**Programming Challenges 3B - November 6th, 2018 - Due on or before 10:10pm**

**Objective:** Classes and Objects

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| --- |
| **Important instructions:**   * *All programs must include comments at the top of your program: your name, course name-section number (e.g. CSIT 839 -26953), program name and the program description in brief.* * *Copy and paste your program code and outputs in Part B of each program.* * *Once it is done, save and submit this word file via Canvas.* |

To receive full credit, your program must:

- Include simple, clear comments explaining your program logic

- Indent your code and line up your braces

- Give descriptive variable names

- Use name constants wherever possible. Name constant must declare with CAPITAL.

- The data of your output should be the same as the given sample output.

1. **PopulationStatistics.cpp (10 pts)**

In population statistics, the birth rate and death rate are calculated as follows:

Birth rate = Number of births / Population

Death rate = Number of deaths / Population

The **Pop** class defined as follows:

class Pop

{

private:

long population; // Current population

int numBirths; // Annual number of births

int numDeaths; // Annual number of deaths

public:

Pop(); // default constructor

Pop(long, int, int); // user’s input (both are overloaded constructors)

// setter functions

void setPopulation(long p);

void setBirths(int b);

void setDeaths(int d);

// getter functions

long getPopulation()

double getBirthRate()

double getDeathRate()

};

If the population is less than 100 is passed to the class, use the default value of 100.

If the birth or death figure less than 0 is passed to the class, use the default value of 0.

The **getBirthRate()** and **getDeathRate()** functions calculate and return the birth and death rates.

Write a program that uses the given **Pop** class to demonstrate the above conditions.

**Sample run:**

Enter a tow name: Santa Clarita

Enter total population: 56

Enter annual number of births: 32

Enter annual number of deaths: 14

Population Statistics of Santa Clarita

Population: 100

Birth Rate: 0.320

Death Rate: 0.140

Another town? (Y/N) y

Enter a tow name: Valley Glen

Enter total population: -25500

Value must be greater than 0. Please re-enter: 25500

Enter annual number of births: 560

Enter annual number of deaths: 410

Population Statistics of Valley Glen

Population: 25500

Birth Rate: 0.022

Death Rate: 0.016

Another town? (Y/N) n

**Copy and paste your program (source) code and the outputs after this line**

**+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++**

/\*

Inola Cohen

PopulationStatistics.cpp

Nov 8, 2018

CO SCI 839 - 26953

Purpose: to ask user for city name,

total population, number of births

and deaths annually, and to calculate

the birth and death rates

population statistics with those values.

\*/

//#include “stdafx.h”

#include <iostream>

#include <iomanip>

#include <string>

#include <iomanip>

using namespace std;

class Pop {

private:

long population; // Current population

int numBirths; // Annual number of births

int numDeaths; // Annual number of deaths

public:

Pop() { // default constructor

population = 100;

numBirths = 0;

numDeaths = 0;

};

Pop(long p, int b, int d) { // overloaded constructor

population = p;

numBirths = b;

numDeaths = d;

};

/\* Setter Function(s) \*/

void setPopulation(long);

void setBirths(int);

void setDeaths(int);

/\* Getter Function(s) \*/

long getPopulation();

double getBirthRate();

double getDeathRate();

};

/\* Main \*/

int main()

{

Pop Population;

string townName;

long totalPop;

int births, deaths;

string answer;

do {

cout << "Enter a town name: ";

getline(cin, townName); // get user's town name

cout << "Enter total population in " << townName << ": "; // population size from user

cin >> totalPop;

Population.setPopulation(totalPop); // set population size in Population object

cout << "Enter annual number of births: ";

cin >> births;

Population.setBirths(births); // set number of births in Population object

cout << "Enter annual number of deaths: ";

cin >> deaths;

Population.setDeaths(deaths); // set number of deaths in Population object

cout << "\nPopulation Statistics of " << townName << "\n" << endl;

cout << "Population: " << Population.getPopulation() << endl; // retrieve population size, call get function

cout << setprecision(2) << fixed << showpoint;

cout << "Birth Rate: " << Population.getBirthRate() \* 100 << "%" << endl; // retrieve birth rate call get function

cout << "Death Rate: " << Population.getDeathRate() \* 100 << "%" << endl; // retrieve birth rate, call get function

cout << "Another town? (Y/N) "; // Ask to create new object

cin >> answer;

cin.clear();

cin.ignore(10000, '\n');

} while (answer == "y"|| answer == "Y"|| answer == "yes"|| answer == "Yes"|| answer == "YES");

return 0;

}

/\* Setter Functions \*/

void Pop::setPopulation(long p) // Set population size in object

{

if (p < 100)

{

cout << "Invalid population. Using default population size of 100" << endl;

population = 100;

}

else

population = p;

}

void Pop::setBirths(int b) // Set number of births in object

{

if (b >= 0)

{

numBirths = b;

}

else

{

cout << "Invalid number of births. Setting it to 0" << endl;

numBirths = 0;

}

}

void Pop::setDeaths(int d) // Set number of deaths in object

{

if (d >= 0)

{

numDeaths = d;

}

else

{

cout << "Invalid number of deaths. Setting it to 0" << endl;

numDeaths = 0;

}

}

/\* Getter Functions \*/

long Pop::getPopulation()

{

return population; // Retrieve population from Population object

}

double Pop::getBirthRate()

{

return (numBirths / double (population)); // Calculate and return birth rate, need to

// convert population to type double

// in order to divide

}

double Pop::getDeathRate()

{

return (numDeaths / double (population)); // Calculate and return death rate, need to

// convert population to type double

// in order to divide

}

A screenshot of text

Description automatically generated