Source: ThisisEngineering RAEng (2020). *Woman in white long sleeve shirt using black laptop computer photo [Photograph]*. Unsplash. https://unsplash.com/photos/ZPeXrWxOjRQ

MODULE 03: LESSON 03

DATA MANIPULATION LANGUAGE

Lesson Learning Outcomes:

- Know and utilize the respective Data Manipulation Commands (DML) in SQL;
- Apprehend DML for database manipulation; and
- Use SQL to query simple data and information.

Time Frame: Week 12

Tables and formulas are handy when dealing with data stored in a database using SQL, but there comes a moment when you need to do more advanced data manipulation. So you'll need Data Manipulation Language. Data Manipulation Language allows you to tell a database precisely what you want it to do by speaking in a language it understands. Adding, moving, or deleting data is easy using Data Manipulation Language. So what are we waiting for, let us go jump into our lesson for this day!

ACTIVITY

Consider a real world company or office, give examples of the following database components. Name as many as you can.

Source: Tingey, W. (2020). *Stack of books on table photo* [Photograph]. https://unsplash.com/photos/snNHKZ-mGfE

ANALYSIS

Suppose you were working as an assistant clerk of a certain office, your boss then told you to create a report for an office meeting base on files given.

1. With these bulky and enormous files, how would you able to organize, select and order these files for you to save better time and resources?

2. While scanning these documents, you noticed some erroneous details on some of the records. How will you able to update them?

3. How will you also able to delete those unnecessary records or files inserted with these documents?

ABSTRACTION

A Data Manipulation Language (DML) provide SQL commands for manipulating data in databases. Inserting data into database tables, accessing existing data, removing data from existing tables, and changing existing data are all part of this manipulation. The data manipulation commands you will learn in this chapter are listed in Table 3.3.

Table 3.3. Data Manipulation Commands

COMMAND OR OPTION	DESCRIPTION
INSERT	Inserts row(s) into a table
SELECT	Selects attributes from rows in one or more tables or views
WHERE	Restricts the selection of rows based on a conditional expression
GROUP BY	Groups the selected rows based on one or more attributes
HAVING	Restricts the selection of grouped rows based on a condition
ORDER BY	Orders the selected rows based on one or more attributes
UPDATE	Modifies an attribute's values in one or more table's rows
DELETE	Deletes one or more rows from a table
COMMIT	Permanently saves data changes
ROLLBACK	Restores data to its original values
Comparison operators	
=, <, >, <=, >=, <>, !=	Used in conditional expressions
Logical operators	
AND/OR/NOT	Used in conditional expressions
Special operators	Used in conditional expressions
BETWEEN	Checks whether an attribute value is within a range
IS NULL	Checks whether an attribute value is null
LIKE	Checks whether an attribute value matches a given string pattern
IN	Checks whether an attribute value matches any value within a value list
EXISTS	Checks whether a subquery returns any rows
DISTINCT	Limits values to unique values
Aggregate functions	Used with SELECT to return mathematical summaries on columns
COUNT	Returns the number of rows with non-null values for a given column
MIN	Returns the minimum attribute value found in a given column
MAX	Returns the maximum attribute value found in a given column
SUM	Returns the sum of all values for a given column
AVG	Returns the average of all values for a given column

Adding Table Rows

SQL requires the use of the INSERT command to enter data into a table. The INSERT command's basic syntax looks like this:

```
INSERT INTO tablename VALUES (value1, value2, ..., valueN)
```

Given the VENDOR table structure defined earlier and the sample VENDOR data shown in Figure 3.2, you would enter the first two data rows as follows:

```
INSERT INTO VENDOR
      VALUES (21225,'Bryson, Inc.','Smithson','615','223-3234','TN','Y');
INSERT INTO VENDOR
      VALUES (21226,'Superloo, Inc.','Flushing','904','215-8995','FL','N');
```

and so on, until all of the VENDOR table records have been entered.

Listing Table Rows

The SELECT command is used to list the contents of a table. The syntax of the SELECT command is as follows:

```
SELECT columnlist FROM tablename
```

The SELECT clause of the query specifies the columns to be retrieved as a column list. The columnlist represents one or more attributes, separated by commas. You could use the asterisk (*) as a wildcard character to list all attributes. A **wildcard character** is a symbol that can be used as a general substitute for other characters or commands. For example, to list all attributes and all rows of the VENDOR table, use the following:

```
SELECT * FROM VENDOR;
```

The **FROM** clause of the query specifies the table or tables from which the data is to be retrieved.

Updating Table Rows

Use the UPDATE command to modify data in a table. The syntax for this command is as follows:

```
UPDATE tablename
SET columnname = expression [, columnname = expression]
[WHERE conditionlist ];
```

For example, if you want to change V_PHONE from 215-8995, to 111-1111, in the second row of the VENDOR table (see Figure 3.2), use the primary key (21226) to locate the correct row. Therefore, type:

```
UPDATE VENDOR
SET V_PHONE = '111-1111'
WHERE V_CODE = 21226;
```

Deleting Table Rows

It is easy to delete a table row using the DELETE statement. The syntax is:

```
DELETE FROM tablename
[WHERE conditionlist ];
```

For example, if you want to delete the product you added earlier whose code (P_CODE) is 'BRT-345', use the following command:

```
DELETE FROM VENDOR
WHERE P_CODE = 21225;
```

In this example, the primary key value lets SQL find the exact record to be deleted from the PRODUCT table. However, deletions are not limited to a primary key match; any attribute may be used. For example, in your VENDOR table, you will see order status for which the V_ORDER attribute has either 'Y' or 'N' values. Use the following command to delete all rows from the VENDOR table for which the V_ORDER is equal to 'N':

```
DELETE FROM VENDOR
WHERE V_ORDER = 'N';
```

Check the VENDOR table's contents again to verify that all vendors with V_ORDER equal to 'N' have been deleted.

Finally, remember that DELETE is a set-oriented command, and that the WHERE condition is optional. Therefore, if you do not specify a WHERE condition, all rows from the specified table will be deleted!

APPLICATION

Provide the following requirements to perform this task:

Make sure that all of your entity names must start with the first three characters of your First Name (ex. **joh**_ENTITYNAME), and then your corresponding attribute names shall begin with the first three characters of your Last Name (ex. **doe**_AttributeName)

Consider the INVOICE table structure below:

1. Normalize the table at least into Third Normal Form (3NF).
2. Provide the corresponding SQL scripts to create its new schema and structure.
3. Populate all the accounted tables. Make sure that all of the data in the INVOICE are present on the normalized entities.
4. Execute at least three (3) update operations in different tables.
5. Delete at least three (3) values in different tables.
6. Show all the data inside each table.

ATTRIBUTE NAME	SAMPLE VALUE	SAMPLE VALUE	SAMPLE VALUE	SAMPLE VALUE	SAMPLE VALUE
INV_NUM	211347	211347	211347	211348	211349
PROD_NUM	AA-E3422QW	QD-300932X	RU-995748G	AA-E3422QW	GH-778345P
SALE_DATE	15-Jan-2016	15-Jan-2016	15-Jan-2016	15-Jan-2016	16-Jan-2016
PROD_LABEL	Rotary sander	0.25-in. drill bit	Band saw	Rotary sander	Power drill
VEND_CODE	211	211	309	211	157
VEND_NAME	NeverFail, Inc.	NeverFail, Inc.	BeGood, Inc.	NeverFail, Inc.	ToughGo, Inc.
QUANT_SOLD	1	8	1	2	1
PROD_PRICE	$49.95	$3.45	$39.99	$49.95	$87.75

Submission:

Method 1. For those who can do simulations, save this assessment task in a PDF file. Provide as well the corresponding screenshots with the respective SQL commands and result sets for each item with the following format:
- File name - [Subject Code] [Course-year-set] [Last Name] - Module [number] (Lesson [number]) ex. **IS311 BSIT3Z Doe - Module 03 (Lesson 03).pdf**
- Size - Letter (8.5 x 11 inches)
- Orientation - Portrait
- Margin - 1 Inch all sides
- Font - Style: Arial; Size: 10
- Spacing - Single

Method 2. For those who can not do Method 1, Your answers must be written by hand on neat and clear paper, and then you must take a/some picture/s of it for submission. The said picture/s should be in JPEG, JPG, or PNG format. Make sure also that your work must be comprehensible, readable, and understandable.

* Stipulate your full name, course, year, set, and subject enrolled in the file/picture's first line/s (upper left corner) of the file/picture. Make sure to optimize your image/s and crop only the essential parts to fit with the maximum file size required on the LMS submission. Additional points for the participation column grade will be given to those who can able to do Method 1. Failure to do the following instructions will invalidate your submission to this assessment.

> **That's the way to do it!** You have just finished another part of our module. In this lesson, you just basically know how to manipulate data in database. In the next lesson, you will learn about some advanced SQL commands.