Spring 2023

Project 2 Report

CSCE 212 - 001

Vu Nguyen

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Date: March 19, 2023
To: Dr. Rasha Karakchi
From: Viet Hoang Vu Nguyen
Subject: Project 2 Report
Class: CSCE 212

1. Program Input/Output

1.1 Program 1:

Output: “Enter number #1: ”
Input: 0
Output: “Enter number #2: ”
Input: 5
Output: “Enter number #3: ”
Input: 3
Output: “The minimum number is: 3”

1.2 Program 2:

Output: “Enter weight (in lbs): ”
Input: 150
Output: “Enter height (in feet): ”
Input: 5.5
Output: “BMI index is normal”
Output: “Enter weight (in lbs): ”

1.3 Program 3:

Output: “Enter number of homeworks: ”
Input: 3
Output: “Enter average time to complete each homework (in hours): ”
Input: 1
Output: “Enter number of exercises: ”
Input: 2
Output: “Enter average time to complete each exercise (in hours): ”
Input: 4
Output: “Total work time is: 11”

2. Program Design

2.1 Program 1:

This program will prompt user to input 3 numbers separated by Enter key. Every time it loops, it will do the prompting and check the input value if it’s a positive number or not. If the input is negative, the program would display error message and ask for another number. If the input is number 0, the program will ignore it and skip the loop by increasing the index by 1. Otherwise, it will compare the newer input to the older one to set minimum. The program, then, prints out the minimum number among the 3 inputs to the console.

2.2 Program 2:

This program will prompt user to input their weight in pounds and height in feet separated by Enter key. The program will calculate the input numbers using the BMI formula in which it will multiply the height by 12 to convert from feet to inches, then by itself to make it square, then divide the weight by the squared height, and finally, multiply by 703. After having the result, the program will check if the result is lower than 24.9 or not. If it is higher, display the overweight message. If it is lower, continue to check if it is lower than 18.5 or not. If it is higher, display normal weight message. If it is lower, display underweight message. The program will loop through the process infinitely so at the end of the message displaying, it will prompt the user for inputs again.

2.3 Program 3:

This program will prompt user to input 4 decimal integers, separated by Enter key. They represent the number of homework, average time to complete each homework, number of exercises, average time to complete each exercise, respectively. After getting the first 2 input, the program will jump to hw_func to calculate the amount of time for homework. After the multiplying the number of home and the time for each, it will jump to total (function) to add the calculated value to total and jump back to where it left to get the rest 2 other inputs. It will then jump again, to exercise_func and do the same thing as with hw_func. Finally, the program will display the total amount of time for the works.

3. Symbol Table

3.1 Program 1:

Register	Purpose & Labels
$t0	Integer variable for loop counter
$t1	Integer variable for minimum number
$t2	Integer variable for user input
$a0	Argument of syscall to store and print string
$v0	System call service of results

3.2 Program 2:

Register	Purpose & Labels
$f1	Floating variable to store num1 which has value of 12.0
$f2	Floating variable to store num2 which has value of 703.0
$f6	Floating variable to store bmi1 which has value of 18.5
$f7	Floating variable to store bmi2 which has value of 24.9
$f3-$f5	Floating variable for calculation
$a0	Argument of syscall to store and print string
$v0	System call service of results

3.3 Program 3:

Register	Purpose & Labels
$s0-$s3	Integer variable for user input
$t0	Temporary integer variable for storing multiplication result
$t1	Integer variable for total work calculation

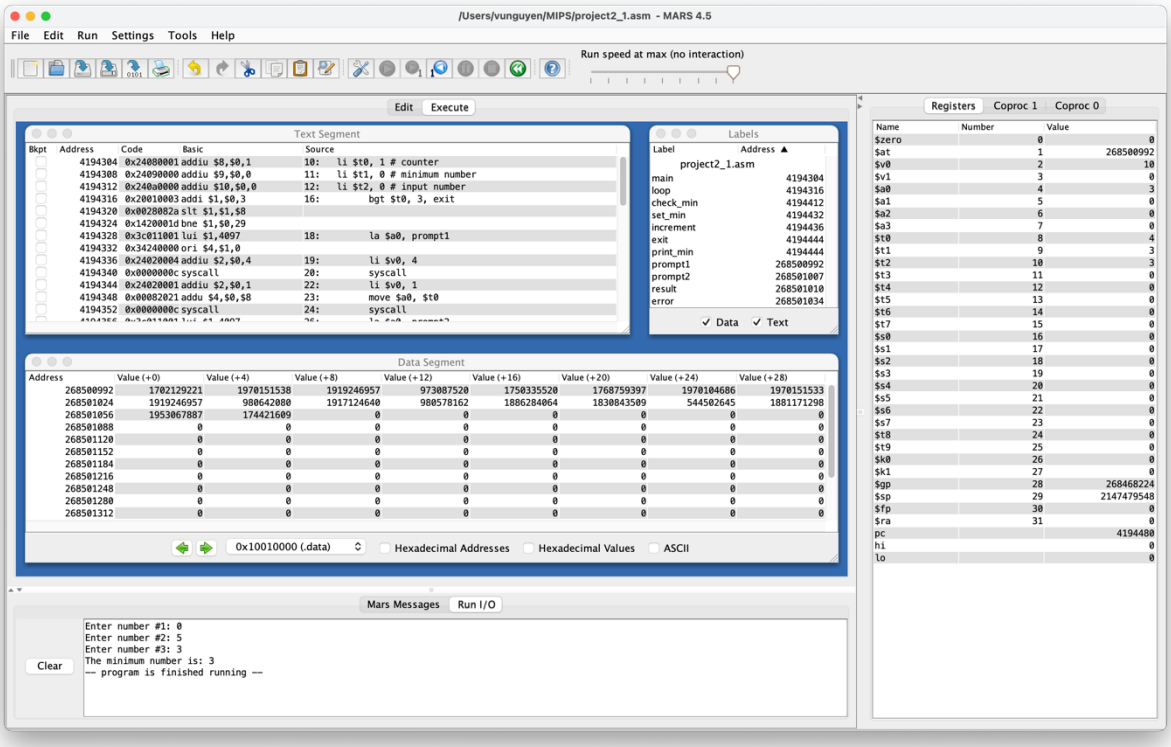
$sp	Stack pointer register
$ra	Return address register
$a0	Argument of syscall to store and print string
$v0	System call service of results

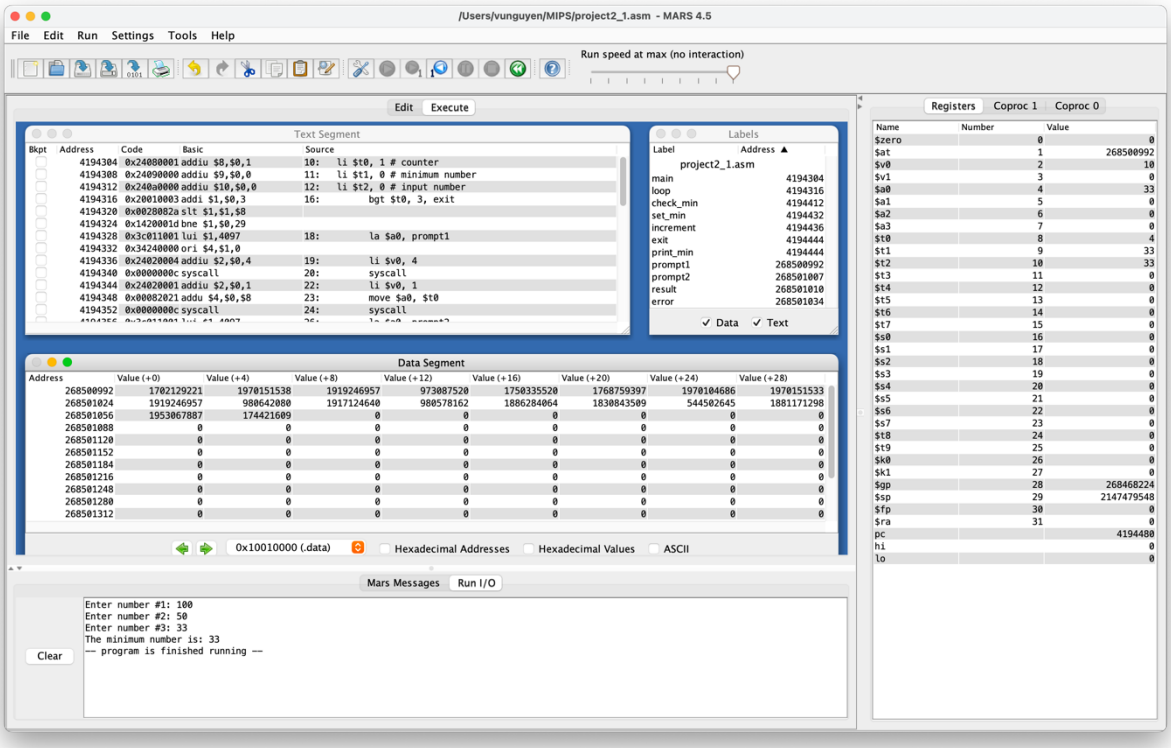
4. Learning Coverage

1. Implementation of nested non-leaf procedure
2. Implementation of leaf procedure
3. Using stack register to jump from one function to another and back
4. Initializing single precision floating number
5. Printing floating number to the console
6. Calculation with floating numbers
7. Conditioning with floating numbers to jump to other functions

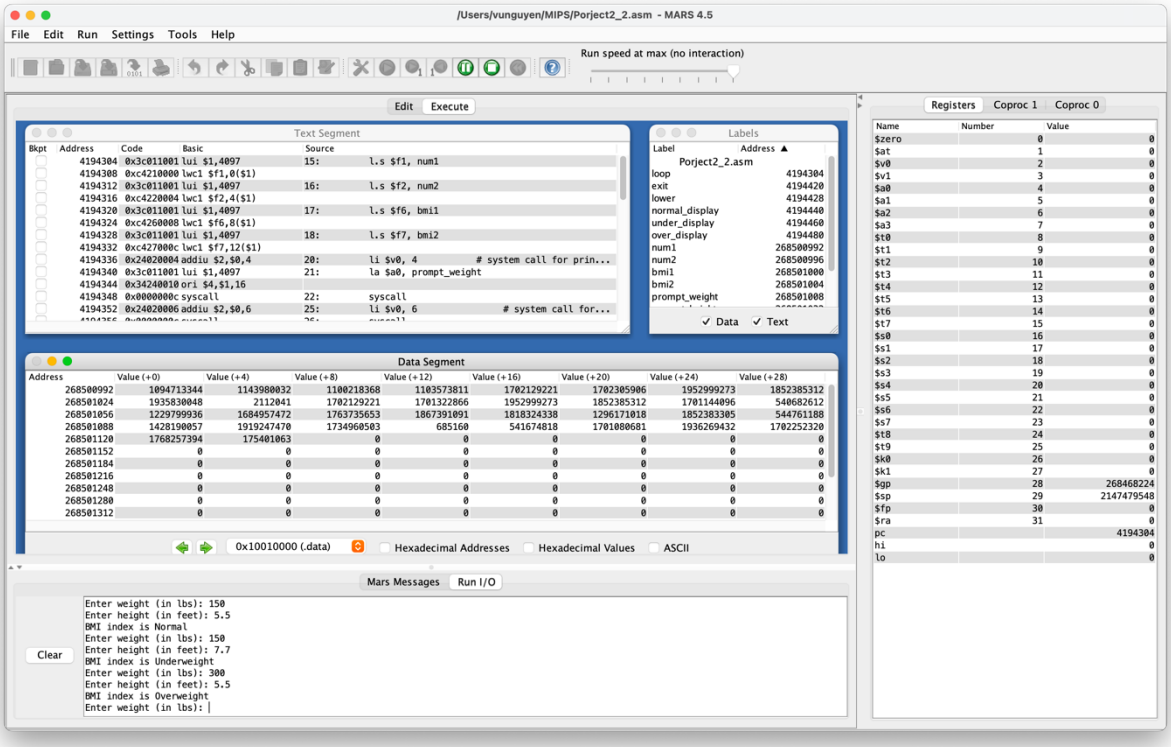
5. Test Results

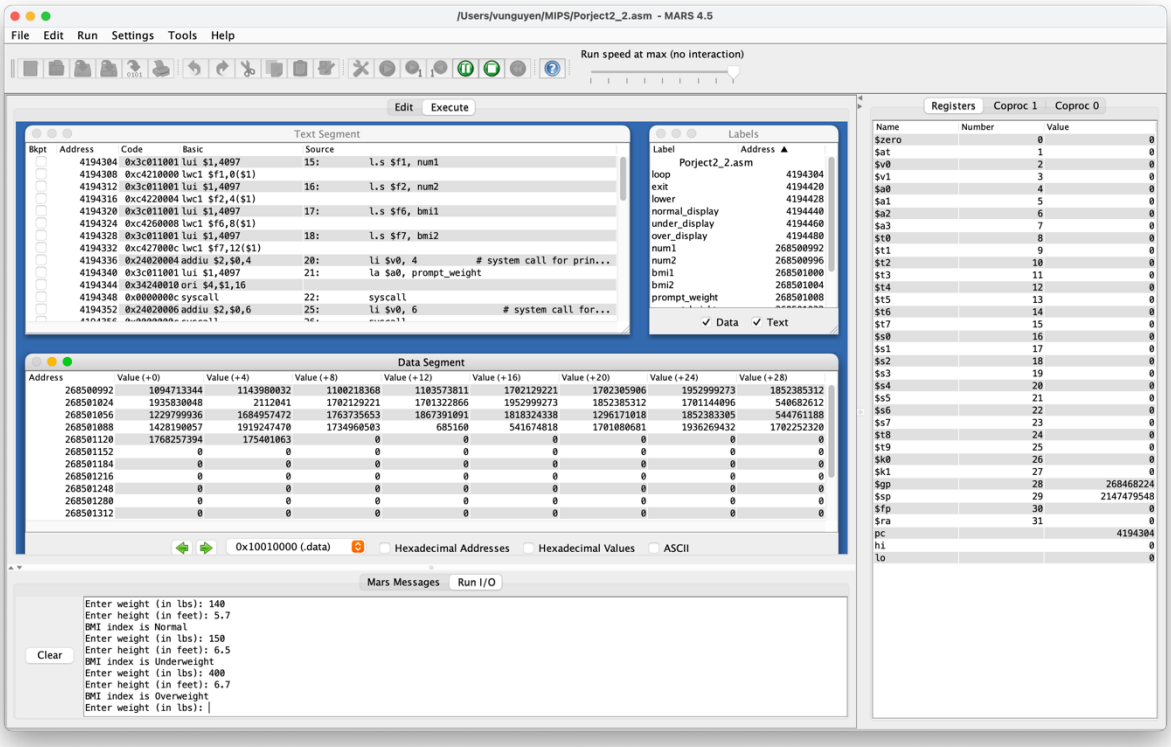
5.1 Program 1:



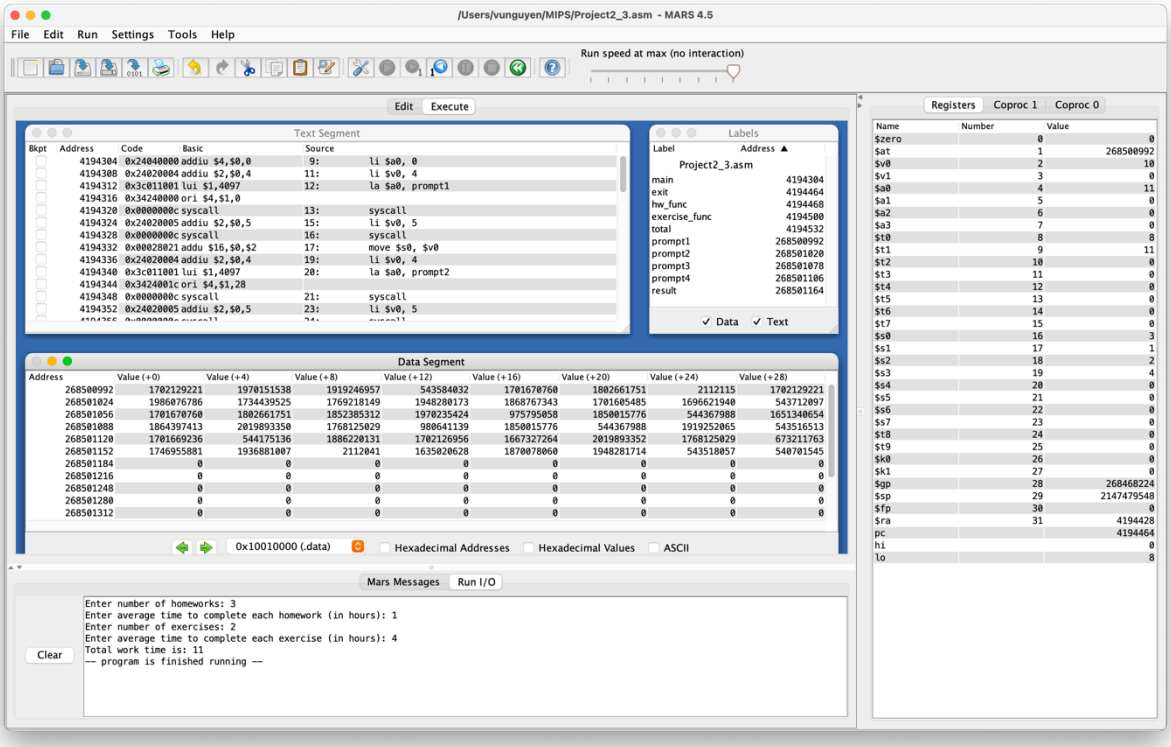


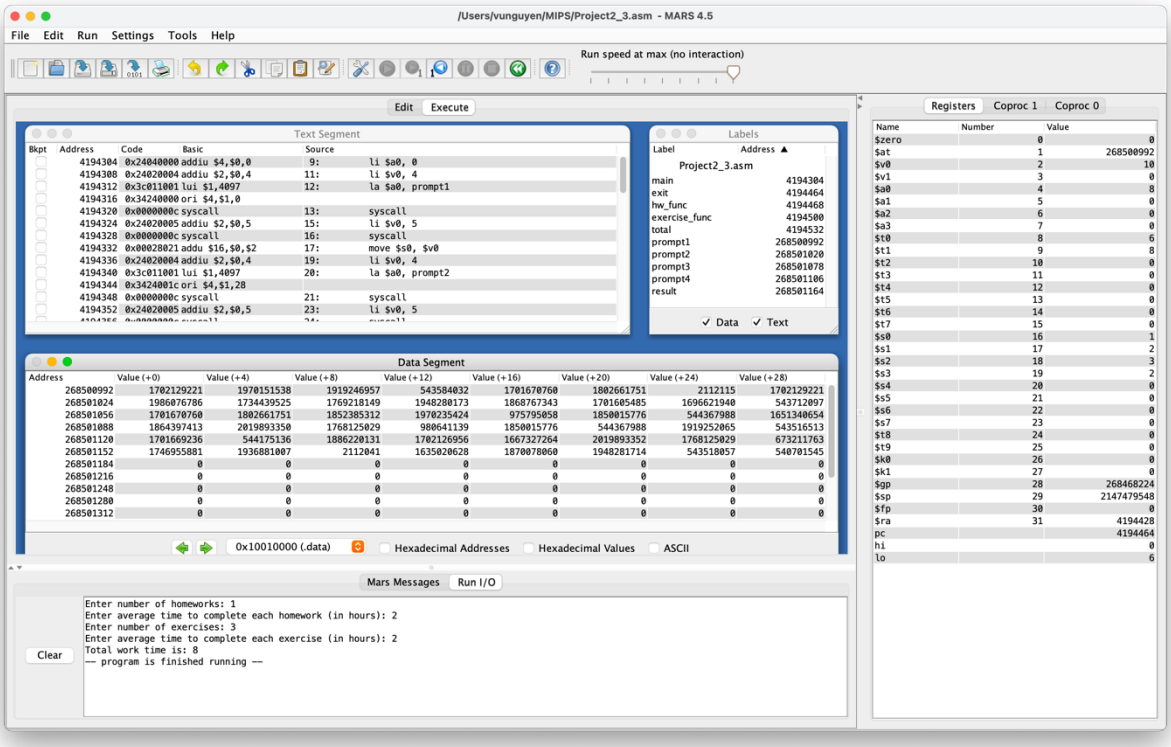
5.2 Program 2:


/Users/vunguyen/MIPS/Porject2_2.asm - MARS 4.5
File Edit Run Settings Tools Help
Run speed at max (no interaction)
Edit Execute
Text Segment
Bkpt Address Code Basic Source
4194304 0x3c011001 lui $1,4097 15: l.s $f1, num1
4194308 0xc4210000 lwc1 $f1,0($1)
4194312 0x3c011001 lui $1,4097 16: l.s $f2, num2
4194316 0xc4220004 lwc1 $f2,4($1)
4194320 0x3c011001 lui $1,4097 17: l.s $f6, bmi1
4194324 0xc4260008 lwc1 $f6,8($1)
4194328 0x3c011001 lui $1,4097 18: l.s $f7, bmi2
4194332 0xc427000c lwc1 $f7,12($1)
4194336 0x24020004 addiu $2,$0,4 20: li $v0, 4 # system call for prin...
4194340 0x3c011001 lui $1,4097 21: la $a0, prompt_weight
4194344 0x34240010 ori $4,$1,16
4194348 0x0000000c syscall 22: syscall
4194352 0x24020006 addiu $2,$0,6 25: li $v0, 6 # system call for...
Labels
Label Address
Porject2_2.asm
loop 4194304
exit 4194420
lower 4194428
normal_display 4194440
under_display 4194460
over_display 4194480
num1 268500992
num2 268500996
bmi1 268501000
bmi2 268501004
prompt_weight 268501008
Data Segment
Address Value (+0) Value (+4) Value (+8) Value (+12) Value (+16) Value (+20) Value (+24) Value (+28)
268500992 1094713344 1143980032 1100218368 1103573811 1702129221 1702305906 1952999273 1852385312
268501024 1935830048 2112041 1702129221 1701322866 1952999273 1852385312 1701144096 540682612
268501056 1229799936 1684957472 1763735653 1867391091 1818324338 1296171018 1852383305 544761188
268501088 1428190057 1919247470 1734960503 685160 541674818 1701080681 1936269432 1702252320
268501120 1768257394 175401063 0 0 0 0 0 0
268501152 0 0 0 0 0 0 0 0
268501184 0 0 0 0 0 0 0 0
268501216 0 0 0 0 0 0 0 0
268501248 0 0 0 0 0 0 0 0
268501280 0 0 0 0 0 0 0 0
268501312 0 0 0 0 0 0 0 0
0x10010000 (.data) Hexadecimal Addresses Hexadecimal Values ASCII
Mars Messages Run I/O
Clear
Enter weight (in lbs): 150
Enter height (in feet): 5.5
BMI index is Normal
Enter weight (in lbs): 150
Enter height (in feet): 7.7
BMI index is Underweight
Enter weight (in lbs): 300
Enter height (in feet): 5.5
BMI index is Overweight
Enter weight (in lbs):
Registers Coproc 1 Coproc 0
Name Number Value
$zero 0 0
$at 1 0
$v0 2 0
$v1 3 0
$a0 4 0
$a1 5 0
$a2 6 0
$a3 7 0
$t0 8 0
$t1 9 0
$t2 10 0
$t3 11 0
$t4 12 0
$t5 13 0
$t6 14 0
$t7 15 0
$s0 16 0
$s1 17 0
$s2 18 0
$s3 19 0
$s4 20 0
$s5 21 0
$s6 22 0
$s7 23 0
$t8 24 0
$t9 25 0
$k0 26 0
$k1 27 0
$gp 28 268468224
$sp 29 2147479548
$fp 30 0
$ra 31 0
pc 4194304
hi 0
lo 0


/Users/vunguyen/MIPS/Porject2_2.asm - MARS 4.5
File Edit Run Settings Tools Help
Run speed at max (no interaction)
Edit Execute
Text Segment
Bkpt Address Code Basic Source
4194304 0x3c011001 lui $1,4097 15: l.s $f1, num1
4194308 0xc4210000 lwc1 $f1,0($1)
4194312 0x3c011001 lui $1,4097 16: l.s $f2, num2
4194316 0xc4220004 lwc1 $f2,4($1)
4194320 0x3c011001 lui $1,4097 17: l.s $f6, bmi1
4194324 0xc4260008 lwc1 $f6,8($1)
4194328 0x3c011001 lui $1,4097 18: l.s $f7, bmi2
4194332 0xc427000c lwc1 $f7,12($1)
4194336 0x24020004 addiu $2,$0,4 20: li $v0, 4 # system call for prin...
4194340 0x3c011001 lui $1,4097 21: la $a0, prompt_weight
4194344 0x34240010 ori $4,$1,16
4194348 0x0000000c syscall 22: syscall
4194352 0x24020006 addiu $2,$0,6 25: li $v0, 6 # system call for...
Labels
Label Address
Porject2_2.asm
loop 4194304
exit 4194420
lower 4194428
normal_display 4194440
under_display 4194460
over_display 4194480
num1 268500992
num2 268500996
bmi1 268501000
bmi2 268501004
prompt_weight 268501008
Data Segment
Address Value (+0) Value (+4) Value (+8) Value (+12) Value (+16) Value (+20) Value (+24) Value (+28)
268500992 1094713344 1143980032 1100218368 1103573811 1702129221 1702305906 1952999273 1852385312
268501024 1935830048 2112041 1702129221 1701322866 1952999273 1852385312 1701144096 540682612
268501056 1229799936 1684957472 1763735653 1867391091 1818324338 1296171018 1852383305 544761188
268501088 1428190057 1919247470 1734960503 685160 541674818 1701080681 1936269432 1702252320
268501120 1768257394 175401063 0 0 0 0 0 0
268501152 0 0 0 0 0 0 0 0
268501184 0 0 0 0 0 0 0 0
268501216 0 0 0 0 0 0 0 0
268501248 0 0 0 0 0 0 0 0
268501280 0 0 0 0 0 0 0 0
268501312 0 0 0 0 0 0 0 0
0x10010000 (.data) Hexadecimal Addresses Hexadecimal Values ASCII
Mars Messages Run I/O
Clear
Enter weight (in lbs): 140
Enter height (in feet): 5.7
BMI index is Normal
Enter weight (in lbs): 150
Enter height (in feet): 6.5
BMI index is Underweight
Enter weight (in lbs): 400
Enter height (in feet): 6.7
BMI index is Overweight
Enter weight (in lbs):
Registers Coproc 1 Coproc 0
Name Number Value
$zero 0 0
$at 1 0
$v0 2 0
$v1 3 0
$a0 4 0
$a1 5 0
$a2 6 0
$a3 7 0
$t0 8 0
$t1 9 0
$t2 10 0
$t3 11 0
$t4 12 0
$t5 13 0
$t6 14 0
$t7 15 0
$s0 16 0
$s1 17 0
$s2 18 0
$s3 19 0
$s4 20 0
$s5 21 0
$s6 22 0
$s7 23 0
$t8 24 0
$t9 25 0
$k0 26 0
$k1 27 0
$gp 28 268468224
$sp 29 2147479548
$fp 30 0
$ra 31 0
pc 4194304
hi 0
lo 0

5.3 Program 3:


/Users/vunguyen/MIPS/Project2_3.asm - MARS 4.5
File Edit Run Settings Tools Help
Run speed at max (no interaction)
Edit Execute
Text Segment
Bkpt Address Code Basic Source
4194304 0x24040000 addiu $4,$0,0 9: li $a0, 0
4194308 0x24020004 addiu $2,$0,4 11: li $v0, 4
4194312 0x3c011001 lui $1,4097 12: la $a0, prompt1
4194316 0x34240000 ori $4,$1,0
4194320 0x0000000c syscall 13: syscall
4194324 0x24020005 addiu $2,$0,5 15: li $v0, 5
4194328 0x0000000c syscall 16: syscall
4194332 0x00028021 addu $16,$0,$2 17: move $s0, $v0
4194336 0x24020004 addiu $2,$0,4 19: li $v0, 4
4194340 0x3c011001 lui $1,4097 20: la $a0, prompt2
4194344 0x3424001c ori $4,$1,28
4194348 0x0000000c syscall 21: syscall
4194352 0x24020005 addiu $2,$0,5 23: li $v0, 5
Labels
Label Address
Project2_3.asm
main 4194304
exit 4194464
hw_func 4194468
exercise_func 4194500
total 4194532
prompt1 268500992
prompt2 268501020
prompt3 268501078
prompt4 268501106
result 268501164
Data Text
Data Segment
Address Value (+0) Value (+4) Value (+8) Value (+12) Value (+16) Value (+20) Value (+24) Value (+28)
268500992 1702129221 1970151538 1919246957 543584032 1701670760 1802661751 2112115 1702129221
268501024 1986076786 1734439525 1769218149 1948280173 1868767343 1701605485 1696621940 543712097
268501056 1701670760 1802661751 1852385312 1970235424 975795058 1850015776 544367988 1651340654
268501088 1864397413 2019893350 1768125029 980641139 1850015776 544367988 1919252065 543516513
268501120 1701669236 544175136 1886220131 1702126956 1667327264 2019893352 1768125029 673211763
268501152 1746955881 1936881007 2112041 1635020628 1870078060 1948281714 543518057 540701545
268501184 0 0 0 0 0 0 0 0
268501216 0 0 0 0 0 0 0 0
268501248 0 0 0 0 0 0 0 0
268501280 0 0 0 0 0 0 0 0
268501312 0 0 0 0 0 0 0 0
0x10010000 (.data) Hexadecimal Addresses Hexadecimal Values ASCII
Mars Messages Run I/O
Clear
Enter number of homeworks: 3
Enter average time to complete each homework (in hours): 1
Enter number of exercises: 2
Enter average time to complete each exercise (in hours): 4
Total work time is: 11
-- program is finished running --
Registers Coproc 1 Coproc 0
Name Number Value
$zero 0 0
$at 1 268500992
$v0 2 10
$v1 3 0
$a0 4 11
$a1 5 0
$a2 6 0
$a3 7 0
$t0 8 8
$t1 9 11
$t2 10 0
$t3 11 0
$t4 12 0
$t5 13 0
$t6 14 0
$t7 15 0
$s0 16 3
$s1 17 1
$s2 18 2
$s3 19 4
$s4 20 0
$s5 21 0
$s6 22 0
$s7 23 0
$t8 24 0
$t9 25 0
$k0 26 0
$k1 27 0
$gp 28 268468224
$sp 29 2147479548
$fp 30 0
$ra 31 4194428
pc 4194464
hi 0
lo 8


/Users/vunguyen/MIPS/Project2_3.asm - MARS 4.5
File Edit Run Settings Tools Help
Run speed at max (no interaction)
Edit Execute
Text Segment
Bkpt Address Code Basic Source
4194304 0x24040000 addiu $4,$0,0 9: li $a0, 0
4194308 0x24020004 addiu $2,$0,4 11: li $v0, 4
4194312 0x3c011001 lui $1,4097 12: la $a0, prompt1
4194316 0x34240000 ori $4,$1,0
4194320 0x0000000c syscall 13: syscall
4194324 0x24020005 addiu $2,$0,5 15: li $v0, 5
4194328 0x0000000c syscall 16: syscall
4194332 0x00028021 addu $16,$0,$2 17: move $s0, $v0
4194336 0x24020004 addiu $2,$0,4 19: li $v0, 4
4194340 0x3c011001 lui $1,4097 20: la $a0, prompt2
4194344 0x3424001c ori $4,$1,28
4194348 0x0000000c syscall 21: syscall
4194352 0x24020005 addiu $2,$0,5 23: li $v0, 5
Labels
Label Address
Project2_3.asm
main 4194304
exit 4194464
hw_func 4194468
exercise_func 4194500
total 4194532
prompt1 268500992
prompt2 268501020
prompt3 268501078
prompt4 268501106
result 268501164
Data Text
Data Segment
Address Value (+0) Value (+4) Value (+8) Value (+12) Value (+16) Value (+20) Value (+24) Value (+28)
268500992 1702129221 1970151538 1919246957 543584032 1701670760 1802661751 2112115 1702129221
268501024 1986076786 1734439525 1769218149 1948280173 1868767343 1701605485 1696621940 543712097
268501056 1701670760 1802661751 1852385312 1970235424 975795058 1850015776 544367988 1651340654
268501088 1864397413 2019893350 1768125029 980641139 1850015776 544367988 1919252065 543516513
268501120 1701669236 544175136 1886220131 1702126956 1667327264 2019893352 1768125029 673211763
268501152 1746955881 1936881007 2112041 1635020628 1870078060 1948281714 543518057 540701545
268501184 0 0 0 0 0 0 0 0
268501216 0 0 0 0 0 0 0 0
268501248 0 0 0 0 0 0 0 0
268501280 0 0 0 0 0 0 0 0
268501312 0 0 0 0 0 0 0 0
0x10010000 (.data) Hexadecimal Addresses Hexadecimal Values ASCII
Mars Messages Run I/O
Clear
Enter number of homeworks: 1
Enter average time to complete each homework (in hours): 2
Enter number of exercises: 3
Enter average time to complete each exercise (in hours): 2
Total work time is: 8
-- program is finished running --
Registers Coproc 1 Coproc 0
Name Number Value
$zero 0 0
$at 1 268500992
$v0 2 10
$v1 3 0
$a0 4 8
$a1 5 0
$a2 6 0
$a3 7 0
$t0 8 6
$t1 9 8
$t2 10 0
$t3 11 0
$t4 12 0
$t5 13 0
$t6 14 0
$t7 15 0
$s0 16 1
$s1 17 2
$s2 18 3
$s3 19 2
$s4 20 0
$s5 21 0
$s6 22 0
$s7 23 0
$t8 24 0
$t9 25 0
$k0 26 0
$k1 27 0
$gp 28 268468224
$sp 29 2147479548
$fp 30 0
$ra 31 4194428
pc 4194464
hi 0
lo 6