Practical No:6

1)Implement following 2D transformations on the object with respect to axis : i) Scaling ii) Rotation about arbitrary point iii) Reflection

Code:

```
#include <iostream>
#include <math.h>
#include <time.h>
#include <GL/glut.h>
#include <vector>
using namespace std;
int edge;
vector<int> xpoint;
vector<int> ypoint;
int ch;
double round(double d){
return floor(d + 0.5);
}
void init(){
  glClearColor(1.0,1.0,1.0,0.0);
  glMatrixMode(GL_PROJECTION);
  gluOrtho2D(0,640,0,480);
  glClear(GL_COLOR_BUFFER_BIT);
}
void translation(){
   int tx, ty;
   cout<<"\t Enter Tx, Ty \n";
```

```
    cin>> tx>> ty;
    for(int i=0;i<edge;i++){
        xpoint[i] = xpoint[i] + tx;
        ypoint[i] = ypoint[i] + ty;
    }
    glBegin(GL_POLYGON);
        glColor3f(0,0,1);
        for(int i=0;i<edge;i++){
            glVertex2i(xpoint[i],ypoint[i]);
        }
    glEnd();
    glFlush();
}
void rotaion(){
    int cx, cy;
    cout<<"\n Enter Ar point x , y ";
    cin >> cx >> cy;
    cx = cx+320;
    cy = cy+240;
    glColor3f(0.0, 1.0, 0.0);
    glBegin(GL_POINTS);
        glVertex2i(cx,cy);
    glEnd();
    glFlush();
    double the;
    cout<<"\n Enter thetha ";
```

```
    cin>>the;
    the = the * 3.14/180;
    glColor3f(0,0,1.0);
    glBegin(GL_POLYGON);
       for(int i=0;i<edge;i++){
          glVertex2i(round(((xpoint[i] - cx)*cos(the) - ((ypoint[i]-cy)*sin(the))) + cx),
                round(((xpoint[i] - cx)*sin(the) + ((ypoint[i]-cy)*cos(the))) + cy));
       }
    glEnd();
    glFlush();
}
void scale(){
    glColor3f(1.0,0,0);
    glBegin(GL_POLYGON);
       for(int i=0;i<edge;i++){
          glVertex2i(xpoint[i]-320,ypoint[i]-240);
       }
    glEnd();
    glFlush();
    cout<<"\n\tIn Scaling whole screen is 1st Qudrant \n";
    int sx, sy;
    cout<<"\t Enter sx, sy \n";
    cin>> sx>> sy;
    for(int i=0;i<edge;i++){
       xpoint[i] = (xpoint[i]-320) * sx;
       ypoint[i] = (ypoint[i]-240) * sy;
```

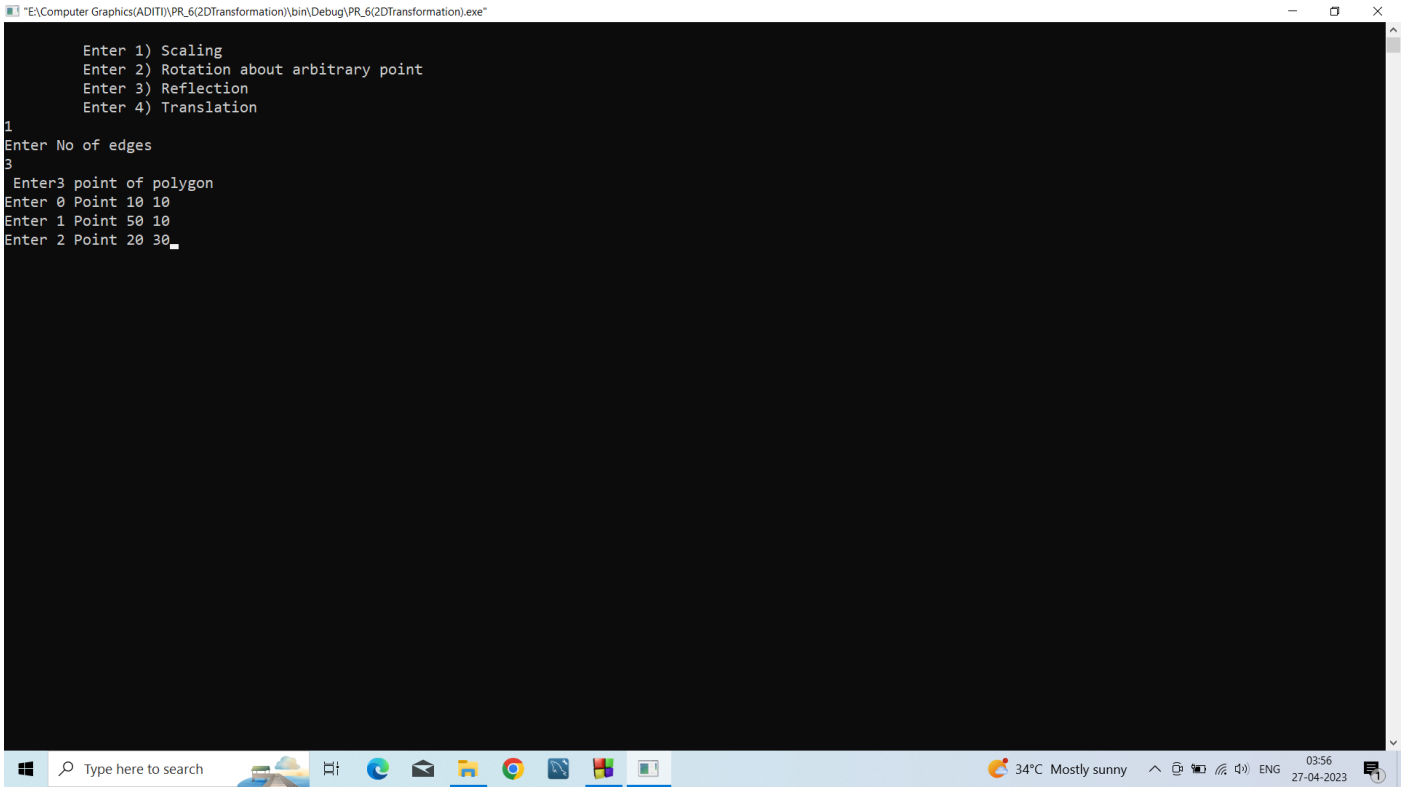
```
    }
    glColor3f(0,0,1.0);
    glBegin(GL_POLYGON);
        for(int i=0;i<edge;i++){
            glVertex2i(xpoint[i],ypoint[i]);
        }
    glEnd();
    glFlush();
}
void reflection(){
    char reflection;
    cout<<"Enter Reflection Axis \n";
    cin>> reflection;
    if(reflection == 'x' || reflection == 'X'){
        glColor3f(0.0,0.0,1.0);
        glBegin(GL_POLYGON);
            for(int i=0;i<edge;i++){
                glVertex2i(xpoint[i], (ypoint[i] * -1)+480);
            }
        glEnd();
        glFlush();
    }
    else if(reflection == 'y' || reflection == 'Y'){
        glColor3f(0.0,0.0,1.0);
        glBegin(GL_POLYGON);
            for(int i=0;i<edge;i++){
```

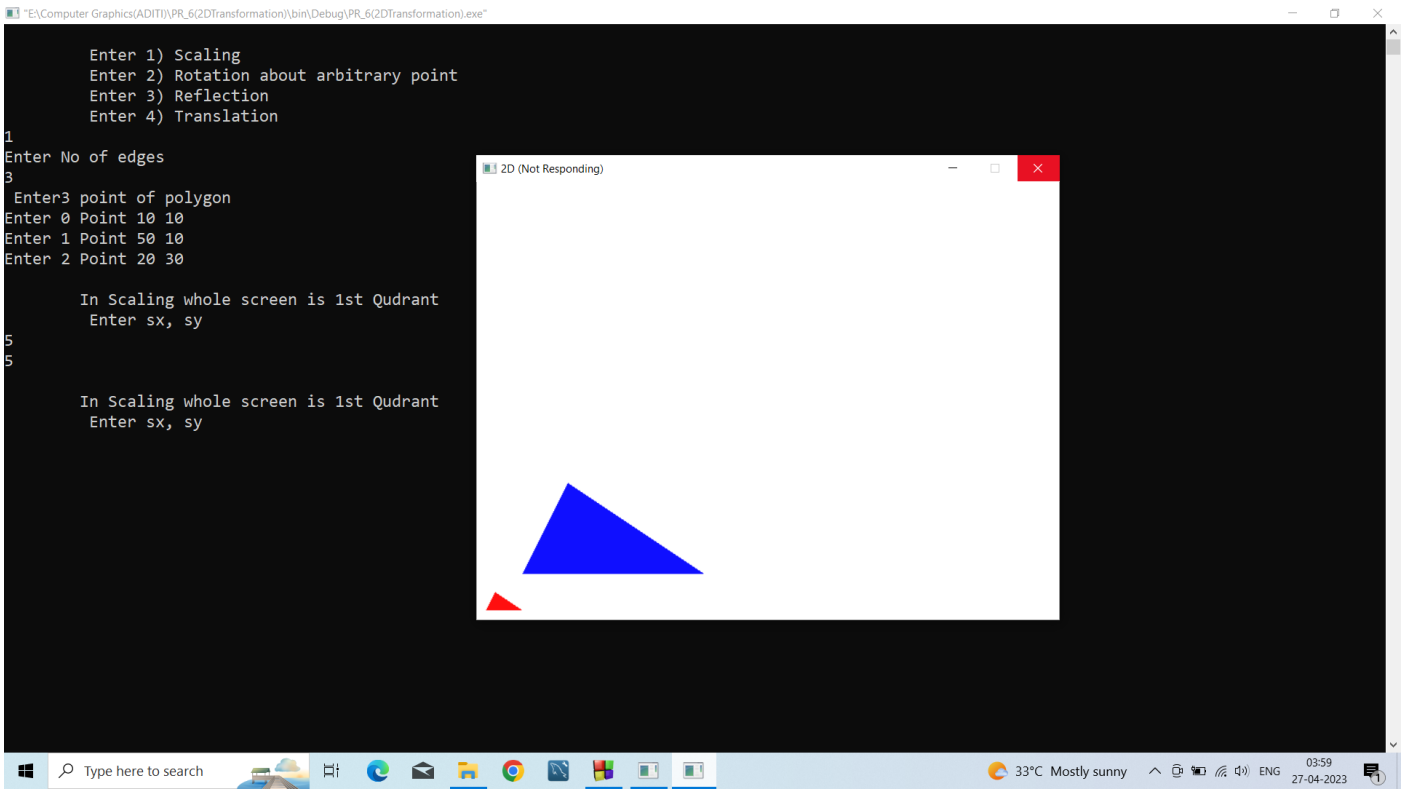
```
            glVertex2i((xpoint[i] * -1)+640,(ypoint[i]));
        }
      glEnd();
      glFlush();
   }
}
void Draw(){
   if(ch==2 || ch==3 || ch==4){
      glColor3f(1.0,0,0);
      glBegin(GL_LINES);
         glVertex2i(0,240);
         glVertex2i(640,240);
      glEnd();
      glColor3f(1.0,0,0);
      glBegin(GL_LINES);
         glVertex2i(320,0);
         glVertex2i(320,480);
      glEnd();
      glFlush();
      glColorf(1.0,0,0);
      glBegin(GL_POLYGON);
         for(int i=0;i<edge;i++){
            glVertex2i(xpoint[i],ypoint[i]);
         }
      glEnd();
      glFlush();
```

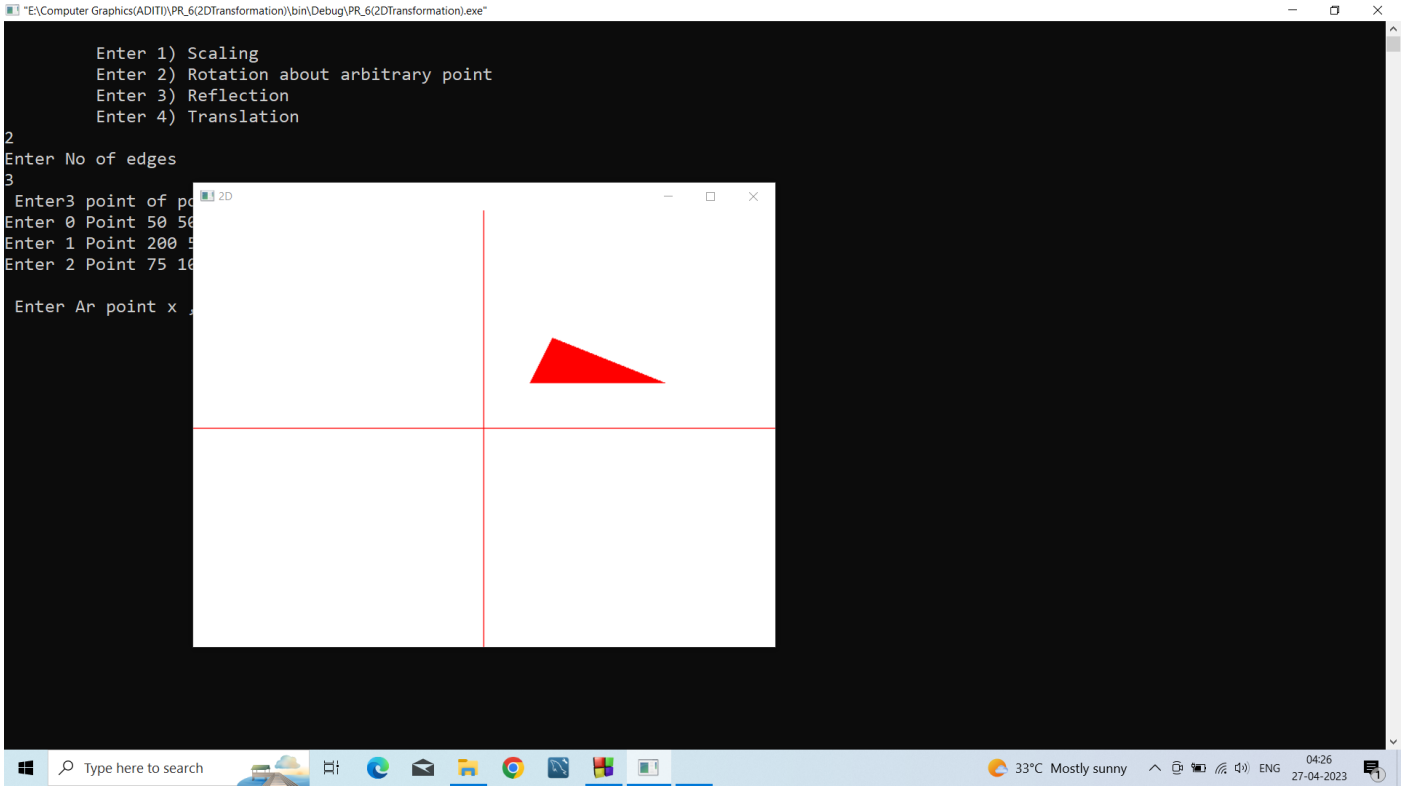
```
    }
    if(ch==1){
        scale();
    }
    else if(ch == 2){
        rotaion();
    }
    else if( ch == 3){
        reflection();
    }
    else if (ch == 4){
        translation();
    }
}
int main(int argc, char** argv){
    cout<<"\n \t Enter 1) Scaling ";
    cout<<"\n \t Enter 2) Rotation about arbitrary point";
    cout<<"\n \t Enter 3) Reflection";
    cout<<"\n \t Enter 4) Translation  \n \t";
    cin>>ch;
    if(ch==1 || ch==2 || ch==3 || ch==4){
        cout<<"Enter No of edges \n";
        cin>> edge;
        int xpointnew, ypointnew;
        cout<<" Enter"<< edge <<" point of polygon \n";
        for(int i=0;i<edge;i++){
```

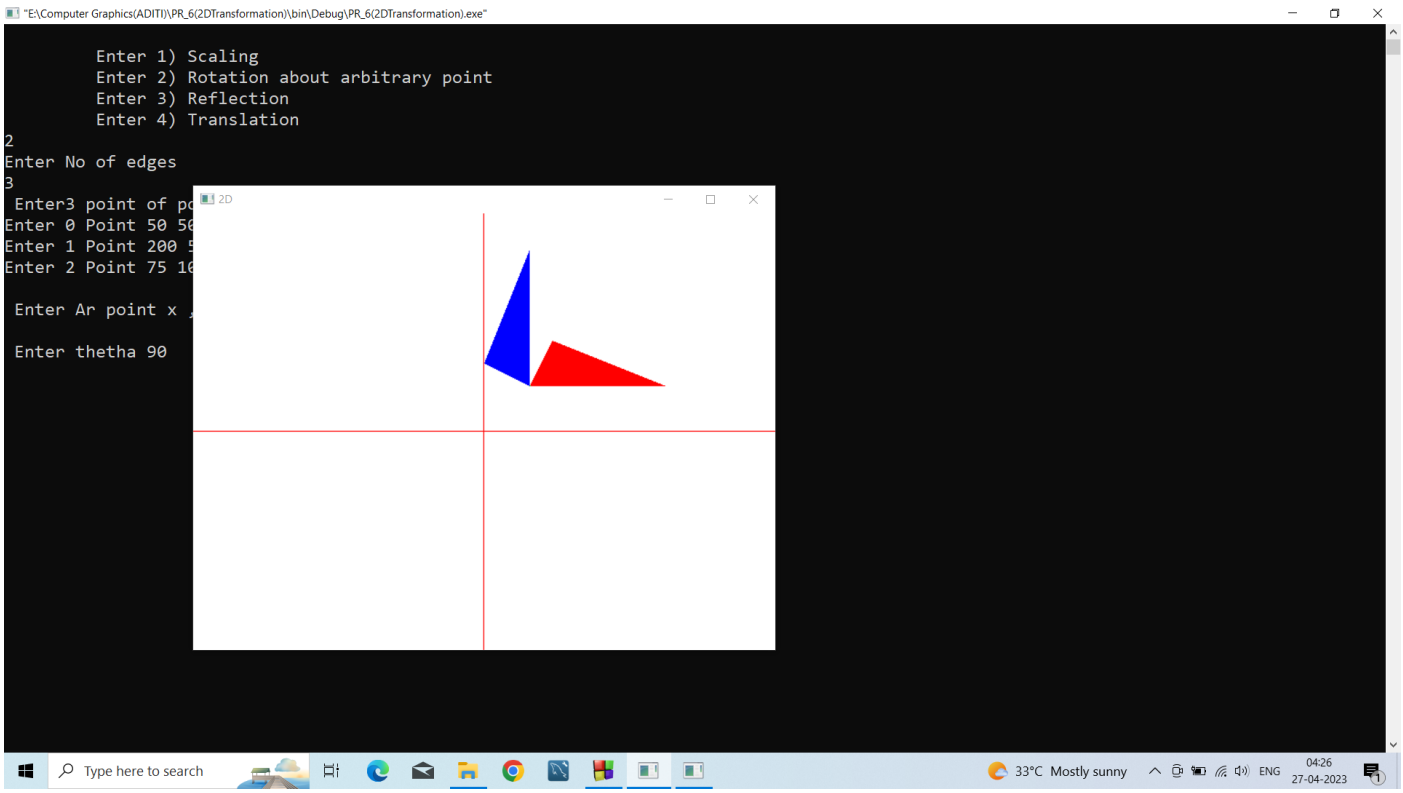
```
        cout<<"Enter "<< i << " Point ";
        cin>>xpointnew>>ypointnew;
        xpoint.push_back(xpointnew+320);
        ypoint.push_back(ypointnew+240);
      }
        glutInit(&argc, argv);
        glutInitDisplayMode(GLUT_SINGLE|GLUT_RGB);
        glutInitWindowSize(640,480);
        glutInitWindowPosition(200,200);
        glutCreateWindow("2D");
        init();
        glutDisplayFunc(Draw);
      glutMainLoop();
        return 0;
      }
      else{
        cout<<"\n \t Check Input run again";
      return 0;
    }
}
```

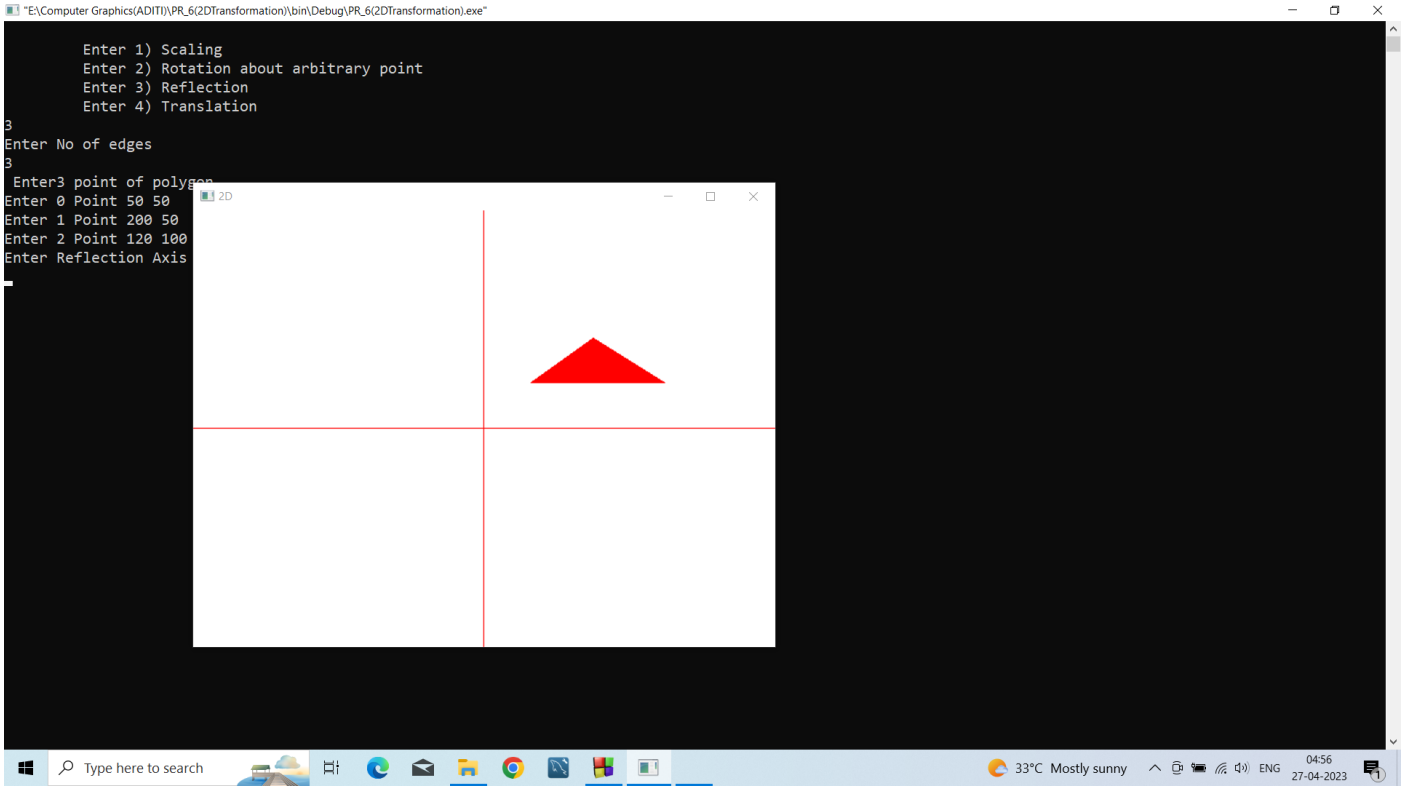
Output:

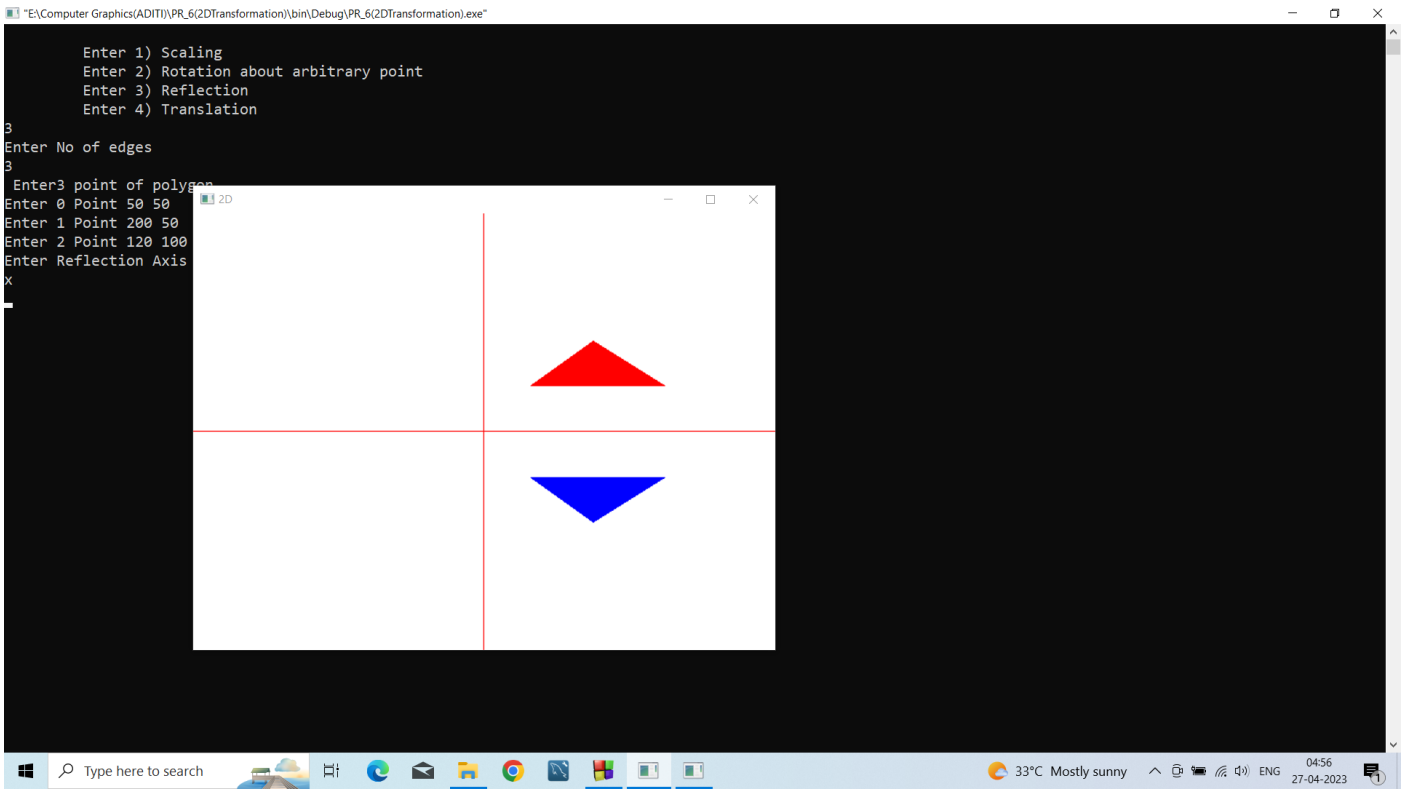

"E:\Computer Graphics(ADITI)\PR_6(2DTransformation)\bin\Debug\PR_6(2DTransformation).exe"
Enter 1) Scaling
Enter 2) Rotation about arbitrary point
Enter 3) Reflection
Enter 4) Translation
1
Enter No of edges
3
Enter3 point of polygon
Enter 0 Point 10 10
Enter 1 Point 50 10
Enter 2 Point 20 30
Type here to search
34°C Mostly sunny
ENG
03:56
27-04-2023


"E:\Computer Graphics(ADITI)\PR_6(2DTransformation)\bin\Debug\PR_6(2DTransformation).exe"
Enter 1) Scaling
Enter 2) Rotation about arbitrary point
Enter 3) Reflection
Enter 4) Translation
1
Enter No of edges
3
Enter3 point of polygon
Enter 0 Point 10 10
Enter 1 Point 50 10
Enter 2 Point 20 30
In Scaling whole screen is 1st Qudrant
Enter sx, sy
5
5
In Scaling whole screen is 1st Qudrant
Enter sx, sy
2D (Not Responding)
Type here to search
33°C Mostly sunny
ENG
03:59
27-04-2023


"E:\Computer Graphics(ADITI)\PR_6(2DTransformation)\bin\Debug\PR_6(2DTransformation).exe"
Enter 1) Scaling
Enter 2) Rotation about arbitrary point
Enter 3) Reflection
Enter 4) Translation
2
Enter No of edges
3
Enter3 point of po
Enter 0 Point 50 50
Enter 1 Point 200 5
Enter 2 Point 75 10
Enter Ar point x
2D
Type here to search
33°C Mostly sunny
ENG
04:26
27-04-2023


"E:\Computer Graphics(ADITI)\PR_6(2DTransformation)\bin\Debug\PR_6(2DTransformation).exe"
Enter 1) Scaling
Enter 2) Rotation about arbitrary point
Enter 3) Reflection
Enter 4) Translation
2
Enter No of edges
3
Enter3 point of po
Enter 0 Point 50 50
Enter 1 Point 200 5
Enter 2 Point 75 10
Enter Ar point x
Enter thetha 90
2D
Type here to search
33°C Mostly sunny
ENG
04:26
27-04-2023


"E:\Computer Graphics(ADITI)\PR_6(2DTransformation)\bin\Debug\PR_6(2DTransformation).exe"
Enter 1) Scaling
Enter 2) Rotation about arbitrary point
Enter 3) Reflection
Enter 4) Translation
3
Enter No of edges
3
Enter3 point of polygon
Enter 0 Point 50 50
Enter 1 Point 200 50
Enter 2 Point 120 100
Enter Reflection Axis
2D
Type here to search
33°C Mostly sunny
ENG
04:56
27-04-2023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Enter 1 Point 200 50
Enter 2 Point 120 100
Enter Reflection Axis
x
2D
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