MICROPROCESSOR LABORATORY

Journal

SEM - II

2020-21

Name :- Ojus Pravin Jaiswal

Roll No. :- SACO19108

Seat No. :- S191094290

Year :- SE

Division :- A

MICROPROCESSOR LABORATORY

Assignment No. 1

NAME :- OJUS PRAVIN JAISWAL

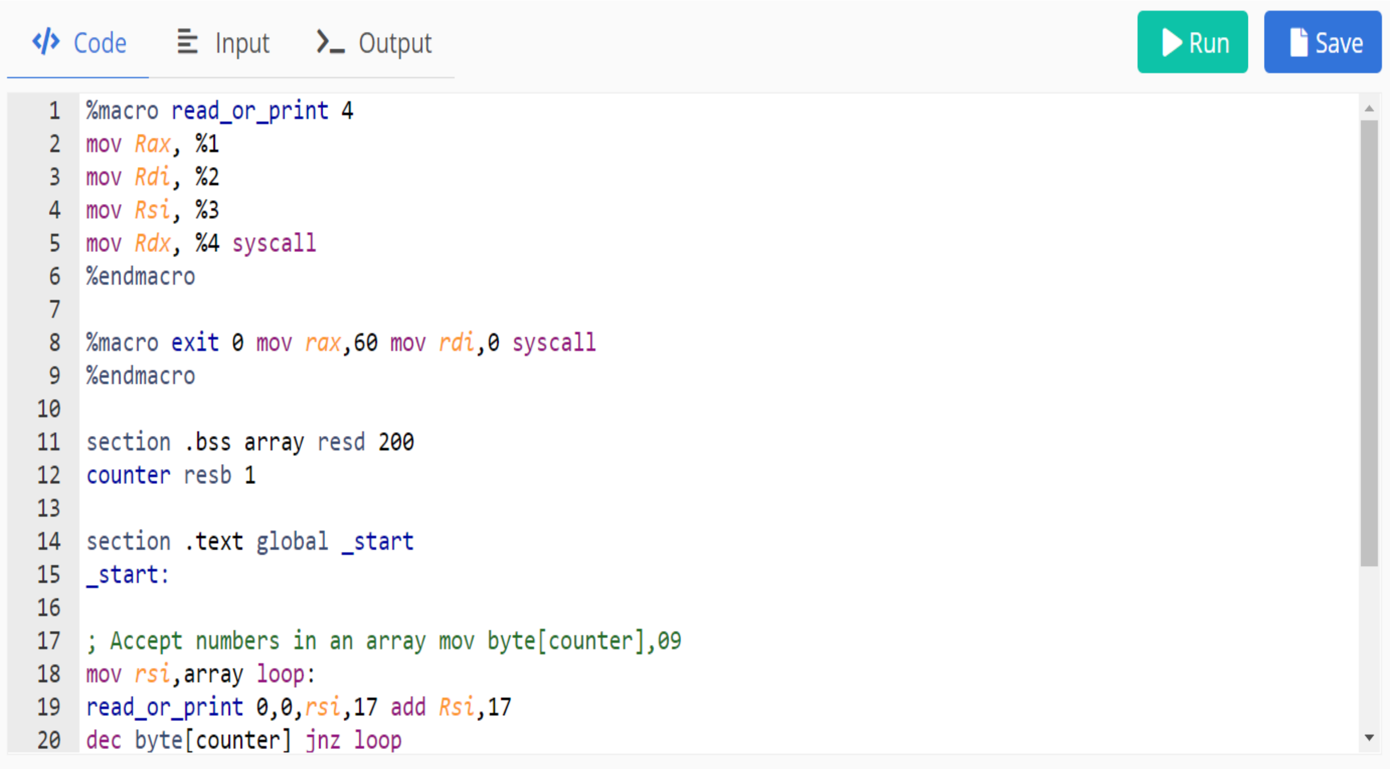
ROLL NO. :- SACO19108

DIVISION :- A

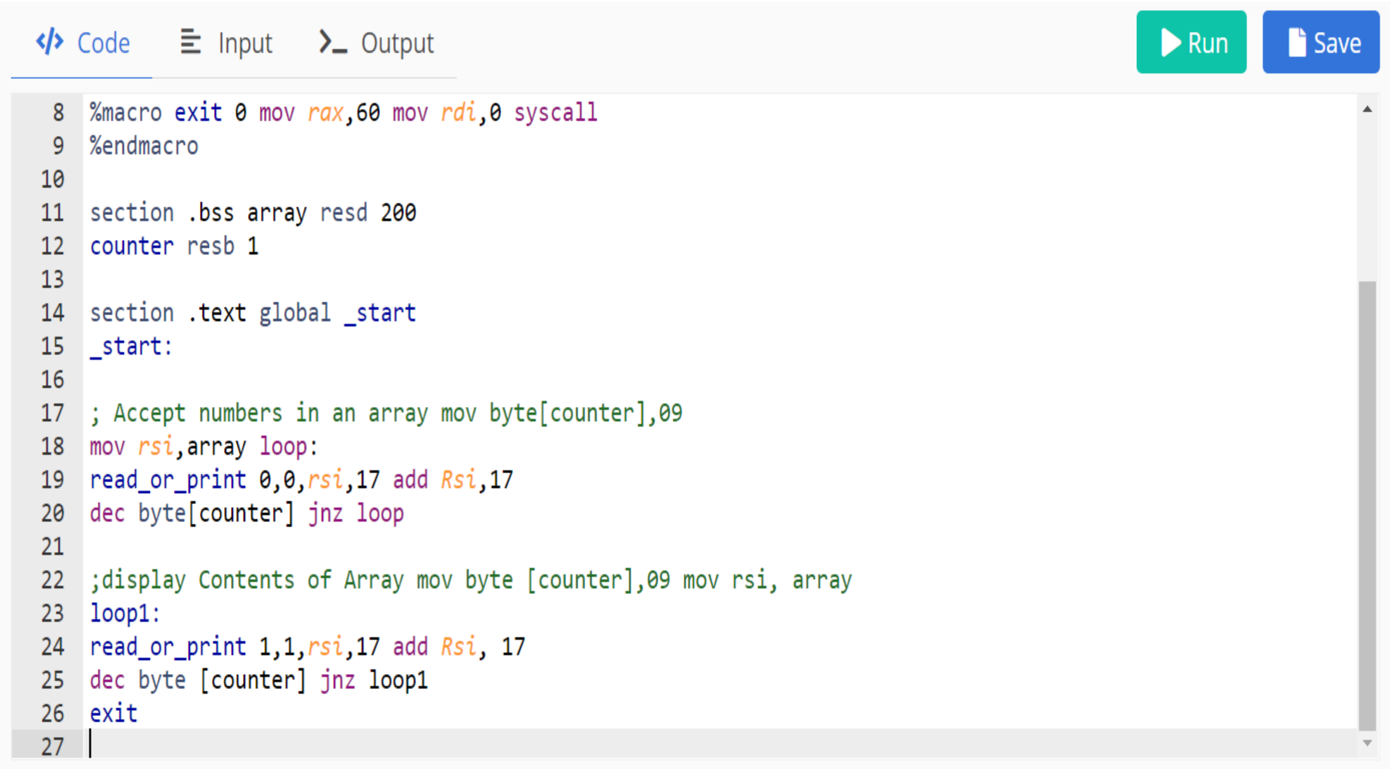
Assignment No. 1

Program :

```
%macro read_or_print 4
mov Rax, %1
mov Rdi, %2
mov Rsi, %3
mov Rdx, %4
syscall
%endmacro

%macro exit 0
mov rax,60
mov rdi,0
syscall
%endmacro

section .bss
array resd 200
counter resb 1

section .text
global _start
_start:

; Accept numbers in an array
mov byte[counter],09
mov rsi,array
loop:
read_or_print 0,0,rsi,17
add Rsi,17
dec byte[counter]
jnz loop

;display Contents of Array
mov byte [counter],09
mov rsi, array
loop1:
read_or_print 1,1,rsi,17
add Rsi, 17
dec byte [counter]
jnz loop1
exit
```

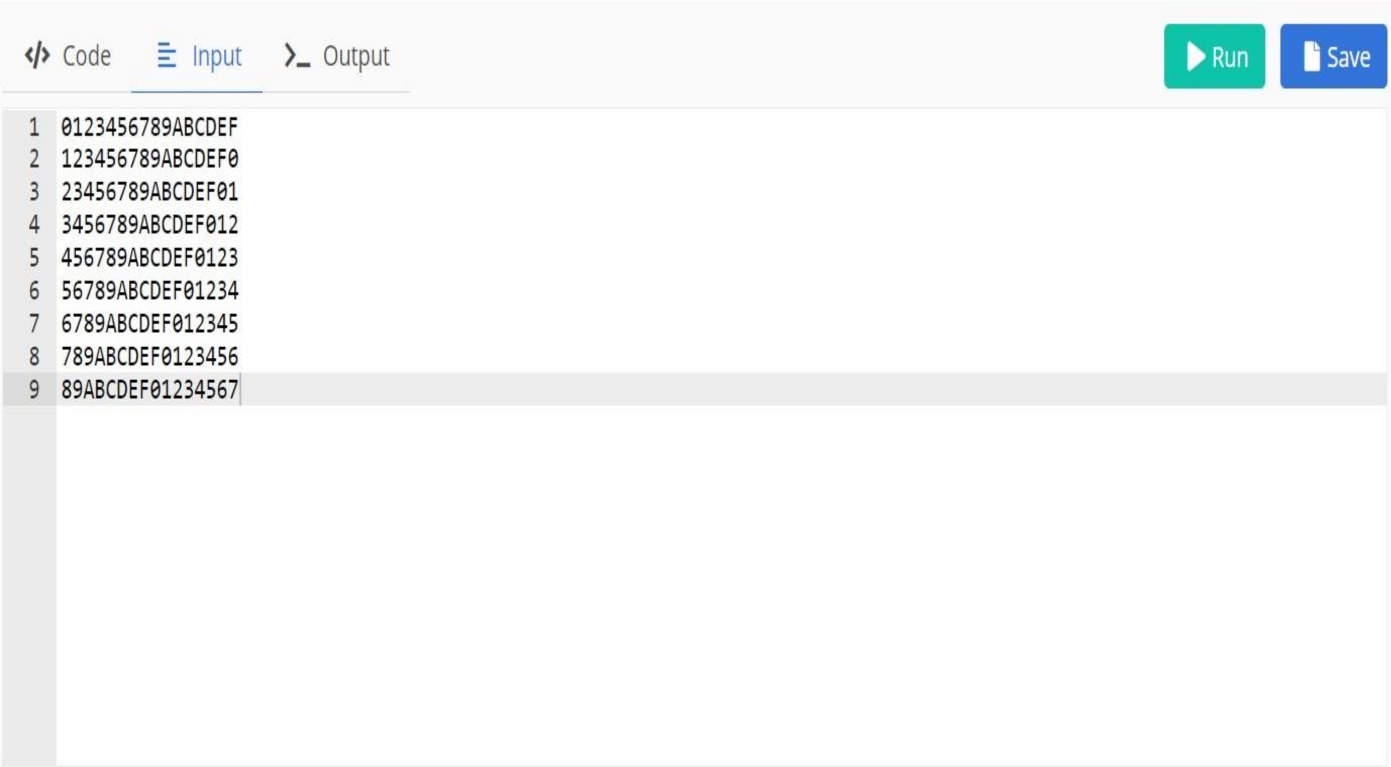


```
%macro read_or_print 4
mov Rax, %1
mov Rdi, %2
mov Rsi, %3
mov Rdx, %4 syscall
%endmacro

%macro exit 0 mov rax,60 mov rdi,0 syscall
%endmacro

section .bss array resd 200
counter resb 1

section .text global _start
_start:

; Accept numbers in an array mov byte[counter],09
mov rsi,array loop:
read_or_print 0,0,rsi,17 add Rsi,17
dec byte[counter] jnz loop
```



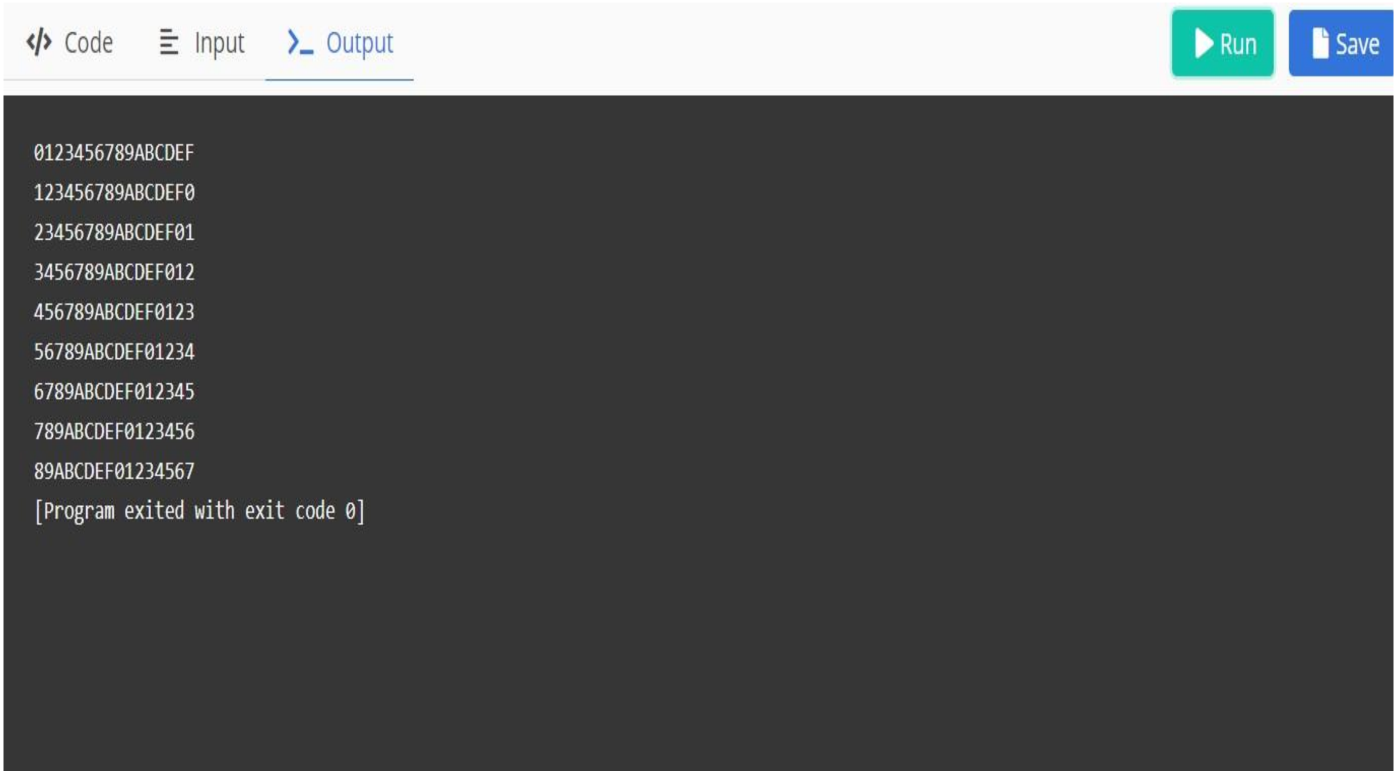
```
%macro exit 0 mov rax,60 mov rdi,0 syscall
%endmacro

section .bss array resd 200
counter resb 1

section .text global _start
_start:

; Accept numbers in an array mov byte[counter],09
mov rsi,array loop:
read_or_print 0,0,rsi,17 add Rsi,17
dec byte[counter] jnz loop

;display Contents of Array mov byte [counter],09 mov rsi, array
loop1:
read_or_print 1,1,rsi,17 add Rsi, 17
dec byte [counter] jnz loop1
exit

```

Input :



```
0123456789ABCDEF
123456789ABCDEF0
23456789ABCDEF01
3456789ABCDEF012
456789ABCDEF0123
56789ABCDEF01234
6789ABCDEF012345
789ABCDEF0123456
89ABCDEF01234567
```

Output :



```
0123456789ABCDEF
123456789ABCDEF0
23456789ABCDEF01
3456789ABCDEF012
456789ABCDEF0123
56789ABCDEF01234
6789ABCDEF012345
789ABCDEF0123456
89ABCDEF01234567
[Program exited with exit code 0]
```

MICROPROCESSOR LABORATORY

ASSIGNMENT NO. 2

Name :- Ojus Pravin Jaiswal

Roll No. :- SACO19108

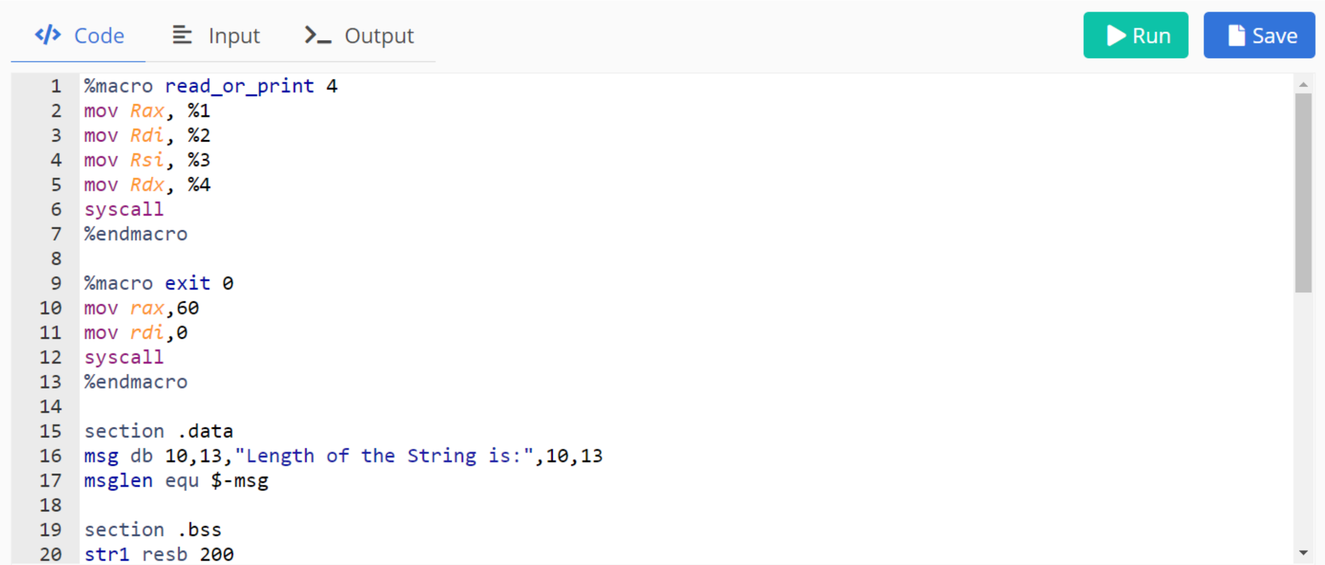
Division :- A

Assignment No. 2

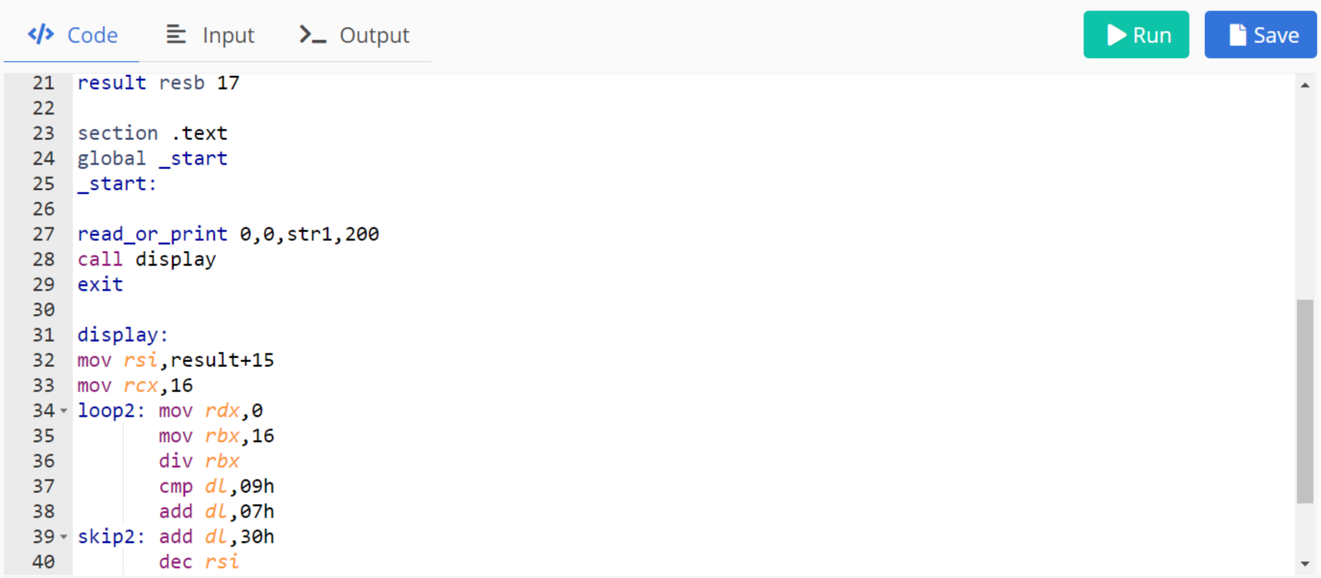
Program :

```
%macro read_or_print 4
mov Rax, %1
mov Rdi, %2
mov Rsi, %3
mov Rdx, %4
syscall
%endmacro

%macro exit 0
mov rax,60
mov rdi,0
syscall
%endmacro

section .data
msg db 10,13,"Length of the String is:",10,13
msglen equ $-msg

section .bss
str1 resb 200
result resb 1
```

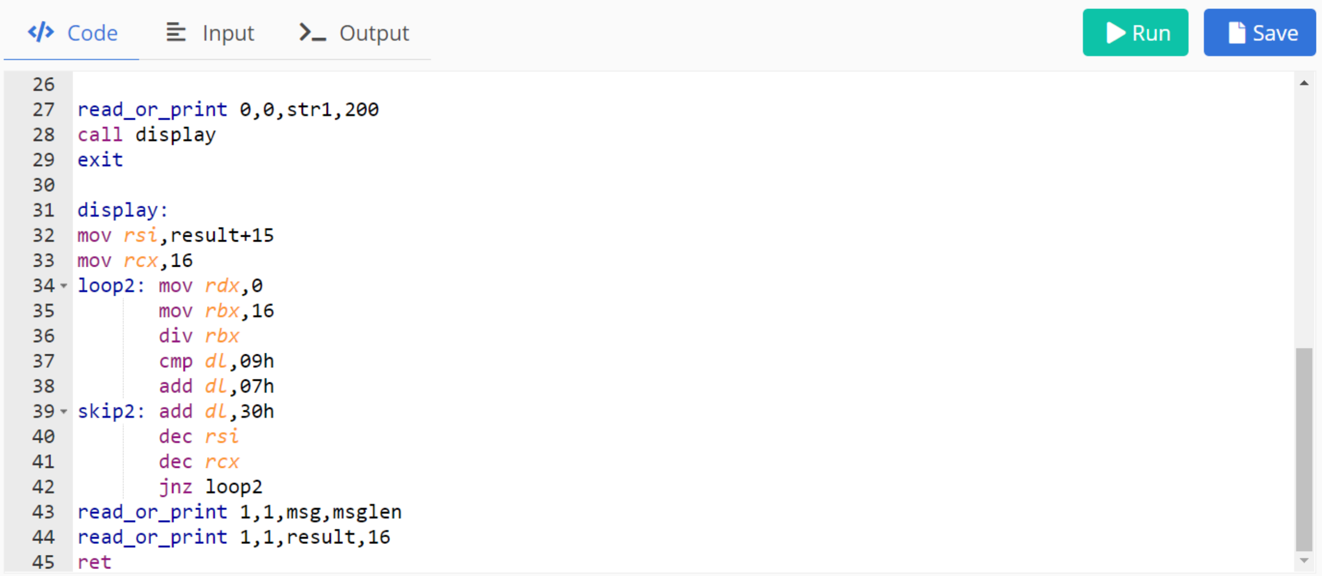
```
section .text
global _start
_start:
  read_or_print 0,0,str1,200
  call display
  exit
display:
          mov rsi,result+15
          mov rcx,16
  loop2:  mov rdx,0
          mov rbx,16
          div rbx
          cmp dl,09h
          jbe skip2
          add dl,07h
  skip2:  add dl,30h
          mov [rsi],dl
          dec rsi
          dec rcx
          jnz loop2
  read_or_print 1,1,msg, msglen
  read_or_print 1,1,result,16
  ret
```



```
%macro read_or_print 4
mov Rax, %1
mov Rdi, %2
mov Rsi, %3
mov Rdx, %4
syscall
%endmacro

%macro exit 0
mov rax,60
mov rdi,0
syscall
%endmacro

section .data
msg db 10,13,"Length of the String is:",10,13
msglen equ $-msg

section .bss
str1 resb 200
```

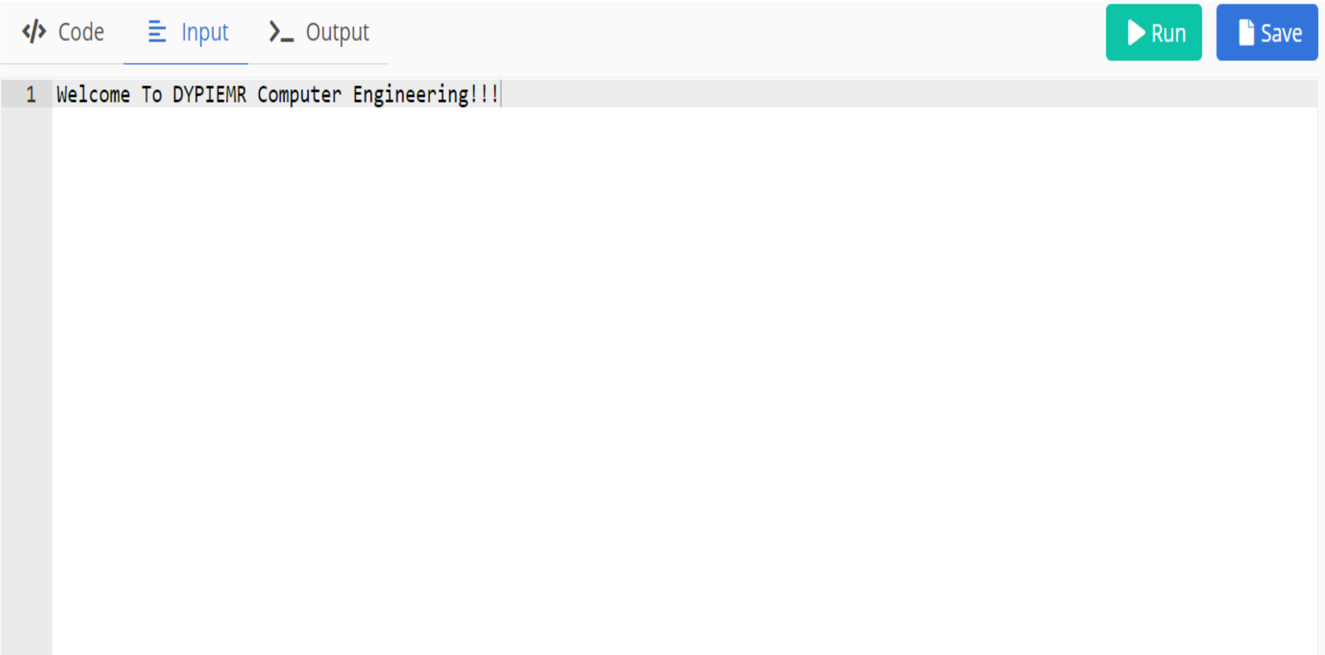


```
result resb 17

section .text
global _start
_start:

read_or_print 0,0,str1,200
call display
exit

display:
mov rsi,result+15
mov rcx,16
loop2: mov rdx,0
       mov rbx,16
       div rbx
       cmp dl,09h
       add dl,07h
skip2: add dl,30h
       dec rsi
```



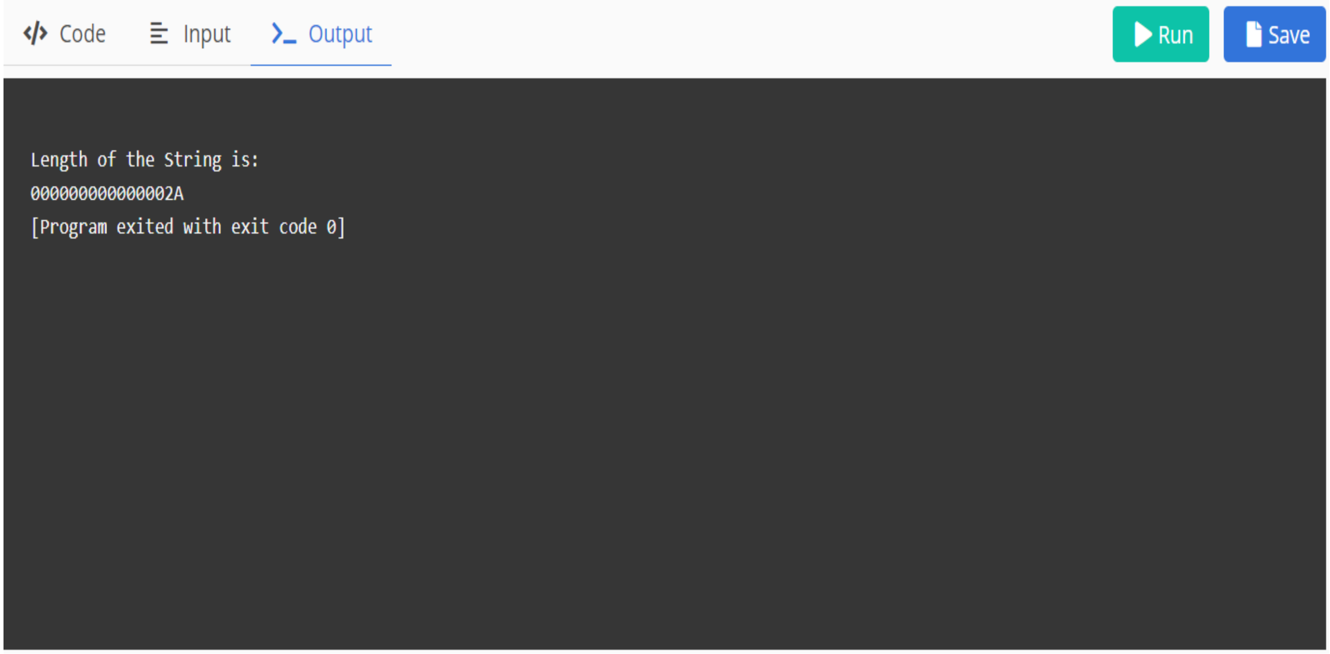
```

read_or_print 0,0,str1,200
call display
exit

display:
mov rsi,result+15
mov rcx,16
loop2: mov rdx,0
       mov rbx,16
       div rbx
       cmp dl,09h
       add dl,07h
skip2: add dl,30h
       dec rsi
       dec rcx
       jnz loop2
read_or_print 1,1,msg,msglen
read_or_print 1,1,result,16
ret
```

Input :



```
Welcome To DYPIEMR Computer Engineering!!!
```

Output :



```
Length of the String is:
000000000000002A
[Program exited with exit code 0]
```

MICROPROCESSOR LABORATORY

Assignment No. 3

Name :- Ojus Pravin Jaiswal
Roll No. :- SACO19108
Division :- A

Assignment No. 3

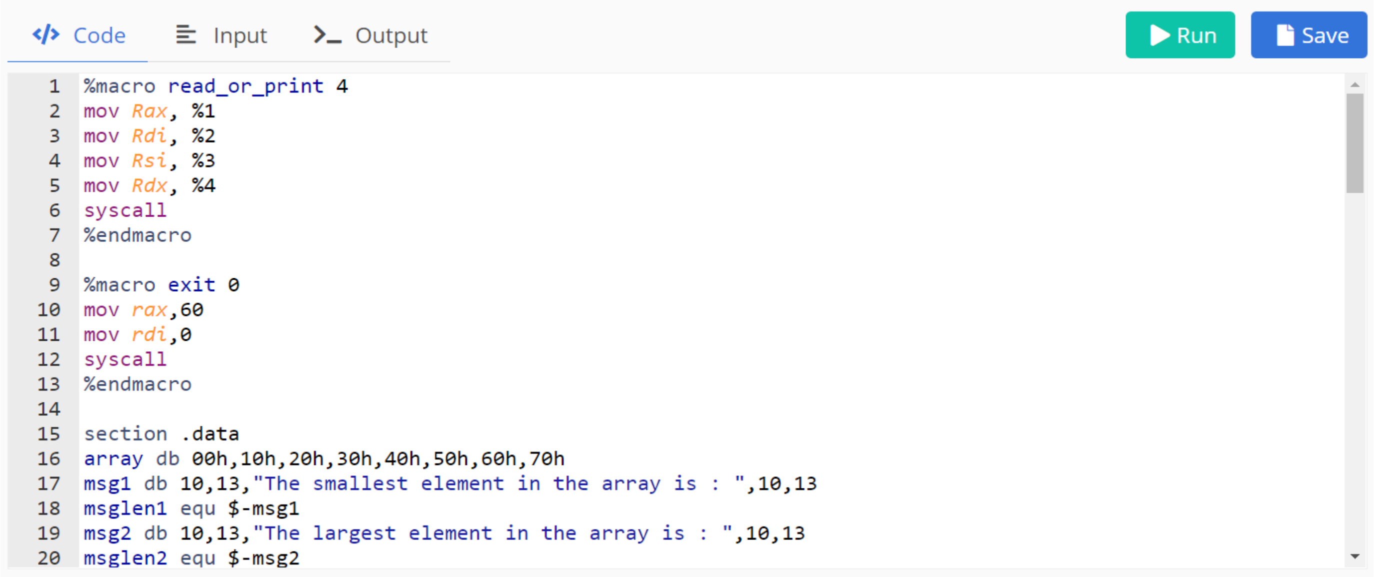
Program :

```
%macro read_or_print 4
mov Rax, %1
mov Rdi, %2
mov Rsi, %3
mov Rdx, %4
syscall
%endmacro

%macro exit 0
mov rax,60
mov rdi,0
syscall
%endmacro

section .data
array db 00h,10h,20h,30h,40h,50h,60h,70h
msg1 db 10,13,"The smallest element in the array is : ",10,13
msglen1 equ $-msg1
msg2 db 10,13,"The largest element in the array is : ",10,13
msglen2 equ $-msg2
```

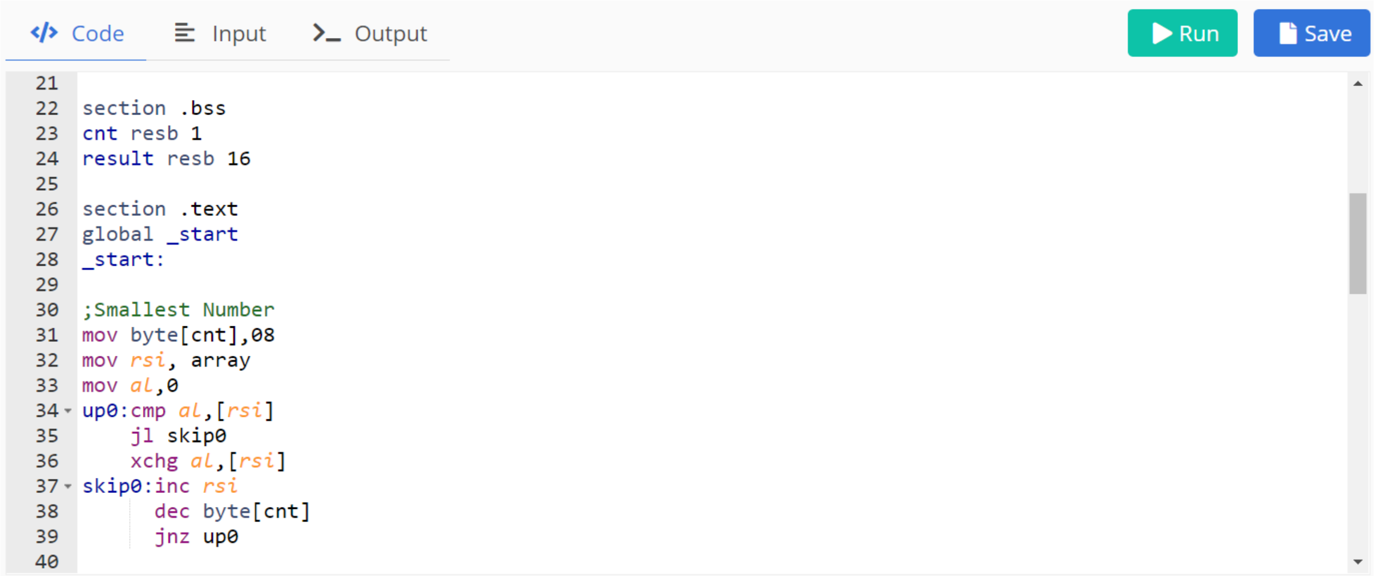
```
section .bss
cnt resb 1
result resb 16

section .text
global _start
_start:

;Smallest Number
mov byte[cnt],08
mov rsi, array
mov al,0
up0:cmp al,[rsi]
      jl skip0
      xchg al,[rsi]
skip0:inc rsi
         dec byte[cnt]
         jnz up0

call display1

;Largest Number
mov byte[cnt],08
mov rsi,array
mov al,0
up1:cmp al,[rsi]
      jg skip1
```

```
    xchg al,[rsi]
skip1:inc rsi
      dec byte[cnt]
      jnz up1

call display2
exit

display1:
mov rsi,result+15
mov rcx,16
loop2:mov rdx,0
      mov rbx,16
      div rbx
      cmp dl,09h
      jbe skip2
      add dl,07h
skip2:add dl,30h
      mov [rsi],dl
      dec rsi
      dec rcx
      jnz loop2
read_or_print 1,1,msg1,msglen1
read_or_print 1,1,result,16
ret
```

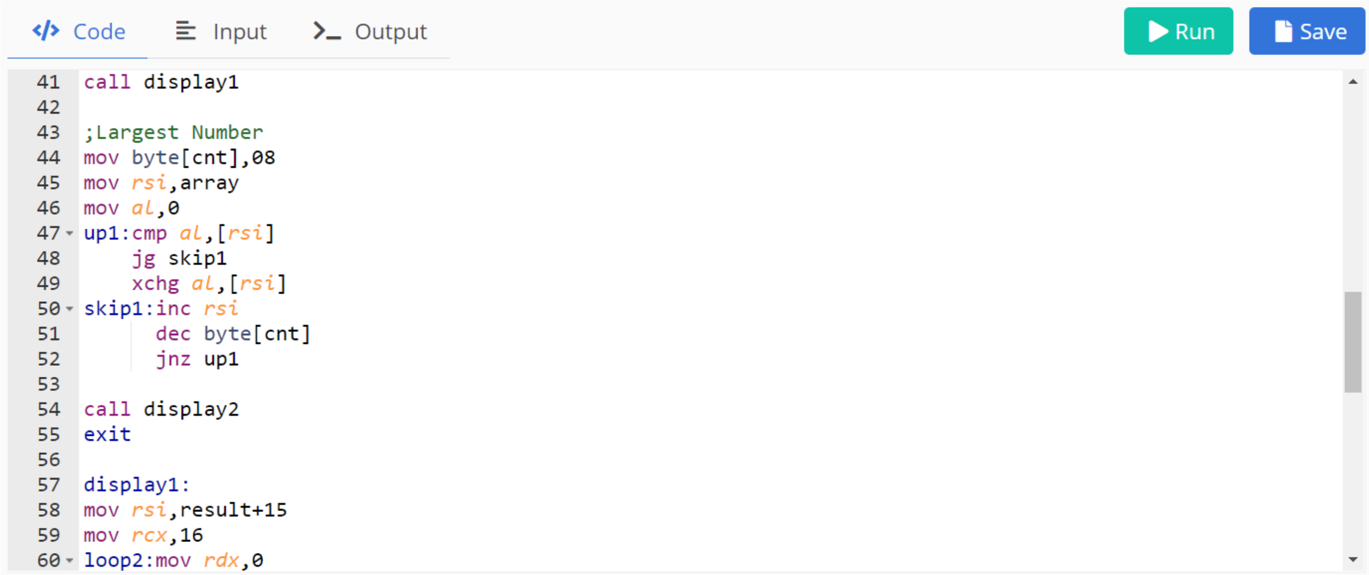
```
display2:

mov rsi,result+15

mov rcx,16

loop3:mov rdx,0

        mov rbx,16

        div rbx

        cmp dl,09h

        jbe skip3

        add dl,07h

skip3:add dl,30h

        mov [rsi],dl

        dec rsi

        dec rcx

        jnz loop3

read_or_print 1,1,msg2,msglen2

read_or_print 1,1,result,16

ret
```



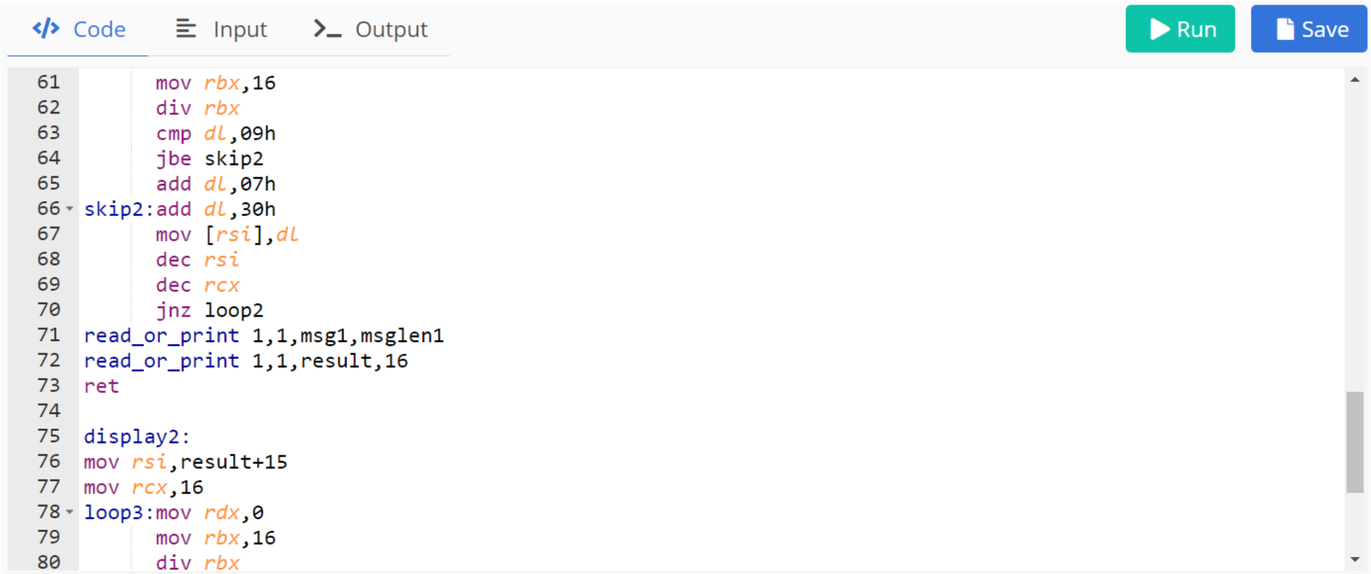
```
%macro read_or_print 4
mov Rax, %1
mov Rdi, %2
mov Rsi, %3
mov Rdx, %4
syscall
%endmacro

%macro exit 0
mov rax,60
mov rdi,0
syscall
%endmacro

section .data
array db 00h,10h,20h,30h,40h,50h,60h,70h
msg1 db 10,13,"The smallest element in the array is : ",10,13
msglen1 equ $-msg1
msg2 db 10,13,"The largest element in the array is : ",10,13
msglen2 equ $-msg2
```



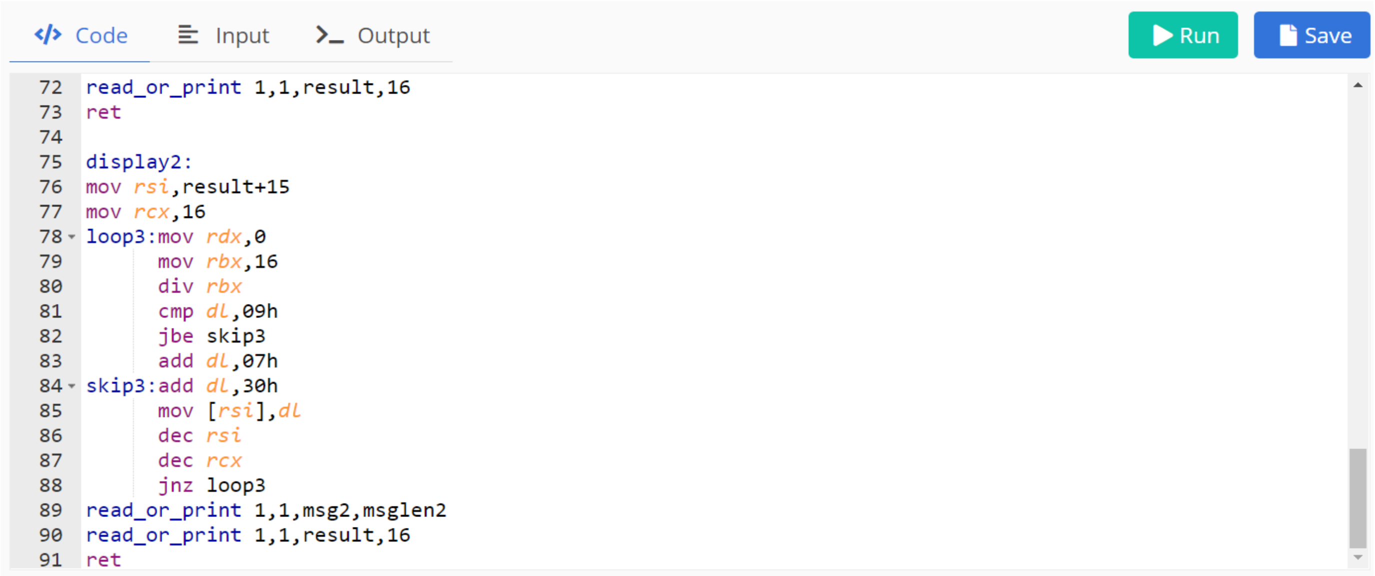
```

section .bss
cnt resb 1
result resb 16

section .text
global _start
_start:

;Smallest Number
mov byte[cnt],08
mov rsi, array
mov al,0
up0:cmp al,[rsi]
    jl skip0
    xchg al,[rsi]
skip0:inc rsi
      dec byte[cnt]
      jnz up0

```



```
call display1

;Largest Number
mov byte[cnt],08
mov rsi,array
mov al,0
up1:cmp al,[rsi]
    jg skip1
    xchg al,[rsi]
skip1:inc rsi
      dec byte[cnt]
      jnz up1

call display2
exit

display1:
mov rsi,result+15
mov rcx,16
loop2:mov rdx,0
```

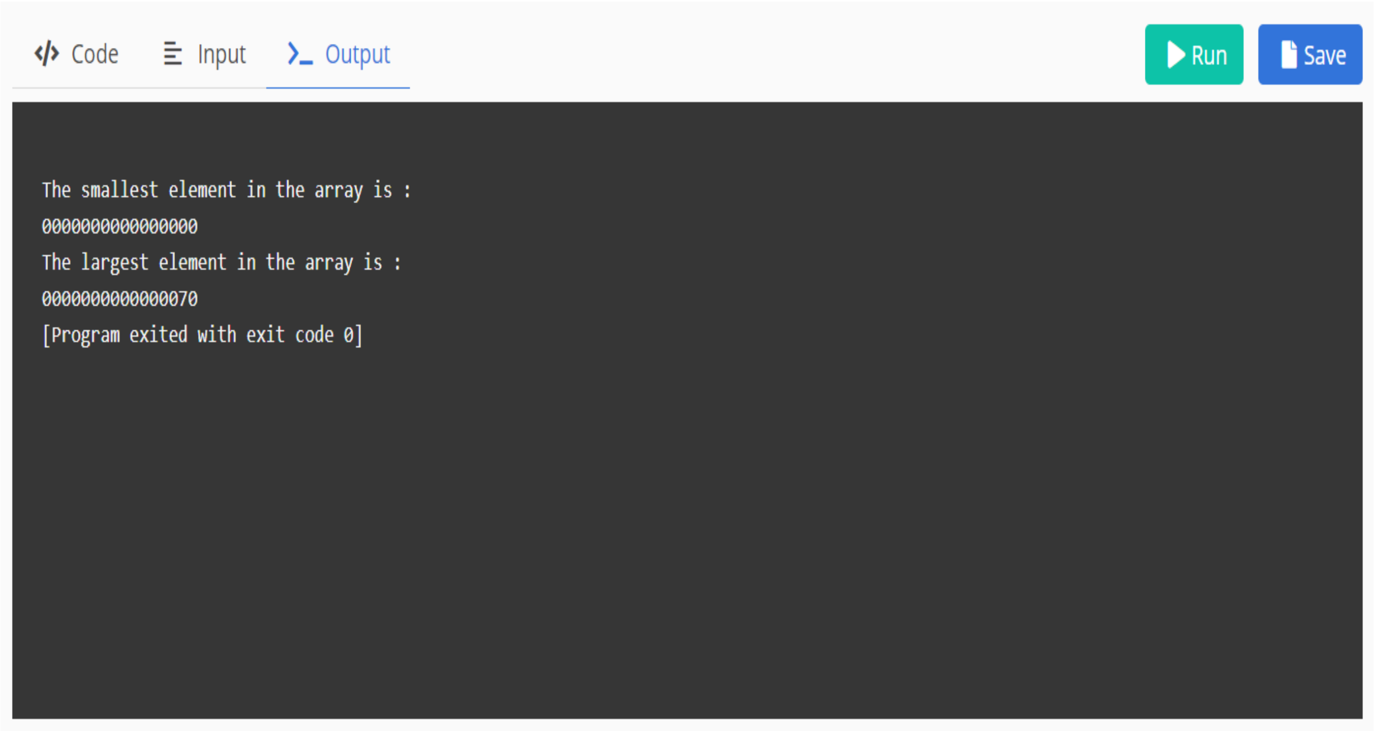


```
      mov rbx,16
      div rbx
      cmp dl,09h
      jbe skip2
      add dl,07h
skip2:add dl,30h
      mov [rsi],dl
      dec rsi
      dec rcx
      jnz loop2
read_or_print 1,1,msg1,msglen1
read_or_print 1,1,result,16
ret

display2:
mov rsi,result+15
mov rcx,16
loop3:mov rdx,0
      mov rbx,16
      div rbx
```



```
read_or_print 1,1,result,16
ret

display2:
mov rsi,result+15
mov rcx,16
loop3:mov rdx,0
      mov rbx,16
      div rbx
      cmp dl,09h
      jbe skip3
      add dl,07h
skip3:add dl,30h
      mov [rsi],dl
      dec rsi
      dec rcx
      jnz loop3
read_or_print 1,1,msg2,msglen2
read_or_print 1,1,result,16
ret
```

Output :



```
The smallest element in the array is :
0000000000000000
The largest element in the array is :
0000000000000070
[Program exited with exit code 0]
```

MICROPROCESSOR LABORATORY

Assignment No. 4

NAME :- OJUS PRAVIN JAISWAL
ROLL NO. :- SACO19108
DIVISION :- A

Assignment No. 4

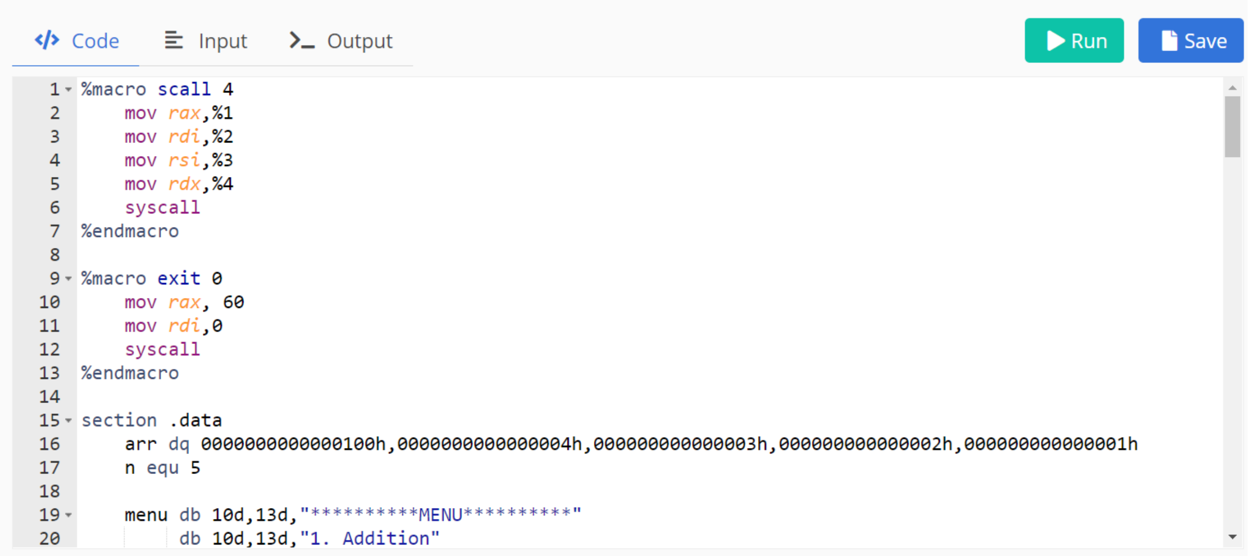
Program :

```
%macro scall 4
   mov rax,%1
   mov rdi,%2
   mov rsi,%3
   mov rdx,%4
   syscall
%endmacro

%macro exit 0
   mov rax, 60
   mov rdi,0
   syscall
%endmacro

section .data
   arr dq 
0000000000000100h,0000000000000004h,000000000000003h,000000000000002h,0000000000
00001h
   n equ 5

   menu db 10d,13d,"**********MENU**********"
       db 10d,13d,"1. Addition"
       db 10d,13d,"2. Subtraction"
       db 10d,13d,"3. Multiplication"
```

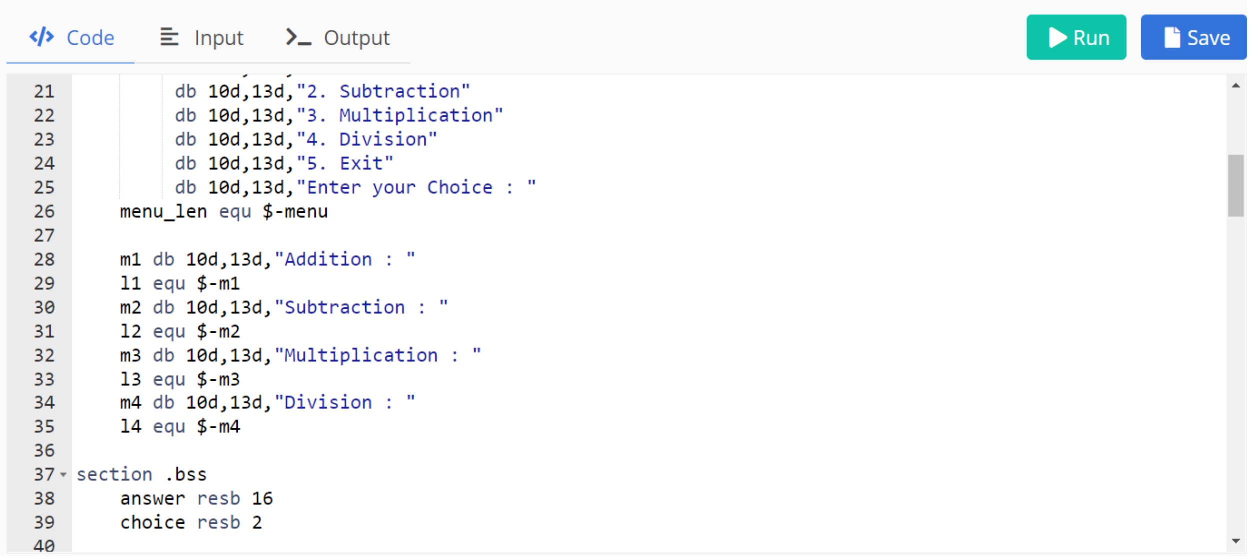
```
        db 10d,13d,"4. Division"
        db 10d,13d,"5. Exit"
        db 10d,13d,"Enter your Choice : "
    menu_len equ $-menu

    m1 db 10d,13d,"Addition : "
    l1 equ $-m1
    m2 db 10d,13d,"Subtraction : "
    l2 equ $-m2
    m3 db 10d,13d,"Multiplication : "
    l3 equ $-m3
    m4 db 10d,13d,"Division : "
    l4 equ $-m4

section .bss
    answer resb 16
    choice resb 2

section .text
global _start:
_start:

    up:scall 1,1,menu,menu_len
       scall 0,0,choice,2

    cmp byte[choice],'1'
    je case1
    cmp byte[choice],'2'
    je case2
    cmp byte[choice],'3'
    je case3
    cmp byte[choice],'4'
    je case4
    cmp byte[choice],'5'
    je case5

    case1: scall 1,1,m1,l1
        call addition
        jmp up

    case2: scall 1,1,m2,l2
        call subtraction
        jmp up

    case3: scall 1,1,m3,l3
        call multiplication
        jmp up

    case4: scall 1,1,m4,l4
        call division
        jmp up

    case5:exit

addition:
    mov rcx,n
    dec rcx
    mov rsi,arr
    mov rax,[rsi]
up1:add rsi,8
    mov rbx,[rsi]
    add rax,rbx
    loop up1
    call display
ret

subtraction:
    mov rcx,n
    dec rcx
    mov rsi,arr
    mov rax,[rsi]
up2:add rsi,8
    mov rbx,[rsi]
    sub rax,rbx
    loop up2
    call display
ret

multiplication:
    mov rcx,n
    dec rcx
    mov rsi,arr
    mov rax,[rsi]
up3:add rsi,8
```

```
    mov rbx,[rsi]
    mul rbx
    loop up3
    call display
ret

division:
    mov rcx,n
    dec rcx
    mov rsi,arr
    mov rax,[rsi]
up4:add rsi,8
    mov rbx,[rsi]
    mov rdx,0
    div rbx
    loop up4
    call display
ret

display:
    mov rsi,answer+15
    mov rcx,16
cnt:mov rdx,0
    mov rbx,16
    div rbx
    cmp dl,09h
    jbe add30
    add dl,07h
```

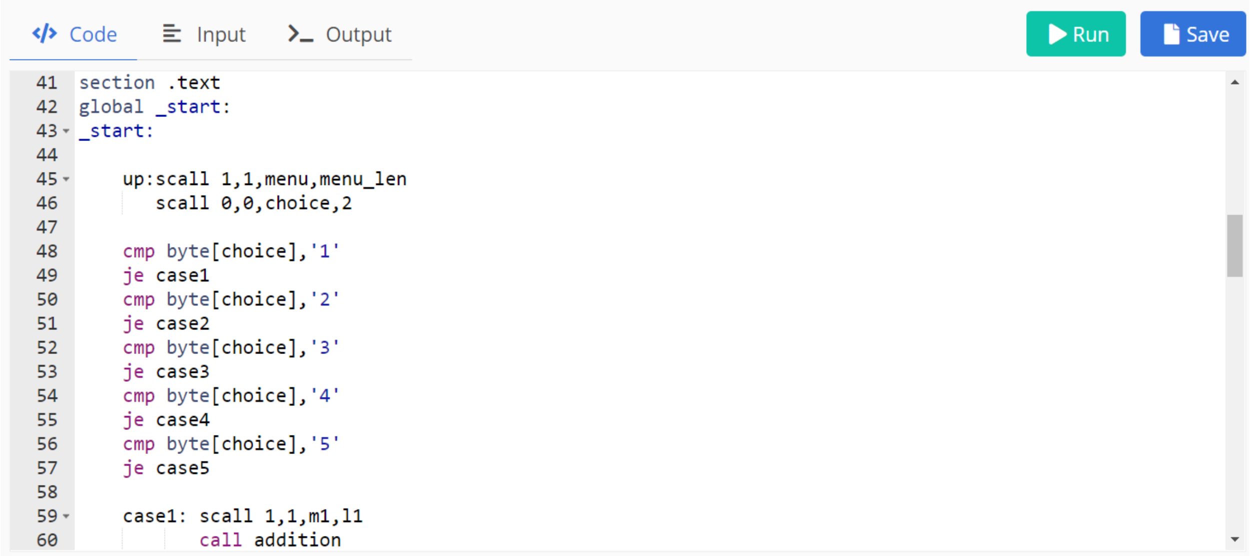
```
add30:add dl,30h
    mov [rsi],dl
    dec rsi
    dec rcx
    jnz cnt
    scall 1,1,answer,16
ret
```



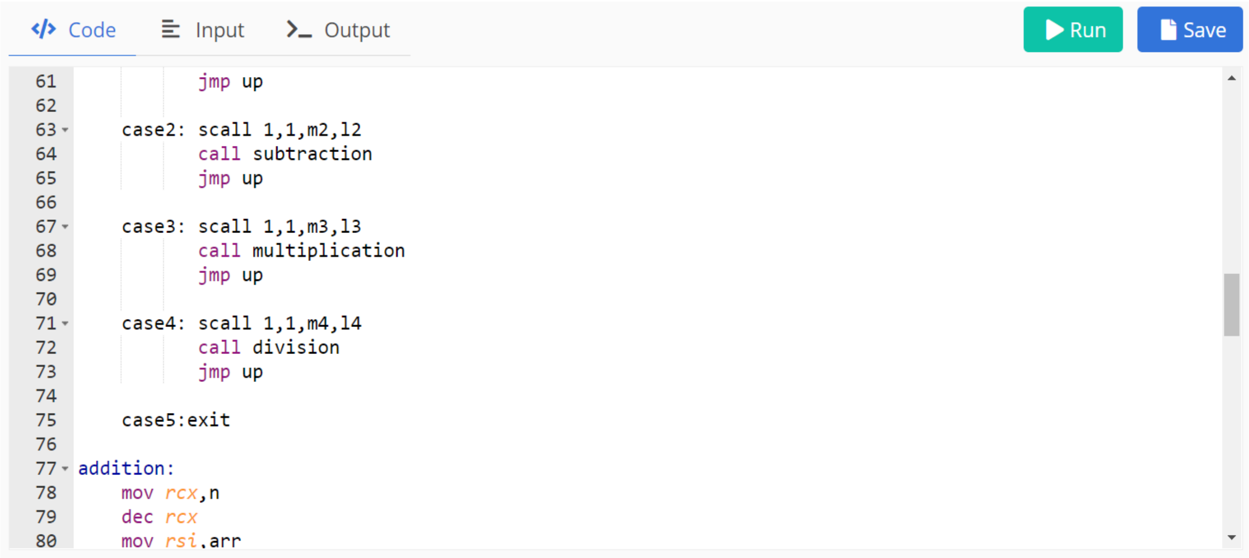
```
%macro scall 4
    mov rax,%1
    mov rdi,%2
    mov rsi,%3
    mov rdx,%4
    syscall
%endmacro

%macro exit 0
    mov rax, 60
    mov rdi,0
    syscall
%endmacro

section .data
    arr dq 0000000000000100h,0000000000000004h,000000000000003h,000000000000002h,000000000000001h
    n equ 5

    menu db 10d,13d,"**********MENU**********"
         db 10d,13d,"1. Addition"
```



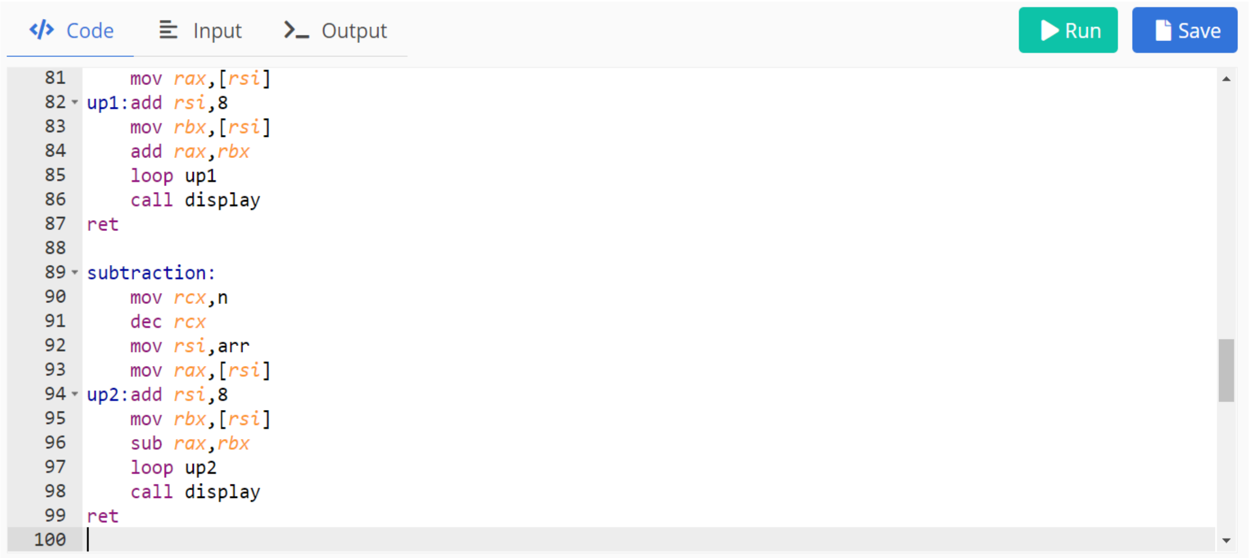
```
         db 10d,13d,"2. Subtraction"
         db 10d,13d,"3. Multiplication"
         db 10d,13d,"4. Division"
         db 10d,13d,"5. Exit"
         db 10d,13d,"Enter your Choice : "
    menu_len equ $-menu

    m1 db 10d,13d,"Addition : "
    l1 equ $-m1
    m2 db 10d,13d,"Subtraction : "
    l2 equ $-m2
    m3 db 10d,13d,"Multiplication : "
    l3 equ $-m3
    m4 db 10d,13d,"Division : "
    l4 equ $-m4

section .bss
    answer resb 16
    choice resb 2
```



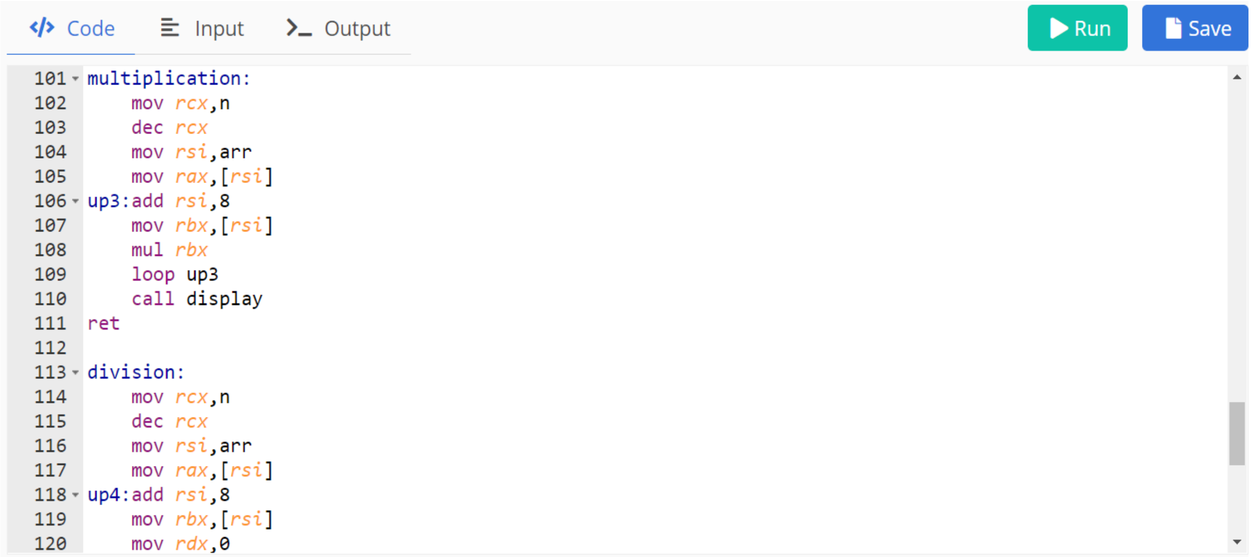
```
section .text
global _start:
_start:

    up:scall 1,1,menu,menu_len
       scall 0,0,choice,2

    cmp byte[choice],'1'
    je case1
    cmp byte[choice],'2'
    je case2
    cmp byte[choice],'3'
    je case3
    cmp byte[choice],'4'
    je case4
    cmp byte[choice],'5'
    je case5

    case1: scall 1,1,m1,l1
           call addition
```



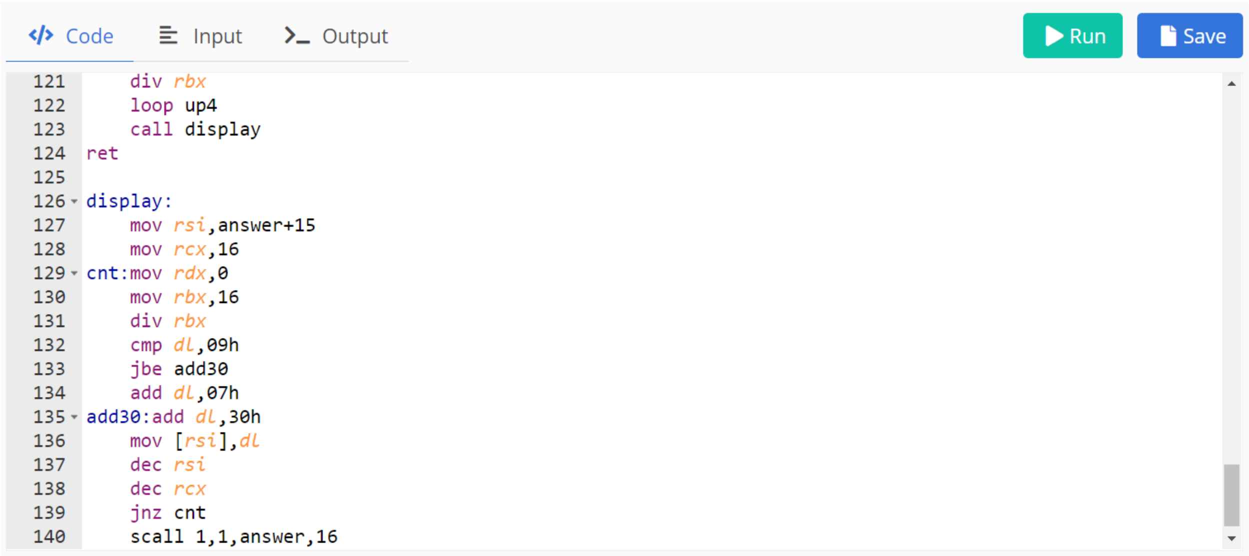
```
           jmp up

    case2: scall 1,1,m2,l2
           call subtraction
           jmp up

    case3: scall 1,1,m3,l3
           call multiplication
           jmp up

    case4: scall 1,1,m4,l4
           call division
           jmp up

    case5:exit

addition:
    mov rcx,n
    dec rcx
    mov rsi,arr
```



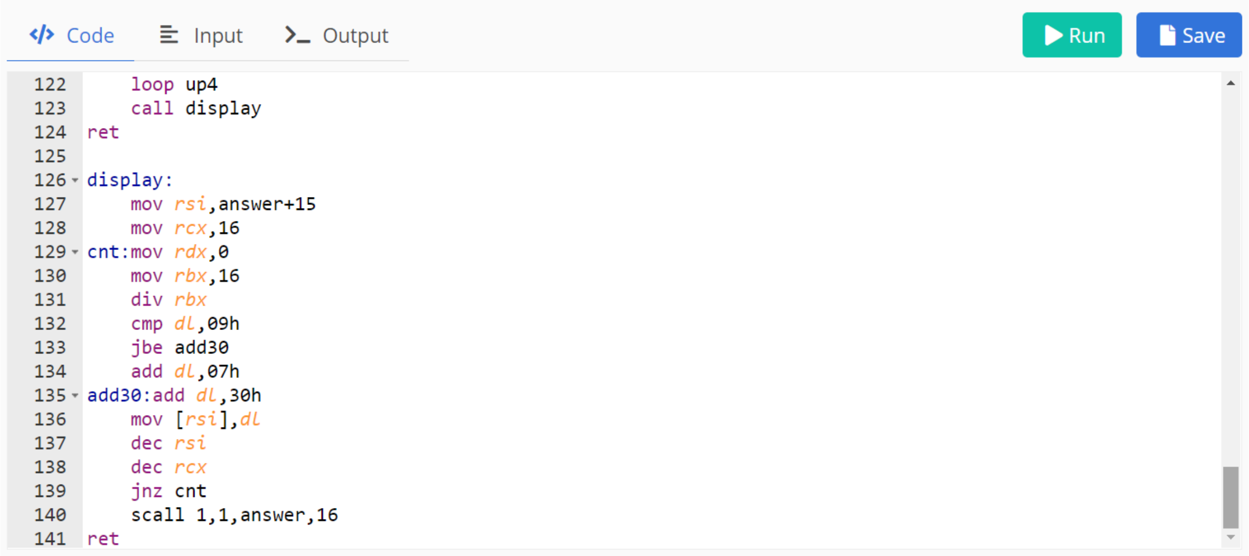
```
    mov rax,[rsi]
up1:add rsi,8
    mov rbx,[rsi]
    add rax,rbx
    loop up1
    call display
ret

subtraction:
    mov rcx,n
    dec rcx
    mov rsi,arr
    mov rax,[rsi]
up2:add rsi,8
    mov rbx,[rsi]
    sub rax,rbx
    loop up2
    call display
ret

```



```
multiplication:
    mov rcx,n
    dec rcx
    mov rsi,arr
    mov rax,[rsi]
up3:add rsi,8
    mov rbx,[rsi]
    mul rbx
    loop up3
    call display
ret

division:
    mov rcx,n
    dec rcx
    mov rsi,arr
    mov rax,[rsi]
up4:add rsi,8
    mov rbx,[rsi]
    mov rdx,0
```

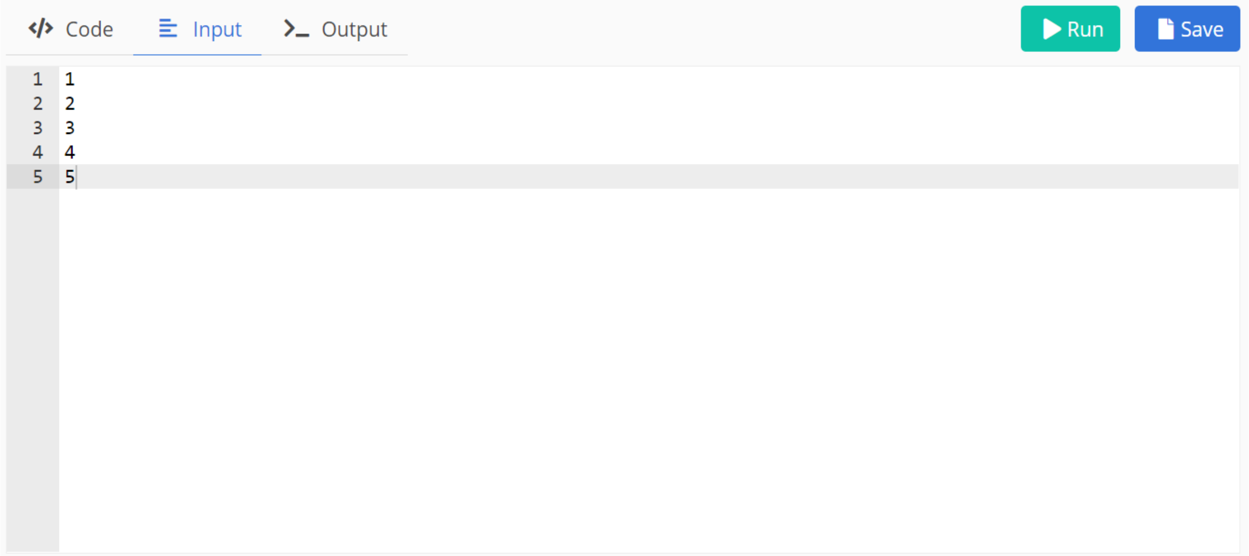


```
    div rbx
    loop up4
    call display
ret

display:
    mov rsi,answer+15
    mov rcx,16
cnt:mov rdx,0
    mov rbx,16
    div rbx
    cmp dl,09h
    jbe add30
    add dl,07h
add30:add dl,30h
    mov [rsi],dl
    dec rsi
    dec rcx
    jnz cnt
    scall 1,1,answer,16
```



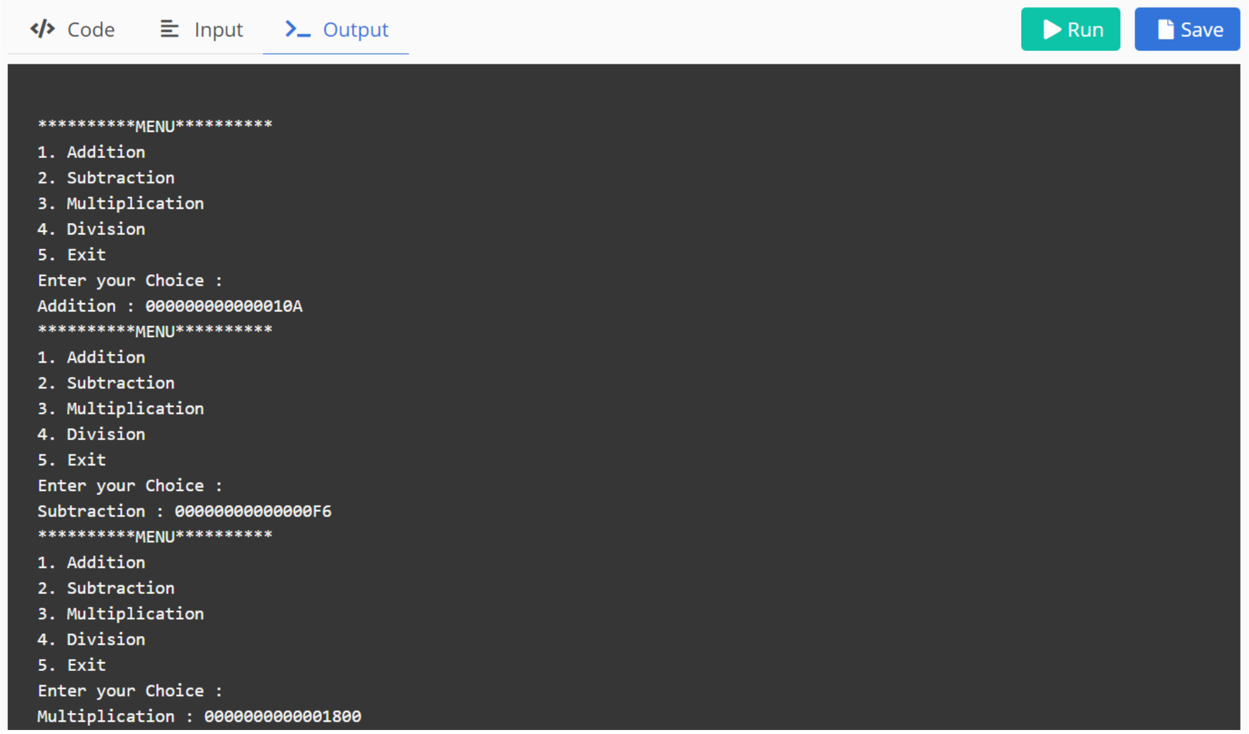
```
    loop up4
    call display
ret

display:
    mov rsi,answer+15
    mov rcx,16
cnt:mov rdx,0
    mov rbx,16
    div rbx
    cmp dl,09h
    jbe add30
    add dl,07h
add30:add dl,30h
    mov [rsi],dl
    dec rsi
    dec rcx
    jnz cnt
    scall 1,1,answer,16
ret
```

Input :

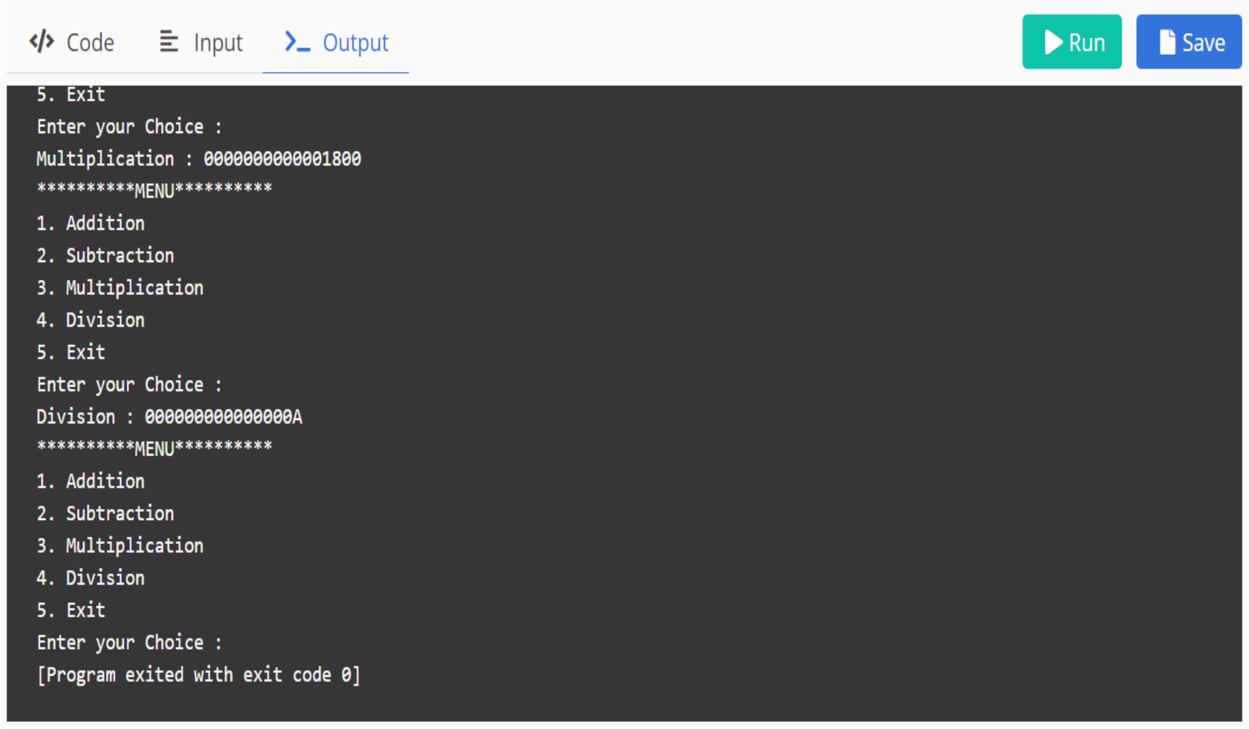


```
1
2
3
4
5
```

Output :



```
**********MENU**********
1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Exit
Enter your Choice :
Addition : 000000000000010A
**********MENU**********
1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Exit
Enter your Choice :
Subtraction : 00000000000000F6
**********MENU**********
1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Exit
Enter your Choice :
Multiplication : 0000000000001800
```



```
5. Exit
Enter your Choice :
Multiplication : 0000000000001800
**********MENU**********
1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Exit
Enter your Choice :
Division : 000000000000000A
**********MENU**********
1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Exit
Enter your Choice :
[Program exited with exit code 0]
```

MICROPROCESSOR LABORATORY

Assignment No. 5

NAME   :- OJUS PRAVIN JAISWAL

ROLL NO. :- SACO19108

DIVISION :- A

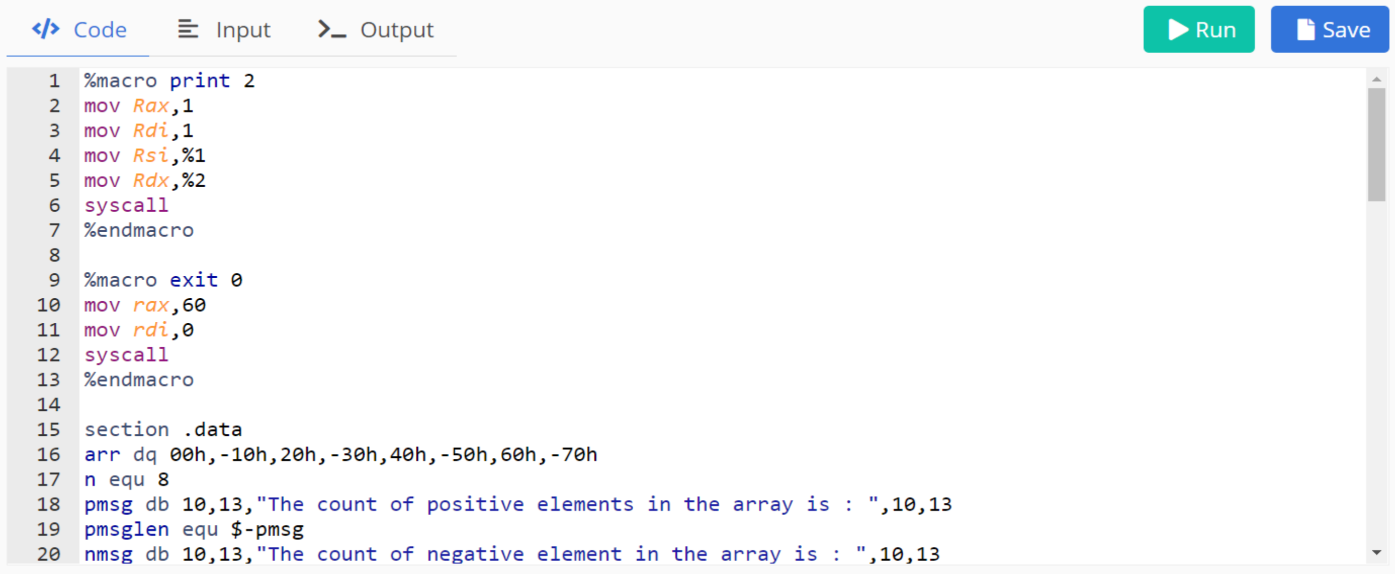
Assignment No. 5

Program :

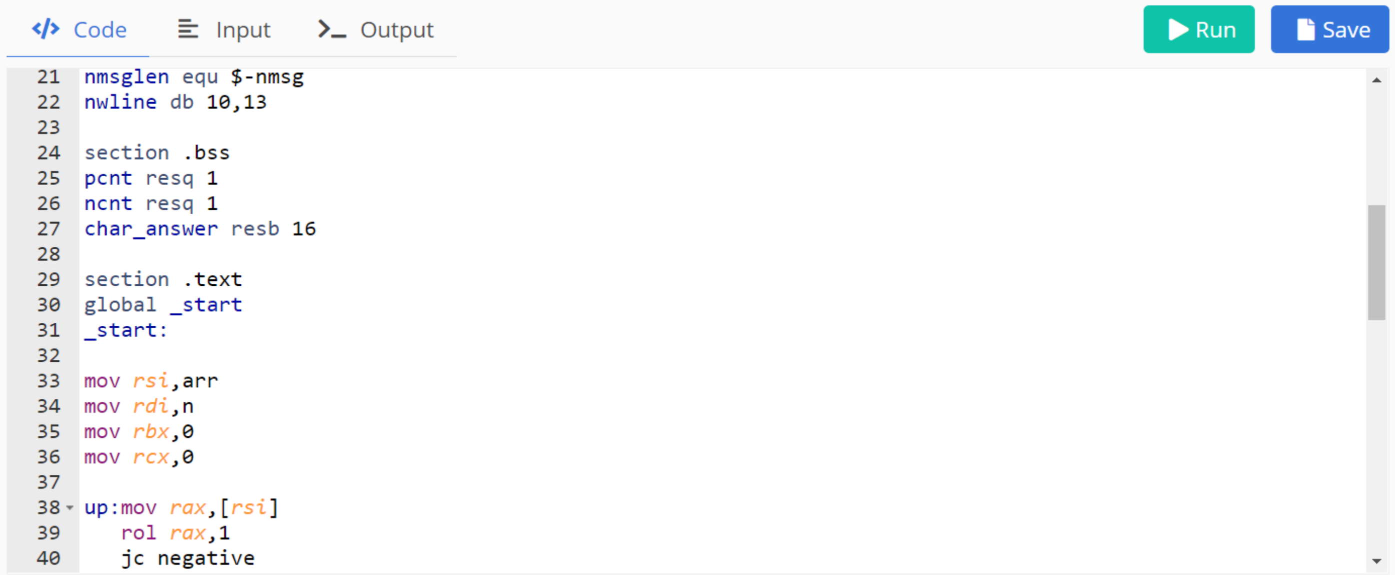
```
%macro print 2
mov Rax,1
mov  Rdi,1
mov Rsi,%1
mov Rdx,%2
syscall
%endmacro

%macro exit 0
mov rax,60
mov rdi,0
syscall
%endmacro

section .data
arr dq 00h,-10h,20h,-30h,40h,-50h,60h,-70h
n equ 8
pmsg db 10,13,"The count of positive elements in the array is : ",10,13
pmsglen equ $-pmsg
nmsg db 10,13,"The count of negative element in the array is : ",10,13
nmsglen equ $-nmsg
nwline db 10,13

section .bss
```

```
pcnt resq 1
ncnt resq 1
char_answer resb 16

section .text
global _start
_start:
mov rsi,arr
mov rdi,n
mov rbx,0
mov rcx,0

up:mov rax,[rsi]
    rol rax,1
    jc negative

positive:inc rbx
           jmp next

negative:inc rcx

next:add rsi,8
      dec rdi
      jnz up

      mov [pcnt],rbx
      mov [ncnt],rcx
```

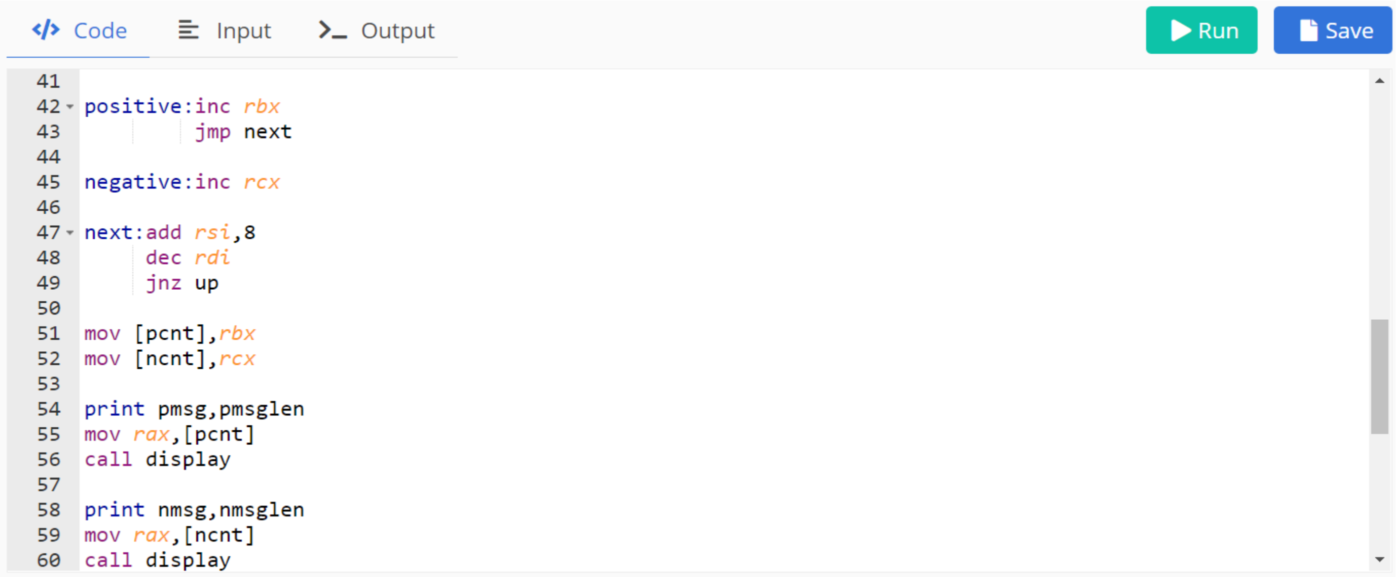
```
        print pmsg,pmsglen
        mov rax,[pcnt]
        call display

        print nmsg,nmsglen
        mov rax,[ncnt]
        call display

        print nwline,1
        exit

display:
 mov rsi,char_answer+15
 mov rcx,16

 cnt:mov rdx,0
       mov rbx,16h
       div rbx
       cmp dl,09h
       jbe add30
       add dl,07h
 add30:add dl,30h
          mov [rsi],dl
          dec rsi
          dec rcx
          jnz cnt
 print char_answer,16
ret
```



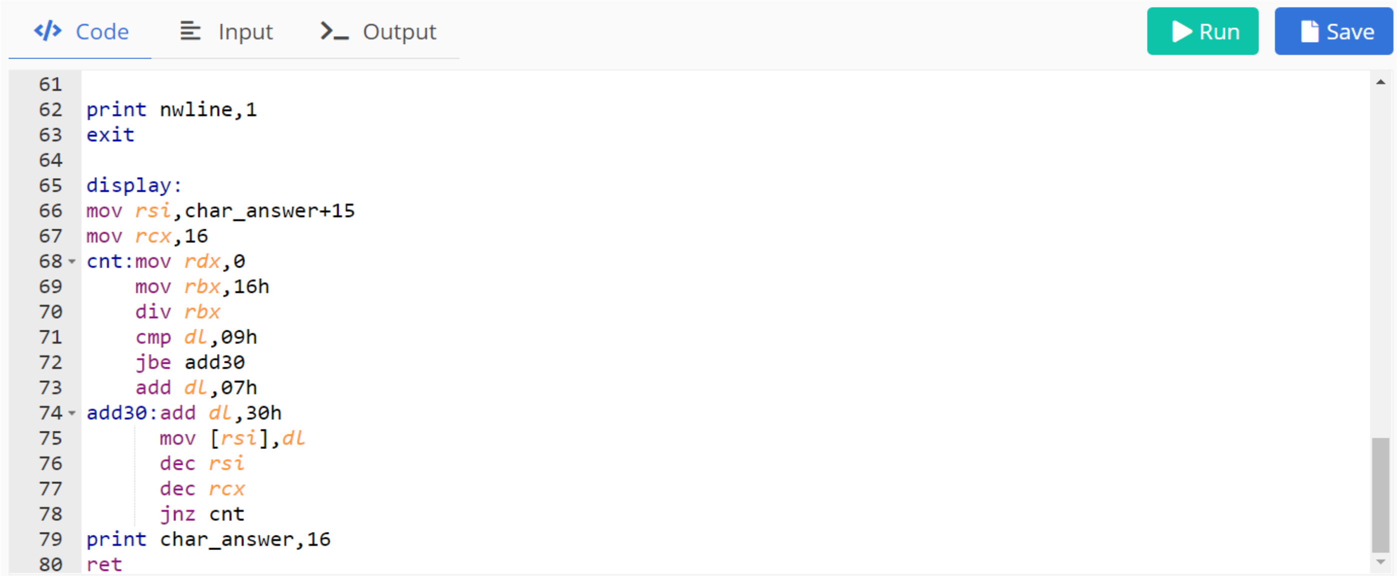
```
%macro print 2
mov Rax,1
mov Rdi,1
mov Rsi,%1
mov Rdx,%2
syscall
%endmacro

%macro exit 0
mov rax,60
mov rdi,0
syscall
%endmacro

section .data
arr dq 00h,-10h,20h,-30h,40h,-50h,60h,-70h
n equ 8
pmsg db 10,13,"The count of positive elements in the array is : ",10,13
pmsglen equ $-pmsg
nmsg db 10,13,"The count of negative element in the array is : ",10,13
```



```
nmsglen equ $-nmsg
nwline db 10,13

section .bss
pcnt resq 1
ncnt resq 1
char_answer resb 16

section .text
global _start
_start:

mov rsi,arr
mov rdi,n
mov rbx,0
mov rcx,0

up:mov rax,[rsi]
   rol rax,1
   jc negative
```

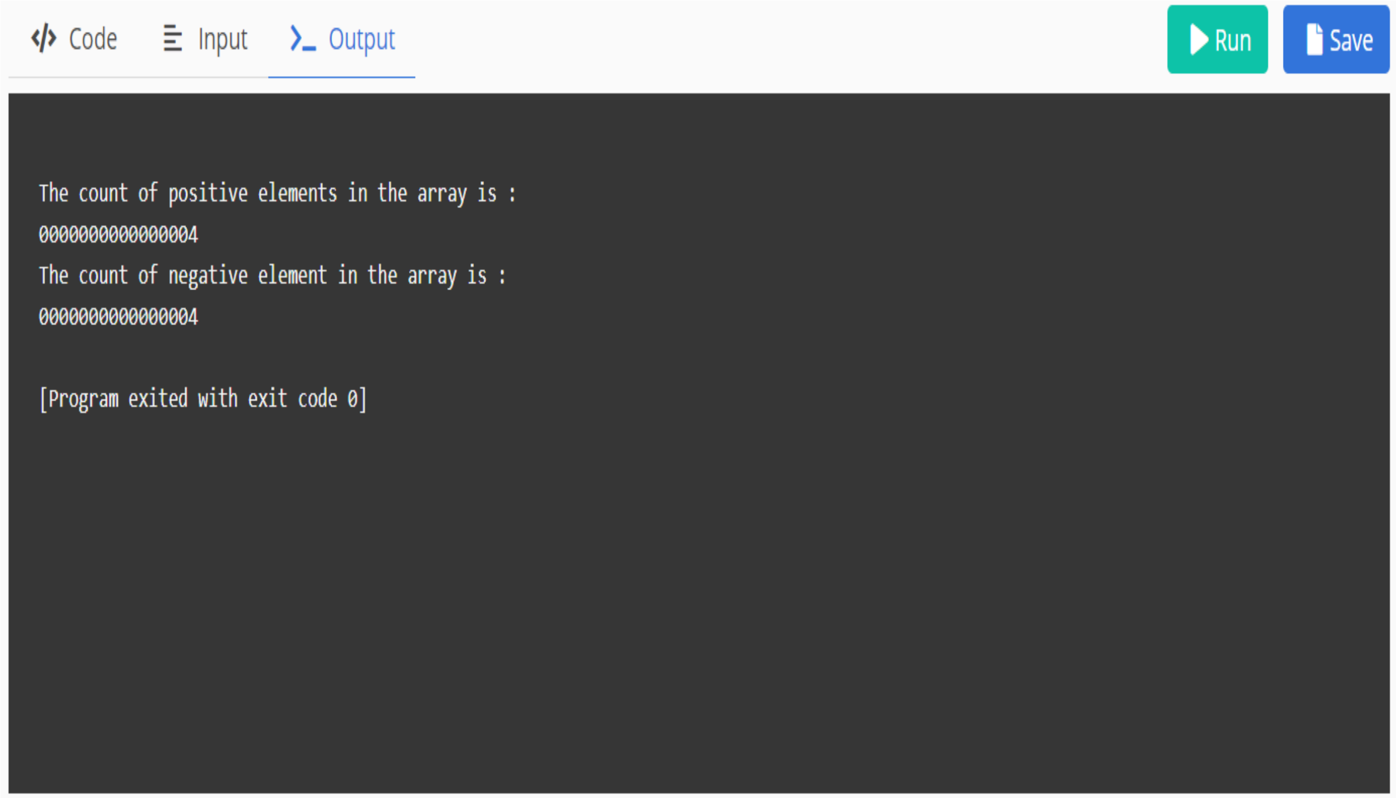


```

positive:inc rbx
         jmp next

negative:inc rcx

next:add rsi,8
     dec rdi
     jnz up

mov [pcnt],rbx
mov [ncnt],rcx

print pmsg,pmsglen
mov rax,[pcnt]
call display

print nmsg,nmsglen
mov rax,[ncnt]
call display
```



```

print nwline,1
exit

display:
mov rsi,char_answer+15
mov rcx,16
cnt:mov rdx,0
    mov rbx,16h
    div rbx
    cmp dl,09h
    jbe add30
    add dl,07h
add30:add dl,30h
      mov [rsi],dl
      dec rsi
      dec rcx
      jnz cnt
print char_answer,16
ret
```

Output :



```
The count of positive elements in the array is :
0000000000000004
The count of negative element in the array is :
0000000000000004

[Program exited with exit code 0]
```

MICROPROCESSOR LABORATORY

ASSIGNMENT NO. 6

Name :- Ojus Pravin Jaiswal

Roll No. :- SACO19108

Division :- A

Assignment No. 6

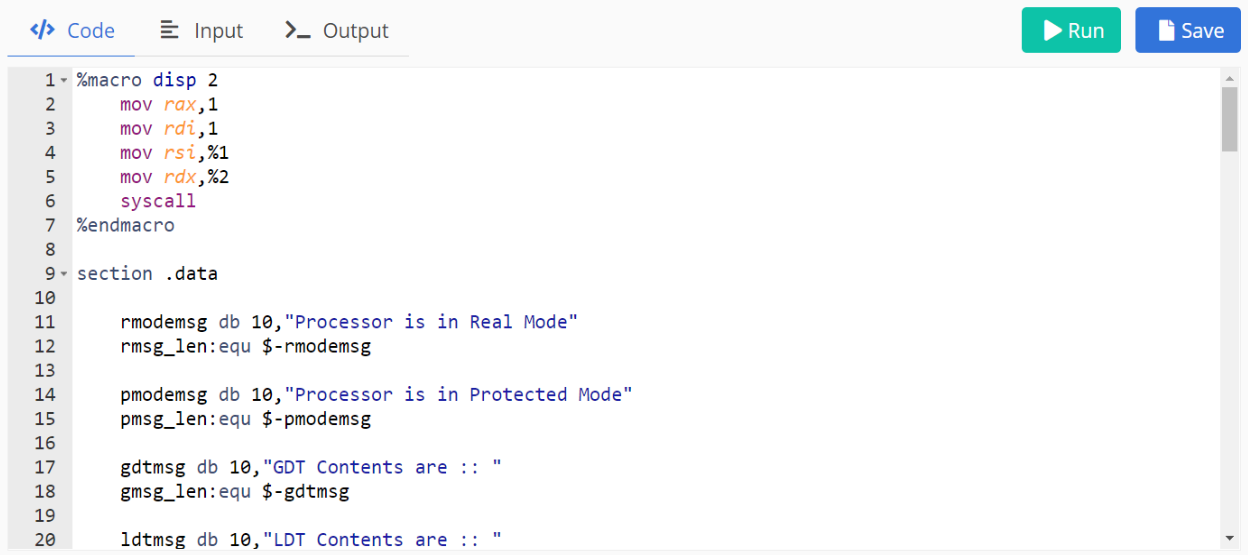
Program :

```
%macro disp 2
    mov rax,1
    mov rdi,1
    mov rsi,%1
    mov rdx,%2
    syscall
%endmacro

section .data

    rmodemsg db 10,"Processor is in Real Mode"
    rmsg_len:equ $-rmodemsg

    pmodemsg db 10,"Processor is in Protected Mode"
    pmsg_len:equ $-pmodemsg

    gdtmsg db 10,"GDT Contents are :: "
    gmsg_len:equ $-gdtmsg

    ldtmsg db 10,"LDT Contents are :: "
    lmsg_len:equ $-ldtmsg

    idtmsg db 10,"IDT Contents are :: "
    imsg_len:equ $-idtmsg
    trmsg db 10,"Task Register Contents are :: "
    tmsg_len:equ $-trmsg

    mswmsg db 10,"Machine Status Word :: "
    mmsg_len:equ $-mswmsg

    promsg db 10,"Processor Information :: "
    promsg_len:equ $-promsg

    colmsg db ':'

    newline db 10

section .bss
    gdt resd 1
        resw 1
    ldt resw 1
    idt resd 1
        resw 1
    tr resw 1
    cr0_data resd 1
    dnum_buff resb 04

section .text
global _start:
_start:
    smsw eax
    mov [cr0_data],eax
    bt eax,0
    jc prmode
    disp rmodemsg,rmsg_len
    jmp nxt1

prmode:disp pmodemsg,pmsg_len

nxt1:sgdt[gdt]
     sldt[ldt]
     sidt[idt]
     str[tr]

     disp gdtmsg,gmsg_len

     mov bx,[gdt+4]
     call disp_num

     mov bx,[gdt+2]
     call disp_num

     disp colmsg,1

     mov bx,[gdt]
     call disp_num

     disp ldtmsg,lmsg_len
```

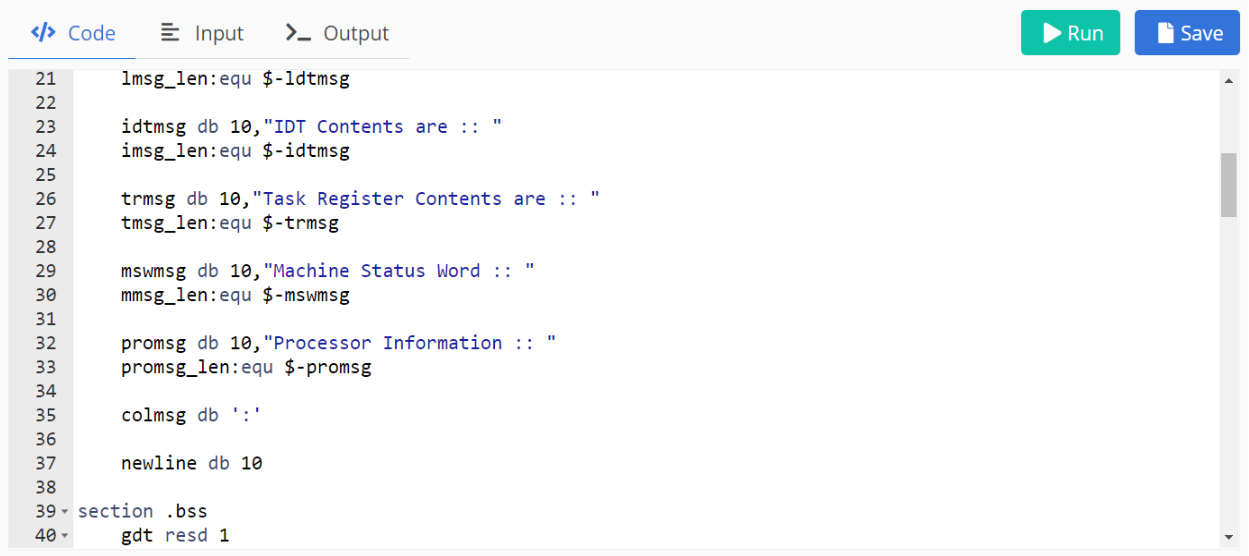
```
mov bx,[ldt]
call disp_num

disp idtmsg,imsg_len

mov bx,[idt+4]
call disp_num

mov bx,[idt+2]
call disp_num

disp colmsg,1

mov bx,[idt]
call disp_num

disp trmsg,tmsg_len

mov bx,[tr]
call disp_num

disp mswmsg,mmsg_len

mov bx,[cr0_data+2]
call disp_num

mov bx,[cr0_data]
call disp_num
```

```
     disp newline,1

     disp promsg,promsg_len

     mov eax,00h
     call disp_num
     cpuid
     call disp_num

exit: mov eax,01
      mov ebx,00
      int 80h

disp_num:
    mov esi,dnum_buff
    mov ecx,04
up1:rol bx,4
    mov dl,bl
    and dl,0fh
    add dl,30h
    cmp dl,39h
    jbe skip1
    add dl,07h
skip1:mov [esi],dl
      inc esi
      loop up1
disp dnum_buff,4
```

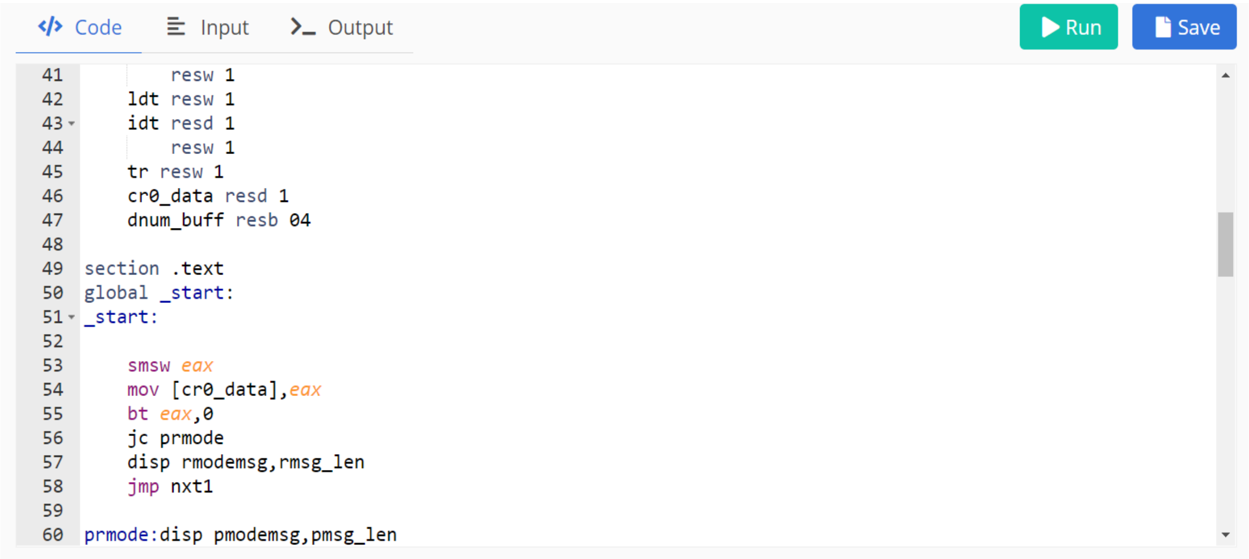
ret



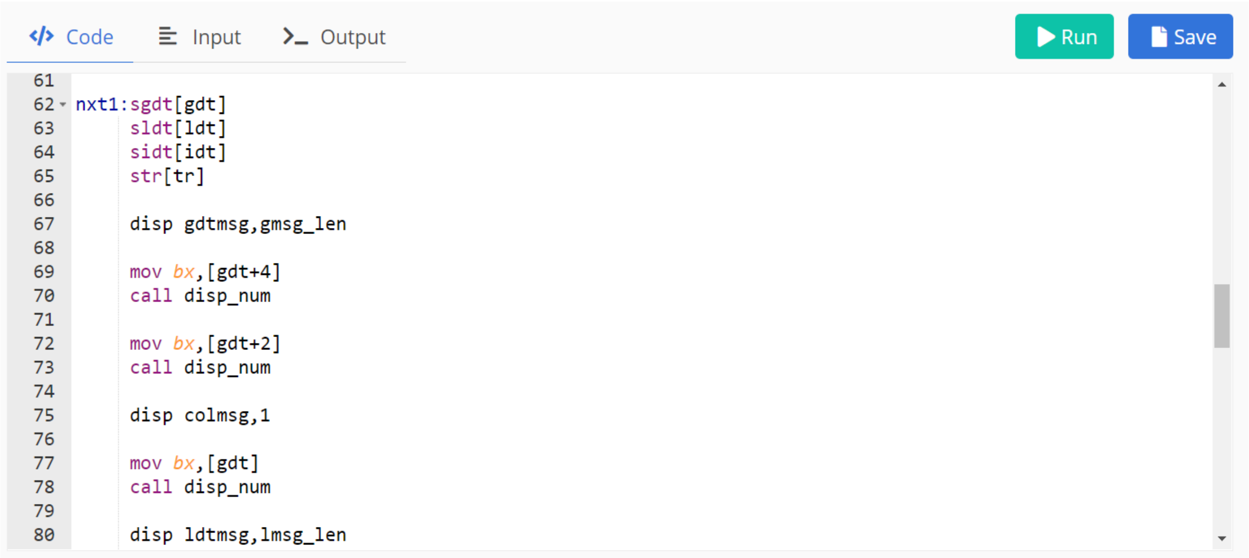
```
%macro disp 2
    mov rax,1
    mov rdi,1
    mov rsi,%1
    mov rdx,%2
    syscall
%endmacro

section .data

    rmodemsg db 10,"Processor is in Real Mode"
    rmsg_len:equ $-rmodemsg

    pmodemsg db 10,"Processor is in Protected Mode"
    pmsg_len:equ $-pmodemsg

    gdtmsg db 10,"GDT Contents are :: "
    gmsg_len:equ $-gdtmsg

    ldtmsg db 10,"LDT Contents are :: "
```



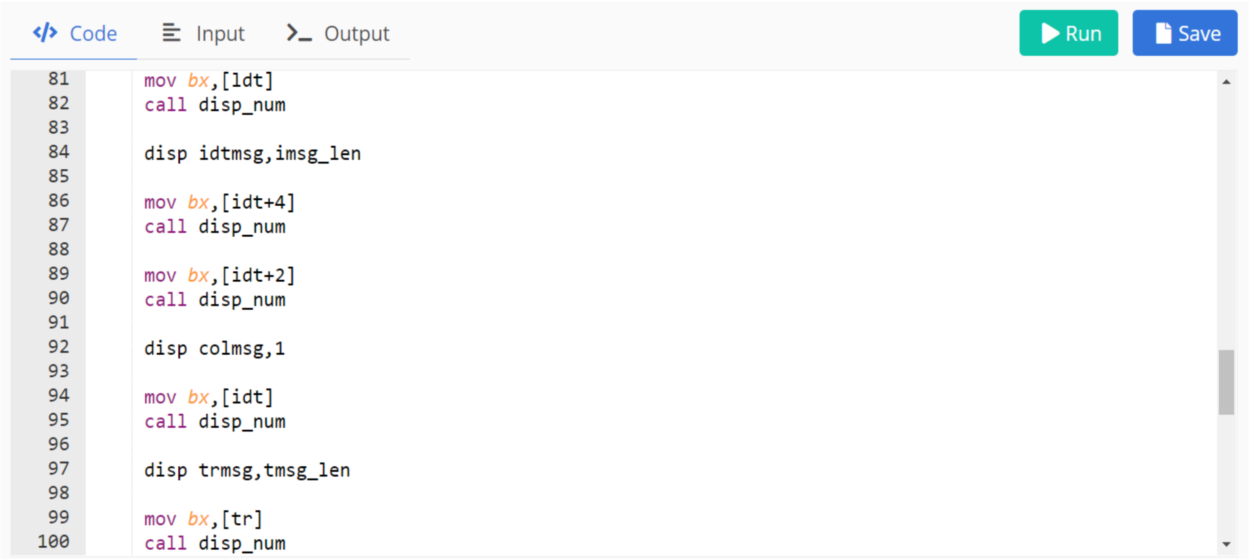
```
    lmsg_len:equ $-ldtmsg

    idtmsg db 10,"IDT Contents are :: "
    imsg_len:equ $-idtmsg

    trmsg db 10,"Task Register Contents are :: "
    tmsg_len:equ $-trmsg

    mswmsg db 10,"Machine Status Word :: "
    mmsg_len:equ $-mswmsg

    promsg db 10,"Processor Information :: "
    promsg_len:equ $-promsg

    colmsg db ':'

    newline db 10

section .bss
    gdt resd 1
```



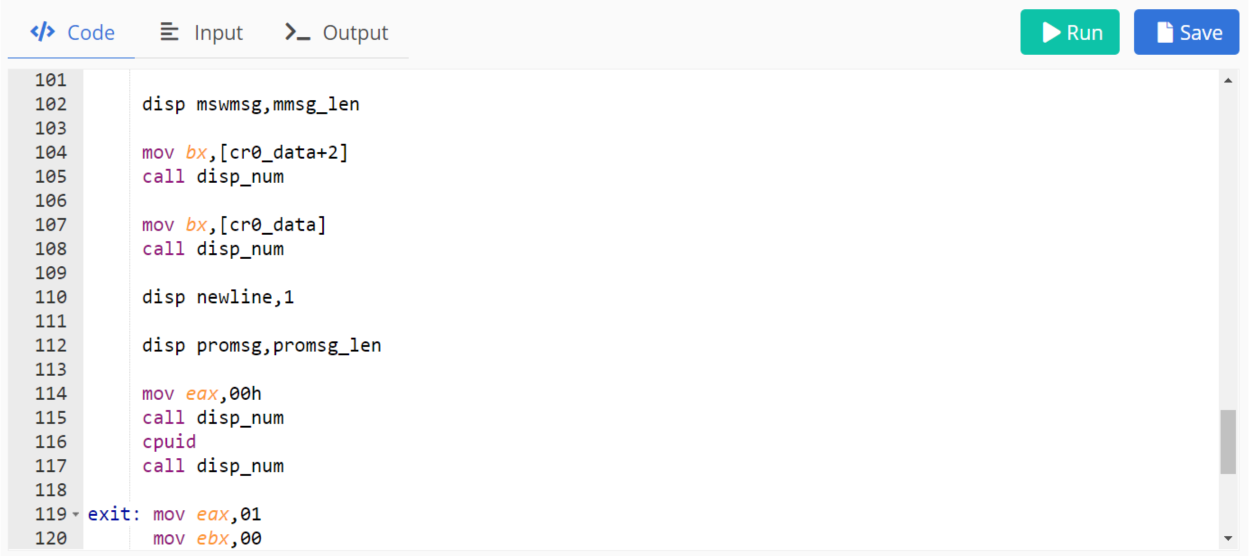
```
        resw 1
    ldt resw 1
    idt resd 1
        resw 1
    tr resw 1
    cr0_data resd 1
    dnum_buff resb 04

section .text
global _start:
_start:

    smsw eax
    mov [cr0_data],eax
    bt eax,0
    jc prmode
    disp rmodemsg,rmsg_len
    jmp nxt1

prmode:disp pmodemsg,pmsg_len
```



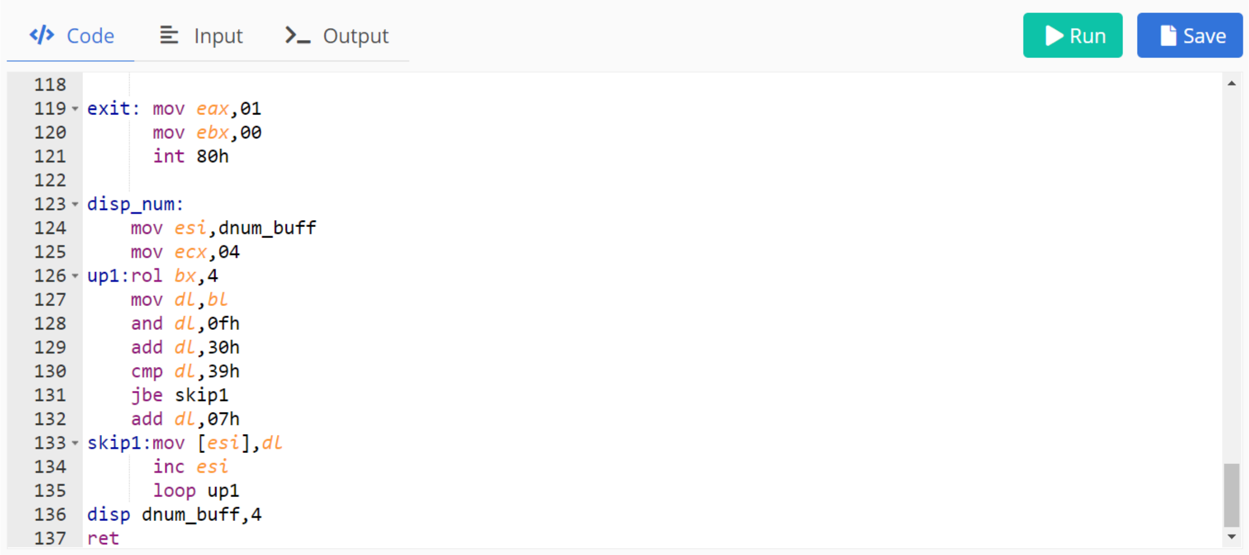
```

nxt1:sgdt[gdt]
     sldt[ldt]
     sidt[idt]
     str[tr]

     disp gdtmsg,gmsg_len

     mov bx,[gdt+4]
     call disp_num

     mov bx,[gdt+2]
     call disp_num

     disp colmsg,1

     mov bx,[gdt]
     call disp_num

     disp ldtmsg,lmsg_len
```



```
     mov bx,[ldt]
     call disp_num

     disp idtmsg,imsg_len

     mov bx,[idt+4]
     call disp_num

     mov bx,[idt+2]
     call disp_num

     disp colmsg,1

     mov bx,[idt]
     call disp_num

     disp trmsg,tmsg_len

     mov bx,[tr]
     call disp_num
```

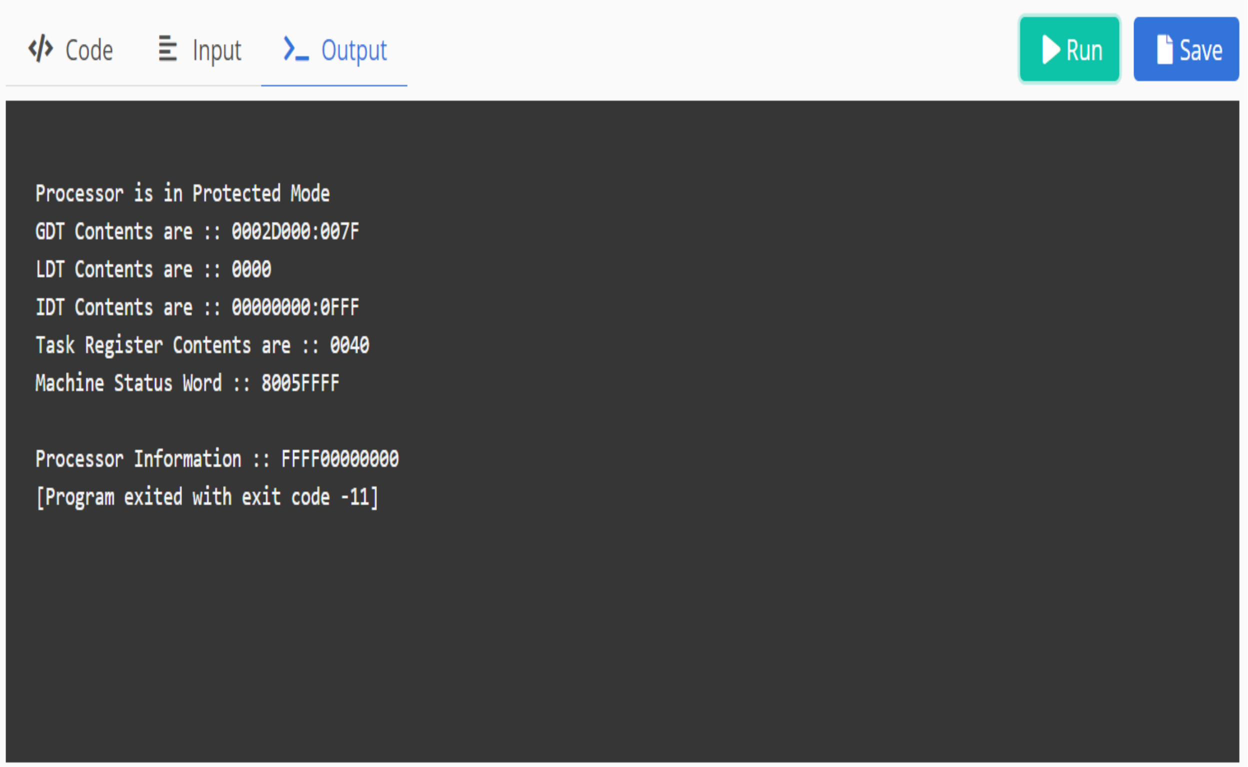


```

    disp mswmsg,mmsg_len

    mov bx,[cr0_data+2]
    call disp_num

    mov bx,[cr0_data]
    call disp_num

    disp newline,1

    disp promsg,promsg_len

    mov eax,00h
    call disp_num
    cpuid
    call disp_num

exit: mov eax,01
      mov ebx,00
```



```

exit: mov eax,01
      mov ebx,00
      int 80h

disp_num:
    mov esi,dnum_buff
    mov ecx,04
up1:rol bx,4
    mov dl,bl
    and dl,0fh
    add dl,30h
    cmp dl,39h
    jbe skip1
    add dl,07h
skip1:mov [esi],dl
      inc esi
      loop up1
disp dnum_buff,4
ret
```

Output :



```
Processor is in Protected Mode
GDT Contents are :: 0002D000:007F
LDT Contents are :: 0000
IDT Contents are :: 00000000:0FFF
Task Register Contents are :: 0040
Machine Status Word :: 8005FFFF

Processor Information :: FFFF00000000
[Program exited with exit code -11]
```

MICROPROCESSOR LABORATORY

Assignment No. 7

NAME :- OJUS PRAVIN JAISWAL
ROLL NO. :- SACO19108
DIVISION :- A

Assignment No. 7

Program :

```
;Non Overlapped Block Transfer

%macro print 2
Mov rax,1
Mov rdi,1
Mov rsi,%1
Mov rdx,%2
syscall
%endmacro

%macro exit 0
mov rax,60
mov rdi,0
syscall
%endmacro

section .data
sblock db 10h,20h,30h,40h,50h
dblock times 5 db 0

msg1 db 10,13,"Before Non Overlapped Block Transfer :- ",10,13
msg1_len equ $-msg1
```

```
msg2 db 10,13,"After Non Overlapped Block Transfer :- ",10,13
msg2_len equ $-msg2

new_line db 10,13

smsg db 10, "Source Block is : "
smsg_len equ $-smsg

dmsg db 10,"Destination Block is : "
dmsg_len equ $-dmsg

space db " "

section .bss
Char_ans resb 2

Section .text
global _start
_start:

print msg1,msg1_len
print smsg,smsg_len
mov rsi,sblock
call block_display

print dmsg,dmsg_len
mov rsi,dblock
call block_display
call block_transfer

print new_line,1
print msg2,msg2_len
print smsg,smsg_len
mov rsi,sblock
call block_display

print dmsg,dmsg_len
mov rsi,dblock
call block_display
print new_line,1

exit

block_transfer:
mov rsi,sblock
mov rdi,dblock
mov rcx,5
up:
mov al,[rsi]
mov [rdi],al
inc rsi
inc rdi
dec rcx
jnz up
ret
```

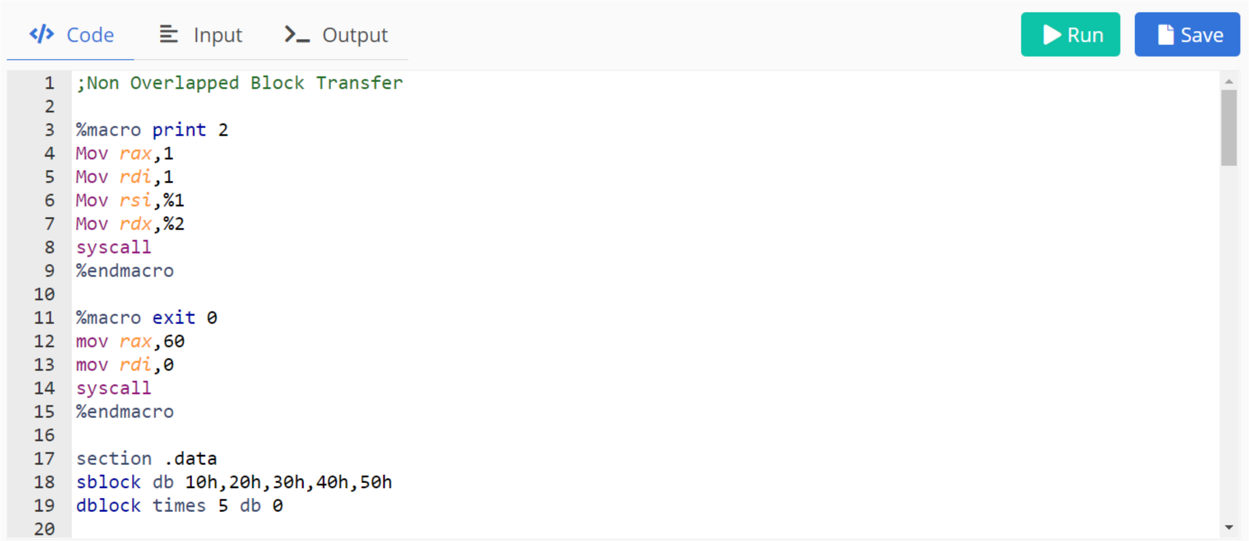
```
block_display:
mov rbp,5
next:
mov al,[rsi]
push rsi
call display
print space,1
pop rsi
inc rsi
dec rbp
jnz next
ret

display:
Mov rsi,Char_ans+1
mov rcx,2
mov rbx,16
up1:
xor rdx,rdx
div rbx
cmp dl,09
jbe add30
add dl,07h
add30:
add dl,30h
mov [rsi],dl
dec rsi
```

dec rcx

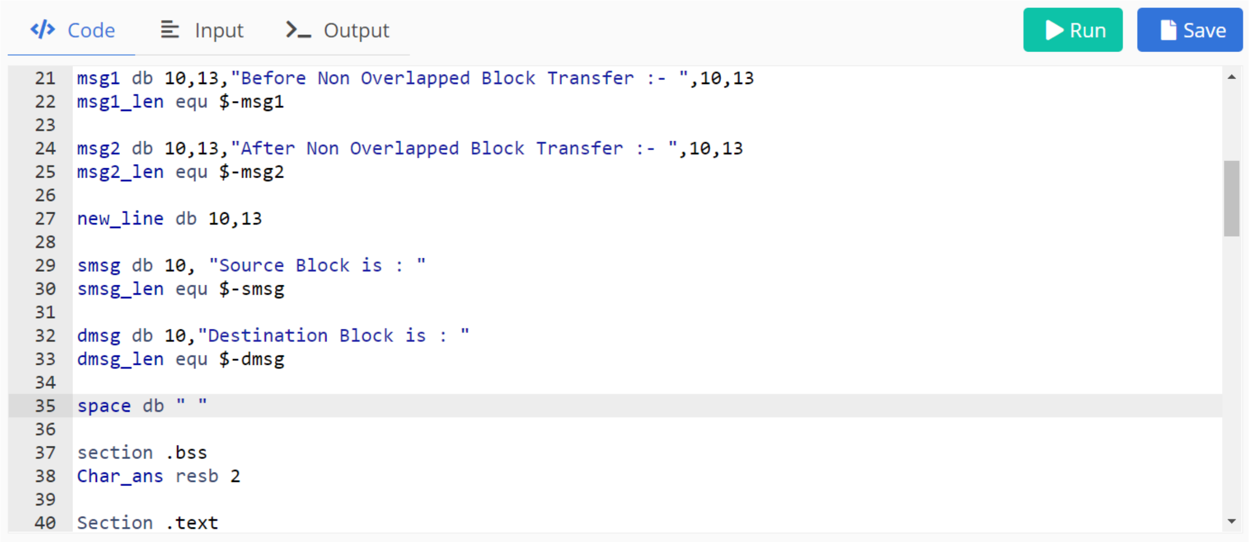
jnz up1

print Char_ans,2

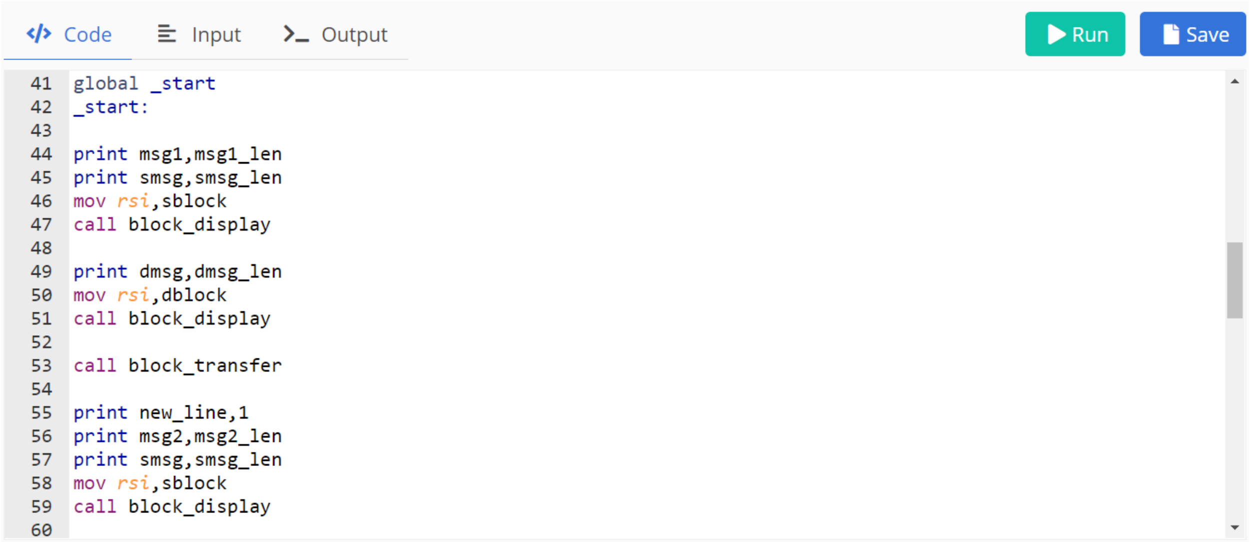
ret



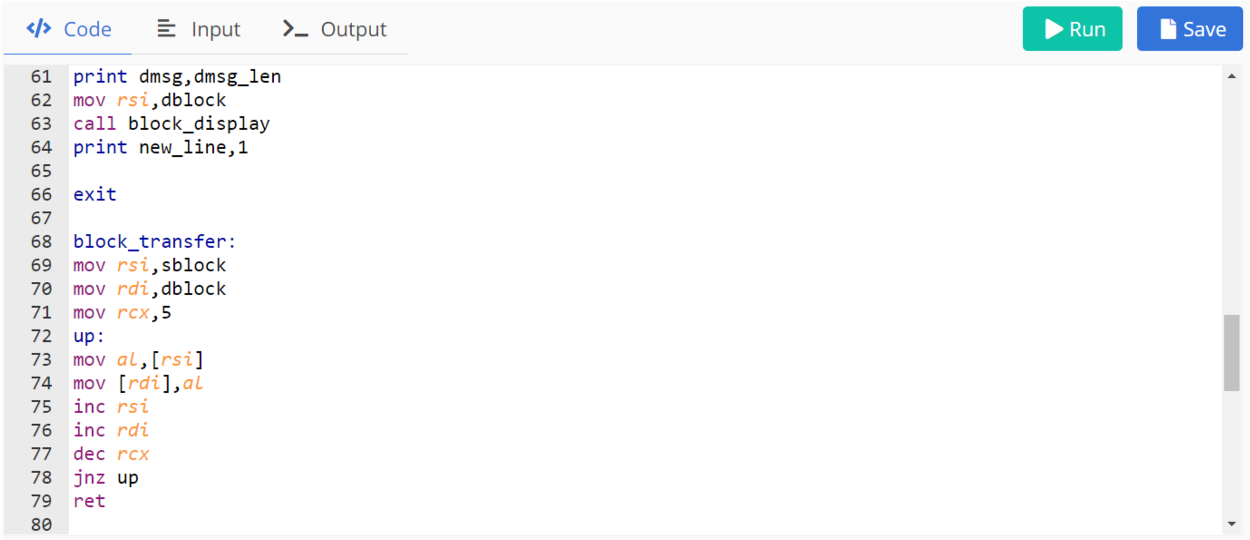
```
;Non Overlapped Block Transfer

%macro print 2
Mov rax,1
Mov rdi,1
Mov rsi,%1
Mov rdx,%2
syscall
%endmacro

%macro exit 0
mov rax,60
mov rdi,0
syscall
%endmacro

section .data
sblock db 10h,20h,30h,40h,50h
dblock times 5 db 0

```



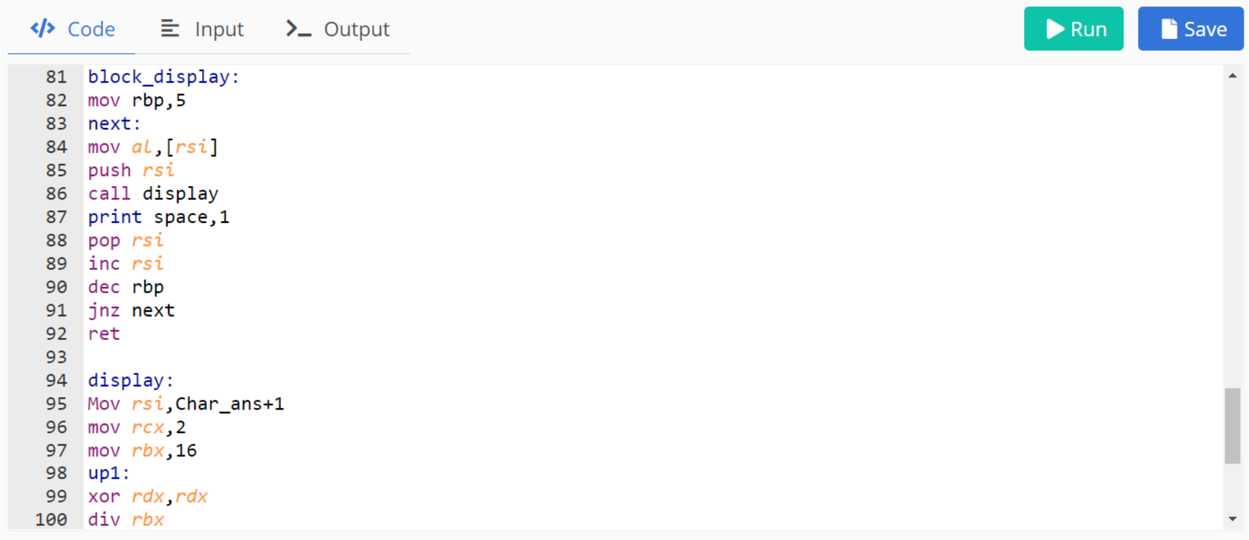
```
msg1 db 10,13,"Before Non Overlapped Block Transfer :- ",10,13
msg1_len equ $-msg1

msg2 db 10,13,"After Non Overlapped Block Transfer :- ",10,13
msg2_len equ $-msg2

new_line db 10,13

smsg db 10, "Source Block is : "
smsg_len equ $-smsg

dmsg db 10,"Destination Block is : "
dmsg_len equ $-dmsg

space db " "

section .bss
Char_ans resb 2

Section .text
```



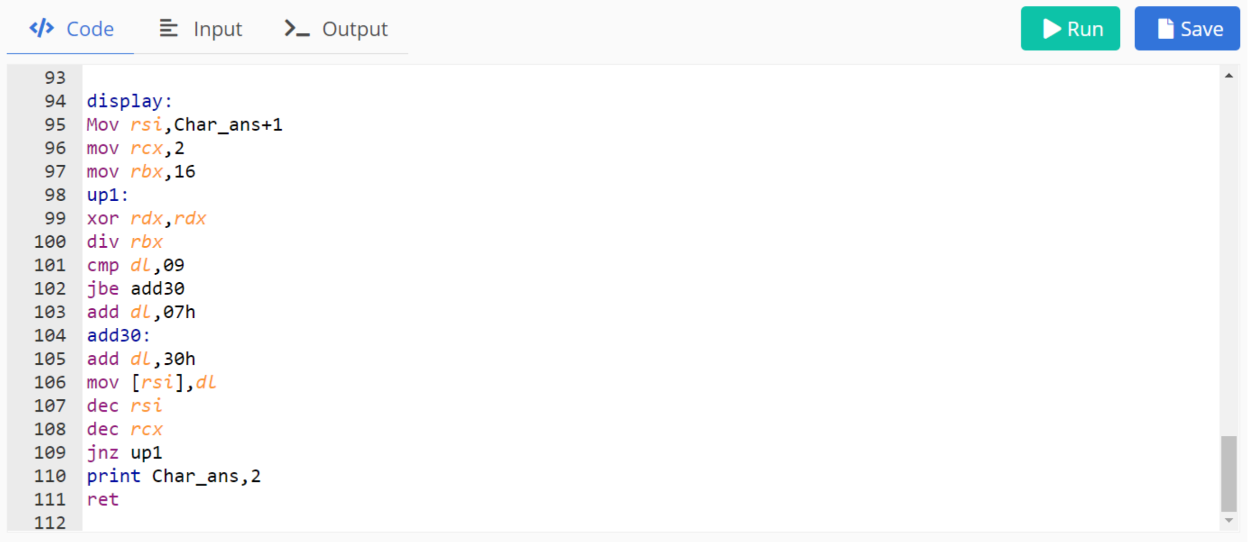
```
global _start
_start:

print msg1,msg1_len
print smsg,smsg_len
mov rsi,sblock
call block_display

print dmsg,dmsg_len
mov rsi,dblock
call block_display

call block_transfer

print new_line,1
print msg2,msg2_len
print smsg,smsg_len
mov rsi,sblock
call block_display

```



```
print dmsg,dmsg_len
mov rsi,dblock
call block_display
print new_line,1

exit

block_transfer:
mov rsi,sblock
mov rdi,dblock
mov rcx,5
up:
mov al,[rsi]
mov [rdi],al
inc rsi
inc rdi
dec rcx
jnz up
ret

```

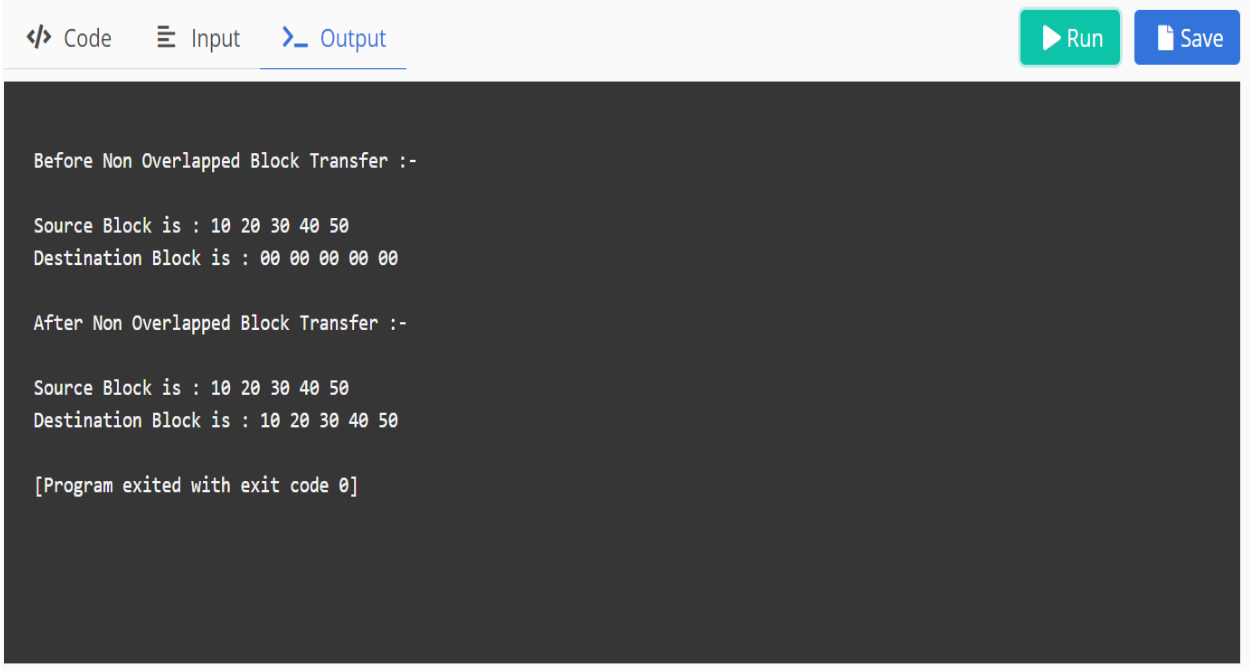


```
block_display:
mov rbp,5
next:
mov al,[rsi]
push rsi
call display
print space,1
pop rsi
inc rsi
dec rbp
jnz next
ret

display:
Mov rsi,Char_ans+1
mov rcx,2
mov rbx,16
up1:
xor rdx,rdx
div rbx
```



```

display:
Mov rsi,Char_ans+1
mov rcx,2
mov rbx,16
up1:
xor rdx,rdx
div rbx
cmp dl,09
jbe add30
add dl,07h
add30:
add dl,30h
mov [rsi],dl
dec rsi
dec rcx
jnz up1
print Char_ans,2
ret

```

Output :



```
Before Non Overlapped Block Transfer :-

Source Block is : 10 20 30 40 50
Destination Block is : 00 00 00 00 00

After Non Overlapped Block Transfer :-

Source Block is : 10 20 30 40 50
Destination Block is : 10 20 30 40 50

[Program exited with exit code 0]
```

MICROPROCESSOR LABORATORY

ASSIGNMENT NO. 8

NAME :- OJUS PRAVIN JAISWAL

ROLL NO. :- SACO19108

DIVISION :- A

Assignment No. 8

Program :

```
;Overlapped Block Transfer

%macro print 2
Mov rax,1
Mov rdi,1
Mov rsi,%1
Mov rdx,%2
syscall
%endmacro

%macro exit 0
mov rax,60
mov rdi,0
syscall
%endmacro

section .data
sblock db 10h,20h,30h,40h,50h
dblock times 5 db 0

msg1 db 10,13,"Before Overlapped Block Transfer :- ",10,13
msg1_len equ $-msg1
```

```
msg2 db 10,13,"After Overlapped Block Transfer :- ",10,13
msg2_len equ $-msg2

new_line db 10,13

smsg db 10, "Source Block is : "
smsg_len equ $-smsg

dmsg db 10,"Destination Block is : "
dmsg_len equ $-dmsg

space db " "

section .bss
Char_ans resb 2

Section .text
global  _start
_start:

print msg1,msg1_len
print smsg,smsg_len
mov rsi,sblock
call block_display

print dmsg,dmsg_len
mov rsi,dblock-2
call block_display
call block_transfer

print new_line,1
print msg2,msg2_len
print smsg,smsg_len
mov rsi,sblock
call block_display

print dmsg,dmsg_len
mov rsi,dblock-2
call block_display
print new_line,1

exit

block_transfer:
mov rsi,sblock+4
mov rdi,dblock+4
mov rcx,5
up:
mov al,[rsi]
mov [rdi],al
dec rsi
dec rdi
dec rcx
jnz up
ret
```

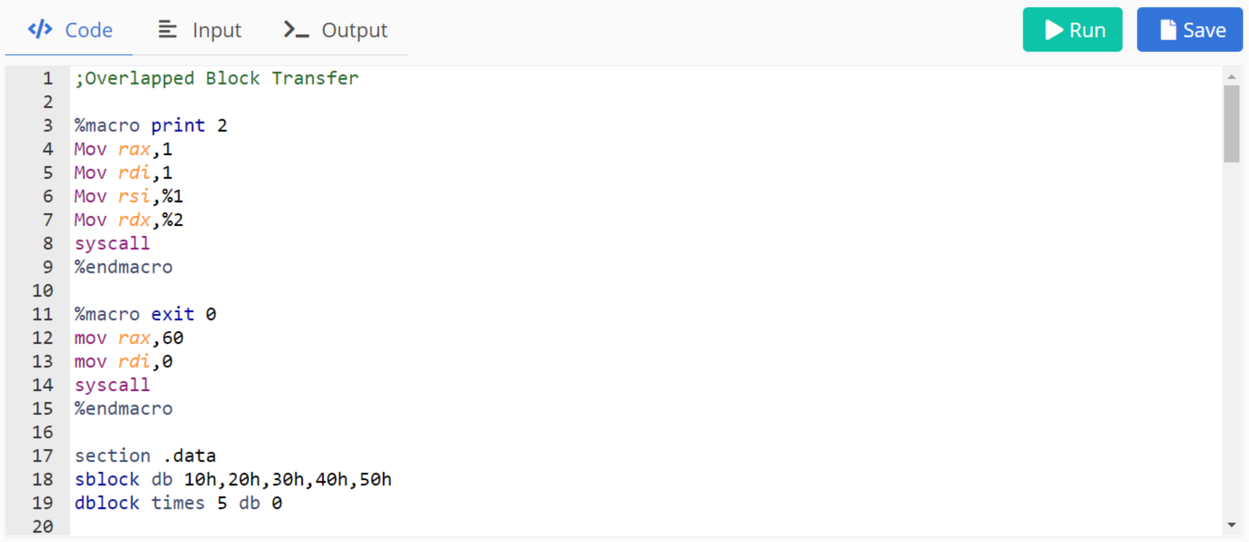
```
block_display:
mov rbp,5
next:
mov al,[rsi]
push rsi
call display
print space,1
pop rsi
inc rsi
dec rbp
jnz next
ret

display:
Mov rsi,Char_ans+1
mov rcx,2
mov rbx,16
up1:
xor rdx,rdx
div rbx
cmp dl,09
jbe add30
add dl,07h
add30:
add dl,30h
mov [rsi],dl
dec rsi
```

dec rcx

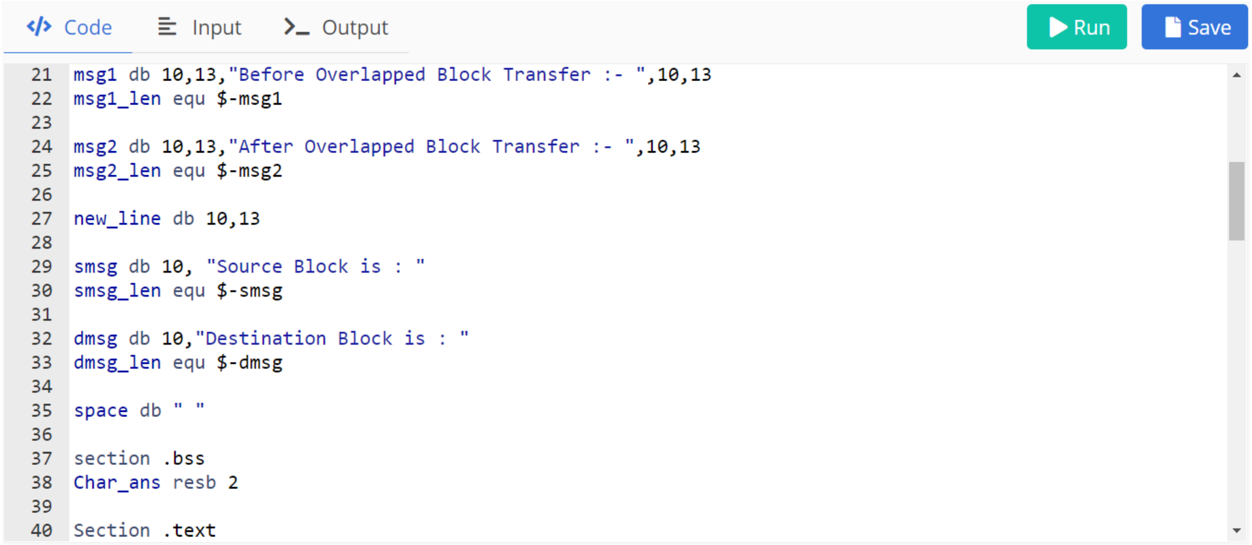
jnz up1

print Char_ans,2

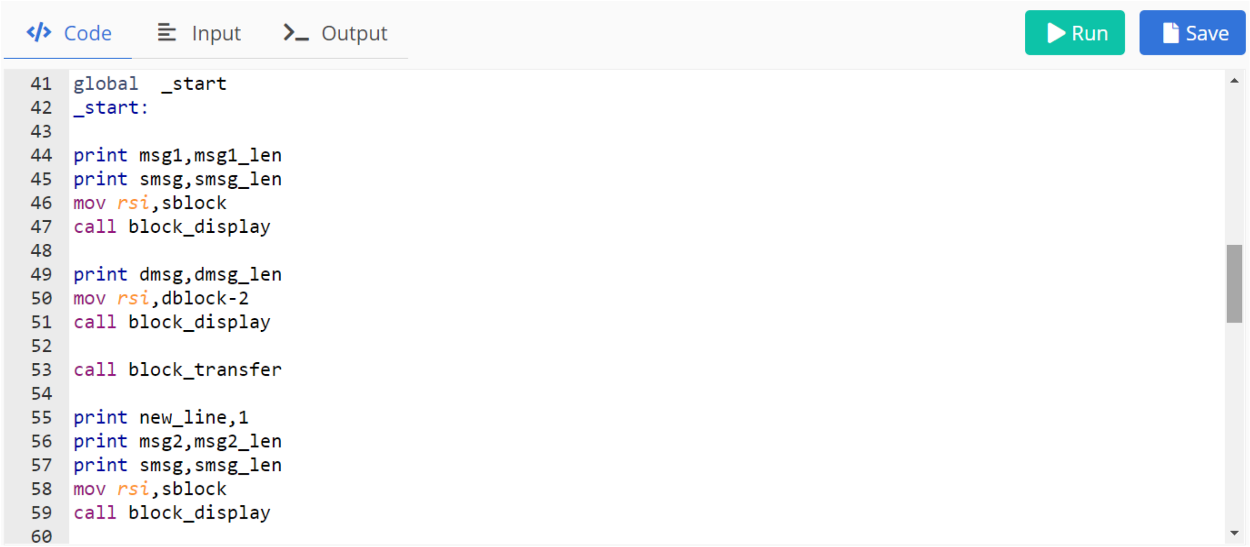
ret



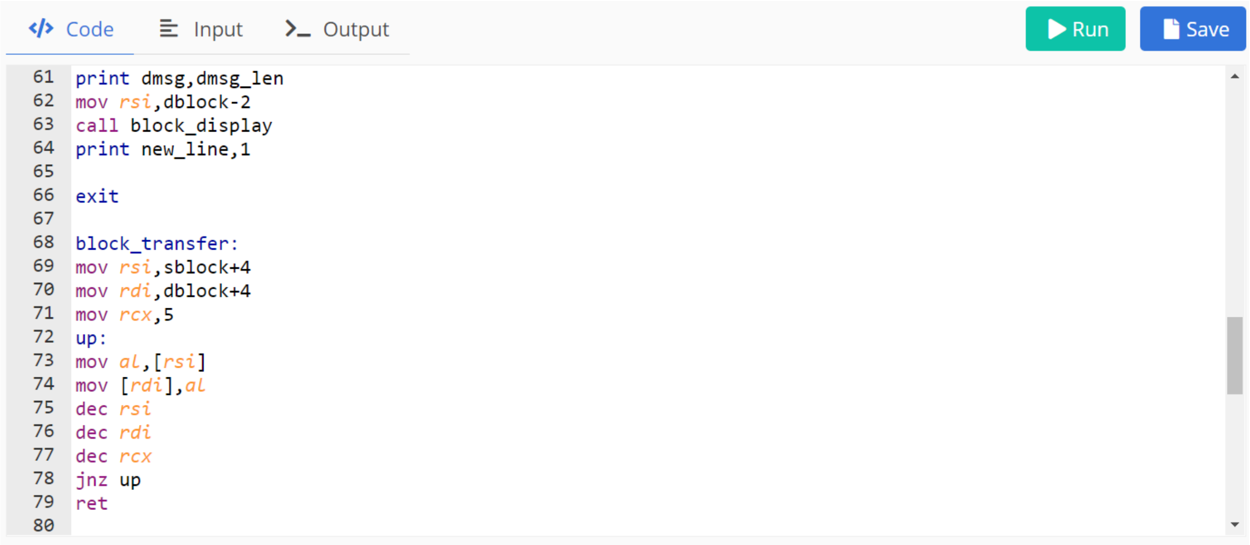
```
;Overlapped Block Transfer

%macro print 2
Mov rax,1
Mov rdi,1
Mov rsi,%1
Mov rdx,%2
syscall
%endmacro

%macro exit 0
mov rax,60
mov rdi,0
syscall
%endmacro

section .data
sblock db 10h,20h,30h,40h,50h
dblock times 5 db 0

```



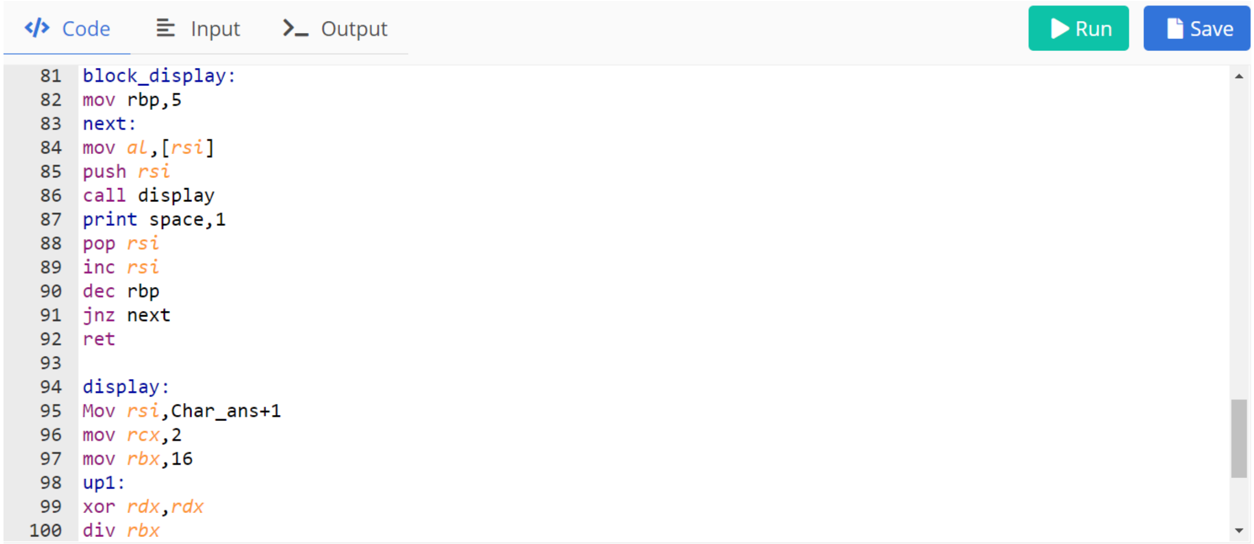
```
msg1 db 10,13,"Before Overlapped Block Transfer :- ",10,13
msg1_len equ $-msg1

msg2 db 10,13,"After Overlapped Block Transfer :- ",10,13
msg2_len equ $-msg2

new_line db 10,13

smsg db 10, "Source Block is : "
smsg_len equ $-smsg

dmsg db 10,"Destination Block is : "
dmsg_len equ $-dmsg

space db " "

section .bss
Char_ans resb 2

Section .text
```



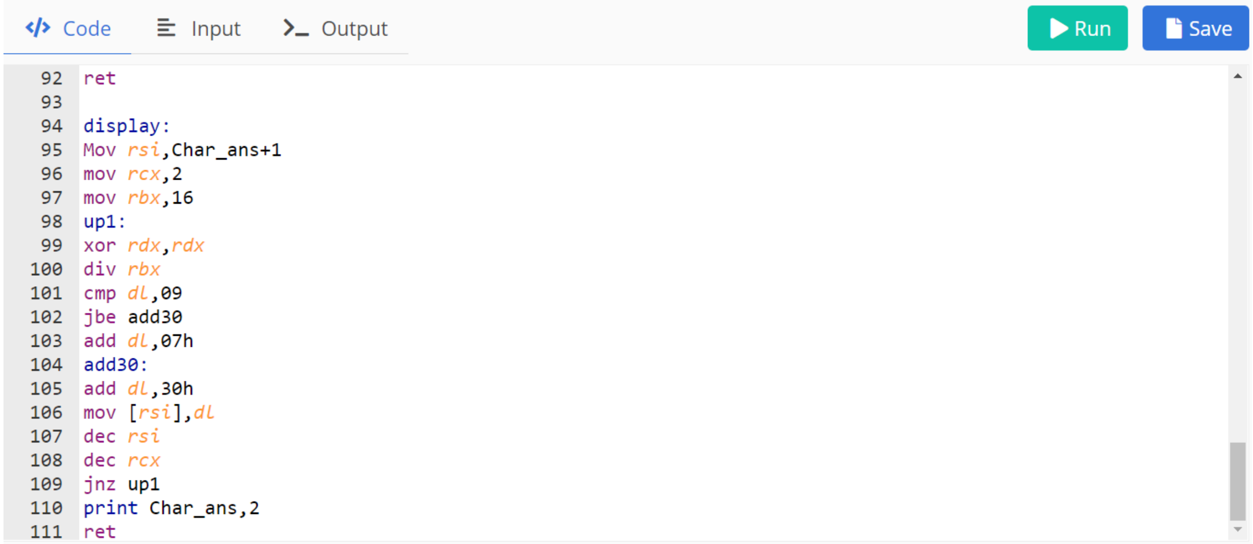
```
global  _start
_start:

print msg1,msg1_len
print smsg,smsg_len
mov rsi,sblock
call block_display

print dmsg,dmsg_len
mov rsi,dblock-2
call block_display

call block_transfer

print new_line,1
print msg2,msg2_len
print smsg,smsg_len
mov rsi,sblock
call block_display

```



```
print dmsg,dmsg_len
mov rsi,dblock-2
call block_display
print new_line,1

exit

block_transfer:
mov rsi,sblock+4
mov rdi,dblock+4
mov rcx,5
up:
mov al,[rsi]
mov [rdi],al
dec rsi
dec rdi
dec rcx
jnz up
ret

```

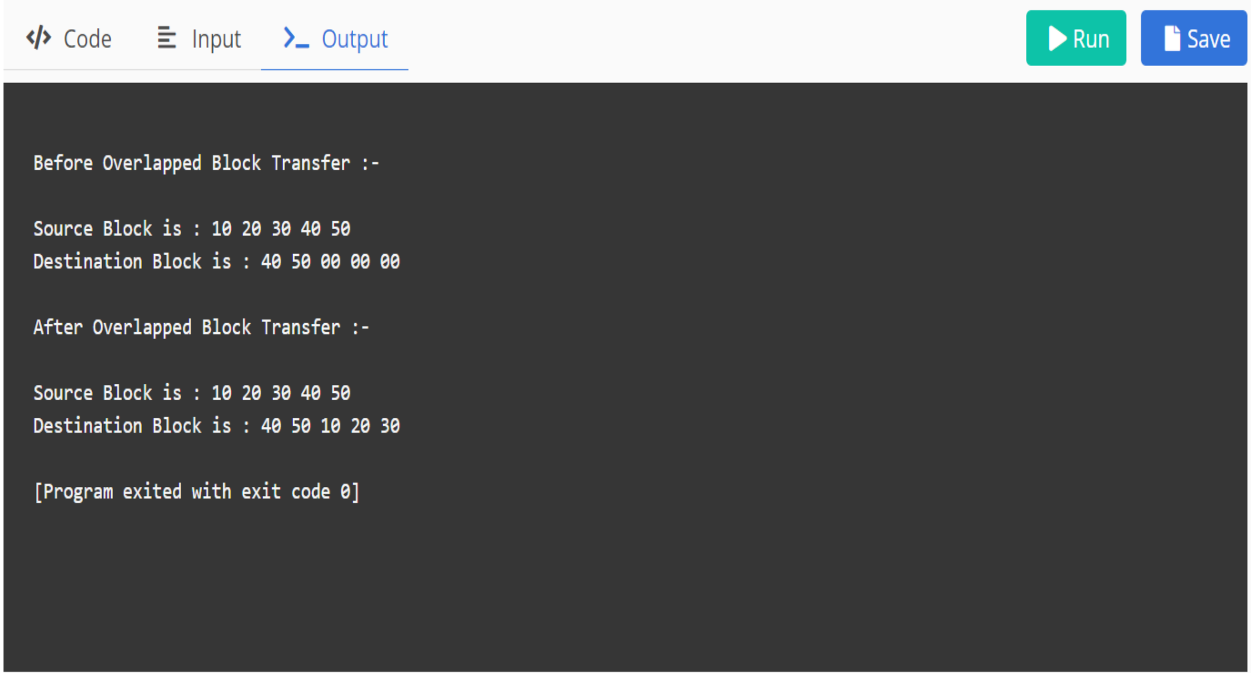


```
block_display:
mov rbp,5
next:
mov al,[rsi]
push rsi
call display
print space,1
pop rsi
inc rsi
dec rbp
jnz next
ret

display:
Mov rsi,Char_ans+1
mov rcx,2
mov rbx,16
up1:
xor rdx,rdx
div rbx
```



```
ret

display:
Mov rsi,Char_ans+1
mov rcx,2
mov rbx,16
up1:
xor rdx,rdx
div rbx
cmp dl,09
jbe add30
add dl,07h
add30:
add dl,30h
mov [rsi],dl
dec rsi
dec rcx
jnz up1
print Char_ans,2
ret
```

Output :



```
Before Overlapped Block Transfer :-

Source Block is : 10 20 30 40 50
Destination Block is : 40 50 00 00 00

After Overlapped Block Transfer :-

Source Block is : 10 20 30 40 50
Destination Block is : 40 50 10 20 30

[Program exited with exit code 0]
```

MICROPROCESSOR LABORATORY

ASSIGNMENT NO. 9

Name :- Ojus Pravin Jaiswal
Roll No. :- SACO19108
Division :- A

Assignment No. 9

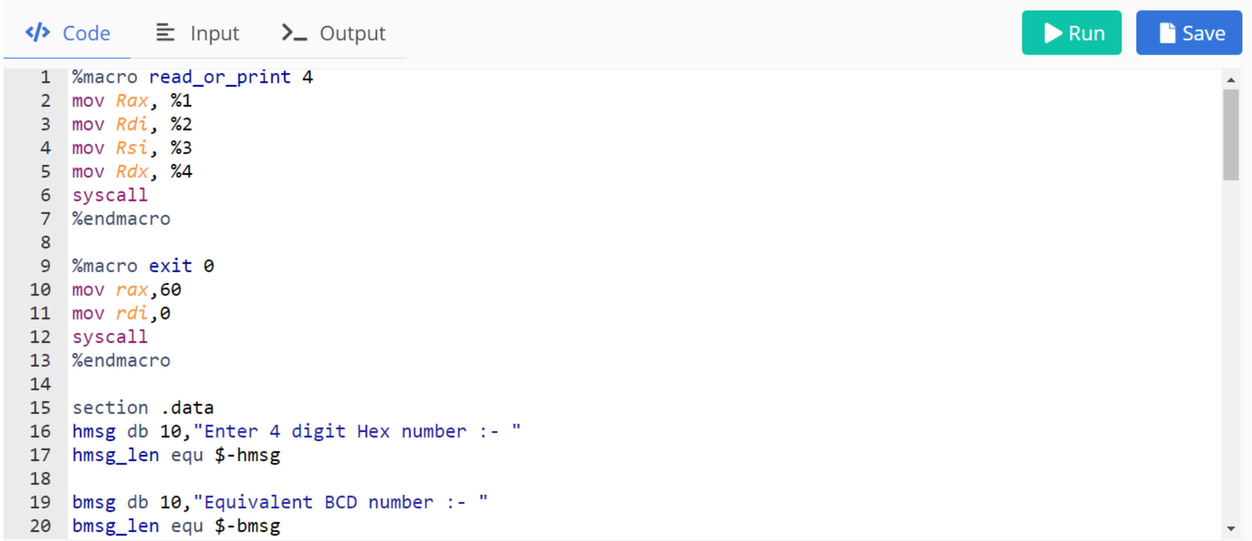
Program :

```
%macro read_or_print 4
mov Rax, %1
mov Rdi, %2
mov Rsi, %3
mov Rdx, %4
syscall
%endmacro

%macro exit 0
mov rax,60
mov rdi,0
syscall
%endmacro

section .data
hmsg db 10,"Enter 4 digit Hex number :- "
hmsg_len equ $-hmsg

bmsg db 10,"Equivalent BCD number :- "
bmsg_len equ $-bmsg

errmsg db 10,"Please enter valid hex number !!!"
errmsg_len equ $-errmsg
```

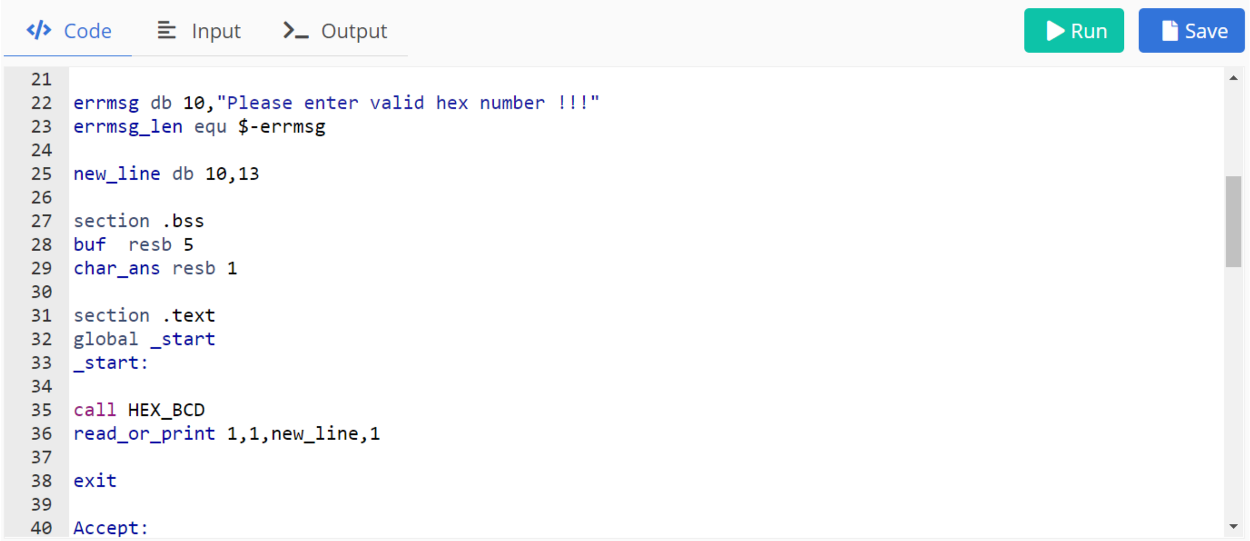
```
new_line db 10,13

section .bss
buf  resb 5
char_ans resb 1

section .text
global _start
_start:

call HEX_BCD
read_or_print 1,1,new_line,1

exit

Accept:
read_or_print 0,0,buf,5
mov rcx,4
mov rsi,buf
xor bx,bx
up: shl bx,4
mov al,[rsi]
cmp al,'0'
jb error
cmp al,'9'
jbe sub30
cmp al,'A'
```

```
jb error
cmp al,'F'
jbe sub37
cmp al,'a'
jb error
cmp al,'f'
jbe sub57

sub57:sub al,20h
sub37:sub al,07h
sub30:sub al,30h

add bx,ax
inc rsi
dec rcx
jnz up
ret

error: read_or_print 1,1,errmsg,errmsg_len

exit

HEX_BCD:
read_or_print 1,1,hmsg,hmsg_len
call Accept
read_or_print 1,1,buf,5
mov ax,bx
mov bx,10
```

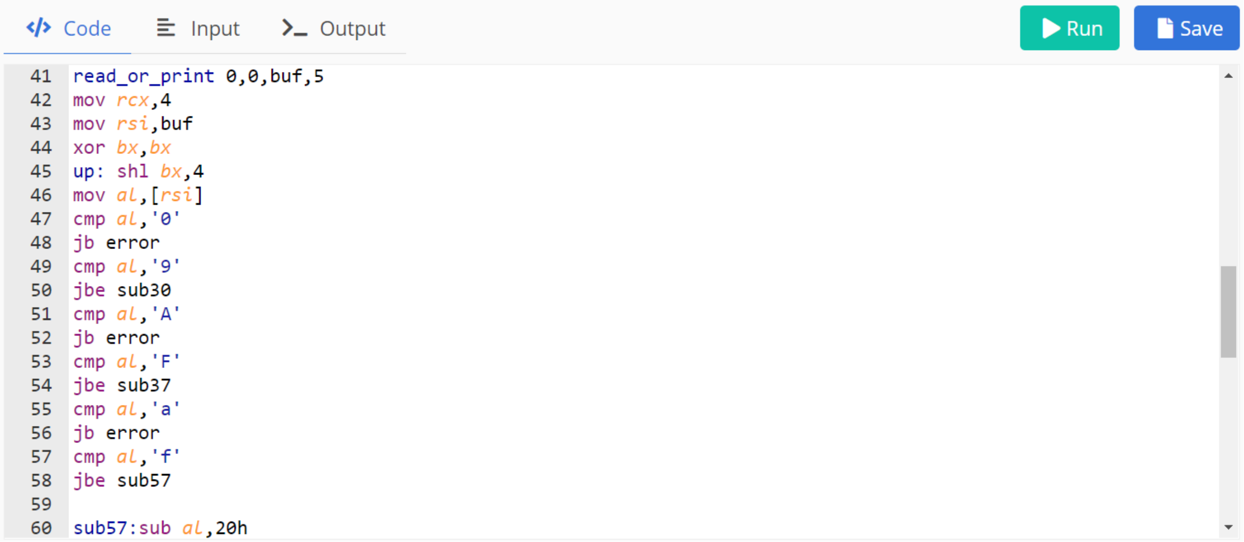
```
xor bp,bp
back: xor dx,dx
div bx
push dx
inc bp
cmp ax,0
jne back

read_or_print 1,1,bmsg,bmsg_len
back1:pop dx
add dl,30h
mov [char_ans],dl
read_or_print 1,1,char_ans,1
dec bp
jnz back1
ret
```



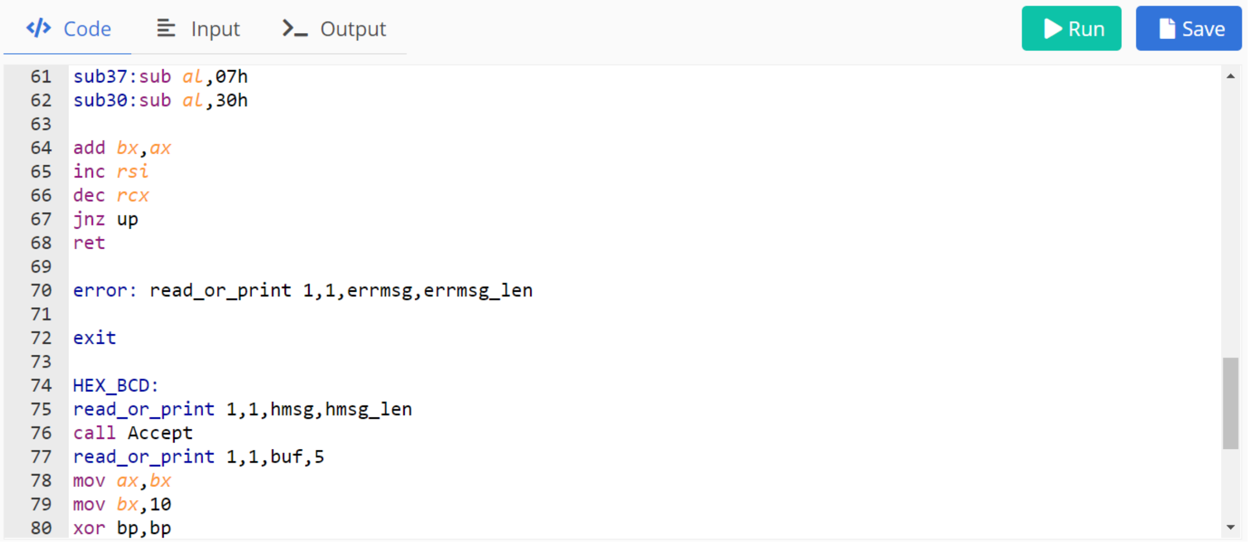
```
%macro read_or_print 4
mov Rax, %1
mov Rdi, %2
mov Rsi, %3
mov Rdx, %4
syscall
%endmacro

%macro exit 0
mov rax,60
mov rdi,0
syscall
%endmacro

section .data
hmsg db 10,"Enter 4 digit Hex number :- "
hmsg_len equ $-hmsg

bmsg db 10,"Equivalent BCD number :- "
bmsg_len equ $-bmsg
```



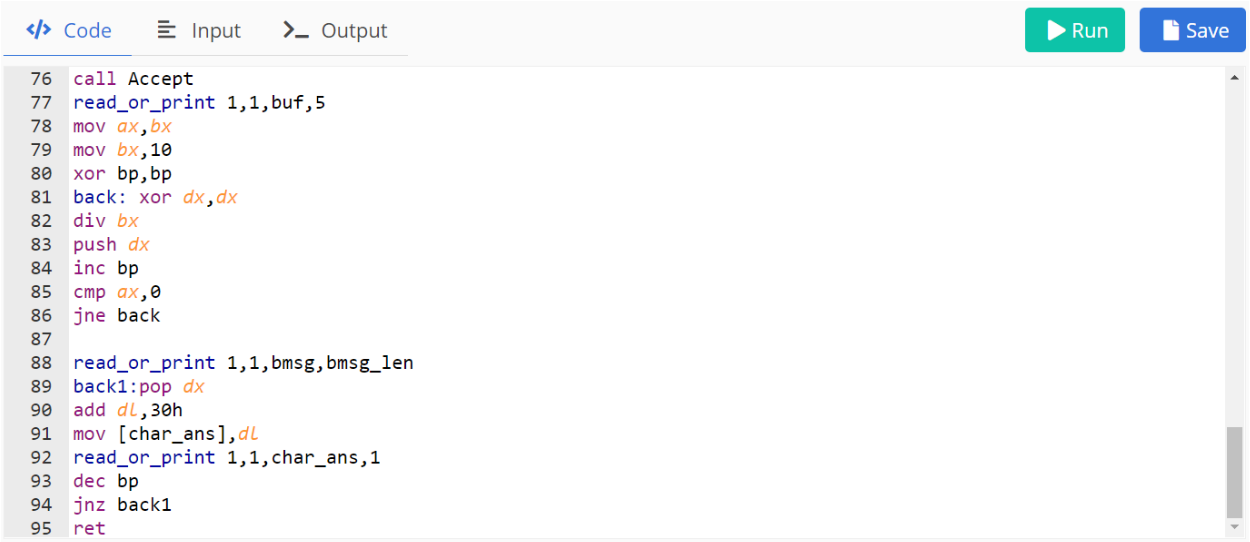
```

errmsg db 10,"Please enter valid hex number !!!"
errmsg_len equ $-errmsg

new_line db 10,13

section .bss
buf  resb 5
char_ans resb 1

section .text
global _start
_start:

call HEX_BCD
read_or_print 1,1,new_line,1

exit

Accept:
```



```
read_or_print 0,0,buf,5
mov rcx,4
mov rsi,buf
xor bx,bx
up: shl bx,4
mov al,[rsi]
cmp al,'0'
jb error
cmp al,'9'
jbe sub30
cmp al,'A'
jb error
cmp al,'F'
jbe sub37
cmp al,'a'
jb error
cmp al,'f'
jbe sub57

sub57:sub al,20h
```

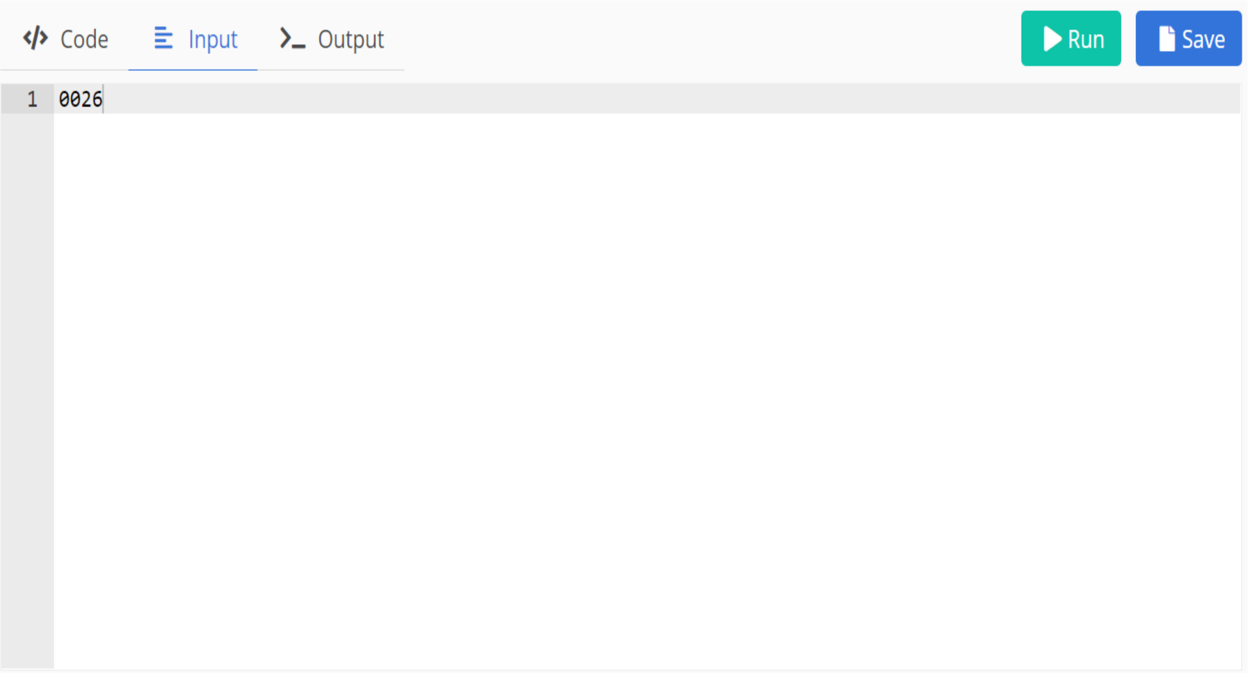


```
sub37:sub al,07h
sub30:sub al,30h

add bx,ax
inc rsi
dec rcx
jnz up
ret

error: read_or_print 1,1,errmsg,errmsg_len

exit

HEX_BCD:
read_or_print 1,1,hmsg,hmsg_len
call Accept
read_or_print 1,1,buf,5
mov ax,bx
mov bx,10
xor bp,bp
```



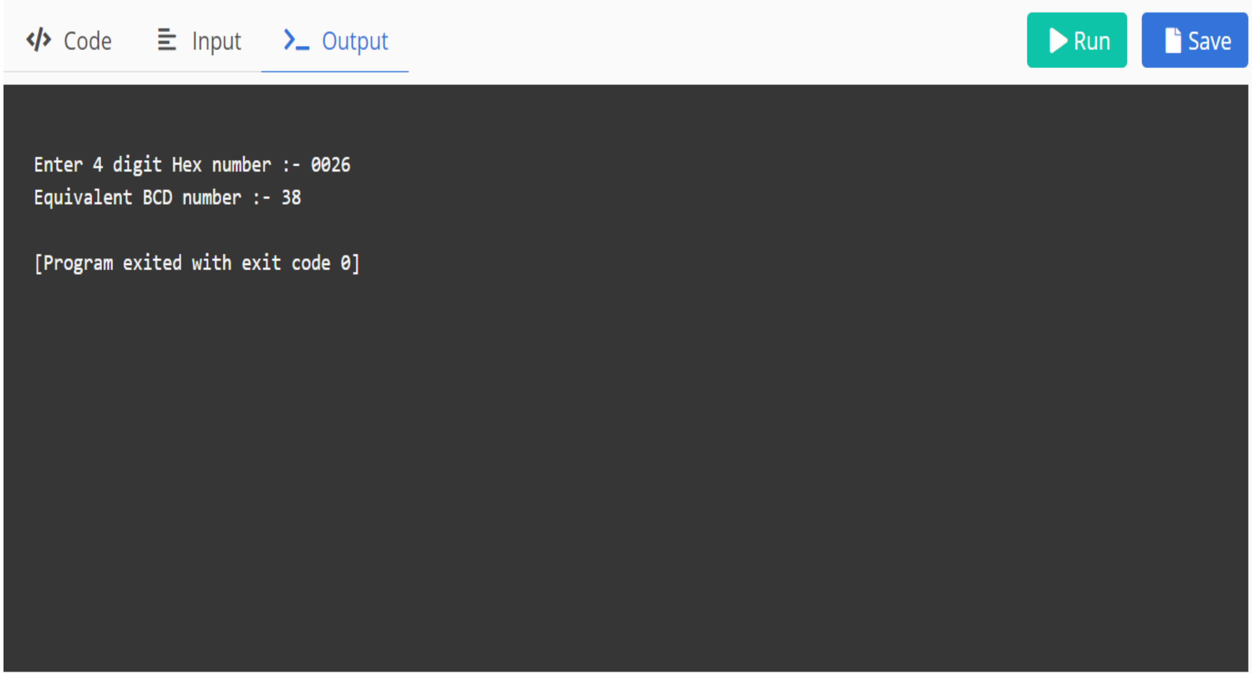
```
call Accept
read_or_print 1,1,buf,5
mov ax,bx
mov bx,10
xor bp,bp
back: xor dx,dx
div bx
push dx
inc bp
cmp ax,0
jne back

read_or_print 1,1,bmsg,bmsg_len
back1:pop dx
add dl,30h
mov [char_ans],dl
read_or_print 1,1,char_ans,1
dec bp
jnz back1
ret
```

Input :



```
0026
```

Output :



```
Enter 4 digit Hex number :- 0026
Equivalent BCD number :- 38

[Program exited with exit code 0]
```

Microprocessor Laboratory

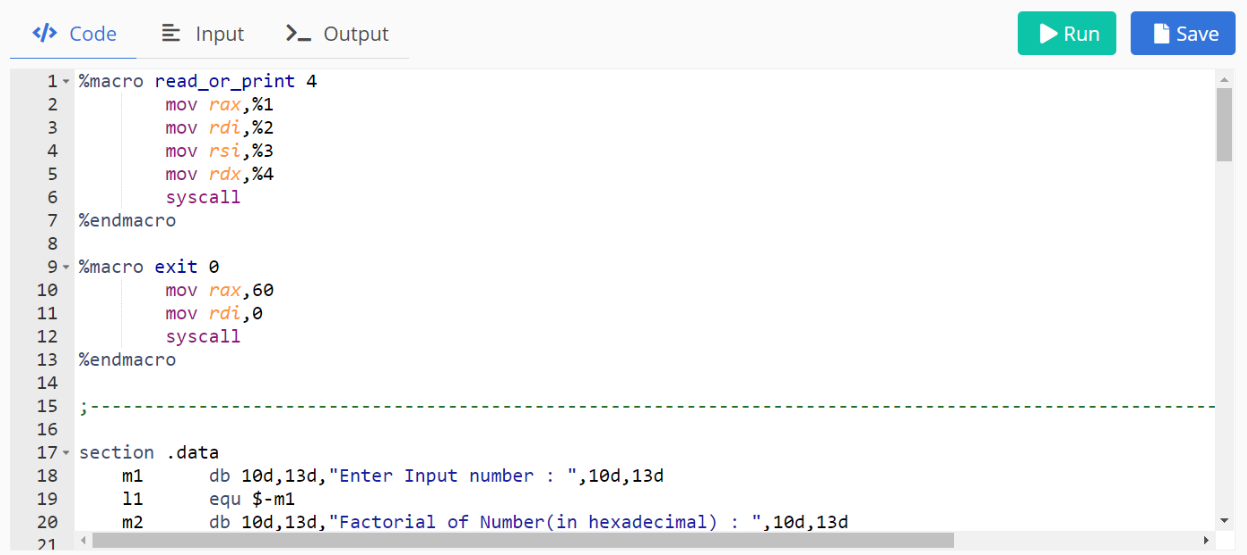
Assignment No. 13

NAME :- OJUS PRAVIN JAISWAL
ROLL NO. :- SACO19108
DIVISION :- A

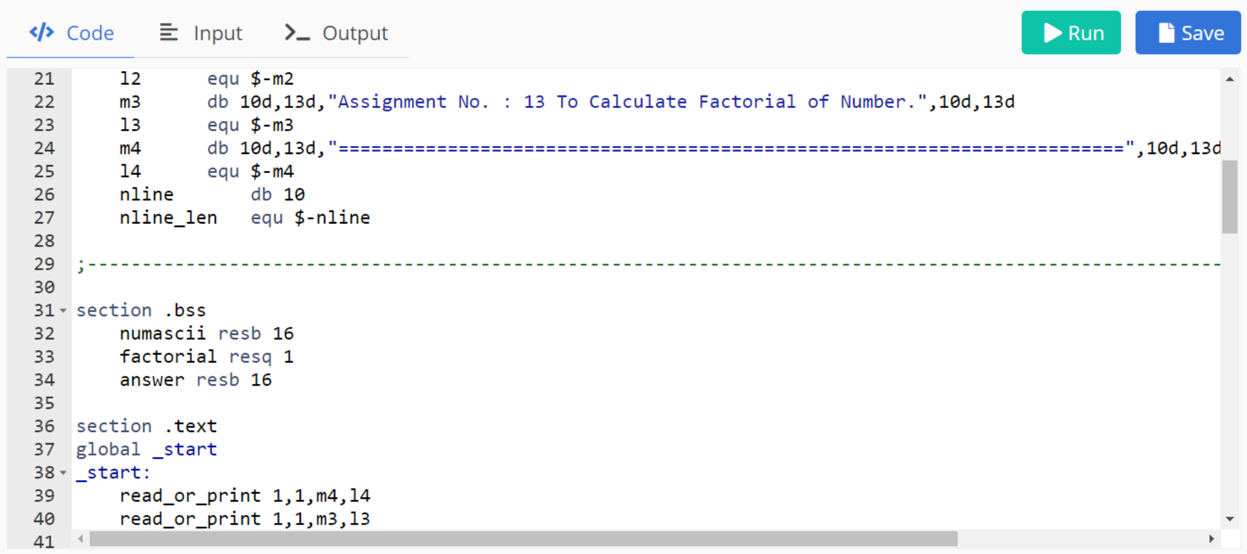
Assignment No. 13

Program :

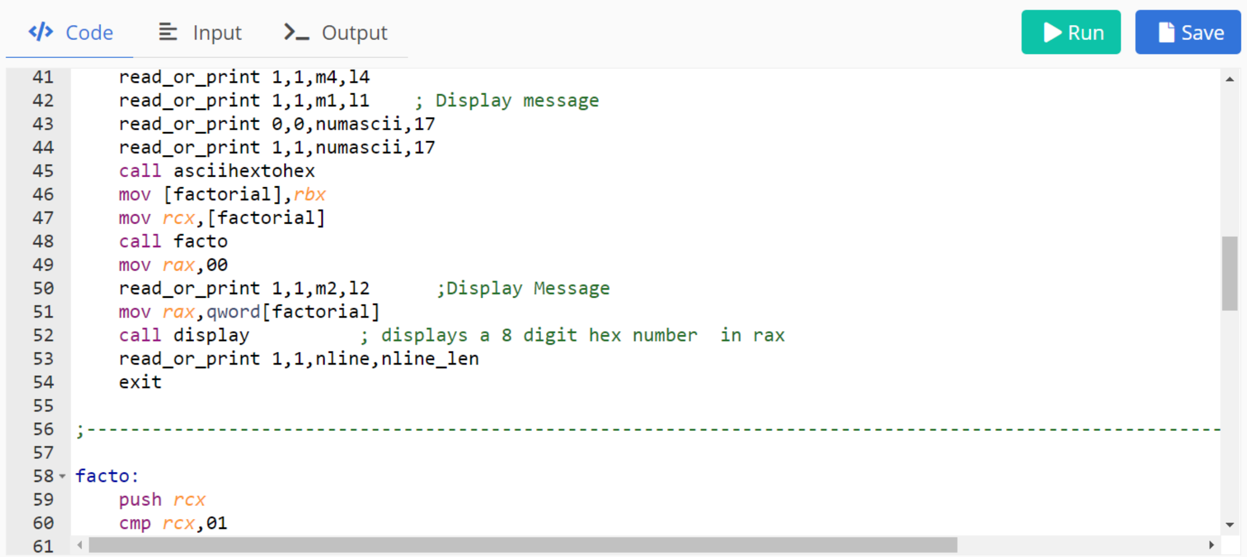
```
%macro read_or_print 4
        mov rax,%1
        mov rdi,%2
        mov rsi,%3
        mov rdx,%4
        syscall
%endmacro

%macro exit 0
        mov rax,60
        mov rdi,0
        syscall
%endmacro

;-------------------------------------------------------------------------------------------------------------------------

section .data
            m1              db 10d,13d,"Enter Input number : ",10d,13d
            l1              equ $-m1
            m2              db 10d,13d,"Factorial of Number (in hexadecimal) : ",10d,13d
            l2              equ $-m2
            m3              db 10d,13d,"Assignment No. : 13 To Calculate Factorial of Number.",10d,13d
            l3              equ $-m3
            m4              db 10d,13d,"======================================================================",10d,13d

            l4              equ $-m4

            nline           db 10

            nline_len       equ $-nline


;---------------------------------------------------------------------------------------------------------------------


section .bss

            numascii resb 16

            factorial resq 1

            answer resb 16


section .text

global _start

_start:

            read_or_print 1,1,m4,l4

            read_or_print 1,1,m3,l3

            read_or_print 1,1,m4,l4

            read_or_print 1,1,m1,l1    ; Display message

            read_or_print 0,0,numascii,17

            read_or_print 1,1,numascii,17

            call asciihextohex

            mov [factorial],rbx

            mov rcx,[factorial]

            call facto

            mov rax,00

            read_or_print 1,1,m2,l2      ;Display Message
            mov rax,qword[factorial]
            call display      ; displays a 8 digit hex number  in rax
            read_or_print 1,1,nline,nline_len
            exit

;----------------------------------------------------------------------------------------------------------


facto:
            push rcx
            cmp rcx,01
            jne ahead
            jmp exit2
ahead:  dec rcx
            mov rax,rcx
            mul qword[factorial]
            mov qword[factorial],rax
            call facto
exit2:  pop rcx

            ret

;------------------------------------------------------------------------------------------------------------

asciihextohex:

            mov rsi,numascii
            mov rcx,16
            mov rbx,0
            mov rax,0

loop1:
            rol rbx,04
            mov al,[rsi]
            cmp al,39h
            jbe skip1
            sub al,07h
skip1:
            sub al,30h
            add rbx,rax
            inc rsi
            dec rcx
            jnz loop1

            ret
;-----------------------------------------------------------------------------------------------------------

display:
            mov rsi,answer+15
            mov rcx,16

loop2:
            mov rdx,0
            mov rbx,16
            div rbx
            cmp dl,09h
            jbe skip2
            add dl,07h
skip2:
            add dl,30h
            mov [rsi],dl
            dec rsi
            dec rcx
            jnz loop2
            read_or_print 1,1,answer,16
            ret
```



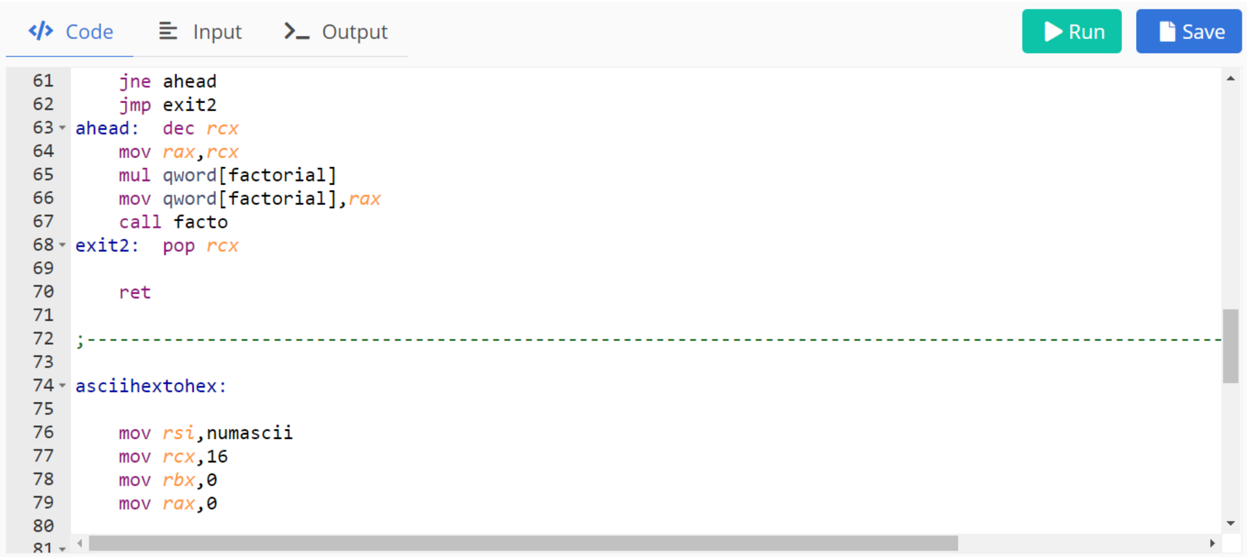
```
%macro read_or_print 4
        mov rax,%1
        mov rdi,%2
        mov rsi,%3
        mov rdx,%4
        syscall
%endmacro

%macro exit 0
        mov rax,60
        mov rdi,0
        syscall
%endmacro

;---------------------------------------------------------------------------------------------------------

section .data
    m1      db 10d,13d,"Enter Input number : ",10d,13d
    l1      equ $-m1
    m2      db 10d,13d,"Factorial of Number(in hexadecimal) : ",10d,13d
```



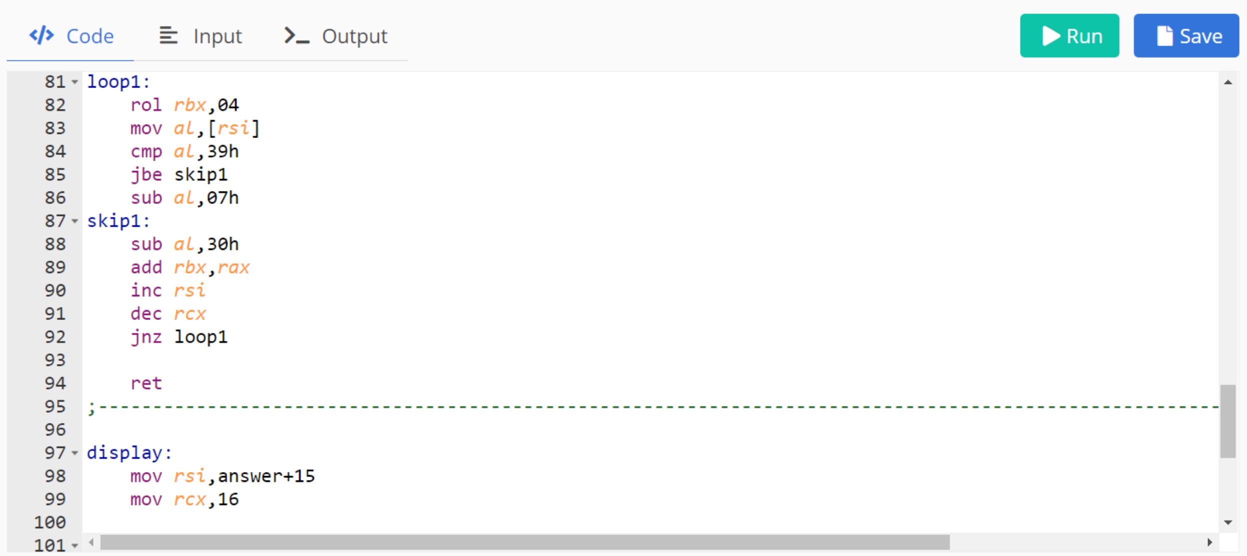
```
    l2      equ $-m2
    m3      db 10d,13d,"Assignment No. : 13 To Calculate Factorial of Number.",10d,13d
    l3      equ $-m3
    m4      db 10d,13d,"=========================================================================",10d,13d
    l4      equ $-m4
    nline       db 10
    nline_len   equ $-nline

;---------------------------------------------------------------------------------------------------------

section .bss
    numascii resb 16
    factorial resq 1
    answer resb 16

section .text
global _start
_start:
    read_or_print 1,1,m4,l4
    read_or_print 1,1,m3,l3
```



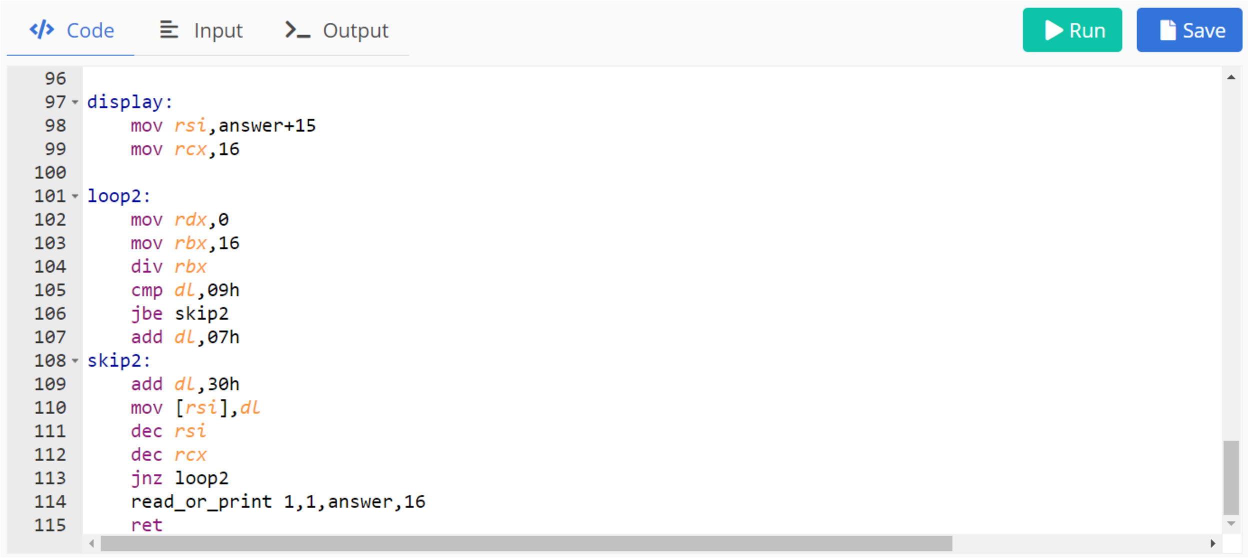
```
    read_or_print 1,1,m4,14
    read_or_print 1,1,m1,11    ; Display message
    read_or_print 0,0,numascii,17
    read_or_print 1,1,numascii,17
    call asciihextohex
    mov [factorial],rbx
    mov rcx,[factorial]
    call facto
    mov rax,00
    read_or_print 1,1,m2,12      ;Display Message
    mov rax,qword[factorial]
    call display          ; displays a 8 digit hex number  in rax
    read_or_print 1,1,nline,nline_len
    exit

;---------------------------------------------------------------------------------------------------------

facto:
    push rcx
    cmp rcx,01
```



```
    jne ahead
    jmp exit2
ahead:  dec rcx
    mov rax,rcx
    mul qword[factorial]
    mov qword[factorial],rax
    call facto
exit2:  pop rcx

    ret

;---------------------------------------------------------------------------------------------------------

asciihextohex:

    mov rsi,numascii
    mov rcx,16
    mov rbx,0
    mov rax,0

```

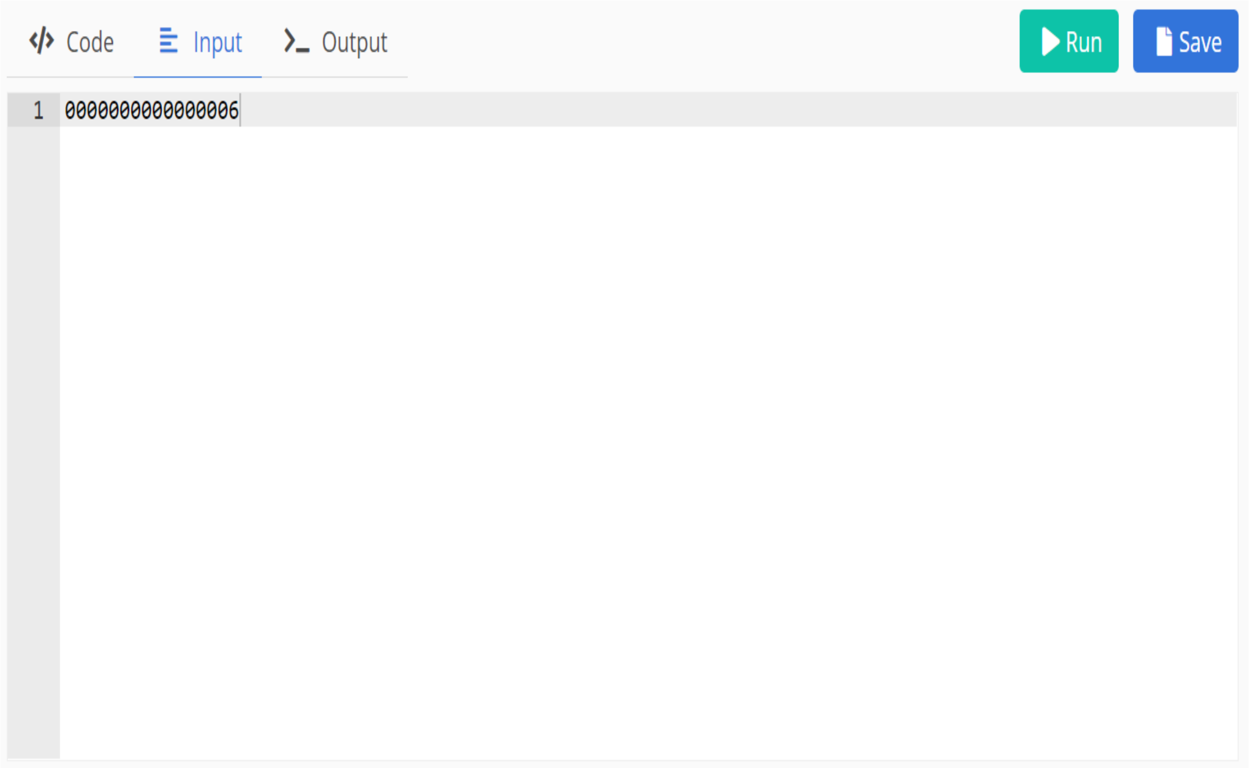


```
loop1:
    rol rbx,04
    mov al,[rsi]
    cmp al,39h
    jbe skip1
    sub al,07h
skip1:
    sub al,30h
    add rbx,rax
    inc rsi
    dec rcx
    jnz loop1

    ret
;---------------------------------------------------------------------------------------------------------

display:
    mov rsi,answer+15
    mov rcx,16

```



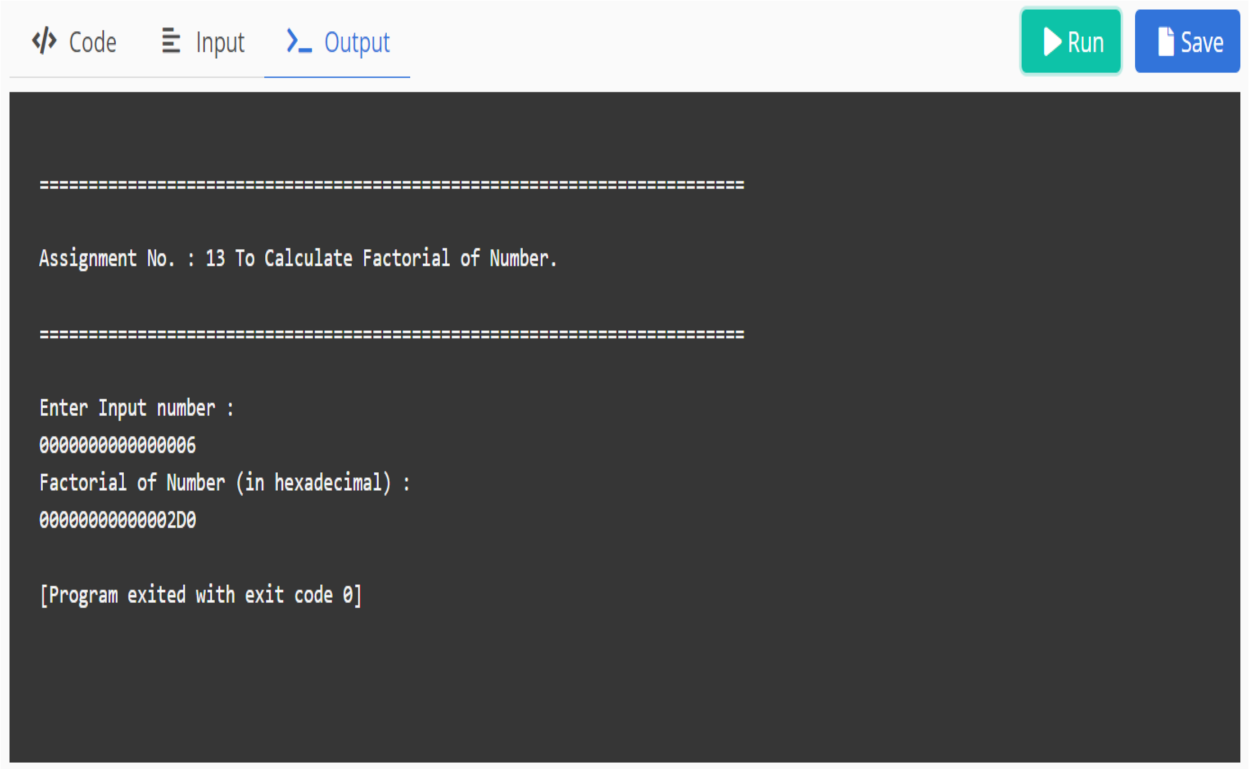
```

display:
    mov rsi,answer+15
    mov rcx,16

loop2:
    mov rdx,0
    mov rbx,16
    div rbx
    cmp dl,09h
    jbe skip2
    add dl,07h
skip2:
    add dl,30h
    mov [rsi],dl
    dec rsi
    dec rcx
    jnz loop2
    read_or_print 1,1,answer,16
    ret
```

Input :



```
0000000000000006
```

Output :



```
========================================================================

Assignment No. : 13 To Calculate Factorial of Number.

========================================================================

Enter Input number :
0000000000000006
Factorial of Number (in hexadecimal) :
00000000000002D0

[Program exited with exit code 0]
```