Instructor Notes:

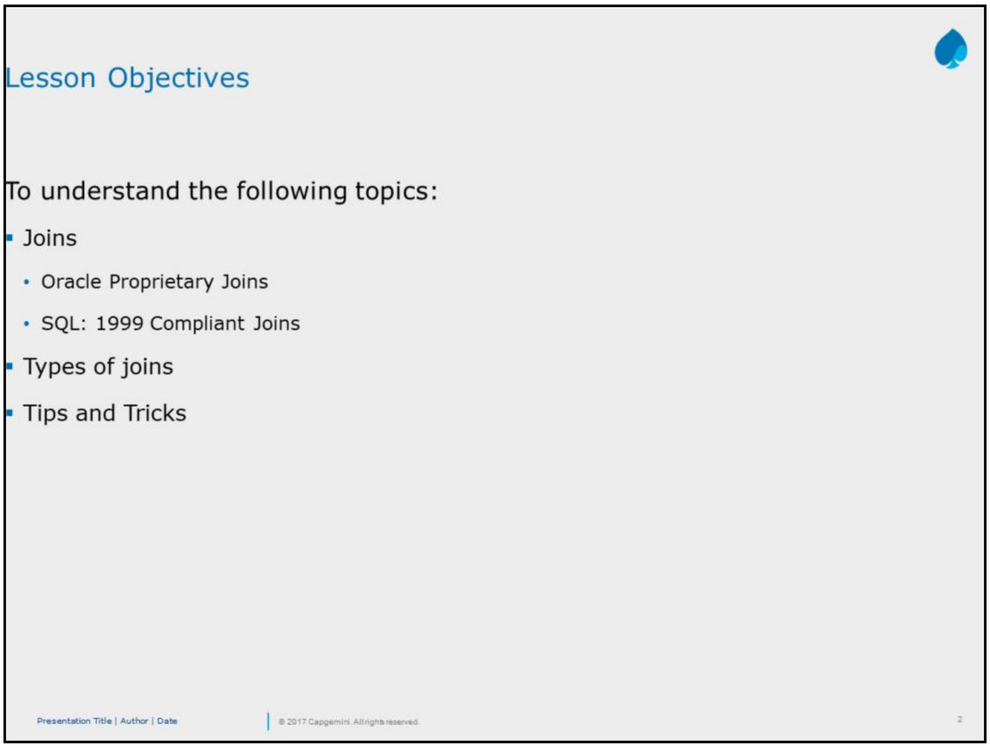
DBMS/SQL

Lesson 06 Joins

Capgemini

Instructor Notes:

None



Lesson Objectives

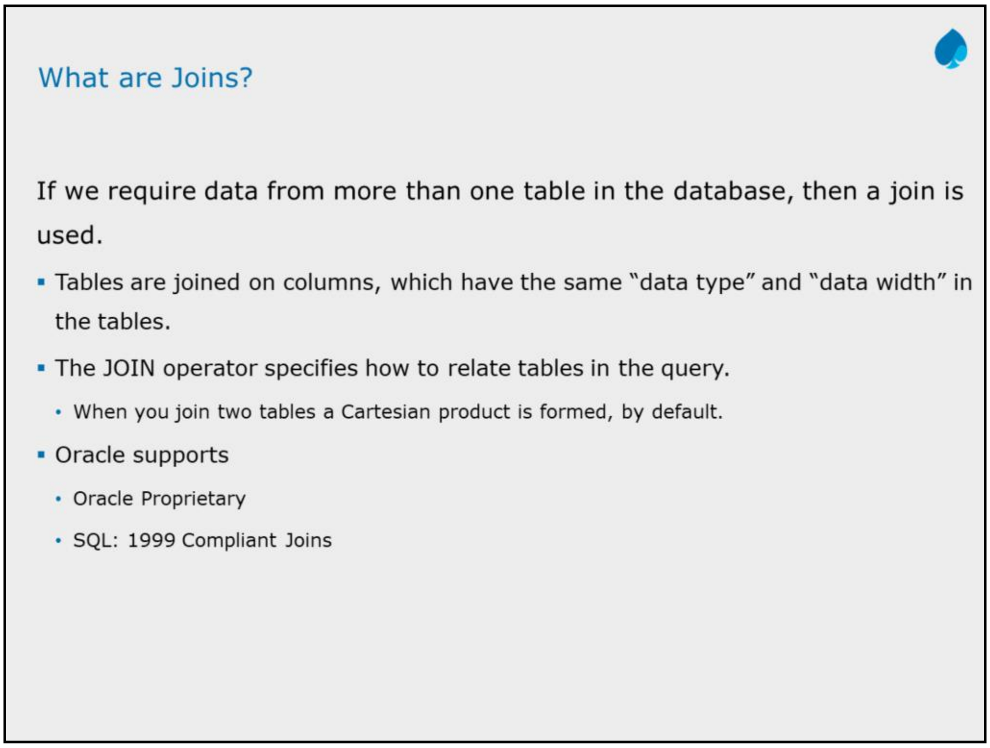
To understand the following topics:

- Joins
  - Oracle Proprietary Joins
  - SQL: 1999 Compliant Joins
- Types of joins
- Tips and Tricks

Presentation Title | Author | Date

Instructor Notes:

None



What are Joins?

If we require data from more than one table in the database, then a join is used.

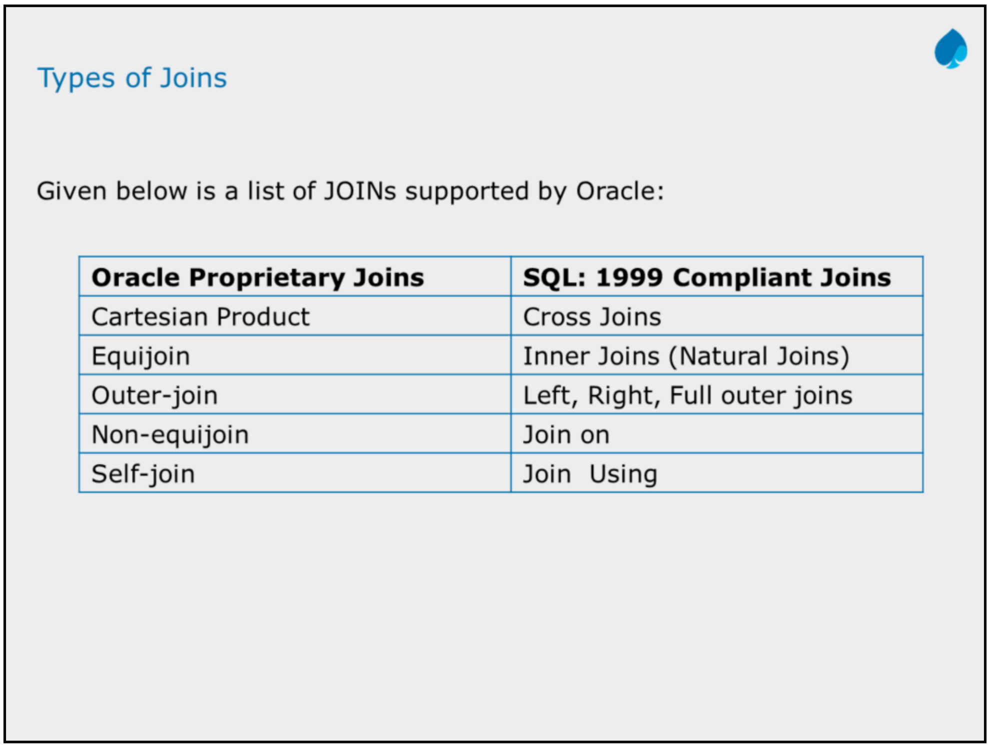
- Tables are joined on columns, which have the same "data type" and "data width" in the tables.
- The JOIN operator specifies how to relate tables in the query.
  - When you join two tables a Cartesian product is formed, by default.
- Oracle supports
  - Oracle Proprietary
  - SQL: 1999 Compliant Joins

<u>Joins</u>:

- JOINS make it possible to select data from more than one table by means of a single statement.
- The joining of tables is done in SQL by specifying the tables to be joined in the FROM clause of the SELECT statement.
- When you join two tables a Cartesian product is formed.
- The conditions for selecting rows from the product are determined by the predicates in the WHERE clause.
- All the subsequent WHERE, GROUP BY, HAVING, ORDER BY clauses work on this product.
- If the same table is used more than once in a FROM clause then "aliases" are used to remove conflicts and ambiquities. They are also called as "co-relation names" or "range variables".

Instructor Notes:

- At the moment, do not get into details of all the Types of JOINS.
- Explain each JOIN one by one, as is done in the following slides.



Types of Joins

Given below is a list of JOINs supported by Oracle:

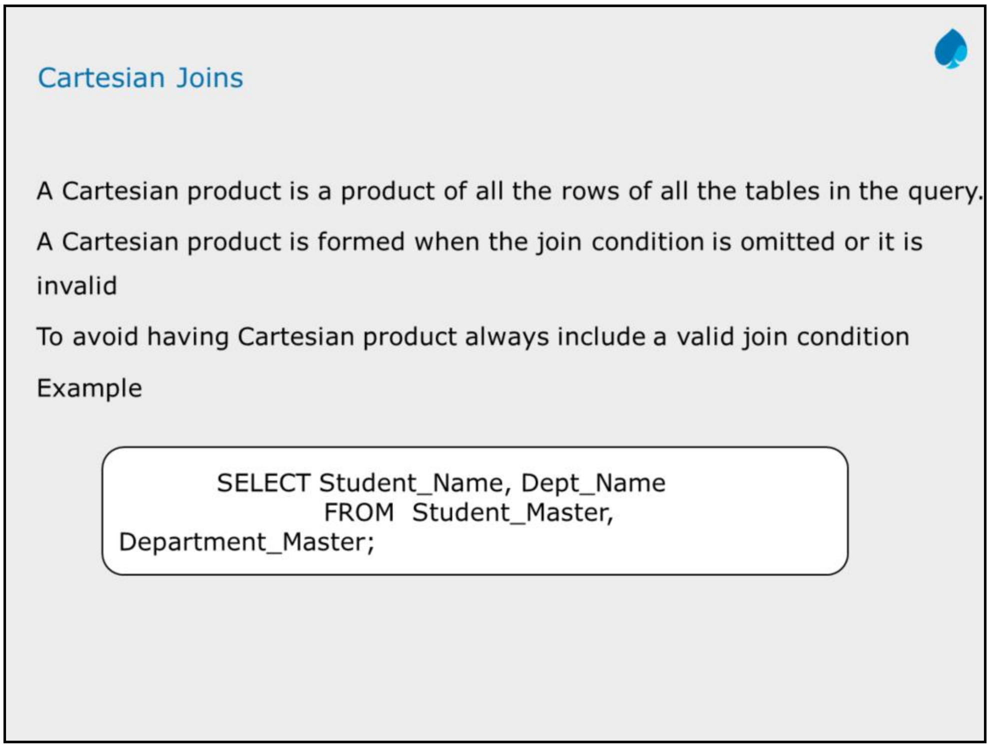
Oracle Proprietary Joins	**SQL: 1999 Compliant Joins**
Cartesian Product	Cross Joins
Equijoin	Inner Joins (Natural Joins)
Outer-join	Left, Right, Full outer joins
Non-equijoin	Join on
Self-join	Join Using

Note:

- Oracle9i onwards offers JOIN syntax that is SQL: 1999 compliant.
- Prior to the 9i release, the JOIN syntax was different from the ANSI standards.
- The new SQL: 1999 compliant JOIN syntax does not offer any performance benefits over the Oracle proprietary JOIN syntax that existed in prior releases.

Instructor Notes:

A Cartesian product is sometimes useful when you want to generate large amount of data for testing purpose



Cartesian Joins

A Cartesian product is a product of all the rows of all the tables in the query.

A Cartesian product is formed when the join condition is omitted or it is invalid

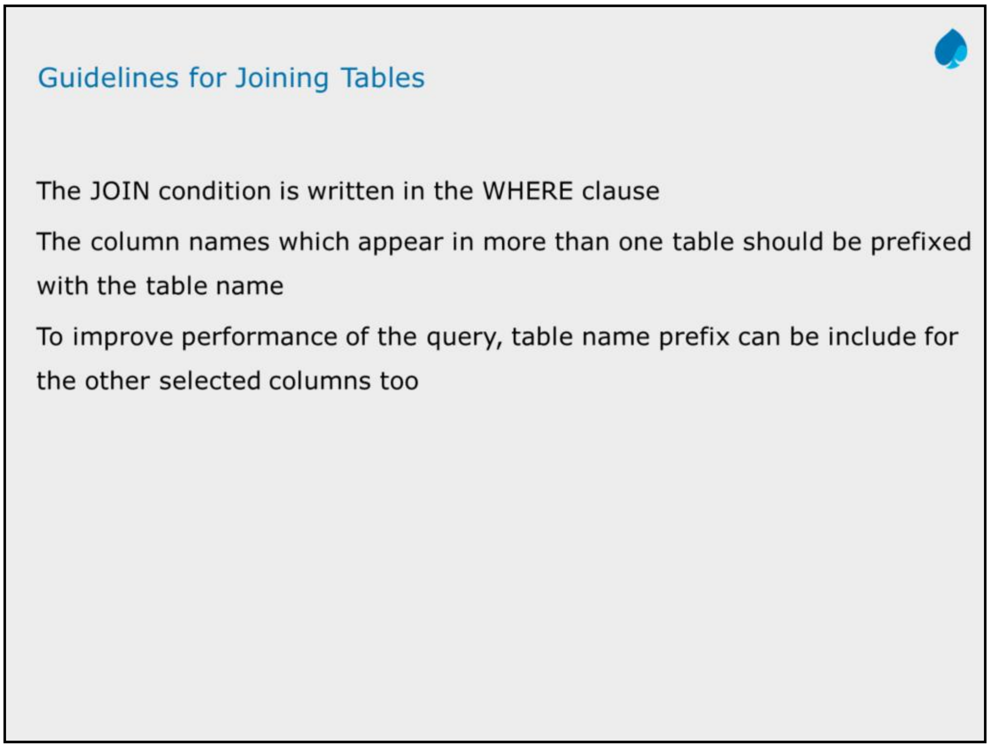
To avoid having Cartesian product always include a valid join condition

Example

```
            SELECT Student_Name, Dept_Name
                       FROM  Student_Master,
Department_Master;
```

Cartesian Product
Whenever a join condition is completely omitted or is invalid a Cartesian product results. It displays all combinations of rows. A Cartesian product tends generates a large number of rows. Unless there is some specific need to combine all rows avoid a Cartesian product by including a valid join condition in the query
The example shown on the slide joins all rows of Student_Master and Department Master resulting in a Cartesian Join

Instructor Notes:



Guidelines for Joining Tables

The JOIN condition is written in the WHERE clause

The column names which appear in more than one table should be prefixed with the table name

To improve performance of the query, table name prefix can be include for the other selected columns too

Before we get on to Joins let us understand some basic guidelines to write Join Queries

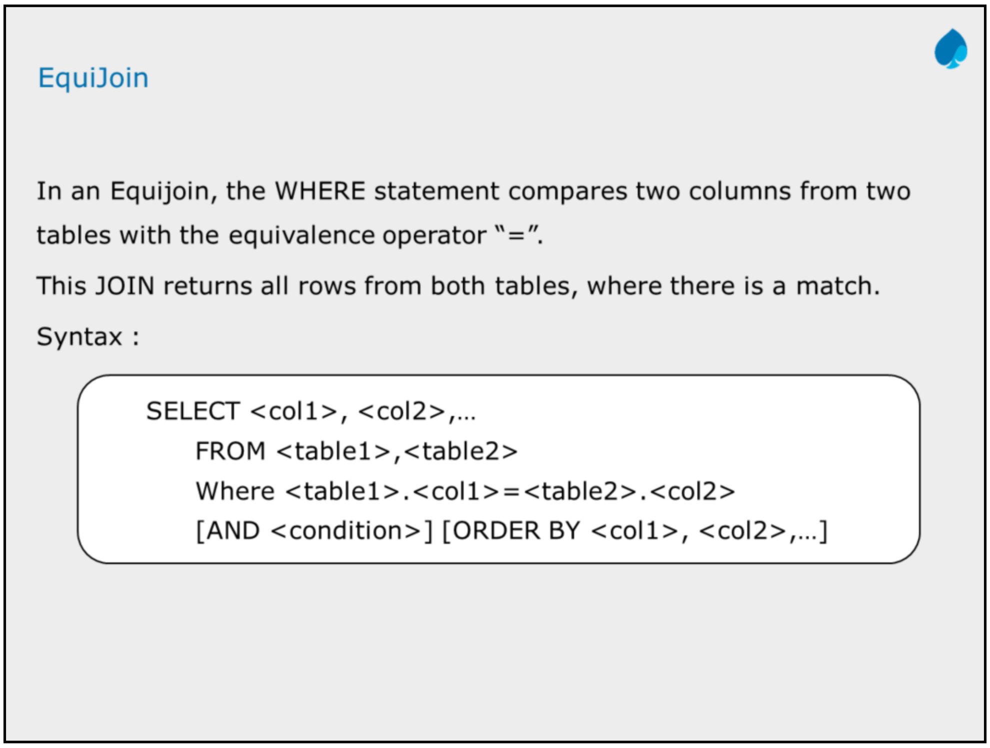
Instructor Notes:

- Explain the use of a decision matrix for simplifying writing JOINS.
- **For example**: If you want to display the name and department number of all the employees who are in the same department as Goyal, you can start by making the following decision tree:

Columns to Display
- last_name column from EMP table
- department_name column from DEPT table

Condition
- last_name='Goyal'
- employees.department_id = departments.department_id

- Now the SQL statement can be easily formulated by looking at the decision matrix. The first column gives the column list in the SELECT statement, the second column gives the tables for the FROM clause, and the third column gives the condition for the WHERE clause.



EquiJoin

In an Equijoin, the WHERE statement compares two columns from two tables with the equivalence operator "=".

This JOIN returns all rows from both tables, where there is a match.

Syntax :

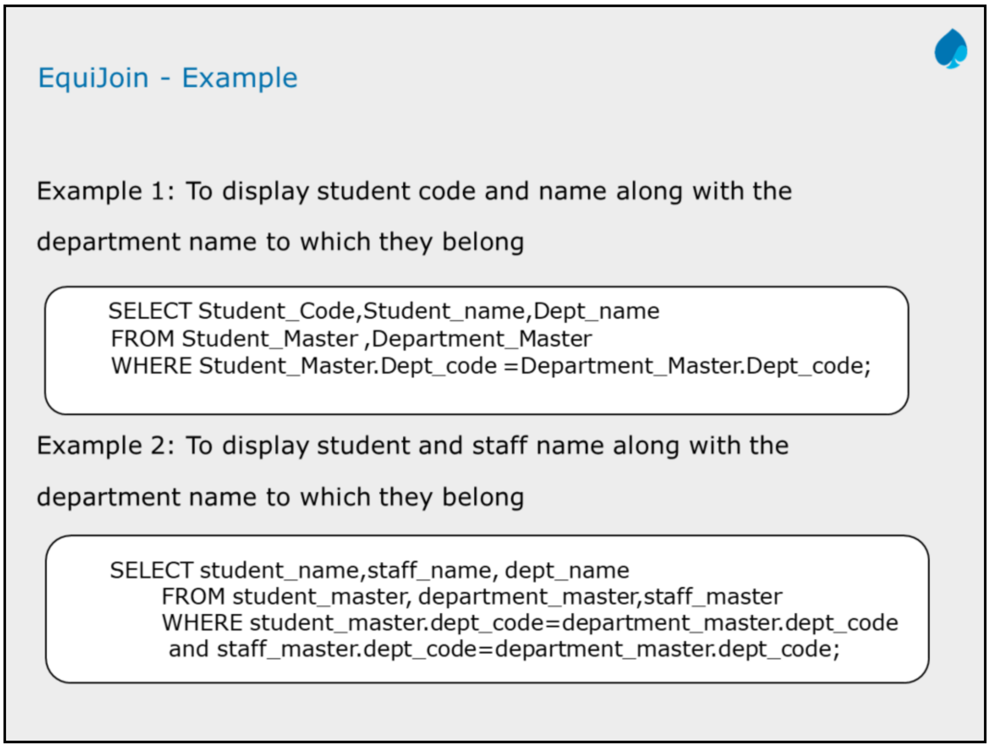
```
SELECT <col1>, <col2>,...
    FROM <table1>,<table2>
    Where <table1>.<col1>=<table2>.<col2>
    [AND <condition>] [ORDER BY <col1>, <col2>,...]
```

Equi Join

• Equi Join which is sometimes also referred to as Inner Join or simple join is done by writing a join condition using the "=" operator
• Typically the tables are joint to get meaningful data.
• The join is based on the equality of column values in the two tables and therefore is called an Equijoin.
• To join together "n" tables, you need a minimum of "n-1" JOIN conditions.
    For example: To join three tables, a minimum of two joins is required.
• In the syntax given in the slide:
Column1 in Table1 is usually the Primary key of that table.
Column2 in Table2 is a Foreign key in that table.
Column1 and Column2 must have the same data type, and for certain data types, they should have same size, as well.

Instructor Notes:

- Write the same examples using table aliases in the class and show it to the participants



EquiJoin - Example

Example 1: To display student code and name along with the department name to which they belong

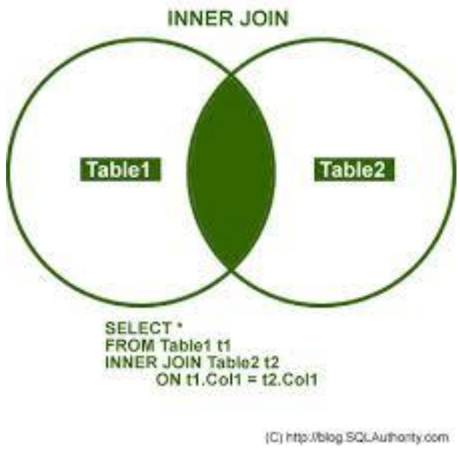
```
SELECT Student_Code,Student_name,Dept_name
 FROM Student_Master ,Department_Master
 WHERE Student_Master.Dept_code =Department_Master.Dept_code;
```

Example 2: To display student and staff name along with the department name to which they belong

```
SELECT student_name,staff_name, dept_name
     FROM student_master, department_master,staff_master
     WHERE student_master.dept_code=department_master.dept_code
      and staff_master.dept_code=department_master.dept_code;
```

Equi Join

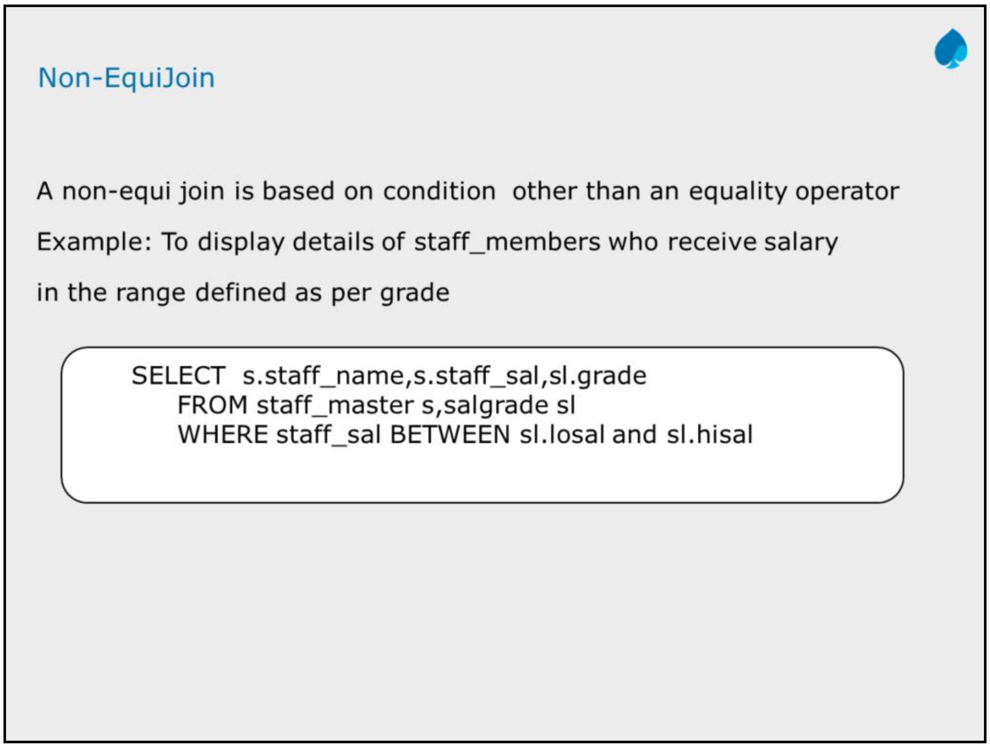
- Frequently, these type of JOIN involves PRIMARY and FOREIGN key complements.
- You can also use table aliases to qualify column names in the SELECT and Join Condition



```
SELECT *
FROM Table1 t1
INNER JOIN Table2 t2
     ON t1.Col1 = t2.Col1
```

Instructor Notes:

None



Non-EquiJoin

A non-equi join is based on condition other than an equality operator

Example: To display details of staff_members who receive salary

in the range defined as per grade

```
SELECT  s.staff_name,s.staff_sal,sl.grade
    FROM staff_master s,salgrade sl
    WHERE staff_sal BETWEEN sl.losal and sl.hisal
```

<u>Non-Equijoin</u>

- A Non-equijoin is a JOIN condition containing something other than an equality operator.
- The example on the slide shows a non-equijoin operation

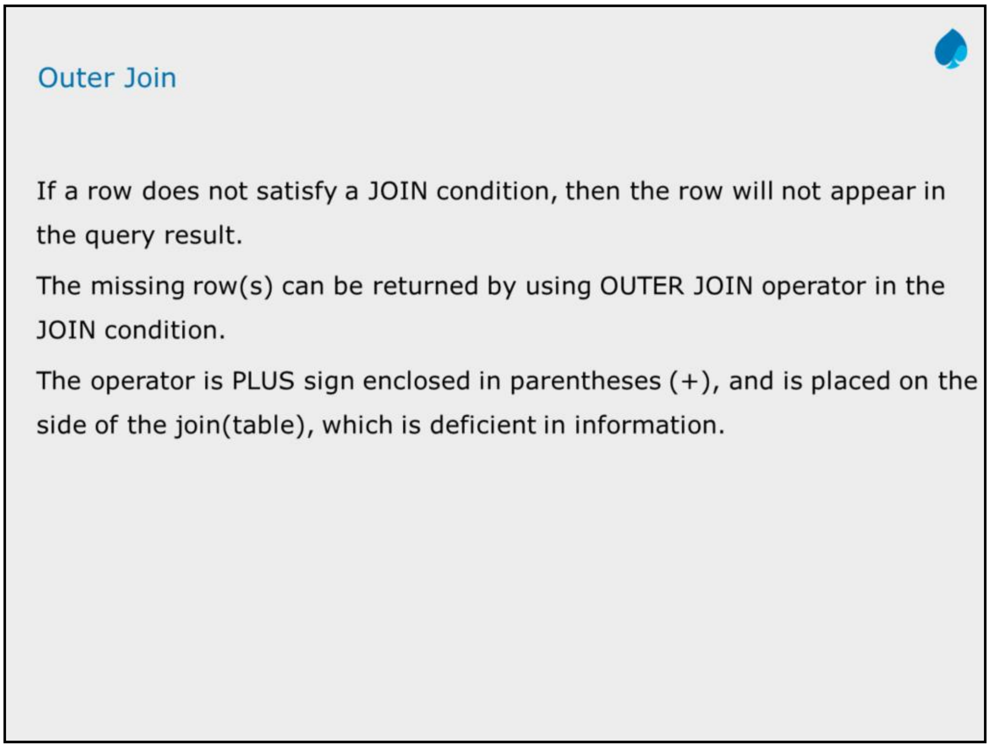
Assume that we have a Salgrade table which is used to determine the range of salary for all staff member. The structure of the table is as follows:

Name	Type
GRADE	NUMBER
LOSAL	NUMBER
HISAL	NUMBER

So to display all the staff members who receive salary between the ranges specified in the salgrade table we will use a non-equijoin

Instructor Notes:

None



Outer Join

If a row does not satisfy a JOIN condition, then the row will not appear in the query result.

The missing row(s) can be returned by using OUTER JOIN operator in the JOIN condition.

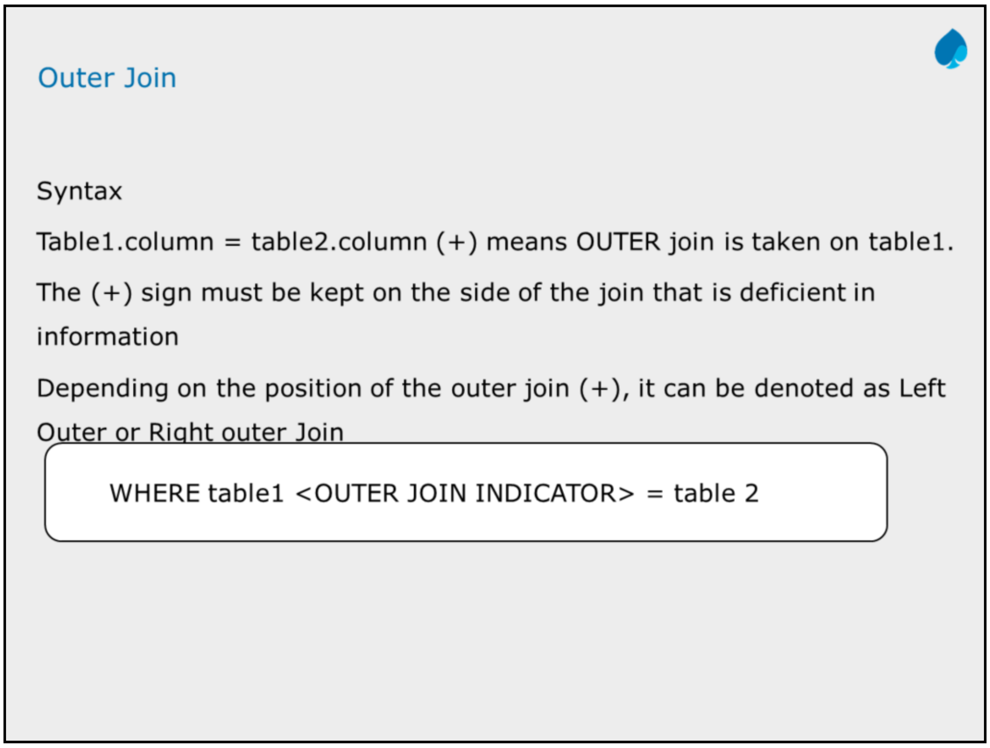
The operator is PLUS sign enclosed in parentheses (+), and is placed on the side of the join(table), which is deficient in information.

<u>**Outer Join**</u>

- If a row does not satisfy the join condition, the row will not appear in the query result. In this situation outer join can be used
- Outer Joins are similar to Inner Joins. However, they give a bit more flexibility when selecting data from related tables. This type of join can be used in situations where it is desired to select “all rows from the table on the left or right ”, regardless whether they match the join condition
- Outer Join is an exclusive “union” of sets (whereas normal joins are intersection). OUTER JOINs can be simulated using UNIONS.
    - ➢ In a JOIN of two tables an Outer Join may be for the first table or the second table. If the Outer Join is taken on, say the DEPARTMENT_MASTER table, then each row of this table will be selected at least once whether or not a JOIN condition is satisfied.
- An Outer Join does not require each record in the two joint tables to have a matching record in the other table. The joint table retains each record — even if there is no matching record.

Instructor Notes:

None



Outer Join

Syntax

Table1.column = table2.column (+) means OUTER join is taken on table1.

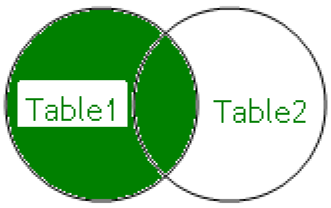
The (+) sign must be kept on the side of the join that is deficient in information

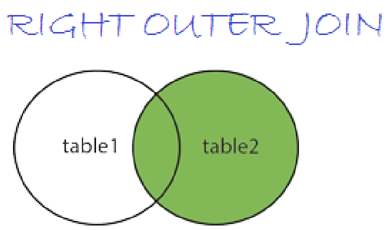
Depending on the position of the outer join (+), it can be denoted as Left Outer or Right outer Join

```
WHERE table1 <OUTER JOIN INDICATOR> = table 2
```

Outer Join (contd.):

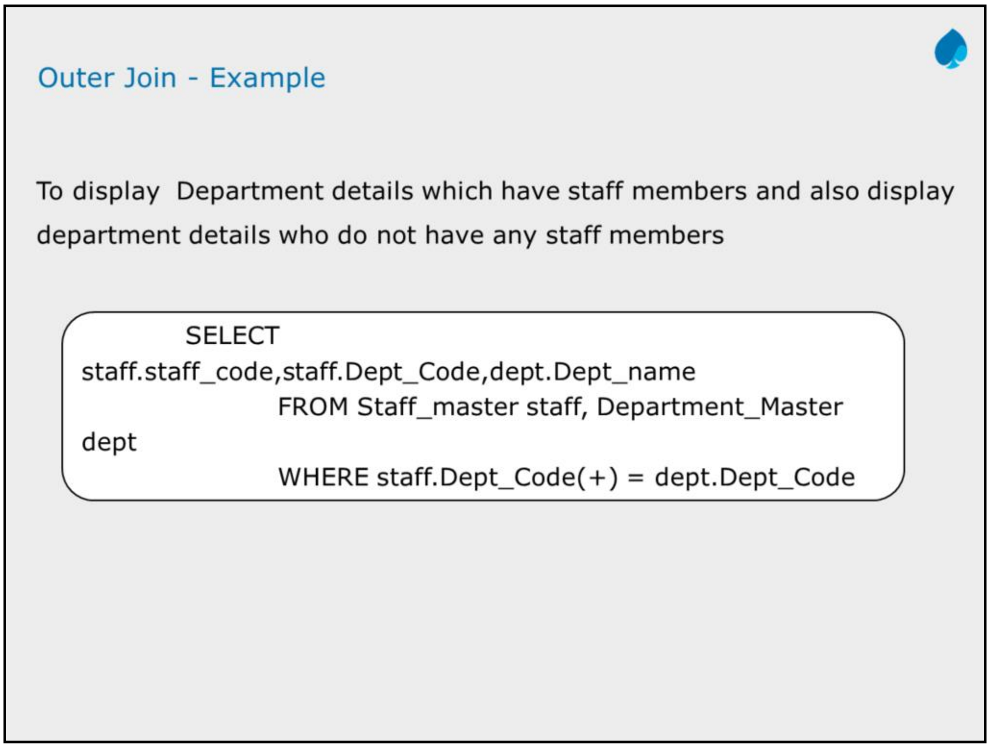
- The plus(+) operator can appear only on one side of the expression. It returns those rows from one table that have no direct match in the other table.
- One restriction on outer join is that you cannot use IN operator or the OR operator to create a complex condition
- Left and right outer join diagrams :





Instructor Notes:

Tell the participants that if the plus is on the left hand side of equal to operator the right side table will show deficient information and vice versa

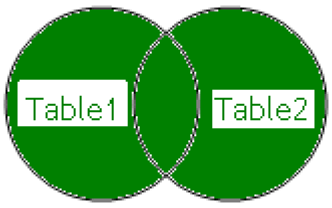


Outer Join - Example

To display Department details which have staff members and also display department details who do not have any staff members

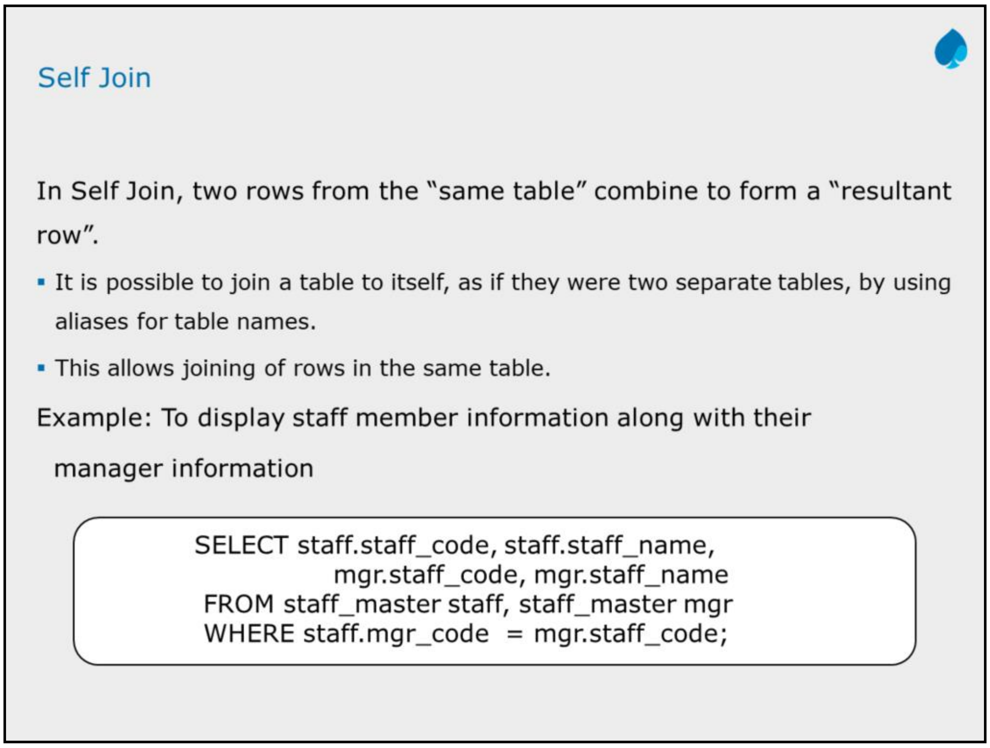
```
          SELECT
staff.staff_code,staff.Dept_Code,dept.Dept_name
                   FROM Staff_master staff, Department_Master
dept
                   WHERE staff.Dept_Code(+) = dept.Dept_Code
```

Full outer join diagram



Instructor Notes:

None



Self Join

In Self Join, two rows from the "same table" combine to form a "resultant row".

- It is possible to join a table to itself, as if they were two separate tables, by using aliases for table names.
- This allows joining of rows in the same table.

Example: To display staff member information along with their manager information

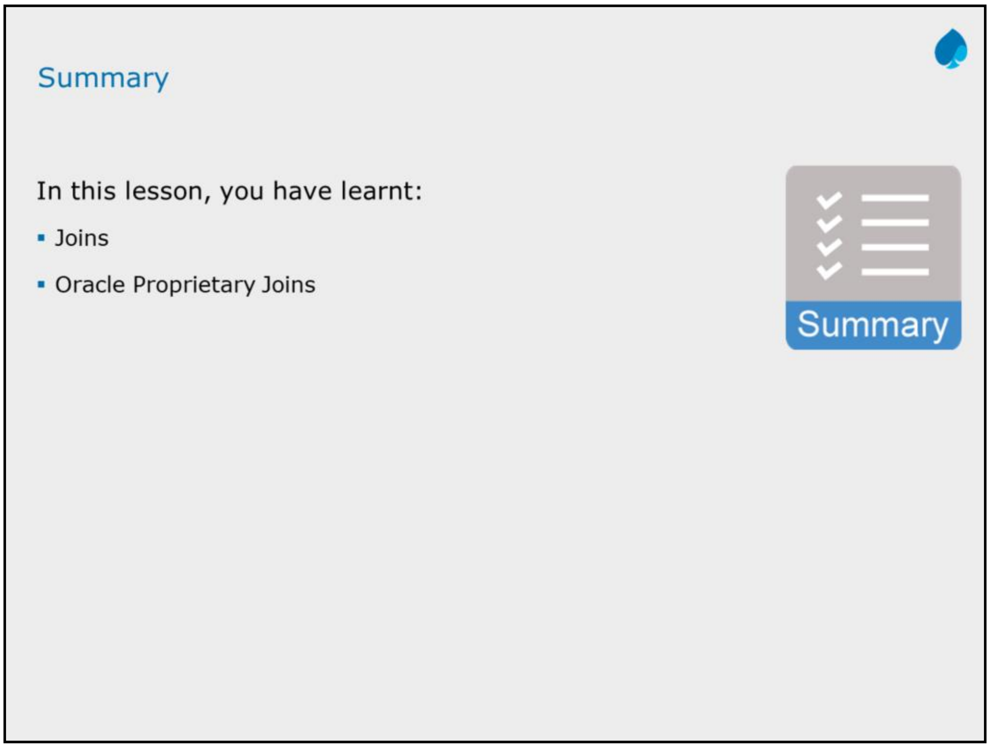
```
SELECT staff.staff_code, staff.staff_name,
           mgr.staff_code, mgr.staff_name
FROM staff_master staff, staff_master mgr
WHERE staff.mgr_code  = mgr.staff_code;
```

Self Join:

- Sometimes is required to join the table to itself. To join a table to itself, "two copies" of the same table have to be opened in the memory.
- Since the table names are the same, the second table will overwrite the first table. In effect, this will result in only one table being in memory.
  - ➢ This is because a table name is translated into a specific memory location.
- Hence in the FROM clause, the table name needs to be mentioned twice with an "alias"
  - ➢ These two table aliases will cause two identical tables to be opened in different memory locations.
  - ➢ This will result in two identical tables to be physically present in the computer memory.

Instructor Notes:

None



Summary

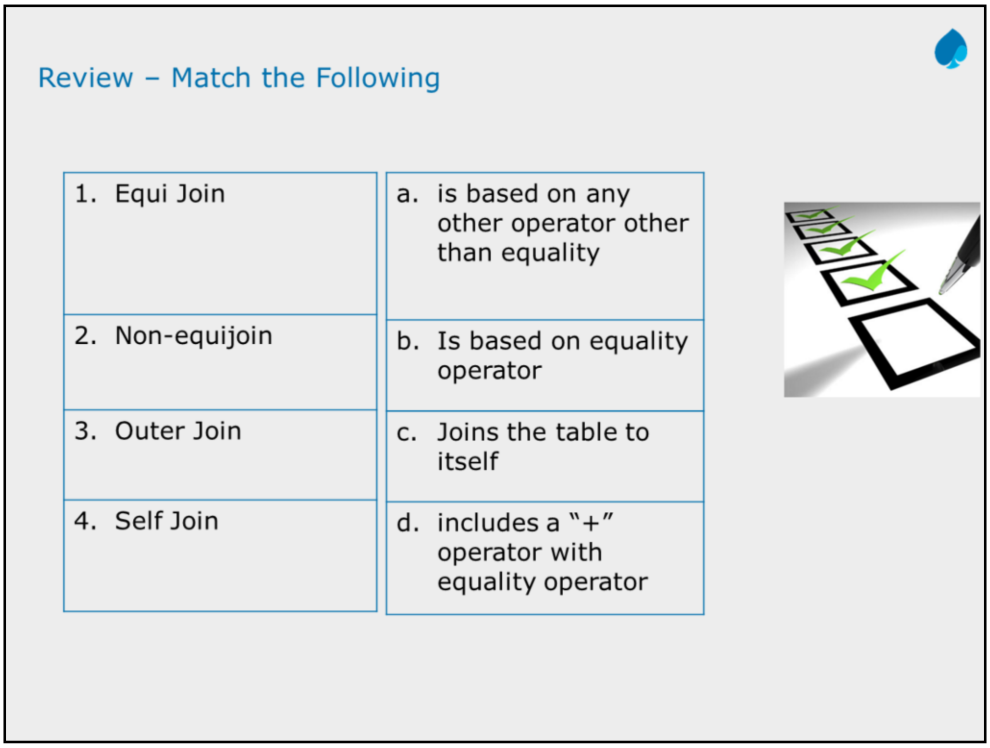
In this lesson, you have learnt:

- Joins
- Oracle Proprietary Joins

Instructor Notes:

Answers for Match the Following:

1 – b
2 – a
3 – d
4 - c



Review – Match the Following

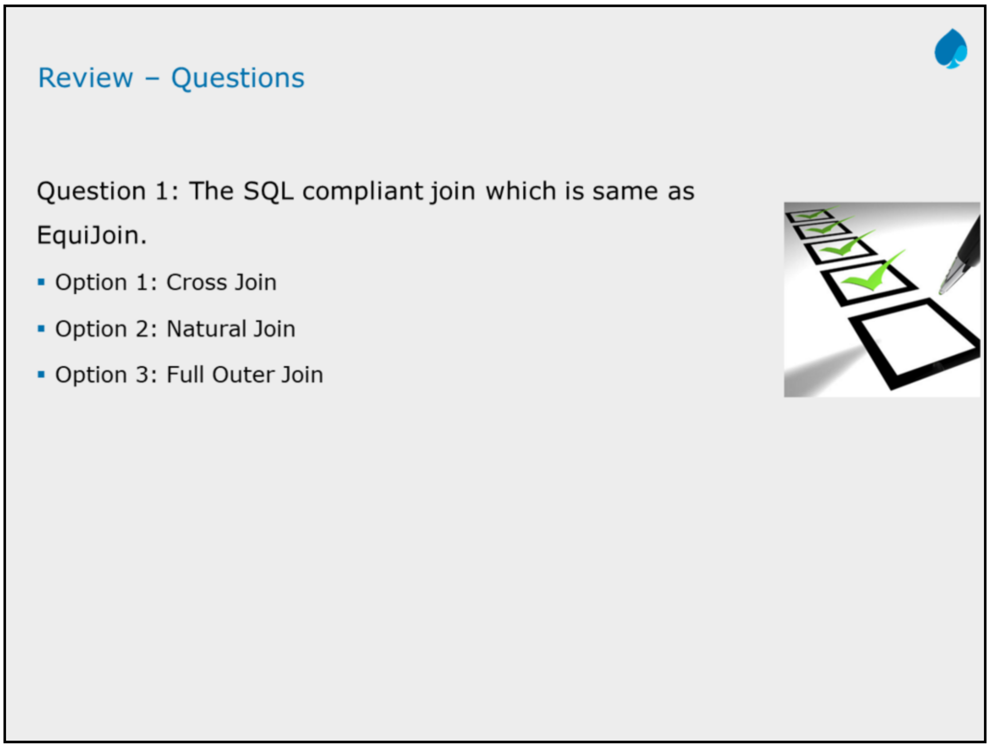
1. Equi Join	a. is based on any other operator other than equality
2. Non-equijoin	b. Is based on equality operator
3. Outer Join	c. Joins the table to itself
4. Self Join	d. includes a "+" operator with equality operator

Instructor Notes:

Answers for Review Questions:

Question 1:
Answer: Option 2.

Question 2:
Answer: Nested query



Review – Questions

Question 1: The SQL compliant join which is same as EquiJoin.

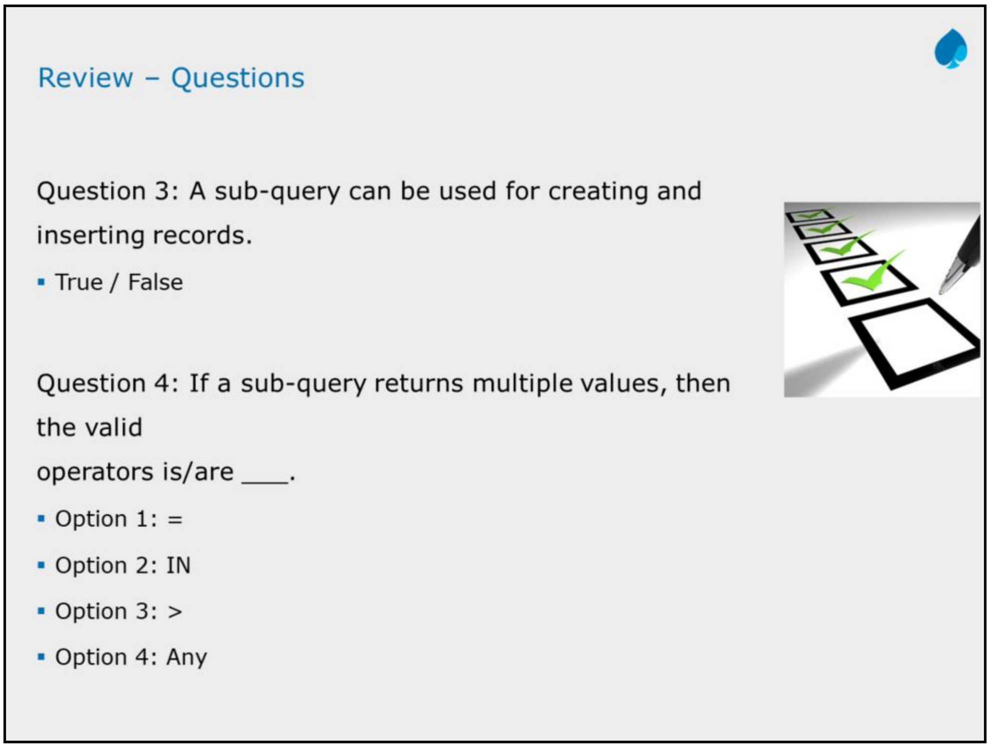
- Option 1: Cross Join
- Option 2: Natural Join
- Option 3: Full Outer Join

Instructor Notes:

Answers for Review Questions:

Question 3:
Answer: True

Question 4:
Answer: Option 2, and Option 4



Review – Questions

Question 3: A sub-query can be used for creating and inserting records.

- True / False

Question 4: If a sub-query returns multiple values, then the valid
operators is/are ____.

- Option 1: =
- Option 2: IN
- Option 3: >
- Option 4: Any