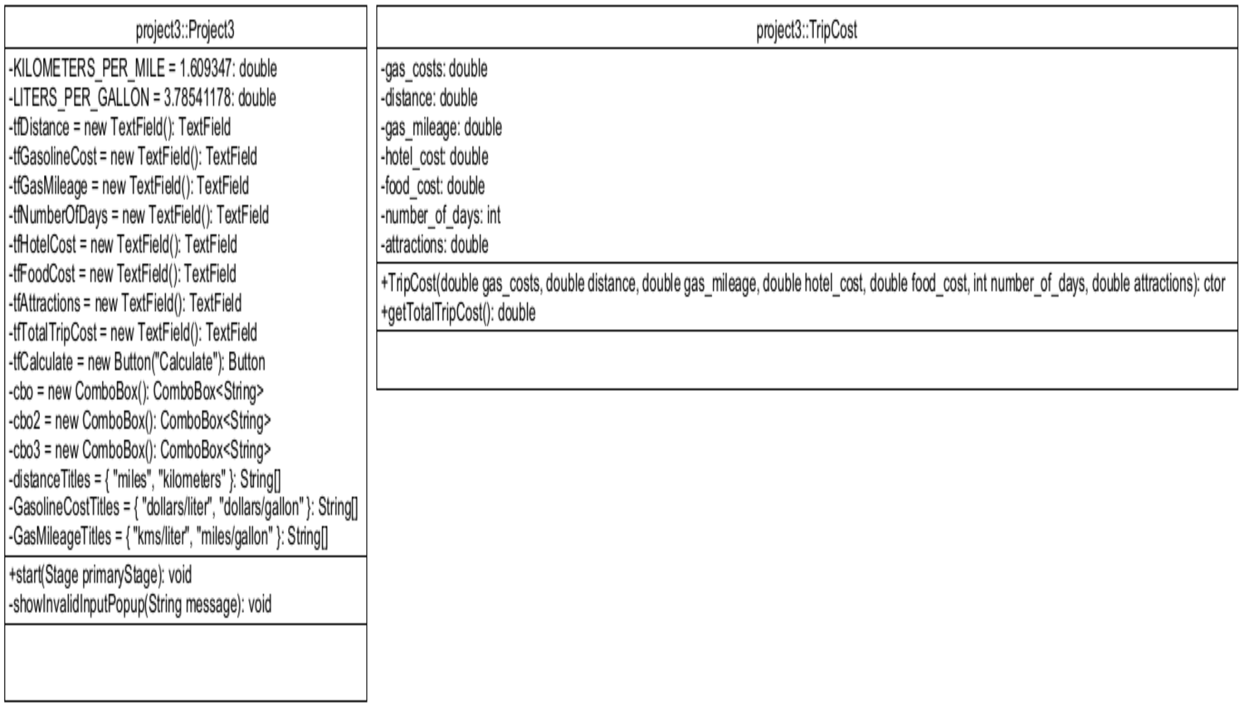
Victoria Lee
CMSC 215
6/25/2024

Project 3 Documentation

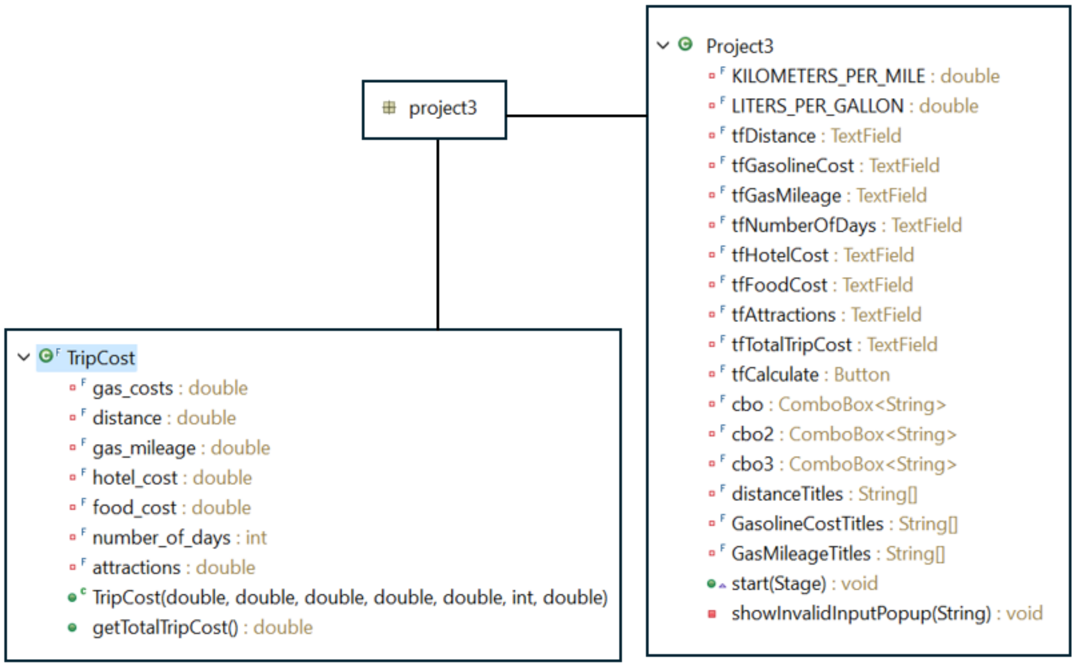
UML Class Diagrams and Package:



```
project3::Project3
-KILOMETERS_PER_MILE = 1.609347: double
-LITERS_PER_GALLON = 3.78541178: double
-tfDistance = new TextField(): TextField
-tfGasolineCost = new TextField(): TextField
-tfGasMileage = new TextField(): TextField
-tfNumberOfDays = new TextField(): TextField
-tfHotelCost = new TextField(): TextField
-tfFoodCost = new TextField(): TextField
-tfAttractions = new TextField(): TextField
-tfTotalTripCost = new TextField(): TextField
-tfCalculate = new Button("Calculate"): Button
-cbo = new ComboBox(): ComboBox<String>
-cbo2 = new ComboBox(): ComboBox<String>
-cbo3 = new ComboBox(): ComboBox<String>
-distanceTitles = { "miles", "kilometers" }: String[]
-GasolineCostTitles = { "dollars/liter", "dollars/gallon" }: String[]
-GasMileageTitles = { "kms/liter", "miles/gallon" }: String[]
+start(Stage primaryStage): void
-showInvalidInputPopup(String message): void
```

```
project3::TripCost
-gas_costs: double
-distance: double
-gas_mileage: double
-hotel_cost: double
-food_cost: double
-number_of_days: int
-attractions: double
+TripCost(double gas_costs, double distance, double gas_mileage, double hotel_cost, double food_cost, int number_of_days, double attractions): ctor
+getTotalTripCost(): double
```

Created UML Class Diagrams and Package:



```
TripCost
  gas_costs : double
  distance : double
  gas_mileage : double
  hotel_cost : double
  food_cost : double
  number_of_days : int
  attractions : double
  TripCost(double, double, double, double, double, int, double)
  getTotalTripCost() : double
```

```
Project3
  KILOMETERS_PER_MILE : double
  LITERS_PER_GALLON : double
  tfDistance : TextField
  tfGasolineCost : TextField
  tfGasMileage : TextField
  tfNumberOfDays : TextField
  tfHotelCost : TextField
  tfFoodCost : TextField
  tfAttractions : TextField
  tfTotalTripCost : TextField
  tfCalculate : Button
  cbo : ComboBox<String>
  cbo2 : ComboBox<String>
  cbo3 : ComboBox<String>
  distanceTitles : String[]
  GasolineCostTitles : String[]
  GasMileageTitles : String[]
  start(Stage) : void
  showInvalidInputPopup(String) : void
```

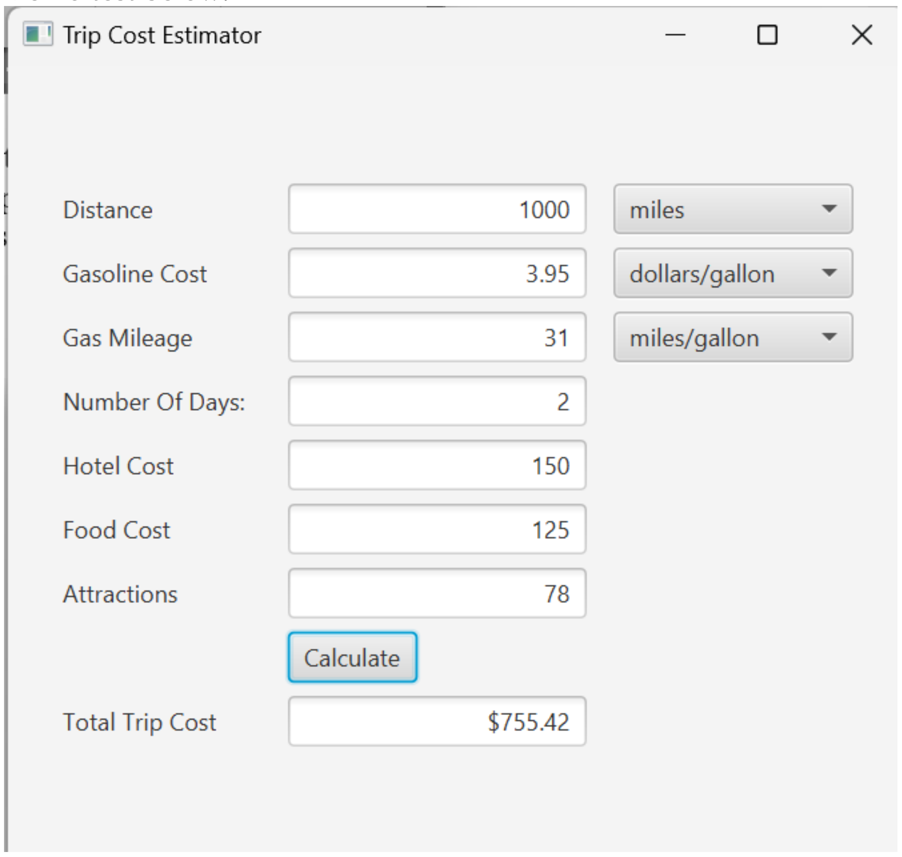
All Test Plans/Cases:

Test 1 (Given): Testing using imperial units

Input:
Distance: 1000 miles
Gasoline Cost: 3.95 dollars/gallon
Gas Mileage: 31 miles/gallon
Number of Days: 2
Hotel Cost: 150
Food Cost: 125
Attractions: 78

Output:
Total Trip Cost: $755.42

Demo test below:



Trip Cost Estimator

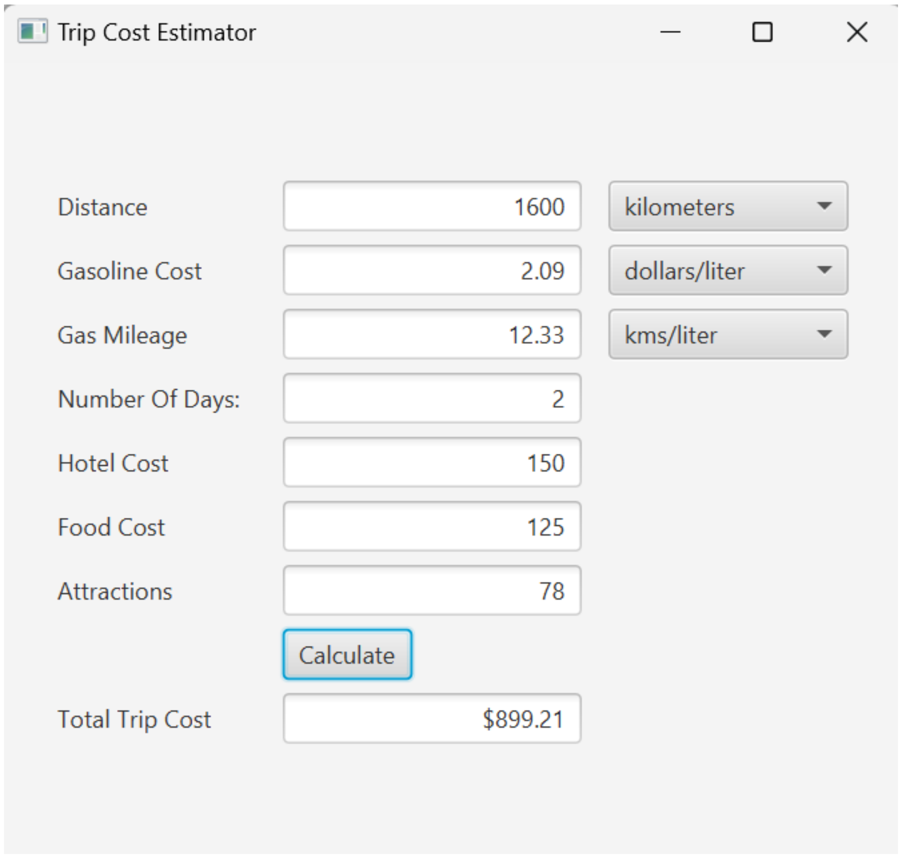
Distance	1000	miles
Gasoline Cost	3.95	dollars/gallon
Gas Mileage	31	miles/gallon
Number Of Days:	2	
Hotel Cost	150	
Food Cost	125	
Attractions	78	
	Calculate	
Total Trip Cost	$755.42	

Test 2 (Given): Testing using metric units

Input:
Distance: 1600 kilometers
Gasoline Cost: 2.09 dollars/liter
Gas Mileage: 12.33 kms/liter
Number of Days: 2
Hotel Cost: 150
Food Cost: 125
Attractions: 78

Output:
Total Trip Cost: $899.21

Demo test below:



Trip Cost Estimator

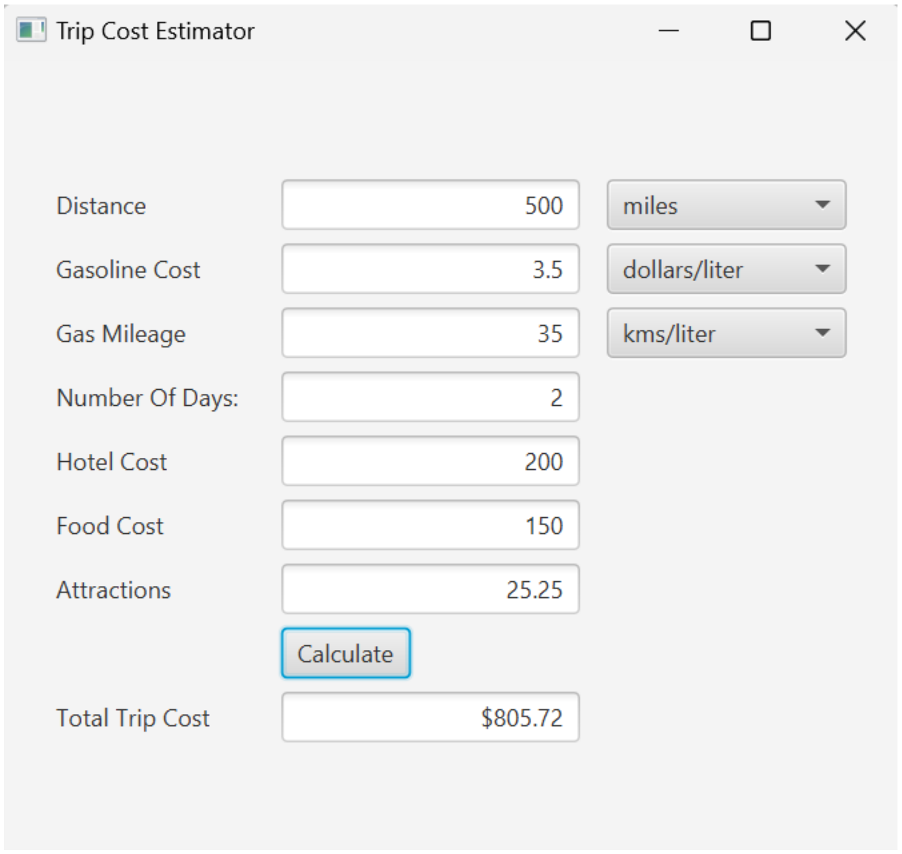
Distance	1600	kilometers
Gasoline Cost	2.09	dollars/liter
Gas Mileage	12.33	kms/liter
Number Of Days:	2	
Hotel Cost	150	
Food Cost	125	
Attractions	78	
	Calculate	
Total Trip Cost	$899.21	

Test 3 (Given): Testing for mixed units (imperial and metric combination)

Input:
Distance: 500 miles
Gasoline Cost: 3.5 dollars/liter
Gas Mileage: 35 kms/liter
Number of Days: 2
Hotel Cost: 200
Food Cost: 150
Attractions: 25.25

Output:
Total Trip Cost: $805.72

Demo test below:


Trip Cost Estimator

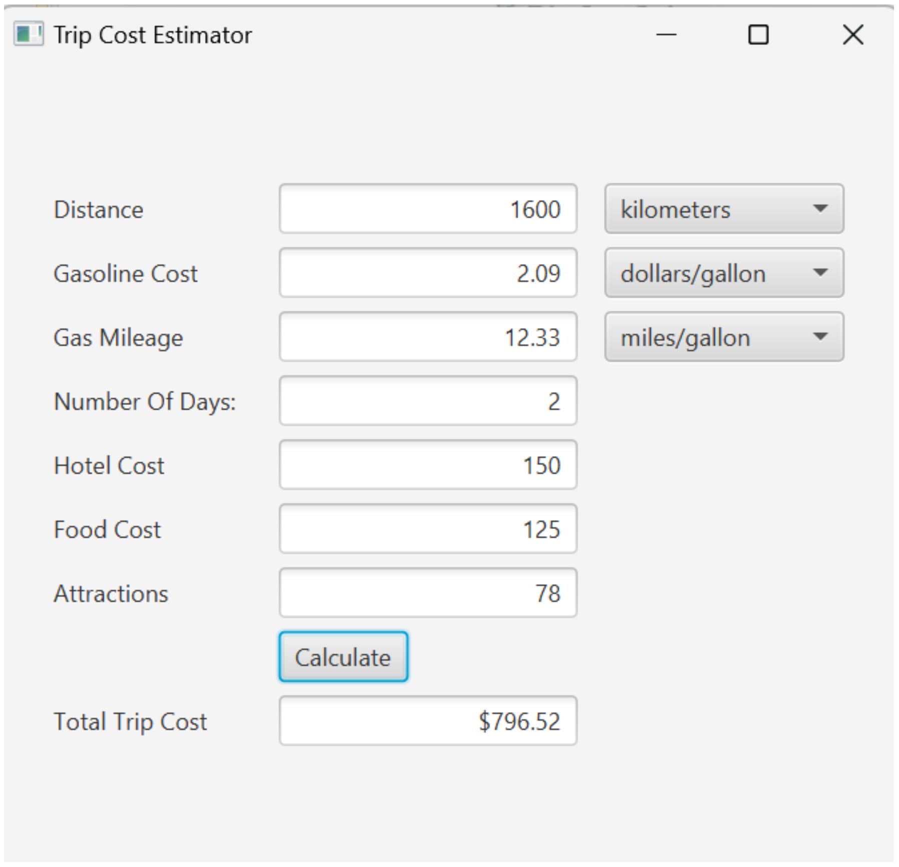
Distance	500	miles
Gasoline Cost	3.5	dollars/liter
Gas Mileage	35	kms/liter
Number Of Days:	2	
Hotel Cost	200	
Food Cost	150	
Attractions	25.25	
	Calculate	
Total Trip Cost	$805.72	

Test 4 (Created): Testing for mixed units (imperial and metric combination)

Input:
Distance: 1600 kilometers
Gasoline Cost: 2.09 dollars/gallon
Gas Mileage: 12.33 miles/gallon
Number of Days: 2
Hotel Cost: 150
Food Cost: 125
Attractions: 78

Output:
Total Trip Cost: $796.52

Demo test below:



Trip Cost Estimator

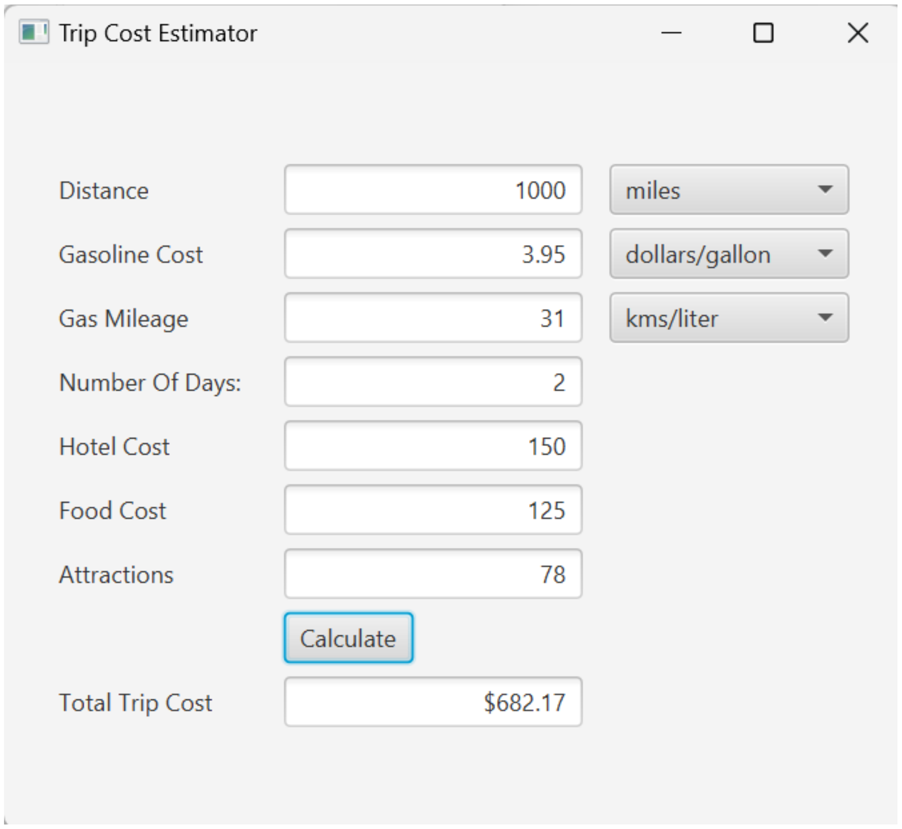
Distance	1600	kilometers
Gasoline Cost	2.09	dollars/gallon
Gas Mileage	12.33	miles/gallon
Number Of Days:	2	
Hotel Cost	150	
Food Cost	125	
Attractions	78	
	Calculate	
Total Trip Cost	$796.52	

Test 5 (Created): Testing for mixed units (imperial and metric combination)

Input:
Distance: 1000 miles
Gasoline Cost: 3.95 dollars/gallon
Gas Mileage: 31 kms/liter
Number of Days: 2
Hotel Cost: 150
Food Cost: 125
Attractions: 78

Output:
Total Trip Cost: $682.17

Demo test below:



Trip Cost Estimator

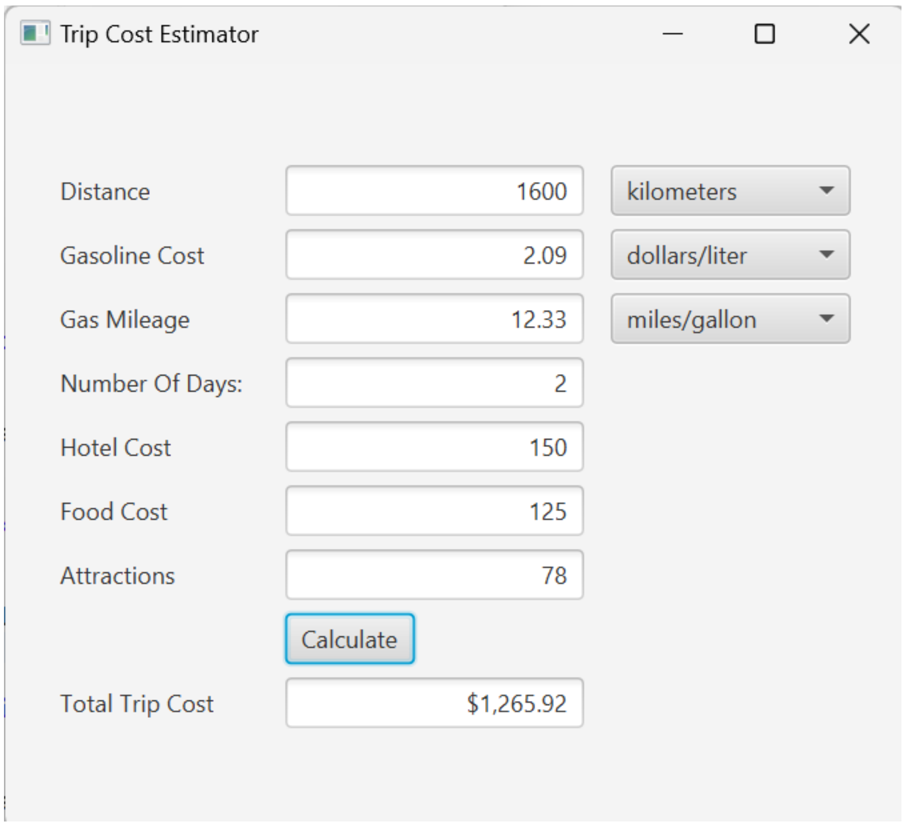
Distance	1000	miles
Gasoline Cost	3.95	dollars/gallon
Gas Mileage	31	kms/liter
Number Of Days:	2	
Hotel Cost	150	
Food Cost	125	
Attractions	78	
	Calculate	
Total Trip Cost	$682.17	

Test 6 (Created): Testing for mixed units (imperial and metric combination)

Input:
Distance: 1600 kilometers
Gasoline Cost: 2.09 dollars/liter
Gas Mileage: 12.33 miles/gallon
Number of Days: 2
Hotel Cost: 150
Food Cost: 125
Attractions: 78

Output:
Total Trip Cost: $1,265.92

Demo test below:



Trip Cost Estimator

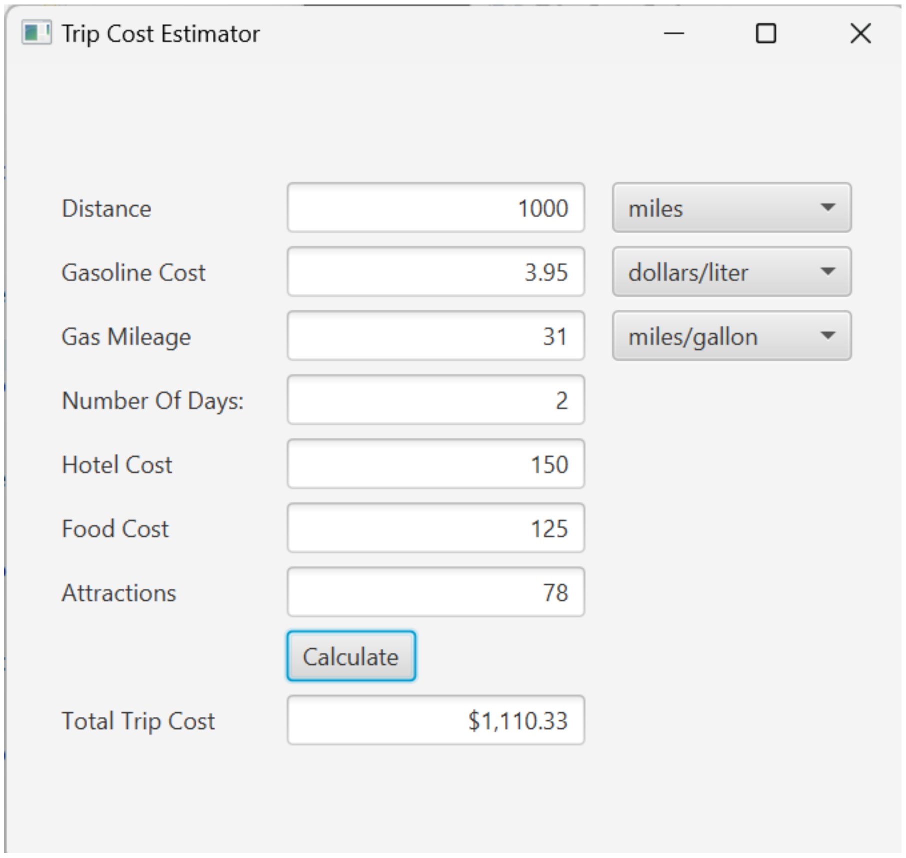
Distance	1600	kilometers
Gasoline Cost	2.09	dollars/liter
Gas Mileage	12.33	miles/gallon
Number Of Days:	2	
Hotel Cost	150	
Food Cost	125	
Attractions	78	
	Calculate	
Total Trip Cost	$1,265.92	

Test 7 (Created): Testing for mixed units (imperial and metric combination)

Input:
Distance: 1000 miles
Gasoline Cost: 3.95 dollars/liter
Gas Mileage: 31 miles/gallon
Number of Days: 2
Hotel Cost: 150
Food Cost: 125
Attractions: 78

Output:
Total Trip Cost: $1,110.33

Demo test below:


Trip Cost Estimator

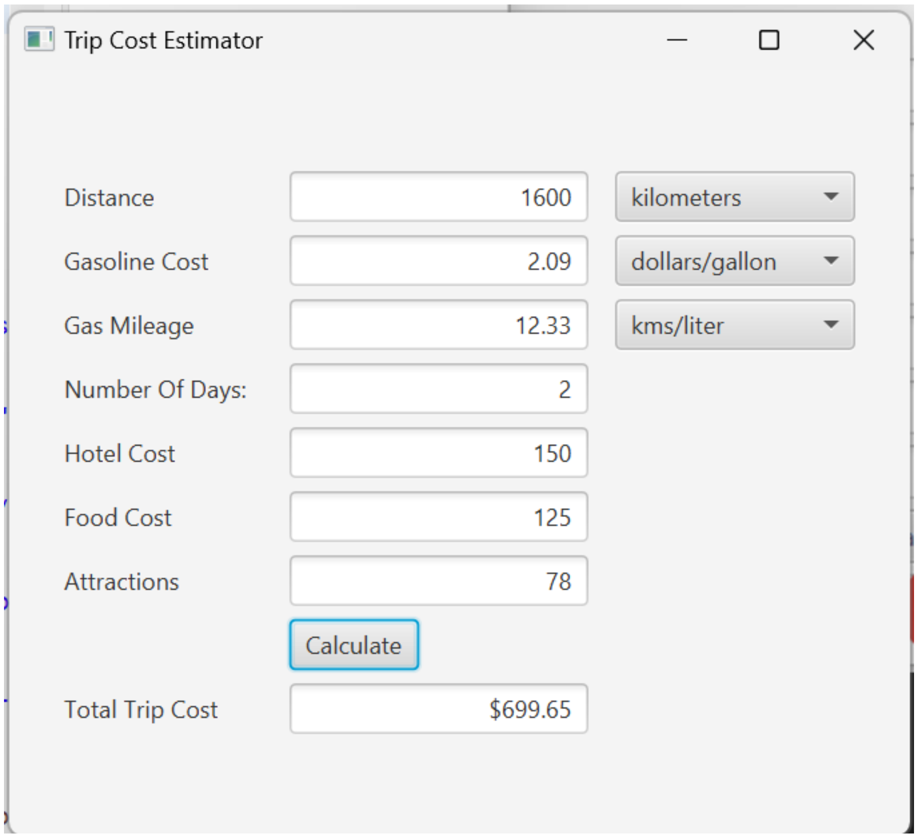
Distance	1000	miles
Gasoline Cost	3.95	dollars/liter
Gas Mileage	31	miles/gallon
Number Of Days:	2	
Hotel Cost	150	
Food Cost	125	
Attractions	78	
	Calculate	
Total Trip Cost	$1,110.33	

Test 8 (Created): Testing for mixed units (imperial and metric combination)

Input:
Distance: 1600 kilometers
Gasoline Cost: 2.09 dollars/gallon
Gas Mileage: 12.33 kms/liter
Number of Days: 2
Hotel Cost: 150
Food Cost: 125
Attractions: 78

Output:
Total Trip Cost: $699.65

Demo test below:



Trip Cost Estimator

Distance	1600	kilometers
Gasoline Cost	2.09	dollars/gallon
Gas Mileage	12.33	kms/liter
Number Of Days:	2	
Hotel Cost	150	
Food Cost	125	
Attractions	78	
	Calculate	
Total Trip Cost	$699.65	

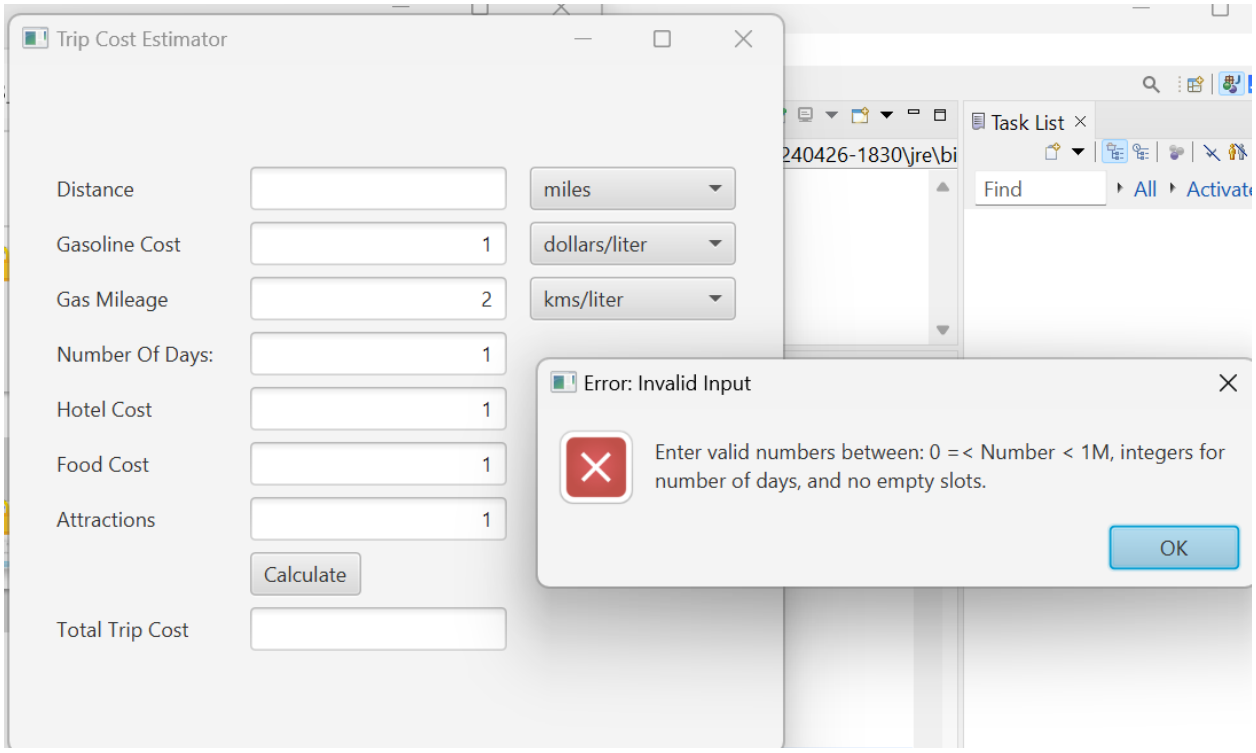
Test 9 (Created): Testing for empty slot or no user input in at least 1 or more boxes. It is an error and should pop up an error or alert message as it is invalid.

Input:
Distance: Blank miles
Gasoline Cost: 1 dollars/liter
Gas Mileage: 2 kms/liter
Number of Days: 1
Hotel Cost: 1
Food Cost: 1
Attractions: 1

Output:
Total Trip Cost: Blank

Alert:
Error: Invalid Input
Enter valid numbers between: 0=< Number < 1Millon, integers for number of days, and no empty slots.

Demo test below:



Trip Cost Estimator

Distance		miles
Gasoline Cost	1	dollars/liter
Gas Mileage	2	kms/liter
Number Of Days:	1	
Hotel Cost	1	
Food Cost	1	
Attractions	1	
	Calculate	
Total Trip Cost		

Error: Invalid Input

Enter valid numbers between: 0 =< Number < 1M, integers for number of days, and no empty slots.

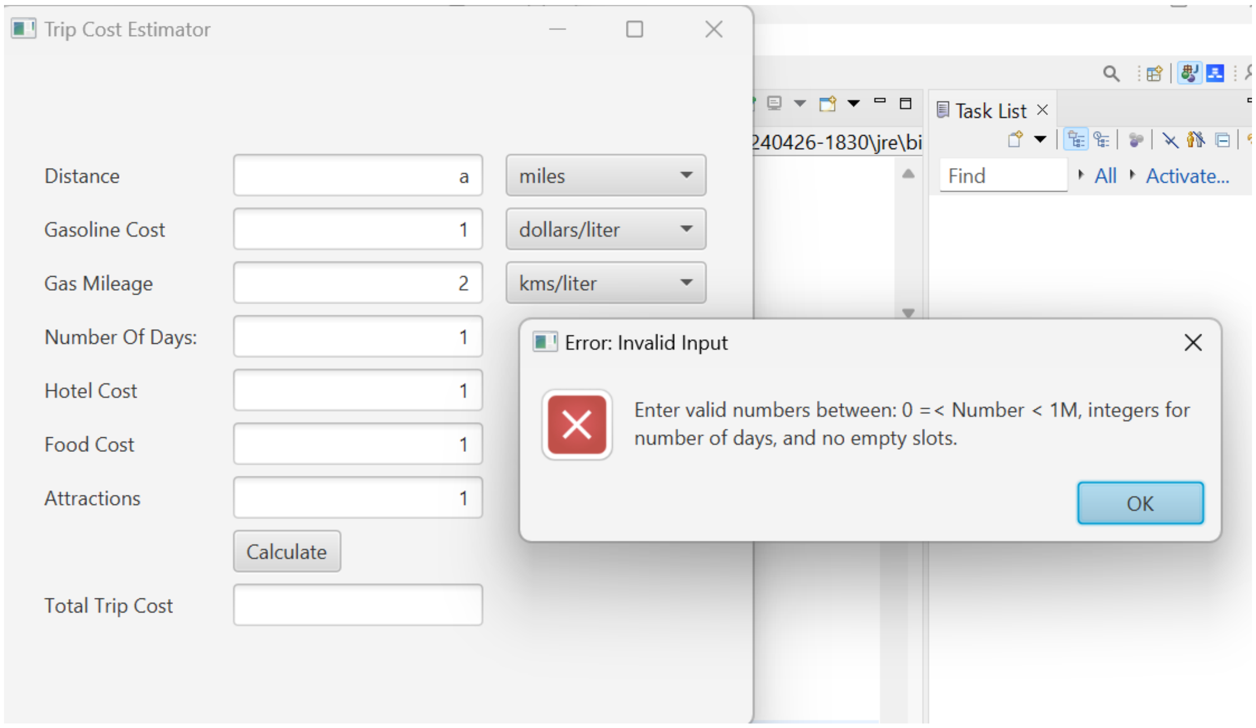
Test 10 (Created): Testing for invalid input of a string, char, letters (uppercase or lower case). It is an error and should pop up an error or alert message as it is invalid.

Input:
Distance: a miles
Gasoline Cost: 1 dollars/liter
Gas Mileage: 2 kms/liter
Number of Days: 1
Hotel Cost: 1
Food Cost: 1
Attractions: 1

Output:
Total Trip Cost: Blank

Alert:
Error: Invalid Input
Enter valid numbers between: 0=< Number < 1Millon, integers for number of days, and no empty slots.

Demo test below:



Trip Cost Estimator

Distance	a	miles
Gasoline Cost	1	dollars/liter
Gas Mileage	2	kms/liter
Number Of Days:	1	
Hotel Cost	1	
Food Cost	1	
Attractions	1	
	Calculate	
Total Trip Cost		

Error: Invalid Input

Enter valid numbers between: 0 =< Number < 1M, integers for number of days, and no empty slots.

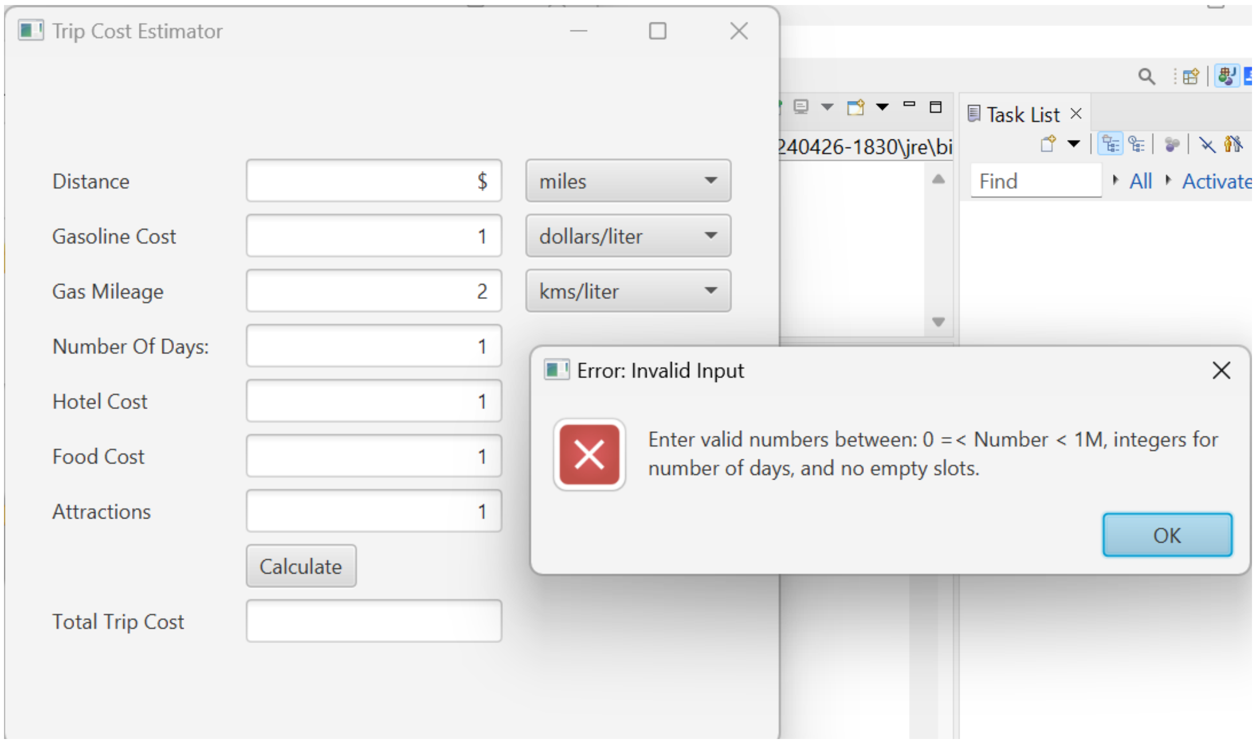
Test 11 (Created): Testing for invalid input of any symbols, for this case the $. It is an error and should pop up an error or alert message as it is invalid.

Input:
Distance: $ miles
Gasoline Cost: 1 dollars/liter
Gas Mileage: 2 kms/liter
Number of Days: 1
Hotel Cost: 1
Food Cost: 1
Attractions: 1

Output:
Total Trip Cost: Blank

Alert:
Error: Invalid Input
Enter valid numbers between: 0=< Number < 1Millon, integers for number of days, and no empty slots.

Demo test below:


Trip Cost Estimator

Distance	$	miles
Gasoline Cost	1	dollars/liter
Gas Mileage	2	kms/liter
Number Of Days:	1	
Hotel Cost	1	
Food Cost	1	
Attractions	1	
Total Trip Cost		

Error: Invalid Input

Enter valid numbers between: 0 =< Number < 1M, integers for number of days, and no empty slots.

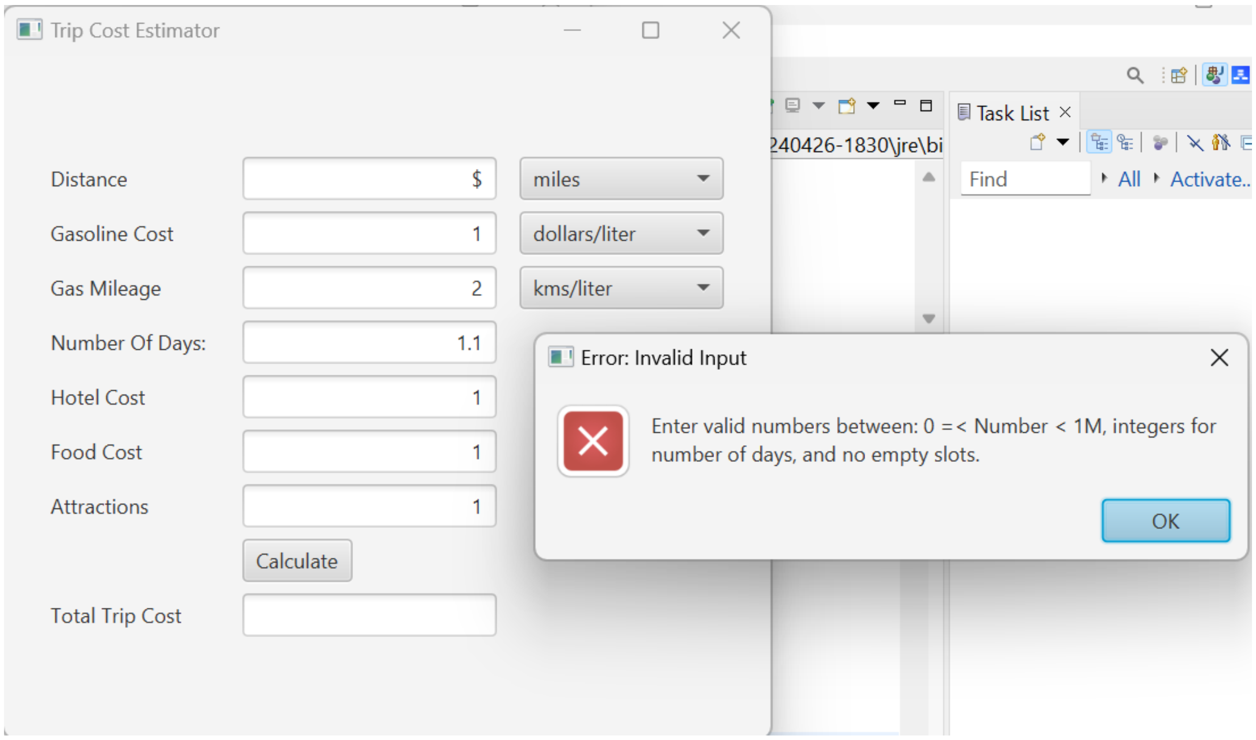
Test 12 (Created): Testing for invalid input of any symbols, and if the number of days is not an integer. Number of days must be integer or it is invalid. It is an error and should pop up an error or alert message as it is invalid.

Input:
Distance: $ miles
Gasoline Cost: 1 dollars/liter
Gas Mileage: 2 kms/liter
Number of Days: 1.1
Hotel Cost: 1
Food Cost: 1
Attractions: 1

Output:
Total Trip Cost: Blank

Alert:
Error: Invalid Input
Enter valid numbers between: 0=< Number < 1Millon, integers for number of days, and no empty slots.

Demo test below:



Distance	$	miles
Gasoline Cost	1	dollars/liter
Gas Mileage	2	kms/liter
Number Of Days:	1.1	
Hotel Cost	1	
Food Cost	1	
Attractions	1	
Total Trip Cost		

Error: Invalid Input

Enter valid numbers between: 0 =< Number < 1M, integers for number of days, and no empty slots.

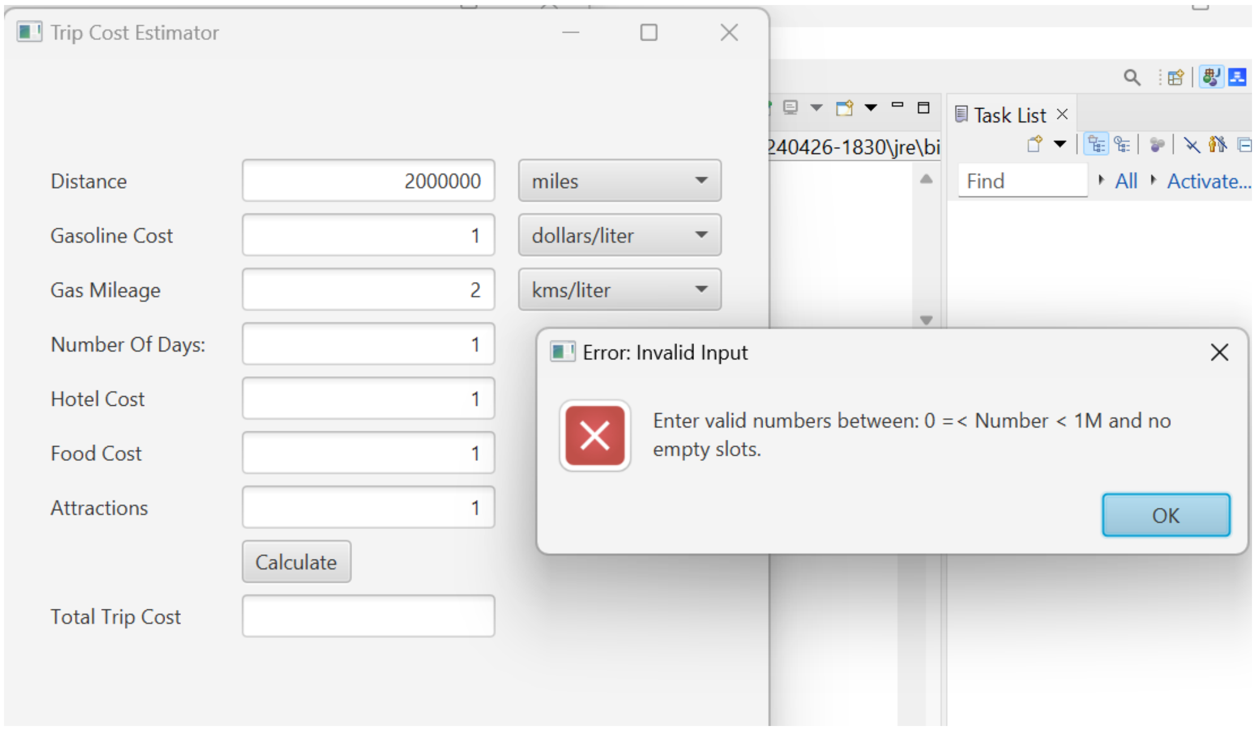
Test 13 (Created): Testing for maximum user input value. I set the maximum to be 1 million, so anything great than it should invoke an error. It is an error and should pop up an error or alert message as it is invalid.

Input:
Distance: 2,000,000 miles
Gasoline Cost: 1 dollars/liter
Gas Mileage: 2 kms/liter
Number of Days: 1
Hotel Cost: 1
Food Cost: 1
Attractions: 1

Output:
Total Trip Cost: Blank

Alert:
Error: Invalid Input
Enter valid numbers between: 0=< Number < 1Millon, integers for number of days, and no empty slots.

Demo test below:



Trip Cost Estimator

Distance	2000000	miles
Gasoline Cost	1	dollars/liter
Gas Mileage	2	kms/liter
Number Of Days:	1	
Hotel Cost	1	
Food Cost	1	
Attractions	1	
Total Trip Cost		

Error: Invalid Input

Enter valid numbers between: 0 =< Number < 1M and no empty slots.

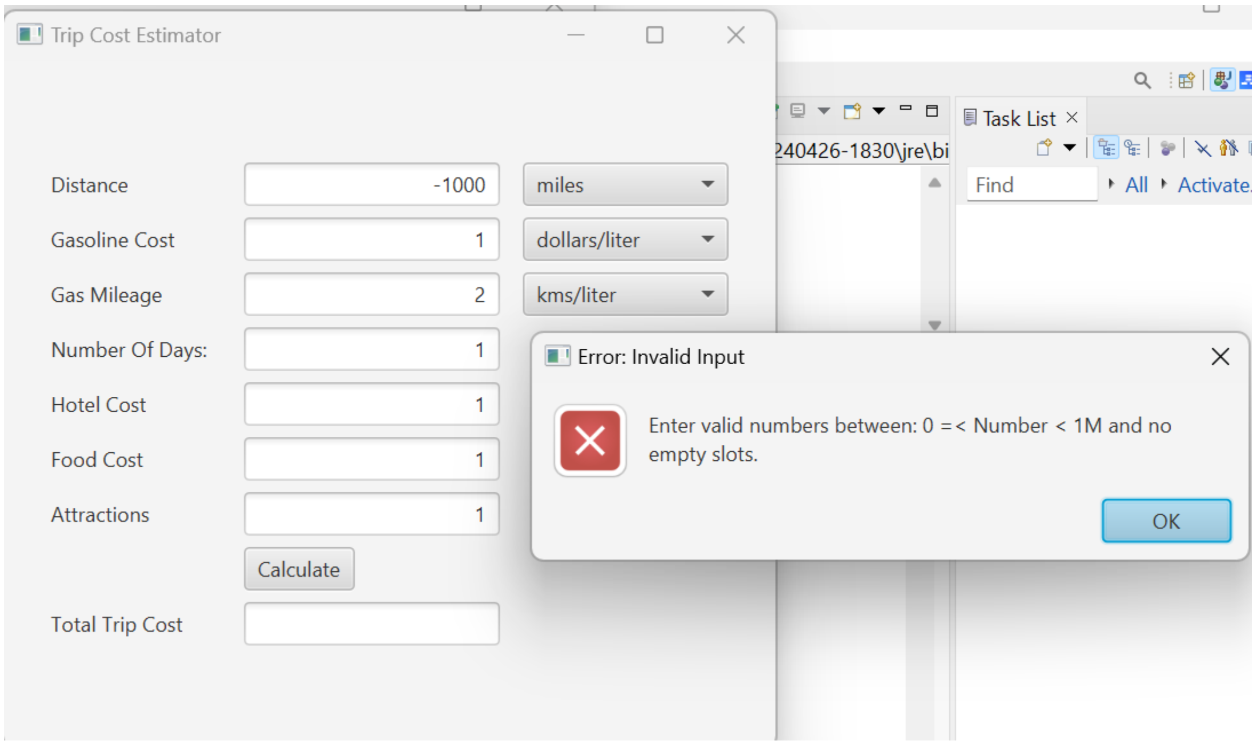
Test 14 (Created): Testing for any negative number user input value. Anything less than 0 should invoke an error. It is an error and should pop up an error or alert message as it is invalid.

Input:
Distance: -1000 miles
Gasoline Cost: 1 dollars/liter
Gas Mileage: 2 kms/liter
Number of Days: 1
Hotel Cost: 1
Food Cost: 1
Attractions: 1

Output:
Total Trip Cost: Blank

Alert:
Error: Invalid Input
Enter valid numbers between: 0=< Number < 1Millon, integers for number of days, and no empty slots.

Demo test below:



Distance	-1000	miles
Gasoline Cost	1	dollars/liter
Gas Mileage	2	kms/liter
Number Of Days:	1	
Hotel Cost	1	
Food Cost	1	
Attractions	1	
Total Trip Cost		

Error: Invalid Input

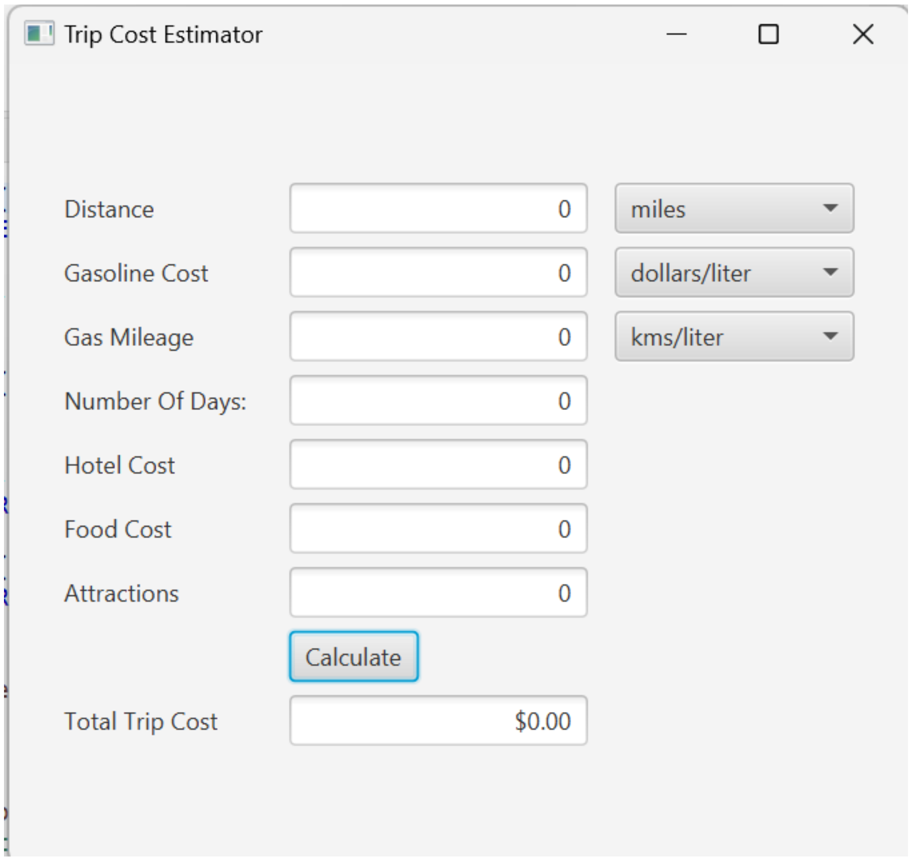
Enter valid numbers between: 0 =< Number < 1M and no empty slots.

Test 15 (Created): Testing for if user inputs 0 and it calculates it to 0. It should also make sure if it is NaN it will output the total trip cost into $0.00.

Input:
Distance: 0 miles
Gasoline Cost: 0 dollars/liter
Gas Mileage: 0 kms/liter
Number of Days: 0
Hotel Cost: 0
Food Cost: 0
Attractions: 0

Output:
Total Trip Cost: $0.00

Demo test below:



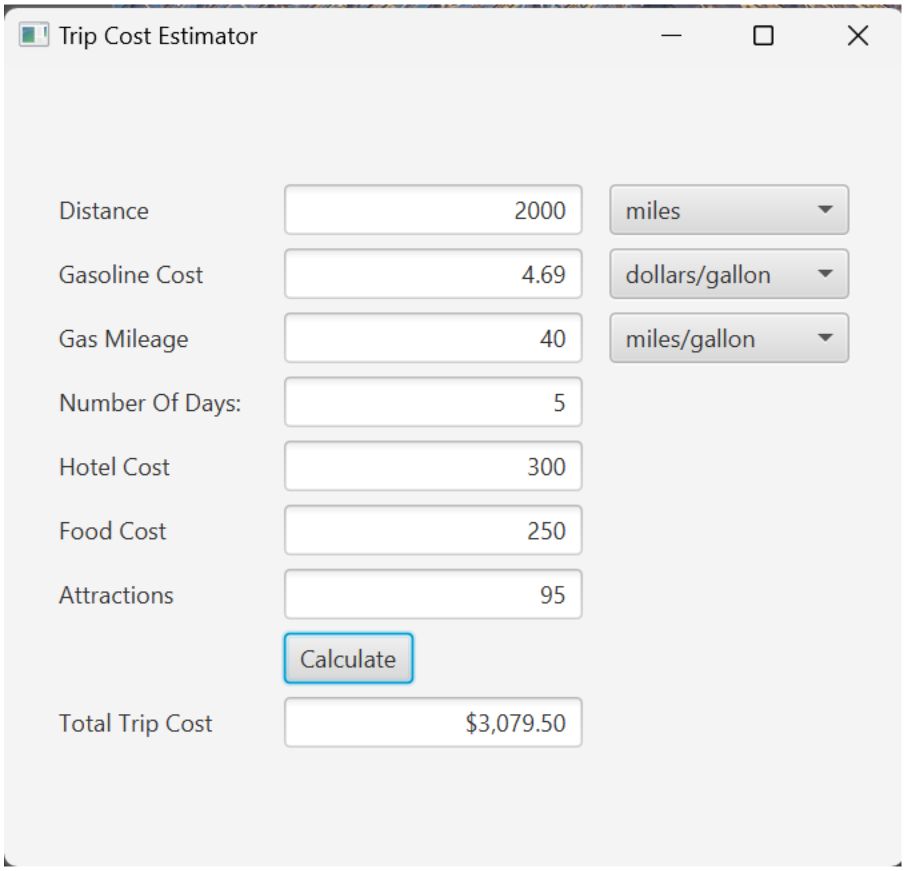
Distance	0	miles
Gasoline Cost	0	dollars/liter
Gas Mileage	0	kms/liter
Number Of Days:	0	
Hotel Cost	0	
Food Cost	0	
Attractions	0	
Total Trip Cost	$0.00	

Test 16 (Created): Testing imperial units with my own choice of values.

Input:
Distance: 2000 miles
Gasoline Cost: 4.69 dollars/gallon
Gas Mileage: 40 miles/gallon
Number of Days: 5
Hotel Cost: 300
Food Cost: 250
Attractions: 95

Output:
Total Trip Cost: $3,079.50

Demo test below:



Trip Cost Estimator

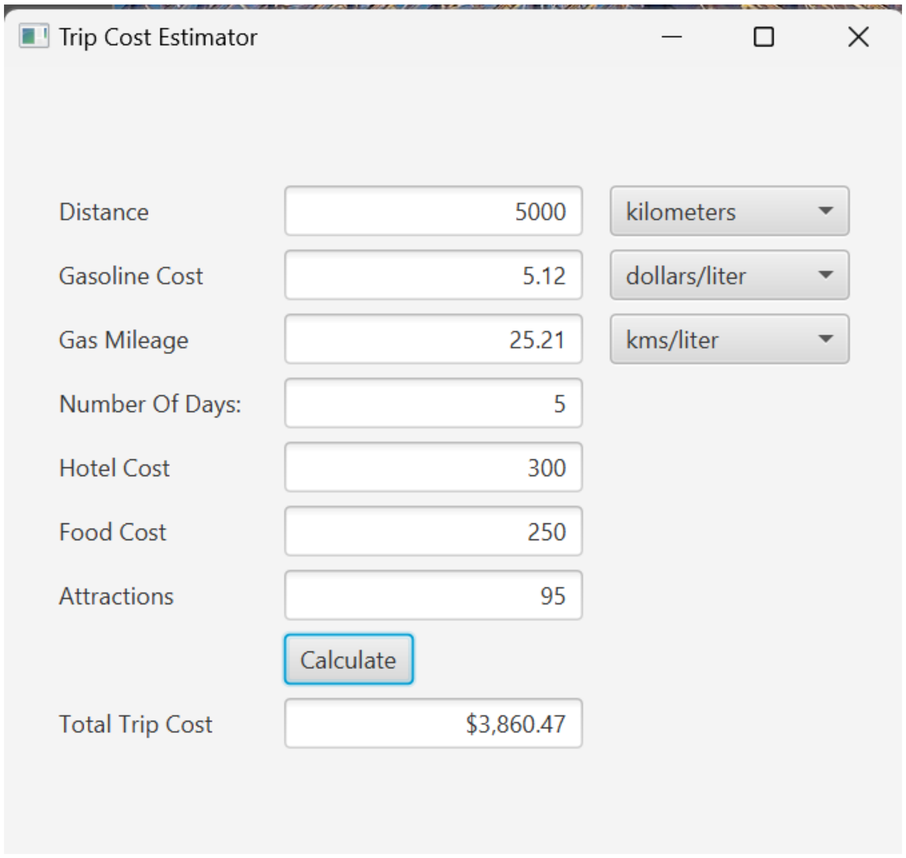
Distance	2000	miles
Gasoline Cost	4.69	dollars/gallon
Gas Mileage	40	miles/gallon
Number Of Days:	5	
Hotel Cost	300	
Food Cost	250	
Attractions	95	
	Calculate	
Total Trip Cost	$3,079.50	

Test 17 (Created): Testing metric units with my own choice of values.

Input:
Distance: 5000 kilometers
Gasoline Cost: 5.12 dollars/liter
Gas Mileage: 25.21 kms/liter
Number of Days: 5
Hotel Cost: 300
Food Cost: 250
Attractions: 95

Output:
Total Trip Cost: $3,860.47

Demo test below:



Distance	5000	kilometers
Gasoline Cost	5.12	dollars/liter
Gas Mileage	25.21	kms/liter
Number Of Days:	5	
Hotel Cost	300	
Food Cost	250	
Attractions	95	
Total Trip Cost	$3,860.47	

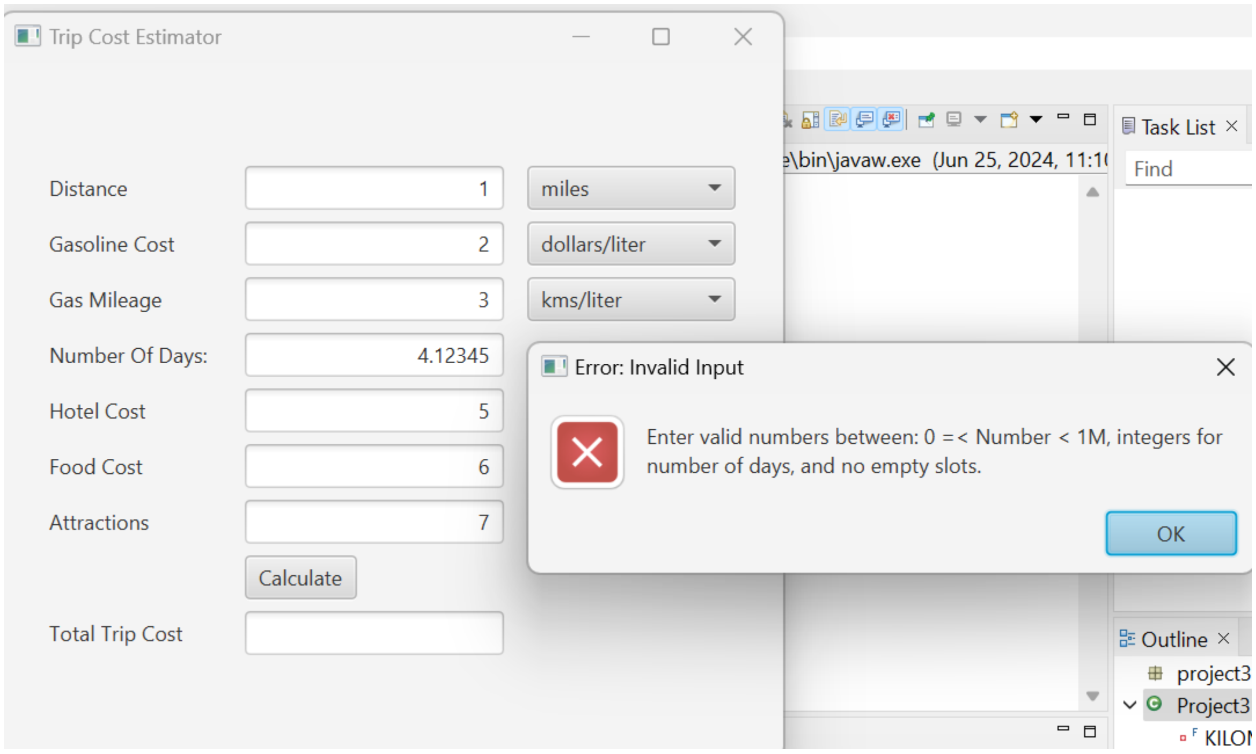
Test 12 (Created): Another version of testing for invalid input if the number of days is not an integer. Number of days must be integer, or it is invalid. It is an error and should pop up an error or alert message as it is invalid.

Input:
Distance: 1 miles
Gasoline Cost: 2 dollars/liter
Gas Mileage: 3 kms/liter
Number of Days: 4.12345
Hotel Cost: 5
Food Cost: 6
Attractions: 7

Output:
Total Trip Cost: Blank

Alert:
Error: Invalid Input
Enter valid numbers between: 0=< Number < 1Millon, integers for number of days, and no empty slots.

Demo test below:



Trip Cost Estimator

Distance	1	miles
Gasoline Cost	2	dollars/liter
Gas Mileage	3	kms/liter
Number Of Days:	4.12345	
Hotel Cost	5	
Food Cost	6	
Attractions	7	
	Calculate	
Total Trip Cost		

Error: Invalid Input

Enter valid numbers between: 0 =< Number < 1M, integers for number of days, and no empty slots.

OK

Lessons Learned (brief paragraphs):

I learned how to create a project, classes, immutable classes or subclasses, try/catch, throw exceptions, methods, functions, and GUI interfaces with JavaFX to achieve my project goals. I learned that the trip cost estimator program with a GUI interface allowed me to comprehend the significant principles of object-oriented programming and software development. A class defines all the attributes which an object can have and methods, which defines the functionality of the object. A subclass inherits its properties and behaviors of another class. Immutable classes in java means that once an object is created, we cannot change its content. The Labeled class is the base class for Label, Button, etc. The ButtonBase class defines the onAction property for specifying a handler for action events. The TextInputControl class is for TextField which fires an action event if you code it. The ComboBox<T> is a class for storing elements of type T and the elements in a combo box are stored in an observable list. Like TextField, the ComboBox can fire an action event when a new item is selected. And so, the main lesson learned for the Project3 class, is that it is responsible for creating the GUI which is the user interface. This interface then could include input fields for distance, gas price, vehicle efficiency, number of days, hotel cost, food cost, and attractions, to calculate the total cost of a trip. Moreover, the second class should be an immutable class. This immutable class is TripCost, which is responsible for the total trip cost calculation. The formulas and conversions are given in the instructions. The main goals in this class's design include its constructor, which initializes the trip cost object, and its method to compute the total trip cost. The immutable objects ensure when a TripCost object is created, it cannot be altered, allowing consistency with debugging and maintenance. This also allows it to also be thread safe. These lessons this week helped me understand the good modular design and reusability for developing applications with JavaFX or GUI. The concept of calculating the correct cost helps design a robust total trip cost estimator. In real life, users can utilize this application to weigh the benefits against these costs and maximize utility. In general, this project about comprehending the calculations and making sure the conversions were correct was the trickiest. Overall, I learned to apply it to project 3 with the lessons about try/catch, exceptions/throws, classes, subclasses, packages, importing libraries, constructors, GUI/JavaFX, and immutable classes.

My design approach was to create the Project3 class first before creating the TripCost class. I started with a Bottom-Up Design when building the code, but then debugged the code through a Top-Down Design. I followed the instructions on what is asked for the Project3 and TripCost classes. I utilized the lessons from the chapters that were in the past few weeks so that I can apply it to the Project3 and TripCost classes. Once it was finished, I went back into Project3 class to create the GUI using JavaFX Application, then the user inputs would be passed into the TripCost class to calculate the total trip cost and output the results back through the Project 3 class. It should create the text fields, labels, combo boxes, button, pane, scene, and other parts of the JavaFX to create the application. If it is an invalid input or 0 calculation/NaN, it must throw an exception as learned in the lessons. To debug the Project3, I ended up looking at the Sample outputs or lessons learned and then modified the classes. Other times, I utilized other examples from the programing exercies and other problems to help me practice this concept. I also adjust the classes so that TripCost constructor would be able to pass the values which is the user input from the text fields. There is an option to convert back in forth between units if the user would like to and it also should convert them when calculating it if it has mixed units. Then, I went back to the Project3 class and checked if the output was correct.

Note: I did not include a Javadoc here due to the fact that the Javadoc compiler wanted the file path of the JDK for the GUI/JavaFX (including imported classes) which made it complicated and so I decided to not put it here. Anyhow, the requirements did not really ask for the whole Javadoc html files here so, maybe for the next project I will include. The Javadoc comments in the coding should be the same as the Javadoc html files if it did work out correctly.