SQL Basics Practice Problems

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

Query: Find the ID and name of each student who has taken at least one Comp. Sci. course; make sure there are no duplicate names in the result.

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

Query:

SELECT DISTINCT takes.ID, instructor.name

FROM takes

JOIN section ON takes.course_id = section.course_id AND takes.sec_id = section.sec_id

JOIN teaches ON section.course_id = teaches.course_id AND section.sec_id = teaches.sec_id

JOIN instructor ON teaches.ID = instructor.ID

WHERE instructor.name = 'Einstein';

44553 Einstein

3. Find the ID and name of each student who has taken at least one Comp. Sci. course;make sure there are no duplicate names in the result.

Query:

SELECT DISTINCT student.ID, student.name

FROM student

JOIN takes ON student.ID = takes.ID

```
JOIN course ON takes.course_id = course.course_id
WHERE course.dept_name = 'Comp. Sci.';
```

ID	name
00128	Zhang
12345	Shankar
45678	Levy
54321	Williams
76543	Brown
98765	Bourikas

4. Find the course id, section id, and building for each section of a Biology course. Query:

```
select section.course_id,section.sec_id ,section.building
from section join course on section.course_id=course.course_id where
course.dept_name='Biology';
```

course_id	sec_id	building
BIO-101	1	Painter
BIO-301	1	Painter

5. Output instructor names sorted by the ratio of their salary to their department's budget(in ascending order).

Query:

```
select instructor.name  from instructor  join department on
instructor.dept_name=department.dept_name order by
(instructor.salary/department.budget)ASC;
```

name

Mozart

Srinivasan

Singh

Katz

Wu

Crick

Brandt

Kim

El Said

Califieri

Gold

Einstein

6. Output instructor names and buildings for each building an instructor has taught in.Include instructor names who have not taught any classes (the building name should be NULL in this case).

```
SELECT instructor.name, section.building
FROM instructor
LEFT JOIN teaches ON instructor.ID = teaches.ID
LEFT JOIN section ON teaches.course_id = section.course_id AND teaches.sec_id
= section.sec_id;
```

name building

Srinivasan Packard

Srinivasan Packard

Srinivasan Watson

Srinivasan Taylor

Wu Packard

Mozart Packard

Einstein Watson

El Said Painter

Gold NULL

Katz Packard

Katz Packard

Katz Watson

Califieri NULL

Singh NULL

Crick Painter

Crick Painter

Brandt Taylor

Brandt Taylor

Brandt Taylor

Kim Taylor

7. **7. Find department names with a budget higher than Astronomy, sorted alphabetically.**

Query:

```
SELECT dept_name
FROM department
WHERE budget > (SELECT budget FROM department WHERE dept_name = 'Astronomy')
ORDER BY dept_name;
```

8. **Output instructor names and buildings for each building an instructor has taught in. Include instructor names who have not taught any classes (the building name should be NULL in this case).**

Query:

```
SELECT instructor.name, section.building
FROM instructor
LEFT JOIN teaches ON instructor.ID = teaches.ID
LEFT JOIN section ON teaches.course_id = section.course_id AND teaches.sec_id = section.sec_id;
```

9. **For each student who has retaken a course at least twice (i.e., the student has taken the course at least three times), show the course ID and the student's ID. Please display your results in order of course ID and do not display duplicate rows.**

Query:

```
SELECT course_id,ID
from takes group by
course_id,ID  having
count(*)>=2  order by
course_id,ID;
```

CS-101 45678

10. **Find the names of Biology students who have taken at least 3 Accounting Courses.**

Query:

```
select student.name from student join takes on student.ID=takes.ID join course on takes.course_id=course.course_id where student.dept_name='Biology' and course.dept_name='Accounting' group by student.ID,student.name having count(*)>=2;
```

11. **Find the rank and name of the 10 students who earned the most A grades (A-, A, A+), using alphabetical order for ties.**

Query:

```
SELECT name, COUNT(*) AS grade_count
FROM student
JOIN takes ON student.ID = takes.ID
WHERE takes.grade IN ('A-', 'A', 'A+')
GROUP BY student.ID, student.name
ORDER BY grade_count DESC, student.name
LIMIT 10;
```

name	grade_count
Shankar	3
Brown	2
Zhang	2
Sanchez	1
Tanaka	1
Williams	1

PRACTICE PROBLEM

1.Find the names of those departments whose budget is higher than that of Astronomy. List them in alphabetic order.

Query:

SELECT dept_name

FROM department

WHERE budget > (SELECT budget FROM department WHERE dept_name = 'Biology')

ORDER BY dept_name;

dept_name Comp.

Sci.

Finance

2. Display a list of all instructors, showing each instructor's ID and the number of sections taught. Make sure to show the number of sections as 0 for instructors who have not taught any section.

Query:

SELECT instructor.ID , count(teaches.course_id) as

num_sections from instructor left join teaches on

instructor.ID=teaches.ID

group by instructor.ID;

ID num_sections

10101 3

12121 1

15151 1

22222 1

32343 1

33456 0

45565 2

58583 0

76543 0

76766 2

83821 3

98345 1

3. 1. Find out the ID and salary of the instructors.

SELECT ID,salary from instructor;

ID salary

10101 65000

12121 90000

15151 40000

22222 95000

32343 60000

33456 87000

45565 75000

58583 62000

76543 80000

76766 72000

83821 92000

98345 80000

2. Find out the ID and salary of the instructor who gets more than $85000;

Query:

select ID,salary from instructor where salary >85000;

ID salary

12121 90000

22222 95000

33456 87000

83821 92000

3. Find out the department names and their budget at the university.

select dept_name,budget from department;

dept_name budget

Biology 90000

Comp. Sci. 100000

Elec. Eng. 85000

Finance 120000

History 50000

Music 80000

Physics 70000

4. List out the names of the instructors from Computer Science who have more than $70,000.

Query:

SELECT name from instructor where dept_name='Comp.Sci.'and salary>70000;

5. For all instructors in the university who have taught some course, find their names and the course ID of all courses they taught.

Query: 127.0.0.1:3309/smalldatabase/instructor/
http://localhost/phpmyadmin/index.php?route=/table/sql&db=smalldatabase&table=instructor

Showing rows 0 - 13 (14 total, Query took 0.0007 seconds.)

```
SELECT distinct instructor.name ,teaches.course_id
from instructor join teaches on instructor.ID =teaches.ID;
```

name course_id

Srinivasan CS-101

Srinivasan CS-315

Srinivasan CS-347

Wu FIN-201

Mozart MU-199

Einstein PHY-101

El Said HIS-351

Katz CS-101

Katz CS-319

Crick BIO-101

Crick BIO-301

Brandt CS-190

Brandt CS-319

Kim EE-181

6. 6. Find the names of all instructors whose salary is greater than at least one instructor in the Biology department.

Query:

SELECT name from instructor where salary >(select salary from instructor where dept_name='Biology');

name

Wu

Einstein

Gold

Katz

Singh

Brandt

Kim

7. Find the advisor of the student with ID 12345.

Query:

SELECT s_id from advisor where s_id=12345;

12345

8. Find the average salary of all instructors.

Query:

```
SELECT avg(salary) as avg_salary from instructor;
```

74833.3333

9.Find the names of all departments whose building name include the substring ‘watson’;

Query:

```
select dept_name from department where  building like '%watson%';
```

dept_name Biology

Physics

10.Find the names of instructors with salary amounts between 90000 and 10000;

Query:

```
select name from instructor where salary BETWEEN 90000 and 100000;
```

name

Wu

Einstein

Brandt

11. Find the instructor names and the courses they taught for all instructors in the Biology department who have taught some course.

Query:

```
SELECT instructor.name
,teaches.course_id  from instructor join
teaches on instructor.ID=teaches.ID

where instructor.dept_name='Biology';
```

name course_id

Crick BIO-101

Crick BIO-301

12.Find the courses taught in Fall-2009 semester.

Query:

select DISTINCT course_id FROM section where semester='Fall' and year=2009;

13. Find the set of all courses taught either in Fall-2017 or in Spring-2019

Query:

SELECT DISTINCT course_id

FROM section

WHERE (semester = 'Fall' AND year = 2017) OR (semester = 'Spring' AND year = 2019);

course_id

CS-101

CS-347

PHY-101

14. Find the set of all courses taught in the Fall-2009 as well as in Spring-2010.

Query:

SELECT DISTINCT course_id

FROM section

WHERE (semester = 'Fall' AND year = 2017) AND

course_id in (select course_id from section where semester = 'Spring' AND year = 2018);

CS-101

15. Find all courses taught in the Fall-2009 semester but not in the Spring-2010 semester.

Query:

SELECT DISTINCT course_id

FROM section

WHERE (semester = 'Fall' AND year = 2017) AND

course_id not in (select course_id from section where semester = 'Spring' AND year = 2018);

course_id

CS-347

PHY-101

16. Find all instructors who appear in the instructor relation with null values for salary. Query:

select name from instructor where salary is null;

17. Find the average salary of instructors in the Finance department.

Query:

select avg(salary) from instructor where dept_name='Finance';

85000.0000

18. Find the total number of instructors who teach a course in the Spring-2017 semester.

Query:

SELECT count(DISTINCT id) from teaches where

semester='Spring' and year=2017;

2

19. Find the average salary in each department.

Query:

```
select dept_name ,avg(salary) as avg_salary from instructor group by dept_name;
```

dept_name avg_salary Biology 72000.0000

Comp. Sci. 77333.3333

Elec. Eng. 80000.0000

Finance 85000.0000

History 61000.0000

Music 40000.0000

Physics 91000.0000

20. Find the number of instructors in each department who teach a course in the Spring-2010 semester.

Query:

```
SELECT count(DISTINCT teaches.ID) as
num_instructors,instructor.dept_name  from instructor join teaches on
instructor.ID=teaches.ID  where teaches.semester='Spring' and
teaches.year=2018 group by instructor.dept_name;
```

num_instructors dept_name

3 Comp. Sci.

1 Finance

1 History

1 Music

21. List out the departments where the average salary of the instructors is more than $42,000.

Query:

```
SELECT  dept_name from instructor
group by dept_name having
avg(salary)>42000;
```

dept_name Biology

Comp. Sci.

Elec. Eng.

Finance

History

Physics

22. For each course section offered in 2009, find the average total credits (tot_cred) of all students enrolled in the section, if the section had at least 2 students.

Query:

```
SELECT takes.course_id, takes.sec_id, AVG(student.tot_cred) AS avg_credits
FROM takes JOIN student ON takes.ID = student.ID WHERE takes.year = 2009
GROUP BY takes.course_id, takes.sec_id HAVING COUNT(takes.ID) >= 2;
```

23. Find all the courses taught in both the Fall-2009 and Spring-2010 semesters.

Query:

```
select course_id from teaches where (semester='Fall' and year =2017)and
course_id in (select course_id from teaches where semester='Spring' and
year='2018');
```

CS-101

24. Find all the courses taught in the Fall-2009 semester but not in the Spring-2010 semester.

Query:

```
select course_id from teaches where (semester='Fall' and year =2017)and
course_id  not in (select course_id from teaches where semester='Spring' and
year='2018');
```

course_id

CS-347

PHY-101

25. Select the names of instructors whose names are neither Mozart nor Einstein.

Query:

```
select name from instructor where name not in ('Mozrat' , 'Einstein');
```

name

Srinivasan

Wu

Mozart

El Said

Gold

Katz

Califieri

Singh

Crick

Brandt

Kim

26. . Find the total number of (distinct) students who have taken course sections taught by the instructor with ID 110011.

Query:

SELECT COUNT(DISTINCT takes.ID) FROM takes JOIN teaches ON takes.course_id = teaches.course_id AND takes.sec_id = teaches.sec_id WHERE teaches.ID = 110011;

27. Find the ID and names of all instructors whose salary is greater than at least one instructor in the History department.

Query:

SELECT ID,name from instructor where salary > any (select salary from instructor where dept_name='History');

ID name

10101 Srinivasan

12121 Wu

22222 Einstein

33456 Gold

45565 Katz

58583 Califieri

76543 Singh

76766 Crick

83821 Brandt

98345 Kim y:

28. Find the names of all instructors that have a salary value greater than that of each instructor in the Biology department.

Query:

SELECT name

FROM instructor

WHERE salary>all(select salary from instructor where dept_name ='Biology');
name

Wu

Einstein

Gold

Katz

Singh

Brandt

Kim

29. Find the departments that have the highest average salary.

Query:

SELECT dept_name from instructor GROUP by dept_name having avg(salary)=

(SELECT MAX(avg_salary)

FROM (SELECT AVG(salary) AS avg_salary FROM instructor GROUP BY dept_name) AS temp

);

Physics

30. 30. Find all courses taught in both the Fall 2009 semester and in the Spring-2010 semester.

Query:

```
select course_id from teaches where (semester='Fall' and year =2017)and
course_id in (select course_id from teaches where semester='Spring' and
year='2018');
```

CS-101

31. Find all students who have taken all the courses offered in the Biology department.

Query:

```
SELECT DISTINCT takes.ID
FROM takes
WHERE NOT EXISTS (
   SELECT course_id
   FROM course
   WHERE dept_name = 'Biology'
   AND course_id NOT IN (
      SELECT course_id
      FROM takes
      WHERE takes.ID = student.ID
   )
);
```

32. Find all courses that were offered at most once in 20017.

Query:

```
SELECT course_id
FROM section
WHERE year = 2017
GROUP BY course_id
HAVING COUNT(sec_id) <= 1;
```

course_id BIO-

101

CS-101

CS-347

EE-181

PHY-101

33.Find all courses that were offered at least twice in 2009.

Query:

```
SELECT course_id
FROM section
WHERE year = 2017
GROUP BY course_id
HAVING COUNT(sec_id) <= 2;
```

course_id BIO-

101

CS-101

CS-190

CS-347

EE-181

34.Find the average instructor salaries of departments where the average salary is greater than $42,000.

Query:

SELECT dept_name from instructor

group by dept_name having

avg(salary)>42000;

dept_name Biology

Comp. Sci.

Elec. Eng.

Finance

History

Physics

35. Find the maximum across all departments of the total salary at each department.

Query:

```
SELECT MAX(total_salary)
FROM (
   SELECT dept_name, SUM(salary) AS total_salary
   FROM instructor
   GROUP BY dept_name
) AS dept_salaries;
```

232000

36. List all departments along with the number of instructors in each department.

Query:

```
SELECT dept_name, COUNT(*) AS num_instructors
FROM instructor
GROUP BY dept_name;
```

dept_name num_instructors

Biology 1

Comp. Sci.	3
Elec. Eng.	1
Finance	2
History	2
Music	1
Physics	2