[1]

UNIT- 2

SQL(Structured Query Language)

LET'S START WITH SQL :)

What is SQL?

- SQL stands for Structured Query Language. SQL is a computer language used to interact with relational database systems.
- SQL is a tool for organizing, managing, and retrieving archived data from a computer database.

Rules:

- Structure query language is not case sensitive. Generally, keywords of SQL are written in uppercase.
- Statements of SQL are dependent on text lines.

Characteristics in SQL:

- SQL is used to access data from relational database management systems.
- SQL can execute queries against the database.
- SQL is used to define the data in the database and manipulate it when needed.
- SQL is used to create a view, stored procedure, function in a database.

SQL Data Type: A column's data type is essentially the type of data format that will be used to store the data in each cell; examples include any type of integer, character, money, date and time, binary, etc.

- There are five datatypes in SQL:
    1. Binary Datatype
    2. Numeric Datatype
    3. Extract Numeric Datatype
    4. String Datatype
    5. Date Datatype

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1. **Binary Datatype:** Binary data types in SQL are used to store binary data such as images, audio, or any other file types. The common binary data types in SQL include:
   I. **BINARY(n):**
      - Fixed-length binary data.
      - ‘n’ specifies the number of bytes.
      - If the data is shorter than n, it will be padded with zero bytes.

   II. **VARBINARY(n):**
      - Variable-length binary data.
      - n specifies the maximum number of bytes.
      - Only uses as many bytes as necessary, up to the specified limit.

Large Binary Data Types (BLOB)

TINYBLOB:

- Maximum length of 255 bytes.
- Used for small binary data.

BLOB(Binary Large Object):

- Maximum length of 65,535 bytes (64 KB).
- Used for general binary data.

MEDIUMBLOB:

- Maximum length of 16,777,215 bytes (16 MB).
- Used for larger binary data.

LONGBLOB:

- Maximum length of 4,294,967,295 bytes (4 GB).
- Used for very large binary data.

2. Numeric Datatype:

INT: Integer, a whole number.

- TINYINT: Very small integer (-128 to 127).
- SMALLINT: Small integer (-32,768 to 32,767).
- MEDIUMINT: Medium integer (-8,388,608 to 8,388,607).
- BIGINT: Large integer (-2^63 to 2^63-1).

DECIMAL(p, s) or NUMERIC(p, s): Fixed-point numbers(-10^38 + 1 to 10^38-1)

- p: Precision (total number of digits).
- s: Scale (number of digits after the decimal).

FLOAT: Single-precision floating-point(-1.79E+308 to 1.79E+308)

DOUBLE: Double-precision floating-point.

3. Extract Numeric Datatype: To extract or convert a numeric data type in SQL, you typically use functions provided by your SQL database management system (DBMS).

4. String Datatype:

CHAR(n): Fixed-length string, up to 255 characters.

VARCHAR(n): Variable-length string, up to 65,535 characters.

TEXT: Large text field.

- TINYTEXT: Up to 255 characters.
- TEXT: Up to 65,535 characters.
- MEDIUMTEXT: Up to 16,777,215 characters.
- LONGTEXT: Up to 4,294,967,295 characters.

5. Date Datatype:

DATE: A data type is used to store the data of date in a record(YYYY-MM-DD).

TIME: A data type is used to store the data of time in a record.

DATETIME: A data type is used to store both the data,date, and time in the record.[2]

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SQL Commands:

- ➔ SQL commands are instructions. It is used to communicate with the database. It is also used to perform specific tasks, functions, and queries of data.
- ➔ SQL can perform various tasks like create a table, add data to tables, drop the table, modify the table, set permission for users.
- ➔ There are Five Commands in SQL:
  1. DDL(Data Definition Language)
  2. DML(Data Manipulation Language)
  3. DCL(Data Control Language)
  4. TCL(Transcation Control Language)
  5. CONSTRAINTS

1. DDL: It is use to define & manage all database objects, such as tables, indexes.

1) CREATE: Used to create database objects.

```
Syntax: CREATE TABLE table_name(

               col 1 datatype,

               col 2 datatype);
```

2) DROP: It is used to delete database objects.

```
Syntax: DROP TABLE table_name;
```

3) ALTER: It is used to modify existing database objects.

```
Syntax: ALTER TABLE table_name

             ADD col_name datatype;
```

4) TRUNCATE: It is used to remove all records from a table.

```
Syntax: TRUNCATE TABLE table_name;
```

5) RENAME: The RENAME command in SQL is used to rename database objects such as tables, columns, indexes, and other schema elements. However, it's important to note that the exact syntax and support for the RENAME command can vary between different database systems (like MySQL, PostgreSQL, SQL Server, Oracle, etc.).

```
Syntax: RENAME TABLE old_table_name TO new_table_name;
```

Example: RENAME TABLE employees TO staff;

2. **<u>DML:</u>** It is used for managing data within schema objects.

1) SELECT: Used to retrieve data from the database.

   Syntax: SELECT col1, col2 FROM table_name:

2) INSERT: Used to insert new records into a table.

   Syntax: INSERT INTO table_name(col1,col2)

   VALUES(val1, val2):

3) UPDATE: Used to modify existing records.

   Syntax: UPDATE table_name SET col1= val1, col2=val2

   WHERE Condition;

4) DELETE: Used to remove records from a table.

   Syntax: DELETE FROM table_name

   WHERE condition;

3. **<u>DCL:</u>** It is used to control access to data in the database.

1) GRANT: Used to give users access privileges.

   Syntax: GRANT privilege [, privilege ...]

   ON object_type object_name

   TO user_or_role [, user_or_role ...]

   [WITH GRANT OPTION];

Parameters

- **privilege**: The type of permission being granted (e.g., SELECT, INSERT, UPDATE, DELETE, ALL).
- **object_type**: The type of database object (e.g., TABLE, VIEW, PROCEDURE).
- **object_name**: The name of the database object.
- **user_or_role**: The name of the user or role to whom the privilege is being granted.

- **WITH GRANT OPTION**: Allows the user to grant the specified privileges to other users.

2) REVOKE: The REVOKE command in SQL is used to remove previously granted privileges from users or roles on database objects.

```
Syntax: REVOKE privilege [, privilege ...]
        ON object_type object_name
        FROM user_or_role [, user_or_role ...];
```

Parameters

- **privilege**: The type of permission being revoked (e.g., SELECT, INSERT, UPDATE, DELETE, ALL).
- **object_type**: The type of database object (e.g., TABLE, VIEW, PROCEDURE).
- **object_name**: The name of the database object.
- **user_or_role**: The name of the user or role from whom the privilege is being revoked.

4. TCL: TCL is used to manage the changes made by DML statements and to group DML statements into transactions.

1) COMMIT: Used to save all changes made in the current transaction.

```
Syntax: COMMIT;
```

2) ROLLBACK: The ROLLBACK command in SQL is used to undo changes made in the current transaction.

```
Syntax: ROLLBACK;
```

3) SAVEPOINT: A SAVEPOINT allows you to set a point within a transaction to which you can later roll back if necessary.

Predicate: A Predicate in DBMS is a condition expression which evaluates and results in boolean value either true or false which enables decision making in retrieving and manipulating a record.

A predicate is a condition that is specified for:

●Filtering the data using the WHERE clause,
●Pattern matching in LIKE operator,
●Specifying a set of list for using IN operator,
●Manipulating a range of values using BETWEEN operator, etc

LOGICAL OPERATOR: logical operators are used to test for the truth of the condition. A logical operator like the Comparison operator returns a boolean value of TRUE, FALSE, or UNKNOWN.

1) AND: The AND operator is used to combines two or more conditions but if it is true when all the conditions are satisfied.
   QUERY: SELECT * FROM emp WHERE emp_city= 'Bangalore' AND
   emp_country='India';

2) OR: The OR operator is used to combines two or more conditions but if it is true when one of the conditions are satisfied.
   QUERY: SELECT * FROM emp WHERE emp_city='Bangalore' OR
   emp_country='India'

3) IN: The IN in SQL is used to filter the result set to include only those rows where a specified column value matches any value in a given list.
   QUERY: SELECT * FROM emp
   WHERE Department IN('sales', 'hr');

4) NOT IN: It reserves the result of a condition, return true if the condition is false.
   QUERY: SELECT * FROM emp WHERE NOT IN('delhi', 'patna');

5) BETWEEN: The SQL **BETWEEN** condition allows you to easily test if an expression is within a range of values.
   QUERY: SELECT * FROM emp
   WHERE Salary BETWEEN 60000 AND 70000;

6) LIKE: The LIKE operator is used in the WHERE clause to search for a specified pattern in a column.
   - ➔ % – It is used for zero or more than one character.
   - ➔ _ – It is used for only one character means fixed length.

CLAUSES: Clauses means condition. Clauses are like tools/conditions that help us to make queries more specific or decide what data to fetch.

1. **WHERE:** WHERE clauses can be used to limit the number of rows to be displayed in the result set, it generally helps in filtering the records.
   Syntax: **SELECT** * **FROM** TABLENAME **WHERE** CONDITION;

2. **GROUP BY:** The GROUP BY statement groups rows that have the same values into summary rows, like "find the number of customers in each country".

   ```
   Syntax: SELECT column1, COUNT(*)
           FROM table_name
           GROUP BY column1;
   ```

3. **HAVING:** When we need to place any conditions on the table's column, we use the WHERE clause in SQL. But if we want to use any condition on a column in Group By clause at that time, we will use the HAVING clause with the Group By clause for column conditions.
   Syntax: TABLENAME **GROUP BY** COLUMNNAME **HAVING** CONDITION;

4. **ORDER BY:** It is used to sort the results in ascending or decending order.

   ```
   Syntax: SELECT column1, column2
            FROM table_name
            ORDER BY column1 ASC, column2 DESC;
   ```

5. **LIMIT:** The LIMIT in sql is used to restrict the no. of rows returned by a query.

   ```
   Syntax: SELECT column1, column2
            FROM table_name
             LIMIT 10;
   ```

Aggregate Function:

- ➔ Aggregate functions perform some operation on a set of rows and then return a single value summarizing the data.
- ➔ **explanation:** Aggregate basically means collated or collected, so all the functions or methods which are helping us to do some manipulation or do some calculation on a collated set of data that is called an aggregate function.
- ➔ Types of AF:

1. COUNT(): It is used to count the no. of rows in database table. It can work on both numeric and non numeric data types.
   QUERY: SELECT COUNT(*) FROM employees;

2. SUM(): It calculates the sum of all values in a numeric col.
   QUERY: SELECT Sum(salary) FROM employees;

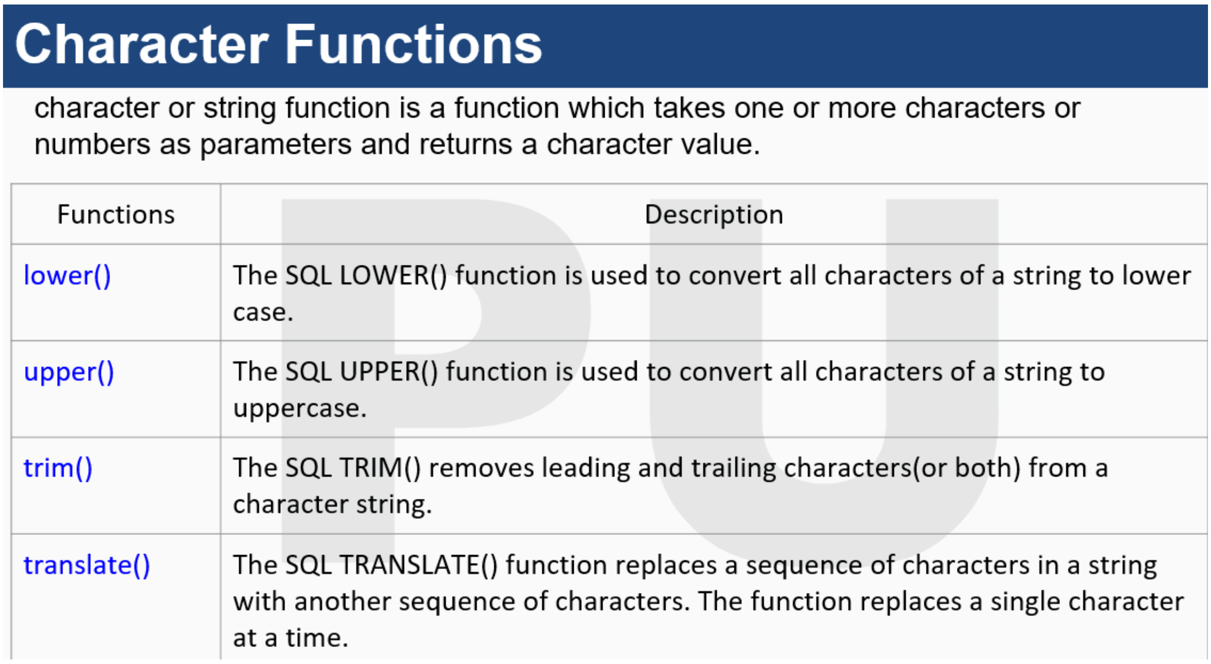
3. AVERAGE(): Return the avg. val of a numeric col.
   QUERY: SELECT AVG(salary) FROM employees;

4. MIN(): Return the min val in a col.
   QUERY: SELECT MIN(salary) FROM employees;

5. MAX(): Return the mix val in a col.
   QUERY: SELECT MAX(salary) FROM employees;

6. GROUP_CONCAT(): Concatenates values from multiple rows into a single string.
   QUERY: SELECT GROUP_CONCAT(EmployeeName) FROM employees;

Character Funcion:



Character Functions

character or string function is a function which takes one or more characters or numbers as parameters and returns a character value.

Functions	Description
lower()	The SQL LOWER() function is used to convert all characters of a string to lower case.
upper()	The SQL UPPER() function is used to convert all characters of a string to uppercase.
trim()	The SQL TRIM() removes leading and trailing characters(or both) from a character string.
translate()	The SQL TRANSLATE() function replaces a sequence of characters in a string with another sequence of characters. The function replaces a single character at a time.

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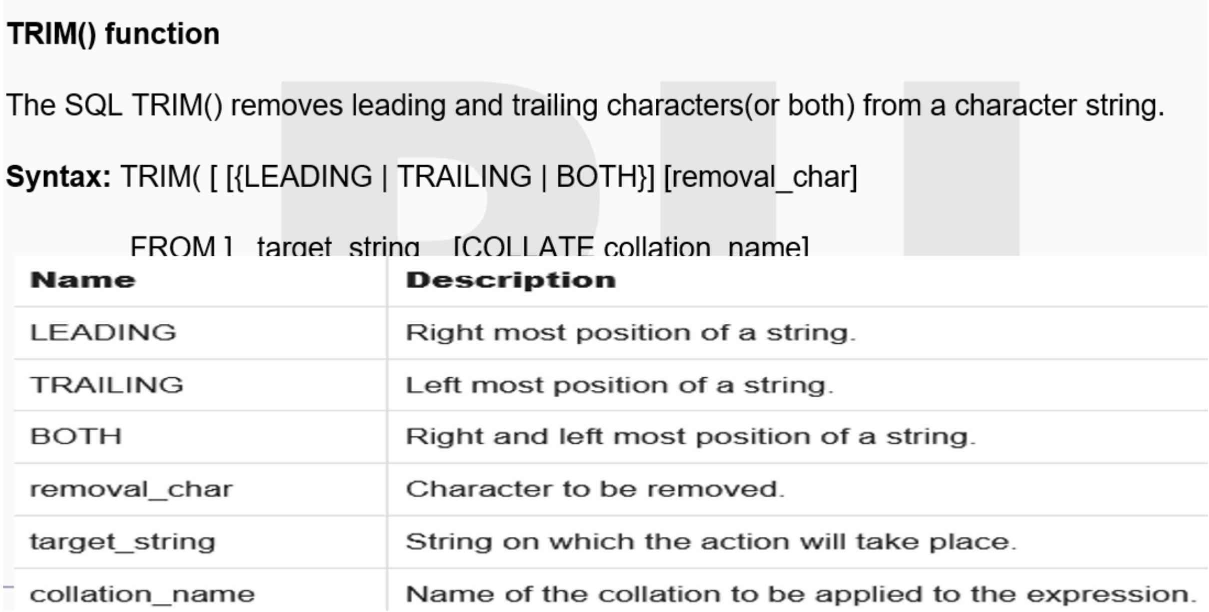


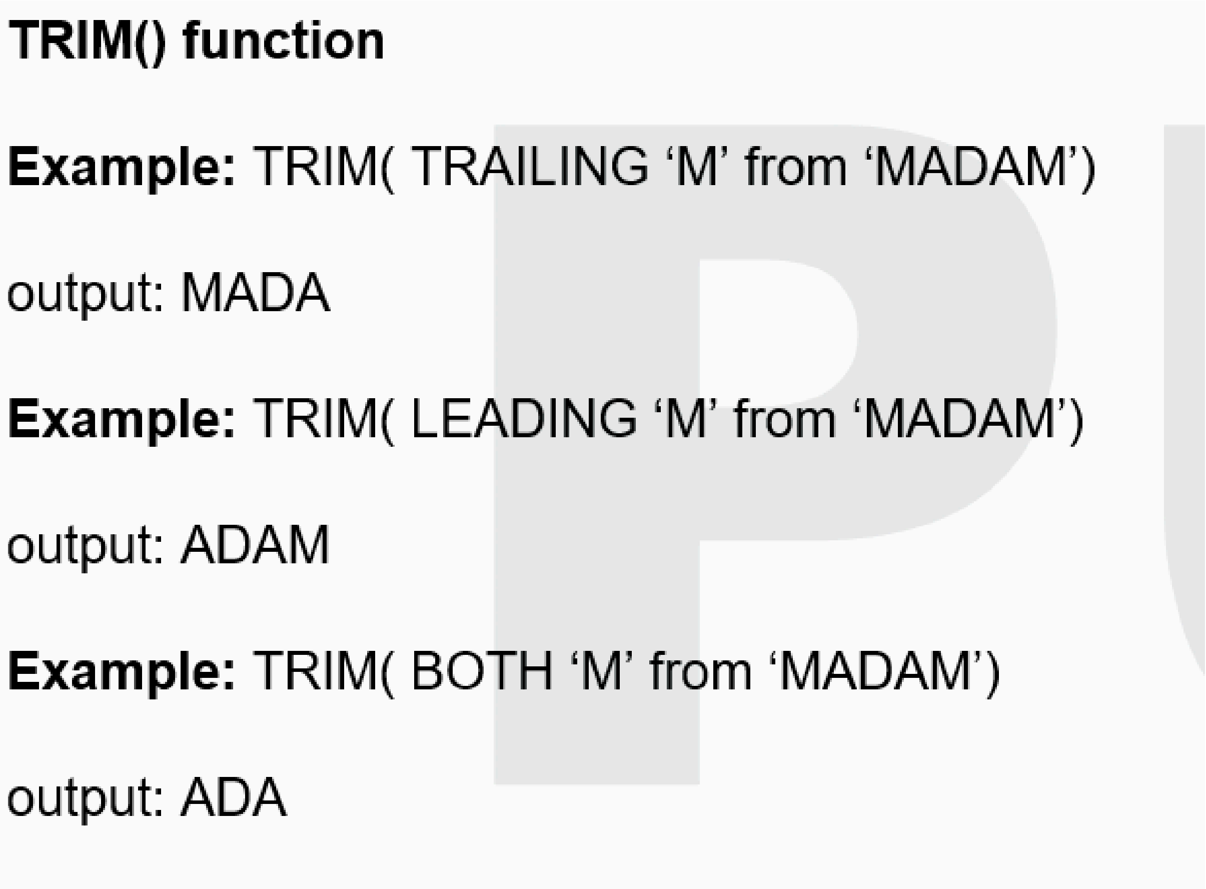
TRIM() function

The SQL TRIM() removes leading and trailing characters(or both) from a character string.

Syntax: TRIM([[{LEADING | TRAILING | BOTH}] [removal_char]

FROM] target_string [COLLATE collation_name]

Name	Description
LEADING	Right most position of a string.
TRAILING	Left most position of a string.
BOTH	Right and left most position of a string.
removal_char	Character to be removed.
target_string	String on which the action will take place.
collation_name	Name of the collation to be applied to the expression.



TRIM() function

Example: TRIM(TRAILING ‘M’ from ‘MADAM’)

output: MADA

Example: TRIM(LEADING ‘M’ from ‘MADAM’)

output: ADAM

Example: TRIM(BOTH ‘M’ from ‘MADAM’)

output: ADA

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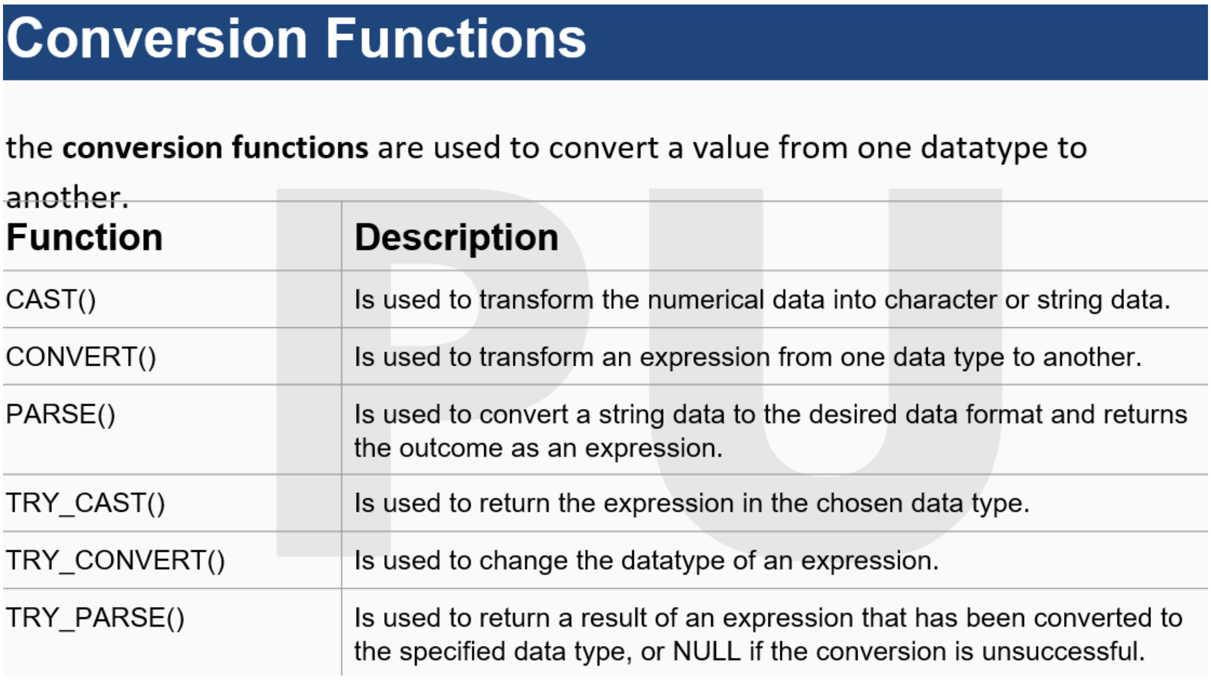
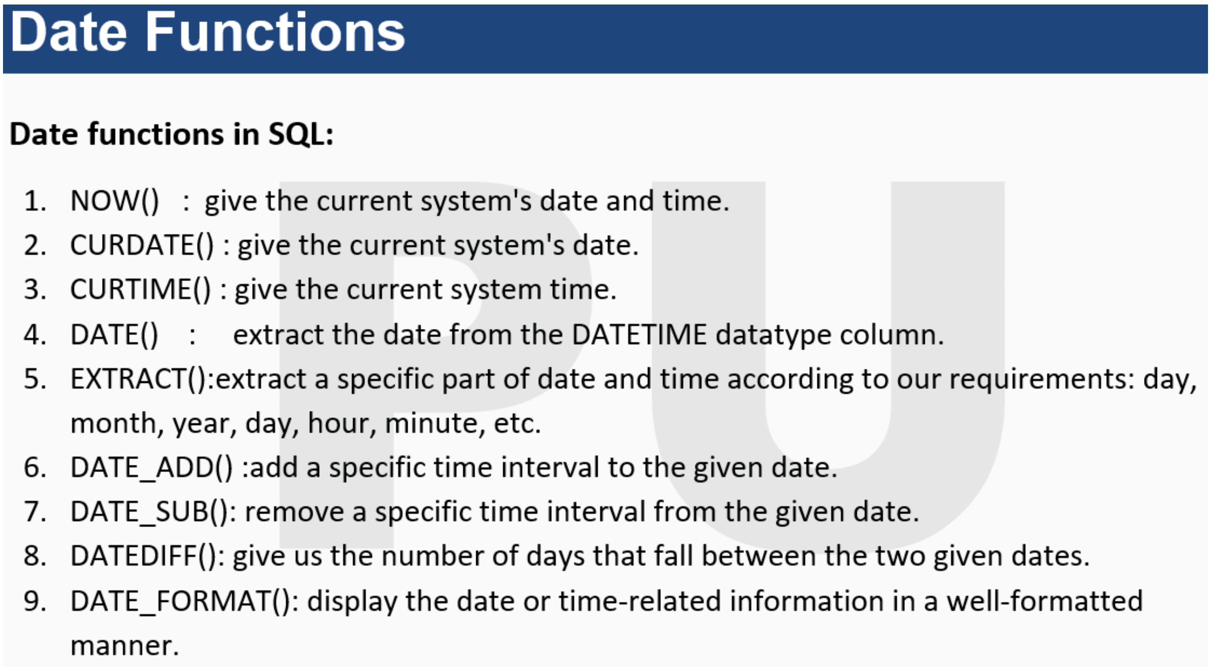


Conversion Functions

the **conversion functions** are used to convert a value from one datatype to another.

Function	Description
CAST()	Is used to transform the numerical data into character or string data.
CONVERT()	Is used to transform an expression from one data type to another.
PARSE()	Is used to convert a string data to the desired data format and returns the outcome as an expression.
TRY_CAST()	Is used to return the expression in the chosen data type.
TRY_CONVERT()	Is used to change the datatype of an expression.
TRY_PARSE()	Is used to return a result of an expression that has been converted to the specified data type, or NULL if the conversion is unsuccessful.



Date Functions

Date functions in SQL:

1. NOW() : give the current system's date and time.
2. CURDATE() : give the current system's date.
3. CURTIME() : give the current system time.
4. DATE() : extract the date from the DATETIME datatype column.
5. EXTRACT():extract a specific part of date and time according to our requirements: day, month, year, day, hour, minute, etc.
6. DATE_ADD() :add a specific time interval to the given date.
7. DATE_SUB(): remove a specific time interval from the given date.
8. DATEDIFF(): give us the number of days that fall between the two given dates.
9. DATE_FORMAT(): display the date or time-related information in a well-formatted manner.

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