**28 Работа с графикой. Трехмерная графика**

Задание №1. Изучить и выполнить примеры Лабораторной работы №10 по книге Программирование на С# Демин, Дорофеев. Выполните задания.

Нарисуйте 5 различных фигур треугольник, эллипс, закрашенный круг, закрашенный прямоугольник, сектор.

Листинг программы:

<Polygon Fill="LimeGreen" Points="50, 150, 150, 50, 250, 150" Margin="-37,-27,546,269" />

<Ellipse Fill="#FFF02B49"

StrokeThickness="5" StrokeDashArray="4 2"

Stroke="#FFD3E240" StrokeDashCap="Round" Margin="226,10,438,287" />

<Rectangle Fill="#FFB6F8FF" Width="200" Height="100" RadiusX="15" RadiusY="15" Margin="378,32,214,287" />

<Ellipse Fill="Transparent" StrokeThickness="2" Stroke="Black" StrokeDashCap="Round" Margin="380,206,284,91" />

<Ellipse Fill="Transparent" StrokeThickness="2" Stroke="Black" StrokeDashCap="Round" Margin="427,248,329,137" />

<Ellipse Fill="Transparent" StrokeThickness="2" Stroke="Black" StrokeDashCap="Round" Margin="396,220,298,105" />

<Ellipse Fill="Transparent" StrokeThickness="2" Stroke="Black" StrokeDashCap="Round" Margin="411,234,313,121" />

<Ellipse Fill="Transparent" StrokeThickness="4" Stroke="Red" StrokeDashCap="Round" Margin="578,104,6,269" />

<Polyline Stroke="Red" StrokeThickness="4" Points="50, 150, 150, 50, 250, 150" Margin="532,-27,-6,277" Fill="White"/>

<Rectangle Fill="Black" HorizontalAlignment="Left" Height="32" Margin="25,211,0,0" Stroke="Black" VerticalAlignment="Top" Width="37"/>

<Rectangle Fill="White" HorizontalAlignment="Left" Height="32" Margin="62,211,0,0" Stroke="Black" VerticalAlignment="Top" Width="37"/>

<Rectangle Fill="Black" HorizontalAlignment="Left" Height="32" Margin="99,211,0,0" Stroke="Black" VerticalAlignment="Top" Width="37"/>

<Rectangle Fill="White" HorizontalAlignment="Left" Height="34" Margin="25,243,0,0" Stroke="Black" VerticalAlignment="Top" Width="37"/>

<Rectangle Fill="#FF080001" HorizontalAlignment="Left" Height="34" Margin="62,243,0,0" Stroke="Black" VerticalAlignment="Top" Width="37"/>

<Rectangle Fill="White" HorizontalAlignment="Left" Height="34" Margin="99,243,0,0" Stroke="Black" VerticalAlignment="Top" Width="37"/>

<Rectangle Fill="Black" HorizontalAlignment="Left" Height="34" Margin="25,273,0,0" Stroke="Black" VerticalAlignment="Top" Width="37"/>

<Rectangle Fill="White" HorizontalAlignment="Left" Height="34" Margin="62,273,0,0" Stroke="Black" VerticalAlignment="Top" Width="37"/>

<Rectangle Fill="Black" HorizontalAlignment="Left" Height="34" Margin="99,273,0,0" Stroke="Black" VerticalAlignment="Top" Width="37"/>

<Rectangle Fill="White" HorizontalAlignment="Left" Height="32" Margin="25,307,0,0" Stroke="Black" VerticalAlignment="Top" Width="37"/>

<Rectangle Fill="Black" HorizontalAlignment="Left" Height="32" Margin="62,307,0,0" Stroke="Black" VerticalAlignment="Top" Width="37"/>

<Rectangle Fill="White" HorizontalAlignment="Left" Height="32" Margin="99,307,0,0" Stroke="Black" VerticalAlignment="Top" Width="37"/>

<Rectangle Fill="Black" HorizontalAlignment="Left" Height="34" Margin="25,335,0,0" Stroke="Black" VerticalAlignment="Top" Width="37"/>

<Rectangle Fill="White" HorizontalAlignment="Left" Height="34" Margin="62,335,0,0" Stroke="Black" VerticalAlignment="Top" Width="37"/>

<Rectangle Fill="Black" HorizontalAlignment="Left" Height="34" Margin="99,335,0,0" Stroke="Black" VerticalAlignment="Top" Width="37"/>

<Rectangle Fill="White" HorizontalAlignment="Left" Height="32" Margin="132,211,0,0" Stroke="Black" VerticalAlignment="Top" Width="38"/>

<Rectangle Fill="#FFF4F4F5" HorizontalAlignment="Left" Height="34" Margin="132,273,0,0" Stroke="Black" VerticalAlignment="Top" Width="38"/>

<Rectangle Fill="#FFF4F4F5" HorizontalAlignment="Left" Height="32" Margin="132,307,0,0" Stroke="Black" VerticalAlignment="Top" Width="38"/>

<Rectangle Fill="#FFF4F4F5" HorizontalAlignment="Left" Height="34" Margin="132,335,0,0" Stroke="Black" VerticalAlignment="Top" Width="38"/>

<Rectangle Fill="#FFF4F4F5" HorizontalAlignment="Left" Height="32" Margin="132,211,0,0" Stroke="Black" VerticalAlignment="Top" Width="38"/>

<Rectangle Fill="Black" HorizontalAlignment="Left" Height="34" Margin="132,243,0,0" Stroke="Black" VerticalAlignment="Top" Width="38"/>

<Rectangle Fill="#FFF4F4F5" HorizontalAlignment="Left" Height="34" Margin="132,273,0,0" Stroke="Black" VerticalAlignment="Top" Width="38"/>

<Rectangle Fill="Black" HorizontalAlignment="Left" Height="32" Margin="132,307,0,0" Stroke="Black" VerticalAlignment="Top" Width="38"/>

<Rectangle Fill="#FFF4F4F5" HorizontalAlignment="Left" Height="34" Margin="132,335,0,0" Stroke="Black" VerticalAlignment="Top" Width="38"/>

<Rectangle Fill="Black" HorizontalAlignment="Left" Height="32" Margin="166,211,0,0" Stroke="Black" VerticalAlignment="Top" Width="37"/>

<Rectangle Fill="#FFF4F4F5" HorizontalAlignment="Left" Height="32" Margin="203,211,0,0" Stroke="Black" VerticalAlignment="Top" Width="37"/>

<Rectangle Fill="#FFF4F4F5" HorizontalAlignment="Left" Height="34" Margin="166,243,0,0" Stroke="Black" VerticalAlignment="Top" Width="37"/>

<Rectangle Fill="Black" HorizontalAlignment="Left" Height="34" Margin="203,243,0,0" Stroke="Black" VerticalAlignment="Top" Width="37"/>

<Rectangle Fill="Black" HorizontalAlignment="Left" Height="34" Margin="166,273,0,0" Stroke="Black" VerticalAlignment="Top" Width="37"/>

<Rectangle Fill="#FFF4F4F5" HorizontalAlignment="Left" Height="34" Margin="203,273,0,0" Stroke="Black" VerticalAlignment="Top" Width="37"/>

<Rectangle Fill="#FFF4F4F5" HorizontalAlignment="Left" Height="32" Margin="166,307,0,0" Stroke="Black" VerticalAlignment="Top" Width="37"/>

<Rectangle Fill="Black" HorizontalAlignment="Left" Height="32" Margin="203,307,0,0" Stroke="Black" VerticalAlignment="Top" Width="37"/>

<Rectangle Fill="Black" HorizontalAlignment="Left" Height="34" Margin="166,335,0,0" Stroke="Black" VerticalAlignment="Top" Width="37"/>

Таблица 28.1 – Входные и выходные данные

|  |  |
| --- | --- |
| Входные данные | Выходные данные |
| Figures data | Figures pictures |

Источник: собственная разработка

Анализ результатов представлен на рисунке 28.1.

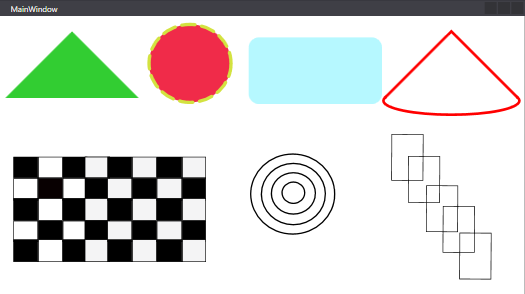


Рисунок 28.1 – Результат работы программы

Источник: собственная разработка

Задание №2. Выполните задание 1 в приложении WPF используя объект DrawingContext.

Листинг программы:

public class Shapes : FrameworkElement

{

SolidColorBrush brush = new SolidColorBrush(Colors.Black);

private Pen mainPen = new Pen(Brushes.Black, 1.0);

protected override void OnRender(DrawingContext drawingContext)

{

drawingContext.DrawEllipse(null, mainPen, new Point(50, 50), 40, 40);

drawingContext.DrawEllipse(null, mainPen, new Point(50, 50), 30, 30);

drawingContext.DrawEllipse(null, mainPen, new Point(50, 50), 20, 20);

drawingContext.DrawRectangle(null, mainPen, new Rect(100, 30, 40, 60));

drawingContext.DrawRectangle(null, mainPen, new Rect(120, 70, 40, 60));

drawingContext.DrawRectangle(null, mainPen, new Rect(140, 110, 40, 60));

drawingContext.DrawRectangle(null, mainPen, new Rect(160, 150, 40, 60));

drawingContext.DrawRectangle(null, mainPen, new Rect(180, 190, 40, 60));

for (int i = 1; i <= 8; i++)

{

for (int j = 1; j <= 8; j++)

{

if (((i % 2 == 0) && (j % 2 != 0)) || ((i % 2 != 0) && (j % 2 == 0)))

drawingContext.DrawRectangle(brush, mainPen, new Rect(20 \* (j + 10), 20 \* i, 20, 20));

else

drawingContext.DrawRectangle(null, mainPen, new Rect(20 \* (j + 10), 20 \* i, 20, 20));

}

}

drawingContext.DrawEllipse(brush, mainPen, new Point(50, 150), 20, 20);

drawingContext.DrawRectangle(brush, mainPen, new Rect(50, 200, 40, 60));

drawingContext.DrawEllipse(null, mainPen, new Point(50, 300), 20, 20);

drawingContext.DrawLine(mainPen, new Point(300, 350), new Point(350, 300));

drawingContext.DrawLine(mainPen, new Point(350, 300), new Point(350, 400));

drawingContext.DrawLine(mainPen, new Point(350, 400), new Point(300, 350));

base.OnRender(drawingContext);

}

}

Таблица 28.2 – Входные и выходные данные

|  |  |
| --- | --- |
| Входные данные | Выходные данные |
| Coordinates | Figures pictures |

Источник: собственная разработка

Анализ результатов представлен на рисунке 28.2.

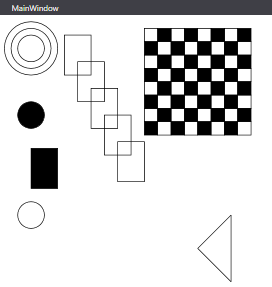


Рисунок 28.2 – Результат работы программы

Источник: собственная разработка

Задание №3. Нарисовать 3 кнопки: Треугольную, круглую, в форме пирамиды.

Листинг программы:

<Button Content="Circle button" HorizontalAlignment="Left" Height="100" Margin="194,159,0,0" VerticalAlignment="Top" Width="100" Background="#FF85FD0D">

<Button.Clip>

<EllipseGeometry Center="50,50" RadiusX="50" RadiusY="50"></EllipseGeometry>

</Button.Clip>

</Button>

<Button Content="Triangle button" HorizontalAlignment="Left" Height="85" Margin="536,196,0,0" VerticalAlignment="Top" Width="88" RenderTransformOrigin="0.5,0.5" Background="#FFBF1B4F">

<Button.RenderTransform>

<TransformGroup>

<ScaleTransform/>

<SkewTransform/>

<RotateTransform Angle="134.842"/>

<TranslateTransform/>

</TransformGroup>

</Button.RenderTransform>

<Button.Clip>

<PathGeometry>

<PathFigure IsClosed="True" StartPoint="10 10">

<LineSegment Point="10 100"/>

<LineSegment Point="100 100"/>

</PathFigure>

</PathGeometry>

</Button.Clip>

</Button>

<Button Content="Pyramid button" HorizontalAlignment="Center" Height="100" Margin="400,154,351,0" VerticalAlignment="Top" Width="41" RenderTransformOrigin="0.5,0.5" Background="#FFB97BD6">

<Button.RenderTransform>

<TransformGroup>

<ScaleTransform/>

<SkewTransform/>

<RotateTransform Angle="-0.402"/>

<TranslateTransform/>

</TransformGroup>

</Button.RenderTransform>

<Button.Clip>

<PathGeometry>

<PathFigure IsClosed="True" StartPoint="10 10">

<LineSegment Point="-1 100"/>

<LineSegment Point="80 200"/>

</PathFigure>

</PathGeometry>

</Button.Clip>

</Button>

</Grid>

Таблица 28.3 – Входные и выходные данные

|  |  |
| --- | --- |
| Входные данные | Выходные данные |
| Transformation values | Transformed buttons |

Источник: собственная разработка

Анализ результатов представлен на рисунке 28.3.

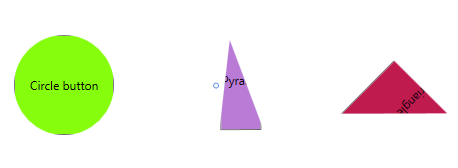


Рисунок 28.3 – Результат работы программы

Источник: собственная разработка