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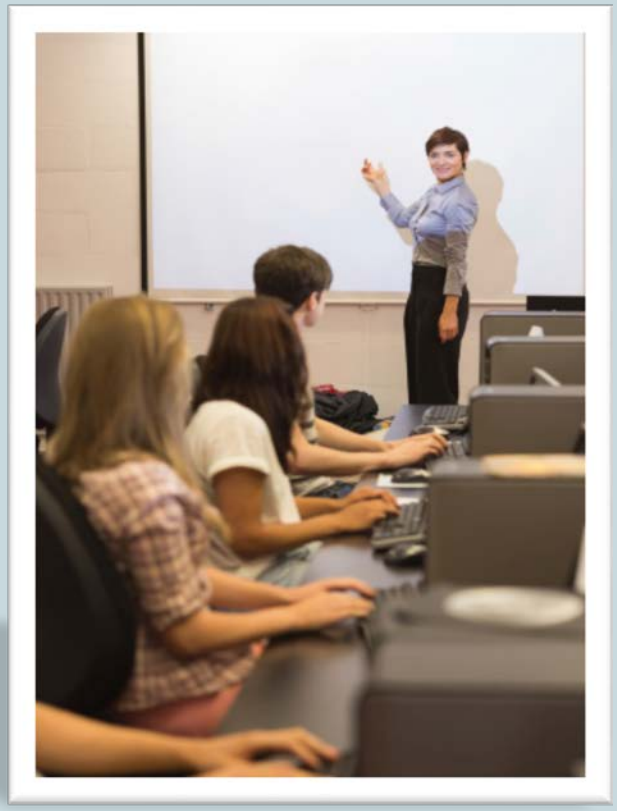
Academy

Database Programming with SQL

9-3
Using Set Operators



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Objectives

This lesson covers the following objectives:

- Define and explain the purpose of Set Operators
- Use a set operator to combine multiple queries into a single query
- Control the order of rows returned using set operators

Purpose

- Set operators are used to combine the results from different SELECT statements into one single result output.
- Sometimes you want a single output from more than one table.
- If you join the tables, the rows that meet the join criteria are returned, but what if a join will return a result set that doesn't meet your needs?
- This is where SET operators come in.
- They can return the rows found in multiple SELECT statements, the rows that are in one table and not the other, or the rows common to both statements.

Setting the Stage

- In order to explain the SET operators, the following two lists will be referred to throughout this lesson:

$$A = \{1, 2, 3, 4, 5\}$$

$$B = \{4, 5, 6, 7, 8\}$$

- Or in reality: two tables, one called A and one called B.

A

A_ID
1
2
3
4
5

B

B_ID
4
5
6
7
8

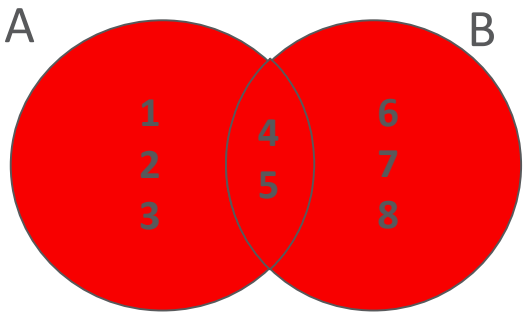
Rules to Remember

- There are a few rules to remember when using SET operators:
  - The number of columns and the data types of the columns must be identical in all of the SELECT statements used in the query.
  - The names of the columns need not be identical.
  - Column names in the output are taken from the column names in the first SELECT statement.
- So any column aliases should be entered in the first statement as you would want to see them in the finished report.

UNION

- The UNION operator returns all rows from both tables, after eliminating duplicates.

```
SELECT a_id
FROM a
 UNION
SELECT b_id
FROM b;
```

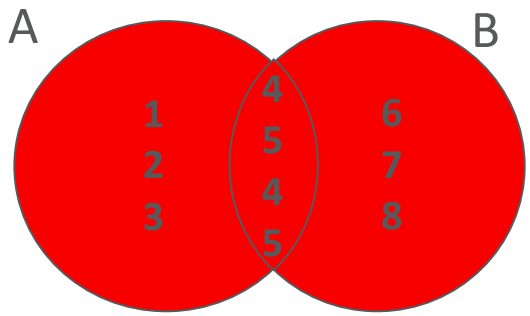


- The result of listing all elements in A and B eliminating duplicates is {1, 2, 3, 4, 5, 6, 7, 8}.
- If you joined A and B you would get only {4, 5}. You would have to perform a full outer join to get the same list as above.

UNION ALL

- The UNION ALL operator returns all rows from both tables, without eliminating duplicates.

```
SELECT a_id
FROM a
 UNION  ALL
SELECT b_id
FROM b;
```

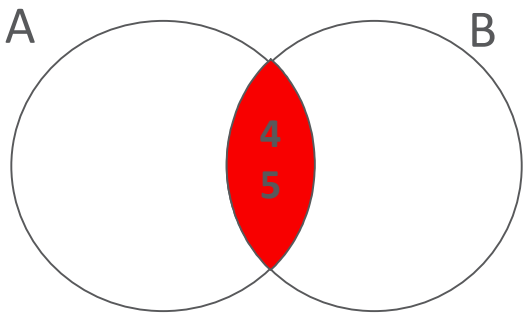


- The result of listing all elements in A and B without eliminating duplicates is {1, 2, 3, 4, 5, 4, 5, 6, 7, 8}.

INTERSECT

- The INTERSECT operator returns all rows common to both tables.

```
SELECT a_id
FROM a
 INTERSECT
SELECT b_id
FROM b;
```

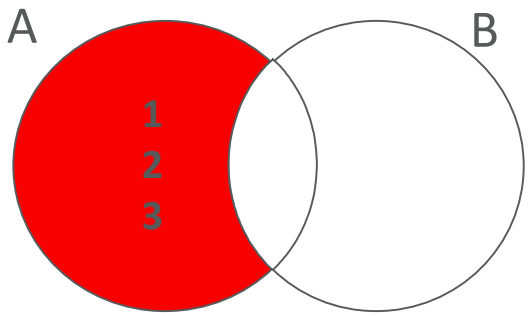


- The result of listing all elements found in both A and B is {4, 5}.

MINUS

- The MINUS operator returns all rows found in one table but not the other.

```
SELECT a_id
FROM a
 MINUS
SELECT b_id
FROM b;
```



- The result of listing all elements found in A but not B is {1, 2, 3}.
- The result of B MINUS A would give {6, 7, 8}.

Set Operator Examples

- Sometimes if you are selecting rows from tables that do not have columns in common, you may have to create your own columns in order to match the number of columns in the queries.
- The easiest way to do this is to include one or more NULL values in the select list.
- Remember to give each one a suitable alias and matching data type.

Set Operator Examples

- For example:
  - The employees table contains a hire date, employee id and a job id.
  - The job history table contains employee id and job id, but does not have a hire date column.
  - The two tables have the employee id and job id in common, but job history does not have a start date .
- You can use the TO_CHAR(NULL) function to create matching columns as in the next slide.

Set Operator Examples

```
SELECT hire_date, employee_id, job_id
FROM employees
 UNION
SELECT TO_DATE(NULL),employee_id, job_id
FROM job_history;
```

HIRE_DATE	EMPLOYEE_ID	JOB_ID
17-Jun-1987	100	AD_PRES
17-Sep-1987	200	AD_ASST
21-Sep-1989	101	AD_VP
03-Jan-1990	103	IT_PROG
21-May-1991	104	IT_PROG
13-Jan-1993	102	AD_VP
07-Jun-1994	205	AC_MGR
07-Jun-1994	206	AC_ACCOUNT
17-Oct-1995	141	ST_CLERK
17-Feb-1996	201	MK_MAN
11-May-1996	174	SA_REP
29-Jan-1997	142	ST_CLERK
17-Aug-1997	202	MK_REP
15-Mar-1998	143	ST_CLERK
24-Mar-1998	176	SA_REP
09-Jul-1998	144	ST_CLERK
07-Feb-1999	107	IT_PROG
24-May-1999	178	SA_REP
16-Nov-1999	124	ST_MAN
29-Jan-2000	149	SA_MAN
-	101	AC_ACCOUNT
-	101	AC_MGR
-	102	IT_PROG
-	114	ST_CLERK
-	122	ST_CLERK
-	176	SA_MAN
-	176	SA_REP
-	200	AC_ACCOUNT
-	200	AD_ASST
-	201	MK_REP

Set Operator Examples

- The keyword NULL can be used to match columns in a SELECT list.
- One NULL is included for each missing column.
- Furthermore, NULL is formatted to match the data type of the column it is standing in for, so TO_CHAR, TO_DATE, or TO_NUMBER functions are used to achieve identical SELECT lists.

SET Operations ORDER BY

- If you want to control the order of the returned rows when using SET operators in your query, the ORDER BY statement must only be used once, in the last SELECT statement in the query.
- Using the previous query example, we could ORDER BY employee_id to see the jobs each employee has held.

```
SELECT hire_date, employee_id, job_id
FROM employees
 UNION
SELECT TO_DATE(NULL),employee_id, job_id
FROM job_history
ORDER BY employee_id;
```

SET Operations ORDER BY

```
SELECT hire_date, employee_id, job_id
FROM employees
 UNION
SELECT TO_DATE(NULL),employee_id, job_id
FROM job_history
ORDER BY employee_id;
```

HIRE_DATE	EMPLOYEE_ID	JOB_ID
17-Jun-1987	100	AD_PRES
21-Sep-1989	101	AD_VP
-	101	AC_ACCOUNT
-	101	AC_MGR
13-Jan-1993	102	AD_VP
-	102	IT_PROG
03-Jan-1990	103	IT_PROG
21-May-1991	104	IT_PROG
07-Feb-1999	107	IT_PROG
-	114	ST_CLERK
…	…	…

SET Operations ORDER BY

- We could improve the readability of the output, by including the start date and end date columns from the job history table, to do this, we would need to match the columns in both queries by adding two more TO_DATE(NULL) columns to the first query.

```
SELECT hire_date, employee_id, TO_DATE(null) start_date,
   TO_DATE(null) end_date, job_id, department_id
FROM   employees
 UNION
SELECT TO_DATE(null), employee_id, start_date, end_date, job_id,
   department_id
FROM job_history
ORDER BY employee_id;
```

SET Operations ORDER BY

HIRE_DATE	EMPLOYEE_ID	START_DATE	END_DATE	JOB_ID	DEPARTMENT_ID
17-Jun-1987	100	-	-	AD_PRES	90
21-Sep-1989	101	-	-	AD_VP	90
-	101	21-Sep-1989	27-Oct-1993	AC_ACCOUNT	110
-	101	28-Oct-1993	15-Mar-1997	AC_MGR	110
13-Jan-1993	102	-	-	AD_VP	90
-	102	13-Jan-1993	24-Jul-1998	IT_PROG	60
03-Jan-1990	103	-	-	IT_PROG	60
21-May-1991	104	-	-	IT_PROG	60
07-Feb-1999	107	-	-	IT_PROG	60
-	114	24-Mar-1998	31-Dec-1999	ST_CLERK	50
-	122	01-Jan-1999	31-Dec-1999	ST_CLERK	50
16-Nov-1999	124	-	-	ST_MAN	50
17-Oct-1995	141	-	-	ST_CLERK	50
29-Jan-1997	142	-	-	ST_CLERK	50
15-Mar-1998	143	-	-	ST_CLERK	50
…	…	…	…	…	…

Terminology

Key terms used in this lesson included:

- INTERSECT
- MINUS
- SET operators
- TO_CHAR(null) – matching the select list
- UNION
- UNION ALL

Summary

In this lesson, you should have learned how to:

- Define and explain the purpose of Set Operators
- Use a set operator to combine multiple queries into a single query
- Control the order of rows returned using set operators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