

Set Operators

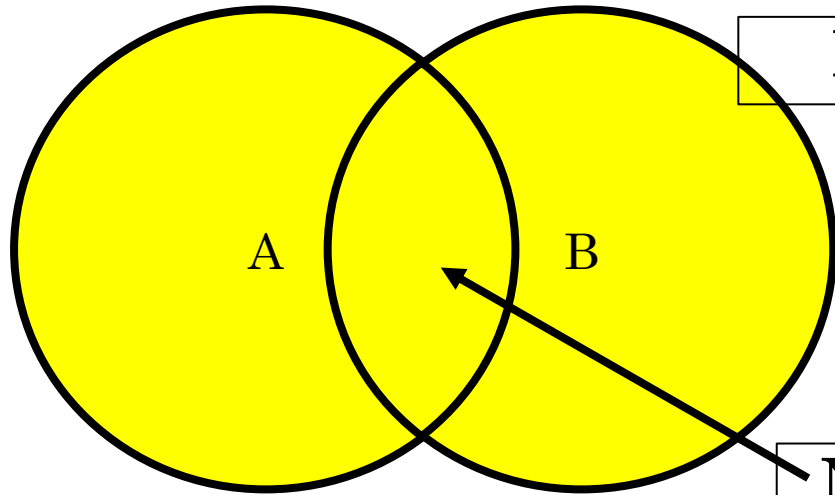
Lecture 05

Set Operators - Overview

- Describe Set Operators
- Use set operators to combine multiple queries into a single query
- Control order of rows returned
- Set Operator Types
 - UNION [DISTINCT]
 - UNION ALL
 - INTERSECT
 - MINUS/ EXCEPT
- Set Operator Rules
- Matching SELECT statement and ORDER BY with set operators

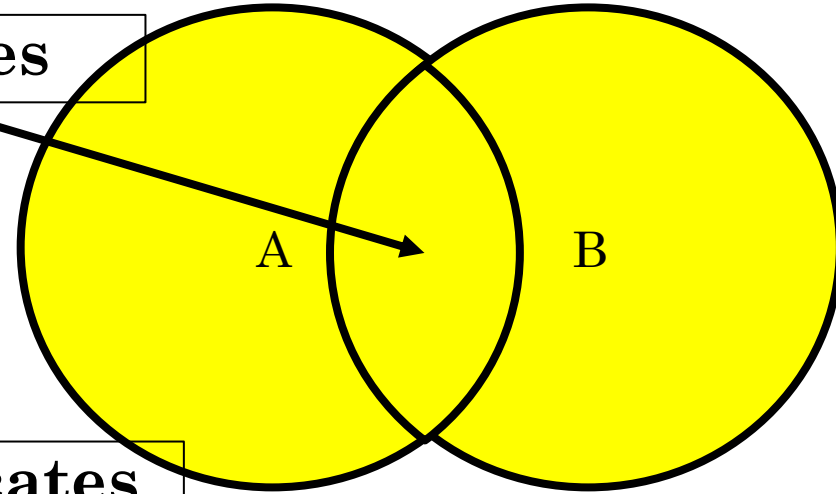
Set Operators - Overview

A UNION [DISTINCT] B

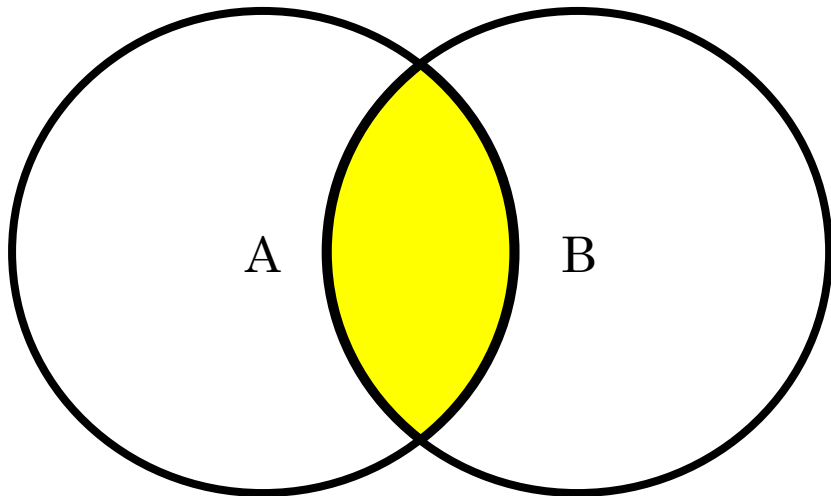


Duplicates

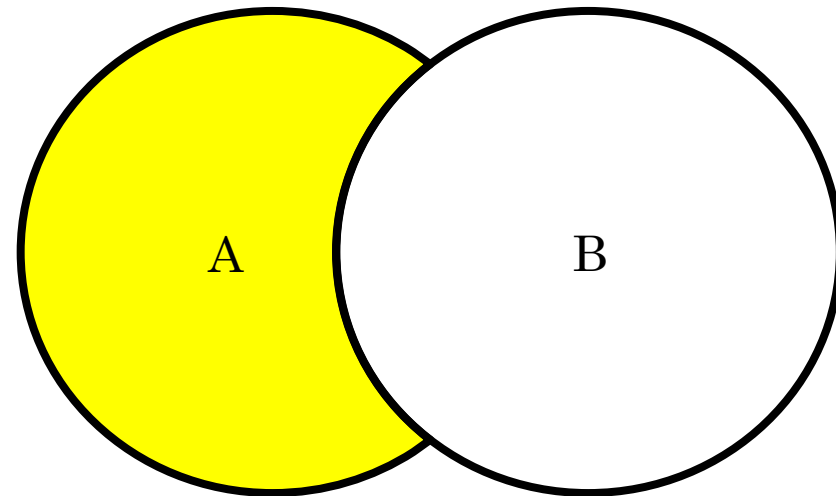
A UNION ALL B



A INTERSECT B



A MINUS/EXCEPT B



Set Operators - Overview

- UNION – returns all rows across both tables, excluding duplicates
- UNION ALL – returns all rows across both tables, including duplicates
- INTERSECT – returns common rows across both tables, excluding duplicates
- INTERSECT ALL – returns common rows across both tables, including duplicates
- EXCEPT – returns rows unique to “LEFT” table, excluding duplicates
- EXCEPT ALL – returns rows unique to “LEFT” table, including duplicates

Set Operators – Data Sets

DEPT

DEPTNO	DEPTNAME	MGRNO	ADMRDEPT	LOCATION
500	SALESEAST	3	502	TORONTO
501	SALESWEST	5	502	VANCOUVER
502	ADMIN	8	502	TORONTO
503	HR	8	502	TORONTO

DEPTUS

DEPTNO	DEPTNAME	MGRNO	ADMRDEPT	LOCATION
600	SALESEASTUS	11	502	NEW YORK
601	SALESWESTUS	19	502	LOS ANGELES
502	ADMIN	8	502	TORONTO
503	HR	8	502	TORONTO

Set Operators – UNION

- UNION – returns all rows across both tables, **excluding** duplicates
- **SELECT DEPTNO, DEPTNAME FROM DEPT**
UNION
SELECT DEPTNO, DEPTNAME FROM DEPTUS

DEPTNO	DEPTNAME
500	SALESEAST
501	SALESWEST
600	SALESEASTUS
601	SALESWESTUS
502	ADMIN
503	HR

Set Operators – UNION

- UNION – returns all rows across both tables, **excluding** duplicates
- **SELECT DEPTNO, DEPTNAME, LOCATION FROM DEPT
UNION
SELECT DEPTNO, DEPTNAME, LOCATION FROM DEPTUS**

DEPTNO	DEPTNAME	LOCATION
500	SALESEAST	TORONTO
501	SALESWEST	VANCOUVER
600	SALESEASTUS	NEW YORK
601	SALESWESTUS	LOS ANGELES
502	ADMIN	TORONTO
503	HR	TORONTO

Same rows in
result set since
third column
continues to match
on the same rows

Set Operators – Data Sets – Small Change

DEPT

DEPTNO	DEPTNAME	MGRNO	ADMRDEPT	LOCATION
500	SALESEAST	3	502	TORONTO
501	SALESWEST	5	502	VANCOUVER
502	ADMIN	8	502	TORONTO
503	HR	8	502	TORONTO

DEPTUS

DEPTNO	DEPTNAME	MGRNO	ADMRDEPT	LOCATION
600	SALESEASTUS	11	502	NEW YORK
601	SALESWESTUS	19	502	LOS ANGELES
502	ADMIN	8	502	TORONTO
503	HR	8	502	MONTREAL

Set Operators – UNION

- UNION – returns all rows across both tables, **excluding** duplicates
- **SELECT** DEPTNO, DEPTNAME, **LOCATION** FROM DEPT
UNION
SELECT DEPTNO, DEPTNAME, **LOCATION** FROM DEPTUS

DEPTNO	DEPTNAME	LOCATION
500	SALESEAST	TORONTO
501	SALESWEST	VANCOUVER
600	SALESEASTUS	NEW YORK
601	SALESWESTUS	LOS ANGELES
502	ADMIN	TORONTO
503	HR	TORONTO
503	HR	MONTREAL

An additional row
is included now in
the result set
because it is no
longer distinct

Set Operators – UNION – with ORDER BY

- UNION – returns all rows across both tables, **excluding** duplicates
- **SELECT DEPTNO, DEPTNAME, LOCATION FROM DEPT**
UNION
SELECT DEPTNO, DEPTNAME, LOCATION FROM DEPTUS
ORDER BY DEPTNO

DEPTNO	DEPTNAME	LOCATION
500	SALESEAST	TORONTO
501	SALESWEST	VANCOUVER
502	ADMIN	TORONTO
503	HR	TORONTO
503	HR	MONTREAL
600	SALESEASTUS	NEW YORK
601	SALESWESTUS	LOS ANGELES

Use ORDER BY to
organize result set
in a more readable
manner

Set Operators – Data Sets – Back to

DEPT

DEPTNO	DEPTNAME	MGRNO	ADMRDEPT	LOCATION
500	SALESEAST	3	502	TORONTO
501	SALESWEST	5	502	VANCOUVER
502	ADMIN	8	502	TORONTO
503	HR	8	502	TORONTO

DEPTUS

DEPTNO	DEPTNAME	MGRNO	ADMRDEPT	LOCATION
600	SALESEASTUS	11	502	NEW YORK
601	SALESWESTUS	19	502	LOS ANGELES
502	ADMIN	8	502	TORONTO
503	HR	8	502	TORONTO

Set Operators – UNION ALL

- UNION ALL – returns all rows across both tables, **including** duplicates
- **SELECT DEPTNO, DEPTNAME, LOCATION FROM DEPT
UNION ALL
SELECT DEPTNO, DEPTNAME, LOCATION FROM DEPTUS**

DEPTNO	DEPTNAME	LOCATION
500	SALESEAST	TORONTO
501	SALESWEST	VANCOUVER
502	ADMIN	TORONTO
503	HR	TORONTO
600	SALESEASTUS	NEW YORK
601	SALESWESTUS	LOS ANGELES
502	ADMIN	TORONTO
503	HR	TORONTO

Set Operators – INTERSECT

- INTERSECT – returns common rows across both tables, **excluding** duplicates
- **SELECT DEPTNO, DEPTNAME, LOCATION FROM DEPT**
INTERSECT
SELECT DEPTNO, DEPTNAME, LOCATION FROM DEPTUS

DEPTNO	DEPTNAME	LOCATION
502	ADMIN	TORONTO
503	HR	TORONTO

Set Operators – Data Sets – Small Change

DEPT

DEPTNO	DEPTNAME	MGRNO	ADMRDEPT	LOCATION
500	SALESEAST	3	502	TORONTO
501	SALESWEST	5	502	VANCOUVER
502	ADMIN	8	502	TORONTO
503	HR	8	502	TORONTO

DEPTUS

DEPTNO	DEPTNAME	MGRNO	ADMRDEPT	LOCATION
600	SALESEASTUS	11	502	NEW YORK
601	SALESWESTUS	19	502	LOS ANGELES
502	ADMIN	8	502	TORONTO
503	HR	8	502	MONTREAL

Set Operators – INTERSECT

- INTERSECT – returns common rows across both tables, **excluding** duplicates
- **SELECT DEPTNO, DEPTNAME FROM DEPT**
INTERSECT
SELECT DEPTNO, DEPTNAME FROM DEPTUS

DEPTNO	DEPTNAME
502	ADMIN
503	HR

Set Operators – INTERSECT

- INTERSECT – returns common rows across both tables, **excluding** duplicates
- **SELECT DEPTNO, DEPTNAME, LOCATION FROM DEPT**
INTERSECT
SELECT DEPTNO, DEPTNAME, LOCATION FROM DEPTUS

DEPTNO	DEPTNAME	LOCATION
502	ADMIN	TORONTO

Set Operators – Data Sets – Back to

DEPT

DEPTNO	DEPTNAME	MGRNO	ADMRDEPT	LOCATION
500	SALESEAST	3	502	TORONTO
501	SALESWEST	5	502	VANCOUVER
502	ADMIN	8	502	TORONTO
503	HR	8	502	TORONTO

DEPTUS

DEPTNO	DEPTNAME	MGRNO	ADMRDEPT	LOCATION
600	SALESEASTUS	11	502	NEW YORK
601	SALESWESTUS	19	502	LOS ANGELES
502	ADMIN	8	502	TORONTO
503	HR	8	502	TORONTO

Set Operators – INTERSECT – with AS

- INTERSECT – returns common rows across both tables, **excluding** duplicates
- **SELECT**
DEPTNO **AS “DEPARTMENT”**,
DEPTNAME,
LOCATION
FROM DEPT
INTERSECT
SELECT DEPTNO, DEPTNAME, LOCATION FROM DEPTUS

DEPARTMENT	DEPTNAME	LOCATION
502	ADMIN	TORONTO
503	HR	TORONTO

Set Operators – INTERSECT

- INTERSECT – returns common rows across both tables, **excluding** duplicates
- **SELECT DEPTNO, DEPTNAME, LOCATION FROM DEPT**
INTERSECT
SELECT DEPTNO, DEPTNAME FROM DEPTUS
- This produces an error !!!
- For Set Operations, the columns after SELECT must be:
 - The same columns in each SELECT
 - With compatible data types
 - If data types are different, you may need to CAST

Set Operators – EXCEPT / MINUS

- EXCEPT – returns rows unique to “LEFT” table, excluding duplicates
- **SELECT DEPTNO, DEPTNAME, LOCATION FROM DEPT
EXCEPT
SELECT DEPTNO, DEPTNAME, LOCATION FROM DEPTUS**

DEPTNO	DEPTNAME	LOCATION
500	SALESEAST	TORONTO
501	SALESWEST	VANCOUVER

Set Operators – EXCEPT / MINUS

- EXCEPT – returns rows unique to “LEFT” table, excluding duplicates
- **SELECT DEPTNO, DEPTNAME, LOCATION FROM DEPTUS
EXCEPT
SELECT DEPTNO, DEPTNAME, LOCATION FROM DEPT**

DEPTNO	DEPTNAME	LOCATION
600	SALESEASTUS	NEW YORK
601	SALESWESTUS	LOS ANGELES

Set Operators – INTERSECT ALL

- INTERSECT ALL – returns common rows across both tables, **including** duplicates

TAB1

COL1
1
1
2
3
4
4

TAB2

COL1
1
1
1
3
5
6

```
SELECT * FROM TAB1  
INTERSECT  
SELECT * FROM TAB2
```

COL1
1
3

```
SELECT * FROM TAB1  
INTERSECT ALL  
SELECT * FROM TAB2
```

COL1
1
1
3

Set Operators – EXCEPT ALL

- EXCEPT ALL – returns unique rows from the left table, **including** duplicates

TAB1

COL1
1
1
2
3
4
4

TAB2

COL1
1
1
1
3
5
6

**SELECT * FROM TAB1
EXCEPT
SELECT * FROM TAB2**

COL1
2
4

**SELECT * FROM TAB1
EXCEPT ALL
SELECT * FROM TAB2**

COL1
2
4
4

Set Operators – EXCEPT ALL

- EXCEPT ALL – returns unique rows from the left table, **including** duplicates

TAB1

COL1
1
1
2
3
4
4

TAB2

COL1
1
1
1
3
5
6

**SELECT * FROM TAB2
EXCEPT
SELECT * FROM TAB1**

COL1
5
6

**SELECT * FROM TAB2
EXCEPT ALL
SELECT * FROM TAB1**

COL1
1
5
6

Set Operators – versus JOINS

- JOINS are about COMBINING the records from two different tables (or objects) where there is some common connection between the two.
- Example: EMPLOYEE table and SALARY table. Both have employee number and name in common, but, one table focuses on one set of attributes about the employee (like personal information such as phone, address, years of service, etc.) – and – the other focuses on a different set of attributes about the employee (like department, salary, commission, etc).
- SET OPERATIONS are about evaluating the commonalities and differences between two different sets of information.
- Example: COMPANY A and COMPANY B. They both sell products that are in common – and – they each sell products that are unique from the other. You would leverage set operations to analyze which products are in common, which are unique to each company, etc.

Set Operators – Additional Guidelines

- You must match the data type when columns do not exist in one or the other table
- You can use various functions like CAST, TO_CHAR or any other conversion function to ensure data types match
- **SELECT**
 department_id,
 TO_NUMBER (null) as location,
 hire_date
FROM employees
UNION
SELECT
 department_id,
 location_id,
 TO_DATE (null)
FROM departments;

Set Operators – Additional Guidelines

- You must match the data type when columns do not exist in one or the other table
- You can use various functions like CAST, TO_CHAR or any other conversion function to ensure data types match
- **SELECT**
 department_id,
 TO_NUMBER (null) as location,
 hire_date
FROM employees
UNION
SELECT
 department_id,
 location_id,
 TO_DATE (null)
FROM departments;
- **SELECT**
 employee_id,
 job_id,
 salary
FROM employees
UNION
SELECT
 employee_id,
 job_id,
 0
FROM job_history;

Set Operators – Additional Guidelines

- The expressions in the SELECT lists must match in number.
 - If you select 3 columns in A, then must have 3 columns in B
 - The data type of each column in the second query must match the data type of its corresponding column in the first query.
- Parentheses can be used to alter the sequence of execution.
- ORDER BY clause can appear only at the very end of the statement.
- Duplicate rows are automatically eliminated except in UNION ALL.
- Column names from the first query are the ones that appear in the result.
- The output is sorted in ascending order by default except in UNION ALL.