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Homework 4

2022 Spring - CS 6083
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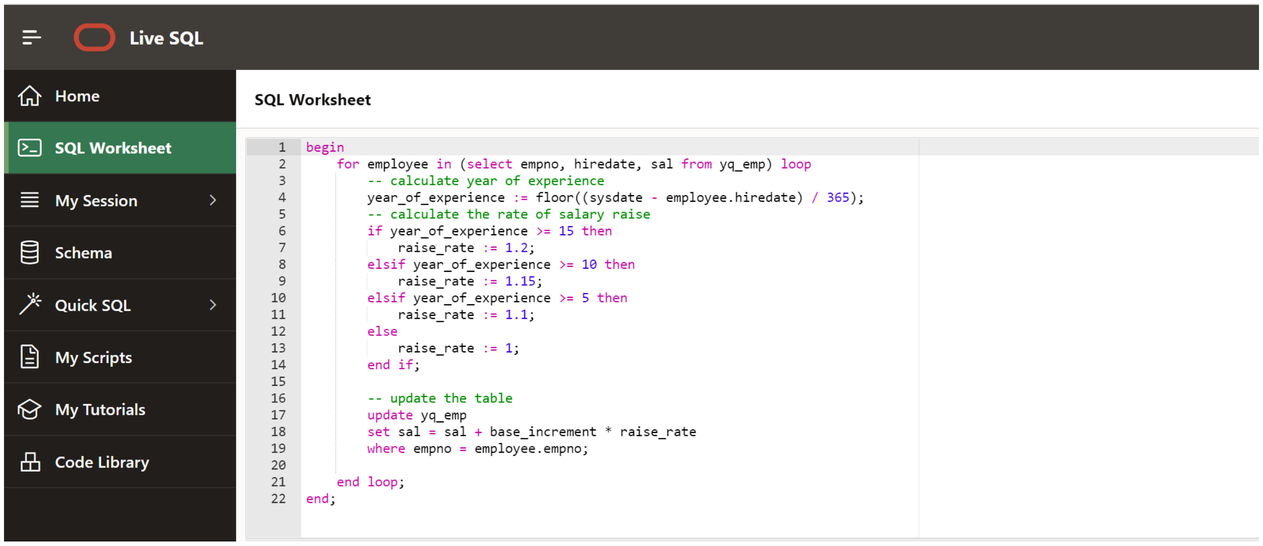
Problem 1

1. Here is the screenshot of the solution Oracle SQL code for problem 1.



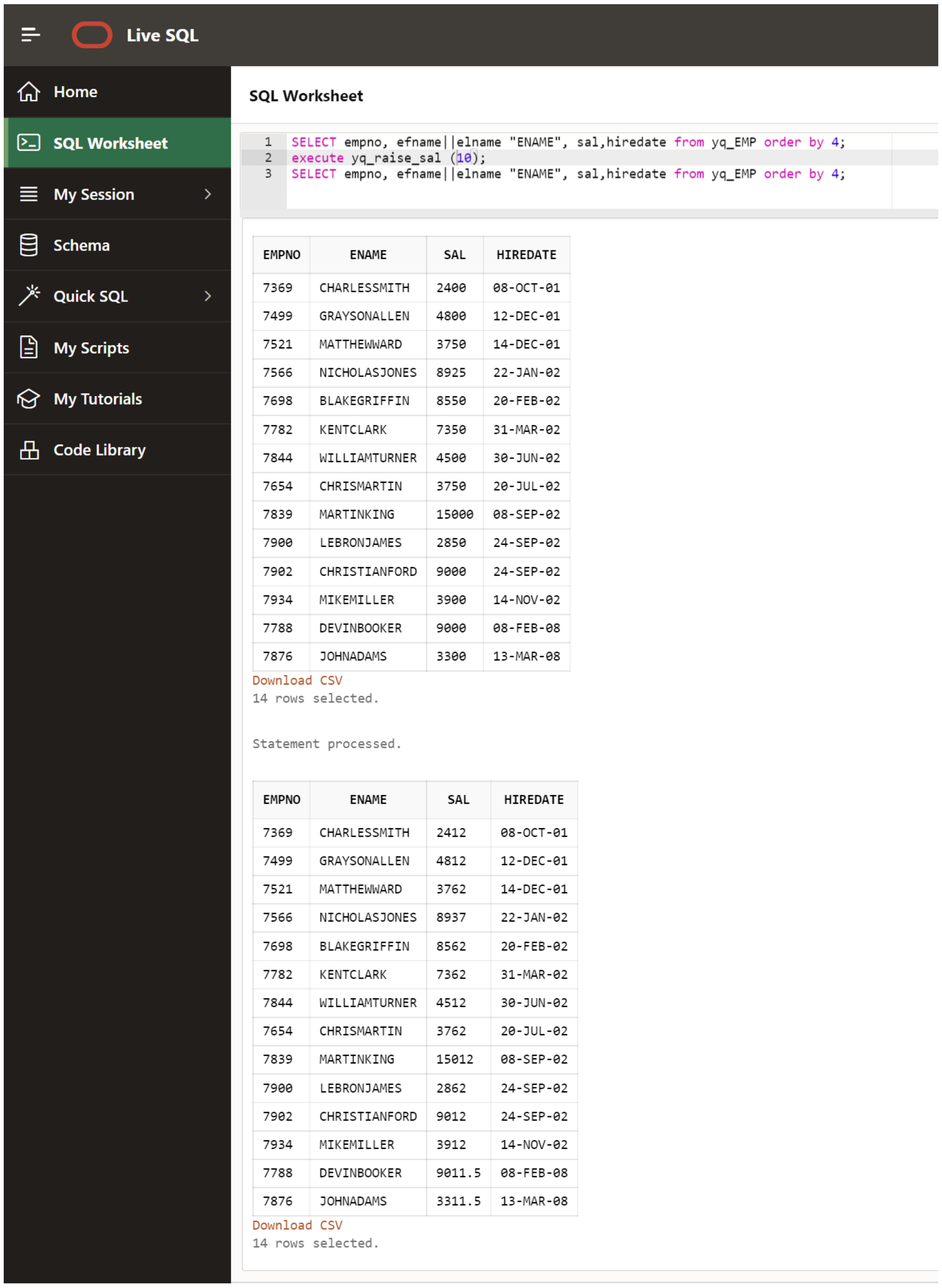
```
begin
    for employee in (select empno, hiredate, sal from yq_emp) loop
        -- calculate year of experience
        year_of_experience := floor((sysdate - employee.hiredate) / 365);
        -- calculate the rate of salary raise
        if year_of_experience >= 15 then
            raise_rate := 1.2;
        elsif year_of_experience >= 10 then
            raise_rate := 1.15;
        elsif year_of_experience >= 5 then
            raise_rate := 1.1;
        else
            raise_rate := 1;
        end if;

        -- update the table
        update yq_emp
        set sal = sal + base_increment * raise_rate
        where empno = employee.empno;

    end loop;
end;
```

Figure 1. Oracle code for problem 1.

2. Here are the screenshots of the “emp” table before and after the procedure run.



```
SELECT empno, efname||elname "ENAME", sal,hiredate from yq_EMP order by 4;
execute yq_raise_sal (10);
SELECT empno, efname||elname "ENAME", sal,hiredate from yq_EMP order by 4;
```

EMPNO	ENAME	SAL	HIREDATE
7369	CHARLESSMITH	2400	08-OCT-01
7499	GRAYSONALLEN	4800	12-DEC-01
7521	MATTHEWWARD	3750	14-DEC-01
7566	NICHOLASJONES	8925	22-JAN-02
7698	BLAKEGRIFFIN	8550	20-FEB-02
7782	KENTCLARK	7350	31-MAR-02
7844	WILLIAMTURNER	4500	30-JUN-02
7654	CHRISMARTIN	3750	20-JUL-02
7839	MARTINKING	15000	08-SEP-02
7900	LEBRONJAMES	2850	24-SEP-02
7902	CHRISTIANFORD	9000	24-SEP-02
7934	MIKEMILLER	3900	14-NOV-02
7788	DEVINBOOKER	9000	08-FEB-08
7876	JOHNADAMS	3300	13-MAR-08

```
Download CSV
14 rows selected.

Statement processed.
```

EMPNO	ENAME	SAL	HIREDATE
7369	CHARLESSMITH	2412	08-OCT-01
7499	GRAYSONALLEN	4812	12-DEC-01
7521	MATTHEWWARD	3762	14-DEC-01
7566	NICHOLASJONES	8937	22-JAN-02
7698	BLAKEGRIFFIN	8562	20-FEB-02
7782	KENTCLARK	7362	31-MAR-02
7844	WILLIAMTURNER	4512	30-JUN-02
7654	CHRISMARTIN	3762	20-JUL-02
7839	MARTINKING	15012	08-SEP-02
7900	LEBRONJAMES	2862	24-SEP-02
7902	CHRISTIANFORD	9012	24-SEP-02
7934	MIKEMILLER	3912	14-NOV-02
7788	DEVINBOOKER	9011.5	08-FEB-08
7876	JOHNADAMS	3311.5	13-MAR-08

```
Download CSV
14 rows selected.
```

Figure 2. Employee table before and after procedure executed.

Problem 2

a. For this problem, we can notice that column "gender", "marital_status" and "race" all take on a relatively small number of distinct of values. Then we could create bitmap indexes for these attributes. Below is the bitmap for each column.

For this problem, since we insert 16 rows into the table, thus the length of each bitmap is 16.

1. The gender bitmap:

Gender	Bitmap value
Male	0000000011111111
Female	1111111100000000

2. The marital status bitmap:

Marital status	Bitmap value
Single	1110000011100000
Married	0001001000010010
Divorced	0000100000001000
Widow or Widower	0000101000001010

3. The race bitmap:

Race	Bitmap value
Asian	1001010010010100
Black	0010100100101001
White	0100001001000010

b. First we can solve the condition "patients who are not Asian"

$$result_1 = \text{NOT}(1001010010010100) = 0110101101101011$$

Then we can calculate the condition "patients who are Female and not Asian"

$$\begin{aligned} result_2 &= result_1 \text{ AND } 1111111100000000 \\ &= 0110101101101011 \text{ AND } 1111111100000000 \\ &= 0110101100000000 \end{aligned}$$

Then we calculate the condition "patients whose marital status is either single or married"

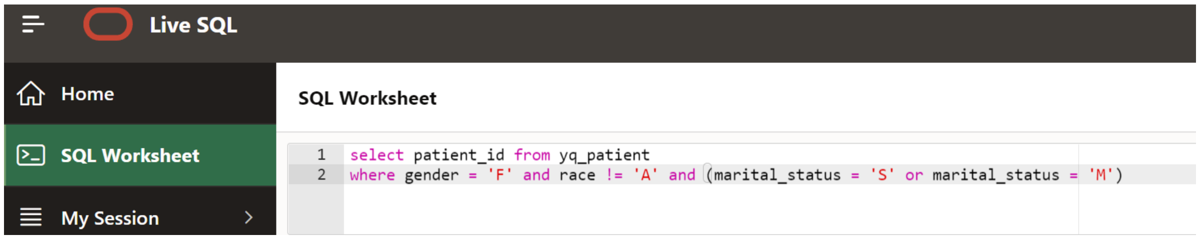
$$result_3 = 1110000011100000 \text{ OR } 0001001000010010 = 1111001011110010$$

Finally, we can get the answer combining "$result_2$" and "$result_3$".

$$result_2 \text{ AND } result_3 = 0110001000000000$$

According to the final bitmap value, we can know the patient's ID that meet this requirement is 10002, 10003 and 10007.

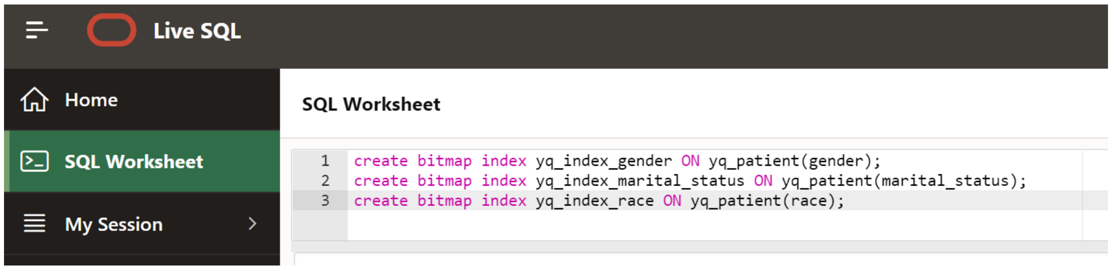
c. The SQL code solving problem b. is listed below:



```sql
select patient_id from yq_patient
where gender = 'F' and race != 'A' and (marital_status = 'S' or marital_status = 'M')
```

Figure 3. Screenshot of SQL code.

d. The DDL code for the bitmap indexes identified in problem a. z



```sql
create bitmap index yq_index_gender ON yq_patient(gender);
create bitmap index yq_index_marital_status ON yq_patient(marital_status);
create bitmap index yq_index_race ON yq_patient(race);
```

Figure 4. Screenshot of DDL code.