

DBMS LAB

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```
Command Prompt - mysql -i x + v

mysql> show databases;
+-----+
| Database |
+-----+
| information_schema |
| mysql |
| performance_schema |
| student |
| sys |
+-----+
5 rows in set (0.02 sec)

mysql> use student;
Database changed
mysql> show tables;
Empty set (0.02 sec)

mysql> CREATE TABLE Students (StudentID INT PRIMARY KEY, FirstName VARCHAR(50), LastName VARCHAR(50), Department VARCHAR(50));
Query OK, 0 rows affected (0.04 sec)

mysql> CREATE TABLE Courses (CourseID INT PRIMARY KEY, CourseName VARCHAR(100), Instructor VARCHAR(100));
Query OK, 0 rows affected (0.03 sec)

mysql> show tables;
+-----+
| Tables_in_student |
+-----+
| courses |
| students |
+-----+
2 rows in set (0.00 sec)

mysql> CREATE TABLE Enrollments (EnrollmentID INT PRIMARY KEY, StudentID INT, CourseID INT, Grade VARCHAR(2), FOREIGN KEY (StudentID) REFERENCES Students(StudentID), FOREIGN KEY (CourseID) REFERENCES Courses(CourseID));
Query OK, 0 rows affected (0.04 sec)

mysql> select * from Courses;
Empty set (0.01 sec)

mysql> INSERT INTO Students (StudentID, FirstName, LastName, Department) VALUES (1, 'John', 'Ibrahim', 'Computer Science');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Students (StudentID, FirstName, LastName, Department) VALUES (2c, 'Ravi', 'Shekhar', 'Computer Science');
ERROR 1054 (42S22): Unknown column '2c' in 'field list'
mysql> INSERT INTO Students (StudentID, FirstName, LastName, Department) VALUES (2, 'Ravi', 'Shekhar', 'Computer Science');
Query OK, 1 row affected (0.01 sec)
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Command Prompt - mysql - 1 x + v
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Students (StudentID, FirstName, LastName, Department) VALUES (2c, 'Ravi', 'Shekhar', 'Computer Science');
ERROR 1054 (42S22): Unknown column '2c' in 'field list'
mysql> INSERT INTO Students (StudentID, FirstName, LastName, Department) VALUES (2, 'Ravi', 'Shekhar', 'Computer Science');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Students (StudentID, FirstName, LastName, Department) VALUES (3, 'Raju', 'Kumar', 'Electrical');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Students (StudentID, FirstName, LastName, Department) VALUES (4, 'Rajiv', 'Kumar', 'Chemical');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Students (StudentID, FirstName, LastName, Department) VALUES (5, 'Pankaj', 'Kumar', 'Civil');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Students (StudentID, FirstName, LastName, Department) VALUES (6, 'Sundar', 'Kumar', 'Mechanical');
Query OK, 1 row affected (0.01 sec)

mysql> select * from Students;
+-----+-----+-----+-----+
| StudentID | FirstName | LastName | Department |
+-----+-----+-----+-----+
| 1 | John | Ibrahim | Computer Science |
| 2 | Ravi | Shokhar | Computer Science |
| 3 | Raju | Kumar | Electrical |
| 4 | Rajiv | Kumar | Chemical |
| 5 | Pankaj | Kumar | Civil |
| 6 | Sundar | Kumar | Mechanical |
+-----+-----+-----+-----+
6 rows in set (0.00 sec)

mysql> INSERT INTO Courses (CourseID, CourseName, Instructor) VALUES (22, 'DBMS', 'Dr. Santosh');
Query OK, 1 row affected (0.00 sec)

mysql> INSERT INTO Courses (CourseID, CourseName, Instructor) VALUES (21, 'Numerical Methods', 'Dr. Kundu');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Courses (CourseID, CourseName, Instructor) VALUES (23, 'Web Technology', 'Dr. Gargi');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Courses (CourseID, CourseName, Instructor) VALUES (231, 'Material Science', 'Dr. Pankaj');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Courses (CourseID, CourseName, Instructor) VALUES (341, 'AutoCAD', 'Dr. Mishra');
Query OK, 1 row affected (0.01 sec)
```

```
Command Prompt - mysql - 1 x + v

mysql> INSERT INTO Courses (CourseID, CourseName, Instructor) VALUES (23, 'Web Technology', 'Dr. Gargi');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Courses (CourseID, CourseName, Instructor) VALUES (231, 'Material Science', 'Dr. Pankaj');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Courses (CourseID, CourseName, Instructor) VALUES (341, 'AutoCAD', 'Dr. Mishra');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Courses (CourseID, CourseName, Instructor) VALUES (346, 'AutoCAD', 'Dr. Mishra');
Query OK, 1 row affected (0.01 sec)

mysql> select * from Courses;
+-----+-----+-----+
| CourseID | CourseName | Instructor |
+-----+-----+-----+
| 21 | Numerical Methods | Dr. Kundu |
| 22 | DBMS | Dr. Santosh |
| 23 | Web Technology | Dr. Gargi |
| 231 | Material Science | Dr. Pankaj |
| 341 | AutoCAD | Dr. Mishra |
| 346 | AutoCAD | Dr. Mishra |
+-----+-----+-----+
6 rows in set (0.00 sec)

mysql> INSERT INTO Enrollments (EnrollmentID, StudentID, CourseID, Grade) VALUES (2275, 1, 21, 'A');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Enrollments (EnrollmentID, StudentID, CourseID, Grade) VALUES (2276, 1, 22, 'B');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Enrollments (EnrollmentID, StudentID, CourseID, Grade) VALUES (2277, 1, 231, 'A');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Enrollments (EnrollmentID, StudentID, CourseID, Grade) VALUES (2278, 1, 23, 'C');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Enrollments (EnrollmentID, StudentID, CourseID, Grade) VALUES (2279, 2, 23, 'A');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Enrollments (EnrollmentID, StudentID, CourseID, Grade) VALUES (2280, 2, 231, 'C');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Enrollments (EnrollmentID, StudentID, CourseID, Grade) VALUES (2281, 2, 22, 'C');
Query OK, 1 row affected (0.01 sec)
```

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Command Prompt - mysql - x + v
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Enrollments (EnrollmentID, StudentID, CourseID, Grade) VALUES (2281, 2, 22, 'C');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Enrollments (EnrollmentID, StudentID, CourseID, Grade) VALUES (2282, 2, 21, 'C');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Enrollments (EnrollmentID, StudentID, CourseID, Grade) VALUES (2284, 3, 21, 'B');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Enrollments (EnrollmentID, StudentID, CourseID, Grade) VALUES (2285, 3, 231, 'B');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Enrollments (EnrollmentID, StudentID, CourseID, Grade) VALUES (2286, 3, 341, 'B');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Enrollments (EnrollmentID, StudentID, CourseID, Grade) VALUES (2287, 3, 346, 'B');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Enrollments (EnrollmentID, StudentID, CourseID, Grade) VALUES (2288, 4, 346, 'C');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Enrollments (EnrollmentID, StudentID, CourseID, Grade) VALUES (2289, 4, 341, 'C');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Enrollments (EnrollmentID, StudentID, CourseID, Grade) VALUES (2290, 4, 231, 'B');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Enrollments (EnrollmentID, StudentID, CourseID, Grade) VALUES (2291, 5, 231, 'B');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Enrollments (EnrollmentID, StudentID, CourseID, Grade) VALUES (2292, 5, 346, 'A');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Enrollments (EnrollmentID, StudentID, CourseID, Grade) VALUES (2293, 5, 21, 'F');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Enrollments (EnrollmentID, StudentID, CourseID, Grade) VALUES (2294, 6, 21, 'C');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Enrollments (EnrollmentID, StudentID, CourseID, Grade) VALUES (2295, 6, 341, 'A');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO Enrollments (EnrollmentID, StudentID, CourseID, Grade) VALUES (2296, 6, 346, 'A');
Query OK, 1 row affected (0.01 sec)
```

```
Command Prompt - mysql - x + v

mysql> SELECT * from students;
+-----+-----+-----+-----+
| StudentID | FirstName | LastName | Department |
+-----+-----+-----+-----+
| 1 | John | Ibrahim | Computer Science |
| 2 | Ravi | Shekhar | Computer Science |
| 3 | Raju | Kumar | Electrical |
| 4 | Rajiv | Kumar | Chemical |
| 5 | Pankaj | Kumar | Civil |
| 6 | Sundar | Kumar | Mechanical |
+-----+-----+-----+-----+
6 rows in set (0.00 sec)

mysql> select * from courses;
+-----+-----+-----+
| CourseID | CourseName | Instructor |
+-----+-----+-----+
| 21 | Numerical Methods | Dr. Mundu |
| 22 | DBMS | Dr. Santosh |
| 23 | Web Technology | Dr. Gargi |
| 231 | Material Science | Dr. Pankaj |
| 341 | AutoCAD | Dr. Mishra |
| 346 | AutoCAD 1 | Dr. Mishra |
+-----+-----+-----+
6 rows in set (0.00 sec)

mysql> select * from enrollments;
+-----+-----+-----+-----+
| EnrollmentID | StudentID | CourseID | Grade |
+-----+-----+-----+-----+
| 2275 | 1 | 21 | A |
| 2276 | 1 | 22 | B |
| 2277 | 1 | 231 | A |
| 2278 | 1 | 23 | C |
| 2279 | 2 | 23 | A |
| 2280 | 2 | 231 | C |
| 2281 | 2 | 22 | C |
| 2282 | 2 | 21 | C |
| 2284 | 3 | 21 | B |
| 2285 | 3 | 231 | B |
| 2286 | 3 | 341 | B |
| 2287 | 3 | 346 | B |
| 2288 | 4 | 346 | C |
| 2289 | 4 | 341 | C |
| 2290 | 4 | 231 | B |
| 2291 | 5 | 231 | B |
| 2292 | 5 | 346 | A |
+-----+-----+-----+-----+
```

```
Command Prompt - mysql - 1 x
6 rows in set (0.00 sec)

mysql> select * from courses;
+----+-----+-----+
| CourseID | CourseName | Instructor |
+----+-----+-----+
| 21 | Numerical Methods | Dr. Mundu |
| 22 | DBMS | Dr. Santosh |
| 23 | Web Technology | Dr. Gargi |
| 231 | Material Science | Dr. Pankaj |
| 341 | AutoCAD | Dr. Mishra |
| 346 | AutoCAD 1 | Dr. Mishra |
+----+-----+-----+
6 rows in set (0.00 sec)

mysql> select * from enrollments;
+-----+-----+-----+-----+
| EnrollmentID | StudentID | CourseID | Grade |
+-----+-----+-----+-----+
| 2275 | 1 | 21 | A |
| 2276 | 1 | 22 | B |
| 2277 | 1 | 231 | A |
| 2278 | 1 | 23 | C |
| 2279 | 2 | 23 | A |
| 2280 | 2 | 231 | C |
| 2281 | 2 | 22 | C |
| 2282 | 2 | 21 | C |
| 2284 | 3 | 21 | B |
| 2285 | 3 | 231 | B |
| 2286 | 3 | 341 | B |
| 2287 | 3 | 346 | B |
| 2288 | 4 | 346 | C |
| 2289 | 4 | 341 | C |
| 2290 | 4 | 231 | B |
| 2291 | 5 | 231 | B |
| 2292 | 5 | 346 | A |
| 2293 | 5 | 21 | F |
| 2294 | 6 | 21 | C |
| 2295 | 6 | 341 | A |
| 2296 | 6 | 346 | A |
| 2297 | 6 | 23 | A |
| 2298 | 6 | 22 | A |
| 2299 | 6 | 231 | A |
+-----+-----+-----+-----+
24 rows in set (0.00 sec)

mysql> |
```

1.

SELECT DISTINCT s.StudentID, s.FirstName, s.LastName FROM Students s JOIN Enrollments e ON s.StudentID = e.StudentID WHERE e.Grade = 'A';

```
+-----+-----+-----+
| StudentID | FirstName | LastName |
+-----+-----+-----+
| 1 | John | Ibrahim |
| 2 | Ravi | Shekhar |
| 5 | Pankaj | Kumar |
| 6 | Sundar | Kumar |
+-----+-----+-----+
4 rows in set (0.00 sec)
```

2.

SELECT c.CourseName, COUNT(e.StudentID) AS NumberOfStudents FROM Courses c LEFT JOIN Enrollments e ON c.CourseID = e.CourseID GROUP BY c.CourseName ORDER BY NumberOfStudents DESC;

CourseName	NumberOfStudents
Material Science	6
Numerical Methods	5
AutoCAD 1	4
DBMS	3
Web Technology	3
AutoCAD	3

3.

```
SELECT s.FirstName, s.LastName FROM Students s JOIN Enrollments e ON
s.StudentID = e.StudentID GROUP BY s.StudentID, s.FirstName, s.LastName
HAVING COUNT(e.CourseID) >= 2;
```

FirstName	LastName
John	Ibrahim
Ravi	Shekhar
Raju	Kumar
Rajiv	Kumar
Pankaj	Kumar
Sundar	Kumar

6 rows in set (0.00 sec)

4.

```
SELECT s.StudentID, s.FirstName, s.LastName
FROM Students s
JOIN Enrollments e ON s.StudentID = e.StudentID
WHERE e.Grade = (
    SELECT MAX(Grade)
```

FROM Enrollments

);

```
+-----+-----+-----+
| StudentID | FirstName | LastName |
+-----+-----+-----+
|          5 | Pankaj    | Kumar    |
+-----+-----+-----+
1 row in set (0.00 sec)
```

5.

SELECT c.CourseID, c.CourseName, c.Instructor

FROM Courses c

LEFT JOIN Enrollments e ON c.CourseID = e.CourseID

WHERE e.EnrollmentID IS NULL;

```
Empty set (0.00 sec)
```

```
mysql> |
```

6.

SELECT s.StudentID, s.FirstName, s.LastName

FROM Students s

JOIN (

SELECT StudentID, COUNT(DISTINCT CourseID) AS EnrolledCourses

FROM Enrollments

GROUP BY StudentID

) AS StudentCourses ON s.StudentID = StudentCourses.StudentID

WHERE EnrolledCourses = (SELECT COUNT(*) FROM Courses);

```
+-----+-----+-----+
| StudentID | FirstName | LastName |
+-----+-----+-----+
|          6 | Sundar   | Kumar    |
+-----+-----+-----+
1 row in set (0.01 sec)
```

7.

```
SELECT c.CourseName,
       AVG(CASE e.Grade
            WHEN 'A' THEN 9
            WHEN 'B' THEN 8
            WHEN 'C' THEN 7
            WHEN 'D' THEN 6
            WHEN 'E' THEN 5
            WHEN 'F' THEN 4
            WHEN 'G' THEN 3
            WHEN 'H' THEN 2
            WHEN 'I' THEN 1
            WHEN 'J' THEN 0
            END) AS AverageGrade
FROM Courses c
JOIN Enrollments e ON c.CourseID = e.CourseID
GROUP BY c.CourseName
ORDER BY AverageGrade DESC;
```

CourseName	AverageGrade
Web Technology	8.3333
AutoCAD 1	8.2500
Material Science	8.1667
DBMS	8.0000
AutoCAD	8.0000
Numerical Methods	7.0000

6 rows in set (0.00 sec)

8.

```
SELECT s.StudentID, s.FirstName, s.LastName, COUNT(e.StudentID) AS
EnrollmentsCount
```

```
FROM Students s
```

```
JOIN Enrollments e ON s.StudentID = e.StudentID
```

```
GROUP BY s.StudentID, s.FirstName, s.LastName
```

```
HAVING COUNT(e.StudentID) = (
```

```
    SELECT MAX(EnrollmentCount)
```

```
    FROM (
```

```
        SELECT COUNT(StudentID) AS EnrollmentCount
```

```
        FROM Enrollments
```

```
        GROUP BY StudentID
```

```
    ) AS EnrollmentsPerStudent
```

```
);
```



```
+-----+-----+-----+-----+
| StudentID | FirstName | LastName | EnrollmentsCount |
+-----+-----+-----+-----+
|          6 | Sundar   | Kumar    |          6        |
+-----+-----+-----+-----+
1 row in set (0.00 sec)
```