Polymorphism

A Toll Bridge System – Introduction

In this lesson we will be creating a system that manages traffic entering a small bridge.

The bridge itself is quite weak and therefore has a maximum weight limit. This system will ensure that the weight limit is not exceeded!

Do not make the 'Bridge' class yet!

The Abstract Class

There are three categories of vehicles that are permitted to make passage across this bridge.

- Motorbikes
- Cars
- Lorries

As such we need to create a generic vehicle class that represents the basic behaviourisms of all three.

Create a Vehicle class with the following attributes:

- Registration number
- Weight

It should also have the following methods:

- CalculateFee() – This will be a different process for each vehicle and thus should be abstract!
- Getter methods for each attribute

Child Classes

- Create the Motorbike, Car and Lorry classes, they should inherit from Vehicle.

If you made the calculateFee() method abstract then you will be forced to override it in your child classes. The differences between the calculations are listed below:

Motorbikes pay a fixed fee of £3.00

Cars pay a fee of £5.00. The average car is expected to weigh approximately 1590kg. With this in mind, the bridge system will add an additional 10p for every additional 100kg in excess of this.

Lorries pay a fee of £10.00 although this becomes £15.00 if the lorry exceeds 8000kg.

The Bridge Class

It is now time to create the bridge class.

The bridge keeps track of what motorbikes, cars and lorries it has allowed on to it. It does this by storing them in an array. For safety reasons, the bridge is only expected to hold a total of 20 vehicles. It also has a maximum weight limit of 30000kg

The bridge has three methods:

- calcTotalWeight() – This method tallies up the total weight of all vehicles currently on the bridge.
- The system must be able to add motorbikes/cars/lorries to the bridge. Think very carefully about what parameter this method will need and what its data type should be!
    - Remember that safety is a serious concern with the bridge; therefore it only holds 20 vehicles. If there are already 20 on the bridge then it should not allow this vehicle on, nor should it add the vehicle to its list.
    - In addition, it should also check the total weight of all vehicles crossing the bridge. If the weight of the vehicle requesting to enter the bridge plus the weight of the traffic on the bridge exceeds the maximum weight limit – the bridge should deny entry.
    - Should the bridge allow the vehicle entry, said vehicle should be added to its list and the fee should be displayed on the screen
- The bridge should also monitor cars leaving the bridge. Our system simply needs to remove a vehicle from the list by its registration number

GUI

Create a GUI for the system and have the main method display it. Here is a suggestion: