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Csc 34200

25 March 2024

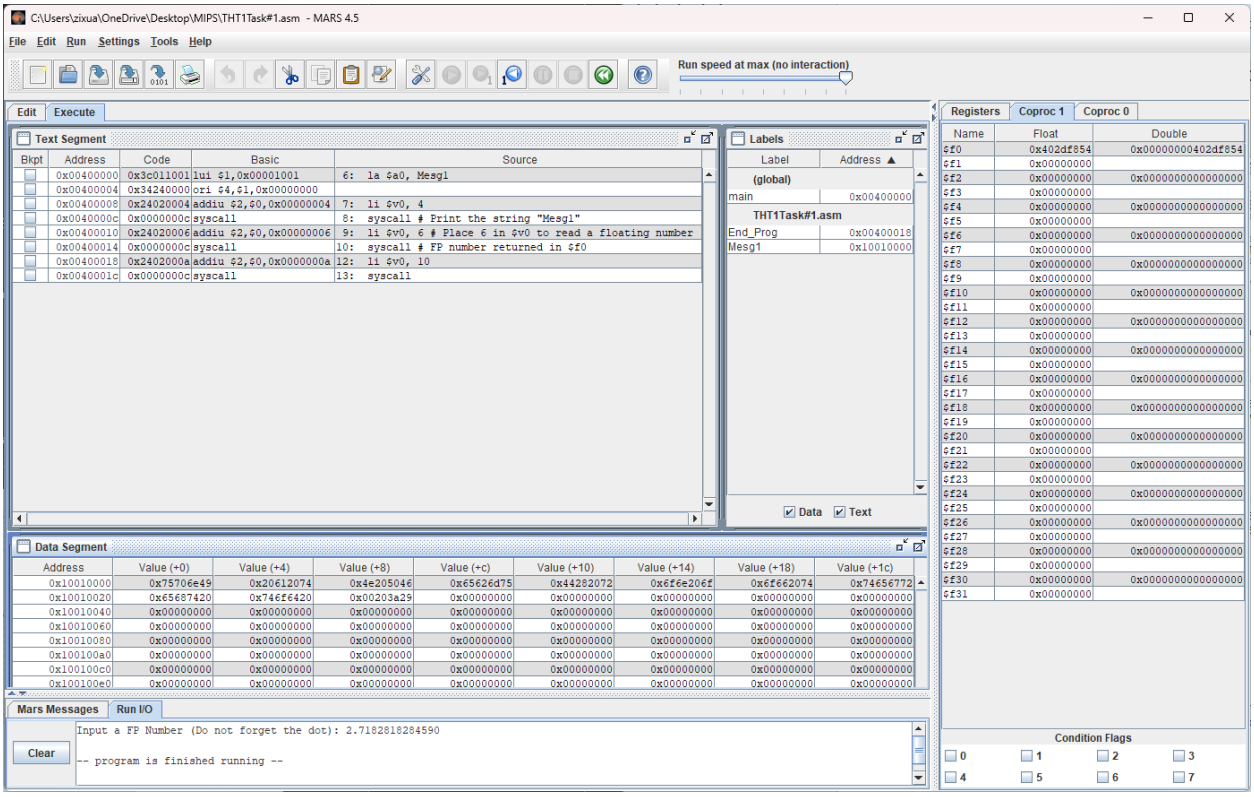
Take At Home Test

Task 1: Question #1

Input the value of e= 2.7182818284590 using SYSCALL ($v0 = 6, which returns the value in $f0).

Write the values:

- Hex Number in $f0: 0x402df854
- Binary Value of $f0: 01000000001011011111100001010100
- Sign: 0, Exponent: 1000 000, Mantissa: 0101 1011 1111 0000 1010 100
- Compute the decimal value stored in $f0: 2.71828174591064453125

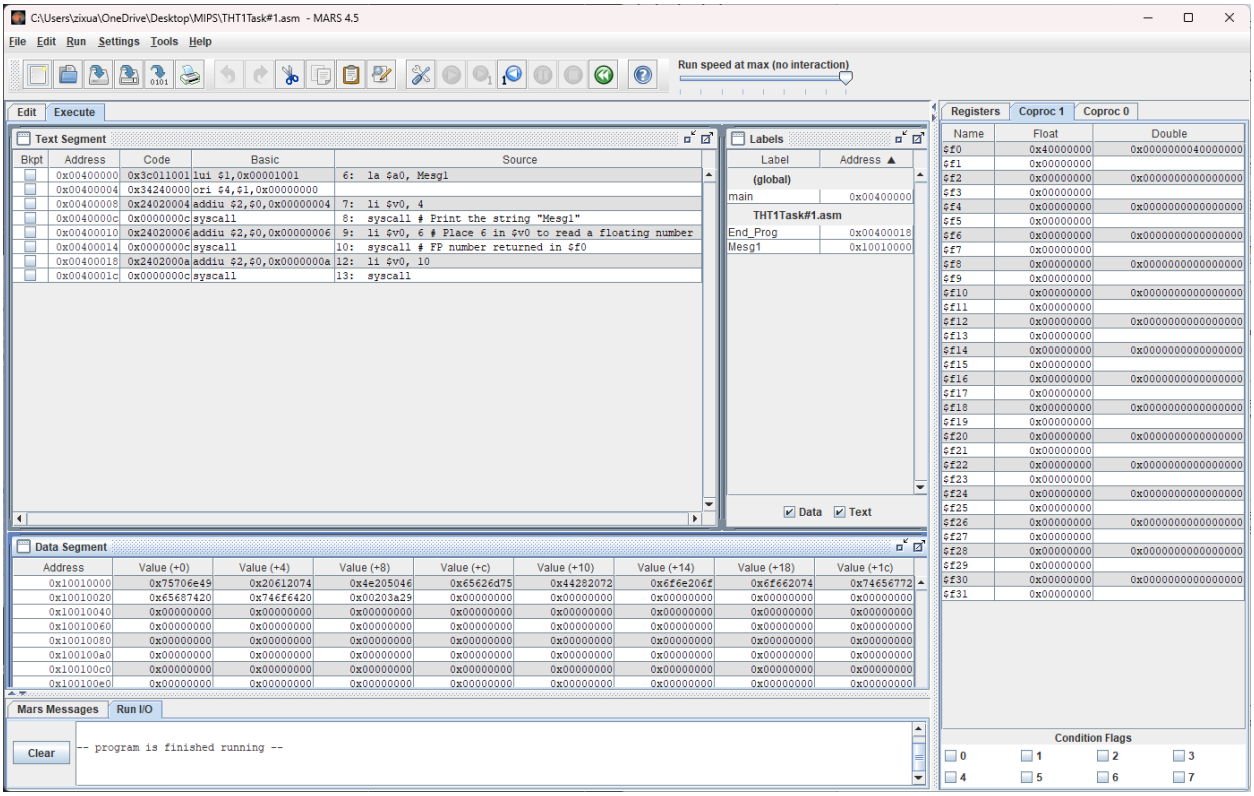


Task 1: Question #2

Input the value of e = 2.0 using SYSCALL ($v0 = 6, which returns the value in $f0).

Write the values:

- Hex Number in $f0: 0x40000000
- Binary Value of $f0: 01000000000000000000000000000000
- Sign: 0, Exponent: 1000 000, Mantissa: 0000 0000 0000 0000 0000 000
- Compute the decimal value stored in $f0: 2



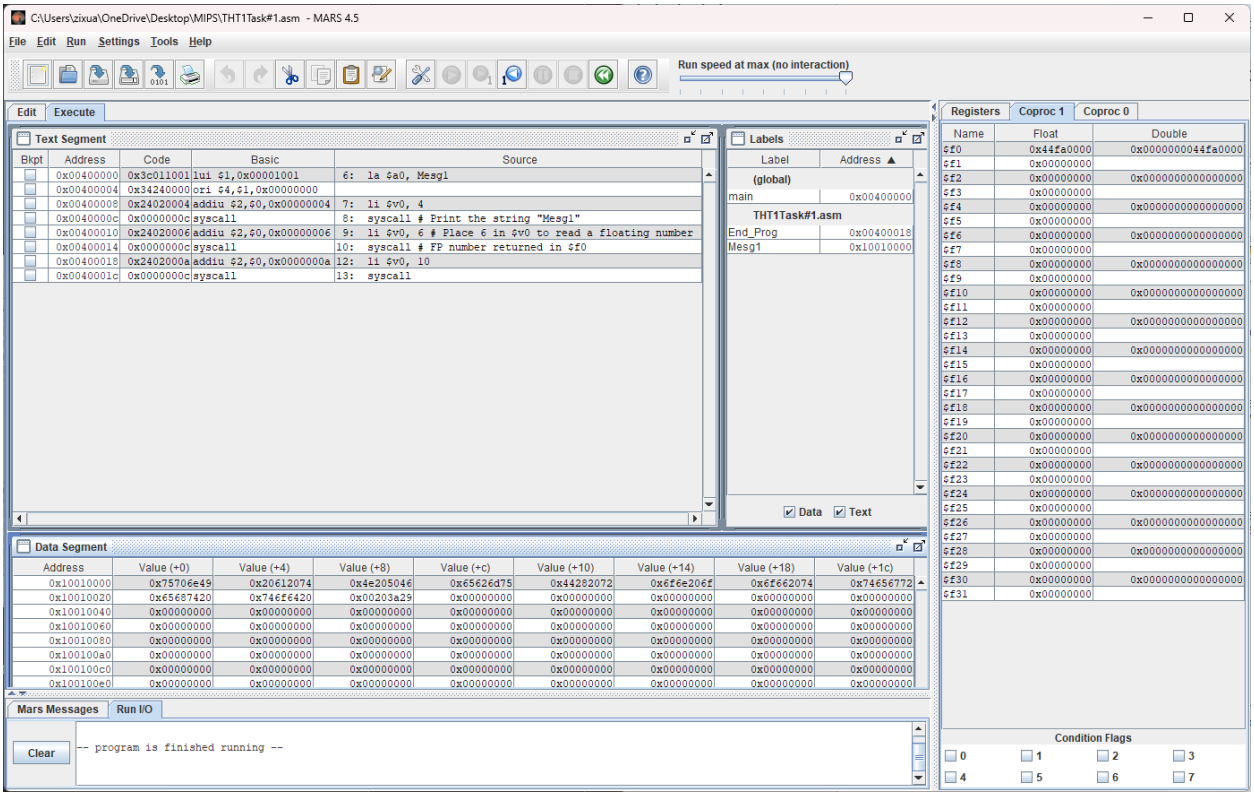
Task 1: Question #3

Input the value of e = 2E3 using SYSCALL ($v0 = 6, which returns the value in $f0).

Write the values:

- Hex Number in $f0: 0x44fa0000
- Binary Value of $f0: 01000100111110100000000000000000
- Sign: 0, Exponent: 1000 1001, Mantissa: 1111 0100 0000 0000 0000 000

- Compute the decimal value stored in $f0: 2000

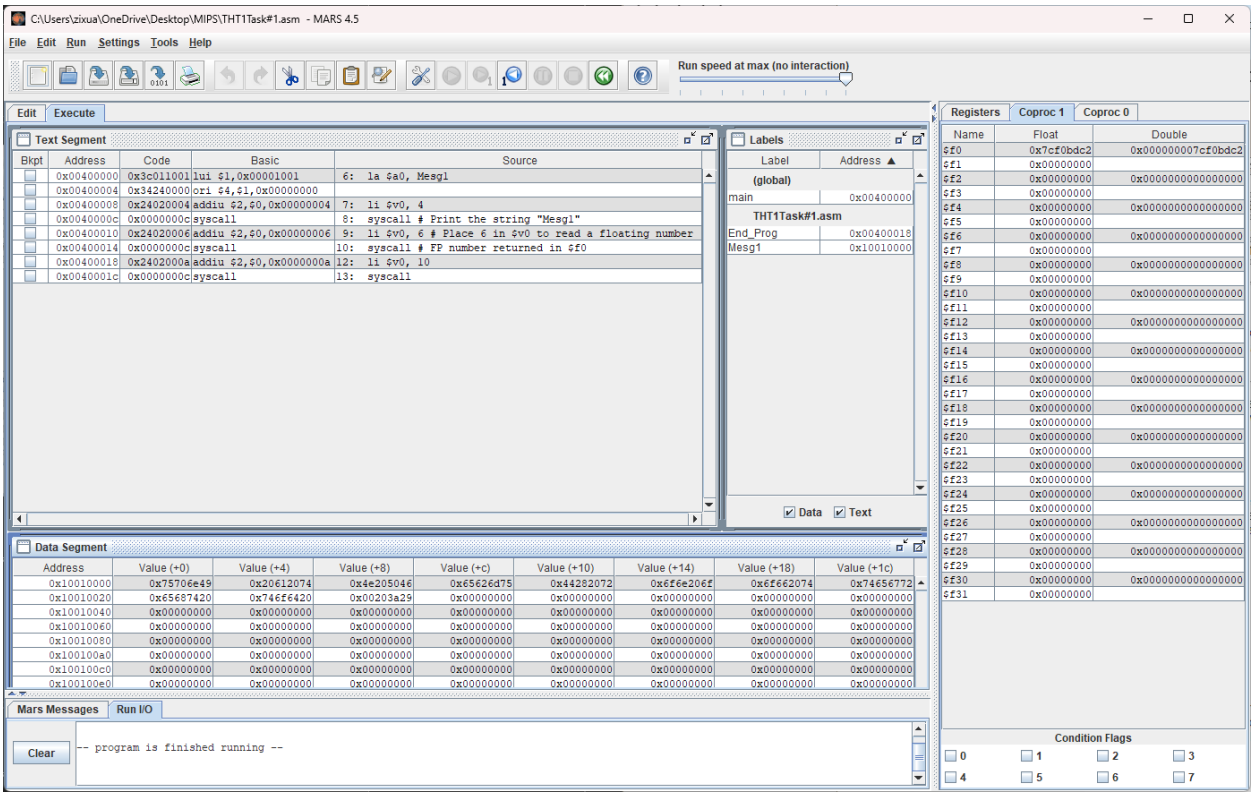


Task 1: Question #4

Input the value of e = 1E37 using SYSCALL ($v0 = 6, which returns the value in $f0).

Write the values:

- Hex Number in $f0: 0x7cf0bdc2
- Binary Value of $f0: 01111100111100001011110111000010
- Sign: 0, Exponent: 1111 1001, Mantissa: 1110 0001 0111 1011 1000 010
- Compute the decimal value stored in $f0: 1 * 10^37

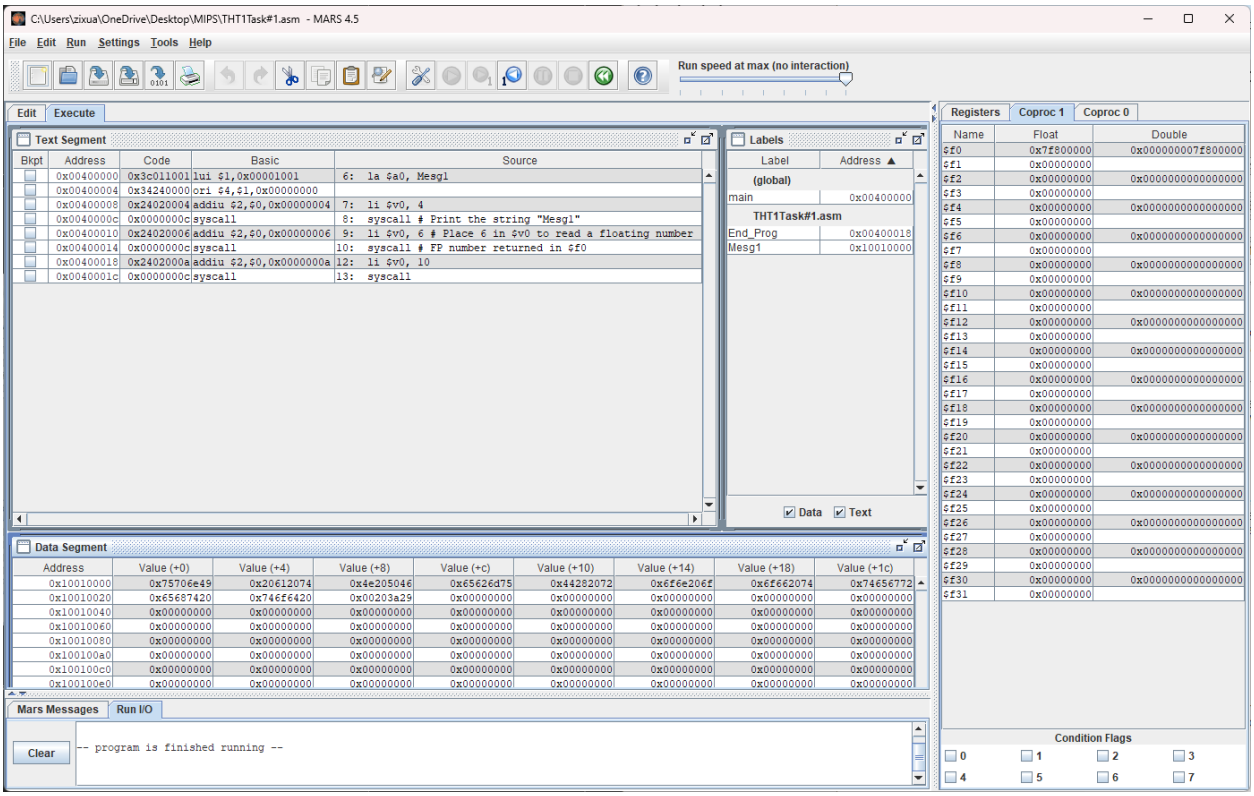


Task 1: Question #5

Input the value of e = 1E39 using SYSCALL ($v0 = 6, which returns the value in $f0).

Write the values:

- Hex Number in $f0: 0x7f800000
- Binary Value of $f0: 10111100000101000011111110100100111000100101000011101000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
- Sign:, Exponent:, Mantissa: (Number is too large to represent)
- Compute the decimal value stored in $f0: 1 * 10^39

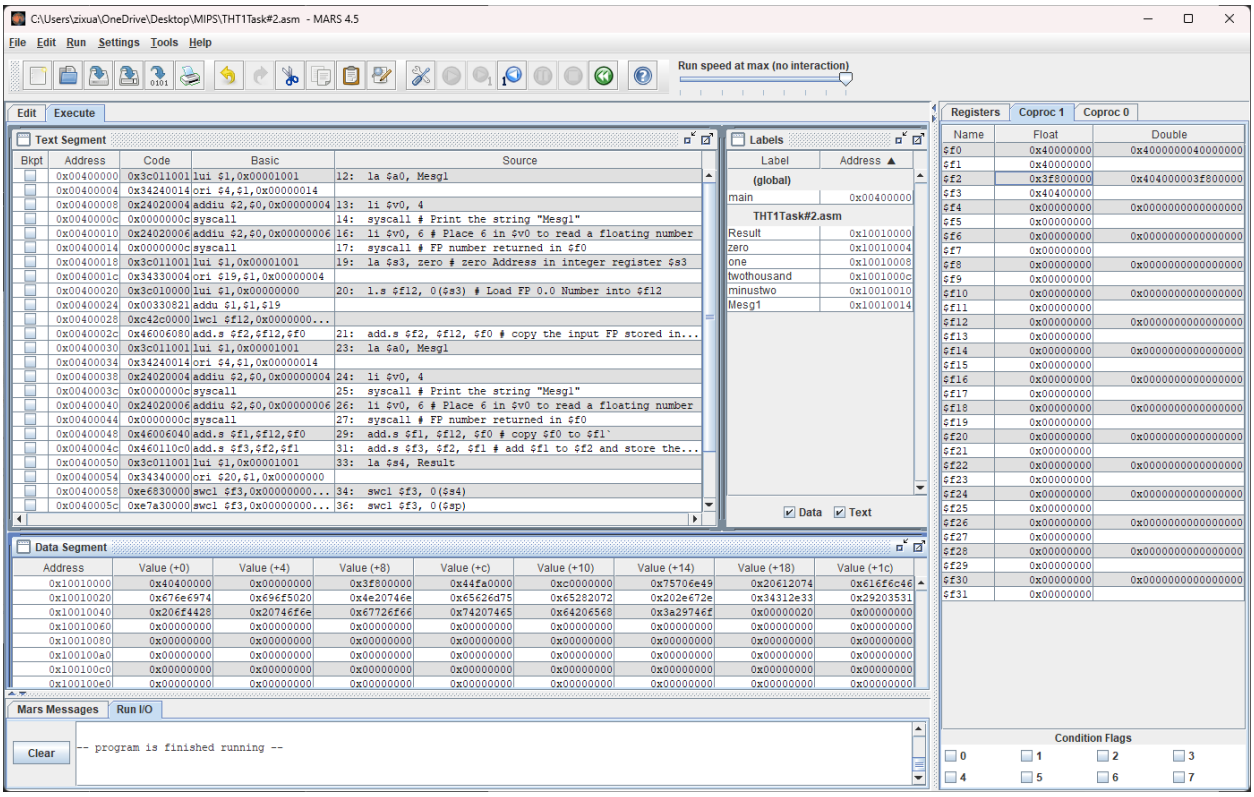


Task 2: Question #1

When running the program in MARS you inputted two floating point numbers in the INPUT WINDOW. The program computed the sum and stored it in register $f3.

Write the values:

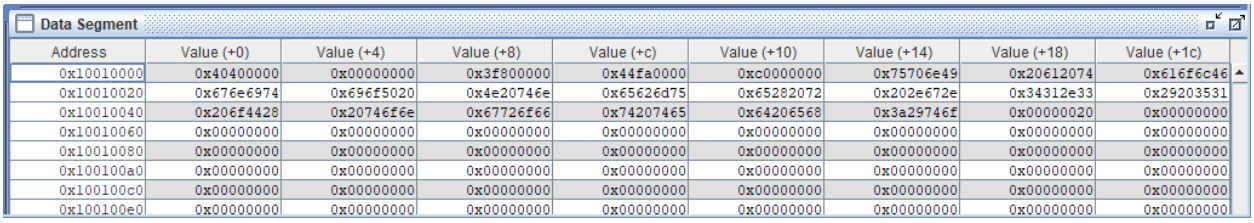
- Hex Number in $f3: 0x40400000
- Binary Value of $f3: 01000000010000000000000000000000
- Sign: 0, Exponent: 1000 0000, Mantissa: 1000 0000 0000 0000 0000 000
- Compute the decimal value stored in $f3: 3
- Explain the result: The two floating point numbers I inputted were 1.0 and 2.0, the sum of these two floating points is 3.0 which is represented in hexadecimal in register $f3.



Task 2: Question #2

Write address of variable Result in data segment where the sum in $f3 is stored. Provide screenshots.

The sum of $f3 is stored in the data segment address 0x10010000.



Task 2: Question #3

Write address of Top of the Stack (Stack pointer) where the sum in $f3 is stored. Provide screenshots of the stack.

The address of the top of the stack where the sum $f3 is stored is 0x7fffeffc.

Registers | Coproc 1 | Coproc 0

Name	Number	Value
$zero	0	0x00000000
$at	1	0x10010000
$v0	2	0x0000000a
$v1	3	0x00000000
$a0	4	0x10010014
$a1	5	0x00000000
$a2	6	0x00000000
$a3	7	0x00000000
$t0	8	0x00000000
$t1	9	0x00000000
$t2	10	0x00000000
$t3	11	0x00000000
$t4	12	0x00000000
$t5	13	0x00000000
$t6	14	0x00000000
$t7	15	0x00000000
$s0	16	0x00000000
$s1	17	0x00000000
$s2	18	0x00000000
$s3	19	0x10010004
$s4	20	0x10010000
$s5	21	0x00000000
$s6	22	0x00000000
$s7	23	0x00000000
$t8	24	0x00000000
$t9	25	0x00000000
$k0	26	0x00000000
$k1	27	0x00000000
$gp	28	0x10008000
$sp	29	0x7fffeffc
$fp	30	0x00000000
$ra	31	0x00000000
pc		0x00400070
hi		0x00000000
lo		0x00000000

Task 2: Question #4

Write address on Stack at the offset +4 from stack pointer where the value $f2 is stored. Display the value of $f2 at this address. Provide screenshots of the stack.

The address on stack at the offset +4 from stack pointer where the value $f2 is stored is 0x7fffefe0.

Data Segment

Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)
0x7fffefe0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x40400000
0x7ffff000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x7ffff020	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x7ffff040	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000

Task 2: Question #5

Write address on Stack at the offset +8 from stack pointer where the value $f1 is stored. Display the value of $f2 at this address. Provide screenshots of the stack.

The address on stack at the offset +8 from stack pointer where the value $f1 is stored is 0x7ffff000.

Data Segment

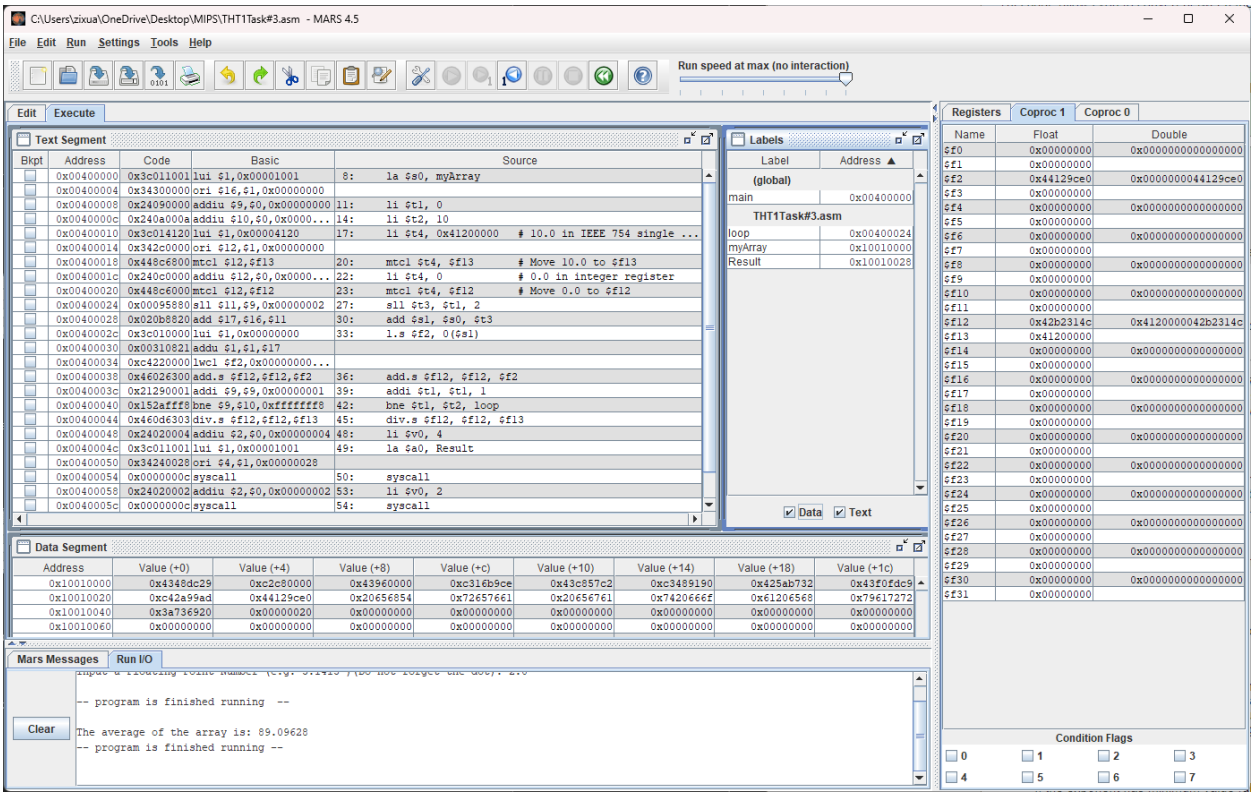
Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)
0x7fffefe0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x40400000
0x7ffff000	0x3f800000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x7ffff020	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x7ffff040	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000

Task 3: Question #1

Correct the code. Provide new, corrected listing and prove that it works.

The average of the numbers 200.86, -100.0, 300.0, -150.7258, 400.68562, -200.5686, 54.6789, 481.9827, -682.4012, 586.4512 is 89.096282. The result of running the program outputs “The average of the array is: 89.09628”.

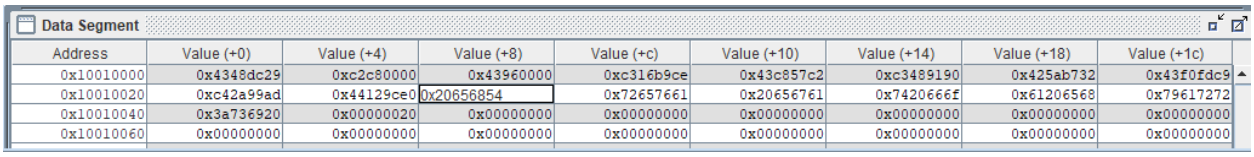
```
.data
myArray: .float 200.86, -100.0, 300.0, -150.7258, 400.68562, -200.5686, 54.6789,
481.9827, -682.4012, 586.4512
Result: .asciiz "The average of the array is: "
.text
.globl main
main:
    la $s0, myArray

    li $t1, 0

    li $t2, 10

    li $t4, 0x41200000   # 10.0 in IEEE 754 single precision (hex representation)

    mtc1 $t4, $f13       # Move 10.0 to $f13

    li $t4, 0            # 0.0 in integer register
    mtc1 $t4, $f12       # Move 0.0 to $f12

loop:
    sll $t3, $t1, 2

    add $s1, $s0, $t3

    l.s $f2, 0($s1)

    add.s $f12, $f12, $f2

    addi $t1, $t1, 1

    bne $t1, $t2, loop

    div.s $f12, $f12, $f13

    li $v0, 4
    la $a0, Result
    syscall

    li $v0, 2
    syscall

    li $v0, 10
    syscall
```



Task 3: Question #2

Provide the address of the variable result and show its value.

The address of the variable result is 0x10010020 and the value is 0x20656854.

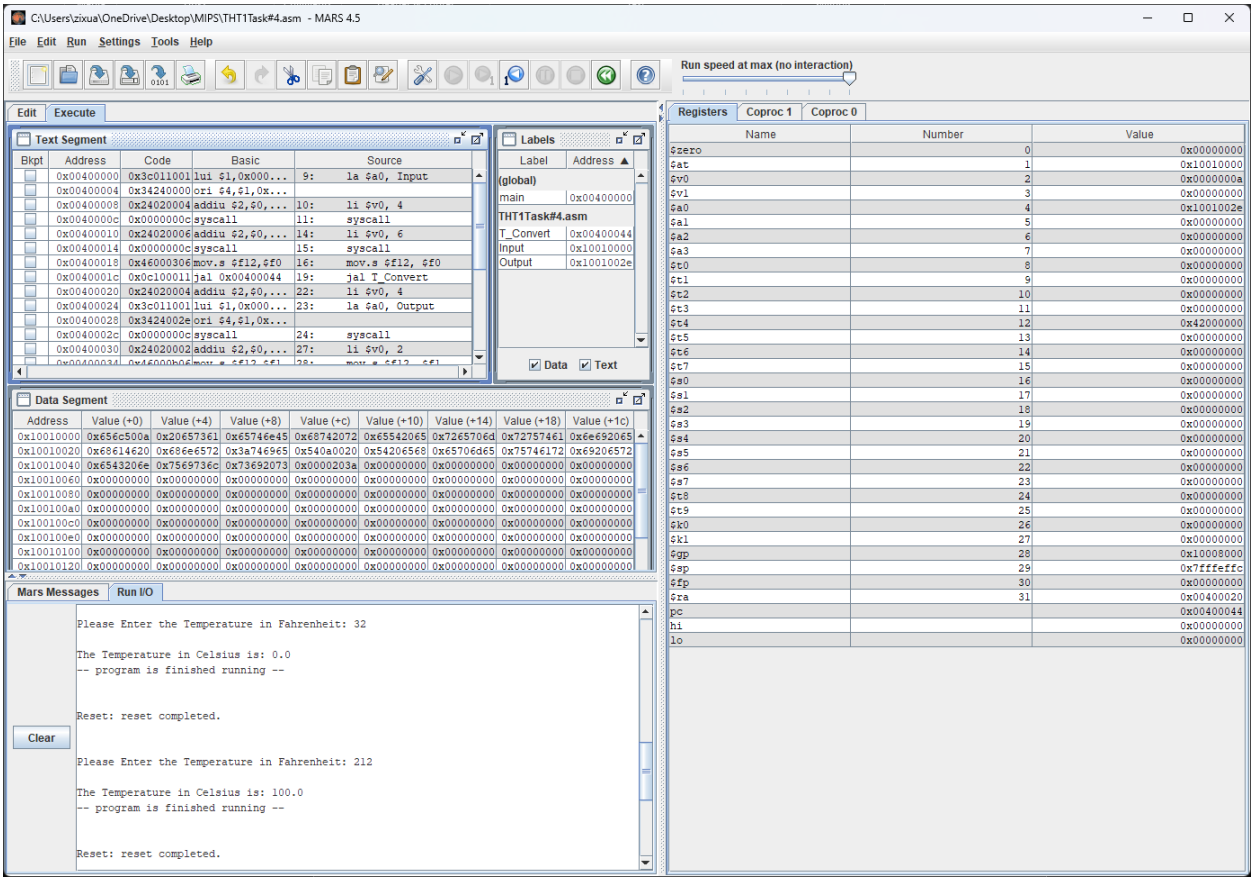


Task 4: Question #1

After correction, verify that your program works correctly. Compare your results with the temperature table. You must show screenshots with the results.

The program works correctly because when I type in 32, 212, 98.6, 122 the program outputs 0, 100, 37, and 50 respectively.

```
.data
Input: .asciiz "\nPlease Enter the Temperature in Fahrenheit: "
Output: .asciiz "\nThe Temperature in Celsius is: "
.text
.globl main

main:
    # Print Input String
    la $a0, Input
    li $v0, 4
    syscall

    # Read the temperature in Fahrenheit into $f0
    li $v0, 6
    syscall
    mov.s $f12, $f0

    # Call the procedure T_Convert with the input in $f12
    jal T_Convert

    # Print Output String
    li $v0, 4
    la $a0, Output
    syscall

    # Print the result contained in $f1
    li $v0, 2
    mov.s $f12, $f1
    syscall

    # Exit
    li $v0, 10
    syscall

T_Convert: # Procedure T_Convert
    li $t4, 0x3fe66666
    mtc1 $t4, $f5

    li $t4, 0x42000000
    mtc1 $t4, $f6

    sub.s $f1, $f12, $f6  # $f1 = Fahrenheit($f12) - 32
    div.s $f1, $f1, $f5   # Celsius ($f1) = (Fahrenheit - 32) / 1.8
    jr $ra  # Return to caller
```




```
Please Enter the Temperature in Fahrenheit: 32

The Temperature in Celsius is: 0.0
-- program is finished running --


Reset: reset completed.


Please Enter the Temperature in Fahrenheit: 212

The Temperature in Celsius is: 100.0
-- program is finished running --
```

```
Please Enter the Temperature in Fahrenheit: 98.6

The Temperature in Celsius is: 37.0
-- program is finished running --


Reset: reset completed.


Please Enter the Temperature in Fahrenheit: 122

The Temperature in Celsius is: 50.0
-- program is finished running --
```

Task 4: Question #2

Temperature in Farenheit	Temperature in Celsius
32	0.0000
212	100.000
98.6	37.0000
122	50.0000

Write a function that prints the table as shown above. Print just temperatures, no need to draw the table.

The following code below prints the table as shown above printing just the temperatures without drawing the table.

```
Temperature in Fahrenheit Temperature in Celsius
32.0                      0.0
212.0                      100.0
98.6                      37.0
122.0                      50.0

-- program is finished running --
```

```
.data
Input:   .asciiz "Temperature in Fahrenheit "
Input2:  .asciiz "Temperature in Celsius\n"
Output:  .asciiz "                        "
Output2: .asciiz "\n"
zero:    .float 0.0
onepointeight:.float 1.8
thirtytwo:.float 32.0
myArray: .float 32.0, 212.0, 98.6, 122.0

.text
.globl main

main:
    # Print initial messages
    li $v0, 4
    la $a0, Input
    syscall

    li $v0, 4
    la $a0, Input2
    syscall

    # Load constants
    l.s $f5, onepointeight
    l.s $f6, thirtytwo
    li $t1, 0

loop:
    # Load Fahrenheit from array
    l.s $f2, myArray($t1)

    # Convert Fahrenheit to Celsius
    sub.s $f1, $f2, $f6
    div.s $f1, $f1, $f5

    # Print Fahrenheit value
    li $v0, 2
    mov.s $f12, $f2
    syscall
    la $a0, Output
    li $v0, 4
    syscall

    # Print Celsius value
```

```
    li $v0, 2
    mov.s $f12, $f1
    syscall
    la $a0, Output2
    li $v0, 4
    syscall

    addi $t1, $t1, 4
    blt $t1, 16, loop

End_Prog:
    li $v0, 10
    syscall
```