SQL

Introduction

What is SQL?

Structured Query Language

SQL is a programming language used to interact with relational databases.

It is used to perform **CRUD** operations :

Create

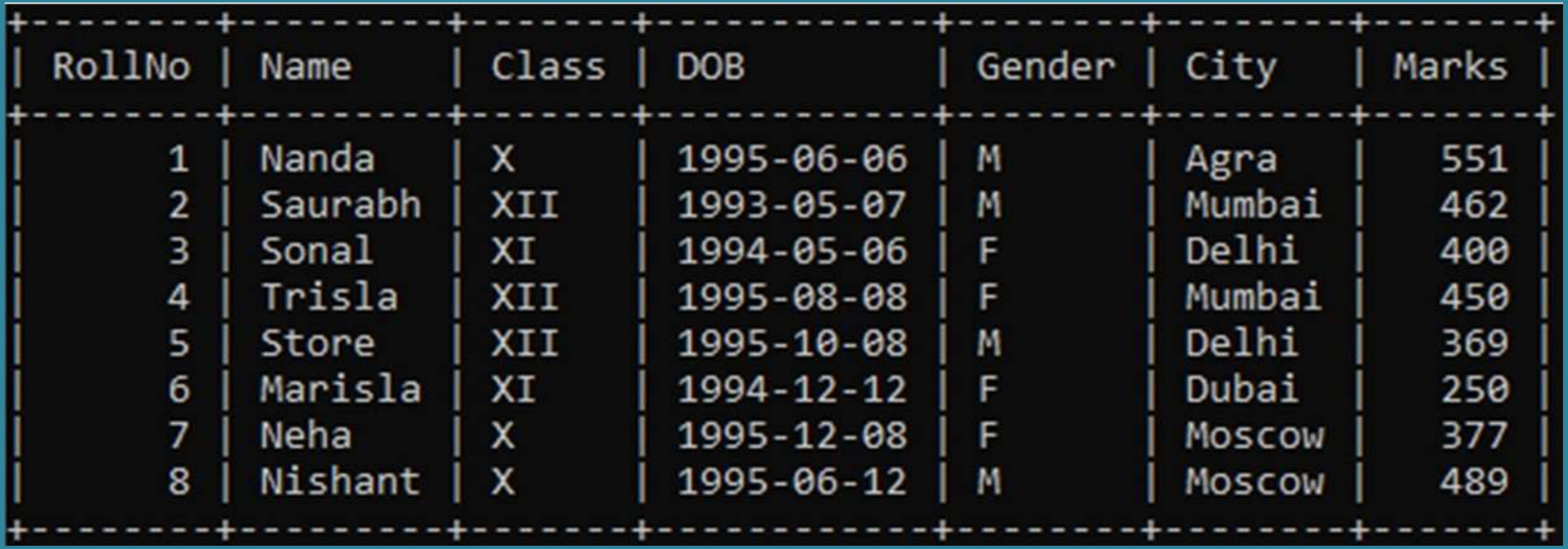
Read

Update

Delete

What is a table?

Student table



```
+--------+---------+-------+------------+--------+--------+-------+
| RollNo | Name    | Class | DOB        | Gender | City   | Marks |
+--------+---------+-------+------------+--------+--------+-------+
|      1 | Nanda   | X     | 1995-06-06 | M      | Agra   |   551 |
|      2 | Saurabh | XII   | 1993-05-07 | M      | Mumbai |   462 |
|      3 | Sonal   | XI    | 1994-05-06 | F      | Delhi  |   400 |
|      4 | Trisla  | XII   | 1995-08-08 | F      | Mumbai |   450 |
|      5 | Store   | XII   | 1995-10-08 | M      | Delhi  |   369 |
|      6 | Marisla | XI    | 1994-12-12 | F      | Dubai  |   250 |
|      7 | Neha    | X     | 1995-12-08 | F      | Moscow |   377 |
|      8 | Nishant | X     | 1995-06-12 | M      | Moscow |   489 |
+--------+---------+-------+------------+--------+--------+-------+
```

Creating our First Database

Our first SQL Query

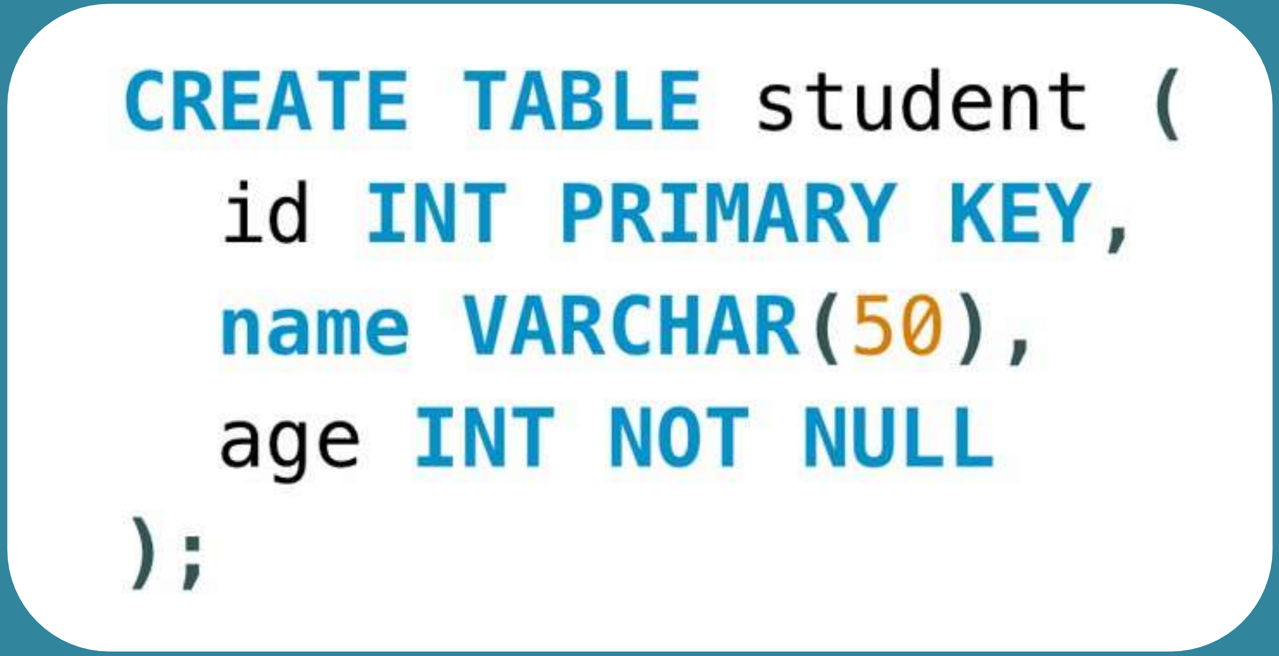
```
CREATE DATABASE db_name;
```

```
DROP DATABASE db_name;
```

Creating our First Table

```
USE db_name;

CREATE TABLE table_name (
    column_name1 datatype constraint,
    column_name2 datatype constraint,
    column_name2 datatype constraint
);
```



```
CREATE TABLE student (
  id INT PRIMARY KEY,
  name VARCHAR(50),
  age INT NOT NULL
);
```

SQL Datatypes

They define the type of values that can be stored in a column

DATATYPE	DESCRIPTION	USAGE
CHAR	string(0-255), can store characters of fixed length	CHAR(50)
VARCHAR	string(0-255), can store characters up to given length	VARCHAR(50)
BLOB	string(0-65535), can store binary large object	BLOB(1000)
INT	integer(-2,147,483,648 to 2,147,483,647)	INT
TINYINT	integer(-128 to 127)	TINYINT
BIGINT	integer(-9,223,372,036,854,775,808 to 9,223,372,036,854,775,807)	BIGINT
BIT	can store x-bit values. x can range from 1 to 64	BIT(2)
FLOAT	Decimal number - with precision to 23 digits	FLOAT
DOUBLE	Decimal number - with 24 to 53 digits	DOUBLE
BOOLEAN	Boolean values 0 or 1	BOOLEAN
DATE	date in format of YYYY-MM-DD ranging from 1000-01-01 to 9999-12-31	DATE
YEAR	year in 4 digits format ranging from 1901 to 2155	YEAR

Types of SQL Commands

DDL (Data Definition Language) : create, alter, rename, truncate & drop

DQL (Data Query Language) : select

DML (Data Manipulation Language) : select, insert, update & delete

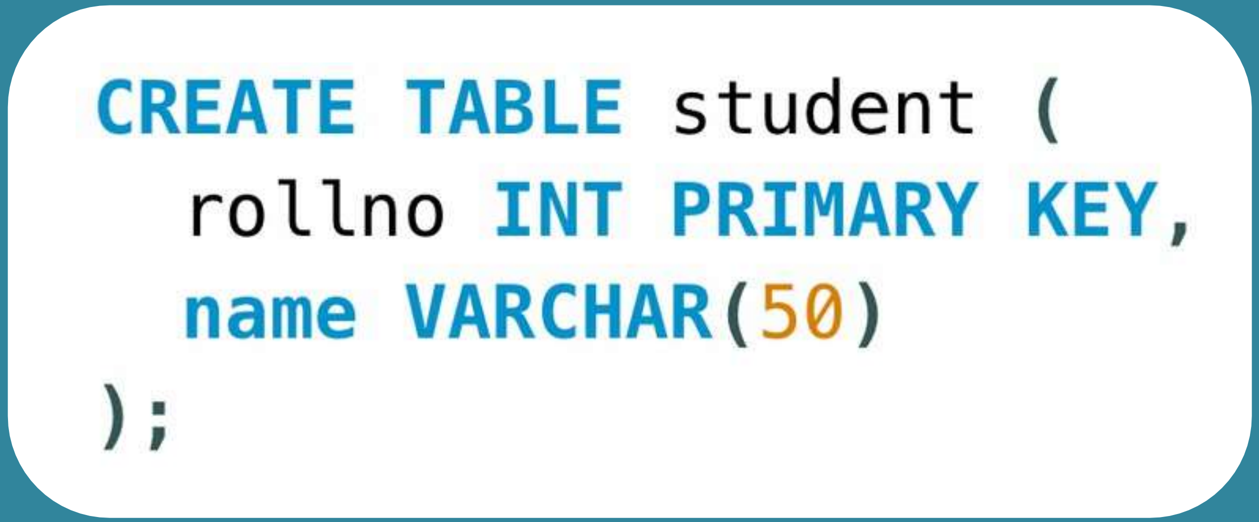
DCL (Data Control Language) : grant & revoke permission to users

TCL (Transaction Control Language) : start transaction, commit, rollback etc.

Table related Queries

Create

```
CREATE TABLE table_name (
    column_name1 datatype constraint,
    column_name2 datatype constraint,
);
```



```
CREATE TABLE student (
  rollno INT PRIMARY KEY,
  name VARCHAR(50)
);
```

Table related Queries

Select & View ALL columns

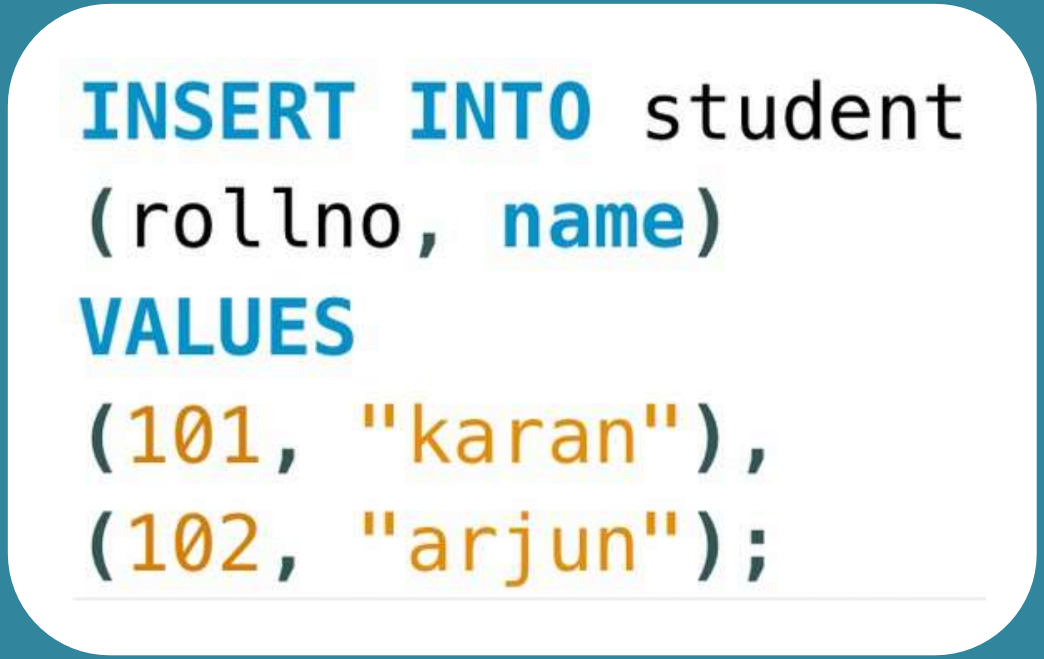
SELECT * FROM *table_name;*

```
SELECT * FROM student;
```

Table related Queries

Insert

INSERT INTO *table_name*
(colname1, colname2);
VALUES
(col1_v1, col2_v1),
(col1_v2, col2_v2);



```
INSERT INTO student
(rollno, name)
VALUES
(101, "karan"),
(102, "arjun");
```

Keys

Primary Key

It is a column (or set of columns) in a table that uniquely identifies each row. (a unique id)

There is only 1 PK & it should be NOT null.

Foreign Key

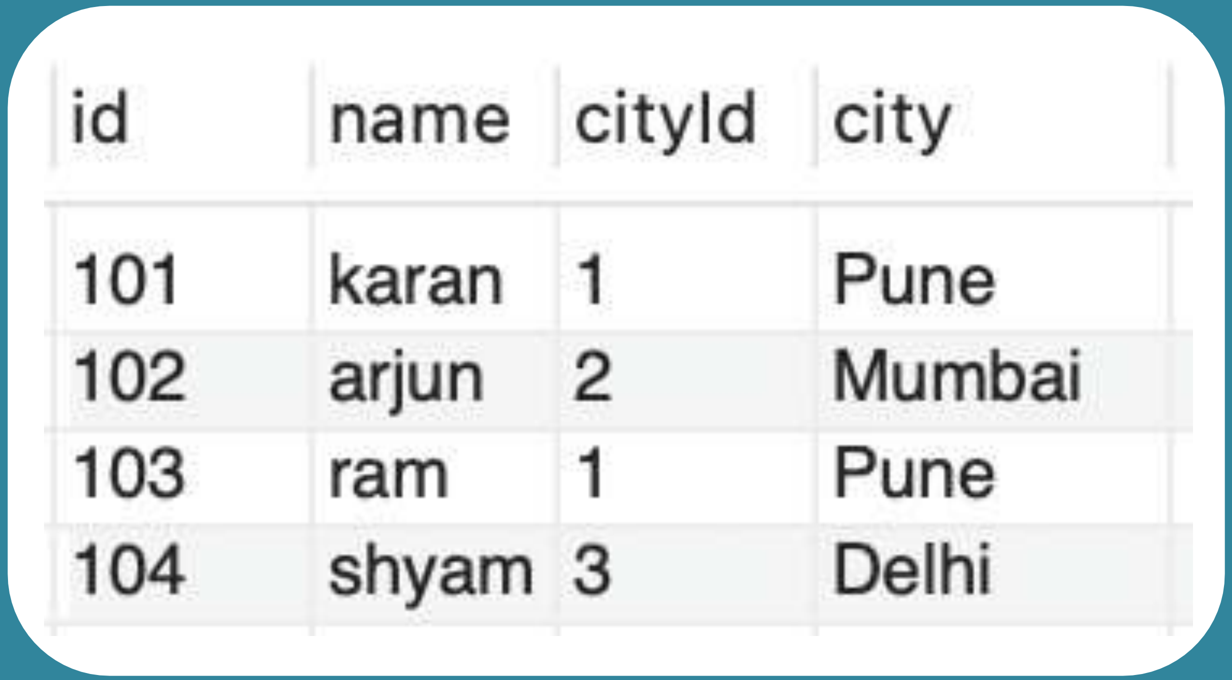
A foreign key is a column (or set of columns) in a table that refers to the primary key in another table.

There can be multiple FKs.

FKs can have duplicate & null values.

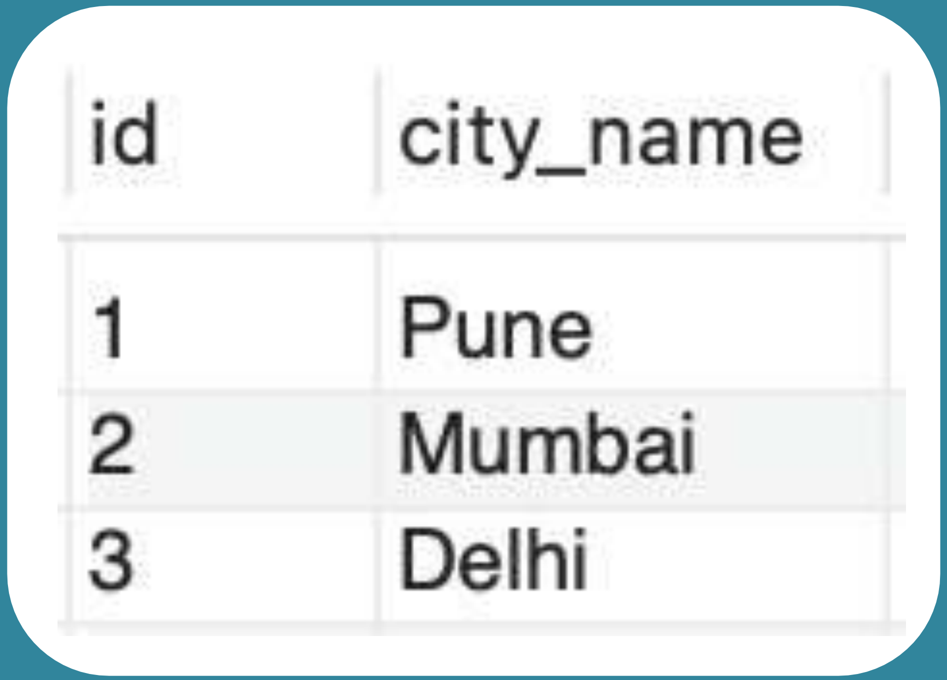
Keys

table1 - Student



id	name	cityId	city
101	karan	1	Pune
102	arjun	2	Mumbai
103	ram	1	Pune
104	shyam	3	Delhi

table2 - City



id	city_name
1	Pune
2	Mumbai
3	Delhi

Select in Detail

used to select any data from the database

Basic Syntax

```
SELECT col1, col2 FROM table_name;
```

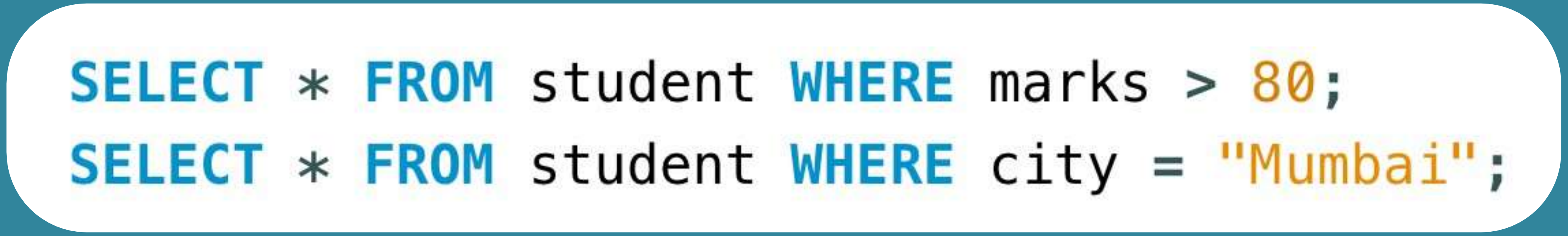
To Select ALL

```
SELECT * FROM table_name;
```

Where Clause

To define some conditions

SELECT *col1, col2* **FROM** *table_name*
WHERE *conditions;*



```
SELECT * FROM student WHERE marks > 80;
SELECT * FROM student WHERE city = "Mumbai";
```

Where Clause

Using Operators in WHERE

Arithmetic Operators : +(addition) , -(subtraction), *(multiplication), /(division), %(modulus)

Comparison Operators : = (equal to), != (not equal to), > , >=, <, <=

Logical Operators : AND, OR , NOT, IN, BETWEEN, ALL, LIKE, ANY

Bitwise Operators : & (Bitwise AND), | (Bitwise OR)

Operators

AND (to check for both conditions to be true)

```
SELECT * FROM student WHERE marks > 80 AND city = "Mumbai";
```

OR (to check for one of the conditions to be true)

```
SELECT * FROM student WHERE marks > 90 OR city = "Mumbai";
```

Operators

Between (selects for a given range)

```
SELECT * FROM student WHERE marks BETWEEN 80 AND 90;
```

In (matches any value in the list)

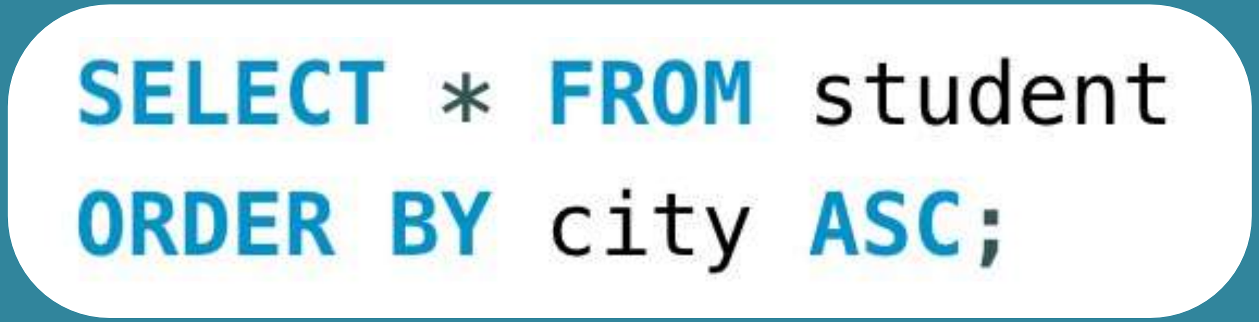
```
SELECT * FROM student WHERE city IN ("Delhi", "Mumbai");
```

NOT (to negate the given condition)

```
SELECT * FROM student WHERE city NOT IN ("Delhi", "Mumbai");
```

Order By Clause

To sort in ascending (ASC) or descending order (DESC)



```
SELECT * FROM student
ORDER BY city ASC;
```

SELECT *col1, col2* **FROM** *table_name*
ORDER BY *col_name(s)* **ASC***;*

Aggregate Functions

Aggregare functions perform a calculation on a set of values, and return a single value.

- COUNT( )
- MAX( )
- MIN( )
- SUM( )
- AVG( )

Get Maximum Marks

```
SELECT max(marks)
FROM student;
```

Get Average marks

```
SELECT avg(marks)
FROM student;
```

Group By Clause

Groups rows that have the same values into summary rows.
It collects data from multiple records and groups the result by one or more column.

*Generally we use group by with some *aggregation function*.

Count number of students in each city

```
SELECT city, count(name)
FROM student
GROUP BY city;
```

Having Clause

Similar to Where i.e. applies some condition on rows.
Used when we want to apply any condition after grouping.

Count number of students in each city where max marks cross 90.

```
SELECT count(name), city
FROM student
GROUP BY city
HAVING max(marks) > 90;
```

General Order

```
SELECT column(s)
FROM table_name
WHERE condition
GROUP BY column(s)
HAVING condition
ORDER BY column(s) ASC;
```

Having Clause

Similar to Where i.e. applies some condition on rows.
Used when we want to apply any condition after grouping.

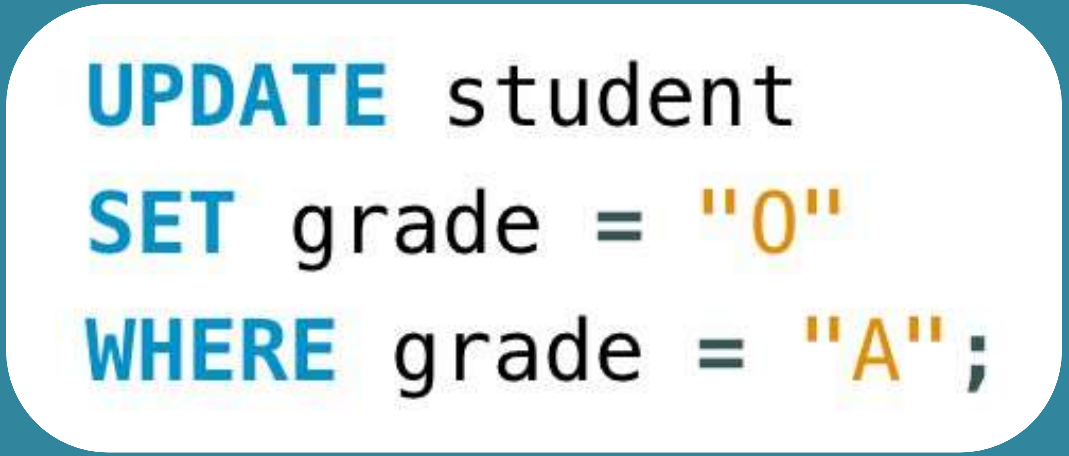
Count number of students in each city where max marks cross 90.

```
SELECT count(name), city
FROM student
GROUP BY city
HAVING max(marks) > 90;
```

Table related Queries

Update (to update existing rows)

UPDATE *table_name*
SET *col1 = val1, col2 = val2*
WHERE *condition;*

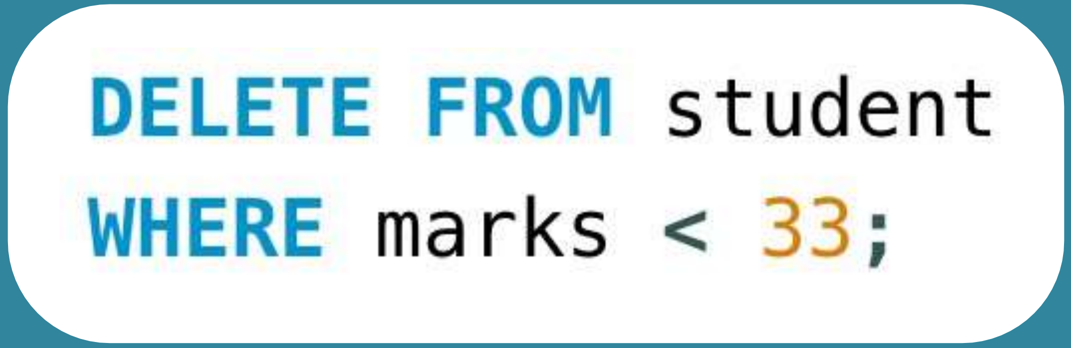


```
UPDATE student
SET grade = "O"
WHERE grade = "A";
```

Table related Queries

Delete (to delete existing rows)

DELETE FROM *table_name*
WHERE *condition;*



```sql
DELETE FROM student
WHERE marks < 33;
```

Table related Queries

Alter (to change the schema)

ADD Column

```
ALTER TABLE table_name
ADD COLUMN column_name datatype constraint;
```

DROP Column

```
ALTER TABLE table_name
DROP COLUMN column_name;
```

RENAME Table

```
ALTER TABLE table_name
RENAME TO new_table_name;
```

Table related Queries

CHANGE Column (rename)

ALTER TABLE *table_name*
CHANGE COLUMN *old_name* ***new_name new_datatype new_constraint;***

MODIFY Column (modify datatype/ constraint)

ALTER TABLE *table_name*
MODIFY *col_name* ***new_datatype new_constraint;***

ADD Column

```sql
ALTER TABLE student
ADD COLUMN age INT NOT NULL DEFAULT 19;
```

DROP Column

```sql
ALTER TABLE student
DROP COLUMN stu_age;
```

MODIFY Column

```sql
ALTER TABLE student
MODIFY age VARCHAR(2);
```

RENAME Table

```sql
ALTER TABLE student
RENAME TO stu;
```

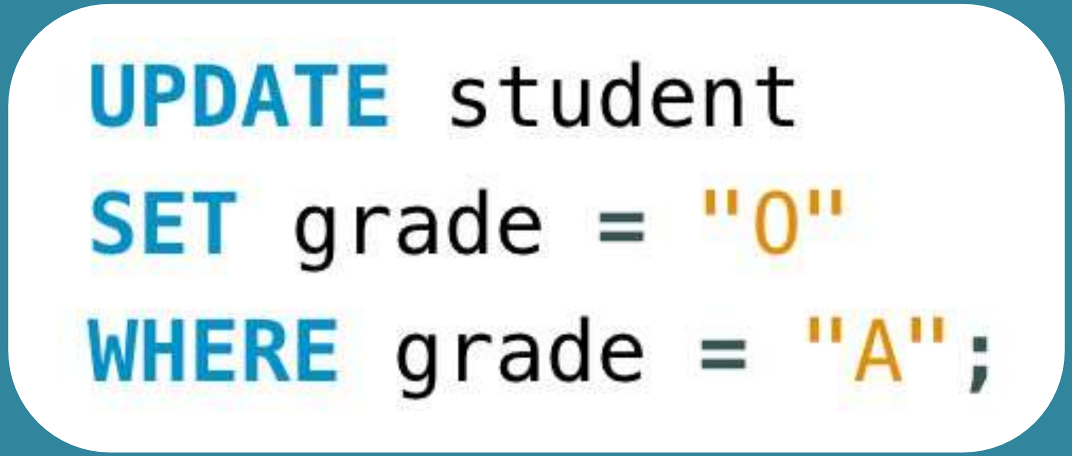
CHANGE Column (rename)

```sql
ALTER TABLE student
CHANGE age stu_age INT;
```

Table related Queries

Truncate (to delete table's data)

TRUNCATE TABLE *table_name ;*



```
UPDATE student
SET grade = "O"
WHERE grade = "A";
```

Joins in SQL

Join is used to combine rows from two or more tables, based on a related column between them.

Types of Joins

a) Inner Joins

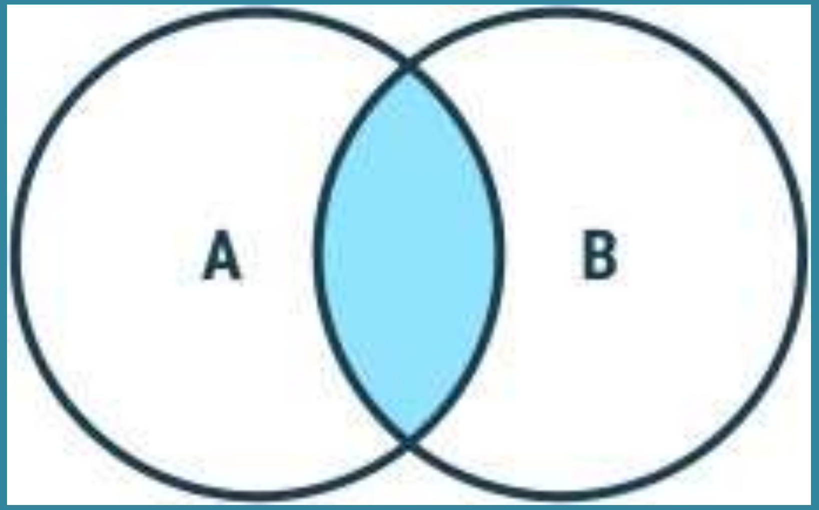
b) Outer Joins

b) Left Joins

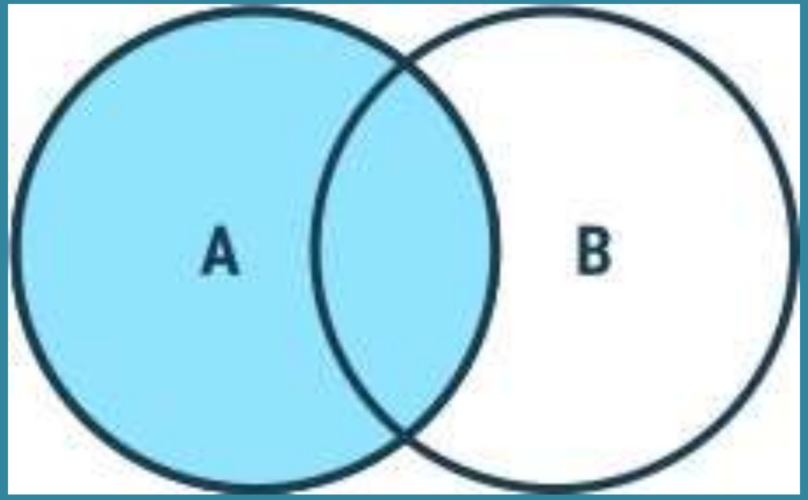
c) Right Joins

d) Full Joins

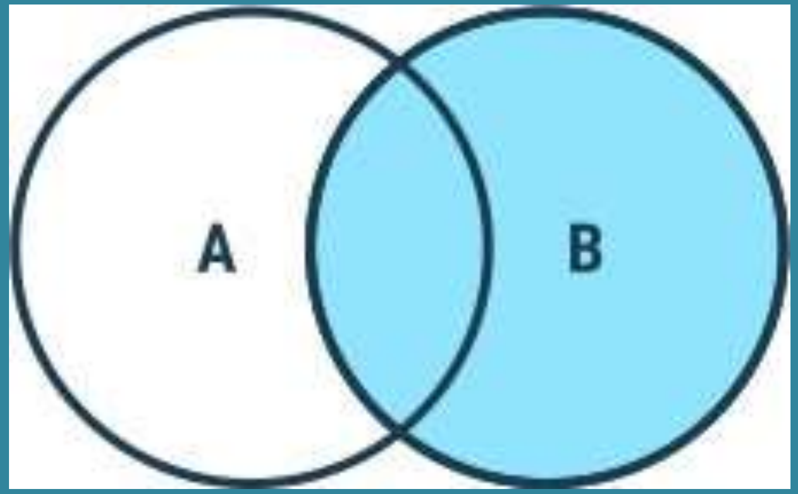
Types of Joins



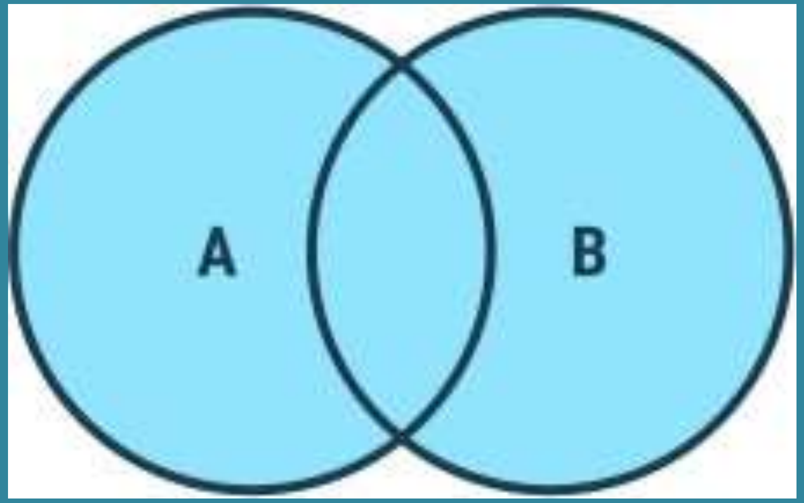
Inner Join



Left Join



Right Join

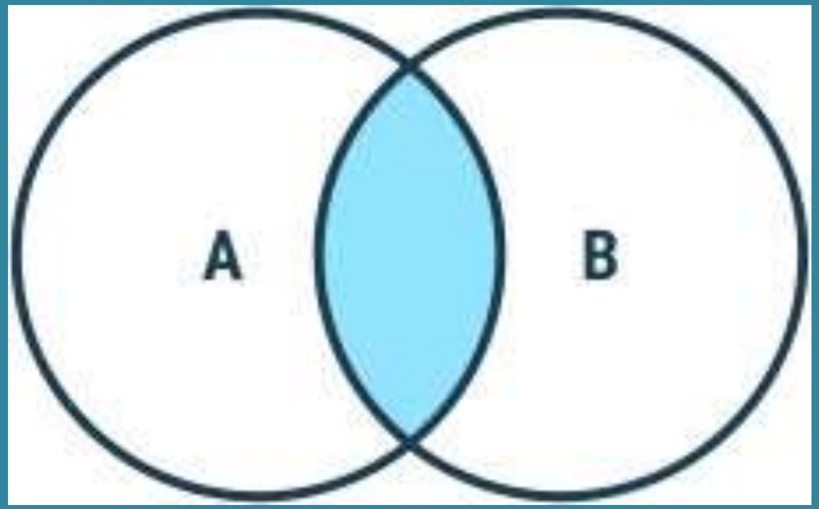


Full Join

Outer Joins

Inner Join

Returns records that have matching values in both tables



Syntax

```
SELECT column(s)
FROM tableA
INNER JOIN tableB
ON tableA.col_name = tableB.col_name;
```

Inner Join

Example

student

student_id	name
101	adam
102	bob
103	casey

course

student_id	course
102	english
105	math
103	science
107	computer science

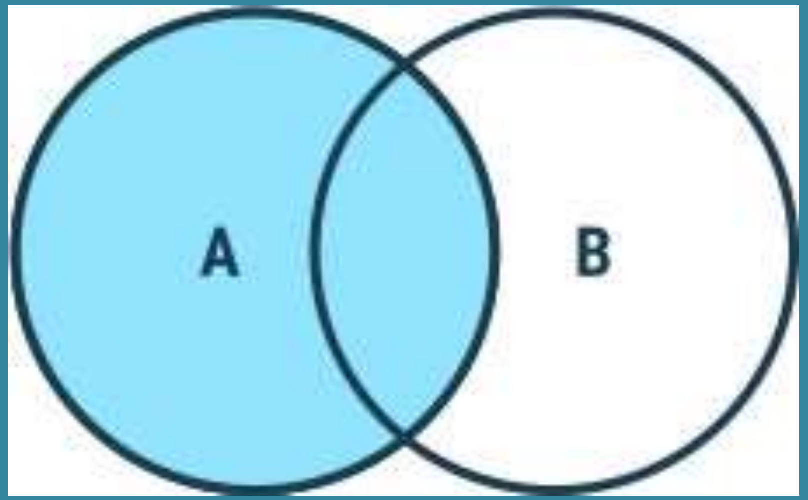
```
SELECT *
FROM student
INNER JOIN course
ON student.student_id = course.student_id;
```

Result

student_id	name	course
102	bob	english
103	casey	science

Left Join

Returns all records from the left table, and the matched records from the right table



Syntax

```
SELECT column(s)
FROM tableA
LEFT JOIN tableB
ON tableA.col_name = tableB.col_name;
```

Left Join

Example

student

student_id	name
101	adam
102	bob
103	casey

course

student_id	course
102	english
105	math
103	science
107	computer science

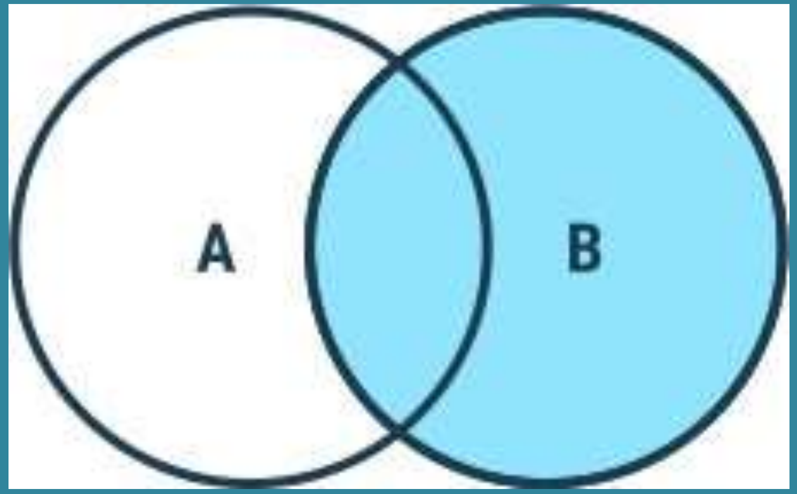
```
SELECT *
FROM student as s
LEFT JOIN course as c
ON s.student_id = c.student_id;
```

Result

student_id	name	course
101	adam	*null*
102	bob	english
103	casey	science

Right Join

Returns all records from the right table, and the matched records from the left table



Syntax

```
SELECT column(s)
FROM tableA
RIGHT JOIN tableB
ON tableA.col_name = tableB.col_name;
```

Right Join

Example

student

student_id	name
101	adam
102	bob
103	casey

course

student_id	course
102	english
105	math
103	science
107	computer science

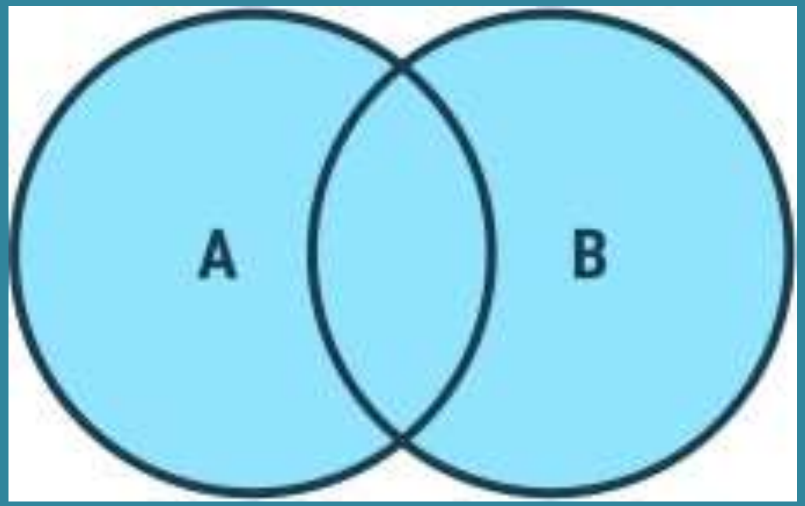
Result

student_id	course	name
102	english	bob
105	math	*null*
103	science	casey
107	computer science	*null*

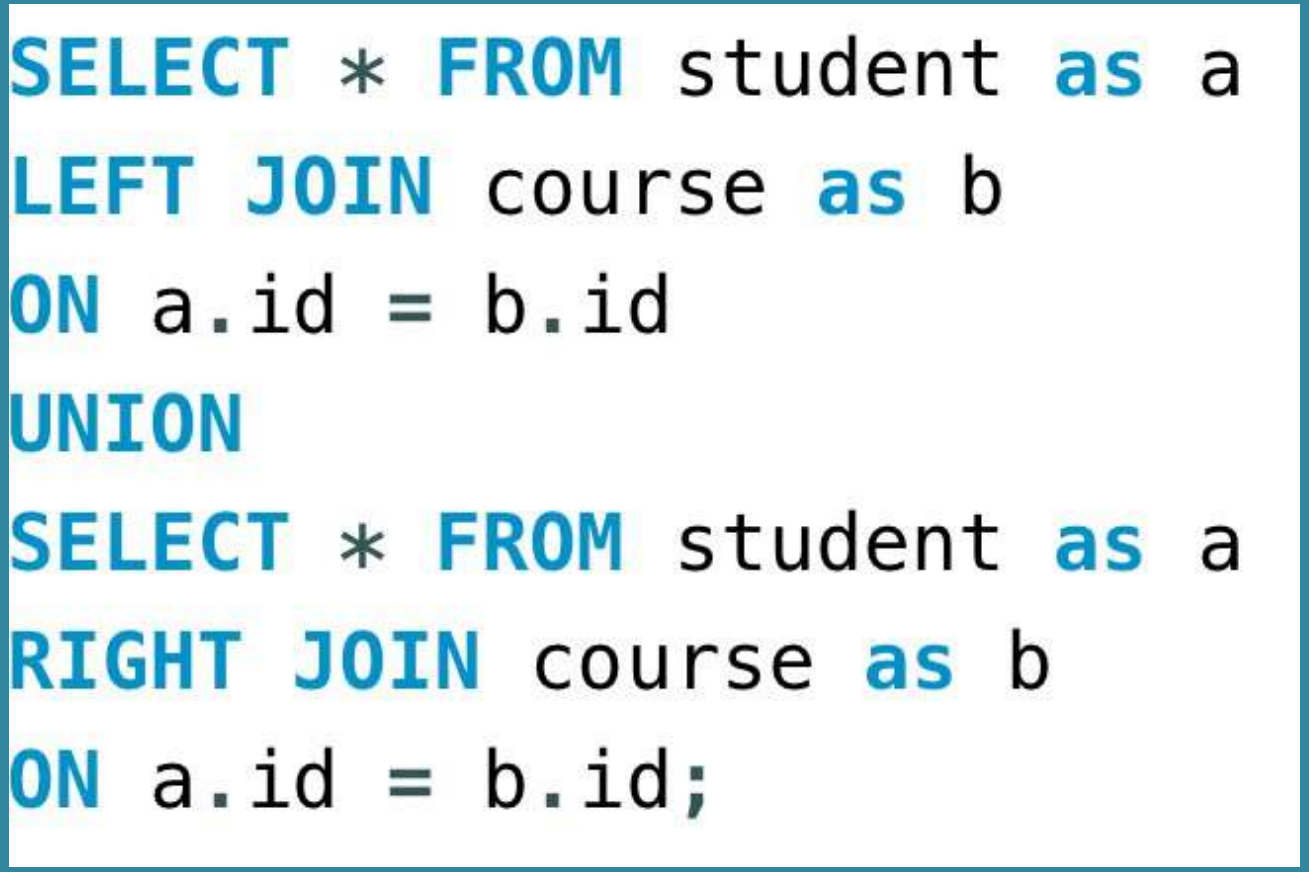
```
SELECT *
FROM student as s
RIGHT JOIN course as c
ON s.student_id = c.student_id;
```

Full Join

Returns all records when there is a match in either left or right table



Syntax in MySQL



```
SELECT * FROM student as a
LEFT JOIN course as b
ON a.id = b.id
UNION
SELECT * FROM student as a
RIGHT JOIN course as b
ON a.id = b.id;
```

LEFT JOIN
UNION
RIGHT JOIN

Full Join

Example

student

student_id	name
101	adam
102	bob
103	casey

course

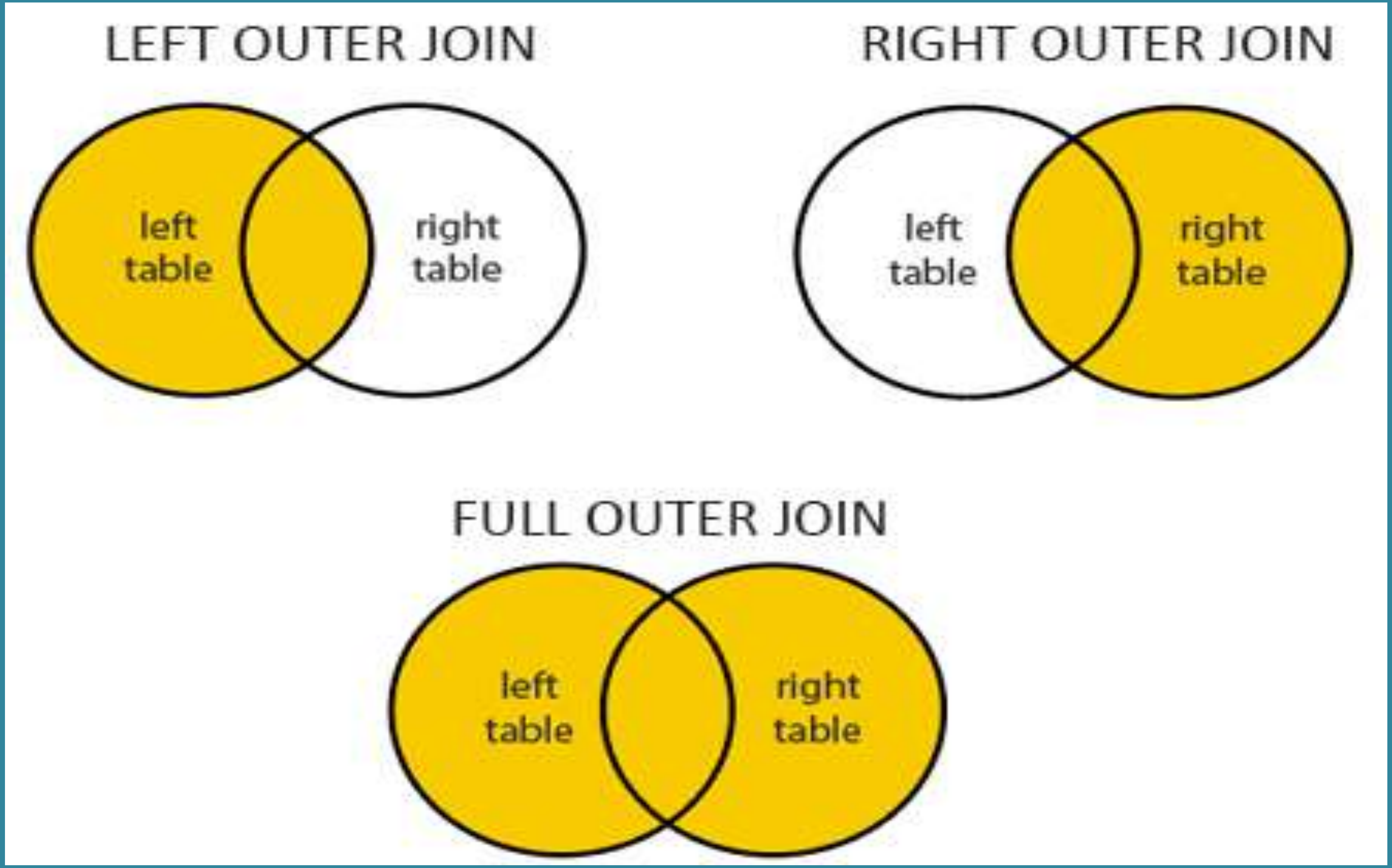
student_id	course
102	english
105	math
103	science
107	computer science

Result

student_id	name	course
101	adam	*null*
102	bob	english
103	casey	science
105	*null*	math
107	*null*	computer science

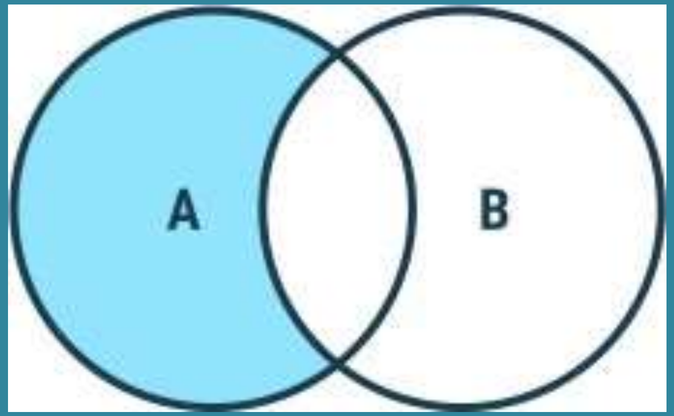
Outer Join

method of combining two or more tables so that the result includes unmatched rows of one of the tables, or of both tables

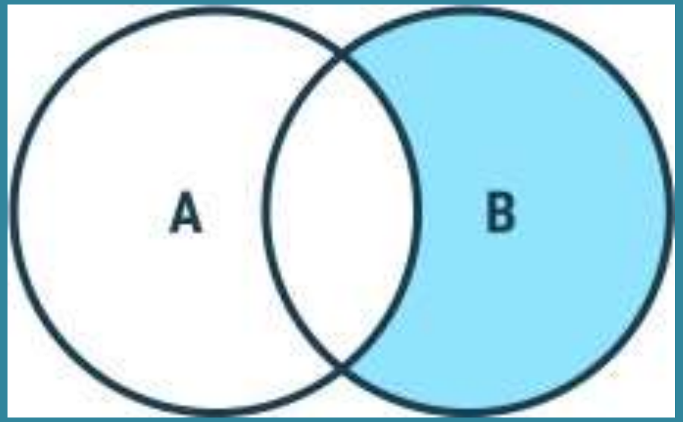


Think & Ans

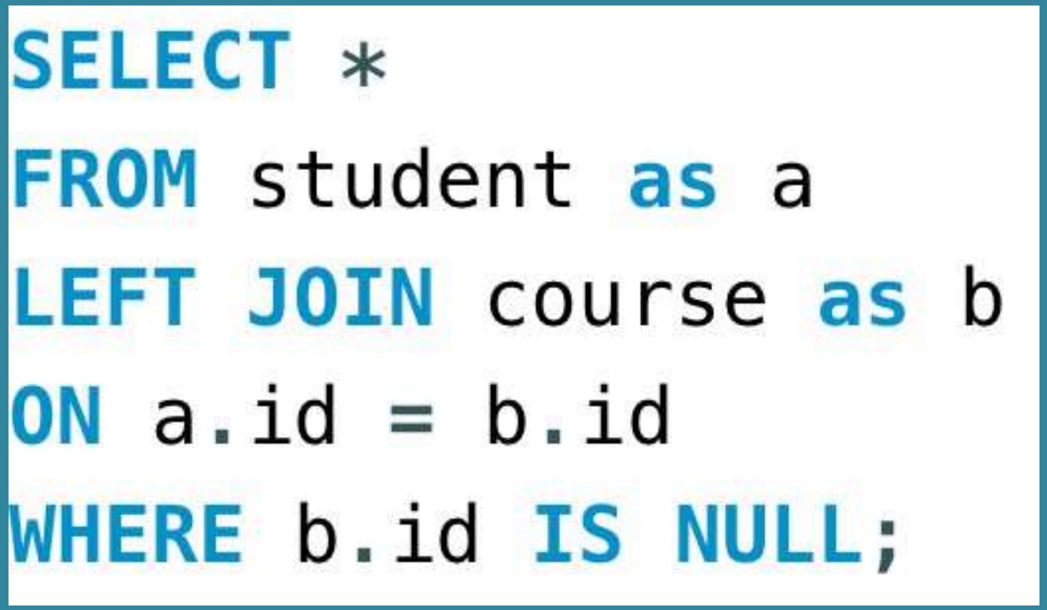
Qs: Write SQL commands to display the right exclusive join :



Left Exclusive Join



Right Exclusive Join

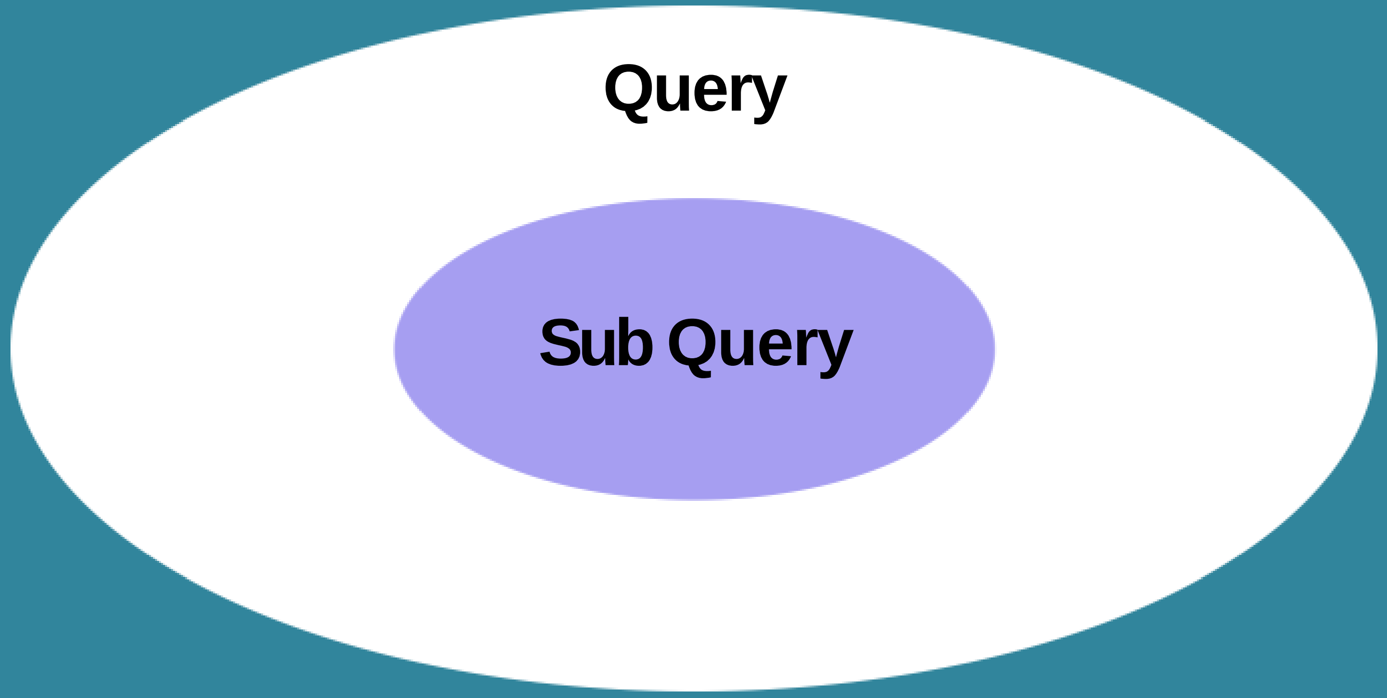


```
SELECT *
FROM student as a
LEFT JOIN course as b
ON a.id = b.id
WHERE b.id IS NULL;
```

SQL Sub Queries

A Subquery or Inner query or a Nested query is a query within another SQL query.

It involves 2 select statements.



Syntax

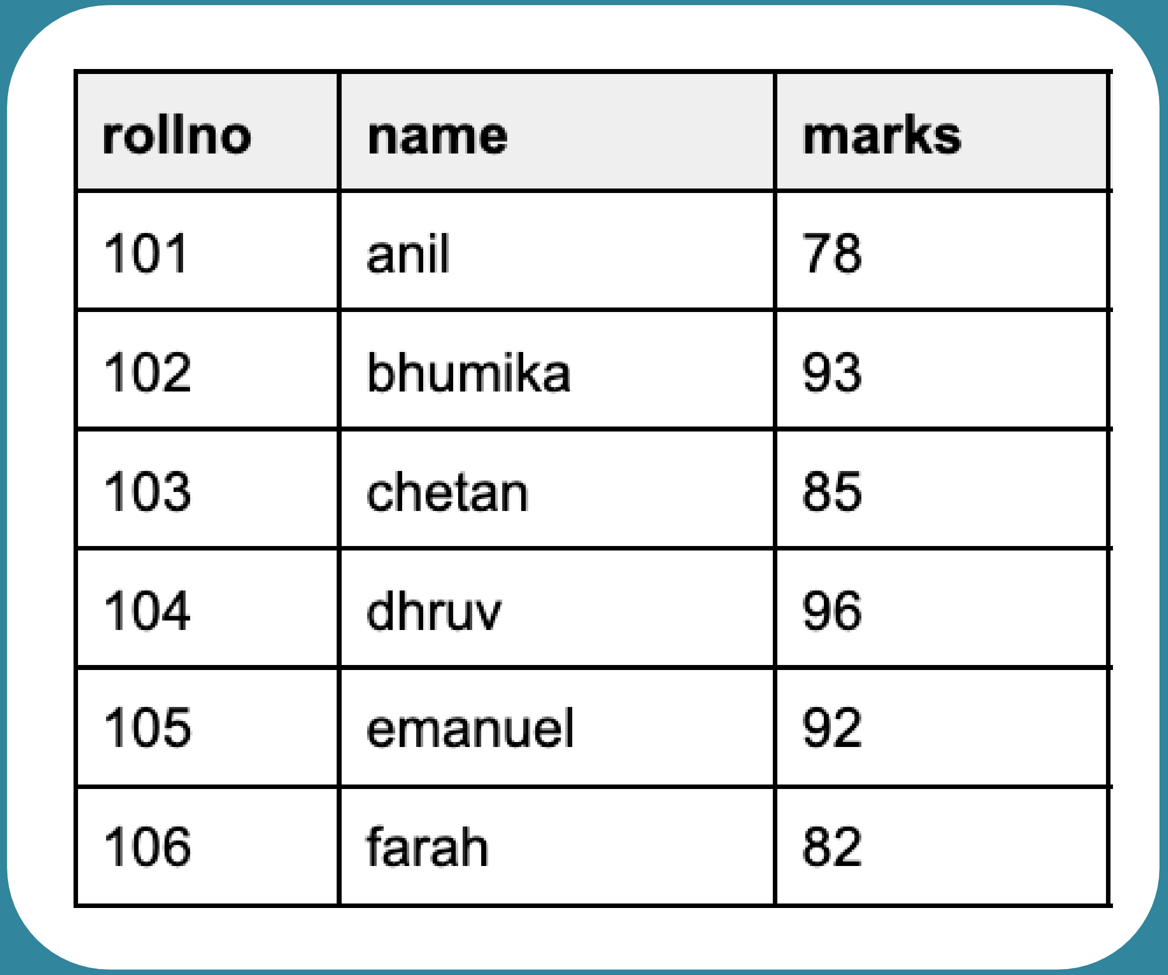
```
SELECT column(s)
FROM table_name
WHERE col_name operator
( subquery );
```

SQL Sub Queries

Example

Get names of all students who scored more than class average.

Step 1. Find the avg of class
Step 2. Find the names of students with marks > avg



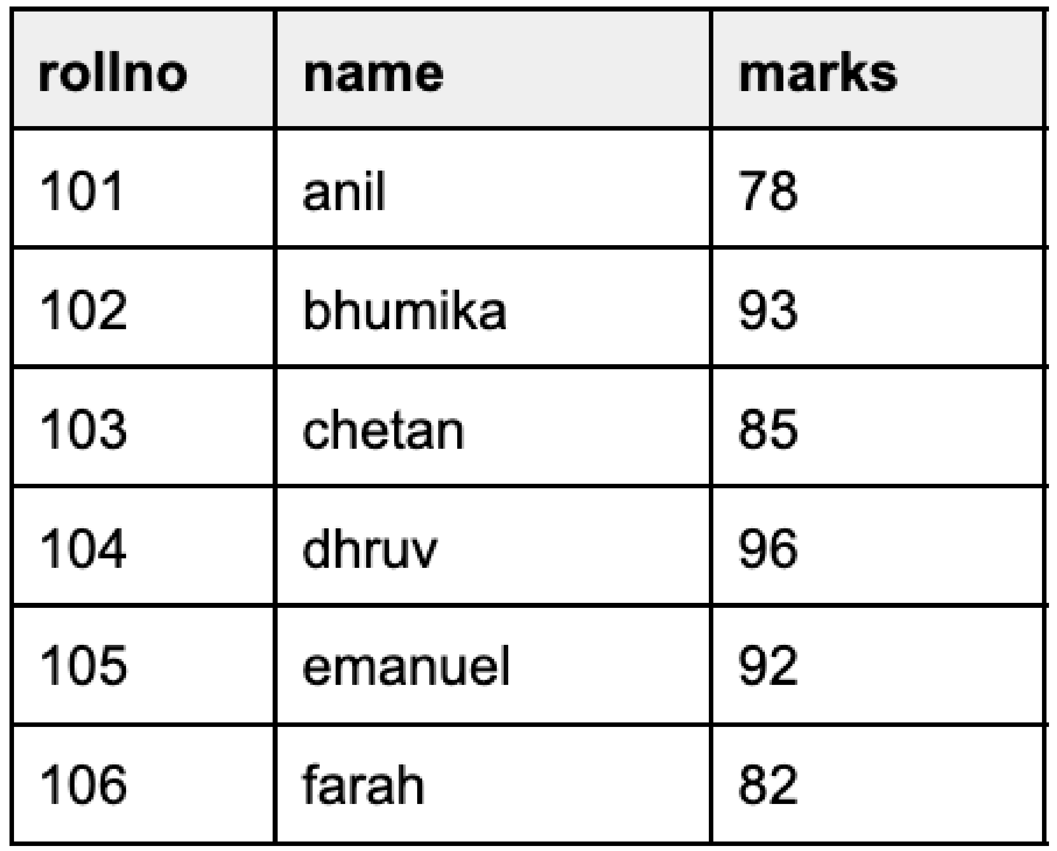
rollno	name	marks
101	anil	78
102	bhumika	93
103	chetan	85
104	dhruv	96
105	emanuel	92
106	farah	82

SQL Sub Queries

Example

Find the names of all students with even roll numbers.

Step 1. Find the even roll numbers
Step 2. Find the names of students with even roll no



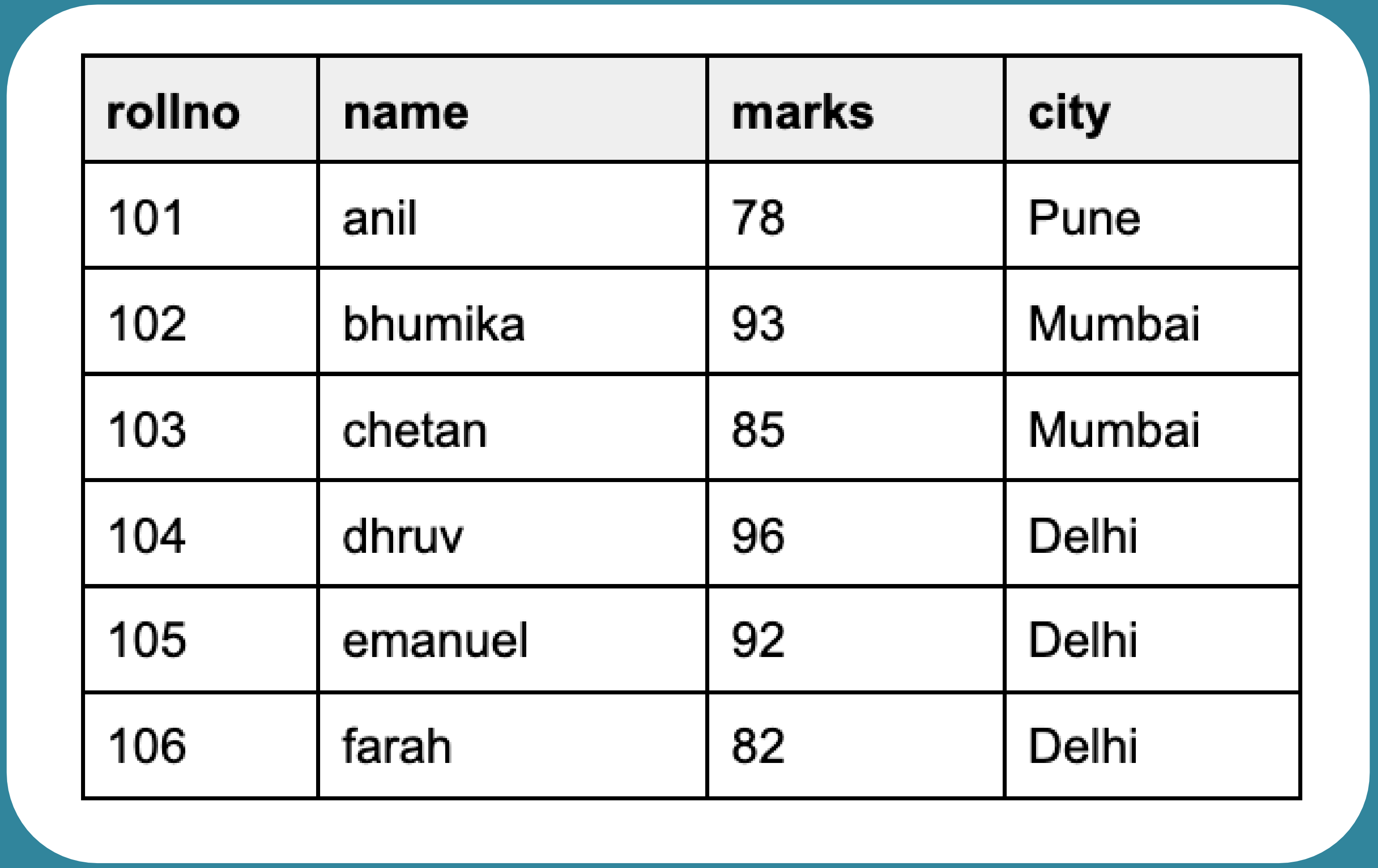
rollno	name	marks
101	anil	78
102	bhumika	93
103	chetan	85
104	dhruv	96
105	emanuel	92
106	farah	82

SQL Sub Queries

Example with FROM

Find the max marks from the students of Delhi

Step 1. Find the students of Mumbai
Step 2. Find their max marks using the sublist in step 1



rollno	name	marks	city
101	anil	78	Pune
102	bhumika	93	Mumbai
103	chetan	85	Mumbai
104	dhruv	96	Delhi
105	emanuel	92	Delhi
106	farah	82	Delhi

String Operations Wild Cards

A wildcard character is used to substitute one or more characters in a string.
Wildcard characters are used with the LIKE operator. The LIKE operator is used in a WHERE clause to search for a specified pattern in a column.

Syntax

```
SELECT * FROM table_name
WHERE column_name like string_operation;
```