《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 上创建的 mariadb 容器					

实验步骤及结果截图：

一. 创建数据库

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

MariaDB [(none)]> show databases;
+--------------------+
| Database           |
+--------------------+
| information_schema |
| mysql              |
| performance_schema |
| school             |
| sys                |
+--------------------+
```

二. 创建数据表

1. 创建 student 表

创建：

```
MariaDB [school]> create table student(
    -> no integer not null,
    -> name varchar(255) not null,
    -> gender varchar(255) not null check(gender='female' or gender='
    -> age integer not null,
    -> primary key(no));
Query OK, 0 rows affected (0.010 sec)
```

结果：

```
MariaDB [school]> show tables;
+------------------+
| Tables_in_school |
+------------------+
| student          |
+------------------+
1 row in set (0.001 sec)
```

2. 创建 dept 表

创建：

```
MariaDB [school]> create table dept(
    -> no integer not null,
    -> name varchar(255) not null,
    -> primary key(no));
Query OK, 0 rows affected (0.014 sec)
```

结果：

```
MariaDB [school]> show tables;
+------------------+
| Tables_in_school |
+------------------+
| dept             |
| student          |
+------------------+
2 rows in set (0.001 sec)
```

3. 创建 course 表

创建：

```
MariaDB [school]> create table course(
    -> no integer not null,
    -> name varchar(255) not null,
    -> credit integer not null,
    -> primary key(no));
Query OK, 0 rows affected (0.017 sec)
```

结果：

```
MariaDB [school]> show tables;
+------------------+
| Tables_in_school |
+------------------+
| course           |
| dept             |
| student          |
+------------------+
3 rows in set (0.001 sec)
```

4. 创建 score 表

创建：

```
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 (0.023 sec)
```

结果：

```
MariaDB [school]> show tables;
+------------------+
| Tables_in_school |
+------------------+
| course           |
| dept             |
| score            |
| student          |
+------------------+
4 rows in set (0.001 sec)
```

三. 查询表结构

1. **student:**

```
MariaDB [school]> desc student;
+--------+-------------+------+-----+---------+-------+
| Field  | Type        | Null | Key | Default | Extra |
+--------+-------------+------+-----+---------+-------+
| no     | int(11)     | NO   | PRI | NULL    |       |
| name   | varchar(255) | NO   |     | NULL    |       |
| gender | varchar(255) | NO   |     | NULL    |       |
| age    | int(11)     | NO   |     | NULL    |       |
+--------+-------------+------+-----+---------+-------+
4 rows in set (0.001 sec)
```

2. **dept**

```
MariaDB [school]> desc dept;
+-------+-------------+------+-----+---------+-------+
| Field | Type        | Null | Key | Default | Extra |
+-------+-------------+------+-----+---------+-------+
| no    | int(11)     | NO   | PRI | NULL    |       |
| name  | varchar(255) | NO   |     | NULL    |       |
+-------+-------------+------+-----+---------+-------+
2 rows in set (0.001 sec)
```

3. **course**

```
MariaDB [school]> desc course;
+--------+-------------+------+-----+---------+-------+
| Field  | Type        | Null | Key | Default | Extra |
+--------+-------------+------+-----+---------+-------+
| no     | int(11)     | NO   | PRI | NULL    |       |
| name   | varchar(255) | NO   |     | NULL    |       |
| credit | int(11)     | NO   |     | NULL    |       |
+--------+-------------+------+-----+---------+-------+
3 rows in set (0.001 sec)
```

4. **score**

```
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)
```

四. 查询建立的约束

1. **student**

```
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    | gender          | CHECK           |
+------------+-----------------+-----------------+
2 rows in set (0.002 sec)
```

2. **dept**

```
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)
```

3. **course**

```
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)
```

4. **score**

```
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)
```

五. 修改字段类型

1. 修改

```
MariaDB [school]> alter table student change column name name char(
Query OK, 1 row affected (0.027 sec)
Records: 1  Duplicates: 0  Warnings: 0
```

2. 结果

```
MariaDB [school]> desc student;
+--------+-------------+------+-----+---------+-------+
| Field  | Type        | Null | Key | Default | Extra |
+--------+-------------+------+-----+---------+-------+
| no     | int(11)     | NO   | PRI | NULL    |       |
| name   | char(15)    | YES  |     | NULL    |       |
| gender | varchar(255)| NO   |     | NULL    |       |
| age    | int(11)     | NO   |     | NULL    |       |
+--------+-------------+------+-----+---------+-------+
4 rows in set (0.009 sec)
```

六. 添加列及其约束

1. student

添加列：

```
MariaDB [school]> alter table student
    -> add column d_no integer not null;
Query OK, 0 rows affected (0.021 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

添加约束：

```
MariaDB [school]> alter table student
    -> add constraint
    -> foreign key(d_no) references dept(no);
Query OK, 0 rows affected (0.032 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

结果：

```
MariaDB [school]> desc student;
+--------+-------------+------+-----+---------+-------+
| Field  | Type        | Null | Key | Default | Extra |
+--------+-------------+------+-----+---------+-------+
| no     | int(11)     | NO   | PRI | NULL    |       |
| name   | char(15)    | YES  |     | NULL    |       |
| gender | varchar(255)| NO   |     | NULL    |       |
| age    | int(11)     | NO   |     | NULL    |       |
| d_no   | int(11)     | NO   | MUL | NULL    |       |
+--------+-------------+------+-----+---------+-------+
5 rows in set (0.009 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    | gender          | CHECK           |
| student    | student_ibfk_1  | FOREIGN KEY     |
+------------+-----------------+-----------------+
3 rows in set (0.001 sec)
```

2. **course**

添加列：

```
MariaDB [school]> alter table course
    -> add column d_no integer not null;
Query OK, 0 rows affected (0.020 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

添加约束：

```
MariaDB [school]> alter table course
    -> add constraint
    -> foreign key(d_no) references dept(no);
Query OK, 0 rows affected (0.029 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

结果：

```
MariaDB [school]> desc course;
+--------+-------------+------+-----+---------+-------+
| Field  | Type        | Null | Key | Default | Extra |
+--------+-------------+------+-----+---------+-------+
| no     | int(11)     | NO   | PRI | NULL    |       |
| name   | varchar(255) | NO   |     | NULL    |       |
| credit | int(11)     | NO   |     | NULL    |       |
| d_no   | int(11)     | NO   |     | NULL    |       |
+--------+-------------+------+-----+---------+-------+
4 rows in set (0.001 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 (0.008 sec)
```

七. 删除约束并建立

1. 删除

```
MariaDB [school]> alter table score drop foreign key score_ibfk_1;
Query OK, 0 rows affected (0.014 sec)
Records: 0  Duplicates: 0  Warnings: 0


MariaDB [school]> alter table score drop foreign key score_ibfk_2;
Query OK, 0 rows affected (0.013 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

2. 删除后的结果

```
MariaDB [school]> select table_name,constraint_name,constraint_type
    -> from information_schema.TABLE_CONSTRAINTS
    -> where table_name='score';
Empty set (0.001 sec)
```

3. 建立

```
MariaDB [school]> alter table score
    -> add constraint
    -> foreign key(s_no) references student(no);
Query OK, 0 rows affected (0.022 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 (0.018 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

4. 建立后的结果

```
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 (0.003 sec)
```

出现的问题：

一. 熟练度

在写 sql 语句时的熟练度不够，常常出现格式和拼写错误

二. 外键建立失败

在最开始创建 student 表的外键的时候失败了

解决方案：

一. 熟练度

多熟练了几次，渐渐正确率和速度有所提升了

二. 外键建立失败

经过思考后，我发现问题出在我之前向 student 表插入了一项数据，其 d_no 值为 null 所以在建立外键时会发生错误，当我将其删除之后，外键就创建成功了