Coding Challenge -CAR RENTAL SYSTEM

Introduction:

The **Car Rental System** is a structured database management system designed to streamline the operations of a car rental company. This case study focuses on the development of a relational database using SQL to efficiently manage vehicle availability, customer details, lease agreements, and payment records.

In the modern era, car rental services play a crucial role in transportation, providing customers with flexible and affordable vehicle leasing options. Managing such a system manually can be challenging, as it involves keeping track of multiple vehicles, customer bookings, payment transactions, and lease durations. By implementing a database-driven solution, the Car Rental System ensures data accuracy, reduces redundancy, and enhances overall efficiency.

This project involves creating and managing four key database tables:

- **Vehicle Table**: Stores details about the vehicles available for rent, including make, model, year, status, passenger capacity, and engine capacity.

- **Customer Table**: Maintains customer information, ensuring proper identification and contact details.

- **Lease Table**: Tracks vehicle leases by linking customers with rented vehicles, along with lease start and end dates.

- **Payment Table**: Records payment transactions associated with each lease, ensuring financial transparency.

Creating Tables:

CREATE DATABASE CarRental;

USE CarRental;

-- Vehicle Table

CREATE TABLE Vehicle (

    vehicleID INT AUTO_INCREMENT PRIMARY KEY,

    make VARCHAR(50) NOT NULL,

    model VARCHAR(50) NOT NULL,

    year INT NOT NULL,

    dailyRate DECIMAL(10,2) NOT NULL,

    status ENUM('available', 'notAvailable') NOT NULL,

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    passengerCapacity INT NOT NULL,

    engineCapacity INT NOT NULL  -- Changed from DECIMAL(5,2) to INT

);


-- Customer Table

CREATE TABLE Customer (

    customerID INT AUTO_INCREMENT PRIMARY KEY,

    firstName VARCHAR(50) NOT NULL,

    lastName VARCHAR(50) NOT NULL,

    email VARCHAR(100) UNIQUE NOT NULL,

    phoneNumber VARCHAR(15) UNIQUE NOT NULL

);


-- Lease Table

CREATE TABLE Lease (

    leaseID INT AUTO_INCREMENT PRIMARY KEY,

    vehicleID INT,

    customerID INT,

    startDate DATE NOT NULL,

    endDate DATE NOT NULL,

    type ENUM('DailyLease', 'MonthlyLease') NOT NULL,

    FOREIGN KEY (vehicleID) REFERENCES Vehicle(vehicleID) ON DELETE
CASCADE,

    FOREIGN KEY (customerID) REFERENCES Customer(customerID) ON DELETE
CASCADE

);


-- Payment Table

CREATE TABLE Payment (

    paymentID INT AUTO_INCREMENT PRIMARY KEY,

    leaseID INT,
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    paymentDate DATE NOT NULL,

    amount DECIMAL(10,2) NOT NULL,

    FOREIGN KEY (leaseID) REFERENCES Lease(leaseID) ON DELETE CASCADE
);
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-- Insert Data into Vehicle Table

INSERT INTO Vehicle (make, model, year, dailyRate, status, passengerCapacity, engineCapacity) VALUES

('Toyota', 'Camry', 2022, 50.00, 'available', 4, 1450),

('Honda', 'Civic', 2023, 45.00, 'available', 7, 1500),

('Ford', 'Focus', 2022, 48.00, 'notAvailable', 4, 1400),

('Nissan', 'Altima', 2023, 52.00, 'available', 7, 1200),

('Chevrolet', 'Malibu', 2022, 47.00, 'available', 4, 1800),

('Hyundai', 'Sonata', 2023, 49.00, 'notAvailable', 7, 1400),

('BMW', '3 Series', 2023, 60.00, 'available', 7, 2499),

('Mercedes', 'C-Class', 2022, 58.00, 'available', 8, 2599),

('Audi', 'A4', 2023, 55.00, 'notAvailable', 4, 2500),

('Lexus', 'ES', 2023, 54.00, 'available', 4, 2500);

-- Insert Data into Customer Table

INSERT INTO Customer (firstName, lastName, email, phoneNumber) VALUES

('John', 'Doe', 'johndoe@example.com', '555-555-5555'),

('Jane', 'Smith', 'janesmith@example.com', '555-123-4567'),

('Robert', 'Johnson', 'robert@example.com', '555-789-1234'),

('Sarah', 'Brown', 'sarah@example.com', '555-456-7890'),

('David', 'Lee', 'david@example.com', '555-987-6543'),

('Laura', 'Hall', 'laura@example.com', '555-234-5678'),

('Michael', 'Davis', 'michael@example.com', '555-876-5432'),

('Emma', 'Wilson', 'emma@example.com', '555-432-1098'),

('William', 'Taylor', 'william@example.com', '555-321-6547'),

('Olivia', 'Adams', 'olivia@example.com', '555-765-4321');

-- Insert Data into Lease Table

INSERT INTO Lease (vehicleID, customerID, startDate, endDate, type) VALUES

(1, 1, '2023-01-01', '2023-01-05', 'DailyLease'),

(2, 2, '2023-02-15', '2023-02-28', 'MonthlyLease'),

(3, 3, '2023-03-10', '2023-03-15', 'DailyLease'),

(4, 4, '2023-04-20', '2023-04-30', 'MonthlyLease'),

(5, 5, '2023-05-05', '2023-05-10', 'DailyLease'),

(4, 7, '2023-06-15', '2023-06-30', 'MonthlyLease'),

(7, 7, '2023-07-01', '2023-07-10', 'DailyLease'),

(8, 8, '2023-08-12', '2023-08-15', 'MonthlyLease'),

(9, 10, '2023-09-07', '2023-09-10', 'DailyLease'),

(10, 10, '2023-10-10', '2023-10-31', 'MonthlyLease');

-- Insert Data into Payment Table

INSERT INTO Payment (leaseID, paymentDate, amount) VALUES

(1, '2023-01-03', 200.00),

(2, '2023-02-20', 1000.00),

(3, '2023-03-12', 75.00),

(4, '2023-04-25', 900.00),

(5, '2023-05-07', 60.00),

(6, '2023-06-18', 1200.00),

(7, '2023-07-03', 40.00),

(8, '2023-08-14', 1100.00),

(9, '2023-09-09', 80.00),

(10, '2023-10-25', 1500.00);

SELECT * FROM Vehicle;

SELECT * FROM Customer;

SELECT * FROM Lease;

SELECT * FROM Payment ;

Table Screenshots:

vehicleID	make	model	year	dailyRate	status	passengerCapacity	engineCapacity
1	Toyota	Camry	2022	50.00	available	4	1450
2	Honda	Civic	2023	45.00	available	7	1500
3	Ford	Focus	2022	48.00	notAvailable	4	1400
4	Nissan	Altima	2023	52.00	available	7	1200
5	Chevrolet	Malibu	2022	47.00	available	4	1800
6	Hyundai	Sonata	2023	49.00	notAvailable	7	1400
7	BMW	3 Series	2023	60.00	available	7	2499
8	Mercedes	C-Class	2022	58.00	available	8	2599
9	Audi	A4	2023	55.00	notAvailable	4	2500
10	Lexus	ES	2023	54.00	available	4	2500
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

| customerID	firstName	lastName	email	phoneNumber
1	John	Doe	johndoe@example.com	555-555-5555
2	Jane	Smith	janesmith@example.com	555-123-4567
3	Robert	Johnson	robert@example.com	555-789-1234
4	Sarah	Brown	sarah@example.com	555-456-7890
5	David	Lee	david@example.com	555-987-6543
6	Laura	Hall	laura@example.com	555-234-5678
7	Michael	Davis	michael@example.com	555-876-5432
8	Emma	Wilson	emma@example.com	555-432-1098
9	William	Taylor	william@example.com	555-321-6547
10	Olivia	Adams	olivia@example.com	555-765-4321
NULL	NULL	NULL	NULL	NULL

	leaseID	vehicleID	customerID	startDate	endDate	type
▶	1	1	1	2023-01-01	2023-01-05	DailyLease
	2	2	2	2023-02-15	2023-02-28	MonthlyLease
	3	3	3	2023-03-10	2023-03-15	DailyLease
	4	4	4	2023-04-20	2023-04-30	MonthlyLease
	5	5	5	2023-05-05	2023-05-10	DailyLease
	6	4	7	2023-06-15	2023-06-30	MonthlyLease
	7	7	7	2023-07-01	2023-07-10	DailyLease
	8	8	8	2023-08-12	2023-08-15	MonthlyLease
	9	9	10	2023-09-07	2023-09-10	DailyLease
	10	10	10	2023-10-10	2023-10-31	MonthlyLease
*	NULL	NULL	NULL	NULL	NULL	NULL

	paymentID	leaseID	paymentDate	amount
▶	1	1	2023-01-03	200.00
	2	2	2023-02-20	1000.00
	3	3	2023-03-12	75.00
	4	4	2023-04-25	900.00
	5	5	2023-05-07	60.00
	6	6	2023-06-18	1200.00
	7	7	2023-07-03	40.00
	8	8	2023-08-14	1100.00
	9	9	2023-09-09	80.00
	10	10	2023-10-25	1500.00
*	NULL	NULL	NULL	NULL

ER Diagram:

The **Car Rental System** consists of four main entities: Vehicle, Customer, Lease, and Payment. These entities are related as follows:

1. Vehicle - Lease (One-to-Many Relationship)

2. Customer - Lease (One-to-Many Relationship)

3. Lease - Payment (One-to-One or One-to-Many Relationship)
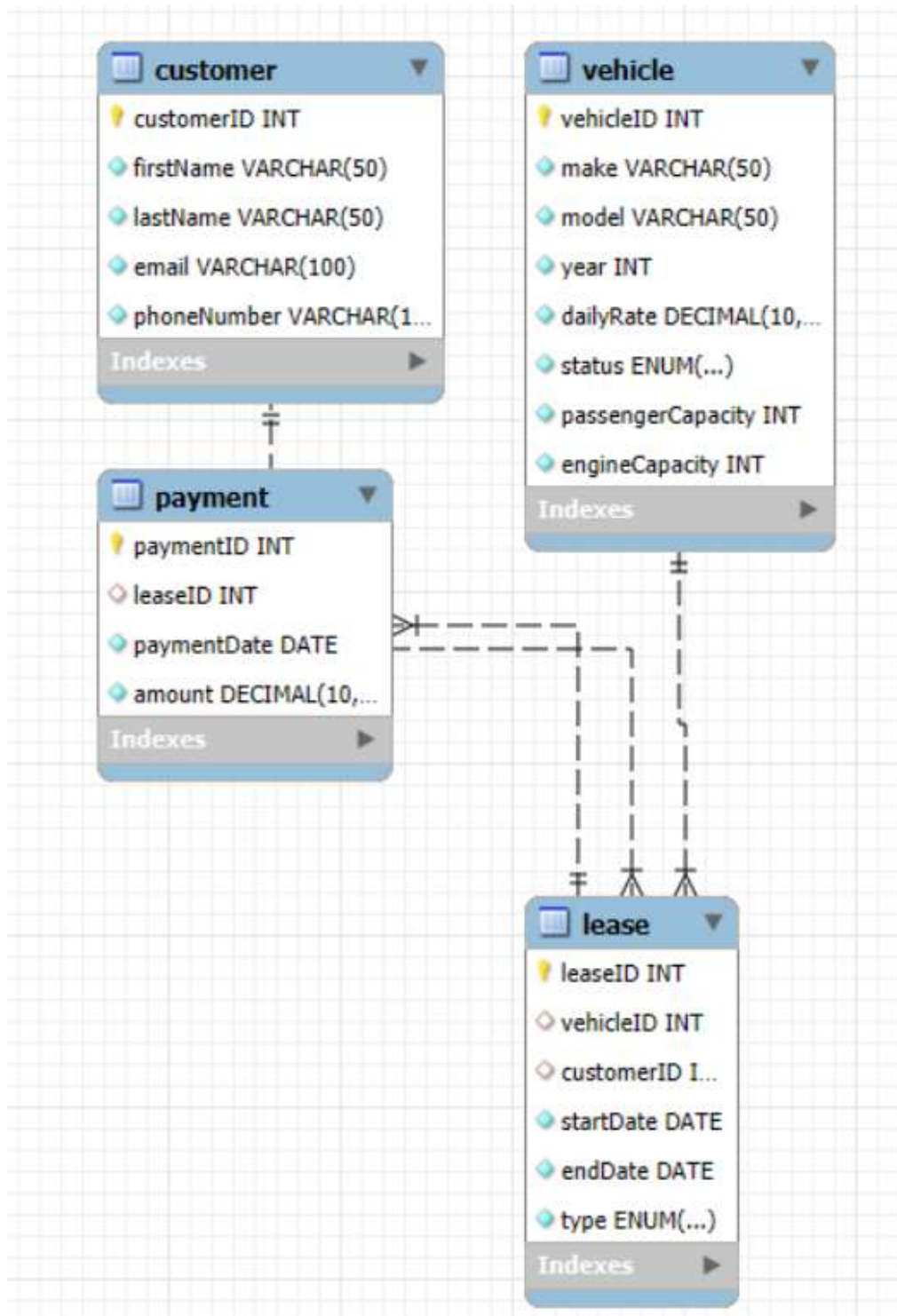
Questions:

1. Update the daily rate for a Mercedes car to 68.

2. Delete a specific customer and all associated leases and payments.

3. Rename the "paymentDate" column in the Payment table to "transactionDate".

4. Find a specific customer by email.

5. Get active leases for a specific customer.

6. Find all payments made by a customer with a specific phone number.

7. Calculate the average daily rate of all available cars.

8. Find the car with the highest daily rate.

9. Retrieve all cars leased by a specific customer.

10. Find the details of the most recent lease.

11. List all payments made in the year 2023.

12. Retrieve customers who have not made any payments.

13. Retrieve Car Details and Their Total Payments.

14. Calculate Total Payments for Each Customer.

15. List Car Details for Each Lease.

16. Retrieve Details of Active Leases with Customer and Car Information.

17. Find the Customer Who Has Spent the Most on Leases.

18. List All Cars with Their Current Lease Information.

Answers:

-- 1. Update the daily rate for a Mercedes car to 68.

UPDATE Vehicle SET dailyRate = 68.00 WHERE vehicleID=8;

6	Hyundai	Sonata	2023	49.00	notAvailable	7	1400
7	BMW	3 Series	2023	60.00	available	7	2499
8	Mercedes	C-Class	2022	68.00	available	8	2599
9	Audi	A4	2023	55.00	notAvailable	4	2500
10	Lexus	ES	2023	54.00	available	4	2500

-- 2. Delete a specific customer and all associated leases and payments.

DELETE FROM Customer WHERE email = 'johndoe@example.com';

| | 18 10:44:22 DELETE FROM Customer WHERE email = johndoe@ex... 1 row(s) affected | | 0.016 sec |

Result Grid | Filter Rows: | Edit: | Export

	customerID	firstName	lastName	email	phoneNumber
▶	2	Jane	Smith	janesmith@example.com	555-123-4567
	3	Robert	Johnson	robert@example.com	555-789-1234
	4	Sarah	Brown	sarah@example.com	555-456-7890
	5	David	Lee	david@example.com	555-987-6543
	6	Laura	Hall	laura@example.com	555-234-5678
	7	Michael	Davis	michael@example.com	555-876-5432
	8	Emma	Wilson	emma@example.com	555-432-1098
	9	William	Taylor	william@example.com	555-321-6547
	10	Olivia	Adams	olivia@example.com	555-765-4321
*	NULL	NULL	NULL	NULL	NULL

-- 3. Rename the "paymentDate" column in the Payment table to "transactionDate".

ALTER TABLE Payment CHANGE paymentDate transactionDate DATE;

Result Grid | Filter Rows: | Ed

	paymentID	leaseID	transactionDate	amount
▶	2	2	2023-02-20	1000.00
	3	3	2023-03-12	75.00
	4	4	2023-04-25	900.00
	5	5	2023-05-07	60.00
	6	6	2023-06-18	1200.00
	7	7	2023-07-03	40.00
	8	8	2023-08-14	1100.00
	9	9	2023-09-09	80.00
	10	10	2023-10-25	1500.00
*	NULL	NULL	NULL	NULL

-- 4. Find a specific customer by email.

SELECT * FROM Customer WHERE email = 'janesmith@example.com';

Result Grid | Filter Rows: | Edit: | Export/Impo

	customerID	firstName	lastName	email	phoneNumber
▶	2	Jane	Smith	janesmith@example.com	555-123-4567
*	NULL	NULL	NULL	NULL	NULL

-- 5. Get active leases for a specific customer.

SELECT * FROM Lease WHERE customerID = (SELECT customerID FROM Customer WHERE email = 'robert@example.com');

	leaseID	vehicleID	customerID	startDate	endDate	type
▶	3	3	3	2023-03-10	2023-03-15	DailyLease
*	NULL	NULL	NULL	NULL	NULL	NULL

-- 6. Find all payments made by a customer with a specific phone number.

SELECT Payment.* FROM Payment

JOIN Lease ON Payment.leaseID = Lease.leaseID

JOIN Customer ON Lease.customerID = Customer.customerID

WHERE Customer.phoneNumber = '555-123-4567';

	paymentID	leaseID	transactionDate	amount
▶	2	2	2023-02-20	1000.00

-- 7. Calculate the average daily rate of all available cars.

SELECT AVG(dailyRate) AS avgDailyRate FROM Vehicle WHERE status = 'available';

	avgDailyRate
▶	52.285714

-- 8. Find the car with the highest daily rate.

SELECT * FROM Vehicle ORDER BY dailyRate DESC LIMIT 1;

	vehicleID	make	model	year	dailyRate	status	passengerCapacity	engineCapacity
▶	7	BMW	3 Series	2023	60.00	available	7	2499
*	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

-- 9. Retrieve all cars leased by a specific customer.

SELECT Vehicle.* FROM Vehicle

JOIN Lease ON Vehicle.vehicleID = Lease.vehicleID

JOIN Customer ON Lease.customerID = Customer.customerID

WHERE Customer.email = 'sarah@example.com';

	vehicleID	make	model	year	dailyRate	status	passengerCapacity	engineCapacity
▶	4	Nissan	Altima	2023	52.00	available	7	1200

-- 10. Find the details of the most recent lease.

SELECT * FROM Lease ORDER BY startDate DESC LIMIT 1;

leaseID	vehicleID	customerID	startDate	endDate	type
10	10	10	2023-10-10	2023-10-31	MonthlyLease
NULL	NULL	NULL	NULL	NULL	NULL

-- 11. List all payments made in the year 2023.

SELECT * FROM Payment WHERE YEAR(transactionDate) = 2023;

paymentID	leaseID	transactionDate	amount
2	2	2023-02-20	1000.00
3	3	2023-03-12	75.00
4	4	2023-04-25	900.00
5	5	2023-05-07	60.00
6	6	2023-06-18	1200.00
7	7	2023-07-03	40.00
8	8	2023-08-14	1100.00
9	9	2023-09-09	80.00
10	10	2023-10-25	1500.00
NULL	NULL	NULL	NULL

-- 12. Retrieve customers who have not made any payments.

SELECT * FROM Customer WHERE customerID NOT IN (SELECT Lease.customerID FROM Lease JOIN Payment ON Lease.leaseID = Payment.leaseID);

customerID	firstName	lastName	email	phoneNumber
6	Laura	Hall	laura@example.com	555-234-5678
9	William	Taylor	william@example.com	555-321-6547
NULL	NULL	NULL	NULL	NULL

-- 13. Retrieve Car Details and Their Total Payments.

SELECT Vehicle.vehicleID, Vehicle.make, Vehicle.model, SUM(Payment.amount) AS totalPayments

FROM Vehicle

JOIN Lease ON Vehicle.vehicleID = Lease.vehicleID

JOIN Payment ON Lease.leaseID = Payment.leaseID

GROUP BY Vehicle.vehicleID, Vehicle.make, Vehicle.model;

	vehicleID	make	model	totalPayments
▶	2	Honda	Civic	1000.00
	3	Ford	Focus	75.00
	4	Nissan	Altima	2100.00
	5	Chevrolet	Malibu	60.00
	7	BMW	3 Series	40.00
	8	Mercedes	C-Class	1100.00
	9	Audi	A4	80.00
	10	Lexus	ES	1500.00

-- 14. Calculate Total Payments for Each Customer.

SELECT Customer.customerID, Customer.firstName, Customer.lastName,
SUM(Payment.amount) AS totalPaid

FROM Customer

JOIN Lease ON Customer.customerID = Lease.customerID

JOIN Payment ON Lease.leaseID = Payment.leaseID

GROUP BY Customer.customerID;

	customerID	firstName	lastName	totalPaid
▶	2	Jane	Smith	1000.00
	3	Robert	Johnson	75.00
	4	Sarah	Brown	900.00
	5	David	Lee	60.00
	7	Michael	Davis	1240.00
	8	Emma	Wilson	1100.00
	10	Olivia	Adams	1580.00

-- 15. List Car Details for Each Lease.

SELECT Lease.leaseID, Vehicle.make, Vehicle.model, Lease.startDate,
Lease.endDate

FROM Lease

JOIN Vehicle ON Lease.vehicleID = Vehicle.vehicleID;

	leaseID	make	model	startDate	endDate
▶	2	Honda	Civic	2023-02-15	2023-02-28
	3	Ford	Focus	2023-03-10	2023-03-15
	4	Nissan	Altima	2023-04-20	2023-04-30
	5	Chevrolet	Malibu	2023-05-05	2023-05-10
	6	Nissan	Altima	2023-06-15	2023-06-30
	7	BMW	3 Series	2023-07-01	2023-07-10
	8	Mercedes	C-Class	2023-08-12	2023-08-15
	9	Audi	A4	2023-09-07	2023-09-10
	10	Lexus	ES	2023-10-10	2023-10-31

-- 16. Retrieve Details of Active Leases with Customer and Car Information.

SELECT Lease.leaseID, Customer.firstName, Customer.lastName, Vehicle.make, Vehicle.model, Lease.startDate, Lease.endDate

FROM Lease

JOIN Customer ON Lease.customerID = Customer.customerID

JOIN Vehicle ON Lease.vehicleID = Vehicle.vehicleID

WHERE Lease.endDate >= CURDATE();

Ie. All lease have ended.

-- 17. Find the Customer Who Has Spent the Most on Leases.

SELECT Customer.customerID, Customer.firstName, Customer.lastName, SUM(Payment.amount) AS totalSpent

FROM Customer

JOIN Lease ON Customer.customerID = Lease.customerID

JOIN Payment ON Lease.leaseID = Payment.leaseID

GROUP BY Customer.customerID

ORDER BY totalSpent DESC LIMIT 1;

	customerID	firstName	lastName	totalSpent
▶	10	Olivia	Adams	1580.00

-- 18. List All Cars with Their Current Lease Information.

SELECT Vehicle.vehicleID, Vehicle.make, Vehicle.model, Lease.startDate, Lease.endDate, Customer.firstName, Customer.lastName

FROM Vehicle

LEFT JOIN Lease ON Vehicle.vehicleID = Lease.vehicleID

LEFT JOIN Customer ON Lease.customerID = Customer.customerID;

vehicleID	make	model	startDate	endDate	firstName	lastName
1	Toyota	Camry	NULL	NULL	NULL	NULL
2	Honda	Civic	2023-02-15	2023-02-28	Jane	Smith
3	Ford	Focus	2023-03-10	2023-03-15	Robert	Johnson
4	Nissan	Altima	2023-04-20	2023-04-30	Sarah	Brown
4	Nissan	Altima	2023-06-15	2023-06-30	Michael	Davis
5	Chevrolet	Malibu	2023-05-05	2023-05-10	David	Lee
6	Hyundai	Sonata	NULL	NULL	NULL	NULL
7	BMW	3 Series	2023-07-01	2023-07-10	Michael	Davis
8	Mercedes	C-Class	2023-08-12	2023-08-15	Emma	Wilson
9	Audi	A4	2023-09-07	2023-09-10	Olivia	Adams
10	Lexus	ES	2023-10-10	2023-10-31	Olivia	Adams