Lab Assignment No.4

Aim : Write C++ program to draw 2-D object and perform following basic transformations, Scaling b) Translation c) Rotation. Apply the concept of operator overloading

Code :

```
#include<iostream>
#include<math.h>
#include<graphics.h>
using namespace std;
class matrix
{
public:
 int n,i,j,tx,ty,k,sum,sx,sy;
 double a[6][3],b[6][3],mult[6][3],mat3[6][3];
 double p,q,r;
 double ang=0,angle=0;
public:
 void get()
 {
 cout<<"\n enter the number of vertices of polygon : ";
 cin>>n;
 // cout<<"n Entering user matix\n";
 for(i=0;i<n;i++)
 {
 cout<<"enter x n y co ordinates";
 cin>>b[i][0];
 cin>>b[i][1];
 b[i][2]=1;
 }
//display object matrix
```

```
 cout<<"\n original co ordinates are"<<"\n";
 for(i=0;i<n;i++)
 {
 for(j=0;j<3;j++)
 {
 cout<<b[i][j]<<"\t";
 }cout<<"\n";
 }
 }
void identitymat()
{
for(i=0;i<n;i++)
 {
 for(j=0;j<3;j++)
 {
 if(i==j)
 {
 a[i][j]=1;
 }
 else
 {
 a[i][j]=0;
 }
 }
 }
}
 void trans()
 {
```

```
cout<<"enter values of tx and ty";
cin>>tx>>ty;
a[2][0]=tx;
a[2][1]=ty;
cout<<"matrix is"<<"\n";
for(i=0;i<n;i++)
{
for(j=0;j<3;j++)
{
cout<<a[i][j]<<"\t";
}cout<<"\n";
}
}
void scale()
{
cout<<"\n Enter the values of sx and sy";
cin>>sx>>sy;
a[0][0]=sx;
a[1][1]=sy;
cout<<"\n Matrix is:"<<"\n";
//To display scaling matrix
for(i=0;i<3;i++)
{
for(j=0;j<3;j++)
{
cout<<a[i][j]<<"\t";
}cout<<"\n";
}
}
```

```
void rot()
{
cout<<"Enter the angle";
cin>>ang;
angle=(ang*3.142)/180;
q=sin(angle);
p=cos(angle);
r=-sin(angle);
a[0][0]=p;
a[0][1]=q;
a[1][0]=r;
a[1][1]=p;
cout<<"tranformation matrix is"<<"\n";
for(i=0;i<3;i++)
{
for(j=0;j<3;j++)
{
cout<<a[i][j]<<"\t";
}cout<<"\n";
}
}
void multi()
{
cout<<"\nMultiplying two matrices...";
for(i=0; i<n; i++)
{
for(j=0; j<3; j++)
{
sum=0;
```

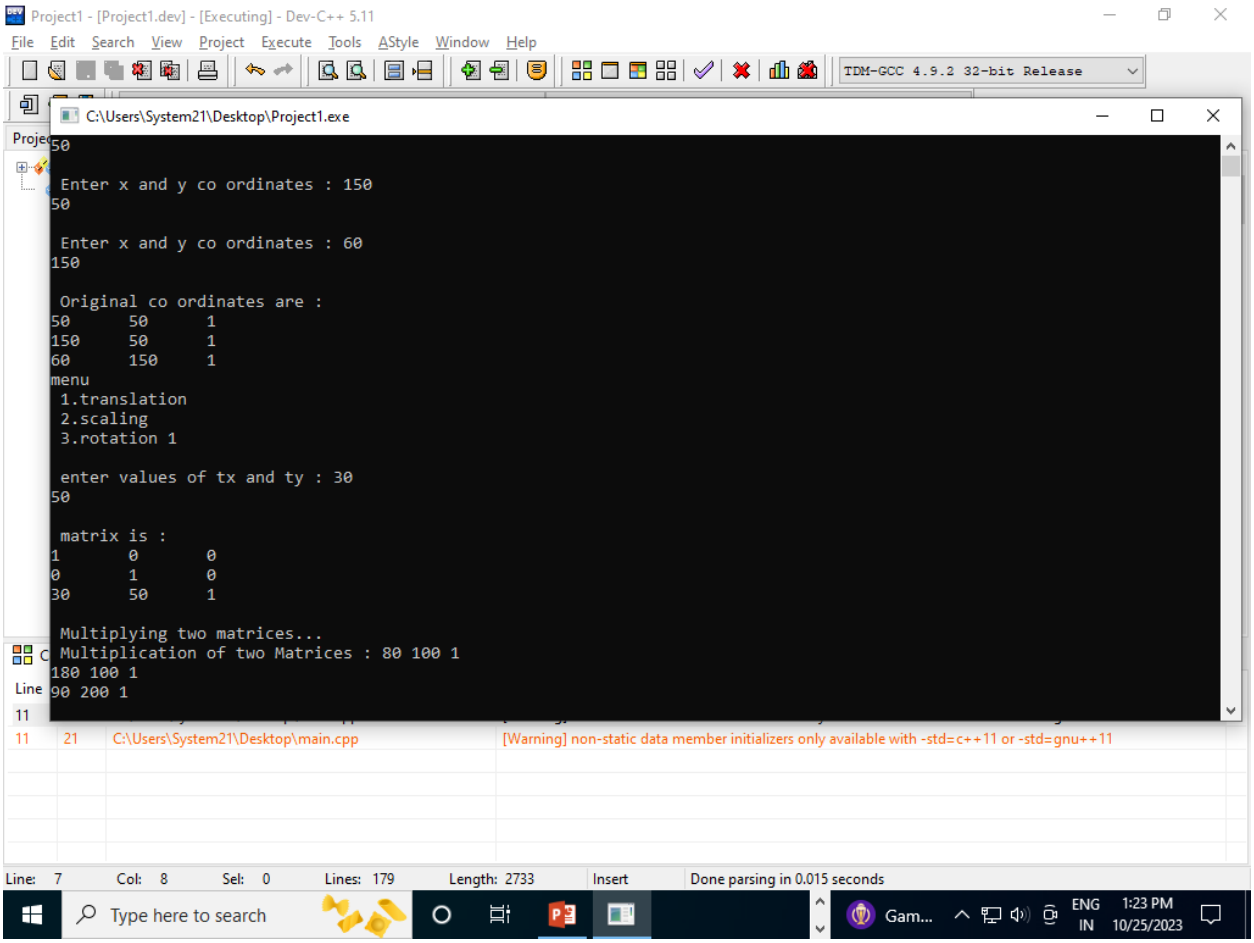
```
for(k=0; k<3; k++)
{
sum = sum + b[i][k] * a[k][j];
}
mat3[i][j] = sum;
}
}
}
void display()
{
cout<<"\nMultiplication of two Matrices : \n";
for(i=0; i<n; i++)
{
for(j=0; j<3; j++)
{
cout<<mat3[i][j]<<" ";
}
cout<<"\n";
}
int gd=DETECT,gm;
initgraph(&gd,&gm,NULL);
for(int i=0;i<n-1;i++)
{
 line(b[i][0],b[i][1],b[i+1][0],b[i+1][1]);
}
line(b[2][0],b[2][1],b[0][0],b[0][1]);
for(int i=0;i<n-1;i++)
{
 line(mat3[i][0],mat3[i][1],mat3[i+1][0],mat3[i+1][1]);
```

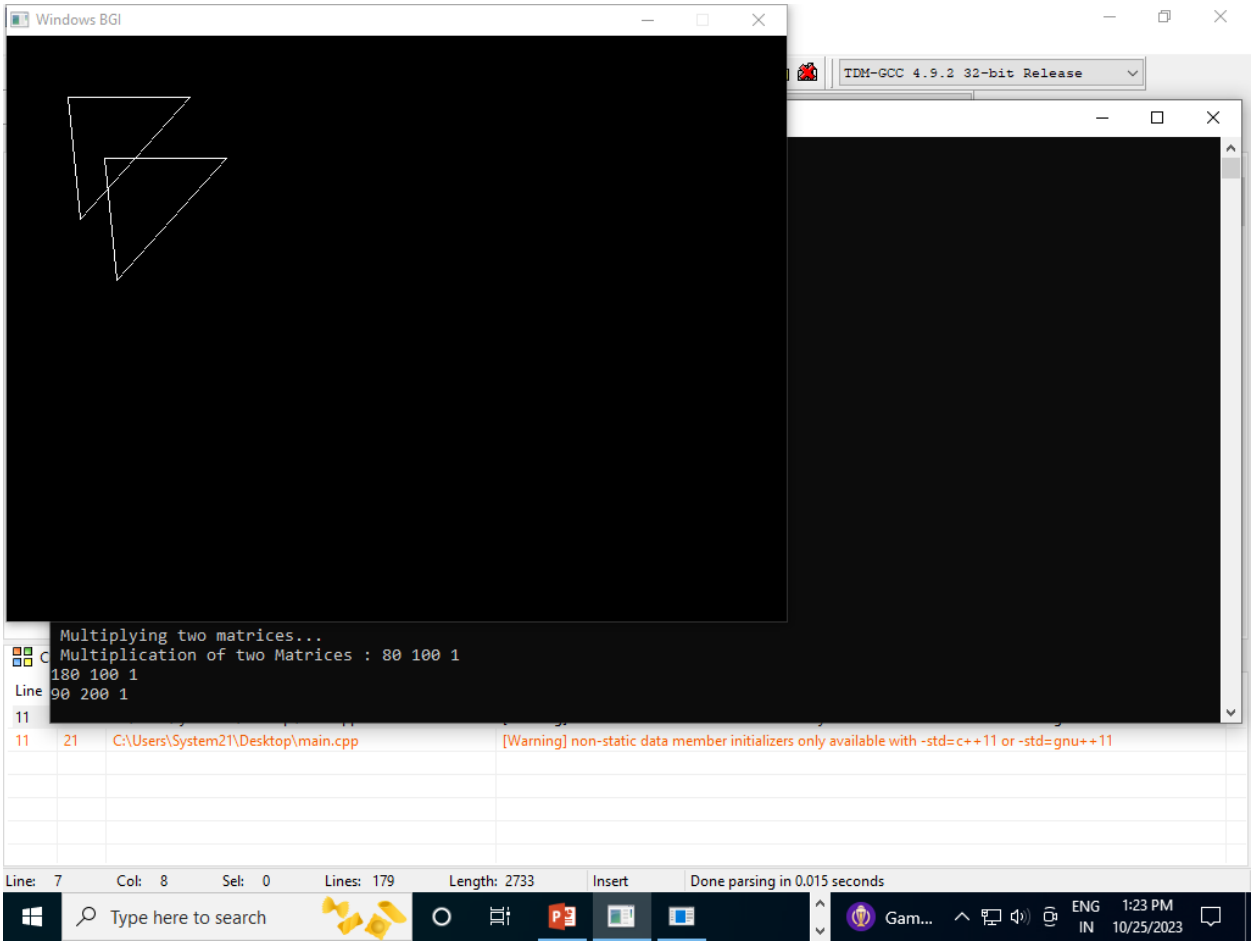
```
}
line(mat3[2][0],mat3[2][1],mat3[0][0],mat3[0][1]);
delay(5000);
closegraph();
 }
 };
int main()
{
 matrix g;
 int ch;
 char ans;
 g.get();
 g.identitymat();
 do
 {
cout<<"menu\n1.translation\n2.scaling\n3.rotation";
 cin>>ch;
 switch(ch)
 {
 case 1:
 g.trans();
 g.multi();
 g.display();
 break;
 case 2:
 g.scale();
 g.multi();
 g.display();
 break;
```

```
 case 3:
 g.rot();
 g.multi();
 g.display();
 break;
 }cin>>ans;
 }while(ans=='Y'&& ans=='y');
return 0;
}
```

Output :

1) **Translation :**




Windows BGI
TDM-GCC 4.9.2 32-bit Release
Multiplying two matrices...
Multiplication of two Matrices : 80 100 1
180 100 1
90 200 1
Line
11
11 21 C:\Users\System21\Desktop\main.cpp [Warning] non-static data member initializers only available with -std=c++11 or -std=gnu++11
Line: 7 Col: 8 Sel: 0 Lines: 179 Length: 2733 Insert Done parsing in 0.015 seconds
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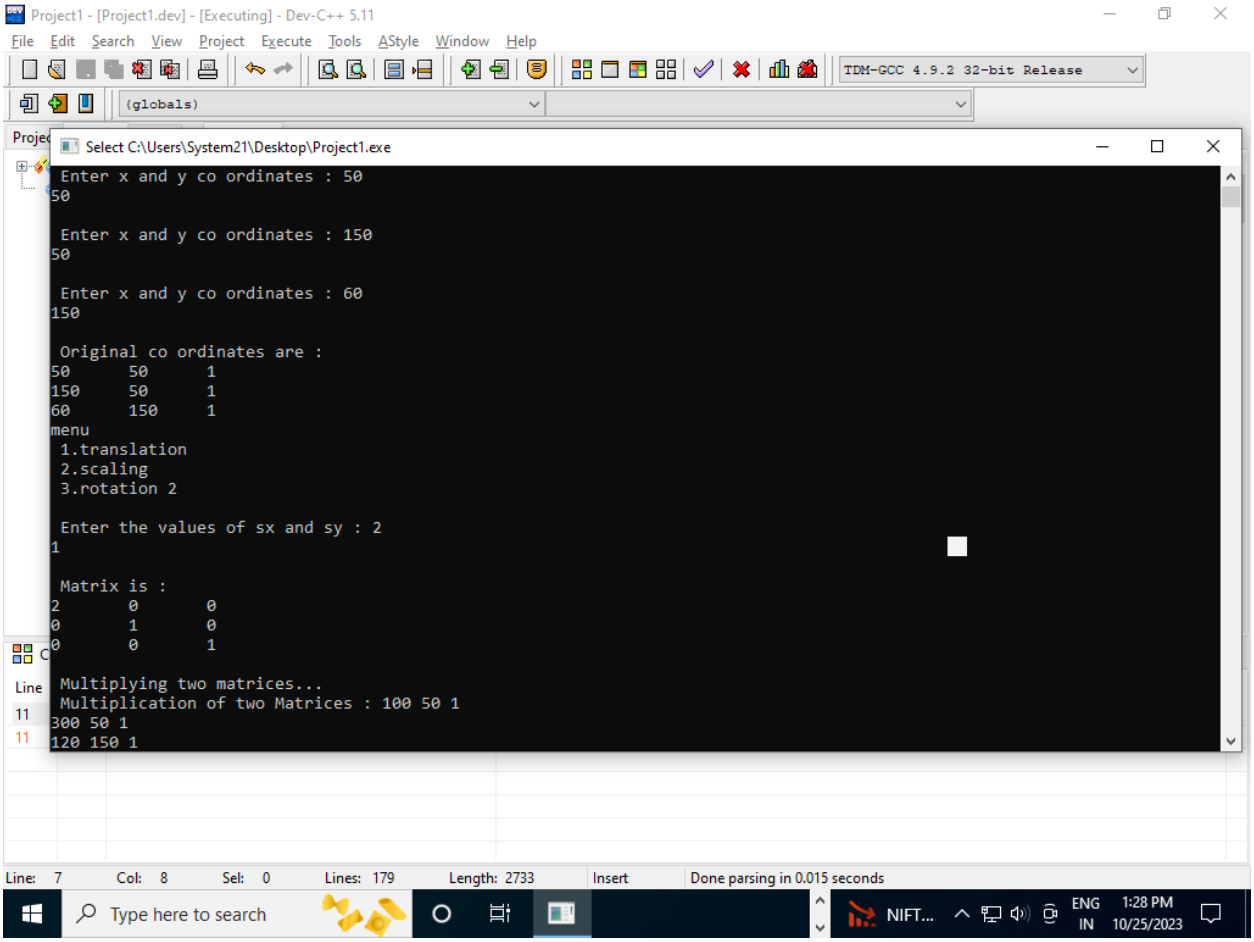
2) Scaling


Project1 - [Project1.dev] - [Executing] - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
TDM-GCC 4.9.2 32-bit Release
(globals)
Select C:\Users\System21\Desktop\Project1.exe
Enter x and y co ordinates : 50
50
Enter x and y co ordinates : 150
50
Enter x and y co ordinates : 60
150
Original co ordinates are :
50 50 1
150 50 1
60 150 1
menu
1.translation
2.scaling
3.rotation 2
Enter the values of sx and sy : 2
1
Matrix is :
2 0 0
0 1 0
0 0 1
Multiplying two matrices...
Multiplication of two Matrices : 100 50 1
300 50 1
120 150 1
Line: 7 Col: 8 Sel: 0 Lines: 179 Length: 2733 Insert Done parsing in 0.015 seconds
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NIFT...
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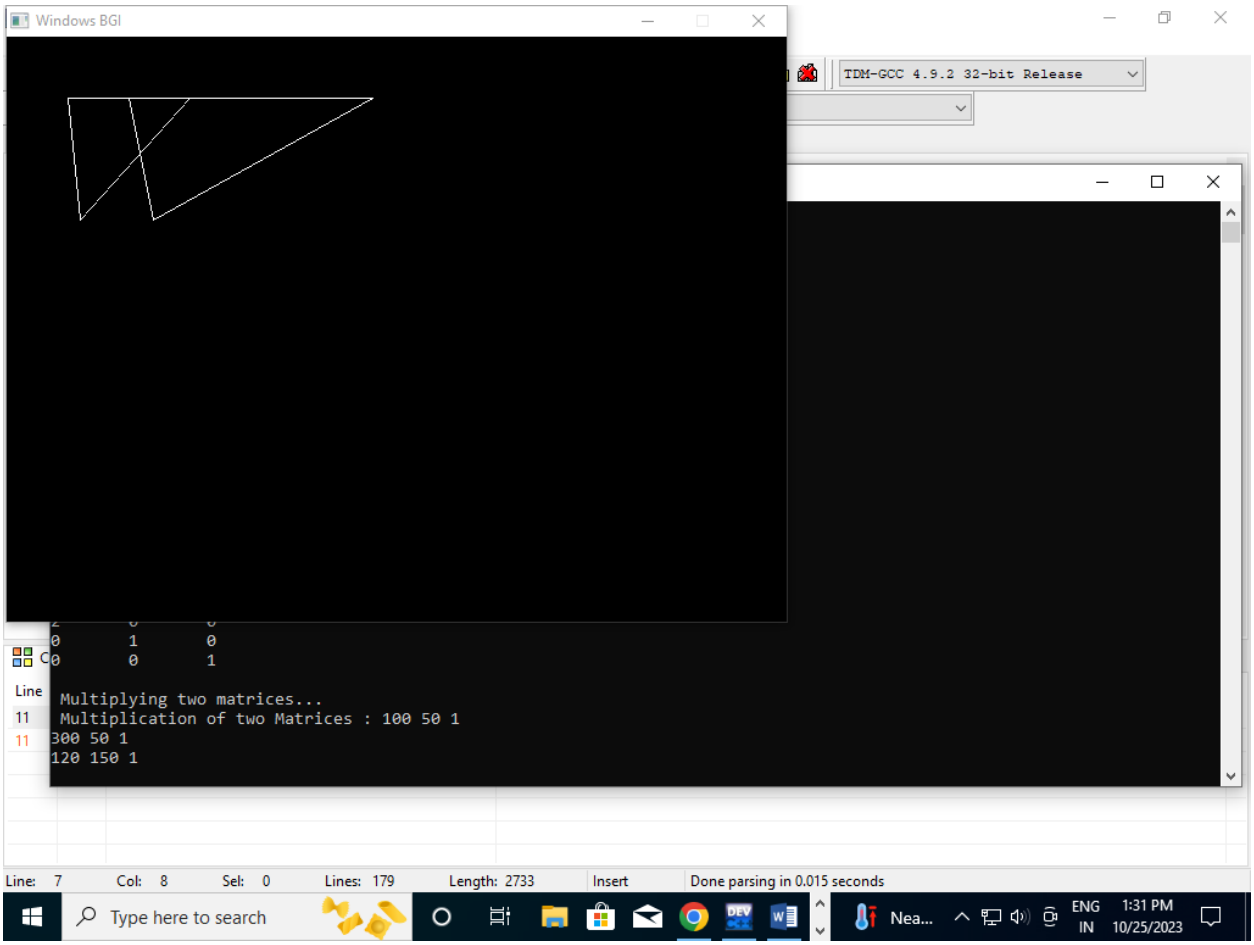
Windows BGI
TDM-GCC 4.9.2 32-bit Release
0 1 0
0 0 1
Multiplying two matrices...
Multiplication of two Matrices : 100 50 1
300 50 1
120 150 1
Line
11
11
Line: 7 Col: 8 Sel: 0 Lines: 179 Length: 2733 Insert Done parsing in 0.015 seconds
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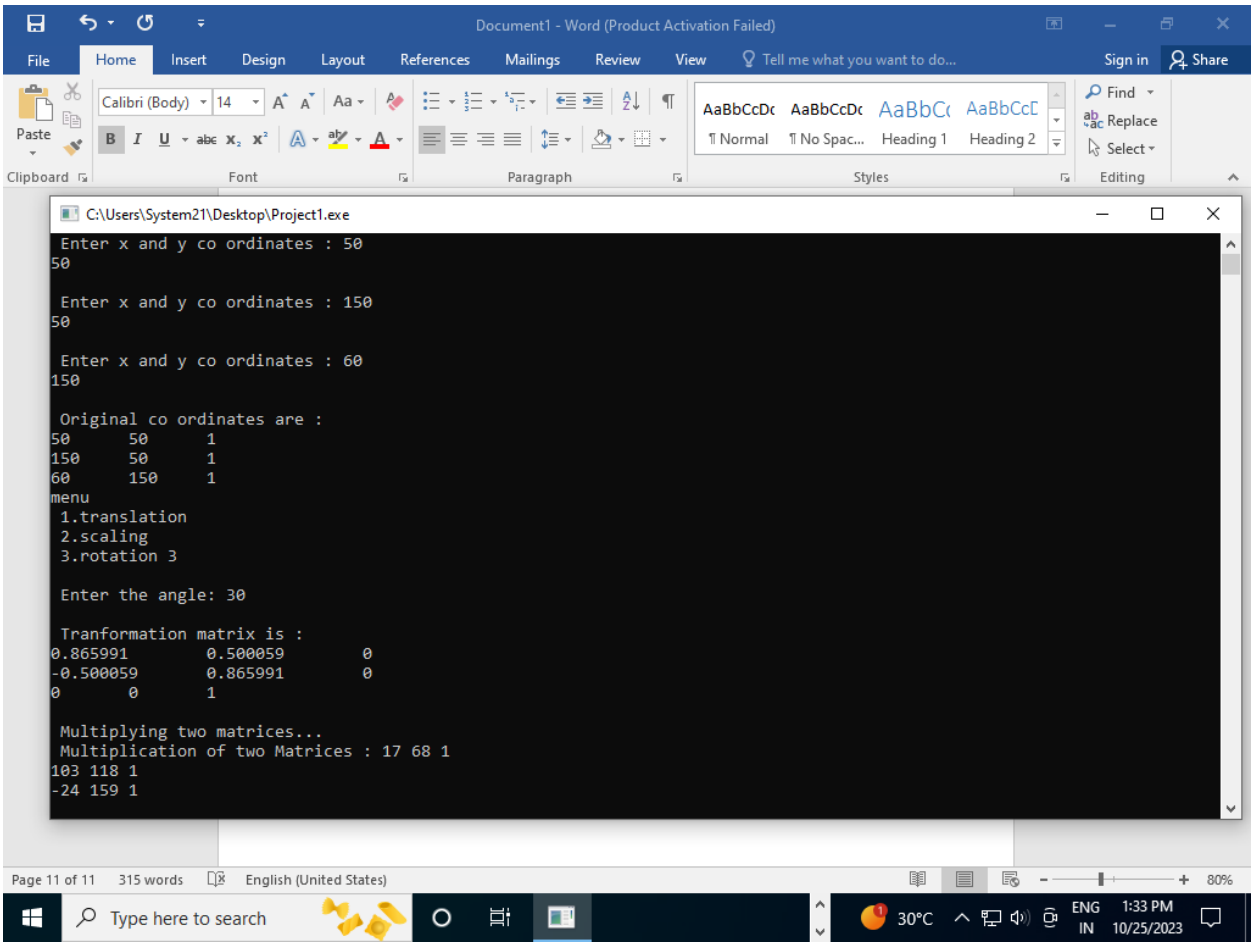
3) Rotation


Document1 - Word (Product Activation Failed)
C:\Users\System21\Desktop\Project1.exe
Enter x and y co ordinates : 50
50
Enter x and y co ordinates : 150
50
Enter x and y co ordinates : 60
150
Original co ordinates are :
50 50 1
150 50 1
60 150 1
menu
1.translation
2.scaling
3.rotation 3
Enter the angle: 30
Tranformation matrix is :
0.865991 0.500059 0
-0.500059 0.865991 0
0 0 1
Multiplying two matrices...
Multiplication of two Matrices : 17 68 1
103 118 1
-24 159 1
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315 words
English (United States)
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IN
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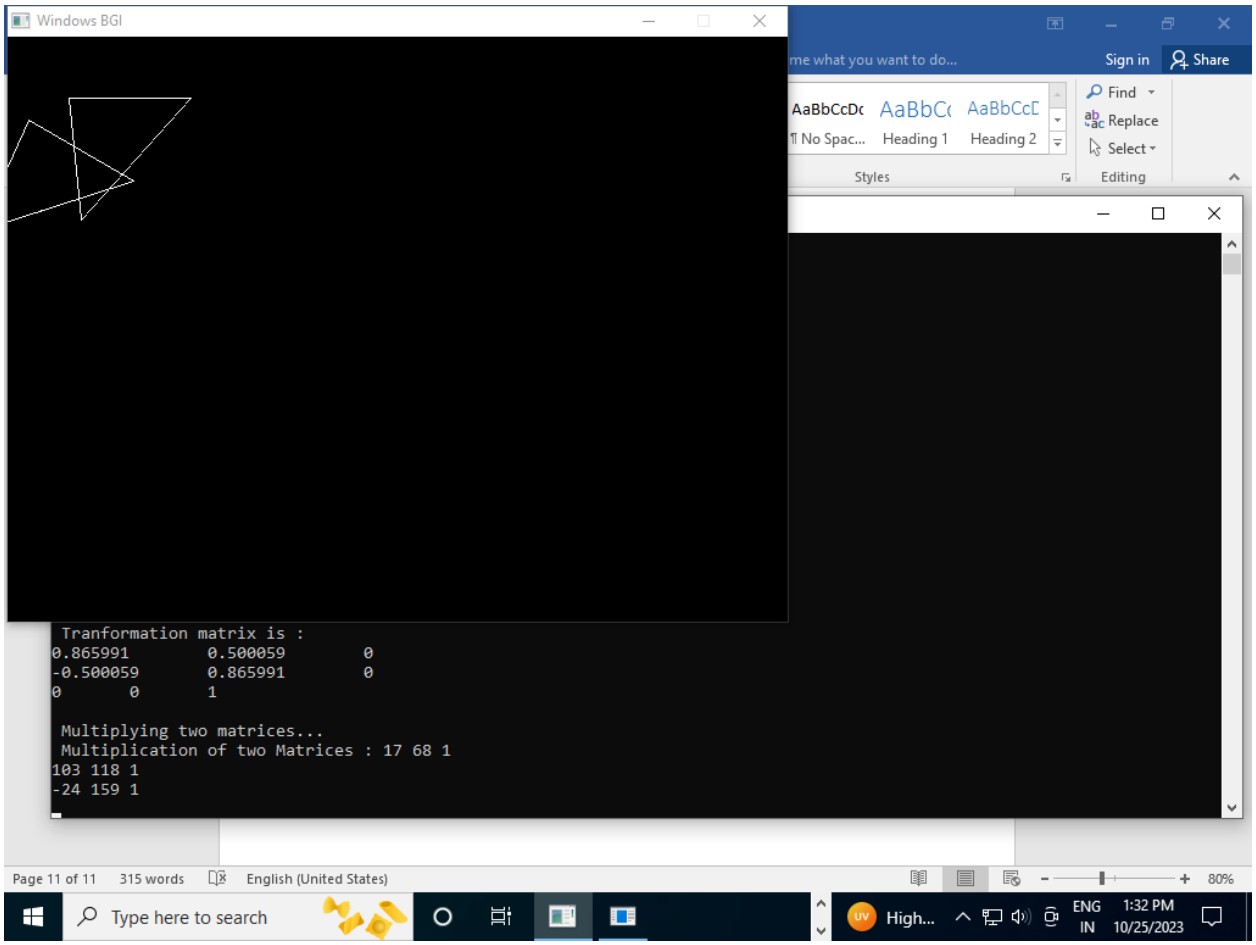
Windows BGI
Tranformation matrix is :
0.865991 0.500059 0
-0.500059 0.865991 0
0 0 1
Multiplying two matrices...
Multiplication of two Matrices : 17 68 1
103 118 1
-24 159 1
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Heading 2
Page 11 of 11
315 words
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