Jun Kim

Satish Singhal

CSCS-1 #0105

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Assignment 5: IOAA Document

**Data Input**

|  |  |  |
| --- | --- | --- |
| Variable name | C++ Data Type | Remarks/Comments |
| fileIn | string | Full path of input file. |
| fileOut | string | Full path of output file. |

**Data Output**

|  |  |  |
| --- | --- | --- |
| Variable name | C++ Data Type | Remarks/Comments |
| nameCity | string | Name of the city in each row. |
| averageCarbon | int | Rounded average carbon FP, Refer to Figure 1. |
| fine | double | Amount of fine, Refer to Figure 2. |
| totalCities | int | Total number of cities in the file. |
| totalFine | double | Total collected fine from cities. |

**Computational Aid and Other Variables**

|  |  |  |
| --- | --- | --- |
| Variable name | C++ Data Type | Remarks/Comments |
| oneCarbon | int | Reading carbon foot print value for single various months. |
| sumCarbon | int | Sum of all oneCarbon. |
| countCarbon | int | total number of oneCarbon. |

**Global Constants**

|  |  |  |
| --- | --- | --- |
| Variable name | C++ Data Type | Remark |
| belowOne | double | Refer to Table 1 |
| oneToThree | double | Refer to Table 1 |
| threeToFive | double | Refer to Table 1 |
| fiveToSeven | double | Refer to Table 1 |
| overSeven | double | Refer to Table 1 |

Table 1: The average carbon footprint per month for a city and fines

|  |  |
| --- | --- |
| Average Carbon footprint (Whole number thresholds) | Fine in $ per year |
| <= 1 | 0.00 |
| >1 but <=3 | 1000000.00 |
| >3 but <=5 | 2000000.00 |
| >5 but <=7 | 3000000.00 |
| >7 | 4500000.00 |

**Analysis**

**\* Figure 1, Formulae for Average Carbon footprint**

From Math Form –

averageCarbon = sumCarbon / countCarbon

To C++ Form with adding round -

averageCarbon = round(sumCarbon/static\_cast<double>(countCarbon))

**\* Figure 2, Conversion Table 1 as a C++ algorithm**

If (averageCarbon <= 1) then

fine = belowOne

Else if (averageCarbon > 1 and averageCarbon <= 3) then

fine = oneToThree

Else if (averageCarbon > 3 and averageCarbon <= 5) then

fine = threeToFive

Else if (averageCarbon >5 and averageCarbon <= 7) then

fine = fiveToSeven

Else

fine = overSeven

End if

**Algorithm**

1. Add all the #include directives, declare global constants
2. declare fileIn as string
3. declare fileOut as string
4. Print greeting message and explain path of input file to console, EOL
5. prompt user for value fileIn
6. use getline to fill fileIn
7. Bond file to input(in)
8. If (input file is open) then
   1. Print explain path of output file to console, EOL
   2. prompt user for value fileOut
   3. use getline to fill fileOut
   4. Bond file to output(out)
   5. If (output file is open) then
      1. declare totalCities as int and set it to zero
      2. declare totalFine as double and set it to zero
      3. Print greeting message to output file, EOL
      4. set formatting flags for console output and outputting to file
      5. print upper page format to console and output file, EOL
      6. while (next character in files is not EOF)
         1. totalCities = totalCities + 1
         2. declare nameCity as string
         3. in <- nameCity
         4. declare averageCarbon as int and set it to zero
         5. declare fine as double and set it to zero
         6. declare oneCarbon as int and set it to zero
         7. declare sumCarbon as int and set it to zero
         8. declare countCarbon as int and set it to zero
         9. in <- oneCarbon
         10. while (oneCarbon >= 0)
             1. sumCarbon = sumCarbon + oneCarbon
             2. countCarbon = countCarbon + 1
             3. in <- oneCarbon
         11. End while
         12. averageCarbon = round(sumCarbon/static\_cast<double>(countCarbon))
         13. If (averageCarbon <= 0) then
             1. Print, nameCity, “No value available for carbon FP.” to console and output file, EOL
         14. Else
             1. If (averageCarbon <= 1) then

fine = belowOne

* + - * 1. Else if (averageCarbon > 1 and averageCarbon <= 3) then

fine = oneToThree

* + - * 1. Else if (averageCarbon > 3 and averageCarbon <= 5) then

fine = threeToFive

* + - * 1. Else if (averageCarbon > 5 and averageCarbon <= 7) then

fine = fiveToSeven

* + - * 1. Else

fine = overSeven

* + - * 1. End if
        2. Print, nameCity, averageCarbon, fine to console and output file, EOL
        3. totalFine = totalFine + fine
      1. End if
    1. End while
    2. Print lower page format to console and output file, EOL
    3. Print, totalCities, totalFine with thank you message to console and output file, EOL
  1. Else
     1. Print error message for output file, EOL
  2. End if
  3. Close output file

1. Else
   1. Print error message for input file, EOL
2. End if
3. Close input file