Lab-2: Basic Arithmetic Operations (04/02/2021)

1. MIPS Program to print “Hello, MIPS”

```
        .data           # the data segment
msg:    .asciiz "Hello, MIPS\n"

        .text           # the code segment
        .globl main
main:
         la $a0, msg    # load the argument string
         li $v0, 4      # load the system call (print)
         syscall        # print the string
         jr $ra         # return to caller
```

2. Given below is a program in `MIPS assembly language that computes the area of a rectangle given the width and the height. The width and height are read from the standard input after prompting the user, and then the program computes the area and prints it on the standard output console. Please go through it line by line.

```
.data
 width:.word 0 # word is a data type with 4bytes
 height:.word 0 # Both height and width is initialized with 0(16 bits)
 area:.word 0#word is a data type with 4bytes
 perimeter:.word 0#Both area and perimeter is initialized with 0(16 bits)

 widthPrompt:.asciiz "Enter width (integer):\n"
 heightPrompt:.asciiz "Enter height (integer):\n"
 areaIs:.asciiz "Rectangle's area is "
 perimeterIs:.asciiz "Its perimeter is "
 newline:.asciiz "\n"
.text
main:
                                 # Print the prompt for width
 addi     $v0, $0, 4             # system call 4 is for printing a string
 la       $a0, widthPrompt       # address of widthPrompt is in $a0
 syscall                         # print the string

                                 # Read the width
 addi     $v0, $0, 5             # system call 5 is for reading an integer
 syscall                         # integer value read is in $v0
 add      $8, $0, $v0            # copy the width into $8

                                 # Print the prompt for height
 addi     $v0, $0, 4             # system call 4 is for printing a string
 la       $a0, heightPrompt      # address of heightPrompt is in $a0
 syscall                         # print the string

                                 # Read the height
 addi     $v0, $0, 5             # system call 5 is for reading an integer
 syscall                         # integer value read is in $v0
 add      $9, $0, $v0            # copy the height into $9

                                 # Calculate area
 mult     $8, $9                 # multiply width * height
 mflo     $10 #bring the product into $10(mflo means “move from LO” to destination register.
```

```
addi    $v0, $0, 4          # system call 4 is for printing a string
la      $a0, areaIs         # address of areaIs string is in $a0
syscall                     # print the string

                            # Print the calculated area (in $10)
addi    $v0, $0, 1          # system call 1 is for printing an integer
add     $a0, $0, $10        # bring the area value from $10 into $a0
syscall                     # print the integer

                            # Print a newline
addi    $v0, $0, 4          # system call 4 is for printing a string
la      $a0, newline        # address of areaIs string is in $a0
syscall                     # print the string

                            # Exit from the program
exit:
 ori $v0, $0, 10            # system call code 10 for exit
 syscall                    # exit the program
```

Output will be as like this:

```
Enter width (integer):
2
Enter height (integer):
4
Rectangle's area is 8
```

3. Modify the above given program so that it also calculates and prints the perimeter (i.e., sum of all sides) of the rectangle. Thus, after modification, the output scenario would be like:

```
Enter width (integer):
2
Enter height (integer):
4
Rectangle's area is 8
Its perimeter is 12
```

4. For any choice of a and b, find (a+b)^2, and print the result. Also print results of each term in the expansion.
5. Find and print the base of a triangle whose area = 6cm^2 and height is 4 cm. [Display the unit of the base].
6. A car approaching a school zone speeds up from 9 m/s to 27 m/s with constant acceleration 2 m/s2. How much time is required to slow down to final velocity? [Print the result with units, Hint : v = u+at]