M.I.T. LAB Assignment – 12

U19CS012

***For first three programs perform only one operation i.e. ADD or SUB.**

1. Write ALP to ADD/SUB 'n' 16 bit numbers stored in consecutive memory location.

TASM Code:

```
.model small
.stack 100
.8086

.data
; Number of Elements 'n'
n dw 0005H
; Data of 5 Elements
a dw 1211H, 0A145H, 4817H, 3C12H, 12F7h
; Answer & Carry
ans dw ?
carry db ?

.code
mov ax,@data
mov ds,ax

; Intialize the Counter = n
mov cx, n
; Intialize the SI
mov si,offset a
; Intial Sum = 0
mov ax,0000h
; Intial Carry = 0
mov dl,00


up:     add ax, [si]
        jnc next    ; IF Carry Generated
        inc dl
next:   inc si
        inc si
        loop up

mov ans,ax
mov carry,dl

mov ax, 4C00H
int 21h
end
```

Input:

Numbers: {1211, A145, 4817, 3C12, 12F7}
Decimal = {4625 + 41285 + 18455 + 15378 + 4855 = 84,598 = (14A76) H}

Output:

```
Program terminated normally
-d 076C:0000
076C:0000  16 00 B8 00 4C CD 21 00-05 00 11 12 45 A1 17 48
076C:0010  12 3C F7 12 76 4A 01 FF-FF FF FF FF FF FF FF FF
076C:0020  FF FF FF FF FF FF FF FF-FF FF FF FF FF FF FF FF
076C:0030  FF FF FF FF FF FF FF FF-FF FF FF FF FF FF FF FF
076C:0040  FF FF FF FF FF FF FF FF-FF FF FF FF FF FF FF FF
076C:0050  FF FF FF FF FF FF FF FF-FF FF FF FF FF FF FF FF
076C:0060  FF FF FF 2C 00 FF FF FF-FF FF FF FF FF FF FF FF
076C:0070  FF FF FF FF FF FF FF FF-FF FF FF FF FF FF 27 00
```

2. Write a Program to find smallest/largest number in a given array of 16 bits numbers.
TASM Code:

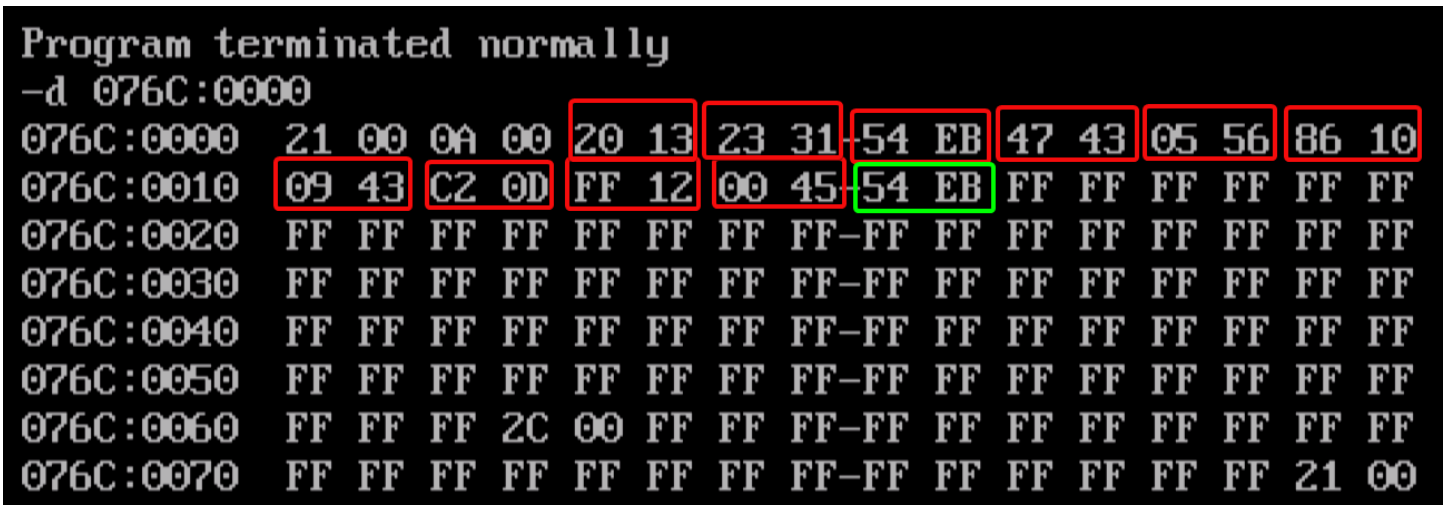
```
.model small
.stack 100
.8086

.data
; Number Of Elements in Array
n dw 000AH
; Elements of Array
a dw 1320h, 3123h, 0EB54h, 4347h, 5605h, 1086h, 4309h, 0DC2h, 12FFh, 4500h
; Answer
ans dw ?

.code
mov ax,@data
mov ds,ax

; Intialize the Counter, Offset and Sum [Intial = 0]
mov cx, n
mov si,offset a
mov ax,0000h
```

```
up:     cmp ax,[si]     ; if (arr[i]>ans)
        jnc next
        mov ax,[si]     ; YES Update ans = arr[i]
next:   inc si          ; NO Continue the Loop
        inc si
        loop up
mov ans,ax

mov ax,4c00h
int 21h
end
```

Input:

{1320h, 3123h, 0EB54h, 4347h, 5605h, 1086h, 4309h, 0DC2h, 12FFh, 4500h}

Output:



3. Write a Program to sort 16 bits given numbers in ascending /descending order.

TASM Code:

```
.model small
.stack 100
.8086

.data

n db 0AH
;storing in b for refernce
b dw 1410h,3443h,0db54h,4337h,5675h,0086h,4209h,0cd2h,12ffh,4500h

a dw 1410h,3443h,0db54h,4337h,5675h,0086h,4209h,0cd2h,12ffh,4500h
```

```
i db ?
tmp db ?

.code
mov ax,@data
mov ds,ax

; Initialize
mov ch,00h
mov cl,n
dec cl
mov si,offset a
mov i,00h

up1:    mov tmp,cl  ;

        mov cl,n
        sub cl,i
        inc i
        dec cl      ; cl = n-i-1
        mov bx, 0000h

up2:    mov ax, [si+bx]
        mov dx, [si+bx+2]
        cmp ax, dx  ; if (ax>=dx) goto next
        jnc next
        mov [si+bx], dx     ; Swap
        mov [si+bx+2], ax

next:   inc bx
        inc bx
        loop up2
        mov cl, tmp
        loop up1

mov ax, 4C00H
int 21h
end
```

Input:

{1410h,3443h,0db54h,4337h,5675h,0086h,4209h,0cd2h,12ffh,4500h}

Output:

```
Program terminated normally
-d 076E:0000
076E:0000  E2 D3 B8 00 4C CD 21 00-0A 10 14 43 34 54 DB 37
076E:0010  43 75 56 86 00 09 42 D2-0C FF 12 00 45 54 DB 75
076E:0020  56 00 45 37 43 09 42 43-34 10 14 FF 12 D2 0C 86
076E:0030  00 09 01 FF FF FF FF FF-FF FF FF FF FF FF FF FF
076E:0040  FF FF FF 2C 00 FF FF FF-FF FF FF FF FF FF FF FF
076E:0050  FF FF FF FF FF FF FF FF-FF FF FF FF FF FF FF FF
076E:0060  FF FF FF FF FF FF FF FF-FF FF FF FF FF FF FF FF
076E:0070  FF FF FF FF FF FF FF FF-FF FF FF FF FF FF FF FF
```

4. Write a Program to find occurrences of a given number in a list of N numbers given through keyboard.

TASM Code:

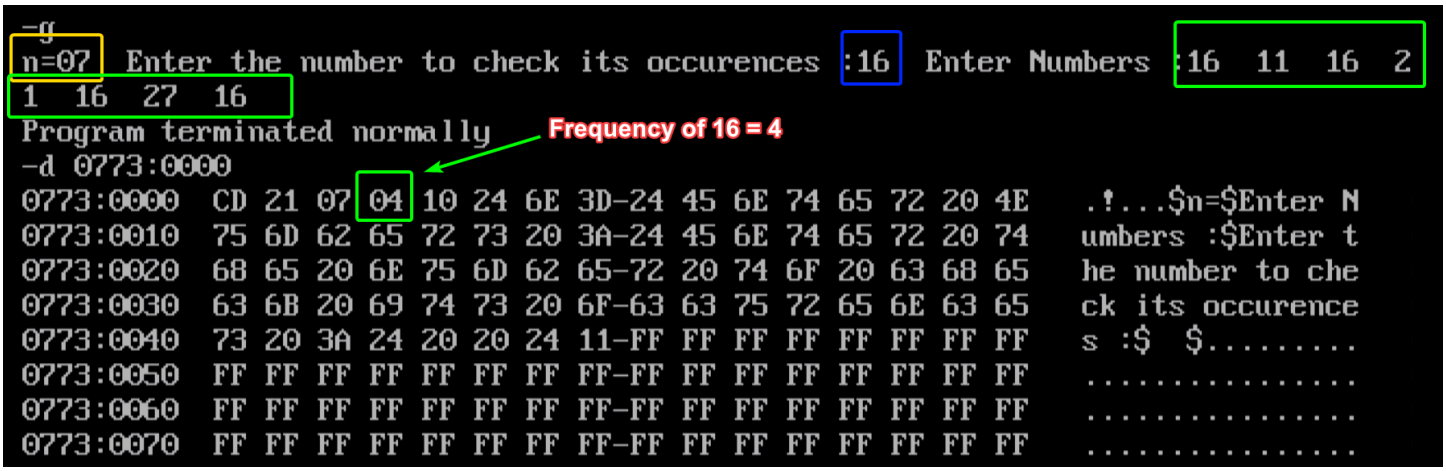
```
.model small
.stack 100
.8086

.data
n db ?
ans db 00h

x db ?
y db "$"

cr equ odh
lf equ 0ah

msg1 db "n=$"
msg2 db "Enter Numbers :$"
msg3 db "Enter the number to check its occurences :$"
msg4 db "  $"

p db ?

; PRINT MACRO
print macro msg
mov ah,09h
mov dx,offset msg
int 21h
endm

; READ MACRO
```

```
read macro no
mov ah,01h
int 21h
sub al,'0'
mov bl,0ah
mul bl
mov no,al
mov ah,01h
int 21h
sub al,'0'
add no,al
endm

.code
mov ax,@data
mov ds,ax

print msg1
read n

print msg4
print msg3
read x

print msg4
print msg2

mov ch,00h
mov cl,n

up: read p
    mov al,x
    cmp al,p
    jnz next    ; Both Equal?
    inc ans
    next: inc p ; Increment the Count
    print msg4
    loop up

mov ax,4c00h
int 21h
end
```

Input:

{16, 11, 16, 21, 16, 27, 16} -> Frequency of 16 = (?) [(04) H]

Output:



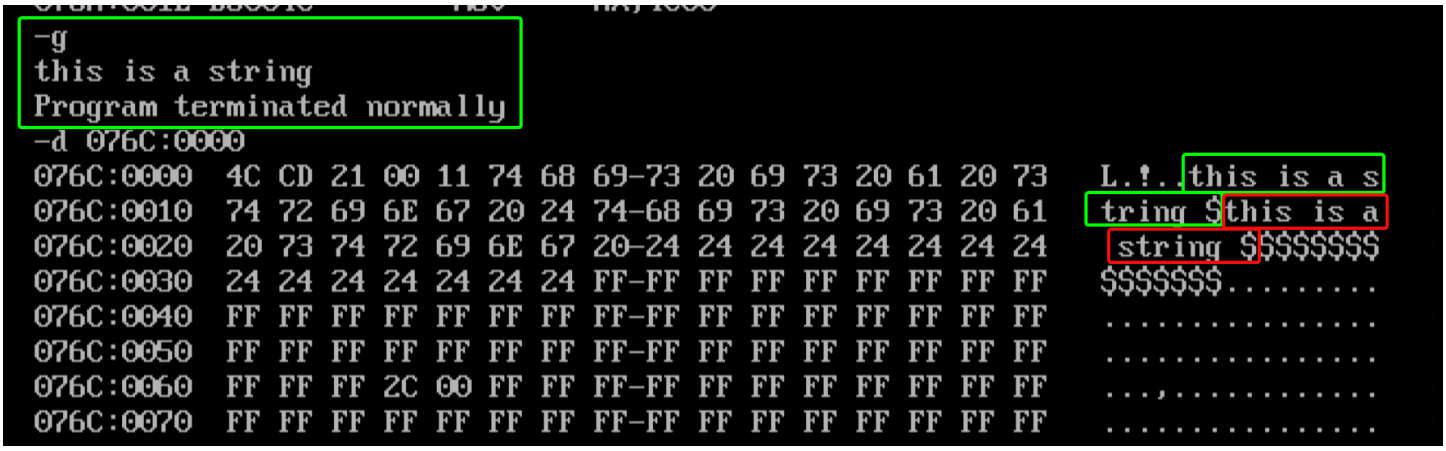
5. Write a Program to move a string from source to destination.

TASM Code:

```
; 5. Write a Program to move a string from source to destination.

.model small
.stack 100
.8086

.data
len db 11h  ; 11h = 17 Length of String
; Source
str1 db "this is a string $"
; Destination
str2 db "$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$"

.code
mov ax,@data
mov ds,ax

mov es,ax
mov ch,00h
mov cl,len  ; Initialize Counter

; Initialize [SI] & [DI]
mov si,offset str1
mov di,offset str2

; Clear Direction Flag
cld

up: movsb
loop up
```

```
; Print the Answer
mov ah,09h
mov dx,offset str2
int 21h

mov ax,4c00h
int 21h
end
```

Output:



6. Write a Program to reverse a given string.

TASM Code:

```
;Q-(6) Write a Program to reverse a given string.

.model small
.stack 100
.8086

.data
; Length of String
len dw 000CH
; Source String
str1 db " ecnalubma $"
; Reverse String
str2 db "$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$"

.code
mov ax,@data
mov ds,ax

mov es,ax
mov cx,len
mov si,offset str1
```

```
add si,len
mov di,offset str2

cld
up: mov al,[si]
    mov [di],al
    inc di
    dec si
    loop up

; Print the Reverse String
mov ah,09h
mov dx,offset str2+3
int 21h

mov ax,4c00h
int 21h
end
```

Input:

String : {" ecnalubma $"}

Output:

7. Write a Program to perform case conversion (U to L, L to U) for a given string.

TASM Code:

```
.model small
.stack 100
.8086

.data
len dw 0024h
str1 db "ab CD ef GH ij KLMN opqr STUV wxyz $"

.code
mov ax,@data
mov ds,ax

mov es,ax
mov cx,len
```

```
mov si,offset str1

cld
up: mov al,[si]
    cmp al, 20   ; ASCII OF ' ' = 32 = 20h
    jz next
    cmp al, 41h  ; ASCII OF 'A' = 65 = 41h
    jc next
    cmp al,5Ah
    jnc smalla
    add al,20h  ; Add 32 to Get Lower Case
    mov [si],al
    jmp next

    smalla: sub al, 20h     ; Subtract 32 to Get Upper Case
            mov [si], al

    next: inc si
    loop up

; Print the Answer
mov ah,09h
mov dx,offset str1
int 21h

mov ax,4c00h
int 21h
end
```

Input:

{"ab CD ef GH ij KLMN opqr STUV wxyz $"}

Output:

```
-g
AB cd EF gh IJ klmn OPQR stuv WXYZ
Program terminated normally
-d 076D:0000
076D:0000  CD 21 B8 00 4C CD 21 00-24 00 41 42 20 63 64 20   .!..L.!.$.AB cd
076D:0010  45 46 20 67 68 20 49 4A-20 6B 6C 6D 6E 20 4F 50   EF gh IJ klmn OP
076D:0020  51 52 20 73 74 75 76 20-57 58 59 5A 20 24 FF FF   QR stuv WXYZ $..
076D:0030  FF FF FF FF FF FF FF FF-FF FF FF FF FF FF FF FF   ................
076D:0040  FF FF FF FF FF FF FF FF-FF FF FF FF FF FF FF FF   ................
076D:0050  FF FF FF 2C 00 FF FF FF-FF FF FF FF FF FF FF FF   ...,............
076D:0060  FF FF FF FF FF FF FF FF-FF FF FF FF FF FF FF FF   ................
076D:0070  FF FF FF FF FF FF FF FF-FF FF FF FF FF FF FF FF   ................
```

8. Write a Program to merge two strings entered through keyboard.

TASM Code:

```
.model small
.stack 100
.8086

.data

len1 db ?
len2 db ?

str1 db "$$$$$$$$$$$$$$$$$$$$"
str2 db "$$$$$$$$$$$$$$$$$$$$"

final db "$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$"

msg1 db "Enter String : $"
msg3 db "Final String : $"
msg4 db "Enter Length : $"
msg5 db " $"

; PRINT MACRO
print macro msg
mov ah,09h
mov dx,offset msg
int 21h
endm

; READ MACRO
read macro str
print msg4
mov ah,01h
int 21h
sub al,'0'
mov len2,al
mov cl,al
mov ch,00h
print msg5
print msg1
mov si,offset str
nextc: mov ah,01h
int 21h
mov [si],al
inc si
loop nextc
endm

; LISTEN MACRO [Take Length of String & String Input]
listen macro str
```

```
print msg4
mov ah,01h
int 21h
sub al,'0'
mov len2,al
mov cl,al
mov ch,00h
print msg5
print msg1
mov si,offset str
next:   mov ah,01h
        int 21h
        mov [si],al
        inc si
        loop next
endm

.code
mov ax,@data
mov ds,ax

mov es,ax
read str1

mov al,len2
mov len1,al

print msg5

listen str2

print msg5

cld
mov si,offset str1
mov di,offset final
mov ch,00h
mov cl,len1
rep movsb

dec di
mov si,offset str2
mov cl,len2
rep movsb

print msg3
print msg5
print final

mov ax,4c00h
```

```
int 21h
end
```

Input:

String 1 : "first"
String 2 : "second"
MergeString : "firstsecond"

Output:

```
-g
Enter Length : 5 Enter String : first Enter Length : 6 Enter String : second Fin
al String :  firssecond
Program terminated normally
-d 0774:0000
0774:0000  BA 38 00 CD 21 B8 00 4C-CD 21 05 06 66 69 72 73   .8..!..L.!..firs
0774:0010  74 24 24 24 24 24 24 24-24 24 24 24 24 24 24 24   t$$$$$$$$$$$$$$$
0774:0020  24 24 73 65 63 6F 6E 64-24 24 24 24 24 24 24 24   $$second$$$$$$$$
0774:0030  24 24 24 24 24 24 24 24-66 69 72 73 73 65 63 6F   $$$$$$$$firsseco
0774:0040  6E 64 24 24 24 24 24 24-24 24 24 24 24 24 24 24   nd$$$$$$$$$$$$$$
0774:0050  24 24 24 24 24 24 24 24-24 24 24 24 24 45 6E 74   $$$$$$$$$$$$$Ent
0774:0060  65 72 20 53 74 72 69 6E-67 20 3A 20 24 46 69 6E   er String : $Fin
0774:0070  61 6C 20 53 74 72 69 6E-67 20 3A 20 24 45 6E 74   al String : $Ent
```

9. Write a Program to search a character in a given string.

TASM Code:

```
.model small
.stack 100
.8086

.data

len1 db ?
char db ?
ans dw ?
str1 db "$$$$$$$$$$$$$$$$$$$$$$$$$$"
msg1 db "Enter String : $"
msg4 db "Enter length : $"
msg2 db "Enter the character to find :$"
msg5 db " $"
msg3 db "Character found at :$"

; PRINT MACRO
print macro msg
mov ah,09h
mov dx,offset msg
```

```
int 21h
endm

; READ MACRO
read macro str
print msg4
mov ah,01h
int 21h
sub al,'0'
mov len1,al
mov cl,al
mov ch,00h
print msg5
print msg1
mov si,offset str
nextc: mov ah,01h
int 21h
mov [si],al
inc si
loop nextc
endm

.code
mov ax,@data
mov ds,ax

mov es,ax
print msg2
mov ah,01h
int 21h
mov char,al

read str1
print msg5

mov di,offset str1

mov cl,len1
mov ch,00h

mov al,char

repnz scasb

mov ans,di
sub ans,offset str1

mov ax,4c00h
int 21h
end
```

Input:

'n' in Monkey = 3rd Place

Output:

```
-g
Enter the character to find :nEnter length : 6 Enter String : monkey
Program terminated normally
-d 0770:0000                    Found at Position 3
0770:0000  0C 00 B8 00 4C CD 21 00-06 6E 03 00 6D 6F 6E 6B   ....L.!..n..monk
0770:0010  65 79 24 24 24 24 24 24-24 24 24 24 24 24 24 24   ey$$$$$$$$$$$$$$
0770:0020  24 24 24 24 24 24 45 6E-74 65 72 20 53 74 72 69   $$$$$$Enter Stri
0770:0030  6E 67 20 3A 20 24 45 6E-74 65 72 20 6C 65 6E 67   ng : $Enter leng
0770:0040  74 68 20 3A 20 24 45 6E-74 65 72 20 74 68 65 20   th : $Enter the
0770:0050  63 68 61 72 61 63 74 65-72 20 74 6F 20 66 69 6E   character to fin
0770:0060  64 20 3A 24 20 24 43 68-61 72 61 63 74 65 72 20   d :$ $Character
0770:0070  66 6F 75 6E 64 20 61 74-20 3A 24 FF FF FF FF FF   found at :$.....
```

10. Write a Program to find occurrences of a given character in a given string through keyboard.

TASM Code:

```
.model small
.stack 100
.8086

.data

;PRINT MACRO
print macro msg
mov ah,09h
mov dx,offset msg
int 21h
endm

; READ MACRO
read macro str
print msg4
mov ah,01h
int 21h
sub al,'0'
mov len1,al
mov cl,al
mov ch,00h
print msg5
print msg1
mov si,offset str
```

```
nextc: mov ah,01h
int 21h
mov [si],al
inc si
loop nextc
endm


len1 db ?
char db ?

ans db 00h

str1 db "$$$$$$$$$$$$$$$$$$$$$$$$$"
msg1 db "Enter String : $"
msg4 db "Enter length : $"
msg2 db "Enter the character to find :$"
msg5 db " $"

.code
mov ax,@data
mov ds,ax

mov es,ax
print msg2  ; Enter Character

; Take Character input and Store in AL
mov ah, 01h
int 21h
mov char, al

; Take String Input
read str1
print msg5

; DI -> Pointing to Str1 [Intialize DI]
mov di,offset str1
; Intialize Counter
mov cl,len1
mov ch,00h

mov al,char

up: mov ah,[di]
    cmp ah,al   ; Compare if the Character is Same?
    jnz skip
    inc ans     ; Increment the Frequency of character
    skip: inc di
    loop up
```

```
; HLT
mov ax,4c00h
int 21h
end
```

Input:

Character = 'a'
String = 'caram'
Frequency of 'a' = 2

Output:

```
-g
Enter the character to find :aEnter length : 5 Enter String : caram
Program terminated normally
-d 0770:0000
0770:0000  F5 B8 00 4C CD 21 05 61-02 63 61 72 61 6D 24 24   ...L.!.a.caram$$
0770:0010  24 24 24 24 24 24 24 24-24 24 24 24 24 24 24 24   $$$$$$$$$$$$$$$$
0770:0020  24 24 24 45 6E 74 65 72-20 53 74 72 69 6E 67 20   $$$Enter String
0770:0030  3A 20 24 45 6E 74 65 72-20 6C 65 6E 67 74 68 20   : $Enter length
0770:0040  3A 20 24 45 6E 74 65 72-20 74 68 65 20 63 68 61   : $Enter the cha
0770:0050  72 61 63 74 65 72 20 74-6F 20 66 69 6E 64 20 3A   racter to find :
0770:0060  24 20 24 FF FF FF FF FF-FF FF FF FF FF FF FF FF   $ $.............
0770:0070  FF FF FF FF FF FF FF FF-FF FF FF FF FF FF FF FF   ................
```

Frequency of 'a' in 'caram'

```
-g
Enter the character to find :aEnter length : 7 Enter String : abaadaa
Program terminated normally
-d 0770:0000
0770:0000  47 E2 F3 B8 00 4C CD 21-07 61 05 61 62 61 61 64   G....L.!.a.abaad
0770:0010  61 61 24 24 24 24 24 24-24 24 24 24 24 24 24 24   aa$$$$$$$$$$$$$$
0770:0020  24 24 24 24 24 45 6E 74-65 72 20 53 74 72 69 6E   $$$$$Enter Strin
0770:0030  67 20 3A 20 24 45 6E 74-65 72 20 6C 65 6E 67 74   g : $Enter lengt
0770:0040  68 20 3A 20 24 45 6E 74-65 72 20 74 68 65 20 63   h : $Enter the c
0770:0050  68 61 72 61 63 74 65 72-20 74 6F 20 66 69 6E 64   haracter to find
0770:0060  20 3A 24 20 24 FF FF FF-FF FF FF FF FF FF FF FF    :$ $...........
0770:0070  FF FF FF FF FF FF FF FF-FF FF FF FF FF FF FF FF   ................
```

Frequency of 'a' = 5 {abaadaa}

11. Program to check whether given substring exist in a main string or not?

TASM Code:

```
.model small
.stack 100
.8086
```

```
.data
len1 db 0Eh
; Change it to 06H <- Mango
len2 db 07h

ans db 00h

str1 db "assassination$"
subsr db "nation$"

; subsr db "mango$" ; NOT FOUND CASE

msg5 db " $"

msg1 db "substring found $"
msg2 db "substring not found$"

temp dw ?

; PRINT MACRO
print macro msg
mov ah,09h
mov dx,offset msg
int 21h
endm


.code
mov ax,@data
mov ds,ax

mov es,ax

mov di,offset str1
mov si,offset subsr

mov ch,00h
mov cl,len1

up: mov si,offset subsr
    mov al,[si]
    repnz scasb
    cmp cx,00h
    jz terminate
    mov temp,di
    push cx
    mov cl,len2
    dec cl
    inc si
    check:  mov al,[si]
```

```
            cmp al,[di]
            jnz skip
            inc si
            inc di
    loop check
    print msg1
    jmp terminate
    skip: pop cx
    mov di,temp
    loop up

; HLT
terminate: mov ax,4c00h
int 21h
end
```

Input:

String: "assassination$"
Sub-String: "nation$"

Output:

Input:

String: "assassination$"
Sub-String: "mango$"

Output:

SUBMITTED BY:

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[U19CS012]