tutorial

Windows App SDK

Memory Game

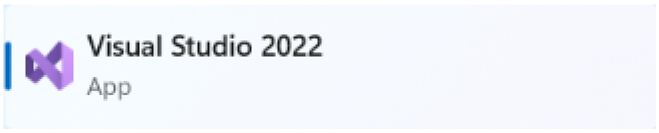
Memory Game

Memory Game shows how you can create a simple moon phase pairing game with emoji and with a toolkit from **NuGet** using the **Windows App SDK**.

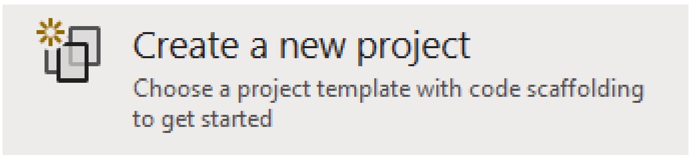
Step 1

Follow **Setup and Start** on how to get **Setup** and **Install** what you need for **Visual Studio 2022** and **Windows App SDK**.

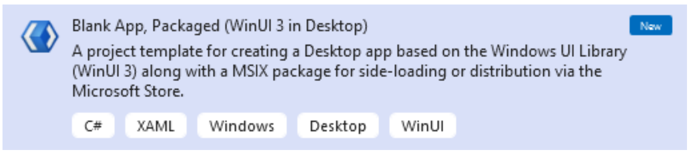
In **Windows 11** choose **Start** and then find or search for **Visual Studio 2022** and then select it.



Once **Visual Studio 2022** has started select **Create a new project**.

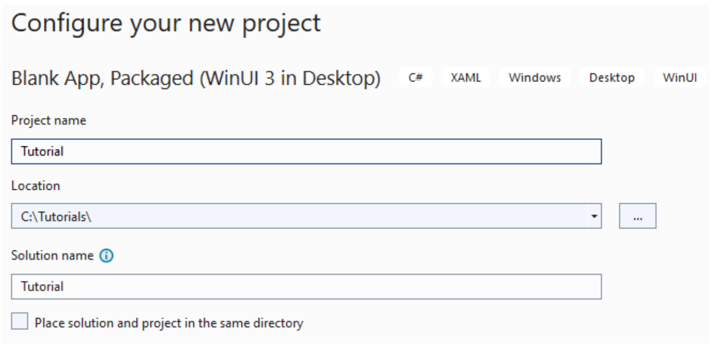

Create a new project
Choose a project template with code scaffolding to get started

Then choose the **Blank App, Packages (WinUI in Desktop)** and then select **Next**.


Blank App, Packaged (WinUI 3 in Desktop)

A project template for creating a Desktop app based on the Windows UI Library (WinUI 3) along with a MSIX package for side-loading or distribution via the Microsoft Store.

After that in **Configure your new project** type in the **Project name** as *MemoryGame*, then select a Location and then select **Create** to start a new **Solution**.


Configure your new project

Blank App, Packaged (WinUI 3 in Desktop)

Project name: Tutorial

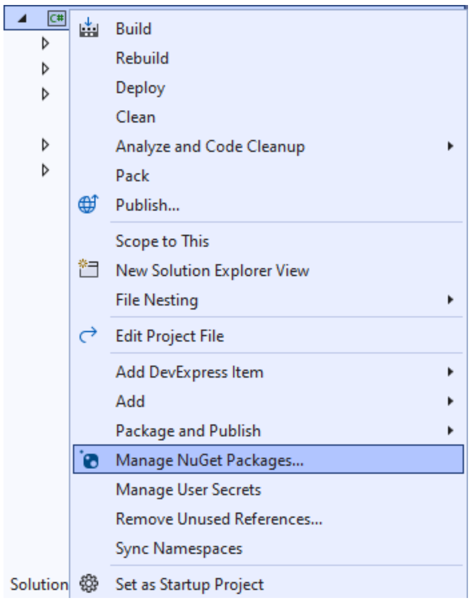
Location: C:\Tutorials\

Solution name: Tutorial

Place solution and project in the same directory

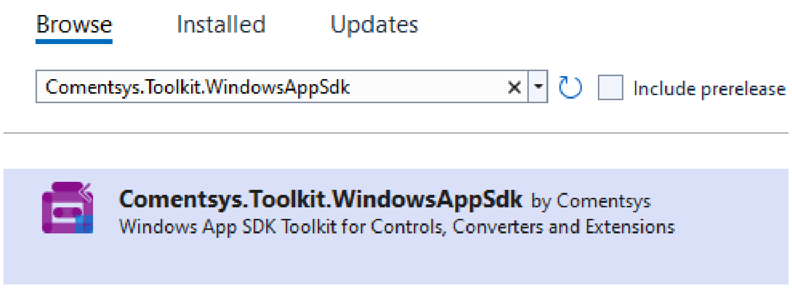
Step 2

Then in **Visual Studio** within **Solution Explorer** for the **Solution**, right click on the **Project** shown below the **Solution** and then select **Manage NuGet Packages...**



Step 3

Then in the **NuGet Package Manager** from the **Browse** tab search for **Comentsys.Toolkit.WindowsAppSdk** and then select **Comentsys.Toolkit.WindowsAppSdk by Comentsys** as indicated and select **Install**



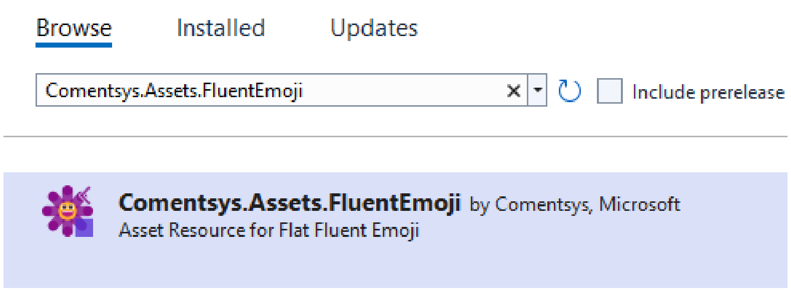
Comentsys.Toolkit.WindowsAppSdk

Comentsys.Toolkit.WindowsAppSdk by Comentsys
Windows App SDK Toolkit for Controls, Converters and Extensions

This will add the package for **Comentsys.Toolkit.WindowsAppSdk** to your **Project**. If you get the **Preview Changes** screen saying **Visual Studio is about to make changes to this solution. Click OK to proceed with the changes listed below.** You can read the message and then select **OK** to **Install** the package.

Step 4

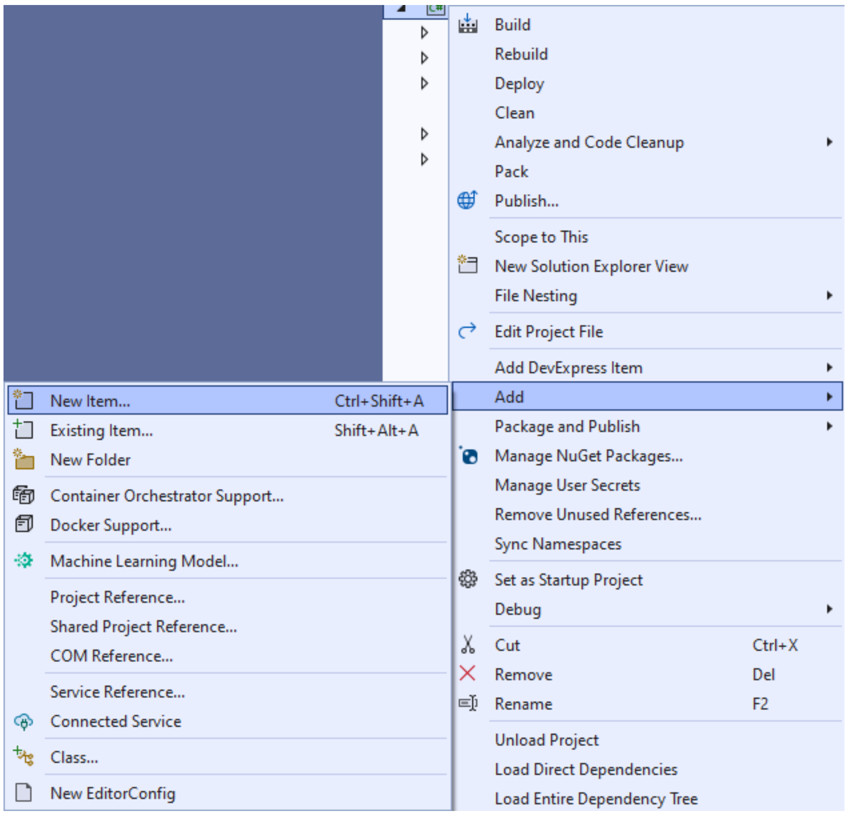
Then while still in the **NuGet Package Manager** from the **Browse** tab search for **Comentsys.Assets.FluentEmoji** and then select **Comentsys.Assets.FluentEmoji by Comentsys** as indicated and select **Install**


Browse
Installed
Updates
Comentsys.Assets.FluentEmoji
Include prerelease
Comentsys.Assets.FluentEmoji by Comentsys, Microsoft
Asset Resource for Flat Fluent Emoji

This will add the package for **Comentsys.Assets.FluentEmoji** to your **Project**. If you get the **Preview Changes** screen saying **Visual Studio is about to make changes to this solution. Click OK to proceed with the changes listed below.** You can read the message and then select **OK** to **Install** the package, then you can close the **tab** for **Nuget: MemoryGame** by selecting the **x** next to it.

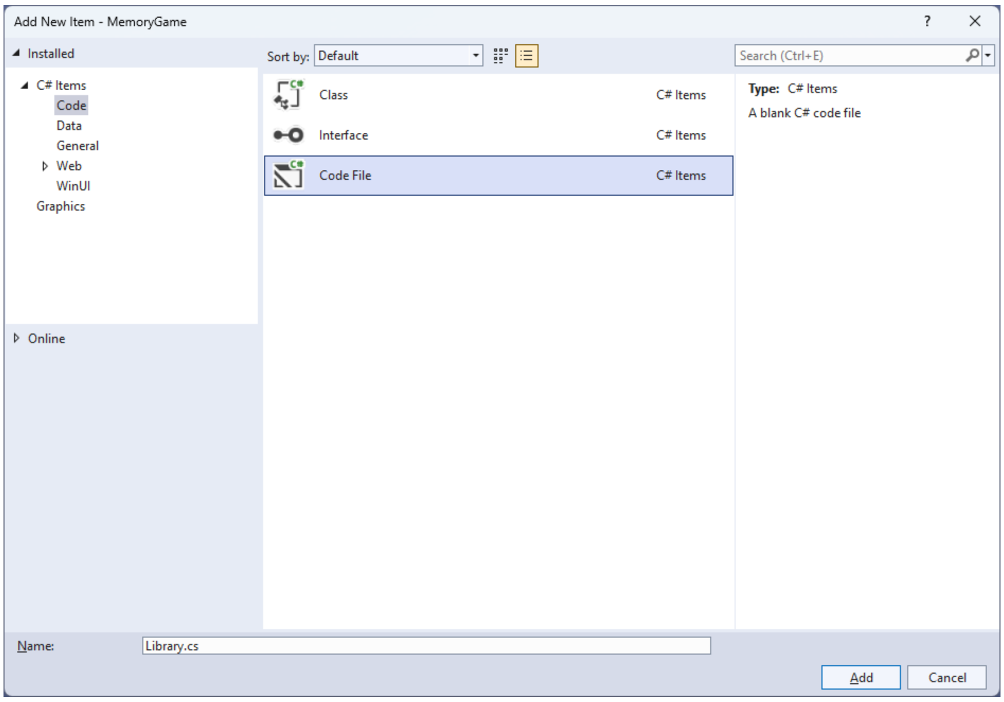
Step 5

Then in **Visual Studio** within **Solution Explorer** for the **Solution**, right click on the **Project** shown below the **Solution** and then select **Add** then **New Item…**



Step 6

Then in **Add New Item** from the **C# Items** list, select **Code** and then select **Code File** from the list next to this, then type in the name of *Library.cs* and then **Click** on **Add**.



Step 7

You will now be in the **View** for the **Code** of *Library.cs*, within this first type the following **Code**:

```
using Comentsys.Assets.FluentEmoji;
using Comentsys.Toolkit.WindowsAppSdk;
using Microsoft.UI.Xaml;
using Microsoft.UI.Xaml.Controls;
using System;
using System.Collections.Generic;
using System.Linq;
using System.Threading.Tasks;

public class Library
{
    private const string title = "Memory Game";
    private const int size = 4;
    private Dialog _dialog;
    private int _moves = 0;
    private int _row = 0;
    private int _column = 0;
    private int _clicks = 0;
    private int _firstId = 0;
    private int _secondId = 0;
    private Button _first;
    private Button _second;
    private readonly int[,] _board = new int[size, size];
    private readonly List<int> _matches = new();
    private static readonly Dictionary<int, FluentEmojiType> _options = new()
    {
         { 1, FluentEmojiType.NewMoon },
         { 2, FluentEmojiType.WaxingCrescentMoon },
         { 3, FluentEmojiType.FirstQuarterMoon },
         { 4, FluentEmojiType.WaxingGibbousMoon },
         { 5, FluentEmojiType.FullMoon },
         { 6, FluentEmojiType.WaningGibbousMoon },
         { 7, FluentEmojiType.LastQuarterMoon },
         { 8, FluentEmojiType.WaningCrescentMoon }
    };
    private readonly Random _random = new((int)DateTime.UtcNow.Ticks);

    // Choose, Asset, Match, NoMatch & Compare

    // Add

    // Layout

    // New

}
```

The **`Class`** that has been defined in so far *Library.cs* has **`using`** for the packages that were added of **`Comentsys.Assets.FluentEmoji`** and **`Comentsys.Toolkit.WindowsAppSdk`** amongst others needed. There are also some **`const`** and **`readonly`** values for parts of the game and to represent the layout including a **`Dictionary`** to represent the moon phases that will be paired up.

Step 8

Still in the **Class** for *Library.cs* after the **Comment** of **// Choose, Asset, Match, NoMatch & Compare** type the following **Methods**:

```
private List<int> Choose(int minimum, int maximum, int total) =>
    Enumerable.Range(minimum, maximum)
        .OrderBy(r => _random.Next(minimum, maximum))
            .Take(total).ToList();

private Viewbox Asset(int option) => new()
{
    Child = new Asset
    {
        AssetResource = FlatFluentEmoji
        .Get(_options[option])
    }
};

private void Match()
{
    _matches.Add(_firstId);
    _matches.Add(_secondId);
    if (_matches.Count == size * size)
        _dialog.Show($"Matched in {_moves} moves!");
}

private void NoMatch()
{
    if (_first != null)
        _first.Content = null;
    if (_second != null)
        _second.Content = null;
}

private async void Compare()
{
    await Task.Delay(TimeSpan.FromSeconds(1.5));
    if (_firstId == _secondId)
        Match();
    else
        NoMatch();
    _first = null;
    _second = null;
    _moves++;
    _firstId = 0;
    _secondId = 0;
    _clicks = 0;
}
```

Choose will use an enumerable to select a set of numbers that will be randomly chosen. **Asset** will be used to show the **Emoji** for the moon phases. **Match** will check to see if a pair has been selected and if the game is over, **NoMatch** will reset selected items if it isn't a pair and **Compare** is used to check for a pair.

Step 9

While still in the **`Class`** for *Library.cs* after the **Comment** of **`// Add`** type in the following **Method**:

```
private void Add(Grid grid, int row, int column)
{
    Button button = new()
    {
        Width = 75,
        Height = 75
    };
    button.Click += (object sender, RoutedEventArgs e) =>
    {
        button = (Button)sender;
        var row = (int)button.GetValue(Grid.RowProperty);
        var column = (int)button.GetValue(Grid.ColumnProperty);
        int option = _board[row, column];
        if (_clicks <= 1 && _matches.IndexOf(option) < 0)
        {
            // First Choice
            if (_row == 0 && _column == 0)
            {
                _clicks++;
                _firstId = option;
                _first = button;
                _first.Content = Asset(option);
                _row = row;
                _column = column;
            }
            // Second Choice
            else if (!(_row == row && _column == column))
            {
                _clicks++;
                _secondId = option;
                _second = button;
                _second.Content = Asset(option);
                Compare();
                _row = 0;
                _column = 0;
            }
        }
    };
    button.SetValue(Grid.ColumnProperty, column);
    button.SetValue(Grid.RowProperty, row);
    grid.Children.Add(button);
}
```

Add is used to create a **`Button`** with an **Event Handler** for **`Click`** which will use **`Asset`** to set the **`Content`** and then check when it is either the first choice or the second choice and see if this is a pair with **`Compare`**.

Step 10

While still in the **`Class`** for *Library.cs* after the **Comment** of **`// Layout`** type the following **Method**:

```
private void Layout(Grid grid)
{
    grid.Children.Clear();
    grid.RowDefinitions.Clear();
    grid.ColumnDefinitions.Clear();
    // Setup Grid
    for (int index = 0; index < size; index++)
    {
        grid.RowDefinitions.Add(new RowDefinition());
        grid.ColumnDefinitions.Add(new ColumnDefinition());
    }
    // Setup Board
    for (int row = 0; row < size; row++)
    {
        for (int column = 0; column < size; column++)
        {
            Add(grid, row, column);
        }
    }
}
```

`Layout` will use **Add** to create the layout for the game.

Step 11

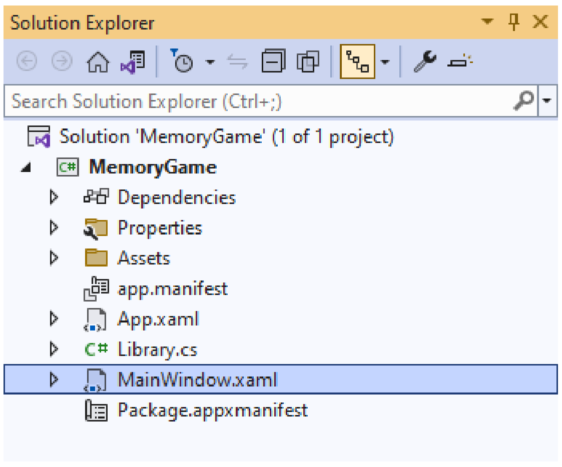
While still in the **Class** for *Library.cs* after the **Comment** of **// New** type the following **Method**:

```
public void New(Grid grid)
{
    _dialog = new Dialog(grid.XamlRoot, title);
    _row = 0;
    _moves = 0;
    _column = 0;
    _clicks = 0;
    Layout(grid);
    int counter = 0;
    _matches.Clear();
    List<int> values = new();
    // Pairs : Random 1 - 8
    while (values.Count <= size * size)
    {
        List<int> numbers = Choose(1, size * 2, size * 2);
        for (int number = 0; number < size * 2; number++)
        {
            values.Add(numbers[number]);
        }
    }
    // Board : Random 1 - 16
    List<int> indices = Choose(1, size * size, size * size);
    // Setup Board
    for (int column = 0; column < size; column++)
    {
        for (int row = 0; row < size; row++)
        {
            _board[column, row] = values[indices[counter] - 1];
            counter++;
        }
    }
}
```

New will setup the **Dialog** along with initialising the values used in the game for the pairs and for the board itself by using **Layout**.

Step 12

Then from **Solution Explorer** for the **Solution** double-click on **MainWindow.xaml** to see the **XAML** for the **Main Window**.



Step 13

In the **XAML** for **MainWindow.xaml** there be some **XAML** for a **`StackPanel`**, this should be **Removed** by removing the following:

```
<StackPanel Orientation="Horizontal"
HorizontalAlignment="Center" VerticalAlignment="Center">
    <Button x:Name="myButton" Click="myButton_Click">Click Me</Button>
</StackPanel>
```

Step 14

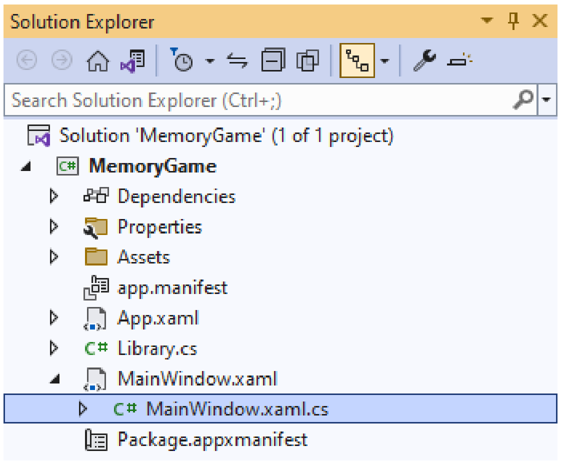
While still in the **XAML** for **MainWindow.xaml** above **`</Window>`**, type in the following **XAML**:

```
<Grid>
    <Viewbox>
        <Grid Margin="50" Name="Display"
        HorizontalAlignment="Center"
        VerticalAlignment="Center" Loaded="New"/>
    </Viewbox>
    <CommandBar VerticalAlignment="Bottom">
        <AppBarButton Icon="Page2" Label="New" Click="New"/>
    </CommandBar>
</Grid>
```

This **XAML** contains a **`Grid`** with a **`Viewbox`** which will **Scale** a **`Grid`**. It has a **`Loaded`** event handler for **`New`** which is also shared by the **`AppBarButton`**.

Step 15

Then, within **Solution Explorer** for the **Solution** select the arrow next to **MainWindow.xaml** then double-click on **MainWindow.xaml.cs** to see the **Code** for the **Main Window**.



Solution Explorer

Search Solution Explorer (Ctrl+;)

Solution 'MemoryGame' (1 of 1 project)
MemoryGame
Dependencies
Properties
Assets
app.manifest
App.xaml
Library.cs
MainWindow.xaml
MainWindow.xaml.cs
Package.appxmanifest

Step 16

In the **Code** for **MainWindow.xaml.cs** there be a **Method** of **`myButton_Click(...)`** this should be **Removed** by removing the following:

```
private void myButton_Click(object sender, RoutedEventArgs e)
{
    myButton.Content = "Clicked";
}
```

Step 17

Once **`myButton_Click(...)`** has been removed, type in the following **Code** below the end of the **Constructor** of **`public MainWindow() { ... }`**:

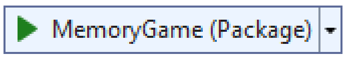
```
private readonly Library _library = new();

private void New(object sender, RoutedEventArgs e) =>
    _library.New(Display);
```

Here an **Instance** of the **Class** of **`Library`** is created then below this is the **Method** of **`New`** that will be used with **Event Handler** from the **XAML**, this **Method** uses Arrow Syntax with the **`=>`** for an Expression Body which is useful when a **Method** only has one line.

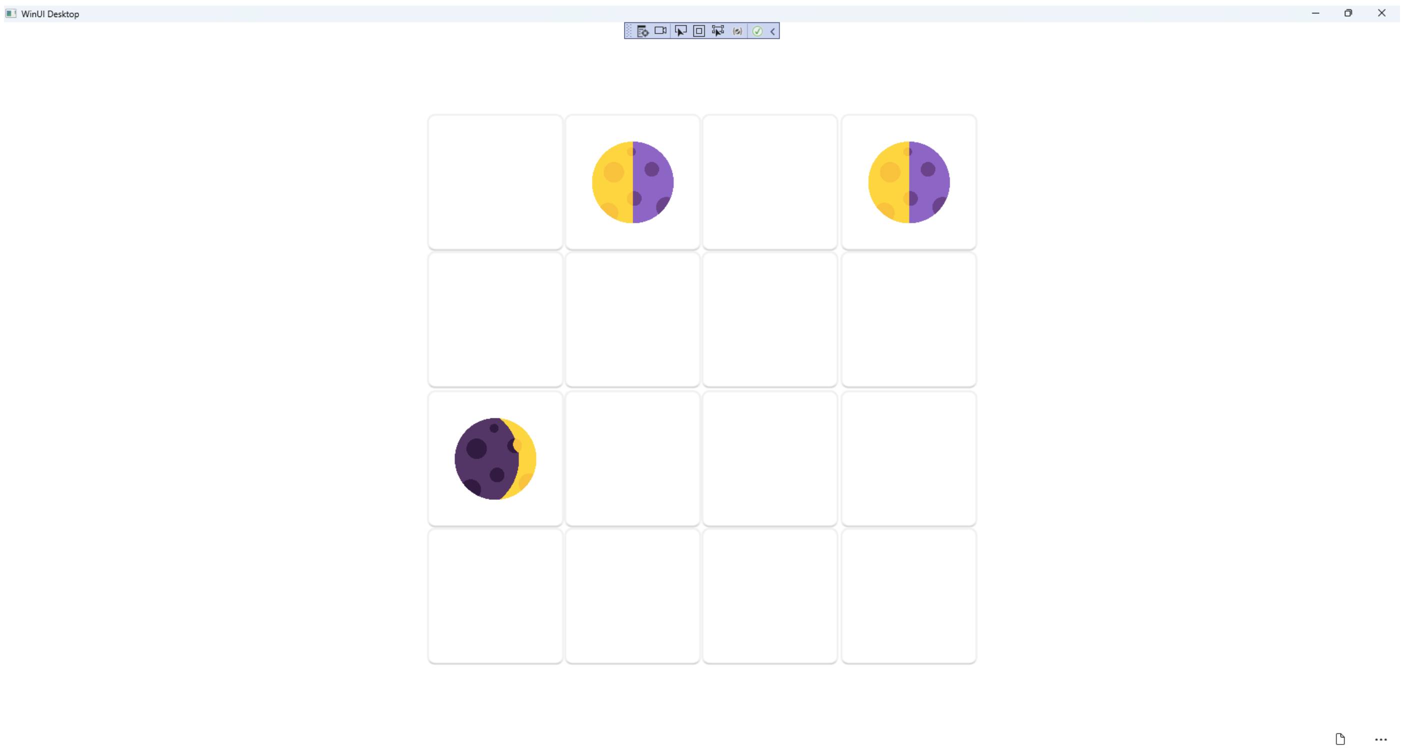
Step 18

That completes the **Windows App SDK** application. In **Visual Studio 2022** from the **Toolbar** select **MemoryGame (Package)** to **Start** the application.



Step 19

Once running you can then **Click** on any two **Buttons** to display a phase of the moon, you need to match the phases to make a pair then match all pairs to win or you can restart the game by selecting *New*.



Step 20

To **Exit** the **Windows App SDK** application, select the **Close** button from the top right of the application as that concludes this **Tutorial** for **Windows App SDK** from tutorialr.com!