Lab Sheet 3

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1. Write 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.

rectangle.s

```
1    .data
2    MSG1: .asciiz "Enter Height: "
3    MSG2: .asciiz "Enter Width: "
4    MSG3: .asciiz "Area: "
5
6    .text
7
8    main:
9    li $v0, 4
0    la $a0, MSG1
1    syscall
2    li $v0, 5
3    syscall
4    move $t3,$v0
5    li $v0, 4
6    la $a0, MSG2
7    syscall
8    li $v0, 5
9    syscall
0    move $t2,$v0
1    mul $t1,$t3,$t2
2    li $v0, 4
3    la $a0,MSG3
4    syscall
5    li $v0,1
6    move $a0,$t1
7    syscall
8    jr $ra
9
```

Console

```
Enter Height: 5
Enter Width: 6
Area: 30
```

2. Write a program in MIPS assembly language to swap two values. Get input from the user and display the values on screen after swap operation.

```
.data
MSG1: .asciiz "Enter First Number: "
MSG2: .asciiz "Enter Second Number: "
MSG3: .asciiz "After Swapping "
MSG4: .asciiz "\nFirst Number: "
MSG5: .asciiz "\nSecond Number: "
.text


main:
li $v0, 4
la $a0, MSG1
syscall
li $v0, 5
syscall
move $t3,$v0
li $v0, 4
la $a0, MSG2
syscall
li $v0, 5
syscall
move $t2,$v0
move $t5,$t3
move $t3,$t2
move $t2,$t5
li $v0, 4
la $a0, MSG3
syscall
li $v0, 4
la $a0, MSG4
syscall
li $v0,1
move $a0,$t3
syscall
li $v0,4
la $a0,MSG5
syscall
li $v0,1
move $a0,$t2
syscall
jr $ra
```

Console

```
Enter First Number: 4
Enter Second Number: 5
After Swapping
First Number: 5
Second Number: 4
```

3. Write a program to check an entered number is odd or even.

```
#Program to check whether a number is odd or even
.data
Msg1: .asciiz "Enter the number:"
Msg2: .asciiz "The number is an Even number"
Msg3: .asciiz "The number is an Odd number"


.text
main:
li $t0,0
li $v0,4
la $a0,Msg1
syscall
li $v0,5
syscall
move $t2,$v0
andi $t2,$t2,1
beq $t2,$t0,Even
li $v0,4
la $a0,Msg3
syscall
j Exit
Even:
li $v0,4
la $a0,Msg2
syscall
j Exit
Exit:
jr $ra
```

```
Console
Enter the number:6
The number is an Even number
```

4. Write programs to evaluate the following expressions. The user should enter the variables, and the program should print back an answer. Prompt the user for all variables in the expression, and print the results in a meaningful manner. The results should be as accurate as possible.
    i. $4x^2 + 2x + 3$.

```
.data
prompt: .asciiz "Enter a value for x: "
result: .asciiz "The result is: "

.text
.globl main
main:
# Get input value, x
addi $v0, $zero, 4
la $a0, prompt
syscall
addi $v0, $zero, 5
syscall
move $s0, $v0
mul $t0, $s0, $s0
mul $t0, $t0, 4
mul $t1, $s0, 2
add $t0, $t0, $t1
addi $s1, $t0, 3
addi $v0, $zero, 4 # Print result string
la $a0, result
syscall
addi $v0, $zero, 1 # Print result
move $a0, $s1
syscall
addi $v0, $zero, 10
syscall
```

Console

```
Enter a value for x: 5
The result is: 113
```

ii. $5x + 3y + z$

```
.data
prompt: .asciiz "Enter a value for x: "
prompt1: .asciiz "Enter a value for y: "
prompt2: .asciiz "Enter a value for z: "
result: .asciiz "The result is: "
.text
.globl main
main:
addi $v0, $zero, 4
la $a0, prompt
syscall
addi $v0, $zero, 5
syscall
move $s0, $v0
addi $v0, $zero, 4
la $a0, prompt1
syscall
addi $v0, $zero, 5
syscall
move $s7, $v0
addi $v0, $zero, 4
la $a0, prompt2
syscall
addi $v0, $zero, 5
syscall
move $s6, $v0
mul $t0, $s0, 5
mul $t1, $s7, 3
add $t0, $t0, $t1
add $s1, $t0, $s6
addi $v0, $zero, 4
la $a0, result
syscall
addi $v0, $zero, 1
move $a0, $s1
syscall
```

Console

```
Enter a value for x: 3
Enter a value for y: 5
Enter a value for z: 1
The result is: 31
```

iii. ((5x + 3y + z) / 2) * 3

4c.s

```
.data
prompt: .asciiz "Enter a value for x: "
prompt1: .asciiz "Enter a value for y: "
prompt2: .asciiz "Enter a value for z: "
result: .asciiz "The result is: "
.text
.globl main
main:
# Get input value, x
addi $v0, $zero, 4
la $a0, prompt
syscall
addi $v0, $zero, 5
syscall
move $s0, $v0
# Get input value, y
addi $v0, $zero, 4
la $a0, prompt1
syscall
addi $v0, $zero, 5
syscall
move $s7, $v0
# Get input value, z
addi $v0, $zero, 4
la $a0, prompt2
syscall
addi $v0, $zero, 5
syscall
move $s6, $v0
# Calculate the result of 5x+3y+z and store i
mul $t0, $s0, 5
mul $t1, $s7, 3
add $t0, $t0, $t1
add $s1, $t0, $s6
div $s1, $s1, 2
mul $s1, $s1, 3
# Print output
addi $v0, $zero, 4 # Print result string
la $a0, result
syscall
addi $v0, $zero, 1 # Print result
move $a0, $s1
syscall
#Exit program
addi $v0, $zero, 10
syscall
```

Console

```
Enter a value for x: 5
Enter a value for y: 23
Enter a value for z: 1
The result is: 141
```

iv. (4x / 3) * y

```
#Program to evaluate ((4x/3)*y)
.data
Msg1: .asciiz "Enter the coeffecient of x: "
Msg2: .asciiz "Enter the coeffecient of y: "
Msg3: .asciiz "Result: "
.text
main:
li $t4,4
li $t5,3
li $v0,4
la $a0,Msg1
syscall
li $v0,5
syscall
move $t0,$v0 #x
li $v0,4
la $a0,Msg2
syscall
li $v0,5
syscall
move $t1,$v0 #y
mul $t3,$t0,$t4
div $t3,$t3,$t5
mul $t3,$t3,$t1
li $v0,4
la $a0,Msg3
syscall
li $v0,1
move $a0,$t3
syscall
jr $ra
```

Console

```
Enter the coeffecient of x: 6
Enter the coeffecient of y: 4
Result: 32
```

****