CS109 2025Spring Assignment5 Vehicle

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> Keyword Annotation:
> **Field(s):** You can see the field(s) you need to define after it.
> **Method(s):** You can see the method(s) you need to define or modify after it.

What to Submit

Time.java

Vehicle.java

Car.java

Bus.java

Introduction

Assuming we have two different types of vehicles: Car and Bus, the calculation of parking fees is distinct for each. This exercise is designed to compute the parking fees for different modes of vehicles.

It is only a simple exercise for the abstract class, inheritance.

Other Important parameters and Test cases

1. The arrive time and leave time of vehicles in all test cases are between 00:00 and 24:00, viz. all operations take place in **one** day only.
2. The same vehicle may enter and exit the parking lot multiple times with **no overlapping**.

Classes

1. class Time

> - Do not modify or remove any methods or fields that have been already defined.
> - You can add other methods or attributes that you think are necessary.

Use 24-hour clock

Fields:

- `private int hour`
- `private int minute`

Methods:

- constructor: `public Time(int hour, int minute)`

  Initializes a newly created Time object using specific hour and minute.

- `public void addMinutes(int minutes)`

  Update the hour and minute attribute values by adding the parameter minutes to the current time.

  For example:

  ```
  Time t1 = new Time(1,20);
  t1.addMinutes(50);
  ```

  After that, the `hour` and `minute` of **t1** are 2 and 10 respectively.

- `public String toString()`

  Override method which **return**s a format type of **String** as "**hour:minute**" such as 01:15, 10:02 or 23:59.

CodeExample:

```
System.out.println(new Time(12, 5));
System.out.println(new Time(4, 11));
```

Result:

```
12:05
04:11
```

2. Class Vehicle

It is an **abstract** class, which is the super class of other concrete vehicle such as Car and Bus.

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Fields:

- `protected String plateNumber`

  The plate number of vehicle. The plate number in all test cases must be six digits, the first digit must start with a capital letter then appended five-digital integers.

- `protected boolean isInside`

Marks whether the current vehicle is parked. The initial value of this field is false. The value of this field depends on whether the arrivalTime is null. If the arrivalTime is null, this field is false, otherwise this field is true.

It is not very useful in this assignment and is mainly used for the 6th assignment.

- `protected Time arriveTime`
  A **Time** type that record the last arriving time of the vehicle.

Methods:

- `public Vehicle(String plateNumber)`

The constructor of this class, in which there is only one parameter. In this method, you should set the original value of the field plateNumber.

- `public String toString()`
  Override this method in each subclass. The output must be `ClassName plateNumber isInside` (each output element are separated by only *one* space)

  For example:

  ```
  Car A11234 false
  Bus B23456 false
  ```

- Getter and setter method of the field arriveTime.
- `public abstract int calculateMoney(Time leaveTime)`

  Override this abstract method in each subclass. If the arriveTime is null, the result value of this method is zero, otherwise the result if according to the field `arriveTime` and the parameter `leaveTime`. After executing this method, arriveTime is reset to null and the value of inside field is reset to false . The way to calculate money will be introduced in subclasses.

3. Class Bus and Car

Those are the *subclasses* of the **class Vehicle**.

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>
> You can add other methods or attributes that you think are necessary.

Methods:

- `public int calculateMoney(Time leaveTime)`

  The way to calculate money is shown as following table:

Price	Car	Bus
Start Price	15	0
Increment Price	5	15
Max Price	60	100

Charges Notes:

Time	Car	Bus
Time < 30 minutes	0	0
30 minutes ≤ **Time** < 1 h	Start Price	Increment Price
1 hour ≤ **Time** < 2 hours	Start Price + Increment Price * hour	Increment Price * (hour+1)
2 hours ≤ **Time**	*Min*(Start Price + Increment Price * hour , Max Price)	*Min*(Increment Price * (hour+1) , Max Price)

If the vehicle arrives the parking lot again:

- If the parking time is less than 30 minutes, no parking fee will be charged and it will not be included in the historical parking time.
- If the parking time exceeds or equals to 30 minutes, the difference(差价) in parking fee will be charged according to the charges nodes table based on the sum of the current parking time and the previous parking time.
- No matter how many times you enter and exit the parking lot, the parking fee will not exceed the Max Price of the current vehicle.

Example of Car:

Times	Parking Time(minutes)	Previous parking time	Calculate Money
1	65	0	20
2	35	65	0
3	500	100	40
4	50	600	0

Another example of Car:

Times	Parking Time(minutes)	Previous parking time	Calculate Money
1	25	0	0
2	25	0	0
3	35	0	15
4	30	35	5