

## Loop Control Statements :

Loop : A loop is defined as a block of statements which are repeatedly executed for certain number of times. ..

→ The C language supports three types of loop control statements .

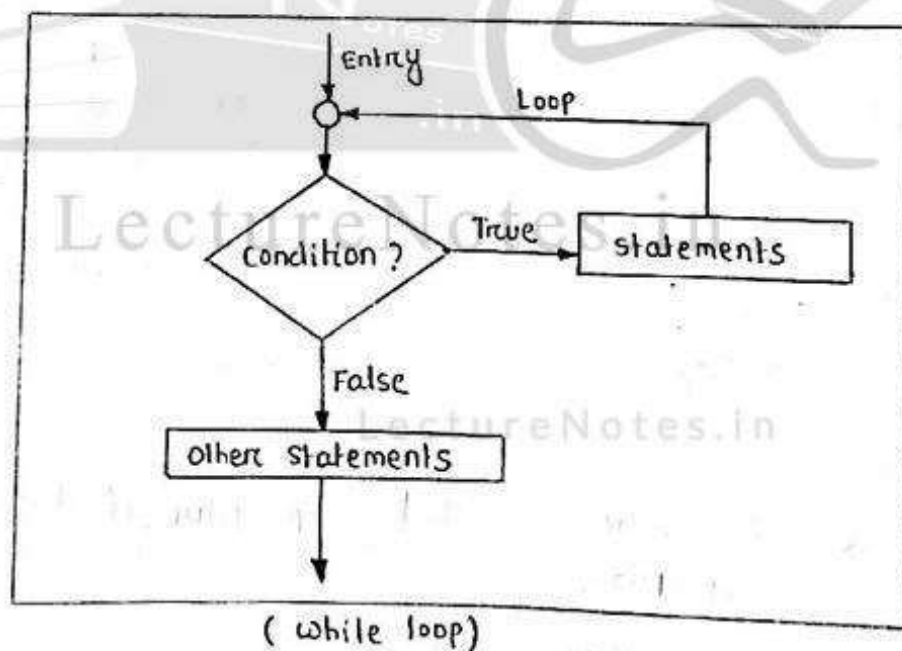
1. while loop
2. do... while loop
3. for loop.

1. while loop : The while loop repeats a statement until the test at the top returns false .

→ Syntax : while ( condition )

```
{  
    statements ;  
}  
other statements ;
```

→ Flowchart :



→ In while loop first , Condition is evaluated . If it is true , statement is executed and condition is reevaluated . This cycle continue until condition becomes false .

Example : /\* write a program to print the numbers from 1 to 10 using while loop \*/

```
#include <stdio.h>
#include <conio.h>
void main()
{
    int a = 1;
    clrscr();
    while (a <= 10)
    {
        printf("%d\t", a);
        a = a + 1; /* statement that changes the value of the
                    condition */
    }
    printf("\n");
    getch();
}
```

output : 1 2 3 4 5 6 7 8 9 10

Example : /\* write a program to print numbers in reverse order from 10 to 2 with a difference of 2 \*/

```
#include <stdio.h>
#include <conio.h>
void main()
{
    int k = 10;
    clrscr();
    while (k >= 2)
    {
        printf("%d\t", k);
        k = k - 2;
    }
    printf("\n");
    getch();
}
```

Output: 10 8 6 4 2

Example : /\* write a program to print the sum of digits of any number \*/

```
#include <stdio.h>
#include <conio.h>
void main()
{
    int n, sum=0, rem;
    clrscr();
    printf("\n Enter the number :");
    scanf("%d", &n);
    while (n > 0)
    {
        rem = n % 10;
        sum = sum + rem;
        n = n / 10;
    }
    printf(" sum of digits of %d is = %d\n", n, sum);
    getch();
}
```

output : Enter the number : 1245  
sum of digits of 1245 is = 12

Example : /\* write a program to convert the binary number to a decimal number \*/

```
#include <stdio.h>
#include <conio.h>
void main()
{
    int n, nsave, rem, d, j=1, dec=0;
    clrscr();
```

```

printf (" Enter the number in binary :\n");
scanf ("%d", &n);
nsave = n;
while (n > 0)
{
    rem = n % 10;
    d = rem * j;
    dec = dec + d;
    j = j * 2;
    n = n / 10;
}
printf (" Binary number = %d Decimal number = %d\n", nsave, dec);
getch();
}

```

Output: Enter the number in binary : 1101  
 Binary number = 1101 Decimal number = 13

## 2. do ... while loop :

- This is very similar to the while loop except that the test occurs at the end of the loop body.
- This guarantees that the loop is executed atleast once before continuing.

→ Syntax :

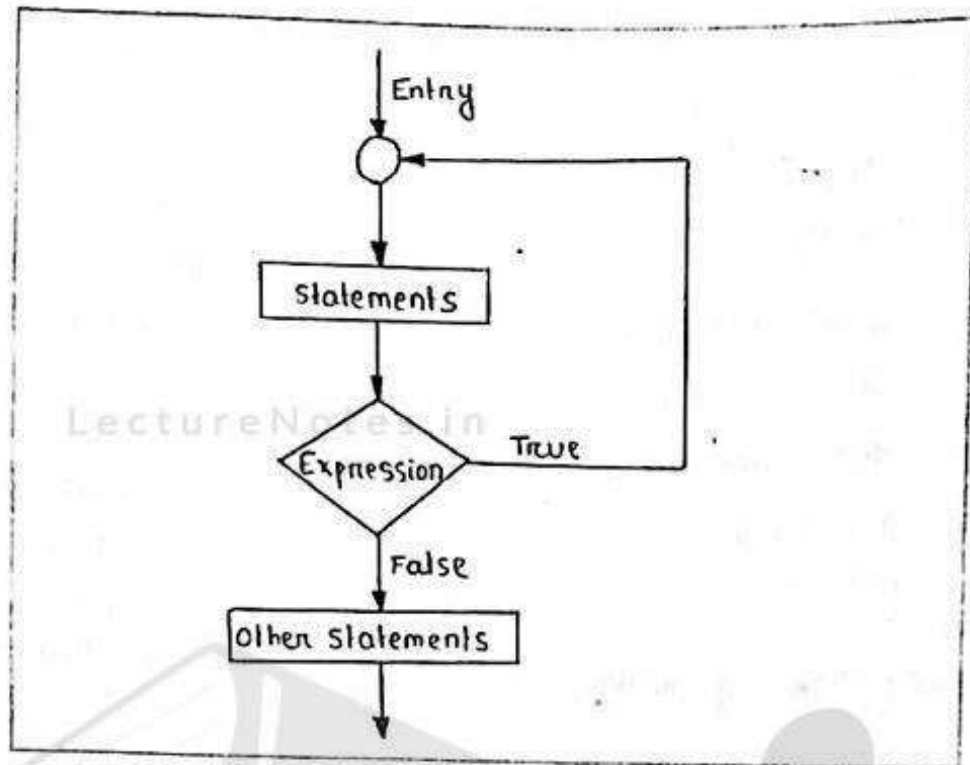
```

do
{
    statements;
} while (expression);

```

- In do..while loop, the statement is executed, then expression is evaluated. If it is true, statement is evaluated again and so on. When expression becomes false, loop terminates.

→ Flowchart :..



( do....while loop)

Example : / \* write a program to print the numbers from 1 to 10  
using do....while loop \*/

```
#include <stdio.h>
#include <conio.h>
void main()
{
    int i=1;
    clrscr();
    do
    {
        printf("%d\t", i);
        i=i+1;
    } while (i<=10);
    printf("\n");
    getch();
}
```

output : 1 2 3 4 5 6 7 8 9 10

Example : /\* write a program to count the digits in any number \*/

```
#include <stdio.h>
```

```
#include <conio.h>
```

```
void main()
```

```
{
```

```
    int n, count = 0; area
```

```
    clrscr();
```

```
    printf ("Enter the number : \n");
```

```
    scanf ("%d", &n);
```

```
    do
```

```
    {
```

```
        n = n/10;
```

```
        count++;
```

```
    } while (n > 0);
```

```
    printf ("Number of digits = %d\n", count);
```

```
    getch();
```

```
}
```

output : Enter the number : 5453

Number of digits = 4

Example : /\* write a program to find the sum of the numbers entered from the keyboard \*/

```
#include <stdio.h>
```

```
#include <conio.h>
```

```
void main()
```

```
{
```

```
    int n, sum = 0;
```

```
    clrscr();
```

```
    printf ("Enter the numbers (0 to stop) :");
```

```
    scanf ("%d", &n);
```

```
    do
```

```
    {
```

```
        sum = sum + n;
```

```
    } while (n != 0);
```

Assignment : /\* write a program to find the product of digits of any number \*/

```
#include <stdio.h>
#include <conio.h>
void main()
{
    int n, product=1, rem;
    clrscr();
    printf("Enter the number:\n");
    scanf("%d", &n);
    while (n>0)
    {
        rem = n%10;
        product = product * rem;
        n = n/10;
    }
    printf("product of digits = %d\n", product);
    getch();
}
```

output : Enter the number : 234  
product of digits = 24

Assignment : /\* write a program to find the factorial of any number \*/

```
#include <stdio.h>
#include <conio.h>
void main()
{
    int n, num;
    long fact=1;
    clrscr();
```

```

printf ( " Enter the number : \n" );
scanf ( "%d", &n );
num = n ;
if ( n < 0 )
    printf ( " No Factorial of negative number \n" );
else
{
    while ( n > 1 )
    {
        fact = fact * n ;
        n -- ;
    }
    printf ( " Factorial of %d is = %d \n", num, fact );
}
getch();
}

```

output : Enter the number : 4  
 Factorial of 4 is = 24

Assignment : /\* write a program to check whether a number is palindromic or not \*/

```

#include <stdio.h>
#include <conio.h>
void main()
{
    int num, rev = 0, rem;
    clrscr();
    printf ( " Enter a number : \n" );
    scanf ( "%d", &num );
    while ( num != 0 )
    {

```



```

    rem = num % 10 ;
    num = num / 10 ;
    rev = rev * 10 + rem ;
}
printf ( " Reverse of a no. is %d \n", rev);
if ( num == rev)
{
    printf ( " The no. is palindrome" );
}
else
{
    printf ( " The no. is not a palindrome" );
}
getch();
}

```

Output : Enter a number : 125  
 Reverse of a no. is 521  
 The no. is not a palindrome .

```
printf("sum is %d\n", sum);  
getch();  
}
```

Output :

[References : 1. S. Srivathava  
2. A. K. Rath]

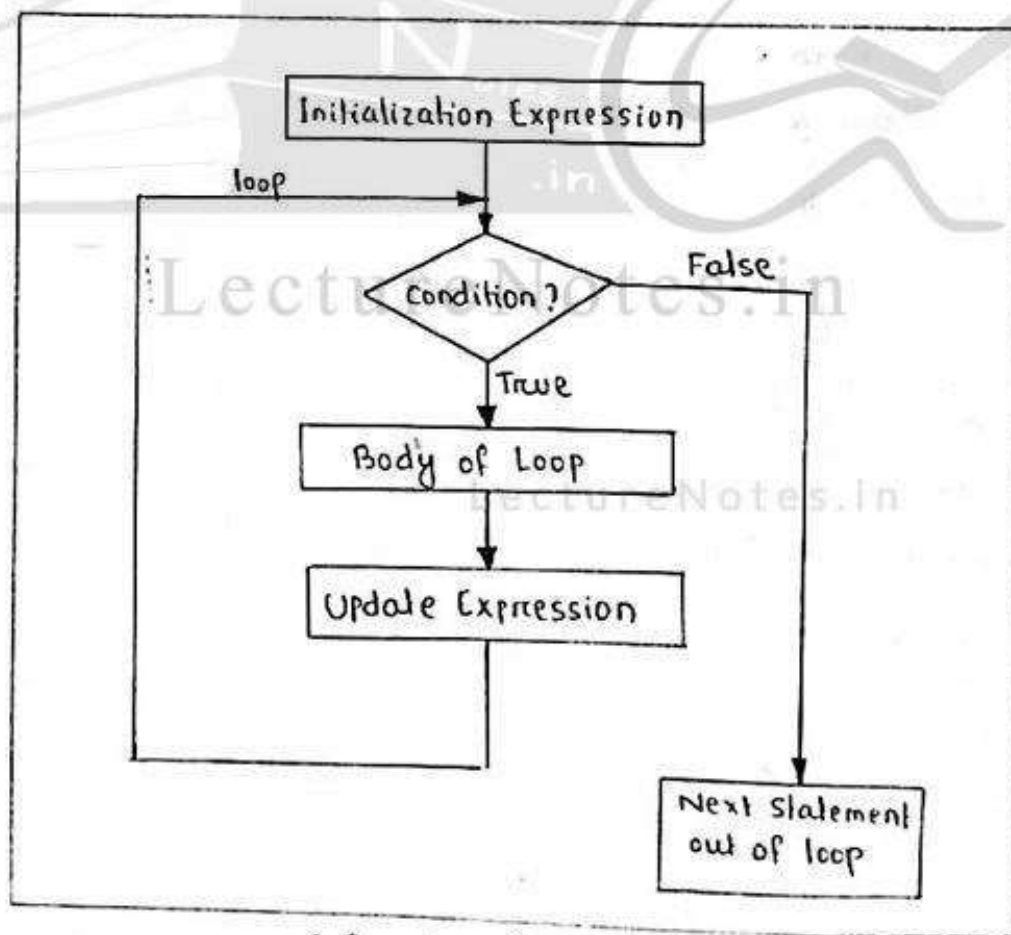
### Lesson Number : 19

3. For loop : The for loop allows to execute a set of instructions until a certain condition is satisfied.

→ Syntax :

```
for ( initialize counter ; test condition ; re-evaluation parameter )  
{  
    Statements ;  
}
```

→ Flowchart :



( for loop )

Example : /\* write a program to print the numbers 1 to 10 using for loop \*/

```
#include <stdio.h>
#include <conio.h>
void main()
{
    int n;
    clrscr();
    for (n = 1; n <= 10; n++)
    {
        printf("%d\t", n);
    }
    printf("\n");
    getch();
}
```

output : 1 2 3 4 5 6 7 8 9 10

Example : /\* write a program to print numbers in reverse order from 1 to 10 with a difference of 2 \*/

```
#include <stdio.h>
#include <conio.h>
void main()
{
    int k;
    clrscr();
    for (k = 10; k >= 2; k -= 2)
    {
        printf("%d\t", k);
    }
    printf("\n");
    getch();
}
```

output : 10 8 6 4 2

Example: /\* write a program to multiply two positive numbers without using \* operator \*/

```
#include <stdio.h>
#include <conio.h>
void main()
{
    int a, b, i; int result = 0;
    clrscr();
    printf (" Enter two numbers to be multiplied : \n");
    scanf ("%d %d", &a, &b);

    for (i = 1; i <= b; i++)
    {
        result = result + a;
    }
    printf ("%d * %d = %d \n", a, b, result);
    getch();
}
```

output: Enter two numbers to be multiplied : 4 5  
4 \* 5 = 20

Example: /\* write a program to find the sum of the series  
1 + 2 + 4 + 7 + 11 + 16 + ..... upto n terms \*/

```
#include <stdio.h>
#include <conio.h>
void main()
{
    int i, n, sum = 0, term = 1;
    clrscr();
    printf (" Enter the number of terms : \n");
    scanf ("%d", &n);
```

```

for ( i = 1 ; i <= n ; i++ )
{
    sum = sum + term ;
    term = term + i ;
}
printf ( " The sum of series upto %d terms is %d\n", n, sum );
getch ( ) ;
}

```

output : Enter number of terms : 4

The sum of series upto 4 terms is 14

Example : /\* write a program to print the fibonacci series \*/  
 1 1 2 3 5 8 13 21 . . . . .

```

#include <stdio.h>
#include <conio.h>
void main ( )
{
    long x, y, z ;
    int i, n ;
    clrscr ( ) ;
    x = 0 ;
    y = 1 ;
    printf ( " Enter the number of terms : \n" ) ;
    scanf ( " %d", &n ) ;
    printf ( " %d", y ) ;
    for ( i = 1 ; i < n ; i++ )
    {
        z = x + y ;
        printf ( " %d", z ) ;
        x = y ;
        y = z ;
    }
}

```

```
printf ( "\n" );
getch();
}
```

output: Enter the number of terms : 3  
1 1 2

### Nesting of ~~For~~ loops:

- When a loop is written inside the body of another loop, then it is known as nesting of loops.
- Any type of loop can be nested inside any other type of loop.
- For example a for loop may be nested inside another for loop or inside a while loop or do...while loop. Similarly while and do...while loops can be nested.

/\* program to understand the nesting in for loop \*/

```
#include <stdio.h>
```

```
#include <conio.h>
```

```
void main()
```

```
{ int i, j;
```

```
for ( i=1 ; i<=3 ; i++ ) /* outer for loop */
```

```
{ printf ( " i = %d\n", i );
```

```
for ( j=1 ; j<=4 ; j++ ) /* inner for loop */
```

```
{ printf ( " j = %d\t", j );
```

```
printf ( "\n" );
```

```
    }
```

```
    getch();
```

```
}
```

Output :

```

i = 1
j = 1   j = 2   j = 3   j = 4
i = 2
j = 1   j = 2   j = 3   j = 4
i = 3
j = 1   j = 2   j = 3   j = 4

```

Example : /\* write a program to find the armstrong number from 100 to 999 \*/

```

#include <stdio.h>
#include <conio.h>
void main()
{
    int num, n, cube, d, sum;
    clrscr();
    printf("Armstrong numbers are :\n");
    for (num = 100; num <= 999; num++) /* outer for loop */
    {
        n = num;
        sum = 0;
        while (n > 0) /* inner while loop */
        {
            d = n % 10;
            n = n / 10;
            cube = d * d * d;
            sum = sum + cube;
        }
        if (num == sum)
            printf("%d\t", num);
    }
    getch();
}

```

perfect no.

↓  
positive int. that  
is equal to the  
sum of its proper  
divisors.

exp. 6, 28, 496,

Strong no.

$145 = 1! + 4! + 5!$   
= 145

output :

Example : /\* write a program to detect the largest number out of five numbers and display it \*/

```
#include <stdio.h>
#include <conio.h>
void main()
{
    int a, b, c, d, e, sum = 0, i;
    clrscr();
    printf ( " Enter five numbers : \n");
    scanf ( " %d %d %d %d %d", &a, &b, &c, &d, &e);
    sum = a + b + c + d + e;
    for ( i = sum; i <= sum; i--)
    {
        if ( i == a || i == b || i == c || i == d || i == e )
        {
            printf ( " The largest number : %d", i);
            break;
        }
    }
    getch();
}
```

output : Enter five numbers : 5 2 7 3 10  
The largest number : 10



## ASSIGNMENTS

/\* program to print the following \*/

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

```
#include <stdio.h>
```

```
#include <conio.h>
```

```
void main()
```

```
{
```

```
    int i, j, n;
```

```
    clrscr();
```

```
    printf("Enter the number of rows : \n");
```

```
    scanf("%d", &n);
```

```
    for (i=1; i<=n; i++)
```

```
    {
        for (j=1; j<=i; j++)
```

```
            printf(" *");
```

```
            printf("\n");
```

```
    }
```

```
    getch();
```

```
}
```

/\* program to print the following \*/

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

```
#include <stdio.h>
```

```
#include <conio.h>
```

```
void main()
```

```
{
```

```

int n, i, j;
clrscr();
printf (" Enter the no. of rows\n");
scanf ("%d", &n);
for (i=1; i<=n; i++)
{
    for (j=1; j<=n-i; j++)
        printf (" ");
    for (j=1; j<=i; j++)
        printf ("* ");
    printf ("\n");
}
getch();
}

```

/\* write a program to print the following \*/

```

1
1 2
1 2 3
1 2 3 4

```

```

#include <stdio.h>
#include <conio.h>
void main()
{
    int n, i, j;
    clrscr();
    printf (" Enter the no. of rows\n");
    scanf ("%d", &n);
    for (i=1; i<=n; i++)
    {

```

```

    for ( j=1 ; j<=i ; j++)
        printf ( "%d", j);
        printf ( "\n");
    }
    getch();
}

```

/\* program to print the following \*/

```

1
2 3
4 5 6
7 8 9 10

```

```

#include <stdio.h>
#include <conio.h>
void main()
{
    int n, i, j, p;
    clrscr();
    printf ( "\n How many rows");
    scanf ( "%d", &n);
    p=1;
    for ( i=1 ; i<=n ; i++)
    {
        for ( j=1 ; j<=i ; j++)
        {
            printf ( "%d", p);
            p=p+1;
        }
        printf ( "\n");
    }
    getch();
}

```

Lesson Number : 20

Solved programs :

/\* program to find the factorial of a number \*/

```
#include <stdio.h>
```

```
#include <conio.h>
```

```
void main()
```

```
{
```

```
    int i, n;
```

```
    long fact = 1;
```

```
    clrscr();
```

```
    printf("Enter the number\n");
```

```
    scanf("%d", &n);
```

```
    if (n < 0)
```

```
        printf("No factorial will be found\n");
```

```
    else
```

```
        { for (i = 1; i <= n; i++)
```

```
            { fact = fact * i;
```

```
            }
```

```
        printf("The factorial of a no. is %d\n", fact);
```

```
    }
```

```
    getch();
```

```
}
```

output : Enter the number 5  
The factorial of a no. is 120.

/\* write a program to convert the decimal no. to binary \*/

```
#include <stdio.h>
```

```
#include <conio.h>
```

```
#include <math.h>
```

```
void main()
```

```
{
```

```
int num, rem, n=0, sum=0;
```

```
clrscr();
```

```
printf (" \n Enter a decimal number");
```

```
scanf ("%d", &num);
```

```
do {
```

```
    rem = num % 2;
```

```
    sum = sum + (rem * pow(10, n));
```

```
    num = num / 2;
```

```
    n++;
```

```
} while (n > 0);
```

```
printf (" Binary equivalent of decimal no. %d = %d\n", num, sum);
```

```
getch();
```

```
}
```

output : Enter a decimal number 5

Binary equivalent of decimal no 5 = 101

/\* program to find the reverse of a number \*/

```
#include <stdio.h>
```

```
#include <conio.h>
```

```
void main()
```

```
{
```

```
    int num, rev=0, rem;
```

```
    clrscr();
```

```
    printf (" Enter the number \n :");
```

```
    scanf ("%d", &num);
```

```
    while (num != 0)
```

```
    {
```

```
        rem = num % 10;
```

```

num = num/10;
rev = rev * 10 + rem;
}
printf("Reverse of the number is %d\n", rev);
getch();
}

```

output : Enter the number 453  
Reverse of the number is 354

/\* program to convert the lowercase letter to uppercase letter  
and uppercase letter to lowercase letter \*/ [A=65  
a=97]

```

#include <stdio.h>
#include <conio.h>
void main()
{
    char ch;
    clrscr();
    printf("\n Enter a character :");
    scanf("%c", &ch);

    if (ch >= 65 && ch <= 90)
        ch = ch - 32;
    else
        if (ch >= 97 && ch <= 122)
            ch = ch + 32;

    printf("%c", ch);
    getch();
}

```

output : Enter a character : A  
a

/\* write a program to print the following \*/

```

* * * *
 * * *
  * *
   *

```

```
#include <stdio.h>
```

```
#include <conio.h>
```

```
void main()
```

```
{
```

```
    int i, j, n;
```

```
    clrscr();
```

```
    printf("\n How many rows");
```

```
    scanf("%d", &n);
```

```
    for (i = 1; i <= n; i++)
```

```
    {
        for (j = 1; j <= n; j++)
```

```
        {
            if (j <= i)
```

```
                printf(" *");
```

```
            else
                printf(" ");
```

```
        }
```

```
        printf("\n");
```

```
    }
```

```
    getch();
```

```
}
```

output: Enter How many rows : 4

```

* * * *
 * * *
  * *
   *

```

\*)

```

A
B B
C C C
D D D D

```

```
void main()
```

```
{
```

```
    int i, j;
```

```
    for (i = 1; i <= 4; i++)
```

```
    {
```

```
        for (j = 0; j <= i; j++)
```

```
        {
```

```
            printf("%c", 'A' + i + j);
```

```
        }
```

```
        printf("\n");
```

```
    }
```

```
}
```

/\* write a program to print the following \*/

```

* * * *
 * * *
  * *
   *

```

```

#include <stdio.h>
#include <conio.h>
void main()
{
    int i, j, n;
    clrscr();
    printf("How many rows\n");
    scanf("%d", &n);
    for (i=1; i<=n; i++)
    {
        for (j=1; j<=n; j++)
        {
            if (j>=i)
                printf(" * ");
            else
                printf(" ");
        }
        printf("\n");
    }
    getch();
}

```

output: How many rows 4

```

* * * *
 * * *
  * *
   *

```

(\*)

```

A
A B
A B C
A B C D

```

```

void main()
{
    int i, j;
    for (i=1; i<=4; i++)
    {
        for (j=1; j<=i; j++)
        {
            printf("%c", 'A'+j-1);
        }
        printf("\n");
    }
}

```

or

```

void main()
{
    char j;
    int i;
    for (i=0; i<4; i++)
    {
        for (j=65; j<=65+i; j++)
        {
            printf("%c", j);
        }
        printf("\n");
    }
}

```



/ \* write a program to print the following \*/

```
0
1 0
0 1 0
1 0 1 0
```

```
#include <stdio.h>
#include <conio.h>
void main()
{
    int i, j, n;
    clrscr();
    printf("How many rows\n");
    scanf("%d", &n);
    for(i=1; i<=n; i++)
    {
        for(j=1; j<=n; j++)
        {
            if(i >= j)
            {
                if((i+j)/2 == 0)
                    printf("0");
                else
                    printf("1");
            }
        }
        printf("\n");
    }
    getch();
}
```

/\* write a program to print the following \*/

#include <stdio.h>

#include <conio.h>

void main()

{ int i, j, n;

clrscr();

printf ("How many rows\n");

scanf ("%d", &n);

for (i=1; i<=n; i++)

{ for (j=1; j<=n; j++)

{ if (j<=i)

printf ("0");

else printf ("1");

} printf ("\n");

getch();

}

/\* write a program to print the following \*/

#include <stdio.h>

#include <conio.h>

void main()

{ int i, j, n;

clrscr();

printf ("How many rows\n");

scanf ("%d", &n);

for (i=1; i<=n; i++)

{

0 1 0 1

0 1 0

0 1

0

0

1 0

0 1 0

1 0 1 0

```

for (j=1; j<=n; j++)
{
    if (i >= j)
    {
        if ((i+j)%2 == 0)
            printf("0");
        else
            printf("1");
    }
    printf("\n");
}
getch();
}

```

/\* write a program to print the following \*/

```

* * * *
* * *
* *
*

```

```
#include <stdio.h>
```

```
#include <conio.h>
```

```
void main()
```

```
{
    int i, j, n;
```

```
    clrscr();
```

```
    printf("How many rows\n");
```

```
    scanf("%d", &n);
```

```
    for (i=1; i<=n; i++)
```

```
    {
        for (j=n; j>=1; j--)
```

```
        {
            if (j >= i)
```

```
                printf(" *");
```

```

else printf (" ");
}
printf ("\n");
}
getch();
}

```

/\* write a program to print the following \*/

```

      *
     * *
    * * *
   * * * *

```

```

#include <stdio.h>
#include <conio.h>
void main()
{
    int i, j, n;
    clrscr();
    printf (" How many rows\n");
    scanf ("%d", &n);
    for (i=1; i<=n; i++)
    {
        for (j=n; j>=1; j--)
        {
            if (i>=j)
                printf (" *");
            else
                printf (" ");
        }
        printf ("\n");
    }
    getch();
}

```