

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 28, at 11:59 p.m. Late submissions will be penalized 20% during a 3-day grace period up until Wednesday, March 3, 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 homework assignment # 3 link the “Week 6, February 15 - 21” module in Canvas -- 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.

“Pair Programming” is not allowed for this assignment. Please do your own work.

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. 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.

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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.

As I mentioned in lecture, the MySQL installer will prompt you for a password for the root account to have access to your MySQL instance. When you enter this root password, write it down so that you don't forget it. If you forget this password, you will have a very hard time using MySQL on your computer and resetting the MySQL root password is an unpleasant task.

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 `mysql` 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.

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Step Three: Creating the Database

Once you have selected your query editor, you need to download the “ClassicModelsCreate” script file from Canvas, 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

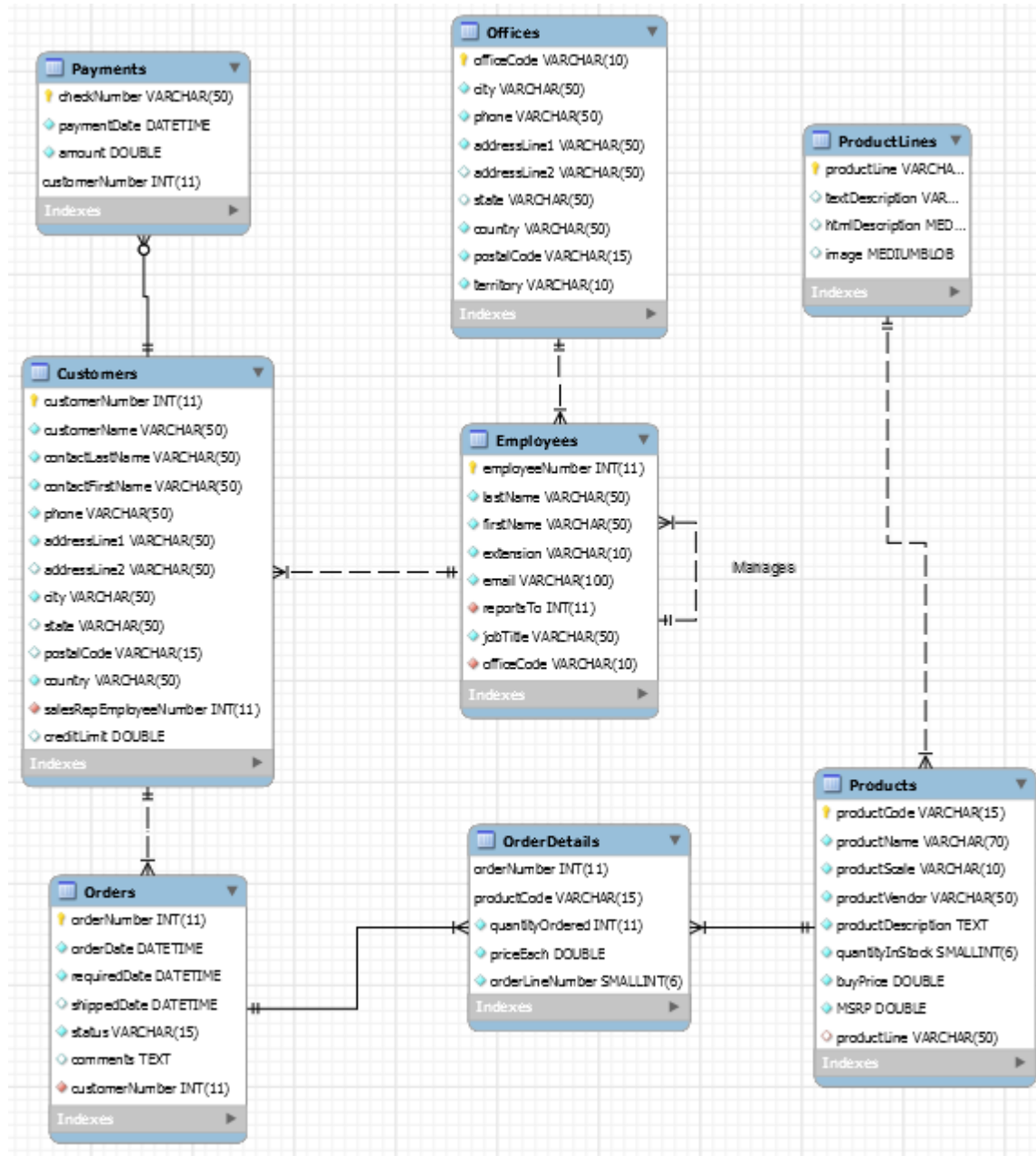
The MySQL sample “Classic Models” database schema consists of the following tables:

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.

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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...)

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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 link the “Week 6, February 15 - 21” module in Canvas -- 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.

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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 without duplicates the names of the cities in Spain where ClassicModels has customers. (3)
2. List the employee id, last name, first name of each employee who works in Paris (use a subquery). (5)
3. List the ProductCode, ProductName, ProductScale, ProductVendor, buyPrice for all products that are in the Motorcycles product line and have a buyPrice greater than 50 and less than 80. (5)
4. List the productCode, productName, productLine, quantityInStock, buyPrice for the least expensive Vintage Cars from ExotoDesigns. (1)
5. List the top 5 most expensive Order Items (by total cost) listing the product name, the vendor, the quantity and the total cost for each ordered item. (5) HINT: total cost = (quantityOrdered * priceEach)

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6. List the customerNumber, customerName, phone, country, state, corresponding RepEmployee's Number, and creditLimit for customers with a credit limit of more than 130,000. List them in order from lowest to highest creditLimit. (5)

7. List the productCode, productName, and count of orders for the product with the most orders where the productVendor is Welly Diecast Productions. Make sure to title the column heading for the count of orders as "OrderCount". (1)

8. (use SUBQUERY)

List the name, city, state, country, credit limit, and total products ordered for the top 3 customers who ordered the most products. (3)

(hint: who has the highest total quantity in OrderProducts across all their orders?) (3)

9. List the OfficeCode, city, state, country of all the offices that are not in USA and occupying the entire building (the office has no addressLine2 recorded).(2)

10. List the productName and productLine for all Vintage Cars made in the 1930s (productName contains the string "193..."). (12)

11. Select the order number, required date, shipped date, date difference, and shipped month for orders which were shipped less than 3 days before they were due (required date - shipping date < 3) for orders shipped in 2005 (10).

12. List the customerNumber, customerName, city, country, and count of their orders for all customers whose customer number is lower than 150. List them in descending order from highest to least number of orders. Title the column heading for the count of orders "Orders". (15)

13. List the customerName and customerNumber for customers in Switzerland that have no orders. (2)

14. Select the product lines with over 12,000 orders (3)

In other words, if you tally up all the orders for classic cars, ships, trains, planes, etc., which categories have over 12,000 orders?

15. Create a NEW table named "TopCustomers" with four columns: CustomerNumber (integer), ContactDate (DATE), OrderCount(integer), 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 "TopCustomer_PK" on CustomerNumber. (no answer set)

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16. Populate the new table "TopCustomers" with the CustomerNumber, today's date, total number of orders (quantity), and the total value of all their orders (PriceEach * quantityOrdered) for those customers whose order total value is greater than \$130,000. (inserted 16 rows, no answer set)
17. List the customerNumber, contactDate, orderCount, and orderTotal with the top five highest order totals from "TopCustomers" in descending orderTotal amount. (5)
18. Add a new column to the TopCustomers table called CustomerRatings (integer) set to zero by default. (No answer set)
19. Update the TopCustomers table, setting the CustomerRatings column to a random number from 0 to 10. This will tell us a scale of customer satisfaction: "0" being "terrible", and "10" being "great service!"
HINT: use the RAND() and/or FLOOR() functions as needed. (16 rows affected)
20. List the contents of the TopCustomers table in descending CustomerRatings sequence. (16)
21. Drop the TopCustomers table. (no answer set)

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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.

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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.)