《数据库系统原理》实验报告（二）					
题目：交互式 SQL (2)					
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实验环境：Docker + mariadb

实验步骤及结果截图：

（1） 建立 students1、depts1、courses1、scores1 表：

```
MariaDB [(none)]> use test
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
MariaDB [test]> create table depts1(
    -> no int not null auto_increment,
    -> name varchar(30) not null,
    -> primary key(no)
    -> );
Query OK, 0 rows affected (0.012 sec)

MariaDB [test]> desc depts1
    -> ;
+-------+-------------+------+-----+---------+----------------+
| Field | Type        | Null | Key | Default | Extra          |
+-------+-------------+------+-----+---------+----------------+
| no    | int(11)     | NO   | PRI | NULL    | auto_increment |
| name  | varchar(30) | NO   |     | NULL    |                |
+-------+-------------+------+-----+---------+----------------+
2 rows in set (0.002 sec)
```

```
MariaDB [test]> create table students1(
    -> no int not null auto_increment,
    -> name varchar(20) not null,
    -> gender varchar(6) not null,
    -> check(gender='Male' or gender='Female'),
    -> age int not null,
    -> d_no int not null,
    -> primary key (no),
    -> constraint st_c_1
    -> foreign key (d_no)
    -> references depts1(no)
    -> );
Query OK, 0 rows affected (0.010 sec)

MariaDB [test]> desc students1
    -> ;
+--------+-------------+------+-----+---------+----------------+
| Field  | Type        | Null | Key | Default | Extra          |
+--------+-------------+------+-----+---------+----------------+
| no     | int(11)     | NO   | PRI | NULL    | auto_increment |
| name   | varchar(20) | NO   |     | NULL    |                |
| gender | varchar(6)  | NO   |     | NULL    |                |
| age    | int(11)     | NO   |     | NULL    |                |
| d_no   | int(11)     | NO   | MUL | NULL    |                |
+--------+-------------+------+-----+---------+----------------+
5 rows in set (0.001 sec)
```

```
MariaDB [test]> create table courses1(
    -> no int not null auto_increment,
    -> name varchar(20) not null,
    -> credit int not null,
    -> d_no int not null,
    -> primary key (no),
    -> constraint co_c_1
    -> foreign key (d_no)
    -> references depts1(no)
    -> );
Query OK, 0 rows affected (0.009 sec)

MariaDB [test]> desc courses1
    -> ;
+--------+-------------+------+-----+---------+----------------+
| Field  | Type        | Null | Key | Default | Extra          |
+--------+-------------+------+-----+---------+----------------+
| no     | int(11)     | NO   | PRI | NULL    | auto_increment |
| name   | varchar(20) | NO   |     | NULL    |                |
| credit | int(11)     | NO   |     | NULL    |                |
| d_no   | int(11)     | NO   | MUL | NULL    |                |
+--------+-------------+------+-----+---------+----------------+
4 rows in set (0.001 sec)
```

```
MariaDB [test]> create table scores1(
    -> s_no int not null auto_increment,
    -> c_no int not null,
    -> score int not null,
    -> constraint sc_c_1
    -> foreign key (s_no)
    -> references students1(no),
    -> constraint sc_c_2
    -> foreign key (c_no)
    -> references courses1(no)
    -> );
Query OK, 0 rows affected (0.010 sec)

MariaDB [test]> desc scores1
    -> ;
+-------+---------+------+-----+---------+----------------+
| Field | Type    | Null | Key | Default | Extra          |
+-------+---------+------+-----+---------+----------------+
| s_no  | int(11) | NO   | MUL | NULL    | auto_increment |
| c_no  | int(11) | NO   | MUL | NULL    |                |
| score | int(11) | NO   |     | NULL    |                |
+-------+---------+------+-----+---------+----------------+
3 rows in set (0.001 sec)
```

（2） 插入数据：

```
MariaDB [test]> insert into depts1 (no,name) values(1,'Computer Science');
Query OK, 1 row affected (0.004 sec)

MariaDB [test]> insert into depts1 (no,name) values(2,'Mathematics');
Query OK, 1 row affected (0.001 sec)

MariaDB [test]> insert into depts1 (no,name) values(3,'Architecture');
Query OK, 1 row affected (0.002 sec)

MariaDB [test]> insert into depts1 (no,name) values(4,'Management');
Query OK, 1 row affected (0.001 sec)

MariaDB [test]> desc depts1
    -> ;
+-------+-------------+------+-----+---------+----------------+
| Field | Type        | Null | Key | Default | Extra          |
+-------+-------------+------+-----+---------+----------------+
| no    | int(11)     | NO   | PRI | NULL    | auto_increment |
| name  | varchar(30) | NO   |     | NULL    |                |
+-------+-------------+------+-----+---------+----------------+
2 rows in set (0.001 sec)

MariaDB [test]> select* from depts1;
+----+------------------+
| no | name             |
+----+------------------+
|  1 | Computer Science |
|  2 | Mathematics      |
|  3 | Architecture     |
|  4 | Management       |
+----+------------------+
4 rows in set (0.001 sec)
```

```
MariaDB [test]> insert into courses1 (no,name,credit,d_no) values(1,'Database',5,1);
Query OK, 1 row affected (0.001 sec)

MariaDB [test]> insert into courses1 (no,name,credit,d_no) values(2,'Mathematics',2,2);
Query OK, 1 row affected (0.001 sec)

MariaDB [test]> insert into courses1 (no,name,credit,d_no) values(3,'Information System',1,4);
Query OK, 1 row affected (0.001 sec)

MariaDB [test]> insert into courses1 (no,name,credit,d_no) values(3,'Operating System',6,1);
ERROR 1062 (23000): Duplicate entry '3' for key 'PRIMARY'
MariaDB [test]> insert into courses1 (no,name,credit,d_no) values(5,'Data Structure',4,1);
Query OK, 1 row affected (0.001 sec)

MariaDB [test]> update courses1
    -> set no = 4
    -> where credit = 6;
Query OK, 0 rows affected (0.001 sec)
Rows matched: 0  Changed: 0  Warnings: 0

MariaDB [test]> insert into courses1 (no,name,credit,d_no) values(4,'Operating System',6,1);
Query OK, 1 row affected (0.002 sec)

MariaDB [test]> insert into courses1 (no,name,credit,d_no) values(6,'Data Processing',2,4);
Query OK, 1 row affected (0.001 sec)

MariaDB [test]> insert into courses1 (no,name,credit,d_no) values(7,'PASCAL',3,1);
Query OK, 1 row affected (0.001 sec)

MariaDB [test]> select * from courses1
    -> ;
+----+--------------------+--------+------+
| no | name               | credit | d_no |
+----+--------------------+--------+------+
|  1 | Database           |      5 |    1 |
|  2 | Mathematics        |      2 |    2 |
|  3 | Information System |      1 |    4 |
|  4 | Operating System   |      6 |    1 |
|  5 | Data Structure     |      4 |    1 |
|  6 | Data Processing    |      2 |    4 |
|  7 | PASCAL             |      3 |    1 |
+----+--------------------+--------+------+
7 rows in set (0.000 sec)

MariaDB [test]>
```

```
MariaDB [test]> insert into students1 (no,name,gender,age,d_no) values(200215120,'Mike','Male',21,3);
Query OK, 1 row affected (0.001 sec)

MariaDB [test]> insert into students1 (no,name,gender,age,d_no) values(200215121,'Tom','Male',20,1);
Query OK, 1 row affected (0.001 sec)

MariaDB [test]> insert into students1 (no,name,gender,age,d_no) values(200215122,'Jerry','Female',19,1);
Query OK, 1 row affected (0.001 sec)

MariaDB [test]> insert into students1 (no,name,gender,age,d_no) values(200215123,'Alice','Female',18,2);
Query OK, 1 row affected (0.001 sec)

MariaDB [test]> insert into students1 (no,name,gender,age,d_no) values(200215125,'Bob','Male',19,3);
Query OK, 1 row affected (0.001 sec)

MariaDB [test]> select * from students1
    -> ;
+-----------+-------+--------+-----+------+
| no        | name  | gender | age | d_no |
+-----------+-------+--------+-----+------+
| 200215120 | Mike  | Male   |  21 |    3 |
| 200215121 | Tom   | Male   |  20 |    1 |
| 200215122 | Jerry | Female |  19 |    1 |
| 200215123 | Alice | Female |  18 |    2 |
| 200215125 | Bob   | Male   |  19 |    3 |
+-----------+-------+--------+-----+------+
5 rows in set (0.000 sec)
```

```
MariaDB [test]> insert into scores1 (s_no,c_no,score) values(200215121,1,92);
Query OK, 1 row affected (0.001 sec)

MariaDB [test]> insert into scores1 (s_no,c_no,score) values(200215121,2,85);
Query OK, 1 row affected (0.001 sec)

MariaDB [test]> insert into scores1 (s_no,c_no,score) values(200215121,3,88);
Query OK, 1 row affected (0.001 sec)

MariaDB [test]> insert into scores1 (s_no,c_no,score) values(200215122,2,90);
Query OK, 1 row affected (0.001 sec)

MariaDB [test]> insert into scores1 (s_no,c_no,score) values(200215122,3,80);
Query OK, 1 row affected (0.001 sec)

MariaDB [test]> select * from scores1;
+-----------+------+-------+
| s_no      | c_no | score |
+-----------+------+-------+
| 200215121 |    1 |    92 |
| 200215121 |    2 |    85 |
| 200215121 |    3 |    88 |
| 200215122 |    2 |    90 |
| 200215122 |    3 |    80 |
+-----------+------+-------+
5 rows in set (0.000 sec)
```

（1） NO.1 查所有年龄在 21 岁以下的学生姓名及其年龄（使用比较运算符）

```
MariaDB [test]> select students1.name,students1.age from students1 where students1.age < 21
    -> ;
+-------+-----+
| name  | age |
+-------+-----+
| Tom   |  20 |
| Jerry |  19 |
| Alice |  18 |
| Bob   |  19 |
+-------+-----+
4 rows in set (0.001 sec)
```

（2） NO.2 查询选 2 号课程(s_no='2')且成绩在 80--90 的学生号。(BETWEEN … AND …)

```
MariaDB [test]> select scores1.s_no
    -> from scores1
    -> where c_no = 2
    -> and score between 80 and 90;
+-----------+
| s_no      |
+-----------+
| 200215121 |
| 200215122 |
+-----------+
2 rows in set (0.002 sec)
```

（3） NO.3 查姓名第二个字母是'e'的学生姓名

```
MariaDB [test]> select students1.name
    -> from students1
    -> where name like '_e%';
+-------+
| name  |
+-------+
| Jerry |
+-------+
1 row in set (0.000 sec)
```

（4） NO.4 查询全体男学生的学号、系、年龄结果按所在的系升序排列，同一系中的学生按年龄降序排列。

```
MariaDB [test]> select students1.no,d_no,age
    -> from students1
    -> where gender = 'Male'
    -> order by d_no, age desc;
+-----------+------+-----+
| no        | d_no | age |
+-----------+------+-----+
| 200215121 |    1 |  20 |
| 200215120 |    3 |  21 |
| 200215125 |    3 |  19 |
+-----------+------+-----+
3 rows in set (0.001 sec)
```

（5） NO.5 查询女学生的总人数和平均年龄。

```
MariaDB [test]> select count(*), avg(age)
    -> from students1
    -> where gender = 'Female';
+----------+----------+
| count(*) | avg(age) |
+----------+----------+
|        2 |  18.5000 |
+----------+----------+
1 row in set (0.001 sec)
```

（6） NO.6 查询选修 3 号课程并及格【分数大于 60】的学生的最高分数、最低分及总分。

```
MariaDB [test]> select max(score),min(score),sum(score) from scores1 where s_no in (select s_no from scores1 where c_no = 3 and score >= 60);
+------------+------------+------------+
| max(score) | min(score) | sum(score) |
+------------+------------+------------+
|         92 |         80 |        435 |
+------------+------------+------------+
1 row in set (0.001 sec)
```

（7） NO.7 向 Score 表中插入一条记录（200215123,1,72）

```
MariaDB [test]> insert into scores1 (s_no,c_no,score) values(200215123,1,72);
Query OK, 1 row affected (0.001 sec)

MariaDB [test]> select *
    -> from scores;
ERROR 1146 (42S02): Table 'test.scores' doesn't exist
MariaDB [test]> select * from scores1;
+-----------+------+-------+
| s_no      | c_no | score |
+-----------+------+-------+
| 200215121 |    1 |    92 |
| 200215121 |    2 |    85 |
| 200215121 |    3 |    88 |
| 200215122 |    2 |    90 |
| 200215122 |    3 |    80 |
| 200215123 |    1 |    72 |
+-----------+------+-------+
6 rows in set (0.000 sec)
```

（8） NO.8 求每个学生（号）的平均成绩，并将其超过 75 分【HAVING AVG(score)>75】的按学号输出【ORDER BY s_no】。

```
MariaDB [test]> select s_no,avg(score)
    -> from scores1
    -> group by s_no
    -> having avg(score) > 75;
+-----------+------------+
| s_no      | avg(score) |
+-----------+------------+
| 200215121 |    88.3333 |
| 200215122 |    85.0000 |
+-----------+------------+
2 rows in set (0.001 sec)
```

（9） NO.9 查询选修了课程 1 或者选修了课程 2 的学生姓名

```
MariaDB [test]> select distinct name from students1, scores1 where students1.no = scores1.s_no and (scores1.c_no = 1 or scores1.c_no = 2);
+-------+
| name  |
+-------+
| Tom   |
| Alice |
| Jerry |
+-------+
3 rows in set (0.001 sec)
```

（10） NO.10 查询既选修了课程 1 又选修了课程 2 的学生姓名【mysql 模拟 intersect: 用 DISTINCT,INNER JOIN 或 DISTINCT,WHERE 等方式，可以实现交集操作即可】

```
MariaDB [test]> select distinct s1.name from students1 as s1, scores1 as s2, scores1 as s3
    -> where s1.no = s2.s_no
    -> and s1.no = s3.s_no
    -> and s2.c_no = 1
    -> and s3.c_no = 2;
+------+
| name |
+------+
| Tom  |
+------+
1 row in set (0.000 sec)
```

（11） **NO.11 查询选修 Database 这门课最高分学生所在的系名**

```
MariaDB [test]> select d.name from depts1 as d,students1 as s1,scores1 as s2,courses
1 as c where d.no = s1.d_no and s1.no = s2.s_no and c.no = s2.c_no and c.name = 'Dat
abase' and s2.score = (select max(scores1.score) from scores1);
+------------------+
| name             |
+------------------+
| Computer Science |
+------------------+
1 row in set (0.001 sec)
```

（12） **NO.12 建立一个包含学生学号，姓名，年龄，以及所在系名的视图（赋予列名为 sno,sname,sage,deptname）【create view】**

```
MariaDB [test]> create view view_branch1 as
    -> select students1.no as sno,students1.name as sname,students1.age as sage,depts1.name as deptname
    -> from students1, depts1
    -> where students1.d_no = depts1.no;
Query OK, 0 rows affected (0.007 sec)

MariaDB [test]> select * from view_branch1
    -> ;
+-----------+-------+------+------------------+
| sno       | sname | sage | deptname         |
+-----------+-------+------+------------------+
| 200215120 | Mike  |   21 | Architecture     |
| 200215121 | Tom   |   20 | Computer Science |
| 200215122 | Jerry |   19 | Computer Science |
| 200215123 | Alice |   18 | Mathematics      |
| 200215125 | Bob   |   19 | Architecture     |
+-----------+-------+------+------------------+
5 rows in set (0.001 sec)
```

出现的问题：

（1） 对题目部分要求感到不是很理解，其中部分是题目出现了错误，比如下面这个 s_no 是学号，实际上应该换成 c_no。

NO.2 查询选2号课程(s_no='2')且成绩在80--90的学生号。
(BETWEEN ... AND ...)

（2） 对题目部分要求感到不是很理解，其中部分是题目出现了错误，在插入时外键并没有事先加入相关表中，导致插入失败

```
MariaDB [test]> insert into scores1 (s_no,c_no,score) values(200215199,1,72);
ERROR 1452 (23000): Cannot add or update a child row: a foreign key constraint fails (`test`.`scores1`, CONSTRAINT `sc_c_1` FOREIGN KEY (`s_no`) REFERENCES `stud
ents1` (`no`))
```

（3） 对 SQL 语句用法不熟练，经常使用错误。

解决方案：

（1） 思考+反馈。

（2） 根据要求调整题目。

```
MariaDB [test]> insert into scores1 (s_no,c_no,score) values(200215199,1,72);
ERROR 1452 (23000): Cannot add or update a child row: a foreign key constraint fails (`test`.`scores1`, CONSTRAINT `sc_c_1` FOREIGN KEY (`s_no`) REFERENCES `stud
ents1` (`no`))
MariaDB [test]> insert into scores1 (s_no,c_no,score) values(200215123,1,72);
Query OK, 1 row affected (0.001 sec)

MariaDB [test]> select *
    -> from scores;
ERROR 1146 (42S02): Table 'test.scores' doesn't exist
MariaDB [test]> select * from scores1;
+-----------+------+-------+
| s_no      | c_no | score |
+-----------+------+-------+
| 200215121 |    1 |    92 |
| 200215121 |    2 |    85 |
| 200215121 |    3 |    88 |
| 200215122 |    2 |    90 |
| 200215122 |    3 |    80 |
| 200215123 |    1 |    72 |
+-----------+------+-------+
6 rows in set (0.000 sec)
```

（3） 多搜多试多练。