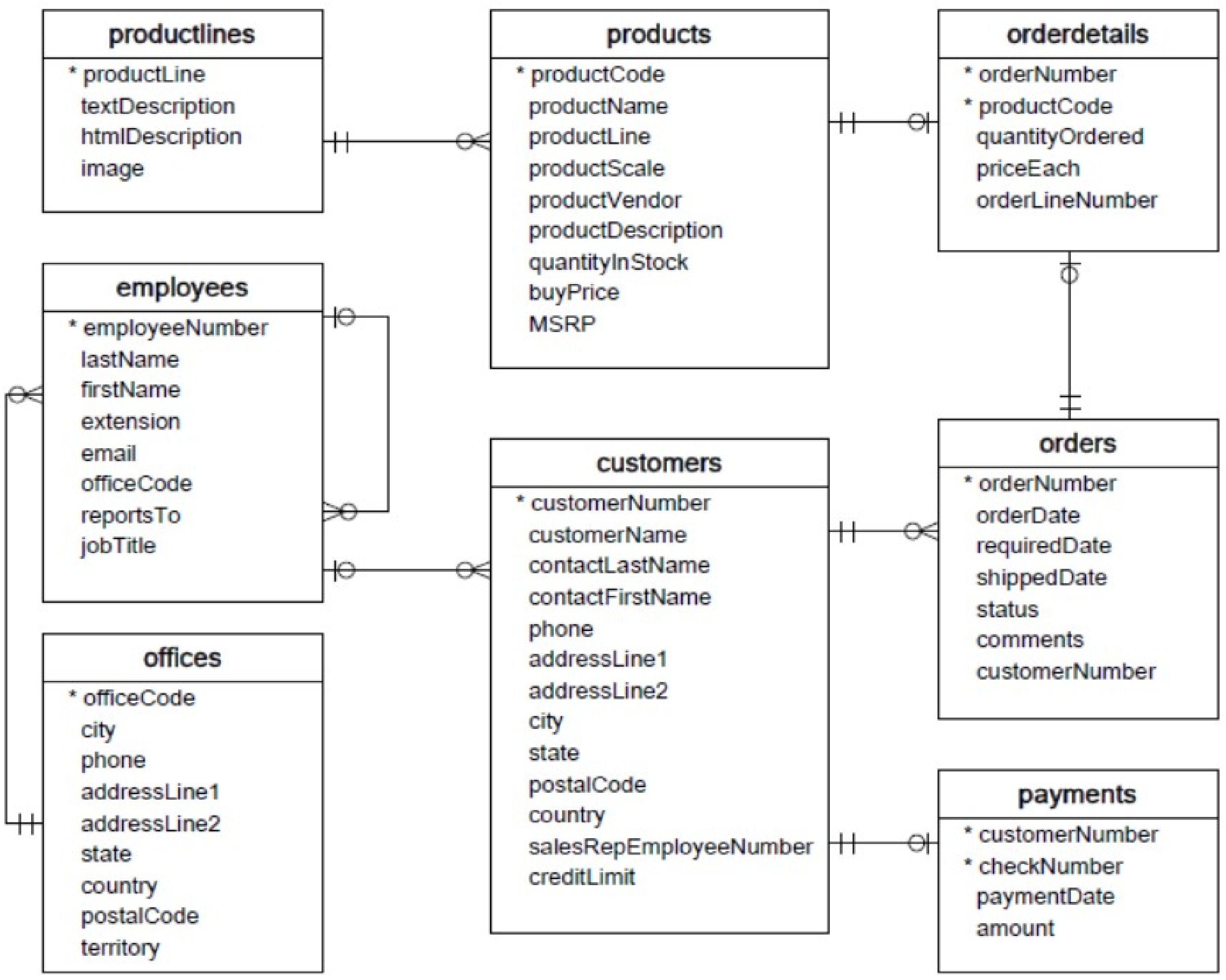
Introduction

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.

- **Customers**: stores customer's 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.

Database ER-diagram



Establishing a connection

Prerequisites:

Need to install Python and MySQL databases. Then install MySQL Connector/Python client or API on your Python environment.

To work with MySQL using Python, you must have an authorized user account on the MySQL server.

Note: Need to install mysql-connector-python package to run your code.

```
# uncomment to install
# !pip install mysql-connector-python
```

```python
# Importing libraries
import warnings
warnings.filterwarnings('ignore')
import pandas as pd
import mysql.connector
import datetime as dt
from dotenv import load_dotenv
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
import plotly.express as px
from scipy import stats

%reload_ext dotenv
%dotenv
import os
# load the database host, user, password from an .env file
db_host = os.getenv("DB_HOST")
db_user = os.getenv("DB_USER")
db_pass = os.getenv("DB_PASSWORD")
```

Establishing a connection to their MySQL database using Python, via MySQL Connector/Python API. To achieve this task please fill in the following steps:

- 1: import the appropriate MySQL connector library using the alias connector
- 2: Next, create a variable called connection and use it to store an instance of the connection made with the database using the connector module. This module uses a method called connect() and you should provide the relevant connection details.

TIP: You need to have an authenticated username and password to establish the connection. If you don't see any error in the output while establishing the connection, your connection is successfully established.

```python
try:
    print("Establishing a new connection between MySQL and Python.")
    mydb=mysql.connector.connect(
    host=db_host,
    user=db_user,
    password=db_pass,
    database='classicmodels')
    print("A connection between MySQL and Python is successfully 
established")

except mysql.connector.Error as er:
    print("Error code:", er.errno)
    print("Error message:", er.msg)

cursor=mydb.cursor()
```

```
Establishing a new connection between MySQL and Python.
A connection between MySQL and Python is successfully established

def run_query(query, mydb = mydb):
    try:
        result = pd.read_sql(query,mydb)
        print(result)

    except mysql.connector.Error as er:
        print("Error code:", er.errno)
        print("Error message:", er.msg)
```

Let's answer few questions

Single Entity

1. Prepare a list of offices sorted by country, state, city.

```
q1 = """
SELECT `officeCode` AS `Office Code`,`country`, `state`, `city`
FROM offices
ORDER BY `country`, `state`, `city`
"""
run_query(q1)

  Office Code    country        state           city
0           6  Australia          NSW         Sydney
1           4     France         None          Paris
2           5      Japan  Chiyoda-Ku          Tokyo
3           7         UK         None         London
4           1        USA           CA  San Francisco
5           2        USA           MA         Boston
6           3        USA           NY            NYC
```

1. How many employees are there in the company?

```
q2 = """
SELECT count(*) AS 'Total Employees'
FROM employees
"""
run_query(q2)

   Total Employees
0               23
```

1. What is the total of payments received?

```
q3 = """
SELECT SUM(payments.amount) AS 'Total Payments ($)'
FROM payments
```

```
"""
run_query(q3)

   Total Payments ($)
0          8853839.23
```

1. List the product lines that contain 'Cars'.

```
q4 = """
SELECT productLine AS `Product Lines: Cars`
FROM productlines
WHERE productLine LIKE '%Car%'
"""
run_query(q4)

  Product Lines: Cars
0        Classic Cars
1        Vintage Cars
```

1. Report total payments for October 28, 2004.

```
q5 = """
SELECT SUM(amount) AS 'Total payments($) on October 28, 2004'
from payments
WHERE paymentDate = '2004-10-28'
"""
run_query(q5)

   Total payments($) on October 28, 2004
0                               47411.33
```

1. Report those payments greater than $100,000.

```
q6 = """
SELECT *
FROM payments
WHERE payments.amount > 100000
"""
run_query(q6)

  checkNumber paymentDate     amount  customerNumber
0    AE215433  2005-03-05  101244.59             124
1     ID10962  2004-12-31  116208.40             141
2    JE105477  2005-03-18  120166.58             141
3    KI131716  2003-08-15  111654.40             124
4    KM172879  2003-12-26  105743.00             148
```

1. List the products in each product line.

```
q7 = """
SELECT productLine AS `Product Line`,GROUP_CONCAT(DISTINCT productName
ORDER BY productName  SEPARATOR " | ") AS `Product Names`
FROM products
GROUP BY productLine
"""
run_query(q7)

       Product Line                                       Product Names
0      Classic Cars  1948 Porsche 356-A Roadster | 1948 Porsche Typ...
1       Motorcycles  1936 Harley Davidson El Knucklehead | 1957 Ves...
2            Planes  1900s Vintage Bi-Plane | 1900s Vintage Tri-Pla...
3             Ships  18th century schooner | 1999 Yamaha Speed Boat...
4            Trains  1950's Chicago Surface Lines Streetcar | 1962 ...
5  Trucks and Buses  1926 Ford Fire Engine | 1940 Ford Pickup Truck...
6      Vintage Cars  18th Century Vintage Horse Carriage | 1903 For...
```

1. How many products in each product line?

```
q8 = """
SELECT productLine AS `Product Line`, count(*) AS 'Count Of Products'
FROM products
GROUP BY productLine
ORDER BY count(*) DESC
"""
run_query(q8)

       Product Line  Count Of Products
0      Classic Cars                 38
1      Vintage Cars                 24
2       Motorcycles                 13
3            Planes                 12
4  Trucks and Buses                 11
5             Ships                  9
6            Trains                  3
```

1. What is the minimum payment received?

```
q9 = """
SELECT MIN(amount) AS 'Minimum Payment($)'
FROM payments
"""
run_query(q9)

   Minimum Payment($)
0              615.45
```

1. List all payments greater than twice the average payment.

```
q10 = """
SELECT *
FROM payments
WHERE amount > (2 * (SELECT AVG(amount) FROM payments));
```

```
"""
run_query(q10)

   checkNumber paymentDate     amount  customerNumber
0     AE215433  2005-03-05  101244.59             124
1     AL493079  2005-05-23   75020.13             323
2     BG255406  2004-08-28   85410.87             124
3      DJ15149  2003-11-03   85559.12             321
4      ET64396  2005-04-16   83598.04             124
5     GN228846  2003-12-03   85024.46             167
6      ID10962  2004-12-31  116208.40             141
7     IN446258  2005-03-25   65071.26             141
8     JE105477  2005-03-18  120166.58             141
9     KI131716  2003-08-15  111654.40             124
10    KM172879  2003-12-26  105743.00             148
11    MA765515  2004-12-15   82261.22             114
12    NQ865547  2004-03-15   80375.24             239
```

1. What is the average percentage markup of the MSRP on buyPrice?

```
q11 = """
SELECT AVG((MSRP-buyPrice)/buyPrice)*100 AS 'Average Percentage
Markup'
from products;
"""
run_query(q11)

   Average Percentage Markup
0                  88.702392
```

1. How many distinct products does ClassicModels sell?

```
q12 = """
SELECT COUNT(DISTINCT productName) AS 'Total Distinct Products'
FROM products
"""
run_query(q12)

   Total Distinct Products
0                      110
```

1. Report the name and city of customers who don't have sales representatives?

```
q13 = """
SELECT customerName, city
FROM customers
WHERE salesRepEmployeeNumber IS NULL ;
"""
run_query(q13)
```

```
                          customerName               city
0                   Havel & Zbyszek Co           Warszawa
1                     Porto Imports Co.            Lisboa
2         Asian Shopping Network, Co          Singapore
3                                  Nat          Cunewalde
4                        ANG Resellers             Madrid
5           Messner Shopping Network          Frankfurt
6                    Franken Gifts, Co            Manheim
7                   BG&E Collectables           Fribourg
8                      Schuyler Imports          Amsterdam
9                      Der Hund Imports             Berlin
10                   Cramer Spezialit        Brandenburg
11               Asian Treasures, Inc.               Cork
12              SAR Distributors, Co           Hatfield
13                   Kommission Auto             Passau
14            Lisboa Souveniers, Inc             Lisboa
15   Stuttgart Collectable Exchange          Stuttgart
16          Feuer Online Stores, Inc            Leipzig
17                 Warburg Exchange             Aachen
18              Anton Designs, Ltd.             Madrid
19                        Mit Vergn           Mannheim
20         Kremlin Collectables, Co.  Saint Petersburg
21             Raanan Stores, Inc            Herzlia
```

1. What are the names of executives with VP or Manager in their title? Use the CONCAT function to combine the employee's first name and last name into a single field for reporting.

```
q14 = """
SELECT concat(firstName, ' ',lastName) AS 'Full Name'
FROM employees
WHERE jobTitle LIKE '%VP%' OR jobTitle LIKE '%Manager%';
"""
run_query(q14)

           Full Name
0     Mary Patterson
1      Jeff Firrelli
2  William Patterson
3      Gerard Bondur
4        Anthony Bow
```

1. Which orders have a value greater than $5,000?

```
q15 = """
SELECT orderNumber, SUM(priceEach * quantityOrdered) AS `Order
Value($)`
FROM orderdetails
GROUP BY orderNumber
HAVING SUM(priceEach * quantityOrdered) > 5000
```

```
ORDER BY SUM(priceEach * quantityOrdered);
"""
run_query(q15)

     orderNumber  Order Value($)
0          10102         5494.78
1          10216         5759.42
2          10422         5849.44
3          10290         5858.56
4          10236         5899.38
..           ...             ...
298        10207        59265.14
299        10212        59830.55
300        10310        61234.67
301        10287        61402.00
302        10165        67392.85

[303 rows x 2 columns]
```

One to many relationship

1. Report the account representative for each customer.

```
r1 = """
SELECT customerName, CONCAT(e.firstName,' ',e.lastName) AS 'Account
Representative'
FROM customers
INNER JOIN employees e ON customers.salesRepEmployeeNumber =
e.employeeNumber;
"""
run_query(r1)

                      customerName Account Representative
0                Atelier graphique       Gerard Hernandez
1               Signal Gift Stores        Leslie Thompson
2       Australian Collectors, Co.            Andy Fixter
3                La Rochelle Gifts       Gerard Hernandez
4               Baane Mini Imports            Barry Jones
..                             ...                    ...
95    Motor Mint Distributors Inc.          George Vanauf
96        Signal Collectibles Ltd.        Leslie Jennings
97  Double Decker Gift Stores, Ltd             Larry Bott
98             Diecast Collectables         Julie Firrelli
99               Kelly's Gift Shop            Peter Marsh

[100 rows x 2 columns]
```

1. Report total payments for Atelier graphique.

```
r2 = """
SELECT c.customerName, SUM(payments.amount) AS 'Total Payments($)'
```

```
FROM payments
INNER JOIN customers c ON payments.customerNumber = c.customerNumber
WHERE c.customerName = 'Atelier graphique'
"""
run_query(r2)

        customerName  Total Payments($)
0  Atelier graphique           22314.36
```

1. Report the total payments by date

```
r3 = """
SELECT paymentDate,SUM(amount) AS 'Amount($)'
FROM payments
GROUP BY paymentDate
"""
run_query(r3)

    paymentDate  Amount($)
0    2004-07-28    9415.13
1    2003-10-24   57251.38
2    2004-09-09    1960.80
3    2005-03-10   23602.90
4    2005-03-05  101244.59
..          ...        ...
227  2004-05-04   36069.26
228  2004-07-10   42044.77
229  2004-01-31    7310.42
230  2004-12-24   39440.59
231  2004-02-29   12573.28

[232 rows x 2 columns]
```

1. Report the products that have not been sold.

```
r4 = """
SELECT productCode, productName, productLine  FROM products
WHERE NOT EXISTS ( SELECT * FROM orderdetails
                   WHERE products.productCode =
orderdetails.productCode )
"""
run_query(r4)

  productCode        productName   productLine
0    S18_3233  1985 Toyota Supra  Classic Cars
```

1. List the amount paid by each customer.

```
r5 = """
SELECT c.customerName AS `Customer Name`, SUM(p.amount) AS `Amount
Paid($)`
```

```
FROM customers c
JOIN payments p
ON c.customerNumber = p.customerNumber
GROUP BY c.customerName
ORDER BY SUM(p.amount) DESC;
"""
run_query(r5)

                       Customer Name  Amount Paid($)
0           Euro+ Shopping Channel       715738.98
1     Mini Gifts Distributors Ltd.       584188.24
2       Australian Collectors, Co.       180585.07
3                Muscle Machine Inc      177913.95
4          Dragon Souveniers, Ltd.       156251.03
..                              ...             ...
93                     Royale Belge       29217.18
94               Frau da Collezione       25358.32
95                Atelier graphique       22314.36
96         Auto-Moto Classics Inc.        21554.26
97                 Boards & Toys Co.        7918.60

[98 rows x 2 columns]
```

1. How many orders have been placed by Herkku Gifts?

```
r6 = """
SELECT COUNT(o.orderNumber) AS 'Total Orders by Herkku Gifts'
FROM orders o
JOIN customers c
ON o.customerNumber = c.customerNumber
WHERE c.customerName = 'Herkku Gifts';
"""
run_query(r6)

   Total Orders by Herkku Gifts
0                             3
```

1. Who are the employees in Boston?

```
r7 = """
SELECT CONCAT(employees.firstName, " ", employees.lastName) AS
'Employee Name', offices.city
FROM employees
JOIN offices ON employees.officeCode = offices.officeCode
WHERE offices.city = 'Boston';
"""
run_query(r7)

     Employee Name    city
0   Julie Firrelli  Boston
1  Steve Patterson  Boston
```

1. Report those payments greater than $100,000. Sort the report so the customer who made the highest payment appears first.

```
r8 = """
SELECT customers.customerName, SUM(amount) AS 'Total Payments($)'
FROM payments
JOIN customers ON customers.customerNumber = payments.customerNumber
WHERE amount > 100000
GROUP BY customers.customerName
ORDER BY customers.customerName DESC;
"""
run_query(r8)

                   customerName  Total Payments($)
0  Mini Gifts Distributors Ltd.          212898.99
1        Euro+ Shopping Channel          236374.98
2       Dragon Souveniers, Ltd.          105743.00
```

1. List the value of 'On Hold' orders.

```
r9 = """
SELECT o.orderNumber, p.amount AS 'Amount on hold($)'
FROM payments p
JOIN orders o
ON p.customerNumber = o.customerNumber
WHERE o.status = 'On Hold';
"""
run_query(r9)

   orderNumber  Amount on hold($)
0        10334           36005.71
1        10334            7674.94
2        10401            7178.66
3        10401           31102.85
4        10407           59551.38
5        10414           18473.71
6        10414           15059.76
```

1. Report the number of orders 'On Hold' for each customer.

```
r10 = """
SELECT customerName , count(*) As 'Orders on Hold'
FROM customers
INNER JOIN orders
ON customers.customerNumber = orders.customerNumber
WHERE orders.status = 'On Hold'
GROUP BY customerName;
"""
run_query(r10)
```

```
                customerName  Orders on Hold
0   Volvo Model Replicas, Co               1
1    Tekni Collectables Inc.               1
2  The Sharp Gifts Warehouse               1
3          Gifts4AllAges.com               1
```

Many to many relationship

1. List products sold by order date.

```
s1 = """
SELECT DISTINCT(p.productName) AS 'Product Name', o.orderDate
FROM (orders o
JOIN orderdetails od
ON o.orderNumber = od.orderNumber)
JOIN products p
ON p.productCode = od.productCode
GROUP BY o.orderDate;
"""
run_query(s1)

                              Product Name  orderDate
0    1969 Harley Davidson Ultimate Chopper 2003-02-24
1    1969 Harley Davidson Ultimate Chopper 2003-05-07
2    1969 Harley Davidson Ultimate Chopper 2003-07-01
3    1969 Harley Davidson Ultimate Chopper 2003-08-25
4    1969 Harley Davidson Ultimate Chopper 2003-10-10
..                                     ...        ...
260               1928 Ford Phaeton Deluxe 2003-08-13
261           1930 Buick Marquette Phaeton 2003-10-08
262                       The Mayflower 2005-03-28
263                 F/A 18 Hornet 1/72 2003-06-25
264                         The Titanic 2003-04-21

[265 rows x 2 columns]
```

1. List the order dates in descending order for orders for the 1940 Ford Pickup Truck.

```
s2 = """
SELECT DISTINCT(products.productName), orders.orderDate
FROM (orders
JOIN orderdetails ON orderdetails.orderNumber = orders.orderNumber)
JOIN products ON orderdetails.productCode = products.productCode
WHERE productName = '1940 Ford Pickup Truck'
ORDER BY orderDate DESC;
"""
run_query(s2)

               productName  orderDate
0   1940 Ford Pickup Truck 2005-05-31
1   1940 Ford Pickup Truck 2005-05-01
```

```
2    1940 Ford Pickup Truck 2005-03-09
3    1940 Ford Pickup Truck 2005-02-17
4    1940 Ford Pickup Truck 2005-01-20
5    1940 Ford Pickup Truck 2004-12-10
6    1940 Ford Pickup Truck 2004-11-29
7    1940 Ford Pickup Truck 2004-11-18
8    1940 Ford Pickup Truck 2004-11-04
9    1940 Ford Pickup Truck 2004-10-21
10   1940 Ford Pickup Truck 2004-10-11
11   1940 Ford Pickup Truck 2004-09-08
12   1940 Ford Pickup Truck 2004-08-17
13   1940 Ford Pickup Truck 2004-07-19
14   1940 Ford Pickup Truck 2004-06-15
15   1940 Ford Pickup Truck 2004-05-04
16   1940 Ford Pickup Truck 2004-03-10
17   1940 Ford Pickup Truck 2004-01-29
18   1940 Ford Pickup Truck 2003-12-05
19   1940 Ford Pickup Truck 2003-11-25
20   1940 Ford Pickup Truck 2003-11-13
21   1940 Ford Pickup Truck 2003-11-06
22   1940 Ford Pickup Truck 2003-10-21
23   1940 Ford Pickup Truck 2003-09-19
24   1940 Ford Pickup Truck 2003-07-24
25   1940 Ford Pickup Truck 2003-05-28
26   1940 Ford Pickup Truck 2003-03-26
27   1940 Ford Pickup Truck 2003-01-29
```

1. List the names of customers and their corresponding order number where a particular order from that customer has a value greater than $25,000?

```
s3 = """
SELECT customers.customerName, orders.orderNumber,
SUM(orderdetails.priceEach * orderdetails.quantityOrdered) AS
Total_Value
FROM customers
JOIN orders ON customers.customerNumber = orders.customerNumber
JOIN orderdetails ON orders.orderNumber = orderdetails.orderNumber
GROUP BY customers.customerName, orders.orderNumber
HAVING Total_Value > 25000;
"""
run_query(s3)

                   customerName  orderNumber  Total_Value
0             Signal Gift Stores        10124     32641.98
1             Signal Gift Stores        10278     33347.88
2    Australian Collectors, Co.        10120     45864.03
3    Australian Collectors, Co.        10223     44894.74
4    Australian Collectors, Co.        10342     40265.60
..                          ...          ...          ...
187    Signal Collectibles Ltd.        10149     29997.09
```

```
188        Diecast Collectables        10207     59265.14
189           Kelly's Gift Shop        10138     32077.44
190           Kelly's Gift Shop        10360     52166.00
191           Kelly's Gift Shop        10399     30253.75

[192 rows x 3 columns]
```

1. Are there any products that appear on all orders?

```
s4 = """
SELECT IF((
SELECT COUNT(productCode) AS ValueFrequency
FROM orderdetails
GROUP BY productCode
ORDER BY ValueFrequency DESC limit 1) = (
SELECT count(*)
FROM orders), "YES", "NO") AS `Are there any products that appear on
all orders`;
"""
run_query(s4)

  Are there any products that appear on all orders
0                                                NO
```

1. List the names of products sold at less than 80% of the MSRP.

```
s5 = """
SELECT distinct products.productName, products.MSRP AS 'MSRP($)',
orderdetails.priceEach AS 'priceEach($)'
FROM products
JOIN orderdetails ON products.productCode = orderdetails.productCode
WHERE orderdetails.priceEach < (0.8*products.MSRP)
ORDER BY products.MSRP DESC;
"""
run_query(s5)

                                productName  MSRP($)  priceEach($)
0                   1952 Alpine Renault 1300   214.30        171.44
1                  1992 Ferrari 360 Spider red   169.34        135.47
2                  1980s Black Hawk Helicopter   157.69        126.15
3                    1957 Corvette Convertible   148.80        119.04
4                        1976 Ford Gran Torino   146.99        117.59
5                             1995 Honda Civic   142.25        113.80
6                             1993 Mazda RX-7   141.54        113.23
7                      1956 Porsche 356A Coupe   140.43        112.34
8                         1972 Alfa Romeo GTA   136.00        108.80
9                1999 Indy 500 Monte Carlo SS   132.00        105.60
10                   1962 Volkswagen Microbus   127.79        102.23
11                       1965 Aston Martin DB5   124.44         99.55
12                       18th century schooner   122.89         98.31
```

```
13                                 1940s Ford truck   121.08          96.86
14                             1996 Moto Guzzi 1100i  118.94          95.15
15                                    ATA: B757-300   118.65          94.92
16                                 1957 Chevy Pickup  118.50          94.80
17                                 1952 Citroen-15CV  117.44          93.95
18                    Diamond T620 Semi-Skirted Tanker 115.75          92.60
19                              1937 Lincoln Berline  102.74          82.19
20                                   1982 Camaro Z28  101.15          80.92
21                          Collectable Wooden Train  100.84          80.67
22                                   1997 BMW F650 ST   99.89          79.91
23                 1932 Alfa Romeo 8C2300 Spider Sport  92.03          73.62
24                        American Airlines: B767-300   91.34          73.07
25                                   P-51-D Mustang     84.48          67.58
26                          American Airlines: MD-11S   74.03          59.22
27                          The USS Constitution Ship   72.28          57.82
28                           Corsair F4U ( Bird Cage)   68.24          54.59
29   1996 Peterbilt 379 Stake Bed with Outrigger        64.64          51.71
30        1950's Chicago Surface Lines Streetcar        62.14          49.71
31                          1971 Alpine Renault 1600s   61.23          48.98
32                                1911 Ford Town Car    60.54          48.43
33                   1962 City of Detroit Streetcar     58.58          46.86
34                                       Pont Yacht     54.60          43.68
35                     1930 Buick Marquette Phaeton     43.64          34.91
36                  1936 Mercedes Benz 500k Roadster    41.03          32.82
37                      1939 Chevrolet Deluxe Coupe     33.19          26.55
```

1. Reports those products that have been sold with a markup of 100% or more (i.e., the priceEach is at least twice the buyPrice)

```
s6 = """
SELECT distinct products.productName, 2*(products.buyPrice) AS
'2*BuyPrice($)', orderdetails.priceEach as 'priceEach($)'
FROM products
JOIN orderdetails ON products.productCode = orderdetails.productCode
WHERE orderdetails.priceEach > 2*products.buyPrice
GROUP BY products.productName;
"""
run_query(s6)

                                  productName  2*BuyPrice($)
priceEach($)
0                  1952 Alpine Renault 1300         197.16
214.30
1        2003 Harley-Davidson Eagle Drag Bike         182.04
187.85
2                         1968 Ford Mustang         190.68
192.62
3                         2001 Ferrari Enzo         191.18
205.72
4                          2002 Suzuki XREO         132.54
```

```
146.10
5                            1969 Ford Falcon         166.10
173.02
6                     1970 Plymouth Hemi Cuda          63.84
75.81
7                           1957 Chevy Pickup         111.40
114.95
8                      1940 Ford Pickup Truck         116.66
116.67
9    1936 Mercedes-Benz 500K Special Roadster          48.52
51.21
10                1980s Black Hawk Helicopter         154.54
157.69
11                  1932 Model A Ford J-Coupe         116.96
125.86
12                      1926 Ford Fire Engine          49.84
58.34
13        1936 Harley Davidson El Knucklehead          48.46
52.70
14                     1928 Mercedes-Benz SSK         145.12
167.06
15               1999 Indy 500 Monte Carlo SS         113.52
126.72
16                1992 Ferrari 360 Spider red         155.80
165.95
17                      1976 Ford Gran Torino         146.98
146.99
18             1948 Porsche Type 356 Roadster         124.32
125.74
19        1932 Alfa Romeo 8C2300 Spider Sport          86.52
88.35
20                    1939 Cadillac Limousine          46.28
47.29
21                  1957 Corvette Convertible         139.86
139.87
22                      1957 Ford Thunderbird          68.42
69.84
23                   1960 BSA Gold Star DBD34          74.64
75.41
24  1938 Cadillac V-16 Presidential Limousine          41.22
44.35
25                   1962 Volkswagen Microbus         122.68
127.79
26        1958 Chevy Corvette Limited Edition          31.82
34.30
27                    1982 Lamborghini Diablo          32.48
34.74
28                  1937 Horch 930V Limousine          52.60
55.89
```

```
29                        Corsair F4U ( Bird Cage)          58.68
62.10
30                           1961 Chevrolet Impala          64.66
67.10
31                     1954 Greyhound Scenicruiser          51.96
53.03
32      1950's Chicago Surface Lines Streetcar          53.44
56.55
33                        1928 Ford Phaeton Deluxe          66.04
68.79
34                              2002 Yamaha YZR M1          68.34
74.85
35                                  The Mayflower          86.60
86.61
36                                     HMS Bounty          79.66
85.09
37                   The USS Constitution Ship          67.94
72.28
38                                 1982 Camaro Z28          93.06
94.07
39                     American Airlines: MD-11S          72.54
74.03
```

1. List the products ordered on a Monday.

```
s7 = """
SELECT orderdetails.productCode, products.productName,
orders.orderDate , DAYNAME(orders.orderDate) As 'DayName'
FROM products
INNER JOIN orderdetails
ON products.productCode = orderdetails.productCode
INNER JOIN Orders
ON orderdetails.orderNumber = orders.orderNumber
WHERE DAYNAME(Orders.orderDate) = 'MONDAY'
GROUP BY productName;
"""
run_query(s7)

   productCode                            productName  orderDate
DayName
0     S10_1678  1969 Harley Davidson Ultimate Chopper 2003-02-24
Monday
1     S10_1949               1952 Alpine Renault 1300 2003-03-24
Monday
2     S10_2016                  1996 Moto Guzzi 1100i 2003-02-24
Monday
3     S10_4698   2003 Harley-Davidson Eagle Drag Bike 2003-02-24
Monday
4     S10_4757                    1972 Alfa Romeo GTA 2003-04-28
Monday
```

```
..          ...                                       ...        ...      .
..
94   S700_3505                            The Titanic 2003-04-21
Monday
95   S700_3962                          The Queen Mary 2005-01-31
Monday
96   S700_4002                American Airlines: MD-11S 2003-02-17
Monday
97    S72_1253                        Boeing X-32A JSF 2003-02-17
Monday
98    S72_3212                              Pont Yacht 2005-01-31
Monday

[99 rows x 4 columns]
```

1. What is the quantity on hand for products listed on 'On Hold' orders?

```
s8 = """
SELECT DISTINCT products.productName, products.quantityInStock,
orders.status
FROM orderDetails
JOIN orders ON orderDetails.orderNumber = orders.orderNumber
JOIN products ON orderDetails.productCode = products.productCode
WHERE orders.status = 'On Hold'
ORDER BY products.quantityInStock DESC;
"""
run_query(s8)

                            productName  quantityInStock   status
0        America West Airlines B757-200             9653  On Hold
1                    2002 Chevy Corvette             9446  On Hold
2      1912 Ford Model T Delivery Wagon             9173  On Hold
3                  1965 Aston Martin DB5             9042  On Hold
4              American Airlines: MD-11S             8820  On Hold
5            1992 Ferrari 360 Spider red             8347  On Hold
6                    1904 Buick Runabout             8290  On Hold
7                 1964 Mercedes Tour Bus             8258  On Hold
8              1966 Shelby Cobra 427 S/C             8197  On Hold
9           1999 Indy 500 Monte Carlo SS             8164  On Hold
10                         ATA: B757-300             7106  On Hold
11             The USS Constitution Ship             7083  On Hold
12          1930 Buick Marquette Phaeton             7062  On Hold
13               Corsair F4U ( Bird Cage)             6812  On Hold
14                 1962 LanciaA Delta 16V             6791  On Hold
15               1940 Ford Delivery Sedan             6621  On Hold
16  1932 Alfa Romeo 8C2300 Spider Sport             6553  On Hold
17               Collectable Wooden Train             6450  On Hold
18            American Airlines: B767-300             5841  On Hold
19                         The Queen Mary             5088  On Hold
20              1969 Chevrolet Camaro Z28             4695  On Hold
```

```
21                 1999 Yamaha Speed Boat             4259  On Hold
22                      1903 Ford Model A             3913  On Hold
23        1928 British Royal Navy Airplane            3627  On Hold
24                    1972 Alfa Romeo GTA             3252  On Hold
25                 1957 Ford Thunderbird             3209  On Hold
26                      1940s Ford truck             3128  On Hold
27                1900s Vintage Tri-Plane             2756  On Hold
28               1917 Grand Touring Sedan             2724  On Hold
29                     1949 Jaguar XK 120             2350  On Hold
30               1962 Volkswagen Microbus             2327  On Hold
31                  1926 Ford Fire Engine             2018  On Hold
32                            The Titanic             1956  On Hold
33                  18th century schooner             1898  On Hold
34                  The Schooner Bluenose             1897  On Hold
35                      1952 Citroen-15CV             1452  On Hold
36             1970 Chevy Chevelle SS 454             1005  On Hold
37                         P-51-D Mustang              992  On Hold
38                          The Mayflower              737  On Hold
39                     F/A 18 Hornet 1/72              551  On Hold
40                     1911 Ford Town Car              540  On Hold
41                             Pont Yacht              414  On Hold
42                       1997 BMW F650 ST              178  On Hold
43               1928 Ford Phaeton Deluxe              136  On Hold
```

Regular expressions

1. Find products containing the name 'Ford'.

```
t1 = """
SELECT productName AS 'Product Names'
FROM Products
WHERE productName LIKE '%Ford%';
"""
run_query(t1)

                     Product Names
0                1968 Ford Mustang
1                 1969 Ford Falcon
2           1940 Ford Pickup Truck
3               1911 Ford Town Car
4         1932 Model A Ford J-Coupe
5            1926 Ford Fire Engine
6       1913 Ford Model T Speedster
7              1934 Ford V8 Coupe
8                1903 Ford Model A
9           1976 Ford Gran Torino
10                1940s Ford truck
11           1957 Ford Thunderbird
12  1912 Ford Model T Delivery Wagon
```

```
13           1940 Ford Delivery Sedan
14           1928 Ford Phaeton Deluxe
```

1. List products ending in 'ship'.

```
t2 = """
SELECT productName AS 'Product Names'
FROM products
WHERE productName LIKE '%ship';
"""
run_query(t2)

               Product Names
0  The USS Constitution Ship
```

1. Report the number of customers in Denmark, Norway, and Sweden.

```
t3 = """
SELECT CustomerName, Country
FROM Customers
WHERE country IN ('Denmark','Norway','Sweden');
"""
run_query(t3)

                CustomerName   Country
0          Baane Mini Imports    Norway
1    Volvo Model Replicas, Co    Sweden
2    Danish Wholesale Imports   Denmark
3                Herkku Gifts  Norway
4        Heintze Collectables   Denmark
5  Norway Gifts By Mail, Co.  Norway
6     Scandinavian Gift Ideas    Sweden
```

1. What are the products with a product code in the range S700_1000 to S700_1499?

```
t4 = """
SELECT productCode,productName
FROM Products
WHERE RIGHT(productCode,4) BETWEEN 1000 AND 1499
ORDER BY RIGHT(productCode,4)
"""
run_query(t4)

  productCode                  productName
0    S24_1046      1970 Chevy Chevelle SS 454
1    S18_1097         1940 Ford Pickup Truck
2    S12_1099             1968 Ford Mustang
3    S12_1108             2001 Ferrari Enzo
4    S18_1129               1993 Mazda RX-7
5   S700_1138          The Schooner Bluenose
6    S72_1253              Boeing X-32A JSF
```

```
7     S32_1268                1980s GM Manhattan Express
8     S50_1341              1930 Buick Marquette Phaeton
9     S18_1342                      1937 Lincoln Berline
10    S18_1367  1936 Mercedes-Benz 500K Special Roadster
11    S32_1374                          1997 BMW F650 ST
12    S50_1392             Diamond T620 Semi-Skirted Tanker
13    S24_1444                        1970 Dodge Coronet
```

1. Which customers have a digit in their name?

```
t5 = """
SELECT customerName
FROM Customers
WHERE customerName RLIKE '[0-9]'
"""
run_query(t5)

        customerName
0  Toys4GrownUps.com
1  Gifts4AllAges.com
```

1. List the names of employees called Dianne or Diane.

```
t6 = """
SELECT firstName, lastName
FROM Employees
WHERE lastName RLIKE 'Dianne|Diane' OR firstName RLIKE 'Dianne|Diane'
"""
run_query(t6)

  firstName lastName
0     Diane   Murphy
```

1. List the products containing ship or boat in their product name.

```
t7 = """
SELECT productName
FROM Products
WHERE productName RLIKE 'ship|boat';
"""
run_query(t7)

                 productName
0     1999 Yamaha Speed Boat
1  The USS Constitution Ship
```

1. List the products with a product code beginning with S700.

```
t8 = """
SELECT  productCode, productName
FROM Products
```

```
WHERE productCode LIKE 'S700%';
"""
run_query(t8)

   productCode                        productName
0    S700_1138           The Schooner Bluenose
1    S700_1691      American Airlines: B767-300
2    S700_1938                     The Mayflower
3    S700_2047                       HMS Bounty
4    S700_2466  America West Airlines B757-200
5    S700_2610         The USS Constitution Ship
6    S700_2824                 1982 Camaro Z28
7    S700_2834                   ATA: B757-300
8    S700_3167              F/A 18 Hornet 1/72
9    S700_3505                      The Titanic
10   S700_3962                   The Queen Mary
11   S700_4002        American Airlines: MD-11S
```

1. List the names of employees called Larry or Barry.

```
t9 = """
SELECT  CONCAT(firstName,' ', lastName) AS 'Employee Name'
FROM Employees
WHERE ('Larry') IN (firstName,lastName) OR
      ('Barry') IN (firstName,lastName)
"""
run_query(t9)

  Employee Name
0    Larry Bott
1   Barry Jones
```

1. List the names of employees with non-alphabetic characters in their names.

```
t10 = """
SELECT CONCAT(firstName,' ', lastName) AS 'Employee Name'
FROM Employees
WHERE CONCAT(firstName,' ', lastName)  RLIKE '[0-9%@]'
"""
run_query(t10)

Empty DataFrame
Columns: [Employee Name]
Index: []
```

1. List the vendors whose name ends in Diecast

```
t11 = """
SELECT productVendor
FROM Products
WHERE productVendor LIKE '%Diecast'
```

```
"""
run_query(t11)

          productVendor
0       Min Lin Diecast
1     Red Start Diecast
2   Second Gear Diecast
3   Second Gear Diecast
4   Second Gear Diecast
5     Red Start Diecast
6       Min Lin Diecast
7     Red Start Diecast
8       Min Lin Diecast
9       Min Lin Diecast
10    Red Start Diecast
11      Min Lin Diecast
12      Min Lin Diecast
13  Second Gear Diecast
14      Min Lin Diecast
15  Second Gear Diecast
16    Red Start Diecast
17  Second Gear Diecast
18    Red Start Diecast
19  Second Gear Diecast
20      Min Lin Diecast
21    Red Start Diecast
22  Second Gear Diecast
```

General queries

1. Who is at the top of the organization (i.e., reports to no one).

```
a1 = """
SELECT employeeNumber, CONCAT(firstName,' ', lastName) AS 'Employee
Name', jobTitle
FROM employees
WHERE reportsTo IS NULL
"""
run_query(a1)

   employeeNumber Employee Name   jobTitle
0            1002  Diane Murphy  President
```

1. Who reports to William Patterson?

```
a2 = """
SELECT employeeNumber, CONCAT(firstName,' ', lastName) AS 'Employee
Name', reportsTo
FROM employees
WHERE reportsTo IN (
SELECT employeeNumber
FROM employees
WHERE firstName = 'William' AND lastName = 'Patterson'
)
"""
run_query(a2)

   employeeNumber Employee Name  reportsTo
0            1611   Andy Fixter       1088
1            1612   Peter Marsh       1088
2            1619      Tom King       1088
```

1. List all the products purchased by Herkku Gifts.

```
a3 = """
SELECT customerName, P.productCode, P.productName
FROM Products P
INNER JOIN OrderDetails OD ON OD.productCode = P.productCode
INNER JOIN Orders O ON O.orderNumber = OD.orderNumber
INNER JOIN Customers C ON C.customerNumber = O.customerNumber
WHERE C.customerName = 'Herkku Gifts';
"""
run_query(a3)

    customerName productCode
productName
0   Herkku Gifts    S12_1099                               1968 Ford
Mustang
1   Herkku Gifts    S12_3380                              1968 Dodge
Charger
2   Herkku Gifts    S12_3990                        1970 Plymouth Hemi
Cuda
3   Herkku Gifts    S12_4675                              1969 Dodge
Charger
4   Herkku Gifts    S18_1129                                 1993 Mazda RX-
7
5   Herkku Gifts    S18_1589                           1965 Aston Martin
DB5
6   Herkku Gifts    S18_1889                      1948 Porsche 356-A
Roadster
7   Herkku Gifts    S18_1984                                1995 Honda
Civic
8   Herkku Gifts    S18_2870                     1999 Indy 500 Monte Carlo
SS
9   Herkku Gifts    S18_3232                      1992 Ferrari 360 Spider
red
10  Herkku Gifts    S18_3278                            1969 Dodge Super
Bee
11  Herkku Gifts    S18_3482                           1976 Ford Gran
Torino
12  Herkku Gifts    S18_3685                   1948 Porsche Type 356
```

```
Roadster
13  Herkku Gifts    S24_1628                  1966 Shelby Cobra 427
S/C
14  Herkku Gifts    S24_2972                    1982 Lamborghini
Diablo
15  Herkku Gifts    S24_3371                  1971 Alpine Renault
1600s
16  Herkku Gifts    S24_3856                    1956 Porsche 356A
Coupe
17  Herkku Gifts    S10_1678      1969 Harley Davidson Ultimate
Chopper
18  Herkku Gifts    S10_2016                      1996 Moto Guzzi
1100i
19  Herkku Gifts    S10_4698       2003 Harley-Davidson Eagle Drag
Bike
20  Herkku Gifts    S18_2625        1936 Harley Davidson El
Knucklehead
21  Herkku Gifts    S24_1578                          1997 BMW R 1100
S
22  Herkku Gifts    S24_2000                     1960 BSA Gold Star
DBD34
23  Herkku Gifts    S32_1374                           1997 BMW F650
ST
24  Herkku Gifts   S700_2834                              ATA: B757-
300
25  Herkku Gifts    S18_1342                       1937 Lincoln
Berline
26  Herkku Gifts    S18_1367   1936 Mercedes-Benz 500K Special
Roadster
27  Herkku Gifts    S18_2795                     1928 Mercedes-Benz
SSK
28  Herkku Gifts    S24_2022  1938 Cadillac V-16 Presidential
Limousine
```

1. Compute the commission for each sales representative, assuming the commission is 5% of the value of an order. Sort by employee last name and first name.

```
a4 = """
SELECT employeeNumber, CONCAT(E.firstName,' ', E.lastName) AS
'Employee Name',
       CAST(.05 * SUM(priceEach * quantityOrdered) AS DECIMAL(8, 2))
AS 'Commission($)'
FROM Employees E, Customers C, Orders O, OrderDetails OD
WHERE E.employeeNumber = C.salesRepEmployeeNumber
AND C.customerNumber = O.customerNumber
AND O.orderNumber = OD.orderNumber
GROUP BY employeeNumber
ORDER BY lastName, firstName ASC
"""
run_query(a4)
```

```
    employeeNumber      Employee Name  Commission($)
0             1337        Loui Bondur       28474.29
1             1501         Larry Bott       36604.84
2             1401    Pamela Castillo       43411.03
3             1188     Julie Firrelli       19333.16
4             1611        Andy Fixter       28129.13
5             1702      Martin Gerard       19373.87
6             1370   Gerard Hernandez       62928.89
7             1165    Leslie Jennings       54076.53
8             1504        Barry Jones       35242.70
9             1612        Peter Marsh       29229.69
10            1621         Mami Nishi       22855.50
11            1216    Steve Patterson       25293.77
12            1166    Leslie Thompson       17376.65
13            1286      Foon Yue Tseng       24410.63
14            1323      George Vanauf       33468.85
```

1. What is the difference in days between the most recent and oldest order date in the Orders file?

```
a5 = """
SELECT DATEDIFF(MAX(orderDate),MIN(orderDate)) AS Difference_in_Days
FROM Orders;
"""
run_query(a5)

   Difference_in_Days
0                 876
```

1. Compute the average time between order date and ship date for each customer ordered by the largest difference.

```
a6 = """
SELECT customerName, FLOOR(AVG(DATEDIFF(shippedDate, orderDate))) AS
AVG_ORDER_TIME
FROM Customers C, Orders O
WHERE C.customerNumber = O.customerNumber
GROUP BY C.customerName
ORDER BY AVG_ORDER_TIME DESC;
"""
run_query(a6)

                          customerName  AVG_ORDER_TIME
0               Dragon Souveniers, Ltd.              14
1                  Osaka Souveniers Co.               7
2          Online Diecast Creations Co.               5
3               Tokyo Collectables, Ltd               5
4              Online Mini Collectables               5
..                                  ...             ...
93                     Mini Auto Werke                2
```

```
94                          Petit Auto              1
95                Toys of Finland, Co.              1
96               UK Collectables, Ltd.              1
97  Bavarian Collectables Imports, Co.              1

[98 rows x 2 columns]
```

1. What is the value of orders shipped in August 2004?

```
a7 = """
SELECT SUM(priceEach * quantityOrdered) AS 'Order_Total($)'
FROM Orders O, OrderDetails OD
WHERE O.orderNumber = OD.orderNumber
AND shippedDate BETWEEN '2004/08/01' AND '2004/08/31';
"""
run_query(a7)

   Order_Total($)
0       355964.29
```

1. Compute the total value ordered, total amount paid, and their difference for each customer for orders placed in 2004 and payments received in 2004.

```
cursor.execute("""
CREATE VIEW total_paid AS
SELECT SUM(amount) AS 'total amount paid', checkNumber,
customerNumber, paymentDate
FROM payments
GROUP BY customerNumber
""")

myresult = cursor.fetchall()

for x in myresult:
  print(x)

cursor.execute("""
CREATE VIEW total_ordered AS
SELECT SUM(od.quantityOrdered * od.priceEach) AS 'total value
ordered', od.orderNumber, od.productCode,o.orderDate, o.customerNumber
FROM orderdetails od
JOIN orders o ON od.orderNumber = o.orderNumber
GROUP BY customerNumber
""")

myresult = cursor.fetchall()

for x in myresult:
  print(x)
```

```
a8 = """
SELECT c.customerNumber, c.customerName, tod.`total value ordered`,
tp.`total amount paid`,
(tod.`total value ordered` - tp.`total amount paid`) AS difference
FROM customers c, total_ordered tod, total_paid tp
WHERE c.customerNumber = tp.customerNumber
AND tp.customerNumber = tod.customerNumber
AND YEAR(tp.paymentDate) = 2004
AND YEAR(tod.orderDate) = 2004
ORDER BY difference DESC
"""
run_query(a8)
```

```
    customerNumber                       customerName  total value
ordered  \
0              450          The Sharp Gifts Warehouse
143536.27
1              362                    Gifts4AllAges.com
84340.32
2              328              Tekni Collectables Inc.
81806.55
3              119                    La Rochelle Gifts
158573.12
4              412         Extreme Desk Decorations, Ltd
90332.38
5              314                           Petit Auto
70851.58
6              157               Diecast Classics Inc.
104358.69
7              166                     Handji Gifts& Co
107746.75
8              204             Online Mini Collectables
55577.26
9              177               Osaka Souveniers Co.
62361.22
10             189              Clover Collections, Co.
49898.27
11             240                    giftsbymail.co.uk
71783.75
12             249                   Amica Models & Co.
82223.23
13             256                          Auto Associ
58876.41
14             260   Royal Canadian Collectables, Ltd.
66812.00
15             286               Marta's Replicas Co.
90545.37
16             298                      Vida Sport, Ltd
108777.92
17             456                      Microscale Inc.
```

```
29230.43
18              173         Cambridge Collectables Co.
32198.69
19              415  Bavarian Collectables Imports, Co.
31310.09
20              239       Collectable Mini Designs Co.
80375.24

    total amount paid    difference
0            59551.38  8.398489e+04
1            33533.47  5.080685e+04
2            38281.51  4.352504e+04
3           116949.68  4.162344e+04
4            66704.94  2.362744e+04
5            62253.85  8.597730e+03
6            98509.25  5.849440e+03
7           105420.57  2.326180e+03
8            55577.26  7.275958e-12
9            62361.22  0.000000e+00
10           49898.27  0.000000e+00
11           71783.75  0.000000e+00
12           82223.23  0.000000e+00
13           58876.41  0.000000e+00
14           66812.00  0.000000e+00
15           90545.37  0.000000e+00
16          108777.92  0.000000e+00
17           29230.43  0.000000e+00
18           32198.69 -3.637979e-12
19           31310.09 -3.637979e-12
20           80375.24 -1.455192e-11
```

1. List the employees who report to those employees who report to Diane Murphy. Use the CONCAT function to combine the employee's first name and last name into a single field for reporting.

```
a9 = """
SELECT employeeNumber, CONCAT(firstName,' ', lastName) AS 'Employee
Name', reportsTo
FROM employees
WHERE reportsTo IN (
SELECT employeeNumber
FROM employees
WHERE reportsTo IN (
SELECT employeeNumber
FROM employees
WHERE lastName = 'Murphy' AND firstName = 'Diane'))
"""
run_query(a9)
```

```
   employeeNumber      Employee Name  reportsTo
0            1088  William Patterson       1056
1            1102      Gerard Bondur       1056
2            1143        Anthony Bow       1056
3            1621         Mami Nishi       1056
```

1. What is the percentage value of each product in inventory sorted by the highest percentage first

```
cursor.execute("""
CREATE VIEW total_product_value AS
SELECT SUM(quantityInStock * MSRP) AS 'total product value',
productCode
FROM products
GROUP BY productCode
""")

myresult = cursor.fetchall()

for x in myresult:
  print(x)

a10 = """
SELECT P.productCode ,P.productName, CAST((TP.`total product value`/(
SELECT SUM(`total product value`) FROM total_product_value) * 100) AS
DECIMAL(5,2)) AS `percentage product value`
FROM products P, total_product_value TP
WHERE P.productCode = TP.productCode
ORDER BY `percentage product value` DESC
"""
run_query(a10)

    productCode                  productName  percentage product value
0      S10_1949     1952 Alpine Renault 1300                      2.78
1      S12_2823         2002 Suzuki XREO                          2.68
2      S18_3232  1992 Ferrari 360 Spider red                      2.51
3      S18_1984             1995 Honda Civic                      2.47
4      S18_3482       1976 Ford Gran Torino                       2.38
..          ...                          ...                       ...
105    S72_3212                   Pont Yacht                      0.04
106    S32_1374             1997 BMW F650 ST                      0.03
107    S12_1099            1968 Ford Mustang                      0.02
108    S32_4289     1928 Ford Phaeton Deluxe                      0.02
109    S24_2000     1960 BSA Gold Star DBD34                      0.00

[110 rows x 3 columns]
```

1. Write a function to convert miles per gallon to liters per 100 kilometers.

```
"""
DELIMITER $$

CREATE FUNCTION MPG2LP100KM(
     x DECIMAL(5,2)
)
RETURNS DECIMAL(5,2)
DETERMINISTIC
BEGIN
    DECLARE LP100KM DECIMAL(5,2);
    SET LP100KM = (235.51 / x);

     -- return the miles per gallon to liters per 100 kilometers
     RETURN LP100KM;
END$$
DELIMITER ;
"""

'\nDELIMITER $$\n\nCREATE FUNCTION MPG2LP100KM(\n\tx DECIMAL(5,2)\n) \
nRETURNS DECIMAL(5,2)\nDETERMINISTIC\nBEGIN\n    DECLARE LP100KM
DECIMAL(5,2);\n    SET LP100KM = (235.51 / x);\n\n\t-- return the
miles per gallon to liters per 100 kilometers\n\tRETURN LP100KM;\nEND$
$\nDELIMITER ;\n'
```

1. Write a procedure to increase the price of a specified product category by a given percentage.

```
"""
DELIMITER //
CREATE PROCEDURE IncreaseThePrice(IN x INT, IN productCategory
VARCHAR(255))
BEGIN
     UPDATE products_test
     SET MSRP = MSRP * (1 + x / 100)
     WHERE productLine = productCategory;
END //
DELIMITER ;
"""

'\nDELIMITER //\nCREATE PROCEDURE IncreaseThePrice(IN x INT, IN
productCategory VARCHAR(255))\nBEGIN\n\tUPDATE products_test\n\tSET
MSRP = MSRP * (1 + x / 100)\n\tWHERE productLine = productCategory;\
nEND //\nDELIMITER ;\n'

cursor.execute("CALL IncreaseThePrice(5, 'Classic Cars');")

myresult = cursor.fetchall()

for x in myresult:
  print(x)
```

1. What is the value of payments received in July 2004?

```
a13 = """
SELECT SUM(amount) AS 'Total Value of Payments($)'
FROM payments
WHERE MONTHNAME(paymentDate) = 'July'
AND YEAR(paymentDate) = 2004
"""
run_query(a13)

   Total Value of Payments($)
0                   284191.48
```

1. What is the ratio of the value of payments made to orders received for each month of 2004?

```
a14 = """
SELECT MONTHNAME(P.paymentDate) AS Month_of_2004,
(SUM(P.amount)/SUM(OD.quantityOrdered * OD.priceEach)) AS RATIO
FROM payments P
JOIN orders O ON P.customerNumber = O.customerNumber
JOIN orderdetails OD ON OD.orderNumber = O.orderNumber
WHERE YEAR(P.paymentDate) = 2004
GROUP BY MONTHNAME(P.paymentDate)
ORDER BY MONTH(P.paymentDate)
"""
run_query(a14)

Error code: -1
Error message: MySQL Connection not available
```

1. What is the difference in the amount received for each month of 2004 compared to 2003?

```
a15 = """
SELECT s1.`Month`, (s1.amount_s1 - s2.amount_s2) AS `Difference($)`
FROM (
SELECT SUM(amount) AS amount_s1 , MONTHNAME(paymentDate) AS `Month`
FROM payments
WHERE YEAR(paymentDate) = 2004
GROUP BY MONTH(paymentDate)
ORDER BY MONTH(paymentDate)) AS s1
JOIN (
SELECT SUM(amount) AS amount_s2 , MONTHNAME(paymentDate) AS `Month`
FROM payments
WHERE YEAR(paymentDate) = 2003
GROUP BY MONTH(paymentDate)) AS s2
ON s1.`Month` = s2.`Month`
"""
run_query(a15)
```

```
Error code: -1
Error message: MySQL Connection not available
```

1. Write a procedure to report the amount ordered in a specific month and year for customers containing a specified character string in their name.

```
"""
DELIMITER //
CREATE PROCEDURE ReportTheAmount(IN yr INT,IN mnth VARCHAR(255), IN
crtr VARCHAR(255))
BEGIN
     SELECT SUM(OD.quantityOrdered * OD.priceEach) AS Total_Amount
    FROM orderdetails OD
    JOIN orders O ON O.orderNumber = O.orderNumber
    JOIN customers C ON C.customerNumber = O.customerNumber
    WHERE C.customerName LIKE CONCAT('%',crtr,'%')
    AND MONTHNAME(O.orderDate) = mnth
    AND YEAR(O.orderDate) = yr;
END //
DELIMITER ;
"""

"\nDELIMITER //\nCREATE PROCEDURE ReportTheAmount(IN yr INT,IN mnth
VARCHAR(255), IN crtr VARCHAR(255))\nBEGIN\n\tSELECT
SUM(OD.quantityOrdered * OD.priceEach) AS Total_Amount\n    FROM
orderdetails OD\n    JOIN orders O ON O.orderNumber = O.orderNumber\n
JOIN customers C ON C.customerNumber = O.customerNumber\n    WHERE
C.customerName LIKE CONCAT('%',crtr,'%')\n    AND
MONTHNAME(O.orderDate) = mnth\n    AND YEAR(O.orderDate) = yr;\
nEND //\nDELIMITER ;\n"
```

1. Write a procedure to change the credit limit of all customers in a specified country by a specified percentage.

```
"""
DELIMITER //
CREATE PROCEDURE ChangeCreditLimit(IN x INT, IN countryName
VARCHAR(255))
BEGIN
     UPDATE customers_test
     SET creditLimit = creditLimit * (1 + x / 100)
     WHERE country = countryName ;
END //
DELIMITER ;
"""

'\nDELIMITER //\nCREATE PROCEDURE ChangeCreditLimit(IN x INT, IN
countryName VARCHAR(255))\nBEGIN\n\tUPDATE customers_test\n\tSET
creditLimit = creditLimit * (1 + x / 100)\n\tWHERE country =
countryName ;\nEND //\nDELIMITER ;\n'
```

```
cursor.execute("CALL ChangeCreditLimit(5, 'USA');")

myresult = cursor.fetchall()

for x in myresult:
  print(x)
```

1. Basket of goods analysis: A common retail analytics task is to analyze each basket or order to learn what products are often purchased together. Report the names of products that appear in the same order ten or more times.

```
a18 = """
SELECT *
FROM (
SELECT a.*, rank() OVER(ORDER BY total_count DESC) AS
Rank_Sold_Together
FROM
(SELECT A.productCode AS Product_A, B.productCode AS Product_B,
COUNT(1) AS total_count
FROM orderdetails A JOIN orderdetails B
ON A.orderNumber = B.orderNumber
AND A.productCode > B.productCode
GROUP BY A.productCode, B.productCode) a ) b
WHERE Rank_Sold_Together < 10
"""
run_query(a18)

    Product_A  Product_B  total_count  Rank_Sold_Together
0   S700_1691   S50_1341           28                   1
1    S18_3136   S18_2957           27                   2
2    S18_3232   S18_2319           27                   2
3    S24_3420   S24_2841           27                   2
4   S700_4002   S24_3949           27                   2
5    S72_1253  S700_2047           27                   2
6    S24_1937   S18_2325           26                   7
7    S72_3212  S700_3962           26                   7
8    S18_2625   S10_2016           26                   7
9    S12_3990   S12_1099           26                   7
10   S50_4713   S32_4485           26                   7
```

1. ABC reporting: Compute the revenue generated by each customer based on their orders. Also, show each customer's revenue as a percentage of total revenue. Sort by customer name.

```
a19 = """
SELECT C.customerName, SUM(OD.quantityOrdered * OD.priceEach) AS
`Revenue Generated($)`,
CAST((SUM(OD.quantityOrdered * OD.priceEach)/(SELECT
SUM(quantityOrdered * priceEach) FROM orderdetails) * 100) AS
DECIMAL(5,2)) AS `% of total revenue`
```

```
FROM orders O
JOIN orderdetails OD ON O.orderNumber = OD.orderNumber
JOIN customers C ON C.customerNumber = O.customerNumber
GROUP BY C.customerNumber
ORDER BY C.customerName
"""
run_query(a19)

                    customerName  Revenue Generated($)  % of total
revenue
0                  Alpha Cognac              60483.36
0.63
1            Amica Models & Co.              82223.23
0.86
2        Anna's Decorations, Ltd            137034.22
1.43
3             Atelier graphique              22314.36
0.23
4   Australian Collectables, Ltd             55866.02
0.58
..                           ...                   ...
...
93         UK Collectables, Ltd.            106610.72
1.11
94                Vida Sport, Ltd           108777.92
1.13
95                Vitachrome Inc.            72497.64
0.75
96      Volvo Model Replicas, Co             66694.82
0.69
97   West Coast Collectables Co.             43748.72
0.46

[98 rows x 3 columns]
```

1. Compute the profit generated by each customer based on their orders. Also, show each customer's profit as a percentage of total profit. Sort by profit descending.

```
a20 = """
SELECT C.customerName, SUM(P.MSRP - P.buyPrice) AS `Profit
Generated($)`,
CAST((SUM(P.MSRP - P.buyPrice)/(SELECT SUM(OD.quantityOrdered *
(P.MSRP - P.buyPrice))
FROM orderdetails OD JOIN products P ON P.productCode = OD.productCode
) * 100) AS DECIMAL(5,2)) AS `% total Profit`
FROM orders O
JOIN orderdetails OD ON O.orderNumber = OD.orderNumber
JOIN customers C ON C.customerNumber = O.customerNumber
JOIN products P ON P.productCode = OD.productCode
GROUP BY C.customerNumber
```

```
ORDER BY `Profit Generated($)` DESC
"""
run_query(a20)

                       customerName  Profit Generated($)  % total Profit
0           Euro+ Shopping Channel             11521.47            0.24
1     Mini Gifts Distributors Ltd.              8537.81            0.17
2       Australian Collectors, Co.              2574.61            0.05
3                Muscle Machine Inc             2379.98            0.05
4                 Land of Toys Inc.             2315.47            0.05
..                              ...                 ...             ...
93                   Microscale Inc.              422.95            0.01
94              Frau da Collezione              381.75            0.01
95               Atelier graphique              344.45            0.01
96          Auto-Moto Classics Inc.              293.56            0.01
97                Boards & Toys Co.              122.19            0.00

[98 rows x 3 columns]
```

1. Compute the revenue generated by each sales representative based on the orders from the customers they serve.

```
a21 = """
SELECT CONCAT(E.firstName,' ', E.lastName) AS 'Employee Name',
SUM(OD.quantityOrdered * OD.priceEach) AS `Revenue Generated($)`
FROM orderdetails OD
JOIN orders O ON O.orderNumber = OD.orderNumber
JOIN customers C ON C.customerNumber = O.customerNumber
JOIN employees E ON E.employeeNumber = C.salesRepEmployeeNumber
GROUP BY C.salesRepEmployeeNumber
ORDER BY `Revenue Generated($)` DESC
"""
run_query(a21)

       Employee Name  Revenue Generated($)
0   Gerard Hernandez            1258577.81
1    Leslie Jennings            1081530.54
2    Pamela Castillo             868220.55
3         Larry Bott             732096.79
4        Barry Jones             704853.91
5      George Vanauf             669377.05
6        Peter Marsh             584593.76
7        Loui Bondur             569485.75
8        Andy Fixter             562582.59
9    Steve Patterson             505875.42
10     Foon Yue Tseng            488212.67
11         Mami Nishi            457110.07
12      Martin Gerard            387477.47
13     Julie Firrelli            386663.20
14   Leslie Thompson             347533.03
```

1. Compute the profit generated by each sales representative based on the orders from the customers they serve.

```
a22 = """
SELECT CONCAT(E.firstName,' ', E.lastName) AS 'Employee Name',
SUM(P.MSRP - P.buyPrice) AS `Profit Generated($)`
FROM orderdetails OD
JOIN orders O ON O.orderNumber = OD.orderNumber
JOIN customers C ON C.customerNumber = O.customerNumber
JOIN products P ON P.productCode = OD.productCode
JOIN employees E ON E.employeeNumber = C.salesRepEmployeeNumber
GROUP BY C.salesRepEmployeeNumber
ORDER BY `Profit Generated($)` DESC
"""
run_query(a22)

       Employee Name  Profit Generated($)
0   Gerard Hernandez             17761.72
1    Leslie Jennings             15572.25
2    Pamela Castillo             12674.19
3         Larry Bott             10729.30
4        Barry Jones             10509.18
5      George Vanauf              9732.01
6        Loui Bondur              8541.75
7        Andy Fixter              8521.29
8        Peter Marsh              8330.55
9    Steve Patterson              7149.23
10     Foon Yue Tseng             6913.02
11        Mami Nishi              6389.42
12    Julie Firrelli              5691.33
13     Martin Gerard              5420.92
14   Leslie Thompson              5015.62
```

1. Compute the revenue generated by each product, sorted by product name.

```
a23 = """
SELECT P.productCode, P.productName, SUM(OD.quantityOrdered *
OD.priceEach) AS `Revenue Generated ($)`
FROM orderdetails OD
JOIN products P ON P.productCode = OD.productCode
GROUP BY P.productCode
ORDER BY P.productName
"""
run_query(a23)

    productCode                          productName  Revenue
Generated ($)
0      S24_2011                 18th century schooner
112427.12
1      S18_3136  18th Century Vintage Horse Carriage
85328.57
```

```
2      S24_2841              1900s Vintage Bi-Plane
58434.07
3      S24_4278              1900s Vintage Tri-Plane
68276.35
4      S18_3140                  1903 Ford Model A
111528.82
..          ...                                ...
...
104   S700_1938                     The Mayflower
69531.61
105   S700_3962                    The Queen Mary
78919.06
106   S700_1138              The Schooner Bluenose
56455.11
107   S700_3505                        The Titanic
84992.25
108   S700_2610          The USS Constitution Ship
66697.13

[109 rows x 3 columns]
```

1. Compute the profit generated by each product line, sorted by profit descending.

```
a24 = """
SELECT P.productLine, SUM(OD.quantityOrdered * (P.MSRP - P.buyPrice))
AS `Profit Generated ($)`
FROM orderdetails OD
JOIN products P ON P.productCode = OD.productCode
GROUP BY P.productLine
ORDER BY `Profit Generated ($)` DESC
"""
run_query(a24)

        productLine  Profit Generated ($)
0      Classic Cars            1953984.94
1      Vintage Cars             933851.74
2       Motorcycles             599665.01
3  Trucks and Buses             517414.19
4            Planes             475351.90
5             Ships             336246.24
6            Trains              84006.26
```

1. Same as Last Year (SALY) analysis: Compute the ratio for each product of sales for 2003 versus 2004.

```
a25 = """
SELECT a.productCode, (b.Sales_2004 / a.Sales_2003 ) AS `SALY Sales
Ratio`
FROM
(SELECT OD.productCode, SUM(OD.quantityOrdered * OD.priceEach) AS
Sales_2003
FROM orderdetails OD
JOIN orders O ON O.orderNumber = OD.orderNumber
WHERE YEAR(O.orderDate) = 2003
GROUP BY OD.productCode ) a
JOIN
(SELECT OD.productCode, SUM(OD.quantityOrdered * OD.priceEach) AS
Sales_2004
FROM orderdetails OD
JOIN orders O ON O.orderNumber = OD.orderNumber
WHERE YEAR(O.orderDate) = 2004
GROUP BY OD.productCode ) b
ON a.productCode = b.productCode
ORDER BY `SALY Sales Ratio` DESC
"""
run_query(a25)
```

```
    productCode  SALY Sales Ratio
0     S700_2834          1.879347
1     S700_2047          1.852005
2      S32_4289          1.847059
3      S24_3420          1.833221
4     S700_3962          1.832903
..          ...               ...
104    S18_1984          1.017561
105    S18_3685          0.980848
106    S18_1589          0.899875
107    S18_4933          0.894290
108    S18_1367          0.844451

[109 rows x 2 columns]
```

1. Compute the ratio of payments for each customer for 2003 versus 2004.

```
a26 = """
SELECT a.customerNumber, (b.payments_2004 / a.payments_2003) AS Ratio
FROM
(SELECT customerNumber, SUM(amount) AS payments_2003
FROM payments
WHERE YEAR(paymentDate) = 2003
GROUP BY customerNumber) a
JOIN
(SELECT customerNumber, SUM(amount) AS payments_2004
FROM payments
WHERE YEAR(paymentDate) = 2004
GROUP BY customerNumber) b
ON a.customerNumber = b.customerNumber
ORDER BY Ratio DESC
"""
run_query(a26)
```

```
    customerNumber      Ratio
0              323  26.639566
1              181  12.193911
2              462   4.846322
3              475   4.697746
4              144   4.691334
..             ...        ...
58             167   0.147464
59             495   0.105907
60             484   0.073130
61             161   0.027223
62             148   0.017398

[63 rows x 2 columns]
```

1. Find the products sold in 2003 but not 2004.

```
a27 = """
SELECT a.productCode
FROM
( SELECT P.productCode FROM products P
JOIN orderdetails OD ON OD.productCode = P.productCode
JOIN orders O ON O.orderNumber = OD.orderNumber
WHERE YEAR(O.orderDate) = 2003
GROUP BY P.productCode ) a
WHERE a.productCode NOT IN
( SELECT P.productCode FROM products P
JOIN orderdetails OD ON OD.productCode = P.productCode
JOIN orders O ON O.orderNumber = OD.orderNumber
WHERE YEAR(O.orderDate) = 2004
GROUP BY P.productCode )
"""
run_query(a27)
```

```
Empty DataFrame
Columns: [productCode]
Index: []
```

1. Find the customers without payments in 2003.

```
a28 = """
SELECT customerNumber
FROM payments
WHERE customerNumber NOT IN
(SELECT customerNumber
FROM payments
WHERE YEAR(paymentDate) = 2003)
GROUP BY customerNumber
"""
run_query(a28)
```

```
    customerNumber
0              119
1              157
2              166
3              173
4              177
5              189
6              204
7              209
8              239
9              240
10             249
11             256
12             260
13             286
14             298
15             314
16             328
17             362
18             398
19             406
20             412
21             415
22             448
23             450
24             456
```

Correlated subqueries

1. Who reports to Mary Patterson?

```
b1 = """
SELECT employeeNumber, CONCAT(firstName,' ', lastName) AS 'Employee
Name'
FROM employees
WHERE reportsTo = (
SELECT employeeNumber
FROM employees
WHERE firstName = 'Mary'
AND lastName = 'Patterson')
"""
run_query(b1)
```

```
   employeeNumber       Employee Name
0            1088  William Patterson
1            1102      Gerard Bondur
2            1143        Anthony Bow
3            1621         Mami Nishi
```

1. Which payments in any month and year are more than twice the average for that month and year?

```
b2 = """
SELECT P.customerNumber, P.paymentDate, P.amount, b.Average
FROM payments P
JOIN (
SELECT DATE_FORMAT(paymentDate, '%M %Y') AS Month_Year , AVG(amount)
AS Average
FROM payments
GROUP BY Month_Year) b
ON DATE_FORMAT(P.paymentDate, '%M %Y') = b.Month_Year
WHERE P.amount > 2 * b.Average
ORDER BY P.paymentDate
"""
run_query(b2)
```

```
    customerNumber paymentDate     amount       Average
0              148  2003-04-22   44380.15  19473.417143
1              124  2003-08-15  111654.40  41034.143333
2              141  2003-10-26   49539.37  24373.689231
3              321  2003-11-03   85559.12  36541.720000
4              167  2003-12-03   85024.46  41331.882000
5              148  2003-12-26  105743.00  41331.882000
6              475  2004-02-13   36070.47  17775.335000
7              239  2004-03-15   80375.24  36782.110000
8              124  2004-08-28   85410.87  34372.209091
9              256  2004-10-22   53116.99  26443.347143
10             114  2004-12-15   82261.22  35621.113913
11             141  2004-12-31  116208.40  35621.113913
12             124  2005-03-05  101244.59  48158.511250
13             141  2005-03-18  120166.58  48158.511250
14             124  2005-04-16   83598.04  36779.544000
15             323  2005-05-23   75020.13  30249.881111
```

1. Report for each product, the percentage value of its stock on hand as a percentage of the stock on hand for product line to which it belongs. Order the report by product line and percentage value within product line descending.

```
b3 = """
SELECT P1.productLine, P1.productName, P1.quantityInStock ,
SUM(P2.quantityInStock)
OVER(PARTITION BY P2.productLine) AS ProductLine_Inventory,
CAST(((P1.quantityInStock) * 100) / SUM(P2.quantityInStock)
OVER(PARTITION BY P2.productLine) AS DECIMAL (4,2) ) AS
percentage_value
FROM Products P1, Products P2 WHERE P1.productCode = P2.productCode
ORDER BY P1.productLine, percentage_value DESC
"""
run_query(b3)
```

```
      productLine                                  productName  
quantityInStock  \
0    Classic Cars                             1995 Honda Civic  
9772   
1    Classic Cars                          2002 Chevy Corvette  
9446   
2    Classic Cars                            1968 Dodge Charger  
9123   
3    Classic Cars                         1976 Ford Gran Torino  
9127   
4    Classic Cars                         1965 Aston Martin DB5  
9042   
..            ...                                          ...  
...   
105  Vintage Cars  1941 Chevrolet Special Deluxe Cabriolet  
2378   
106  Vintage Cars          1936 Mercedes Benz 500k Roadster  
2081   
107  Vintage Cars                    1928 Mercedes-Benz SSK  
548   
108  Vintage Cars                        1911 Ford Town Car  
540   
109  Vintage Cars                  1928 Ford Phaeton Deluxe  
136   

     ProductLine_Inventory  percentage_value  
0                 219183.0              4.46  
1                 219183.0              4.31  
2                 219183.0              4.16  
3                 219183.0              4.16  
4                 219183.0              4.13  
..                     ...               ...  
105               124880.0              1.90  
106               124880.0              1.67  
107               124880.0              0.44  
108               124880.0              0.43  
109               124880.0              0.11  

[110 rows x 5 columns]
```

1. For orders containing more than two products, report those products that constitute more than 50% of the value of the order.

```
b4 = """
SELECT * FROM
(SELECT orderNumber, productCode, (quantityOrdered * priceEach) AS
productValue,
0.5 * SUM(quantityOrdered * priceEach) OVER (PARTITION BY orderNumber)
AS half_order_value
FROM orderdetails) a
```

```
WHERE a.productValue > a.half_order_value
ORDER BY a.orderNumber
"""
run_query(b4)
```

```
    orderNumber productCode  productValue  half_order_value
0         10102     S18_1342       3726.45          2747.390
1         10112     S10_1949       5717.64          3837.470
2         10116     S32_3207       1627.56           813.780
3         10118    S700_3505       3101.40          1550.700
4         10125     S18_2795       4704.92          3782.540
5         10130     S18_3856       3284.16          3018.480
6         10132    S700_3167       2880.00          1440.000
7         10144     S32_4289       1128.20           564.100
8         10146     S18_4721       3797.26          3315.680
9         10154     S24_3151       2332.13          2232.925
10        10156    S700_1691       3726.72          2299.760
11        10158     S24_2000       1491.38           745.690
12        10166     S18_3140       5873.37          4988.925
13        10189     S12_2823       3879.96          1939.980
14        10199    S700_1691       3901.92          3839.125
15        10216     S12_1666       5759.42          2879.710
16        10218     S18_3232       5181.94          3806.030
17        10231     S12_1108       8116.50          7661.465
18        10242     S24_3969       1679.92           839.960
19        10243     S18_2325       5257.89          3138.300
20        10255     S18_2795       3240.00          2316.155
21        10256     S18_1342       3178.66          2355.365
22        10265     S18_3482       6050.03          4707.565
23        10269     S24_4258       4581.12          3209.920
24        10277     S12_4675       2611.84          1305.920
25        10286     S18_3782       1960.80           980.400
26        10290     S24_4258       3769.20          2929.280
27        10294    S700_3962       4424.40          2212.200
28        10298     S10_2016       4128.54          3033.390
29        10303     S18_2248       2617.86          1737.330
30        10317     S24_4278       2434.25          1217.125
31        10323     S18_4600       4552.42          3733.160
32        10335     S32_1268       3390.20          3233.220
33        10345     S24_2022       1676.14           838.070
34        10364     S32_2206       1834.56           917.280
35        10376     S12_3380       3452.75          1726.375
36        10385     S24_3816       2916.71          2233.355
37        10387     S32_1374       3516.04          1758.020
38        10408     S24_3969        615.45           307.725
39        10409     S24_1937       1700.68          1163.090
40        10421     S18_2795       5847.10          3819.550
41        10422     S18_1342       4663.44          2924.720
```

Spatial data

1. Which customers are in the Southern Hemisphere?

```
c1 = """
SELECT customerNumber, customerName, ST_X(customerLocation) AS
latitude, ST_Y(customerLocation) AS longitude
FROM customers
WHERE ST_X(customerLocation) < 0
"""
run_query(c1)
```

```
   customerNumber                   customerName   latitude
longitude
0             114      Australian Collectors, Co. -37.813187
144.962980
1             276         Anna's Decorations, Ltd -33.838634
151.207114
2             282       Souveniers And Things Co. -33.796076
151.183102
3             323      Down Under Souveniers, Inc -36.848460
174.763331
4             333     Australian Gift Network, Co -27.474750
153.016937
5             356            SAR Distributors, Co -25.748733
28.238043
6             357                  GiftsForHim.com -36.848460
174.763331
7             412   Extreme Desk Decorations, Ltd -41.292494
174.773235
8             471    Australian Collectables, Ltd -37.878543
145.164812
9             496               Kelly's Gift Shop -36.848460
174.763331
```

1. Which US customers are south west of the New York office?

```
c2 = """
SELECT customerNumber, customerName, ST_X(customerLocation) AS
latitude, ST_Y(customerLocation) AS longitude
FROM customers
WHERE ST_X(customerLocation) < (SELECT ST_X(officeLocation)
FROM offices
WHERE city = 'NYC')
AND ST_Y(customerLocation) < (SELECT ST_Y(officeLocation)
FROM offices
WHERE city = 'NYC')
AND country = 'USA'
"""
run_query(c2)
```

```
    customerNumber                  customerName   latitude
longitude
0              112            Signal Gift Stores  36.114646 -
115.172816
1              124  Mini Gifts Distributors Ltd.  37.973535 -
122.531087
2              129               Mini Wheels Co.  37.774929 -
122.465158
3              131             Land of Toys Inc.  40.714353  -
74.005973
4              151            Muscle Machine Inc  40.714353  -
74.005973
5              157          Diecast Classics Inc.  40.608430  -
75.490183
6              161           Technics Stores Inc.  37.584103 -
122.366083
7              181               Vitachrome Inc.  40.714353  -
74.005973
8              205             Toys4GrownUps.com  34.147785 -
118.144515
9              219             Boards & Toys Co.  34.142508 -
118.255075
10             239  Collectable Mini Designs Co.  32.715329 -
117.157255
11             321      Corporate Gift Ideas Co.  37.774929 -
122.419415
12             339        Classic Gift Ideas, Inc  39.952335  -
75.163789
13             347    Men 'R' US Retailers, Ltd.  34.052234 -
118.243685
14             424           Classic Legends Inc.  40.714353  -
74.005973
15             447               Gift Ideas Corp.  33.538652 -
112.185987
16             450     The Sharp Gifts Warehouse  37.339386 -
121.894956
17             456               Microscale Inc.  40.714353  -
74.005973
18             475   West Coast Collectables Co.  34.180839 -
118.308966
19             486  Motor Mint Distributors Inc.  39.952335  -
75.163789
```

1. Which customers are closest to the Tokyo office (i.e., closer to Tokyo than any other office)?

```
c3 = """
SELECT customerNumber, customerName, ST_X(customerLocation) AS
latitude, ST_Y(customerLocation) AS longitude
FROM customers
```

```
WHERE ST_Distance(customerLocation, (
SELECT officeLocation
FROM offices
WHERE city = 'Tokyo')) <
LEAST(
ST_Distance(customerLocation, (
SELECT officeLocation
FROM offices
WHERE city = 'San Francisco')),
ST_Distance(customerLocation, (
SELECT officeLocation
FROM offices
WHERE city = 'Boston')),
ST_Distance(customerLocation, (
SELECT officeLocation
FROM offices
WHERE city = 'NYC')),
ST_Distance(customerLocation, (
SELECT officeLocation
FROM offices
WHERE city = 'Paris')),
ST_Distance(customerLocation, (
SELECT officeLocation
FROM offices
WHERE city = 'Sydney')),
ST_Distance(customerLocation, (
SELECT officeLocation
FROM offices
WHERE city = 'London')))
"""
run_query(c3)
```

```
   customerNumber                   customerName   latitude   longitude
0             148       Dragon Souveniers, Ltd.    1.352083  103.819836
1             166              Handji Gifts& Co    1.352083  103.819836
2             177           Osaka Souveniers Co.  35.752804  139.733481
3             206     Asian Shopping Network, Co   1.352083  103.819836
4             211   King Kong Collectables, Co.  22.281944  114.158056
5             385               Cruz & Sons Co.  14.550000  121.033333
6             398      Tokyo Collectables, Ltd  35.658068  139.751599
```

1. Which French customer is furthest from the Paris office?

```
c4 = """
SELECT customerNumber, customerName, ST_X(customerLocation) AS
latitude, ST_Y(customerLocation) AS longitude,
MAX(ST_Distance(customerLocation, (
SELECT officeLocation
FROM offices
WHERE city = 'Paris'))) AS `Distance`
```

```
FROM customers
WHERE country = 'France'
"""
run_query(c4)

   customerNumber       customerName   latitude  longitude  
Distance
0             103  Atelier graphique  47.216842  -1.556744  
660728.953508
```

1. Who is the northernmost customer?

```
c5 = """
SELECT customerNumber, customerName, MAX(ST_X(customerLocation)) AS 
latitude, ST_Y(customerLocation) AS longitude
FROM customers
"""
run_query(c5)

   customerNumber       customerName   latitude  longitude
0             103  Atelier graphique  65.621637  -1.556744
```

1. What is the distance between the Paris and Boston offices?

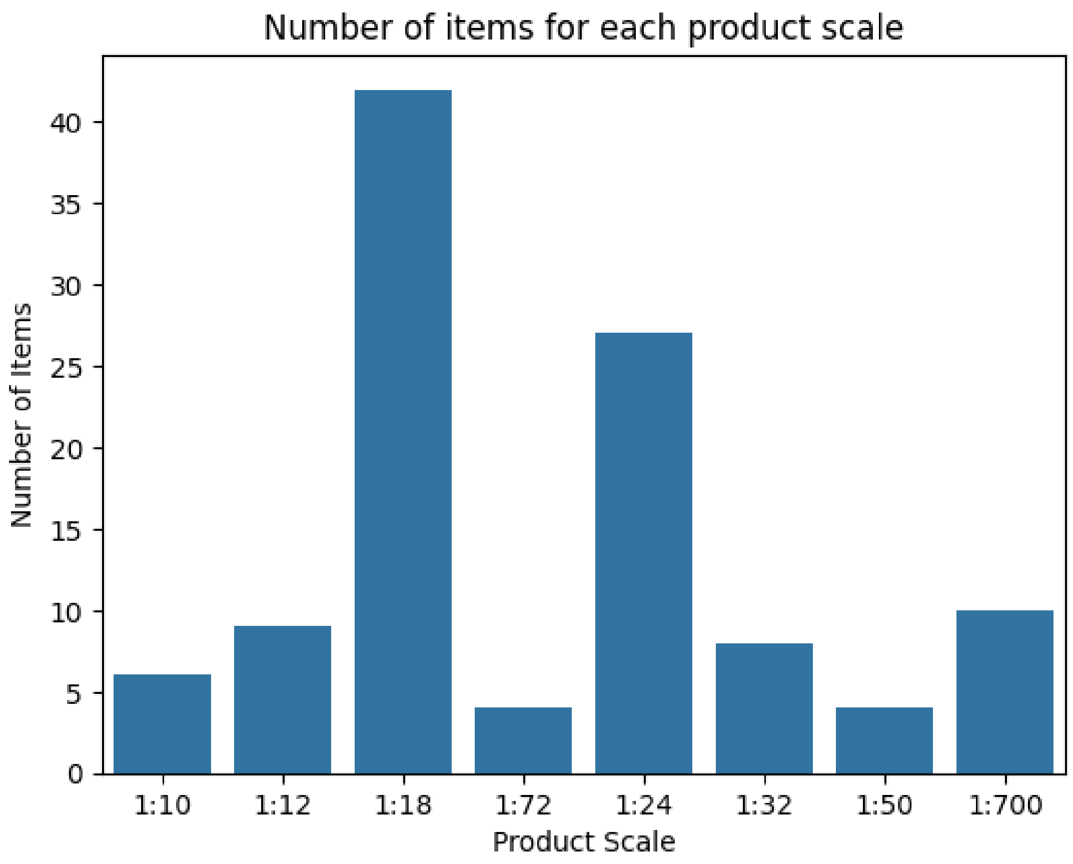
```
c6 = """
SELECT ST_X(officeLocation) INTO @lat1 FROM offices WHERE city = 
'Paris';
SELECT ST_Y(officeLocation) INTO @lon1 FROM offices WHERE city = 
'Paris';
SELECT ST_X(officeLocation) INTO @lat2 FROM offices WHERE city = 
'Boston';
SELECT ST_Y(officeLocation) INTO @lon2 FROM offices WHERE city = 
'Boston';
SELECT 
(ACOS(SIN(@lat1*PI()/180)*SIN(@lat2*PI()/180)+COS(@lat1*PI()/180)*COS(
@lat2*PI()/180)* COS((@lon1-@lon2)*PI()/180))*180/PI())*60*1.8532 AS 
Distance
"""
run_query(c6)

      Distance
0  5531.163849
```

Data visualization

1. Visualize in blue the number of items for each product scale.

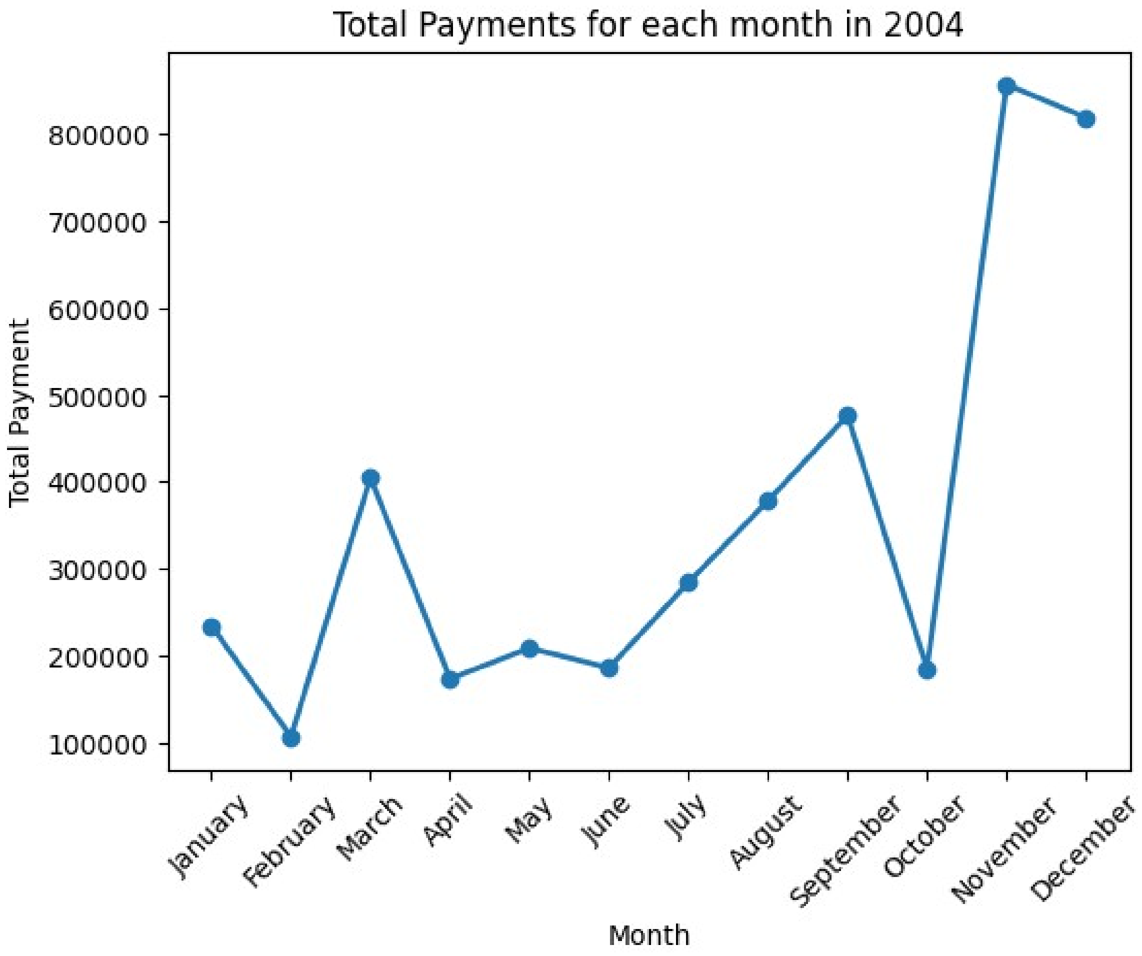
```
v1 = """
SELECT productScale AS 'Product Scale', COUNT(productCode) AS `Number 
of Items`
FROM products
```

```
GROUP BY productScale
"""
data1 = pd.read_sql(v1,mydb)

sns.barplot(x='Product Scale',y='Number of Items', data=data1)
plt.title('Number of items for each product scale')
plt.show()
```



1. Prepare a line plot with appropriate labels for total payments for each month in 2004.

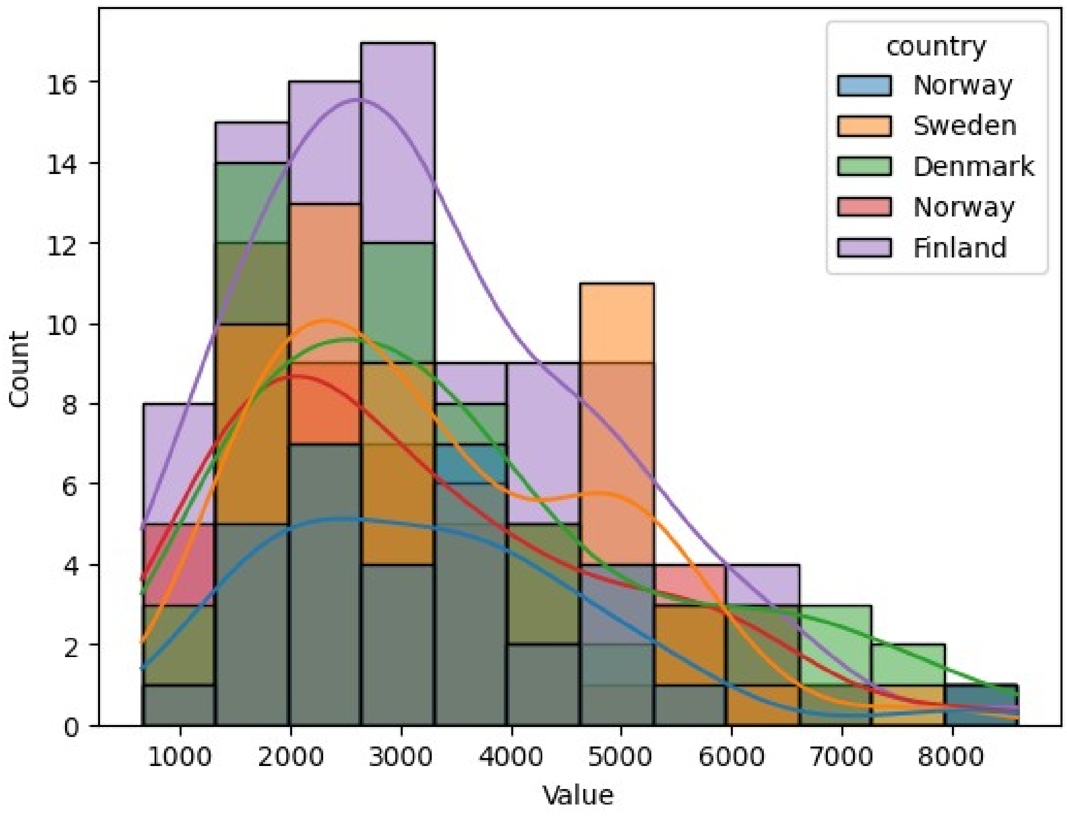
```
v2 = """
SELECT MONTHNAME(paymentDate) AS 'Month', SUM(amount) AS `Total
Payment`
FROM payments
WHERE YEAR(paymentDate) = 2004
GROUP BY MONTH(paymentDate)
ORDER BY MONTH(paymentDate)
"""
data2 = pd.read_sql(v2,mydb)

plt.plot('Month', 'Total Payment',data = data2, linewidth=2,marker =
'o')
plt.xlabel('Month')
plt.xticks(rotation=45)
plt.ylabel('Total Payment')
plt.title('Total Payments for each month in 2004')

# Show the plot
plt.show()
```



1. Create a histogram with appropriate labels for the value of orders received from the Nordic countries (Denmark,Finland, Norway,Sweden).

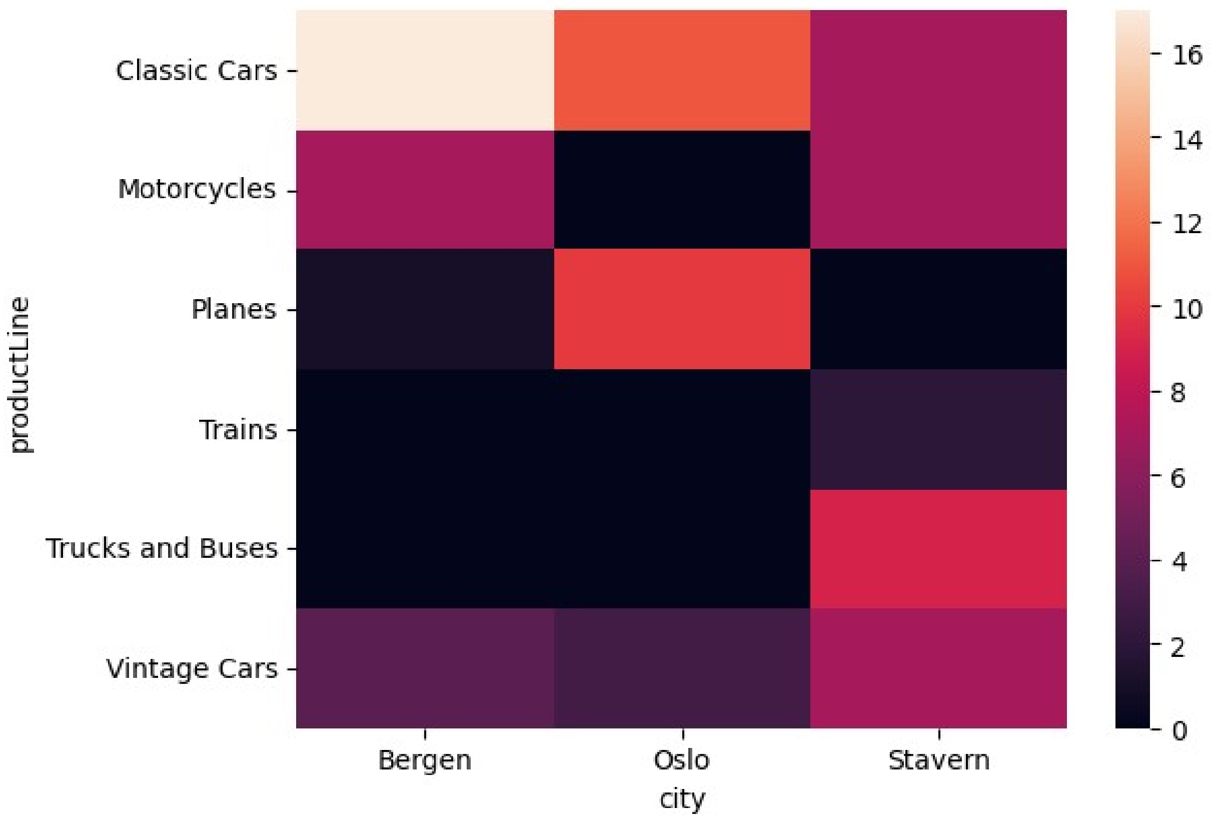
```
v3 = """
SELECT C.customerNumber, (OD.quantityOrdered * OD.priceEach) AS
'Value', C.country
FROM orderdetails OD
JOIN orders O ON O.orderNumber = OD.orderNumber
JOIN customers C ON C.customerNumber = O.customerNumber
WHERE C.country IN ('Denmark','Finland', 'Norway','Sweden')
"""
data3 = pd.read_sql(v3,mydb)
```

```
sns.histplot(data= data3, x='Value', kde=True,hue = 'country')
plt.show()
```



1. Create a heatmap for product lines and Norwegian cities.

```
v4 = """
SELECT count(*) as frequency, productLine, city
FROM Products, OrderDetails, Orders, Customers
                WHERE Products.productCode = OrderDetails.productCode
                AND OrderDetails.orderNumber = Orders.orderNumber
                AND Orders.customerNumber = Customers.customerNumber
                AND country = 'Norway'
                GROUP BY productLine, city
"""
data4 = pd.read_sql(v4,mydb)
data4 = data4.pivot(index='productLine', columns='city',
values='frequency').fillna(0)

sns.heatmap(data4)
plt.show()
```


Classic Cars
Motorcycles
Planes
Trains
Trucks and Buses
Vintage Cars
productLine
Bergen
Oslo
Stavern
city
0
2
4
6
8
10
12
14
16

```
## mydb.close()
```