PostgreSQL

Lesson 4: PostgreSQL - Joins and Subqueries

Lesson Objectives

In this lesson, you will learn about:

- Joins:
  - CROSS JOINS
  - INNER JOIN
  - LEFT OUTER JOIN
  - RIGHT OUTER JOIN
  - FULL OUTER JOIN
- Subqueries
  - Single row
  - Multirow
- Set operators
  - Union, Union All, Intersect, Except

JOINS

- To combine data from two or more tables in a database we can use Joins
- We can combine fields from two tables by using values common to each
- Types of joins in PostgreSQL:
  - CROSS JOINS
  - INNER JOIN
  - LEFT OUTER JOIN
  - RIGHT OUTER JOIN
  - FULL OUTER JOIN

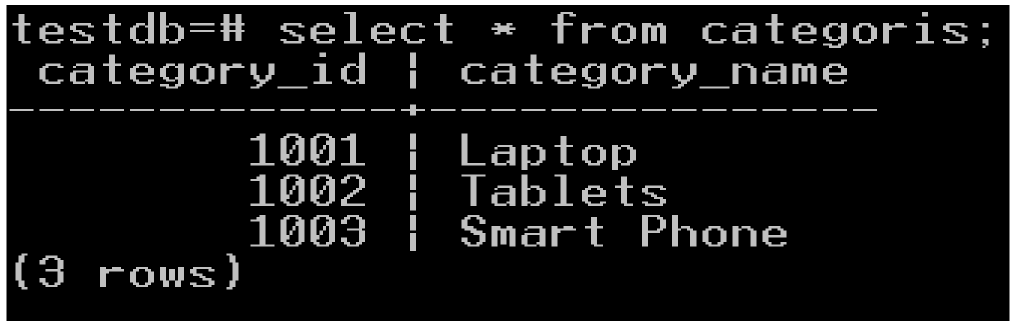
CROSS JOIN

- CROSS JOIN – Every row from first table matches with every row in second table
- If input tables have x and y rows then result will have x*y rows
- So if we have to show employee table along with department names

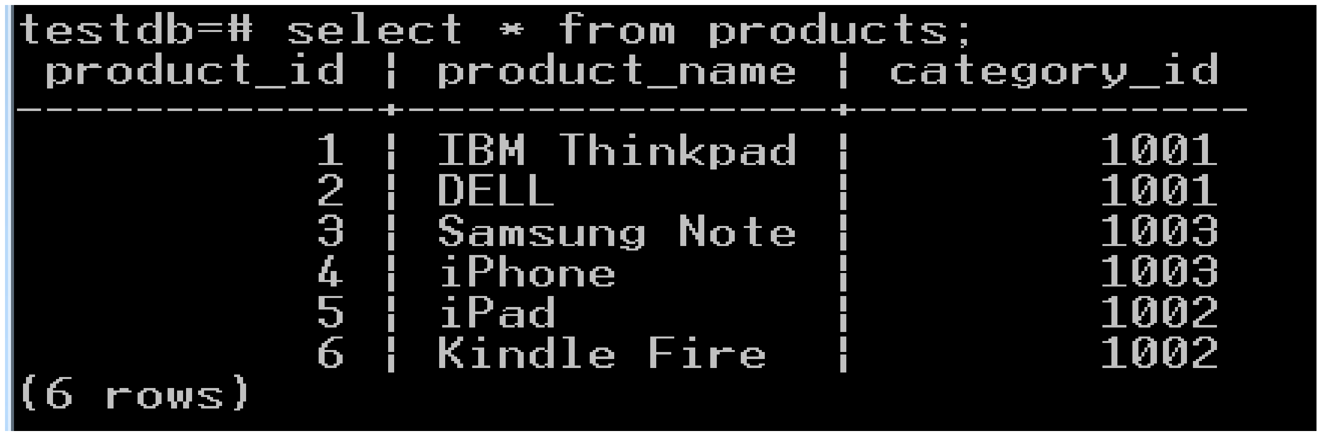
```
SELECT empid, name, dname FROM employee CROSS JOIN department;
```

NATURAL JOIN

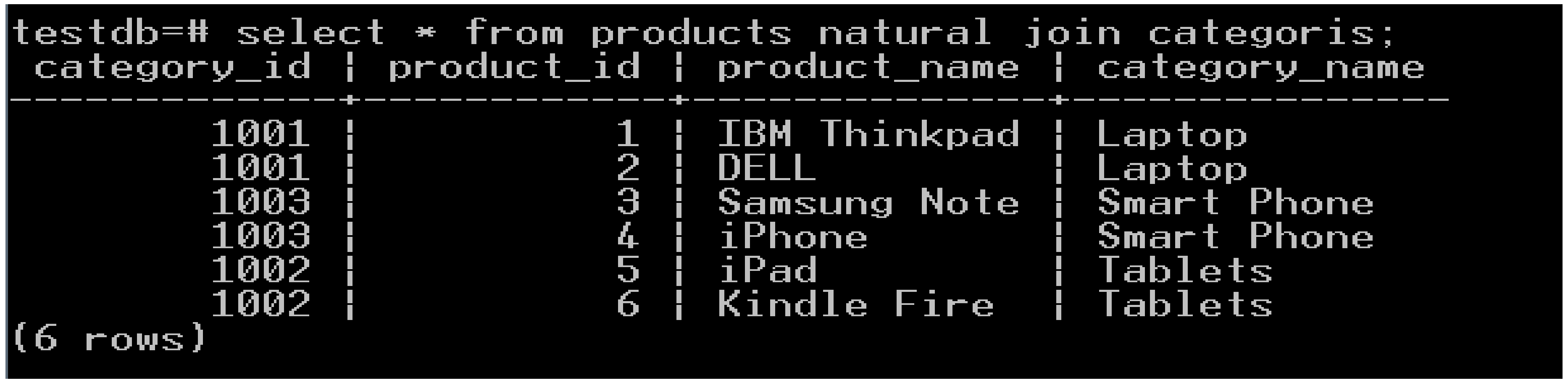
- NATURAL JOIN – Natural join can be used to access the data from two or more tables
- A natural join is a join that creates an implicit join based on the same column names in the joined tables



```
testdb=# select * from categoris;
 category_id | category_name
-------------+---------------
        1001 | Laptop
        1002 | Tablets
        1003 | Smart Phone
(3 rows)
```



```
testdb=# select * from products;
 product_id | product_name   | category_id
------------+----------------+-------------
          1 | IBM Thinkpad   |        1001
          2 | DELL           |        1001
          3 | Samsung Note   |        1003
          4 | iPhone         |        1003
          5 | iPad           |        1002
          6 | Kindle Fire    |        1002
(6 rows)
```



```
testdb=# select * from products natural join categoris;
 category_id | product_id | product_name   | category_name
-------------+------------+----------------+---------------
        1001 |          1 | IBM Thinkpad   | Laptop
        1001 |          2 | DELL           | Laptop
        1003 |          3 | Samsung Note   | Smart Phone
        1003 |          4 | iPhone         | Smart Phone
        1002 |          5 | iPad           | Tablets
        1002 |          6 | Kindle Fire    | Tablets
(6 rows)
```

INNER JOIN

- INNER JOIN :
- A INNER JOIN creates a new result table by combining column values of two tables (table1 and table2) based upon the join-predicate
- The query compares each row of table1 with each row of table2 to find all pairs of rows, which satisfy the join-condition
- When the join-condition is satisfied, column values for each matched pair of rows of table1 and table2 are combined into a result row
- INNER JOIN is the most common type of join and is the default type of join. You can use INNER keyword optionally
- Example:

```
 SELECT empid, name, dname FROM employee INNER JOIN department
ON employee.deptno=department.deptid;
```

LEFT OUTER JOIN

- OUTER JOIN :
- Outer join is extension of INNER join
- PostgreSQL supports 3 types of OUTER joins:
  - LEFT
  - RIGHT
  - FULL
- LEFT OUTER JOIN
- First INNER join is performed
- Then, for each row in table T1 that does not satisfy the join condition with any row in table T2, a row is added with null values in columns of T2
- Example:

```
SELECT empid, name, dname FROM department
LEFT OUTER JOIN employee ON employee.deptno=department.deptid;
```

RIGHT OUTER JOIN, FULL OUTER JOIN

- This is similar to LEFT OUTER Join, only that it adds null values to match the table on right side
- Example:

```
SELECT empid, name, dname FROM employee
RIGHT OUTER JOIN department ON employee.deptno=department.deptid;
```

- FULL OUTER JOIN:
- Rows on right side table that do not satisfy the join condition with table on left side, a null value is added
- Also, rows on left side that do not satisfy the join condition with table on right side, a null value is added
- So it is called as full outer join

```
SELECT empid, name, dname FROM employee
FULL OUTER JOIN department ON employee.deptno=department.deptid;
```

Subqueries

- How can we get data about employees working in same department as ‘Divya’?
- This can be solved in following way:
  - Which department does ‘Divya’ work?

```
SELECT deptno FROM employee where name=‘Divya’;            => 30
```

  - Who all are working in department 30?

```
SELECT * FROM employee where deptno=30;
```

- Running 2 queries gives required solution.
- This can be done using 1 query using subqueries:

```
SELECT * FROM employee
where deptno=(SELECT deptno FROM employee where name=‘Divya’);
```

Subqueries

- Subquery is a query with in a query – inner query or nested query
- Subquery returns data which in turn is used to restrict the rows in outer query
- Subquery must follow some rules:
  - It must be enclosed in a parentheses
  - Subquery can use only one column in select clause unless multiple columns are in main query
  - Order by clause cannot be used in the subquery
  - Subquery that returns single value can use single row operators like >,<,=, <= and >=
  - Subquery that returns multiple values can use multi row operators like IN, ANY and ALL

Subqueries – returning multiple values

- If subquery returns multiple values, then we have to use multirow operators
- Multirow operators are as follows:
  - IN
  - ANY
  - ALL

  - IN – to match every value in the return list
  - Example: Get data about employees earning same salaries as that in department 10

```
SELECT * FROM employee
where salary  IN (SELECT salary FROM employee where deptno=10);
```

Subqueries – returning multiple values

- ANY – to check if row value is > or < any one value in the return list
- Example: Get data about employees earning salaries > any employee from department 10

```
SELECT * FROM employee
where salary  >any (SELECT salary FROM employee where deptno=10);
```

- ALL – to check if row value is > or < all the values in return list
- Example: Get data about employees earning salaries > all employees from department 10

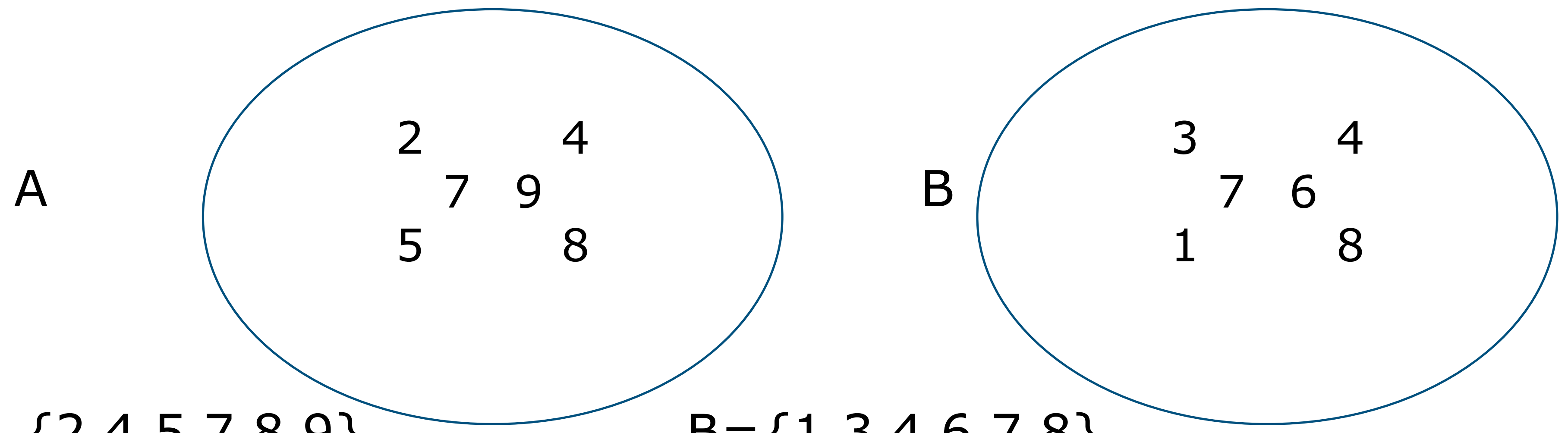
```
SELECT * FROM employee
where salary  >all (SELECT salary FROM employee where deptno=10);
```

SET Operators

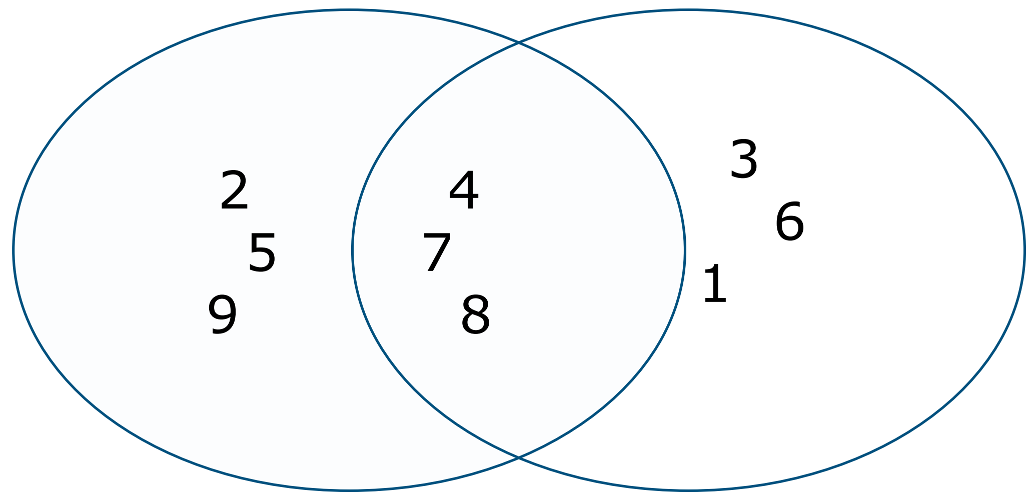
- Types of SET operators in PostgreSQL:
  - UNION
  - INTERSECT
  - EXCEPT

UNION Operators

- According to SET theory



- A = {2,4,5,7,8,9}   B={1,3,4,6,7,8}



A UNION B = {1,2,3,4,5,6,7,8,9}

A UNIONALL B={1,2,3,4,4,5,6,7,7,8,8,9}

UNION operator

- UNION Operator:
- It combines result set of two or more queries into a single result
- Rules applied to the queries using UNION operator:
  - Both queries must return the same number of columns.
  - The corresponding columns in the queries must have compatible data types
  - Example: show employee names who work in department 10 and also those who get salary >30000

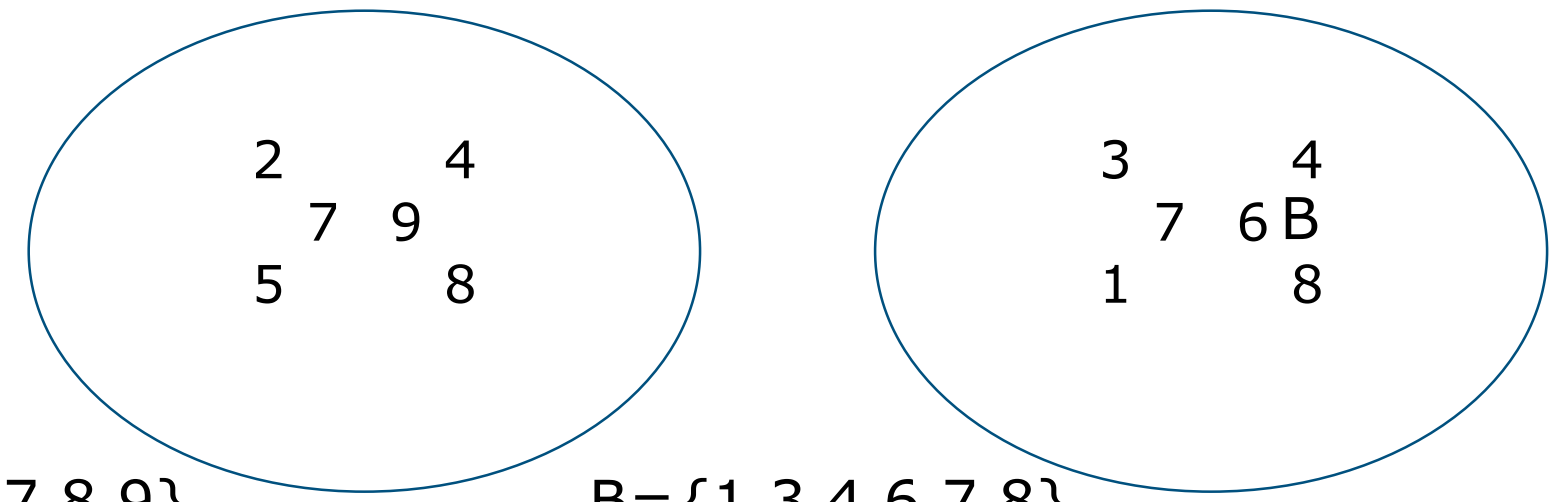
```
SELECT empid, name FROM employee where deptno=10
UNION
SELECT empid, name FROM employee where salary >30000;
```

UNION operator

- UNION removes all duplicate rows
- If you need to include duplicate rows also then we have to use UNION ALL
- If you have to sort the data then use ORDER BY clause in the last query

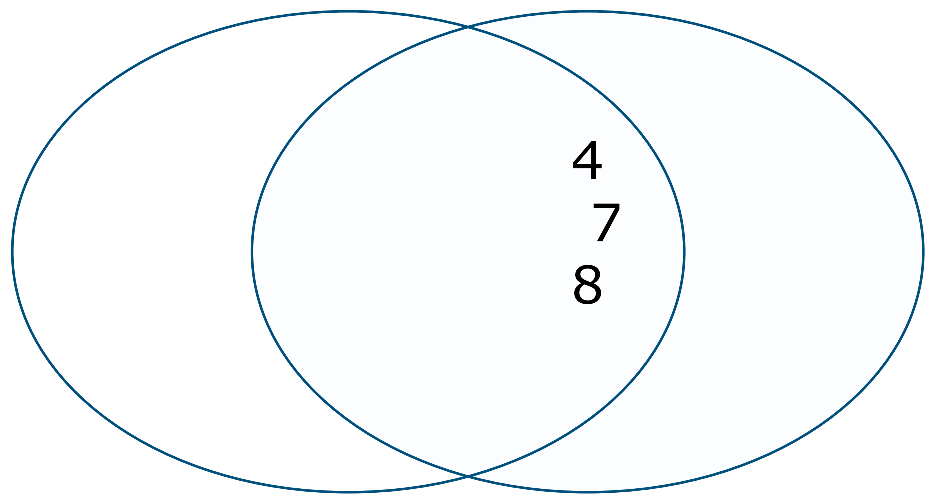
INTERSECT Operators

- According to SET theory



A = {2,4,5,7,8,9}

B={1,3,4,6,7,8}



A INTERSECT B = {4, 7,8}

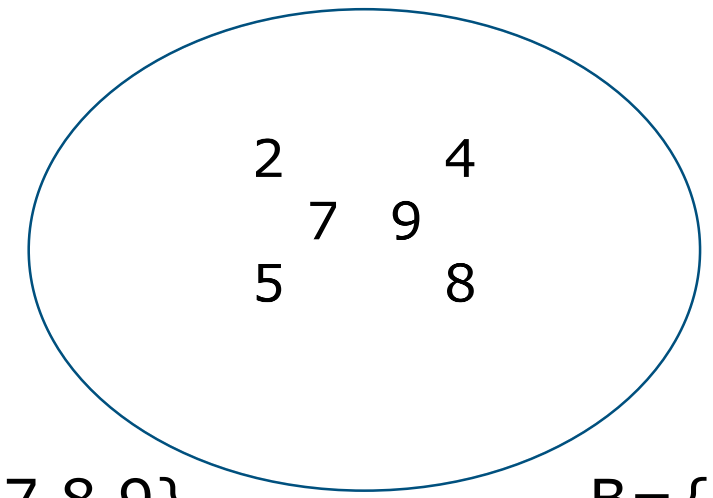
INTERSECT operator

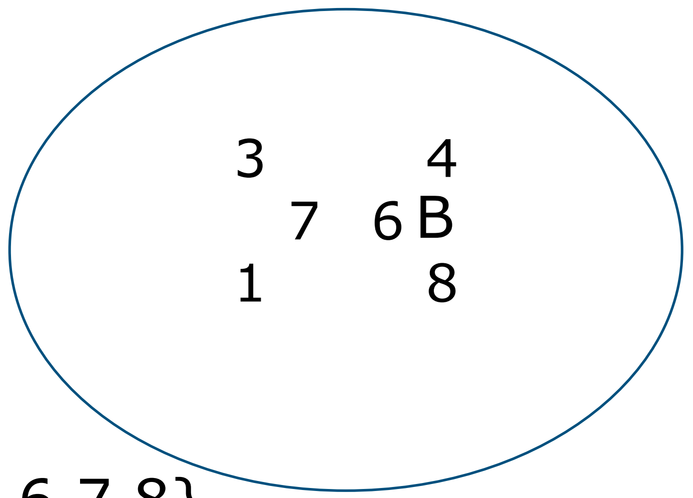
- INTERSECT Operator:
- It combines result set of two or more queries into a single result
- It returns all the rows in both result sets i.e. common rows in both

```
 SELECT empid, name, deptno, salary FROM employee where deptno=10
UNION
SELECT empid, name, deptno, salary FROM employee where salary >30000;
```

EXCEPT Operators

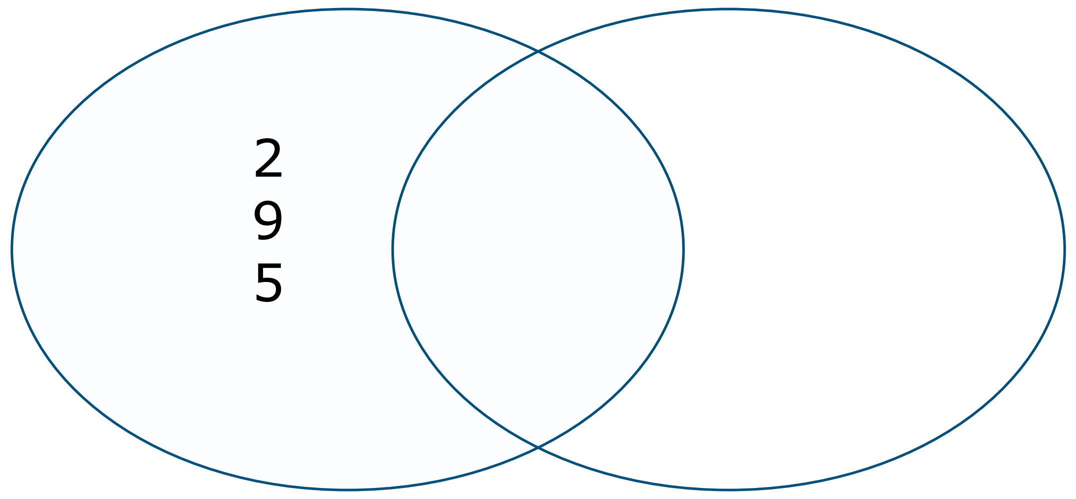
- According to SET theory





A = {2,4,5,7,8,9}

B={1,3,4,6,7,8}



A INTERSECT B = {4, 7,8}

EXCEPT operator

- EXCEPT Operator:
- It combines result set of two or more queries into a single result
  - It returns all the rows in both result sets i.e. common rows in both
  - EXCEPT operator to return the rows in the first query that do not appear in the output of the second query
- To combine the queries using EXCEPT operator, you must obey the following rules:
  - The number of columns and their orders must be the same in the two queries.
  - The data types of the respective columns must be compatible.

```
 SELECT empid, name, deptno, salary FROM employee where deptno=10
EXCEPT
SELECT empid, name, deptno, salary FROM employee where salary >30000;
```

Demo

Using all Join types

Create subqueries

Using set operators

Lab

Lab 3

Summary

In this lesson, you have learn about:

- Joins are used to fetch data from more then one table
- Different types of joins are inner join, outer join – left, right and full, cross join and self join
- Subquery is a query within a query. Inner query returns a result which is used by outer query.
- Single row sub query uses single row operator and multirow operator uses multirow operators
- Set operators are used to combine results of two different queries

Review Question

Question 1: If we try to fetch data from two different tables without writing join condition then we call it as ________.

Question 2: We need result set from first query which does not exist in second query, then we use which of the following operator?

- UNION
- UNION ALL
- INTERSECT
- EXCEPT

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