Experiment No. 1

Write C++ program to draw a concave polygon and fill it with desired color using scan fill algorithm. Apply the concept of inheritance.

```
#include <conio.h>
#include <iostream>
#include <graphics.h>
#include <stdlib.h>
using namespace std;
class point
{
 public:
 int x,y;
};
class poly
{
 private:
 point p[20];
 int inter[20],x,y;
 int v,xmin,ymin,xmax,ymax;
 public:
 int c;
 void read();
 void calcs();
 void display();
 void ints(float);
 void sort(int);
};
void poly::read()
{
 int i;
 cout<<"\n Scan Fill Algorithm ";
 cout<<"\n Enter Number Of Vertices Of Polygon: ";
 cin>>v;
```

```
 if(v>2)
 {
 for(i=0;i<v; i++) //ACCEPT THE VERTICES
 {
 cout<<"\nEnter co-ordinate no. "<<i+1<<" : ";
 cout<<"\n\tx"<<(i+1)<<"=";
 cin>>p[i].x;
 cout<<"\n\ty"<<(i+1)<<"=";
 cin>>p[i].y;
 }
 p[i].x=p[0].x;
 p[i].y=p[0].y;
 xmin=xmax=p[0].x;
 ymin=ymax=p[0].y;
 }
 else
 cout<<"\n Enter valid no. of vertices.";
}
void poly::calcs()
{
 for(int i=0;i<v;i++)
 {
 if(xmin>p[i].x)
 xmin=p[i].x;
 if(xmax<p[i].x)
 xmax=p[i].x;
 if(ymin>p[i].y)
 ymin=p[i].y;
 if(ymax<p[i].y)
 ymax=p[i].y;
 }
}
void poly::display()
{
 int ch1;
 char ch='y';
```

```
 float s,s2;
 do
 {
 cout<<"\n\nMENU:";
 cout<<"\n\n\t1 . Scan line Fill ";
 cout<<"\n\n\t2 . Exit ";
 cout<<"\n\nEnter your choice:";
 cin>>ch1;
 switch(ch1)
 {
 case 1:
 s=ymin+0.01;
 delay(100);
 cleardevice();
 while(s<=ymax)
 {
 ints(s);
 sort(s);
 s++;
 }
 break;
 case 2:
 exit(0);
 }
 cout<<"Do you want to continue?: ";
 cin>>ch;
 }while(ch=='y' || ch=='Y');
}
void poly::ints(float z)
{
 int x1,x2,y1,y2,temp;
 c=0;
 for(int i=0;i<v;i++)
 {
 x1=p[i].x;
 y1=p[i].y;
```

```
x2=p[i+1].x;
y2=p[i+1].y;
if(y2<y1)
{
temp=x1;
x1=x2;
x2=temp;
temp=y1;
y1=y2;
y2=temp;
}
if(z<=y2&&z>=y1)
{
if((y1-y2)==0)
x=x1;
else
{
x=((x2-x1)*(z-y1))/(y2-y1);
x=x+x1;
}
if(x<=xmax && x>=xmin)
inter[c++]=x;
}
}
}
void poly::sort(int z) // sorting
{
int temp,j,i;
for(i=0;i<v;i++)
{
line(p[i].x,p[i].y,p[i+1].x,p[i+1].y);
}
delay(100);
for(i=0; i<c;i+=2)
{
delay(100);
```

```
 line(inter[i],z,inter[i+1],z);
 }
}
int main() //main
{
 int cl;
 initwindow(500,600);
 cleardevice();
 poly x;
 x.read();
 x.calcs();
 cleardevice();
 cout<<"\n\tEnter The Color You Want :(In Range 0 To 15 )->"; //selecting color
 cin>>cl;
 setcolor(cl);
 x.display();

 closegraph(); //closing graph
 getch();
 return 0;
}
```

Input :

Number of Vertices : 4

Cordinates 1st :
x1= 200
y1= 200

Cordinates 2st :
x2= 200
y2= 400

Cordinates 3st :
x3= 400

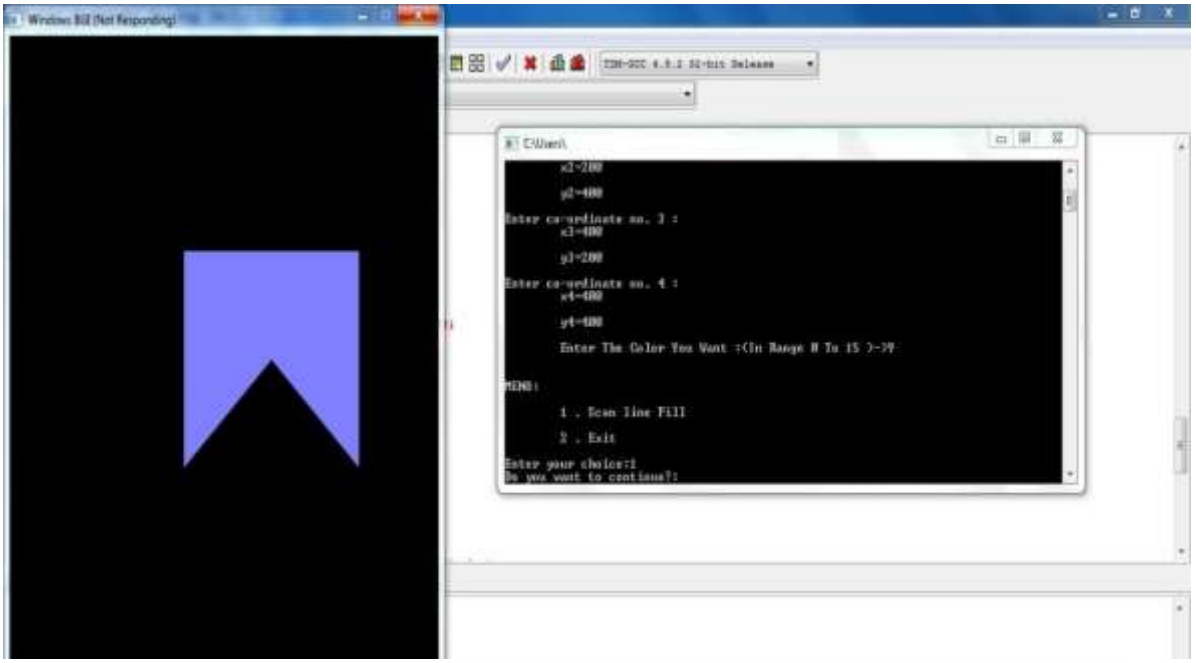
y3= 200

Cordinates 4st :

x4= 400

y4= 400

Output :



Experiment No. 2

Write C++ program to implement Cohen Southerland line clipping algorithm.

Code :

```
#include<iostream>
#include<stdlib.h>
#include<math.h>
#include<graphics.h>
#include<dos.h>
using namespace std;
class Coordinate
{
	public:
		int x,y;
		char code[4];
};
class Lineclip
{
	public:
		Coordinate PT;
		void drawwindow();
		void drawline(Coordinate p1,Coordinate p2);
		Coordinate setcode(Coordinate p);
		int visibility(Coordinate p1,Coordinate p2);
		Coordinate resetendpt(Coordinate p1,Coordinate p2);
};
int main()
{
	Lineclip lc;
	int gd = DETECT,v,gm;
	Coordinate p1,p2,p3,p4,ptemp;
	cout<<"\n Enter x1 and y1\n";
	cin>>p1.x>>p1.y;
	cout<<"\n Enter x2 and y2\n";
	cin>>p2.x>>p2.y;
```

```
        initgraph(&gd,&gm,"");
        lc.drawwindow();
        delay(2000);
        lc.drawline (p1,p2);
        delay(2000);
        cleardevice();
        delay(2000);
        p1=lc.setcode(p1);
        p2=lc.setcode(p2);
        v=lc.visibility(p1,p2);
        delay(2000);
        switch(v)
        {
                case 0: lc.drawwindow();
                                delay(2000);
                                lc.drawline(p1,p2);
                                break;
           case 1:lc.drawwindow();
                delay(2000);
                break;
           case 2:p3=lc.resetendpt(p1,p2);
                  p4=lc.resetendpt(p2,p1);
                  lc.drawwindow();
                  delay(2000);
                  lc.drawline(p3,p4);
                  break;
  }
   delay(2000);
   closegraph();
}

void Lineclip::drawwindow()
{
        line(150,100,450,100);
        line(450,100,450,350);
```

```
        line(450,350,150,350);
        line(150,350,150,100);
 }

 void Lineclip::drawline(Coordinate p1,Coordinate p2)
 {
        line(p1.x,p1.y,p2.x,p2.y);
 }
Coordinate Lineclip::setcode(Coordinate p)
{
        Coordinate ptemp;
        if(p.y<100)
           ptemp.code[0]='1';
        else
           ptemp.code[0]='0';

        if(p.y>350)
                ptemp.code[1]='1';
        else
                ptemp.code[1]='0';
        if(p.x>450)
                ptemp.code[2]='1';
        else
                ptemp.code[2]='0';

        if(p.x<150)
                ptemp.code[3]='1';
        else
                ptemp.code[3]='0';
                ptemp.x=p.x;
        ptemp.y=p.y;
        return(ptemp);
};
int Lineclip:: visibility(Coordinate p1,Coordinate p2)
{
        int i,flag=0;
```

```
	for(i=0;i<4;i++)
	{
		if(p1.code[i]!='0' || (p2.code[i]=='1'))
		  flag='0';
	}
	if(flag==0)
	 return(0);

		for(i=0;i<4;i++)
	{
		if(p1.code[i]==p2.code[i] && (p2.code[i]=='1'))
		 flag='0';
	}

	if(flag==0)
		return(1);
		return(2);
}
Coordinate Lineclip::resetendpt(Coordinate p1,Coordinate p2)
{
	Coordinate temp;
	int x,y,i;
	float m,k;
		if(p1.code[3]=='1')
		x=150;
	if(p1.code[2]=='1')
		x=450;
	if((p1.code[3]=='1') || (p1.code[2])=='1')
	{
		m=(float)(p2.y-p1.y)/(p2.x-p1.x);
		k=(p1.y+(m*(x-p1.x)));
		temp.y=k;
		temp.x=x;
		for(i=0;i<4;i++)
		temp.code[i]=p1.code[i];
```

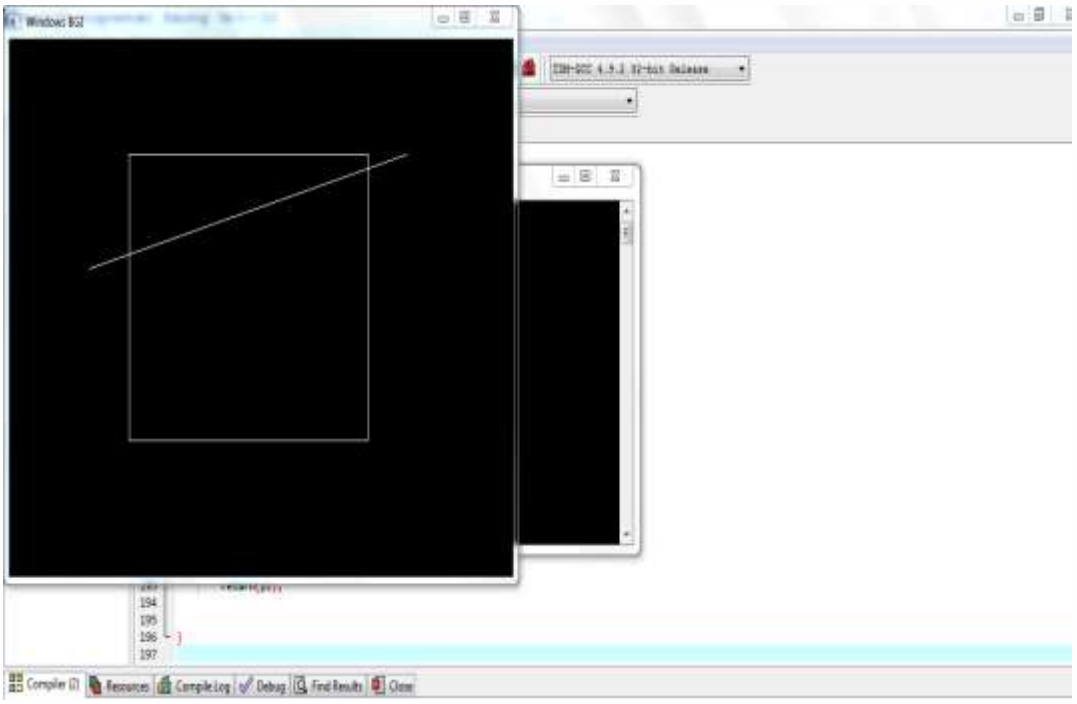
```
    if(temp.y<=350 && temp.y>=100)
        return (temp);
}
if(p1.code[0]=='1')
        y=100;
if(p1.code[1]=='1')
        y=350;
if((p1.code[1]=='1') || (p1.code[1]=='1'))
{
        m=(float)(p2.y-p1.y)/(p2.x-p1.x);
        k=(float)p1.x+(float)(y-p1.y)/m;
        temp.x=k;
        temp.y=y;

        for(i=0;i<4;i++)
                temp.code[i]=p1.code[i];

        return(temp);
}
else
        return(p1);
}
```

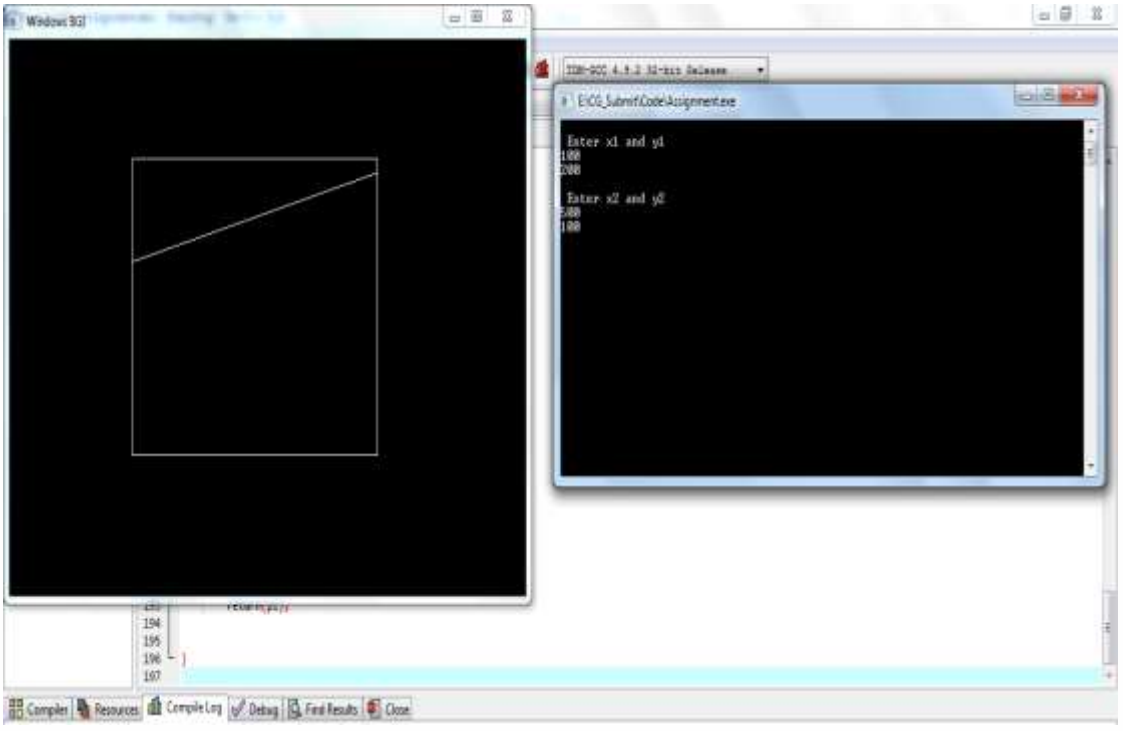
Input :

X1 , Y1:
100
200

X2, Y2 :
500
100

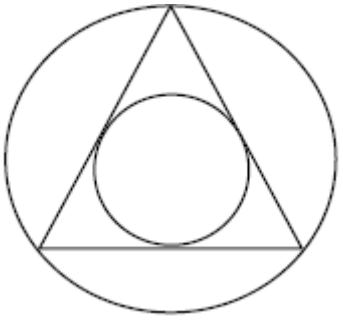
Output :




E:\CG_Submit\Code\Assignment.exe
Enter x1 and y1
100
200
Enter x2 and y2
500
100

Experiment No. 3

a) **Write C++ program to draw the following pattern. Use DDA line and Bresenham's circle drawing algorithm. Apply the concept of encapsulation.**



Code :

```
#include <iostream>
# include <graphics.h>
# include <stdlib.h>
using namespace std;
class dcircle
{
private: int x0, y0;
public:
dcircle()
{
x0=0;
y0=0;
}
void setoff(int xx, int yy)
{
x0=xx;
y0=yy;
}
void drawc(int x1, int y1, int r)
{
float d;
int x,y;
```

```
x=0;
y=r;
d=3-2*r;
do
{
putpixel(x1+x0+x, y0+y-y1, 15);
putpixel(x1+x0+y, y0+x-y1,15);
putpixel(x1+x0+y, y0-x-y1,15);
putpixel(x1+x0+x,y0-y-y1,15);
putpixel(x1+x0-x,y0-y-y1,15);
putpixel(x1+x0-y, y0-x-y1,15);
putpixel(x1+x0-y, y0+x-y1,15);
putpixel(x1+x0-x, y0+y-y1,15);
if (d<=0)
{
d = d+4*x+6;
}
else
{
d=d+4*(x-y)+10;
y=y-1;
}
x=x+1;
}
while(x<y);
}
};

class pt
{
protected: int xco, yco,color;
public:
pt()
{
xco=0,yco=0,color=15;
}
```

```
void setco(int x, int y)
{
xco=x;
yco=y;
}
void setcolor(int c)
{
color=c;
}
void draw()
{
putpixel(xco,yco,color);
}
};
class dline:public pt
{
private: int x2, y2;
public:
dline():pt()
{
x2=0;
y2=0;
}
void setline(int x, int y, int xx, int yy)
{
pt::setco(x,y);
x2=xx;
y2=yy;
}
void drawl( int colour)
{
float x,y,dx,dy,length;
int i;
pt::setcolor(colour);
dx= abs(x2-xco);
dy=abs(y2-yco);
```

```
if(dx>=dy)
{
length= dx;
}
else
{
length= dy;
}
dx=(x2-xco)/length;
dy=(y2-yco)/length;
x=xco+0.5;
y=yco+0.5;
i=1;
while(i<=length)
{
pt::setco(x,y);
pt::draw();
x=x+dx;
y=y+dy;
i=i+1;
}
pt::setco(x,y);
pt::draw();
}
};
int main()
{
int gd=DETECT, gm;
initgraph(&gd, &gm, NULL);
int x,y,r, x1, x2, y1, y2, xmax, ymax, xmid, ymid, n, i;
dcircle c;
cout<<"\nenter coordinates of centre of circle : ";
cout<<"\n enter the value of x : ";
cin>>x;
cout<<"\nenter the value of y : ";
cin>>y;
```

```
cout<<"\nenter the value of radius : ";
cin>>r;
xmax= getmaxx();
ymax=getmaxy();
xmid=xmax/2;
ymid=ymax/2;
setcolor(1);
c.setoff(xmid,ymid);
line(xmid, 0, xmid, ymax);
line(0,ymid,xmax,ymid);
setcolor(15);
c.drawc(x,y,r);
pt p1;
p1.setco(100,100);
p1.setcolor(14);
dline l;
l.setline(x1+xmid, ymid-y1, x2+xmid, ymid-y2);
cout<<"Enter Total Number of lines : ";
cin>>n;
for(i=0;i<n;i++)
{
cout<<"Enter co-ordinates of point x1 : ";
cin>>x1;
cout<<"enter coordinates of point y1 : ";
cin>>y1;
cout<<"Enter co-ordinates of point x2 : ";
cin>>x2;
cout<<"enter coordinates of point y2 : ";
cin>>y2;
l.setline(x1+xmid, ymid-y1, x2+xmid, ymid-y2);
l.drawl(15);
}
cout<<"\nEnter coordinates of centre of circle : ";
cout<<"\n Enter the value of x : ";
cin>>x;
cout<<"\nEnter the value of y : ";
```

```
cin>>y;
cout<<"\nEnter the value of radius : ";
cin>>r;
setcolor(5);
c.drawc(x,y,r);
getch();
delay(200);
closegraph();
return 0;
}
```

Input :

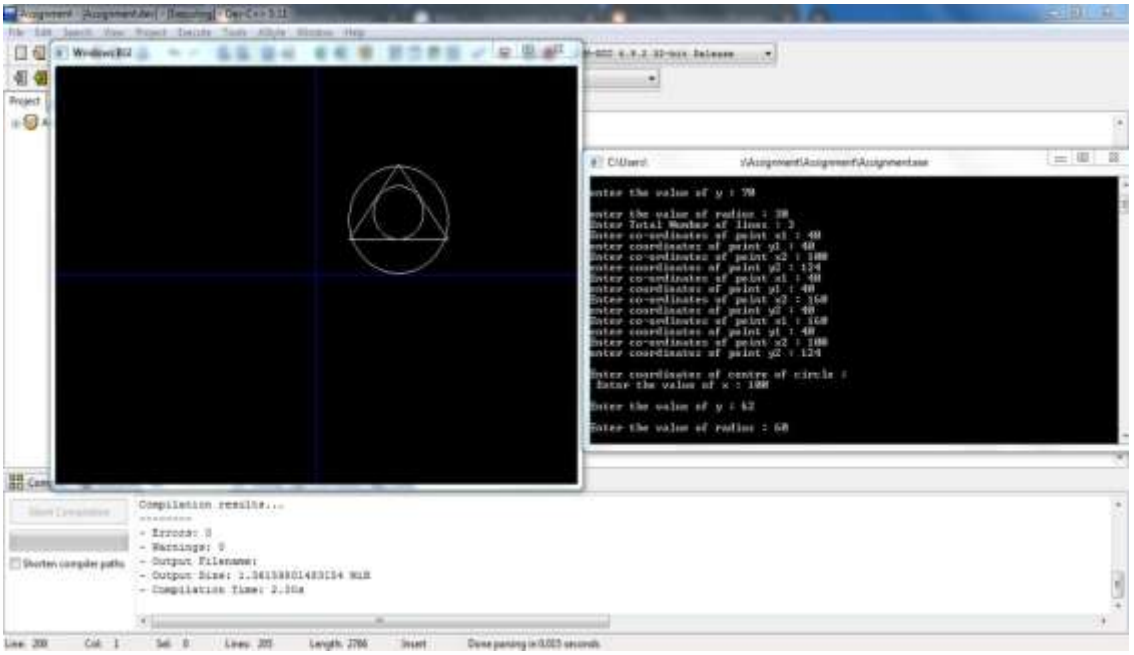
Value Of X : 100

Value Of Y : 70

Value Of R : 30

Next Inputs In Image Given Below.

Output :



Experiment No. 4

Write C++ program to draw 2-D object and perform following basic transformation

a) Scaling

b) Translation

c) Rotation

Apply the concept of operator overloading.

Code :

```
#include<iostream>
#include<graphics.h>
#include<math.h>
using namespace std;
class transform
{
	public:
		int m,a[20][20],c[20][20];
		int i,j,k;
		public:
		void object();
		void accept();
		void operator *(float b[20][20])
		{
			for(int i=0;i<m;i++)
			{
				for(int j=0;j<m;j++)
				{
					c[i][j]=0;
					for(int k=0;k<m;k++)
					{
						c[i][j]=c[i][j]+(a[i][k]*b[k][j]);
```

```
                                        }
                                    }
                                }
                            }
};
void transform::object()
{
          int gd,gm;
          gd=DETECT;
          initgraph(&gd,&gm,NULL);
  line(300,0,300,600);
  line(0,300,600,300);
   for( i=0;i<m-1;i++)
   {
          line(300+a[i][0],300-a[i][1],300+a[i+1][0],300-a[i+1][1]);
          }
          line(300+a[0][0],300-a[0][1],300+a[i][0],300-a[i][1]);
          for( i=0;i<m-1;i++)
          {
                    line(300+c[i][0],300-c[i][1],300+c[i+1][0],300-c[i+1][1]);
          }
          line(300+c[0][0],300-c[0][1],300+c[i][0],300-c[i][1]);
          int temp;
          cout << "Press 1 to continue";
          cin >> temp;
          closegraph();
}
void transform::accept()
{
cout<<"\n";
 cout<<"Enter the Number Of Edges:";
    cin>>m;
    cout<<"\nEnter The Coordinates :";
    for(int i=0;i<m;i++)
    {
          for(int j=0;j<3;j++)
```

```
        {
                if(j>=2)
                a[i][j]=1;
                else
                cin>>a[i][j];
                }
        }
}
int main()
{
        int ch,tx,ty,sx,sy;
        float deg,theta,b[20][20];
        transform t;
        t.accept();

          cout<<"\nEnter your choice";
          cout<<"\n1.Translation"
              "\n2.Scaling"
                      "\n3.Rotation";
                      cin>>ch;
                switch(ch)
                {
                case 1: cout<<"\nTRANSLATION OPERATION\n";
                      cout<<"Enter value for tx and ty:";
                      cin>>tx>>ty;
                      b[0][0]=b[2][2]=b[1][1]=1;
                              b[0][1]=b[0][2]=b[1][0]=b[1][2]=0;
                              b[2][0]=tx;
                              b[2][1]=ty;
                              t * b;
                              t.object();
                              break;
          case 2: cout<<"\nSCALING OPERATION\n";
                      cout<<"Enter value for sx,sy:";
                      cin>>sx>>sy;
                      b[0][0]=sx;
```

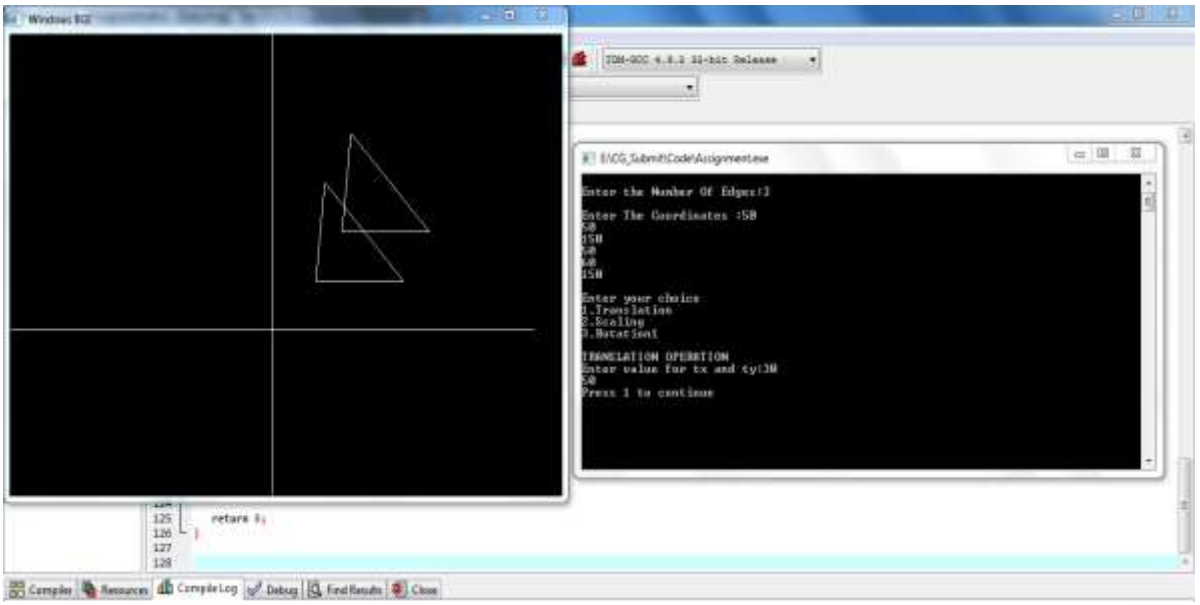
```
                b[1][1]=sy;
                b[0][1]=b[0][2]=b[1][0]=b[1][2]=0;
                b[2][0]=b[2][1]=0;
                        b[2][2] = 1;
                        t * b;
                        t.object();
                        break;
            case 3: cout<<"\nROTATION OPERATION\n";
                cout<<"Enter value for angle:";
                cin>>deg;
                        theta=deg*(3.14/100);
                        b[0][0]=b[1][1]=cos(theta);
                        b[0][1]=sin(theta);
                        b[1][0]=sin(-theta);
                        b[0][2]=b[1][2]=b[2][0]=b[2][1]=0;
                        b[2][2]=1;
                        t * b;
                        t.object();
                        break;
            default:
               cout<<"\nInvalid choice";
            }
        getch();
    return 0;
}
```

Input :

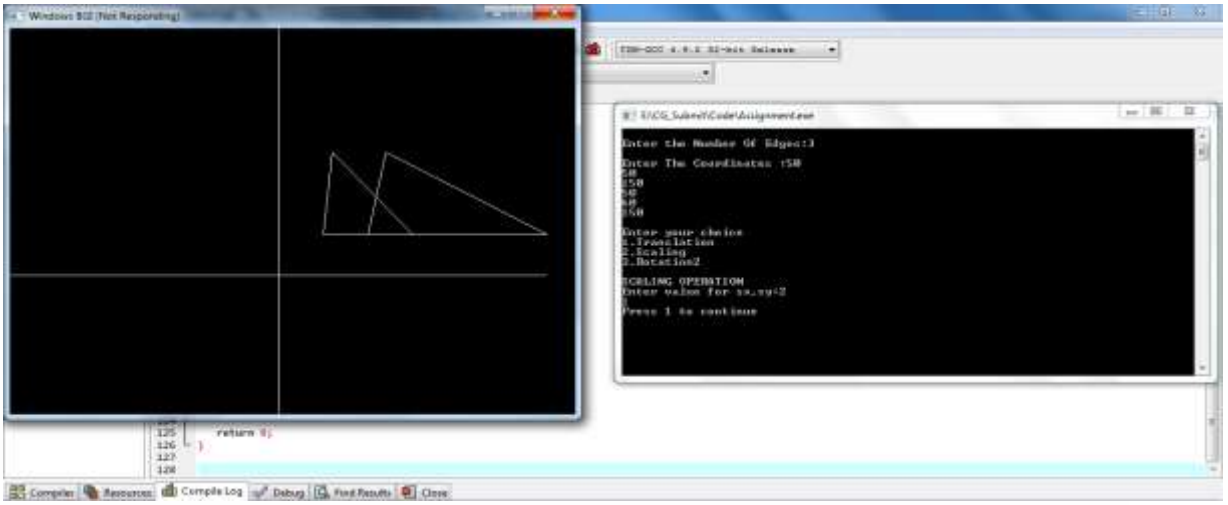
Provided In Image Given Below

Output :

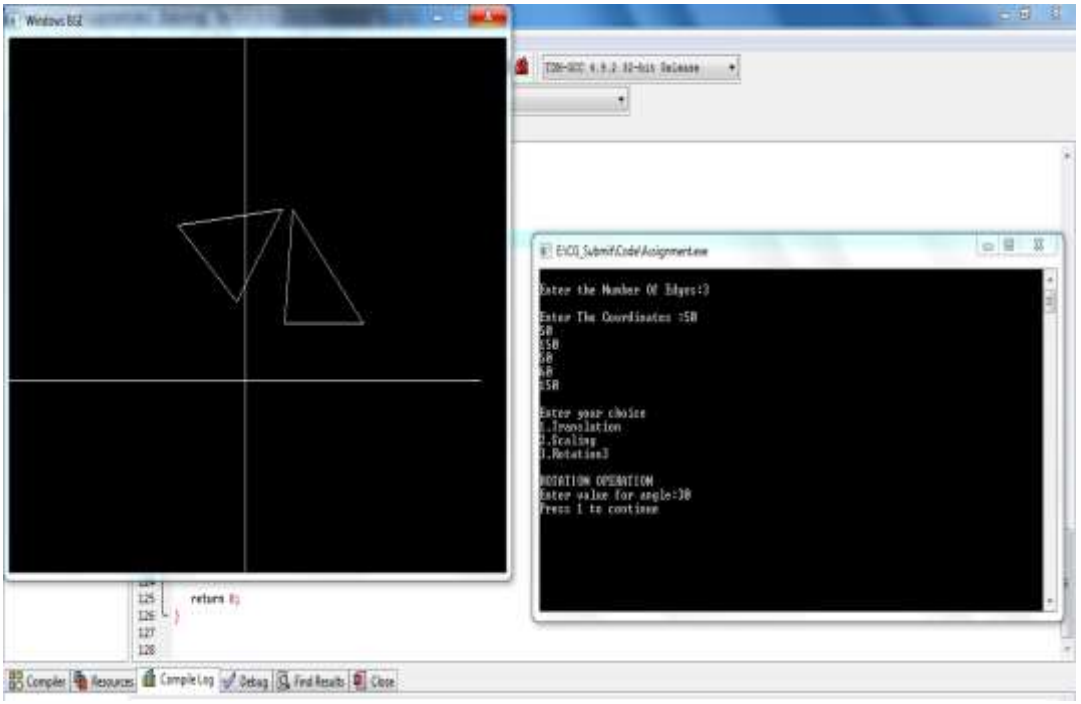
For Tranlation :


Enter the Number Of Edges:3
Enter The Coordinates :50
50
150
250
50
150
Enter your choice
1.Translation
2.Scaling
3.Rotation1
TRANSLATION OPERATION
Enter value for tx and ty:30
50
Press 1 to continue

For Scaling :


Enter the Number Of Edges:3
Enter The Coordinates :50
50
150
250
50
150
Enter your choice
1.Translation
2.Scaling
3.Rotation2
SCALING OPERATION
Enter value for sx,sy:2
2
Press 1 to continue

For Rotation :



Experiment No. 5

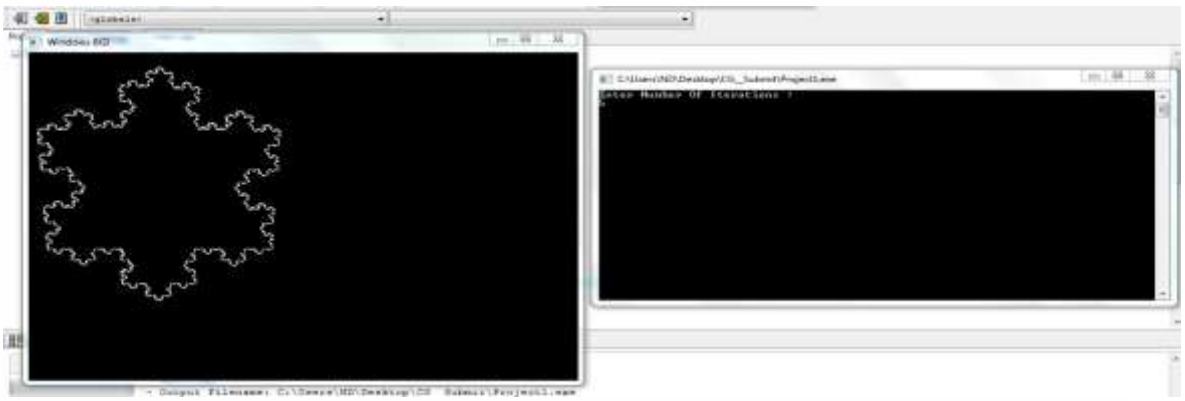
Write C++ Program To Generate Fractal Patterns By Using Koch Curves

Code :

```
#include <iostream>
#include <math.h>
#include <graphics.h>
using namespace std;
class kochCurve
{
public:
void koch(int it,int x1,int y1,int x5,int y5)
{
int x2,y2,x3,y3,x4,y4;
int dx,dy;
if (it==0)
{
line(x1,y1,x5,y5);
}
else
{
delay(10);
dx=(x5-x1)/3;
dy=(y5-y1)/3;
x2=x1+dx;
y2=y1+dy;
x3=(int)(0.5*(x1+x5)+sqrt(3)*(y1-y5)/6);
y3=(int)(0.5*(y1+y5)+sqrt(3)*(x5-x1)/6);
x4=2*dx+x1;
y4=2*dy+y1;
koch(it-1,x1,y1,x2,y2);
```

```
koch(it-1,x2,y2,x3,y3);
koch(it-1,x3,y3,x4,y4);
koch(it-1,x4,y4,x5,y5);
}
}
};
int main()
{
kochCurve k;
int it;
cout<<"Enter Number Of Iterations : "<<endl;
cin>>it;
int gd=DETECT,gm;
initgraph(&gd,&gm,NULL);
k.koch(it,150,20,20,280);
k.koch(it,280,280,150,20);
k.koch(it,20,280,280,280);
getch();
closegraph();
return 0;
}
```

Output :



Experiment No. 6

Write C++ program to draw 3-D cube and perform following transformations on it using OpenGL i)Translation ii)Scaling iii)Rotation about an axix (X/Y/Z)

Code :

```
#include<iostream>
#include<math.h>
#include<GL/glut.h>
using namespace std;
typedef float Matrix4 [4][4];
Matrix4 theMatrix;
static GLfloat input[8][3]=
{
 {40,40,-50},{90,40,-50},{90,90,-50},{40,90,-50},
 {30,30,0},{80,30,0},{80,80,0},{30,80,0}
};
float output[8][3];
float tx,ty,tz;
float sx,sy,sz;
float angle;
int choice,choiceRot;
void setIdentityM(Matrix4 m)
{
for(int i=0;i<4;i++)
 for(int j=0;j<4;j++)
 m[i][j]=(i==j);
}
void translate(int tx,int ty,int tz)
{
for(int i=0;i<8;i++)
{
```

```
output[i][0]=input[i][0]+tx;
output[i][1]=input[i][1]+ty;
output[i][2]=input[i][2]+tz;
}
}
void scale(int sx,int sy,int sz)
{
 theMatrix[0][0]=sx;
 theMatrix[1][1]=sy;
 theMatrix[2][2]=sz;
}
void RotateX(float angle) //Parallel to x
{
angle = angle*3.142/180;
 theMatrix[1][1] = cos(angle);
theMatrix[1][2] = -sin(angle);
theMatrix[2][1] = sin(angle);
theMatrix[2][2] = cos(angle);
}
void RotateY(float angle) //parallel to y
{
angle = angle*3.14/180;
theMatrix[0][0] = cos(angle);
theMatrix[0][2] = -sin(angle);
theMatrix[2][0] = sin(angle);
theMatrix[2][2] = cos(angle);
}
void RotateZ(float angle) //parallel to z
{
angle = angle*3.14/180;
theMatrix[0][0] = cos(angle);
theMatrix[0][1] = sin(angle);
theMatrix[1][0] = -sin(angle);
theMatrix[1][1] = cos(angle);
}
void multiplyM()
```

```
{
//We Don't require 4th row and column in scaling and rotation
//[8][3]=[8][3]*[3][3] //4th not used
for(int i=0;i<8;i++)
{
 for(int j=0;j<3;j++)
 {
 output[i][j]=0;
 for(int k=0;k<3;k++)
 {
 output[i][j]=output[i][j]+input[i][k]*theMatrix[k][j];
 }
 }
}
}
void Axes(void)
{
glColor3f (0.0, 0.0, 0.0); // Set the color to BLACK
glBegin(GL_LINES); // Plotting X-Axis
glVertex2s(-1000 ,0);
glVertex2s( 1000 ,0);
glEnd();
glBegin(GL_LINES); // Plotting Y-Axis
glVertex2s(0 ,-1000);
glVertex2s(0 , 1000);
glEnd();
}
void draw(float a[8][3])
{
 glBegin(GL_QUADS);
 glColor3f(0.7,0.4,0.5); //behind
 glVertex3fv(a[0]);
 glVertex3fv(a[1]);
 glVertex3fv(a[2]);
 glVertex3fv(a[3]);
 glColor3f(0.8,0.2,0.4); //bottom
```

```
 glVertex3fv(a[0]);
 glVertex3fv(a[1]);
 glVertex3fv(a[5]);
 glVertex3fv(a[4]);
 glColor3f(0.3,0.6,0.7); //left
 glVertex3fv(a[0]);
 glVertex3fv(a[4]);
 glVertex3fv(a[7]);
 glVertex3fv(a[3]);
 glColor3f(0.2,0.8,0.2); //right
glVertex3fv(a[1]);
glVertex3fv(a[2]);
glVertex3fv(a[6]);
glVertex3fv(a[5]);
glColor3f(0.7,0.7,0.2); //up
glVertex3fv(a[2]);
glVertex3fv(a[3]);
glVertex3fv(a[7]);
glVertex3fv(a[6]);
glColor3f(1.0,0.1,0.1);
glVertex3fv(a[4]);
glVertex3fv(a[5]);
glVertex3fv(a[6]);
glVertex3fv(a[7]);
glEnd();
}
void init()
{
 glClearColor(1.0,1.0,1.0,1.0); //set backgrond color to white
 glOrtho(-454.0,454.0,-250.0,250.0,-250.0,250.0);
 // Set the no. of Co-ordinates along X & Y axes and their gappings
 glEnable(GL_DEPTH_TEST);
 // To Render the surfaces Properly according to their depths
}
void display()
{
```

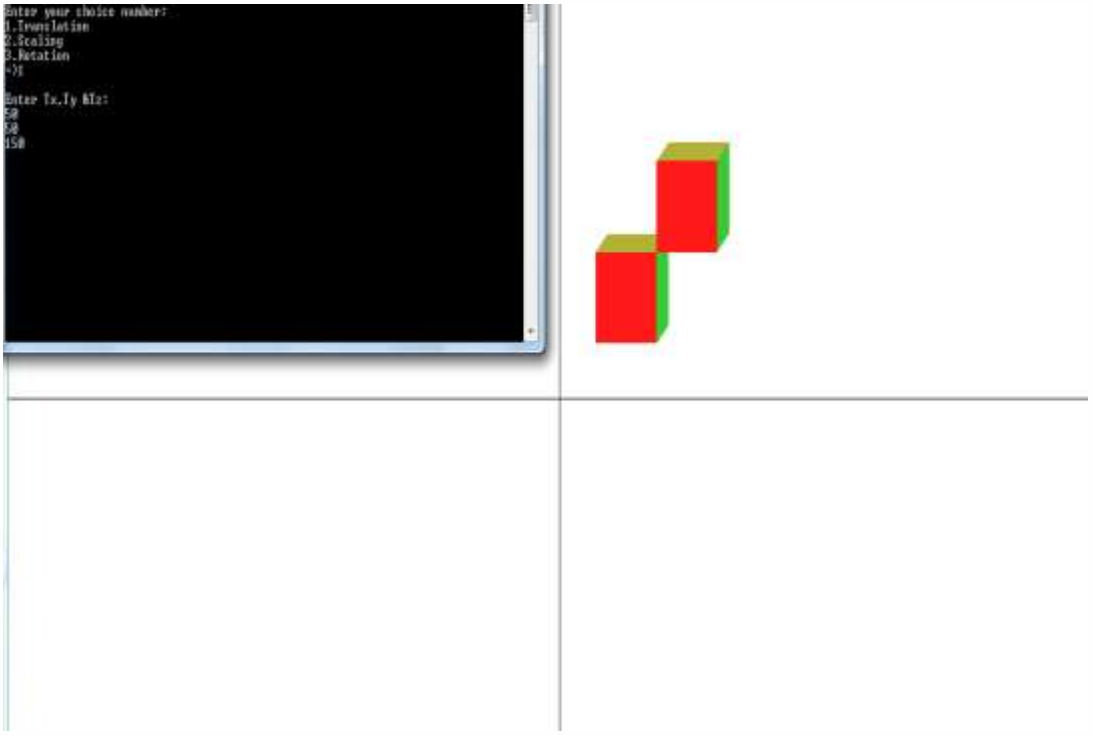
```
glClear(GL_COLOR_BUFFER_BIT|GL_DEPTH_BUFFER_BIT);
Axes();
glColor3f(1.0,0.0,0.0);
draw(input);
setIdentityM(theMatrix);
switch(choice)
{
case 1:
 translate(tx,ty,tz);
 break;
case 2:
 scale(sx,sy,sz);
multiplyM();
 break;
case 3:
 switch (choiceRot) {
 case 1:
 RotateX(angle);
 break;
 case 2: RotateY(angle);
 break;
 case 3:
 RotateZ(angle);
 break;
 default:
 break;
 }
multiplyM();
 break;
}
draw(output);
glFlush();
}
int main(int argc, char** argv)
{
 glutInit(&argc,argv);
```

```
glutInitDisplayMode(GLUT_SINGLE|GLUT_RGB|GLUT_DEPTH);
glutInitWindowSize(1362,750);
glutInitWindowPosition(0,0);
glutCreateWindow("3D TRANSFORMATIONS");
init();
cout<<"Enter your choice number:\n1.Translation\n2.Scaling\n3.Rotation\n=>";
cin>>choice;
switch (choice) {
case 1:
cout<<"\nEnter Tx,Ty &Tz: \n";
cin>>tx>>ty>>tz;
break;
case 2:
cout<<"\nEnter Sx,Sy & Sz: \n";
cin>>sx>>sy>>sz;
break;
case 3:
cout<<"Enter your choice for Rotation about axis:\n1.parallel to X-axis."
<<"(y& z)\n2.parallel to Y-axis.(x& z)\n3.parallel to Z-axis."
<<"(x& y)\n =>";
cin>>choiceRot;
switch (choiceRot) {
case 1:
cout<<"\nENter Rotation angle: ";
cin>>angle;
break;
case 2:
cout<<"\nENter Rotation angle: ";
cin>>angle;
break;
case 3:
cout<<"\nENter Rotation angle: ";
cin>>angle;
break;
default:
break;
```

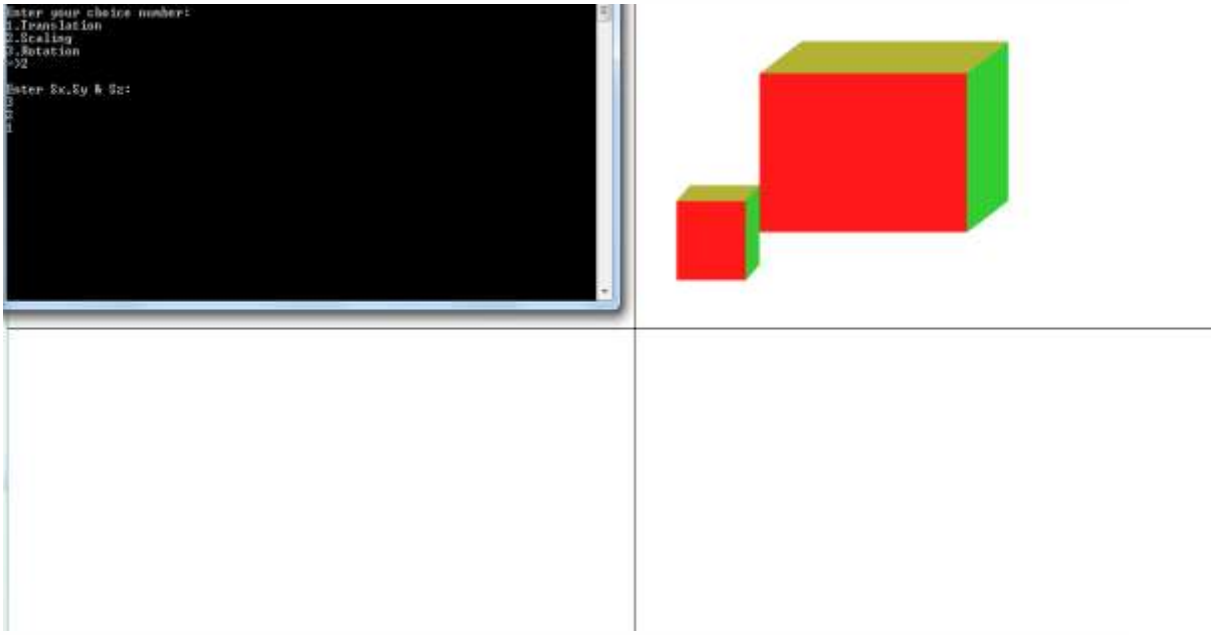
```
 }
 break;
 default:
 break;
 }
 glutDisplayFunc(display);
 glutMainLoop();
return 0;
}
```

Output :

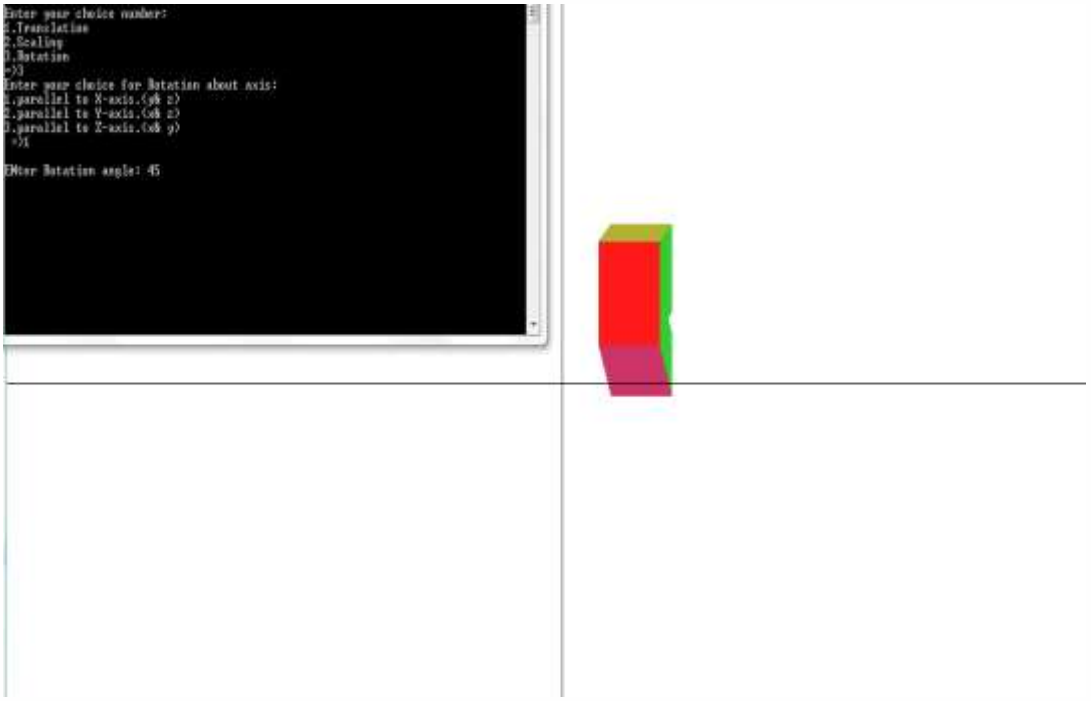
1. Translation :



2. Scaling :



3. Rotation:



Experiment No. 7

Write a C++ program to implement bouncing ball using sine wave form. Apply the concept of polymorphism.

```
#include<dos.h>
#include<iostream.h>
#include<graphics.h>
#include<math.h>
#include<conio.h>
void main()
 {
   int d=DETECT,m;
   initgraph(&d,&m,"e:\tcc\bgi");
   float x=1,y=0.00000,j=.5,count=.1;
   float r=15;
   setcolor(14);
   line(0,215,650,215);
    sleep(1);
    for(int k=0;k<=7;k++)
     {

      for(float i=90;i<270;i+=10)
       {
 y=cos(((i*22/7)/180))/j;
```

```
if(y>0)
y=-y;
x+=5;
setcolor(14);
setfillstyle(1,14);
circle(x,y*100+200,r);
floodfill(x,y*100+200,14);
  delay(100);
setcolor(0);
setfillstyle(1,0);
circle(x,y*100+200,r);
floodfill(x,y*100+200,0);
     }
     j+=count;
     count+=.1;
    }
  getch();
}
```

Output