CS111

Assignment 1, 2023, Semester 1

Due Date: Sunday, 2 April 2023 [11:55pm FJ Time]

This project is worth 10% of your coursework.

Section 1: Rules

1.1 Every student has to make a submission.

This is an individual assignment.

1.2 Submit before the Deadline

You have to submit your work before the deadline 2 April 2023, 11:55pm(Fiji Time). Lab computers are scarce, so the trick is to start EARLY. Also when you finish don't hold on to your assignment till the last moment. Submit as soon as you are satisfied with it.

Submitting late:
If you think that you will not be able to submit the assignment on time due to circumstances which are beyond your control, then you will need to seek approval from the course coordinator prior to the due date. This means you have to ask for an extension, explaining the reasons, before the deadline, and not after.
A late submission will be penalized by 30% for each 24 hour period it is late. Where possible, it is better to hand in your work early and get credit for partial work than handing in late. A partial work may earn more points than a working assignment which is submitted late.

1.3 Submission
You will have to submit exactly two files on Moodle.

1. A write-up answering the questions in Section 2 and 4
2. A program for Section 3

Program
Be sure you submit .cpp files only. Name your program file as *Assign1YourIdNumber.cpp,* where *YourIdNumber* is your student id number (e.g. *Assign1S01234561.cpp).*
Do not submit the .exe executable versions of your program. Also be sure that you submit the assignment only once you are totally satisfied. We will not accept "corrected versions" submitted through other channels after the due date. However, you can submit the assignment as many times as you like on Moodle before the due date!

Write-up
Your write-up will have to be written in English. Try to keep your answers short and clear. Excessively verbose answers will be penalized. Upload your write-up as a single document. The preferred format is a PDF file. Word documents are good for editing, but you should export or save the final version as PDF. This is the format for reading.

1.5 Plagiarism

For this and other work in CS111, it is essential that you avoid plagiarism. Not only do you expose yourself to possibly serious disciplinary consequences, but you will also cheat yourself of a proper understanding of the concepts emphasized in the project. You will almost certainly fail the short tests and/or the final which will test your understanding of the project.
It is not plagiarism to discuss the assignment with your friends and consider solutions to the problems together.

However, it is plagiarism for you to copy all or part of each other's programs. If you find somebody has stolen your assignment and produced it as their own, it will be considered plagiarism.

We are using automated tools to assist with the detection of plagiarism. They will highlight any unusual co de that is similar between students. All cases that are flagged as potential plagiarism will be checked by hand.
So do not leave your flash drives around. Be careful with them. And make sure you log out of the lab machines when you are finished working with them. Don't copy part of someone solutions, and do not give somebody else an electronic copy of your solution. If you give someone your program it is almost guaranteed that part of it will end up in their program, no matter whether you ask them not to copy.
Any student posting code for this project on Moodle will be considered to be committing plagiarism. Do not submit your code to any discussion group or mail it to anyone except the lecturers or tutors.
Do not be concerned if Moodle tells you that a file cannot be checked by TurnItIn for plagiarism. This will be your program file. We will check programs separately once submitted.

1.6 Support

If you have a problem with the assignment, with C++, Dev C++, the exercises, and questions in this assignment, lecture notes, the book, please ask. First use the forum for your questions. This will also help other students with the same questions. Then ask your tutor for help, or otherwise the course coordinator.
If you have any problems with the assignment or the course, feel free to email or consult the course coordinator or any of the TAs.

Section 2

2.1 Exercises

[Read Problem statement in Section 3 before answering Exercises 1-4]

Exercise 1 [Organize & Manage] (20 marks)

(a) Write a pseudocode for your program.

Exercise 2 [Find & Generate] (8 marks)

Please answer the following:

1. (2 marks) Which variables do you need?

2. (2 marks) Which variables do you use for input?

3. (2 marks) Which types do you use for which variable. Explain why?

4. (2 marks) What type of loop is best to validate the input? What is the loop condition?

Exercise 3 [Evaluate & Reflect] (9 marks)

Please describe at least three test cases that will allow you to assess whether the program is correct. Which inputs should you choose, and what outputs would you expect? Answer in less than 300 words. Does your program actually satisfy those test cases?

Exercise 4 [Communicate & Apply Ethically] (8 marks)

The program for this assignment is honest, in that it reports honestly what the user provides as input. Of course, rather than reporting what the user enters, your program could make a biased report - a preferred option - more income or less tax if it wants to.

Would this be ethical to do? Would this be in line with the ACS Code of Ethics and with basic Programming Ethics? Explain. Please answer in less than 300 words.

Section 3 (50 marks)

3.1 Problem Statement

Design and implement a C++ program that asks user for their:

A. Name (First & Surname);
B. Employee ID;
C. Gender (M/F);
D. Year of Birth; and
E. Number of hours worked in a week.

And then calculates the annual income (52 weeks) and the income tax due on the annual income. The calculations of the annual income and the income tax are to be based on the guidance provided below.

Program Specifications:

1. Prompt the user to enter the required information, A-E above
2. All input should be validated wherever necessary. For instance, the input for year of birth has to be only in integers.
3. Calculate the age, annual income and the associated tax and display in a presentable manner in dollars.
4. Repeat steps 1 and 2 until the user enters "Q".

Income Calculation

A rate of $20 per hour applies for a 40-hour normal week or any number of hours worked below 40. Any hours worked above 40 hours is considered as overtime. For every 5 hours above this normal 40-hour week, overtime pay rate factor of 1.5, i.e. time and half overtime pay will apply and a pay rate factor of 2 for anything above 45 hours, ie double time.

Tax Calculations

Age < 55
Male :
0% tax if annual income < 10 000,
10% tax if 10 000 ≤ annual income ≤ 30 000
20% tax if 30 000 < annual income ≤ 100 000
30% tax if annual income > 100 000

Female :
0% tax if annual income < 12 000,
10% tax if 12 000 ≤ annual income ≤ 35 000
20% tax if 35 000 < annual income ≤ 100 000
30% tax if annual income > 100 000

55 ≤ Age < 80
Male and Female:
0% tax if annual income < 50 000,
10% tax if 50 000 ≤ annual income ≤ 70 000
20% tax if 70 000 < annual income ≤ 150 000
30% tax if annual income > 150 000

Age > = 80
Male and Female:
0% tax on all income (No Tax)

Example ScreenShot:

Below is a screen shot of a sample output:

```
Welcome to Income and Tax Calculator
Enter 'C' to continue or 'Q' to quit
C
Please enter your First Name:
James

Please enter your Surname:
Bond

Please enter your Employee ID:
007

Please enter your Gender (M => Male, F => Female):
M

Please enter your Year of Birth:
2000

Please enter number of hours you worked in a week:
60


*****************************************************************
                Income and Tax Calculator
                ------ --- --- ----------
        Name:           James Bond
        Employee ID:    007
        Age:            23years
        Gross Pay Week: $1550
        Annual Salary:  $80600
        Tax Amount:     $16120
*****************************************************************
Welcome to Income and Tax Calculator
Enter 'C' to continue or 'Q' to quit
```

Note:

- In all your program constructs you must write comments where necessary. Don't write comments for obvious code, but segments of code which seem complex. Also include your name, student id# and tutorial group as comments at the top of your program code.
- No need to use functions as it has not been yet covered in the course.
- All input should be validated wherever necessary. For instance, the input for age has to be only in integers.

Important: In all your program constructs you must write comments where necessary. Do not write comments for obvious code, but for segments which seem complex. Include your name and student number as comments at the top of your program code.

Partial Credit:. Even if your program does not work perfectly, you will receive partial credit for each part you get to work. For example, if your program compiles but gives incorrect results, you can still receive a mark provided that your code is well-written.

3.2 Marking

This exercise will be marked using the rubric attached. The following may lead to deductions for the different categories:

Documentation

- Forgetting to add your name as comment.
- Poor comments or complete lack thereof.
- Pointless comments.

Programming Style

- Poor indentation.
- Lack of brackets.
- Poor variable names.
- Poor layout.
- Magic constants.

Semantics

- Uninitialized variables.
- Unused variables.
- Wrong type of loop.
- Wrong data type.
- Wrong Boolean expressions or conditions.
- Wrong use of ifs.

Correctness

- Wrong result for normal test cases.
- Wrong results for boundary cases.
- Does not handle unusual input.
- Wrong or no input validation.

Note that this list is not exhaustive. There are many more mistakes that will result in deductions.

Section 4 Final Checklist

Exercise 5 [Embark & Clarify] (5 marks)

1. Please answer the following:

(a) Did you copy from other groups, other students, or public sources?

(b) Did you let other students copy from you?

2.

- Did you put your name and student number on the first page? YES/NO
- Did you put your name and student numbers into the program? YES/NO
- Will you upload a write-up for Sections 2 & 4? YES/NO
- Did you upload the program for section 3? YES/NO
- Did you submit before the deadline? YES/NO