Computer Organization And Architecture

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1. MIPS Program to print “Hello, MIPS”

```
.data

        msg: .asciiz "Hello, MIPS"

.text
        .globl main

        main:
                la $a0, msg
                li $v0, 4
                syscall
                jr $ra
```

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.

```
.data
        prompt1: .asciiz "Enter the Width : "
        prompt2: .asciiz "\nEnter the Height : "
        area: .asciiz "\nThe Area of Rectangle is : "

.text

        .globl main
        main:

                addi $v0,$0,4
                la $a0,prompt1
                syscall

                addi $v0,$0,5
                syscall
                add $8,$0,$v0
```

```
        addi $v0,$0,4
        la $a0,prompt2
        syscall

        addi $v0,$0,5
        syscall
        add $9,$0,$v0

        mult $8,$9
        mflo $10

        addi $v0,$0,4
        la $a0,area
        syscall

        addi $v0,$0,1
        add $a0,$0,$10
        syscall

exit:
    ori $v0,$0,10
    syscall
```

3. Modify the above given program so that it also calculates and prints the perimeter (i.e., sum of all sides) of the rectangle.

```
.data
        prompt1: .asciiz "Enter the Width : "
        prompt2: .asciiz "\nEnter the Height : "
        area: .asciiz "\nThe Area of Rectangle is : "
        perimeter: .asciiz "\n\nThe Perimeter of Rectangle is : "

.text
        .globl main

        main:
                addi $v0,$0,4
                la $a0,prompt1
                syscall
                addi $v0,$0,5
                syscall
                add $8,$0,$v0
```

```
addi $v0,$0,4
la $a0,prompt2
syscall

addi $v0,$0,5
syscall
add $9,$0,$v0
mult $8,$9
mflo $10

addi $v0,$0,4
la $a0,area
syscall

addi $v0,$0,1
add $a0,$0,$10
syscall

add $8,$8,$9
addi $10,$0,2
mult $8,$10
mflo $10
```

```
        addi $v0,$0,4
        la $a0,perimeter
        syscall

        addi $v0,$0,1
        add $a0,$0,$10
        syscall

exit:
    ori $v0,$0,10
    syscall
```

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.

```
.data
    prompt1: .asciiz "Enter the A : "
    prompt2: .asciiz "\nEnter the B : "
```

```
        a1: .asciiz "\nA : "
        b1: .asciiz "\n\nB : "
        aout: .asciiz "\n\nA^2 : "
        bout: .asciiz "\n\nB^2 : "
        cout: .asciiz "\n\n2AB : "
        finalout: .asciiz "\n\n(A+B)^2 => A^2 + B^2 + 2AB => "

.text
        .globl main
        main:

                addi $v0,$0,4
                la $a0,prompt1
                syscall

                addi $v0,$0,5
                syscall
                add $8,$0,$v0

                addi $v0,$0,4
                la $a0,prompt2
                syscall
```

```
addi $v0,$0,5
syscall
add $9,$0,$v0

add $11,$0,$8
add $12,$0,$9

addi $v0,$0,4
la $a0,a1
syscall

addi $v0,$0,1
add $a0,$0,$11
syscall

addi $v0,$0,4
la $a0,b1
syscall

addi $v0,$0,1
add $a0,$0,$12
syscall
```

```
mult $8,$8
mflo $13

mult $9,$9
mflo $14

addi $v0,$0,4
la $a0,aout
syscall

addi $v0,$0,1
add $a0,$0,$13
syscall

addi $v0,$0,4
la $a0,bout
syscall

addi $v0,$0,1
add $a0,$0,$14
syscall
```

```
addi $15,$0,2
mult $11,$15
mflo $10

mult $10,$12
mflo $10

addi $v0,$0,4
la $a0,cout
syscall

addi $v0,$0,1
add $a0,$0,$10
syscall

add $15,$13,$14
add $15,$15,$10

addi $v0,$0,4
la $a0,finalout
syscall
```

```
        addi $v0,$0,1
        add $a0,$0,$15
        syscall

exit:
    ori $v0,$0,10
    syscall
```

5. Find and print the base of a triangle whose area = 6cm^2 and height is 4 cm. [Display the unit of the base].

```
.data

        prompt1: .asciiz "Enter the Area of Triangle : "
        prompt2: .asciiz "\nEnter the Height of Triangle : "
        area : .asciiz "\nArea of Triangle is : "
        height: .asciiz "\n\nHeight of Triangle is : "
        base: .asciiz "\n\nBase of Triangle : "
        unit: .asciiz " cm"

.text
        .globl main

        main:

                addi $v0,$0,4
                la $a0,prompt1
                syscall

                addi $v0,$0,5
```

```
syscall
add $8,$0,$v0

addi $v0,$0,4
la $a0,prompt2
syscall

addi $v0,$0,5
syscall
add $9,$0,$v0

addi $v0,$0,4
la $a0,area
syscall

addi $v0,$0,1
add $a0,$0,$8
syscall

addi $v0,$0,4
la $a0,height
syscall
```

```
addi $v0,$0,1
add $a0,$0,$9
syscall

addi $10,$0,2
mult $10,$8
mflo $10

div $10,$9
mflo $10

addi $v0,$0,4
la $a0,base
syscall

addi $v0,$0,1
add $a0,$0,$10
syscall

addi $v0,$0,4
la $a0,unit
syscall
```

```
exit:

        ori $v0,$0,10
        syscall
```

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]

```
.data
        prompt1: .asciiz "Enter the v : "
        prompt2: .asciiz "\nEnter the u : "
        prompt3: .asciiz "\nEnter the a : "
        v: .asciiz "\n\nv : "
        u: .asciiz "\n\nu : "
        a: .asciiz "\n\na : "
        time: .asciiz "\n\nTime Required : "
```

```
.text
        .globl main
        main:
                addi $v0,$0,4
                la $a0,prompt1
                syscall

                addi $v0,$0,5
                syscall
                add $8,$0,$v0

                addi $v0,$0,4
                la $a0,prompt2
                syscall

                addi $v0,$0,5
                syscall
                add $9,$0,$v0

                addi $v0,$0,4
                la $a0,prompt3
                syscall
```

```
addi $v0,$0,5
syscall
add $10,$0,$v0

addi $v0,$0,4
la $a0,v
syscall

addi $v0,$0,1
add $a0,$0,$8
syscall

addi $v0,$0,4
la $a0,u
syscall

addi $v0,$0,1
add $a0,$0,$9
syscall

addi $v0,$0,4
la $a0,a
```

```
        syscall

        addi $v0,$0,1
        add $a0,$0,$10
        syscall

        sub $8,$8,$9
        div $8,$10
        mflo $8

        addi $v0,$0,4
        la $a0,time
        syscall

        addi $v0,$0,1
        add $a0,$0,$8
        syscall

exit:

    ori $v0,$0,10
    syscall
```


Console
Enter the v : 27
Enter the u : 9
Enter the a : 2
v : 27
u : 9
a : 2
Time Required : 9

Thankyou!!