Lab-C

The Question

1. Create a working directory for this exercise.

2. Create a file in the working directory named **Prog.s**. Note that the name has to be **exactly** like this (e.g. it should **not** be PROG.s or prog.s) or else your submission will not be marked.

3. Copy and paste the code fragment at the bottom of this page to the newly created file.

4. Complete the development of the file such that it translates the following Java program to a MIPS assembly language program (i.e. the two programs should produce <u>identical</u> outputs when the same input is supplied to them):

```
//------------------------------------------------------------
import java.util.Scanner;
public class Prog
{
        public static void main(String[] args)
        {
                int n = 34;
                int x = (new Scanner(System.in)).nextInt();
                if (x < n)
                {
                        int tmp = compute(x, n);
                        System.out.println(tmp);
                }
                else
                {
                        int tmp = gar(x);
                        System.out.println(tmp);
                }
        }
        public static int compute(int a, int b)
        {
                int result = a - b * a;
                return result;
```

```
        }
        public static int gar(int a)
        {
                int result;
                if (a == 1)
                {
                        result = 0;
                }
                else
                {
                        result = 1 + gar(a / 2);
                }
                return result;
        }
    }
    //---------------------------------------------------------
```

5. You can assume, as a precondition, that no exception will be thrown. This implies all entries are valid and no illegal or out of bound computation will take place.

Note

The main method is already translated for you. **>> DO NOT <<** modify anything in it.

Test Cases

You can generate as many test cases as you want by simply running the provided Java program and comparing its output to your MIPS program for a number of test cases that cover the various possibilities.

Submitting Your Work

1. Issue the following command from the working directory:

   ```
   submit 2021 LabC_Tue Prog.s
   ```

2. Note that every submission you make **overwrites** the content and the timestamp of any previous one; i.e. we only keep the very last file you submit.

3. This test is **40 minute** long.

The Code Fragment

Copy and paste this fragment into the file to be submitted:

```
###########################################################
#
#                         Prog.s
#
###########################################################
        .text
main:   sw      $ra, 0($sp)
        addi    $sp, $sp, -4

        addi    $s0, $0, 34      # s0 = n
        addi    $v0, $0, 5
        syscall
        add     $s1, $0, $v0     # s1 = x

        slt     $t5, $s1, $s0
        beq     $t5, $0, part2

part1:  add     $a0, $0, $s1
        add     $a1, $0, $s0
        jal     compute
        add     $a0, $0, $v0
        addi    $v0, $0, 1
        syscall
        j       done

part2:  add     $a0, $0, $s1
        jal     gar
        add     $a0, $0, $v0
        addi    $v0, $0, 1
        syscall
        j       done

done:   addi    $sp, $sp, 4
        lw      $ra, 0($sp)
        jr      $ra
```

```
#----------------------------compute
compute:

#------------------------------gar
gar:

###########################################################
```

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