COAL LAB#011 TASKS

Name: Saman Khan

ID: 19K-0354

Section: H

TASK#01:

```
TITLE My First Program (Test.asm)
INCLUDE Irvine32.inc

.data
msg1 BYTE "Enter three numbers : ",0
msg2 BYTE "The product of these three numbers is : ",0

.code
main PROC
mov edx, offset msg1
call writestring
mov ecx, 3
L1:
call readint
push eax
LOOP L1
call ThreeProd
pop eax
pop eax
pop eax
exit
main ENDP

ThreeProd PROC
enter 0,1
mov eax, [ebp+8]
mov ebx, [ebp+12]
imul ebx
mov ebx, [ebp+16]
imul ebx
mov edx, offset msg2
call writestring
call writeint
call crlf
leave
ret
ThreeProd ENDP
END main
```

```
msg2 BYTE "The product of these three numbers is : ",0

.code
main PROC
mov edx, offset msg1
call writestring
mov ecx, 3
L1:
call readint
push eax
LOOP L1
call ThreeProd
pop eax
pop eax
pop eax
exit
main ENDP

ThreeProd PROC
enter 0,1
mov eax, [ebp+8]
mov ebx, [ebp+12]
imul ebx
mov ebx, [ebp+16]
imul ebx
mov edx, offset msg2
call writestring
call writeint
call crlf
leave
ret
ThreeProd ENDP
END main
```

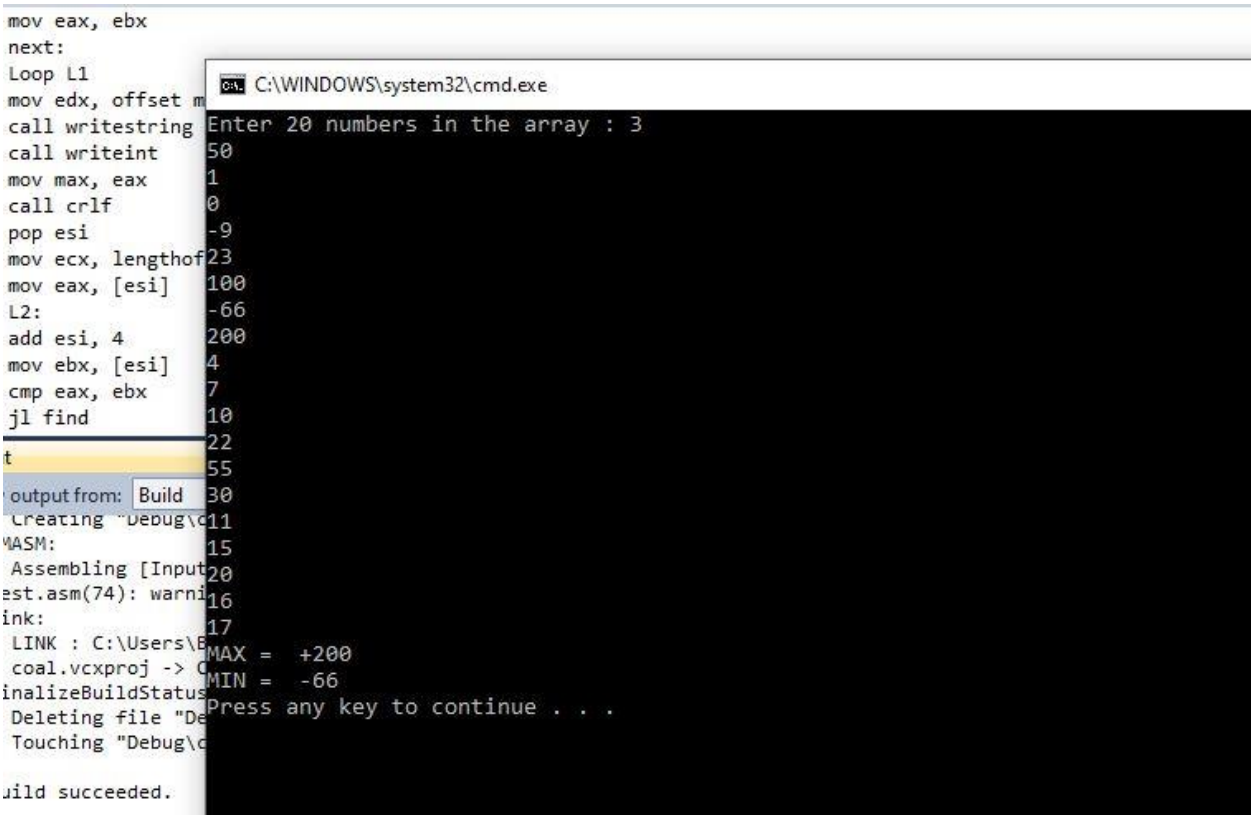
```
C:\WINDOWS\system32\cmd.exe
Enter three numbers : 5
-5
5
The product of these three numbers is : -125
Press any key to continue . . .
```

TASK#02:

```
TITLE My First Program (Test.asm)
INCLUDE Irvine32.inc

.data
arr SDWORD 20 dup(?)
min SDWORD ?
max SDWORD ?
msg1 BYTE "Enter 20 numbers in the array : ",0
msg2 BYTE "MIN =  ",0
msg3 BYTE "MAX =  ",0

MinMaxArray PROTO, X: PTR DWORD

.code
main PROC
push ebp
mov ebp, esp
mov edx, offset msg1
call writestring
mov ecx, lengthof arr
mov esi, 0
L1:
call readint
mov arr[esi], eax
add esi, 4
```

```
Loop L1
mov esi, offset arr
INVOKE MinMaxArray, addr arr
pop ebp
add esp, 4
ret
exit
main ENDP

MinMaxArray PROC, X: PTR DWORD
push ebp
mov ebp, esp
push esi
mov ecx, lengthof arr
mov eax, [esi]
L1:
add esi, 4
mov ebx, [esi]
cmp eax, ebx
jg next
mov eax, ebx
next:
Loop L1
mov edx, offset msg3
call writestring
call writeint
mov max, eax
call crlf
pop esi
mov ecx, lengthof arr
mov eax, [esi]
L2:
add esi, 4
mov ebx, [esi]
cmp eax, ebx
jl find
mov eax, ebx
find:
Loop L2
mov edx, offset msg2
call writestring
call writeint
mov min, eax
call crlf
pop ebp
add esp, 8
ret
MinMaxArray ENDP
```

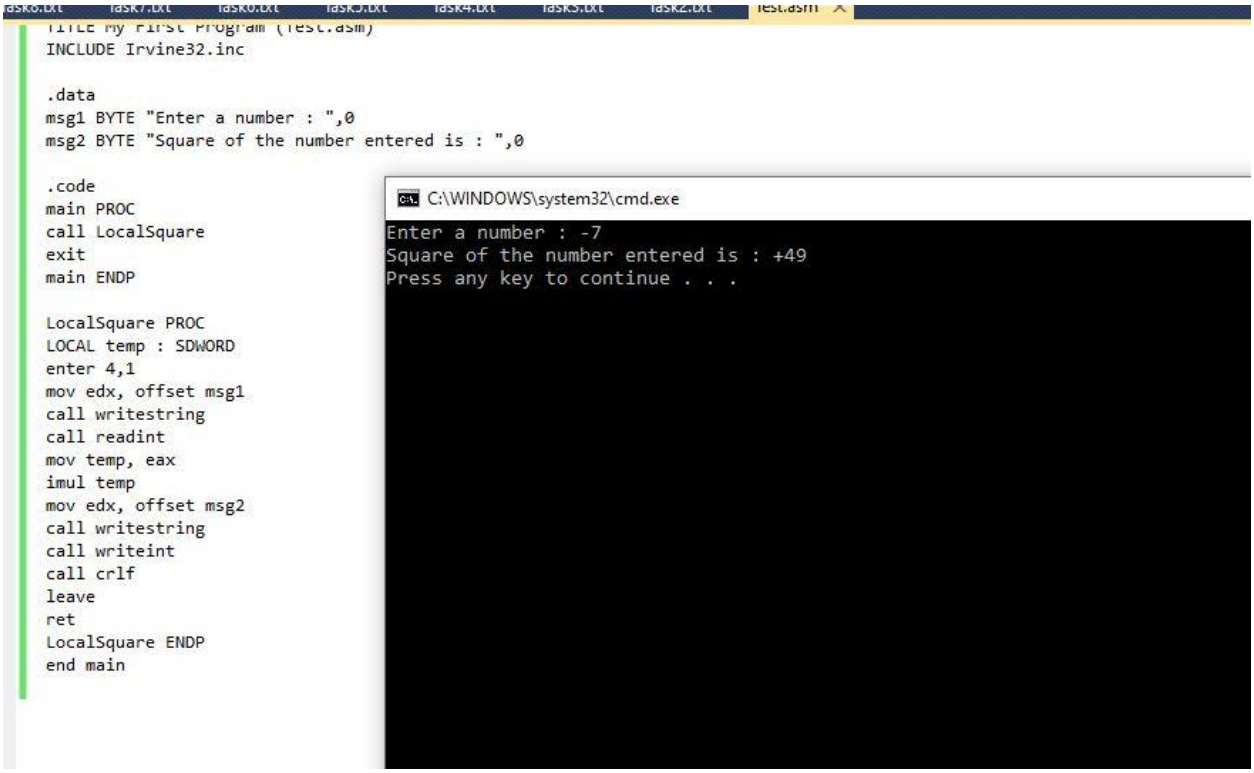
END main



TASK#03:

```
TITLE My First Program (Test.asm)
INCLUDE Irvine32.inc

.data
msg1 BYTE "Enter a number : ",0
msg2 BYTE "Square of the number entered is : ",0

.code
main PROC
call LocalSquare
exit
main ENDP

LocalSquare PROC
LOCAL temp : SDWORD
enter 4,1
mov edx, offset msg1
call writestring
call readint
mov temp, eax
imul temp
mov edx, offset msg2
```

call writestring
call writeint
call crlf
leave
ret
LocalSquare ENDP
end main



TASK#04:

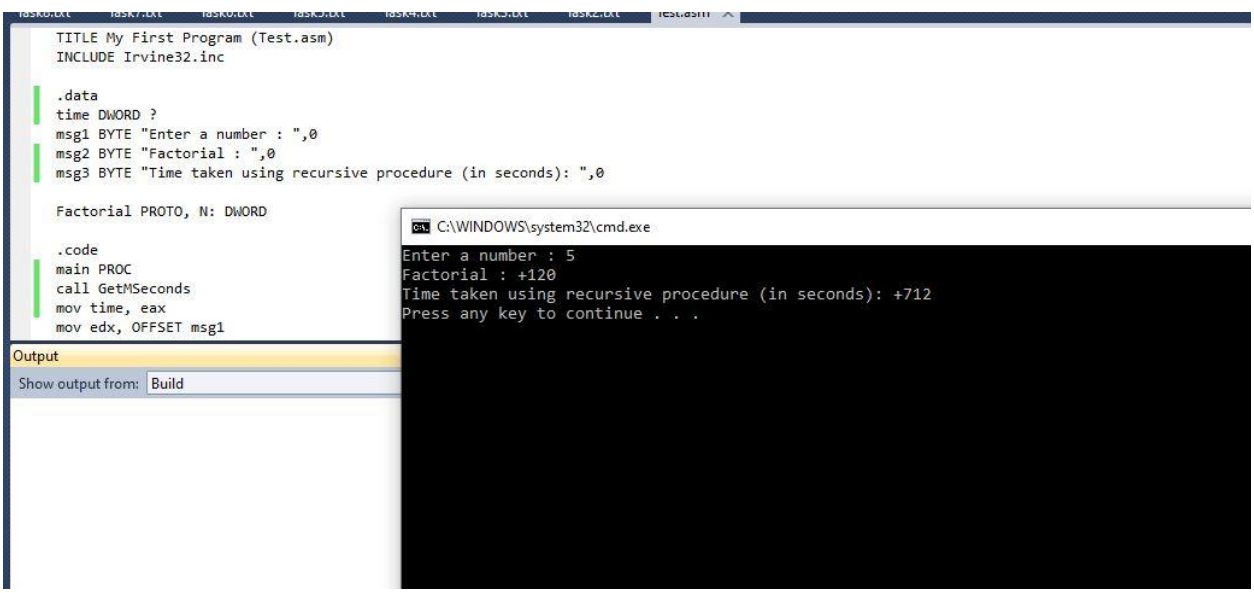
TITLE My First Program (Test.asm)
INCLUDE Irvine32.inc

.data
time DWORD ?
msg1 BYTE "Enter a number : ",0
msg2 BYTE "Factorial : ",0
msg3 BYTE "Time taken using recursive procedure (in seconds): ",0

Factorial PROTO, N: DWORD

.code
main PROC
call GetMSeconds
mov time, eax
mov edx, OFFSET msg1
call WriteString

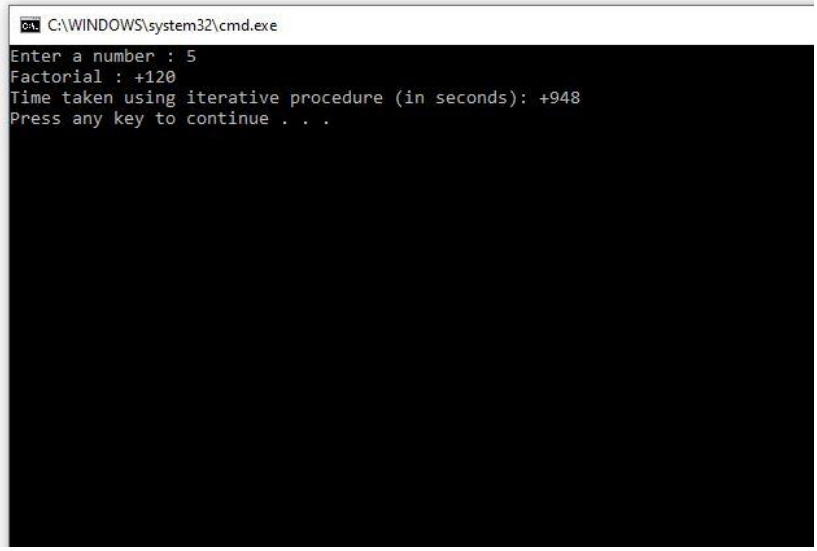
```
call readint
mov ebx, eax
INVOKE Factorial, eax
mov edx, OFFSET msg2
call WriteString
call writeint
call crlf
call GetMSeconds
sub eax, time
mov edx, OFFSET msg3
call WriteString
call writeint
call crlf
exit
main ENDP

Factorial PROC, N: DWORD
push ebp
mov ebp, esp
dec ebx
cmp ebx, 0
jz last
mul ebx
INVOKE Factorial, ebx
last:
pop ebp
add esp, 8
ret
Factorial endp
end main
```



TASK#05:

```
TITLE My First Program (Test.asm)
INCLUDE Irvine32.inc

.data
time DWORD ?
msg1 BYTE "Enter a number : ",0
msg2 BYTE "Factorial : ",0
msg3 BYTE "Time taken using iterative procedure (in seconds): ",0

Factorial PROTO, N: DWORD

.code
main PROC
call GetMSeconds
mov time, eax
mov edx, OFFSET msg1
call WriteString
call readint
mov ecx, eax
INVOKE Factorial, eax
mov edx, OFFSET msg2
call WriteString
call writeint
call crlf
call GetMSeconds
sub eax, time
mov edx, OFFSET msg3
call WriteString
call writeint
call crlf
exit
main ENDP

Factorial PROC, N: DWORD
push ebp
mov ebp, esp
dec ecx
L1:
mul ecx
Loop L1
pop ebp
add esp, 8
ret
Factorial endp
end main
```

```
msg1 BYTE "Enter a number : ",0
msg2 BYTE "Factorial : ",0
msg3 BYTE "Time taken using iterative procedure (in seconds): ",0

Factorial PROTO, N: DWORD

.code
main PROC
call GetMSeconds
mov time, eax
mov edx, OFFSET msg1
call WriteString
call readint
mov ecx, eax
INVOKE Factorial, eax
mov edx, OFFSET msg2
call WriteString
call writeint
call crlf
call GetMSeconds
sub eax, time
mov edx, OFFSET msg3
call WriteString
call writeint
call crlf
exit
main ENDP

Factorial PROC, N: DWORD
push ebp
```



PS: After comparing the time taken by both iterative and recursive procedures it can be clearly seen that a recursive solution takes less time as compared to an iterative procedure.

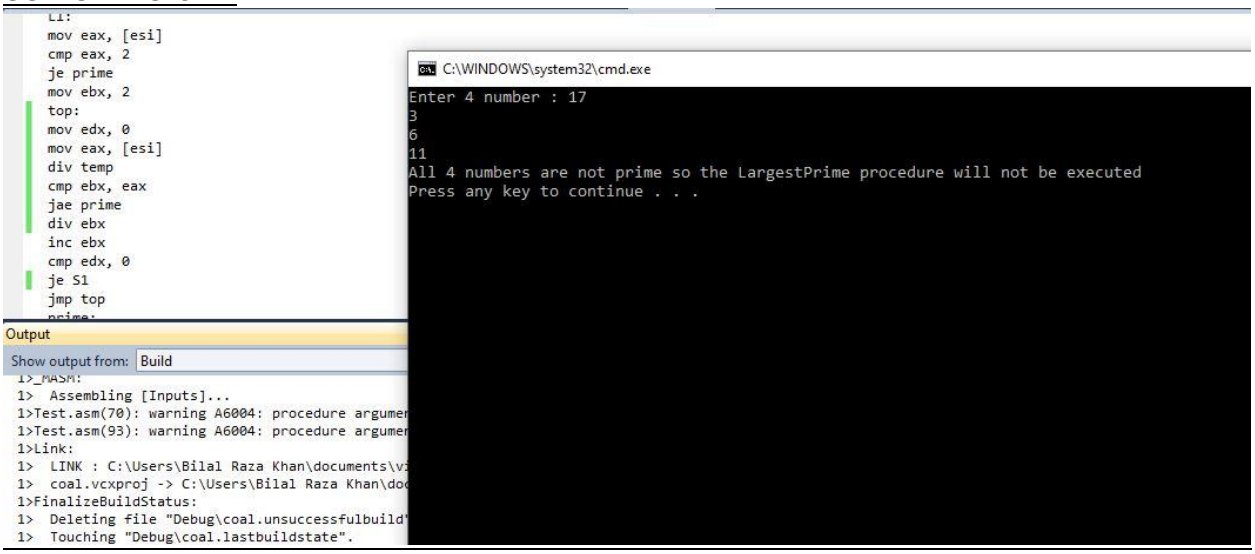
TASK#06:

```
TITLE My First Program (Test.asm)
INCLUDE Irvine32.inc

.data
var DWORD 4 dup(?)
temp DWORD 2h
max DWORD ?
msg1 BYTE "Enter 4 number : ",0
msg2 BYTE "All 4 numbers are not prime so the LargestPrime procedure will not be executed",0
msg3 BYTE "All numbers are prime ",0
msg4 BYTE "Largest Prime =  ",0

CheckPrime PROTO, X: PTR DWORD
LargestPrime PROTO, Y: PTR DWORD

.code
main PROC
mov edx, offset msg1
call writestring
mov ecx, 4
mov esi, 0
L1:
call readint
mov var[esi], eax
add esi, 4
```

```
Loop L1
mov esi, offset var
INVOKE CheckPrime, esi
next:
exit
main ENDP

CheckPrime PROC, X: PTR DWORD
push ebp
mov ebp, esp
mov ecx, lengthof var
L1:
mov eax, [esi]
cmp eax, 2
je prime
mov ebx, 2
top:
mov edx, 0
mov eax, [esi]
div temp
cmp ebx, eax
jae prime
mov edx, 0
mov eax, [esi]
div ebx
inc ebx
cmp edx, 0
je S1
jmp top
prime:
add esi, 4
Loop L1
mov edx, offset msg3
call writestring
call crlf
mov esi, offset var
INVOKE LargestPrime, esi
jmp final
S1:
mov edx, offset msg2
call writestring
call crlf
final:
pop ebp
add esp, 8
ret
CheckPrime ENDP
```

```
LargestPrime PROC, Y: PTR DWORD
push ebp
mov ebp, esp
mov ecx, lengthof var
mov eax, [esi]
L1:
add esi, 4
mov ebx, [esi]
cmp eax, ebx
ja next
mov eax, ebx
next:
Loop L1
mov max, eax
mov edx, offset msg4
call writestring
call writeint
call crlf
pop ebp
add esp, 8
ret
LargestPrime ENDP
END main
```

OUTPUT IN CASE 1:



OUTPUT IN CASE 2:

```
mov ebp, esp
mov ecx, lengthof var
L1:
mov eax, [esi]
cmp eax, 2
je prime
mov ebx, 2
top:
mov edx, 0
mov eax, [esi]
div temp
cmp ebx, eax
jae prime
mov edx, 0
mov eax, [esi]
div ebx
```

Output

Show output from: Build

```
1>_MASM:
1>  Assembling [Inputs]...
1>Test.asm(72): warning A6004: procedure argument c
1>Test.asm(95): warning A6004: procedure argument c
1>Link:
1>  LINK : C:\Users\Bilal Raza Khan\documents\visua
1>  coal.vcxproj -> C:\Users\Bilal Raza Khan\docume
1>FinalizeBuildStatus:
1>  Deleting file "Debug\coal.unsuccessfulbuild".
1>  Touching "Debug\coal.lastbuildstate".
1>
```

C:\WINDOWS\system32\cmd.exe

```
Enter 4 number : 19
2
7
13
All numbers are prime
Largest Prime =  +19
Press any key to continue . . .
```