ACPCE

Where Knowledge is Second Nature

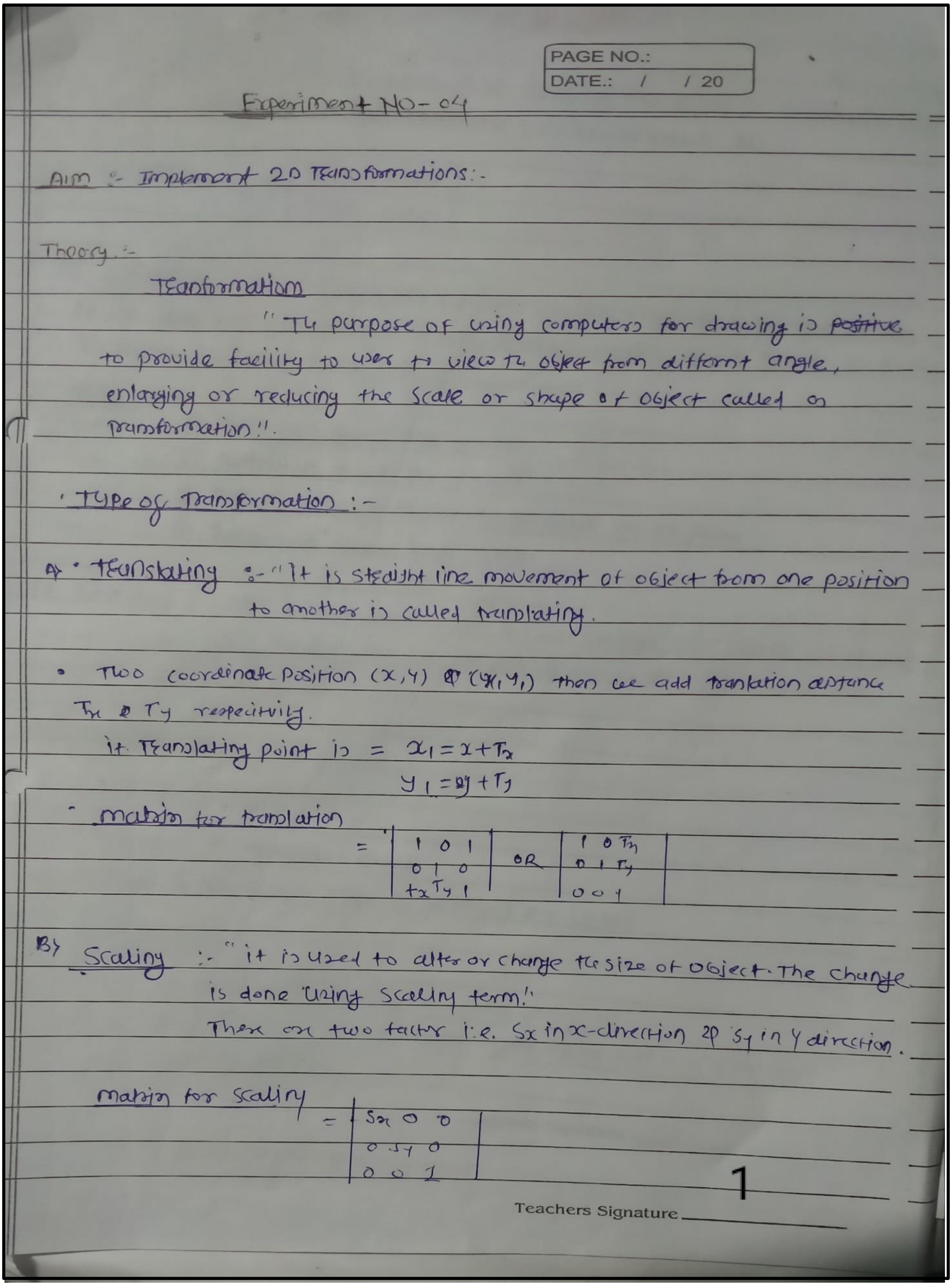
Jawahar Education Societys Annasaheb Chudaman Patil College of Engineering, Kharghar, Navi Mumbai

NAME: PRIYUSH BHIMRAO KHOBRAGADE

PRN NO: 211112018

SUBJECT: COMPUTER GRAPHICS

AIM: Implement 2D Transformations



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Experiment NO - 04

AIM :- Implemont 2D Transformations :-

Theory :-

Transformation

"Th purpose of using computers for drawing is ~~positive~~ to provide facility to user to view th object from diffornt angle, enlarging or reducing the scale or shape of object called as transformation".

Type of Transformation :-

A) • Translating :- "It is straight line movement of object from one position to another is called translating.

- Two coordinate position (x,y) & (x_1,y_1) then we add translation distance T_x & T_y respecitvily.

  it Translating point is = $x_1 = x + T_x$

  $y_1 = y + T_y$

- matrix for translation

$$= \begin{vmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ t_x & T_y & 1 \end{vmatrix} \quad OR \quad \begin{vmatrix} 1 & 0 & T_x \\ 0 & 1 & T_y \\ 0 & 0 & 1 \end{vmatrix}$$

B) Scaling :- "it is used to alter or change the size of object. The change is done using scaling term."

There are two factor i.e. S_x in x-direction & S_y in y direction.

matrix for scaling

$$= \begin{vmatrix} S_x & 0 & 0 \\ 0 & S_y & 0 \\ 0 & 0 & 1 \end{vmatrix}$$

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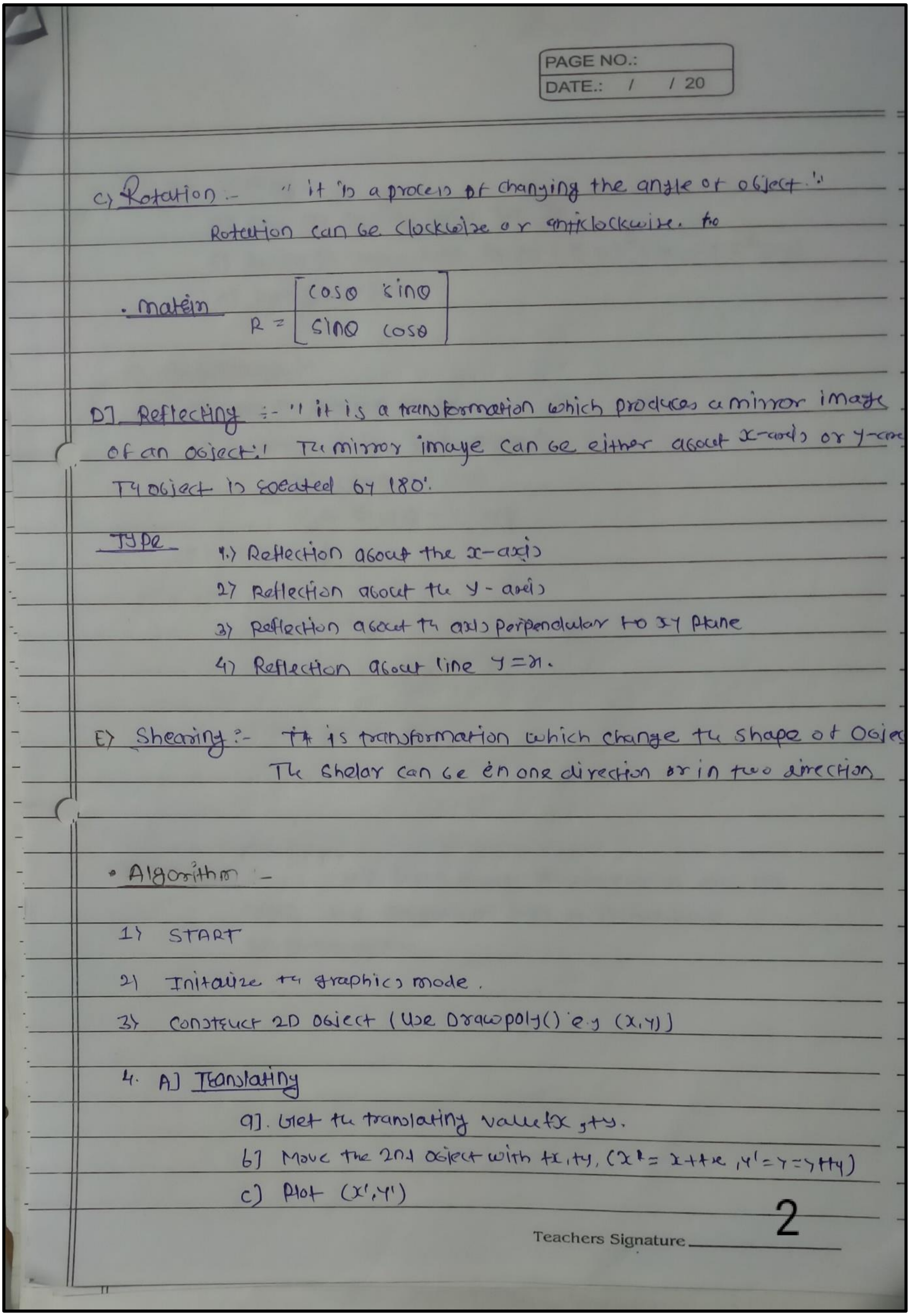
AIM: Implement 2D Transformations



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c) Rotation :- " it is a process of changing the angle of object."
Rotation can be clockwise or anticlockwise. to

- matrix

$$R = \begin{bmatrix} \cos\theta & \sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$$

D] Reflecting :- " it is a transformation which produces a mirror image of an object." The mirror image can be either about x-axis or y-axis
The object is rotated by 180°.

Type

1.) Reflection about the x-axis
2) Reflection about the y-axis
3) Reflection about the axis perpendicular to xy plane
4) Reflection about line $y = x$.

E) Shearing :- It is transformation which change the shape of Object
The shelar can be in one direction or in two direction

- Algorithm :-

```
1) START
2) Initalize the graphics mode.
3) Construct 2D object (use Drawpoly() e.g (x,y))
4. A] Translating
        a]. Get the translating value tx, ty.
        b] Move the 2nd object with tx, ty, (x' = x+tx, y' = y = y+ty)
        c) Plot (x', y')
```

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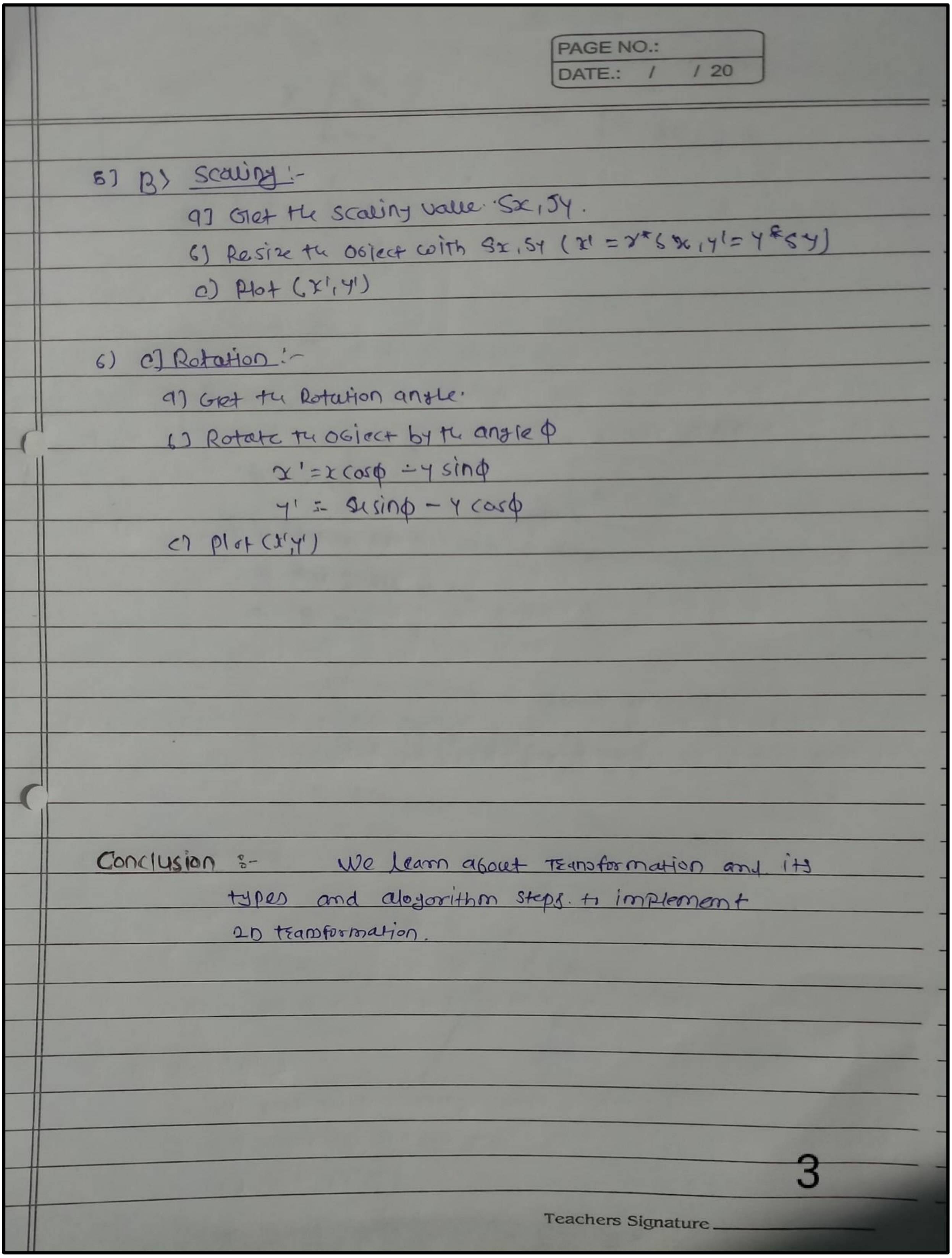
Priyush B. Khobragade



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5] B> Scaling :-

a] Get the scaling value Sx, Sy.

b] Resize the object with Sx, Sy ($x' = x*Sx, y' = y*Sy$)

c) Plot (x', y')

6) C] Rotation :-

a] Get the Rotation angle.

b] Rotate the object by the angle ϕ

$$x' = x\cos\phi \div y\sin\phi$$

$$y' = x\sin\phi - y\cos\phi$$

c] plot (x', y')

Conclusion :- We learn about transformation and its types and alogorithm steps. to implement 2D transformation.

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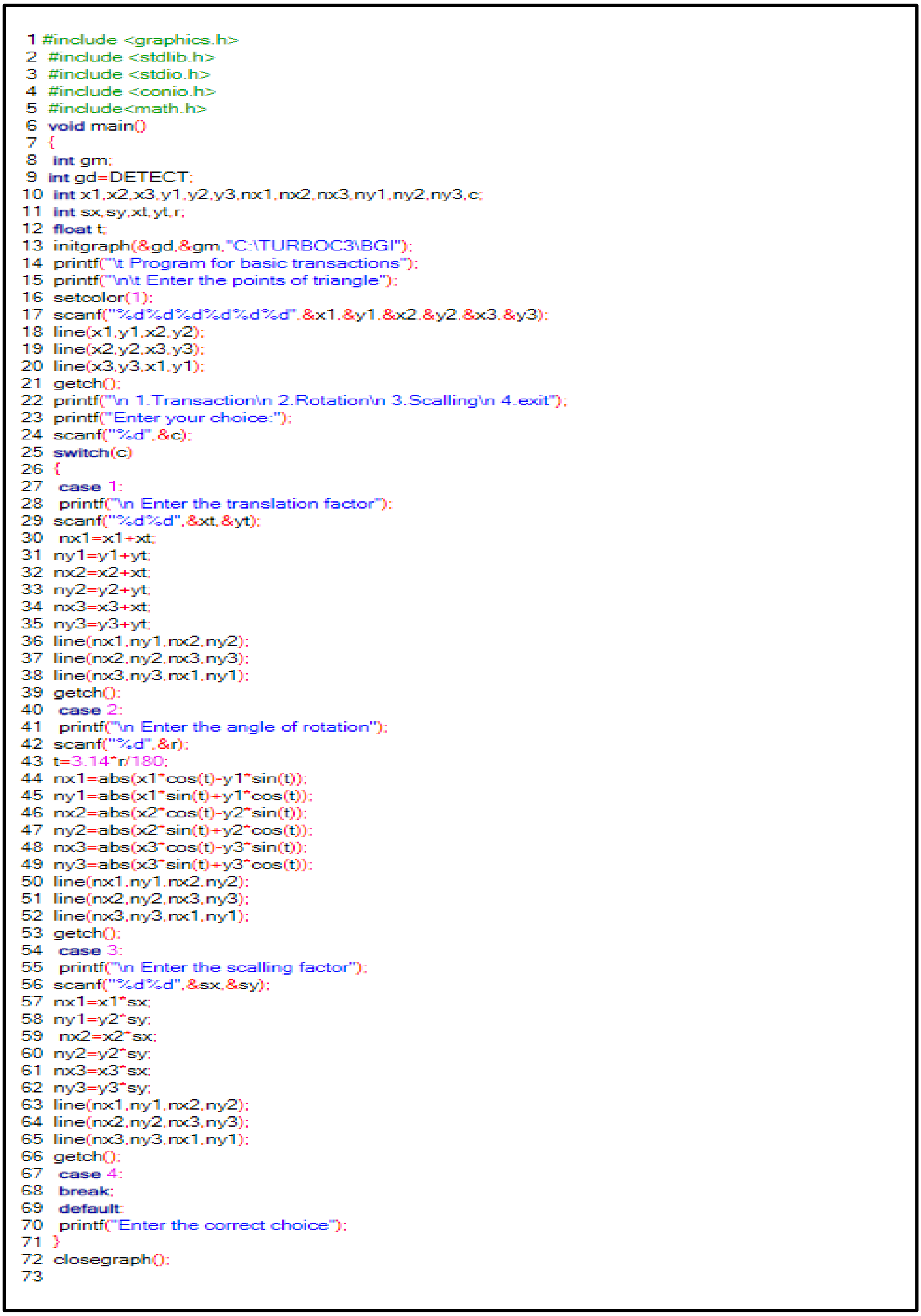
AIM: Implement 2D Transformations

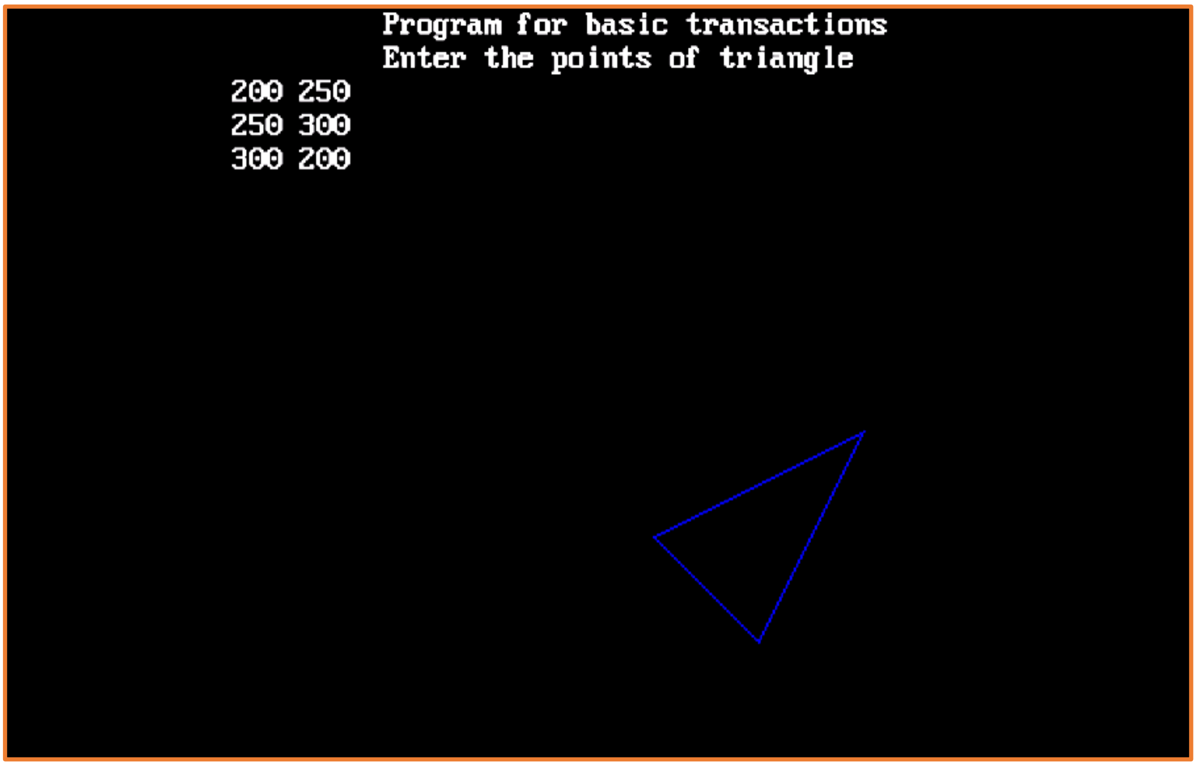
Input:



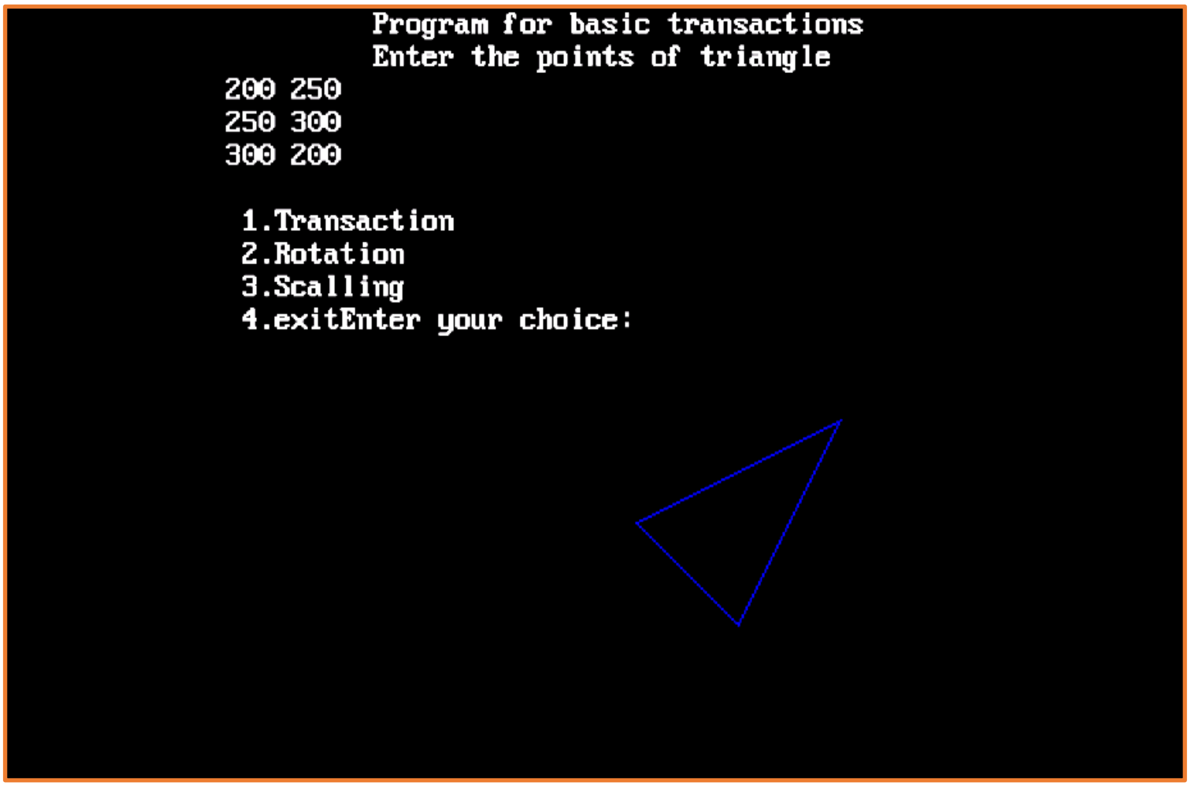
```c
#include <graphics.h>
 #include <stdlib.h>
 #include <stdio.h>
 #include <conio.h>
 #include<math.h>
 void main()
 {
  int gm;
 int gd=DETECT;
 int x1,x2,x3,y1,y2,y3,nx1,nx2,nx3,ny1,ny2,ny3,c;
 int sx,sy,xt,yt,r;
 float t;
 initgraph(&gd,&gm,"C:\TURBOC3\BGI");
 printf("\t Program for basic transactions");
 printf("\n\t Enter the points of triangle");
 setcolor(1);
 scanf("%d%d%d%d%d%d",&x1,&y1,&x2,&y2,&x3,&y3);
 line(x1,y1,x2,y2);
 line(x2,y2,x3,y3);
 line(x3,y3,x1,y1);
 getch();
 printf("\n 1.Transaction\n 2.Rotation\n 3.Scalling\n 4.exit");
 printf("Enter your choice:");
 scanf("%d",&c);
 switch(c)
 {
  case 1:
  printf("\n Enter the translation factor");
 scanf("%d%d",&xt,&yt);
  nx1=x1+xt;
 ny1=y1+yt;
 nx2=x2+xt;
 ny2=y2+yt;
 nx3=x3+xt;
 ny3=y3+yt;
 line(nx1,ny1,nx2,ny2);
 line(nx2,ny2,nx3,ny3);
 line(nx3,ny3,nx1,ny1);
 getch();
  case 2:
  printf("\n Enter the angle of rotation");
 scanf("%d",&r);
 t=3.14*r/180;
 nx1=abs(x1*cos(t)-y1*sin(t));
 ny1=abs(x1*sin(t)+y1*cos(t));
 nx2=abs(x2*cos(t)-y2*sin(t));
 ny2=abs(x2*sin(t)+y2*cos(t));
 nx3=abs(x3*cos(t)-y3*sin(t));
 ny3=abs(x3*sin(t)+y3*cos(t));
 line(nx1,ny1,nx2,ny2);
 line(nx2,ny2,nx3,ny3);
 line(nx3,ny3,nx1,ny1);
 getch();
  case 3:
  printf("\n Enter the scalling factor");
 scanf("%d%d",&sx,&sy);
 nx1=x1*sx;
 ny1=y2*sy;
  nx2=x2*sx;
 ny2=y2*sy;
 nx3=x3*sx;
 ny3=y3*sy;
 line(nx1,ny1,nx2,ny2);
 line(nx2,ny2,nx3,ny3);
 line(nx3,ny3,nx1,ny1);
 getch();
  case 4:
  break;
  default:
  printf("Enter the correct choice");
 }
 closegraph();
```

AIM: Implement 2D Transformations

Output:-



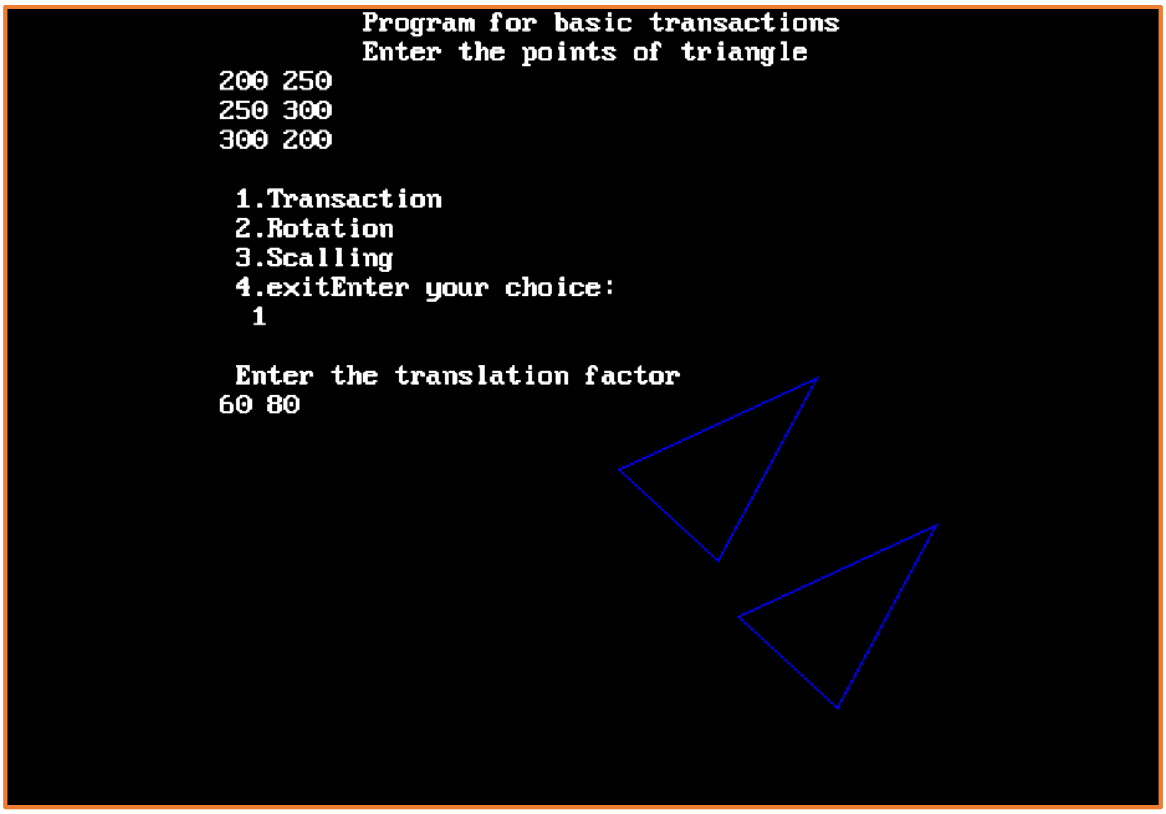
```
Program for basic transactions
Enter the points of triangle
200 250
250 300
300 200
```



```
Program for basic transactions
Enter the points of triangle
200 250
250 300
300 200

 1.Transaction
 2.Rotation
 3.Scalling
 4.exitEnter your choice:
```

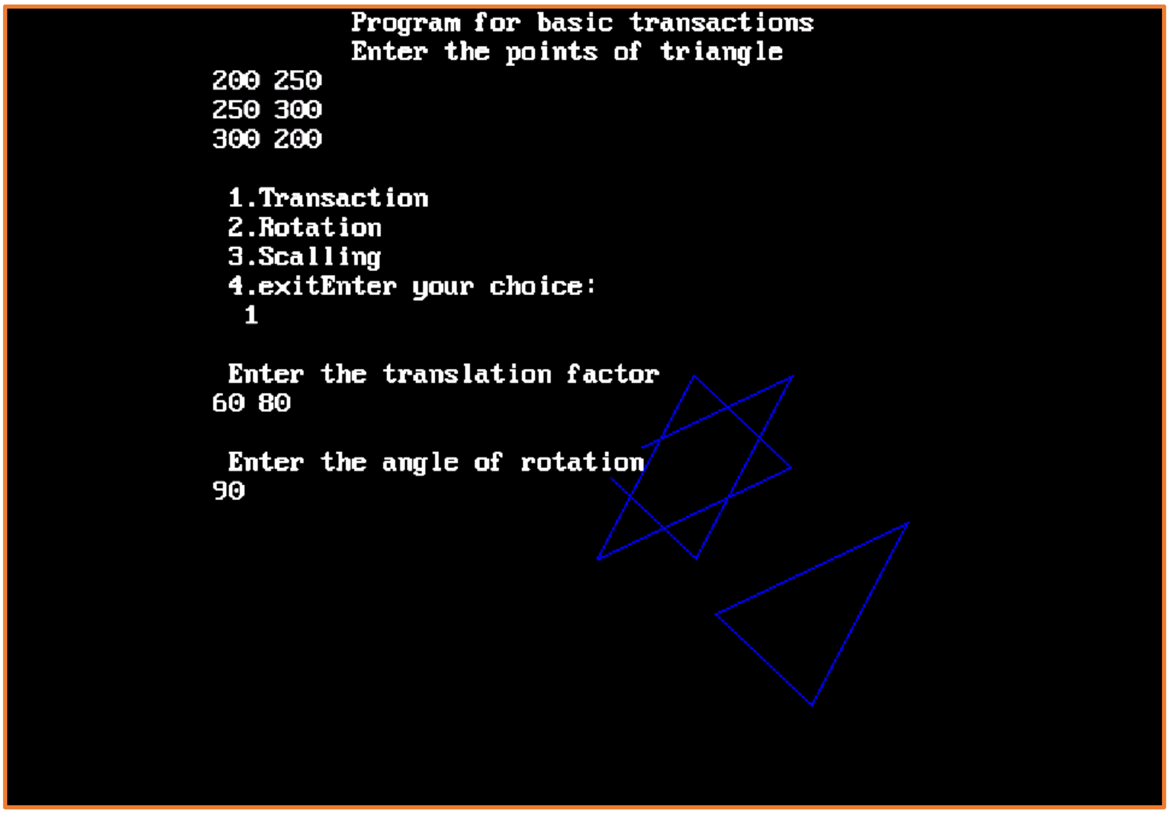
AIM: Implement 2D Transformations



```
                  Program for basic transactions
                  Enter the points of triangle
         200 250
         250 300
         300 200

          1.Transaction
          2.Rotation
          3.Scalling
          4.exitEnter your choice:
           1

          Enter the translation factor
         60 80
```



```
                  Program for basic transactions
                  Enter the points of triangle
         200 250
         250 300
         300 200

          1.Transaction
          2.Rotation
          3.Scalling
          4.exitEnter your choice:
           1

          Enter the translation factor
         60 80

          Enter the angle of rotation
         90
```

Conclusion: - We learn about Transformations and its types as well as step of implementation 2D Transformations

Priyush B. Khobragade