



INFORMATICS INSTITUTE OF TECHNOLOGY

In collaboration with

UNIVERSITY OF WESTMINSTER

Object Oriented Principles

5COSC007C

Coursework – Phase 4

Vehicle Rental System

Module Leader's Name – Mr. Guhanathan Poravi

Dinuka Piyadigama

UoW ID – 17421047

IIT ID – 2018373

Contents

Design.....	2
1) Use Case Diagram	2
2) Class Diagram.....	3
All Code + Screenshots of GUIs.....	4
ConsoleApp.....	4
Controller – Package	7
API	7
DatabaseController	11
GUIController	16
WestminsterRentalVehicleManager	22
Model	33
RentalVehicleManager	33
Vehicle	34
Schedule	37
Car	39
Motorbike	41
View.....	43
GUI.....	43
Screenshots – JavaFX GUI	53
Angular GUI.....	63
app.component.html.....	63
app.component.ts	66
vehicle.service.ts	73
styles.scss.....	74
app.component.scss.....	75
Screenshots – Angular GUI	77
Testing	81
Test Plan	81
Automated testing with Junit	84
Code – Junit testing.....	84
Screenshots – Junit testing.....	99

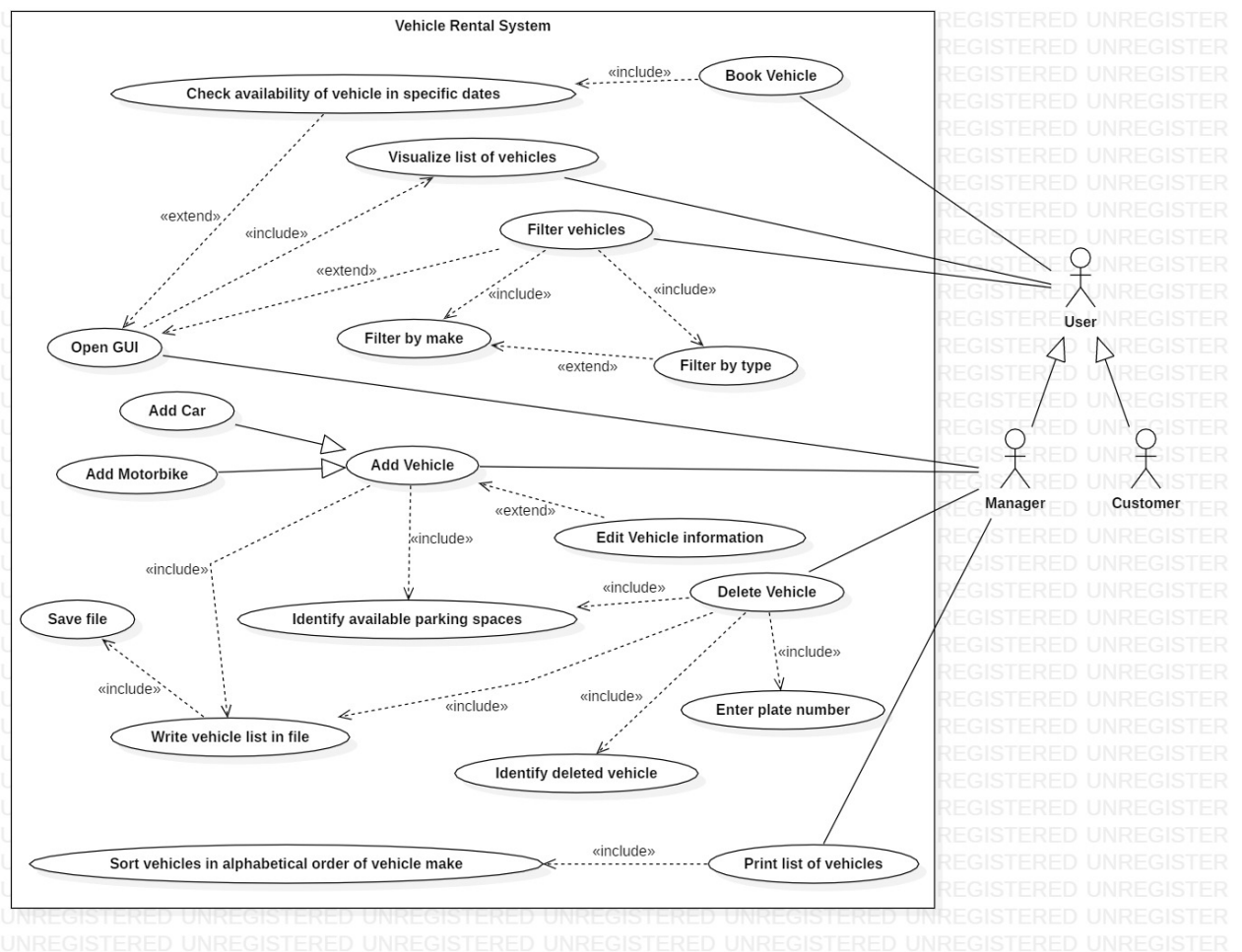
1) Use Case Diagram

"You are required to develop a program that implements a basic vehicle rental system."

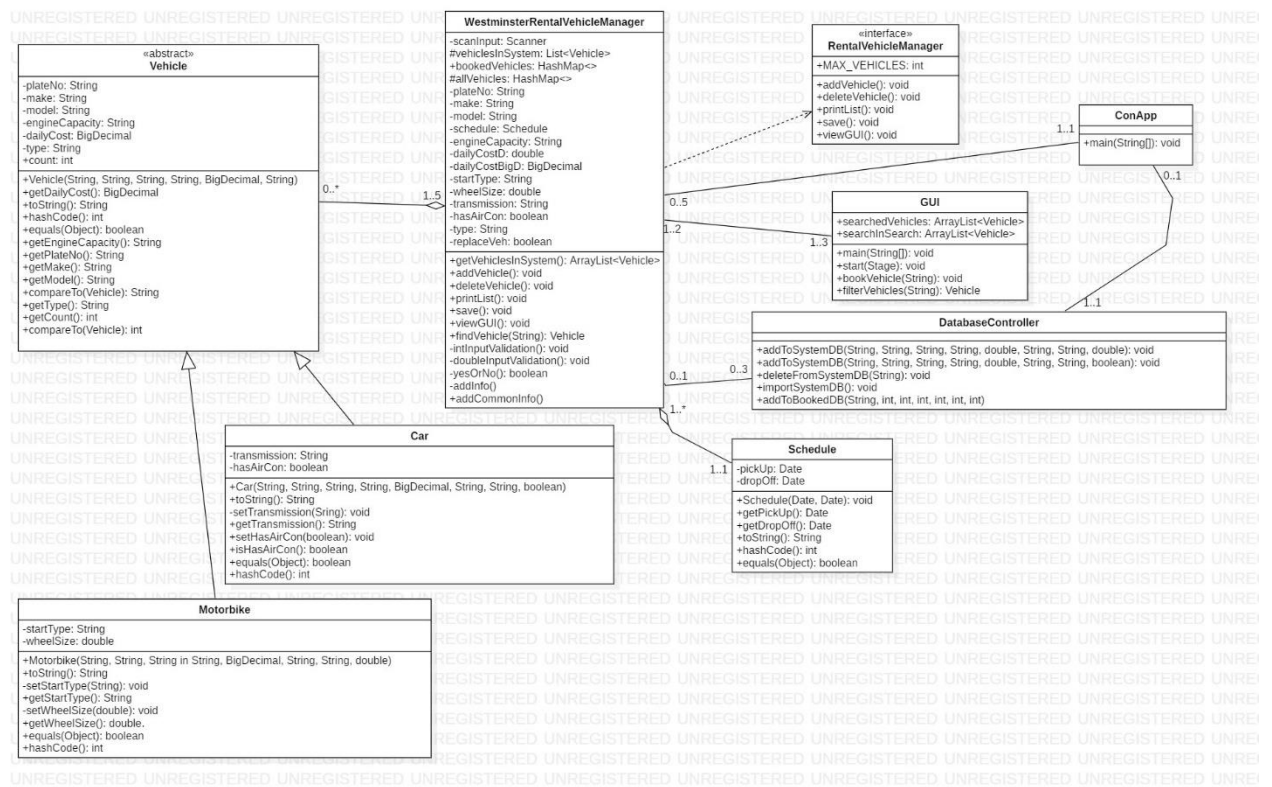
I have included the GUI section and the Console section in the same use case diagram as the assignments says that both of these are part of a single system.

“Create a Graphical User Interface (GUI) that can be opened selecting an option from the menu console”
My use case diagram satisfies this condition as well.

But I have ensured that the customers can't change the information in the system by using specialization, which clearly shows that the Manager is only allowed to perform managerial operations.



2) Class Diagram



All Code + Screenshots of GUIs

ConsoleApp

```
package lk.dinuka.VehicleRentalSystem;

import lk.dinuka.VehicleRentalSystem.Controller.API;
import lk.dinuka.VehicleRentalSystem.Controller.DatabaseController;
import lk.dinuka.VehicleRentalSystem.Controller.WestminsterRentalVehicleManager;

import java.util.HashMap;
import java.util.Scanner;

public class ConApp {

    private static HashMap<String, String> accessCredentials = new HashMap<>();    //used to
store for the user name & password to access the system functions
    //A hashMap is used to allow multiple user access credentials

    public static void main(String[] args) {

        accessCredentials.put("PrimaryAdmin", "welcome123");    //valid user name and
password

        Scanner sc = new Scanner(System.in);
        System.out.println("Enter Login Credentials to access system");
        System.out.printf("UserName: ");
        String username = sc.nextLine();
        System.out.printf("Password: ");
        String password = sc.nextLine();
        sc.reset();    //clearing the cache of the scanner to secure username and password

        if (accessCredentials.containsKey(username) &&
password.equals(accessCredentials.get(username))) {

            int chooseOption;

            API.allowHeaders();    //allow headers in multiple responses

            DatabaseController.importSystemDB();    //importing Vehicles and Bookings saved
in database

            System.out.println("\n----All vehicles and bookings retrieved from database.----");

            System.out.println(".....");
            System.out.println(".....");

            do {
```

```

System.out.println("\n\t\|~~~~~\|");
System.out.println("\t| |'```` ~~~\tVehicle Rental System\t~~ ```` | |");
System.out.println("\t/~~~~~\|");

//display main menu
System.out.println("\n1) Add item");
System.out.println("2) Delete item");
System.out.println("3) Print list of items");
System.out.println("4) Open GUI");
System.out.println("5) Exit program");
// Scanner sc = new Scanner(System.in);
System.out.print("\nEnter Option:\n>>");

while (!sc.hasNextInt()) { //validation for integer input
    System.out.println("Only integer numbers are allowed! Please provide a valid
input"); //error handling message for characters other than integers
    sc.next(); //removing incorrect input entered
}

chooseOption = sc.nextInt();

WestminsterRentalVehicleManager managementAction = new
WestminsterRentalVehicleManager(); //new object

switch (chooseOption) {
    case 1: //add vehicle
        managementAction.addVehicle();
        break;

    case 2: //delete vehicle
        managementAction.deleteVehicle();
        break;

    case 3: //print list of vehicles
        managementAction.printList();
        break;

    case 4: //open GUI
        managementAction.viewGUI();
        break;

    case 5: //display exit message
        System.out.println("\n\n**** +-----+ ****");
        System.out.println(" Thank you for using the Vehicle Management System");
        System.out.println("\tLooking forward to assist you in the future.");
        System.out.println("\t\tExiting Program...");
        System.out.println(" +-----+ ");
        System.exit(0);
}

```

```

        default:
            System.out.println("Invalid input. Please try again");
        }
    } while (chooseOption != 5);
} else {
    System.out.println("> Incorrect Access Credentials were entered! <");
}

}
}

```

/*Reference:

<https://stackoverflow.com/questions/7421612/slf4j-failed-to-load-class-org-slf4j-impl-staticloggerbinder>

*/

Controller – Package

API

```
package lk.dinuka.VehicleRentalSystem.Controller;

import com.google.gson.Gson;
import com.google.gson.GsonBuilder;
import lk.dinuka.VehicleRentalSystem.Model.Schedule;
import spark.Spark;

import java.time.LocalDate;

import static spark.Spark.*;

public class API {

    public static void getAllVehiclesToFront() {

        Gson prettyGson = new GsonBuilder().setPrettyPrinting().create();
        String vehiclesPrettyJson =
        prettyGson.toJson(WestminsterRentalVehicleManager.getVehiclesInSystem());

        //    System.out.println("Cars in Json Format: " + vehiclesPrettyJson);

        //GET - used to load data into GUI
        get("/hello", "application/json", (request, response) -> {
            return vehiclesPrettyJson;
        });

    }

    public static void postBookingsFromFront() {

        //get plateNo of vehicle and days, book vehicle if available and let the front end know it's
        availability

        //POST - used to book
        post("/books", "application/json", (request, response) -> {

            String responsePrettyJson;

            String plateNo = request.queryParams("plateNo");

            int yearPickUp = Integer.parseInt(request.queryParams("yearPickUp"));
            int monthPickUp = Integer.parseInt(request.queryParams("monthPickUp"));
            int dayPickUp = Integer.parseInt(request.queryParams("dayPickUp"));

            int yearDropOff = Integer.parseInt(request.queryParams("yearDropOff"));
```



```

int monthDropOff = Integer.parseInt(request.queryParams("monthDropOff"));
int dayDropOff = Integer.parseInt(request.queryParams("dayDropOff"));

LocalDate pickUpDate = LocalDate.of(yearPickUp, monthPickUp, dayPickUp);
LocalDate dropOffDate = LocalDate.of(yearDropOff, monthDropOff, dayDropOff);

Schedule newBooking = new Schedule(pickUpDate, dropOffDate);

//      System.out.println(newBooking);

boolean created = GUIController.createBooking(plateNo, newBooking);

response.status(201); // 201 Created

if (created) { //if booking was created
    Gson prettyGson = new GsonBuilder().setPrettyPrinting().create();
    responsePrettyJson = prettyGson.toJson("successful");

    // adding new booking to the database
    DatabaseController.addToBookedDB(plateNo, yearPickUp, monthPickUp, dayPickUp,
        yearDropOff, monthDropOff, dayDropOff);

}else{ //if booking wasn't created (already booked)
    Gson prettyGson = new GsonBuilder().setPrettyPrinting().create();
    responsePrettyJson = prettyGson.toJson("unsuccessful");
}

//      return created; //true if successful
return responsePrettyJson;
});

}

public static void postAvailabilityFromFront() {

    //get plateNo of vehicle and days. check whether vehicle is available and let the front end
    know it's availability

    //POST - used to book
    post("/checks", "application/json", (request, response) -> {

        String responsePrettyJson;

        String plateNo = request.queryParams("plateNo");

        int yearPickUp = Integer.parseInt(request.queryParams("yearPickUp"));
        int monthPickUp = Integer.parseInt(request.queryParams("monthPickUp"));
        int dayPickUp = Integer.parseInt(request.queryParams("dayPickUp"));

        int yearDropOff = Integer.parseInt(request.queryParams("yearDropOff"));

```

```

int monthDropOff = Integer.parseInt(request.queryParams("monthDropOff"));
int dayDropOff = Integer.parseInt(request.queryParams("dayDropOff"));

LocalDate pickUpDate = LocalDate.of(yearPickUp,monthPickUp,dayPickUp);
LocalDate dropOffDate = LocalDate.of(yearDropOff,monthDropOff,dayDropOff);

Schedule newBooking = new Schedule(pickUpDate,dropOffDate);

//      System.out.println(newBooking);

boolean created = GUIController.checkAvailabilityOfVeh(plateNo,newBooking);

response.status(201); // 201 Created

if (created) {    //if booking was created
    Gson prettyGson = new GsonBuilder().setPrettyPrinting().create();
    responsePrettyJson = prettyGson.toJson("successful");
}else{    //if booking wasn't created (already booked)
    Gson prettyGson = new GsonBuilder().setPrettyPrinting().create();
    responsePrettyJson = prettyGson.toJson("unsuccessful");
}

//      return created;    //true if successful
return responsePrettyJson;
});

}

public static void allowHeaders() {
    Spark.staticFiles.location("/assets");
    Spark.staticFiles.header("Access-Control-Allow-Origin", "*");

    options("/*", (req, res) -> {
        String accessControlRequestHeaders = req.headers("Access-Control-Request-Headers");
        if (accessControlRequestHeaders != null) {
            res.header("Access-Control-Allow-Headers", accessControlRequestHeaders);
        }

        String accessControlRequestMethod = req.headers("Access-Control-Request-Method");
        if (accessControlRequestMethod != null) {
            res.header("Access-Control-Allow-Methods", accessControlRequestMethod);
        }

        return "OK";
    });
}

```

```

before((req, res) -> {
    res.header("Access-Control-Allow-Origin", "*");
    res.header("Access-Control-Allow-Headers", "*");
    res.type("application/json");
});

}
}

```

/*

References:

<https://github.com/perwendel/spark>

<http://sparkjava.com/documentation#response-transformer>

JSON and java objects

<https://github.com/google/gson>

<https://www.baeldung.com/spark-framework-rest-api>

<https://gist.github.com/saeidzebardast/e375b7d17be3e0f4dddf#gistcomment-2704256>

<https://technology.finra.org/code/serialize-deserialize-interfaces-in-java.html>

<https://crunchify.com/in-java-how-to-convert-arraylist-to-jsonobject/>

Make http requests from browser

<https://github.com/axios/axios>

<https://gist.github.com/akexorcist/ea93ee47d39cf94e77802bc39c46589b>

*/

DatabaseController

```
package lk.dinuka.VehicleRentalSystem.Controller;

import com.mongodb.MongoClientURI;
import com.mongodb.client.MongoCollection;
import com.mongodb.client.MongoDatabase;
import com.mongodb.client.model.Filters;
import lk.dinuka.VehicleRentalSystem.Model.Car;
import lk.dinuka.VehicleRentalSystem.Model.Motorbike;
import lk.dinuka.VehicleRentalSystem.Model.Schedule;
import lk.dinuka.VehicleRentalSystem.Model.Vehicle;
import org.bson.Document;

import java.math.BigDecimal;
import java.time.LocalDate;
import java.util.ArrayList;

public class DatabaseController {

    public static void addToSystemDB(String plateNo, String make, String model, String
engineCapacity, double dailyCost, String type, String startType, double wheelSize) {
        //Adding a Motorbike to the Collection

        MongoClientURI uri = new MongoClientURI(
            "mongodb+srv://cw_user:123098@cluster0-
gxfyy.gcp.mongodb.net/test?retryWrites=true&w=majority");
        com.mongodb.MongoClient mongoClient = new com.mongodb.MongoClient(uri);
        MongoDatabase database = mongoClient.getDatabase("VehicleRentalSystem");

        //Access collection
        MongoCollection<Document> collection = database.getCollection("VehiclesInSystem");

        //create a document
        Document newVehicle = new Document("Plate No", plateNo)
            .append("Make", make)
            .append("Model", model)
            .append("Engine Capacity", engineCapacity)
            .append("Daily Cost", dailyCost)
            .append("Type", type)
            .append("Start Type", startType)
            .append("Wheel Size", wheelSize);

        //insert the document
        collection.insertOne(newVehicle);
    }
}
```

```

    public static void addToSystemDB(String plateNo, String make, String model, String
engineCapacity, double dailyCost, String type, String transmission, boolean hasAirCon) {
        //Adding a car to the Collection

        MongoClientURI uri = new MongoClientURI(
            "mongodb+srv://cw_user:123098@cluster0-
gxfyy.gcp.mongodb.net/test?retryWrites=true&w=majority");
        com.mongodb.MongoClient mongoClient = new com.mongodb.MongoClient(uri);
        MongoDBDatabase database = mongoClient.getDatabase("VehicleRentalSystem");

        //Access collection
        MongoCollection<Document> collection = database.getCollection("VehiclesInSystem");

        //create a document
        Document newVehicle = new Document("Plate No", plateNo)
            .append("Make", make)
            .append("Model", model)
            .append("Engine Capacity", engineCapacity)
            .append("Daily Cost", dailyCost)
            .append("Type", type)
            .append("Transmission", transmission)
            .append("Air Con", hasAirCon);

        //insert the document
        collection.insertOne(newVehicle);
    }

```

```

    public static void deleteFromSystemDB(String plateNo) {    //Deleting an item from the
Collection

```

```

        MongoClientURI uri = new MongoClientURI(
            "mongodb+srv://cw_user:123098@cluster0-
gxfyy.gcp.mongodb.net/test?retryWrites=true&w=majority");
        com.mongodb.MongoClient mongoClient = new com.mongodb.MongoClient(uri);
        MongoDBDatabase database = mongoClient.getDatabase("VehicleRentalSystem");

        //Access collection
        MongoCollection<Document> collection = database.getCollection("VehiclesInSystem");

        collection.deleteOne(Filters.eq("Plate No", plateNo));
    }

```

```

    public static void importSystemDB() {    //Importing stored data in db to application (From
VehiclesInSystem & BookedVehicles)

```

```

        MongoClientURI uri = new MongoClientURI(
            "mongodb+srv://cw_user:123098@cluster0-
gxfyy.gcp.mongodb.net/test?retryWrites=true&w=majority");

```

```

com.mongodb.MongoClient mongoClient = new com.mongodb.MongoClient(uri);
MongoDatabase database = mongoClient.getDatabase("VehicleRentalSystem");

//importing from VehiclesInSystem collection (For allVehicles HashMap & vehiclesInSystem
ArrayList)
//Access collection
MongoCollection<Document> savedCollection =
database.getCollection("VehiclesInSystem");

for(Document selectedDoc : savedCollection.find()){
    String plateNo = (String)selectedDoc.get("Plate No");
    String make = (String) selectedDoc.get("Make");
    String model = (String) selectedDoc.get("Model");
    String engineCapacity = (String) selectedDoc.get("Engine Capacity");
    double dailyCostD = (double) selectedDoc.get("Daily Cost");
    String type = (String) selectedDoc.get("Type");

    BigDecimal dailyCostBigD = BigDecimal.valueOf(dailyCostD); //converting double to
    BigDecimal, to use for calculations

    if(type.equals("Car")){
        String transmission = (String) selectedDoc.get("Transmission");
        boolean hasAirCon = (boolean) selectedDoc.get("Air Con");

        Vehicle storedCar = new
Car(plateNo,make,model,engineCapacity,dailyCostBigD,type,transmission,hasAirCon);
        WestminsterRentalVehicleManager.allVehicles.put(plateNo,storedCar);
        WestminsterRentalVehicleManager.vehiclesInSystem.add(storedCar);
//        System.out.println(storedCar); //to check whether Car was added

    }else if(type.equals("Motorbike")){
        String startType = (String) selectedDoc.get("Start Type");
        double wheelSize = (double) selectedDoc.get("Wheel Size");

        Vehicle storedBike = new
Motorbike(plateNo,make,model,engineCapacity,dailyCostBigD,type,startType,wheelSize);
        WestminsterRentalVehicleManager.allVehicles.put(plateNo,storedBike);
        WestminsterRentalVehicleManager.vehiclesInSystem.add(storedBike);
//        System.out.println(storedBike); //to check whether Motorbike was added
    }

}

//=====
//importing from BookedVehicles collection (For bookedVehicles HashMap)

```

```

MongoCollection<Document> bookedCollection =
database.getCollection("BookedVehicles");

for(Document selectedDoc : bookedCollection.find()){
    String plateNo = (String)selectedDoc.get("Plate No");

    Document pickUpObject = (Document) selectedDoc.get("pick up");
    Document dropOffObject = (Document) selectedDoc.get("drop off");

    //breaking down date document to create date using Schedule constructor
    //pick up date
    int yearUp = pickUpObject.getInteger("year");
    int monthUp = pickUpObject.getInteger("month");
    int dayUp = pickUpObject.getInteger("day");
    //drop off date
    int yearDown = dropOffObject.getInteger("year");
    int monthDown = dropOffObject.getInteger("month");
    int dayDown = dropOffObject.getInteger("day");

    LocalDate pickUpDate = LocalDate.of(yearUp,monthUp,dayUp);
    LocalDate dropOffDate = LocalDate.of(yearDown,monthDown,dayDown);

    Schedule bookedSchedule = new Schedule(pickUpDate,dropOffDate);

    if (WestminsterRentalVehicleManager.bookedVehicles.containsKey(plateNo)){
        ArrayList bookedDates =
WestminsterRentalVehicleManager.bookedVehicles.get(plateNo);
        bookedDates.add(bookedSchedule);
        WestminsterRentalVehicleManager.bookedVehicles.put(plateNo,bookedDates);
    }else{

        ArrayList bookedDate = new ArrayList();
        bookedDate.add(bookedSchedule);
        WestminsterRentalVehicleManager.bookedVehicles.put(plateNo,bookedDate);
    }

}

}

public static void addToBookedDB(String plateNo, int yearUp, int monthUp, int dayUp, int
yearDown, int monthDown, int dayDown) {

```

```

MongoClientURI uri = new MongoClientURI(
    "mongodb+srv://cw_user:123098@cluster0-
gxfyy.gcp.mongodb.net/test?retryWrites=true&w=majority");
com.mongodb.MongoClient mongoClient = new com.mongodb.MongoClient(uri);
MongoDatabase database = mongoClient.getDatabase("VehicleRentalSystem");

//Access collection
MongoCollection<Document> collection = database.getCollection("BookedVehicles");

//if already existing, delete document and add new document-----

//create a document
Document newSchedule = new Document("Plate No", plateNo)
    .append("pick up", new Document("year", yearUp)        //document inside document
        .append("month", monthUp)
        .append("day", dayUp))
    .append("drop off", new Document("year", yearDown)      //document inside
document
        .append("month", monthDown)
        .append("day", dayDown));

//insert the document
collection.insertOne(newSchedule);

}
}

/*
References:
https://www.tutorialspoint.com/mongodb/mongodb\_java
https://mongodb.github.io/mongo-java-driver/3.4/driver/getting-started/quick-start/
https://mongodb.github.io/mongo-java-driver/3.4/driver/getting-started/installation/
https://mongodb.github.io/mongo-java-driver/
https://github.com/mongodb/mongo-java-driver/tree/master

Importing MongoDB documents to Java ArrayList
https://stackoverflow.com/questions/19435621/extract-field-value-from-mongodb-
basicDBObject?rq=1
*/

```


GUIController

```
package lk.dinuka.VehicleRentalSystem.Controller;

import lk.dinuka.VehicleRentalSystem.Model.Schedule;
import lk.dinuka.VehicleRentalSystem.Model.Vehicle;

import java.math.BigDecimal;
import java.time.LocalDate;
import java.time.Period;
import java.util.ArrayList;
import java.util.List;

import static
lk.dinuka.VehicleRentalSystem.Controller.WestminsterRentalVehicleManager.bookedVehicles;

public class GUIController {

    public static boolean createBooking(Vehicle chosenVeh, Schedule newBooking ) {
        //used to create a booking as required and add booking info into the system

        List<Schedule> bookedVehicleDates = new ArrayList<>(); //used to record pick up & drop
off dates of a vehicle
        //Only used to store the dates into the bookedVehicles HashMap

        boolean availability = checkAvailabilityOfVeh(chosenVeh, newBooking); //checking
whether vehicle is available for booking

        System.out.println();
        System.out.println("---checked availability---");
        System.out.println();

        if (availability) {
            System.out.println("Vehicle is available for booking");

            if (bookedVehicles.containsKey(chosenVeh.getPlateNo())) {
                bookedVehicleDates = bookedVehicles.get(chosenVeh.getPlateNo()); //getting
recorded bookings into temporary list
            }
            bookedVehicleDates.add(newBooking); //adding the newly booked dates to the list of
bookings.

            WestminsterRentalVehicleManager.bookedVehicles.put(chosenVeh.getPlateNo(),
(ArrayList) bookedVehicleDates); //adding all booked vehicles to bookedVehicles HashMap

            System.out.println(WestminsterRentalVehicleManager.bookedVehicles); //checking
whether required booking was entered into the system
            return true;
        }
    }
}
```

```

    } else {
        System.out.println("Vehicle isn't available for booking during the requested time
period.");
        //vehicle isn't available to be book
        return false;
    }
}

//~~~~~

public static boolean checkAvailabilityOfVeh(Vehicle chosenVeh, Schedule newBooking ) {
    //used to check for the availability of a chosen vehicle

    String plateNoOfChosen = chosenVeh.getPlateNo();    //The plate number of the chosen
vehicle

    if (!WestminsterRentalVehicleManager.bookedVehicles.containsKey(plateNoOfChosen)) {
        return true;    //vehicle is not booked
    } else {

        List<Schedule> bookedVehicleDates = new ArrayList<>();    //used to record pick up &
drop off dates of a vehicle
        bookedVehicleDates = bookedVehicles.get(chosenVeh.getPlateNo());    //getting
recorded bookings into temporary list
        //Only used to get each of the dates from the bookedVehicles HashMap Values

        int totalBookings = bookedVehicles.get(plateNoOfChosen).size();
        int passedChecks = 0;

        for (int i = 0; i < totalBookings; i++) {

            boolean checkPickUpBefore = LocalDate.from(newBooking.getPickUp()).isBefore(
//pick up before booked pickup
                bookedVehicleDates.get(i).getPickUp());
            boolean checkDropOffBefore = LocalDate.from(newBooking.getDropOff()).isBefore(
//drop off before booked pick up
                bookedVehicleDates.get(i).getPickUp());

            boolean checkPickUpAfter = LocalDate.from(newBooking.getPickUp()).isAfter(
//pick up after booked drop off
                bookedVehicleDates.get(i).getDropOff());
            boolean checkDropOffAfter = LocalDate.from(newBooking.getDropOff()).isAfter(
//drop off after booked drop off
                bookedVehicleDates.get(i).getDropOff());

```

```

        if ((checkPickUpBefore && checkDropOffBefore) || (checkPickUpAfter &&
checkDropOffAfter)) {
            // if both requested pick up and drop off are either before the booked pick up date
or after the
            // booked drop off date, the vehicle is available for requested period

            passedChecks += 1;

        }
        //if false for at least one, can't book
    }

    //-----

    //      if (totalBookings>0){
    //          return passedChecks == totalBookings;          //if all the bookings don't interfere with
the requested time -> true
    //
    //      } else{
    //          return true;
    //          //since this else block will run only if there has been at least one previous entry, the
above verification isn't required
    //          return passedChecks == totalBookings;          //if all the bookings don't interfere with the
requested time -> true

    //      }
    //  }

    public static BigDecimal getCalculatedRent(BigDecimal dailyCost, Schedule newBooking) {
    //      have calculation of total cost here

        BigDecimal totalCost = BigDecimal.valueOf(0);

        Period period =
Period.between(newBooking.getPickUp(),newBooking.getDropOff());//difference between the
number of days
        int noOfDays = period.getDays();

        if (noOfDays > 0) {
            return dailyCost.multiply(BigDecimal.valueOf(noOfDays)); //dailyCost*noOfDays
        }
        return totalCost;

    }
}

```

```

//----->>>>
//Booking methods for Angular GUI
public static boolean createBooking(String plateNo, Schedule newBooking ) {
    //used to create a booking as required and add booking info into the system

    List<Schedule> bookedVehicleDates = new ArrayList<>(); //used to record pick up & drop
off dates of a vehicle
    //Only used to store the dates into the bookedVehicles HashMap

    boolean availability = checkAvailabilityOfVeh(plateNo, newBooking); //checking whether
vehicle is available for booking

    if (availability) {
//        System.out.println("Vehicle is available for booking");

        if (bookedVehicles.containsKey(plateNo)) {
            bookedVehicleDates = bookedVehicles.get(plateNo); //getting recorded
bookings into temporary list
        }
        bookedVehicleDates.add(newBooking); //adding the newly booked dates to the list of
bookings.

        WestminsterRentalVehicleManager.bookedVehicles.put(plateNo, (ArrayList)
bookedVehicleDates); //adding all booked vehicles to bookedVehicles HashMap

        return true;
    } else {
        //vehicle isn't available to be book
        return false;
    }
}

//~~~~~

public static boolean checkAvailabilityOfVeh(String plateNo, Schedule newBooking ) {
    //used to check for the availability of a chosen vehicle

    String plateNoOfChosen = plateNo; //The plate number of the chosen vehicle

    if (!WestminsterRentalVehicleManager.bookedVehicles.containsKey(plateNoOfChosen)) {
        return true; //vehicle is not booked
    } else {

```

```

        List<Schedule> bookedVehicleDates = new ArrayList<>(); //used to record pick up &
drop off dates of a vehicle
        bookedVehicleDates = bookedVehicles.get(plateNoOfChosen); //getting recorded
bookings into temporary list
        //Only used to get each of the dates from the bookedVehicles HashMap Values

        int totalBookings = bookedVehicles.get(plateNoOfChosen).size();
        int passedChecks = 0;

        for (int i = 0; i < totalBookings; i++) {

            boolean checkPickUpBefore = LocalDate.from(newBooking.getPickUp()).isBefore(
//pick up before booked pickup
                bookedVehicleDates.get(i).getPickUp());
            boolean checkDropOffBefore = LocalDate.from(newBooking.getDropOff()).isBefore(
//drop off before booked pick up
                bookedVehicleDates.get(i).getPickUp());

            boolean checkPickUpAfter = LocalDate.from(newBooking.getPickUp()).isAfter(
//pick up after booked drop off
                bookedVehicleDates.get(i).getDropOff());
            boolean checkDropOffAfter = LocalDate.from(newBooking.getDropOff()).isAfter(
//drop off after booked drop off
                bookedVehicleDates.get(i).getDropOff());

            if ((checkPickUpBefore && checkDropOffBefore) || (checkPickUpAfter &&
checkDropOffAfter)) {
                // if both requested pick up and drop off are either before the booked pick up date
or after the
                // booked drop off date, the vehicle is available for requested period

                passedChecks += 1;
            }
            //if false for at least one, can't book
        }

        //since this else block will run only if there has been at least one previous entry, the
above verification isn't required
        return passedChecks == totalBookings; //if all the bookings don't interfere with the
requested time -> true

    }
}
}

```

/*

References:

Current Date & Time

<https://stackoverflow.com/questions/833768/java-code-for-getting-current-time>

<https://docs.oracle.com/javase/1.5.0/docs/api/java/text/SimpleDateFormat.html#month>

<https://www.javatpoint.com/java-get-current-date>

Java8DateTimeExamples.java

<https://gist.github.com/mscharhag/9195718>

*/

WestminsterRentalVehicleManager

```
package lk.dinuka.VehicleRentalSystem.Controller;

import lk.dinuka.VehicleRentalSystem.Model.Car;
import lk.dinuka.VehicleRentalSystem.Model.Motorbike;
import lk.dinuka.VehicleRentalSystem.Model.RentalVehicleManager;
import lk.dinuka.VehicleRentalSystem.Model.Vehicle;
import lk.dinuka.VehicleRentalSystem.View.GUI;

import java.io.*;
import java.math.BigDecimal;
import java.nio.file.DirectoryNotEmptyException;
import java.nio.file.Files;
import java.nio.file.NoSuchFileException;
import java.nio.file.Paths;
import java.util.*;

public class WestminsterRentalVehicleManager implements RentalVehicleManager {

    private static Scanner scanInput = new Scanner(System.in);

    protected static HashMap<String, Vehicle> allVehicles = new HashMap<>();    //used to
    check whether the plate No already exists in the system
    protected static List<Vehicle> vehiclesInSystem = new ArrayList<>();    //used for sorting and
    printing.    protected: making sure that customers can't modify the vehicles in the system
    public static HashMap<String, ArrayList> bookedVehicles = new HashMap<>();    //used to
    record booked vehicles (plateNo, ArrayList of Schedules)

    public static List<Vehicle> getVehiclesInSystem() {    //accessed in GUI
        return vehiclesInSystem;
    }

    public static HashMap<String, Vehicle> getAllVehicles() {
        return allVehicles;
    }

    private static String plateNo;
    private static String make;
    private static String model;
    private static String engineCapacity;
    private static double dailyCostD;
    private static BigDecimal dailyCostBigD;
    private static String startType;
    private static double wheelSize;
    private static String transmission;
    private static boolean hasAirCon;
    private static String type;
```

```
private static boolean replaceVeh;    //used to check whether vehicle data is being added
or edited
```

```
@Override
public void addVehicle() {           //add vehicle into system
```

```
    //Pointless the getting the inputs in the console because edit option is in the add option
    (will have to repeat code)
```

```
    if (Vehicle.getCount() <= MAX_VEHICLES) {    //checking whether the vehicles existing in
    the system has occupied all the available parking lots
```

```
        int typeSelection;
        do {
            System.out.println("\nChoose the type of Vehicle to be added:");
            System.out.println("1) Car\n2) Motorbike");
            System.out.print(">");
            intInputValidation();
            typeSelection = scanInput.nextInt();
            scanInput.nextLine();    //to consume the rest of the line

        } while (!(typeSelection == 1 || typeSelection == 2));
```

```
        System.out.println("\nEnter Plate No:");
        System.out.print(">");
        plateNo = scanInput.nextLine();
```

```
        if (allVehicles.containsKey(plateNo)) {
            System.out.println("This Plate No. exists in the system.");
            System.out.println();    //to keep space for clarity
```

```
        replaceVeh = false;
```

```
        printListForEdit();    //display information of vehicle
```

```
        System.out.println();    //to keep space for clarity
        System.out.println("Do u want to edit information related to this vehicle?");
        System.out.print(">");
```

```
        boolean edit = yesOrNo();
```

```
        if (edit) {
```

```
            replaceVeh = true;
```

```
            //remove vehicle from db
            DatabaseController.deleteFromSystemDB(plateNo);
```



```

        addInfo(typeSelection);          //add information related to a Vehicle of identified
plateNo.

        deleteFile();    //deleting existing file
        save();    //saving info in file

        API.getAllVehiclesToFront();          //update vehicles in front end

    } else {
        System.out.println();    //keeps space and goes back to main menu
    }
} else {

        addInfo(typeSelection);          //add information related to a Vehicle of identified
plateNo.

        save();    //saving info in file

        API.getAllVehiclesToFront();          //update vehicles in front end

    }

} else {
    System.out.println("There are no available spaces. 50 vehicles have been added!");
}
}

@Override
public void deleteVehicle() {          //delete vehicle by entering plate no. of vehicle
    System.out.println("Enter the plate number of the vehicle that u desire to delete:");
    System.out.print(">");          //get plateNo from user to choose vehicle to be deleted
    String searchNo = scanInput.nextLine();

    if (allVehicles.containsKey(searchNo)) {
        Vehicle vehicleToBeDeleted = allVehicles.get(searchNo);

        type = vehicleToBeDeleted.getType();

        System.out.println("\nA " + type + " has been deleted from the system.");
        System.out.println("The details of the vehicle that was deleted: " +
vehicleToBeDeleted.toString());    //displaying information of deleted vehicle

        vehiclesInSystem.remove(vehicleToBeDeleted);
        allVehicles.remove(searchNo);
        Vehicle.count -= 1;    //decreasing the number of vehicles from the system by one
    }
}

```

```

//Deleting from noSQL Database
DatabaseController.deleteFromSystemDB(searchNo);

System.out.println("There are " + (MAX_VEHICLES - Vehicle.getCount()) + " parking lots
left in the garage.");

save(); //save changes to file

API.getAllVehiclesToFront(); //update vehicles in front end

} else {
    System.out.println("There's no vehicle related to the Plate No: " + searchNo);
}
}

@Override
public void printList() { //prints list of vehicles in the system

    Collections.sort(vehiclesInSystem); //sort vehicles alphabetically, according to make

    // print the plate number, the type of vehicle (car/ van/ motorbike).

    String leftAlignFormat = "| %-15s | %-12s |%n";

    System.out.format("+-----+-----+%n");
    System.out.format("| Plate ID | Type |%n");
    System.out.format("+-----+-----+%n");

    for (Vehicle item : vehiclesInSystem) {
        if (item instanceof Car) {
            System.out.format(leftAlignFormat, item.getPlateNo(), "Car");
        } else if (item instanceof Motorbike) {
            System.out.format(leftAlignFormat, item.getPlateNo(), "Motorbike");
        }
    }
    System.out.println("+-----+");
}

@Override
public void save() { //saves the information of vehicles entered into the system
    //Rewrite the file every time a change is made.

    deleteFile(); //delete existing file

    try { //creating the file
        File myFile = new File("allVehicles.txt");
        myFile.createNewFile();
    }
}

```

```
//      System.out.println("\nFile created: " + myFile.getName());
      FileWriter soldFile = new FileWriter("allVehicles.txt", true);

      soldFile.write(String.format("+-----+-----+-----+-----+-----+
-----+-----+-----+-----+-----+-----+-----+-----+-----+
      soldFile.write(String.format("| Plate ID   | Make      | Model    | Engine Capacity|
Daily Cost(£) | Type    | transmission | AirCon | Start type    | Wheel Size |%n"));
      soldFile.write(String.format("+-----+-----+-----+-----+-----+
-----+-----+-----+-----+-----+-----+-----+-----+-----+
      soldFile.write(System.getProperty("line.separator"));    //line break

      String leftAlignFormat2 = "| %-15s | %-13s | %-12s | %-14s | %-13s | %-9s | %-12s | %-
6s | %-15s | %-10s |%n";

      //writing into the file
      for (Vehicle veh : vehiclesInSystem) {
          if (veh instanceof Motorbike) {
              soldFile.write(String.format(leftAlignFormat2, veh.getPlateNo(), veh.getMake(),
veh.getModel(), veh.getEngineCapacity(),
              veh.getDailyCost(), veh.getType(), "    -    ", " - ", ((Motorbike)
veh).getStartType(), ((Motorbike) veh).getWheelSize()));
          } else {
              soldFile.write(String.format(leftAlignFormat2, veh.getPlateNo(), veh.getMake(),
veh.getModel(), veh.getEngineCapacity(),
              veh.getDailyCost(), veh.getType(), ((Car) veh).getTransmission(), ((Car)
veh).isHasAirCon(), "    -    ", " - "));
          }
          soldFile.write(System.getProperty("line.separator"));    //line break
      }
      soldFile.write(String.format("+-----+-----+-----+-----+-----+
-----+-----+-----+-----+-----+-----+-----+-----+-----+
      soldFile.close();

      } catch (IOException e) {
          System.out.println("\nAn error occurred.");
          e.printStackTrace();
      }
  }

  @Override
  public void viewGUI() {    //opens a chosen GUI
      int guiSelection;

      do {
```

```

System.out.println("\nChoose the required GUI:");
System.out.println("1) Angular\n2) JavaFX");
System.out.print(">");
intInputValidation();
guiSelection = scanInput.nextInt();
scanInput.nextLine();          //to consume the rest of the line

} while (!(guiSelection == 1 || guiSelection == 2));

if (guiSelection == 1) {      // Angular GUI

    API.getAllVehiclesToFront();      //send vehicles to front end
    API.postBookingsFromFront();      //handle booking
    API.postAvailabilityFromFront();  //handle availability

    //Open Angular GUI in browser
    ProcessBuilder builder = new ProcessBuilder("explorer.exe", "http://localhost:4200/");

    builder.redirectErrorStream(true);

    Process p = null;
    try {
        p = builder.start();
    } catch (IOException e) {
        e.printStackTrace();
    }
    BufferedReader r = new BufferedReader(new InputStreamReader(p.getInputStream()));
    String line;
    while (true) {
        try {
            line = r.readLine();
            if (line == null) {
                break;
            }
            System.out.println(line);

        } catch (IOException e) {
            e.printStackTrace();
        }
    }
}

} else {                      //JavaFX GUI

    GUI.main(null);          //used to open javafx application

}

```

```

    }

// ---- repeated methods ----

    private static void addInfo(int typeSelection) {    //method to add information related to a
Vehicle of identified plateNo.

        if (replaceVeh) {
            vehiclesInSystem.remove(allVehicles.get(plateNo));    //removing vehicle from
ArrayList, if editing it's information
        }

        if (typeSelection == 1) {    //new Car chosen
            addCommonInfo();

            type = "Car";

            System.out.println("\nEnter the type of transmission:");
            System.out.print(">");
            transmission = scanInput.nextLine();

            System.out.println("\nDoes this car have A/C?");
            System.out.print(">");

            hasAirCon = yesOrNo();

            Vehicle newCar = new Car(plateNo, make, model, engineCapacity, dailyCostBigD, type,
transmission, hasAirCon);

            allVehicles.put(plateNo, newCar);    //adding a car into the allVehicles hashMap
            vehiclesInSystem.add(newCar);

            //adding new Car to noSQL database
            DatabaseController.addToSystemDB(plateNo, make, model, engineCapacity, dailyCostD,
type, transmission, hasAirCon);

            System.out.println(newCar);    //displaying added vehicle

        } else if (typeSelection == 2) {    //new Motorbike chosen
            addCommonInfo();

            type = "Motorbike";

            System.out.println("\nEnter start type:");
            System.out.print(">");

```

```

startType = scanInput.nextLine();

System.out.println("\nEnter wheel size:");
System.out.print(">");
doubleInputValidation();
wheelSize = scanInput.nextDouble();
scanInput.nextLine();    //to consume the rest of the line

Vehicle newBike = new Motorbike(plateNo, make, model, engineCapacity, dailyCostBigD,
type, startType, wheelSize);

    allVehicles.put(plateNo, newBike);    //adding a motorbike into the allVehicles
hashMap
    vehiclesInSystem.add(newBike);

    //adding new Bike to noSQL database
    DatabaseController.addToSystemDB(plateNo, make, model, engineCapacity, dailyCostD,
type, startType, wheelSize);

    System.out.println(newBike);    //displaying added vehicle
}

System.out.println("\nThere are " + (MAX_VEHICLES - Vehicle.getCount()) + " parking lots
left, to park vehicles.");

}

private static void addCommonInfo() {    //common information related to Car & Motorbike
in addVehicle

    System.out.println("\nEnter Make:");
    System.out.print(">");
    make = scanInput.nextLine();

    System.out.println("\nEnter Model:");
    System.out.print(">");
    model = scanInput.nextLine();

    System.out.println("\nEnter Engine Capacity (in CC):");
    System.out.print(">");
    engineCapacity = scanInput.nextLine();

    System.out.println("\nEnter Daily cost (in £):");
    System.out.print(">$");
    doubleInputValidation();

```

```

        dailyCostD = scanInput.nextDouble();

        dailyCostBigD = BigDecimal.valueOf(dailyCostD);    //converting double to BigDecimal, to
        use for calculations

        scanInput.nextLine();        //to consume the rest of the line
    }

    public static void printListForEdit() {
        //print information of vehicle when asked whether to edit
        System.out.println("Make: " + allVehicles.get(plateNo).getMake());
        System.out.println("Model: " + allVehicles.get(plateNo).getModel());
        System.out.println("Engine Capacity: " + allVehicles.get(plateNo).getEngineCapacity());
        System.out.println("Daily Cost (in £): " + allVehicles.get(plateNo).getDailyCost());
        System.out.println("Type: " + allVehicles.get(plateNo).getType());

        if (allVehicles.get(plateNo) instanceof Car) {
            System.out.println("Transmission: " + ((Car) allVehicles.get(plateNo)).getTransmission());
            System.out.println("Has Air Conditioning: " + ((Car)
allVehicles.get(plateNo)).isHasAirCon());
        } else {
            System.out.println("Start Type: " + ((Motorbike)
allVehicles.get(plateNo)).getStartType());
            System.out.println("Wheel Size: " + ((Motorbike)
allVehicles.get(plateNo)).getWheelSize());
        }
    }

    private static boolean yesOrNo() {        //gets yes/ no input

        while (!scanInput.hasNextBoolean()) {        //check whether this works
as expected!!!!!!!!!!!!
            String inputYN = scanInput.nextLine().toLowerCase();
            if (inputYN.equals("y") || inputYN.equals("yes")) {
                return true;
            } else if (inputYN.equals("n") || inputYN.equals("no")) {
                return false;
            } else {
                System.out.println("Invalid input. Please try again.");
                System.out.print(">");
            }
        }
        return false;        //won't reach this point (added to get rid of the missing return
statement error)
    }

```

```

private static void intInputValidation() {           //validating integer input

    while (!scanInput.hasNextInt()) {
        System.out.println("Only integer numbers are allowed! Please provide a valid input");
//error handling message for characters other than integers
        scanInput.next();                          //removing incorrect input entered
    }
}

private static void doubleInputValidation() {       //validating double input

    while (!scanInput.hasNextDouble()) {
        System.out.println("Only numbers are allowed! Please provide a valid input");
//error handling message for characters other than integers
        scanInput.next();                          //removing incorrect input entered
    }
}

private static void deleteFile() {    //deleting file, if exists (When vehicle is added/ deleted/
edited)
    try {
        Files.deleteIfExists(Paths.get("C:\\Users\\Dell XPS15\\Documents\\IIT
Work\\L5\\OOP\\Coursework 01\\OOP-CW\\OOP-CW+\\allVehicles.txt"));
    } catch (NoSuchFileException e) {
        System.out.println("No such file/directory exists");
    } catch (DirectoryNotEmptyException e) {
        System.out.println("Directory is not empty.");
    } catch (IOException e) {
        System.out.println("Invalid permissions.");
    }
}
}

```

/*

References:

Open URL in browser (Angular GUI)

<https://alvinalexander.com/blog/post/java/how-open-read-url-java-url-class-example-code>

Java Big Decimal

<https://www.geeksforgeeks.org/bigdecimal-class-java/>

<https://stackoverflow.com/questions/27409718/java-reading-multiple-objects-from-a-file-as-they-were-in-an-array>

replacing hashMap value

<https://stackoverflow.com/questions/35297537/difference-between-replace-and-put-for-hashmap>

<https://stackoverflow.com/questions/13102045/scanner-is-skipping-nextline-after-using-next-or-nextfoo>

<https://www.callicoder.com/java-arraylist/>

<https://stackoverflow.com/questions/48720936/java-enhanced-for-loop-for-arraylist-with-custom-object>

To open GUI from console

<https://stackoverflow.com/questions/2550310/can-a-main-method-of-class-be-invoked-from-another-class-in-java>

File handling

https://www.w3schools.com/java/java_files.asp

Next line in file handling

<https://stackoverflow.com/questions/17716192/insert-line-break-when-writing-to-file>

File handling - table format

<https://stackoverflow.com/questions/26229140/writing-data-to-text-file-in-table-format>

Delete file

<https://www.geeksforgeeks.org/delete-file-using-java/>

Table display format for print list

<https://stackoverflow.com/questions/15215326/how-can-i-create-table-using-ascii-in-a-console>

Selling date/time

<https://www.javatpoint.com/java-get-current-date>

Search for object in ArrayList

<https://stackoverflow.com/questions/17526608/how-to-find-an-object-in-an-arraylist-by-property>

*/

Model

RentalVehicleManager

```
package lk.dinuka.VehicleRentalSystem.Model;
```

```
public interface RentalVehicleManager {
```

```
    //constants
```

```
    int MAX_VEHICLES = 50;
```

```
    //methods
```

```
    void addVehicle();
```

```
    void deleteVehicle();
```

```
    void printList();
```

```
    void save();
```

```
    void viewGUI();
```

```
}
```

Vehicle

```
package lk.dinuka.VehicleRentalSystem.Model;

import java.math.BigDecimal;
import java.util.Objects;

public abstract class Vehicle implements Comparable<Vehicle> {
    private String plateNo;
    private String make;
    private String model;
    private String engineCapacity;
    private BigDecimal dailyCost;
    private String type;

    public static int count = 0;

    public Vehicle(String plateNo, String make, String model, String engineCapacity, BigDecimal
dailyCost, String type) {
        this.plateNo = plateNo;
        this.make = make;
        this.model = model;
        this.engineCapacity = engineCapacity;
        this.dailyCost = dailyCost;
        this.type = type;

        count++;
    }

    @Override
    public String toString() {
        return "Vehicle{" +
            "plateNo=" + plateNo + "\" +
            ", make=" + make + "\" +
            ", model=" + model + "\" +
            ", engineCapacity=" + engineCapacity + "\" +
            ", dailyCost=" + dailyCost +
            ", type=" + type + "\" +
            "}";
    }

    public static int getCount() {
        return count;
    }

    public String getPlateNo() {
        return plateNo;
    }
}
```

```

public String getMake() {
    return make;
}

public String getModel() {
    return model;
}

public String getEngineCapacity() {
    return engineCapacity;
}

public BigDecimal getDailyCost() {
    return dailyCost;
}

public String getType() {
    return type;
}

@Override
public boolean equals(Object o) {
    if (this == o) return true;
    if (o == null || getClass() != o.getClass()) return false;
    Vehicle vehicle = (Vehicle) o;
    return Objects.equals(plateNo, vehicle.plateNo) &&
        Objects.equals(make, vehicle.make) &&
        Objects.equals(model, vehicle.model) &&
        Objects.equals(engineCapacity, vehicle.engineCapacity) &&
        Objects.equals(dailyCost, vehicle.dailyCost) &&
        Objects.equals(type, vehicle.type);
}

@Override
public int hashCode() {
    return Objects.hash(plateNo, make, model, engineCapacity, dailyCost, type);
}

@Override
public int compareTo(Vehicle obj) {
    return this.make.compareTo(obj.getMake());    //used for sorting vehicle alphabetically
    according to make
}

}

/*

```

References:

<https://www.geeksforgeeks.org/comparable-vs-comparator-in-java/>

<https://beginnersbook.com/2013/12/java-arraylist-of-object-sort-example-comparable-and-comparator/>

*/

Schedule

```
package lk.dinuka.VehicleRentalSystem.Model;

import java.time.LocalDate;
import java.util.Objects;

public class Schedule {
    private LocalDate pickUp;
    private LocalDate dropOff;

    public Schedule(LocalDate pick, LocalDate drop) {
        this.pickUp = pick;
        this.dropOff = drop;
    }

    public LocalDate getPickUp() {
        return pickUp;
    }

    public LocalDate getDropOff() {
        return dropOff;
    }

    // public String getTime() {
    //     return time;
    // }

    // public void setTime() { //getting time at which the booking was made
    //     Calendar cal = Calendar.getInstance();
    //     SimpleDateFormat sdf = new SimpleDateFormat("HH:mm:ss");
    //     String h1 = sdf.format(cal.getTime());
    //     this.time = sdf.format(cal.getTime());
    // }

    @Override
    public boolean equals(Object o) {
        if (this == o) return true;
        if (o == null || getClass() != o.getClass()) return false;
        Schedule schedule = (Schedule) o;
        return Objects.equals(pickUp, schedule.pickUp) &&
            Objects.equals(dropOff, schedule.dropOff);
    }

    @Override
```

```

public int hashCode() {
    return Objects.hash(pickUp, dropOff);
}

@Override
public String toString() {
    return "Schedule{" +
        "pickUp=" + pickUp +
        ", dropOff=" + dropOff +
        '}';
}
}

```

/*

References:

Java 8 DateTime

<https://gist.github.com/mscharhag/9195718>

Current time

<https://stackoverflow.com/questions/833768/java-code-for-getting-current-time>

<https://docs.oracle.com/javase/1.5.0/docs/api/java/text/SimpleDateFormat.html#month>

<https://www.javatpoint.com/java-get-current-date>

*/

Car

```
package lk.dinuka.VehicleRentalSystem.Model;

import java.math.BigDecimal;
import java.util.Objects;

public class Car extends Vehicle {

    private String transmission;
    private boolean hasAirCon;

    public Car(String plateNo, String make, String model, String engineCapacity, BigDecimal
dailyCost, String type, String transmission, boolean hasAirCon) {
        super(plateNo, make, model, engineCapacity, dailyCost, type);
        this.transmission = transmission;          //making sure that this extra info is added when
creating a new Car object
        this.hasAirCon = hasAirCon;
    }

    public String getTransmission() {
        return transmission;
    }

    public void setTransmission(String transmission) {
        this.transmission = transmission;
    }

    public boolean isHasAirCon() {
        return hasAirCon;
    }

    public void setHasAirCon(boolean hasAirCon) {
        this.hasAirCon = hasAirCon;
    }

    @Override
    public String toString() {
        return super.toString() + " {" +
            "transmission=\"" + transmission + "\" +
            ", hasAirCon=" + hasAirCon +
            '}';
    }

    @Override
    public boolean equals(Object o) {
        if (this == o) return true;
        if (o == null || getClass() != o.getClass()) return false;
        if (!super.equals(o)) return false;
```



```
Car car = (Car) o;  
return hasAirCon == car.hasAirCon &&  
    Objects.equals(transmission, car.transmission);  
}  
  
@Override  
public int hashCode() {  
    return Objects.hash(super.hashCode(), transmission, hasAirCon);  
}  
}
```

Motorbike

```
package lk.dinuka.VehicleRentalSystem.Model;

import java.math.BigDecimal;
import java.util.Objects;

public class Motorbike extends Vehicle {

    private String startType;    //Kick Start or Electric Start
    private double wheelSize;

    public Motorbike(String plateNo, String make, String model, String engineCapacity,
        BigDecimal dailyCost, String type, String startType, double wheelSize) {
        super(plateNo, make, model, engineCapacity, dailyCost, type);
        this.startType = startType;    //making sure that this extra info is added when
        creating a new Motorbike object
        this.wheelSize = wheelSize;
    }

    public String getStartType() {
        return startType;
    }

    public void setStartType(String startType) {
        this.startType = startType;
    }

    public double getWheelSize() {
        return wheelSize;
    }

    public void setWheelSize(double wheelSize) {
        this.wheelSize = wheelSize;
    }

    @Override
    public String toString() {
        return super.toString() + " " +
            "startType=" + startType + "\" +
            ", wheelSize=" + wheelSize +
            "\"";
    }

    @Override
    public boolean equals(Object o) {
        if (this == o) return true;
        if (o == null || getClass() != o.getClass()) return false;
        if (!super.equals(o)) return false;
        Motorbike motorbike = (Motorbike) o;
```

```
        return Double.compare(motorbike.wheelSize, wheelSize) == 0 &&  
            Objects.equals(startType, motorbike.startType);  
    }  
  
    @Override  
    public int hashCode() {  
        return Objects.hash(super.hashCode(), startType, wheelSize);  
    }  
}
```

View

GUI

```
package lk.dinuka.VehicleRentalSystem.View;

import javafx.application.Application;
import javafx.event.ActionEvent;
import javafx.event.EventHandler;
import javafx.geometry.Insets;
import javafx.scene.Scene;
import javafx.scene.control.*;
import javafx.scene.control.cell.PropertyValueFactory;
import javafx.scene.layout.HBox;
import javafx.scene.layout.VBox;
import javafx.scene.paint.Color;
import javafx.scene.text.Text;
import javafx.stage.Stage;
import lk.dinuka.VehicleRentalSystem.Controller.DatabaseController;
import lk.dinuka.VehicleRentalSystem.Controller.GUIController;
import lk.dinuka.VehicleRentalSystem.Controller.WestminsterRentalVehicleManager;
import lk.dinuka.VehicleRentalSystem.Model.*;

import java.util.ArrayList;

public class GUI extends Application {
    public static void main(String[] args) {
        launch(args);
    }

    private static ArrayList<Vehicle> searchedVehicles = new ArrayList<>(); //used to pass in
    searched vehicles into the table
    private static ArrayList<Vehicle> searchInSearch = new ArrayList<>(); //used to filter
    search by Vehicle type

    //-----//

    @Override
    public void start(Stage primaryStage) throws Exception {
        // Platform.setImplicitExit(false);
        primaryStage.setTitle("List of vehicles in system");

        TableView tableOfVehicles = new TableView();

        //Creating columns to be added to the table
        TableColumn<String, Vehicle> plateNoColumn = new TableColumn<>("Plate No");
        plateNoColumn.setCellValueFactory(new PropertyValueFactory<>("plateNo"));

        TableColumn<String, Vehicle> makeColumn = new TableColumn<>("Make");
```

```

makeColumn.setCellValueFactory(new PropertyValueFactory<>("make"));

TableColumn<String, Vehicle> modelColumn = new TableColumn<>("Model");
modelColumn.setCellValueFactory(new PropertyValueFactory<>("model"));

TableColumn<String, Vehicle> engineCapacityColumn = new TableColumn<>("Engine
Capacity(CC)");
engineCapacityColumn.setCellValueFactory(new
PropertyValueFactory<>("engineCapacity"));
engineCapacityColumn.setMinWidth(130);

TableColumn<String, Vehicle> dailyCostColumn = new TableColumn<>("Daily Cost(£)");
dailyCostColumn.setCellValueFactory(new PropertyValueFactory<>("dailyCost"));
dailyCostColumn.setMinWidth(110);

TableColumn<String, Vehicle> typeColumn = new TableColumn<>("Type");
typeColumn.setCellValueFactory(new PropertyValueFactory<>("type"));

TableColumn<String, Vehicle> transmissionColumn = new TableColumn<>("Transmission");
transmissionColumn.setCellValueFactory(new PropertyValueFactory<>("transmission"));
transmissionColumn.setMinWidth(130);

TableColumn<String, Vehicle> hasAirConColumn = new TableColumn<>("Has Air
Conditioning");
hasAirConColumn.setCellValueFactory(new PropertyValueFactory<>("hasAirCon"));
hasAirConColumn.setMinWidth(180);

TableColumn<String, Vehicle> startTypeColumn = new TableColumn<>("Start Type");
startTypeColumn.setCellValueFactory(new PropertyValueFactory<>("startType"));
startTypeColumn.setMinWidth(120);

TableColumn<String, Vehicle> wheelSizeColumn = new TableColumn<>("Wheel Size");
wheelSizeColumn.setCellValueFactory(new PropertyValueFactory<>("wheelSize"));
wheelSizeColumn.setMinWidth(130);

tableOfVehicles.getColumns().addAll(plateNoColumn, makeColumn, modelColumn,
engineCapacityColumn, dailyCostColumn,
    typeColumn, transmissionColumn, hasAirConColumn, startTypeColumn,
wheelSizeColumn);    //adding all the columns to the table

tableOfVehicles.getItems().addAll(WestminsterRentalVehicleManager.getVehiclesInSystem());
//adding all the vehicles in the available
// in the vehiclesInSystem ArrayList

searchedVehicles.addAll(WestminsterRentalVehicleManager.getVehiclesInSystem());
//to get filter by vehicle type to work before searching for a Make

```

```

//-----

HBox searchSection = new HBox();
searchSection.setMinWidth(220);
searchSection.getChildren().add(new Label("Search Make:"));

TextField makeSearch = new TextField();
searchSection.getChildren().add(makeSearch);

Button searchClick = new Button("Search");
searchSection.getChildren().add(searchClick);
Button resetClick = new Button("Reset");
searchSection.getChildren().add(resetClick);

//    VBox filterSection = new VBox(new Label("Filter By"));

HBox filterType = new HBox(new Label("Filter Type:"));
Button filterCarClick = new Button("Cars");
filterType.getChildren().add(filterCarClick);
Button filterBikeClick = new Button("Motorbikes");
filterType.getChildren().add(filterBikeClick);

filterType.setPadding(new Insets(10, 0, 0, 0));

//    HBox filterEngineCap = new HBox(new Label("Engine Capacity:"));

filterType.setMinWidth(200);
//    filterSection.getChildren().addAll(filterType);

VBox allSearchFilter = new VBox(searchSection, filterType);
allSearchFilter.setPadding(new Insets(20, 0, 20, 20));

//-----

VBox bookingSection = new VBox();

HBox allDates = new HBox();

//pick up date entry section
HBox pickUpDateSec = new HBox(new Label("Pick Up:"));

// ----->>>>>>
DatePicker pickDatePicker = new DatePicker();

//    pickUpDateSec.getChildren().addAll(dayPickUp, monthPickUp, yearPickUp);

```

```

pickUpDateSec.getChildren().addAll(pickDatePicker);

//drop off date entry section
HBox dropOffDateSec = new HBox();
Label dropOffLabel = new Label("Drop Off:");

// ----->>>>>>
DatePicker dropDatePicker = new DatePicker();
// dropOffDateSec.getChildren().addAll(dropOffLabel, dayDropOff, monthDropOff,
yearDropOff);
dropOffDateSec.getChildren().addAll(dropOffLabel, dropDatePicker);

Button availabilityCheck = new Button("Check Availability");

allDates.setSpacing(10.0);

Button bookOnClick = new Button("Book");
// bookOnClick.setAlignment(right);

Text checkBookedStatus = new Text();
Text bookStatusText = new Text();
Text displayTotalCost = new Text();

VBox buttonsForBooking = new VBox();
buttonsForBooking.getChildren().addAll(availabilityCheck, bookOnClick);
buttonsForBooking.setSpacing(5.0);

allDates.getChildren().addAll(pickUpDateSec, dropOffDateSec, buttonsForBooking);

bookingSection.getChildren().addAll(allDates, checkBookedStatus, bookStatusText,
displayTotalCost);

bookingSection.setPadding(new Insets(20, 0, 20, 20));

//-----

VBox parent = new VBox(allSearchFilter, tableOfVehicles, bookingSection);
Scene newScene = new Scene(parent);
primaryStage.setScene(newScene);
primaryStage.show();
primaryStage.setAlwaysOnTop(true); //open the application on top of intelliJ

//-----//-----//-----//-----//

```

```

//Button actions

searchClick.setOnAction(new EventHandler<ActionEvent>() {           //actions when search
button is clicked

    @Override
    public void handle(ActionEvent event) {

        String vehMakeSearch = makeSearch.getText();    //getting Make to be searched

        searchedVehicles.clear();    //clearing previous search results from ArrayList

        for (Vehicle searchVeh : WestminsterRentalVehicleManager.getVehiclesInSystem()) {
            if (searchVeh.getMake().equals(vehMakeSearch)) {
                searchedVehicles.add(searchVeh);    //adding vehicles that have matching makes
as searched into ArrayList
            }
        }
//        System.out.println(searchedVehicles);    //to check

        tableOfVehicles.getItems().clear();    //clearing table
        tableOfVehicles.getItems().addAll(searchedVehicles);

    }
});

resetClick.setOnAction(new EventHandler<ActionEvent>() {           //actions when reset
button is clicked

    @Override
    public void handle(ActionEvent event) {

        searchedVehicles.clear();    //resetting search to all Vehicles
        searchedVehicles.addAll(WestminsterRentalVehicleManager.getVehiclesInSystem());

        tableOfVehicles.getItems().clear();    //reseting display to all Vehicles

        tableOfVehicles.getItems().addAll(WestminsterRentalVehicleManager.getVehiclesInSystem());

        makeSearch.setText("");
    }
});

filterCarClick.setOnAction(new EventHandler<ActionEvent>() {           //actions when Filter
Cars button is clicked

    @Override

```



```

        public void handle(ActionEvent event) {

            searchInSearch.clear();

            for (Vehicle searchVeh : searchedVehicles) {
                if (searchVeh instanceof Car) {
                    searchInSearch.add(searchVeh);    //adding vehicles that are of Type Car into
ArrayList
                }
            }
//            System.out.println(searchInSearch);    //to check

            tableOfVehicles.getItems().clear();    //clearing table
            tableOfVehicles.getItems().addAll(searchInSearch);

        }
    });

    filterBikeClick.setOnAction(new EventHandler<ActionEvent>() {    //actions when Filter
Motorbikes button is clicked

        @Override
        public void handle(ActionEvent event) {

            searchInSearch.clear();

            for (Vehicle searchVeh : searchedVehicles) {
                if (searchVeh instanceof Motorbike) {
                    searchInSearch.add(searchVeh);    //adding vehicles that are of Type Car into
ArrayList
                }
            }
//            System.out.println(searchInSearch);    //to check

            tableOfVehicles.getItems().clear();    //clearing table
            tableOfVehicles.getItems().addAll(searchInSearch);

        }
    });

    //-----

    availabilityCheck.setOnAction(new EventHandler<ActionEvent>() {    //actions when
Availability check button is clicked

        @Override

```

```

public void handle(ActionEvent event) {

    try {
        if (tableOfVehicles.getSelectionModel().getSelectedItem() != null) {

            Vehicle chosenVeh = (Vehicle)
tableOfVehicles.getSelectionModel().getSelectedItem();    //selected vehicle's information

//            System.out.println(chosenVeh);    //to check whether expected vehicle was
chosen

            Schedule newBooking = new Schedule(pickDatePicker.getValue(),
dropDatePicker.getValue());

            boolean availability = GUIController.checkAvailabilityOfVeh(chosenVeh,
newBooking);

            if (availability) { //vehicle available
                checkBookedStatus.setFill(Color.GREEN);
//            System.out.println("Vehicle is available for booking.");
                checkBookedStatus.setText(chosenVeh.getPlateNo() + " is available for
booking.");
            } else {
                checkBookedStatus.setFill(Color.RED);
//            System.out.println("Vehicle isn't available for booking during requested time
period.");
                checkBookedStatus.setText(chosenVeh.getPlateNo() + " isn't available for
booking during requested time period.");
            }
        } else {
            checkBookedStatus.setFill(Color.DARKGRAY);
            checkBookedStatus.setText("Please select a vehicle to book.");

            bookStatusText.setText("");    //clearing old booking details
            displayTotalCost.setText("");
        }
    } catch (NumberFormatException e) {
        checkBookedStatus.setFill(Color.DARKGRAY);
        checkBookedStatus.setText("Please enter a valid date in Integer Numbers.");
    }
}

bookOnClick.setOnAction(new EventHandler<ActionEvent>() {    //actions when Book
button is clicked

```

```

@Override
public void handle(ActionEvent event) {

    try {
        if (tableOfVehicles.getSelectionModel().getSelectedItem() != null) {
            //getting selected vehicle's information
            Vehicle chosenVeh = (Vehicle)
tableOfVehicles.getSelectionModel().getSelectedItem();    //selected vehicle's information
            //down-casted from Object type to Vehicle type
            System.out.println(chosenVeh);    //to check whether expected vehicle was
chosen

            Schedule newBooking = new Schedule(pickDatePicker.getValue(),
dropDatePicker.getValue());

            boolean booked = GUIController.createBooking(chosenVeh, newBooking);

            if (booked) {

                checkBookedStatus.setFill(Color.GREEN);
//            System.out.println("Vehicle is available for booking.");
                checkBookedStatus.setText(chosenVeh.getPlateNo() + " is available for
booking.");

                bookStatusText.setText("Booked vehicle with Plate No: " +
chosenVeh.getPlateNo() + " from " +
                    newBooking.getPickUp() + " to " + newBooking.getDropOff());

                displayTotalCost.setText("Total Cost: £" +
GUIController.getCalculatedRent(chosenVeh.getDailyCost(), newBooking));

                int yearPickUpInput = pickDatePicker.getValue().getYear();
                int monthPickUpInput = pickDatePicker.getValue().getMonthValue();
                int dayPickUpInput = pickDatePicker.getValue().getDayOfMonth();

                int yearDropOffInput = pickDatePicker.getValue().getYear();
                int monthDropOffInput = pickDatePicker.getValue().getMonthValue();
                int dayDropOffInput = pickDatePicker.getValue().getDayOfMonth();

                //addToBookedDB here
                DatabaseController.addToBookedDB(chosenVeh.getPlateNo(), yearPickUpInput,
monthPickUpInput, dayPickUpInput,
                    yearDropOffInput, monthDropOffInput, dayDropOffInput);

```

```

        } else {
            //notify the user that the vehicle isn't available for rent during the chosen time
period.
            checkBookedStatus.setFill(Color.RED);
//
            System.out.println("Vehicle isn't available for booking during requested time
period.");
            checkBookedStatus.setText(chosenVeh.getPlateNo() + " isn't available for
booking during requested time period.");

            bookStatusText.setText("");
            displayTotalCost.setText("");
        }
    } else {
        checkBookedStatus.setFill(Color.DARKGRAY);
        checkBookedStatus.setText("Please select a vehicle to book.");

    }
} catch (NumberFormatException e) {
    checkBookedStatus.setFill(Color.DARKGRAY);
    checkBookedStatus.setText("Please enter a valid date in Integer Numbers.");
}

}
});
}
}

```

/*

References:

<https://stackoverflow.com/questions/14169240/getting-integer-values-from-textfield>

How to get information of selected row in javafx tableview

<https://stackoverflow.com/questions/17388866/getting-selected-item-from-a-javafx-tableview>

javafx Datepicker

<http://tutorials.jenkov.com/javafx/datepicker.html>

Error handling in GUI

<https://stackoverflow.com/questions/18711896/how-can-i-prevent-java-lang-numberformatexception-for-input-string-n-a>

https://docs.oracle.com/javafx/2/layout/size_align.htm

Multithreading for GUI

<https://code-examples.net/en/q/173180e>

<https://stackoverflow.com/questions/24320014/how-to-call-launch-more-than-once-in-java?noredirect=1&lq=1>

<https://stackoverflow.com/questions/32355335/on-javafx-how-to-hide-stage-without-disposing-it-and-closing-the-application/32356741>

*/

Screenshots – JavaFX GUI

Visualize the list of vehicles

Plate No	Make	Model	Engine Capacit...	Daily Cost(£)	Type	Transmission	Has Air Conditioning	Start Type	Wheel Size
CAR 6069	Audi	A6	2400	120.0	Car	Auto	true		
BIM-4041	Bajaj	Pulsar	150	30.0	Motorbike			Kick	14.0
CBK 2424	Benz	C200	2000	100.0	Car	Auto	true		
HUN-8909	Hero	Maestro	110	35.0	Motorbike			Electric	12.0
BIK 2525	Honda	Cuvic	1000	50.0	Motorbike			Electric	14.0
CRV 8281	Honda	Fit	1400	60.0	Car	Manual	true		
PIQ-2019	Honda	Hornet	250	50.0	Motorbike			Electric	16.0
BMS 2123	Suzuki	Gixxer	155	30.0	Motorbike			Electric	17.0
KJ 5031	Toyota	Corolla	1800	70.0	Car	Manual	true		
GM 7194	Toyota	Allion	1800	75.0	Car	Auto	false		
2dg	Yamah	YC300	1000	29.0	Motorbike			Kick	60.0
jh	hb	hbK	87yh	879.0	Car	uih	true		

Code

```
@Override
public void start(Stage primaryStage) throws Exception {
//    Platform.setImplicitExit(false);
    primaryStage.setTitle("List of vehicles in system");

    TableView tableOfVehicles = new TableView();

    //Creating columns to be added to the table
    TableColumn<String, Vehicle> plateNoColumn = new TableColumn<>("Plate No");
    plateNoColumn.setCellValueFactory(new PropertyValueFactory<>("plateNo"));

    TableColumn<String, Vehicle> makeColumn = new TableColumn<>("Make");
    makeColumn.setCellValueFactory(new PropertyValueFactory<>("make"));

    TableColumn<String, Vehicle> modelColumn = new TableColumn<>("Model");
    modelColumn.setCellValueFactory(new PropertyValueFactory<>("model"));

    TableColumn<String, Vehicle> availabilityColumn = new TableColumn<>("Availability");
    availabilityColumn.setCellValueFactory(new PropertyValueFactory<>("availability"));
    availabilityColumn.setMinWidth(100);

    TableColumn<String, Vehicle> engineCapacityColumn = new TableColumn<>("Engine
Capacity");
```

```

        engineCapacityColumn.setCellValueFactory(new
PropertyConnectionFactory<>("engineCapacity"));
        engineCapacityColumn.setMinWidth(130);

        TableColumn<String, Vehicle> dailyCostColumn = new TableColumn<>("Daily Cost");
        dailyCostColumn.setCellValueFactory(new PropertyConnectionFactory<>("dailyCost"));
        dailyCostColumn.setMinWidth(110);

        TableColumn<String, Vehicle> typeColumn = new TableColumn<>("Type");
        typeColumn.setCellValueFactory(new PropertyConnectionFactory<>("type"));

        TableColumn<String, Vehicle> transmissionColumn = new TableColumn<>("Transmission");
        transmissionColumn.setCellValueFactory(new PropertyConnectionFactory<>("transmission"));
        transmissionColumn.setMinWidth(130);

        TableColumn<String, Vehicle> hasAirConColumn = new TableColumn<>("Has Air
Conditioning");
        hasAirConColumn.setCellValueFactory(new PropertyConnectionFactory<>("hasAirCon"));
        hasAirConColumn.setMinWidth(180);

        TableColumn<String, Vehicle> startTypeColumn = new TableColumn<>("Start Type");
        startTypeColumn.setCellValueFactory(new PropertyConnectionFactory<>("startType"));
        startTypeColumn.setMinWidth(120);

        TableColumn<String, Vehicle> wheelSizeColumn = new TableColumn<>("Wheel Size");
        wheelSizeColumn.setCellValueFactory(new PropertyConnectionFactory<>("wheelSize"));
        wheelSizeColumn.setMinWidth(130);

        tableOfVehicles.getColumns().addAll(plateNoColumn, makeColumn, modelColumn,
availabilityColumn, engineCapacityColumn, dailyCostColumn,
        typeColumn, transmissionColumn, hasAirConColumn, startTypeColumn,
wheelSizeColumn);        //adding all the columns to the table

        tableOfVehicles.getItems().addAll(WestminsterRentalVehicleManager.getVehiclesInSystem());
        //adding all the vehicles in the available
        // in the vehiclesInSystem ArrayList

        searchedVehicles.addAll(WestminsterRentalVehicleManager.getVehiclesInSystem());
        //to get filter by vehicle type to work before searching for a Make

```

Explanation of the functionality

When the GUI is opened, the list of all vehicles is displayed as shown above.

Filter vehicles by type

Filtered by cars

List of vehicles in system

Search Make:

SearchReset

Filter Type:

CarsMotorbikes

Plate No	Make	Model	Engine Capacit...	Daily Cost(£)	Type	Transmission	Has Air Conditioning	Start Type	Wheel Size
CAR 6069	Audi	A6	2400	120.0	Car	Auto	true		
CBK 2424	Benz	C200	2000	100.0	Car	Auto	true		
CRV 8281	Honda	Fit	1400	60.0	Car	Manual	true		
KJ 5031	Toyota	Corolla	1800	70.0	Car	Manual	true		
GM 7194	Toyota	Allion	1800	75.0	Car	Auto	false		
jh	hb	hbk	87yh	879.0	Car	uih	true		

Pick Up:

Drop Off:

Check Availability

Book

Code

```
filterCarClick.setOnAction(new EventHandler<ActionEvent>() {           //actions when Filter
Cars button is clicked
```

```
    @Override
    public void handle(ActionEvent event) {

        searchInSearch.clear();

        for (Vehicle searchVeh : searchedVehicles) {
            if (searchVeh instanceof Car) {
                searchInSearch.add(searchVeh);    //adding vehicles that are of Type Car into
ArrayList
            }
        }
//        System.out.println(searchInSearch);    //to check

        tableOfVehicles.getItems().clear();    //clearing table
        tableOfVehicles.getItems().addAll(searchInSearch);

    }
});
```



```

        filterBikeClick.setOnAction(new EventHandler<ActionEvent>() {           //actions when Filter
Motorbikes button is clicked

        @Override
        public void handle(ActionEvent event) {

            searchInSearch.clear();

            for (Vehicle searchVeh : searchedVehicles) {
                if (searchVeh instanceof Motorbike) {
                    searchInSearch.add(searchVeh);    //adding vehicles that are of Type Car into
ArrayList
                }
            }
//            System.out.println(searchInSearch);    //to check

            tableOfVehicles.getItems().clear();    //clearing table
            tableOfVehicles.getItems().addAll(searchInSearch);

        }
    });

```

Explanation of the functionality

When the “Filter Type: Cars” button is clicked, all the cars in the system are displayed in the table. Similarly, it works for Motorbikes as well.

Filter vehicles by make

Search Make:

Filter Type:

Plate No	Make	Model	Engine Capacit...	Daily Cost(£)	Type	Transmission	Has Air Conditioning	Start Type	Wheel Size
KJ 5031	Toyota	Corolla	1800	70.0	Car	Manual	true		
GM 7194	Toyota	Allion	1800	75.0	Car	Auto	false		

Pick Up: Drop Off:

Code

```
searchClick.setOnAction(new EventHandler<ActionEvent>() {    //actions when search
button is clicked

    @Override
    public void handle(ActionEvent event) {

        String vehMakeSearch = makeSearch.getText();    //getting Make to be searched

        searchedVehicles.clear();    //clearing previous search results from ArrayList

        for (Vehicle searchVeh : WestminsterRentalVehicleManager.getVehiclesInSystem()) {
            if (searchVeh.getMake().equals(vehMakeSearch)) {
                searchedVehicles.add(searchVeh);    //adding vehicles that have matching makes
as searched into ArrayList
            }
        }
//        System.out.println(searchedVehicles);    //to check

        tableOfVehicles.getItems().clear();    //clearing table
        tableOfVehicles.getItems().addAll(searchedVehicles);

    }
});
```

Explanation of the functionality

When the required make is typed in and search using the search box, all vehicles related to the searched Make is displayed.

When researched is clicked all Filters and search results are removed, displaying all the vehicles available in the system.

Check availability on specific dates

List of vehicles in system

Search Make:

Search

Reset

Filter Type:

Cars

Motorbikes

Plate No	Make	Model	Engine Capacit...	Daily Cost(£)	Type	Transmission	Has Air Conditioning	Start Type	Wheel Size
CAR 6069	Audi	A6	2400	120.0	Car	Auto	true		
BIM-4041	Bajaj	Pulsar	150	30.0	Motorbike			Kick	14.0
CBK 2424	Benz	C200	2000	100.0	Car	Auto	true		
HUN-8909	Hero	Maestro	110	35.0	Motorbike			Electric	12.0
BIK 2525	Honda	Cuvic	1000	50.0	Motorbike			Electric	14.0
CRV 8281	Honda	Fit	1400	60.0	Car	Manual	true		
PIQ-2019	Honda	Hornet	250	50.0	Motorbike			Electric	16.0
BMS 2123	Suzuki	Gixxer	155	30.0	Motorbike			Electric	17.0
KJ 5031	Toyota	Corolla	1800	70.0	Car	Manual	true		
GM 7194	Toyota	Allion	1800	75.0	Car	Auto	false		
2dg	Yamah	YC300	1000	29.0	Motorbike			Kick	60.0
jh	hb	hbk	87yh	879.0	Car	uih	true		

Pick Up: 02/12/2019

Drop Off: 05/12/2019

Check Availability

Book

KJ 5031 is available for booking.

List of vehicles in system

Search Make:

Search

Reset

Filter Type:

Cars

Motorbikes

Plate No	Make	Model	Engine Capacit...	Daily Cost(£)	Type	Transmission	Has Air Conditioning	Start Type	Wheel Size
CAR 6069	Audi	A6	2400	120.0	Car	Auto	true		
BIM-4041	Bajaj	Pulsar	150	30.0	Motorbike			Kick	14.0
CBK 2424	Benz	C200	2000	100.0	Car	Auto	true		
HUN-8909	Hero	Maestro	110	35.0	Motorbike			Electric	12.0
BIK 2525	Honda	Cuvic	1000	50.0	Motorbike			Electric	14.0
CRV 8281	Honda	Fit	1400	60.0	Car	Manual	true		
PIQ-2019	Honda	Hornet	250	50.0	Motorbike			Electric	16.0
BMS 2123	Suzuki	Gixxer	155	30.0	Motorbike			Electric	17.0
KJ 5031	Toyota	Corolla	1800	70.0	Car	Manual	true		
GM 7194	Toyota	Allion	1800	75.0	Car	Auto	false		
2dg	Yamah	YC300	1000	29.0	Motorbike			Kick	60.0
jh	hb	hbk	87yh	879.0	Car	uih	true		

Pick Up: 02/12/2019

Drop Off: 05/12/2019

Check Availability

Book

KJ 5031 isn't available for booking during requested time period.

Code

```
availabilityCheck.setOnAction(new EventHandler<ActionEvent>() { //actions when
Availability check button is clicked
```

```
@Override
public void handle(ActionEvent event) {
```

```

try {
    if (tableOfVehicles.getSelectionModel().getSelectedItem() != null &&
        pickDatePicker.getValue() != null &&
        dropDatePicker.getValue() != null){

        Vehicle chosenVeh = (Vehicle)
tableOfVehicles.getSelectionModel().getSelectedItem();    //selected vehicle's information

//          System.out.println(chosenVeh);    //to check whether expected vehicle was
chosen

        Schedule newBooking = new Schedule(pickDatePicker.getValue(),
dropDatePicker.getValue());

        boolean availability = GUIController.checkAvailabilityOfVeh(chosenVeh,
newBooking);

        if (availability) { //vehicle available
            checkBookedStatus.setFill(Color.GREEN);
//          System.out.println("Vehicle is available for booking.");
            checkBookedStatus.setText(chosenVeh.getPlateNo() + " is available for
booking.");

            bookStatusText.setText("");    //clearing old booking details
            displayTotalCost.setText("");

        } else {
            checkBookedStatus.setFill(Color.RED);
//          System.out.println("Vehicle isn't available for booking during requested time
period.");
            checkBookedStatus.setText(chosenVeh.getPlateNo() + " isn't available for
booking during requested time period.");

            bookStatusText.setText("");    //clearing old booking details
            displayTotalCost.setText("");

        }
    } else{
        checkBookedStatus.setFill(Color.DARKGRAY);
        checkBookedStatus.setText("Please select a vehicle to book and enter a valid date
range.");

        bookStatusText.setText("");    //clearing old booking details
        displayTotalCost.setText("");
    }
} catch (NullPointerException e) {
    checkBookedStatus.setFill(Color.DARKGRAY);

```

```

        checkBookedStatus.setText("Please select a vehicle to book and enter a valid date
range.");
    }
}
});

```

Explanation of the functionality

When “Check Availability” is clicked after a vehicle is selected and pick up & drop off dates are specified, the system will let the user know whether the chosen vehicles is available or not during the requested time period. This is checked when “Book Vehicle” is clicked as well.

Book vehicle

Code

```

bookOnClick.setOnAction(new EventHandler<ActionEvent>() {           //actions when Book
button is clicked

```

```

@Override

```

```

public void handle(ActionEvent event) {

```

```

    try {

```

```

        if (tableOfVehicles.getSelectionModel().getSelectedItem() != null &&

```

```

            pickDatePicker.getValue() != null &&

```

```

            dropDatePicker.getValue() != null) {

```

```

            //getting selected vehicle's information

```

```

        Vehicle chosenVeh = (Vehicle)
tableOfVehicles.getSelectionModel().getSelectedItem();    //selected vehicle's information
        //down-casted from Object type to Vehicle type
        System.out.println(chosenVeh);    //to check whether expected vehicle was
chosen

        Schedule newBooking = new Schedule(pickDatePicker.getValue(),
dropDatePicker.getValue());

        boolean booked = GUIController.createBooking(chosenVeh, newBooking);

        if (booked) {

            checkBookedStatus.setFill(Color.GREEN);
//            System.out.println("Vehicle is available for booking.");
            checkBookedStatus.setText(chosenVeh.getPlateNo() + " is available for
booking.");

            bookStatusText.setText("Booked vehicle with Plate No: " +
chosenVeh.getPlateNo() + " from " +
                newBooking.getPickUp() + " to " + newBooking.getDropOff());

            displayTotalCost.setText("Total Cost: £" +
GUIController.getCalculatedRent(chosenVeh.getDailyCost(), newBooking));

            int yearPickUpInput = pickDatePicker.getValue().getYear();
            int monthPickUpInput = pickDatePicker.getValue().getMonthValue();
            int dayPickUpInput = pickDatePicker.getValue().getDayOfMonth();

            int yearDropOffInput = pickDatePicker.getValue().getYear();
            int monthDropOffInput = pickDatePicker.getValue().getMonthValue();
            int dayDropOffInput = pickDatePicker.getValue().getDayOfMonth();

            //addToBookedDB here
            DatabaseController.addToBookedDB(chosenVeh.getPlateNo(), yearPickUpInput,
monthPickUpInput, dayPickUpInput,
                yearDropOffInput, monthDropOffInput, dayDropOffInput);

        } else {
            //notify the user that the vehicle isn't available for rent during the chosen time
period.

            checkBookedStatus.setFill(Color.RED);
//            System.out.println("Vehicle isn't available for booking during requested time
period.");
            checkBookedStatus.setText(chosenVeh.getPlateNo() + " isn't available for
booking during requested time period.");

```

```

        bookStatusText.setText("");
        displayTotalCost.setText("");
    }
} else {
    checkBookedStatus.setFill(Color.DARKGRAY);
    checkBookedStatus.setText("Please select a vehicle to book and enter a valid date
range.");
}

} catch (NullPointerException e) {
    checkBookedStatus.setFill(Color.DARKGRAY);
    checkBookedStatus.setText("Please select a vehicle to book and enter a valid date
range.");
}

}
});

```

Explanation of the functionality

When 'Book' button is clicked, the system will perform a similar check like "Check Availability" and let the user know that the vehicle was booked for the requested time period.

The total cost will also be displayed below.

Required inputs not given – Error Handling

Plate No	Make	Model	Engine Capacit...	Daily Cost(£)	Type	Transmission	Has Air Conditioning	Start Type	Wheel Size
jh	hb	hbk	87yh	879.0	Car	uih	true		
2dg	Yamah	YC300	1000	29.0	Motorbike			Kick	60.0
BIK 2525	Honda	Cuvic	1000	50.0	Motorbike			Electric	14.0
CBK 2424	Benz	C200	2000	100.0	Car	Auto	true		
CAR 6069	Audi	A6	2400	120.0	Car	Auto	true		
KJ 5031	Toyota	Corolla	1800	70.0	Car	Manual	true		
GM 7194	Toyota	Allion	1800	75.0	Car	Auto	false		
CRV 8281	Honda	Fit	1400	60.0	Car	Manual	true		
BMS 2123	Suzuki	Gixxer	155	30.0	Motorbike			Electric	17.0
BIM-4041	Bajaj	Pulsar	150	30.0	Motorbike			Kick	14.0
PIQ-2019	Honda	Hornet	250	50.0	Motorbike			Electric	16.0
HUN-8909	Hero	Maestro	110	35.0	Motorbike			Electric	12.0

Angular GUI

app.component.html

```
<mat-toolbar color="primary">
  <mat-toolbar-row class="header">
    <span>Westminster Vehicle Rental Store</span>
  </mat-toolbar-row>
</mat-toolbar>

<div class="fullContainer">
  <div class="subHeader">
    <mat-form-field>
      <input matInput (keyup)="applyFilter($event.target.value)" placeholder="Filter">
    </mat-form-field>

    <div class="bookingSection">
      <mat-form-field>
        <input matInput [matDatepicker]="picker1" placeholder="Pick-Up Date"
          [(ngModel)]="pickUpDate" [min]="today">
        <mat-datepicker-toggle matSuffix [for]="picker1"></mat-datepicker-toggle>
        <mat-datepicker #picker1></mat-datepicker>
      </mat-form-field>
      <mat-form-field>
        <input matInput [matDatepicker]="picker2" placeholder="Drop-Off Date"
          [(ngModel)]="dropOffDate" [min]="pickUpDate">
        <mat-datepicker-toggle matSuffix [for]="picker2"></mat-datepicker-toggle>
        <mat-datepicker #picker2></mat-datepicker>
      </mat-form-field>

      <button mat-button (click)="checkAvailability()">Check Availability</button>
      <button mat-raised-button (click)="bookVehicle()">Book Vehicle</button>
    </div>
  </div>

  <div class="tableContainer mat-elevation-z8">
    <table mat-table [dataSource]="dataSource">

      <!-- Note that these columns can be defined in any order.
           The actual rendered columns are set as a property on the row definition" -->

      <ng-container matColumnDef="plateNo">
        <th mat-header-cell *matHeaderCellDef> Plate No. </th>
        <td mat-cell *matCellDef="let element"> {{element.plateNo}} </td>
      </ng-container>

      <ng-container matColumnDef="make">
        <th mat-header-cell *matHeaderCellDef> Make </th>
        <td mat-cell *matCellDef="let element"> {{element.make}} </td>
```



```

</ng-container>

<ng-container matColumnDef="model">
  <th mat-header-cell *matHeaderCellDef> Model </th>
  <td mat-cell *matCellDef="let element"> {{element.model}} </td>
</ng-container>

<ng-container matColumnDef="engineCapacity">
  <th mat-header-cell *matHeaderCellDef> Engine Capacity(CC) </th>
  <td mat-cell *matCellDef="let element"> {{element.engineCapacity}} </td>
</ng-container>

<ng-container matColumnDef="dailyCost">
  <th mat-header-cell *matHeaderCellDef> Daily Cost(£) </th>
  <td mat-cell *matCellDef="let element"> {{element.dailyCost}} </td>
</ng-container>

<ng-container matColumnDef="type">
  <th mat-header-cell *matHeaderCellDef> Type </th>
  <td mat-cell *matCellDef="let element"> {{element.type}} </td>
</ng-container>

<ng-container matColumnDef="transmission">
  <th mat-header-cell *matHeaderCellDef> Transmission </th>
  <td mat-cell *matCellDef="let element"> {{element.transmission}} </td>
</ng-container>

<ng-container matColumnDef="hasAirCon">
  <th mat-header-cell *matHeaderCellDef> Has Air Conditioning </th>
  <td mat-cell *matCellDef="let element"> {{element.hasAirCon}} </td>
</ng-container>

<ng-container matColumnDef="startType">
  <th mat-header-cell *matHeaderCellDef> Start Type </th>
  <td mat-cell *matCellDef="let element"> {{element.startType}} </td>
</ng-container>

<ng-container matColumnDef="wheelSize">
  <th mat-header-cell *matHeaderCellDef> Wheel Size </th>
  <td mat-cell *matCellDef="let element"> {{element.wheelSize}} </td>
</ng-container>

<tr mat-header-row *matHeaderRowDef="displayedColumns sticky: true"></tr>
<tr mat-row *matRowDef="let row; columns: displayedColumns;" (click) =
"rowClicked(row)" [ngClass]="{'highlight': selectedRowIndex == row.plateNo}">
  <!-- if equal, the colour of the row will be changed -->
</tr>
</table>
</div>

```

</div>

<router-outlet></router-outlet>

```

app.component.ts
import { Component, OnInit } from '@angular/core';
import { VehicleService } from '../app/services/vehicle.service';
import { MatTableDataSource } from '@angular/material';
import axios from 'axios';
import { stringify } from 'query-string';
import { MatSnackBar } from '@angular/material/snack-bar';

// -----

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.scss']
})

export class AppComponent implements OnInit {

  title = 'ng-GUI';
  heading: string;

  getAllVehicles: any;
  allVehicles: any[];

  selectedIndex = -1;
  chosenPlateNo: string;

  today = new Date(); // used to get current date
  pickUpDate: any;
  dropOffDate: any;

  displayPickUpDate: any;
  displayDropOffDate: any;

  responseBook: any;
  responseCheck: any = '';

  completeMessage: any;

  bookingURL: any = 'http://localhost:4567/books';
  checkingURL: any = 'http://localhost:4567/checks';

  // -----
  // tslint:disable-next-line: max-line-length
  displayedColumns: string[] = ['plateNo', 'make', 'model', 'engineCapacity', 'dailyCost', 'type',
    'transmission', 'hasAirCon', 'startType', 'wheelSize'];
  dataSource;

```

```
// -----

constructor(private vehicleService: VehicleService,
             private snackBar: MatSnackBar) { } // creating an instance of the service

ngOnInit() {
  this.heading = 'Vehicle List';

  this.getAllVehicles = this.getServiceData();
  // console.log(this.getAllVehicles);
}

getServiceData() { // get data
  this.vehicleService.getData().subscribe( // requesting service for information received from
the backend
    data => {
      // console.log(data); // what to do with the received data
      // const jsonInfo = JSON.parse(data);
      this.allVehicles = data;
      this.dataSource = new MatTableDataSource(this.allVehicles);
      console.log(this.allVehicles);
    }
  );
}

postBookingData() { // post plate no & booking data to backend, to book vehicle

  const data = { plateNo: this.chosenPlateNo,
    yearPickUp: this.pickUpDate.getFullYear(),
    monthPickUp: this.pickUpDate.getMonth() + 1, // months are from 0-11
    dayPickUp: this.pickUpDate.getDate(),
    yearDropOff: this.dropOffDate.getFullYear(),
    monthDropOff: this.dropOffDate.getMonth() + 1, // months are from 0-11
    dayDropOff: this.dropOffDate.getDate()
  };

  axios.post(this.bookingURL, stringify(data) , {
    headers: {
      'Content-Type': 'application/x-www-form-urlencoded'
    }
  })
  .then((response) => {
    // console.log(response.data);
    this.responseBook = response.data;

    this.openSnackBarBooking('Close');
  });
}
```

```

    })
    .catch((error) => {
        console.log(error);
    });

    // const url = this.bookingURL;
    // const data = { plateNo: this.chosenPlateNo,
    //               yearPickUp: this.pickUpDate.getFullYear(),
    //               monthPickUp: this.pickUpDate.getMonth(),
    //               dayPickUp: this.pickUpDate.getDate(),
    //               yearDropOff: this.dropOffDate.getFullYear(),
    //               monthDropOff: this.dropOffDate.getMonth(),
    //               dayDropOff: this.dropOffDate.getDate()
    //               };
    // console.log(data); // all the data is getting added into data here
    // try {
    //   const response = await fetch(url, {
    //     method: 'POST', // or 'PUT'
    //     body: qs.JSON.stringify(data), // data can be `string` or {object}!
    //     headers: {
    //       'Content-Type': 'application/x-www-form-urlencoded'
    //     }
    //   });
    // }

    // const json = await response.json(); // not receiving response at front end
    // console.log(json);
    // console.log('Success:', JSON.stringify(json));
    // } catch (error) {
    //   console.error('Error:', error);
    // }
    // this.vehicleService
    //   .addBooking(this.chosenPlateNo);
    //   .subscribe(booking => this.bookings.push(booking));
    // }
  }

  postCheckingData() { // post plate no & booking data to backend, to check availability

    const data = { plateNo: this.chosenPlateNo,
                  yearPickUp: this.pickUpDate.getFullYear(),
                  monthPickUp: this.pickUpDate.getMonth() + 1, // months are from 0-11
                  dayPickUp: this.pickUpDate.getDate(),
                  yearDropOff: this.dropOffDate.getFullYear(),
                  monthDropOff: this.dropOffDate.getMonth() + 1, // months are from 0-11
                  dayDropOff: this.dropOffDate.getDate()
                };

    axios.post(this.checkingURL, stringify(data), {
      headers: {

```

```

        'Content-Type': 'application/x-www-form-urlencoded'
    }
}
)
.then((response) => {
    console.log(response.data);
    this.responseCheck = response.data;

    this.openSnackBarAvailability('Close');

})
.catch((error) => {
    console.log(error);
});
}

bookVehicle() {
    console.log('book vehicle');

    try {
        this.postBookingData(); // call post method to book vehicle
    } catch {
        this.snackBar.open('Make sure that you have chosen the required vehicle and entered the
pick up & drop off dates!', 'Close', {
            duration: 10000,
            panelClass: ['error-snackbar']
        });
    }
}

checkAvailability() {
    console.log('check availability of vehicle');

    try {
        this.postCheckingData(); // call post method to check availability
    } catch {
        this.snackBar.open('Make sure that you have chosen the required vehicle and entered the
pick up & drop off dates!', 'Close', {
            duration: 10000,
            panelClass: ['error-snackbar']
        });
    }
}

// ----- for table filter function
applyFilter(filterValue: string) {
    this.dataSource.filter = filterValue.trim().toLowerCase();
}

```

```

rowClicked(row: any): void {
  console.log(row);
  this.chosenPlateNo = row.plateNo;
  console.log(this.chosenPlateNo);

  this.selectedRowIndex = row.plateNo;
}

```

```

openSnackBarBooking(action: string) { // content to display when a vehicle is requested to
be booked
  if (this.responseCheck === 'successful') {

    const options = { weekday: 'long', year: 'numeric', month: 'long', day: 'numeric' };
    this.displayPickUpDate = this.pickUpDate.toLocaleDateString('en-US', options);
    this.displayDropOffDate = this.dropOffDate.toLocaleDateString('en-US', options);

    const dateRange = ' was booked from '.concat(this.displayPickUpDate).concat(' to ',
this.displayDropOffDate);
    this.completeMessage = 'The vehicle with Plate No:
'.concat(this.chosenPlateNo).concat(dateRange);
    console.log(this.completeMessage);

    this.snackBar.open(this.completeMessage, action, {
      duration: 15000,
      panelClass: ['success-snackbar']
    });

  } else {
    const chosenVehicle = 'The vehicle with Plate No: '.concat(this.chosenPlateNo);
    this.completeMessage = chosenVehicle.concat(' isn\'t available for booking during the
requested time period. ');
    this.snackBar.open(this.completeMessage, action, {
      duration: 10000,
    });
  }
}

```

```

openSnackBarAvailability(action: string) { // content to display when the availability of a
vehicle is checked
  if (this.responseCheck === 'successful') {

    const options = { weekday: 'long', year: 'numeric', month: 'long', day: 'numeric' };
    this.displayPickUpDate = this.pickUpDate.toLocaleDateString('en-US', options);
    this.displayDropOffDate = this.dropOffDate.toLocaleDateString('en-US', options);

```

```

    const dateRange = ' is available for booking from '.concat(this.displayPickUpDate).concat(' to '
    , this.displayDropOffDate);
    this.completeMessage = 'The vehicle with Plate No: '
    .concat(this.chosenPlateNo).concat(dateRange);
    console.log(this.completeMessage);

    this.snackBar.open(this.completeMessage, action, {
        duration: 15000,
        panelClass: ['success-snackbar']
    });
} else {
    const chosenVehicle = 'The vehicle with Plate No: '.concat(this.chosenPlateNo);
    this.completeMessage = chosenVehicle.concat(' isn\'t available for booking during the
    requested time period. ');
    this.snackBar.open(this.completeMessage, action, {
        duration: 10000,
    });
}
}
}
}

```

/*References:

https://www.w3schools.com/angular/angular_tables.asp

<https://stackoverflow.com/questions/34973654/angularjs-create-a-table-from-an-array>

<https://stackoverflow.com/questions/22209117/create-table-from-json-data-with-angularjs-and-ng-repeat/22209337>

<https://material.angular.io/components/table/overview>

Booking confirmation - Snack bar

<https://material.angular.io/components/snack-bar/overview>

<https://stackoverflow.com/questions/56389290/angular-material-snackbar-change-color>

Calendar Date input

<https://material.angular.io/components/datepicker/overview>

Button

<https://material.angular.io/components/button/overview>

mat table selection

<https://stackblitz.com/edit/mat-table-row-click-event>

<https://stackoverflow.com/questions/52759637/how-to-get-the-selected-row-values-in-table-in-angular>

matDatePicker

<https://angular-material-nw1brd.stackblitz.io/>

<https://stackoverflow.com/questions/54828459/angular-material-date-picker-min-and-max-date-validation-messages>

<https://www.devglan.com/angular/angular-data-table-example>

JS Date

https://www.w3schools.com/js/js_date_methods.asp

<https://stackoverflow.com/questions/3552461/how-to-format-a-javascript-date>

https://www.tutorialspoint.com/typescript/typescript_string_concat.htm

Typescript passing functions

<https://stackoverflow.com/questions/47813442/could-not-able-to-access-property-of-angular-component-inside-it>

*/

vehicle.service.ts

```
import { Injectable } from '@angular/core';
import { HttpClient, HttpEvent, HttpRequest } from '@angular/common/http';
import { Observable } from 'rxjs';
// import { catchError } from 'rxjs/operators';
import axios from 'axios';
```

```
@Injectable({
  providedIn: 'root'
})
```

```
export class VehicleService {
```

```
  // get endpoint
  endpointURL: any = 'http://localhost:4567/hello'; // back-end URL
  // service makes an HTTP call to the backend
  // bookingURL: any = 'http://localhost:4567/books';

  constructor(private http: HttpClient) { }
  getData(): Observable<any> {
    return this.http.get(this.endpointURL); // getting JSON from the backend
  }
```

```
  // POST
```

```
}
```

```
/*Reference:
```

```
https://angular.io/guide/http
```

```
*/
```

styles.scss

```
html, body { height: 100%; }  
body {  
  margin: 0;  
  font-family: Roboto, "Helvetica Neue", sans-serif;  
  background: lavender;  
}
```

```
.error-snackbar {  
  color: lightcoral;  
}
```

```
.success-snackbar{  
  color: lightgreen;  
}
```

app.component.scss

```
.header{
  font-family: Roboto,"Helvetica Neue Light","Helvetica Neue",Helvetica,Arial,"Lucida
Grande",sans-serif;
  font-weight: 300;
  // margin: 0;
  padding: 28px 15px;
  font-size: 20px;
  color: #fff;
}
```

```
.subHeader{
  background: linear-gradient( to top,lavender,white 40%);
}
```

```
table {
  width: 100%;
  // margin: auto;
  cursor:pointer;
}
```

```
.tableContainer{
  width: 95%;
  margin: auto;
  max-height: 80vh;
  overflow:auto;
}
```

```
/* width */
.tableContainer::-webkit-scrollbar {
  width: 8px;
}
```

```
/* Track */
.tableContainer::-webkit-scrollbar-track {
  background: #f1f1f1;
}
```

```
/* Handle */
.tableContainer::-webkit-scrollbar-thumb {
  background: rgb(172, 172, 172);
  border-radius: 15px;
}
```

```
/* Handle on hover */
::-webkit-scrollbar-thumb:hover {
  background: rgba(85, 85, 85, 0.767);
}
```

```
.bookingSection{
  float: right;
}

.fullContainer{
  width:97%;
  margin:auto;
}

.highlight{
  background: rgb(197, 229, 231);
  transition: 0.25s;
}
```

/*Reference:

CSS custom scrollbar

https://www.w3schools.com/howto/howto_css_custom_scrollbar.asp

Change colour of table row on selection

<https://stackoverflow.com/questions/45417248/angular-4-material-table-highlight-a-row>

Toolbar/ Header

<https://material.angular.io/components/toolbar/examples>

*/

Screenshots – Angular GUI

The screenshot shows the 'Westminster Vehicle Rental Store' application. At the top, there is a navigation bar with a 'Filter' dropdown and buttons for 'Pick-Up Date', 'Drop-Off Date', 'Check Availability', and 'Book Vehicle'. Below this is a table listing various vehicles. The table has columns for Plate No., Make, Model, Engine Capacity(CC), Daily Cost(£), Type, Transmission, Has Air Conditioning, Start Type, and Wheel Size. The table contains 12 rows of vehicle data.

Plate No.	Make	Model	Engine Capacity(CC)	Daily Cost(£)	Type	Transmission	Has Air Conditioning	Start Type	Wheel Size
jh	hb	hbk	87yh	879	Car	uih	true		
2dg	Yamah	YC300	1000	29	Motorbike			Kick	60
BIK 2525	Honda	Cuvic	1000	50	Motorbike			Electric	14
CBK 2424	Benz	C200	2000	100	Car	Auto	true		
CAR 6069	Audi	A6	2400	120	Car	Auto	true		
KJ 5031	Toyota	Corolla	1800	70	Car	Manual	true		
GM 7194	Toyota	Allion	1800	75	Car	Auto	false		
CRV 8281	Honda	Fit	1400	60	Car	Manual	true		
BMS 2123	Suzuki	Gixxer	155	30	Motorbike			Electric	17
BIM-4041	Bajaj	Pulsar	150	30	Motorbike			Kick	14
PIQ-2019	Honda	Hornet	250	50	Motorbike			Electric	16

Filtering Function – Works for all fields

The screenshot shows the same 'Westminster Vehicle Rental Store' application, but with the 'Filter' dropdown set to 'Toy'. The table now only displays three vehicles that match the filter: KJ 5031, GM 7194, and another GM 7194. The table structure and columns remain the same as in the previous screenshot.

Plate No.	Make	Model	Engine Capacity(CC)	Daily Cost(£)	Type	Transmission	Has Air Conditioning	Start Type	Wheel Size
KJ 5031	Toyota	Corolla	1800	70	Car	Manual	true		
GM 7194	Toyota	Allion	1800	75	Car	Auto	false		
GM 7194	Toyota	Allion	1800	75	Car	Auto	false		

Check whether all required information has been added before making a request to the API.

The screenshot shows a web browser window with the URL localhost:4200. The page title is "Westminster Vehicle Rental Store". Below the title is a navigation bar with a "Filter" input field and buttons for "Pick-Up Date", "Drop-Off Date", "Check Availability", and "Book Vehicle". The main content is a table of vehicles with the following columns: Plate No., Make, Model, Engine Capacity(CC), Daily Cost(£), Type, Transmission, Has Air Conditioning, Start Type, and Wheel Size. The table contains 12 rows of vehicle data. A modal message is displayed over the table, stating: "Make sure that you have chosen the required vehicle and entered the pick up & drop off dates!".

Plate No.	Make	Model	Engine Capacity(CC)	Daily Cost(£)	Type	Transmission	Has Air Conditioning	Start Type	Wheel Size
jh	hb	hbk	87yh	879	Car	uih	true		
2dg	Yamah	YC300	1000	29	Motorbike			Kick	60
BIK 2525	Honda	Cuvic	1000	50	Motorbike			Electric	14
CBK 2424	Benz	C200	2000	100	Car	Auto	true		
CAR 6069	Audi	A6	2400	120	Car	Auto	true		
KJ 5031	Toyota	Corolla	1800	70	Car	Manual	true		
GM 7194	Toyota	Allion	1800	75	Car	Auto	false		
CRV 8281	Honda	Fit	1400	60	Car	Manual	true		
BMS 2123	Suzuki	Gixxer	155	30	Motorbike			Electric	17
BIM-4041	Bajaj	Pulsar	150					Kick	14
PIQ-2019	Honda	Hornet	250					Electric	16

Checking for availability to book a vehicle during a required time period (When "Check Availability" button is clicked).

The screenshot shows the same web browser window as the previous one, but with the "Pick-Up Date" set to 12/4/2019 and the "Drop-Off Date" set to 12/6/2019. The "Check Availability" button is highlighted. The table of vehicles is the same, but the row for "CAR 6069" is highlighted in light blue. A modal message is displayed over the table, stating: "The vehicle with Plate No. CAR 6069 is available for booking from Wednesday, December 4, 2019 to Friday, December 6, 2019".

Plate No.	Make	Model	Engine Capacity(CC)	Daily Cost(£)	Type	Transmission	Has Air Conditioning	Start Type	Wheel Size
jh	hb	hbk	87yh	879	Car	uih	true		
2dg	Yamah	YC300	1000	29	Motorbike			Kick	60
BIK 2525	Honda	Cuvic	1000	50	Motorbike			Electric	14
CBK 2424	Benz	C200	2000	100	Car	Auto	true		
CAR 6069	Audi	A6	2400	120	Car	Auto	true		
KJ 5031	Toyota	Corolla	1800	70	Car	Manual	true		
GM 7194	Toyota	Allion	1800	75	Car	Auto	false		
CRV 8281	Honda	Fit	1400	60	Car	Manual	true		
BMS 2123	Suzuki	Gixxer	155	30	Motorbike			Electric	17
BIM-4041	Bajaj	Pulsar	150					Kick	14
PIQ-2019	Honda	Hornet	250					Electric	16

Booking a vehicle and letting the user know the exact booking details. (When “Book Vehicle” button is clicked).

The screenshot shows the Westminster Vehicle Rental Store application. The interface includes a header with the store name, a filter input, and date pickers for 'Pick-Up Date' (12/4/2019) and 'Drop-Off Date' (12/6/2019). There are buttons for 'Check Availability' and 'Book Vehicle'. A table lists various vehicles with columns: Plate No., Make, Model, Engine Capacity(CC), Daily Cost(£), Type, Transmission, Has Air Conditioning, Start Type, and Wheel Size. The vehicle with Plate No. CAR 6069 (Audi A6) is highlighted in light blue. A dark grey toast message at the bottom center states: 'The vehicle with Plate No: CAR 6069 was booked from Wednesday, December 4, 2019 to Friday, December 6, 2019'. A 'Close' button is visible on the right side of the toast.

Plate No.	Make	Model	Engine Capacity(CC)	Daily Cost(£)	Type	Transmission	Has Air Conditioning	Start Type	Wheel Size
jh	hb	hbk	87yh	879	Car	uih	true		
2dg	Yamah	YC300	1000	29	Motorbike			Kick	60
BIK 2525	Honda	Cuvic	1000	50	Motorbike			Electric	14
CBK 2424	Benz	C200	2000	100	Car	Auto	true		
CAR 6069	Audi	A6	2400	120	Car	Auto	true		
KJ 5031	Toyota	Corolla	1800	70	Car	Manual	true		
GM 7194	Toyota	Allion	1800	75	Car	Auto	false		
CRV 8281	Honda	Fit	1400	60	Car	Manual	true		
BMS 2123	Suzuki	Gixxer	155	30	Motorbike			Electric	17
BIM-4041	Bajaj	Pulsar	150					Kick	14
PIQ-2019	Honda	Hornet	250					Electric	16

Letting the user know that the vehicle is unavailable for booking during the requested time period (When “Book Vehicle”/ “Check Availability” button is clicked).

The screenshot shows the Westminster Vehicle Rental Store application. The interface is identical to the previous one, but the vehicle with Plate No. CAR 6069 is no longer highlighted. A dark grey toast message at the bottom center states: 'The vehicle with Plate No: CAR 6069 isn't available for booking during the requested time period.' A 'Close' button is visible on the right side of the toast.

Plate No.	Make	Model	Engine Capacity(CC)	Daily Cost(£)	Type	Transmission	Has Air Conditioning	Start Type	Wheel Size
jh	hb	hbk	87yh	879	Car	uih	true		
2dg	Yamah	YC300	1000	29	Motorbike			Kick	60
BIK 2525	Honda	Cuvic	1000	50	Motorbike			Electric	14
CBK 2424	Benz	C200	2000	100	Car	Auto	true		
CAR 6069	Audi	A6	2400	120	Car	Auto	true		
KJ 5031	Toyota	Corolla	1800	70	Car	Manual	true		
GM 7194	Toyota	Allion	1800	75	Car	Auto	false		
CRV 8281	Honda	Fit	1400	60	Car	Manual	true		
BMS 2123	Suzuki	Gixxer	155	30	Motorbike			Electric	17
BIM-4041	Bajaj	Pulsar	150					Kick	14
PIQ-2019	Honda	Hornet	250					Electric	16

Restrictions for date input, to get valid date ranges
(Pick-Up date is available only from the current date, drop-off date is available on from the pick-up date onwards).
Ease of date selection using a date picker.

Pick-Up Date

Drop-Off Date

12/4/2019

12/6/2019

Check Availability

Transmission	Has Air Co	Size
uih	true	
Auto	true	
Auto	true	
Manual	true	

DEC 2019

S

M

T

W

T

F

S

DEC

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

Testing

Test Plan

Test Case ID	Test Case	Input	Expected Output
1	Add vehicle (Car)	1	Request user to choose whether to add a car or a motorbike
		1	Prompt user with information relevant for a car
		Enter all prompted information	Add vehicle to system.
2	Add vehicle (Motorbike)	1	Request user to choose whether to add a car or a motorbike
		2	Prompt user with information relevant for a motorbike
		Enter all prompted information	Add vehicle to system.
3	Edit vehicle (Car/ Motorbike)	1	Prompt user with information relevant for a motorbike
		1 OR 2	Prompt user for Plate No. of the vehicle
		Enter plate number that's already in the system (BIK 2525)	Display message to user that, "This Plate No exists in the system." Display the information of the vehicle with the entered Plate No. Prompt user, "Do u want to edit information related to this vehicle?"
		Y OR yes OR Yes OR y	Prompt all information relevant to vehicle type chosen
		Enter all prompted information	Remove old vehicle information from the system. Add new vehicle information to the system.
4	Edit vehicle (Car/ Motorbike)	1	Prompt user with information relevant for a motorbike
		1 OR 2	Prompt user for Plate No. of the vehicle
		Enter plate number that's already in the system (BIK 2525)	Display message to user that, "This Plate No exists in the system." Display the information of the vehicle with the entered Plate No. Prompt user, "Do u want to edit information related to this vehicle?"
		N OR No or no OR n	Display the main menu with its options.

			Prompt for selection of option
5	Delete vehicle - available	2	Prompt user for the Plate No. of the vehicle required to be deleted.
		Enter plate number that's already in the system (BIK 2525)	Display the type of vehicle that was deleted (car/ motorbike) Print the details of the vehicle that was deleted. Display the remaining parking slots left in the garage. Remove vehicle from system.
6	Delete vehicle - unavailable	2	Prompt user for the Plate No. of the vehicle required to be deleted.
		Enter plate number that's not in the system (fg)	Display, "There's no vehicle related to the Plate No: fg" Re prompt main menu.
7	Print List of vehicles	3	Sort the list of vehicles in alphabetical order of make. Print all the plateIDs and types of all the vehicles in the system.
8	Open GUI	4	Prompt user to enter required GUI (Angular / JavaFX)
		1	Open Angular GUI in the default web browser.
9	Open GUI	4	Prompt user to enter required GUI (Angular / JavaFX)
		2	Open JavaFX GUI in a new window.
10	Exit program with exit message	5	Display exit message and exit console application.
		20	Display message for invalid input & re prompt menu
		-5	
		f	
		@	Display, "Only integer numbers are allowed! Please provide a valid input". Re prompt menu
11	Write/ Save vehicle stock list into a file after any changes.	Add vehicle	Write vehicle information into a file.
		Edit vehicle information	Edit vehicle information in the file.

		Delete vehicle	Delete vehicle information from the file.
12	Validate integer input	4	Get out of validation loop. Continue with rest of the program functions.
		d	Display, "Only integer numbers are allowed! Please provide a valid input". Re prompt for input.
		#	
13	Validate double input	3	Get out of validation loop. Continue with rest of the program functions.
		4.7	Display, "Only numbers are allowed! Please provide a valid input". Re prompt for input.
		f	
		%	

Automated testing with Junit

Code – Junit testing

```
package lk.dinuka.VehicleRentalSystem.Controller;

import lk.dinuka.VehicleRentalSystem.Model.Car;
import lk.dinuka.VehicleRentalSystem.Model.Motorbike;
import lk.dinuka.VehicleRentalSystem.Model.Vehicle;
import org.junit.Rule;
import org.junit.Test;
import org.junit.rules.TemporaryFolder;

import java.io.*;
import java.math.BigDecimal;
import java.util.*;

import static lk.dinuka.VehicleRentalSystem.Model.RentalVehicleManager.MAX_VEHICLES;
import static lk.dinuka.VehicleRentalSystem.Model.Vehicle.count;
import static org.junit.Assert.assertEquals;
import static org.junit.Assert.assertTrue;

public class WestminsterRentalVehicleManagerTest {

    @Test
    public void addVehicleCar() { //testing whether a car can be added into the system
        //test HashMap
        HashMap<String, Vehicle> vehiclesMap = new HashMap<>(); //used to check whether
        the plate No already exists in the system

        //test arrayList
        List<Vehicle> vehiclesArrayList = new ArrayList<>(); //temporary arrayList

        Vehicle newCar = new Car("CAR-123", "Honda", "Grace", "1300", BigDecimal.valueOf(70),
        "Car", "Auto", true);

        int initialNumOfVehicles = vehiclesArrayList.size();

        if (initialNumOfVehicles <= MAX_VEHICLES) { //checking whether the vehicles existing in
        the system has occupied all the available parking lots

            vehiclesMap.put("CAR-123", newCar); //adding new car into vehiclesMap
            vehiclesArrayList.add(newCar);

            //      System.out.println(vehiclesArrayList);
            //      System.out.println(vehiclesMap);
        }
    }
}
```

```

//      assertTrue("New Car wasn't added into the system", vehiclesArrayList.add(newCar));
//checking whether the car was added to the arrayList
    assertEquals(initialNumOfVehicles + 1, vehiclesArrayList.size());    //??
    assertEquals(initialNumOfVehicles + 1, vehiclesMap.size());

        System.out.println("\nThere are " + (MAX_VEHICLES - Vehicle.getCount()) + " parking lots
left, to park vehicles.");

        assertTrue("The new car hasn't been added to the system arrayList",
vehiclesArrayList.contains(newCar));
        assertTrue("The new car hasn't been added to the system hashMap",
vehiclesMap.containsKey("CAR-123"));

    } else {
        System.out.println("There are no available spaces. 50 vehicles have been added!");
    }

    System.out.println("~~~~~");
    ~~~~~);    //used to separate test outputs
}

@Test
public void addVehicleBike() {    //testing whether a motorbike can be added into the
system
    //test HashMap
    HashMap<String, Vehicle> vehiclesMap = new HashMap<>();    //used to check whether
the plate No already exists in the system

    //test arrayList
    List<Vehicle> vehiclesArrayList = new ArrayList<>();    //temporary arrayList

    Vehicle newBike = new Motorbike("BIK-123", "Hero", "Honda", "800",
BigDecimal.valueOf(40), "Motorbike", "Push", 15);

    int initialNumOfVehicles = vehiclesArrayList.size();
    System.out.println(vehiclesArrayList);
    System.out.println(vehiclesMap);

    if (initialNumOfVehicles <= MAX_VEHICLES) {    //checking whether the vehicles existing in
the system has occupied all the available parking lots

        vehiclesMap.put("BIK-123", newBike);    //adding new car into vehicles arrayList
        vehiclesArrayList.add(newBike);

    //      System.out.println(vehiclesArrayList);

```

```

//      System.out.println(vehiclesMap);

//      assertTrue("New Motorbike wasn't added into the system",
vehiclesArrayList.add(newBike));    //checking whether the motorbike was added to the
arrayList
    assertEquals(initialNumOfVehicles + 1, vehiclesArrayList.size());    //??
    assertEquals(initialNumOfVehicles + 1, vehiclesMap.size());

        System.out.println("\nThere are " + (MAX_VEHICLES - Vehicle.getCount()) + " parking lots
left, to park vehicles.");

        assertTrue("The new motorbike hasn't been added to the system arrayList",
vehiclesArrayList.contains(newBike));
        assertTrue("The new motorbike hasn't been added to the system hashMap",
vehiclesMap.containsKey("BIK-123"));

    } else {
        System.out.println("There are no available spaces. 50 vehicles have been added!");
    }

    System.out.println("~~~~~");
    ~~~~~);    //used to separate test outputs
}

@Test
public void testEditCar() {
    //test HashMap
    HashMap<String, Vehicle> vehiclesMap = new HashMap<>();    //used to check whether
the plate No already exists in the system

    //test arrayList
    List<Vehicle> vehiclesArrayList = new ArrayList<>();    //temporary arrayList

    Vehicle newCar = new Car("CAR-123", "Honda", "Grace", "1300", BigDecimal.valueOf(70),
"Car", "Auto", true);
    String enteredPlateNo = newCar.getPlateNo();

    vehiclesArrayList.add(newCar);
    vehiclesMap.put(enteredPlateNo, newCar);

    if (vehiclesMap.containsKey(enteredPlateNo)) {
        System.out.println("This Plate No exists in the system.");
        System.out.println();    //to keep space for clarity
    }
}

```

```

        //print information of vehicle when asked whether to edit
        System.out.println("Make: " + vehiclesMap.get(enteredPlateNo).getMake());
        System.out.println("Model: " + vehiclesMap.get(enteredPlateNo).getModel());
        System.out.println("Engine Capacity: " +
vehiclesMap.get(enteredPlateNo).getEngineCapacity());
        System.out.println("Daily Cost (in £): " +
vehiclesMap.get(enteredPlateNo).getDailyCost());
        System.out.println("Type: " + vehiclesMap.get(enteredPlateNo).getType());

        if (vehiclesMap.get(enteredPlateNo) instanceof Car) {
            System.out.println("Transmission: " + ((Car)
vehiclesMap.get(enteredPlateNo)).getTransmission());
            System.out.println("Has Air Conditioning: " + ((Car)
vehiclesMap.get(enteredPlateNo)).isHasAirCon());
        } else {
            System.out.println("Start Type: " + ((Motorbike)
vehiclesMap.get(enteredPlateNo)).getStartType());
            System.out.println("Wheel Size: " + ((Motorbike)
vehiclesMap.get(enteredPlateNo)).getWheelSize());
        }

        boolean edit = true;
        if (edit) {
            System.out.println("\nMake required changes to vehicle information.");

        } else {
            System.out.println();    //keeps space and goes back to main menu
        }
    }

//    vehiclesMap.clear();    //clearing to make sure that other unit tests aren't affected by
//    this unit test
//    vehiclesArrayList.clear();

    System.out.println("~~~~~");
    //used to separate test outputs
}

@Test
public void testEditBike() {
    //test HashMap
    HashMap<String, Vehicle> vehiclesMap = new HashMap<>();    //used to check whether
the plate No already exists in the system

    //test arrayList
    List<Vehicle> vehiclesArrayList = new ArrayList<>();    //temporary arrayList

```



```

    Vehicle newBike = new Motorbike("BIK-123", "Hero", "Honda", "800",
BigDecimal.valueOf(40), "Motorbike", "Push", 15);
    String enteredPlateNo = newBike.getPlateNo();

    vehiclesArrayList.add(newBike);
    vehiclesMap.put(enteredPlateNo, newBike);

    if (vehiclesMap.containsKey(enteredPlateNo)) {
        System.out.println("This Plate No exists in the system.");
        System.out.println();    //to keep space for clarity

        //print information of vehicle when asked whether to edit
        System.out.println("Make: " + vehiclesMap.get(enteredPlateNo).getMake());
        System.out.println("Model: " + vehiclesMap.get(enteredPlateNo).getModel());
        System.out.println("Engine Capacity: " +
vehiclesMap.get(enteredPlateNo).getEngineCapacity());
        System.out.println("Daily Cost (in £): " +
vehiclesMap.get(enteredPlateNo).getDailyCost());
        System.out.println("Type: " + vehiclesMap.get(enteredPlateNo).getType());

        if (vehiclesMap.get(enteredPlateNo) instanceof Car) {
            System.out.println("Transmission: " + ((Car)
vehiclesMap.get(enteredPlateNo)).getTransmission());
            System.out.println("Has Air Conditioning: " + ((Car)
vehiclesMap.get(enteredPlateNo)).isHasAirCon());
        } else {
            System.out.println("Start Type: " + ((Motorbike)
vehiclesMap.get(enteredPlateNo)).getStartType());
            System.out.println("Wheel Size: " + ((Motorbike)
vehiclesMap.get(enteredPlateNo)).getWheelSize());
        }

        boolean edit = true;
        if (edit) {
            System.out.println("\nMake required changes to vehicle information.");

        } else {
            System.out.println();    //keeps space and goes back to main menu
        }
    }

    //    vehiclesMap.clear();    //clearing to make sure that other unit tests aren't affected by
this unit test
    //    vehiclesArrayList.clear();

    System.out.println("~~~~~");
    ~~~~~);    //used to separate test outputs
}

```

```

@Test
public void testDeleteCarAvailable() {    //testing the result when a car that is in the system is
requested to be deleted
    //test HashMap
    HashMap<String, Vehicle> vehiclesMap = new HashMap<>();    //used to check whether
the plate No already exists in the system

    //test arrayList
    List<Vehicle> vehiclesArrayList = new ArrayList<>();    //temporary arrayList

    Vehicle newCar = new Car("CAR-123", "Honda", "Grace", "1300", BigDecimal.valueOf(70),
"Car", "Auto", true);

    String carPlateNo = "CAR-123";

    vehiclesMap.put(carPlateNo, newCar);
    vehiclesArrayList.add(newCar);

    int initialNumOfVehicles = vehiclesArrayList.size();

    //    System.out.println(vehiclesArrayList);
    //    System.out.println(vehiclesMap);

    if (vehiclesMap.containsKey(carPlateNo)) {
        Vehicle vehicleToBeDeleted = vehiclesMap.get(carPlateNo);

        vehiclesArrayList.remove(vehicleToBeDeleted);
    //    assertTrue(vehiclesArrayList.remove(vehicleToBeDeleted));
        vehiclesMap.remove(carPlateNo);
        count -= 1;    //decreasing the number of vehicles from the system by one

        String type = vehicleToBeDeleted.getType();

        System.out.println("\nA " + type + " has been deleted from the system.");
        System.out.println("The details of the vehicle that was deleted: " +
vehicleToBeDeleted.toString());    //displaying information of deleted vehicle

    //    System.out.println(initialNumOfVehicles);
    //    assertEquals(initialNumOfVehicles - 1, vehiclesArrayList.size());
    //    System.out.println(initialNumOfVehicles);
    //    assertEquals(initialNumOfVehicles - 1, vehiclesMap.size());
    } else {
        System.out.println("There's no vehicle related to the Plate No: " + carPlateNo);
    }
}

```

```

        System.out.println("~~~~~");
    }

    @Test
    public void testDeleteCarUnavailable() {    // testing the result when cars that are not
        // in the system are requested to be deleted

        //test HashMap
        HashMap<String, Vehicle> vehiclesMap = new HashMap<>();    //used to check whether
        the plate No already exists in the system

        //test arrayList
        List<Vehicle> vehiclesArrayList = new ArrayList<>();    //temporary arrayList

        String carPlateNo = "CAR-123";

        int initialNumOfVehicles = vehiclesArrayList.size();

        //    System.out.println(vehiclesArrayList);
        //    System.out.println(vehiclesMap);

        if (vehiclesMap.containsKey(carPlateNo)) {
            Vehicle vehicleToBeDeleted = vehiclesMap.get(carPlateNo);

            vehiclesArrayList.remove(vehicleToBeDeleted);
            //    assertTrue(vehiclesArrayList.remove(vehicleToBeDeleted));
            vehiclesMap.remove(carPlateNo);
            count -= 1;    //decreasing the number of vehicles from the system by one

            String type = vehicleToBeDeleted.getType();

            System.out.println("\nA " + type + " has been deleted from the system.");
            System.out.println("The details of the vehicle that was deleted: " +
            vehicleToBeDeleted.toString());    //displaying information of deleted vehicle

            assertEquals(initialNumOfVehicles - 1, vehiclesArrayList.size());
            //    assertEquals(initialNumOfVehicles - 1, vehiclesMap.size());
        } else {
            System.out.println("There's no vehicle related to the Plate No: " + carPlateNo);
        }

        System.out.println("~~~~~");
    }
}

```

```

@Test
public void testDeleteBikeAvailable() {    //testing the result when a motorbike that is in the
system is requested to be deleted
    //test HashMap
    HashMap<String, Vehicle> vehiclesMap = new HashMap<>();    //used to check whether
the plate No already exists in the system

    //test arrayList
    List<Vehicle> vehiclesArrayList = new ArrayList<>();    //temporary arrayList

    Vehicle newBike = new Motorbike("BIK-123", "Hero", "Honda", "800",
BigDecimal.valueOf(40), "Motorbike", "Push", 15);

    String bikePlateNo = "BIK-123";

    vehiclesMap.put(bikePlateNo, newBike);
    vehiclesArrayList.add(newBike);

    int initialNumOfVehicles = vehiclesArrayList.size();

    //    System.out.println(vehiclesArrayList);
    //    System.out.println(vehiclesMap);

    if (vehiclesMap.containsKey(bikePlateNo)) {
        Vehicle vehicleToBeDeleted = vehiclesMap.get(bikePlateNo);

        vehiclesArrayList.remove(vehicleToBeDeleted);
    //    assertTrue(vehiclesArrayList.remove(vehicleToBeDeleted));
        vehiclesMap.remove(bikePlateNo);
        count -= 1;    //decreasing the number of vehicles from the system by one

        String type = vehicleToBeDeleted.getType();

        System.out.println("\nA " + type + " has been deleted from the system.");
        System.out.println("The details of the vehicle that was deleted: " +
vehicleToBeDeleted.toString());    //displaying information of deleted vehicle

        assertEquals(initialNumOfVehicles - 1, vehiclesArrayList.size());
    //    assertEquals(initialNumOfVehicles - 1, vehiclesMap.size());
    } else {
        System.out.println("There's no vehicle related to the Plate No: " + bikePlateNo);
    }

    System.out.println("~~~~~");
    ~~~~~);    //used to separate test outputs

```

```

    }

    @Test
    public void testDeleteBikeUnavailable() {        // testing the result when motorbikes that are
not
        // in the system are requested to be deleted
        //test HashMap
        HashMap<String, Vehicle> vehiclesMap = new HashMap<>();        //used to check whether
the plate No already exists in the system

        //test arrayList
        List<Vehicle> vehiclesArrayList = new ArrayList<>();    //temporary arrayList

        String bikePlateNo = "BIK-123";

        int initialNumOfVehicles = vehiclesMap.size();

        //    System.out.println(vehiclesArrayList);
        //    System.out.println(vehiclesMap);

        if (vehiclesMap.containsKey(bikePlateNo)) {
            Vehicle vehicleToBeDeleted = vehiclesMap.get(bikePlateNo);

            vehiclesArrayList.remove(vehicleToBeDeleted);
//            assertTrue(vehiclesArrayList.remove(vehicleToBeDeleted));
            vehiclesMap.remove(bikePlateNo);
            count -= 1;        //decreasing the number of vehicles from the system by one

            String type = vehicleToBeDeleted.getType();

            System.out.println("\nA " + type + " has been deleted from the system.");
            System.out.println("The details of the vehicle that was deleted: " +
vehicleToBeDeleted.toString());    //displaying information of deleted vehicle

            assertEquals(initialNumOfVehicles - 1, vehiclesArrayList.size());
//            assertEquals(initialNumOfVehicles - 1, vehiclesMap.size());
        } else {
            System.out.println("There's no vehicle related to the Plate No: " + bikePlateNo);
        }

        System.out.println("~~~~~");
        ~~~~~    //used to separate test outputs
    }

```

```

@Test
public void testPrintList() {
    Vehicle newCar = new Car("CAR-123", "Honda", "Grace", "1300", BigDecimal.valueOf(70),
"Car", "Auto", true);
    Vehicle newBike = new Motorbike("BIK-123", "Hero", "Honda", "800",
BigDecimal.valueOf(40), "Motorbike", "Push", 15);

    //test arrayList
    List<Vehicle> vehiclesArrayList = new ArrayList<>();    //temporary arrayList

    vehiclesArrayList.add(newCar);
    vehiclesArrayList.add(newBike);

    Collections.sort(vehiclesArrayList);    //sort vehicles alphabetically, according to make

    // print the plate number, the type of vehicle (car/ motorbike).

    String leftAlignFormat = "| %-15s | %-12s |%n";

    System.out.format("+-----+-----+%n");
    System.out.format("|   Plate ID   |   Type   |%n");
    System.out.format("+-----+-----+%n");

    for (Vehicle item : vehiclesArrayList) {
        if (item instanceof Car) {
            System.out.format(leftAlignFormat, item.getPlateNo(), "Car");
        } else if (item instanceof Motorbike) {
            System.out.format(leftAlignFormat, item.getPlateNo(), "Motorbike");
        }
    }
    System.out.println("+-----+");

    vehiclesArrayList.clear();    //emptying arrayList so that other unit tests can run
smoothly
    count -= 2;

    System.out.println("~~~~~");
    ~~~~~);    //used to separate test outputs

}

//testing write/ save file -----
@Rule
public TemporaryFolder tempFolder = new TemporaryFolder();

@Test

```

```
public void testSaveFile() throws IOException {
    //test arrayList
    List<Vehicle> vehiclesArrayList = new ArrayList<>();    //temporary arrayList

    File file = tempFolder.newFile("test.txt");

    FileWriter soldFile = new FileWriter("test.txt", true);

    soldFile.write(String.format("+-----+-----+-----+-----+-----+
+-----+-----+-----+-----+-----+%n"));
    soldFile.write(String.format("| Plate ID   | Make      | Model   | Engine Capacity|
Daily Cost(£) | Type     | transmission | AirCon | Start type | Wheel Size |%n"));
    soldFile.write(String.format("+-----+-----+-----+-----+-----+
+-----+-----+-----+-----+-----+%n"));
    //        soldFile.write(System.getProperty("line.separator"));    //line break

    String leftAlignFormat2 = "| %-15s | %-13s | %-12s | %-14s | %-13s | %-9s | %-12s | %-6s |
%-10s | %-10s |%n";

    //writing into the file
    for (Vehicle veh : vehiclesArrayList) {
        if (veh instanceof Motorbike) {
            soldFile.write(String.format(leftAlignFormat2, veh.getPlateNo(), veh.getMake(),
veh.getModel(), veh.getEngineCapacity(),
veh.getDailyCost(), veh.getType(), " - ", " - ", ((Motorbike)
veh).getStartType(), ((Motorbike) veh).getWheelSize()));
        } else {
            soldFile.write(String.format(leftAlignFormat2, veh.getPlateNo(), veh.getMake(),
veh.getModel(), veh.getEngineCapacity(),
veh.getDailyCost(), veh.getType(), ((Car) veh).getTransmission(), ((Car)
veh).isHasAirCon(), " - ", " - "));
        }
        soldFile.write(System.getProperty("line.separator"));    //line break
    }
    soldFile.write(String.format("+-----+-----+-----+-----+-----+
+-----+-----+-----+-----+-----+%n"));

    assertTrue(file.exists());
}
// -----
```

```

@Test
public void testViewGUIFX() {
//    GUI.main(null);    //used to open javafx application
//test won't complete until javaFX application is closed
}

@Test
public void testViewGUIAngular() {
//    API.getAllVehiclesToFront();    //send vehicles to front end
//    API.postBookingsFromFront();    //handle booking
//    API.postAvailabilityFromFront();    //handle availability
//
//
//    //Open Angular GUI in browser
//    ProcessBuilder builder = new ProcessBuilder("explorer.exe", "http://localhost:4200/");
//
//    builder.redirectErrorStream(true);
//
//    Process p = null;
//    try {
//        p = builder.start();
//    } catch (IOException e) {
//        e.printStackTrace();
//    }
//    BufferedReader r = new BufferedReader(new InputStreamReader(p.getInputStream()));
//    String line;
//    while (true) {
//        try {
//            line = r.readLine();
//            if (line == null) {
//                break;
//            }
//            System.out.println(line);
//        } catch (IOException e) {
//            e.printStackTrace();
//        }
//    }
//
}

@Test
public void testIntInputValidationString() {

    String data = "Hello Human\r\n";
    InputStream stdin = System.in;
    try {
        System.setIn(new ByteArrayInputStream(data.getBytes()));
        Scanner scanInput = new Scanner(System.in);
    }
}

```



```

        System.out.println("Input entered: " + scanInput.nextLine());

//        while (!scanInput.hasNextInt()) {
//            if (!scanInput.hasNextInt()) {
//                System.out.println("Only integer numbers are allowed! Please provide a valid input");
//error handling message for characters other than integers
//                scanInput.next(); //removing incorrect input entered
//            }

//        } finally {
//            System.setIn(stdin);
//        }
//    }

@Test
public void testIntInputValidationCharacter() {

    String data = "@\r\n";
    InputStream stdin = System.in;
    try {
        System.setIn(new ByteArrayInputStream(data.getBytes()));
        Scanner scanInput = new Scanner(System.in);
        System.out.println("Input entered: " + scanInput.nextLine());

//        while (!scanInput.hasNextInt()) {
//            if (!scanInput.hasNextInt()) {
//                System.out.println("Only integer numbers are allowed! Please provide a valid input");
//error handling message for characters other than integers
//                scanInput.next(); //removing incorrect input entered
//            }

//        } finally {
//            System.setIn(stdin);
//        }
//    }

@Test
public void testIntInputValidationInteger() {
    int scanInput = 4;

    assertTrue("Only integer numbers are allowed! Please provide a valid input", scanInput ==
(int) scanInput);

}

@Test
public void testDoubleInputValidationString() {
    String data = "Hello Humans\r\n";
    InputStream stdin = System.in;

```

```

try {
    System.setIn(new ByteArrayInputStream(data.getBytes()));
    Scanner scanInput = new Scanner(System.in);
    System.out.println("Input entered: " + scanInput.nextLine());

//    while (!scanInput.hasNextInt()) {
//        if (!scanInput.hasNextInt()) {
//            System.out.println("Only numbers are allowed! Please provide a valid input");
//error handling message for characters other than integers
//            scanInput.next(); //removing incorrect input entered
//        }

    } finally {
        System.setIn(stdin);
    }
}

@Test
public void testDoubleInputValidationCharacter() {

    String data = "$\r\n";
    InputStream stdin = System.in;
    try {
        System.setIn(new ByteArrayInputStream(data.getBytes()));
        Scanner scanInput = new Scanner(System.in);
        System.out.println("Input entered: " + scanInput.nextLine());

//        while (!scanInput.hasNextInt()) {
//            if (!scanInput.hasNextInt()) {
//                System.out.println("Only numbers are allowed! Please provide a valid input");
//error handling message for characters other than integers
//            scanInput.next(); //removing incorrect input entered
//        }

    } finally {
        System.setIn(stdin);
    }
}

@Test
public void testDoubleInputValidation() {
    double scanInput = 4.02;

    assertTrue("Only numbers are allowed! Please provide a valid input", scanInput == (double)
scanInput);
}
}

```

/*Reference:

<https://stackoverflow.com/questions/156503/how-do-you-assert-that-a-certain-exception-is-thrown-in-junit-4-tests>

<https://www.mkyong.com/unittest/junit-4-tutorial-2-expected-exception-test/>

<https://stackoverflow.com/questions/12558206/how-can-i-check-if-a-value-is-of-type-integer>

JUnit: How to simulate System.in testing

<http://www.javased.com/?post=1647907>

*/

Screenshots – Junit testing

The screenshots show the IntelliJ IDEA interface with the 'Run' tab active, displaying the output of a JUnit test suite for 'WestminsterRentalVehicleManagerTest'. The test suite consists of 18 tests, all of which passed.

First Screenshot:

- Tests passed: 18 of 18 tests - 239 ms
- Output: "C:\Program Files\Java\jdk1.8.0_212\bin\java.exe" -ea -Didea.test.cyclic.buffer.size=1048576 "-javaagent:C:\Program Files\JetBr... This Plate No exists in the system."
- Test Results (all passed):
 - testEditBike (208 ms)
 - testSaveFile (3 ms)
 - addVehicleCar (1 ms)
 - testViewGUIAngular (1 ms)
 - testInputValidationInteger (1 ms)
 - testDoubleInputValidationCharacter (6 ms)
 - testPrintList (2 ms)
 - testDeleteCarAvailable (1 ms)
 - testViewGUIFX (1 ms)
 - testDeleteCarUnavailable (1 ms)
 - testInputValidationString (3 ms)
 - testDeleteBikeAvailable (1 ms)
 - testDeleteBikeUnavailable (2 ms)
 - testDoubleInputValidation (1 ms)
 - testInputValidationCharacter (2 ms)
 - addVehicleBike (2 ms)
 - testDoubleInputValidationString (2 ms)
 - testEditCar (1 ms)
- Test Output:

```
Make: Hero
Model: Honda
Engine Capacity: 800
Daily Cost (in £): 40
Type: Motorbike
Start Type: Push
Wheel Size: 15.0

Make required changes to vehicle information.

There are 48 parking lots left, to park vehicles.

Input entered: $
Only numbers are allowed! Please provide a valid input

+-----+-----+
| Plate ID | Type |
+-----+-----+
| BIK-123  | Motorbike |
| CAR-123  | Car       |
+-----+-----+

A Car has been deleted from the system.
The details of the vehicle that was deleted: Vehicle{plateNo='CAR-123', make='Honda', model='Grace', engineCapacity='1300', dai
There's no vehicle related to the Plate No: CAR-123

Input entered: Hello Human
Only integer numbers are allowed! Please provide a valid input

A Motorbike has been deleted from the system.
```

Second Screenshot:

- Tests passed: 18 of 18 tests - 239 ms
- Output: "There's no vehicle related to the Plate No: CAR-123"
- Test Results (all passed):
 - testEditBike (208 ms)
 - testSaveFile (3 ms)
 - addVehicleCar (1 ms)
 - testViewGUIAngular (1 ms)
 - testInputValidationInteger (1 ms)
 - testDoubleInputValidationCharacter (6 ms)
 - testPrintList (2 ms)
 - testDeleteCarAvailable (1 ms)
 - testViewGUIFX (1 ms)
 - testDeleteCarUnavailable (1 ms)
 - testInputValidationString (3 ms)
 - testDeleteBikeAvailable (1 ms)
 - testDeleteBikeUnavailable (2 ms)
 - testDoubleInputValidation (1 ms)
 - testInputValidationCharacter (2 ms)
 - addVehicleBike (2 ms)
 - testDoubleInputValidationString (2 ms)
 - testEditCar (1 ms)
- Test Output:

```
There's no vehicle related to the Plate No: CAR-123

Input entered: Hello Human
Only integer numbers are allowed! Please provide a valid input

A Motorbike has been deleted from the system.
The details of the vehicle that was deleted: Vehicle{plateNo='BIK-123', make='Hero', model='Honda', engineCapacity='800', dai
There's no vehicle related to the Plate No: BIK-123

Input entered: @
Only integer numbers are allowed! Please provide a valid input

[]
{}

There are 47 parking lots left, to park vehicles.

Input entered: Hello Humans
Only numbers are allowed! Please provide a valid input
This Plate No exists in the system.

Make: Honda
Model: Grace
Engine Capacity: 1300
Daily Cost (in £): 70
Type: Car
Transmission: Auto
Has Air Conditioning: true

Make required changes to vehicle information.

Process finished with exit code 0
```