CSCE 212: Intro to Computer Architecture
Project 1

Part A (40%): Create a MIPS assembly code that reads four positive integers **a**, **b**, **c**, and **d** as input parameters. The code shall execute in MARS to prompt the user to enter four positive integers represented in decimal, each separated by the **Enter** key. The program shall calculate **$f=(a^x+b^y)$** and **$g=(c^z+d^w)$** using your own self-written multiplication code, in which **x**, **y**, **z**, and **w** are the first, second, third, and fourth leftmost non-zero digits of your Student ID. Here are some samples for better clarification:

Student ID	Corresponding **f** and **g** expressions
R12345678	**$f=(a^1+b^2)$** and **$g=(c^3+d^4)$**
G87654321	**$f=(a^8+b^7)$** and **$g=(c^6+d^5)$**
D02040608	**$f=(a^2+b^4)$** and **$g=(c^6+d^8)$**

The program should output **f** in decimal and binary, using **syscall** routines for each output.

Part B (20%): Create a MIPS assembly code, which calculates the below expressions:

```
h = f/g;
```

Hint: Given a positive integer *X*, and a positive integer *Y* where *X>Y*, the division *X*/*Y* is computed such that unique integers *Q* and *R* satisfy *X=(Y * Q + R) where* $0 \leq R < Y$. The value *Q* is called the quotient and *R* is called the remainder. Some examples are:

{X = 7, Y = 2} then 7 = 2 * 3 + 1 so Q=3 and R=1
{X = 8, Y = 4} then 8 = 4 * 2 + 0 so Q=2 and R=0
{X = 13, Y = 5} then 13 = 5 * 2 + 3 so Q=2 and R=3

IMPORTANT NOTE 1: You are not allowed to use any of these instructions: {**mul, mul.d, mul.s, mulo, mulou, mult, multu, mulu, div, divu, rem, sll, sllv, sra, srav, srl, srlv**}

- Exponents (or Powers) are required to be realized only by using loops and **add** instruction.
- Quotient and Remainder should be calculated only by using loops and **sub** instruction.

IMPORTANT NOTE 1: You are **NOT** allowed to use functions and subroutines.

Sample Output:

ID = "Print your student ID Here, e.g. R02040608"		
Enter	4	integers for a,b,c,d respectively:
4		
3		
2		
1		
f_ten	=	97
f_two	=	00000000000000000000000001100001
g_ten	=	65
g_two	=	00000000000000000000000001000001
h_quotient = 1		
h_remainder = 32		

Project 1 Report (40%)

Project Report submission: 100 points total as follows:

- **Professional preparation: [10 points total]** as follows:
  i.e. Typed document with text of the paragraphs in Times New Roman 11 pt font, clear and grammatically well-formed explanations, cover sheet provided, page numbering and document heading numbering (1.0, 2.0, 3.0, etc to identify the required sections listed below).
- **Report Content: [90 points total]** as follows having the following numbered section headings:

  1.0 Project Description: project name and description including program inputs and outputs. [10 points]

  2.0 Program Design: description of how your code operates, and a flowchart with sufficient explanation about the program design. [10 points for description and 10 points for high quality flowchart]

  3.0 Symbol Table: a 2-column Table describing all Registers used and their specific Purpose in the code, where each register is listed on a separate row and identified by register name **`$t0,$s0,`** etc., as well as any Labels used and their purpose on separate rows. [10 points for register table and 10 points for label table]

  4.0 Learning Coverage: provide a list of at least 5 technical topics learned from this project. [10 points]

  5.0 Test Plan: provide details in sentences identifying the inputs chosen to test the program and why these were selected, and justification why they provide adequate test coverage. [15 points]

  6.0 Test Results: provide screen shot(s) of at least 3 proper MIPS code executions in MARS for your Test Plan inputs. [15 points]