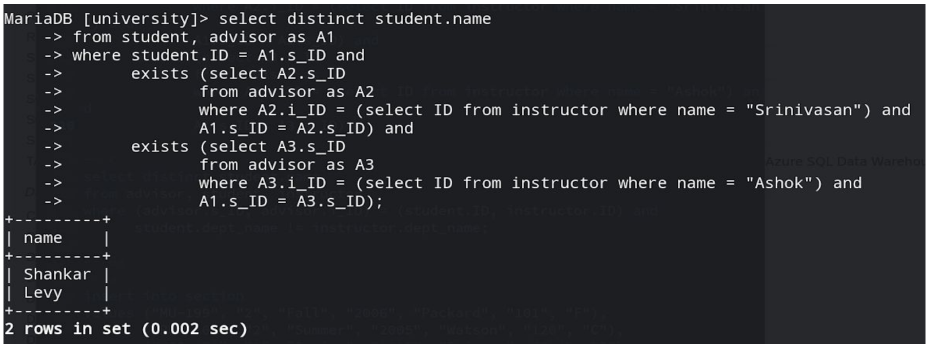
```
MariaDB [university]> select student.name
    -> from advisor, student
    -> where student.ID = advisor.s_ID
    -> group by advisor.s_ID
    -> having count(advisor.i_ID) > 3;
+---------+
| name    |
+---------+
| Shankar |
| Aoi     |
+---------+
2 rows in set (0.001 sec)
```

- Find all students who are co-advised by Prof. Srinivas and Prof. Ashok.

Query:

```
select distinct student.name
from student, advisor as A1
where student.ID = A1.s_ID and
          exists (select A2.s_ID
          from advisor as A2
          where A2.i_ID = (select ID from instructor where name = "Srinivasan") and
          A1.s_ID = A2.s_ID) and
          exists (select A3.s_ID
          from advisor as A3
          where A3.i_ID = (select ID from instructor where name = "Ashok") and
          A1.s_ID = A3.s_ID);
```

Result:



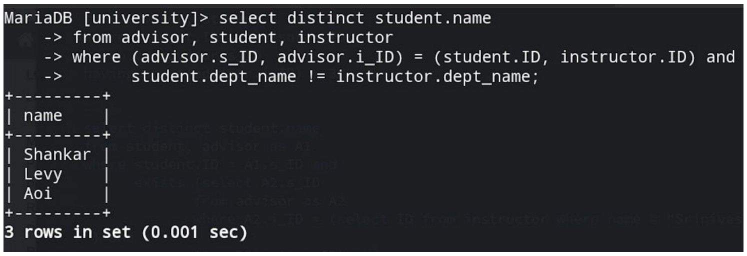
```
MariaDB [university]> select distinct student.name
    -> from student, advisor as A1
    -> where student.ID = A1.s_ID and
    ->       exists (select A2.s_ID
    ->              from advisor as A2
    ->              where A2.i_ID = (select ID from instructor where name = "Srinivasan") and
    ->              A1.s_ID = A2.s_ID) and
    ->       exists (select A3.s_ID
    ->              from advisor as A3
    ->              where A3.i_ID = (select ID from instructor where name = "Ashok") and
    ->              A1.s_ID = A3.s_ID);
+---------+
| name    |
+---------+
| Shankar |
| Levy    |
+---------+
2 rows in set (0.002 sec)
```

- Find students advised by instructors from different departments. Etc.

Query:

```
select distinct student.name
from advisor, student, instructor
where (advisor.s_ID, advisor.i_ID) = (student.ID, instructor.ID) and
          student.dept_name != instructor.dept_name;
```

Result:



```
MariaDB [university]> select distinct student.name
    -> from advisor, student, instructor
    -> where (advisor.s_ID, advisor.i_ID) = (student.ID, instructor.ID) and
    ->       student.dept_name != instructor.dept_name;
+---------+
| name    |
+---------+
| Shankar |
| Levy    |
| Aoi     |
+---------+
3 rows in set (0.001 sec)
```

4. Write SQL queries for the following:

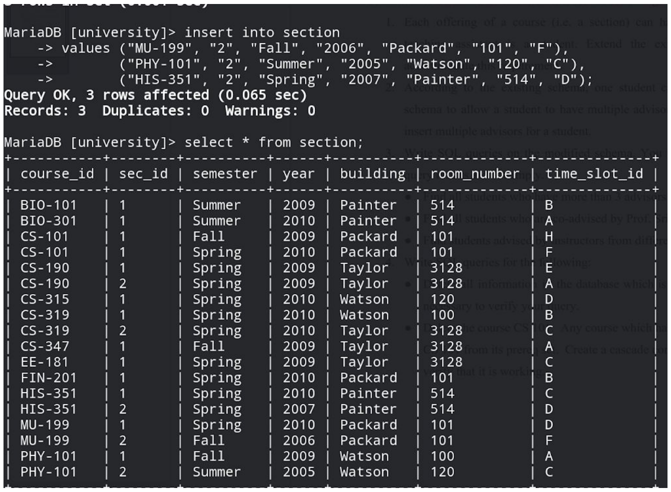
● Delete all information in the database which is more than 10 years old. Add data as necessary to verify your query.

Query:

```
-- Insert data which is more than ten years old
insert into section
values ("MU-199", "2", "Fall", "2006", "Packard", "101", "F"),
        ("PHY-101", "2", "Summer", "2005", "Watson", "120", "C"),
        ("HIS-351", "2", "Spring", "2007", "Painter", "514", "D");

-- Delete the old data
delete from section
where year < (select year(current_timestamp) - 10);
```

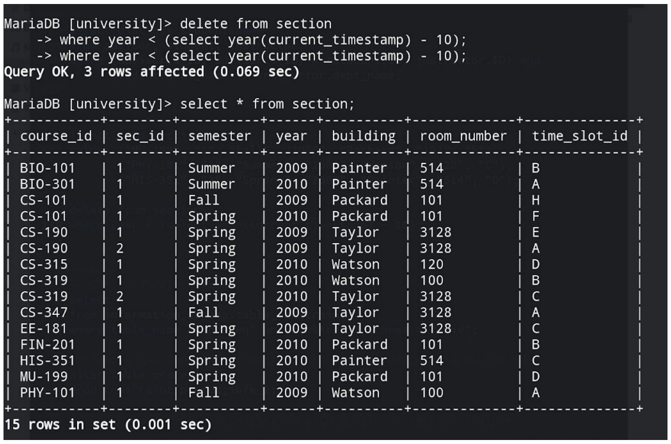
Result:

(Before)



```
MariaDB [university]> insert into section
    -> values ("MU-199", "2", "Fall", "2006", "Packard", "101", "F"),
    ->        ("PHY-101", "2", "Summer", "2005", "Watson", "120", "C"),
    ->        ("HIS-351", "2", "Spring", "2007", "Painter", "514", "D");
Query OK, 3 rows affected (0.065 sec)
Records: 3  Duplicates: 0  Warnings: 0

MariaDB [university]> select * from section;
+-----------+--------+----------+------+----------+-------------+--------------+
| course_id | sec_id | semester | year | building | room_number | time_slot_id |
+-----------+--------+----------+------+----------+-------------+--------------+
| BIO-101   | 1      | Summer   | 2009 | Painter  | 514         | B            |
| BIO-301   | 1      | Summer   | 2010 | Painter  | 514         | A            |
| CS-101    | 1      | Fall     | 2009 | Packard  | 101         | H            |
| CS-101    | 1      | Spring   | 2010 | Packard  | 101         | F            |
| CS-190    | 1      | Spring   | 2009 | Taylor   | 3128        | E            |
| CS-190    | 2      | Spring   | 2009 | Taylor   | 3128        | A            |
| CS-315    | 1      | Spring   | 2010 | Watson   | 120         | D            |
| CS-319    | 1      | Spring   | 2010 | Watson   | 100         | B            |
| CS-319    | 2      | Spring   | 2010 | Taylor   | 3128        | C            |
| CS-347    | 1      | Fall     | 2009 | Taylor   | 3128        | A            |
| EE-181    | 1      | Spring   | 2009 | Taylor   | 3128        | C            |
| FIN-201   | 1      | Spring   | 2010 | Packard  | 101         | B            |
| HIS-351   | 1      | Spring   | 2010 | Painter  | 514         | C            |
| HIS-351   | 2      | Spring   | 2007 | Painter  | 514         | D            |
| MU-199    | 1      | Spring   | 2010 | Packard  | 101         | D            |
| MU-199    | 2      | Fall     | 2006 | Packard  | 101         | F            |
| PHY-101   | 1      | Fall     | 2009 | Watson   | 100         | A            |
| PHY-101   | 2      | Summer   | 2005 | Watson   | 120         | C            |
```

(After)



```
MariaDB [university]> delete from section
    -> where year < (select year(current_timestamp) - 10);
    -> where year < (select year(current_timestamp) - 10);
Query OK, 3 rows affected (0.069 sec)

MariaDB [university]> select * from section;
+-----------+--------+----------+------+----------+-------------+--------------+
| course_id | sec_id | semester | year | building | room_number | time_slot_id |
+-----------+--------+----------+------+----------+-------------+--------------+
| BIO-101   | 1      | Summer   | 2009 | Painter  | 514         | B            |
| BIO-301   | 1      | Summer   | 2010 | Painter  | 514         | A            |
| CS-101    | 1      | Fall     | 2009 | Packard  | 101         | H            |
| CS-101    | 1      | Spring   | 2010 | Packard  | 101         | F            |
| CS-190    | 1      | Spring   | 2009 | Taylor   | 3128        | E            |
| CS-190    | 2      | Spring   | 2009 | Taylor   | 3128        | A            |
| CS-315    | 1      | Spring   | 2010 | Watson   | 120         | D            |
| CS-319    | 1      | Spring   | 2010 | Watson   | 100         | B            |
| CS-319    | 2      | Spring   | 2010 | Taylor   | 3128        | C            |
| CS-347    | 1      | Fall     | 2009 | Taylor   | 3128        | A            |
| EE-181    | 1      | Spring   | 2009 | Taylor   | 3128        | C            |
| FIN-201   | 1      | Spring   | 2010 | Packard  | 101         | B            |
| HIS-351   | 1      | Spring   | 2010 | Painter  | 514         | C            |
| MU-199    | 1      | Spring   | 2010 | Packard  | 101         | D            |
| PHY-101   | 1      | Fall     | 2009 | Watson   | 100         | A            |
+-----------+--------+----------+------+----------+-------------+--------------+
15 rows in set (0.001 sec)
```

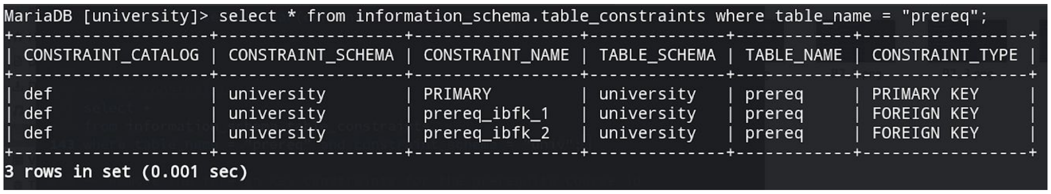
● Delete the course CS 101. Any course which has CS 101 as a prereq should remove CS 101 from its prereq set. Create a cascade constraint to enforce the above rule, and verify that it is working.

Query:

```
-- Get the constraint names
select *
from information_schema.table_constraints
where table_name = "prereq" and constraint_schema = "univ";

-- Remove the existing foreign key constraint on the prerequisite id
alter table prereq
drop constraint prereq_ibfk_2;

-- Add new foreign key constraint with delete on cascade feature
alter table prereq
add foreign key (prereq_id) references course (course_id) on delete cascade;

-- Delete CS-101 course
delete from course
where course_id = "CS-101";
```

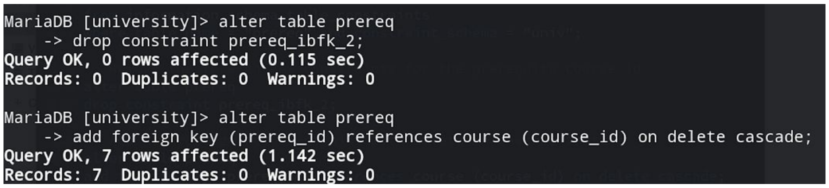
Result:

(Constraint names)



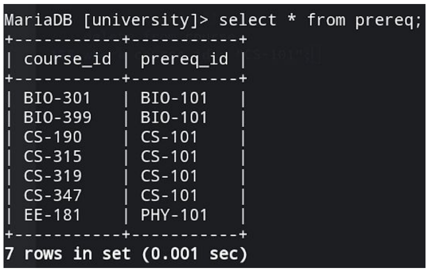
```
MariaDB [university]> select * from information_schema.table_constraints where table_name = "prereq";
+--------------------+-------------------+-----------------+--------------+------------+-----------------+
| CONSTRAINT_CATALOG | CONSTRAINT_SCHEMA | CONSTRAINT_NAME | TABLE_SCHEMA | TABLE_NAME | CONSTRAINT_TYPE |
+--------------------+-------------------+-----------------+--------------+------------+-----------------+
| def                | university        | PRIMARY         | university   | prereq     | PRIMARY KEY     |
| def                | university        | prereq_ibfk_1   | university   | prereq     | FOREIGN KEY     |
| def                | university        | prereq_ibfk_2   | university   | prereq     | FOREIGN KEY     |
+--------------------+-------------------+-----------------+--------------+------------+-----------------+
3 rows in set (0.001 sec)
```

(Altering constraints)



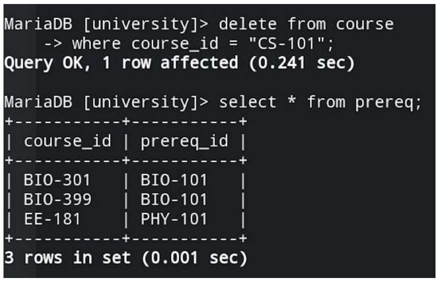
```
MariaDB [university]> alter table prereq
    -> drop constraint prereq_ibfk_2;
Query OK, 0 rows affected (0.115 sec)
Records: 0  Duplicates: 0  Warnings: 0

MariaDB [university]> alter table prereq
    -> add foreign key (prereq_id) references course (course_id) on delete cascade;
Query OK, 7 rows affected (1.142 sec)
Records: 7  Duplicates: 0  Warnings: 0
```

(Before deletion)



```
MariaDB [university]> select * from prereq;
+-----------+-----------+
| course_id | prereq_id |
+-----------+-----------+
| BIO-301   | BIO-101   |
| BIO-399   | BIO-101   |
| CS-190    | CS-101    |
| CS-315    | CS-101    |
| CS-319    | CS-101    |
| CS-347    | CS-101    |
| EE-181    | PHY-101   |
+-----------+-----------+
7 rows in set (0.001 sec)
```

(After deletion)



```
MariaDB [university]> delete from course
    -> where course_id = "CS-101";
Query OK, 1 row affected (0.241 sec)

MariaDB [university]> select * from prereq;
+-----------+-----------+
| course_id | prereq_id |
+-----------+-----------+
| BIO-301   | BIO-101   |
| BIO-399   | BIO-101   |
| EE-181    | PHY-101   |
+-----------+-----------+
3 rows in set (0.001 sec)
```