

CSc 110 Assignment 4
Static Methods with: Parameter Passing & Return Values
The Carbon Calculator

Learning Outcomes:

When you have completed this assignment, you should understand:

- That passing parameters is equivalent to assignment.
- How to design and test static methods according to a given specification.
- How to use a `Scanner` to implement a program that collects input from the console (aka keyboard) using prompts.
- How to identify repetitive portions of code and replace them with a parameterized method that improves clarity and reduces the total size of your code.
- Limitations of the `int` and `double` types.
- How to build-up a complex program from simple methods (incremental development).

Programming Problem Description:

This assignment requires you to write a program to calculate a user's carbon footprint over 1 year. It will prompt the user for a series of keyboard inputs, and use the entered values to calculate CO₂ emissions for transportation, electricity, and food. It will then print out a report summarizing the carbon footprint in metric tons per year.

Carbon Calculations:

We will use the following formulae to estimate the carbon footprint:

1. Transportation:

Regular gasoline in North America produces 2.3 kg CO₂ per litre.

$\text{kgCO}_2 = 2.3 \times \text{litresUsedPerYear}$

$\text{litresUsedPerYear} = 365 \times (\text{kmPerDay} \div \text{fuelEfficiency})$

where `fuelEfficiency` of the car is in km/litre.

2. Electricity

The average CO₂ emission for electricity produced in Canada is 0.257 kg/kWh

$\text{kgCO}_2 = (\text{kWhPerMonth} \times 12 \times 0.257) \div \text{numPeopleInHome}$

Note: kilowatt hours per month can be determined from your electric bill.

3. Food

A rough estimate can be calculated based on the percentages of meat/fish, dairy, fruit/veggies, and carbohydrates in the user's diet:

Yearly kgCO₂ for meat = (% meat and fish eaten) x 53.1

Yearly kgCO₂ for dairy = (% dairy eaten) x 13.8

Yearly kgCO₂ for fruit&veg = (% fruit and veg eaten) x 7.6

Yearly kgCO₂ for Carbs = (% carbs eaten) x 3.1

Total yearly kgCO₂ for food is the sum of the above 4 values.

4. Total Carbon Footprint = (sum of footprints for transportation, electricity, and food) ÷ 1000
(This total is given in metric tons per year).

Program Requirements:

Create a program named CFCalculator. It will calculate the carbon footprint using the formulae above.

Your program must include and use methods with the following signatures:

```
public static double determineTransportationEmission()
public static double determineElectricityEmission()
public static double determineFoodEmission()
public static double calculateTotalEmission(double trans, double elec,
double food)
public static void printReport(<you decide what to pass in as
parameters>)
```

You will need to use Scanner in the first 3 methods to prompt for the user's values. The user will input any values that are not constants in the equations above. Be sure to prompt for the values you need, with enough detail in the prompt that the user knows what to enter.

Your program must print a report matching the format of the sample output below. (Note that actual values will differ depending on what the user inputs.)

Sample output of the program:

```
You produce an annual total of 7.14432 metric tons of CO2 per year.
The breakdown is as follows:
    Car          32.90166%
    Electricity   0.43167156%
    Food         66.66667%
```

Tip: Use iterative development:

Start by creating a skeleton program that includes the methods above but has them do nothing. When necessary, return a dummy value like 1.0. Then work on one method at a time, testing to ensure it does what you expect before moving on to the next method.

HAND IN: Submit the final code that you produced using the 'Assignments' link of the course Connex site.