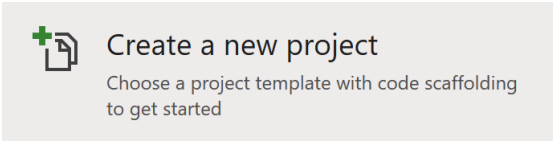
Universal Windows Platform – Memory Game

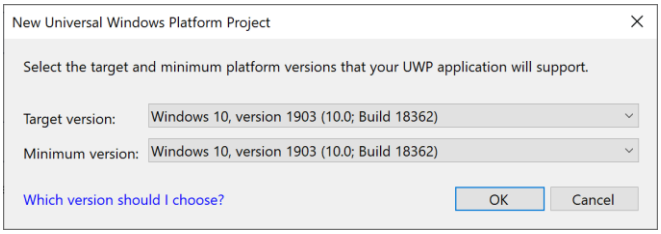
Memory Game shows how to use **Grid** to implement a simple memory game to pair moon phases

Step 1



Follow **Setup and Start** on how to Install and/or Get Started with **Visual Studio 2019** if not already or in **Windows 10** choose **Start**, find and select **Visual Studio 2019** then from the **Get started** screen select **Create a new project**

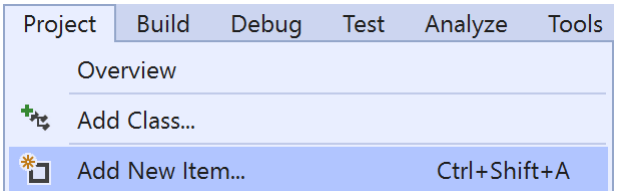
Then choose **Blank App (Universal Windows)** and select **Next** and then in **Configure your new project** enter the **Project name** as **MemoryGame** and select **Create**



Finally, in **New Universal Windows Platform Project** pick the **Target version** and **Minimum version** to be at least **Windows 10, version 1903 (10.0; Build 18362)** and then select **OK**

Target Version will control the most recent features of Windows 10 your application can use. To make sure you always have the most recent version, check for any Notifications or Updates in Visual Studio 2019

Step 2



Choose **Project** then **Add New Item...** from the **Menu** in **Visual Studio 2019**

Step 3

Then choose **Code File** from **Add New Item** in **Visual Studio 2019**, enter the **Name** as **Library.cs** and select **Add**

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Step 4

In the **Code** View of **Library.cs** will be displayed and in this the following should be entered:

```
using System;
using System.Collections.Generic;
using System.Threading.Tasks;
using Windows.UI.Popups;
using Windows.UI.Xaml;
using Windows.UI.Xaml.Controls;
using Windows.UI.Xaml.Media;

public class Library
{
    private const string title = "Memory Game";
    private const int size = 4;

    private int _moves = 0;
    private int _firstId = 0;
    private int _secondId = 0;
    private Button _first;
    private Button _second;
    private int[,] _board = new int[size, size];
    private List<int> _matches = new List<int>();
    private Random _random = new Random((int)DateTime.Now.Ticks);
    private Dictionary<int, string> _moon = new Dictionary<int, string>()
    {
        { 1, "\U0001F311" }, // New
        { 2, "\U0001F312" }, // Waxing Crescent
        { 3, "\U0001F313" }, // First Quarter
        { 4, "\U0001F314" }, // Waxing Gibbous
        { 5, "\U0001F315" }, // Full
        { 6, "\U0001F316" }, // Waning Gibbous
        { 7, "\U0001F317" }, // Last Quarter
        { 8, "\U0001F318" }  // Waning Crescent
    };


}
```

There are `using` statements to include necessary functionality. There are `private` members for various parts of the game including the two-dimensional array `_board` which represents what will appear in the game and a `Dictionary<int, string>` to represent the Emoji characters to represent each phase of the moon that should be matched

Then below the **`private Dictionary<int, string> _moon = new Dictionary<int, string>() { ... };`** the following **methods** should be entered:

```
private void Show(string content, string title)
{
    _ = new MessageDialog(content, title).ShowAsync();
}
```

`Show()` is used to display a basic `MessageDialog`

Next below the **`private void Show(...) {...}` method** the following **method** should be entered:

```
private Viewbox Phase(int value)
{
    TextBlock textblock = new TextBlock()
    {
        Text = _moon[value],
        IsColorFontEnabled = true,
        TextLineBounds = TextLineBounds.Tight,
        FontFamily = new FontFamily("Segoe UI Emoji"),
        HorizontalTextAlignment = TextAlignment.Center
    };
    return new Viewbox()
    {
        Child = textblock
    };
}
```

`Phase(...)` is used to `return` a `Viewbox` which contains a `TextBlock` which will contain the Emoji value of a phase of the moon

Next after the **`private Viewbox Phase(...) { ... }` method** the following **method** should be entered:

```
private List<int> Choose(int start, int maximum, int total)
{
    int number;
    List<int> numbers = new List<int>();
    while ((numbers.Count < total)) // Select Numbers
    {
        // Random Number between Start and Finish
        number = _random.Next(start, maximum + 1);
        if ((!numbers.Contains(number)) || (numbers.Count < 1))
        {
            numbers.Add(number); // Add if number Chosen or None
        }
    }
    return numbers;
}
```

`Choose()` method is used to `return` a `List<int>` of numbers using `Random` to select them

Then after the **`private List<int> Choose(...) { ... }` method** the following **methods** should be entered:

```
private void Match()
{
    _matches.Add(_firstId);
    _matches.Add(_secondId);
    if (_first != null)
    {
        _first.Background = null;
        _first = null;
    }
    if (_second != null)
    {
        _second.Background = null;
        _second = null;
    }
    if (_matches.Count == size * size)
    {
        Show($"Matched all moon phases in {_moves} moves!", title);
    }
}

private async void NoMatch()
{
    await Task.Delay(TimeSpan.FromSeconds(1.5));
    if (_first != null)
    {
        _first.Content = null;
        _first = null;
    }
    if (_second != null)
    {
        _second.Content = null;
        _second = null;
    };
}

private void Compare()
{
    if (_firstId == _secondId)
        Match();
    else
        NoMatch();
    _moves++;
    _firstId = 0;
    _secondId = 0;
}
```

`Match()` method will handle what should happen when a pair of phases patch and then if the game is over will display a message. `NoMatch()` method will reset selected items after a `Delay` of 1.5 seconds and the `Compare` method will handle when to call those methods

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Next after the **`private void Compare()` method** the following **method** should be entered:

```
private void Add(ref Grid grid, int row, int column)
{
    Button button = new Button()
    {
        Width = 75,
        Height = 75,
        Margin = new Thickness(10),
        Style = (Style)Application.Current.Resources
        ["ButtonRevealStyle"]
    };
    button.Click += (object sender, RoutedEventArgs e) =>
    {
        int selected;
        button = (Button)(sender);
        row = (int)button.GetValue(Grid.RowProperty);
        column = (int)button.GetValue(Grid.ColumnProperty);
        selected = _board[row, column];
        if ((_matches.IndexOf(selected) < 0))
        {
            if (_firstId == 0) // No Match
            {
                _first = button;
                _firstId = selected;
                _first.Content = Phase(selected);
            }
            else if (_secondId == 0)
            {
                _second = button;
                if (!_first.Equals(_second)) // Different
                {
                    _secondId = selected;
                    _second.Content = Phase(selected);
                    Compare();
                }
            }
        }
    };
    button.SetValue(Grid.ColumnProperty, column);
    button.SetValue(Grid.RowProperty, row);
    grid.Children.Add(button);
}
```

The `Add(...)` method is used to add a `Button` to a `Grid` to contain each part of the game and it will be used to check if the `_first` item selected with a `Button` and calls the `Compare()` method

Next after the **`Add(...) { ... }` method** the following **method** should be entered:

```
private void Layout(ref Grid grid)
{
    _moves = 0;
    _matches.Clear();
    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(ref grid, row, column);
        }
    }
}
```

`Layout(...)` configures a `Grid` and sets up the layout of the game using the `Add(...)` method and `_board`

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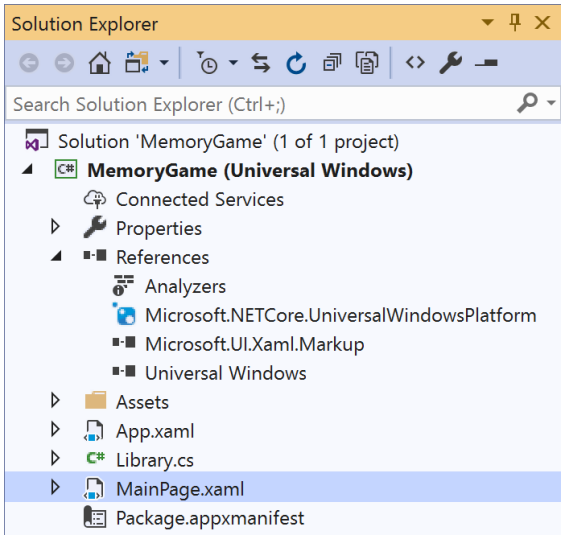
Finally after the **`private void Layout(...) { ... }` method** the following **`public` method** should be entered:

```
public void New(Grid grid)
{
    Layout(ref grid);
    int counter = 0;
    List<int> values = new List<int>();
    // 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 layout of the `Grid` using the `Layout` method, it will also select the Pairs of items that will be matched in the game and setup the Board

Step 5



In the **Solution Explorer** of **Visual Studio 2019** select **MainPage.xaml**

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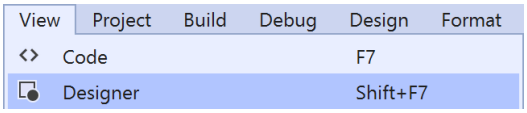
Step 6



Choose **View** then **Designer** from the **Menu** in **Visual Studio 2019**

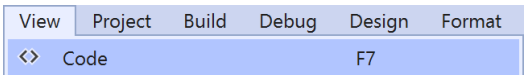
Step 7

In the **Design** View and **XAML** View of **Visual Studio 2019** will be displayed, and in this between the **`Grid`** and **`/Grid`** elements enter the following **XAML**:

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

The first block of XAML the main user interface features a Viewbox to contain a Grid which will display the game. The second block of XAML is the CommandBar which contains New to start a new game

Step 8



Choose **View** then **Code** from the **Menu** in **Visual Studio 2019**

Step 9

Once in the **Code** View, below the end of **`public MainPage() { ... }`** the following Code should be entered:

```
Library library = new Library();

private void New_Click(object sender, RoutedEventArgs e)
{
    library.New(Display);
}
```

Below the MainPage(...) method an instance of the **`Library`** Class is created. In the **`New_Click(...)`** Event handler will call the **`New(...)`** method in the **`Library`** class

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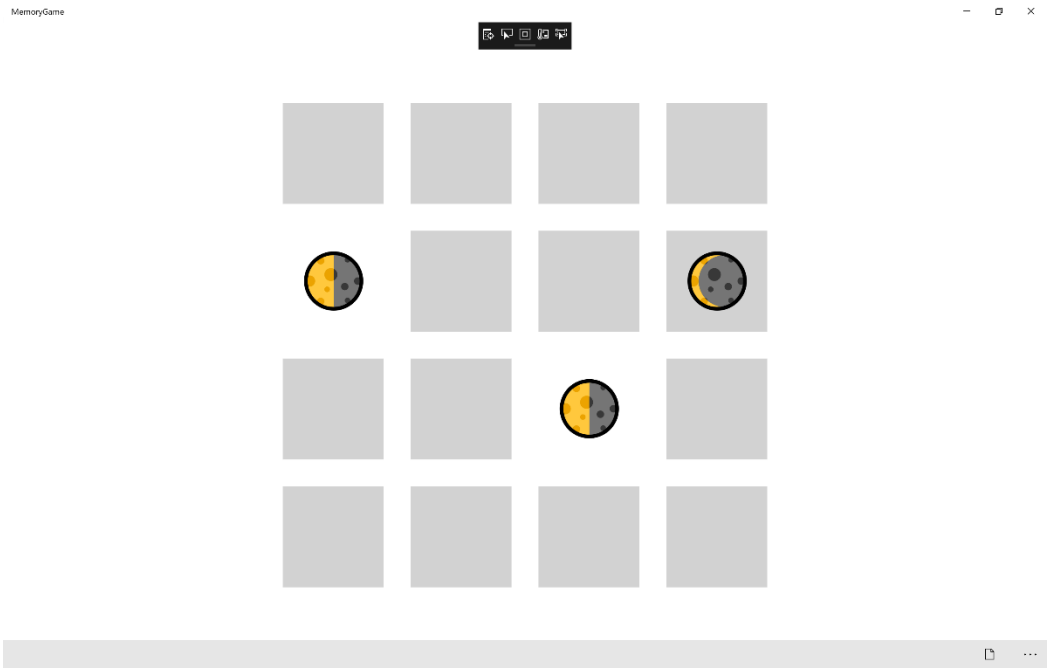
Step 10

That completes the **Universal Windows Platform** Application, in **Visual Studio 2019** select **Local Machine** to run the Application

Step 11

Once the Application is running you can click the **New** Button and then click on any two **Buttons** to display a phase of the moon, match the phases to make a pair and match them all to win!



Step 12

To Exit the Application, select the **Close** button in the top right of the Application