

Lab 3

Scientific evidence indicates that global warming is real, and that a significant contributor to global warming is the carbon dioxide emitted by passenger vehicles. The non-profit group Cyclists Against Global Warming (CAGloW) is lobbying the California Legislature for a bill that would charge motorists for the emissions produced by cars they drive. Your job is to write a C program that would let a motorist find out how much s/he would have to pay if the bill passes, how many kilograms of carbon would be offset for that vehicle, and estimate the total fees paid and total kilograms of carbon offset for all automobiles in California (with certain assumptions).

Objectives:

1. Develop an outline (design) for the program and bring that with you to lab (you must have a hard copy of your outline when lab begins).
2. Convert the outline to your first original C program
3. Become familiar with assignment, arithmetic, scanf, and printf statements.
4. Practice good style: commenting, indenting blocks appropriately, good identifier names, etc.
5. Enter your program into Visual Studio, compile and debug it.

Part 1: Design the Program**Program Description:**

The US Environmental Protection Agency estimates that each gallon of gas consumed by a motor vehicle produces 8,887 grams of carbon dioxide. Thus the amount of carbon dioxide produced depends on how far the car is driven and what its average gas mileage is. CAGloW is lobbying for a fee of \$1.00 for each kilogram of carbon dioxide generated. The California Department of Motor Vehicles says there are 24,487,807 automobiles registered in California.

Write a program that:

1. Uses the printf () C statement to prompt the user to enter the number of miles driven each year and the average gas mileage of the vehicle.
2. Uses the scanf () C statement to read both values typed by the vehicle owner into your program into an appropriately named variable.
3. Calculates the number of kilograms of carbon dioxide produced by this vehicle each year, and the annual fee.
4. Assuming **all** automobiles in California are driven the same number of miles annually as entered by the user, and achieve the same gas mileage as entered by the user, calculates the total fee paid by all registered automobiles, and the total number of kilograms of carbon offset by the fee.

Analyze and Design your program.

1. Analyze this program description.
2. Determine the variables and algorithms/equations needed to calculate the desired results.
3. Test your algorithm/equations on paper to validate your design.
4. Create an outline of your program structure, which you will include as a large comment at the beginning of your program.

Part 2. Implement the program you designed

Write your C program and test/debug it.

1. Open up VS and Create a new **Project**
2. This will be a **console program** in C
3. Type in your program using good style practices
4. Test and debug your program
5. Submit the source program files to Camino

Please start each Lab with a descriptive block that includes minimally the following information:

```
/* Name: <your name>
Date: <due date> (the day you have lab)
Title: Carbon dioxide fee calculation
File: Lab3
Description:
This program computes ... <you should
complete an appropriate description here.>
*/
```

A sample running of the program might look something like this:

```
Welcome to the carbon dioxide fee calculation program.
Enter miles driven annually and average mileage> 12500 26.1
For this vehicle:
Total carbon dioxide produced is 4256.23 kilograms
Total offset fee is $4256.23
For all registered automobiles assuming same values:
Total carbon dioxide produced is 104225642149.90 kilograms
Total offset fee for all vehicles is $104225642149.90
```

Note that this is an example, you may format your output slightly differently.

Part 3. Modify your program

Of course, future improvements in auto emissions technology may reduce the

emissions per gallon, and the fee amount per kilogram of carbon dioxide may change. Modify your program to reflect improvements so only 6,453 grams of carbon dioxide are emitted per mile, and a fee reduction to \$.25 per kilogram of carbon dioxide. (For a well-designed program this should require changing only two things.)

Requirements to complete the lab

1. Give the TA a copy of your program design outline at the very beginning of lab.
2. You must show the TA correct execution of the program you wrote for Part 2.
3. You must show the TA correct execution of the modified program for Part 3.
4. Submit source code for both programs online through Camino.

Be sure to retain copies (machine and/or printed) of your program source code. You will want these for study purposes and to resolve any grading questions (should they arise).