

## Division Operator in SQL

The division operator is used when we have to evaluate queries which contain the keyword **ALL**.

Example:

- Which person has account in all the banks of a particular city?
- Which students have taken all the courses required to graduate?

Another way how we can identify the usage of division operator is by using the logical implication of **if...then**.

**Above queries can be written as,**

- If there is a bank in that particular city, that person must have an account in that bank.
- If there is a course in the list of courses required to be graduated, that person must have taken that course.

***There is no direct way by which we can express the division operator***

## Division Operator in SQL

Query:

Find all the students who can graduate.

OR

Who have taken all the subjects required for one to graduate.

Table 2: Course\_Required

Course
Databases
Programming Languages

Table 1: Course\_Taken

Student_Name	Course
Robert	Databases
Robert	Programming Languages
David	Databases
David	Operating Systems
Hannah	Programming Languages
Hannah	Machine Learning
Tom	Operating Systems

Table 2: Course\_Required - It consists of the courses that one is required to take in order to graduate

## Division Operator in SQL

Query:

Find all the students who can graduate.

OR

Who have taken all the subjects required for one to graduate.

SOLUTION:

- I. Find all the students
- II. Find all the students and the courses required to graduate
- III. Find all the students and the required courses they have not taken
- IV. Find all students who cannot graduate
- V. Find all students who can graduate

Table 1: Course\_Taken

Student_Name	Course
Robert	Databases
Robert	Programming Languages
David	Databases
David	Operating Systems
Hannah	Programming Languages
Hannah	Machine Learning
Tom	Operating Systems

Table 2:  
Course\_Required

Course

Databases

Programming Languages

Query:  
Find all the students who can graduate.

SOLUTION:

I. Find all the students

Create a set of all students that  
have taken courses

```
CREATE TABLE AllStudents  
AS SELECT DISTINCT  
Student_Name FROM  
Course_Taken
```

Table 1: Course_Taken	
Student_Name	Course
Robert	Databases
Robert	Programming Languages
David	Databases
David	Operating Systems
Hannah	Programming Languages
Hannah	Machine Learning
Tom	Operating Systems

Table: AllStudents
Student_name
Robert
David
Hannah
Tom

Table 2: Course_Required
Course
Databases
Programming Languages

Query:  
Find all the students who can graduate.

SOLUTION:

2. Find all the students and the courses required to graduate

Perform Cartesian Product of AllStudents and Course\_Required using the following command.

```
CREATE table StudentsAndRequired AS  
SELECT AllStudents.Student_Name, Course_Required.Course  
FROM AllStudents, Course_Required
```

Table: StudentsAndRequired	
Student_Name	Course
Robert	Databases
Robert	Programming Languages
David	Databases
David	Programming Languages
Hannah	Databases
Hannah	Programming Languages
Tom	Databases
Tom	Programming Languages

Query:  
Find all the students who can graduate.

SOLUTION:

3. Find all the students and the required courses they have not taken

Table: StudentsAndNotTaken	
Student_Name	Course
David	Programming Languages
Hannah	Databases
Tom	Databases
Tom	Programming Languages

```
CREATE table StudentsAndNotTaken AS
SELECT * FROM StudentsAndRequired WHERE NOT EXISTS
(Select * FROM Course_Taken WHERE StudentsAndRequired.Student_Name =
Course_Taken.Student_Name
AND StudentsAndRequired.Course = Course_Taken.Course)
```

The idea is to simply find the students who have not taken certain courses that are required for graduation and hence they won't be able to graduate.

Query:  
Find all the students who can graduate.

SOLUTION:

4. Find all students who cannot graduate

Table: CannotGraduate

David

Hannah

Tom

```
CREATE table CannotGraduate AS SELECT DISTINCT Student_Name FROM StudentsAndNotTaken
```

All the students who are present in the table StudentsAndNotTaken are the ones who cannot graduate. Therefore, we can find the students who cannot graduate

Query:  
Find all the students who can graduate.

SOLUTION:

5. Find all students who can graduate

```
CREATE Table CanGraduate AS SELECT * FROM AllStudents  
WHERE NOT EXISTS  
(SELECT * FROM CannotGraduate WHERE  
    CannotGraduate.Student_name =  
AllStudents.Student_name)
```

Table: CanGraduate

Robert

Table: CannotGraduate

David

Hannah

Tom

Table: AllStudents

Student\_name

Robert

David

Hannah

Tom

The students who can graduate are simply those who are present in AllStudents but not in CannotGraduate