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Relational DB Design, Functional Dependency

Complete Course on Database Management System

Vishvadeep Gothi • Lesson 10 • June 29, 2023

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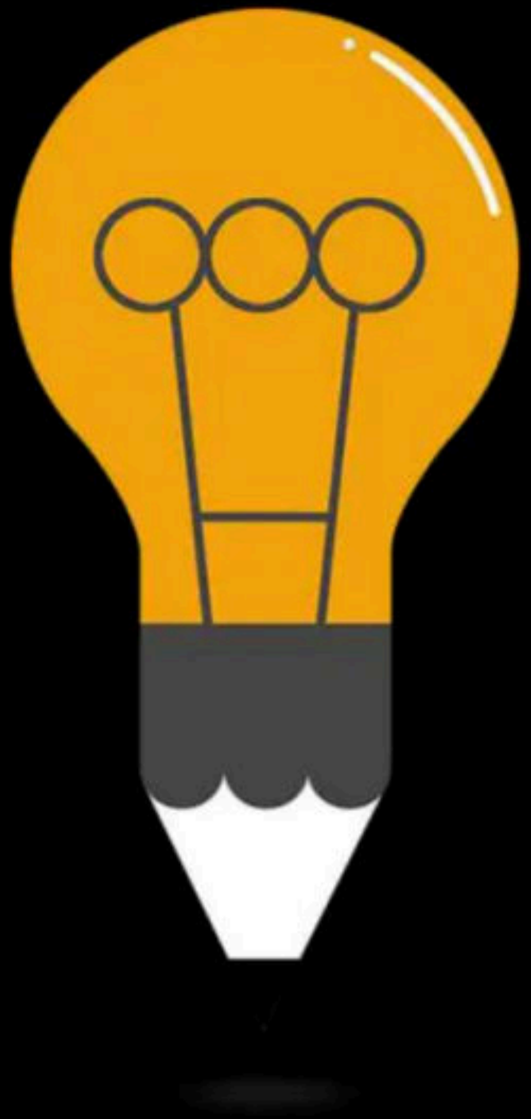

DBMS
SQL

By: Vishvadeep Gothi

Group by Clause

Used in collaboration with the SELECT statement to arrange identical data into groups

```
select ._____...
from ._____.
where ._______...
group by ._____...
```

Sequence:-

from ⟹ where ⟹ group by ⇒ select

The column on which group by is done, that must be included in select.

Group by Clause

Student(Rno, Name, Fname, Dob)

Select * from student

Group by Clause

Student(Rno, Name, Fname, Dob)

Select * from student group by Dob

1	A	x	21 Jan
3	A	y	27 oct
4	d	y	27 nov
5	C	d	1 Dec

student

Rno	name	fname	dob
1	A	x	21 Jan
2	C	y	21 Jan
3	A	y	27 oct
4	d	y	27 nov
5	C	d	1 Dec

4 groups

```
select * from customers group by Country
```

for each country => There will be group

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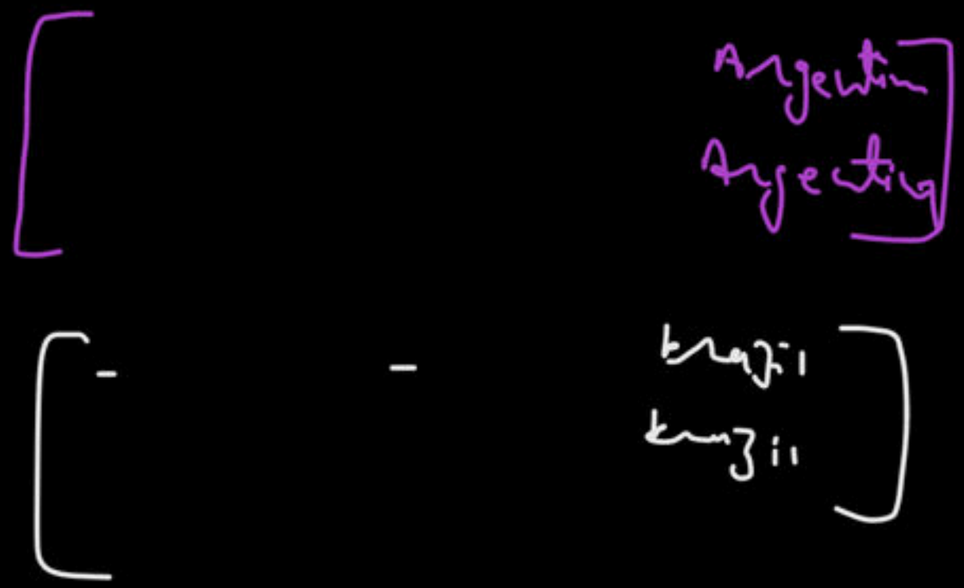
Group by Clause

Count number of customers from each country?

```
select country, count(customerId) from customers group by country
```



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Products Table

ProductID	ProductName	SupplierID	CategoryID	Unit	Price
1	Chais	1	1	10 boxes x 20 bags	18
2	Chang	1	1	24 - 12 oz bottles	19
3	Aniseed Syrup	1	2	12 - 550 ml bottles	10
4	Chef Anton's Cajun Seasoning	2	2	48 - 6 oz jars	22
5	Chef Anton's Gumbo Mix	2	2	36 boxes	21.35
6	Grandma's Boysenberry Spread	3	2	12 - 8 oz jars	25
7	Uncle Bob's Organic Dried Pears	3	7	12 - 1 lb pkgs.	30
8	Northwoods Cranberry Sauce	3	2	12 - 12 oz jars	40
9	Mishi Kobe Niku	4	6	18 - 500 g pkgs.	97
10	Ikura	4	8	12 - 200 ml jars	31
11	Queso Cabrales	5	4	1 kg pkg.	21
12	Queso Manchego La Pastora	5	4	10 - 500 g pkgs.	38
13	Konbu	6	8	2 kg box	6
14	Tofu	6	7	40 - 100 g pkgs.	23.25
15	Genen Shouyu	6	2	24 - 250 ml bottles	15.5

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Group by Clause

Write a query to fetch sum of prices of all products for each of the category?

```
select categoryId, sum(price) from products group by categoryId
```

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Group by Clause

Write a query to fetch min of prices of all products for each of the category, only when the price of product is greater than 20?

```
select categoryId, min(price) from products where price>20
group by categoryId
```

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Group by Clause

Write a query to fetch sum of prices of all products for each of the category, only when sum of price is greater than 200?

Condⁿ of result of agg. funcⁿ per group.

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Having Clause

The HAVING clause in SQL is used if we need to filter the result set based on aggregate functions such as MIN() and MAX(), SUM() and AVG() and COUNT().

The HAVING clause was introduced because the WHERE clause does not support aggregate functions. Also, GROUP BY must be used before the HAVING clause.

Sequence:-

from → where → group by → having → select

Ans:-

```
select categoryid, sum(price) from products
group by categoryid having sum(price) > 200
```

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Where vs Having

HAVING Clause	WHERE Clause
The HAVING clause checks the condition on **a group of rows**.	The WHERE clause checks the condition **on each individual row**.
The HAVING is used with aggregate functions.	The WHERE clause cannot be used with aggregate functions.
The HAVING clause is executed after the GROUP BY clause.	The WHERE clause is executed before the GROUP BY clause.

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ORDER BY Clause

The ORDER BY keyword is used to sort the result-set in ascending or descending order

select . . . .

from . — . .

where . . . . . .

=

order by columnname

from → where → group by → having

↓

order by ← select

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ORDER BY Clause

Fetch all customers records but sorted by country name

```
select * from customers order by country
```

or

```
select * from customers order by country asc
```

ascending order

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ORDER BY Clause

Fetch all customers records but sorted by country name in descending order

```
select * from customers order by country desc
```

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ORDER BY Clause

Can we fetch records which are sorted for 2 columns?

```
select * from customers order by country, postalcode
```

```
select * from customers order by country, postalcode desc
```

—— // —————————— country desc, postalcode

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Subquery

Query in a Query

select ..... (select .....)

⇒ subquery → in select
in where
& from

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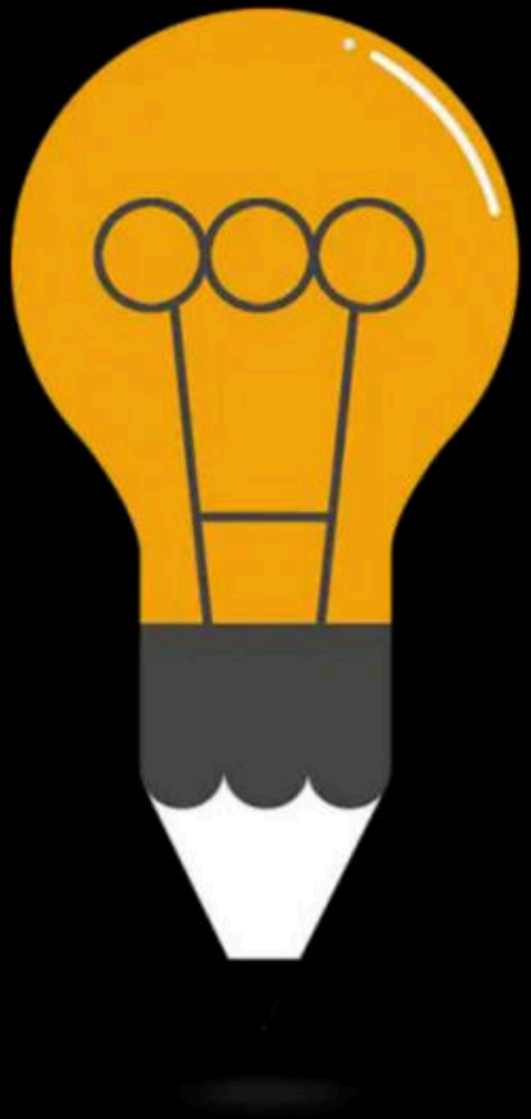

DBMS

SQL 5

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Subquery

A Subquery or Inner query or a Nested query is a query within another SQL query and embedded within the WHERE clause.

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Subquery

1. Single row subquery → returns single row of one column (one value)
2. Multiple row subquery → returns multiple rows of a column
3. correlated subquery

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Single row subQuery

_____ where (Inner Query)

=> Run Inner Query => return it's result

=> Run outer Query using result

=> Fetch the name of all customers which are from same country of customer named 'The Cracker Box'

```
select customername from customers where
country =
(select country from customers where
customername = 'The Cracker Box')
```

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Subquery

Find all such products which are having price less than price of product name 'Tofu'

```
select * from products
where price <
(select price from products where
productname = 'Tofu')
```

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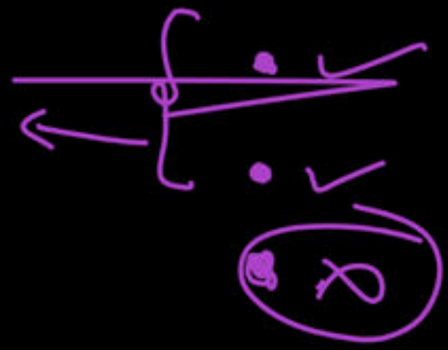
Subquery

Find the product with second highest price

productname,

```
select max(price) from products
where price <
(select max(price) from products)
```



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Subquery

Find the product with third highest price

```
select max(price) from products where price <
(select max(price) from products where price <
(select max(price) from products))
```

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Subquery

1. In
2. Any
3. All
4. Exist

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Suppliers Table

SupplierID	SupplierName	ContactName	Address	City	PostalCode	Country	Phone
1	Exotic Liquid	Charlotte Cooper	49 Gilbert St.	Londona	EC1 4SD	UK	(171) 555-2222
2	New Orleans Cajun Delights	Shelley Burke	P.O. Box 78934	New Orleans	70117	USA	(100) 555-4822
3	Grandma Kelly's Homestead	Regina Murphy	707 Oxford Rd.	Ann Arbor	48104	USA	(313) 555-5735
4	Tokyo Traders	Yoshi Nagase	9-8 Sekimai Musashino-shi	Tokyo	100	Japan	(03) 3555-5011
5	Cooperativa de Quesos 'Las Cabras'	Antonio del Valle Saavedra	Calle del Rosal 4	Oviedo	33007	Spain	(98) 598 76 54
6	Mayumi's	Mayumi Ohno	92 Setsuko Chuo-ku	Osaka	545	Japan	(06) 431-7877
7	Pavlova, Ltd.	Ian Devling	74 Rose St. Moonie Ponds	Melbourne	3058	Australia	(03) 444-2343
8	Specialty Biscuits, Ltd.	Peter Wilson	29 King's Way	Manchester	M14 GSD	UK	(161) 555-4448
9	PB Knäckebröd AB	Lars Peterson	Kaloadagatan 13	Göteborg	S-345 67	Sweden	031-987 65 43
10	Refrescos Americanas LTDA	Carlos Diaz	Av. das Americanas 12.890	São Paulo	5442	Brazil	(11) 555 4640
11	Heli Süßwaren GmbH & Co. KG	Petra Winkler	Tiergartenstraße 5	Berlin	10785	Germany	(010) 9984510
12	Plutzer Lebensmittelgroßmärkte AG	Martin Bein	Bogenallee 51	Frankfurt	60439	Germany	(069) 992755
13	Nord-Ost-Fisch Handelsgesellschaft mbH	Sven Petersen	Frahmredder 112a	Cuxhaven	27478	Germany	(04721) 8713
14	Formaggi Fortini s.r.l.	Elio Rossi	Viale Dante, 75	Ravenna	48100	Italy	(0544) 60323

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Customers Table

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
2	Ana Trujilo Emparedados y helados	Ana Trujilo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taqueria	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico
4	Around the Horn	Thomas Hardy	120 Hanover Sq.	London	WA1 1DP	UK
5	Berglunds snabbköp	Christina Berglund	Berguvsvägen 8	Luleå	S-958 22	Sweden
6	Blauer See Delikatessen	Hanna Moos	Forsterstr. 57	Mannheim	68306	Germany
7	Blondel père et fils	Frédérique Citeaux	24, place Kléber	Strasbourg	67000	France
8	Bólido Comidas preparadas	Martin Sommer	C/ Araquil, 67	Madrid	28023	Spain
9	Bon app'	Laurence Lebihans	12, rue des Bouchers	Marseille	13008	France
10	Bottom-Dollar Marketse	Elizabeth Lincoln	23 Tsawassen Blvd.	Tsawassen	T2F 8M4	Canada
11	B's Beverages	Victoria Ashworth	Fauntleroy Circus	London	EC2 5NT	UK
12	Cactus Comidas para llevar	Patricio Simpson	Cerrito 333	Buenos Aires	1010	Argentina
13	Centro comercial Moctezuma	Francisco Chang	Sierras de Granada 9993	México D.F.	05022	Mexico
14	Chop-suey Chinese	Yang Wang	Hauptstr. 29	Bern	3012	Switzerland
15	Comércio Mineiro	Pedro Afonso	Av. dos Lusíadas, 23	São Paulo	05432-043	Brazil
16	Consolidated Holdings	Elizabeth Brown	Berkeley Gardens 12 Brewery	London	WX1 6LT	UK

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Subquery

Find all customers that are from the same countries as the suppliers

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Subquery

Find all customers, that are from those countries where there is not any suppliers

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Orders Table

OrderID	CustomerID	EmployeeID	OrderDate	ShipperID
10248	90	5	1996-07-04	3
10249	81	6	1996-07-05	1
10250	34	4	1996-07-08	2
10251	84	3	1996-07-08	1
10252	76	4	1996-07-09	2
10253	34	3	1996-07-10	2
10254	14	5	1996-07-11	2
10255	68	9	1996-07-12	3
10256	88	3	1996-07-15	2
10257	35	4	1996-07-16	3
10258	20	1	1996-07-17	1
10259	13	4	1996-07-18	3
10260	55	4	1996-07-19	1
10261	61	4	1996-07-19	2
10262	65	8	1996-07-22	3
10263	20	9	1996-07-23	3
10264	24	6	1996-07-24	3
10265	7	2	1996-07-25	1
10266	87	3	1996-07-26	3

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Subquery

Find all customers, who have placed more than 2 orders

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Why subquery not Join

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Subquery

In operator can only has “Equal to” comparison

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Any with Subquery

```
SELECT column_name(s)
FROM table_name
WHERE column_name operator ANY
  (SELECT column_name
  FROM table_name
  WHERE condition);
```

The operator must be a standard comparison operator (=, <>, !=, >, >=, <, or <=)

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OrderDetails Table

OrderDetailID	OrderID	ProductID	Quantity
1	10248	11	12
2	10248	42	10
3	10248	72	5
4	10249	14	9
5	10249	51	40
6	10250	41	10
7	10250	51	35
8	10250	65	15
9	10251	22	6
10	10251	57	15
11	10251	65	20
12	10252	20	40
13	10252	33	25
14	10252	60	40
15	10253	31	20
16	10253	39	42
17	10253	49	40
18	10254	24	15
19	10254	55	21

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Any with Subquery

Find the ProductName of all those products which have their orders Quantity larger than 50

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Any with Subquery

Find the ProductName of all those products which have their productIDs less than any of the product having orders Quantity equal to 1

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ALL with Subquery

```
SELECT column_name(s)
FROM table_name
WHERE column_name operator ALL
  (SELECT column_name
  FROM table_name
  WHERE condition);
```

The operator must be a standard comparison operator (=, <>, !=, >, >=, <, or <=)

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ALL with Subquery

Find the ProductName of all those products which have their orders Quantity larger than 50

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ALL with Subquery

Find the ProductName of all those products which have their productIDs less than all of the product having orders Quantity equal to 1

Subquery

Consider the following table:

Employee (EmployeeID, FirstName, LastName, JobID, Salary, DepartmentID)

Finds all employees whose salaries are greater than the salary of all the employees in the Sales department with DepartmentID is 2:

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Subquery

Operator	Meaning
= ALL	
> ALL	
< ALL	
> = ALL	
< = ALL	

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Subquery

Operator	Meaning
= ANY	
< ANY	
< ANY	
> = ANY	
< = ANY	

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Exists with Subquery

Used to test for the existence of any record in a subquery

Returns TRUE if the subquery returns one or more records

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Exists with Subquery

```
SELECT column_name(s)
FROM table_name
WHERE EXISTS
(SELECT column_name FROM table_name WHERE condition)
```

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Exists with Subquery

Select * from Customers where CustomerID=1

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Exists with Subquery

```
Select * from customers where exists
        (Select * from Customers
          where CustomerID=1)
```

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Exists with Subquery

```
Select * from Orders where exists
        (Select * from Customers
          where CustomerID>89)
```

Exists with Subquery

```
Select * from Orders where exists
        (Select NULL)
```

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Exists with Subquery

Write a query to select all such customers record which have atleast one order placed

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Set Operators

Set operators are used to combine results from two or more SELECT statements

1. Union
2. Union all
3. Intersect
4. Minus or Except

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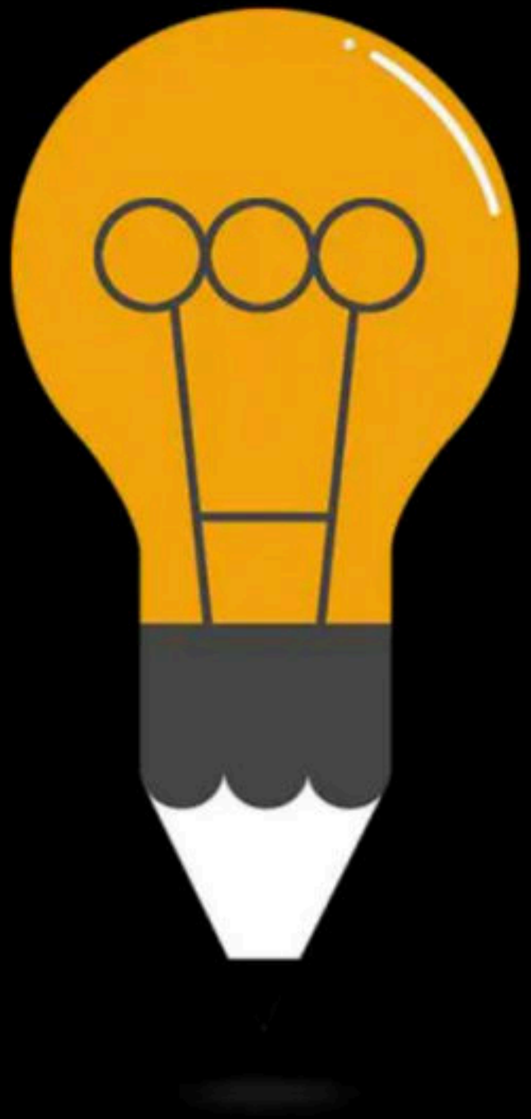

SQL PYQs

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GATE-1999

Which of the following is/are correct?

A. An SQL query automatically eliminates duplicates
B. An SQL query will not work if there are no indexes on the relations
C. SQL permits attribute names to be repeated in the same relation
D. None of the above

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GATE-1999

Consider the set of relations

- EMP (Employee-no. Dept-no, Employee-name, Salary)
- DEPT (Dept-no. Dept-name, Location)

Write an SQL query to:

a)Find all employees names who work in departments located at 'Calcutta' and whose salary is greater than Rs.50,000.

b)Calculate, for each department number, the number of employees with a salary greater than Rs. 1,00,000.

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GATE-2000

Given relations r(w, x) and s(y, z) the result of

```
select distinct w, x
from r, s
```

is guaranteed to be same as r, provided.

A. r has no duplicates and s is non-empty
B. r and s have no duplicates
C. s has no duplicates and r is non-empty
D. r and s have the same number of tuples

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GATE-2000

In SQL, relations can contain null values, and comparisons with null values are treated as unknown. Suppose all comparisons with a null value are treated as false. Which of the following pairs is not equivalent?

A. $x = 5$ $not(not(x = 5))$

B. $x = 5$ $x > 4$ and $x < 6$, where x is an integer

C. $x \neq 5$ $not(x = 5)$

D. none of the above

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GATE-2001

Consider a relation geq which represents "greater than or equal to", that is, $(x, y) \in$ geq only if $y \geq x$.

```
create table geq
(
    ib integer not null,
    ub integer not null,
    primary key ib,
    foreign key (ub) references geq on delete cascade
);
```

Which of the following is possible if tuple (x,y) is deleted?

A. A tuple (z,w) with z > y is deleted
B. A tuple (z,w) with z > x is deleted
C. A tuple (z,w) with w < x is deleted
D. The deletion of (x,y) is prohibited

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GATE-2001

Consider a relation examinee (regno, name, score), where regno is the primary key to score is a real number. Write an SQL query to list the *regno* of examinees who have a score greater than the average score.

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GATE-2001

Consider a relation examinee (regno, name, score), where regno is the primary key to score is a real number.

Suppose the relation appears (regno, centr_code) specifies the center where an examinee appears. Write an SQL query to list the centr_code having an examinee of score greater than 80.

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GATE-2003

Consider the set of relations shown below and the SQL query that follows.

Students: (Roll_number, Name, Date_of_birth)

Courses: (Course_number, Course_name, Instructor)

Grades: (Roll_number, Course_number, Grade)

```
Select distinct Name
from Students, Courses, Grades
where Students.Roll_number=Grades.Roll_number
 and Courses.Instructor = 'Korth'
 and Courses.Course_number = Grades.Course_number
 and Grades.Grade = 'A'
```

Which of the following sets is computed by the above query?

A. Names of students who have got an A grade in all courses taught by Korth
B. Names of students who have got an A grade in all courses
C. Names of students who have got an A grade in at least one of the courses taught by Korth
D. None of the above

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GATE-2004

The employee information in a company is stored in the relation

- Employee (name, sex, salary, deptName)

Consider the following SQL query

```
Select deptName
    From Employee
    Where sex = 'M'
    Group by deptName
    Having avg(salary) >
        (select avg (salary) from Employee)
```

It returns the names of the department in which

A. the average salary is more than the average salary in the company
B. the average salary of male employees is more than the average salary of all male employees in the company
C. the average salary of male employees is more than the average salary of employees in same the department
D. the average salary of male employees is more than the average salary in the company

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GATE-2004

A relational database contains two tables student and department in which student table has columns roll_no, name and dept_id and department table has columns dept_id and dept_name. The following insert statements were executed successfully to populate the empty tables:

```
Insert into department values (1, 'Mathematics')
Insert into department values (2, 'Physics')
Insert into student values (1, 'Navin', 1)
Insert into student values (2, 'Mukesh', 2)
Insert into student values (3, 'Gita', 1)
```

How many rows and columns will be retrieved by the following SQL statement?

```
Select * from student, department
```

A. 0 row and 4 columns

B. 3 rows and 4 columns

C. 3 rows and 5 columns

D. 6 rows and 5 columns

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GATE-2004

A table T1 in a relational database has the following rows and columns:

Roll no.	Marks
1	10
2	20
3	30
4	NULL

The following sequence of SQL statements was successfully executed on table T1.

```
Update T1 set marks = marks + 5
Select avg(marks) from T1
```

What is the output of the select statement?

A. 18.75 B. 20 C. 25 D. Null

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GATE-2004

Consider two tables in a relational database with columns and rows as follows:

Table: Student

Roll_no	Name	Dept_id
1	ABC	1
2	DEF	1
3	GHI	2
4	JKL	3

Table: Department

Dept_id	Dept_name
1	A
2	B
3	C

Roll_no is the primary key of the Student table, Dept_id is the primary key of the Department table and Student.Dept_id is a foreign key from Department.Dept_id

What will happen if we try to execute the following two SQL statements?

i. update Student set Dept_id = Null where Roll_on = 1
ii. update Department set Dept_id = Null where Dept_id = 1

A. Both i and ii will fail
B. i will fail but ii will succeed
C. i will succeed but ii will fail
D. Both i and ii will succeed

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GATE-2005

The relation **book** (title,price) contains the titles and prices of different books. Assuming that no two books have the same price, what does the following SQL query list?

```
select title
from book as B
where (select count(*)
    from book as T
    where T.price>B.price) < 5
```

A. Titles of the four most expensive books

B. Title of the fifth most inexpensive book

C. Title of the fifth most expensive book

D. Titles of the five most expensive books

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GATE-2005

In an inventory management system implemented at a trading corporation, there are several tables designed to hold all the information. Amongst these, the following two tables hold information on which items are supplied by which suppliers, and which warehouse keeps which items along with the stock-level of these items.

Supply = (supplierid, itemcode)
Inventory = (itemcode, warehouse, stocklevel)

For a specific information required by the management, following SQL query has been written

```
Select distinct STMP.supplierid
From Supply as STMP
Where not unique (Select ITMP.supplierid
                  From Inventory, Supply as ITMP
                  Where STMP.supplierid = ITMP.supplierid
                  And ITMP.itemcode = Inventory.itemcode
                  And Inventory.warehouse = 'Nagpur');
```

For the warehouse at Nagpur, this query will find all suppliers who

A. do not supply any item
B. supply exactly one item
C. supply one or more items
D. supply two or more items

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GATE-2006

Consider the relation account (customer, balance) where the customer is a primary key and there are no null values. We would like to rank customers according to decreasing balance. The customer with the largest balance gets rank 1. Ties are not broke but ranks are skipped: if exactly two customers have the largest balance they each get rank 1 and rank 2 is not assigned.

Query 1 :

```
select A.customer, count(B.customer)
from account A, account B
where A.balance <=B.balance
group by A.customer
```

Query 2 :

```
select A.customer, 1+count(B.customer)
from account A, account B
where A.balance < B.balance
group by A.customer
```

Consider these statements about Query 1 and Query 2.

1. Query 1 will produce the same row set as Query 2 for some but not all databases.
2. Both Query 1 and Query 2 are a correct implementation of the specification
3. Query1 is a correct implementation of the specification but Query 2 is not
4. Neither Query 1 nor Query 2 is a correct implementation of the specification
5. Assigning rank with a pure relational query takes less time than scanning in decreasing balance order assigning ranks using ODBC.

Which two of the above statements are correct?

A. 2 and 5 B. 1 and 3 C. 1 and 4 D. 3 and 5

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GATE-2006

Consider the relation enrolled (student, course) in which (student, course) is the primary key, and the relation paid (student, amount) where student is the primary key. Assume no null values and no foreign keys or integrity constraints. Given the following four queries:

Query1:

```
select student from enrolled where student in (select student from paid)
```

Query2:

```
select student from paid where student in (select student from enrolled)
```

Query3:

```
select E.student from enrolled E, paid P where E.student = P.student
```

Query4:

```
select student from paid where exists
    (select * from enrolled where enrolled.student = paid.student)
```

Which one of the following statements is correct?

A. All queries return identical row sets for any database
B. Query2 and Query4 return identical row sets for all databases but there exist databases for which Query1 and Query2 return different row sets
C. There exist databases for which Query3 returns strictly fewer rows than Query2
D. There exist databases for which Query4 will encounter an integrity violation at runtime

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GATE-2006

Consider a database with three relation instances shown below. The primary keys for the Drivers and Cars relation are *did* and *cid* respectively and the records are stored in ascending order of these primary keys as given in the tables. No indexing is available in the database.

D: Drivers relation

did	dname	rating	age
22	Karthikeyan	7	25
29	Salman	1	33
31	Boris	8	55
32	Amoldt	8	25
58	Schumacher	10	35
64	Sachin	7	35
71	Senna	10	16
74	Sachin	9	35
85	Rahul	3	25
95	Ralph	3	53

R: Reserves relation

did	Cid	day
22	101	10 – 10 – 06
22	102	10 – 10 – 06
22	103	08 – 10 – 06
22	104	07 – 10 – 06
31	102	10 – 11 – 16
31	103	06 – 11 – 16
31	104	12 – 11 – 16
64	101	05 – 09 – 06
64	102	08 – 09 – 06
74	103	08 – 09 – 06

C: Cars relation

Cid	Cname	colour
101	Renault	blue
102	Renault	red
103	Ferrari	green
104	Jaguar	red

What is the output of the following SQL query?

```
select D.dname
from Drivers D
where D.did in  (
                    select R.did
                    from Cars C, Reserves R
                    where R.cid = C.cid and C.colour = 'red'
                    intersect
                    select R.did
                    from Cars C, Reserves R
                    where R.cid  = C.cid and C.colour = 'green'
                     )
```

A. Karthikeyan, Boris
B. Sachin, Salman
C. Karthikeyan, Boris, Sachin
D. Schumacher, Senna

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GATE-2007

Consider the table **employee**(empId, name, department, salary) and the two queries Q_1, Q_2 below. Assuming that department 5 has more than one employee, and we want to find the employees who get higher salary than anyone in the department 5, which one of the statements is **TRUE** for any arbitrary employee table?

Q_1 :
```
Select e.empId
From employee e
Where not exists
    (Select * From employee s Where s.department = "5" and s.salary >= e.salary)
```

Q_2 :
```
Select e.empId
From employee e
Where e.salary > Any
    (Select distinct salary From employee s Where s.department = "5")
```

A. Q_1 is the correct query

B. Q_2 is the correct query

C. Both Q_1 and Q_2 produce the same answer

D. Neither Q_1 nor Q_2 is the correct query

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GATE-2008

Student (school-id, sch-roll-no, sname, saddress)
School (school-id, sch-name, sch-address, sch-phone)
Enrolment(school-id sch-roll-no, erollno, examname)
ExamResult(erollno, examname, marks)

What does the following SQL query output?

```
SELECT sch-name, COUNT (*)
FROM School C, Enrolment E, ExamResult R
WHERE E.school-id = C.school-id
AND
E.examname = R.examname AND E.erollno = R.erollno
AND
R.marks = 100 AND S.school-id IN (SELECT school-id
                                  FROM student
                                  GROUP BY school-id
                                   HAVING COUNT (*) > 200)
GROUP By school-id
```

A. for each school with more than 200 students appearing in exams, the name of the school and the number of 100s scored by its students
B. for each school with more than 200 students in it, the name of the school and the number of 100s scored by its students
C. for each school with more than 200 students in it, the name of the school and the number of its students scoring 100 in at least one exam
D. nothing; the query has a syntax error

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GATE-2009

Consider the following relational schema:

Suppliers(sid:integer, sname:string, city:string, street:string)

Parts(pid:integer, pname:string, color:string)

Catalog(sid:integer, pid:integer, cost:real)

Consider the following relational query on the above database:

```
SELECT S.sname
FROM    Suppliers S
WHERE S.sid NOT IN (SELECT C.sid
                    FROM Catalog C
                    WHERE C.pid NOT IN (SELECT P.pid
                                        FROM Parts P
                                        WHERE P.color<>'blue'))
```

Assume that relations corresponding to the above schema are not empty. Which one of the following is the correct interpretation of the above query?

A. Find the names of all suppliers who have supplied a non-blue part.

B. Find the names of all suppliers who have not supplied a non-blue part.

C. Find the names of all suppliers who have supplied only non-blue part.

D. Find the names of all suppliers who have not supplied only blue parts.

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GATE-2010

A relational schema for a train reservation database is given below.

- **passenger(pid, pname, age)**
- **reservation(pid, class, tid)**

Passenger

pid	pname	Age
0	Sachine	65
1	Rahul	66
2	Sourav	67
3	Anil	69

Reservation

pid	class	tid
0	AC	8200
1	AC	8201
2	SC	8201
5	AC	8203
1	SC	8204
3	AC	8202

What **pids** are returned by the following SQL query for the above instance of the tables?

```
SELECT pid
FROM Reservation
WHERE class='AC' AND
    EXISTS (SELECT *
            FROM Passenger
            WHERE age>65 AND
            Passenger.pid=Reservation.pid)
```

A. 1, 0 B. 1, 2 C. 1, 3 D. 1, 5

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GATE-2011

Consider a database table T containing two columns X and Y each of type integer. After the creation of the table, one record (X=1, Y=1) is inserted in the table.

Let MX and MY denote the respective maximum values of X and Y among all records in the table at any point in time. Using MX and MY, new records are inserted in the table 128 times with X and Y values being MX+1, 2*MY+1 respectively. It may be noted that each time after the insertion, values of MX and MY change.

What will be the output of the following SQL query after the steps mentioned above are carried out?

```
SELECT Y FROM T WHERE X=7;
```

A. 127 B. 255 C. 129 D. 257

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GATE-2011

Database table by name Loan_Records is given below.

Borrower	Bank_Manager	Loan_Amount
Ramesh	Sunderajan	10000.00
Suresh	Ramgopal	5000.00
Mahesh	Sunderajan	7000.00

What is the output of the following SQL query?

```
SELECT count(*)
FROM (
    SELECT Borrower, Bank_Manager FROM Loan_Records) AS S
    NATURAL JOIN
    (SELECT Bank_Manager, Loan_Amount FROM Loan_Records) AS T
);
```

A. 3 B. 9 C. 5 D. 6

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GATE-2012

Which of the following statements are **TRUE** about an SQL query?

P : An SQL query can contain a HAVING clause even if it does not have a GROUP BY clause
Q : An SQL query can contain a HAVING clause only if it has a GROUP BY clause
R : All attributes used in the GROUP BY clause must appear in the SELECT clause
S : Not all attributes used in the GROUP BY clause need to appear in the SELECT clause

A. P and R B. P and S C. Q and R D. Q and S

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GATE-2012

Consider the following relations A, B and C :

A

Id	Name	Age
12	Arun	60
15	Shreya	24
99	Rohit	11

B

Id	Name	Age
15	Shreya	24
25	Hari	40
98	Rohit	20
99	Rohit	11

C

Id	Phone	Area
10	2200	02
99	2100	01

How many tuples does the result of the following SQL query contain?

```
SELECT A.Id
FROM A
WHERE A.Age > ALL (SELECT B.Age
                   FROM B
                   WHERE B.Name = 'Arun')
```

A. 4 B. 3 C. 0 D. 1

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GATE-2014

Given the following statements:

S1: A foreign key declaration can always be replaced by an equivalent check assertion in SQL.

S2: Given the table $R(a, b, c)$ where a and b together form the primary key, the following is a valid table definition.

```
CREATE TABLE S (
     a INTEGER,
     d INTEGER,
     e INTEGER,
     PRIMARY KEY (d),
     FOREIGN KEY (a) references R)
```

Which one of the following statements is **CORRECT**?

A. S1 is TRUE and S2 is FALSE
B. Both S1 and S2 are TRUE
C. S1 is FALSE and S2 is TRUE
D. Both S1 and S2 are FALSE

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GATE-2014

Given the following schema:

employees(emp-id, first-name, last-name, hire-date, dept-id, salary)

departments(dept-id, dept-name, manager-id, location-id)

You want to display the last names and hire dates of all latest hires in their respective departments in the location ID 1700. You issue the following query:

```
SQL>SELECT last-name, hire-date
    FROM employees
    WHERE (dept-id, hire-date) IN
    (SELECT dept-id, MAX(hire-date)
    FROM employees JOIN departments USING(dept-id)
    WHERE location-id =1700
    GROUP BY dept-id);
```

What is the outcome?

A. It executes but does not give the correct result
B. It executes and gives the correct result.
C. It generates an error because of pairwise comparison.
D. It generates an error because of the GROUP BY clause cannot be used with table joins in a sub-query.

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GATE-2014

SQL allows duplicate tuples in relations, and correspondingly defines the multiplicity of tuples in the result of joins. Which one of the following queries always gives the same answer as the nested query shown below:

```
select * from R where a in (select S.a from S)
```

A. select R.* from R, S where R.a=S.a
B. select distinct R.* from R,S where R.a=S.a
C. select R.* from R,(select distinct a from S) as S1 where R.a=S1.a
D. select R.* from R,S where R.a=S.a and is unique R

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GATE-2014

Consider the following relational schema:

employee (empId,empName,empDept)

customer (custId,custName,salesRepId,rating)

salesRepId is a foreign key referring to **empId** of the employee relation. Assume that each employee makes a sale to at least one customer. What does the following query return?

```
SELECT empName   FROM employee E
WHERE NOT EXISTS (SELECT custId
    FROM customer C
    WHERE C.salesRepId = E.empId
    AND C.rating <> 'GOOD');
```

A. Names of all the employees with at least one of their customers having a 'GOOD' rating.
B. Names of all the employees with at most one of their customers having a 'GOOD' rating.
C. Names of all the employees with none of their customers having a 'GOOD' rating.
D. Names of all the employees with all their customers having a 'GOOD' rating.

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GATE-2015

Consider the following relation:

Student

Roll_No	Student_Name
1	Raj
2	Rohit
3	Raj

Performance

Roll_No	Course	Marks
1	Math	80
1	English	70
2	Math	75
3	English	80
2	Physics	65
3	Math	80

Consider the following SQL query.

```
SELECT S.Student_Name, Sum(P. Marks)
FROM Student S, Performance P
WHERE S.Roll_No= P.Roll_No
GROUP BY S.STUDENT_Name
```

The numbers of rows that will be returned by the SQL query is_____.

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GATE-2015

Consider the following relation

Cinema(*theater, address, capacity*)

Which of the following options will be needed at the end of the SQL query

```
SELECT P1.address
FROM Cinema P1
```

such that it always finds the addresses of theaters with maximum capacity?

A.
```
WHERE P1.capacity >= All (select P2.capacity from Cinema P2)
```

B.
```
WHERE P1.capacity >= Any (select P2.capacity from Cinema P2)
```

C.
```
WHERE P1.capacity > All (select max(P2.capacity) from Cinema P2)
```

D.
```
WHERE P1.capacity > Any (select max(P2.capacity) from Cinema P2)
```

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GATE-2016

Consider the following database table named water_schemes:

Water_schemes

scheme_no	district_name	capacity
1	Ajmer	20
1	Bikaner	10
2	Bikaner	10
3	Bikaner	20
1	Churu	10
2	Churu	20
1	Dungargarh	10

The number of tuples returned by the following SQL query is _____.

```
with total (name, capacity) as
    select district_name, sum (capacity)
    from water_schemes
    group by district_name
with total_avg (capacity) as
   select avg (capacity)
   from total
select name
   from total, total_avg
   where total.capacity ≥ total_avg.capacity
```

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GATE-2017

Consider a database that has the relation schema EMP (EmpId, EmpName, and DeptName). An instance of the schema EMP and a SQL query on it are given below:

EMP

EmpId	EmpName	DeptName
1	XYA	AA
2	XYB	AA
3	XYC	AA
4	XYD	AA
5	XYE	AB
6	XYF	AB
7	XYG	AB
8	XYH	AC
9	XYI	AC
10	XYJ	AC
11	XYK	AD
12	XYL	AD
13	XYM	AE

```
SELECT AVG(EC.Num)
FROM EC
WHERE (DeptName, Num) IN
    (SELECT DeptName, COUNT(EmpId) AS
                      EC(DeptName, Num)
    FROM EMP
    GROUP BY DeptName)
```

The output of executing the SQL query is _____ .

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GATE-2017

Consider the following database table named top_scorer.

top_scorer

player	country	goals
Klose	Germany	16
Ronaldo	Brazil	15
G Muller	Germany	14
Fontaine	France	13
Pele	Brazil	12
Klinsmann	Germany	11
Kocsis	Hungary	11
Batistuta	Argentina	10
Cubillas	Peru	10
Lato	Poland	10
Lineker	England	10
T Muller	Germany	10
Rahn	Germany	10

Consider the following SQL query:

```
SELECT ta.player FROM top_scorer AS ta
WHERE ta.goals >ALL (SELECT tb.goals
    FROM top_scorer AS tb
    WHERE tb.country = 'Spain')
AND ta.goals > ANY (SELECT tc.goals
    FROM top_scorer AS tc
    WHERE tc.country='Germany')
```

The number of tuples returned by the above SQL query is _____

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GATE-2018

Consider the following two tables and four queries in SQL.

Book (isbn, bname), Stock(isbn, copies)

Query 1:

```
SELECT B.isbn, S.copies FROM Book B INNER JOIN Stock S ON B.isbn=S.isbn;
```

Query 2:

```
SELECT B.isbn, S.copies FROM Book B LEFT OUTER JOIN Stock S ON B.isbn=S.isbn;
```

Query 3:

```
SELECT B.isbn, S,copies FROM Book B RIGHT OUTER JOIN Stock S ON B.isbn=S.isbn
```

Query 4:

```
SELECT B.isbn, S.copies FROM Book B FULL OUTER JOIN Stock S ON B.isbn=S.isbn
```

Which one of the queries above is certain to have an output that is a superset of the outputs of the other three queries?

A. Query 1 B. Query 2 C. Query 3 D. Query 4

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GATE-2019

A relational database contains two tables Student and Performance as shown below:

Table: student

Roll_no	Student_name
1	Amit
2	Priya
3	Vinit
4	Rohan
5	Smita

Table: Performance

Roll_no	Subject_code	Marks
1	A	86
1	B	95
1	C	90
2	A	89
2	C	92
3	C	80

The primary key of the Student table is Roll_no. For the performance table, the columns Roll_no. and Subject_code together form the primary key. Consider the SQL query given below:

```
SELECT S.Student_name, sum(P.Marks) FROM Student S, Performance P WHERE P.Marks >84 GROUP BY S.Student_name;
```

The number of rows returned by the above SQL query is _____

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Subquery

Find all customers that are from the same countries as the suppliers

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Subquery

Find all customers, that are from those countries where there is not any suppliers

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Orders Table

OrderID	CustomerID	EmployeeID	OrderDate	ShipperID
10248	90	5	1996-07-04	3
10249	81	6	1996-07-05	1
10250	34	4	1996-07-08	2
10251	84	3	1996-07-08	1
10252	76	4	1996-07-09	2
10253	34	3	1996-07-10	2
10254	14	5	1996-07-11	2
10255	68	9	1996-07-12	3
10256	88	3	1996-07-15	2
10257	35	4	1996-07-16	3
10258	20	1	1996-07-17	1
10259	13	4	1996-07-18	3
10260	55	4	1996-07-19	1
10261	61	4	1996-07-19	2
10262	65	8	1996-07-22	3
10263	20	9	1996-07-23	3
10264	24	6	1996-07-24	3
10265	7	2	1996-07-25	1
10266	87	3	1996-07-26	3

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Subquery

Find all customers, who have placed more than 2 orders

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Why subquery not Join

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Subquery

In operator can only has “Equal to” comparison

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6th July

11 am

4 PM