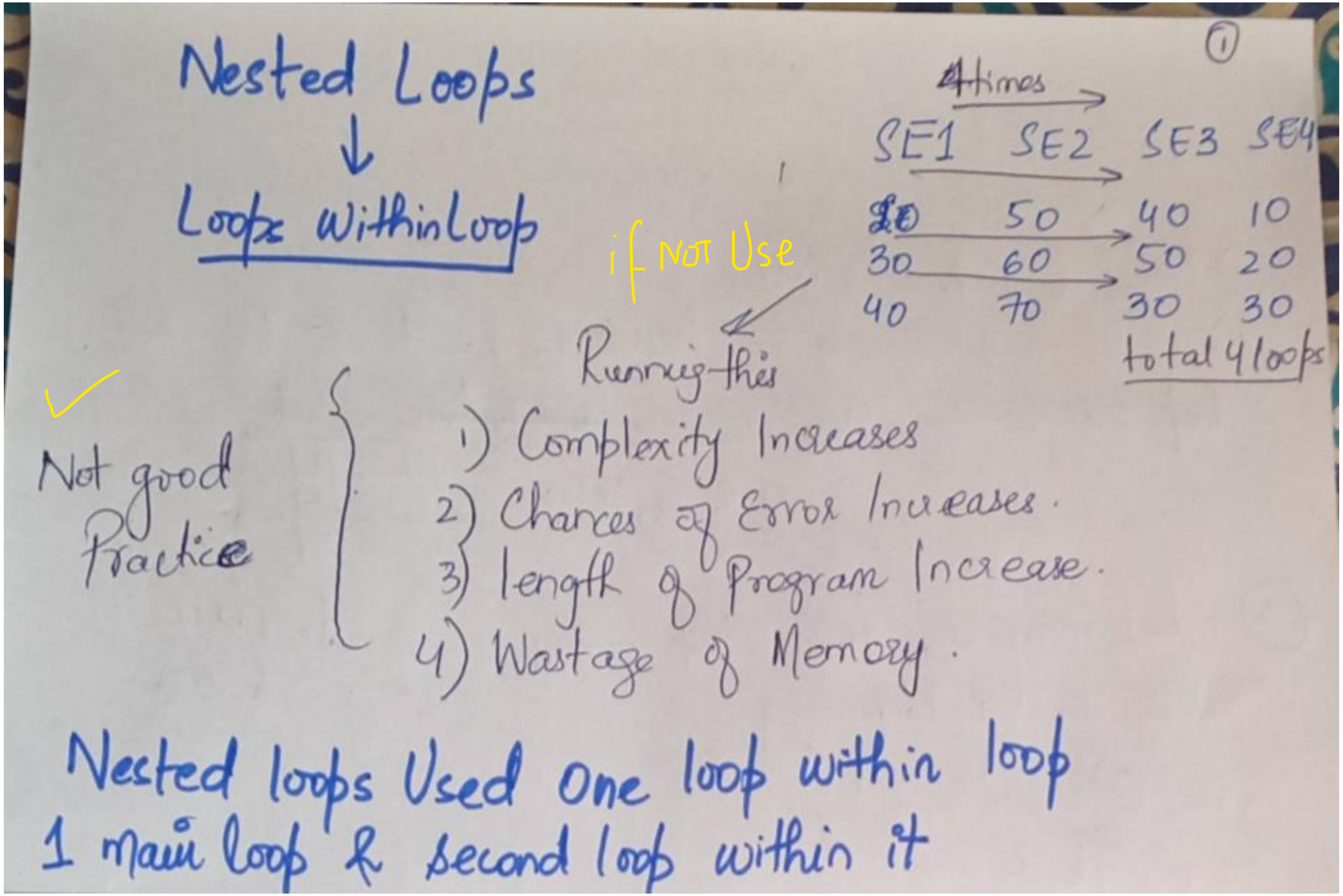
# Nested loop



# Nested Loops

↓

Loops within Loop

4 times →

| SE1 | SE2 | SE3 | SE4 |
|---|---|---|---|
| 20 | 50 | 40 | 10 |
| 30 | 60 | 50 | 20 |
| 40 | 70 | 30 | 30 |

total 4 loops

if NOT Use

Running this

✓ Not good Practice

1) Complexity Increases
2) Chances of Error Increases.
3) length of Program Increase.
4) Wastage of Memory.

Nested loops Used one loop within loop
1 main loop & second loop within it

```
L1:                                  }
                                     }
  L2:          }                     }
               } Nested loop         }  Main loop
  Loop L2      }                     }
                                     }
Loop L1                              }
```

Need of Nested loop:-

1) Reduce Complexity. (Bigger data) (Only Run for 2 times Main & Nested loop)

2) Maintain Program (Aligned) (We can find error) (Organized).

3).

# Use Nested loop

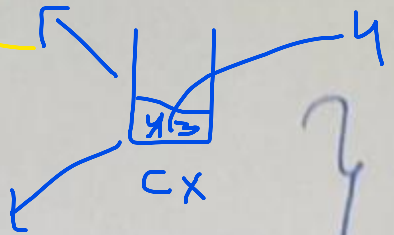
How use it in assembly language.

We have to run loop 4 times, so before loop, we write

```
    Mov cx, 4
L1:
   mov cx, 3
L2:

loop L2

loop L1
```

Nested loop

Main loop.



Set counter Register.

Main loop counter register value is 4 & nested loop CX (counter register) value is 3, when loop starts the value of Main loop replaced by nested loop.
So we push cx & pop cx, With the help of PUSH & POP.

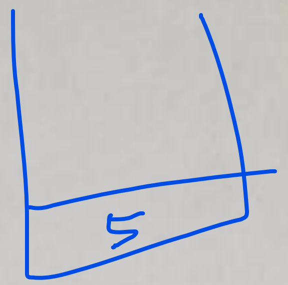
~~[illegible]~~

```
Mov cx, 4
L1:
Push CX          → Value 4 save in stack first.

MovCX, 3
L2:                then it runs

loop L2

POP CX           → then we pop it, got back value 4
Loop L1
```

# Pyramid

```
        *
       **
5     ***
      * * *
      * ** **
```

```
mov cx,5          → Main loop runs five times.
L1:
Push cx
```



```
L2:
Mov dx,'*'
mov ah,2
int 21h           → Print *
```

⑥.

```
Mov dx,10
mov ah,2
int 21h
Mov dx,13
mov ah,2
int 21h
```

~~loop~~

Next line
~~enter~~ New line feed
Carriage return

value not Const

Now, last time we see constant value but this time pyramid pattern
```
 *
 **
 ***.
```
so for this how many time to run nested loop, We take register, ~~[illegible]~~ and put value 1 in it, then we call it & increment it.

```
[mov bx, 1        inner loop → take register bx & put value 1.
mov cx, 5
L1:               → loop 1 start
Push cx
[Mov cx, bx       → ~~past~~ value is 1, it run 1 time
                    next time it increment run 2,
                    3, or as many times.
L2:
Mov dx, '*'
Mov ah, 2
int 21h
Mov dx, 10
Mov ah, 2
int 21h
Mov dx, 13
Mov ah, 2
int 21h
Loop L2
[Inc bx]          → increment in bx, now value
                    is 2.
Pop cx
Loop L1
```

## Procedure

# PROCEDURE

If you want to print Any four statements / strings.

- String 1
- String 2
- String 3
- String 4

After string 1 is printed, for enter you need to write Six lines of codes.

for Enter

```
Mov dx, 10
Mov ah, 2
int 21h
Mov dx, 13
Mov ah, 2
int 21h
```

If print more strings, for every line if we write these six lines, Complexity Increases, Program length increases. Chances of error increases. (not a good practice).
So better to write Code Once, Named It, When needed Call it.

"**Procedure** : is just a block of code that can be called anywhere in the Program with name"

**Need:-**

1) Reusability (Used anywhere, anytime we used it)
2) Complexity Reduced (No need to write 6 lines code after every line).

# Procedure Use in Assembly

```
Name proc

return

Name endp
```

Main proc

Main end

~~Blocked~~

For enter key Procedure

```
enterkey proc
    mov dx,10
   mov ah,2
   int 21h
   Mov dx,13
   mov ah,2
   int 21h
ret
enterkey endp
```

- How to Use the procedure.
  We call it by its name, like → Call Name

String 1
← Call enterkey
String 2

- In assembly program, we write

```
.code
main proc

main endp
```

} It is also a procedure, main is name of our procedure (any name we use but we use main standard way).

Q. No use of ret here, no need of ret only one procedure & when we work on it.

If new procedure made, it call, performed work, ~~performed~~ it also returned.
No need of ret in main.

We follow this pattern

```
.code
main proc


main endp
end main
```

→ Our prog end on this
If we make another proc
we not write it here, we
write it last.

So, code looks like this.

```
.code
main proc
call enterkey
main endp
enterkey Proc
mov dx,10
mov ah,2
int 21h
mov dx,13
mov ah,2
int 21h
Ret
enterkey endp.
End main
```

*. Careful with Names writing.

## Initial program structure

```
.data
str1 db 'karachi$'
str2 db 'Lahore$'
str3 db 'Islamabad$'
.code
main proc
mov ax, @data
mov ds, ax
mov dx, offset str1
mov ah, 9
int 21h
call enterkey
mov dx, offset str2
mov ah, 9
int 21h
call enterkey
mov dx, offset str3
mov ah, 9
int 21h
mov ah, 4ch
int 21h
main endp
enterkey proc
mov dx, 10
mov ah, 2
int 21h
mov dx, 13
mov ah, 2
int 21h
ret
enterkey endp
end main
```

## Macro

# Macro

If want to print strings, for every time the method is,

```
mov dx, offset str1
mov ah,9
int 21h
```

If multiple strings, same method applied. Best practise is write this once and just give name it will print it.

Q. Procedure can also create for this?

For Print { mov dx, offset str1
mov ah, 9
int 21h $\rightarrow$ [ Print proc

Ret
print endp ]

If we write procedure for it str1 is fixed. Proc not have input again. We have to print multiple string, and only want to change name of string. Not possible in Procedure.

Macro: is just a block of code that can be used with input parameters anywhere in the program with name.

In Procedure, input not passed, (fixed value), we call multiple times; there we give I/P, then print all seperately. It is perfect function like any other language function/method ~~is~~ we passed input parameter.

Need: ✓ Reusability with Input Parameters
Reduce Complexity.

## Macro Used in Assembly

```
Name macro

endm
```

✓ Any parameter to pass write infront of macro (Used any name) ✓

```
Name macro P1, P2, ....
Name macro msg1, msg2, ....
```

```
.data
Str1 ______
Str2 ______
```

$\boxed{\text{for Print Str1}}$

Call like

Print Str1

go

Print macro P1

(str1 is P1)

for Print
```
Mov dx, offset P1
mov ah, 9
int 21h
```

endm

- To called method is, Name P1, P2 → Name(Parameter)
- No need of return in Macro, it is fast.

## Difference

| Proc | Macro. |
|---|---|
| No input parameters | Input parameters |
| Ret is used | No ret is used |
| slow, goes & run code. | fast, replace with code. |

When in prog, create proc, call it and give name of proc, → Prog current position move to where proc name & print it, run code.

In macro print block code is replaced with code, i.e. why fast, no need of return.

To print string, use macro :-

→ Macro, always created ~~sto~~ before starting of program.

```
Print macro P1
Mov dx., offset P1
Mov ah, 9
int 21h
endm

. model small
. stack 100h
. data
str1 db ______
str2 db ______
```

```
.code
main proc
mov ax, @data
mov ds, ax
Print str1
print str2

Mov ah, 4ch
int 21h
main endp
end main
```