Structured Query Language (SQL)

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CONTENTS

- Fetching or retrieving data using SQL SELECT Statement
- Restricting the data being fetched
- Sorting the data after fetching it
- Single-row functions to transform the data
- Conversion functions and conditional expressions

SQL Command Groups

- Data Query Language (DQL) statement
  - Used for querying database
  - SELECT - used to retrieve the data present in the database
- Data Definition Language (DDL) statements
  - Used to define the database structure or schema

DDL	Description
CREATE	Create objects in the database
ALTER	Alters the structure of the database
DROP	Delete objects from the database
TRUNCATE	Remove all records from a table permanently
COMMENT	Add comments to the data dictionary
RENAME	Rename an object

SQL Command Groups (Contd …)

- Data Manipulation Language (DML) statements
  - Used for managing data within objects

DML	Description
INSERT	insert data into a table
UPDATE	updates existing data within a table
DELETE	deletes unwanted/all records from a table
MERGE	UPSERT operation (insert or update)

- Data Control Language (DCL) statements
  - Used for granting and denying access privileges to users

DCL	Description
GRANT	gives user's access privileges to database
REVOKE	withdraw access privileges given with the GRANT command

SQL Command Groups (Contd …)

- Transaction Control (TCL):
  - Used to manage the changes made by DML statements
  - Allows statements to be grouped together into logical transactions

TCL	Description
COMMIT	Save work done
ROLLBACK	Restore database to original state since the last COMMIT
SAVEPOINT	Identify a point in a transaction to which you can later roll back

Primitive Data Types

Data Type	Description
Numeric	• Stores numeric data • Some types: INT, TINYINT, SMALLINT, MEDIUMINT, BIGINT, FLOAT(M, D), DOUBLE(M, D) where M & D are display length and no. of decimals, etc.
String	• Stores character strings • Some types: CHAR(M), VARCHAR(M), BLOB or TEXT, etc. • Value of M can be 1 to 255. For CHAR columns, it pads rest of the places by spaces; whereas for VARCHAR that actual length is M itself.
Date	• Stores data and time data types • DATE (YYYY-MM-DD format), DATETIME (DATE (YYYY-MM-DD format), TIMESTAMP (YYYYMMDDHHMMSS format), TIME (HH:MM:SS format), YEAR(M) – Year in 2-digit or 4-digit format

RETRIEVING DATA USING THE SQL SELECT STATEMENT

- SELECT statement to retrieve the data from the database
- Retrieves the data stored in relational tables
- Never modifies or alters the data in the database
- Provides a read-only method of extracting the data

TYPES OF SELECT STATEMENTS

Projection	Selection	Join
Restricts the number of columns retrieved from the table	Restricts the number of rows retrieved from the table	Obtains data from multiple tables by specifying the relationship between them

BASIC SELECT STATEMENT

- In its simplest form, a SELECT statement should have:
  - A SELECT clause, which specifies the columns to be projected
  - A FROM clause, which specifies the table/tables from which the data is to be retrieved

```
SELECT {*|[DISTINCT] column|expression [alias],...}
FROM table;
```

- SELECTing all columns

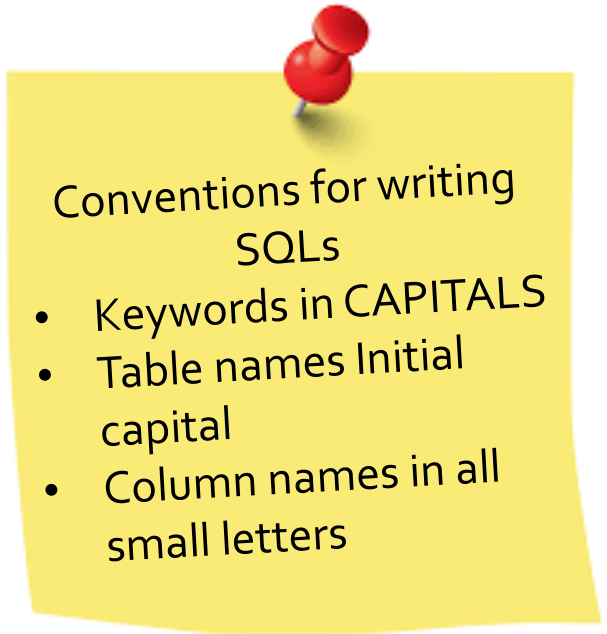
```
SELECT * FROM Employees;
```

- SELECTing specific set of columns (PROJECTION)

```
SELECT employee_id, first_name, last_name
FROM Employees;
```

GUIDELINES FOR SQL STATEMENTS

- SQL statements are not case sensitive
- Can be entered on one or more lines
- Put the clauses (like SELECT, FROM,WHERE etc.) on separate lines (for easy editing and code maintenance)
- Use indents are enhance readability
- Terminate every SQL statement with a semicolon



ARITHMETIC EXPRESSION IN SELECT

- Calculations like – addition(+), subtraction(-), multiplication(*) and division (/) can be performed on the data retrieved from the tables
- For example:

```
SELECT last_name, salary, salary + 300
FROM   Employees;
```

  - The column salary + 300 is a computed column
- Annual compensation of salary is obtained by multiplying the salaries of each employee by 12 and providing a one time bonus of $500

```
SELECT first_name,salary*12 + 500
FROM   Employees;
```

- Get the employee first name, last name and the annual compensation of employees, by providing a monthly bonus of $100 (Check operator precedence)

```
SELECT first_name, last_name, (salary+100)*12
FROM Employees;
```

COLUMN ALIASES

- SQL uses the name of the selected column as the column heading
- The entire computation "(salary + salary * commission_pct)" would be displayed as column header, which is not descriptive
- A meaningful name to the column header can be given using Column Alias

```
SELECT first_name, last_name,
(salary + salary * commission_pct) AS monthly_gross
FROM Employees;

SELECT first_name, last_name,
(salary + salary * commission_pct)*12 "Annual gross"
FROM Employees;
```

- Keyword "AS" is optional
- Use double-quotes if a space or any special character is required

COLUMNS WITH NULL IN SELECT

- If a row or a tuple does not have a value its said to be NULL
- NULL indicates that the value is unavailable, unassigned, unknown or not applicable
- NULL is not zero or a blank space, it's indicates absence of a value
- The COMMISSION_PCT column in EMPLOYEES table has values only for sales people. For other employees it is NULL as they are not eligible for it
- This query would result in NULL values for employees who do not earn commission

```
SELECT last_name, salary + (salary*commission_pct)
FROM  Employees;
```

- If the value of any column in an expression is NULL, the whole expression becomes NULL

CONCATENATION OPERATOR

- Useful to link columns or character strings to other columns
- Columns are combined to make a single column using CONCAT:

```
SELECT CONCAT(first_name,last_name) AS fullname
FROM Employees;
```

- With a space between names:

```
SELECT CONCAT(first_name, ' ', last_name) AS
fullname  FROM Employees;
```

- It can be used to provide more meaning to the output:

```
SELECT CONCAT(first_name,' works as ', job_id, ' in
dept.', department_id)  AS employee_desc
FROM Employees;
```

ELIMINATING DUPLICATE ROWS

- SELECT by default, displays all the rows in the table inclusive of duplicate rows
- To eliminate duplicate rows in the result, include the DISTINCT keyword in SELECT
- Get unique list of departments where employees are working:

```
SELECT DISTINCT department_id
FROM Employees;
```

- Get unique list of departments and jobs:

```
SELECT DISTINCT department_id, job_id
FROM Employees;
```

- Note that the above query might show duplicate department ids as there can be employees in it with more than one job id

DESCRIBE COMMAND

- Describe command on a table displays:
  - Names of the columns in the table
  - Whether a column is NOT NULL
  - Datatype of the column
  - Note that is is not an SQL statement though
- `DESCRIBE Employees;`

```
+----------------+------------------+------+-----+---------+-------+
| Field          | Type             | Null | Key | Default | Extra |
+----------------+------------------+------+-----+---------+-------+
| employee_id    | int(11) unsigned | NO   | PRI | NULL    |       |
| first_name     | varchar(20)      | YES  |     | NULL    |       |
| last_name      | varchar(25)      | NO   |     | NULL    |       |
| email          | varchar(25)      | NO   |     | NULL    |       |
| phone_number   | varchar(20)      | YES  |     | NULL    |       |
| hire_date      | date             | NO   |     | NULL    |       |
| job_id         | varchar(10)      | NO   | MUL | NULL    |       |
| salary         | decimal(8,2)     | NO   |     | NULL    |       |
| commission_pct | decimal(2,2)     | YES  |     | NULL    |       |
| manager_id     | int(11) unsigned | YES  | MUL | NULL    |       |
| department_id  | int(11) unsigned | YES  | MUL | NULL    |       |
+----------------+------------------+------+-----+---------+-------+
```

SELECTING IMMEDIATE DATA

- Examples:

```
SELECT 10+20;
```
… outputs 30.

- Today's date:

```
SELECT CURRENT_DATE();
```

- Current time:

```
SELECT CURRENT_TIME();
```

- Today's date & time:

```
SELECT NOW();
```

Restricting the SELECTed data

WHERE CLAUSE

- Rows returned from SELECT can be restricted using a WHERE clause which follows the FROM clause
- The WHERE clause contains a condition that must be satisfied (evaluated to true) to restrict the rows

```
SELECT *|{[DISTINCT] column|expression [alias],...}
FROM   table
[WHERE logical expression(s)];
```

- Example:

```
SELECT employee_id, last_name, job_id
FROM   Employees
WHERE  department_id = 90 ;
```

- Displays details of employees working in department 90.

WHERE CLAUSE

- Specifies the condition which needs to be evaluated
- Character and date values need to be enclosed within single-quotes

```
SELECT last_name, hire_date, salary
FROM  Employees
WHERE hire_date > '2000-01-01';

SELECT last_name, salary * 12 AS annual_sal
FROM  Employees
WHERE last_name = 'Livingston';
```

- Note that the string enclosed within single-quote is case sensitive

WHERE CLAUSE

- A column alias cannot be used in the conditions
- Example:

```
SELECT last_name, salary * 12 AS annual_sal
FROM  Employees
WHERE annual_sal > 10000; -- Error
```

- Because aliasing of columns is done at the end, after applying WHERE conditions
- Hence the above query should be written as:

```
SELECT last_name, salary * 12 AS annual_sal
FROM  Employees
WHERE salary * 12 > 150000;
```

WHERE CLAUSE – LOGICAL OPERATORS

- Query: Retrieve last name and salary of all employees who have salary greater than 50,000, working in department 90.
- To retrieve the requested data:
  - Restrict the data using the conditions: salary > 50,000 AND department_id = 90

```
SELECT last_name, salary
FROM   Employees
WHERE  salary > 10000
AND department_id = 90;
```

  - Restrict the data using the conditions: salary < 50,000 OR hire_date > '01-JAN-2008'

```
SELECT last_name, hire_date, salary
FROM   Employees
WHERE  salary < 5000
OR Hire_date > '2000-01-01';
```

WHERE CLAUSE – LOGICAL OPERATORS PRECEDENCE

- Logical operators' precedence in that order is: NOT, AND, OR
- Query below tries to list employees drawing salary > 10000 from department 80 or 90:

```
SELECT last_name, department_id, salary
FROM   Employees
WHERE  salary > 10000
AND department_id = 80
OR department_id = 90;      // Improper query
```

- Above query retrieves all employees from dept. 90 and only those employees from dept. 80 who draw salary > 10000.
- Parenthesize the query appropriately to get the expected result

```
SELECT last_name, department_id, salary
FROM   Employees
WHERE  salary > 10000
AND (department_id = 80
OR department_id = 90);
```

WHERE CLAUSE – BETWEEN OPERATOR

- Rows can be retrieved based on a range of values. The range specifies the upper limit and the lower limit (both inclusive)
- Below query displays the last name and salary of all employees whose salary is greater than or equal to 10,000 and less than or equal to 25,000

```
SELECT last_name, salary
FROM   Employees
WHERE  salary >= 10000 AND
       salary <= 25000;
```

- Alternatively, the above can be achieved by using the BETWEEN operator

```
SELECT last_name, salary
FROM   Employees
WHERE  salary BETWEEN  10000 AND 25000 ;
```

WHERE CLAUSE – IN OPERATOR

- To test for values in a specified set of values, IN operator is used in the WHERE clause which tests the membership condition
- Below query retrieves last name, salary and manager_id of employees whose manager_id is 100,101 or 201

```
SELECT last_name, salary, manager_id
FROM  Employees
WHERE  manager_id IN (100,101,201);
```

- The above query can be achieved using a combination of OR conditions

```
SELECT last_name, salary, manager_id
FROM   Employees
WHERE  manager_id = 100 OR manager_id = 101
OR manager_id = 201;
```

- The set of values to the IN operator can be specified in any order

WHERE CLAUSE – LIKE OPERATOR

- The exact value to be searched (to restrict the rows) might not be known while executing the query
- Rows can be selected that match a character pattern by using the LIKE operator in the WHERE clause
- These patterns are denoted by:
  - % - zero or many characters
  - _ - one character

```
SELECT first_name, last_name
FROM   Employees
WHERE  first_name LIKE 'S%';

SELECT first_name, last_name
FROM   Employees
WHERE  last_name LIKE '_O%';  -- Last name 2nd char 'O'
```

WHERE CLAUSE – IS NULL

- Conditional operators cannot be used to check for NULL values
- IS NULL operator is used to check for the presence NULL values
- Below query retrieves all employees who does not have a manager

```
SELECT first_name, last_name,
FROM   Employees
WHERE  manager_id IS NULL;
```

- IS NOT operator is used to check for the absence of NULL values

```
SELECT first_name, last_name,
FROM   Employees
WHERE  COMMISSION_PCT IS NOT NULL;
```

WHERE CLAUSE – OPERATOR PRECEDENCE

- Rules of precedence determine the order in which the expressions are evaluated
- Use of parenthesis around the expressions would override the default precedence

Operator	Meaning
1	Arithmetic operators
2	Concatenation operator
3	Comparison conditions
4	IS [NOT] NULL, LIKE, [NOT] IN
5	[NOT] BETWEEN
6	Not equal to
7	NOT logical condition
8	AND logical condition
9	OR logical condition

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ORDER BY CLAUSE

- The order of rows returned in a query result is undefined.
- Use ORDER BY clause to sort the retrieved rows : ASC: Ascending order
- The ORDER BY is the last clause in the SELECT statement
- Columns not in the SELECT list can also be used for sorting

```
SELECT   last_name, job_id, department_id, hire_date
FROM     Employees
ORDER BY hire_date;

SELECT   last_name, job_id, department_id, hire_date
FROM     Employees
ORDER BY hire_date DESC ;
```

- Null values are displayed last for ascending sequences and first for descending sequences

ORDER BY CLAUSE

- Alias columns can be used for sorting purpose:

```
SELECT employee_id, last_name, salary*12 annsal
FROM Employees
ORDER BY annsal ;
```

- Sorting the data based on the numeric position of a column:

```
SELECT   last_name, job_id, department_id, hire_date
FROM     Employees
ORDER BY 3;
```

- Sorts by ascending order of dept id and then within each department sort in the descending order of the salary:

```
SELECT last_name, department_id, salary
FROM   Employees
ORDER BY department_id, salary DESC;
```

CASE EXPRESSION

- CASE expressions allow to use the IF-THEN-ELSE logic in SQL statements without the need to invoke procedures.

```
SELECT last_name, job_id, salary,
  CASE job_id WHEN 'IT_PROG'  THEN  1.10*salary
              WHEN 'ST_CLERK' THEN  1.15*salary
              WHEN 'SA_REP'   THEN  1.20*salary
  ELSE       salary END AS "REVISED_SALARY"
FROM   Employees;
```

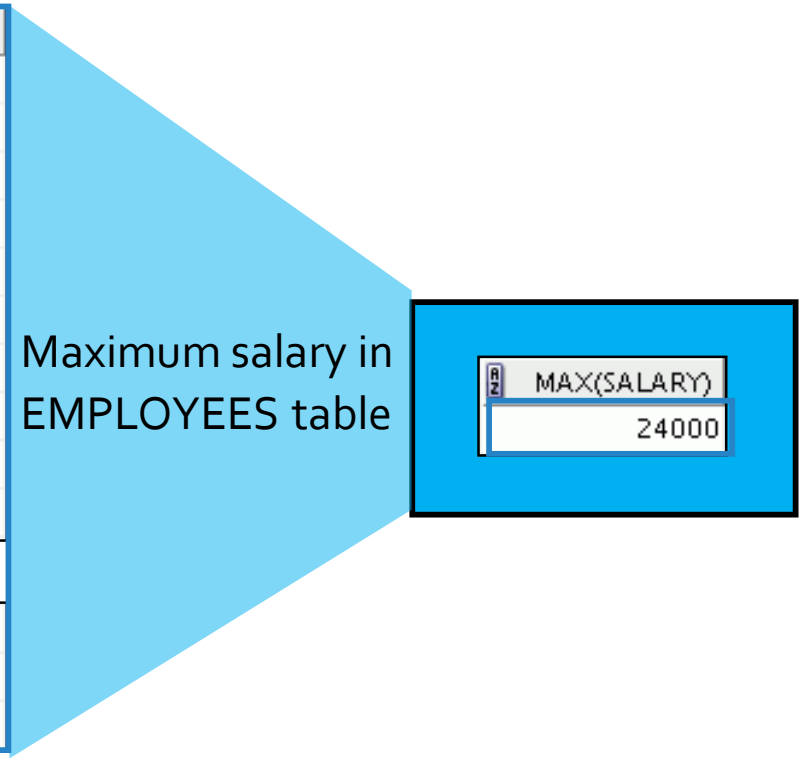
- Both expressions, after WHEN and THEN, must be of the same data type
- All of the return values also must be of the same data type

GROUP FUNCTIONS

- Group functions operate on sets of rows and outputs one result per group

EMPLOYEES

	DEPARTMENT_ID	SALARY
1	10	4400
2	20	13000
3	20	6000
4	110	12000
5	110	8300
6	90	24000
7	90	17000
8	90	17000
9	60	9000
10	60	6000
...		
18	80	11000
19	80	8600
20	(null)	7000



- AVG
- MEDIAN
- COUNT
- MAX
- MIN
- STDDEV
- SUM
- VARIANCE

USING COUNT FUNCTION

- COUNT(*) returns the number of rows in a table

```
SELECT COUNT(*)
FROM   Employees
WHERE  department_id = 50;
```

- COUNT(expr) returns the number of rows with non-null values for expr

```
SELECT COUNT(commission_pct)
FROM   Employees
WHERE  department_id = 50;
```

- COUNT(DISTINCT expr) returns the number of distinct non-null values of expr. This query displays the number of distinct departments in the EMPLOYEES table

```
SELECT COUNT(DISTINCT department_id)
FROM   Employees;
```

USING GROUP FUNCTIONS

- All group functions ignore null values. Functions like IF, IFNULL, etc. can be used to make group functions consider them
- Query below displays the average, highest, lowest, and sum of monthly salaries for all sales representatives

```
SELECT AVG(salary), MAX(salary),
MIN(salary), SUM(salary)
FROM   Employees
WHERE  job_id LIKE '%REP%';
```

- Below query shows the earliest and latest join dates of employees

```
SELECT MIN(hire_date), MAX(hire_date)
FROM   Employees;
```

GROUP FUNCTIONS AND NULL VALUES

- Group functions ignore null values in the column

```
SELECT AVG(commission_pct)
FROM   Employees;
```

- COUNT(expr) returns the number of rows with non-null values for expr

```
SELECT AVG(NVL(commission_pct, 0))
FROM   Employees;
```

- MEDIAN(expr) returns the median value of set of data

```
SELECT MEDIAN(salary))
FROM Employees;
```

GROUPING ROWS

- GROUP BY clause divides the rows into groups
- Summary information of each group can be obtained

EMPLOYEES

	DEPARTMENT_ID	SALARY
1	10	4400
2	20	13000
3	20	6000
4	50	2500
5	50	2600
6	50	3100
7	50	3500
8	50	5800
9	60	9000
10	60	6000
11	60	4200
12	80	11000
13	80	8600
...		
18	110	8300
19	110	12000
20	(null)	7000

4400

9500

3500

6400

10033

Average salary in the EMPLOYEES table for each

	DEPARTMENT_ID	AVG(SALARY)
1	(null)	7000
2	20	9500
3	90	19333.333333333333...
4	110	10150
5	50	3500
6	80	10033.333333333333...
7	10	4400
8	60	6400

GROUPING ROWS – GROUP BY CLAUSE FUNCTIONS

- WHERE clause can be used to restrict rows before dividing them into groups
- Cannot use a column alias in the GROUP BY clause

```
SELECT   department_id, AVG(salary)
FROM     Employees
GROUP BY department_id ;
```

- Grouping can be done on multiple columns:

```
SELECT   department_id, job_id, SUM(salary)
FROM     Employees
GROUP BY department_id, job_id;
```

ILLEGAL GROUP FUNCTIONS

- Any column or expression in the SELECT list that is not an aggregate function must be in the GROUP BY clause
- Query below gives error. Department_id should be included in the GROUP BY clause:

```
SELECT department_id, COUNT(last_name)
FROM   Employees;
```

- Column job_id is missing in GROUP BY

```
SELECT department_id, job_id,          COUNT(last_name)
FROM   Employees
GROUP BY department_id;
```

- Similarly, group functions cannot be included in the WHERE clause

```
SELECT   department_id, AVG(salary)
FROM     Employees
WHERE    AVG(salary) > 8000
GROUP BY department_id;
```

RESTRICTING GROUP ROWS – HAVING CLAUSE

- HAVING clause is used to restrict groups in the same way that you use the WHERE clause to restrict the rows that you select
- List those departments where the maximum salary > 1000

```
SELECT   department_id, MAX(salary)
FROM     Employees
GROUP BY department_id
HAVING   MAX(salary)>10000 ;
```

- Job ids which more than 10 employees have:

```
SELECT job_id, COUNT(employee_id)
FROM Employees
GROUP BY job_id
HAVING COUNT(job_id) > 10;
```

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Displaying Data from Multiple Tables using Joins

JOINS

- Used to query data from two or more tables
- Based on a relationship between certain columns in these tables
- Tables in a database are often related to each other with common columns (For e.g. dept_no in employee and dept tables)
- Two (or more) tables are joined based on the common columns among each pair of tables
- Names of common columns may not be same in tables
- If N tables are being joined, there would be N-1 joining statements

JOINING TABLES - SYNTAX

- ANSI SQL 99 Syntax to retrieve data from multiple tables

```
SELECT table1.column, table2.column
FROM table1
[NATURAL JOIN table2] |
[JOIN table2 USING (column_name)] |
[INNER JOIN table2
  ON (table1.column_name = table2.column_name)]|
[LEFT|RIGHT|FULL OUTER JOIN table2
  ON (table1.column_name = table2.column_name)]|
[CROSS JOIN table2];
```

CARTESIAN PRODUCT JOIN

- Each row in the first table is paired with all the rows in the second table
- This happens when there is no relationship defined between the two tables
- This is the default join between tables if no joining condition is specified

- E.g.: Assume Emp and Dept tables contain 100 rows and 10 rows respectively.
- Their Cartesian join will return 1000 rows.

```
SELECT  Emp.emp_id,  Dept.dept_id
FROM Emp, Dept;
```

- This query can also be written as:

```
SELECT  Emp.emp_id,  Dept.dept_id
FROM Emp CROSS JOIN Dept;
```

- One reason to use a Cartesian join is to generate a large amount of rows to use for performance testing

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DIFFERENT SQL JOINS

- INNER JOIN:
  - Returns rows that match on common key values, compared from both tables
- LEFT JOIN:
  - Returns matched rows from both tables
  - And Unmatched rows from the left table
- RIGHT JOIN:
  - Returns matched rows from both tables
  - And Unmatched rows from the Right table

INNER JOIN

- Syntax:

```
SELECT <column_name(s)>
FROM <table_name1>
INNER JOIN <table_name2>
   ON <table_name1.column_name> = <table_name2.column_name>
[INNER JOIN <table_name3>
   ON <table_name2.column_name> = <table_name3.column_name>
   … and so on.]
[WHERE <condition(s)> ]
```

INNER JOIN

- Display details of employee and department
  - Department_id is a common column between Employees & Departments tables
  - 'e' and 'd' are alias for the table names

SYNTAX 1 (ANSI Std)

```
SELECT employee_id, first_name, last_name,
department_name
FROM Employees e INNER JOIN Departments d
ON e.department_id = d.department_id
WHERE employee_id < 111
ORDER BY department_name, employee_id;
```

SYNTAX 2

```
SELECT employee_id, first_name, last_name,
department_name
FROM Employees e, Departments d
WHERE employee_id < 111
AND e.department_id = d.department_id
ORDER BY department_name, employee_id;
```

INNER JOIN

- More than two tables can be joined together
- Two tables should have common columns between them
- Names of columns need not be same; however their data types should match
- Following query extends previous query to include location & country details

```
SELECT employee_id, first_name, last_name,      department_name,
j.job_id, j.job_title, city
FROM Employees e, Departments d, Jobs j, Locations l
WHERE employee_id < 111
AND e.department_id = d.department_id
AND e.job_id = j.job_id
AND d.location_id = l.location_id
ORDER BY 4, 5, 1;
```

LEFT OUTER JOIN

- The LEFT JOIN keyword returns all rows from the left table (table_name1) , even if there are no matches in the right table (table_name1)
- Retrieves rows from right table (table_name2), that match based on common key
- For non-matching rows, only left table columns are retrieved, with right table columns as NULL

Syntax:

```
SELECT <column_name(s)>
FROM   <table_name1>
LEFT   [OUTER] JOIN <table_name2>
       ON table_name1.column_name = table_name2.column_name
[LEFT [OUTER] JOIN <table_name3>
       ON table_name2.column_name = table_name3.column_name...]
[WHERE <condition(s)>]
```

Example: LEFT OUTER JOIN

- List all departments those with and without employees
- Employee names will be NULL for those departments in which there are no employees

```
SELECT employee_id, first_name, last_name, department_name
FROM  Departments d LEFT OUTER JOIN Employees e
ON d.department_id = e.department_id
ORDER BY 4, 1;
```

Result: LEFT OUTER JOIN

EMPLOYEE_ID	FIRST_NAME	LAST_NAME	DEPARTMENT_NAME
205	Shelley	Higgins	Accounting
206	William	Gietz	Accounting
200	Jennifer	Whalen	Administration
			Benefits
			Construction
			Corporate Tax
100	Steven	King	Executive
101	Neena	Kochhar	Executive
102	Lex	De Haan	Executive
108	Nancy	Greenberg	Finance
109	Daniel	Faviet	Finance
112	Jose Manuel	Urman	Finance
113	Luis	Popp	Finance
			Government Sales
203	Susan	Mavris	Human Resources
103	Alexander	Hunold	IT
104	Bruce	Ernst	IT

RIGHT OUTER JOIN

- Returns all rows from the right table (table_name2), even if there are no matches in the left table (table_name1)
- Retrieves rows from Left table (table_name2) that match based on common key
- For non-matching rows, only right table columns are retrieved, with left table columns as NULL

Syntax:

```
SELECT <column_name(s)>
FROM   <table_name1> RIGHT [OUTER] JOIN <table_name2>
       ON table_name1.column_name = table_name2.column_name
[RIGHT [OUTER] JOIN <table_name3>
       ON table_name2.column_name = table_name3.column_name...]
[WHERE <condition(s)>]
```

Example: RIGHT OUTER JOIN

- List all cities that are outside of US and departments names in them
- For those cities where there are no departments, their names will be shown as NULL

```
SELECT department_id, department_name, city, country_id
FROM Departments d RIGHT OUTER JOIN Locations l
ON d.location_id = l.location_id
WHERE country_id <> 'US';
```

Result: RIGHT OUTER JOIN

DEPARTMENT_ID	DEPARTMENT_NAME	CITY	COUNTRY_ID
		Roma	IT
		Venice	IT
		Tokyo	JP
		Hiroshima	JP
20	Marketing	Toronto	CA
		Whitehorse	CA
		Beijing	CN
120	Treasury	Bombay	IN
		Sydney	AU
		Singapore	SG
40	Human Resources	London	UK
80	Sales	Oxford	UK
		Stretford	UK
70	Public Relations	Munich	DE
		Sao Paulo	BR
		Geneva	CH
		Utrecht	NL
		Mexico City	MX

FULL OUTER JOIN

- Combination of LEFT and RIGHT OUTER JOINs
- Includes unmatched rows from both sides

```
SELECT <column_name(s)>
FROM   <table_name1> FULL [OUTER] JOIN <table_name2>
ON     table_name1.column_name = table_name2.column_name
[WHERE <condition(s)>]
```

```
SELECT e.employee_id, e.first_name, e.last_name, d.department_name
FROM Employees e FULL OUTER JOIN Departments d
ON e.employee_id = d.manager_id;
```

- Note: Employees and Departments tables are joined on manager_id column

Result: FULL OUTER JOIN

EMPLOYEE_ID	FIRST_NAME	LAST_NAME	DEPARTMENT_NAME
100	Steven	King	Executive
101	Neena	Kochhar	
102	Lex	De Haan	
103	Alexander	Hunold	IT
104	Bruce	Ernst	
108	Nancy	Greenberg	Finance
196	Alana	Walsh	
197	Kevin	Feeney	Human Resources
198	Donald	OConnell	
200	Jennifer	Whalen	Administration
202	Pat	Fay	
203	Susan	Mavris	
204	Hermann	Baer	Public Relations
205	Shelley	Higgins	Accounting
206	William	Gietz	
			Payroll
			Recruiting
			Retail Sales
			Government Sales
			IT Helpdesk

SELF JOIN

- Joining the table with itself
- Example: Show ids and names of employees and their managers

```
SELECT emp.employee_id, emp.first_name, mgr.employee_id,
mgr.first_name
FROM Employees emp, Employees mgr
WHERE emp.manager_id = mgr.employee_id
ORDER BY mgr.employee_id, emp.employee_id;
```

- List peers of 'John Chen' (Join Employees table with itself based on job_id)

```
SELECT peer.employee_id, peer.first_name
FROM Employees emp, Employees peer
WHERE emp.job_id = 'FI_ACCOUNT'
AND emp.first_name = 'John'
AND peer.first_name != 'John'
AND emp.job_id = peer.job_id
ORDER BY peer.employee_id, emp.employee_id;
```

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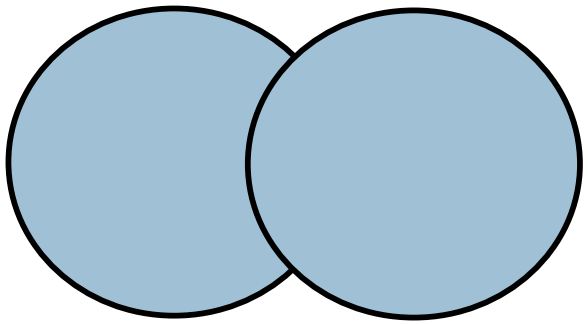
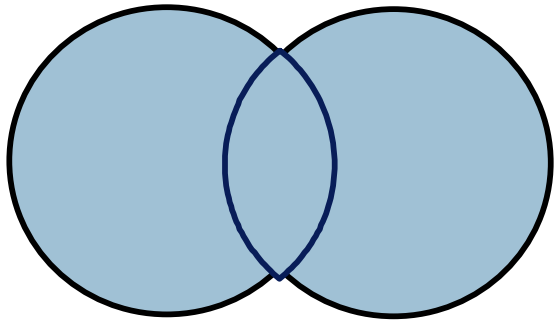
Set Operations

UNION

- Used to combine the result-set of two or more SELECT statements removing duplicates*
- Each SELECT statement within the UNION **must** have the same number of columns
- The selected columns **must** be of similar data types and **must** be in the same order in each SELECT statement
- More than two queries can be clubbed using more than one UNION statement



UNION



UNION ALL

UNION

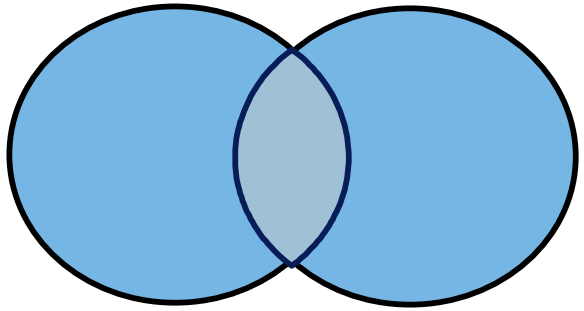
- Query to get a UNION of all types of managers

```
SELECT e.employee_id, e.first_name, j.job_title, d.department_name
FROM Employees e, Jobs j, Departments d
WHERE (j.job_id LIKE '%_MAN' OR j.job_id LIKE '%_MGR')
AND e.job_id = j.job_id
AND e.department_id = d.department_id
UNION
SELECT e.employee_id, e.first_name, j.job_title, d.department_name
FROM Employees e, Departments d, Jobs j
WHERE e.employee_id = d.manager_id
AND e.job_id = j.job_id;
```

INTERSECT

- Used to select common result-set from two or more SELECT statements
- All conditions that apply to UNION apply here also
- List all dept. managers whose role is also ending with either 'MAN' or 'MGR'

```
SELECT e.employee_id, e.first_name, j.job_title,     d.department_name
FROM Employees e, Jobs j, Departments d
WHERE (j.job_id LIKE '%_MAN' OR j.job_id LIKE '%_MGR')
AND e.job_id = j.job_id
AND e.department_id = d.department_id
INTERSECT
SELECT e.employee_id, e.first_name, j.job_title,     d.department_name
FROM Employees e, Departments d, Jobs j
WHERE e.employee_id = d.manager_id
AND e.job_id = j.job_id;
```



INTERSECT

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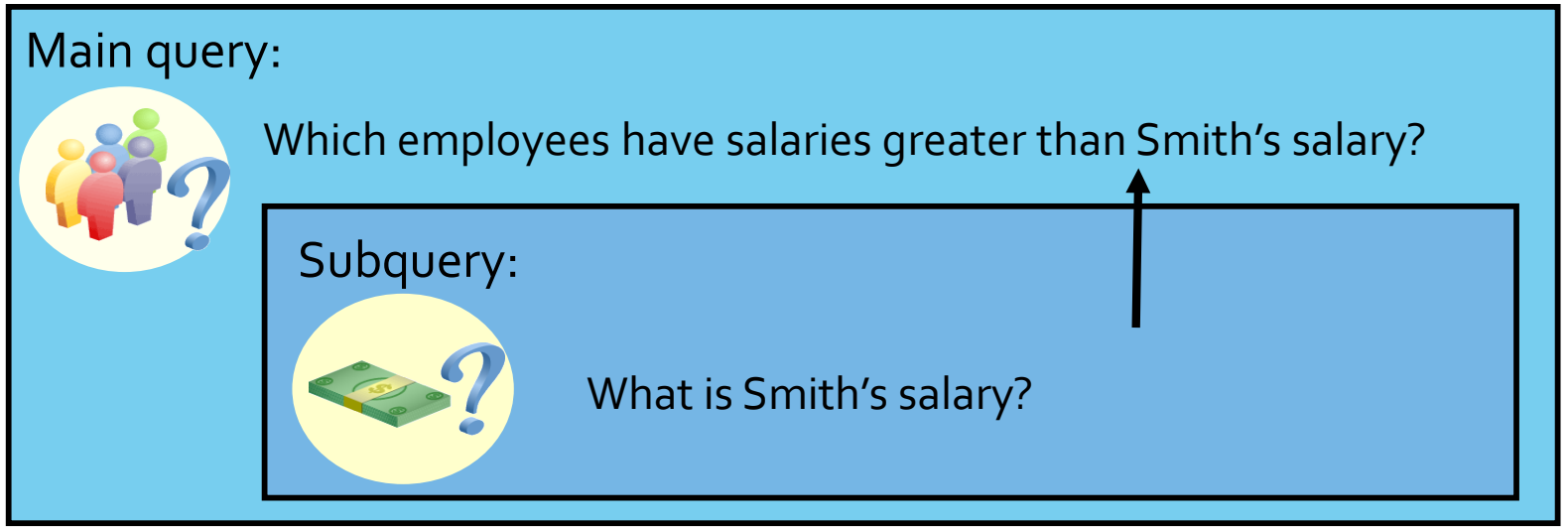
Using Subqueries

SUBQUERY

- Sub query is a query within a query
- Also called as Inner query or Nested query
- Usually added in the WHERE clause of the SQL, but can be in other clauses also
- Used when it is known how to search for a value using a SELECT statement, but do not know the exact value
- Sub queries are an alternate way of returning data from multiple tables



SUBQUERY

- The subquery (inner query) executes before the main query (outer query)
- The result of the subquery is used by the main query to restrict the rows
- Comparison operator can be any of >, =, >=, <, <>, <= (Single row operators) and IN, ANY, ALL, EXISTS (Multiple row operators)
- The subquery generally executes first, and its output is used to complete the query condition for the main (or outer) query
- List salaries of those employees who draw higher salary than 'Abel':

```
SELECT last_name, salary
FROM   Employees
WHERE  salary >
      (SELECT salary
       FROM   Employees
       WHERE  last_name = 'Abel');
```

- A query can contain more than one sub-query in it
- A sub-query in-turn can contain sub-queries

SUBQUERY: EXAMPLE

- List employees who have same job id say Nayer but draw higher salary than her:

```
SELECT last_name, job_id, salary
FROM   Employees
WHERE  job_id = (SELECT job_id FROM   Employees
                 WHERE  last_name = 'Nayer')
AND    salary > (SELECT salary FROM   Employees
                 WHERE  last_name = 'Nayer');
```

- This query can also be written using equivalent join version:

```
SELECT e2.last_name, e2.job_id, e2.salary
FROM   Employees e1, Employees e2
WHERE  e1.last_name = 'Nayer'
AND e2.job_id = e1.job_id
AND    e2.salary > e1.salary;
```

Not all sub-queries can be converted into equivalent JOIN statements

GROUP FUNCTIONS IN SUBQUERY

- The database executes the subqueries first
- It returns results into the HAVING clause of the main query

```
SELECT   department_id, MIN(salary)
FROM     Employees
GROUP BY department_id
HAVING   MIN(salary) > (SELECT MIN(salary)
                        FROM   Employees
                        WHERE  department_id = 50);
```

List departments whose minimum salary is more than the min. salary of dept 50.

- Following query results in error as the inner query returns multiple rows:

```
SELECT employee_id, last_name
FROM   Employees
WHERE  salary = (SELECT   MIN(salary)
                 FROM     Employees
                 GROUP BY department_id);
```

SUBQUERY: TYPES

Single-row sub query

- Returns one row
- Scalar sub query returns a single row with one column
- Comparison operator is any of the following:
  - = equal
  - > greater than
  - >= greater than or equal
  - < less than
  - <= less than or equal
  - <> not equal n

Multiple-row sub query

- Return multiple rows
- Commonly used to generate result sets which are passed to a DML or SELECT statement for further processing
- Comparison operator is any of the following:
  - IN: equal to any member in the list
  - NOT IN: not equal to any member in the list
  - ANY: returns rows that match with any of the values in the list
  - ALL: returns rows that match with all the values in the list

SUBQUERIES WITHIN SUBQUERY

- List employees who work in countries other than US & UK:

```
SELECT employee_id, first_name, last_name
FROM   Employees
WHERE  department_id IN
          (SELECT department_id FROM Departments
        WHERE location_id IN
                (SELECT location_id FROM Locations
                 WHERE country_id NOT IN ('US','UK')));
```

SUBQUERY: USING ANY CLAUSE

- Compares a value to each value in a list or a query output
- Must be preceded by =, !=, >, <, <= or >=.
- Can be followed by any expression or sub-query that returns one or more values
- Evaluates to FALSE if the query returns no rows
- List employees and their job id & salary whose salary is less than any of the IT_PROG's salary

```
SELECT employee_id, last_name, job_id, salary
FROM   Employees
WHERE  salary < ANY (SELECT salary
                     FROM   Employees
                     WHERE  job_id = 'IT_PROG')
AND    job_id <> 'IT_PROG';
```

SUBQUERY: USING ALL CLAUSE

- Compares a value to every value in a list or returned by a query
- Must be preceded by =, !=, >, <, <= or >=
- Can be followed by any expression or sub-query that returns one or more values
- Evaluates to TRUE if the query returns no rows
- List employees and their job id & salary whose salary is less than all of the IT_PROG's salary:

```
SELECT employee_id, last_name, job_id, salary
FROM   Employees
WHERE  salary < ALL (SELECT salary
                     FROM   Employees
                     WHERE  job_id = 'IT_PROG')
AND    job_id <> 'IT_PROG';
```

SUBQUERY IN FROM CLAUSE

- A sub query can also be found in the FROM clause
- These are called *inline views*, *'dept'* in this query example:

```
SELECT employee_id, first_name, last_name, department_name
FROM   Employees e,
(SELECT * FROM Departments WHERE location_id <> 1700) dept
        WHERE  e.department_id = dept.department_id;
```

MULTIPLE-COLUMNS IN SUBQUERY

- Rows in the sub query results are evaluated in the main query in pair-wise comparison.
- That is, column-to-column comparison and row-to-row comparison
- Example: List peers of employee id 123

```
SELECT employee_id, first_name, last_name, job_id
FROM   Employees e
WHERE employee_id != 123
AND (job_id, department_id) IN
(SELECT job_id, department_id FROM Employees
 WHERE employee_id = 123);
```

NULL VALUES IN SUBQUERY

- Display all the departments where there are no employees working:

```
SELECT department_id FROM Departments
WHERE department_id NOT IN
(SELECT department_id FROM Employees);
```

- The above query will not return any rows as the department_id of an employee is NULL
- As there is a NULL value in the subquery, it fails
- The corrected query will be:

```
SELECT department_id FROM Departments
WHERE department_id NOT IN
(SELECT department_id FROM Employees
 WHERE department_id IS NOT NULL);
```

CORRELATED SUBQUERY

- Both inner and the outer query are interdependent
- For every row processed by the inner query, the outer query is processed as well
- The inner query depends on the outer query before it can be processed
- Example: List details of employees who draw more salary than the average salaries of their respective departments and job ids:

```
SELECT employee_id, first_name, department_id, job_id, salary
FROM Employees e1
WHERE salary > (SELECT AVG(salary) FROM Employees e2
 WHERE e1.department_id = e2.department_id
 AND e1.job_id = e2.job_id);
```

EXISTS OPERATOR

- The EXISTS operator is used in queries where the query result depends on whether or not certain rows exist in a table
- It evaluates to TRUE if the subquery returns at least one row

```
SELECT employee_id, salary, last_name
FROM employees m
WHERE EXISTS (SELECT employee_id FROM employees e
 WHERE (e.manager_id = m.employee_id)
AND e.salary > 10000);
```

- NOT EXISTS evaluates to TRUE if the subquery returns no rows

```
SELECT * FROM departments d
WHERE NOT EXISTS
(SELECT * FROM employees e
 WHERE e.department_id=d.department_id);
```

EXISTS / NOT EXISTS are usually co-related sub-queries; where as, IN / NOT IN are normally independent sub-queries

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Manipulating Data

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DML STATEMENT

- Statements for manipulating the data in the database
  - INSERT, UPDATE, DELETE, MERGE, …
- Should use COMMIT to make the changes permanent
- Use ROLLBACK to undo the changes
- ROLLBACK will undo till the last commit
- Any DDL statement executed after DML statements will implicitly COMMIT the changes
- Hence exercise caution while using DML and DDL statements together to prevent unwanted changes getting COMMITted

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INSERT INTO STATEMENT

- To insert a new row into a table (one row at a time)
- List of column names is optional
- If it is omitted, values for all columns should be passed in the same order as in the table
- To insert rows with values in specific columns, column names must be mentioned in the query
- Values for all non-nullable columns must be passed in the INSERT statements
- Syntax:

```
INSERT INTO     <table_name> [(<column_name/s>)]
VALUES          (<value 1>, <value 2>,...);
```

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EXAMPLE: INSERT INTO

- Inserting values in all columns:

```
INSERT INTO Employees
VALUES(301, 'Suma', 'Sinha','ssinha', '515.124.4579',
SYSDATE, 'AC_MGR', 12500, NULL, 101, 110);
```

- Inserting specific columns:

```
INSERT INTO Locations (location_id, city, country_id)
VALUES(3300, 'Bengaluru', 'IN');
```

- NULL will be inserted to rest of the columns in the last case
- Note that all non-nullable columns should be specified in the column list

EXAMPLE: INSERT INTO

- Inserting using subquery:

```
INSERT INTO Departments (department_id, department_name)
VALUES ((SELECT MAX(department_id)+10 FROM Departments),
'Training');
```

- Inserting using SELECT:

```
INSERT INTO Temp_Emp
SELECT * FROM Employees WHERE department_id = 50;
```

- Temp_Emp should have the same structure as Employees table

UPDATE STATEMENT

- Updates columns of a table as per the condition specified
- Syntax:

```
UPDATE <table name>
SET    <column_name> = <value> [, <column_name> = <value>, ...]
[WHERE condition(s)];
```

- Updating All Rows:

```
UPDATE Employees
SET    commission_pct = NULL;
```

- Updating Specific rows:

```
UPDATE Departments
SET    manager_id = 150
WHERE  department_id IS NULL
AND location_id <> 1700;
```

UPDATE STATEMENT

- Updating Multiple Columns

```
UPDATE Locations
SET street_address = '#24, 4th Main, 7th Sector',
postal_code = '570 100',
state_province = 'KA'
WHERE  city = 'Bengaluru';
```

- Updating using subqueries (needed to access other tables):

```
UPDATE Departments
SET manager_id = (SELECT employee_id FROM Employees
WHERE job_id = 'ST_MAN' AND hire_date = '01-MAY-95')
WHERE manager_id IS NULL
AND department_name LIKE 'IT%';
```

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DELETE FROM STATEMENT

- To delete rows from a table as per the condition specified
- DELETE command can delete only row(s) and not column(s) from a table
- Syntax:
  DELETE FROM <table name>
  [WHERE <condition>];

- Deleting All Rows
  DELETE FROM Jobs;

- Important note: Parent record will not get deleted if it has child records i.e. if there are employees in a given job_id, then that job_id row can not be deleted unless all its child records are deleted

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DELETE FROM STATEMENT

- Deleting Specific Rows:

```
DELETE FROM Employees
WHERE employee_id = 199;
```

- Deleting rows based on conditions that are based on other tables
- Deleting departments where there are no employees working:

```
DELETE FROM Departments d
WHERE NOT EXISTS
(SELECT 1 FROM Employees e
 WHERE e.department_id = d.department_id);
```

- Note: Since the EXISTS clause subquery checks for existence of a row in the subquery, it doesn't matter which column gets selected in the subquery

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NOTE: DML STATEMENTS

- COMMIT statement makes the changes made by the DML statements, permanent
- A ROLLBACK will rollback or undo all the changes (but not after COMMIT)
- ROLLBACK to <savepoint> will undo the changes till the save point

```
INSERT INTO Books …
UPDATE Books SET …
SAVEPOINT sp1;
INSERT INTO Book_Sales …
DELETE FROM Books …
ROLLBACK TO sp1;
COMMIT;
```

Example:

- ROLLBACK will rollback the last 2 INSERT & DELETE statements
- COMMIT will commit first INSERT & UPDATE statements

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TRUNCATE STATEMENT

- Removes all rows from a table, leaving the table empty and the table structure intact
- Data definition language (DDL) statement rather than a DML statement; cannot easily be undone
- Since it's a DDL statement, it's auto-committed; hence it cannot be rolled back
- DELETE statement without a WHERE clause also deletes all rows; however, it can be rolled back

```
TRUNCATE TABLE temp_emp;
```

ADVANTAGES OF COMMIT AND ROLLBACK STATEMENTS

- With COMMIT and ROLLBACK statements, you can:
  - Ensure data consistency
  - Preview data changes before making changes permanent
  - Group logically related operations

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DDL to Create and Manage Tables

DDL STATEMENTS

- CREATE <object>
- ALTER <object>
- DROP <object>
- TRUNCATE <object>
- COMMENT <object>
- RENAME <object>

- <object> can be TABLE, VIEW, INDEX, SEQUENCE, etc.

CREATE TABLE EXAMPLE

Column Name	Data type	Constraints
Cust_Id	Int(8)	Primary key of the table
Cust_Fname	Varchar(20)	First name - Not Null column
Cust_LName	Varchar (20)	Last name
Account_No	Bigint(18)	Not null, Unique column
Branch_Code	Varchar(10)	Not Null column
Cust_Email	Varchar (50)	Unique column
Cust_Phone_no	Varchar(20)	
Curr_Balance	Decimal(20,2)	Current balance - Not null

Saving_Account_Details

SQL - CREATE TABLE

- PRIMARY KEY ,NOT NULL and UNIQUE

```
CREATE TABLE Savings_Account_Details
(
    Cust_Id INT(8) PRIMARY KEY,
    Cust_FName VARCHAR(20) NOT NULL,
    Cust_Lname VARCHAR(20),
    Account_No BIGINT(18) NOT NULL UNIQUE,
    Branch_code VARCHAR(10) NOT NULL,
    Cust_Email VARCHAR(50) UNIQUE,
    Cust_Phone_No VARCHAR(20),
    Curr_Balance  DECIMAL (20, 2) NOT NULL
);
```

TYPES OF CONSTRAINTS

- Primary Key
- Foreign Key
- Not Null *
- Check
- Unique

```
CREATE TABLE Subject_Info
( subject_name    Varchar(20) NOT NULL,
  subject_id      Int(10) PRIMARY KEY,
  semester        Int(2),
  branch_id       Varchar(20),
  UNIQUE (branch_id, semester));
```

*All constraints except NOT NULL can specify more than one column

CREATE TABLE (CONTD…)

Column Name	Data type	Constraints
Loan_AccNo	Bigint(18)	Primary key
Cust_Id	Int(8)	Can take only those values which are present in the Cust_Id of the Savings_Account_Details Table
Loan_Amount	Decimal(20,2)	
Loan_Term	Int(2)	In months
Loan_Int_Type	Character(1)	Loan interest type: 'F' for 'Fixed' or 'V' for Variable

Loan_Account

Primary Key and Foreign Key Constraints

CREATE TABLE (CONTD…)

- Foreign Key:

```
CREATE TABLE Loan_Account (
    Loan_AccNo BIGINT(18) PRIMARY KEY,
    Cust_Id  INT(5) REFERENCES
Savings_Account_Details(Cust_Id),
    Loan_Amount DECIMAL(18,2),
    Loan_Term INT(2),
    Loan_Int_Type CHAR(1)
         CHECK(Loan_Int_Type ='F' OR Loan_Int_Type = 'V')
);
```

CREATE TABLE (CONTD…)

Column Name	Data type	Constraints
Employee_No	Int(6)	Primary key of the table
First_Name	Varchar(20)	
Last_Name	Varchar (20)	
Email_Id	Varchar (30)	
Dept_No	Int(2)	Default 10 (Say, 'TRAINING')
Manager_EmpNo	Int(6)	Can take only those values which are present in Employee_No column

Employee
Implementation of Self Referencing Foreign key

CREATE TABLE (CONTD…)

- Self Referential Foreign Key and DEFAULT:

```
CREATE TABLE Employee
(
    Employee_No INT(6) PRIMARY KEY,
    First_Name    VARCHAR(20),
    Last_Name     VARCHAR(20),
    Email_Id      VARCHAR (30),
    Dept_No       INT(2)     DEFAULT 10,
    Manager_Emp_No  INT(6) REFERENCES Employee(Employee_No)
);
```

CREATE TABLE (CONTD…)

Column Name	Data type	Constraints
FD_Acc_No	Bitint(14)	Primary key
Cust_Id	Int(8)	Can take only those values which are present in the Cust_Id of the Savings_Account_Details Table
FD_Amount	Decimal(20,2)	
Interest_Rate	Decimal(5,2)	Can take values only between 2.5 to 12.0

FD_Account

Implementation of Check Constraints

CREATE TABLE (CONTD…)

- CHECK constraint:

```
CREATE TABLE FD_Account(
    FD_Acc_No BIGINT(14) PRIMARY KEY,
    Cust_Id INT(8) REFERENCES
Savings_Account_Details(Cust_Id),
    FD_Amount  DECIMAL(20,2),
    Interest_Rate DECIMAL(5,2)
    CHECK (Interest_Rate >=2.5 AND Interest_Rate <=12.0)
);
```

CREATE TABLE (CONTD…)

Column Name	Data type	Constraints
Cust_Id	Int(8)	Can take only those values which are present in Cust_Id column of Savings_Account_Details Table
Txn_Date	Date	(Cust_Id,Transaction_Date) are together forming the Primary Key of the table.
Txn_Type	Char(2)	'CR' or 'DB'
Txn_Amt	Decimal(20,2)	
Available_Bal	Decimal(24,2)	

Transaction_Table

Implementation of Composite Primary Key Constraints

CREATE TABLE (CONTD…)

- Composite Primary key constraint:

```
CREATE TABLE Transaction_Table(
    Cust_Id INT(8) REFERENCES
Savings_Account_Details(Cust_Id),
    Acct_No    BIGINT(14),
    Txn_Date   TIMESTAMP(6),
    Txn_Type   CHAR(2) CHECK (txn_type='CR' OR
txn_type='DB'),
    Txn_Amt   DECIMAL(20,2),
    Available_Bal  DECIMAL(24,2),
    PRIMARY KEY(Acct_No, Txn_Date)
);
```

CREATE TABLE (CONTD…)

- Composite Foreign key constraint

```
CREATE TABLE Journal_Update(
    Journal_ID    BIGINT(16),
    Journal_Type  VARCHAR(20),
    JU_Cust_Id    INT(8),
    JU_Txn_Date   TIMESTAMP(6),
    Txn_Amt       DECIMAL(20,2),
    FOREIGN KEY(JU_Txn_date, JU_Cust_Id) REFERENCES
Transaction_Table(Txn_date,Cust_Id)
);
```

CREATE TABLE (CONTD…)

- From a SELECT statement
  - New table gets created with the columns and data from the SELECT statement

```
CREATE TABLE <table name> AS
          <SELECT statement>

CREATE TABLE Emp_Info AS
       SELECT employee_id, first_name, last_name, job_id,
            d.department_id, department_name
       FROM   Employees e, Departments d
       WHERE  e.department_id = d.department_id;
```

If the selected columns have NOT NULL constraint, it will be copied onto the new table.

ALTER TABLE

- Add/Drop/Modify /Rename Column
- Syntax:

```
ALTER TABLE tablename (ADD/MODIFY/RENAME/DROP column_name)
```

- Examples:

```
ALTER TABLE Emp_Info
      ADD contact_no VARCHAR(20);

ALTER TABLE Emp_Info
      MODIFY contact_no INT(10);

ALTER TABLE Emp_Info
      DROP COLUMN contact_no;

ALTER TABLE Emp_Info
RENAME COLUMN job_id TO job_code;
```

ALTER TABLE (CONTD…)

ADD/DROP/MODIFY Column

- Used to modify the structure of a table by adding and / or removing columns
- MODIFY option cannot be used to change the name of a column or table
- Column to be modified should be empty to decrease the column length or to change its data type
- If the table has only one column, the ALTER TABLE statement cannot be used to drop that column because that would make the table definition invalid

ALTER TABLE (CONTD…)

- Add/Drop Constraint

```
ALTER TABLE Emp_Info
  ADD CONSTRAINT PK_Emp_Info PRIMARY KEY (employee_id);

ALTER TABLE Book_Info
  DROP PRIMARY KEY;
```

ALTER TABLE (CONTD …)

- ADD/DROP Foreign Key Constraint

```
ALTER TABLE Emp_Info
  ADD CONSTRAINT FK_dept_id FOREIGN KEY (department_id)
REFERENCES Departments(department_id);

ALTER TABLE Emp_Info
  DROP FOREIGN KEY FK_dept_id;
```

- A table can have one or more Foreign keys
- Adding a foreign key constraint using ALTER TABLE command will result in an error if the existing data in master or child table does not support the foreign key restriction

ALTER TABLE (CONTD …)

- ALTER TABLE statement can be used to Add or Drop:
  - Primary key
  - Foreign key
  - Unique constraint
  - Check constraint

- If a table already has a primary key, then adding a primary key using the ALTER TABLE statement results in an error
- RDBMS will not allow a PRIMARY KEY constraint on column(s) if the column(s) have NULL or duplicate values

TRUNCATE TABLE

- Deleting All Rows of a table:

```
TRUNCATE TABLE Emp_Info;
```

- Similar to DELETE, without a WHERE clause
- It is very fast on both large and small tables
- Cannot undo TRUNCATE (using ROLLBACK) unlike DELETE
- TRUNCATE is DDL and, like all DDL, performs an implicit commit
- Hence, any uncommitted DML changes will also be committed with the TRUNCATE

SQL - DROP TABLE

- DROP TABLE
  - Deletes table structure
  - Cannot be recovered
  - Should be used with caution

```
DROP TABLE Emp_Info;
```

- NOTE: Cannot drop the table with unique or primary keys referenced by foreign keys in another table.

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THANK YOU