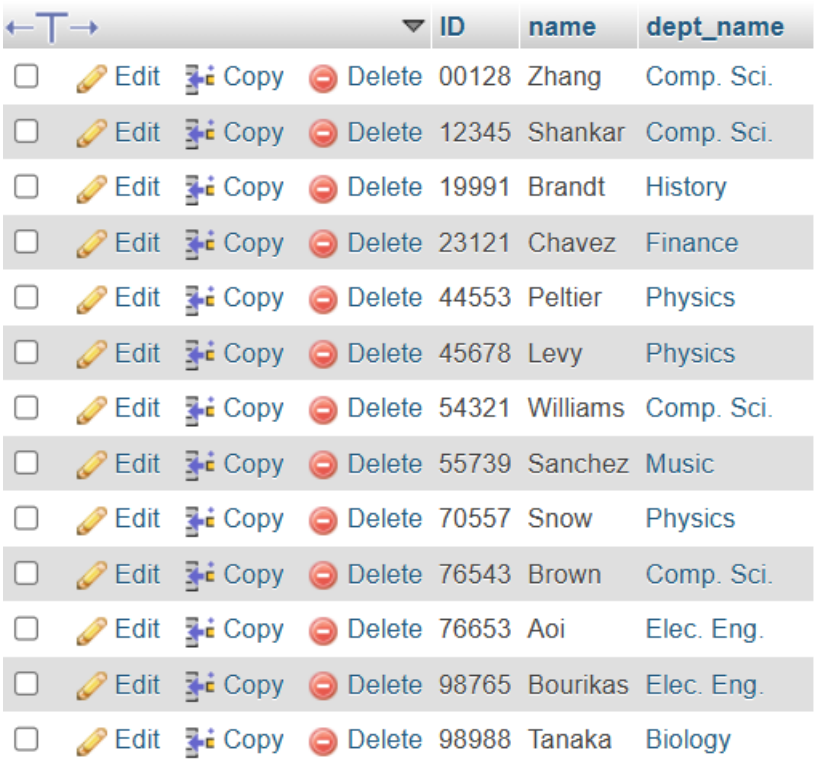
1.. List All Students and Their Departments o Query the student table to list all students with their corresponding department names

Ans: select ID,name,dept_name

FROM student



	ID	name	dept_name
Edit Copy Delete	00128	Zhang	Comp. Sci.
Edit Copy Delete	12345	Shankar	Comp. Sci.
Edit Copy Delete	19991	Brandt	History
Edit Copy Delete	23121	Chavez	Finance
Edit Copy Delete	44553	Peltier	Physics
Edit Copy Delete	45678	Levy	Physics
Edit Copy Delete	54321	Williams	Comp. Sci.
Edit Copy Delete	55739	Sanchez	Music
Edit Copy Delete	70557	Snow	Physics
Edit Copy Delete	76543	Brown	Comp. Sci.
Edit Copy Delete	76653	Aoi	Elec. Eng.
Edit Copy Delete	98765	Bourikas	Elec. Eng.
Edit Copy Delete	98988	Tanaka	Biology

2. Retrieve all courses and the names of the instructors teaching them.

Ans: select c.course_id,i.name

from course AS c

inner join teaches AS t

ON c.course_id=t.course_id

INNER JOIN instructor AS i

ON t.id=i.id

course_id	name
CS-101	Srinivasan
CS-315	Srinivasan
CS-347	Srinivasan
FIN-201	Wu
MU-199	Mozart
PHY-101	Einstein
HIS-351	El Said
CS-101	Katz
CS-319	Katz
BIO-101	Crick
BIO-301	Crick
CS-190	Brandt
CS-190	Brandt
CS-319	Brandt
EE-181	Kim

3. Find all sections for the course with course code 'CS-101' and show the term, year, building, and room number.

Ans: select *

from section

where course_id='CS-101'

←T→	course_id	sec_id	semester	year	building	room_number	time_slot_id
Edit Copy Delete	CS-101	1	Fall	2017	Packard	101	H
Edit Copy Delete	CS-101	1	Spring	2018	Packard	101	F

4. Display each instructor's ID, name, and the course section they are teaching.

Ans: SELECT i.ID,i.name,s.sec_id

from instructor AS i

INNER JOIN teaches AS t

ON i.ID=t.ID

inner join section AS s

ON t.course_id=s.course_id

ID	name	sec_id
10101	Srinivasan	1
10101	Srinivasan	1
10101	Srinivasan	1
10101	Srinivasan	1
12121	Wu	1
15151	Mozart	1
22222	Einstein	1
32343	El Said	1
45565	Katz	1
45565	Katz	1
45565	Katz	1
45565	Katz	2
76766	Crick	1
76766	Crick	1
83821	Brandt	1
83821	Brandt	2
83821	Brandt	1
83821	Brandt	2
83821	Brandt	1
83821	Brandt	2
98345	Kim	1

5. List all students enrolled in the course 'BIO-101', including their IDs and names.

Ans: SELECT c.course_id,s.ID,s.name

from course AS c

Inner JOIN takes AS t

ON t.course_id=c.course_id

INNER JOIN student AS s

ON s.ID=t.ID

WHERE c.course_id='BIO-101'

course_id	ID	name
BIO-101	98988	Tanaka

6. Retrieve all students with their advisor's ID and name

Ans : SELECT

```
  s.ID AS student_id,
  s.name AS student_name,
  a.i_ID AS advisor_id,
  i.name AS advisor_name
FROM
  student AS s
JOIN
  advisor AS a ON s.ID = a.s_ID
JOIN
  instructor AS i ON a.i_ID = i.ID;
```

student_id	student_name	advisor_id	advisor_name
12345	Shankar	10101	Srinivasan
44553	Peltier	22222	Einstein
45678	Levy	22222	Einstein
00128	Zhang	45565	Katz
76543	Brown	45565	Katz
23121	Chavez	76543	Singh
98988	Tanaka	76766	Crick
76653	Aoi	98345	Kim
98765	Bourikas	98345	Kim

7. List all courses that have prerequisites, including the course code, course name, and the prerequisite course code.

Ans: SELECT

c.course_id AS course_code,

c.title AS course_name,

p.prereq_id AS prerequisite_course_code

FROM

course AS c

JOIN

prereq AS p ON c.course_id = p.course_id;

course_code	course_name	prerequisite_course_code
BIO-301	Genetics	BIO-101
BIO-399	Computational Biology	BIO-101
CS-190	Game Design	CS-101
CS-315	Robotics	CS-101
CS-319	Image Processing	CS-101
CS-347	Database System Concepts	CS-101
EE-181	Intro. to Digital Systems	PHY-101

8. Show each department with the courses it offers, including department name and course title.

Ans: SELECT

d.dept_name AS department_name,

c.title AS course_title

FROM

department AS d

JOIN

course AS c ON d.dept_name = c.dept_name

ORDER BY

d.dept_name, c.title;

department_name	course_title
Biology	Computational Biology
Biology	Genetics
Biology	Intro. to Biology
Comp. Sci.	Database System Concepts
Comp. Sci.	Game Design
Comp. Sci.	Image Processing
Comp. Sci.	Intro. to Computer Science
Comp. Sci.	Robotics
Elec. Eng.	Intro. to Digital Systems
Finance	Investment Banking
History	World History
Music	Music Video Production
Physics	Physical Principles

9. Find all courses taught by the instructor with ID '83821', including course codes and titles.

Ans: SELECT c.course_id,i.ID

from course AS c

INNER JOIN department AS d

ON d.dept_name=c.dept_name

INNER JOIN instructor AS i

ON i.dept_name=d.dept_name

WHERE i.ID='83821'

course_id	ID
CS-101	83821
CS-190	83821
CS-315	83821
CS-319	83821
CS-347	83821

10. List students and their grades for the course 'CS-319'.

Ans: SELECT s.ID,t.grade,c.course_id

from student AS s

INNER join takes as t

on t.ID=s.ID

INNER JOIN course as c

on c.course_id=t.course_id

where c.course_id='CS-319'

ID	grade	course_id
45678	B	CS-319
76543	A	CS-319

11. Find students who have taken all courses offered by the Comp. Sci. Department.

Ans : SELECT d.dept_name,c.course_id,s.name

from student as s

INNER join department as d

on d.dept_name=s.dept_name

INNER join course as c

on c.dept_name=d.dept_name

WHERE d.dept_name="Comp. Sci."

dept_name	course_id	name
Comp. Sci.	CS-101	Zhang
Comp. Sci.	CS-190	Zhang
Comp. Sci.	CS-315	Zhang
Comp. Sci.	CS-319	Zhang
Comp. Sci.	CS-347	Zhang
Comp. Sci.	CS-101	Shankar
Comp. Sci.	CS-190	Shankar
Comp. Sci.	CS-315	Shankar
Comp. Sci.	CS-319	Shankar
Comp. Sci.	CS-347	Shankar
Comp. Sci.	CS-101	Williams
Comp. Sci.	CS-190	Williams
Comp. Sci.	CS-315	Williams
Comp. Sci.	CS-319	Williams
Comp. Sci.	CS-347	Williams
Comp. Sci.	CS-101	Brown
Comp. Sci.	CS-190	Brown
Comp. Sci.	CS-315	Brown
Comp. Sci.	CS-319	Brown
Comp. Sci.	CS-347	Brown

12. List instructors who teach more than one course, including their IDs and the count of courses they teach.

Ans: SELECT i.ID, i.name, COUNT(t.course_id) AS course_count

FROM instructor AS i

JOIN teaches AS t ON i.ID = t.ID

GROUP BY i.ID, i.name

HAVING COUNT(t.course_id) > 1;

ID	name	course_count
10101	Srinivasan	3
45565	Katz	2
76766	Crick	2
83821	Brandt	3

13. List students whose advisors are from the Comp. Sci. department, including student IDs and advisor names

Ans SELECT s.ID AS student_id, s.name AS student_name, i.name AS advisor_name

FROM student AS s

JOIN advisor AS a ON s.ID = a.s_ID

JOIN instructor AS i ON a.i_ID = i.ID

WHERE i.dept_name = 'Comp. Sci.';

student_id	student_name	advisor_name
12345	Shankar	Srinivasan
00128	Zhang	Katz
76543	Brown	Katz

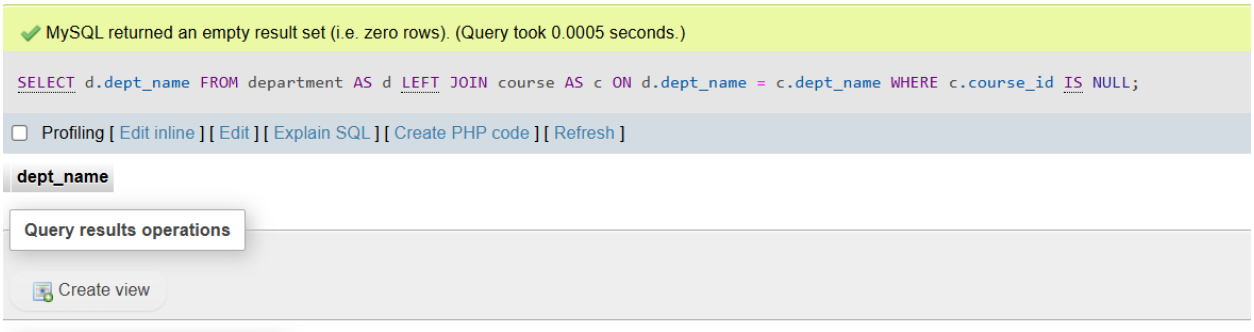
14. Find departments that do not offer any courses, including department names.

Ans: SELECT d.dept_name

FROM department AS d

LEFT JOIN course AS c ON d.dept_name = c.dept_name

WHERE c.course_id IS NULL;



15. Calculate the average grade for each course, including course codes, titles, and average grades

Ans: SELECT

```
  c.course_id,
  c.title,
  AVG(
    CASE
      WHEN t.grade = 'A' THEN 4.0
      WHEN t.grade = 'B' THEN 3.0
      WHEN t.grade = 'C' THEN 2.0
      WHEN t.grade = 'D' THEN 1.0
      WHEN t.grade = 'F' THEN 0.0
      ELSE NULL
    END
  ) AS average_grade
FROM
  course AS c
JOIN
  takes AS t ON c.course_id = t.course_id
```

```
GROUP BY
    c.course_id, c.title;
```

course_id	title	average_grade
BIO-101	Intro. to Biology	4.00000
BIO-301	Genetics	*NULL*
CS-101	Intro. to Computer Science	2.50000
CS-190	Game Design	4.00000
CS-315	Robotics	3.50000
CS-319	Image Processing	3.50000
CS-347	Database System Concepts	4.00000
EE-181	Intro. to Digital Systems	2.00000
FIN-201	Investment Banking	*NULL*
HIS-351	World History	3.00000
MU-199	Music Video Production	*NULL*
PHY-101	Physical Principles	*NULL*

16. Determine which time slot (e.g., 'A', 'B', 'C', etc.) is most frequently assigned to sections of each course.

Ans:
```
WITH TimeSlotFrequency AS (
    SELECT
        s.course_id,
        s.time_slot_id,
        COUNT(*) AS frequency
    FROM
        section AS s
    GROUP BY
        s.course_id, s.time_slot_id
),
MaxFrequency AS (
```

```
    SELECT
        course_id,
        MAX(frequency) AS max_frequency
    FROM
        TimeSlotFrequency
    GROUP BY
        course_id
)
SELECT
    tf.course_id,
    tf.time_slot_id,
    tf.frequency
FROM
    TimeSlotFrequency AS tf
JOIN
    MaxFrequency AS mf
    ON tf.course_id = mf.course_id AND tf.frequency = mf.max_frequency;
```

course_id	time_slot_id	frequency
BIO-101	B	1
BIO-301	A	1
CS-101	F	1
CS-101	H	1
CS-190	A	1
CS-190	E	1
CS-315	D	1
CS-319	B	1
CS-319	C	1
CS-347	A	1
EE-181	C	1
FIN-201	B	1
HIS-351	C	1
MU-199	D	1
PHY-101	A	1

17. Find the student who has taken the highest number of credits in each department.

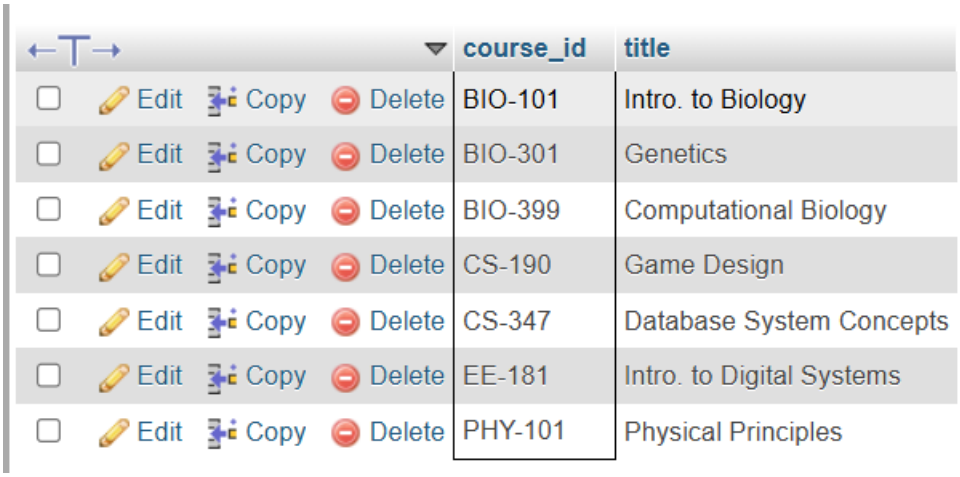
Ans:
```
WITH StudentCredits AS (
  SELECT
    s.ID,
    s.name,
    s.dept_name,
    SUM(c.credits) AS total_credits
  FROM
    student AS s
  JOIN
    takes AS t ON s.ID = t.ID
  JOIN
    course AS c ON t.course_id = c.course_id
```

```
    GROUP BY
        s.ID, s.name, s.dept_name
),
MaxCredits AS (
    SELECT
        dept_name,
        MAX(total_credits) AS max_credits
    FROM
        StudentCredits
    GROUP BY
        dept_name
)
SELECT
    sc.ID,
    sc.name,
    sc.dept_name,
    sc.total_credits
FROM
    StudentCredits AS sc
JOIN
    MaxCredits AS mc ON sc.dept_name = mc.dept_name AND sc.total_credits =
mc.max_credits;
```

ID	name	dept_name	total_credits
98988	Tanaka	Biology	8
12345	Shankar	Comp. Sci.	14
98765	Bourikas	Elec. Eng.	7
23121	Chavez	Finance	3
19991	Brandt	History	3
55739	Sanchez	Music	3
45678	Levy	Physics	11

18. List courses that were not taught in the Spring 2018 semester.

Ans:
```
SELECT c.course_id, c.title
FROM course AS c
WHERE NOT EXISTS (
   SELECT 1
   FROM teaches AS t
   WHERE t.course_id = c.course_id
    AND t.semester = 'Spring'
    AND t.year = 2018
);
```



	course_id	title
Edit Copy Delete	BIO-101	Intro. to Biology
Edit Copy Delete	BIO-301	Genetics
Edit Copy Delete	BIO-399	Computational Biology
Edit Copy Delete	CS-190	Game Design
Edit Copy Delete	CS-347	Database System Concepts
Edit Copy Delete	EE-181	Intro. to Digital Systems
Edit Copy Delete	PHY-101	Physical Principles

19. Count the number of courses taught by each department and list them in descending order.

Ans: SELECT

```
  d.dept_name,
  COUNT(DISTINCT c.course_id) AS course_count
FROM
  department AS d
JOIN
  course AS c ON d.dept_name = c.dept_name
JOIN
  teaches AS t ON c.course_id = t.course_id
GROUP BY
  d.dept_name
ORDER BY
  course_count DESC;
```

dept_name	course_count ▼ 1
Comp. Sci.	5
Biology	2
Elec. Eng.	1
Music	1
Finance	1
Physics	1
History	1

20. Display the relationship between instructors, students, and the courses they are enrolled in, including the course code, student ID, student name, instructor ID, and instructor name

Ans: SELECT

```
    c.course_id,
    s.ID AS student_id,
    s.name AS student_name,
    i.ID AS instructor_id,
    i.name AS instructor_name
FROM
    takes AS t
JOIN
    course AS c ON t.course_id = c.course_id
JOIN
    student AS s ON t.ID = s.ID
JOIN
    section AS sec ON t.course_id = sec.course_id AND t.sec_id = sec.sec_id AND t.semester = sec.semester AND t.year = sec.year
JOIN
```

teaches AS te ON sec.course_id = te.course_id AND sec.sec_id = te.sec_id AND sec.semester = te.semester AND sec.year = te.year

JOIN

instructor AS i ON te.ID = i.ID

course_id	student_id	student_name	instructor_id	instructor_name
CS-101	00128	Zhang	10101	Srinivasan
CS-101	12345	Shankar	10101	Srinivasan
CS-101	45678	Levy	10101	Srinivasan
CS-101	54321	Williams	10101	Srinivasan
CS-101	76543	Brown	10101	Srinivasan
CS-101	98765	Bourikas	10101	Srinivasan
CS-315	12345	Shankar	10101	Srinivasan
CS-315	98765	Bourikas	10101	Srinivasan
CS-347	00128	Zhang	10101	Srinivasan
CS-347	12345	Shankar	10101	Srinivasan
FIN-201	23121	Chavez	12121	Wu
MU-199	55739	Sanchez	15151	Mozart
PHY-101	44553	Peltier	22222	Einstein
HIS-351	19991	Brandt	32343	El Said
CS-101	45678	Levy	45565	Katz
CS-319	45678	Levy	45565	Katz
BIO-101	98988	Tanaka	76766	Crick
BIO-301	98988	Tanaka	76766	Crick
CS-190	12345	Shankar	83821	Brandt
CS-190	54321	Williams	83821	Brandt
CS-319	76543	Brown	83821	Brandt
EE-181	76653	Aoi	98345	Kim