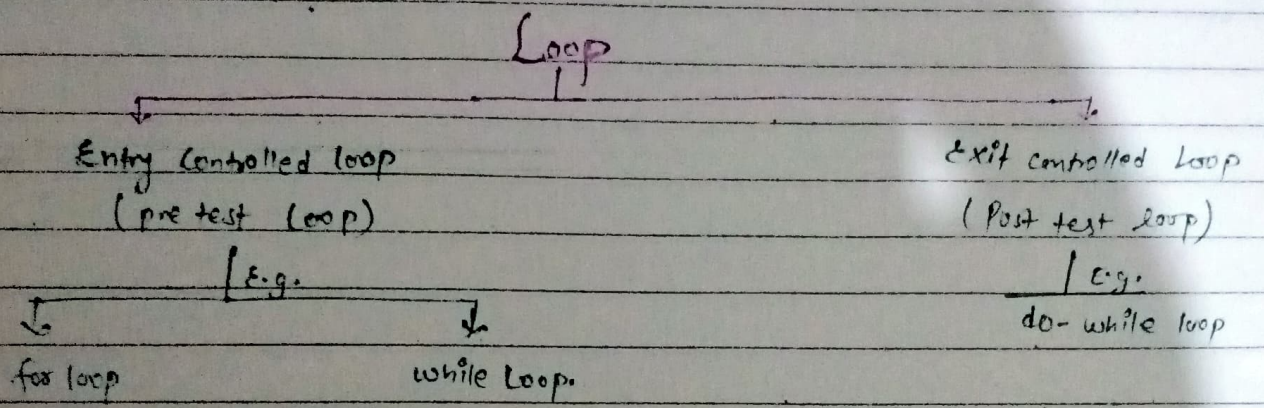
Unit - 3

Loop (Iteration) ⇒ Loop or Iteration means repetation of same set of statements again and again until a specified condition holds true.

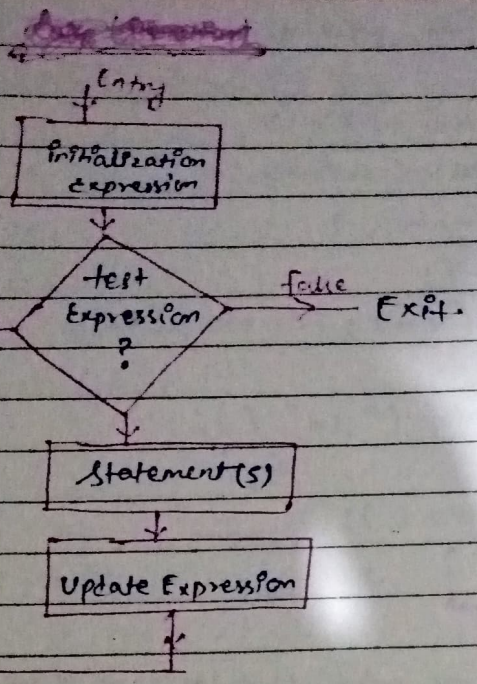
→ In C-language yo loop can be classified into the following types.



① **for Loop :-** It is a pre test loop is basically used when number of iteration are known in Advance.

Syntax :-

```
for (initialization Expression; test Expression; Update Expression)
{
    Statement(s); // statement or statements which is to be repeated.
}
```



Que write a program to print Hello World 100 times.

Sol'n

```
# include <stdio.h>
# include <conio.h>
  void main ( )
{  int i;
  for (i=1; i<=100; i++)
    {
      Printf ("Hello.");
    }
      getch ( );
    }
```

RUN

(1) i=1
(2) i<=100 ?
i<=100
true
Hello (1 time) . .

Que. Write a program to print 1 number from 1 to 100.

Sol⇒

```
#include <stdio.h>
#include <conio.h>
void main ()
{ int i;
for ( i=1; i<=100 ; i++)
{
printf ("%d", i);
}
getch ();
}
```

Que. Write a program to print the table of a given number.

Sol⇒

```
#include <stdio.h>
#include <conio.h>
void main ()
{ int n, P, i;
Printf ("Enter a number");
Scanf ("%d", &n);
for (i=1; i<=10; i++)
{
P= n*i;
Printf ("%d", P);
}
getch ();
}
```

RUN	
Enter a No.	i=2, 2<=10
8	True Loop
i=1, 1<=10 ?	P= 8*2
True Loop	P= 16
P= 8*1	Print
P= 8	

Que. Write a program to print number from 1 to 100.

Sol=>

```
# include <stdio.h>
# include <conio.h>
void main ( )
{ int i;
for ( i=1; i<=100 ; i++)
{
Printf (" %d", i);
}
getch ( );
}
```

Que. Write a program to print the table of a given number.

Sol=>

```
# include <stdio.h>
# include <conio.h>
void main ( )
{ int n, P, i;
Printf ("Enter a number");
Scanf ("%d", & n);
for (i=1; i<=10; i++)
{
P = n * i;
Printf ("%d", P);
}
getch ( );
}
```

RUN	
Enter a No.	i=2 , 2<=10
8	True loop
i=1 , 1<=10 ?	P= 8*2
True loop	P = 16
P= 8*1	Print
P= 8	

Que:- Write a program to find whether a given number is prime or not. (A Number is prime if it is divisible by 1 and itself only).

E.g. 2, 3, 5, 7, 11, 13, 17, ...

Sol" =>

```
# Include <stdio.h>
# Include <conio.h>
  void main ( ).
{
  int n, i, c = 0;
  Printf ("Enter a number");
  Scanf ("%d", &n);
  for ( i = 1; i <= n ; i ++)
      { if (n % i == 0)
          c++;
      }
      if (c == 2)
      Printf ("%d" is prime ", n);
      else
      Printf("%d", is not prime");
      getch ( );
}
```

RUN.

first time		Second time
i = 1 . 1 <= 5 ? ↓ True		i = 2 2 <= 5 ? ↓ True
if 5 % 1 == 0 ↓ True		if 5 % 2 == 0 ↓ false
c++	c = 0 + 1 c = 1	value of c will not change

```
#include<stdio.h>
#include<conio.h>
void main()
{
  int n, i, c=0;
Printf("Enter a number");
Scanf("%d", &n);
  for(i=2; i<=n/2; i++)
  {
    if(n%i==0)
      c++;
  }
    if(c==0)
Printf("%d is prime", n);
else
    Printf("%d is not prime", n);
      getch();
    }
```

Ex: Write a program to find whether a given number is ~~perf~~ perfect number or not.

(A number is perfect if its factors sum (including 1) is equal to that number.

Eg. If number = 6

factors = 1, 2, 3

Sum = 1+2+3 = 6

Sol'n

```
#Include<stdio.h>
#Include<conio.h>
  Void main()
{
  int n, i, Sum=0;
Printf("Enter a number");
Scanf("%d", &n);
  for (i=1; i<=n/2; i++)

  { if (n%i==0)
      Sum = Sum + i;
  }
  If Sum == n
  Printf("%d is a perfect number", n);
else
Printf("%d is not a perfect number", n);
      getch();
}
```

RUN Enter a no. 28	Second
i=1, 1<=14	↓
↓ True	i=1, 1<=14
if 28%1==0	↓ True
↓ True	if 28%1==0
Sum = 0+1 = 1	↓ True
	Sum = 1+2
	Sum = 3

Que- WAP to print Fibonacci series upto n terms. (In Fibonacci series first two terms are 0 and 1 and next term is Equal to the sum of previous two terms).

Ex- 0 1 1 2 3 5 8 13 .....

Sol⇒

```
# include <stdio.h>
# include <conio.h>
  void main()
{
  int a=0, b=1, c, i, n;
  Printf ("How many terms");
  Scanf ("%d", &n);
   if n==1
   { printf ("%d", a);
      }
     else
     {
       Printf ("%d %d", a, b);
   }
   for (i=1; i<=n-2; i++)
   {
      c= a+b
  Printf ("%d", c);
      a= b;
      b= c;
   }
     getch ();
     }
```

RUN

first	Second	Third
i=1, i<=3	i=2, 2<=3	i=3, 3<=3
↓ True	↓ True	↓ True
c= 0+1	c=1+1	c= 1+2
c= 1	c=2	c=3
a=1	a=1	a=2
b=1	b=2	b=3

Ex-1

Que- Write a program to find the sum of fibonacci series upto n terms.

Soln

```
# include <stdio.h>
# include <conio.h>
void main ( )
{
int a=0 , b=1 , c, i, n , sum;
Printf ("How many terms");
Scanf ("%d", &n) ;
if (n==1)
{
Print ("%d", a);
sum=0
}
else
{
Printf("%d %d", a, b);
Sum=1
}
for (i=1; i<=n-2; i++)
{
c= a+b
Printf ("%d", c);
Sum = Sum+c
a= b;
b= c;
}
Printf ("Sum of fibonacci series =%d", Sum);
getch ( );
}
```

Rohan

Q. Write A program to print the following.

$-8\ -6\ -4\ -2\ 0\ 2\ 4\ 6\ 8$.

Sol^n

```
#t Include<stdio.h>
#t Include <conio.h>
  void main()
{
  Int i;
 for (i=-8; i<=8 ; i=(i+2)
  {
    printf("%d",i);
  }
     getch();
    }
```

While loop → It is also a pretest loop, while loop is basically used when number of iteration are not known in Advance.

Syntax:-

```
Initailization Expression;
while (test Expression?)
  {
    Statement(s);
  Update Expression;
  }
```

Q. write program to print "Hello word 100 times.

Sol:

```
#  include<stdio.h>
#  include<conio.h>
   void main()
{
   int i=1;
   while (i<=100)
   {
     Printf ("Hellow");
      i++;
   }
     getch();
   }
```

Run

Loop	i = 2 i<=100
i=1	↓ yes
i<=100	Loop
↓ yes	Hellow
Hello.	

Q. W.AP to print the Table of a given Number using while loop

Sol

```
#  include<stdio.h>
#  include<conio.h>
   void main()
{
   int n, p, i=1;
   ~~while (i<=10)~~
   Printf ("Enter a number");
   Scanf ("%d", &n);
while (i<=10) → p=n*i;
   Printf ("%d", p);
      i++;
   }
     getch();
   }
```

Que. Write a program to find the sum of digits of a number.

Eg:- 375

Sum of digits = 3+7+5
= 15)

Soln

```
# Include<stdio.h>
# Include<conio.h>
void main()
{
  int n, r, sum = 0;
Printf("Enter a number");
 scanf("%d", &n)
while (n) or (n != 0) or (n > 0).
{
   r = n % 10;
  sum = sum + r;
   n = n / 10;
}
  Printf("Sum of digits = %d", sum);
   getch();
}
```

RUN

Enter a Number	Second time	Third time	Fourth time
n = 789	n > 0	n > 0	n > 0
First time	78 > 0 ?	7 > 0	0 > 0
n > 0	↓ True	↓ True	↓ False.
789 > 0	r = 8	r = 17 + 7	
↓ True	Sum = 9 + 8	= 24	
r = 9	= 17	n = 0	
Sum = 0 + 9	n = 7		
n = 78			

Q. WAP to find the reverse of a number.

Eg number = 658

reverse = 856

Sol^n

1st method

```
#Include<stdio.h>
#Include<conio.h>
void main()
{
int n, r; rev=0;
Printf("Enter a number");
Scanf("%d", &n);
while(n>0)
{
r = n%10
Printf("%d", r);
n = n/10;
}
getch();
}
```

2nd method

```
#Include<stdio.h>
#Include<conio.h>
void main()
{
int n, r, rev=0;
Printf("Enter a number");
Scanf("%d", &n);
while(n>0
{
r = n%10
rev = rev*10+r;
n = n/10;
}
Printf("Reverse of number =%d", rev);
getch();
}
```

RUN

Enter a number	Second time	Third time
n=175	n>0	n>0
first time	17>0	1>0
n>0	True	True
175>0	r=7	loop.
True	rev = 5*10+7	r=1
r=5	= 57	rev=57*10+1
rev = 0*10+5	n=1	= 571
= 5		n=0
n=17		

Q. Write A program find whether a given number is palindrome or not.

(A number is palindrome if reverse of the number is Equal to number itself).

Eg: number = 121
reverse = 121

```
#include <stdio.h>
#include <conio.h>
void main ()
{
int n, r, rev=0, copy;
Printf ("Enter a number");
Scanf ("%d", &n);
copy = n;
while (n>0)
{
r = n%10;
rev = rev * 10 + r;
n = n/10;
}
if (copy == rev)
Printf ("%d is palindrome", copy);
else
Printf ("%d is not palindrome", copy);
getch ();
}
```

125
...

125
64
+ 19

Ques. WAP to find whether a given number is Amstrong or not.

(A number is Amstrong if the sum of cube of its digit is equal to number itself).

E.g = 153

Sum = $1^3 + 5^3 + 3^3$

= 1 + 125 + 27

= 153

```
# include <stdio.h>
# include <conio.h>
void main ( ).
{
  int n, r, sum=0, copy;
  Printf ("Enter a number");
  Scanf ("%d", &n);
   copy = n;
  while (n>0)
  {
   r=n%10;
   sum = sum + rxrxr;
   n=n/10;
  }
  if (copy = = sum)
  Printf ("d is Amstrong", copy);
  else
   Printf ("%d is not Amstrong", copy);
   getch ( );
  }
```

RUN

n=153

copy=153

Ent

n>0

153>0

r=3

sum= 0+27 ...

n=15

Q. Write A program find whether a given number is palindrome or not.

(A number is palindrome if reverse of the number is Equal to number itself).

Eg: number = 121
reverse = 121

```
#include <stdio.h>
#include <conio.h>
void main ()
{
int n, r, rev=0, copy;
Printf ("Enter a number");
Scanf ("%d", &n);
copy = n;
while (n>0)
{
r = n%10;
rev = rev * 10 + r;
n = n/10;
}
if (copy == rev)
Printf ("%d is palindrome", copy);
else
Printf ("%d is not palindrome", copy);
getch ();
}
```

Ques. WAP to find whether a given number is Armstrong or not.

(A number is Armstrong if the sum of cube of its digit is equal to number itself).

E.g = 153

Sum = $1^3 + 5^3 + 3^3$

= 1 + 125 + 27

= 153

```
# include <stdio.h>
# include <conio.h>
  void main ()
  {
    int n, r, sum=0, copy;
    Printf ("Enter a number");
    Scanf ("%d", &n);
      copy = n;
    while (n>0)
      {
      r = n % 10;
      sum = sum + r*r*r;
        n = n/10;
      }
      if (copy == sum)
      Printf ("d is Armstrong", copy);
      else
        Printf ("%d is not Armstrong", copy);
          getch ();
          }
```

RUN

n = 153

copy = 153

First

n > 0

153 > 0

r = 3

sum = 0 + 27 + 27 + 27

n = 15

(3) do while loop, do while loop is a post test loop, this loop will execute at least, Once whether the condition of the loop is True or false.

Syntax:

```
intialization
do
{
  Statement(s);
  Update Expression;
}
while (test Expression);
```

Q- WAP to whether a given number is armstrong or not using do-while loop

Sol-

```
#include <stdio.h>
# ~~conio~~ #include <conio.h>
void main()
{
int n, r, sum = 0, copy;
Printf ("Enter a number");
Scanf ("%d", &n);
  copy = n;
  do
  {
    r = n % 10;
  sum = sum + r * r * r;
  n = n/10;
  } while (n>0);
if (copy == sum)
Printf ("%d is Armstrong", copy);
else
  Printf ("%d is not Armstrong number");
        getch();
}
```

Break and continue statement loop

Break → when a break statement is encountered in a loop, it immediately terminate the loop and Transfer the control outside the loop. It is usually associated with if statement.

E.g
```
# include <stdio.h>
# include <conio.h>
  void main ( )
{ int i;
for (i=1; i<=10; i++)
 {
   if (i==5)
   break;
 Printf ("%d", i);
}
  getch ( );
  }
```
output 1, 2, 3, 4.

Continue → when a continue statement is encountered in a loop, it skip any code in between the loop and continue with the next iteration of the loop. It is usually associated with if statement.

Eg.
```
# include <stdio.h>
# include <conio.h>
  void main( )
{ int i;
for (i=1; i<=10; i++)
 { if (i==5)
```

```
continue;
printf ("%d", i);
}
getch();
}
```

output → 1,2,3,4,6,7,8,9,10

Que. WAP to print Even number from 1 to 100 using continue.

Sol'n

```
# include <stdio.h>
# include <conio.h>
void main()
{
int i;
for (i=1; i<=100; i++)
{
if(i%2!=0)
continue;
Printf ("%d", i);
}
getch ( );
}
```

[2,4,6,8,10 ... 100]

* Nested loop → when we write one loop inside another loop this is called nested loop.

Que. Write a program to print table from m to n.

Sol⁰ →

```
#include <stdio.h>
#include <conio.h>
void main ()
{
int m, n, P, i, j;
Printf (" Enter Range Value of m & n");
Scanf ("%od %od", &m, &n);
for (i=m; i<=n; i++) // Range
  {
  for (j=1; j<=10; j++) // Table
      P= i*j;
  Printf ("%od", P);
  }
    printf ("\n");
  }
    getch ();
    }
```

RUN.

m=3, n=10	J=2, 2<=10	---- j=10, 10<=10
outer loop	↓True	↓True
i=3 | 3<=10	loop	loop
↓True	P= 3*2	P= 3*10
loop	=6	= 30
j=1 | 1<=10		
↓True		
loop		
P= 3*1		
=3		

Que WAP to print all prime number from 5 to 500.

```
#Include<stdio.h>
#Include<conio.h>
void main()
{ int n, i, c;

for (n=5; n<=500; n++)
 {
   c=0
  for (i=2; i<=n/2; i++)
   {
     if (n%i==0)
        c++
   }
     if (c==0)
   printf ("%d is prime", n);
   }
     getch();
     }
```

RUN.

Outer loop. n=5 | 5<=500	i++ | i=3 | 3<=2	outer loop	
↓ True	↓ false	n++ | n=6 | 6<=500	i++ | i=4 | 4<=6/2
Inner loop c=0	Exit from inner loop	↓ True	↓ false
i=2 | 2<=5/2		Inner loop c=0	Exit from
↓ True	5 is prime.	i=2 | 2<=6/2	inner loop.
if (5%2==0)		↓ true.	
↓ false		if (6%2==0)	
c++ | c=0+1		c++ | c=0+1	
		=1	

Qu WAP to print following pattern:

```
1
1 2
1 2 3
1 2 3 4
1 2 3 4 5
```

```
*
* *
* * *
* * * *
* * * * *
```

```
#include <stdio.h>
#include <conio.h>
void main()
{ int i, j;
  for (i=1; i<=5; i++) // Row
  {
    for (j=1; j<=i; j++) // column
    {
      Printf ("%d", j);
    }
    print ("\n");
  }
  getch();
}
```

For star

```
#include <stdio.h>
#include <conio.h>
void main( )
{ int i, j;
  for (i=1; i<=5; i++) //Row
  {
    for (j=1; j<=i; j++) //column
    {
      Printf (" *");
    }
    Printf ("\n");
  }
  getch();
}
```

RUN

outer loop	outer loop	J=2 | 2<=2
i=1 | 1<=5 ↓ True	i=2 | 2<=5 ↓ True	↓ True
Inner loop	Inner loop	2 print
j=1 | 1<=1 | j=2 | 2<=1 ↓ false	J=1 | 1<=2 ↓ true	
Print 1	1 Print	

Q. WAP to print following pattern

```
1
2 2
3 3 3
4 4 4 4
5 5 5 5 5
```

Sol:

```
#include<stdio.h>
#include<conio.h>
void main()
{int i, j;
for (i=1; i<=5; i++) //Row
{
for (j=1; j<=i; j++) // column
{
printf("%d",i);
}
printf("\n");
}
getch();
}
```

Q. WAP to print following ~~to~~ pattern.

```
1
2 3
4 5 6
7 8 9 10
11 12 13 14 15
```

Sol⁽²⁾⇒

```
#include<stdio.h>
#include<conio.h>
void main()
{ int n, i, j, count=1;
for (i=1; i<=5; i++) //Row
{
for (j=1; j<=i; j++) // column.
{
printf("%d", count);
count++;
} print("\n");
getch();
}
```

Que WAP to print following pattern : 5 4 3 2 1

5 4 3 2

5 4 3

5 4

5

Sol

```
# Include <stdio.h>
# Include <conio.h>
Void main()
{ int i, j ;
  for (i = 1 ; i <= 5 ; i++) // Row
  {
   for (j = 5 ; j >= i ; j--) // column
     {
      Printf ("%d", j);
     }
     Printf ("\n");
      }
       getch ();
        }
```

Array :— An Array is a collection homogeneous Type of data elements i.e. collection of similar data Type elements which are stored contiguous memory under a common variable name.

Array is basically used when we have number of variables having same data Type.

Array declaration → one dimensional Array.

Syntax : `data Type Array-name [Size];` [ ] → index or subscript

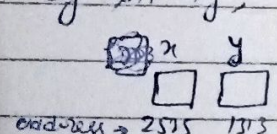
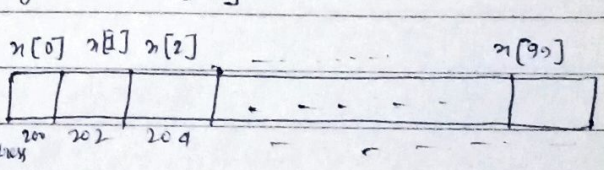
E.g. (i) `int x[100];`

It is an array having 100 element (variable) & value of all 100 elements would be integer.

(ii) `float y[40];`

(iii) `char z[5];`

(iv) `double xxx[50];`

Simple variable in memory	Array in memory
Eg. `int x,y;`  Random address are provided	Eg. `int x[100];`  continuous memory By default index value starts from 0 to n-1 Suppose Integer takes 2 byte space in memory. So the difference in address is 2

☆ Supply of value in Array using initialization :→

Simple variable initialization	Array initialization
(i) int n = 5 (ii) float y = 4.5	Eg. (i) int n[5] = {5,3,17,2,6}; n[0] = 5 n[1] = 3 n[2] = 17 n[3] = 2 n[4] = 6 int n[5] = {5,3,17}; n[0] = 5 n[1] = 3 n[2] = 17 n[3] = 0 n[4] = 0

☆ Supply of value in Array using scanf() function :→

We will use scanf function inside for loop. to input value in array.

Qu- WAP to input 10 numbers & find their sum.

```
#
#
  void main ( )
{ int  n[10] , i, sum=0;
  Printf ("Enter 10 numbers");
  for (i=0 ; i<=9 ; i++)
{
  Scanf ("%d", &n[i]);
  }
      for (i=0; i<=9 ; i++)
  {
    sum = sum+n[i];
    }
    printf (" Sum of 10 number "%d );
      getch ();
       }
```

Two dimensional array

Syntax:

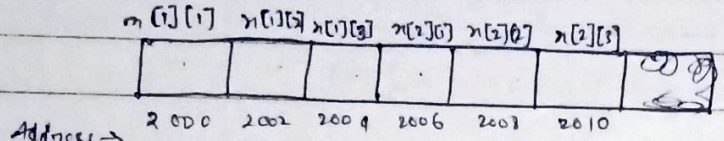
Data Type Array-name [size1] [size2];

size1 → Rows, size2 → column

Eg. (i) int n[2][3]

There are 6 elements in this array and all the elements belongs to integers.

(Suppose index value starts from 1)



Eg. float y[5][4];

Que. WAP to input elements in a 2×3 matrix and print the matrix.

Sol:

```
#include<stdio.h>
#include<conio.h>
void main()
{ int a[2][3],i,j;
printf("Enter elements in 2×3 matrix");
  for(i=1; i<=2 , i++) //Rows
    {
    for (j=1 ; j<=3 ; j++) // column
    {
      scanf("%d",&a[i][j]);
    }
    }
      printf("matrix is");
      for (i=1 ; i<=2 ; i++)
       { print("\n");
```

```
for ( j = 1 ; j<=3 ; j++)
{
    Printf ("\t %d", a[i][j] );
}
}
    getch ( );
}
```

RUN

Enter elements 2×3 matrix
6
3
7
2
5
4
matrix is

6	3	7
2	5	4

Que- WAP to input elements in a m×n matrix and print the matrix.

Sol:

```
# include<stdio.h>
# include <conio.h>
void main( )
{ int a [10] [10] ,m,n, i, j ;
printf ("Enter the row & column, maximum 10");
Scanf ("%d %d", &m, &n);
Printf ("Enter elements of matrix");
  for (i=1; i<=m; i++) //Rows
  {
   for (j=1; j<=n; j++) // column
   {
       scanf ("%d", & a[i][j]
   }
  }
  Printf ("matrix is ");
  for ( i=1 ; j<= n; j++) :
  { printf ("\t %d", a[i][j]);
  }
  } getch ( );
   }
```

Que. WAP to add two matrix.

```
#include<stdio.h>
#include<conio.h>
void main()
{ int a[10][10], b[10][10], c[10][10], m, n, i, j;
  printf("Enter row & column, maximum 10");
  scanf("%d %d", &m, &n);
  Printf("Enter elements of first matrix");
    for (i=1; i<=m; i++)
    {
      for (j=1; j<=n; j++)
      {
        scanf("%d", &a[i][j]);
      }
      }
      Printf("Enter elements of second matrix");
    for (i=1; i<=m; i++)
    {
     for(j=1; j<=n; j++)
     {
      scanf("%d", &b[i][j]);
     }
     }
      for (i=1; i<=m; i++)
     {
      for (j=1; j<=n; j++)
      {
        c[i][j] = a[i][j] + b[i][j]
      }
      }
```

```
Printf ("matrix after Addition is");
for (i=1; i<=m; i++)
{
  Printf ("\n");
for (j=1; j<=n; j++)
{
  Printf ("\t %d", c[i][j]);
}
}
  getch ( );
}
```

for Substraction of matrix.

```
# Include <stdio.h>
# Include <conio.h>
  void main ( )
{ int a[10][10] ,b[10][10], c[10][10], m, n, i, j;
  Printf ("Enter row & column, maximum 10");
  Scanf ("%d %d", &m, &n);
  Printf (" Enter elements of first matrix");
    for (i=1; i<=m; i++)
    {
      for (j=1; j<=n; j++)
      {
        Scanf ("%d", &a[i][j];
      }
      }
        Printf ("Enter element of second matrix");
        for (i=1; i<=m ; i++)
        {
          for (j=1 ; j<=n; j++)
            {
```

```
scanf ("%d", &b[i][j]);
}
}
for (i=1; i<=m; i++)
{
  for (j=1; j<=n; j++)
  {
    c[i][j] = a[i][j] - b[i][j]
  }
  }
  Printf ("matrix after substraction is");
  for (i=1; i<=m; i++)
  {
    Printf ("\n");
  for (j=1; j<=n; j++)
  {
    Printf ("\t.%d", c[i][j]);
  }
  }
    getch();
  }
```

(3) WAP to find the Transpose of matrix. Eg $a = \begin{bmatrix} 3 & 2 & 5 \\ 6 & 7 & 1 \end{bmatrix}$

Sol^n

Transpose of $a = \begin{bmatrix} 3 & 6 \\ 2 & 7 \\ 5 & 1 \end{bmatrix}$

```
#include <stdio.h>
#include <conio.h>
  void main ( )
{ int a[10][10], t[10][10], m, n, i, j;
 Printf ("Enter rows & column, maximum 10);
  Scanf ("%d %d", &m, &n);
 Printf ("Enter elements of matrix");
  for (i=1; i<= m; i++)
    {
     for (j=1; j<=n; j++)
   { Scanf ("%d", & a[i][j]);
   } }
      }
   for (j=1; j<=n; i++)
     {
       for (j=1; j<= m; j++)
       {
          t[i][j] = a[j][i];
          }
          }
        Printf ("matrix after transpose\n");
  for (i=1; i<=n; i++)
    {
      Printf ("\n");
  for (j=1; j<=m; j++)
   {
    Printf ("\t %d", t[i][j]);
   }
   }
     getch( )
       }
```

RUN

Enter Rows & column

2 - m

3 - n

Enter elements of matrix

3 - a[1][1]

2 - a[1][2]

5 - a[1][3]

6 - a[2][1]

7 - a[2][2]

1 - a[2][3]

t[1][1] = a[1][1]

= 3

t[1][2] = a[2][1]

= 6

. . . .

Q. Write a program to find the sum of principal ~~dig~~ diagonal elements of a square matrix.

Eg. $$a = \begin{bmatrix} 3 & 5 & 7 \\ 2 & 4 & 6 \\ 3 & 7 & 8 \end{bmatrix}_{3\times3}$$

Square matrix same no. of rows & column.

→ Principal diagonal.

```
#include <stdio.h>
#include<conio.h>
void main( )
{ int a[10][10], m, i, j, sum=0;
 printf ("Enter order (row or column) of square matrix");
  scanf ("%d",&m);
 printf (" Enter elements of square matrix");
    for (i=1; i<= m; i++)
  {
  for (j=1; j<=m; j++)
  {
   scanf ("%d", &a[i][j]);
  }
  }
    for (i=1; i<= m ; i++)
  {
   for (j=1; j<=m; j++)
   {
     if (i==j)
   sum = sum + a[i][j];
   }
   } printf ("Sum of principal diagonal element =%d", sum);
        getch ();
        }
```

Que. WAP to find the sum of all the elements of matrix.

Sol:

```
#Include <stdio.h>
#include <conio.h>
void main()
{ int a[10][10], m, i, j, Sum=0;
Printf("Enter the elements of matrix of order row and column");
Printf("Enter order (row or column) of square matrix");
Scanf("%d", &m);
Printf("Enter element of square matrix");
   for (i=1; i<=m; i++)
   {
    for (j=1; j<=m; j++)
    {
    Scanf("%d", &a[i][j]);
   }
   }
    for (j=1; i<=m; i++);
    {
     for (j=1; j<=m; j++)
     {
        if (i==j)
      Sum = Sum + a[i][j];
     }
     }
      Printf("Sum of element = %d", Sum);
        getch();
       }
```

Que. WAP to find whether a given square matrix is symmetric or not ($A = A^T$)

Eg.

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 4 \\ 3 & 4 & 1 \end{bmatrix} \quad A^T = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 4 \\ 3 & 4 & 1 \end{bmatrix}$$

Both are same so this matrix is symmetric.

Sol^n)

```
#include <stdio.h>
#include <conio.h>
void main ()
{ int a[10][10], t[10][10], m, i, j, unequal=0;
printf ("Enter order(row or column) of square matrix");
scanf ("%d", &m);
printf ("Enter Elements of square matrix");
for (i=1; i<=m; i++)
{
for (j=1; j<=m; j++)
{
scanf ("%d", &a[i][j]);
}
}
for (i=1; i<=m; i++)
{
for (j=1; j<=m; j++)
{
t[i][j] = a[i][j];
}
}
for (i=1; i<=m; i++)
{
for (j=1; j<=m; j++)
{
if (a[i][j] != t[i][j])
{ unequal = 1;
break;
}
if (unequal == 1)
break;
} if (unequal==0)
Printf ("matrix is symmetric");
else
Printf ("matrix is not symmetric");
getch();
}
```

Ex: write a program to multiply two matrix.

```
#include<stdio.h>
#include<conio.h>
void main()
{ int a[10][10], b[10][10], c[10][10], m1, n1, m2, n2, i, j, k;
  printf("Enter row and column of first matrix");
  scanf("%d%d", &m1, &n1);
  printf("Enter row and column of second matrix");
  scanf("%d%d", &m2, &n2);
    if (n1 != m2)
  {
    printf("matrix can not multiply");
  }
  else
  { printf("Enter element of first matrix");
     for(i=1; i<=m1; i++)
    {
     for(j=1; j<=n1; j++)
     {
      scanf("%d", &a[i][j]);
     }
    }
    printf("Enter elements of second matrix");
     for (i=1; i<=m2; i++)
     {
      for(j=1; j<=n2; j++)
      {
       scanf("%d", &b[i][j]);
      }
     }
```

```
for (i=1; i<= m1; i++)
  {
  for (j=1; j<= n2; j++)
   { c[i][j] = 0;
  for (k=1; k<= n1; k++)
   {
   c[i][j] = c[i][j] + a[i][k] * b[k][j];
    }
    }
    }
     Printf ("matrix after multiplication is");
    for (i=1; i<= m1; i++)
    {
     Printf ("\n");
    for (j=1; j<= n2; j++)
    {
     Printf ("\t%d", c[i][j]);
    }
    }
    }
     getch();
    }
```

E.g

$$a = \underset{m_1 \times n_1}{\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 5 \end{bmatrix}_{2\times 3}}, \quad b = \underset{m_2 \times n_2}{\begin{bmatrix} 3 & 2 & 5 \\ 1 & 2 & 6 \end{bmatrix}_{2\times 3}}$$

$n_1 != m_2$

Eg → Can not multiply.

Que WAP to multiply two matrix of dimension 4x4.

Sol:
```
# include <stdio.h>
# include <conio.h>
void main()
{ int a[4][4], b[4][4], c[4][4], i, j, K;
  Printf ("Enter elements of first matrix ");
  for (i=1; i<=4 ; i++)
  {
   for (j=1; j<=4 ; j++)
    {
    Scanf("%d", & a[i][j]);
  }
  }
  Printf("Enter elements of second matrix");
 for( i=1; i<=4 ; i++)
  {
   for ( j=1 ; j<=4 ; j++)
  {
   Scanf("%d" & b[i][j]);
   }
   }
 for (i=1; i<=4 ; i++) //Row of first matrix
  {
  for (J=1; J<=4 ; j++) // Second matrix column.
  { c[i][j] =0;
   for (K=1;  K<= 4 ; K++)
   {
    c[i][j] = c[i][j] + a[i][K] * b[K][j];
    }
    }
    }
```

1 1 | 1 1
2 2 | 2 2

1+2

```
Printf ("matrix after multiplication is");
 for (i=1; i<=4; i++)
 {
   Printf ("\n");
 for (j=1; j<=4; j++)
 {
   Printf ("\t %d", c[i][j]);
 }
 }
   getch();
     }.
```