CSCI3287 Database Systems

Homework Number Three – SQL

Overview

This Project is worth 150 points (150 out of 1000, or 15%) toward your final grade. It is due on Sunday, February 23, at 11:59 p.m. Late submissions will be penalized 20% during a 3-day grace period up until Wednesday, February 26, 11:59 p.m. After that time, no late work will be accepted. Your submission should be a document saved and submitted as a PDF file via the link found in the assignment section of the "Week 5, February 10 - 16" in Moodle -- which is the same place where you found this file.

This assignment will give you hands-on practice in working with MySQL and the SQL language. In this Project you will create a database and populate it with data using the scripts provided. You will use the database you create for running a variety of queries and answering a few questions.

Objectives

1. Become familiar with the SQL language & syntax for SELECT queries, DDL and DML
2. Become familiar with a tool of your choice for building and submitting queries (whether command mode or GUI.)
3. Successfully run the scripts necessary to create a sample database, verify that your database is correctly built.
4. Run SQL queries against your database to answer the assigned problems.

Step One: Downloading and Installing MySQL

For this project assignment you will need to download and install MySQL on your computer. How you do this will depend on what type of computer you have and what Operating System it is running.

You will want to download **MySQL Community Server 8.0.*** The current release number changes from time to time. As of this writing, the most recent release is 8.0.17. If for some reason you don't want to use version 8.0 – for example if you already have version 5.7 running on your computer, you can use version 5.7.x. Either version will work fine.

Do **NOT** download "MySQL Cluster" software -- similar name, but a ***VERY*** different DBMS product.

This page (below) contains online documentation links where you can find help with the download and installation if you need it.

The download you need can be found here: https://dev.mysql.com/downloads/mysql/

Choose the download file that matches your computer's OS and version.

Once you have downloaded and installed MySQL, you should launch the MySQL instance so that it is running in the background on your computer.

Step Two: Choose Your Preferred Query Editor Tool

In order to create SQL queries and run them against your MySQL database, you will need a tool or a user interface through which you can create and execute queries, and then view/copy/export the answer set.

The default is the mysqld command line interface. This command line interface is installed with MySQL and is similar to using the Linux shell. If you choose to do your queries via the MySQL command line interface, you do not need to download/install any query tool.

However, managing and running queries against MySQL databases is simpler, faster and easier if you use a GUI (graphic user interface) tool. There are many available.

You can use **MySQL Workbench**. You have seen your instructor use MySQL Workbench in class to create an ERD (Entity Relationship Diagram) data model and then generate SQL to create tables. MySQL Workbench is free. You can use MySQL Workbench to build and submit queries against your database. It is available here: https://dev.mysql.com/downloads/workbench/

MySQL offers versions for Windows, Linux, MAC.

A great open source alternative is **DBeaver**. The community edition is free and it comes with versions for many different OS builds and works fine with MySQL. https://dbeaver.io/download/

Another alternative for MAC users is **DataGrip**. https://www.jetbrains.com/datagrip/ They offer a free 30-day trial, and a special free edition for students that you can sign up for.

Step Three: Creating the Database

Once you have selected your query editor, you need to download the "ClassicModelsCreate" script file from Moodle, unzip it and execute it. It will create your database and tables, and then load the tables with data. The script runs fine as-is without any modification.

Before you can create your database, you need to make sure that your instance of MySQL is running in the background.

Then using your query editor, you must connect to the running MySQL instance prior to running the script.

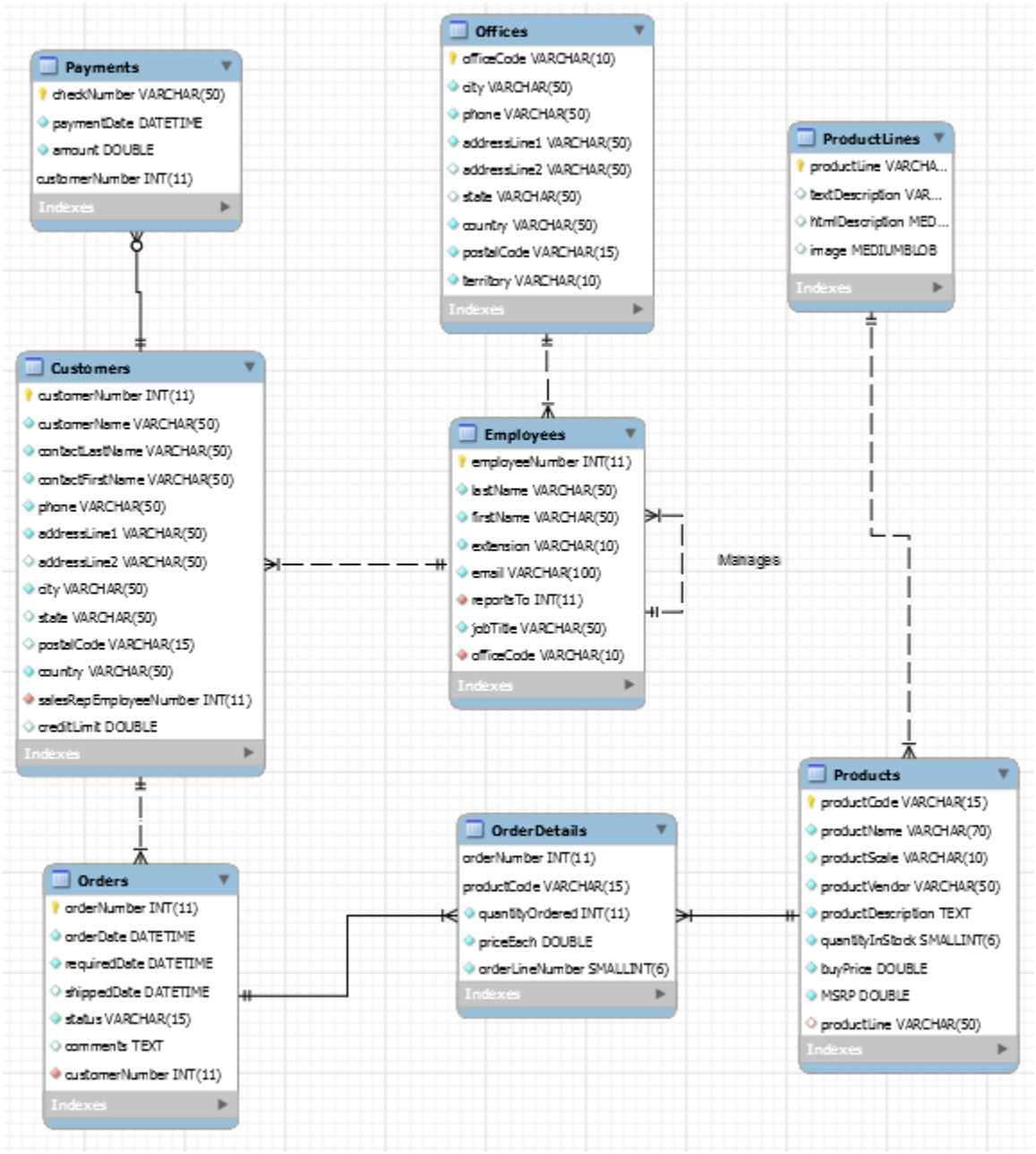
HINT: You should download and print this ERD (below) and keep it handy when you are writing your queries. It is very helpful to have table and column names in front of you when writing SQL queries.

MySQL Sample Database Schema

The MySQL sample "Classic Models" database schema consists of the following tables:

Customers	stores customer data.
Products	stores a list of scale model cars.
ProductLines	stores a list of product line categories.
Orders	stores sales orders placed by customers.
OrderDetails	stores sales order line items for each sales order.
Payments	stores payments made by customers based on their accounts
Employees	stores all employee information as well as the organization structure such as who reports to whom.
Offices	stores sales office data.

See "Appendix A" for a more detailed description of the ClassicModels business and database.



Note: GUI Query Editor Users: After you run some queries to create your tables, you might expect the new tables to immediately appear under the "object explorer" on the left side of your GUI query editor. They will eventually show up, but to see them appear right away, you will need to click on the "refresh" icon (if your tool has one.) If this icon does not appear, then click somewhere within your "object explorer" and the newly created tables should appear. (Depends on your query tool…)

If you are using the command line editor, you can enter `SHOW TABLES` and MySQL will show you all the tables in your database.

After running the unzipped script file to create and load your database, you should run the following "Verify" script to ensure that your database is built correctly.

Verify Script:

```
SELECT table_schema, table_name, table_rows

      FROM information_schema.tables

      WHERE TABLE_SCHEMA LIKE 'classic%';
```

You should see the following tables and row counts for your Classic Models database.

table_schema	table_name	table_rows
classicmodels	customers	122
classicmodels	employees	23
classicmodels	offices	7
classicmodels	orderdetails	2996
classicmodels	orders	326
classicmodels	payments	273
classicmodels	productlines	7
classicmodels	products	110

Preparing Your Assignment Submission

Your results for this homework assignment should be captured in a document (such as a .txt file, MS Word or similar tool.) Please then save your final deliverable document as a **PDF**. Your submission should be a document saved and submitted as a PDF file via the link found in the assignment section of the "Week 5, February 10 - 16" in Moodle -- which is the same place where you found this file.

You must turn in BOTH your SQL Code and your ANSWER SET (unless otherwise specified.). Please include the question number, your SQL code, and the answer set as displayed in the sample below.

Sample Submission Format:

Question 3:

```
select customerNumber, concat(contactFirstName, ', ', contactLastName) as Name
       from customers
       where country = 'Canada';
```

customerNumber	Name
202	Yoshi , Tamuri
233	Jean , Fresnière
260	Elizabeth , Lincoln

For each problem where a multi-row answer set is created, the number of rows you should expect in your answer set is listed in parentheses after the problem/question. Some queries will produce NO answer set.

Query Problems

For this project you must create and execute queries against the ClassicModels database to fulfill the requirements listed below. For each query requirement, as a "hint", the number of rows to expect in your answer set is listed in parentheses.

1. List in alphabetical order the names of the cities in Australia where ClassicModels has customers. (5)

2. List the EmployeeNumber, LastName, FirstName, Extension for all employees working out of the Sydney office. (4)

3. List the ProductCode, ProductName, ProductVendor, QuantityInStock and ProductLine for all products with a QuantityInStock greater than 4000 and less than 5000. (8)

4. (Use a SUBQUERY) List the ProductCode, ProductName, ProductVendor, BuyPrice and MSRP for the most expensive (highest MSRP) product sold by ClassicModels. ("MSRP" is the Manufacturer's Suggested Retail Price.) (1)

5. List the ProductName, MSRP, BuyPrice, and Margin of the product that has the lowest Margin (Margin = MSRP minus BuyPrice). (1)

6. List the country and the number of customers from that country for all countries with more than five customers. List the countries in order from most to least customers. Title the column heading for the count of customers as "Customers". (4)

7. List the ProductCode, ProductName, and number of orders for the product with the most orders. Title the column heading for the count of orders as "OrderCount". (1)

8. Create an "Employee Roster" report listing the Manager's name and the name of the employees who report to that manager. Sort by Manager. For both managers and employees, concatenate Firstname + Lastname and refer to them as "ManagerName" and "EmployeeName" in the answer set. (22)

9. List the EmployeeNumber, LastName, FirstName of the president of the company (the one employee with no boss.) (1)

10. List the ProductName for all products in the "Classic Cars" product line from the 1960's. (11)

11. List the month name and the year and the order count for the TOP TWO months in which ClassicModels customers placed the highest number of orders. (2)

12. List the firstname, lastname of employees who are Sales Reps who have no assigned customers. (2)

13. List the customername of customers from Switzerland with no orders. (2)

14. List the customername and total quantity of products ordered for customers who have ordered less than 500 products across all their orders. (11)

15. Create a NEW table named "LowCustomers" with three columns: CustomerNumber (integer), ContactDate (DATE) and OrderTotal (a decimal number with 9 digits in total having two decimal places). None of these columns can be NULL. Include a PRIMARY KEY constraint named "LowCustomer_PK" on CustomerNumber. (no answer set)

16. Populate the new table "LowCustomers" with the CustomerNumber, today's date, and the total value of all their orders (PriceEach * quantityOrdered) for those customers whose order total value is less than $50,000. (inserted 16 rows, no answer set)

17. List the contents of the LowCustomers table in descending OrderTotal sequence. (16)

18. Add a new column to the LowCustomers table called OrderCount (integer). (No answer set)

19. Update the LowCustomers table, setting the OrderCount column to a random number (from 0 to 18). (Should update 16 rows) HINT: use the RAND() and FLOOR() functions.

20. List the contents of the LowCustomers table in descending OrderCount sequence. (16)

21. Drop the LowCustomers table. (no answer set)

Appendix A – The ClassicModels database

Introduction The Classic Models Inc. example database has been developed as part of the Eclipse BIRT (Business Intelligence Reporting Tools) project.

Its main goal is to be obvious and simple, yet able to support a wide range of interesting report examples.

The database represents a fictitious company: Classic Models Inc. which buys collectable model cars, trains, trucks, buses, trains and ships directly from manufacturers and sells them to distributors across the globe.

Database Tables

Offices Table

Classic Models Inc. has 7 offices worldwide (San Francisco, Boston, NYC, Paris, Tokyo, Sydney, London) and is headquartered in San Francisco, CA. Based on geography each office is assigned to a sales territory (APAC, NA, EMEA or JAPAN)

Employees Table

The company has 23 employees: 6 Execs and 17 Sales Reps, all assigned to one of the company's seven offices. Sales Reps are also assigned to a number of customers (distributors) in their respective geographies that they sell to. New Sales Reps (that are still in training) don't have customers assigned to them. Each Sales Rep reports to the Sales Manager for his/her territory. The only exceptions are the two Sales Reps in the Tokyo office. One of them acts as a Sales Manager and reports directly to the VP of Sales. The second one reports to him.
The Execs: President, VP Sales, VP Marketing, Sales Manager (JAPAN, APAC), Sales Manager (EMEA), Sales Manager (NA) don't work directly with customers. Each Sales Manager reports to the VP of Sales. Nobody reports to the VP of Marketing. The two VPs report to the company's President.

Customers Table

Classic Models Inc. has 122 customers across the world. Approximately 20 of those are brand new customers that don't have an assigned sales rep and haven't placed any orders yet. Each customer has a credit limit which determines their maximum outstanding balance.

Orders Table

Customers place their orders and expect to receive them approximately within 6 to 10 days. Once an order is placed it's assembled and shipped within 1 to 6 days (7-8 for Japan). There are a total of 326 orders, which span the period from 1/1/2003 to 6/1/2005. Orders can be in one of these states: In Process (the initial state for all orders), Shipped, Cancelled (used to indicate that the customer called to cancel the order right after the order was placed and typically before it was shipped), Disputed (used to indicate that the customer received the order but doesn't like it), Resolved (used to indicate that the order was disputed, but successfully resolved) or On Hold (used to indicate that the order will not ship until a payment is received because the customer's credit limit has been exceeded). Approximately 93% of the orders are in the Shipped state.

OrderDetails Table

Each order contains an average of 9 unique products (order line items) with an average quantity of 35 per product (so there is an average total of 9x35 items per order). Each order line item reflects the negotiated price per product (which is based on the corresponding product's MSRP) as well as the quantity per product.

Products Table

Classic Models Inc. sells 110 unique models which they purchase from 13 vendors. The models are classified as 7 distinct product lines: Classic Cars, Vintage Cars, Motorcycles, Trucks and Buses, Planes, Ships, Trains. Additionally models are classified based on their scale (e.g. 1:18, 1:72 etc.). For each product the price at which the product was purchased from the vendor (buyPrice) as well as the product's MSRP are provided. The average MSRP is $100 ranging from $33 to $214. The MSRP price is on average 45% (30% to 60%) above the buyPrice.

Payments Table

Customers make payments (by check) on average 2-3 weeks after they place an order. In some cases one check covers more than 1 order.

ProductLines Table

Products are classified as 7 distinct product lines. Each product line is associated with a text description, html description as well as with the capability to store an image. (Due to size constraints, images are not included in the initial data load.)