Control Structures

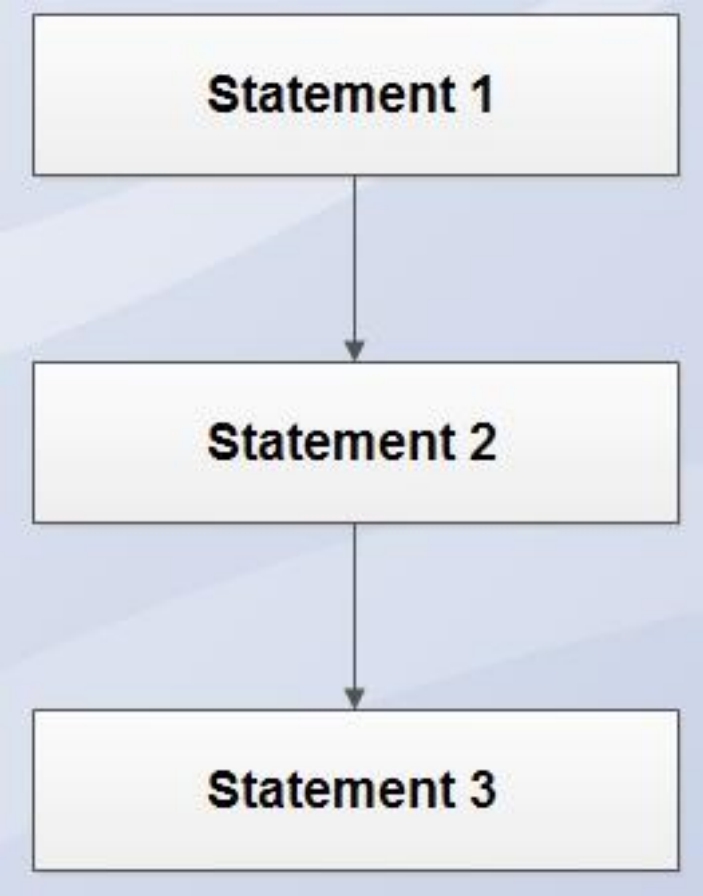
Control structures the structures which control the flow of program from one part to another depending on condition

Types of control structures:

1. Sequential Structure
2. Selection Structure / Branching Structure: if –else, switch-case
3. Loop Structure/ Iteration Construct:- for, while , do - while

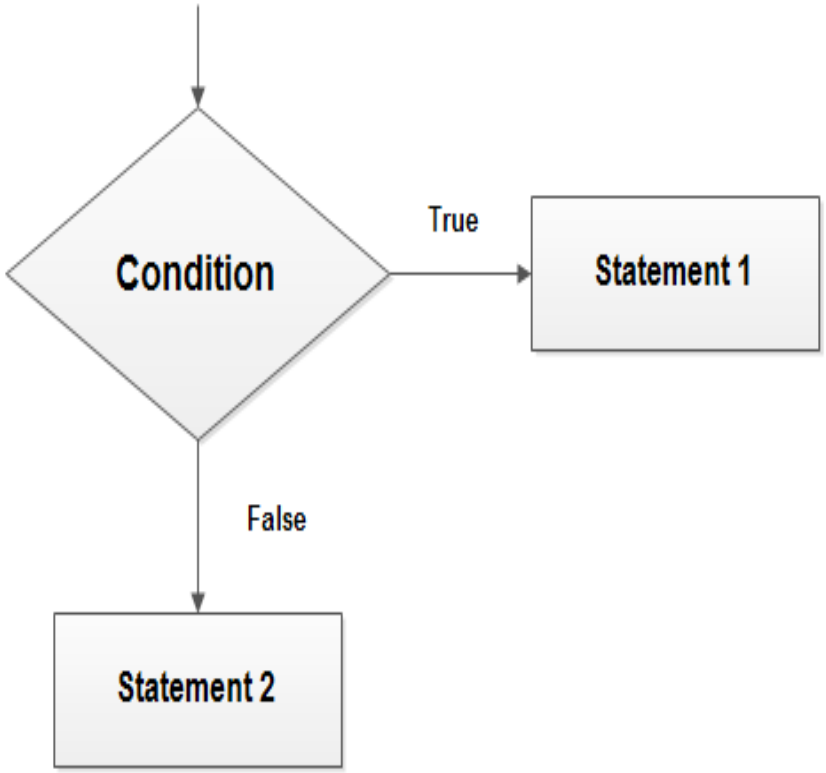
Sequential Structure

It is the most simplest programming structure where statements are executed sequentially from top to bottom without repetition, branching and without any condition



Selective Construct

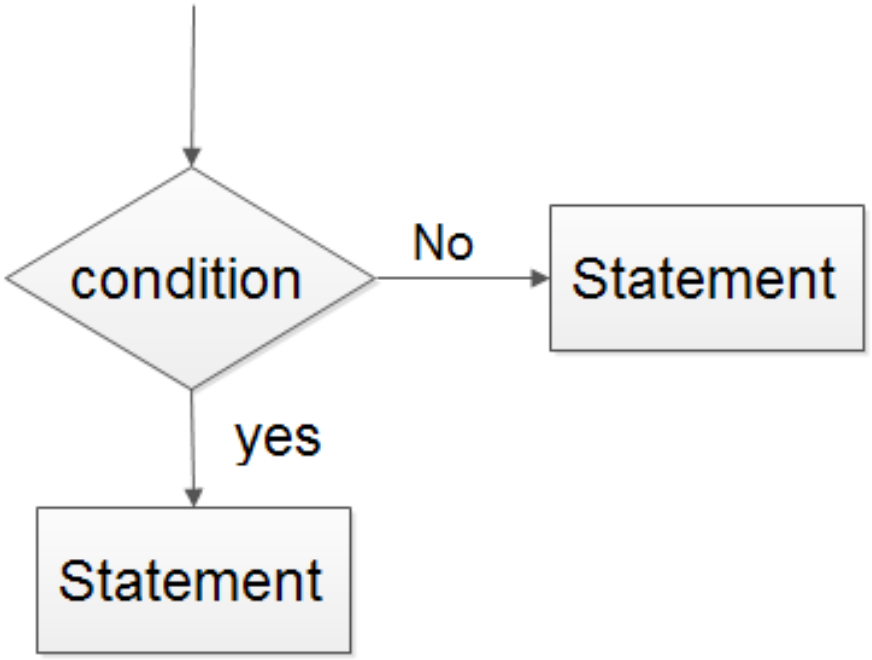
In this structure execution of statements depends upon a condition. If condition is true, one action is followed, otherwise another action is followed. It is also known as branching structure or decision construct.



if Statement

Syntax:

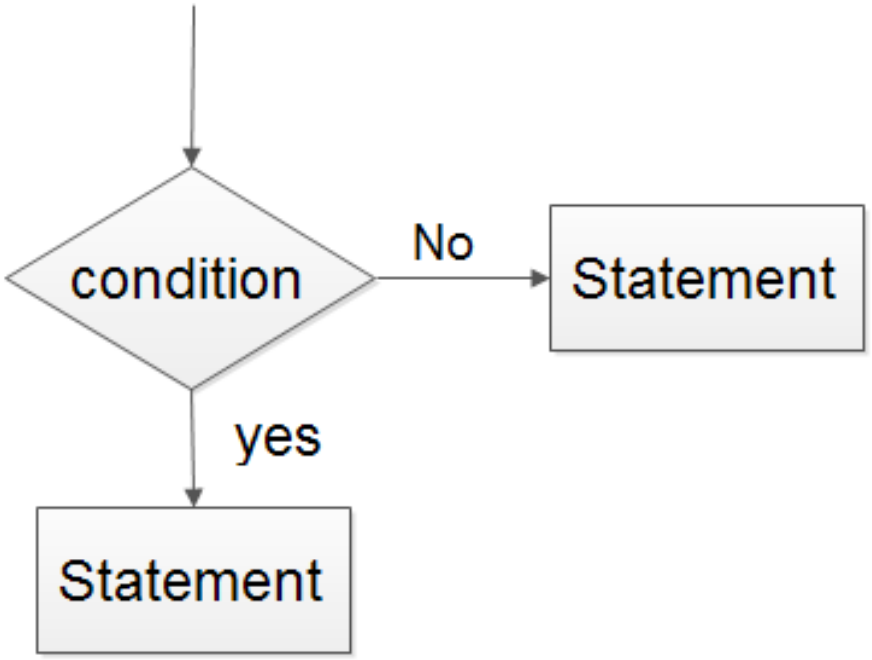
```
if(Conditional expression)
    {
        Statement(s)
    }
```



if-else Statement

Syntax

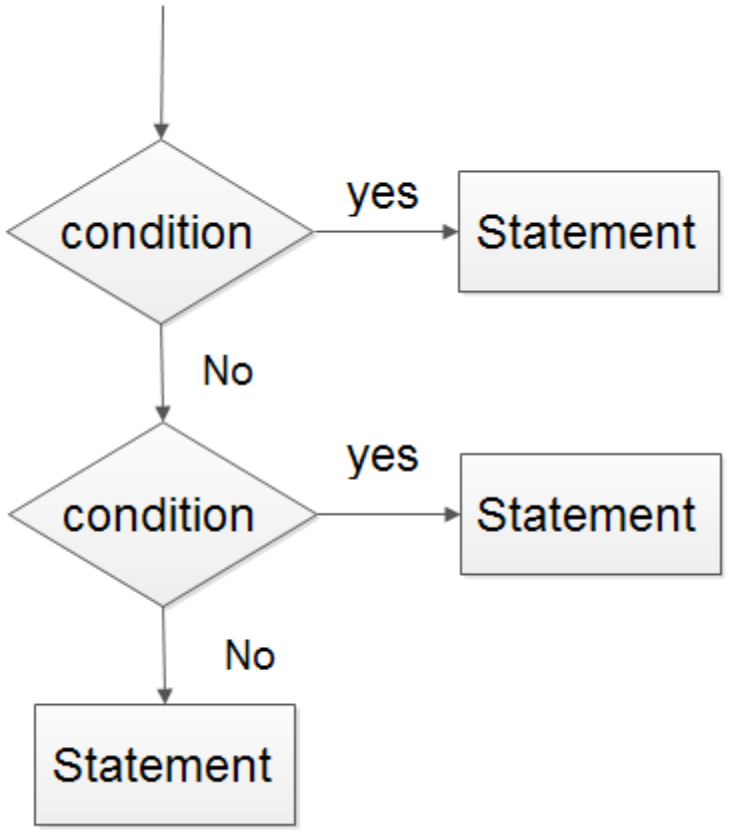
```
if (conditional expression)
    {
        statement
    }
Else
    {
        statement
    }
```



if-else if statement

Syntax

```
if (conditional expression)
      {
          statement
      }
else if (conditional expression)
      {
          statement
      }
else
      {
          statement
      }
```



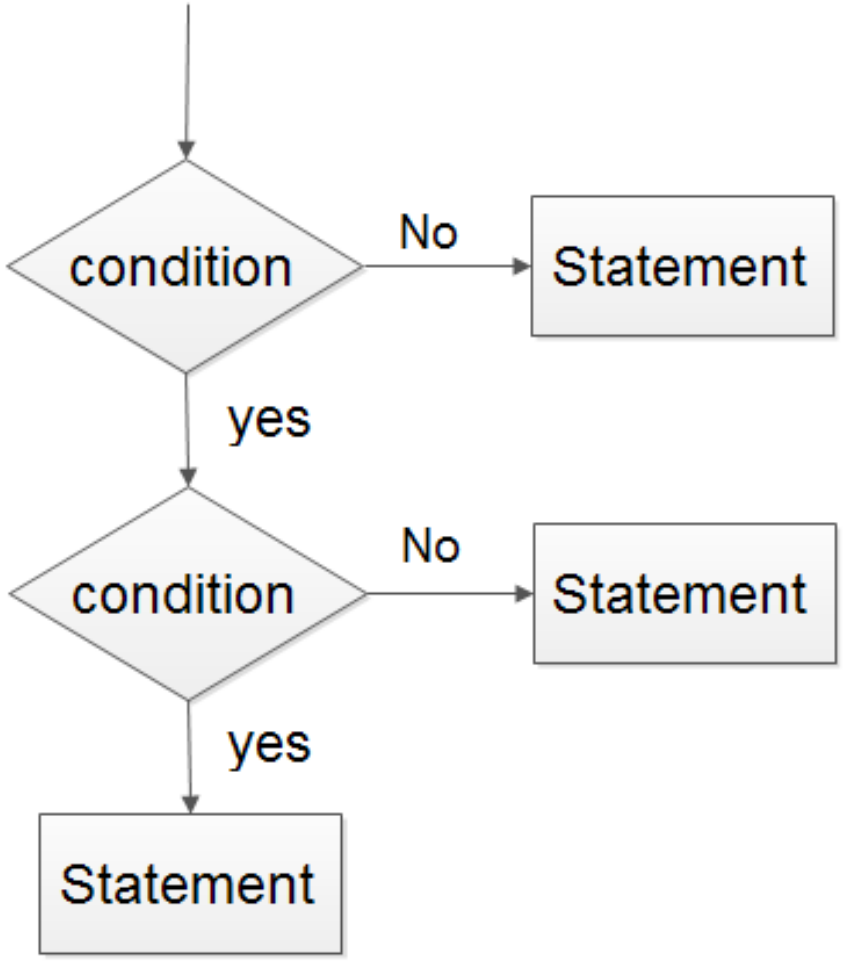
Practical Questions

1. Write algorithm, flow chart and program to find out the given number is negative or positive.
2. Write algorithm, flow chart and program to find out the given number is odd or even.
3. Write algorithm, flow chart and program to read three integer numbers and print the maximum.
4. 4. Write a flowchart and a program to find out whether the given 4 digit number (year) is a leap year or not

Nested if-else statement

Syntax

```
if (conditional expression)
      {
          if (conditional expression
                    {
                       statement
                    }
          else
                    {
                       statement
                    }
      }
else
      {
          statement
      }
```



1. Write algorithm, flow chart and program to find out the given number is negative or positive.

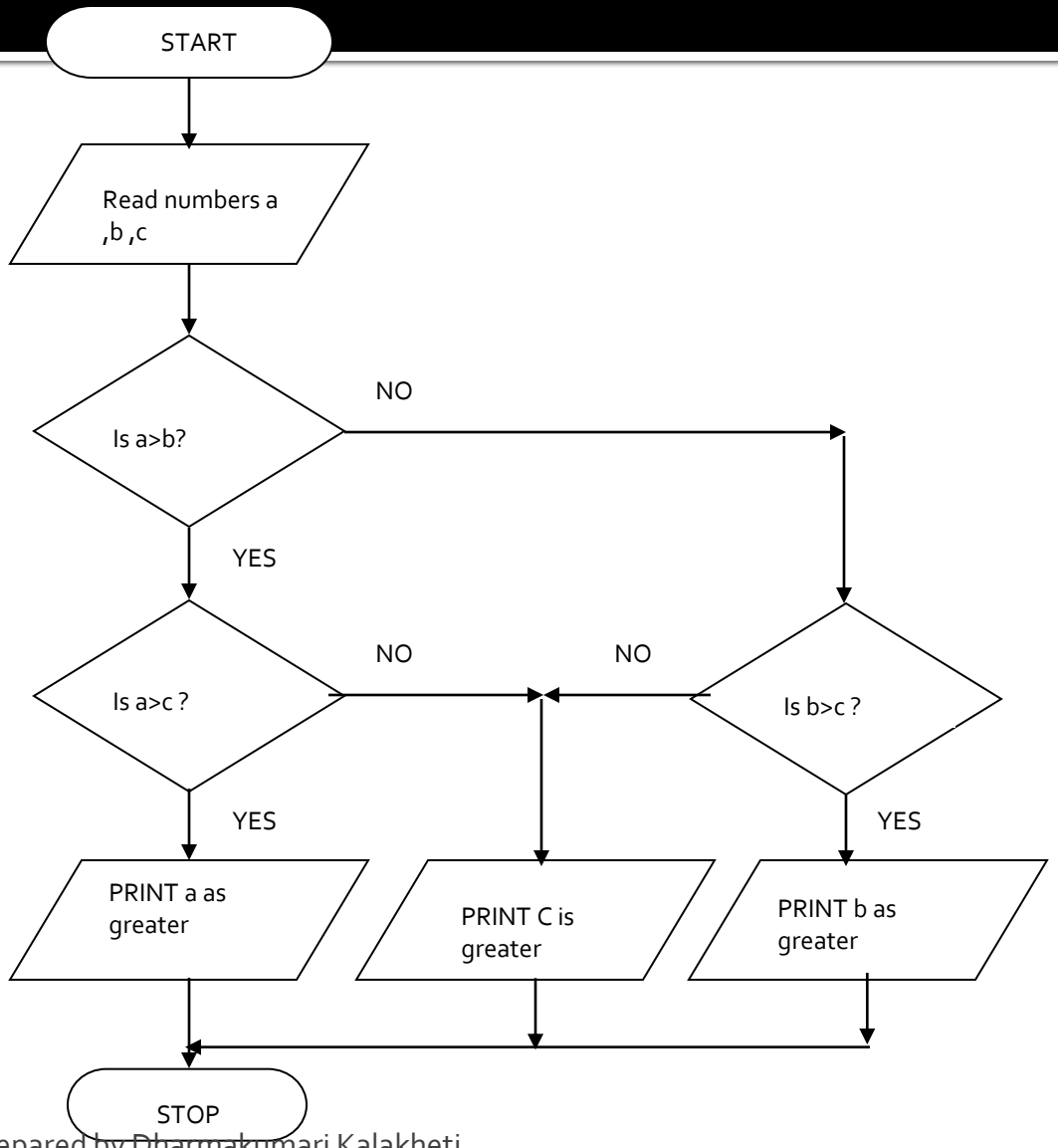
```
#include<stdio.h>
#include<conio.h>
void main()
                                        {
      clrscr();
      int n;
      printf("enter the value of n= ");
      scanf("%d",&n);
      if(n>=o)
      printf("positive number  ");
      else
      printf("negative number  ");
      getch();
      }
```

2. Write algorithm, flow chart and program to find out the given number is odd or even.

```
#include<stdio.h>
#include<conio.h>
void main()
        {
    clrscr();
    int x;
    printf("Enter the value of x= ");
    scanf("%d",&x);
    if(x%2==0)
    printf("even number  ");
    else
    printf("odd number  ");
    getch();
    }
```

3. Write algorithm, flow chart and program to read three integer numbers and print the maximum.

```
#include<stdio.h>
#include<conio.h>
//lude<math.h>
void main()
  {
            clrscr();
            int a,b,c;
  printf("enter the three number: a,b,c=");
  scanf("%d,%d,%d", &a,&b,&c);
  printf("a=%d,b=%d,c=%d\n",a,b,c);
  if (a>=b && a>=c)
  printf("a is greater ");
  else if (b>=a && b>=c)
  printf("b is greater");
            else
            printf("C is greater");
            getch();
  }
```


START
Read numbers a ,b ,c
Is a>b?
NO
YES
Is a>c ?
NO
NO
Is b>c ?
YES
YES
PRINT a as greater
PRINT C is greater
PRINT b as greater
STOP

4. Write a program to display whether the input digit is odd or even

```
#include<stdio.h>
#include<conio.h>
void main()
                                        {
      clrscr();
      int n,b;
      printf("enter the value of n= ");
      scanf("%d",&n);
      if(n%2)
      {b==0;
      printf("Even number");
      }
      else
      printf("Odd number ");
      getch();
      }
```

7. Write a program to read average temperature of a day in Fahrenheit to print
"Nice Day" if temp is >60 & <80
"Cold Day" if temp is <=60
"Hot Day" if temp is >=80

8. Write a flowchart a program to read length & breadth of a room and print area & print

"Auditorium " if area >2500
" Hall" if area.>=500 and <=2500
"Big Room" if area>150 and <500
"Small Room " if area <=150

9. Write a flowchart and a program to find out whether the given 4 digit number (year) is a leap year

WAP to input number and display it if it is exactly divisible by 5 but not by 11 (first semester 2072-12-24)

```
#include <stdio.h>
#include <conio.h>
#include <math.h>
void main()
      {
 int a;
      clrscr();
       printf("three any number=");
       scanf("%d",&a);

       if(a/5==0&& a/11!=0)
       printf(" %d is the divisible by 5and not divisible by 11 ");
       else
       printf("the condition is not satisfied ");
       getch(); }
```

17. Write a program to read average temperature of a day in Fahrenheit to print
"Nice Day" if temp is >60 & <80
"Cold Day" if temp is <=60
"Hot Day" if temp is >=80

```
#include<stdio.h>
#include<conio.h>
void main()
      {
        int temp;
        clrscr();
        printf("Enter temp: ");
        scanf("%d",&temp);
        if(temp > 60 && temp<80)
        printf("nice day: ");
        else if(temp<=60)
         printf("cold day: ");
           else if(temp>=80)
          printf("hot day :");
          getch();
          }
```

WAP to check if input number is palindrome or not

```
#include <stdio.h>
#include <conio.h>
void main()
{
int n,a,r,s=0;
printf("enter the number");
scanf("%d",&n);
a=n;
{
r=n%10;
s=s*10+r;
n=n/10;
}
if(a==s)
printf("It is palindrome");
 else
printf("It is not palindrome");
 getch();
 }
```

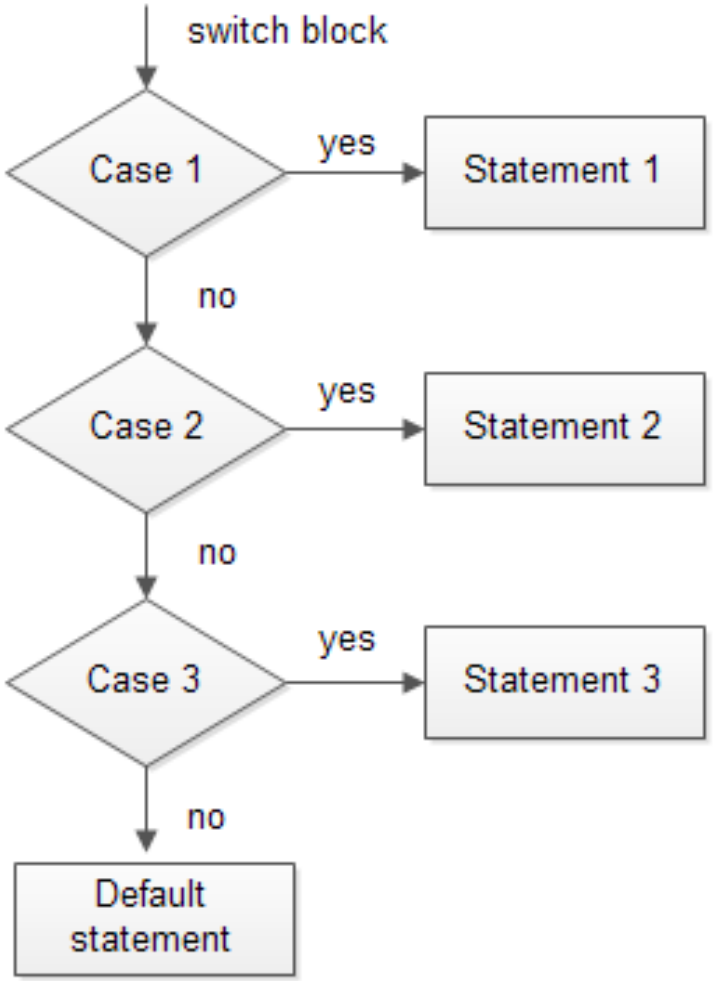
16. Write a flowchart a program to read length & breadth of a room and print area & print
"Auditorium " if area >2500
" Hall" if area.>=500 and <=2500
"Big Room" if area>150 and <500
"Small Room " if area <=150

```
#include<stdio.h>
#include<conio.h>
void main()
{
int l,b,a;
printf("enter the lenth=");
scanf("%d",&l);
printf("enter the breadth=");
scanf("%d",&b);
a=l*b;
printf("\narea=%d",a);
if(a>2500)
printf("\nauditorium");
else if(a>=500&&a<=2500)
  printf("\nHall");
  else if(a>150&&a<500)
  printf("\nBigroom");
  else if(a<=500)
   printf("\nsmall room");
   else
   printf("\nNO space");
   getch();
     }
```

switch-case statement

Syntax

```
switch (expression)
{
    case value 1:
        statement block;
        break;
    case value 2:
        statement block;
        break
    case value 3:
        statement block;
        break;
    ..
    default
        statement  block:
}
```



```
#include <conio.h>
#include <stdio.h>
 void  main()
 {

 int
s,a=4,b=4,sum,product
,division;
 printf("enter any case
:");
 scanf("%d",&s);
 switch(s)
 {
 case 1:
 sum=a+b;

printf("Sum=%d",sum);
 break;
```

```
case 2:
 product=a*b;
 printf("product=%d",product);
 break;
 case 3:
 division=a%b;
 printf("division=%d",division);
 }
  getch();

 }
```

```
#include <stdio.h>
 #include <conio.h>
 void  main()
 {
 icte:
 clrscr();
 int s,a,b,sum,product,division;
 //printf("enter any two numbers a and b:\n
");
 //scanf("%d%d",&a,&b);
 printf("case 1: sum\n");
 printf("case 2:produt\n");
 printf("case 3: division\n");
 scanf("%d",&s);
 switch(s)

 {
 case 1:
 printf("enter any two numbers a and b:\n
");
 scanf("%d%d",&a,&b);
 sum=a+b;
 printf("Sum=%d",sum);
 break;
case 2:
 printf("enter any two numbers a and b:\n ");
 scanf("%d%d",&a,&b);
 product=a*b;
 printf("product=%d",product);
 break;
 case 3:
 printf("enter any two numbers a and b:\n ");
 scanf("%d%d",&a,&b);
 division=a%b;
 printf("division=%d",division);
 }
  getch();
  goto icte;
  }
```

WAP to read two numbers and display the following menu: using switch case

MENU

i.Summation
ii.Sum of squares
iii.Sum of cubes
iv.product
v.Exit

```
#include <stdio.h>
#include <conio.h>
#include <math.h>
#include <stdlib.h>
  void main()
  {
  int n,s,p,x=5,y=4,cub,sqr;
  //clrscr();
  icte:
  printf("\n\t case 1: Summation");
  printf("\n\t case 2: Sum of cubes");
  printf("\n\t case 3: Sum of squares");
  printf("\n\t case 4: product");
  printf("\n\t case 5: exit");
  printf("\n\tenter the case=");
  scanf("%d",&n);
  clrscr();
switch(n)
   {
   case 1:
   s=x+y;
   printf("sum=%d",s);
   break;

 case 2:
  cub=pow(x,3)+pow(y,3);
  printf("sum of cube=%d",cub);
   break;
   case 3:
   sqr= pow(x,2)+pow(y,2);
   printf(" sum of sqr=%d",sqr);
   break;
   case 4:
    p=x*y;
  printf("prod=%d",p);
  break;
  case 5:
  exit(0);
   }
   getch();
  goto icte;
    }
```

Conditional Operators

The operator pair "? :"is known as conditional operator. Unlike all other operators ? : in C operator is ternary operator i.e. it takes three operands. The conditional operator has the following construct :

expr1 ? expr2: expr3

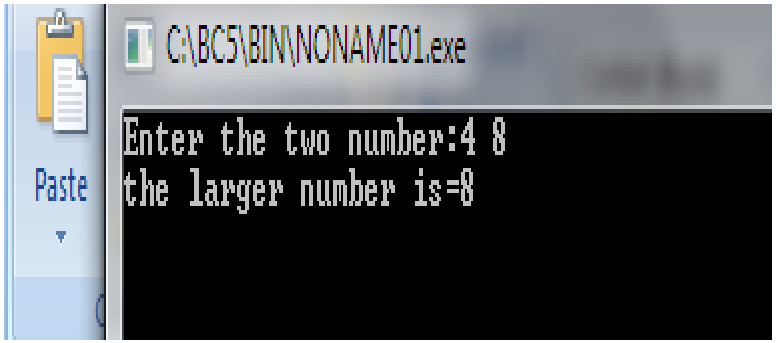
Here , expr1 is evaluated first. If expr1 is true, the value of value of expr2 is the value of conditional expression. If expr1 is false , the value of expr3 is the value of conditional expression.

Example of conditional operators

```
#include <stdio.h>
  #include <conio.h>
  void main()
  {
  int a,b,larger;
  clrscr();
  printf("Enter the two number:");
  scanf("%d %d",&a,&b);
   larger=a>b? a:b;
   printf("the larger number is=%d",
     larger);

   getch();

   }
```



Conditional oprators

```
#include <stdio.h>
#include <conio.h>
int main()
{
  int x=15,y;
  y=(x> 5)? 3:5;

  printf("%d",y);
  getch(); }
```

examples :

Write a program to display the massage "welcome to my college" ten times

a) Without using loop

```
Void main()
{ Int I;
Clrscr();
Printf("\n Welcome to my college");
Printf("\n Welcome to my college");
Printf("\n Welcome to my college");
Printf("\n Welcome to my college");
Printf("\n Welcome to my college");
Printf("\n Welcome to my college");
Printf("\n Welcome to my college");
Printf("\n Welcome to my college");
Printf("\n Welcome to my college");
Printf("\n Welcome to my college");
Getch(); }
```

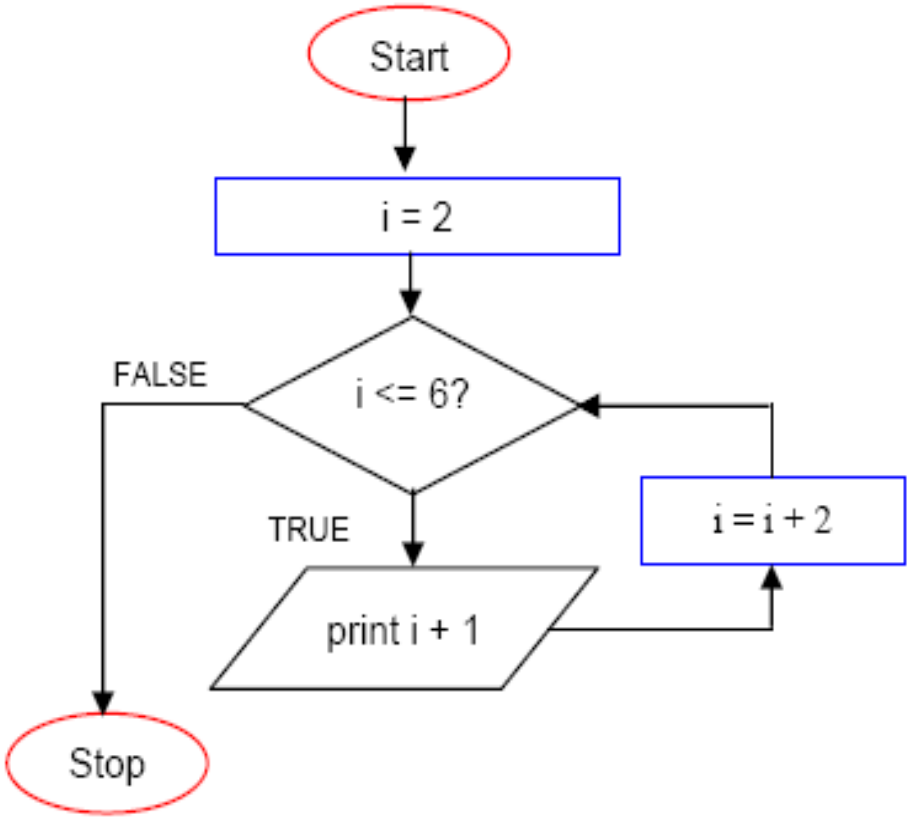
b) Using loop

```
#include <stdio.h>
#include <conio.h>
void main()
 {
   int i;
   clrscr();
   for(i=0;i<10;i++)
   printf("\n Wellcome to my college");
  getch();
}
```

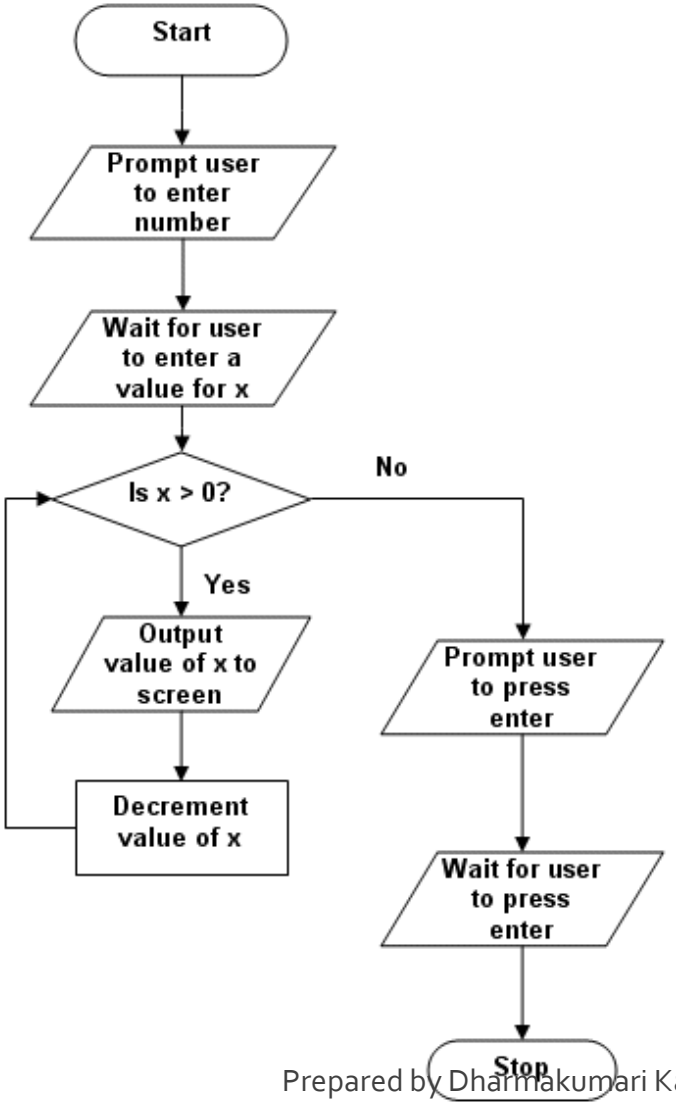
The for loop

The "for loop" loops from one number to another number and increases by a specified value each time. The "for loop" uses the following structure:

for (Start value; continue or end condition; increase/decrease value) statement;



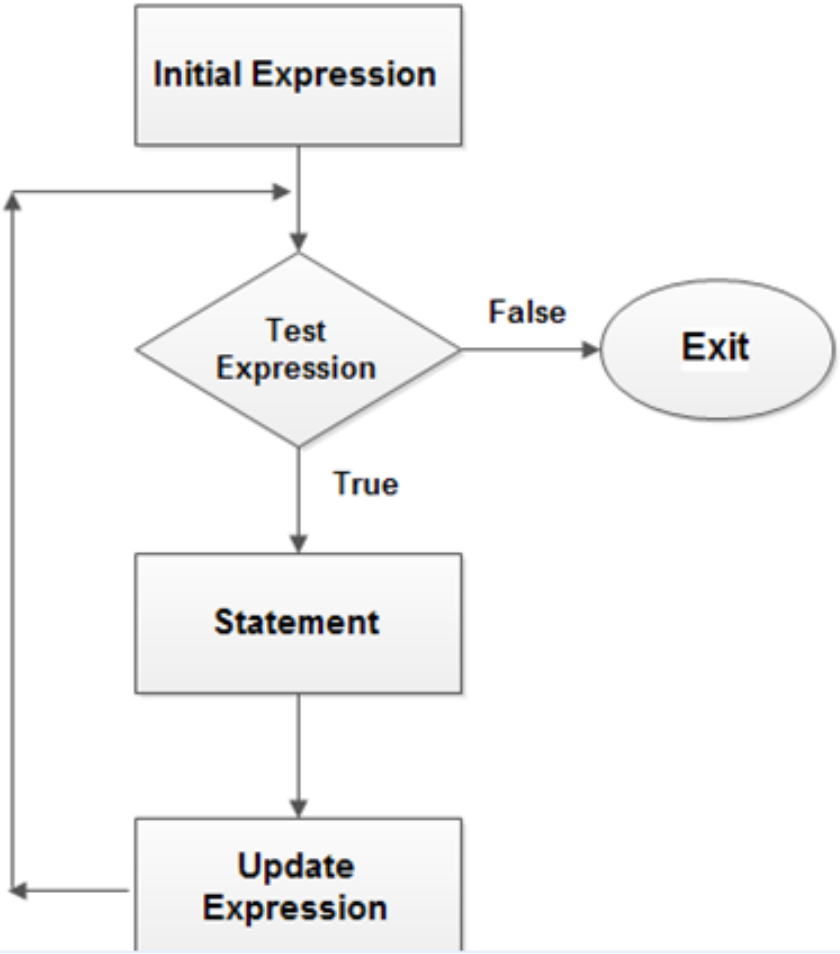
For(i=1;i<=6 ; i++)


Start
Prompt user to enter number
Wait for user to enter a value for x
Is x > 0?
No
Yes
Output value of x to screen
Decrement value of x
Prompt user to press enter
Wait for user to press enter
Stop

For loop

Syntax

```
for (counter-initialization, condition,
      increment/decrement)
{
      statement(s);
}
```



Examples

```
#include< conio.h>
#include<stdio.h>
 void main()
 { int i;
 for (i = 0; i < 10; i++)
 { printf ("Hello\n");
  printf ("World\n");
}
Getch();
}
```

Sample Program 1

```
/* program to print the natural numbers from 1 to 10 */
#include<stdio.h>
#include<conio.h>
void main()
{
    int i;
    for (i=1; i<=10; i++)
    {
    printf("%d\n", i);
    }
getch();
}
```

Do ...while loop

In **do** ....**while** loop, the body of the loop is executed first without testing condition. At the end of the loop, test condition in the while statement is evaluated. If the condition is true , the program continues to evaluate the body of the loop once again . This process continues as long as the condition is true. When the condition becomes false the loop is terminated, and the control goes to the statement that appears immediately after the while statement .

Cont…

Since the test condition is evaluated at the bottom of the loop the **do**…. **While** loop construct provides an exit- controlled or bottom –tested loop and therefore the body of the loop is always executed at least once.

2. WAP to print 10 to 1 number using do while loop

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

While Loop

In the beginning of while loop, test expression is checked. If it is true, codes inside the body of while loop, i.e., code/s inside parenthesis are executed and again the test expression is checked and process continues until the test expression becomes false

Syntax of while loop

```
while (test expression)/condition
        {
    statements to be executed.
            }
```

Write a flow chart and program to print 1 to 10number using while loop.

```
#include <stdio.h>
#include <conio.h>
  void main()
  {
  clrscr();
  int n;
  n=0;
   while(n<=10)
    {
  printf("%d\n",n);
    n++;
    }

    getch();
    }
```

. Write a program to read any integer and to print its multiplication table.

```
#include <stdio.h>
#include <conio.h>
void main()
      {

      int a,b,c;
      clrscr();
      a=1;
      printf("enter any number=");
      scanf("%d",&b);
      for(a=1;a<=10;a++)
      {
      c = b*a;
       printf("\n%d * %d = %d",b,a,c);
       }
       getch();
       }
```

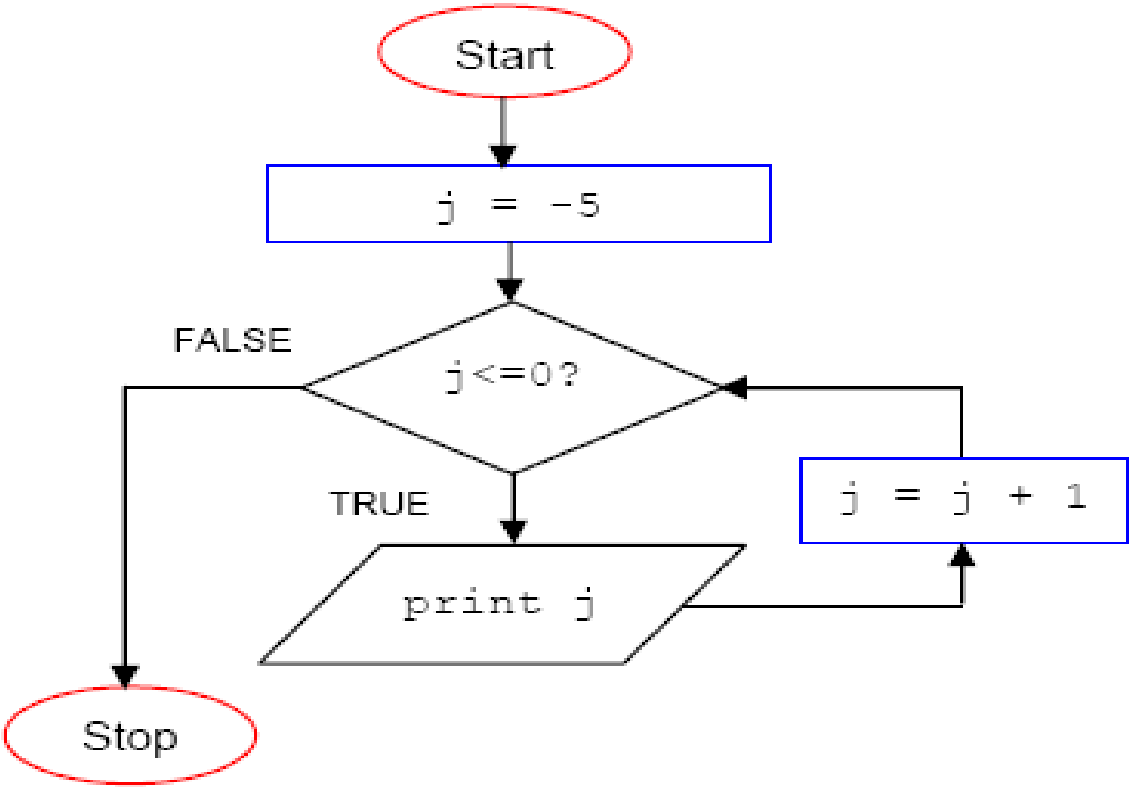
Write a program to print multiplication table from 1 to 10.

```
#include <stdio.h>
#include <conio.h>
void main()
      {

      int a,b,c;
      clrscr();
      for(a=1;a<=10;a++)
         {
         for(b=1;b<=10; b++)
              {
               c = a*b;
        printf("\t %d",c);
               }

         }
       getch();
       }
```

Flowchart




```
#include <stdio.h>
#include <conio.h>
void main()
{
  int i,j,n=6;
  for (i=1;i<=n;i++)
  {
  for (j=1;j<=i;j++)
  printf("\t*");
  printf("\t");
  printf("\n");
  }
  getch(); }
```

Find out factorial number

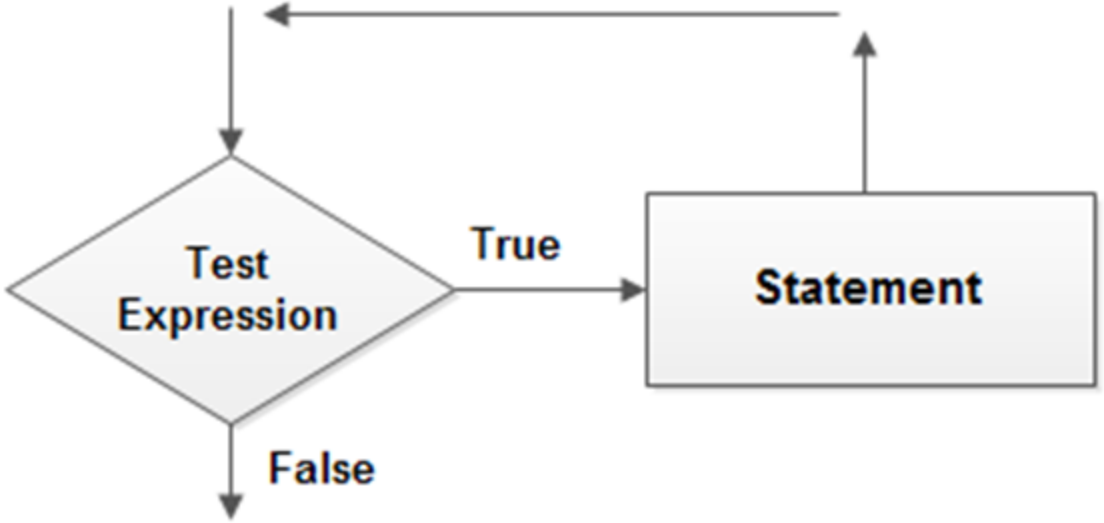
```
#include<stdio.h>
#include<conio.h>
 void main()
   {
    int n,fact=1;
  printf("enter the number=");
  scanf("%d",&n);
  while (n>1)
  {

  fact=fact*n;
  n-- ;
   }
   printf("fact=%d",fact);
   getch();
   }
```

while Loop

Syntax

```
while (condition)
{
    statement(s);
}
```



Write a program to print of ASCII character for 45 to 96.(using while loop)

```
#include<stdio.h>
#include<conio.h>
void main()
    {
    clrscr();
    int n;
    n=46;
    while(n<=85)
    {
    printf("ascii number=%d,charecter=%c\n",n,n);
    n++;
    }
    getch();
    }
```

WAP to enter the marks of five subjects and find out the total mark.

```
#include  <stdio.h>
#include  <conio.h>
void main()
      {

      int n,m,s=0;
      clrscr();
       printf("Enter student marks:\n");
        for(n=1;n<=3;n++)
        {
        scanf("%d",&m);
        s = s+m;
          }
        printf( "\nsum=%d",s);
         getch();
         }
```

Q. Write a program to find out sum of digit of a given integer of arbitrary length.(Using while loop)

```
#include <stdio.h>
#include <conio.h>
void main()
	{
	int n,sum=0,d;
	clrscr();
	printf("Enter the integer=");
	scanf(" %d",&n);
	 while(n!=0)
	{
	d=n%10;
	sum=sum+d;
	n=n/10;
	}
	printf("value of arbitery lengh=%d",sum);
	getch();
	}
```

. Write a program to read 3 digit no and to test whether it is a Armstrong number or not ($a^3+b^3+c^3=abc$)

```
#include<stdio.h>
#include<conio.h>
#include<math.h>
void main()
{
clrscr();
int n,n1,d1,d2,d3,arm;
printf("Enter  number = ");
scanf("%d",&n);
n1=n;
d1=n%10;
n=n/10;
d2=n%10;
n=n/10;
d3=n;
arm= pow(d1,3)+pow(d2,3)+pow(d3,3);
if(n1==arm)
printf("armstrong.....");
else
printf("Not armstrong");234
 getch();
}
```

Write a program to read 3 digit no and to test whether it is a Armstrong number or not ($a^3+b^3+c^3=abc$)

```
#include <stdio.h>
#include <conio.h>
int main()
{
 int n, sum=0,temp, rem;
 printf("Enter an integer: ");
 scanf("%d", &n);
 temp=n;
 while(n!=0)
 {
   rem=n%10;
   sum=sum+rem*rem*rem;
   n/=10;
 }
 if(sum==temp)
 printf("Armstrong") ;
 else
 printf("Not Armstrong");
 getch(); }
```

Write a program to all three digit Armstrong number.

```
#include <stdio.h>
#include <conio.h>
#include <math.h>
void main()
      {
int n1,n,d1,d2,d3,arm;
    clrscr();
    printf("three arm.number=");
    for(n1=100;n1<=999;n1++)
{
 n=n1;
 d1=n%10;
 n=n/10;
 d2=n%10;
 n=n/10 ;
 d3=n;
 arm=pow(d1,3)+pow(d2,3)+pow(d3,3);
  if (arm==n1)
  printf("\n %d",n1);
  }
```

Armstrong number(2nd method)

```
#include <stdio.h>
#include <conio.h>
#include <math.h>
void main()
      {

      int n,c,a,sum=0;
      clrscr();
      printf("Enter the arm=");
       scanf("%d",&n);
         c=n;
       while(c!=0)
       {
       a=c%10;
       c=c/10;
       sum=(sum+ pow(a,3));
       }
       if(sum==n)


       printf("Arm");
       else
       printf("NOT ARM");

       getch();
       }
```

Display the series: 1 5 9 13 17…nth term

```
#include <stdio.h>
#include <conio.h>
void main()
      {
      clrscr();
      int i,n,a;
      printf("Enter the value of Nth term ");
      scanf("%d",&n);
      printf("the reqired series is \n");
      a=1;
      for(i=1;i<=n;i++)
      {
      printf("%d\t",a);
      a= a+4;
       }
       getch();
       }
```

Write a program to generate the following Fibonacci Series 1,1,2,3,5,8,.....25 terms

```
#include <stdio.h>
#include <conio.h>
  void main()
  {
  clrscr();
  int x,y,z, count;
  x=1;
  y=1;
  printf("%d,%d",x,y);
  for (count=1;count<=25;count++)
  {
  z=x+y;
  printf("\t%d",z);
  x=y;
  y=z;
  }
  getch();
  }
```

1 WAP show this

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

```
#include <stdio.h>
#include <conio.h>
void main()
        {
      clrscr();
      int a,b;

      for(a=1;a<=5;a++)
        {
      printf("\n");
      for(b=1; b<=a; b++)
      printf("%d",a);
          }
       getch();
          }
```

WAP show this

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

```
#include <stdio.h>
#include <conio.h>
void main()
        {
        clrscr();
        int a,b;

        for(a=1;a<=5;a++)
        {
        printf("\n");
        for(b=1;b<=a;b++)
       printf("%d",b);
            }
         getch();
```

Q.WAP to determine whether a number is prime or not.

```
#include <conio.h>
#include <math.h>
void main()
    {
    clrscr();
    int i,n;
    printf("Enter the number :");
    scanf("%d",&n);
    for(i=2;i<=n;i++)
     if(n%i==0)
     break;
     if(n==i)
     printf("prime");
     else
     printf("Not prime ");
     getch();
     }
```

```
#include <stdio.h>
#include <conio.h>    //WAP to print 50 prime number
void main()
       {

     int ,i,j;
      clrscr();
      for(i=2;i<=200;i++)
         {
       for(j=2;j<=i-1;j++)
        if(i%j==0)
        break;//number is divisiable by some other number
         if(i==j)
         printf("%d\t",i);        }
        getch();
         }
```

/*WAP to generate the following series and print sum 1*4,2*7,3*10…….n terms*/

```
#include<stdio.h>
#include<conio.h>
void main()

    {
    int a=1,b=4,y,z,n,sum=0;
    clrscr();
    a=1;
    b=4;

    printf("enter the y=");
    scanf("%d",&y);
     for (n=1;n<=y;n++)
     {
     z=a*b;
     sum=sum+z;
     printf("\nseries:%dx%d\t",a,b);
     b+=3;
     }
    printf("\ntotal value of series:%d",sum);
    getch();
    }
```

/*WAP to genrate the following series 1*4,2*7,3*10.....n terms*/

```
#include <stdio.h>
#include <conio.h>
void main()
        {
        int n=1,x=4,y,z;
        clrscr();
        printf("enter the y=");
        scanf("%d",&y);
         for (n=1;n<=y;n++)
         {
         z=n*x;
         x+=3;
         printf("\nseries:%dx%d\t",n,x);

         }
         getch();
        }
```

/* C program to check whether a number is palindrome or not */

```
#include <stdio.h>
#include <conio.h>
void main()
{

 int n, reverse=0, rem,temp;
 printf("Enter an integer: ");
 scanf("%d", &n);
temp=n;
 while(temp!=0)
{ rem=temp%10;
reverse=reverse*10+rem;
temp/=10; } /* Checking if umber entered by user and it's reverse number is equal.
      */
if(reverse==n)
  printf("%d is a palindrome.",n);
else printf("%d is not a palindrome.",n);
  getch(); }
```

3. Write a flowchart and a program to read 15 persons age and find out how many person fall under the following categories.
Baby – age 0 to 5
Attending School- age 6 to 17
Adult – age 18 and over

(Using for loop)

```
 void main
{
      int baby=0,adult=0,school=0,count,age;
      clrscr();
      for(count=1;count<=15;count++)
      {
      printf("enter the age of our baby age:%d=",count);
      scanf("%d",&age);
      if(age>=0 && age<=5)
          baby=baby+1;
      else if(age>=6 && age <=17)
          school=school+1;
       else
          adult=adult+1;
          }

      printf("number of baby:%d",baby);
      printf("\nnumber of school age:%d",school);
      printf ("\nnumber of adul age :%d",adult);
       getch();
       }
```

4. Write a flowchart and a program to read 15 persons age maximum, minimum

```
#include <stdio.h>
#include <conio.h>
#include <math.h>
void main()
        {

        int max=0,min=100,count,age;
        clrscr();
        for(count=1;count<=15;count++)
                {
        printf(“Enter the age of ict students=");
        scanf("%d",&age);
       if(age>=max)
        max=age;
        if (age<=min)
        min=age;
        }
        printf("\nmax age=%d",max);
        printf("\nmin age=%d",min);
         getch();
         }
```