

# 数据库概论第二次实习报告

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In [491]:

```
%reload_ext sql
import pymysql
pymysql.install_as_MySQLdb()
# %sql mysql://stu2101213030:stu2101213030@162.105.146.37:43306
%sql mysql://stu1800012972:stu1800012972@162.105.146.37:43306
%sql show databases;
%sql use stu1800012972;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
3 rows affected.
* mysql://stu1800012972:***@162.105.146.37:43306
0 rows affected.
```

Out[491]:

[]

## 练习一：生成身份证号

In [492]:

```
%%sql
drop table if exists myxzqh;
create table myxzqh(code varchar(30), name varchar(30)) select * from dataset.xzqh;
# show tables;
# select * from myxzqh;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
0 rows affected.
3218 rows affected.
0 rows affected.
```

Out[492]:

[]

### (1) 生成校验码的函数

In [493]:

```

%%sql
DROP FUNCTION if exists GetCheckCode;

create function GetCheckCode (id char(17))
returns char
begin

    declare sum,i int;
    declare weights varchar(100);
    declare curweight varchar(3);
    declare mp char(11);
    declare ans char;

    set sum=0;
    set i=1;
    set weights='7 9 10 5 8 4 2 1 6 3 7 9 10 5 8 4 2';
    set mp='10X98765432';

    while i<=17 do
        set curweight=left(weights, instr(weights,' ')-1);
        set weights=right(weights, length(weights)-instr(weights,' '));
        set sum =sum + cast(curweight as signed) * substr(id,i,1);
        set i=i+1;
    end while;

    set sum=sum%11;
    set ans = substr(mp,sum+1,1);

    return ans;
end

```

```

* mysql://stu1800012972:***@162.105.146.37:43306
0 rows affected.
0 rows affected.

```

Out[493]:

[]

以实习ppt中的例子为例测试:

In [494]:

```

%%sql select stu1800012972.GetCheckCode(43283119641115081);

```

```

* mysql://stu1800012972:***@162.105.146.37:43306
1 rows affected.

```

Out[494]:

```

stu1800012972.GetCheckCode(43283119641115081)

```

0

## (2) 定义存储过程，构造省份证号

In [495]:

```
%%sql
DROP PROCEDURE if exists GenerateID;

create procedure GenerateID(province varchar(20),city varchar(20),district varchar(20),
                           birthdate date,gender varchar(20))
begin
    declare i1516, i17 int;
    declare id varchar(18);

    set id = (select code from stu1800012972.myxzqh where name=district);
    set i1516=floor(rand()*100);
    set i17 = floor(rand()*4)*2;
    if gender='男' then set i17=i17+1; end if;

    set id = concat(id,date_format(birthdate,"%Y%m%d"));
    set id = concat(id,lpad(i1516,2,'0'));
    set id = concat(id,i17) ;
    set id = concat(id, GetCheckCode(id));
    select id;
end
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
0 rows affected.
0 rows affected.
```

Out[495]:

[]

## 测试该存储过程

In [496]:

```
%%sql
call GenerateID('浙江省','杭州市','余杭区','2000-07-12','女');
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
1 rows affected.
```

Out[496]:

```
      id
33011020000712354X
```

In [497]:

```
%%sql
call GenerateID('江苏省','南京市','江宁区','1981-03-05','男');
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
1 rows affected.
```

Out[497]:

```
      id
320115198103053676
```

## 练习二：触发器

In [541]:

```
%%sql
drop table if exists my_stock;

create table my_stock(
    stock_id int, volume int, avg_price double, profit int,
    PRIMARY KEY (`stock_id`))

* mysql://stu1800012972:***@162.105.146.37:43306
0 rows affected.
0 rows affected.
```

Out[541]:

[]

In [542]:

```
%%sql
drop table if exists trans;

create table trans(
    trans_id int, stock_id int, date int, price int, amount int ,sell_or_buy char,
    PRIMARY KEY (`trans_id`))

* mysql://stu1800012972:***@162.105.146.37:43306
0 rows affected.
0 rows affected.
```

Out[542]:

[]

我们构造辅助表 buy\_trans , 记录当前各条买入记录分别还剩下多少股票, 方便计算profit

In [543]:

```
%%sql
drop table if exists buy_trans;

create table buy_trans(
    trans_id int, stock_id int, price int, amount int,
    PRIMARY KEY(`trans_id`))

* mysql://stu1800012972:***@162.105.146.37:43306
0 rows affected.
0 rows affected.
```

Out[543]:

[]

In [544]:

```

%%sql
drop trigger if exists UpdateStock;

create trigger UpdateStock before insert on trans
for each row
begin

    declare ptr_transid, ptr_stockid, ptr_price, ptr_amount int;
    declare ptr cursor for select * from buy_trans order by `trans_id` asc;

    # 如果买入且没有该股票, 在my_stock中新建一个条目
    # 如果卖出且没有该股票, 报错
    if new.stock_id not in (select stock_id from my_stock where stock_id=new.stock_id) then
        if new.sell_or_buy='B' then
            INSERT INTO my_stock(stock_id, volume, avg_price, profit)
                VALUES (new.stock_id, 0, 0, 0);
        else
            SIGNAL SQLSTATE '02000' SET MESSAGE_TEXT =
                'Warning: invalid trans: sold stock not exists!';
        end if;
    end if;

    if new.sell_or_buy='B' then
        # 买入, 更新avg_price与volume
        update my_stock set
            avg_price=(volume*avg_price+new.price*new.amount)/(volume+new.amount),
            volume=volume+new.amount where my_stock.stock_id=new.stock_id;

        # 向 buy_trans中加入一条新的买入记录
        insert into buy_trans(trans_id, stock_id, price, amount)
            values(new.trans_id, new.stock_id, new.price, new.amount);

    elseif new.sell_or_buy='S' then
        if new.amount <= (select volume from my_stock where stock_id=new.stock_id) then
            set @rest_amount=new.amount;
            set @cur_profit=0;
            set @cur_amount=0;
            set @cur_price=0;

            open ptr;

            # 游标遍历买入记录表, 按顺序计算卖出各个记录获得的profit
            label: loop
                fetch ptr into ptr_transid, ptr_stockid, ptr_price, ptr_amount;
                if ptr_stockid!=new.stock_id then iterate label;
                end if;
                set @cur_amount=least(@rest_amount, ptr_amount);
                set @cur_profit=@cur_profit+(new.price-ptr_price)*@cur_amount;
                set @rest_amount=@rest_amount-@cur_amount;
                set @cur_price=@cur_price+new.price*@cur_amount;
                update buy_trans set amount=ptr_amount-@cur_amount
                    where buy_trans.trans_id=ptr_transid;
                if @rest_amount<=0 then leave label;
                end if;
            end loop;

            close ptr;

            # 删掉已经没有剩余股票的买入记录

```

```

delete from buy_trans where amount=0;

# 更新avg_price, volume, profit
# 注意卖光了不能除
update my_stock set
    avg_price= case when volume-new.amount!=0
        then (volume*avg_price-@cur_price)/(volume-new.amount)
        else 0 end,
    volume=volume-new.amount, profit=profit+@cur_profit
where my_stock.stock_id=new.stock_id;

else
    SIGNAL SQLSTATE '02000' SET MESSAGE_TEXT =
        'Warning: invalid trans: sold amount greater than current volume!';
end if;

end if;

end

```

```

* mysql://stu1800012972:***@162.105.146.37:43306
0 rows affected.
0 rows affected.

```

Out[544]:

[]

### 以ppt中的例子测试

In [545]:

```

%%sql
INSERT INTO trans(trans_id, stock_id, date, price, amount, sell_or_buy) VALUES(1,1,1,10,1000,'B');
select * from trans;

```

```

* mysql://stu1800012972:***@162.105.146.37:43306
1 rows affected.
1 rows affected.

```

Out[545]:

trans_id	stock_id	date	price	amount	sell_or_buy
1	1	1	10	1000	B

In [546]:

```

%%sql
select * from buy_trans;

```

```

* mysql://stu1800012972:***@162.105.146.37:43306
1 rows affected.

```

Out[546]:

trans_id	stock_id	price	amount
1	1	10	1000

In [547]:

```
%%sql
select * from my_stock;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
1 rows affected.
```

Out[547]:

stock_id	volume	avg_price	profit
1	1000	10.0	0

In [548]:

```
%%sql
INSERT INTO trans(trans_id, stock_id, date, price, amount, sell_or_buy) VALUES(2, 1, 2, 11, 500, 'B');
select * from trans;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
1 rows affected.
2 rows affected.
```

Out[548]:

trans_id	stock_id	date	price	amount	sell_or_buy
1	1	1	10	1000	B
2	1	2	11	500	B

In [549]:

```
%%sql
select * from buy_trans;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
2 rows affected.
```

Out[549]:

trans_id	stock_id	price	amount
1	1	10	1000
2	1	11	500

In [550]:

```
%%sql
select * from my_stock;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
1 rows affected.
```

Out[550]:

stock_id	volume	avg_price	profit
1	1500	10.333333333333334	0

In [551]:

```
%%sql
INSERT INTO trans(trans_id, stock_id, date, price, amount, sell_or_buy) VALUES(3, 1, 3, 12, 800, 'S');
select * from trans;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
1 rows affected.
3 rows affected.
```

Out[551]:

trans_id	stock_id	date	price	amount	sell_or_buy
1	1	1	10	1000	B
2	1	2	11	500	B
3	1	3	12	800	S

In [552]:

```
%%sql
select * from buy_trans;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
2 rows affected.
```

Out[552]:

trans_id	stock_id	price	amount
1	1	10	200
2	1	11	500

In [553]:

```
%%sql
select * from my_stock;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
1 rows affected.
```

Out[553]:

stock_id	volume	avg_price	profit
1	700	8.428571428571429	1600



In [554]:

```
%%sql
INSERT INTO trans(trans_id, stock_id, date, price, amount, sell_or_buy) VALUES(4, 1, 4, 12, 1000, 'S');

* mysql://stu1800012972:***@162.105.146.37:43306
(pymysql.err.OperationalError) (1643, 'Warning: invalid trans: sold amount greater than current volume!')
[SQL: INSERT INTO trans(trans_id, stock_id, date, price, amount, sell_or_buy) VALUES (4, 1, 4, 12, 1000, 'S');]
(Background on this error at: https://sqlalche.me/e/14/e3q8) (https://sqlalche.me/e/14/e3q8)
```

因为sell的股票数大于现有的股票数，我们报错

In [555]:

```
%%sql
select * from trans;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
3 rows affected.
```

Out[555]:

trans_id	stock_id	date	price	amount	sell_or_buy
1	1	1	10	1000	B
2	1	2	11	500	B
3	1	3	12	800	S

In [556]:

```
%%sql
INSERT INTO trans(trans_id, stock_id, date, price, amount, sell_or_buy) VALUES(5, 1, 5, 9, 1000, 'B');
select * from trans;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
1 rows affected.
4 rows affected.
```

Out[556]:

trans_id	stock_id	date	price	amount	sell_or_buy
1	1	1	10	1000	B
2	1	2	11	500	B
3	1	3	12	800	S
5	1	5	9	1000	B

In [557]:

```
%%sql
select * from buy_trans;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
3 rows affected.
```

Out[557]:

trans_id	stock_id	price	amount
1	1	10	200
2	1	11	500
5	1	9	1000

In [558]:

```
%%sql
select * from my_stock;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
1 rows affected.
```

Out[558]:

stock_id	volume	avg_price	profit
1	1700	8.764705882352942	1600

In [559]:

```
%%sql
INSERT INTO trans(trans_id, stock_id, date, price, amount, sell_or_buy) VALUES(6, 1, 6, 12, 800, 'S');
select * from trans;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
1 rows affected.
5 rows affected.
```

Out[559]:

trans_id	stock_id	date	price	amount	sell_or_buy
1	1	1	10	1000	B
2	1	2	11	500	B
3	1	3	12	800	S
5	1	5	9	1000	B
6	1	6	12	800	S

In [560]:

```
%%sql
select * from buy_trans;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
1 rows affected.
```

Out[560]:

trans_id	stock_id	price	amount
5	1	9	900

这一次，我们卖了 $200*2+500*1+100*3=1200$ ，前两条记录清空

In [561]:

```
%%sql
select * from my_stock;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
1 rows affected.
```

Out[561]:

stock_id	volume	avg_price	profit
1	900	5.888888888888891	2800

In [562]:

```
%%sql
INSERT INTO trans(trans_id, stock_id, date, price, amount, sell_or_buy) VALUES(7, 1, 7, 7, 800, 'S');
select * from trans;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
1 rows affected.
6 rows affected.
```

Out[562]:

trans_id	stock_id	date	price	amount	sell_or_buy
1	1	1	10	1000	B
2	1	2	11	500	B
3	1	3	12	800	S
5	1	5	9	1000	B
6	1	6	12	800	S
7	1	7	7	800	S

In [563]:

```
%%sql
select * from buy_trans;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
1 rows affected.
```

Out[563]:

trans_id	stock_id	price	amount
5	1	9	100

In [564]:

```
%%sql
select * from my_stock;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
1 rows affected.
```

Out[564]:

stock_id	volume	avg_price	profit
1	100	-2.9999999999999982	1200

测试不同编号的股票不会互相影响

In [565]:

```
%%sql
INSERT INTO trans(trans_id, stock_id, date, price, amount, sell_or_buy) VALUES(8, 2, 7, 7, 1000, 'B');
select * from trans;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
1 rows affected.
7 rows affected.
```

Out[565]:

trans_id	stock_id	date	price	amount	sell_or_buy
1	1	1	10	1000	B
2	1	2	11	500	B
3	1	3	12	800	S
5	1	5	9	1000	B
6	1	6	12	800	S
7	1	7	7	800	S
8	2	7	7	1000	B

In [566]:

```
%%sql
select * from buy_trans;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
2 rows affected.
```

Out[566]:

trans_id	stock_id	price	amount
5	1	9	100
8	2	7	1000

In [567]:

```
%%sql
select * from my_stock;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
2 rows affected.
```

Out[567]:

stock_id	volume	avg_price	profit
1	100	-2.999999999999982	1200
2	1000	7.0	0

In [568]:

```
%%sql
INSERT INTO trans(trans_id, stock_id, date, price, amount, sell_or_buy) VALUES(9, 2, 7, 6, 800, 'S');
select * from trans;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
1 rows affected.
8 rows affected.
```

Out[568]:

trans_id	stock_id	date	price	amount	sell_or_buy
1	1	1	10	1000	B
2	1	2	11	500	B
3	1	3	12	800	S
5	1	5	9	1000	B
6	1	6	12	800	S
7	1	7	7	800	S
8	2	7	7	1000	B
9	2	7	6	800	S

In [569]:

```
%%sql
select * from buy_trans;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
2 rows affected.
```

Out[569]:

trans_id	stock_id	price	amount
5	1	9	100
8	2	7	200

In [570]:

```
%%sql
select * from my_stock;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
2 rows affected.
```

Out[570]:

stock_id	volume	avg_price	profit
1	100	-2.999999999999982	1200
2	200	11.0	-800

In [571]:

```
%%sql
INSERT INTO trans(trans_id, stock_id, date, price, amount, sell_or_buy) VALUES(10, 2, 7, 8, 200, 'S');
select * from trans;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
1 rows affected.
9 rows affected.
```

Out[571]:

trans_id	stock_id	date	price	amount	sell_or_buy
1	1	1	10	1000	B
2	1	2	11	500	B
3	1	3	12	800	S
5	1	5	9	1000	B
6	1	6	12	800	S
7	1	7	7	800	S
8	2	7	7	1000	B
9	2	7	6	800	S
10	2	7	8	200	S

In [572]:

```
%%sql
select * from buy_trans;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
1 rows affected.
```

Out[572]:

trans_id	stock_id	price	amount
5	1	9	100

In [573]:

```
%%sql
select * from my_stock;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
2 rows affected.
```

Out[573]:

stock_id	volume	avg_price	profit
1	100	-2.999999999999982	1200
2	0	0.0	-600

再买一次2号股票

In [574]:

```
%%sql
INSERT INTO trans(trans_id, stock_id, date, price, amount, sell_or_buy) VALUES(11, 2, 7, 8, 200, 'B');
select * from trans;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
1 rows affected.
10 rows affected.
```

Out[574]:

trans_id	stock_id	date	price	amount	sell_or_buy
1	1	1	10	1000	B
2	1	2	11	500	B
3	1	3	12	800	S
5	1	5	9	1000	B
6	1	6	12	800	S
7	1	7	7	800	S
8	2	7	7	1000	B
9	2	7	6	800	S
10	2	7	8	200	S
11	2	7	8	200	B

In [575]:

```
%%sql
select * from buy_trans;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
2 rows affected.
```

Out[575]:

trans_id	stock_id	price	amount
5	1	9	100
11	2	8	200

In [576]:

```
%%sql
select * from my_stock;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
2 rows affected.
```

Out[576]:

stock_id	volume	avg_price	profit
1	100	-2.9999999999999982	1200
2	200	8.0	-600

In [577]:

```
%%sql
INSERT INTO trans(trans_id, stock_id, date, price, amount, sell_or_buy) VALUES(12, 2, 7, 7, 200, 'S');
select * from trans;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
1 rows affected.
11 rows affected.
```

Out[577]:

trans_id	stock_id	date	price	amount	sell_or_buy
1	1	1	10	1000	B
2	1	2	11	500	B
3	1	3	12	800	S
5	1	5	9	1000	B
6	1	6	12	800	S
7	1	7	7	800	S
8	2	7	7	1000	B
9	2	7	6	800	S
10	2	7	8	200	S
11	2	7	8	200	B
12	2	7	7	200	S



In [578]:

```
%%sql
select * from buy_trans;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
1 rows affected.
```

Out[578]:

trans_id	stock_id	price	amount
5	1	9	100

我们保留2号股票卖光之前的profit; 8买入, 7卖出200, 又赔了200, 现在profit是-800

In [579]:

```
%%sql
select * from my_stock;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
2 rows affected.
```

Out[579]:

stock_id	volume	avg_price	profit
1	100	-2.9999999999999982	1200
2	0	0.0	-800

尝试卖出一个不存在的3号股票, 报错

In [580]:

```
%%sql
INSERT INTO trans(trans_id, stock_id, date, price, amount, sell_or_buy) VALUES(13, 3, 7, 8, 200, 'S');
select * from trans;
```

```
* mysql://stu1800012972:***@162.105.146.37:43306
(pymysql.err.OperationalError) (1643, 'Warning: invalid trans: sold stock not exist
s!')
[SQL: INSERT INTO trans(trans_id, stock_id, date, price, amount, sell_or_buy) VALUES
(13, 3, 7, 8, 200, 'S');]
(Background on this error at: https://sqlalche.me/e/14/e3q8) (https://sqlalche.me/e/14/e3q8)
```

In [581]:

```
%%sql
select * from trans;
```

\* mysql://stu1800012972:\*\*\*@162.105.146.37:43306  
11 rows affected.

Out[581]:

trans_id	stock_id	date	price	amount	sell_or_buy
1	1	1	10	1000	B
2	1	2	11	500	B
3	1	3	12	800	S
5	1	5	9	1000	B
6	1	6	12	800	S
7	1	7	7	800	S
8	2	7	7	1000	B
9	2	7	6	800	S
10	2	7	8	200	S
11	2	7	8	200	B
12	2	7	7	200	S

In [582]:

```
%%sql
select * from my_stock;
```

\* mysql://stu1800012972:\*\*\*@162.105.146.37:43306  
2 rows affected.

Out[582]:

stock_id	volume	avg_price	profit
1	100	-2.999999999999982	1200
2	0	0.0	-800

In [ ]: