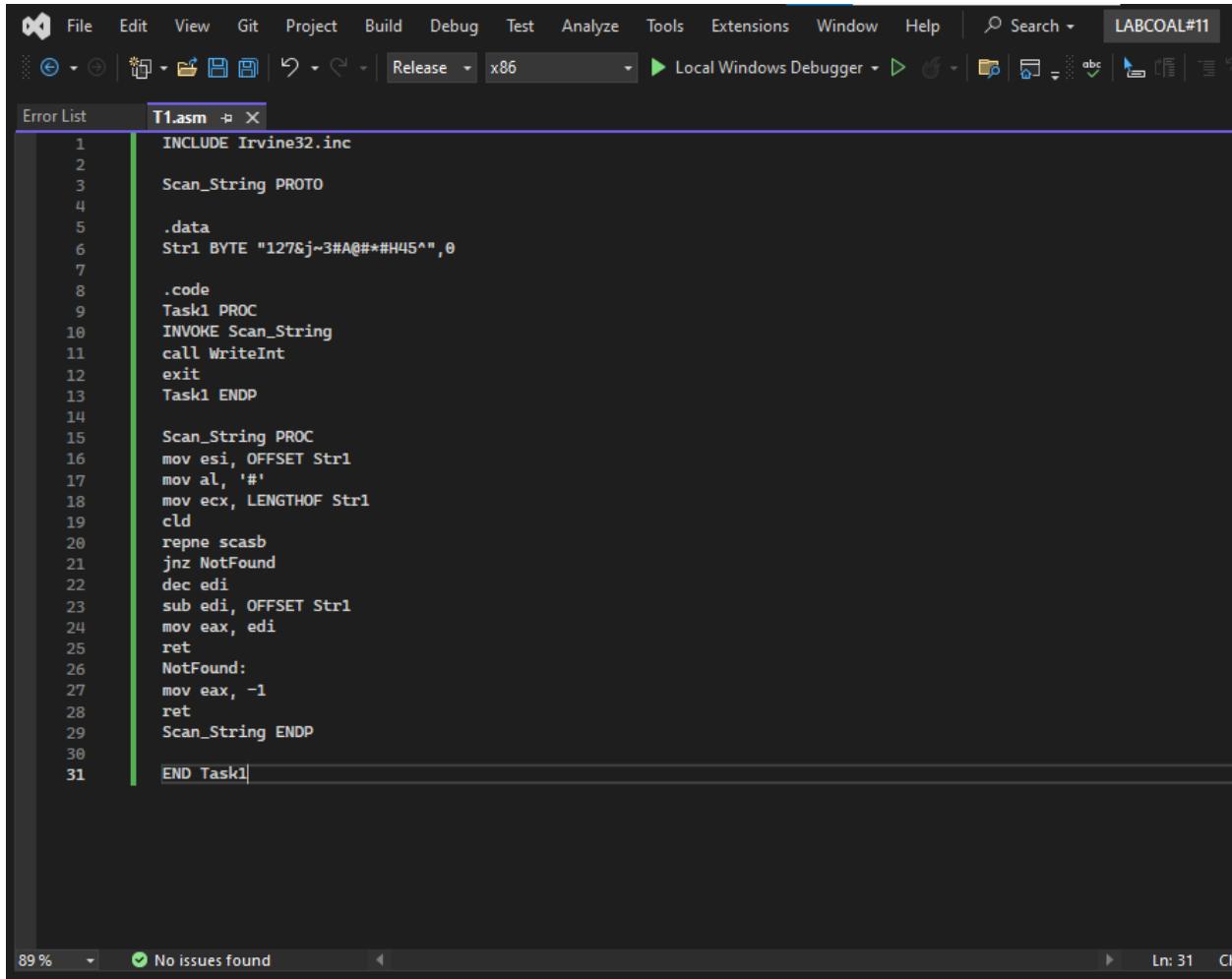


# COAL LAB # 11

## Task 1:



The screenshot shows the Microsoft Visual Studio IDE interface. The title bar reads "LABCOAL#11". The menu bar includes File, Edit, View, Git, Project, Build, Debug, Test, Analyze, Tools, Extensions, Window, Help. The toolbar has various icons for file operations. The status bar at the bottom shows "89 %", "No issues found", "Ln: 31", and "Ch". The main window displays the assembly code for T1.asm. The code includes includes Irvine32.inc, defines Scan\_String as a prototype, declares Str1 as a byte array, and defines Task1 as a procedure. Task1 calls Scan\_String, WriteInt, and exits. Scan\_String uses repne scasb to search for '#' in Str1, and if not found, sets eax to -1 and exits.

```
1 INCLUDE Irvine32.inc
2
3 Scan_String PROTO
4
5 .data
6 Str1 BYTE "127&j~3#A@##H45^",0
7
8 .code
9 Task1 PROC
10    INVOKE Scan_String
11    call WriteInt
12    exit
13 Task1 ENDP
14
15 Scan_String PROC
16    mov esi, OFFSET Str1
17    mov al, '#'
18    mov ecx, LENGTHOF Str1
19    cld
20    repne scasb
21    jnz NotFound
22    dec edi
23    sub edi, OFFSET Str1
24    mov eax, edi
25    ret
26 NotFound:
27    mov eax, -1
28    ret
29 Scan_String ENDP
30
31 END Task1
```

## Output:

```
-1
C:\Users\Lenovo\OneDrive\Desktop\BAI-3\COAL LAB\LABCOAL#11\LABCOAL#11\Release\LABCOAL#11.exe (process 11492) exited with
code 0 (0x0).
Press any key to close this window . . .
```

## Task 2:

The screenshot shows the Microsoft Visual Studio IDE interface. The title bar reads "LABCOAL#11". The menu bar includes File, Edit, View, Git, Project, Build, Debug, Test, Analyze, Tools, Extensions, Window, Help. The toolbar has icons for file operations like Open, Save, and Build. The status bar at the bottom right shows "Ln: 18 Ch: 14 SPC CRLF".

The code editor window displays assembly language for a program named T2.asm. The code includes includes Irvine32.inc, defines symbols like Scan\_String2, and implements a search algorithm. A green vertical bar highlights the assembly output area.

```
INCLUDE Irvine32.inc

Scan_String2 PROTO

.data
Str1 BYTE "Hello #World",0
msg1 BYTE "Searching for character: ",0
msg2 BYTE "In string: ",0
msg3 BYTE "Position found: ",0
msg4 BYTE "Character not found",0

.code
Task2 PROC
    mov edx, OFFSET msg1
    call WriteString
    mov al, "#"
    call WriteChar
    call Crlf
    mov edx, OFFSET msg2
    call WriteString
    mov edx, OFFSET Str1
    call WriteString
    call Crlf
    call Crlf
    push '#'
    push OFFSET Str1
    call Scan_String2
    mov edx, OFFSET msg3
    call WriteString
    cmp eax, -1
    je ShowNotFound
    call WriteInt
    call Crlf
    jmp Done
ShowNotFound:
    mov edx, OFFSET msg4
    call WriteString
    call Crlf
Done:
    exit
Task2 ENDP

Scan_String2 PROC
    push ebp
    mov ebp, esp
    mov edi, [ebp+8]
    mov al, BYTE PTR [ebp+12]
    mov ecx, LENGTHOF Str1
    cld
    repne scasb
    jnz NotFound2
    dec edi
    sub edi, [ebp+8]
    mov eax, edi
    jmp End2
NotFound2:
    mov eax, -1
End2:
    mov esp, ebp
    pop ebp
    ret 8
Scan_String2 ENDP

END Task2
```

The status bar at the bottom left shows "67 %". The bottom right corner of the status bar has a green checkmark icon indicating "No issues found".

This screenshot is identical to the one above, showing the same assembly code for T2.asm in the Microsoft Visual Studio IDE. The code implements a string search function using Irvine32.inc and handles character not found cases.

```
INCLUDE Irvine32.inc

Scan_String2 PROTO

.data
Str1 BYTE "Hello #World",0
msg1 BYTE "Searching for character: ",0
msg2 BYTE "In string: ",0
msg3 BYTE "Position found: ",0
msg4 BYTE "Character not found",0

.code
Task2 PROC
    mov edx, OFFSET msg1
    call WriteString
    mov al, "#"
    call WriteChar
    call Crlf
    mov edx, OFFSET msg2
    call WriteString
    mov edx, OFFSET Str1
    call WriteString
    call Crlf
    call Crlf
    push '#'
    push OFFSET Str1
    call Scan_String2
    mov edx, OFFSET msg3
    call WriteString
    cmp eax, -1
    je ShowNotFound
    call WriteInt
    call Crlf
    jmp Done
ShowNotFound:
    mov edx, OFFSET msg4
    call WriteString
    call Crlf
Done:
    exit
Task2 ENDP

Scan_String2 PROC
    push ebp
    mov ebp, esp
    mov edi, [ebp+8]
    mov al, BYTE PTR [ebp+12]
    mov ecx, LENGTHOF Str1
    cld
    repne scasb
    jnz NotFound2
    dec edi
    sub edi, [ebp+8]
    mov eax, edi
    jmp End2
NotFound2:
    mov eax, -1
End2:
    mov esp, ebp
    pop ebp
    ret 8
Scan_String2 ENDP

END Task2
```

## Output

```

Searching for character: #
In string: Hello #World#
Position found: +6

C:\Users\Lenovo\OneDrive\Desktop\BAI-3\COAL LAB\LABCOAL#11\LABCOAL#11\Release\LABCOAL#11.exe (process 6184) exited with
code 0 (0x0).
Press any key to close this window . . .

```

### Task 3:

The screenshot shows the Microsoft Visual Studio IDE interface. The title bar says "LABCOAL#11". The menu bar includes File, Edit, View, Git, Project, Build, Debug, Test, Analyze, Tools, Extensions, Window, Help, and Search. The toolbar has icons for file operations like Open, Save, and Build. The status bar at the bottom shows "Ln: 37 Ch: 5 SPC CRLF".

The code editor window displays assembly code for "T3.asm". The code includes includes Irvine32.inc, defines IsCompare PROTO, and implements Task3 PROC. It uses mov, call, cmp, je, jne, inc, and jmp instructions to compare strings s1 and s2, and output results msgEqual, msgGreater, or msgLess.

```

INCLUDE Irvine32.inc
IsCompare PROTO
.data
    s1 BYTE "abcd",0
    s2 BYTE "abcde",0
    msg1 BYTE "Comparing: ",0
    msg2 BYTE "Result: ",0
    msgEqual BYTE " (Strings are equal)",0
    msgGreater BYTE " (s1 > s2)",0
    msgLess BYTE " (s1 < s2)",0
.code
Task3 PROC
    mov edx, OFFSET msg1
    call WriteString
    mov edx, OFFSET s1
    call WriteString
    mov edx, OFFSET msg2
    call WriteString
    mov edx, OFFSET s2
    call WriteString
    call Crlf
    push OFFSET s2
    push OFFSET s1
    call IsCompare
    push eax
    mov edx, OFFSET msgResult
    call WriteString
    pop eax
    push eax
    call WriteInt
    pop eax
    cmp eax, 0
    je ShowEqual
    cmp eax, 1
    je ShowGreater
    mov edx, OFFSET msgLess
    jmp ShowMsg
ShowEqual:
    mov edx, OFFSET msgEqual
    jmp ShowMsg
ShowGreater:
    mov edx, OFFSET msgGreater
    ShowMsg:
    call WriteString
    call Crlf
    .ENDP
    .CODE
    .END Task3

```

The status bar at the bottom left shows "67 %". The status bar at the bottom right shows "Ln: 37 Ch: 5 SPC CRLF". A message "Build succeeded" is displayed at the bottom left.

This screenshot shows the same Microsoft Visual Studio interface as the previous one, but with additional comments added to the assembly code. The comments explain the purpose of each section: CompareLoop, NotEqual, Equal, Greater, and Less. The assembly code remains the same as in the first screenshot.

```

INCLUDE Irvine32.inc
IsCompare ENDP
IsCompare PROC
    mov esp, esp
    add esp, [ebp+12]
    mov edi, [ebp+12]
    CompareLoop:
        cmp es1, [esi]
        mov bl, [edi]
        cmp bl, 0
        jne NotEqual
        tsc, al
        ltr, al
        inc esi
        inc edi
        jep CompareLoop
    NotEqual:
        movzx eax, al
        movzx ebx, bl
        cmp ax, bx
        ja Greater
        jb Less
    Equal:
        mov eax, 0
        jne Done
    Greater:
        mov eax, 1
        jne Done
    Less:
        mov eax, -1
    Done:
        mov eax, ebp
        pop ebp
        ret 8
    IsCompare ENDP
    .CODE
    .END Task3

```

The status bar at the bottom left shows "67 %". The status bar at the bottom right shows "Ln: 37 Ch: 5 SPC CRLF". A message "Build succeeded" is displayed at the bottom left.

## Output:

```
Comparing: abcd vs abce
Result: -1 (s1 < s2)

C:\Users\Lenovo\OneDrive\Desktop\BAI-3\COAL LAB\LABCOAL#11\LABCOAL#11\Release\LABCOAL#11.exe (process 5540) exited with
code 0 (0x0).
```

## Task 4:

```
INCLUDE Irvine32.inc

Str_Reverse PROTO pStr:PTR BYTE

.data
myStr BYTE "Reverse Me",0

.code
Task4 PROC
    INVOKE Str_Reverse, ADDR myStr
    mov edx, OFFSET myStr
    call WriteString
    exit
Task4 ENDP

Str_Reverse PROC uses esi edi, pStr:PTR BYTE
    mov esi, pStr
    mov edi, esi
    xor ecx, ecx
FindLen:
    cmp BYTE PTR [edi+ecx], 0
    je DoReverse
    inc ecx
    jmp FindLen
DoReverse:
    dec ecx
    add edi, ecx
SwapLoop:
    cmp edi, esi
    jl Done
    mov al, [esi]
    mov bl, [edi]
    mov [esi], bl
    mov [edi], al
    inc esi
    dec edi
    jmp SwapLoop
Done:
    mov eax, 0
    ret
Str_Reverse ENDP
END Task4
```

## Output:

```
esreveR
C:\Users\Lenovo\OneDrive\Desktop\BAI-3\COAL LAB\LABCOAL#11\LABCOAL#11\Release\LABCOAL#11.exe (process 3104) exited with
code 0 (0x0).
Press any key to close this window . . .
```

## Task 5:

The screenshot shows the Microsoft Visual Studio Code interface with the following details:

- File Bar:** File, Edit, View, Git, Project, Build, Debug, Test, Analyze, Tools, Extensions, Window, Help, Search.
- Toolbars:** Standard toolbar with icons for file operations like Open, Save, Find, and Run.
- Status Bar:** Shows "Release x86" and "Local Windows Debugger".
- Code Editor:** The file "T5.asm" is open. The code is as follows:

```
1 INCLUDE Irvine32.inc
2
3 LoadArray PROTO pArray:PTR DWORD, arrCount:DWORD, multiplier:DWORD
4
5 .data
6 array DWORD 1,2,3,4,5
7 count DWORD 5
8
9 .code
10 Task5 PROC
11     INVOKE LoadArray, ADDR array, count, 10
12     mov esi, OFFSET array
13     mov ecx, 5
14     PrintLoop:
15         mov eax, [esi]
16         call WriteInt
17         call CrLf
18         add esi, 4
19         loop PrintLoop
20         exit
21 Task5 ENDP
22
23 LoadArray PROC uses esi edi, pArray:PTR DWORD, arrCount:DWORD, multiplier:DWORD
24     mov esi, pArray
25     mov ecx, arrCount
26     mov ebx, multiplier
27
28     MultiplyLoop:
29         test ecx, ecx
30         jz LDone
31         mov eax, [esi]
32         imul eax, ebx
33         mov [esi], eax
34         add esi, 4
35         dec ecx
36         jmp MultiplyLoop
37
38 LDone:
39     ret
40 LoadArray ENDP
41
42 END Task5
```

The status bar at the bottom indicates "81 %", "No issues found", and "Ready".

## Output:

The terminal window displays the following output:

```
+10
+20
+30
+40
+50

C:\Users\Lenovo\OneDrive\Desktop\BAI-3\COAL LAB\LABCOAL#11\LABCOAL#11\Release\LABCOAL#11.exe (process 11620) exited with
code 0 (0x0).
Press any key to close this window . . .
```

## Task 6:

The screenshot shows the Microsoft Visual Studio IDE interface. The title bar reads "File Edit View Git Project Build Debug Test Analyze Tools Extensions Window Help Search". Below the title bar, there are several icons and a dropdown menu for "Release" and "x86". The main window displays an assembly file named "T6.asm". The code is as follows:

```
.code
Task6 PROC
    INVOKE Get_frequencies, ADDR target, ADDR freqTable
    mov esi, OFFSET freqTable
    mov ecx, 256
PrintFreqs:
    mov eax, [esi]
    test eax, eax
    jz Skip
    push ecx
    push esi
    mov edx, esi
    sub edx, OFFSET freqTable
    shr edx, 2
    mov eax, edx
    call WriteChar
    mov al, ':'
    call WriteChar
    mov al, ' '
    call WriteChar
    pop esi
    push esi
    mov eax, [esi]
    call WriteDec
    call Crlf
    pop esi
    pop ecx
Skip:
    add esi, 4
    loop PrintFreqs
    exit
Task6 ENDP

Get_frequencies PROC uses esi edi, pTarget:PTR BYTE, pFreqTable:PTR DWORD
    mov esi, pTarget
    mov edi, pFreqTable
    cld
ScanLoop:
    lodsb
    cmp al, 0
    je Done
    movzx eax, al
    mov ebx, edi
    shl eax, 2
    add ebx, eax
    inc DWORD PTR [ebx]
    jmp ScanLoop
Done:
    ret
Get_frequencies ENDP
```

The status bar at the bottom left shows "67 %". Below the status bar, there is a message "No issues found" with a green checkmark icon. At the very bottom of the status bar, there is a "Ready" indicator.

## Output:

The terminal window displays the following output:

```
: 2
A: 2
B: 3
C: 2
D: 1
E: 1
F: 1

C:\Users\Lenovo\OneDrive\Desktop\BAI-3\COAL LAB\LABCOAL#11\LABCOAL#11\Release\LABCOAL#11.exe (process 1448) exited with
code 0 (0x0).
Press any key to close this window . . .
```

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