Harmony IT Solution

Database Design and Programming

Tahaluf Training Center 2022

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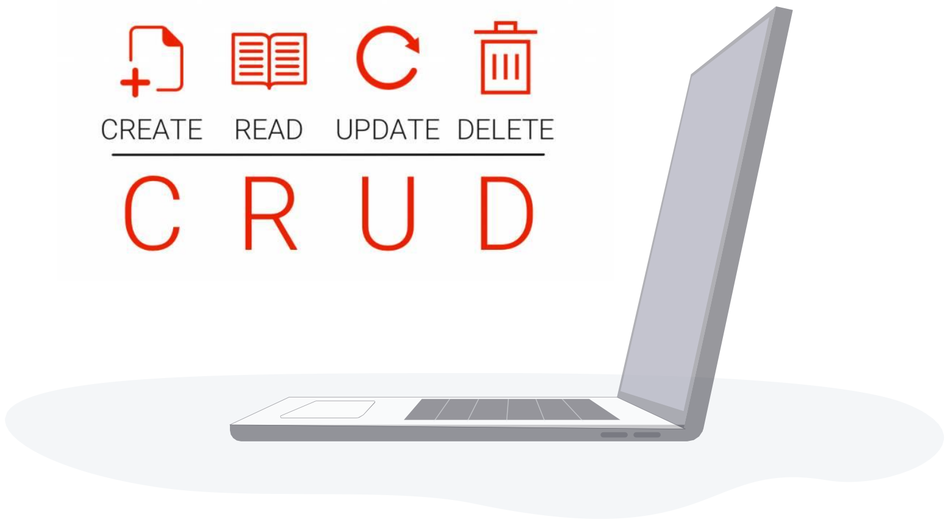
1. Overview of Data Manipulation Language (DML)
2. Data Manipulation Language (DML) Commandes



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Overview of Data Manipulation Language (DML)

- **Data Manipulation Language (DML)** is a language used to select, insert, update and delete data from a database.

- DML used to manipulate and retrieve data in a relational database.

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DML commands are as follows:

- INSERT.
- UPDATE.
- DELETE.
- SELECT.

Note: DML performs read-only queries of data.

Exercise

Create a database for the following scenario:

In an exam system, each course contains a many of exams. Each course has a name, id, description, start date and end date. Each exam has name, id, duration, start time.

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Exercise Solution

```
CREATE TABLE Course(
    Id NUMBER GENERATED BY DEFAULT AS IDENTITY,
    Name VARCHAR2(50) NOT NULL,
    Description VARCHAR2(250) NOT NULL,
    StartDate DATE NOT NULL,
    EndDate DATE NOT NULL,
    PRIMARY KEY(Id)
);
```

```
CREATE TABLE Exam (
 Id NUMBER GENERATED BY DEFAULT AS IDENTITY,
 Name VARCHAR2(50) NOT NULL,
 Duration TIMESTAMP NOT NULL,
 StartTime TIMESTAMP NOT NULL,
 courseID NUMBER,
 CONSTRAINT FKeyCourse_Exam
 FOREIGN KEY (courseID)
 REFERENCES Course (Id)
);
```

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INSERT command

- **INSERT command** is used to insert a data into a table.

- This command can used to add one or more records to a single table in a database.

```
INSERT INTO table(column, column...)
VALUES (value, value...);

INSERT INTO table
VALUES (value, value...);
```

There are many mistakes that users make with the insert statement:

- ✓Duplicate value violating any primary or unique key constraint.
- ✓Forgetting a mandatory value for a NOT NULL column.
- ✓Referential integrity maintained for foreign key constraint.
- ✓Any value violating a CHECK constraint.
- ✓Values too **wide** to **fit** in column or **data type mismatches**.

Example

Insert a record into course table.

Example Solution

```
INSERT INTO Course(Name, Description, StartDate,EndDate)
VALUES ('Math101', 'Maths', DATE'2021-01-01', DATE'2021-10-01');
```

Exercise:

Insert a three record into Course table. Then, Insert a five record into Exam table.

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Exercise Solution

```sql
INSERT INTO Course(Name, Description, StartDate,EndDate)
VALUES ('IT101', 'IT', DATE'2021-02-15', DATE'2023-08-01');

INSERT INTO Course(Name, Description, StartDate,EndDate)
VALUES ('English101', 'English', DATE'2050-02-09', DATE'2070-08-01');

INSERT INTO Course(Name, Description, StartDate,EndDate)
VALUES ('English102', 'English', DATE'2000-02-09', DATE'2010-12-05');

INSERT INTO Exam(Name, Duration, StartTime,Id)
VALUES ('FirstExam',timestamp '2017-10-12 21:22:23', CURRENT_TIMESTAMP, 2);

INSERT INTO Exam(Name, Duration, StartTime,Id)
VALUES ('FirstExam',timestamp '2021-09-16 01:30:23', timestamp '2021-09-16 3:22:23', 2);

INSERT INTO Exam(Name, Duration, StartTime,Id)
VALUES ('SecondExam',timestamp '2021-09-16 01:30:23', timestamp '2021-09-16 3:22:23', 4);
```

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UPDATE command

- **UPDATE command** is used to modify the records in a table.

- This command is used to update existing data changes it of one or more records in a table.

```
UPDATE table
SET column = value [, column = value, ...]
[WHERE condition];
```

Example

Update a course name if the description contains English.

Example Solution

```
UPDATE Course
SET Name = 'English100'
WHERE Description = 'English';
```

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DELETE command

- **DELETE command** is used to delete or remove a single record or multiple records from a table.

```
DELETE FROM table WHERE condition;
```

Example

Delete a course if the course name is IT 101.

Example Solution

```
DELETE FROM Course
WHERE Name = 'IT101';
```

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TRUNCATE TABLE

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- **TRUNCATE TABLE** command is used to delete all records from a table.
- It is the same command as a DELETE without a WHERE clause.

```
TRUNCATE TABLE table_name;
```

If you need to truncate a table, the TRUNCATE TABLE command can not be rolled back.

Example

Delete all record from course table.

Example Solution

```
TRUNCATE TABLE Course;
```

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SELECT statement

A SELECT statement retrieves data from database. It is used to:

1. **Projection:** select the columns in a table that are returned using a query.

2. **Selection:** select the rows in a table that are returned using a query.

3. **Joining:** bring together data that is stored in different tables.

SELECT Example:

```
SELECT id, name, description, startdate, enddate
FROM Course;
```

	ID	NAME	DESCRIPTION	STARTDATE	ENDDATE
1	15	English101	English	09-FEB-50	01-AUG-70
2	16	English102	English	09-FEB-00	05-DEC-10
3	17	IT101	IT	15-FEB-21	01-AUG-23
4	18	English101	English	09-FEB-50	01-AUG-70
5	19	English102	English	09-FEB-00	05-DEC-10

SELECT Example:

```
SELECT * FROM Course;
```

	ID	NAME	DESCRIPTION	STARTDATE	ENDDATE
1	15	English101	English	09-FEB-50	01-AUG-70
2	16	English102	English	09-FEB-00	05-DEC-10
3	17	IT101	IT	15-FEB-21	01-AUG-23
4	18	English101	English	09-FEB-50	01-AUG-70
5	19	English102	English	09-FEB-00	05-DEC-10

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Arithmetic Operators

- **Arithmetic Operators** are used to add, negate, multiply, subtract, and divide **numeric** values:

  1. **(+ , -)** : Unary operators denotes a negative or positive expression.

  2. **(*, /)** : Binary operators represent a multiplies and divides.

  3. **(+, -)** : Binary operators represent adds, subtracts.

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Arithmetic Operators Examples:

```
SELECT id+5, name, description, startdate, enddate
FROM Course;
```

	ID+5	NAME	DESCRIPTION	STARTDATE	ENDDATE
1	20	English101	English	09-FEB-50	01-AUG-70
2	21	English102	English	09-FEB-00	05-DEC-10
3	22	IT101	IT	15-FEB-21	01-AUG-23
4	23	English101	English	09-FEB-50	01-AUG-70
5	24	English102	English	09-FEB-00	05-DEC-10

Arithmetic Operators Examples:

```
SELECT name, 5+mark*12, id
FROM Student;
```

	NAME	5+MARK*12	ID
1	ahmad	1085	1
2	ali	965	2
3	sami	1061	3
4	fade	1025	4

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Arithmetic Operators Examples:

```
SELECT name, (5+mark)*12, id
FROM Student;
```

	NAME	(5+MARK)*12	ID
1	ahmad	1140	1
2	ali	1020	2
3	sami	1116	3
4	fade	1080	4

ALIASES Statement

- **ALIASES Statement** is used to create a temporary name for tables or columns.

- COLUMN ALIASES are used to make column names easier to read.

```
column_name AS alias_name
```

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COLUMN ALIASES Example

```
SELECT name, (5+mark)*12 AS IncreaseSalary, id FROM Student;
```

	NAME	INCREASESALARY	ID
1	ahmad	1140	1
2	ali	1020	2
3	sami	1116	3
4	fade	1080	4
5	H	(null)	1

TABLE ALIASES are used to make a table easier to read or to perform a self join.

```
table_name alias_name
```

TABLE ALIASES Example :

```
SELECT name, (5+mark)*12, id FROM Student Std;
```

	NAME	(5+MARK)*12	ID
1	ahmad	1140	1
2	ali	1020	2
3	sami	1116	3
4	fade	1080	4
5	H	(null)	1

DISTINCT Operator :

exclude duplicate rows.

Example

```
SELECT DISTINCT name, startdate, enddate, description FROM
Course;
```

	NAME	STARTDATE	ENDDATE	DESCRIPTION
1	English102	09-FEB-00	05-DEC-10	English
2	English101	09-FEB-50	01-AUG-70	English
3	IT101	15-FEB-21	01-AUG-23	IT

WHERE Clause :

is used to restrict the rows returned.

Example

```
SELECT * FROM Student WHERE MARK > 80;
```

	NAME	MARK	ID
1	ahmad	90	1
2	sami	88	3
3	fade	85	4

Equal Operator

```
SELECT * FROM Student WHERE MARK = 90;
```

	NAME	MARK	ID
1	ahmad	90	1

Not equal Operator

```
SELECT * FROM Student WHERE MARK <> 90;
```

OR

```
SELECT * FROM Student WHERE MARK != 90;
```

	NAME	MARK	ID
1	ali	80	2
2	sami	88	3
3	fade	85	4

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Greater Than or Equal Operator

```
SELECT * FROM Student WHERE MARK >= 85;
```

	NAME	MARK	ID
1	ahmad	90	1
2	sami	88	3
3	fade	85	4

Less Than Operator

```
SELECT * FROM Student WHERE MARK < 85;
```

	NAME	MARK	ID
1	ali	80	2

Less Than or Equal Operator

```
SELECT * FROM Student WHERE MARK <= 85;
```

	NAME	MARK	ID
1	ali	80	2
2	fade	85	4

IN Operator : Matches a value in a list.

```
SELECT * FROM Student WHERE MARK IN (90, 80);
```

	NAME	MARK	ID
1	ahmad	90	1
2	ali	80	2

NOT Operator : Negates a condition.

```
SELECT * FROM Student WHERE MARK NOT IN (90, 80);
```

	NAME	MARK	ID
1	sami	88	3
2	fade	85	4

BETWEEN Operator : Within a range (inclusive).

```
SELECT * FROM Student WHERE MARK BETWEEN 85 AND 90;
```

	NAME	MARK	ID
1	ahmad	90	1
2	sami	88	3
3	fade	85	4

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IS NULL Operator : NULL value.

```
SELECT * FROM Student WHERE MARK IS NULL;
```

	NAME	MARK	ID
1	H	(null)	1

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IS NOT NULL Operator : Non-NULL value.

```
SELECT * FROM Student WHERE MARK IS NOT NULL;
```

	NAME	MARK	ID
1	ahmad	90	1
2	ali	80	2
3	sami	88	3
4	fade	85	4

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LIKE Examples

```
SELECT * FROM Student WHERE Name LIKE '%i';
```

	NAME	MARK	ID
1	ali	80	2
2	sami	88	3

LIKE Examples

```
SELECT * FROM Student WHERE Mark LIKE '8_';
```

	NAME	MARK	ID
1	ali	80	2
2	sami	88	3
3	fade	85	4

Logical Conditions combines the results of two conditions to produce a single result.

1. **NOT** returns TRUE if the condition is FALSE.

2. **AND** returns TRUE if both conditions are TRUE.

3. **OR** returns TRUE if either condition is TRUE.

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Logical Conditions Examples

```
SELECT * FROM Student WHERE name LIKE 'a%' OR mark = 90;
```

	NAME	MARK	ID
1	ahmad	90	1
2	ali	80	2

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Logical Conditions Examples

```
SELECT * FROM Student WHERE name LIKE 'a%' And mark = 90;
```

	NAME	MARK	ID
1	ahmad	90	1

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Logical Conditions Examples

```
SELECT * FROM Student WHERE name NOT LIKE'%i';
```

	NAME	MARK	ID
1	ahmad	90	1
2	fade	85	4
3	H	(null)	1

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ORDER BY Clause

- In Oracle, **ORDER BY** Clause is used to sort or re-arrange the records in the result set.

- The **ORDER BY** clause is only used with SELECT statement.

```
SELECT expressions
FROM tables
WHERE conditions
ORDER BY expression [ ASC | DESC ];
```

Example:

```
SELECT * FROM Student WHERE name NOT LIKE'%i’ ORDER BY ID
ASC;
```

Note: ORDER BY ASC is the default case.

	NAME	MARK	ID
1	ahmad	90	1
2	H	(null)	1
3	fade	85	4

Example:

```
SELECT * FROM Student WHERE name NOT LIKE'%i’ ORDER BY ID
DESC;
```

	NAME	MARK	ID
1	fade	85	4
2	H	(null)	1
3	ahmad	90	1

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SQL function

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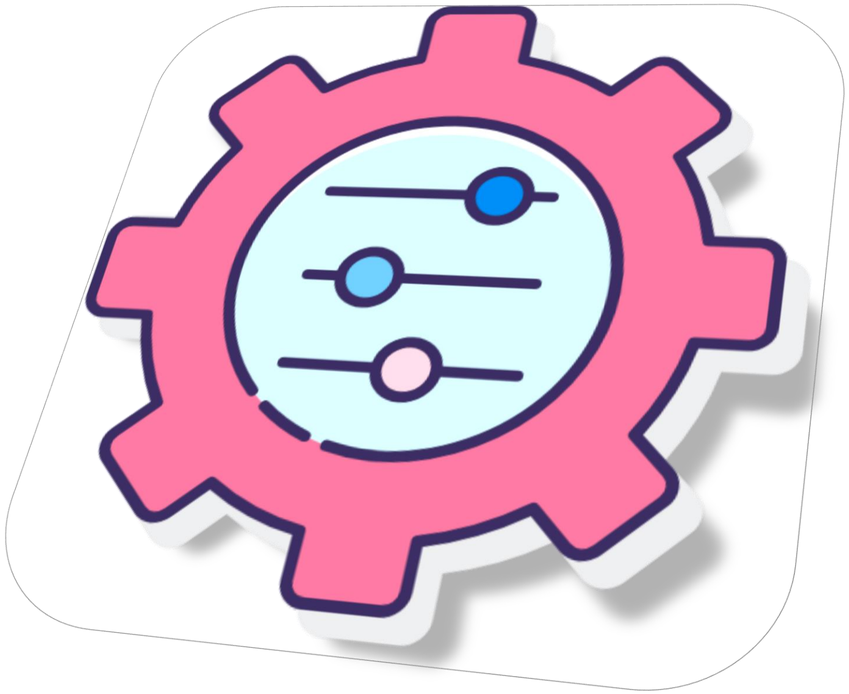
SQL function :

1. Single Row Function:

a) Character.
b) Number.
c) Date.
d) Conversion.

2. Multiple Row Function:

a) Aggregate function GROUP BY.



Character functions example:

```
1. SELECT INITCAP(name) from Student;

2. SELECT LENGTH(name) from Student;

3. SELECT ROUND(mark) from Student;

4. SELECT TRUNC(mark) from Student;
```

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General function example:

1. SELECT MOD(mark, id) from Student;

2. SELECT NVL(name, 0) FROM employee;

	NAME
1	khaled
2	sami
3	vaseen
4	(null)
5	alaa
6	(null)

SELECT NVL(name, 0) FROM employee;

NVL(NAME,0)
khaled
sami
vaseen
0
alaa
0

Aggregate function GROUP BY example:

```
1. SELECT name, Min(Mark) AS "Min" FROM student GROUP BY name;

2. SELECT name, Max(Mark) AS "Max" FROM student GROUP BY name;

3. SELECT name, COUNT(*) FROM student GROUP BY name;

4. SELECT name, COUNT(*) FROM student WHERE Id= 1 GROUP BY name;

5. SELECT name FROM student HAVING SUM(mark)>=90 GROUP BY name;
```

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References :

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[3]. https://en.wikibooks.org/wiki/Oracle_Database/SELECT_Statement
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