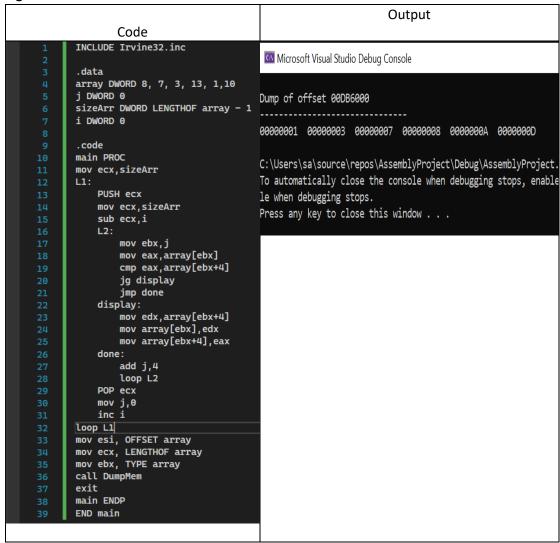
## **ASSIGNMENT 2**

Name: Kulsoom Khurshid

Reg#: Sp20-BCS-044

Course: Microprocessor and Assembly Language

1. Write a program in assembly language that sorts a given integer array using bubble sort algorithm.

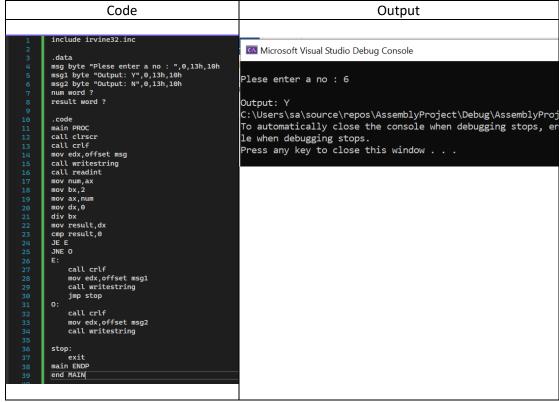


2. Given an integer array, write a program that finds the smallest and the largest integers among them. The program must place the smallest number in EAX register and the largest number in EBX register.

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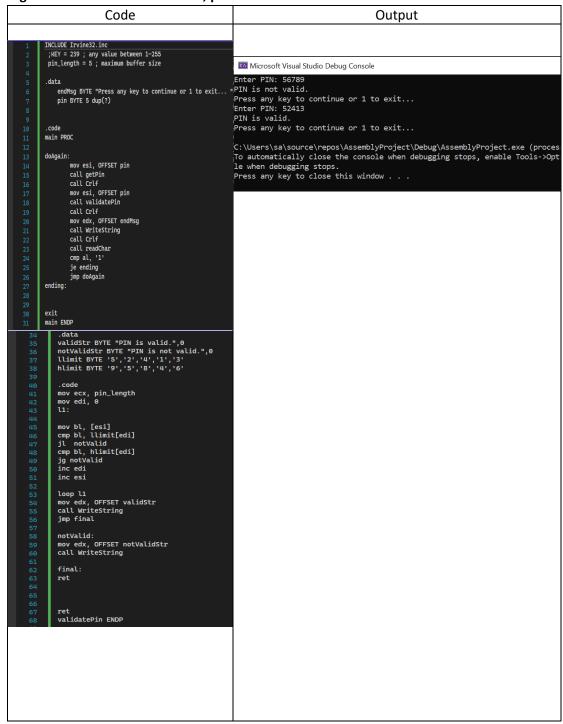
```
INCLUDE Irvine32.inc
.data
                                          EAX=00000001 EBX=0000000D ECX=00000000 EDX=007710AA
                                          ESI=00000014 EDI=007710AA EBP=00B5F8A4 ESP=00B5F898
arr DWORD 8, 7, 3, 13,1,10
sizeArr DWORD LENGTHOF arr - 1
                                          EIP=007736A1 EFL=00000206 CF=0 SF=0 ZF=0 OF=0 AF=0 PF=1
. code
                                        C:\Users\sa\source\repos\AssemblyProject\Debug\AssemblyProject.exe (proce
main PROC
                                         To automatically close the console when debugging stops, enable Tools->Op
                                        le when debugging stops.
Press any key to close this window . . .
mov ecx,sizeArr
mov esi,0
mov eax,arr[esi]
mov ebx, arr[esi]
     cmp arr[esi],ebx
    jg func1
     jmp done
func1:
     mov ebx,arr[esi]
done:
     cmp arr[esi], eax
     jl func2
     jmp ans
func2:
    mov eax, arr[esi]
    add esi,4
loop L1
call DumpRegs
exit
main ENDP
END main
```

3. Write a program that finds out whether an unsigned integer in EAX register is even or odd. If the number is even, place 'Y' in DL otherwise 'N' in DL. (Hint: Least significant bit of an even number is always 0 while that of odd number is 1)



4. Banks use a Personal Identification Number (PIN) to uniquely identify each customer. Let us assume that our bank has a specified range of acceptable values for each digit in its customers' 5-digit PINs. The table shown below contains the acceptable ranges, where digits are numbered from left to right in the PIN. Then we can see that the PIN 52413 is valid. But the PIN 43534 is invalid because the first digit is out of range. Similarly, 64535 is invalid because of its last digit.

Write a program in assembly language that validates the given PIN number. If any digit is found to be outside its valid range, place the digit's position (between 1 and 5) in the EAX register. If the entire PIN is valid, place 0 in EAX.



```
data
enterPin SYTE "Enter PIN: ",0
numbersonlyStr BYTE "Numbers only! Try again... ",0

code
again:
mov edx, OFFSET enterPin
call WriteString

mov exx, pin_length
mov edi,esi

li:
la:
call RacAchar
call writechar
call writechar
call writesonly
cap al, '0'
jl numbersonly
cap al, '9'
jg numbersonly
cap al, '9'
jg numbersonly
cap al, '9'
call cad a

mov edi, al
inc edi
loop ll
jmp final

numbersonly:
call Crlf
jmp again

final:

final:

ret
getPin ENDP
```