

COAL Assignment-02

Rayyan Aamir | 24K-0687 | BCS-3F

Question 1:

Rayyan Aamir
24K-0687
BCS-3F

Computer Organization & Assembly Language
Assignment # 02

Date: _____

Question 01:-

mov eax, 3		eax = 7
mov ebx, 7		ebx = 10
push eax		eax = 3
push ebx	7 10	
pop eax	3	
push 10		
pop ebx		
pop eax		

Final Values :-
eax = 3, ebx = 10, stack is empty.

Question 2:

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; Assignment 02 | Question 02

INCLUDE Irvine32.inc

.data

num1 SDWORD ?

num2 SDWORD ?

num3 SDWORD ?

num4 SDWORD ?

colon BYTE ": ",0

prompt BYTE "Enter the value of number ",0

result SDWORD ?

msg BYTE "Final Result: ",0

.code

main PROC

mov ebx, 0

inc ebx

mov edx, OFFSET prompt

call WriteString

mov eax, ebx

call WriteDec

mov edx, OFFSET colon

call WriteString

call ReadInt

mov num1, eax

```
inc ebx
mov edx, OFFSET prompt
call WriteString
mov eax, ebx
call WriteDec
mov edx, OFFSET colon
call WriteString
call ReadInt
mov num2, eax
```

```
inc ebx
mov edx, OFFSET prompt
call WriteString
mov eax, ebx
call WriteDec
mov edx, OFFSET colon
call WriteString
call ReadInt
mov num3, eax
```

```
inc ebx
mov edx, OFFSET prompt
call WriteString
mov eax, ebx
call WriteDec
mov edx, OFFSET colon
call WriteString
call ReadInt
```

```
mov num4, eax
```

L1:

```
mov ebx, num2
```

```
cmp num1, ebx
```

```
jng L2
```

```
mov ebx, num4
```

```
cmp num3, ebx
```

```
je L2
```

```
mov eax, num1
```

```
add eax, num3
```

```
mov result, eax
```

```
jmp display_result
```

L2:

```
mov ebx, num4
```

```
cmp num2, ebx
```

```
jne L3
```

```
mov eax, num2
```

```
sub eax, num1
```

```
mov result, eax
```

```
jmp display_result
```

L3:

```
mov result, 0
```

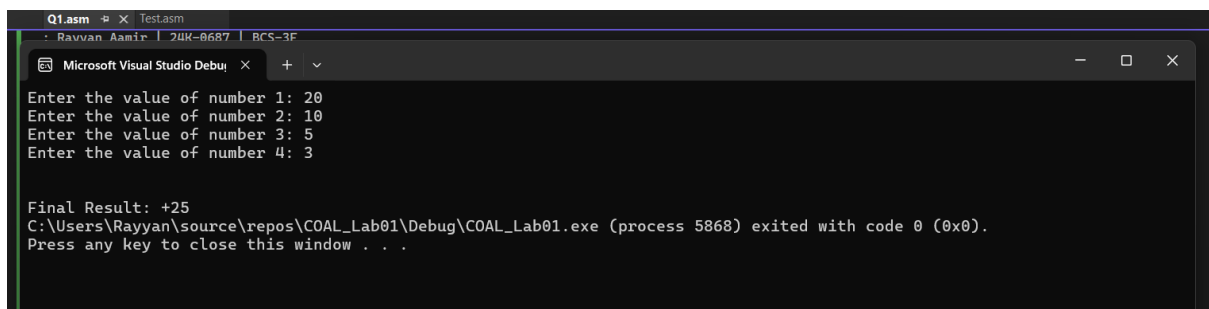
display_result:

```
call CRLF  
call CRLF  
mov edx, OFFSET msg  
call WriteString  
mov eax, result  
call WriteInt
```

```
exit
```

```
main ENDP
```

```
END main
```



```
Q1.asm - Testasm  
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Microsoft Visual Studio Debug  
Enter the value of number 1: 20  
Enter the value of number 2: 10  
Enter the value of number 3: 5  
Enter the value of number 4: 3  
  
Final Result: +25  
C:\Users\Rayyan\source\repos\COAL_Lab01\Debug\COAL_Lab01.exe (process 5868) exited with code 0 (0x0).  
Press any key to close this window . . .
```

Question 3:

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; Assignment 02 | Question 03

```
INCLUDE Irvine32.inc
```

```
.data
```

```
arr SDWORD 5,-10,15,-20,25,0
```

```
sum SDWORD 0
```

```
countArr DWORD ?
```

```
msg BYTE "Sum: ",0
```

```
.code
```

```
main PROC
```

```
    mov eax, LENGTHOF arr
```

```
    mov countArr, eax
```

```
    mov ebx, 0
```

```
    mov esi, 0
```

```
calculate_sum:
```

```
    cmp ebx, countArr
```

```
    jge exit_program
```

```
    cmp arr[esi], 0
```

```
    jg add_sum
```

```
    dec sum
```

```
    jmp next
```

```
add_sum:
```

```
    mov eax, sum
```

```
    add eax, arr[esi]
```

```
    mov sum, eax
```

```
next:
```

```
    add esi, TYPE arr
```

```
    inc ebx
```

```
    jmp calculate_sum
```

exit_program:

mov edx, OFFSET msg

call WriteString

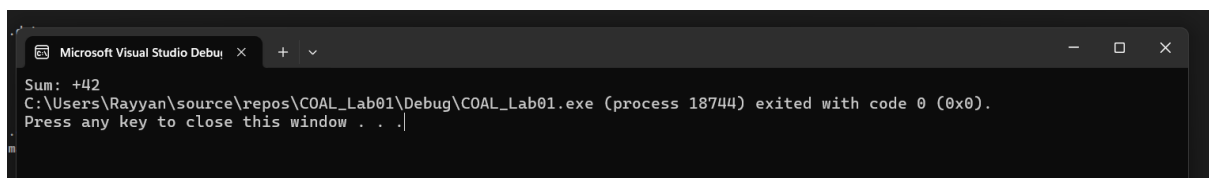
mov eax, sum

call WriteInt

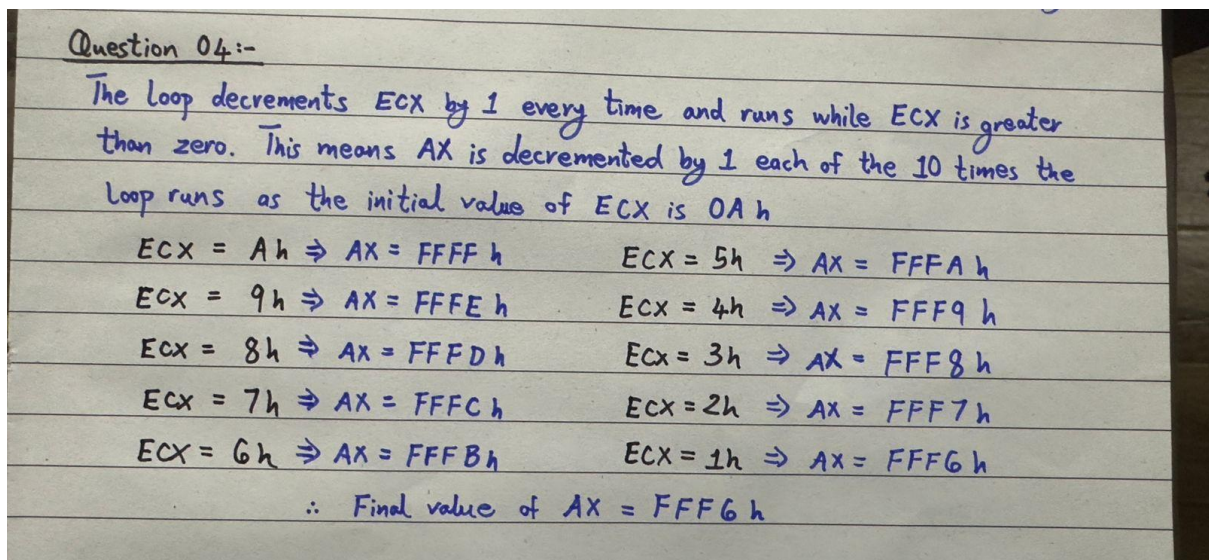
exit

main ENDP

END main



Question 4:



Question 5:

Question 05 :-

```
mov AL, 0D4H ; AL = 1101 0100 b
shl AL, 3 ; AL = 1010 0000 b = A0h
mov AL, 0D4H ; AL = 1101 0100 b
sal AL, 3 ; AL = 1010 0000 b = A0h
stc ; CF = 1
mov AL, 0D4H ; AL = 1101 0100 b
rol AL, 1 ; AL = 1010 1001 b = A9h
stc ; CF = 1
```

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Date: _____

```
mov AL, 0D4H ; AL = 1101 0100 b
rcr AL, 3 ; AL = 0011 1010 b = 3Ah
```



dry Run:-

i	CF _{in}	AL before	AL after	CF _{out}
1	1	1101 0100	1110 1010	0
2	0	1110 1010	0111 0101	0
3	0	0111 0101	0011 1010	1

//

Final Values:-

A0h, A0h, A9h, 3Ah

Question 6:

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; Assignment 02 | Question 06

INCLUDE Irvine32.inc

.data

op1 DWORD 5

op2 DWORD 8

x DWORD 3

y DWORD 6

z DWORD 0

msg BYTE "Final value of z: ",0

.code

main PROC

while_loop:

mov eax, op2

cmp op1, eax

jg exit_loop

mov eax, x

cmp op1, eax

jl else_condition

mov eax, y

cmp op1, eax

jg else_condition

add z, 10

jmp next

else_condition:

sub z, 10

next:

dec op1

jmp while_loop

exit_loop:

mov eax, z

mov edx, OFFSET msg

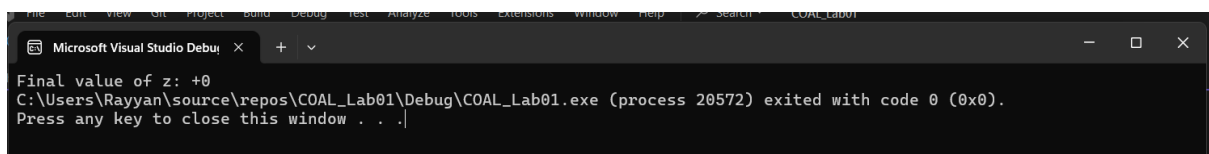
call WriteString

call WriteInt

exit

main ENDP

END main



Question 7:

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; Assignment 02 | Question 07

INCLUDE Irvine32.inc

.data

prompt BYTE "Enter a number: ",0

msgZero BYTE "The number entered is zero.",0

msgPos BYTE "The number entered is positive.",0

msgNeg BYTE "The number entered is negative.",0

num SBYTE ?

.code

main PROC

mov edx, OFFSET prompt

call WriteString

call ReadInt

mov num, al

cmp num, 0

je ZERO

jg POSITIVE

call CRLF

call CRLF

mov edx, OFFSET msgNeg

call WriteString

jmp end_program

ZERO:

```
call CRLF  
call CRLF  
mov edx, OFFSET msgZero  
call WriteString  
jmp end_program
```

POSITIVE:

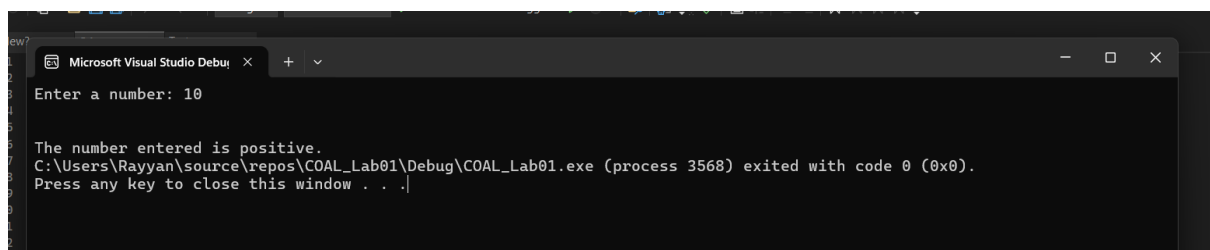
```
call CRLF  
call CRLF  
mov edx, OFFSET msgPos  
call WriteString
```

end_program:

```
exit
```

main ENDP

END main



The screenshot shows a dark-themed window titled "Microsoft Visual Studio Debug Console". The text inside the console is as follows:

```
Enter a number: 10  
  
The number entered is positive.  
C:\Users\Rayyan\source\repos\COAL_Lab01\Debug\COAL_Lab01.exe (process 3568) exited with code 0 (0x0).  
Press any key to close this window . . .|
```

Question 8:

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; Assignment 02 | Question 08

INCLUDE Irvine32.inc

.data

num1 SWORD ?

num2 SWORD ?

result SDWORD ?

prompt BYTE "Enter a number: ",0

msg BYTE "Result: ",0

.code

main PROC

mov edx, OFFSET prompt

call WriteString

call ReadInt

mov num1, ax

mov edx, OFFSET prompt

call WriteString

call ReadInt

mov num2, ax

movsx eax, num1

movsx ebx, num2

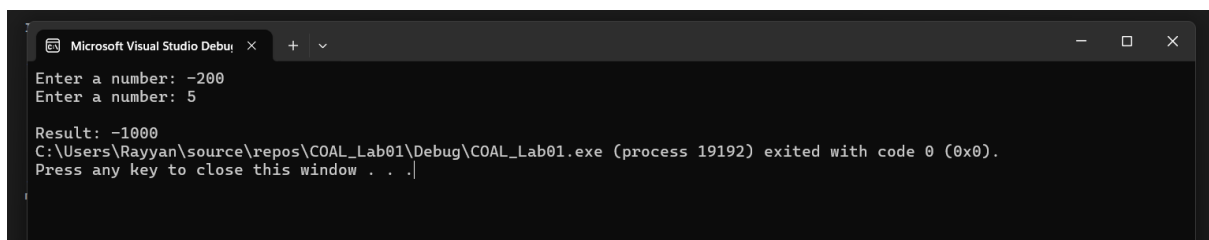
imul eax, ebx

```
    mov result, eax
    call CRLF
    mov edx, OFFSET msg
    call WriteString
    mov eax, result
    call WriteInt

    exit

main ENDP

END main
```

A screenshot of a Microsoft Visual Studio Debug Console window. The window has a title bar with "Microsoft Visual Studio Debug" and standard window controls. The console output shows: "Enter a number: -200", "Enter a number: 5", "Result: -1000", and "C:\Users\Rayyan\source\repos\COAL_Lab01\Debug\COAL_Lab01.exe (process 19192) exited with code 0 (0x0). Press any key to close this window . . .".

```
Microsoft Visual Studio Debug
Enter a number: -200
Enter a number: 5

Result: -1000
C:\Users\Rayyan\source\repos\COAL_Lab01\Debug\COAL_Lab01.exe (process 19192) exited with code 0 (0x0).
Press any key to close this window . . .
```

Question 9:

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; Assignment 02 | Question 09

```
INCLUDE Irvine32.inc
```

```
.data
```

```
arr WORD 5,10,51,68,25,50
```

```
sample WORD 50
```

```
arrSize WORD LENGTHOF arr
```

```
index WORD 0
```

```
sum WORD 0
```

```
msg BYTE "Sum: ",0
```

```
.code
main PROC
while_loop:
    mov ax, index
    cmp ax, arrSize
    jge exit_loop

    movzx esi, index
    mov cx, arr[esi * TYPE arr]

    cmp cx, sample
    jg greater_than_sample

    mov ax, sum
    add ax, cx
    mov sum, ax

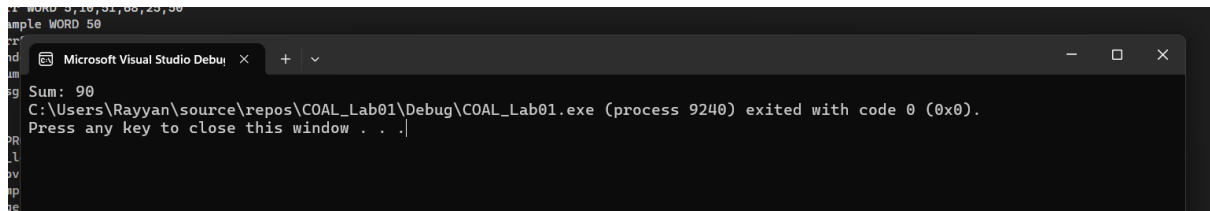
greater_than_sample:
    inc index
    jmp while_loop

exit_loop:
    mov edx, OFFSET msg
    call WriteString
    movzx eax, sum
    call WriteDec

    exit
```


main ENDP

END main



Question 10 (a) & (b):

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; Assignment 02 | Question 10

INCLUDE Irvine32.inc

COMMENT !

Intuition:

$$26 = 16 + 8 + 2$$

$$26 = 2^4 + 2^3 + 2^1$$

$$2^4 = \text{shift left 4 times}$$

$$2^3 = \text{shift left 3 times}$$

$$2^1 = \text{shift left 1 time}$$

$$\text{EAX} * 26 = (\text{EAX} * 2^4) + (\text{EAX} * 2^3) + (\text{EAX} * 2^1)$$

!

.data

initialVal DWORD 2

result DWORD 0

```
msg BYTE "2 * 26 = ",0
```

```
.code
```

```
main PROC
```

```
    mov eax, initialVal
```

```
    shl eax, 4
```

```
    mov result, eax
```

```
    mov eax, initialVal
```

```
    shl eax, 3
```

```
    add result, eax
```

```
    mov eax, initialVal
```

```
    shl eax, 1
```

```
    add result, eax
```

```
    mov eax, result
```

```
    mov edx, OFFSET msg
```

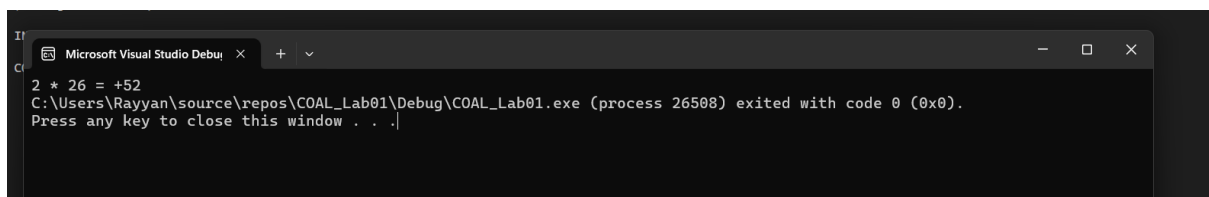
```
    call WriteString
```

```
    call WriteInt
```

```
    exit
```

```
main ENDP
```

```
END main
```



```
Microsoft Visual Studio Debug Console
2 * 26 = +52
C:\Users\Rayyan\source\repos\COAL_Lab01\Debug\COAL_Lab01.exe (process 26508) exited with code 0 (0x0).
Press any key to close this window . . .
```