HO CHI MINH UNIVERSITY OF TECHNOLOGY

Faculty of Computer Science and Engineering

COMPUTER ARCHITECTURE

Lab 2

Practical session - Week 2, Semester 2020

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Question 1. Write a simple MIPS program that can execute these steps:

1. Print a sentence to terminal to request an integer number from user;

2. Collect the number and increase it by 1;

3. Print the result to terminal.

Answer

```
.text
.globl main
main:
li $v0,4
la $a0,request
syscall        #Print a sentence to terminal to request an integer number from user


li $v0,5
syscall        #Read the number
move $t0,$v0



addi $t0,$t0,1  #Increase the number by 1


li $v0,4
la $a0,result
syscall


li $v0,1
move $a0,$t0
```

syscall   #Print the result

.data

request: .asciiz "Input integer value: "

result: .asciiz "The result: "

Question 2. Write a small program that is able collect two integer numbers from users and print out the sum of the two numbers.

Answer

.text

.globl main

main:

li $v0,4

la $a0,request

syscall   #Print a sentence to terminal to request 2 integer numbers from user

li $v0,5

syscall   #Read 1st number

move $s0,$v0

li $v0,5

syscall   #Read 2nd number

move $s1,$v0

add $t0,$s0,$s1

li $v0,4

la $a0,result

syscall

li $v0,1

move $a0,$t0

syscall   #Print the sum

.data

request: .asciiz "Input 2 integer value: "

result: .asciiz "The result: "

Question 3. Write a small program that allows users to input values for variables a, b, c, and d. The program then calculates the following expressions and prints the results to terminal.

$$f = (a + b) - (c - d - 2) \qquad\qquad (1)$$

$$g = (a + b) * 3 - (c + d) * 2 \qquad\qquad (2)$$

Answer

.globl main

.text

```
main:
        li $v0,4
        la $a0, inputa
        syscall

        li $v0,5
        syscall
        move $t0,$v0
        #-------------------input a
        li $v0,4
        la $a0, inputb
        syscall

        li $v0,5
        syscall
        move $t1,$v0
        #--------------------input b
        li $v0,4
        la $a0, inputc
        syscall

        li $v0,5
        syscall
        move $t2,$v0
```

```
#---------------------input c
li $v0,4
la $a0, inputd
syscall

li $v0,5
syscall
move $t3,$v0
#---------------------input d

add $t4,$t0,$t1    # a+b
add $t5,$t2,$t3    # c+d
sub $t6,$t2,$t3    # c-d

addi $t6,$t6,-2    # c-d-2

sub $s0,$t4,$t6    # f

mul $t4,$t4,3      # (a+b)*3
mul $t5,$t5,2      # (c+d)*2

sub $s1,$t4,$t5    # g

#---------------------process
li $v0,4
```

```
la $a0, answerf
syscall


li $v0,1
move $a0,$s0
syscall

li $v0,4
la $a0, newline
syscall
#---------------------

li $v0,4
la $a0, answerg
syscall


li $v0,1
move $a0,$s1
syscall

li $v0,4
la $a0, newline
syscall
```

```
#----------------------

li $v0,10

syscall

.data


inputa: .asciiz "Enter a: "

inputb: .asciiz "Enter b: "

inputc: .asciiz "Enter c: "

inputd: .asciiz "Enter d: "


answerf: .asciiz "f="

answerg: .asciiz "g="

newline: .asciiz "\n"
```

Question 4. Write a small program that allows users to input 5 different integer numbers. The program then prints those numbers in reverse. For example, users input 1, 2, 3, 4, 5; the program should print 5, 4, 3, 2, 1.

Answer

.globl main

.text

main:

```
li $v0,4
la $a0, msg
syscall        #Print str: Input value

li $v0,5
syscall
move $s1,$v0    #Read 1st num

li $v0,5
syscall
move $s2,$v0    #Read 2nd num

li $v0,5
syscall
move $s3,$v0    #Read 3rd num

li $v0,5
syscall
move $s4,$v0    #Read 4th num

li $v0,5
syscall
move $s5,$v0    #Read 5th num
```

```
li $v0,4
la $a0, result
syscall        #Print str: Reverse result


li $v0,1
move $a0, $s5
syscall


li $v0,1
move $a0, $s4
syscall


li $v0,1
move $a0, $s3
syscall


li $v0,1
move $a0, $s2
syscall


li $v0,1
move $a0, $s1
syscall


.data
```

msg: .asciiz "Input value: "

result: .asciiz "Print reverse: "

Question 5. Write a MIPS program that calculates and prints the result of the following equation to the terminal with the number of instructions as small as possible.

$$66000 + 30 + 30 + 30 + 30 + 30 + 30 + 30 + 30 + 30 + 30 - 6000 + 25 \ (3)$$

Answer

.globl main

.text

main:

addi $s0,$zero,66000   #Assign 66000 to $s0

addi $s1,$zero,30   #Assign 30 to $s1

mul $s1,$s1,10   # $1 = 30*10

addi $s2,$zero,-6000   #Assign -6000 to $s2

addi $s3,$zero,25

add $t0,$s0,$s1

add $t1,$s2,$s3

add $t0,$t0,$t1   #Result

li $v0,4

la $a0,msg

syscall

li $v0,1

move $a0,$t0

syscall

.data

msg: .asciiz "The result: "

Question 6. Write a MIPS program that receives values for a, b, c, d, and x variables from users and prints result of following equation:

$$f = a \times x^3 + b \times x^2 + c \times x + d \qquad (4)$$

Answer

.globl main

.text

main:

li $v0,4

la $a0,input

syscall

#---------------read a,b,c,d,x

li $v0,5

syscall

move $s1,$v0   # a

```
        li $v0,5
        syscall
        move $s2,$v0     # b


        li $v0,5
        syscall
        move $s3,$v0     # c


        li $v0,5
        syscall
        move $s4,$v0     # d


        li $v0,5
        syscall
        move $s0,$v0     # x
        #-----------------calculate


        mul $t0,$s0,$s0    # x^2
        mul $t1,$t0,$s0    # x^3
        mul $t2,$t1,$s1    # a*x^3
        mul $t3,$t0,$s2    # b*x^2
        mul $t4,$s0,$s3    # c*x
        add $t5,$t2,$t3    # a*x^3 + b*x^2
        add $t6,$t4,$s4    # c*x + d
        add $t5,$t5,$t6    # result
```

```
#---------print result

li $v0,4
la $a0,msg
syscall


li $v0,1
move $a0,$t5
syscall


.data
input: .asciiz "Input a,b,c,d,x:\n"
msg: .asciiz "The result: "
```