**C/C++ PI COMPUTATION LAB REPORT**

**1) Enter your name, student ID, platform (Mac or PC) and date**

Name and StudentID: Samuel Indurkar, 0888068

Class: CIS054 C/C++ Programming

Platform (Mac or PC): gcc and eclipse on mac  
Date: 6/24/17

**OBJECTIVES:**

Use a  **while** loop to compute an approximate value of pi using 'n' terms of an infinite series.

**PROJECT DESCRIPTION:**

An approximate value of pi can be calculated using the series given below:

 \pi = \frac{4}{1} - \frac{4}{3} + \frac{4}{5} - \frac{4}{7} + \frac{4}{9} - \frac{4}{11} + \frac{4}{13} - \cdots

Write a C or C++ program that uses the successive approximation to compute pi. The program reads the number of terms for the calculation. Each term represents one of the fractions used in the computation. When pi has been computed, display the computed value of pi to 10 decimal places, the expected value, and the difference between the two values.

|  |  |  |
| --- | --- | --- |
| **INPUTS** | **PROCESSING** | **OUTPUTS** |
| Number of terms | Compute pi | Pi\_computed Pi\_constant The difference |

**LAB REPORT:**

**2) Fill in the TEST VALUES & ACTUAL RESULTS table**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **RUN** | **TERMS** | **EXPECTED RESULT**  Computed values before  the program is run | **ACTUAL RESULT**  Fill in the output displayed by the program | **DIFFERENCE**  Between the expected result and the actual result |
| 1 | 10 | 3.0418396189 | 3.0418396189 | 0.0997530347 |
| 2 | 100 | 3.1315929036 | 3.1315929036 | 0.0099997500 |
| 3 | 1,000 | 3.1405926538 | 3.1405926538 | 0.0009999997 |
| 4 | 10,000 | 3.1414926536 | 3.1414926536 | 0.0001000000 |
| 5 | 100,000 | 3.1415826536 | 3.1415826536 | 0.0000100000 |

NOTE: You cannot use a comma when entering numbers with cin or scanf.

**DISCUSSION:**

**3) Complete the DISCUSSION section. It does not need to be long, but it needs to be complete.**3a) What did you do to develop the program? ("Followed the Directions" is not a complete description

First is asked the user for how many terms they want

then using the Leibniz algorithm I set a constant numerator of 4 while changing the denominator by 2 everytime.

Then based on what count the loop is one (odd or even) it would either add or subtract to the variable “pi”.

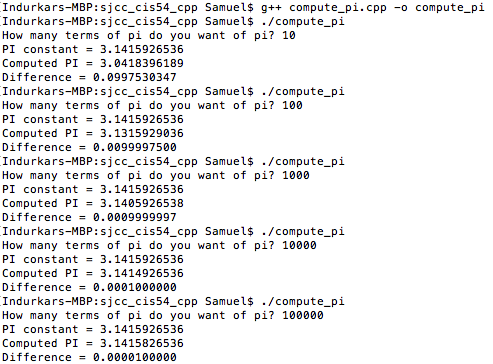
Then display it all to the user and compare my answer with actual pi and show the difference.

3b) What problems did you have and how did you overcome the problems?

I had defined M\_PI but there was no need because the “cmath” took care of it. Also in a few places i tried calling the variable “pi” with “Pi” and it was showing me a bug which i later fixed by changing the case of the “p” and making the variable name consistent at all places “pi”.

**PROGRAM OUTPUT:**

**4) Show five screen shots of the program. One for each of the runs (terms = 10, 100, 1000, 10000, 100000)**

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For the Mac, hold down **command + shift + control** keys and press the **3** key.

Use **command+V** to paste the clipboard into the lab report.

For Windows, There are two ways you can capture a screen shot of only your program:

* Use Microsoft's **Snipping Tool** by clicking on the **Start** icon and selecting **"All Programs"** then **"Accessories".** Use the mouse to select the area of the screen you want to save then click Ctrl-C or select the menu items Edit-Copy to save the image to the clipboard.
* Capture the active window to the clipboard by holding down the **Alt** key and tapping the **PrintScreen** key. NOTE: some notebook computers require that you hold down a [**Fn**] key and **Alt** keys to activate the **PrintScreen** function. NOTE: Do not click PrintScreen without the Alt key. This would capture the entire screen which would make your program output difficult to see.

Use **Ctrl+V** to paste the clipboard into the lab report.

|  |
| --- |
| **Sample program output for 500 terms** |
| **How many terms do you want to compute Pi? 500**  **Computed Pi = 3.1395926556**  **Expected value = 3.1415926536**  **Difference = 0.0019999980** |

**PROGRAM LISTING:**

**5) Copy and paste the code that YOU typed to make the program work. Your program should include a comment block at the top that shows the name of the program, date, version and your name.**

**/\***

**\* compute\_pi.cpp**

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**\* Created on: Jun 24, 2017**

**\* Author: Samuel**

**\*/**

**#include <iostream>**

**#include <iomanip>**

**#include <cmath>**

**using namespace std;**

**int main (int argc, char\* argv[ ] )**

**{**

**//const double M\_PI = 3.14159265358979;**

**// list of variables and constants**

**double numerator = 4.0;**

**double denominator = 1.0;**

**double fraction;**

**double pi = 0.0;**

**int terms;**

**cout <<"How many terms of pi do you want of pi? ";**

**cin >>terms;**

**for (int i=1; i<=terms; i++)**

**{**

**fraction = numerator / denominator;**

**if (i % 2) // determine Odd or Even**

**pi += fraction; // Odd, then add Fraction**

**else**

**pi -= fraction; // Even, subtract Fraction**

**// prepare for next time through of loop**

**denominator += 2.0;**

**}**

**cout << setiosflags(ios::fixed) << setiosflags(ios::showpoint);**

**cout << "PI constant = " << setprecision(10) << M\_PI << endl;**

**cout << "Computed PI = " << setprecision(10) << pi << endl;**

**cout << "Difference = " << setprecision(10) << fabs(pi - M\_PI) << endl;**

**}**