E-ZPass Lab: Midterm

Objective

Your project is to generate data for 200 trips along Route 256. Recall that one trip records an entrance on and exit off the highway. A round trip consists of two trips (a total of four records) in which a driver leaves a, arrives at b, leaves b, and arrives at a. You must write code to help you generate your data. Everyone will receive special instructions for breaking down their trips among different drivers. These instructions may include where your drivers live, what they do for a living, what their weekly routines are, or personal details about their lives. Your individual instructions are to be kept strictly private!

Grading

Your grade is out of 100 pts. and will be based on submitting...

- A spreadsheet with valid data in the correct format (50 pts.)
- Java files with the code that you used to generate your data (25 pts.)
- Your work on time. The deadline is **Thursday, December 15 at 4:00 p.m.** (25 pts.)

Getting Organized

> Your shared folder should already have a directory called `E-ZPass Lab` with subfolders called `Part 1` and `Part 2`. If you forgot to do this, then do it now.

> Create a subfolder of the `E-ZPass Lab` folder called `Midterm`. This is where you will save your files for this part of the lab.

Data Requirements

> Read these instructions carefully. Taking the time to understand them fully will help you avoid having to start and restart your data multiple times.

- **Privacy:** All of your data and your special instructions must be kept private and not shared with other students. This includes any distinctive or humorous you may find or create. Part 3 of the lab will combine everyone's data. Sharing your instructions may lead to an inconsistent dataset or spoil surprises.
- **Verisimilitude:** Your trips should mirror real-world conditions. No one leaves home exactly at 8:30:00 a.m. and arrives at work exactly at 9:00:00 a.m. No one drives exactly 65.0 mph. You should write code that helps you simulate this randomness.
- **Driver restrictions**
    - *Driver profiles:* You will be assigned to create records for a specific number of drivers, each of which must have a unique name and vehicle with a unique license plate.
    - *Commuter behavior:* Commuters typically spend their time traveling to and from work. No commuter in New Detroit lives more than three exits from work (e.g., a driver living in Chicago may work as far west as Costa Nowhere and as far east as Sam City). Other types of drivers may have less predictable travel patterns.
    - *Drive safely, mostly:* The speed limit on Route 256 is 65 MPH. State troopers consider a safe speed of travel to be 5 MPH above or below the speed limit. No more than 5% of your trips may go faster than 70 MPH. No more than 1% of your trips may go below 65 MPH.
- **Time restrictions**

    - *Use a real calendar:* All trips must be on actual days in the month of January 2023. For example, if one of your drivers works Monday through Friday, your trips must have correct numbers for weekdays in January 2023. Use a calendar to stay organized.
    - *No multi-day trips:* Every trip must start and end on the same day. The individual trips of a round trip may be on different days (e.g., leave for the beach Friday, return home Sunday).
    - *Daily travel frequency:* One driver may have a maximum of 3 trips (6 records) on the same day. It is okay for multiple drivers to travel on the same day (e.g., 3 drivers may have a maximum of 9 trips on the same day). It is also okay if a driver has no trips as long as this is logical for your driver.
- **Strictly follow these requirements...** Make sure you understand the above requirements before you start working. We are combining data in Part 3, so it is important that you follow them strictly. This ensures that solutions for Part 3 will be as straightforward as possible.
- **...except when your special instructions override:** In some cases, your special instructions will override these requirements. I am looking at each person's data to find these deviations from the requirements. Help me by using the comment field in your data whenever you do this (see below).

Code Requirements

- Have a method named `getPlate()` that generates a random license plate in the correct format.
- Have a method named `getOffTime()` that takes a trip's start time (in any format), a desired distance, and a desired speed and generates (either prints or returns) the trip's end time (in any format).
- Ideally, you will use the code to assist you in this process. I am asking you to write 200 trips because I want you to focus on automating the hard parts of this process rather than doing it all manually.

What to Turn in

- The Java files you write to generate your data, including at least `getPlate()` and `getOffTime()`.
- A copy of this Google Sheet with all empty cells filled with data. Each trip is its own row, which is why there are 200 empty rows. The data in each cell must match the column header and the following data formats and conventions:
    - `day` The number of an actual day in January 2023. For example, Thursday, January 5, 2023 would be recorded as `5`.
    - `onExit` The exit number at which the vehicle entered Route 256. It must be an actual exit number on Route 256 (see map).
    - `timeOn` The time when the vehicle entered Route 256 in the format `hhmmss`. For example, a vehicle entering at 1:46:23 p.m. would be recorded as `134623`.
    - `offExit` The exit number at which the vehicle left Route 256. It must be an actual exit number on Route 256.
    - `timeOff` The time when the vehicle left Route 256 in the format `hhmmss`. For example, a vehicle leaving at 12:57:33 a.m. would be recorded as `005733`.
    - `plate` The license plate of the vehicle on the highway in the format `aaa-####`. The plates should be generated by your code, unless your special instructions tell you otherwise.
    - `customer` You may choose any customer name, real or fictional, as long as it is school-appropriate. It must be in the format Firstname Lastname.
    - `notes` Enter any necessary comments about individual trips here. Use comments sparingly; most trips should not have a comment. Use this field to indicate trips that follow special instructions.
- **HINT:** If your code outputs these values in order, separated by commas, then you can copy/paste from the jGRASP console to the spreadsheet. Once in the spreadsheet, you can go to Data > Split text to columns to put each value in the correct column.