4. Section speed control

Section speed control is used in many countries to control traffic. It is based on the vehicles passing two control gates that are several kilometres from each other. At both points the license plate number of the vehicle and the time of passing the gate are recorded. The average speed is calculated from the two time values. If it exceeds the maximum allowed speed for the given section, then the driver has violated the traffic rules. The section speed control measurement data of one of the lanes of a road section of length 10 km, which is single-lane in both directions, are available. The road section is closed, that is, vehicles cannot enter or exit it at any other point than the endpoint.

Text file `measurements.txt` contains the measurement data of a 1-hour measurement starting at 8 a.m. on a given day. Each vehicle appears only once among the measurement data. The measurement data of a given vehicle are given in one line separated by single spaces. A line contains 9 pieces of data, the license plate number of the vehicle (6 characters) and the time recorded at the entry and exit points of the section in hour, minute, second, millisecond format. (The file does not contain the data of vehicle that did not have a recorded time at the entry or the exit point of the section.)

The number of lines is at most 1000. The data are ordered by the time recorded at the entry point. For example:

```
OXZ648 8 4 44 861 8 11 53 432
QUT385 8 4 53 376 8 9 28 185
QTS988 8 5 0 854 8 12 19 879
OTP604 8 5 2 263 8 12 21 288
```

According to the example, the vehicle with license plate number QTS988 passed the recorder at the entry point at 8:5:0.854 and passed the recorder at the exit point at 8:12:19.879. Its average speed is 82 km/h, which is the distance travelled (10 km) divided by the elapsed time (0.1219 hour).

Create a program that uses the data given in file `measurements.txt` to answer the following questions. Save the source code of the program as `speedcontrol`. (When writing the program, you do not have to check the correctness and the validity of the data given by the user, you can assume that the available data correspond to the description above.)

If an exercise requires displaying data on the screen, display the exercise number before displaying the result (for example: `Exercise 3.`). If you request data from the user, display the nature of the requested data on the screen. Displaying without accents is also acceptable. When displaying decimal digits, use the default display method of the programming language used.

Display the results and communicate with the user according to the example given at the end of the exercise.

1. Read and store the data of file `measurements.txt`.

2. Display the number of vehicles whose data were recorded in the measurement on the screen.

3. From the available data, determine the number of vehicles that passed the exit point of the section before 9 o'clock. Display the number on the screen.

4. Request a time given in hour minute form from the user.

    a. Determine the number of vehicles that passed the entry point in the given minute. If in the given minute no vehicle passed the entry point, then display value 0.

    b. Determine the traffic intensity, which is the number of vehicle on the road section in the minute that starts at the given minute (e.g. if the given hour minute

is 08:09, then between 08:09:00.000-08:09:59.999) divided by the length of the road section. Display the value in decimal fraction format.

5. Find the speed of the vehicle with the highest average speed and the number of vehicles overtaken by it in the measured section. If there are several highest average speeds, it is enough to display only one of them. Display the license plate number of the vehicle, the average speed as an integer and the number of overtaken vehicles.

6. Determine what percent of the vehicles exceeded the maximum speed limit on the measured section (90 km/h) with their average speed. Display the result in decimal number format according to the example.

7. Create a text file with name *fines.txt*, which contains the data of the speeding vehicles. This text file should contain the data of vehicles whose average speed exceeds 104 km/h. The file should contain the license plate number of the vehicle, the average speed given as an integer and the value of the fine with units, separated by semicolons or tabs. The speeding fines are given in the following table.

Average speed	Fine
above 104 km/h, up to 121 km/h	30 000 Ft
above 121 km/h, up to 136 km/h	45 000 Ft
above 136 km/h, up to 151 km/h	60 000 Ft
above 151 km/h	200 000 Ft

45 marks

Example for the textual output:

```
Exercise 2.
The data of 687 vehicles were recorded in the measurement.

Exercise 3.
Before 9 o'clock 603 vehicles passed the exit point recorder.

Exercise 4.
Enter an hour and minute value: 8 20
        a. The number of vehicle that passed the entry point recorder: 12
        b. The traffic intensity: 9,4

Exercise 5.
The data of the vehicle with the highest speed are
        license plate number: OKL564
        average speed: 137 km/h
        number of overtaken vehicles: 33

Exercise 6.
11,94% percent of the vehicles were speeding.

The file is ready.
```

Contents of file fines.txt**:**

```
QZV314  128 km/h      45000 Ft
OJW811  107 km/h      30000 Ft
QUT385  131 km/h      45000 Ft
QRC440  128 km/h      45000 Ft
QJQ854  109 km/h      30000 Ft
...
```