

# COMP101 Lab6: Toll charge report

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## Requirements

The problem to solve were to write a program that will calculate and print the classification of the vehicle (1-6), name of that class and the cost when the user will input the number of wheels (integer  $\geq 2$ ), the height at the first axle (real number  $> 0$ ), the number of axles (integer  $\geq 2$ ) and whether it is during a day or night (boolean). As the extended requirements the program should calculate and print the total cost of journeys (days, nights and total) paying per journey and compare them with the monthly pass whether it is better to buy a monthly pass or not after input by user from keyboard: number of wheels, height at the first axle, the number of axles, number of journeys during the days, number of journeys during the nights.

## Analysis and design

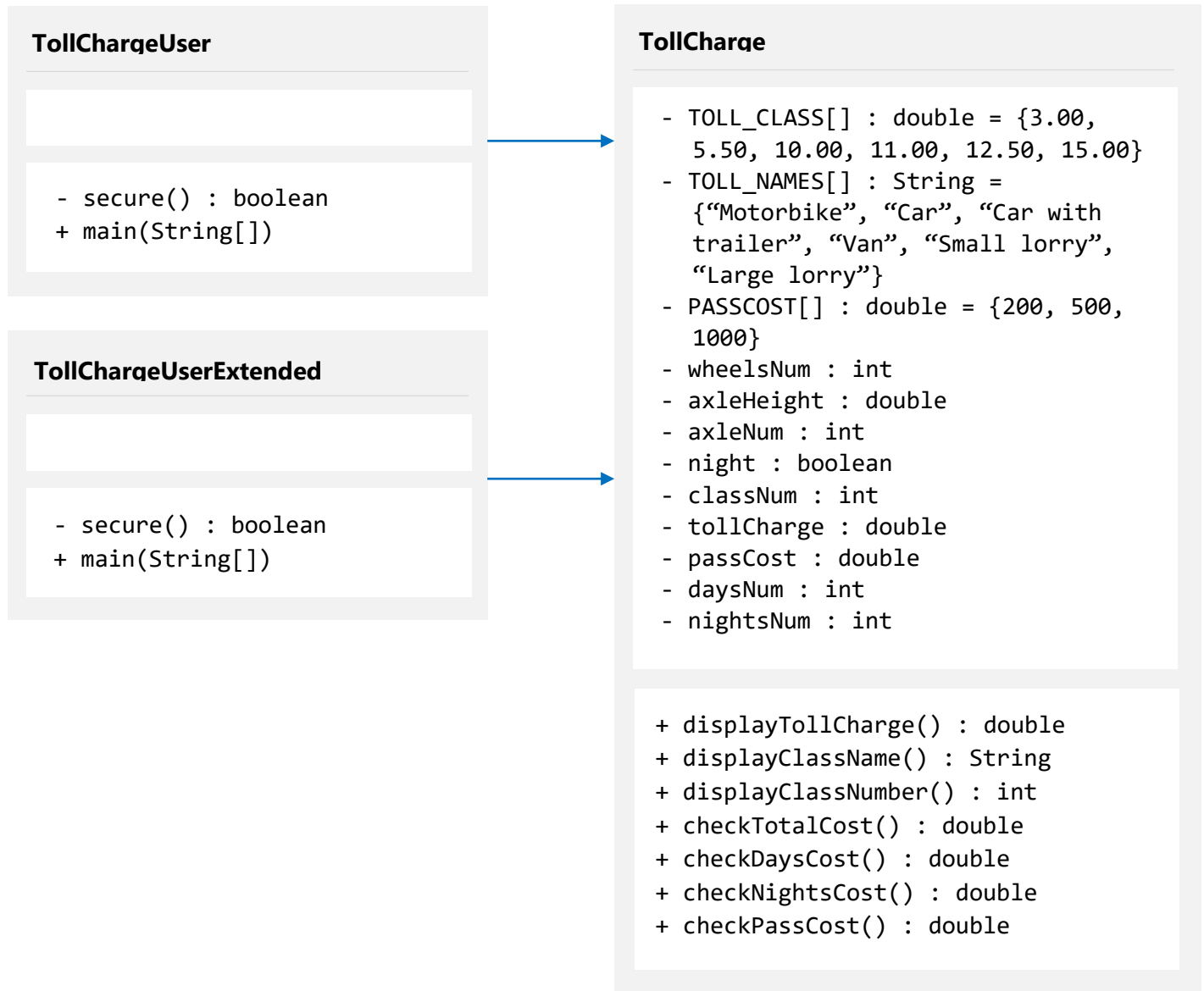
I wrote this program in three classes. `TollChargeUser` – class where I call another `TollCharge` class, `TollChargeUser` – it does extended requirements and `TollCharge` where the main core of the program is.

In `TollCharge` class which is common for both, normal and extended requirements. I created three constant arrays to keep data from toll charges per class, names of each class and cost of pass for each class. In constructor method I created a sets of "if-else" statements to determine to which class this vehicle with entered details belong. Finally I created methods to calculate and display the toll charge, name of the class, number of the class, the total cost of journeys on days, the total cost of journeys per night and total cost of journeys on both, days and nights and the cost of the pass.

In `TollChargeUser` class, first I created an input-checking method which I will call later. In main method I created four inputs for numbers of wheels, height of the axle, the number of axles and whether it is on the day or night. Then I'm calling an input-checking method. If the inputs fail this test then the error is displayed, otherwise the char 'y' or 'n' is converted into boolean `true` or `false` and the object type of `TollCharge` is instantiated and the output is printed.

In `TollChargeUserExtended` class, first I created an input-checking method which I will call later. In main method I created four inputs for numbers of wheels, height of the axle, the number of axles the number of journeys during the days and the number of journeys during the nights. Then I'm calling an input-checking method. If the inputs fail this test then the error is displayed, otherwise the object type of `TollCharge` is instantiated, the output is printed and total cost of journeys is compared to cost of the monthly pass and the results printed.

# Class diagram



# Pseudocode

```
CLASS TollCharge
    LOCAL DATA
        TOLL_CLASS[] = {3.00, 5.50, 10.00, 11.00, 12.50, 15.00},
        TOLL_NAMES[] = {"Motorbike", "Car", "Car with trailer", "Van", "Small lorry", "Large lorry"},
        PASSCOST[] = {200, 500, 1000}
        All of these are constants
    LOCAL DATA wheelsNum, axleNum, classNum, daysNum, nightsNum - integers
    LOCAL DATA axleHeight, tollCharge, passCost - double variables
    LOCAL DATA night - boolean
    METHOD TollCharge (Constructor method)
        INPUT inputWheelsNum, inputAxleNum, inputDaysNum, inputNightsNum - integers, inputAxleHeight - double, inputNight - boolean
        IF axleHeight >= 4
            THEN: IF axleHeight >= 1.3
                THEN: IF axleNum = 2
                    THEN Set the class of the vehicle as 4
                    ELSE IF axleNum >= 3 and axleNum <= 6
                        THEN Set the class of the vehicle as 5
                    ELSE
                        Set the class of the vehicle as 6
                ELSE IF axleNum = 2
                    THEN Set the class of the vehicle as 2
                ELSE
                    Set the class of the vehicle as 3
            ELSE
                Set the class of the vehicle as 1

        IF night = true
            THEN divide tollCharge by 2
    METHOD displayTollCharge: INPUT , OUTPUT tollCharge
    METHOD displayClassName: INPUT , OUTPUT TOLL_NAMES[classNum-1]
    METHOD displayClassNumber: INPUT , OUTPUT classNum
    METHOD checkTotalCost: INPUT , OUTPUT the sum of checkDaysCost and checkNightsCost
    METHOD checkDaysCost: INPUT , OUTPUT the product of tollCharge and daysNum
    METHOD checkNightsCost: INPUT , OUTPUT the product of tollCharge and daysNum divided by 2
    METHOD checkPassCost: INPUT , OUTPUT passCost

CLASS TollChargeUser
    METHOD secure
        INPUT wheelNum, axleNum - integers; axleHeight - double; night - char
        OUTPUT error
        SET error as false
        IF wheelNum < 2 or axleHeight < 0 or axleNum < 2 or (night != 'y' and night != 'n')
            THEN SET error as true
    METHOD main
        INPUT args
        OUTPUT
        READ wheelNum (int >= 2), axleHeight (double > 0), axleNum (int >= 2), night (char = 'y' or 'n') from keyboard
```

```

SET err (Boolean) as returned value of secure method with given inputs as
arguments
IF err is false
    THEN SET nightBool as false
    SWITCH the variable of night
        CASE 'y': SET nightBool as true
        CASE 'n': SET nightBool as false
    CREATE instance of class TollCharge
    PRINT the toll charge, vehicle class and class name
ELSE
    PRINT the error message

CLASS TollChargeUserExtended
METHOD secure
    INPUT wheelNum, axleNum - integers; axleHeight - double
    OUTPUT error
    SET error as false
    IF wheelNum < 2 or axleHeight < 0 or axleNum < 2
        THEN SET error as true
METHOD main
    INPUT args
    OUTPUT
    READ wheelNum (int >= 2), axleHeight (double > 0), axleNum (int >= 2),
    daysNum, nightsNum (integers > 0) from keyboard
    SET err (Boolean) as returned value of secure method with given inputs as
    arguments
    IF err is false
        THEN SET nightBool as false
        CREATE instance of class TollCharge
        PRINT the total cost for journeys on days, the total cost of
        journeys on nights, the total cost of journeys (days+nights),
        class of the vehicle, name of this class and the cost of
        monthly pass
        IF total cost of journeys > the cost of monthly pass
            THEN PRINT information that it is better to buy a pass
        ELSE IF total cost of journeys = the cost of monthly pass
            THEN PRINT information that there is no difference
        ELSE
            PRINT information that it is better not to buy a pass
    ELSE
        PRINT the error message

```

# Testing

INPUT VALUES	EXPECTED RESULT
wheelNum = 2 axleHeight = 2 axleNum = 2 night = 'n'	Toll charge = 3.00 Vehicle class = 1 Vehicle class name = "Motorbike"
wheelNum = 2 axleHeight = 0 axleNum = 2 night = 'n'  OR  wheelNum = -1 axleHeight = 2 axleNum = 2 night = 'y'  OR  wheelNum = 2 axleHeight = 2 axleNum = 2 night = 'l'  OR  wheelNum = 2 axleHeight = 2 axleNum = -3 night = 'n'	Display error message
wheelNum = 4 axleHeight = 2.35 axleNum = 7 night = 'n'	Toll charge = 15.00 Vehicle class = 6 Vehicle class name = "Large lorry"
wheelNum = 6 axleHeight = 1.30 axleNum = 4 night = 'y'	Toll charge = 6.25 Vehicle class = 5 Vehicle class name = "Small lorry"

INPUT VALUES	EXPECTED RESULT
<pre>wheelNum = 2 axleHeight = 2 axleNum = 2 daysNum = 3 nightsNum = 3</pre>	<pre>Cost of journeys during the days = 9.00 Cost of journeys during the nights = 4.50 Total cost without the pass = 13.50 Vehicle class = 1 Vehicle class name = "Motorbike" Pass cost = 200.00  Message: "It is better not to buy a pass."</pre>
<pre>wheelNum = 0 axleHeight = 2 axleNum = 2 daysNum = 3 nightsNum = 3 OR wheelNum = 2 axleHeight = 1.30 axleNum = 2 daysNum = -1 nightsNum = 3 OR wheelNum = 2 axleHeight = 2 axleNum = 2 daysNum = 3 nightsNum = 0 OR wheelNum = 2 axleHeight = 0 axleNum = -2 daysNum = 3 nightsNum = 3</pre>	<pre>Display error message</pre>
<pre>wheelNum = 4 axleHeight = 1.30 axleNum = 5 daysNum = 75 nightsNum = 43</pre>	<pre>Cost of journeys during the days = 937.50 Cost of journeys during the nights = 268.75 Total cost without the pass = 1206.25 Vehicle class = 5 Vehicle class name = "Small lorry" Pass cost = 1000.00 Message: "It is better to buy a pass - you will save money!"</pre>
<pre>wheelNum = 4 axleHeight = 1 axleNum = 4 daysNum = 20 nightsNum = 60</pre>	<pre>Cost of journeys during the days = 200.00 Cost of journeys during the nights = 300.00 Total cost without the pass = 500.00 Vehicle class = 3 Vehicle class name = "Car with trailer" Pass cost = 500.00 Message: "There is no difference between cost of pass and total cost without pass."</pre>

The finally working program returned:

## CONSOLE

```
$java TollChargeUser

===== TOLL CHARGE =====
This program calculates the the toll charge of the vehicle dependent on its type
.

Give me the number of wheels: 2
Give me the height at the first axle: 2
Give me the number of axles: 2
Are you going at night? (y/n): n

The toll charge is 3.00 pounds
Your vehicle is classified as Motorbike (CLASS 1)

$java TollChargeUser

===== TOLL CHARGE =====
This program calculates the the toll charge of the vehicle dependent on its type
.

Give me the number of wheels: 2
Give me the height at the first axle: 0
Give me the number of axles: 2
Are you going at night? (y/n): n
You entered incorrect data.

$java TollChargeUser

===== TOLL CHARGE =====
This program calculates the the toll charge of the vehicle dependent on its type
.

Give me the number of wheels: -1
Give me the height at the first axle: 2
Give me the number of axles: 2
Are you going at night? (y/n): y
```

You entered incorrect data.

```
$java TollChargeUser
```

```
===== TOLL CHARGE =====
```

This program calculates the the toll charge of the vehicle dependent on its type  
.

Give me the number of wheels: 2

Give me the height at the first axle: 2

Give me the number of axles: 2

Are you going at night? (y/n): 1

You entered incorrect data.

```
$java TollChargeUser
```

```
===== TOLL CHARGE =====
```

This program calculates the the toll charge of the vehicle dependent on its type  
.

Give me the number of wheels: 2

Give me the height at the first axle: 2

Give me the number of axles: -3

Are you going at night? (y/n): n

You entered incorrect data.

```
$java TollChargeUser
```

```
===== TOLL CHARGE =====
```

This program calculates the the toll charge of the vehicle dependent on its type  
.

Give me the number of wheels: 4

Give me the height at the first axle: 2.35

Give me the number of axles: 7

Are you going at night? (y/n): n

The toll charge is 15.00 pounds

Your vehicle is classified as Large lorry (CLASS 6)



```
$java TollChargeUser
```

```
===== TOLL CHARGE =====
```

```
This program calculates the the toll charge of the vehicle dependent on its type
.
```

```
Give me the number of wheels: 6
```

```
Give me the height at the first axle: 1.30
```

```
Give me the number of axles: 4
```

```
Are you going at night? (y/n): y
```

```
The toll charge is 6.25 pounds
```

```
Your vehicle is classified as Small lorry (CLASS 5)
```

## CONSOLE

```
$java TollChargeUserExtended
```

```
===== TOLL CHARGE EXTENDED =====
```

```
This program calculates the the toll charge of the vehicle dependent on its type.
```

```
Give me the number of wheels: 2
```

```
Give me the height at the first axle: 2
```

```
Give me the number of axles: 2
```

```
How many times on days will you use this toll checkout? 3
```

```
How many times on nights will you use this toll checkout? 3
```

```
The cost for 3 journeys on days without pass is 9.00 pounds
```

```
The cost for 3 journeys on nights without pass is 4.50 pounds
```

```
The total cost without pass is 13.50 pounds
```

```
Your vehicle is classified as Motorbike (CLASS 1) so the cost of the monthly pass
is 200.00 pounds.
```

```
It is better not to buy a pass.
```

```
$java TollChargeUserExtended
```

```
===== TOLL CHARGE EXTENDED =====
```

```
This program calculates the the toll charge of the vehicle dependent on its type.
```

```
Give me the number of wheels: 0
```

Give me the height at the first axle: 2

Give me the number of axles: 2

How many times on days will you use this toll checkout? 3

How many times on nights will you use this toll checkout? 3

You entered incorrect data.

```
$java TollChargeUserExtended
```

```
===== TOLL CHARGE EXTENDED =====
```

This program calculates the the toll charge of the vehicle dependent on its type.

Give me the number of wheels: 2

Give me the height at the first axle: 1.30

Give me the number of axles: 2

How many times on days will you use this toll checkout? -1

How many times on nights will you use this toll checkout? 3

You entered incorrect data.

```
$java TollChargeUserExtended
```

```
===== TOLL CHARGE EXTENDED =====
```

This program calculates the the toll charge of the vehicle dependent on its type.

Give me the number of wheels: 2

Give me the height at the first axle: 2

Give me the number of axles: 2

How many times on days will you use this toll checkout? 3

How many times on nights will you use this toll checkout? 0

You entered incorrect data.

```
$java TollChargeUserExtended
```

```
===== TOLL CHARGE EXTENDED =====
```

This program calculates the the toll charge of the vehicle dependent on its type.

Give me the number of wheels: 2

Give me the height at the first axle: 0

Give me the number of axles: -2

How many times on days will you use this toll checkout? 3

How many times on nights will you use this toll checkout? 3

You entered incorrect data.

```
$java TollChargeUserExtended
```

```
===== TOLL CHARGE EXTENDED =====
```

This program calculates the the toll charge of the vehicle dependent on its type.

Give me the number of wheels: 4

Give me the height at the first axle: 1.30

Give me the number of axles: 5

How many times on days will you use this toll checkout? 75

How many times on nights will you use this toll checkout? 43

The cost for 75 journeys on days without pass is 937.50 pounds

The cost for 43 journeys on nights without pass is 268.75 pounds

The total cost without pass is 1206.25 pounds

Your vehicle is classified as Small lorry (CLASS 5) so the cost of the monthly pass is 1000.00 pounds.

It is better to buy a pass - you will save money!

```
$java TollChargeUserExtended
```

```
===== TOLL CHARGE EXTENDED =====
```

This program calculates the the toll charge of the vehicle dependent on its type.

Give me the number of wheels: 4

Give me the height at the first axle: 1

Give me the number of axles: 4

How many times on days will you use this toll checkout? 20

How many times on nights will you use this toll checkout? 60

The cost for 20 journeys on days without pass is 200.00 pounds

The cost for 60 journeys on nights without pass is 300.00 pounds

The total cost without pass is 500.00 pounds

Your vehicle is classified as Car with trailer (CLASS 3) so the cost of the monthly pass is 500.00 pounds.

There is no difference between cost of pass and total cost without pass.