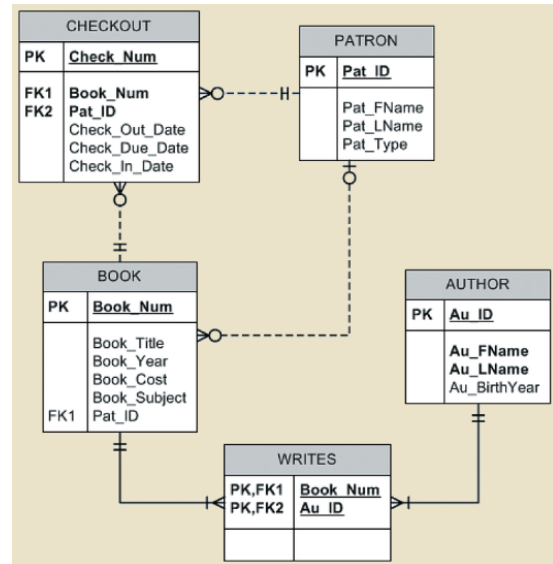


## Prac #6

### Using SQL Commands on MySQL Workbench for Creating a Database Model

Through Prac 4, you developed a simple relational database for a small e-book library (as shown in the ERD provided) using MySQL Workbench.

While you created the database schema and tables and filled the table using import facility in Prac 4, you will, in this prac, use SQL queries in MySQL Workbench to create tables and insert all necessary data to the table created.



- **Learning outcomes and objectives**

Student will be able to:

- use basic SQL for data administration (to create tables) and for data manipulation (to add, modify, delete, and retrieve data)

- **Pre-requisites**

You are assumed basic knowledge about SQL commands to create a database structure and manipulate the contents of the data within it. Chapter 8 from Coronel-Morris textbook, which explains SQL to create a table manually and to do data manipulation, is also required reading.

- **Task Overview**

[Task 1] is to create a database using SQL commands on MySQL Workbench. The required steps are summarised here:

- Step 1: Create an initial (empty) database schema having no tables contained.
- Step 2: Write and Run SQL queries (via SQL query editor provided by MySQL Workbench) to create each table structure
- Step 3: Write and Run SQL queries to insert data to each table
- Step 4: Apply reverse engineering process to create the ERD for the database model created (You can do this step after Step 2)

[Task 2] is to apply various SQL commands to manipulate the structure of existing tables to add, modify, and remove columns and constraints. You will also need to apply SQL commands to do data manipulation like insert, update, and delete rows of data.

## [Task 1]

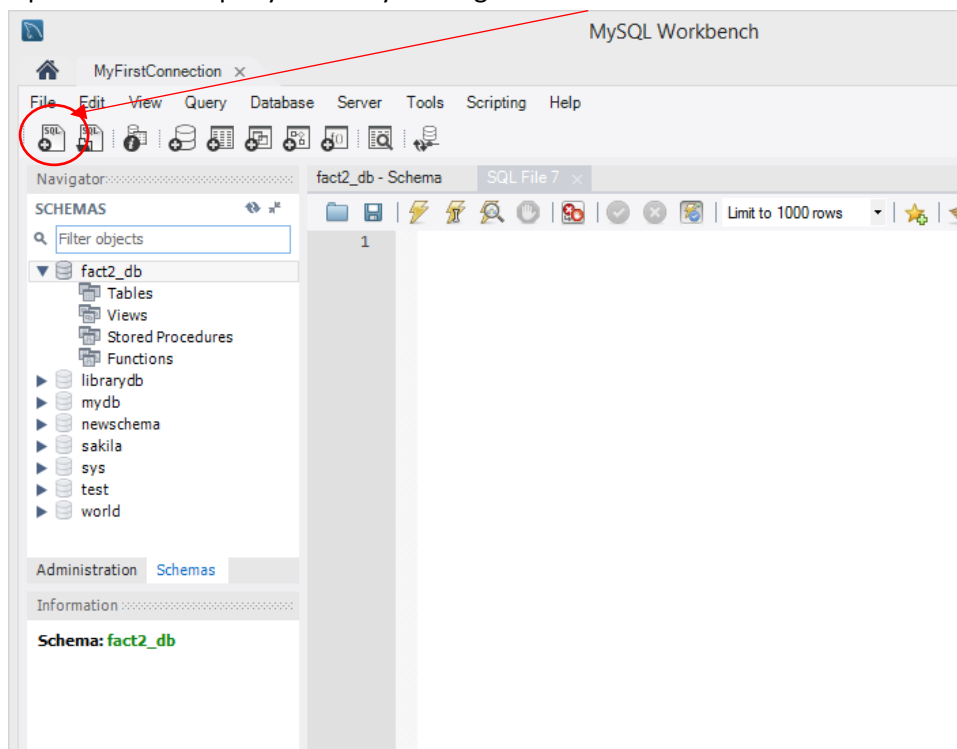
### Create a database using SQL commands on MySQL Workbench

We can use SQL to create database and table structures and to perform basic data management chores (insert, update, and delete). Follow the process as instructed below to create the library database using SQL commands.

1. Start the new connection on MySQL Workbench
2. On the SCHEMAS Navigator panel, put the mouse over the list of schemas and right-click on the mouse, then select "Create Schema ...." menu.
3. Rename the schema into your own new library database title (e.g. 'fact2\_db'), and click "Apply". This will process to create a new (empty) database.
4. Check through SCHEMAS Navigator panel to find that the current list of schemas includes your new database now. (If needed, refresh the list by clicking the refresh button)
5. Double click on the new database (fact2\_db) and you will find that the database contains currently no components like tables

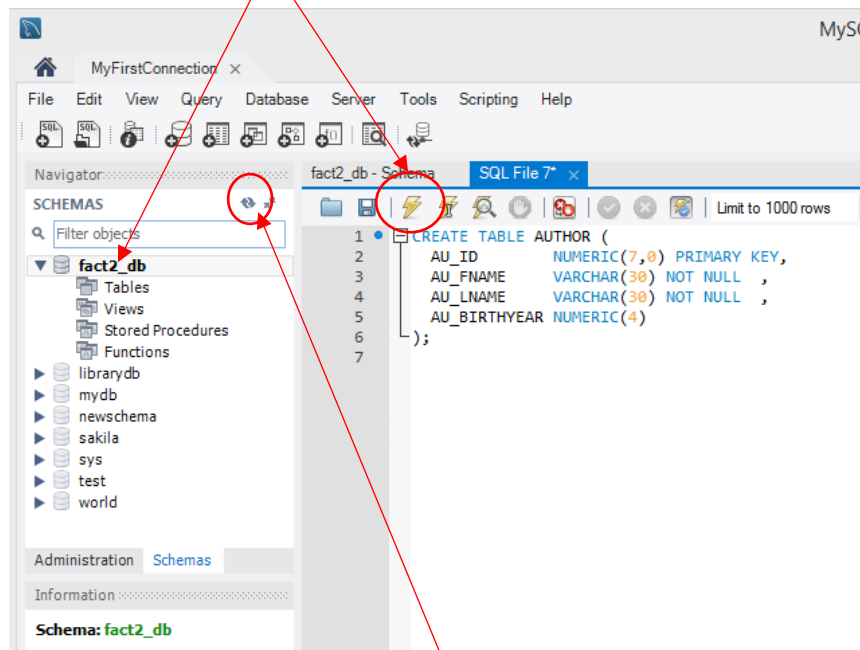
Now, it is time to create table structures. Each table structure will be created using one SQL query each.

6. Open a new SQL query editor by clicking the SQL+ icon on the overhead menu bar.



- Write the following SQL query to create the author table. After writing the query, click 'execute' button to execute the SQL code. (Note: you need to make sure to select the database (fact2\_db) by double-clicking on the database name before executing the query)

```
CREATE TABLE AUTHOR (
  AU_ID    NUMERIC(7,0) PRIMARY KEY,
  AU_FNAME VARCHAR(30) NOT NULL ,
  AU_LNAME VARCHAR(30) NOT NULL ,
  AU_BIRTHYEAR NUMERIC(4)
);
```



After running this query, you will find (through the navigator panel) that the fact2\_db contains one new table called author. (refresh the list if needed)

(You can close the current query editor for your convenience, but it is optional to save the individual query or not. At this stage, you do not need to save, but you will need to save the query if needed for your assignment☺)

- Create the second table patron by running the following SQL query.

```
CREATE TABLE PATRON (
  PAT_ID    NUMERIC(10,0) PRIMARY KEY,
  PAT_FNAME VARCHAR(20) NOT NULL ,
  PAT_LNAME VARCHAR(20) NOT NULL ,
  PAT_TYPE  VARCHAR(10) NOT NULL
);
```

- You can apply the same way to create the other three tables by running each SQL query. However, you run a series of queries by running once. For this, you need to add BEGIN; command at the start and add COMMIT; at the end. The whole code to create three tables (book, patron, writes) at one time is shown below.

```

BEGIN;

CREATE TABLE PATRON (
    PAT_ID    NUMERIC(10,0) PRIMARY KEY,
    PAT_FNAME VARCHAR(20) NOT NULL ,
    PAT_LNAME VARCHAR(20) NOT NULL ,
    PAT_TYPE  VARCHAR(10) NOT NULL
);

CREATE TABLE BOOK (
    BOOK_NUM NUMERIC(10,0) PRIMARY KEY,
    BOOK_TITLE VARCHAR(120) NOT NULL ,
    BOOK_YEAR  NUMERIC(4)          ,
    BOOK_COST  NUMERIC(8,2)        ,
    BOOK_SUBJECT VARCHAR(120)      ,
    PAT_ID     NUMERIC(10),
    FOREIGN KEY(PAT_ID) REFERENCES PATRON(PAT_ID)
);

CREATE TABLE CHECKOUT (
    CHECK_NUM    NUMERIC(15) PRIMARY KEY,
    BOOK_NUM     NUMERIC(10),
    PAT_ID       NUMERIC(10),
    CHECK_OUT_DATE DATE,
    CHECK_DUE_DATE DATE,
    CHECK_IN_DATE DATE,
    FOREIGN KEY (BOOK_NUM) REFERENCES BOOK(BOOK_NUM),
    FOREIGN KEY (PAT_ID) REFERENCES PATRON(PAT_ID)
);

CREATE TABLE WRITES (
    BOOK_NUM NUMERIC(10),
    AU_ID    NUMERIC(7),
    CONSTRAINT WRITES_BOOK_AU_PK PRIMARY KEY (BOOK_NUM, AU_ID),
    CONSTRAINT WRITES_BOOK_NUM_FK FOREIGN KEY(BOOK_NUM) REFERENCES
BOOK(BOOK_NUM),
    CONSTRAINT WRITES_AU_ID_FK FOREIGN KEY(AU_ID) REFERENCES
AUTHOR(AU_ID)
);

COMMIT;

```

Now your database (fact2\_db) currently has table structures with no actual record (data). At this stage, you may import table data directly from external files as learned in the Prac 4. For this task, let's try to use SQL code to insert each data into the existing table one by one (or by series of SQL codes as a whole).

10. Create a new query to insert the first record of author table.

```
INSERT INTO AUTHOR VALUES (185, 'Benson', 'Reeves', 1990);
```

11. To insert all other records, you need to create and run multiple number of SQL queries. For your convenience, MySQL codes for creating this database are provided. Please download the file 'fact\_mysql.txt' and use the code appropriately for your usage. (Hint: you can run the multiple queries at one time using 'begin;' and 'commit;' command)
12. Fully check (through SCHEMAS navigator) that all tables and data records are correctly imported.
13. Save the database as a self-contained file (fact2\_dump.sql) so that you can open the database anywhere when needed in the future. (Refer to previous pracs (Prac 3 or 4) to learn how to back up your database).
14. Submit (or show your prac tutor) this exported dump file (fact2\_dump.sql) to be marked off this week's lab activity

## [Task 2]

Source: Coronel-Morris textbook (13<sup>th</sup> edition) **Chapter 8 Problems Q1 ~ Q15**

1. Create a database named 'ConstructCo\_db' on MySQL Workbench. Use the SQL command scripts provided (Ch08\_ConstructCo\_MySQL.txt).
2. Apply 'Reverse Engineering' process to create an ERD for this database. Save the ERD as a file named 'ConstructCo.mwb'.

If you created the database successfully, you will see that the structure and contents of the ConstructCo database are as shown in the following figure.

Relational diagram

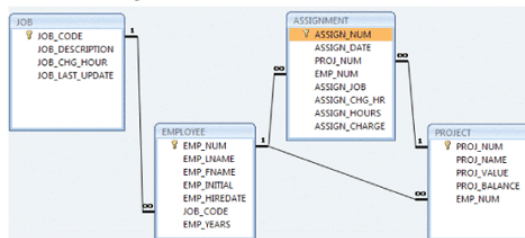


Table name: JOB

JOB_CODE	JOB_DESCRIPTION	JOB_CHG_HOUR	JOB_LAST_UPDATE
500	Programmer	35.75	20-Nov-17
501	Systems Analyst	96.75	20-Nov-17
502	Database Designer	125.00	24-Mar-18
503	Electrical Engineer	84.50	20-Nov-17
504	Mechanical Engineer	67.90	20-Nov-17
505	Civil Engineer	55.78	20-Nov-17
506	Clerical Support	26.87	20-Nov-17
507	DSS Analyst	45.95	20-Nov-17
508	Applications Designer	48.10	24-Mar-18
509	Bio Technician	34.55	20-Nov-17
510	General Support	18.36	20-Nov-17

Table name: PROJECT

PROJ_NUM	PROJ_NAME	PROJ_VALUE	PROJ_BALANCE	EMP_NUM
15	Evergreen	1453500.00	1002350.00	103
18	Amber Wave	3500500.00	2110346.00	108
22	Rolling Tide	805000.00	500345.20	102
25	Starflight	2650500.00	2308880.00	107

Table name: EMPLOYEE

EMP_NUM	EMP_LNAME	EMP_FNAME	EMP_INITIAL	EMP_HIREDATE	JOB_CODE	EMP_YEARS
101	News	John	G	08-Nov-00	502	12
102	Senior	David	H	12-Jul-89	501	23
103	Arbough	June	E	01-Dec-96	500	18
104	Ramoras	Anne	K	15-Nov-87	501	25
105	Johnson	Alice	K	01-Feb-93	502	19
106	Smithfield	William		22-Jun-04	500	8
107	Alonzo	Maria	D	10-Oct-93	500	19
108	Washington	Ralph	B	22-Aug-91	501	21
109	Smith	Larry	vV	18-Jul-97	501	15
110	Olenko	Gerald	A	11-Dec-95	505	17
111	Wabash	Geoff	B	04-Apr-91	506	21
112	Smithson	Darlene	M	23-Oct-94	507	18
113	Joenbrood	Delbert	K	15-Nov-96	508	16
114	Jones	Annelise		20-Aug-93	508	19
115	Bawangi	Travis	B	25-Jan-92	501	20
116	Pratt	Gerald	L	05-Mar-97	510	15
117	Williamson	Angle	H	19-Jun-96	509	16
118	Frommer	James	J	04-Jan-05	510	7

Table name: ASSIGNMENT

ASSIGN_NUM	ASSIGN_DATE	PROJ_NUM	EMP_NUM	ASSIGN_JOB	ASSIGN_CHG_HR	ASSIGN_HOURS	ASSIGN_CHARGE
1001	22-Mar-18	18	103	503	84.50	3.5	295.75
1002	22-Mar-18	22	117	509	34.55	4.2	145.11
1003	22-Mar-18	18	117	509	34.55	2.0	69.10
1004	22-Mar-18	18	103	503	84.50	5.9	498.55
1005	22-Mar-18	25	108	501	96.75	2.2	212.85
1006	22-Mar-18	22	104	501	96.75	4.2	406.35
1007	22-Mar-18	25	113	508	50.75	3.8	192.85
1008	22-Mar-18	18	103	503	84.50	0.9	76.05
1009	23-Mar-18	15	115	501	96.75	5.6	541.80
1010	23-Mar-18	15	117	509	34.55	2.4	82.92
1011	23-Mar-18	25	105	502	105.00	4.3	451.50
1012	23-Mar-18	18	108	501	96.75	3.4	328.95
1013	23-Mar-18	25	115	501	96.75	2.0	193.50
1014	23-Mar-18	22	104	501	96.75	2.8	270.90
1015	23-Mar-18	15	103	503	84.50	6.1	515.45
1016	23-Mar-18	22	105	502	105.00	4.7	493.50
1017	23-Mar-18	18	117	509	34.55	3.8	131.29
1018	23-Mar-18	25	117	509	34.55	2.2	76.01
1019	24-Mar-18	25	104	501	110.50	4.9	541.45
1020	24-Mar-18	15	101	502	125.00	3.1	387.50
1021	24-Mar-18	22	108	501	110.50	2.7	298.35
1022	24-Mar-18	22	115	501	110.50	4.9	541.45
1023	24-Mar-18	22	105	502	125.00	3.5	437.50
1024	24-Mar-18	15	103	503	84.50	3.3	278.95
1025	24-Mar-18	18	117	509	34.55	4.2	145.11

The **Ch07\_ConstructCo** database stores data for a consulting company that tracks all charges to projects. The charges are based on the hours each employee works on each project.

Note that the ASSIGNMENT table stores the JOB\_CHG\_HOUR values as an attribute (ASSIGN\_CHG\_HR) to maintain historical accuracy of the data. The JOB\_CHG\_HOUR values are likely to change over time. In fact, a JOB\_CHG\_HOUR change will be reflected in the ASSIGNMENT table. And, naturally, the employee primary job assignment might change, so the ASSIGN\_JOB is also stored. Because those attributes are required to maintain the historical accuracy of the data, they are *not* redundant.

Given the structure and contents of the ConstructCo database, use SQL commands for the following problems (1)~(15). (Save each SQL command as a separate file or copy/paste to one WORD document)

- (1) Write the SQL code that will create the table structure for a table named EMP\_1. This table is a subset of the EMPLOYEE table. The basic EMP\_1 table structure is summarized in the table below. Use EMP\_NUM as the primary key. Note that the JOB\_CODE is the FK to JOB so be certain to enforce referential integrity. Your code should also prevent null entries in EMP\_LNAME and EMP\_FNAME.
- (2) Having created the table structure in Problem (1), write the SQL code to enter the first two rows for the table shown as below. Each row should be inserted individually, without using a subquery. Insert the rows in the order that they are listed in the table as shown.

[The contents of the EMP\_1 table]

EMP_NUM	EMP_LNAME	EMP_FNAME	EMP_INITIAL	EMP_HIREDATE	JOB_CODE
101	News	John	G	08-Nov-00	502
102	Senior	David	H	12-Jul-89	501
103	Arbough	June	E	01-Dec-96	500
104	Ramoras	Anne	K	15-Nov-87	501
105	Johnson	Alice	K	01-Feb-93	502
106	Smithfield	William		22-Jun-04	500
107	Alonzo	Maria	D	10-Oct-93	500
108	Washington	Ralph	B	22-Aug-91	501
109	Smith	Larry	W	18-Jul-97	501

- (3) Using the EMPLOYEE table that already exists, use a subquery to insert the remaining rows from the EMPLOYEE table into the EMP\_1 table. Remember, your subquery should only retrieve the columns needed for the EMP\_1 table and only the employees shown in the figure.
- (4) Write the SQL code that will save the changes made to the EMP\_1 table.
- (5) Write the SQL code to change the job code to 501 for the person whose employee number (EMP\_NUM) is 107.
- (6) Write the SQL code to delete the row for the person named William Smithfield, who was hired on June 22, 2004, and whose job code classification is 500. (*Hint*: Use logical operators to include all of the information given in this problem. Remember, if you are using MySQL, will have to first disable “safe mode”. You can set up this under Edit>Preferences>SQL

Editor>unclick “Safe Updates”. Please be cautious that this setting requires restart of your server and reconnection thus you will need to save your database firstly in particular if you use Workbench in a lab computer.)

- (7) Write the SQL code to create a copy of EMP\_1, including all of its data, and naming the copy EMP\_2.
- (8) Using the EMP\_2 table, write the SQL code that will add the attributes EMP\_PCT and PROJ\_NUM to EMP\_2. The EMP\_PCT is the bonus percentage to be paid to each employee. The new attribute characteristics are:  
  
EMP\_PCTNUMBER(4,2)  
PROJ\_NUMCHAR(3)  
  
(Note: If your SQL implementation allows it, you may use DECIMAL(4,2) or NUMERIC(4,2) rather than NUMBER(4,2). Use DECIMAL(4,2) for MySQL Workbench.)
- (9) Using the EMP\_2 table, write the SQL code to change the EMP\_PCT value to 3.85 for the person whose employee number (EMP\_NUM) is 103.
- (10) Using the EMP\_2 table, write a single SQL command to change the EMP\_PCT values to 5.00 for the people with employee numbers 101, 105, and 107.
- (11) Using the EMP\_2 table, write a single SQL command to change the EMP\_PCT values to 10.00 for all employees who do not currently have a value for EMP\_PCT.
- (12) Using the EMP\_2 table, write a single SQL command to add 0.15 to the EMP\_PCT of the employee whose name is Maria D. Alonzo. (Use the employee name in your command to determine the correct employee.)
- (13) Using a single command sequence with the EMP\_2 table, write the SQL code that will change the project number (PROJ\_NUM) to 18 for all employees whose job classification (JOB\_CODE) is 500.
- (14) Using a single command sequence with the EMP\_2 table, write the SQL code that will change the project number (PROJ\_NUM) to 25 for all employees whose job classification (JOB\_CODE) is 502 or higher.
- (15) Write the SQL code that will change the PROJ\_NUM to 14 for employees who were hired before January 1, 1994, and whose job code is at least 501.

When you finish Problems 7 ~ 15, the EMP\_2 table will contain the data shown in the following table.

EMP_NUM	EMP_LNAME	EMP_FNAME	EMP_INITIAL	EMP_HIREDATE	JOB_CODE	EMP_PCT	PROJ_NUM
101	News	John	G	08-Nov-00	502	5	25
102	Senior	David	H	12-Jul-89	501	10	14
103	Arbough	June	E	01-Dec-96	500	3.85	18
104	Ramoras	Anne	K	15-Nov-87	501	10	14
105	Johnson	Alice	K	01-Feb-93	502	5	14
107	Alonzo	Maria	D	10-Oct-93	501	5.15	14
108	Washington	Ralph	B	22-Aug-91	501	10	14
109	Smith	Larry	W	18-Jul-97	501	10	

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This is the end of Prac #6.

You are required to submit (or show your prac tutor) the following files to be marked off:

- fact2\_db.sql
  - ConstructCo.mwb
  - A MS Word document containing SQL commands you wrote and saved for [Task 2] problems (1)~(15)
-