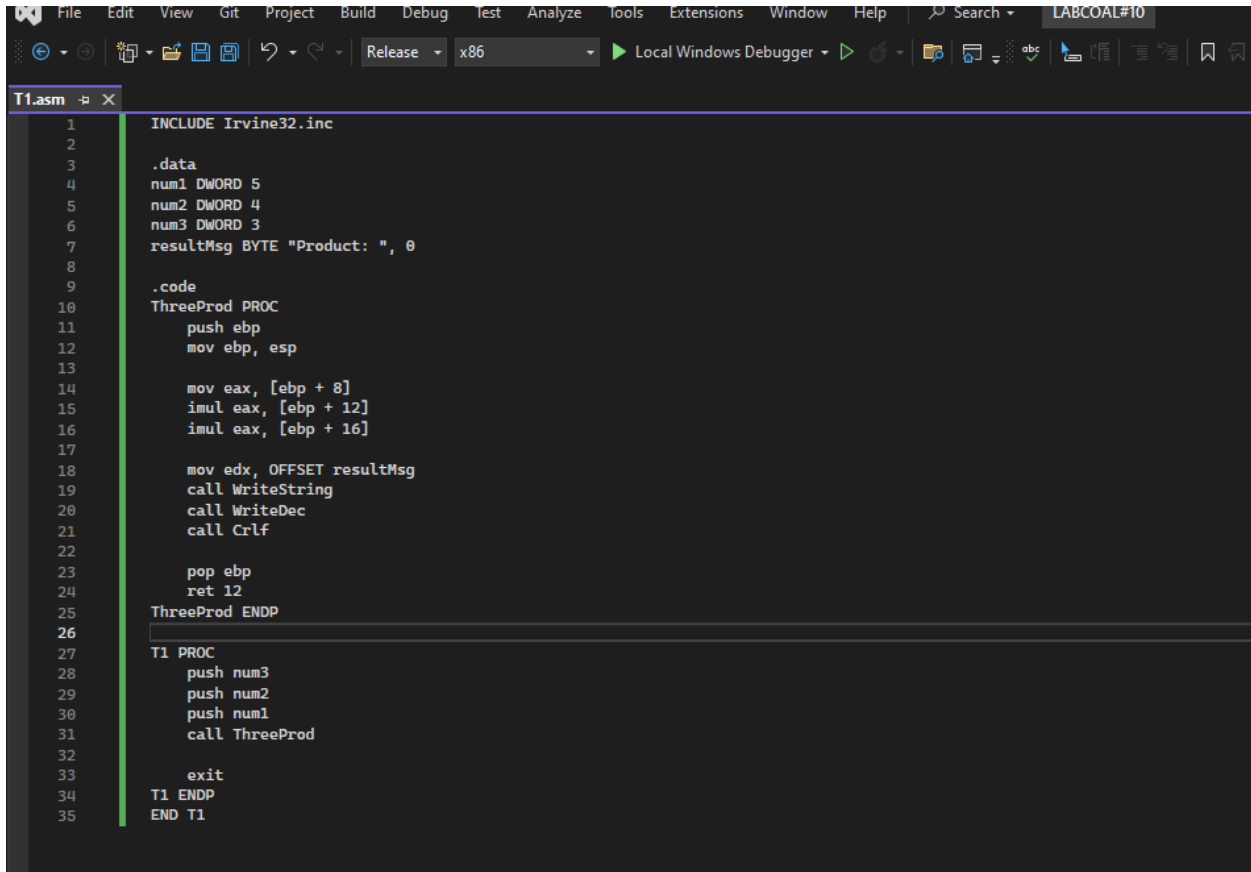


# COAL LAB 10

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BAI-3A

## Task 1:



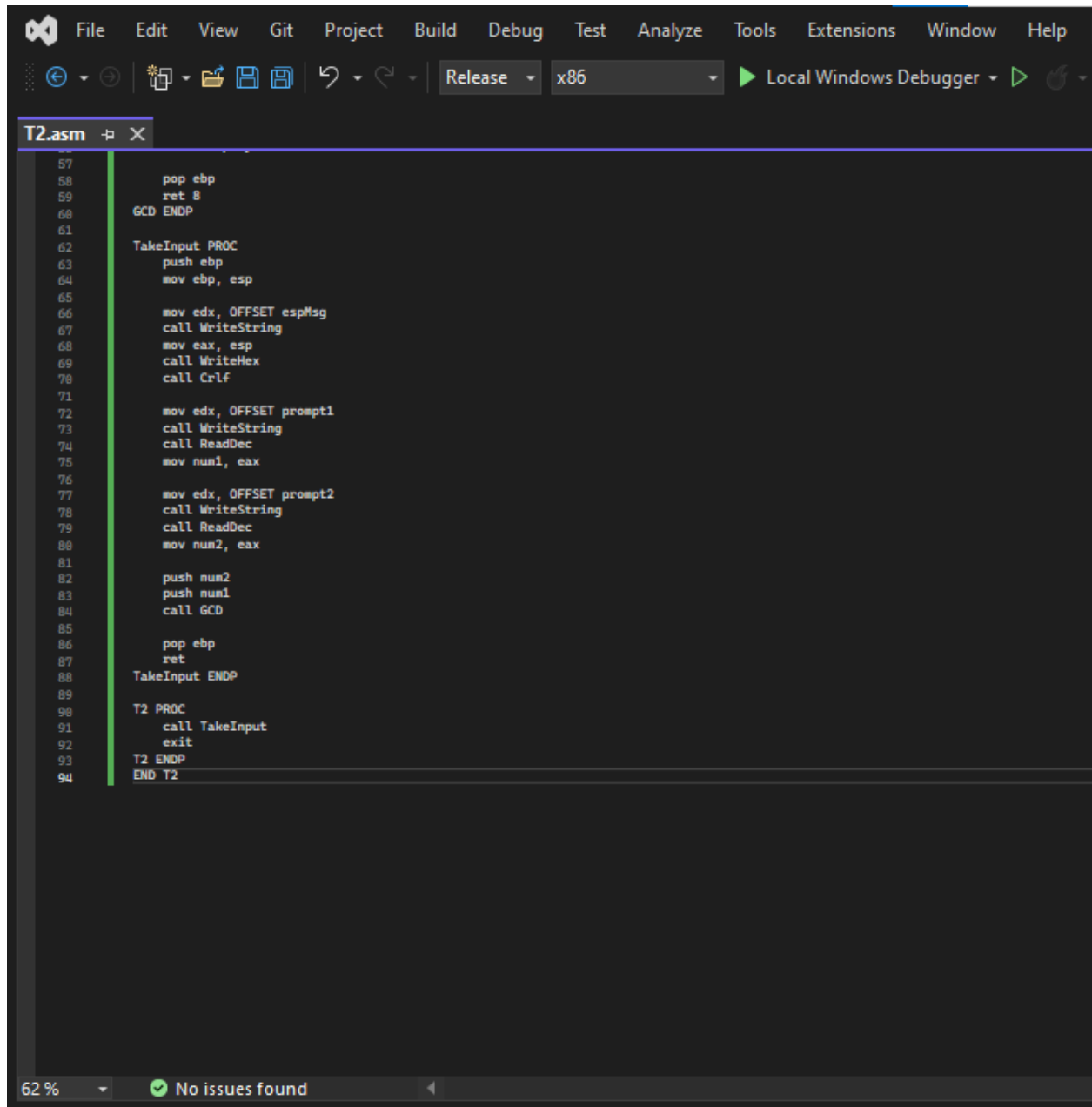
```
1      INCLUDE Irvine32.inc
2
3      .data
4      num1 DWORD 5
5      num2 DWORD 4
6      num3 DWORD 3
7      resultMsg BYTE "Product: ", 0
8
9      .code
10     ThreeProd PROC
11         push ebp
12         mov ebp, esp
13
14         mov eax, [ebp + 8]
15         imul eax, [ebp + 12]
16         imul eax, [ebp + 16]
17
18         mov edx, OFFSET resultMsg
19         call WriteString
20         call WriteDec
21         call Crlf
22
23         pop ebp
24         ret 12
25     ThreeProd ENDP
26
27     T1 PROC
28         push num3
29         push num2
30         push num1
31         call ThreeProd
32
33         exit
34     T1 ENDP
35     END T1
```

## Output:

```
Product: 60
C:\Users\Lenovo\OneDrive\Desktop\BAI-3\COAL LAB\LABCOAL#10\LABCOAL#10\Release\LABCOAL#10.exe (process 4616) exited with
code 0 (0x0).
Press any key to close this window . . .
```

## Task 2:

```
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Release x86 Local Windows Debugger
T2.asm
1 INCLUDE Irvine32.inc
2
3 .data
4 prompt1 BYTE "Enter first number: ", 0
5 prompt2 BYTE "Enter second number: ", 0
6 espMsg BYTE "ESP value: ", 0
7 resultMsg BYTE "GCD: ", 0
8 num1 DWORD ?
9 num2 DWORD ?
10
11 .code
12 Display PROC
13     push ebp
14     mov ebp, esp
15
16     mov edx, OFFSET espMsg
17     call WriteString
18     mov eax, esp
19     call WriteHex
20     call Crlf
21
22     mov eax, [ebp + 8]
23     mov edx, OFFSET resultMsg
24     call WriteString
25     call WriteDec
26     call Crlf
27
28     pop ebp
29     ret 4
30 Display ENDP
31
32 GCD PROC
33     push ebp
34     mov ebp, esp
35
36     mov edx, OFFSET espMsg
37     call WriteString
38     mov eax, esp
39     call WriteHex
40     call Crlf
41
42     mov eax, [ebp + 8]
43     mov ebx, [ebp + 12]
44
45 gcd_loop:
46     cmp ebx, 0
47     je gcd_done
48     mov edx, 0
49     div ebx
50     mov eax, ebx
51     mov ebx, edx
52     jmp gcd_loop
53
54 gcd_done:
55     push eax
56     call Display
```



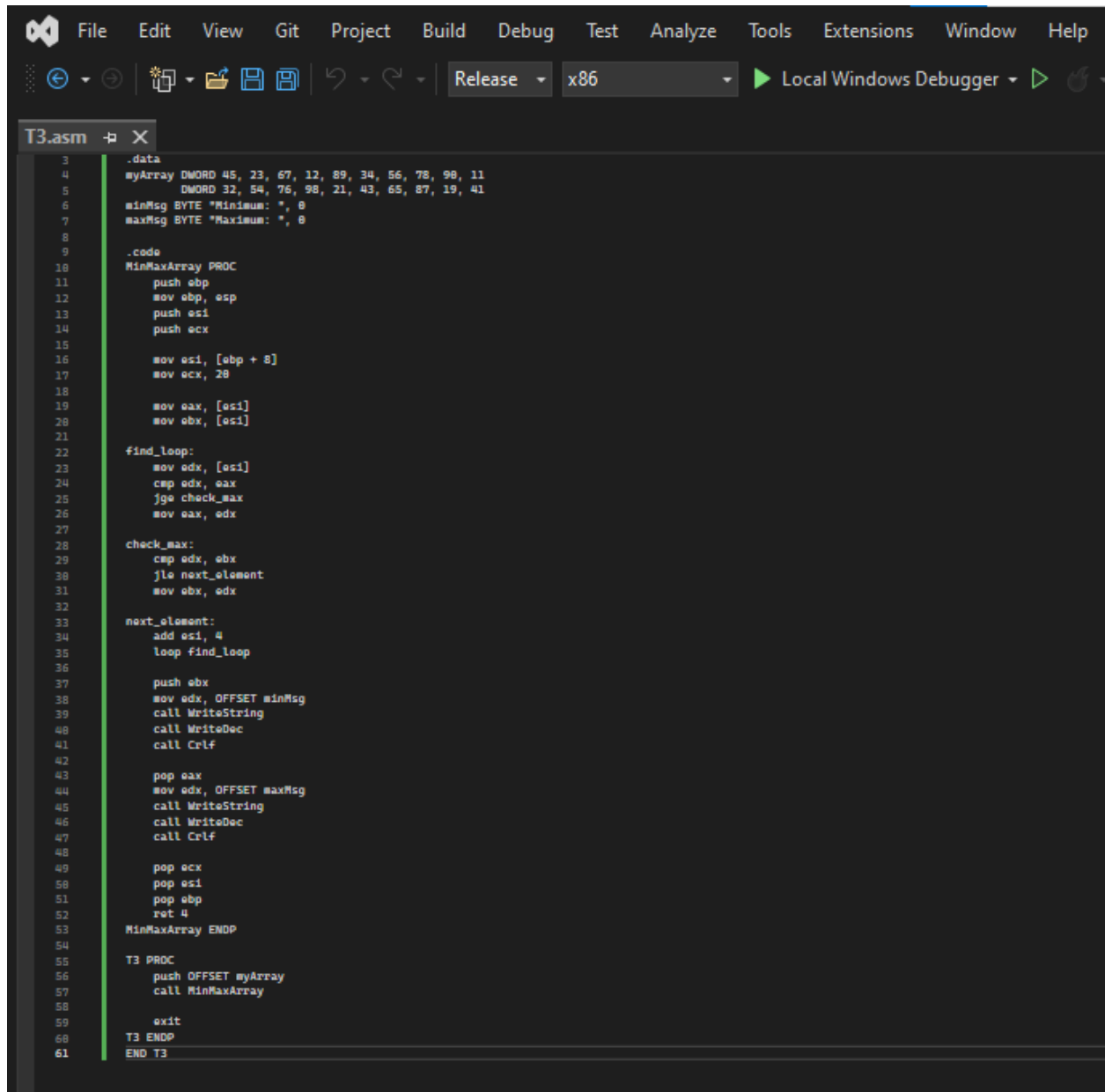
```
57
58     pop ebp
59     ret 8
60 GCD ENDP
61
62 TakeInput PROC
63     push ebp
64     mov ebp, esp
65
66     mov edx, OFFSET espMsg
67     call WriteString
68     mov eax, esp
69     call WriteHex
70     call Crlf
71
72     mov edx, OFFSET prompt1
73     call WriteString
74     call ReadDec
75     mov num1, eax
76
77     mov edx, OFFSET prompt2
78     call WriteString
79     call ReadDec
80     mov num2, eax
81
82     push num2
83     push num1
84     call GCD
85
86     pop ebp
87     ret
88 TakeInput ENDP
89
90 T2 PROC
91     call TakeInput
92     exit
93 T2 ENDP
94 END T2
```

### Output:

```
ESP value: 008FFA40
Enter first number: 20
Enter second number: 4
ESP value: 008FFA30
ESP value: 008FFA24
GCD: 4

C:\Users\Lenovo\OneDrive\Desktop\BAI-3\COAL LAB\LABCOAL#10\LABCOAL#10\Release\LABCOAL#10.exe (process 72) exited with code 0 (0x0).
Press any key to close this window . . .
```

### Task 3:



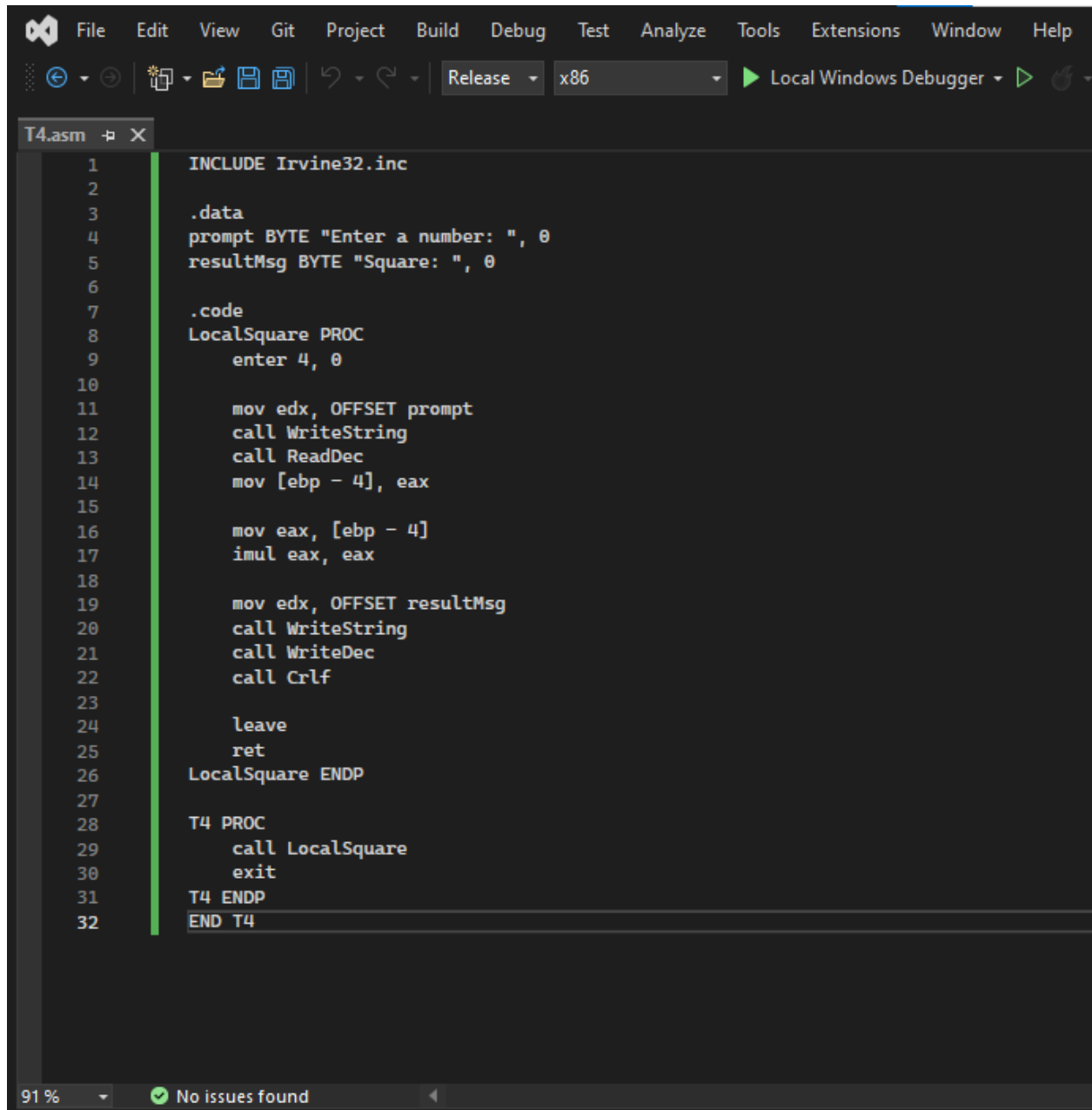
```
3      .data
4      myArray DWORD 45, 23, 67, 12, 89, 34, 56, 78, 98, 11
5             DWORD 32, 54, 76, 98, 21, 43, 65, 87, 19, 41
6      minMsg BYTE "Minimum: ", 0
7      maxMsg BYTE "Maximum: ", 0
8
9      .code
10     MinMaxArray PROC
11         push ebp
12         mov ebp, esp
13         push esi
14         push ecx
15
16         mov esi, [ebp + 8]
17         mov ecx, 20
18
19         mov eax, [esi]
20         mov ebx, [esi]
21
22     find_loop:
23         mov edx, [esi]
24         cmp edx, eax
25         jge check_max
26         mov eax, edx
27
28     check_max:
29         cmp edx, ebx
30         jle next_element
31         mov ebx, edx
32
33     next_element:
34         add esi, 4
35         loop find_loop
36
37         push ebx
38         mov edx, OFFSET minMsg
39         call WriteString
40         call WriteDec
41         call Crlf
42
43         pop ebx
44         mov edx, OFFSET maxMsg
45         call WriteString
46         call WriteDec
47         call Crlf
48
49         pop ecx
50         pop esi
51         pop ebp
52         ret 4
53     MinMaxArray ENDP
54
55     T3 PROC
56         push OFFSET myArray
57         call MinMaxArray
58
59         exit
60     T3 ENDP
61     END T3
```

Output:

```
Minimum: 11
Maximum: 98

C:\Users\Lenovo\OneDrive\Desktop\BAI-3\COAL LAB\LABCOAL#10\LABCOAL#10\Release\LABCOAL#10.exe (process 6084) exited with
code 0 (0x0).
Press any key to close this window . . .
```

Task 4:



```
1  INCLUDE Irvine32.inc
2
3  .data
4  prompt BYTE "Enter a number: ", 0
5  resultMsg BYTE "Square: ", 0
6
7  .code
8  LocalSquare PROC
9      enter 4, 0
10
11      mov edx, OFFSET prompt
12      call WriteString
13      call ReadDec
14      mov [ebp - 4], eax
15
16      mov eax, [ebp - 4]
17      imul eax, eax
18
19      mov edx, OFFSET resultMsg
20      call WriteString
21      call WriteDec
22      call Crlf
23
24      leave
25      ret
26  LocalSquare ENDP
27
28  T4 PROC
29      call LocalSquare
30      exit
31  T4 ENDP
32  END T4
```

91 %    No issues found

### Output:

```
Enter a number: 15
Square: 225

C:\Users\Lenovo\OneDrive\Desktop\BAI-3\COAL LAB\LABCOAL#10\LABCOAL#10\Release\LABCOAL#10.exe (process 14264) exited with
code 0 (0x0).
Press any key to close this window . . .
```

### Task 5:

```
1  .code
2
3  prompt BYTE "Enter n: ", 0
4  resultMsg BYTE "Factorial: ", 0
5  n DWORD ?
6
7
8  .code
9  Fact PROC
10     push ebp
11     mov ebp, esp
12
13     mov eax, [ebp + 8]
14     cmp eax, 1
15     jle base_case
16
17     dec eax
18     push eax
19     call Fact
20
21     mov ebx, [ebp + 8]
22     imul eax, ebx
23     jmp fact_done
24
25     base_case:
26         mov eax, 1
27
28     fact_done:
29         pop ebp
30         ret 4
31 Fact ENDP
32
33 T5 PROC
34     mov edx, OFFSET prompt
35     call WriteString
36     call ReadDec
37     mov n, eax
38
39     push n
40     call Fact
41
42     mov edx, OFFSET resultMsg
43     call WriteString
44     call WriteDec
45     call Crlf
46
47     exit
48 T5 ENDP
49 END T5
```

75 % No issues found

Output:

```
Enter n: 5
Factorial: 120

C:\Users\Lenovo\OneDrive\Desktop\BAI-3\COAL LAB\LABCOAL#10\LABCOAL#10\Release\LABCOAL#10.exe (process 6372) exited with
code 0 (0x0).
Press any key to close this window . . .
```

Task 6:

VS Code

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Release x86 ▶ Local Windows Debugger ▶

Error List 🔍 T6.asm

1234567891011121314151617181920212223242526272829303132333435363738394041424344454647484950515253545556

```
1  INCLUDE Irvine32.inc
2  .data
3  p BYTE "Enter number: ",0
4  np BYTE "Not all prime",0
5  lp BYTE "Largest prime = ",0
6  nums DWORD 4 DUP(?)
7  .code
8
9  T6 PROC
10 call Clrscr
11 mov ecx,4
12 lea edi, nums
13
14 readLoop:
15 mov edx, OFFSET p
16 call WriteString
17 call ReadInt
18 mov [edi], eax
19 add edi,4
20 loop readLoop
21
22 lea esi, nums
23 mov ecx,4
24
25 checkLoop:
26 mov eax, [esi]
27 push eax
28 call CheckPrime
29 add esp,4
30 cmp eax,1
31 jne notAllPrime
32 add esi,4
33 loop checkLoop
34 jmp allPrime
35
36 notAllPrime:
37 mov edx, OFFSET np
38 call WriteString
39 call CrLf
40 ret
41
42 allPrime:
43 lea eax, nums
44 push eax
45 call LargestPrime
46 add esp,4
47 call CrLf
48 ret
49 T6 ENDP
50
51 CheckPrime PROC
52 push ebp
53 mov ebp, esp
54
55 mov eax, [ebp+8]
56 cmp eax,2
```

```
55     mov eax, [ebp+8]
56     cmp eax, 2
57     jle notPrime
58
59     mov ebx, eax
60     mov ecx, 2
61
62     primeLoop:
63     mov edx, 8
64     mov eax, ebx
65     div ecx
66     cmp edx, 8
67     jle notPrime
68
69     inc ecx
70
71     mov edx, ecx
72     imul edx, ecx
73
74     cmp edx, ebx
75     jle primeLoop
76
77     mov eax, 1
78     jmp finish
79
80     notPrime:
81     mov eax, 0
82
83     finish:
84     pop ebp
85     ret 4
86     CheckPrime ENDP
87
88     LargestPrime PROC
89     push ebp
90     mov ebp, esp
91
92     mov esi, [ebp+8]
93     mov ecx, 4
94     mov edi, 8
95
96     findLoop:
97     mov eax, [esi]
98     cmp eax, edi
99     jle next
100    mov edi, eax
101    next:
102    add esi, 4
103    loop findLoop
104
105    mov edx, OFFSET IsPrime
106    call WriteString
107    mov eax, edi
108    call WriteInt
109
110    pop ebp
111    ret 4
112    LargestPrime ENDP
113
114    END T6
```

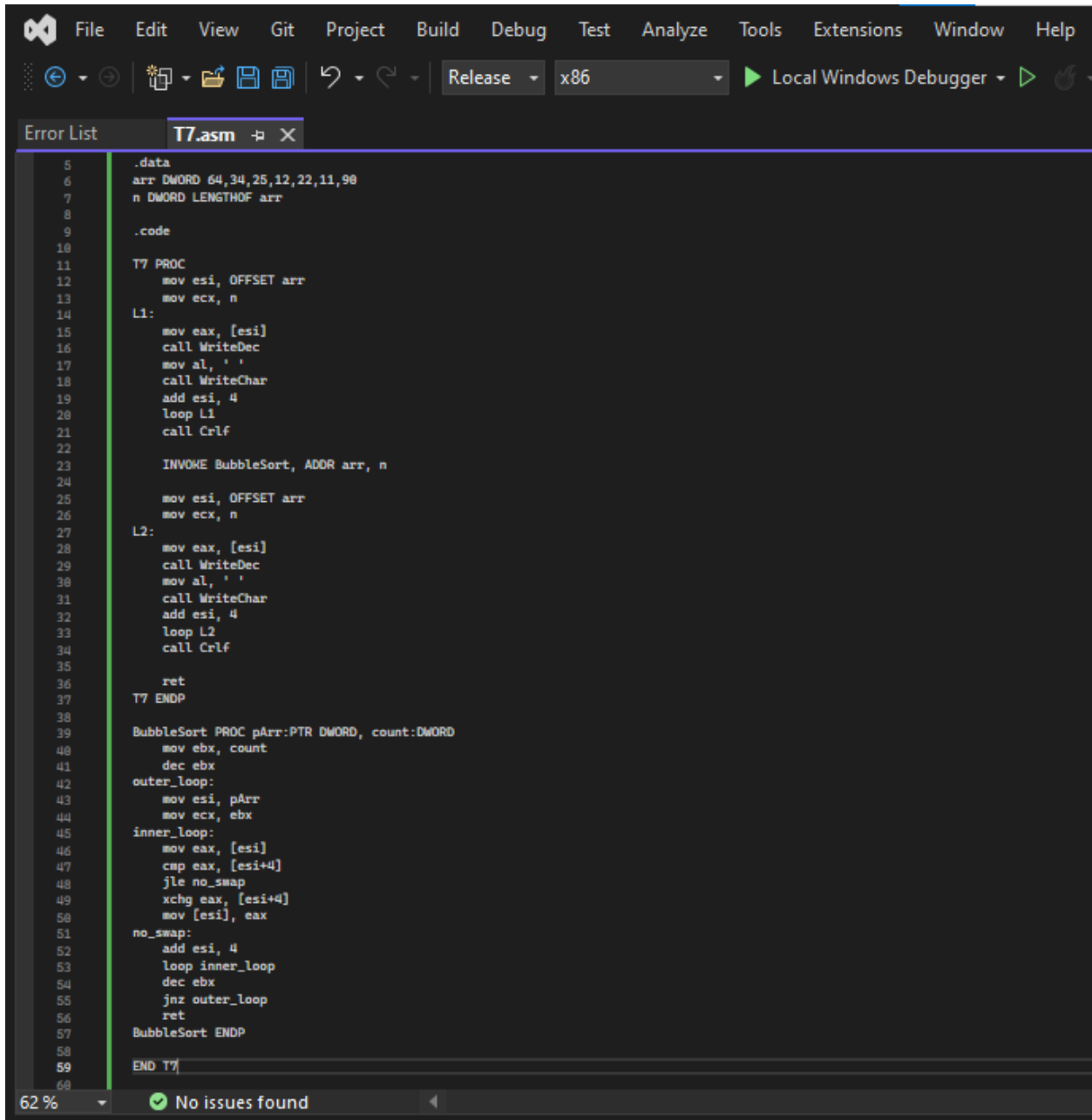
Output:

```
Enter number: 5
Enter number: 8
Enter number: 7
Enter number: 9
Not all prime

C:\Users\Lenovo\OneDrive\Desktop\BAI-3\COAL LAB\LABCOAL#10\LABCOAL#10\Release\LABCOAL#10.exe (process 11384) exited with
code -1073741819 (0xc0000005).
Press any key to close this window . . .
```



## Task 7:



```
5      .data
6      arr DWORD 64,34,25,12,22,11,90
7      n DWORD LENGTHOF arr
8
9      .code
10
11     T7 PROC
12         mov esi, OFFSET arr
13         mov ecx, n
14     L1:
15         mov eax, [esi]
16         call WriteDec
17         mov al, ' '
18         call WriteChar
19         add esi, 4
20         loop L1
21         call Crlf
22
23         INVOKE BubbleSort, ADDR arr, n
24
25         mov esi, OFFSET arr
26         mov ecx, n
27     L2:
28         mov eax, [esi]
29         call WriteDec
30         mov al, ' '
31         call WriteChar
32         add esi, 4
33         loop L2
34         call Crlf
35
36         ret
37     T7 ENDP
38
39     BubbleSort PROC pArr:PTR DWORD, count:DWORD
40         mov ebx, count
41         dec ebx
42     outer_loop:
43         mov esi, pArr
44         mov ecx, ebx
45     inner_loop:
46         mov eax, [esi]
47         cmp eax, [esi+4]
48         jle no_swap
49         xchg eax, [esi+4]
50         mov [esi], eax
51     no_swap:
52         add esi, 4
53         loop inner_loop
54         dec ebx
55         jnz outer_loop
56         ret
57     BubbleSort ENDP
58
59     END T7
60
```

62 % No issues found

## Output:

```
64 34 25 12 22 11 90
11 12 22 25 34 64 90

C:\Users\Lenovo\OneDrive\Desktop\BAI-3\COAL LAB\LABCOAL#10\LABCOAL#10\Release\LABCOAL10.exe (process 13340) exited with
code 32 (0x20).
Press any key to close this window . . .
```

## Task 8:

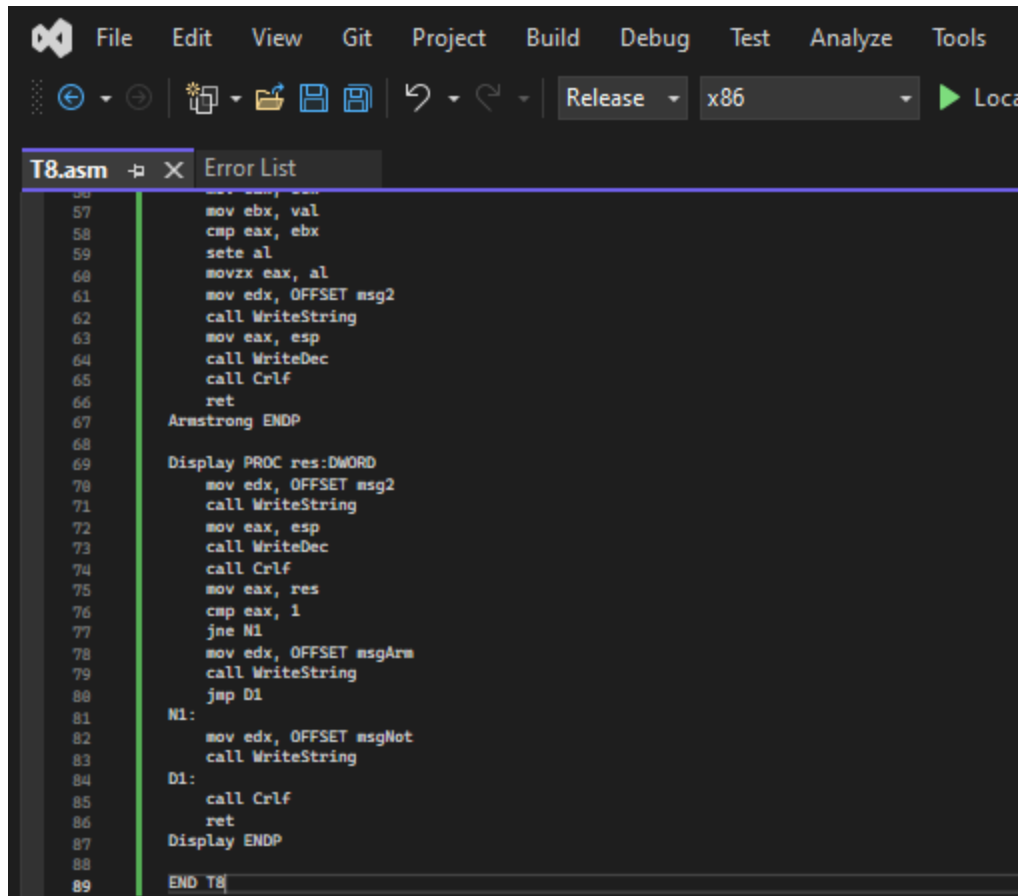
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Release x86 Local Windows Debugger

T8.asm Error List

```
1  INCLUDE Irvine32.inc
2
3  TakeInput PROTO
4  Armstrong PROTO :DWORD
5  Display PROTO :DWORD
6
7  .data
8  msg1 BYTE "Enter a number: ",0
9  msg2 BYTE "ESP = ",0
10 msgArm BYTE "Armstrong",0
11 msgNot BYTE "Not Armstrong",0
12 num DWORD ?
13
14 .code
15
16 T8 PROC
17     INVOKE TakeInput
18     INVOKE Armstrong, num
19     INVOKE Display, eax
20     ret
21 T8 ENDP
22
23 TakeInput PROC
24     mov edx, OFFSET msg1
25     call WriteString
26     call ReadInt
27     mov num, eax
28     mov edx, OFFSET msg2
29     call WriteString
30     mov eax, esp
31     call WriteDec
32     call CrLf
33     ret
34 TakeInput ENDP
35
36 Armstrong PROC val:DWORD
37     mov eax, val
38     mov ebx, eax
39     mov ecx, 0
40 L1:
41     mov edx, 0
42     mov edi, ebx
43     mov ebx, 10
44     div ebx
45     mov ebx, edi
46     mov edx, eax
47     mov eax, ebx
48     mov ebx, eax
49     imul ebx, ebx
50     imul ebx, eax
51     add ecx, ebx
52     mov eax, edx
53     mov ebx, eax
54     test eax, eax
55     jnz L1
56     mov eax, ecx
```

62 % No issues found



```
56      mov ebx, val
57      mov ebx, val
58      cmp eax, ebx
59      sete al
60      movzx eax, al
61      mov edx, OFFSET msg2
62      call WriteString
63      mov eax, esp
64      call WriteDec
65      call Crlf
66      ret
67      Armstrong ENDP
68
69      Display PROC res:DWORD
70      mov edx, OFFSET msg2
71      call WriteString
72      mov eax, esp
73      call WriteDec
74      call Crlf
75      mov eax, res
76      cmp eax, 1
77      jne N1
78      mov edx, OFFSET msgArm
79      call WriteString
80      jmp D1
81      N1:
82      mov edx, OFFSET msgNot
83      call WriteString
84      D1:
85      call Crlf
86      ret
87      Display ENDP
88
89      END T8
```

Output:

```
Enter a number: 153
ESP = 15726752
ESP = 15726744
ESP = 15726744
Not Armstrong

C:\Users\Lenovo\OneDrive\Desktop\BAI-3\COAL LAB\LABCOAL#10\LABCOAL#10\Release\LABCOAL10.exe (process 9644) exited with c
ode 15726744 (0xeff898).
Press any key to close this window . . .
```