LABSHEET 8

Module
Web Solutions Development

Module Code
IT5035FP

Duration
18 hours

Title:

Data manipulation using SQL queries.

Objective(s):

In this lab, students will learn to create, save, load, and execute SQL queries upon completing the following:

- Load and execute an SQL file
- Create SQL queries to insert records
- Create SQL queries to retrieve records
- Create SQL queries to modify records
- Create SQL queries to delete records

Tools, Equipment and Materials:

1 Personal Computer with Internet access
2 SQL Server
3 SQL Server Management Studio

Instructions:

Part (A): Load and Execute an SQL File

1 In the previous lab, the 4 tables (i.e. COLLEGE, DEPARTMENT, PROFESSOR, STUDENT) were deleted. This lab will start with the creation of these 4 tables using the **CreateSigmaUniversityTables.sql** file.

2 To load **CreateSigmaUniversityTables.sql** file, go to the main menu and click **File** → **Open** → **File**. Select the **CreateSigmaUniversityTables.sql** file, and click the **Open** button.

3 To create the 4 tables, click on the **Execute** button. This will execute the SQL statements to create the 4 tables in SigmaUniversity database. If the tables are created successfully, the **Messages** panel will display ***Commands completed successfully.*** Press the **F5** key to refresh the Object Explorer panel, and the 4 new tables will be displayed.

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Part (B): Create SQL Queries to Insert Records

1 In this part of the lab, you will enter data into the 4 tables using SQL statements. Click on the **New Query** button to launch a new SQL editor window, and save the SQL query as **SigmaUniversityTablesData.sql**.

2 Enter the following SQL statements into the SQL editor to insert records into ***COLLEGE table***. Click on the **Parse** button to check for errors in your SQL statements. **Correct any errors in your SQL statements before continuing.** Save the SQL file.

```
/* Insert data into COLLEGE table */
INSERT INTO COLLEGE (CollegeCode, CollegeName, DeanFirstName, DeanLastName, DeanEmail)
    VALUES (100, 'College of Business', 'Mary', 'Tan', 'tan.mary@sigma.uni.edu');
INSERT INTO COLLEGE (CollegeCode, CollegeName, DeanFirstName, DeanLastName, DeanEmail)
    VALUES (200, 'College of Engineering', 'Robert', 'Goh', 'goh.robert@sigma.uni.edu');
```

3 Enter the following SQL statements into the SQL editor to insert records into ***DEPARTMENT table***. Click on the **Parse** button to check for errors in your SQL statements. **Correct any errors in your SQL statements before continuing.** Save the SQL file.

```
/* Insert data into DEPARTMENT table */
INSERT INTO DEPARTMENT(DepartmentCode, DepartmentName, CollegeCode)
    VALUES (101, 'Accounting', 100);
INSERT INTO DEPARTMENT (DepartmentCode, DepartmentName, CollegeCode)
    VALUES (102, 'Economics', 100);
INSERT INTO DEPARTMENT (DepartmentCode, DepartmentName, CollegeCode)
    VALUES (103, 'Finance', 100);
INSERT INTO DEPARTMENT (DepartmentCode, DepartmentName, CollegeCode)
    VALUES (201, 'Civil Engineering', 200);
INSERT INTO DEPARTMENT (DepartmentCode, DepartmentName, CollegeCode)
    VALUES (202, 'Computer Engineering', 200);
INSERT INTO DEPARTMENT (DepartmentCode, DepartmentName, CollegeCode)
    VALUES (203, 'Electronics Engineering', 200);
```

4 Enter the following SQL statements into the SQL editor to insert records into ***PROFESSOR table***. Click on the **Parse** button to check for errors in your SQL statements. **Correct any errors in your SQL statements before continuing.** Save the SQL file.

```
/* Insert data into PROFESSOR table */
INSERT INTO PROFESSOR (ProfessorCode, FirstName, LastName, Email, DepartmentCode)
    VALUES (51001, 'Alan', 'Tan', 'tan.alan@sigma.uni.edu', 101);
INSERT INTO PROFESSOR (ProfessorCode, FirstName, LastName, Email, DepartmentCode)
    VALUES (51002, 'Sophie Binte', 'Jaafar', 'jaafar.sophie@sigma.uni.edu', 102);
INSERT INTO PROFESSOR (ProfessorCode, FirstName, LastName, Email, DepartmentCode)
    VALUES (51003, 'Ali Bin', 'Johan', 'johan.ali@sigma.uni.edu', 103);
INSERT INTO PROFESSOR (ProfessorCode, FirstName, LastName, Email, DepartmentCode)
    VALUES (52001, 'Mandy', 'Tan', 'tan.mandy@sigma.uni.edu', 201);
INSERT INTO PROFESSOR (ProfessorCode, FirstName, LastName, Email, DepartmentCode)
    VALUES (52002, 'John', 'Lee', 'lee.john@sigma.uni.edu', 202);
INSERT INTO PROFESSOR (ProfessorCode, FirstName, LastName, Email, DepartmentCode)
    VALUES (52003, 'Terry', 'Kim', 'kim.terry@sigma.uni.edu', 203);
```

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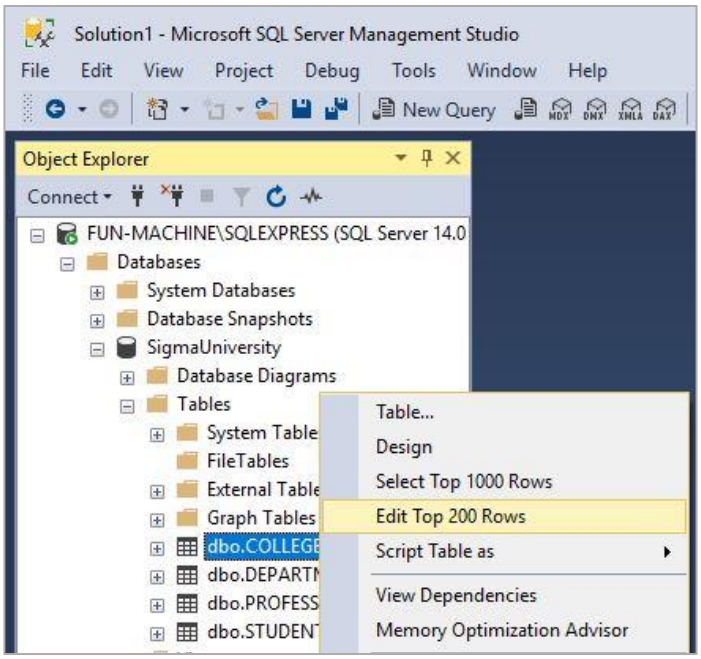
5 Enter the following SQL statements into the SQL editor to insert records into ***STUDENT table***. Click on the **Parse** button to check for errors in your SQL statements. **Correct any errors in your SQL statements before continuing.** Save the SQL file.

```
/* Insert data into STUDENT table */
INSERT INTO STUDENT (StudentCode, FirstName, LastName, Email, RegisterDate, DepartmentCode)
    VALUES (2011002, 'Aini Binte', 'Imran', 'imran.aini@sigma.uni.edu', '02/04/2018', 101);
INSERT INTO STUDENT (StudentCode, FirstName, LastName, Email, RegisterDate, DepartmentCode)
    VALUES (2011003, 'Ayu Binte', 'Faizal', 'faizal.ayu@sigma.uni.edu', '02/04/2018', 102);
INSERT INTO STUDENT (StudentCode, FirstName, LastName, Email, RegisterDate, DepartmentCode)
    VALUES (2011005, 'Connor', 'Lee', 'lee.connor@sigma.uni.edu', '02/04/2018', 103);
INSERT INTO STUDENT (StudentCode, FirstName, LastName, Email, RegisterDate, DepartmentCode)
    VALUES (2011008, 'Madison', 'Tan', 'tan.madison@sigma.uni.edu', '02/04/2018', 201);
INSERT INTO STUDENT (StudentCode, FirstName, LastName, Email, RegisterDate, DepartmentCode)
    VALUES (2011009, 'William', 'Tan', 'tan.william@sigma.uni.edu', '02/04/2018', 202);
INSERT INTO STUDENT (StudentCode, FirstName, LastName, Email, RegisterDate, DepartmentCode)
    VALUES (2011011, 'Andrew', 'Tan', 'tan.andrew@sigma.uni.edu', '02/04/2018', 203);
```

6 Click on the **Execute** button. This will execute the SQL statements to insert records into the 4 tables in SigmaUniversity database. There are 2 methods to verify that the records are inserted into the tables.

Method 1: Verify Using GUI Tools

7 In the Object Explorer, right-click on the table (e.g. **dbo.COLLEGE**), and click **Edit Top 200 Rows**.



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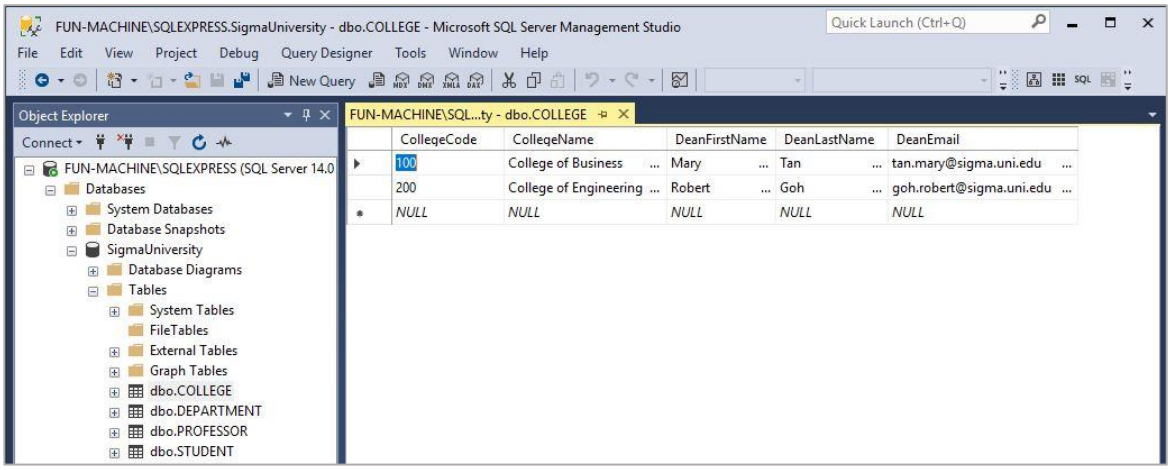
8 A view of the table contents will be displayed. Verify that all records inserted are correct. Otherwise, correct any errors in your SQL statements.



9 Verify the records for the other 3 tables. Correct any errors in your SQL statements.

Method 2: Verify Using SQL Statements

10 This method will be covered in the next part of the lab.

Part (C): Create SQL Queries to Retrieve Records

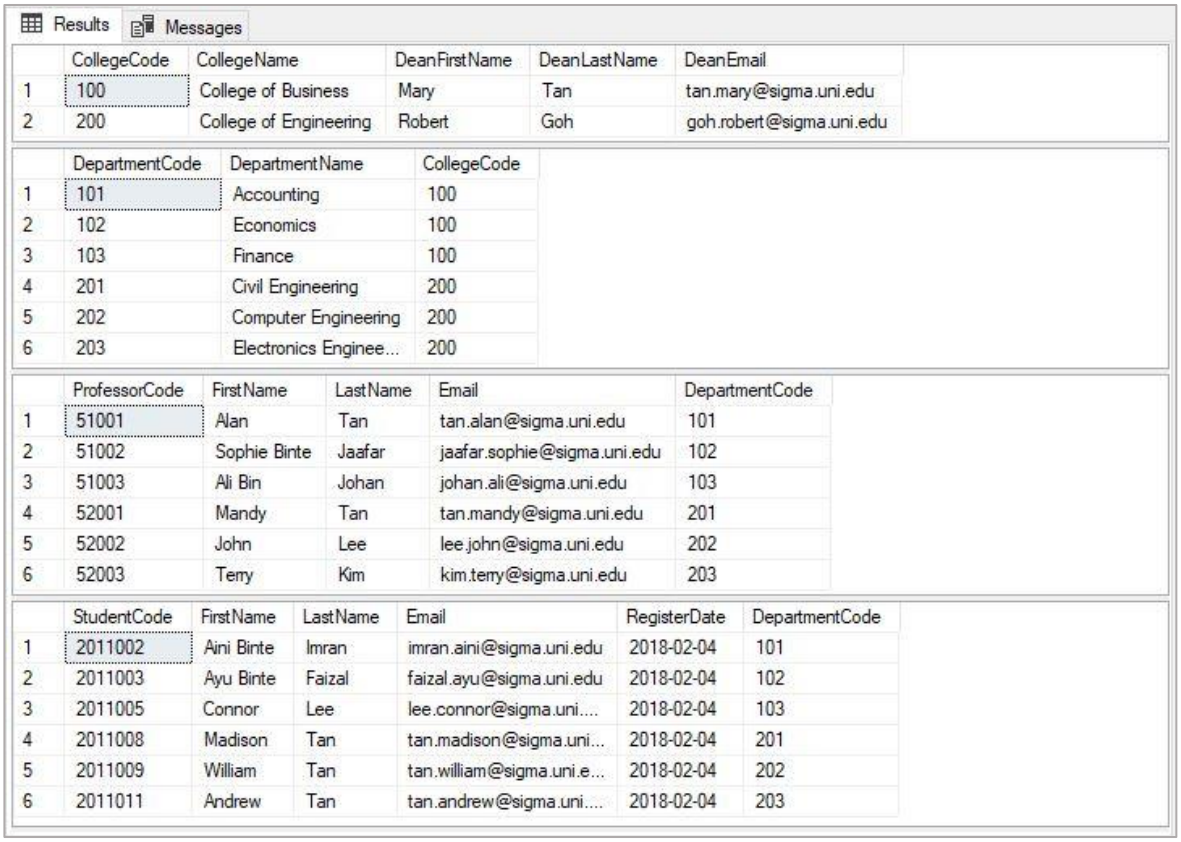
1 Click on the **New Query** button to launch a new SQL editor window, and save the SQL query as **SigmaUniversityTablesDataRetrieve.sql**.

2 Enter the following SQL statements into the SQL editor to ***retrieve records from the 4 tables***. Click on the **Parse** button to check for errors in your SQL statements. **Correct any errors in your SQL statements before continuing.** Save the SQL file.

```
/* Retrieve data from COLLEGE table */
SELECT * FROM COLLEGE;

/* Retrieve data from DEPARTMENT table */
SELECT * FROM DEPARTMENT;

/* Retrieve data from PROFESSOR table */
SELECT * FROM PROFESSOR;

/* Retrieve data from STUDENT table */
SELECT * FROM STUDENT;
```

Note: In SQL, the wildcard ***** in the SELECT statement represents zero or more characters. This allows all records to be selected in the table.

3 Click on the **Execute** button. This will execute the SQL statements to retrieve records from the 4 tables in SigmaUniversity database. Verify that all records inserted are correct. Otherwise, correct any errors in your SQL statements.



Results Messages

	CollegeCode	CollegeName	DeanFirstName	DeanLastName	DeanEmail
1	100	College of Business	Mary	Tan	tan.mary@sigma.uni.edu
2	200	College of Engineering	Robert	Goh	goh.robert@sigma.uni.edu

	DepartmentCode	DepartmentName	CollegeCode
1	101	Accounting	100
2	102	Economics	100
3	103	Finance	100
4	201	Civil Engineering	200
5	202	Computer Engineering	200
6	203	Electronics Enginee...	200

	ProfessorCode	FirstName	LastName	Email	DepartmentCode
1	51001	Alan	Tan	tan.alan@sigma.uni.edu	101
2	51002	Sophie Binte	Jaafar	jaafar.sophie@sigma.uni.edu	102
3	51003	Ali Bin	Johan	johan.ali@sigma.uni.edu	103
4	52001	Mandy	Tan	tan.mandy@sigma.uni.edu	201
5	52002	John	Lee	lee.john@sigma.uni.edu	202
6	52003	Terry	Kim	kim.terry@sigma.uni.edu	203

	StudentCode	FirstName	LastName	Email	RegisterDate	DepartmentCode
1	2011002	Aini Binte	Imran	imran.aini@sigma.uni.edu	2018-02-04	101
2	2011003	Ayu Binte	Faizal	faizal.ayu@sigma.uni.edu	2018-02-04	102
3	2011005	Connor	Lee	lee.connor@sigma.uni....	2018-02-04	103
4	2011008	Madison	Tan	tan.madison@sigma.uni...	2018-02-04	201
5	2011009	William	Tan	tan.william@sigma.uni.e...	2018-02-04	202
6	2011011	Andrew	Tan	tan.andrew@sigma.uni....	2018-02-04	203

4 You can select specific records from multiple tables using a combination of DML clauses, logical operators, aggregate functions, comparison operators, and comparison keywords as shown. Refer to your theory notes for more information.

DML Clause	Logical Operator	Aggregate Function	Comparison Operator	Comparison Keyword
WHERE	AND	COUNT	=	BETWEEN
LIKE	OR	SUN	<>	EXISTS
DISTINCT	NOT	AVG	<	IN
ORDER BY		MIN	>	LIKE
GROUP BY		MAX	<=	
JOIN			>=	

5 The following SQL statements allow you to select specific records from the 4 tables in SigmaUniversity database. Click on the **New Query** button to launch a new SQL editor window, and save the SQL query as **SigmaUniversityTablesDataSpecific.sql**.

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6 Enter the following SQL statements into the SQL editor to ***retrieve Department Names from the DEPARTMENT table based on a specific College Code***. Click on the **Parse** button to check for errors in your SQL statements. **Correct any errors in your SQL statements before continuing.** Save the SQL file.

```
/* Select records using
DML Clause (WHERE), and
Comparison Operator (=) */
SELECT DepartmentName
FROM DEPARTMENT
WHERE CollegeCode=100;
```

7 Click on the **Execute** button. This will execute the SQL statements to retrieve the Department Names. Verify that all records retrieved are correct. Otherwise, correct any errors in your SQL statements.

	DepartmentName
1	Accounting
2	Economics
3	Finance

8 Enter the following SQL statements into the SQL editor to ***retrieve Student's Name from the STUDENT table based on a specific Last Name and Department Code***. Click on the **Parse** button to check for errors in your SQL statements. **Correct any errors in your SQL statements before continuing.** Save the SQL file.

```
/* Select records using
DML Clause (WHERE),
Comparison Operator (=), and
Logical Operator (AND) */
SELECT FirstName, LastName
FROM STUDENT
WHERE LastName='Tan' AND DepartmentCode=202;
```

9 Click on the **Execute** button. This will execute the SQL statements to retrieve the Student's Name. Verify that all records retrieved are correct. Otherwise, correct any errors in your SQL statements.

	FirstName	LastName
1	William	Tan

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10 Enter the following SQL statements into the SQL editor to ***retrieve Professors' Name from the PROFESSOR table and the corresponding Department Name from the DEPARTMENT table based on matching Department Code***. Click on the **Parse** button to check for errors in your SQL statements. **Correct any errors in your SQL statements before continuing.** Save the SQL file.

```
/* Select records from multiple tables using
DML Clause (INNER JOIN), and
Comparison Operator (=) */
SELECT PROFESSOR.FirstName, PROFESSOR.LastName, DEPARTMENT.DepartmentName
FROM PROFESSOR
INNER JOIN DEPARTMENT ON PROFESSOR.DepartmentCode=DEPARTMENT.DepartmentCode;
```

11 Click on the **Execute** button. This will execute the SQL statements to retrieve the Professors' Name and Department Name. Verify that all records retrieved are correct. Otherwise, correct any errors in your SQL statements.

	FirstName	LastName	DepartmentName
1	Alan	Tan	Accounting
2	Sophie Binte	Jaafar	Economics
3	Ali Bin	Johan	Finance
4	Mandy	Tan	Civil Engineering
5	John	Lee	Computer Engin...
6	Terry	Kim	Electronics Eng...

12 Enter the following SQL statements into the SQL editor to ***count the number of Student Codes retrieved from the STUDENT table based on a range of Student Codes***. Click on the **Parse** button to check for errors in your SQL statements. **Correct any errors in your SQL statements before continuing.** Save the SQL file.

```
/* Count number of records selected using
Aggregate Function (COUNT),
Comparison Keyword (BETWEEN), and
Logical Operator (AND) */
SELECT COUNT (StudentCode) AS Result
FROM STUDENT
WHERE StudentCode BETWEEN 2011003 AND 2011009;
```

13 Click on the **Execute** button. This will execute the SQL statements to count the number of Student Codes. Verify that the number of records retrieved is correct. Otherwise, correct any errors in your SQL statements.

	Result
1	4

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Part (D): Create SQL Queries to Modify Records

1 Click on the **New Query** button to launch a new SQL editor window, and save the SQL query as **SigmaUniversityTablesDataModify.sql**.

2 Enter the following SQL statements into the SQL editor to ***update Student Registration Dates in the STUDENT table for a range of Student Codes***. Click on the **Parse** button to check for errors in your SQL statements. **Correct any errors in your SQL statements before continuing.** Save the SQL file.

```
/* Update records (single field) using
DML Clause (WHERE), and
Comparison Operator (>=)  */
UPDATE STUDENT
SET RegisterDate='02/05/2018'
WHERE StudentCode>=2011009;
```

3 Click on the **Execute** button. This will execute the SQL statements to update the student record. Verify that the record has been updated correctly. Otherwise, correct any errors in your SQL statements.

	StudentCode	FirstName	LastName	Email	RegisterDate	DepartmentCode
1	2011002	Aini Binte	Imran	imran.aini@sigma.uni.edu	2018-02-04	101
2	2011003	Ayu Binte	Faizal	faizal.ayu@sigma.uni.edu	2018-02-04	102
3	2011005	Connor	Lee	lee.connor@sigma.uni.edu	2018-02-04	103
4	2011008	Madison	Tan	tan.madison@sigma.uni.edu	2018-02-04	201
5	2011009	William	Tan	tan.william@sigma.uni.edu	2018-02-05	202
6	2011011	Andrew	Tan	tan.andrew@sigma.uni.edu	2018-02-05	203

4 Enter the following SQL statements into the SQL editor to ***update both Professor's Last Name and Email in the PROFESSOR table for a specific Professor***. Click on the **Parse** button to check for errors in your SQL statements. **Correct any errors in your SQL statements before continuing.** Save the SQL file.

```
/* Update records (multiple fields) using
DML Clause (WHERE), and
Comparison Operator (=)  */
UPDATE PROFESSOR
SET LastName='Lim-Tan', Email='lim-tan.mandy@sigma.uni.edu'
WHERE ProfessorCode=52001;
```

5 Click on the **Execute** button. This will execute the SQL statements to update the student record. Verify that the record has been updated correctly. Otherwise, correct any errors in your SQL statements.

	ProfessorCode	FirstName	LastName	Email	DepartmentCode
1	51001	Alan	Tan	tan.alan@sigma.uni.edu	101
2	51002	Sophie Binte	Jaafar	jaafar.sophie@sigma.uni.edu	102
3	51003	Ali Bin	Johan	johan.ali@sigma.uni.edu	103
4	52001	Mandy	Lim-Tan	lim-tan.mandy@sigma.uni.edu	201
5	52002	John	Lee	lee.john@sigma.uni.edu	202
6	52003	Terry	Kim	kim.terry@sigma.uni.edu	203

Part (E): Create SQL Queries to Delete Records

1 Click on the **New Query** button to launch a new SQL editor window, and save the SQL query as **SigmaUniversityTablesDataDelete.sql**.

2 Enter the following SQL statements into the SQL editor to ***delete a Student record in the STUDENT table based on a specific Student Code***. Click on the **Parse** button to check for errors in your SQL statements. **Correct any errors in your SQL statements before continuing.** Save the SQL file.

```
/* Delete record using
DML Clause (WHERE), and
Comparison Operator (=) */
DELETE FROM STUDENT
WHERE StudentCode=2011009;
```

3 Click on the **Execute** button. This will execute the SQL statements to delete the student record. Verify that the record has been deleted. Otherwise, correct any errors in your SQL statements.

	StudentCode	FirstName	LastName	Email	RegisterDate	DepartmentCode
1	2011002	Aini Binte	Imran	imran.aini@sigma.uni.edu	2018-02-04	101
2	2011003	Ayu Binte	Faizal	faizal.ayu@sigma.uni.edu	2018-02-04	102
3	2011005	Connor	Lee	lee.connor@sigma.uni.edu	2018-02-04	103
4	2011008	Madison	Tan	tan.madison@sigma.uni.edu	2018-02-04	201
5	2011011	Andrew	Tan	tan.andrew@sigma.uni.edu	2018-02-05	203

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Part (F): Challenge

1 Click on the **New Query** button to launch a new SQL editor window, and save the SQL query as **SigmaUniversityTablesDataExercise.sql**.

2 Enter the SQL statements into the SQL editor to do the tasks listed below. Use the Parse function to check for errors, and the Execute function to ensure the SQL statement works correctly. **Correct any errors in your SQL statements before continuing to the next task.** Save the SQL file after each task.

a) Retrieve department records with department names starting with the letter 'C'.

	DepartmentCode	DepartmentName	CollegeCode
1	201	Civil Engineering	200
2	202	Computer Engineering	200

b) List all student last names without duplicate results in alphabetical order.

	LastName
1	Faizal
2	Imran
3	Lee
4	Tan

c) List the number of students registered based on their register date.

	RegisterDate	StudentCount
1	2018-02-04	4
2	2018-02-05	1

d) List all Colleges and their respective Departments.

	CollegeName	DepartmentName
1	College of Business	Accounting
2	College of Business	Economics
3	College of Business	Finance
4	College of Engineering	Civil Engineering
5	College of Engineering	Computer Engineering
6	College of Engineering	Electronics Engineering

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e) List all Professors with the last name 'Tan' or 'Kim'.

	ProfessorCode	FirstName	LastName	Email	DepartmentCode
1	51001	Alan	Tan	tan.alan@sigma.uni.edu	101
2	52003	Terry	Kim	kim.terry@sigma.uni.edu	203

f) List all students that are not registered on '02/05/2018'.

	StudentCode	FirstName	LastName	Email	RegisterDate	DepartmentCode
1	2011002	Aini Binte	Imran	imran.aini@sigma.uni.edu	2018-02-04	101
2	2011003	Ayu Binte	Faizal	faizal.ayu@sigma.uni.edu	2018-02-04	102
3	2011005	Connor	Lee	lee.connor@sigma.uni....	2018-02-04	103
4	2011008	Madison	Tan	tan.madison@sigma.uni...	2018-02-04	201

g) List all Professors with the last name containing 'Tan'.

	ProfessorCode	FirstName	LastName	Email	DepartmentCode
1	51001	Alan	Tan	tan.alan@sigma.uni.edu	101
2	52001	Mandy	Lim-Tan	lim-tan.mandy@sigma.uni.edu	201

h) List all Students with the first name containing 'n' in the third position and 'o' in the fifth position.

	StudentCode	FirstName	LastName	Email	RegisterDate	DepartmentCode
1	2011005	Connor	Lee	lee.connor@sigma.uni.edu	2018-02-04	103

i) List all Professor and Student email addresses in reverse alphabetical order (e.g. Z to A).

	Email
1	tan.madison@sigma.uni.edu
2	tan.andrew@sigma.uni.edu
3	tan.alan@sigma.uni.edu
4	lim-tan.mandy@sigma.uni.edu
5	lee.john@sigma.uni.edu
6	lee.connor@sigma.uni.edu
7	kim.terry@sigma.uni.edu
8	johan.ali@sigma.uni.edu
9	jaafar.sophie@sigma.uni.edu
10	imran.aini@sigma.uni.edu
11	faizal.ayu@sigma.uni.edu

- END -