

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!

Below I shall detail the different classes the system requires. You should be sure to write unit tests for this system as you go. I would encourage writing this in a Test-Driven Development style

This system will involve inheritance, abstraction and polymorphism.

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 behaviours 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!

You do not need to write tests for the vehicle class (it's functionality will be tested along with the child classes)

Child Classes

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

You should override the `calculateFee()` method in each of these 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 a list. 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.
 - 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
- The bridge should also monitor cars leaving the bridge. Our system simply needs to remove a vehicle from the list by its registration number