DataBase Assignment due 10/8 Tue

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Complete practice exercises. (with screenshots of queries and execution results)
(주의: 현실적인 대학교 시스템 생각하면서 풀기)

Ex1)

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

```
practice=# select title
practice-# from course
practice-# where dept_name = 'Comp. Sci.' and credits = 3;
         title
-------------------------
 Robotics
 Image Processing
 Database System Concepts
(3개 행)
```

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

```
practice=# select distinct takes.ID
practice-# from takes join teaches using(course_id)
practice-# where teaches.ID = (select ID
practice(# from instructor
practice(# where name = 'Einstein');
  id
-------
 44553
(1개 행)
```

c. Find the highest salary of any instructor

```
practice=# select max (salary)
practice-# from instructor;
   max
----------
 95000.00
(1개 행)
```

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

```
practice=# select name
practice-# from instructor
practice-# where salary = (select max (salary)
practice(# from instructor);
   name
----------
 Einstein
(1개 행)
```

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

(각 분반마다 해당 강의를 듣는 학생 수 / with)

```
practice=# select course_id, sec_id, count(id) as enrollment
practice-# from takes
practice-# where semester = 'Fall' and year = 2009
practice-# group by course_id, sec_id;
 course_id | sec_id | enrollment
-----------+--------+------------
 CS-101    | 1      |          6
 CS-347    | 1      |          2
 PHY-101   | 1      |          1
(3개 행)
```

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

=> maximum enrollment라면, 모든 enrollment 카운트 수치에 대해서 가장 크거나 같은 값

```
practice=# with enroll(value) as (select count(id)
practice(# from takes
practice(# where semester = 'Fall' and year = 2009
practice(# group by course_id, sec_id)
practice-# select max(value) as max_enrollment
practice-# from enroll;
 max_enrollment
----------------
              6
(1개 행)
```

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

```
practice=# with section_id(c_id, s_id, value) as (select course_id, sec_id, count(id)
practice(# from takes
practice(# where semester = 'Fall' and year = 2009
practice(# group by course_id, sec_id),
practice-# max_enroll(value) as (select max(value) as max_enrollment
practice(# from section_id)
practice-# select c_id, s_id
practice-# from section_id, max_enroll
practice-# where section_id.value = max_enroll.value;
  c_id  | s_id
--------+------
 CS-101 | 1
(1개 행)
```

Ex2) Make a relation grade points(grade, points), which provides a conversion from letter grades in the takes relation to numeric scores. The tuples of the grade points relation : (A+, 4.3), (A, 4.0), (A-, 3.7), (B+, 3.3), (B, 3.0), (B-, 2.7), (C+, 2.3), (C, 2.0), (C-, 1.7) The grade points earned by a student for a course offering (section) is defined as the number of credits for the course multiplied by the numeric points for the grade that the student received. You can assume for simplicity that no takes tuple has the null value for grade. The result of the student who doesn't take any class is 0

(아무것도 안 듣는 학생은 따로 처리를 해야함 이 부분 주의)

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

```
practice=# select sum(points * credits) as total_grade_points
practice-# from (takes join grade_point using (grade)) join course using (course_id)
practice-# where id = '12345';
 total_grade_points
--------------------
               48.0
(1개 행)
```

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

```
practice=# select sum(points * credits) / sum(credits) as GPA
practice-# from (takes join grade_point using (grade)) join course using (course_id)
practice-# where id = '12345';
        gpa
--------------------
 3.4285714285714286
(1개 행)
```

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

- 주의 할 점: takes에 속하지 않은, 수업을 전혀 수강하지 않은 수강생)
- 수강하지 않는 수강생은 union 오퍼레이션을 통해 따로 묶자.

```
practice=# (select distinct id, sum(points * credits) / sum(credits) as GPA
practice(# from (takes join grade_point using (grade)) join course using (course_id)
practice(# group by id)
practice-# union
practice-# (select distinct id, 0
practice(# from student
practice(# where id not in (select id
practice(# from takes));
  id   |        gpa
-------+--------------------
 23121 | 2.3000000000000000
 54321 | 3.5000000000000000
 98988 | 4.0000000000000000
 19991 | 3.0000000000000000
 12345 | 3.4285714285714286
 76543 | 4.0000000000000000
 76653 | 2.0000000000000000
 70557 |                  0
 00128 | 3.8714285714285714
 98765 | 2.2571428571428571
 44553 | 2.7000000000000000
 45678 | 2.0181818181818182
 55739 | 3.7000000000000000
(13개 행)


practice=#
```

Ex3) Write the following inserts, deletes or updates in SQL, using the university schema.

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

```
practice=# select *
practice-# 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=# update instructor
practice-# set salary = salary * 1.1
practice-# where dept_name = 'Comp. Sci.';
UPDATE 3
practice=# select *
practice-# 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)
```

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

삭제 전 상태 스크린샷

```
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=# select * from section
practice-# ;
 course_id | sec_id | semester | year | building | room_number | time_slot_id
-----------+--------+----------+------+----------+-------------+--------------
 BIO-101   | 1      | Summer   | 2009 | Painter  | 514         | B
 BIO-301   | 1      | Summer   | 2010 | Painter  | 514         | A
 CS-101    | 1      | Fall     | 2009 | Packard  | 101         | H
 CS-101    | 1      | Spring   | 2010 | Packard  | 101         | F
 CS-190    | 1      | Spring   | 2009 | Taylor   | 3128        | E
 CS-190    | 2      | Spring   | 2009 | Taylor   | 3128        | A
 CS-315    | 1      | Spring   | 2010 | Watson   | 120         | D
 CS-319    | 1      | Spring   | 2010 | Watson   | 100         | B
 CS-319    | 2      | Spring   | 2010 | Taylor   | 3128        | C
 CS-347    | 1      | Fall     | 2009 | Taylor   | 3128        | A
 EE-181    | 1      | Spring   | 2009 | Taylor   | 3128        | C
 FIN-201   | 1      | Spring   | 2010 | Packard  | 101         | B
 HIS-351   | 1      | Spring   | 2010 | Painter  | 514         | C
 MU-199    | 1      | Spring   | 2010 | Packard  | 101         | D
 PHY-101   | 1      | Fall     | 2009 | Watson   | 100         | A
(15개 행)
```

삭제 후 스크린샷

```
practice=# select distinct course_id from course;
 course_id
-----------
 BIO-301
 CS-347
 CS-315
 EE-181
 MU-199
 PHY-101
 CS-319
 FIN-201
 BIO-101
 HIS-351
 CS-101
 BIO-399
 CS-190
(13개 행)


practice=# select distinct course_id from section;
 course_id
-----------
 BIO-301
 CS-347
 FIN-201
 CS-315
 EE-181
 BIO-101
 MU-199
 HIS-351
 PHY-101
 CS-319
 CS-101
 CS-190
(12개 행)


practice=# delete from course
practice-# where course_id not in (select course_id
practice(# from section);
DELETE 1
practice=# select distinct course_id from course;
 course_id
-----------
 BIO-301
 CS-347
 CS-315
 EE-181
 MU-199
 PHY-101
 CS-319
 FIN-201
 BIO-101
 HIS-351
 CS-101
 CS-190
(12개 행)
```

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

(변경 전후 모두를 합쳐 하나의 스크린샷으로 다음페이지에 찍음)

SQL Shell (psql)

```
practice=# select * from student;
  id   |   name   | dept_name  | tot_cred
-------+----------+------------+----------
 00128 | Zhang    | Comp. Sci. |      102
 12345 | Shankar  | Comp. Sci. |       32
 19991 | Brandt   | History    |       80
 23121 | Chavez   | Finance    |      110
 44553 | Peltier  | Physics    |       56
 45678 | Levy     | Physics    |       46
 54321 | Williams | Comp. Sci. |       54
 55739 | Sanchez  | Music      |       38
 70557 | Snow     | Physics    |        0
 76543 | Brown    | Comp. Sci. |       58
 76653 | Aoi      | Elec. Eng. |       60
 98765 | Bourikas | Elec. Eng. |       98
 98988 | Tanaka   | Biology    |      120
(13개 행)


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=# 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)
```