

Database HW3 : Practice 1

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Exercise 1

- a. Find the titles of courses in the Comp. Sci. department that have 3 credits

```
SQL Shell (psql)
practice=# SELECT title
practice=# FROM course
practice=# WHERE dept_name = 'Comp. Sci.' AND credits = 3;
           title
-----
Robotics
Image Processing
Database System Concepts
(3개 행)

practice=#
```

- b. Find the IDs of all students who were taught by an instructor named Einstein; make sure there are no duplicates in the result

```
SQL Shell (psql)
practice=# SELECT DISTINCT takes.ID
practice=# FROM takes JOIN teaches USING (course_id, sec_id, semester, year)
practice=# WHERE teaches.ID = (
practice(#   SELECT ID
practice(#   FROM instructor
practice(#   WHERE instructor.name = 'Einstein'
practice(#   );
           id
-----
44553
(1개 행)

practice=#
```

- c. Find the highest salary of any instructor

```
SQL Shell (psql)
practice=# SELECT MAX (salary) AS highest_salary
practice=# FROM instructor;
highest_salary
-----
          95000.00
(1개 행)

practice=#
```

- d. Find all instructors earning the highest salary (there may be more than one with the same salary)

```
선택 SQL Shell (psql)
practice=# SELECT *
practice=# FROM instructor
practice=# WHERE salary = (
practice=#     SELECT MAX (salary)
practice=#     FROM instructor
practice=# );
 id | name | dept_name | salary
-----+-----+-----+-----
22222 | Einstein | Physics | 95000.00
(1개 행)

practice=#
```

- e. Find the enrollment for each section that was offered in Fall 2009

```
SQL Shell (psql)
practice=# SELECT COUNT (ID) AS enrollment
practice=# FROM takes
practice=# WHERE semester = 'Fall' AND year = 2009
practice=# GROUP BY course_id, sec_id;
enrollment
-----
          6
          2
          1
(3개 행)

practice=#
```

- f. Find the maximum enrollment, across all sections, in Fall 2009

```
SQL Shell (psql)
practice=# WITH enroll (enrollment) AS (
practice(#   SELECT COUNT (ID) AS enrollment
practice(#   FROM takes
practice(#   WHERE semester = 'Fall' AND year = 2009
practice(#   GROUP BY course_id, sec_id
practice(# )
practice=# SELECT MAX (enrollment) AS max_enrollment
practice=# FROM enroll;
max_enrollment
-----
6
(1개 행)

practice=#
```

- g. Find the sections that had the maximum enrollment in Fall 2009

```
SQL Shell (psql)
practice=# WITH enroll (course_id, sec_id, semester, year, enrollment) AS (
practice(#   SELECT course_id, sec_id, semester, year, COUNT (ID) AS enrollment
practice(#   FROM takes
practice(#   WHERE semester = 'Fall' AND year = 2009
practice(#   GROUP BY course_id, sec_id, semester, year
practice(# )
practice=# SELECT *
practice=# FROM section NATURAL JOIN enroll
practice=# WHERE enroll.enrollment = (
practice(#   WITH enroll (enrollment) AS (
practice(#   SELECT COUNT (ID) AS enrollment
practice(#   FROM takes
practice(#   WHERE semester = 'Fall' AND year = 2009
practice(#   GROUP BY course_id, sec_id
practice(#   )
practice(#   SELECT MAX (enrollment) AS max_enrollment
practice(#   FROM enroll
practice(# );
course_id | sec_id | semester | year | building | room_number | time_slot_id | enrollment
-----+-----+-----+-----+-----+-----+-----+-----
CS-101    | 1      | Fall     | 2009 | Packard  | 101         | H             | 6
(1개 행)

practice=#
```

Exercise 2

0. Create grade_points

```
SQL Shell (psql)
practice=# CREATE TABLE grade_points (
practice(#   grade   varchar(4),
practice(#   points  numeric(2,1)
practice(# );
CREATE TABLE
practice=# INSERT INTO grade_points VALUES ('A+', 4.3);
INSERT 0 1
practice=# INSERT INTO grade_points VALUES ('A', 4.0);
INSERT 0 1
practice=# INSERT INTO grade_points VALUES ('A-', 3.7);
INSERT 0 1
practice=# INSERT INTO grade_points VALUES ('B+', 3.3);
INSERT 0 1
practice=# INSERT INTO grade_points VALUES ('B', 3.0);
INSERT 0 1
practice=# INSERT INTO grade_points VALUES ('B-', 2.7);
INSERT 0 1
practice=# INSERT INTO grade_points VALUES ('C+', 2.3);
INSERT 0 1
practice=# INSERT INTO grade_points VALUES ('C', 2.0);
INSERT 0 1
practice=# INSERT INTO grade_points VALUES ('C-', 1.7);
INSERT 0 1
practice=#
```

- a. Find the total grade-points earned by the student with ID 12345, across all courses taken by the student

```
선택 SQL Shell (psql)
practice=# SELECT SUM (gp) AS total_gp
practice=# FROM (
practice(#   SELECT (points * course.credits) AS gp
practice(#   FROM (takes NATURAL JOIN grade_points) JOIN course USING (course_id)
practice(#   WHERE takes.ID = '12345'
practice(# ) AS grade_point;
total_gp
-----
48.0
(1개 행)

practice=#
```

- b. Find the grade-point average (GPA) for the above student, that is, the total grade-points divided by the total credits for the associated courses

```
선택 SQL Shell (psql)
practice=# SELECT (gp / tot_cred) AS GPA
practice=# FROM (
practice(# SELECT SUM (points * course.credits) AS gp, SUM (course.credits) AS tot_cred
practice(# FROM (takes NATURAL JOIN grade_points) JOIN course USING (course_id)
practice(# WHERE takes.ID = '12345'
practice(# ) AS studentGPA;
           gpa
-----
3.4285714285714286
(1개 행)

practice=#
```

- c. Find the ID and the grade-point average of every student

```
선택 SQL Shell (psql)
practice=# WITH studentGPA (ID, GPA) AS (
practice(# SELECT ID, (gp / tot_cred) AS GPA
practice(# FROM (
practice(# SELECT ID, SUM (points * course.credits) AS gp, SUM (course.credits) AS tot_cred
practice(# FROM (takes NATURAL JOIN grade_points) JOIN course USING (course_id)
practice(# GROUP BY ID
practice(# ) AS _GPA
practice(# )
practice=# SELECT ID, GPA
practice=# FROM studentGPA UNION (
practice(# SELECT ID, 0.0000000000000000
practice(# FROM student
practice(# WHERE NOT EXISTS (
practice(# SELECT *
practice(# FROM studentGPA
practice(# WHERE studentGPA.ID = student.ID
practice(# )
practice(# );
 id |      gpa
-----+-----
23121 | 2.3000000000000000
54321 | 3.5000000000000000
98988 | 4.0000000000000000
19991 | 3.0000000000000000
12345 | 3.4285714285714286
45678 | 3.1714285714285714
76543 | 4.0000000000000000
76653 | 2.0000000000000000
70557 | 0.0000000000000000
00128 | 3.8714285714285714
98765 | 2.2571428571428571
44553 | 2.7000000000000000
55739 | 3.7000000000000000
(13개 행)

practice=#
```

Exercise 3

- a. Increase the salary of each instructor in the Comp. Sci. department by 10%

- before

```
선택 SQL Shell (psql)
practice=# SELECT * FROM instructor;
 id | name      | dept_name | salary
-----+-----+-----+-----
10101 | Srinivasan | Comp. Sci. | 65000.00
12121 | Wu         | Finance   | 90000.00
15151 | Mozart     | Music     | 40000.00
22222 | Einstein   | Physics   | 95000.00
32343 | El Said    | History   | 60000.00
33456 | Gold       | Physics   | 87000.00
45565 | Katz        | Comp. Sci. | 75000.00
58583 | Califieri  | History   | 62000.00
76543 | Singh      | Finance   | 80000.00
76766 | Crick      | Biology   | 72000.00
83821 | Brandt     | Comp. Sci. | 92000.00
98345 | Kim        | Elec. Eng. | 80000.00
(12개 행)
```

```
practice=#
```

- after

```
선택 SQL Shell (psql)
practice=# UPDATE instructor
practice=#     SET salary = salary * 1.1
practice=#     WHERE dept_name = 'Comp. Sci.';
UPDATE 3
practice=# SELECT * FROM instructor;
 id | name      | dept_name | salary
-----+-----+-----+-----
12121 | Wu         | Finance   | 90000.00
15151 | Mozart     | Music     | 40000.00
22222 | Einstein   | Physics   | 95000.00
32343 | El Said    | History   | 60000.00
33456 | Gold       | Physics   | 87000.00
58583 | Califieri  | History   | 62000.00
76543 | Singh      | Finance   | 80000.00
76766 | Crick      | Biology   | 72000.00
98345 | Kim        | Elec. Eng. | 80000.00
10101 | Srinivasan | Comp. Sci. | 71500.00
45565 | Katz        | Comp. Sci. | 82500.00
83821 | Brandt     | Comp. Sci. | 101200.00
(12개 행)
```

```
practice=#
```

b. Delete all courses that have never been offered (that is, do not occur in the section relation)

- before

```
SQL Shell (psql)
practice=# SELECT * FROM course;
course_id | title | dept_name | credits
-----|-----|-----|-----
BIO-101 | Intro. to Biology | Biology | 4
BIO-301 | Genetics | Biology | 4
BIO-399 | Computational Biology | Biology | 3
CS-101 | Intro. to Computer Science | Comp. Sci. | 4
CS-190 | Game Design | Comp. Sci. | 4
CS-315 | Robotics | Comp. Sci. | 3
CS-319 | Image Processing | Comp. Sci. | 3
CS-347 | Database System Concepts | Comp. Sci. | 3
EE-181 | Intro. to Digital Systems | Elec. Eng. | 3
FIN-201 | Investment Banking | Finance | 3
HIS-351 | World History | History | 3
MU-199 | Music Video Production | Music | 3
PHY-101 | Physical Principles | Physics | 4
(13개 행)

practice=#
```

- after

```
선택 SQL Shell (psql)
practice=# DELETE FROM course
practice=# WHERE course_id IN (
practice=#     SELECT course_id
practice=#     FROM (
practice=#         SELECT course.course_id
practice=#         FROM course
practice=#     ) AS co1 EXCEPT (
practice=#         SELECT DISTINCT course.course_id
practice=#         FROM course NATURAL JOIN section
practice=#     )
practice=# );
DELETE 1
practice=# SELECT * FROM course;
course_id | title | dept_name | credits
-----|-----|-----|-----
BIO-101 | Intro. to Biology | Biology | 4
BIO-301 | Genetics | Biology | 4
CS-101 | Intro. to Computer Science | Comp. Sci. | 4
CS-190 | Game Design | Comp. Sci. | 4
CS-315 | Robotics | Comp. Sci. | 3
CS-319 | Image Processing | Comp. Sci. | 3
CS-347 | Database System Concepts | Comp. Sci. | 3
EE-181 | Intro. to Digital Systems | Elec. Eng. | 3
FIN-201 | Investment Banking | Finance | 3
HIS-351 | World History | History | 3
MU-199 | Music Video Production | Music | 3
PHY-101 | Physical Principles | Physics | 4
(12개 행)

practice=#
```

- c. Insert every student whose tot_cred attribute is greater than 100 as an instructor in the same department, with a salary of \$30,000

- before

```
SQL Shell (psql)
practice=# SELECT * FROM instructor;
 id | name | dept_name | salary
-----+-----+-----+-----
12121 | Wu | Finance | 90000.00
15151 | Mozart | Music | 40000.00
22222 | Einstein | Physics | 95000.00
32343 | El Said | History | 60000.00
33456 | Gold | Physics | 87000.00
58583 | Califieri | History | 62000.00
76543 | Singh | Finance | 80000.00
76766 | Crick | Biology | 72000.00
98345 | Kim | Elec. Eng. | 80000.00
10101 | Srinivasan | Comp. Sci. | 71500.00
45565 | Katz | Comp. Sci. | 82500.00
83821 | Brandt | Comp. Sci. | 101200.00
(12개 행)

practice=#
```

- after

```
선택 SQL Shell (psql)
practice=# INSERT INTO instructor
practice=# SELECT ID, name, dept_name, 30000
practice=# FROM student
practice=# WHERE tot_cred > 100;
INSERT 0 3
practice=# SELECT * FROM instructor;
 id | name | dept_name | salary
-----+-----+-----+-----
12121 | Wu | Finance | 90000.00
15151 | Mozart | Music | 40000.00
22222 | Einstein | Physics | 95000.00
32343 | El Said | History | 60000.00
33456 | Gold | Physics | 87000.00
58583 | Califieri | History | 62000.00
76543 | Singh | Finance | 80000.00
76766 | Crick | Biology | 72000.00
98345 | Kim | Elec. Eng. | 80000.00
10101 | Srinivasan | Comp. Sci. | 71500.00
45565 | Katz | Comp. Sci. | 82500.00
83821 | Brandt | Comp. Sci. | 101200.00
00128 | Zhang | Comp. Sci. | 30000.00
23121 | Chavez | Finance | 30000.00
98988 | Tanaka | Biology | 30000.00
(15개 행)

practice=#
```