《数据库系统原理》实验报告（1）

题目：交互式 SQL (1)

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实验环境：Docker MariaDB

实验步骤及结果截图：

1.进入 mariadb 环境：

```
# mariadb -u root -p
Enter password:
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 3
Server version: 11.1.2-MariaDB-1:11.1.2+maria~ubu2204 mariadb.org binary distribution

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MariaDB [(none)]>
```

2.创建名为 school 的数据库：

```
MariaDB [(none)]> create database school;
Query OK, 1 row affected (0.001 sec)
```

3.进入创建的 school 数据库：

```
MariaDB [(none)]> use school
Database changed
MariaDB [school]>
```

4. 创建表格 student：

```
MariaDB [school]> create table student(
    ->     no integer not null,
    ->     name varchar(50) not null,
    ->     gender varchar(10) not null,
    ->     age integer not null,
    ->     primary key (no),
    ->     check (gender in ("female", "male"))
    -> );
Query OK, 0 rows affected (0.014 sec)
```

5. 创建表格 dept：

```
MariaDB [school]> create table dept(
    ->     no integer not null,
    ->     name varchar(50) not null,
    ->     primary key (no)
    -> );
Query OK, 0 rows affected (0.011 sec)
```

6. 创建表格 course：

```
MariaDB [school]> create table course(
    ->    no integer not null,
    ->    name varchar(50) not null,
    ->    credit integer not null,
    ->    primary key (no)
    -> )
    -> ;
Query OK, 0 rows affected (0.013 sec)
```

7. 创建表格 score：

```
MariaDB [school]> create table score(
    ->    s_no integer not null,
    ->    c_no integer not null,
    ->    score integer not null,
    ->    foreign key (s_no) references student(no),
    ->    foreign key (c_no) references course(no)
    -> );
Query OK, 0 rows affected (0.016 sec)
```

8. 查看新建的四张表：

```
MariaDB [school]> desc student;
+--------+-------------+------+-----+---------+-------+
| Field  | Type        | Null | Key | Default | Extra |
+--------+-------------+------+-----+---------+-------+
| no     | int(11)     | NO   | PRI | NULL    |       |
| name   | varchar(50) | NO   |     | NULL    |       |
| gender | varchar(10) | NO   |     | NULL    |       |
| age    | int(11)     | NO   |     | NULL    |       |
+--------+-------------+------+-----+---------+-------+
```

```
MariaDB [school]> desc dept;
+-------+-------------+------+-----+---------+-------+
| Field | Type        | Null | Key | Default | Extra |
+-------+-------------+------+-----+---------+-------+
| no    | int(11)     | NO   | PRI | NULL    |       |
| name  | varchar(50) | NO   |     | NULL    |       |
+-------+-------------+------+-----+---------+-------+
2 rows in set (0.001 sec)
```

```
MariaDB [school]> desc course;
+--------+-------------+------+-----+---------+-------+
| Field  | Type        | Null | Key | Default | Extra |
+--------+-------------+------+-----+---------+-------+
| no     | int(11)     | NO   | PRI | NULL    |       |
| name   | varchar(50) | NO   |     | NULL    |       |
| credit | int(11)     | NO   |     | NULL    |       |
+--------+-------------+------+-----+---------+-------+
3 rows in set (0.001 sec)
```

```
MariaDB [school]> desc score;
+-------+---------+------+-----+---------+-------+
| Field | Type    | Null | Key | Default | Extra |
+-------+---------+------+-----+---------+-------+
| s_no  | int(11) | NO   | MUL | NULL    |       |
| c_no  | int(11) | NO   | MUL | NULL    |       |
| score | int(11) | NO   |     | NULL    |       |
+-------+---------+------+-----+---------+-------+
3 rows in set (0.001 sec)
```

9. 查询四张表的约束：

```
MariaDB [(none)]> SELECT table_name, constraint_name, constraint_type
    -> FROM information_schema.TABLE_CONSTRAINTS
    -> WHERE table_name="student";
+------------+-----------------+-----------------+
| table_name | constraint_name | constraint_type |
+------------+-----------------+-----------------+
| student    | PRIMARY         | PRIMARY KEY     |
| student    | CONSTRAINT_1    | CHECK           |
+------------+-----------------+-----------------+
2 rows in set (0.001 sec)
```

```
MariaDB [(none)]> SELECT table_name, constraint_name, constraint_type
    -> FROM information_schema.TABLE_CONSTRAINTS
    -> WHERE table_name="dept";
+------------+-----------------+-----------------+
| table_name | constraint_name | constraint_type |
+------------+-----------------+-----------------+
| dept       | PRIMARY         | PRIMARY KEY     |
+------------+-----------------+-----------------+
1 row in set (0.001 sec)
```

```
MariaDB [(none)]> SELECT table_name, constraint_name, constraint_type
    -> FROM information_schema.TABLE_CONSTRAINTS
    -> WHERE table_name="course";
+------------+-----------------+-----------------+
| table_name | constraint_name | constraint_type |
+------------+-----------------+-----------------+
| course     | PRIMARY         | PRIMARY KEY     |
+------------+-----------------+-----------------+
1 row in set (0.001 sec)
```

```
MariaDB [(none)]> SELECT table_name, constraint_name, constraint_type
    -> FROM information_schema.TABLE_CONSTRAINTS
    -> WHERE table_name="score";
+------------+-----------------+-----------------+
| table_name | constraint_name | constraint_type |
+------------+-----------------+-----------------+
| score      | score_ibfk_1    | FOREIGN KEY     |
| score      | score_ibfk_2    | FOREIGN KEY     |
+------------+-----------------+-----------------+
2 rows in set (0.001 sec)
```

10. 将 student 中的 name 由 varchar 改为 char(15)：

```
MariaDB [school]> alter table student modify name char(15);
Query OK, 0 rows affected (0.023 sec)
Records: 0  Duplicates: 0  Warnings: 0

MariaDB [school]> desc student
    -> ;
+--------+-------------+------+-----+---------+-------+
| Field  | Type        | Null | Key | Default | Extra |
+--------+-------------+------+-----+---------+-------+
| no     | int(11)     | NO   | PRI | NULL    |       |
| name   | char(15)    | YES  |     | NULL    |       |
| gender | varchar(10) | NO   |     | NULL    |       |
| age    | int(11)     | NO   |     | NULL    |       |
+--------+-------------+------+-----+---------+-------+
4 rows in set (0.007 sec)
```

11. 在 student 表中添加 d_no 项，设置约束，并查询表和约束：

```
MariaDB [school]> alter table student add column d_no integer not null;
Query OK, 0 rows affected (0.009 sec)
Records: 0  Duplicates: 0  Warnings: 0

MariaDB [school]> alter table student add constraint foreign key (d_no) references dept(no)
    -> ;
Query OK, 0 rows affected (0.022 sec)
Records: 0  Duplicates: 0  Warnings: 0

MariaDB [school]> desc student
    -> ;
+--------+-------------+------+-----+---------+-------+
| Field  | Type        | Null | Key | Default | Extra |
+--------+-------------+------+-----+---------+-------+
| no     | int(11)     | NO   | PRI | NULL    |       |
| name   | char(15)    | YES  |     | NULL    |       |
| gender | varchar(10) | NO   |     | NULL    |       |
| age    | int(11)     | NO   |     | NULL    |       |
| d_no   | int(11)     | NO   | MUL | NULL    |       |
+--------+-------------+------+-----+---------+-------+
5 rows in set (0.008 sec)

MariaDB [school]> SELECT table_name, constraint_name, constraint_type
    -> FROM information_schema.TABLE_CONSTRAINTS
    -> WHERE table_name="student";
+------------+-----------------+-----------------+
| table_name | constraint_name | constraint_type |
+------------+-----------------+-----------------+
| student    | PRIMARY         | PRIMARY KEY     |
| student    | CONSTRAINT_1    | CHECK           |
| student    | student_ibfk_1  | FOREIGN KEY     |
+------------+-----------------+-----------------+
3 rows in set (0.000 sec)
```

12. 在 course 表中添加 d_no 项，设置约束，并查询表和约束：

```
MariaDB [school]> alter table course add column d_no not null;
ERROR 4161 (HY000): Unknown data type: 'not'
MariaDB [school]> alter table course add column d_no integer not null;
Query OK, 0 rows affected (0.016 sec)
Records: 0  Duplicates: 0  Warnings: 0

MariaDB [school]> alter table course add foreign key (d_no) references dept(no);
Query OK, 0 rows affected (0.021 sec)
Records: 0  Duplicates: 0  Warnings: 0

MariaDB [school]> desc course
    -> ;
+--------+-------------+------+-----+---------+-------+
| Field  | Type        | Null | Key | Default | Extra |
+--------+-------------+------+-----+---------+-------+
| no     | int(11)     | NO   | PRI | NULL    |       |
| name   | varchar(50) | NO   |     | NULL    |       |
| credit | int(11)     | NO   |     | NULL    |       |
| d_no   | int(11)     | NO   | MUL | NULL    |       |
+--------+-------------+------+-----+---------+-------+
4 rows in set (0.008 sec)

MariaDB [school]> SELECT table_name, constraint_name, constraint_type
    -> FROM information_schema.TABLE_CONSTRAINTS
    -> WHERE table_name="course";
+------------+-----------------+-----------------+
| table_name | constraint_name | constraint_type |
+------------+-----------------+-----------------+
| course     | PRIMARY         | PRIMARY KEY     |
| course     | course_ibfk_1   | FOREIGN KEY     |
+------------+-----------------+-----------------+
2 rows in set (0.001 sec)
```

13. 删除 score 表中的所有约束：

```
MariaDB [school]> SELECT table_name, constraint_name, constraint_type FROM information_schema.TABLE_CONSTRAINTS WHERE table_name="score";
+------------+-----------------+-----------------+
| table_name | constraint_name | constraint_type |
+------------+-----------------+-----------------+
| score      | score_ibfk_1    | FOREIGN KEY     |
| score      | score_ibfk_2    | FOREIGN KEY     |
+------------+-----------------+-----------------+
2 rows in set (0.001 sec)

MariaDB [school]> alter table score drop foreign key score_ibfk_1;
Query OK, 0 rows affected (0.017 sec)
Records: 0  Duplicates: 0  Warnings: 0

MariaDB [school]> alter table score drop foreign key score_ibfk_2;
Query OK, 0 rows affected (0.014 sec)
Records: 0  Duplicates: 0  Warnings: 0

MariaDB [school]> SELECT table_name, constraint_name, constraint_type FROM information_schema.TABLE_CONSTRAINTS WHERE table_name="score";
Empty set (0.001 sec)
```

14. 重新建立 score 表中的所有约束：

```
MariaDB [school]> SELECT table_name, constraint_name, constraint_type FROM information_schema.TABLE_CONSTRAINTS WHERE table_name="score";
Empty set (0.001 sec)

MariaDB [school]> alter table score add constraint foreign key (s_no) references student(no);
Query OK, 0 rows affected (0.024 sec)
Records: 0  Duplicates: 0  Warnings: 0

MariaDB [school]> alter table score add constraint foreign key (c_no) references course(no);
Query OK, 0 rows affected (0.026 sec)
Records: 0  Duplicates: 0  Warnings: 0

MariaDB [school]> SELECT table_name, constraint_name, constraint_type FROM information_schema.TABLE_CONSTRAINTS WHERE table_name="score";
+------------+-----------------+-----------------+
| table_name | constraint_name | constraint_type |
+------------+-----------------+-----------------+
| score      | score_ibfk_1    | FOREIGN KEY     |
| score      | score_ibfk_2    | FOREIGN KEY     |
+------------+-----------------+-----------------+
2 rows in set (0.007 sec)

MariaDB [school]> desc score;
+-------+---------+------+-----+---------+-------+
| Field | Type    | Null | Key | Default | Extra |
+-------+---------+------+-----+---------+-------+
| s_no  | int(11) | NO   | MUL | NULL    |       |
| c_no  | int(11) | NO   | MUL | NULL    |       |
| score | int(11) | NO   |     | NULL    |       |
+-------+---------+------+-----+---------+-------+
3 rows in set (0.001 sec)
```

出现的问题：

1. **未选择数据库：**

```
MariaDB [(none)]> create table student(
    ->    no integer not null,
    ->    name varchar not null,
    ->    gender varchar not null,
    ->    age integer not null,
    ->    primary key no,
    ->    check gender in ("female", "male")
    -> );
ERROR 1046 (3D000): No database selected
MariaDB [(none)]> use school
```

2. **varchar 没有指定长度：**

```
MariaDB [school]> create table score(
    ->    s_no integer not null,
    ->    c_no integer not null,
    ->    score integer not null,
    ->    foreign key s_no references student(no),
    ->    foreign key c_no references course(no)
    -> );
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that corresponds to your MariaDB server version for the
 right syntax to use near 'references student(no),
    foreign key c_no references course(no)
 )' at line 5
```

3. **表名"student"未加引号：**

```
MariaDB [school]> SELECT table_name, constraint_name, constraint_type
    -> FROM information_schema.TABLE_CONSTRAINTS
    -> WHERE table_name=student;
ERROR 1054 (42S22): Unknown column 'student' in 'where clause'
```

4. **删除约束时语法错误：**

```
MariaDB [school]> alter table score drop constraint 'score_ibfk_1';
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that corresponds to your MariaDB server version for the right syntax to use near ''sco
re_ibfk_1'' at line 1
```

解决方案：

1. 通过"**create database <数据库名>;**"创建数据库，再通过"**use <数据库名>;**"选择数据库；

2. **char** 是固定长度字符数据类型，在存储时始终占用指定的字符数；**varchar** 是可变长度字符数据类型，它在存储时只占用实际文本数据的长度加上一些额外的开销。但是，仍然需要通过 **varchar(最大长度)**来指定最大长度；

3. 语句中的表名需要用引号包裹；

4. 正确的语法为："**alter table <表名> drop <约束名>;**"。