C8. SQL Join.

The SQL JOIN clause is used to combine rows from two or more tables, based on logical links (e.g. common fields) between them. Usually the foreign key from a table is linked with the primary key of another table.

1.1. JOIN syntax

Two syntaxes are permitted by SQL.

The first one is called implicit JOIN. It require multiple tables in the FROM clause. The join condition is in this case embedded in the WHERE condition.

The general syntax for implicit join is:

SELECT t1.column$_m$,…,t2.column$_n$,…

FROM table1 t1, table2 t2 …

WHERE t1.column$_i$ = t2.column$_j$

[AND select_conditions];

The second syntax is for explicit JOIN. In that case both tables and join conditions are embedded into the FROM clause.

ACTIVITY 1: Using SQL Workshop -> SQL Commands run the following SQL command:

SELECT p.*, d.*

FROM Persons p, Departments d

WHERE p.dep_id = d.id;

ACTIVITY 2: Using SQL Workshop -> Object Browser -> Create -> Table create and populate following tables:

SAILORS

Table Data Indexes Model Constraints Grants Statistics UI Defaults

Add Column | Modify Column | Rename Column | Drop Column | Rename | Copy | Drop

Column Name	Data Type	Nullable	Default	Primary Key
SID	NUMBER	No	-	1
NAME	VARCHAR2(24)	No	-	-
AGE	NUMBER(3,0)	Yes	-	-
RANK	NUMBER(1,0)	Yes	-	-

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EDIT	SID	NAME	AGE	RANK
	71	John	55	9
	29	Anna	39	3
	22	John	45	7
	31	Horace	33	1
	58	Andrei	58	8
	61	Rupert	19	1
	15	Viktor	25	7
	19	Joe	-	4
	23	Sven	53	4
	27	Karin	23	7
	72	Anna	25	3
	12	Horace	46	2

BOATS

Table Data Indexes Model Constraints Grants Statistics UI Defaults

Add Column | Modify Column | Rename Column | Drop Column | Rename | Copy | Drop

Column Name	Data Type	Nullable	Default	Primary Key
BID	NUMBER(3,0)	No	-	1
NAME	VARCHAR2(24)	No	-	-
COLOR	VARCHAR2(16)	Yes	-	-

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EDIT	BID	NAME	COLOR
	102	Gazelle	Red
	103	Poseidon	Green
	101	Cleo	Blue
	104	Athena	Yellow

row(s) 1 - 4 of 4

RESERVES

Table Data Indexes Model Constraints Grants Statistics UI Defaults

Add Column | Modify Column | Rename Column | Drop Column | Rename | Copy | Drop

Column Name	Data Type	Nullable	Default	Primary Key
SID	NUMBER(3,0)	No	-	1
BID	NUMBER(3,0)	No	-	2
RDATE	DATE	No	-	3

1 - 3

EDIT	SID	BID	RDATE
	22	102	10/08/2014
	58	101	10/03/2014
	58	102	10/12/2014
	58	103	11/23/2014
	900	101	07/09/2014

row(s) 1 - 5 of 5

Note: the default format for dates is Month/Day/Year.

1.2. Types of JOIN

- INNER JOIN - returns all rows when there is at least one match in both tables. Implicit syntax imply inner join. For explicit syntax use:

```
SELECT column_name(s)
        FROM table1 [INNER] JOIN table2
        ON table1.PK=table2.FK …
        [WHERE selection_condition…];
```

- LEFT (OUTER) JOIN - return all rows from the left table, and the matched rows from the right table. NULL for missing corresponding fields
- RIGHT (OUTER) JOIN - return all rows from the right table, and the matched rows from the left table
- FULL (OUTER) JOIN - return all rows when there is a match in at least one of the tables

```
SELECT column_name(s)
        FROM table1
                LEFT/RIGTH/FULL [OUTER]
                JOIN table2
                ON table1.PK=table2.FK …
        [WHERE selection_condition…];
```

ACTIVITY 3: Using SQL Workshop -> SQL Commands run the following SQL commands:

```
SELECT s.name, s.rank, r.rdate, b.name AS boat
        FROM ((Sailors s RIGHT JOIN Reserves r
                ON s.sid=r.sid) INNER JOIN Boats b
                        ON r.bid=b.bid);
```

- Question: what happened when add a selection condition WHERE age>25?
- Exercise: list all boats. If a boat was reserved add reserves and sailors information.

1.3. Oracle Syntax for Outer Join

Oracle defines an outer join operator (+) that can be included in WHERE condition to specify an LEFT or RIGHT JOINS instead a default INNER join. However, it cannot be used to implement FULL JOIN.

The syntax for LEFT JOIN is:

```
SELECT s.name, s.rank, r.date
        FROM Sailors s, Reserves r
        WHERE s.sid = r.sid(+);
```

For RIGHT JOIN the syntax is: s.sid(+) = r.sid.

ACTIVITY 4: Using SQL Workshop -> SQL Commands run the following SQL command:

```
SELECT s.name, s.rank, r.date
    FROM Sailors s, Reserves r
    WHERE s.sid = r.sid(+);
```

ACTIVITY 5: Create an interactive report to display reserves. The report will display all reserves made for all boats in a given color. It will contain the sailor name, the reserve date and the boat name. For reading the color add an input field and a validation button to the report.

Note: APEX regions do not support duplicate name fields. To add both sailors.name and boat.name, use AS keyword to rename one of them. (Otherwise the system display an error that say "APEX: unique constraint APEX_040200.WWV_FLOW _WORKSHEET_COLUMNS_UK2 violated")