Assignment 1

Objectives

- Introduction to Java
- Review methods, arrays, classes
- Exposure to testing

Introduction

The environmental impact of transport is significant because it is a major user of energy, and burns most of the world's petroleum. This creates air pollution, including nitrous oxides and particulates, and is a significant contributor to global warming through emission of carbon dioxide, for which transport is the fastest-growing emission sector. [1]

This assignment has two parts. Part I requires you to write and test a set of methods that operate on an array. Part II requires you to write a program that can calculate the transportation carbon footprint for single person over one year as well as the carbon footprint of a population. For both parts of this assignment you are to write tests for each method you implement by adding to the partial test files provided.

Quick Start

Part I

1. Download `ArrayOperationsTester.java` and `ArrayOperations.java` to the same directory.
2. Read `ArrayOperationsTester.java` and `ArrayOperations.java` carefully.
    a. Compile and run the `ArrayOperationsTester` program from the directory you downloaded the files to.
    To compile: `javac ArrayOperationsTester.java`
    To run: `java ArrayOperationsTester`
    b. Fix the method, recompile and rerun the tester until the tests pass. See the section below entitled *Understanding the Test Programs* for more information.
3. Implement each method in ArrayOperations.java, by repeating the following steps:
    a. Uncomment the tests in the corresponding method in `ArrayOperationsTester.java`
    b. Add a stub for the method in `ArrayOperations.java`
    c. Compile and run to ensure your tests and stub is correct
    d. Implement the function by completing the stub
    e. Compile and run (repeat steps d and e until your tests pass)

CRITICAL: You **must** name the methods in `ArrayOperations.java` as specified in the documentation (above the purpose) or you will receive a **zero grade** for that method.

Part II

1. Download `carbon_calculator_tester.py` and `carbon_calculator.py` for your reference. This is a full implementation of the Carbon Calculator in Python.
2. Download `CarbonCalculatorTester.java` and `CarbonCalculatorTester.java` to the same directory as Part I.

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[1] http://en.wikipedia.org/wiki/Environmental_impact_of_transport

3. Implement each method in `CarbonCalculator.java`, again following the steps:
    a. Uncomment the tests in the corresponding method in `CarbonCalculatorTester.java`
    b. Add a stub for the method in `CarbonCalculator.java`
    c. Compile and run to ensure your tests and stub is correct
    d. Implement the function by completing the stub
    e. Compile and run (repeat steps d and e until your tests pass)

    CRITICAL: You **must** name the methods in `CarbonCalculator.java` as specified in the documentation (above the purpose) or you will receive a **zero grade** for that method.

Understanding the test programs

`ArrayOperationsTester.java` tests your implementation of `ArrayOperations.java` and `CarbonCalculatorTester.java` tests your implementation of `CarbonCalculator.java`

The first things you should do after downloading the source files is to compile and run the test program:

Compile the test program by typing: `javac ArrayOperationsTester.java`
Run the test program by typing: `java ArrayOperationsTester`
You should see the following output:

```
a1: {2}
a2: {1,0,3,2}
a3: {-1,2,4,3,0}
Failed test: testSumArray at line 65
Failed test: testSumArray at line 69
Failed test: testSumArray at line 73
Passed 0/3 tests
```

The first 3 lines are the output of the call to the `printArray` method to print out the values in a1, a2 and a3 declared globally in the program.

The last 3 lines are reporting that your implementation is failing in the `testSumArray` method at lines 65, 69 and 73 and the last line says you passed 0 tests of the 3 tests that were run. This is because we have only provided you with a stub for the `testSumArray` method. Once you complete the implementation of this method, those `Failed test` lines should change to `Passed...`

Submission

Submit the following files with your name and student ID at the top of each file using conneX.

- `ArrayOperationsTester.java`
- `ArrayOperations.java`
- `CarbonCalculatorTester.java`
- `CarbonCalculator.java`

A reminder that it is OK to talk about your assignment with your classmates, and you are encouraged to design solutions together, but each student must implement their own solution. We will be using plagiarism detection software on your assignment submissions. **Be sure you submit your assignment, not just save a draft**.

Grading

If you submit files that do not compile, or that do not use the correct method names you will receive a **zero grade** for the assignment. It is your responsibility to ensure you follow the specification and submit the correct files.

You will receive one mark for having your name and student ID at the top of each file and one mark for each test case you pass. Your code must **not** be written to specifically pass the test cases in the testers, instead, it must work on all valid inputs. We may change the input values when we run the tests and we will inspect your code for hard-coded solutions.