



XAM135

# Layout in Xamarin.Forms

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Xamarin University

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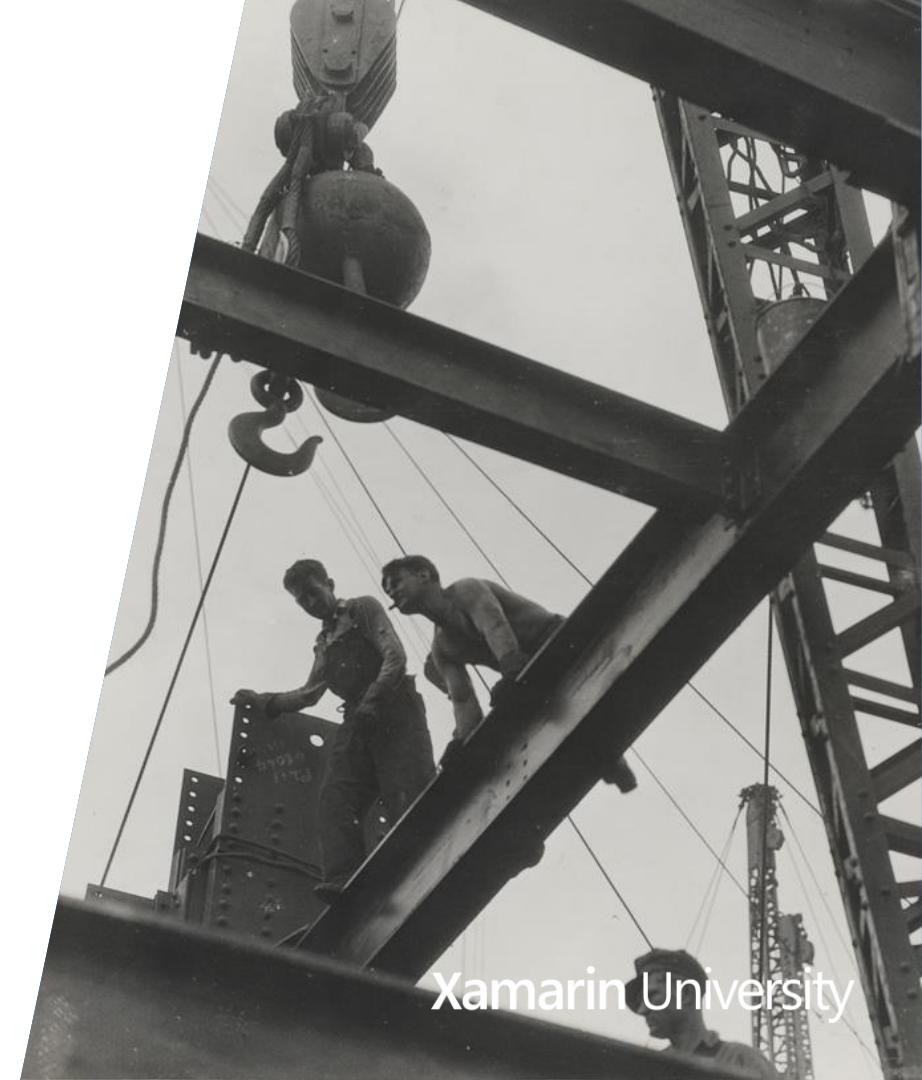
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# Objectives

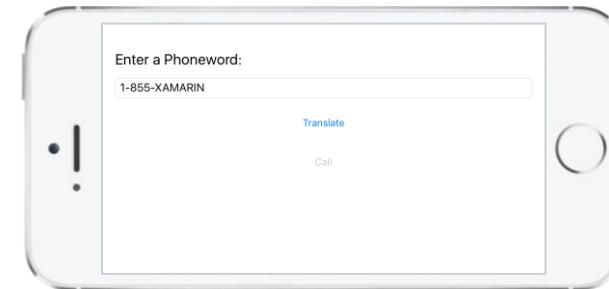
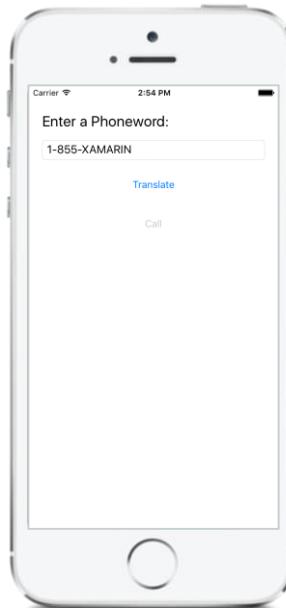
1. Specify the size of a view
2. Arrange views with **StackLayout**
3. Apply Attached Properties
4. Arrange views with **Grid**
5. Scroll a layout with **ScrollView**



# Motivation

- ❖ Using layout containers to calculate view size and position helps your UI adapt to varied screen dimensions and resolutions

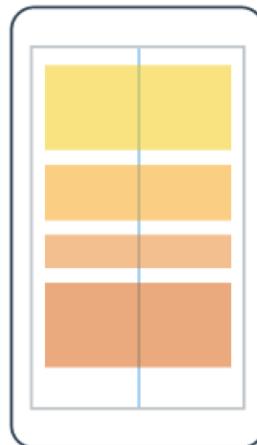
E.g. you request that views are "stacked" one after the other



Sizes/positions are recalculated automatically when device rotates

# What is a layout?

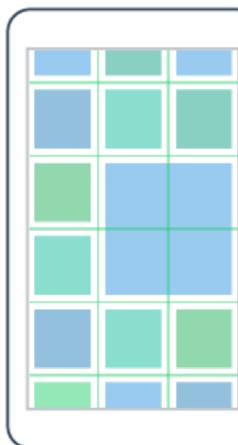
- ❖ A *layout* is a Xamarin.Forms container that determines the size and position for a collection of children



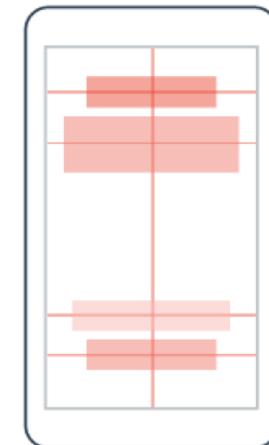
StackLayout



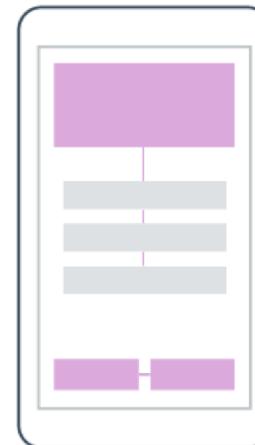
Covered in this course



Grid



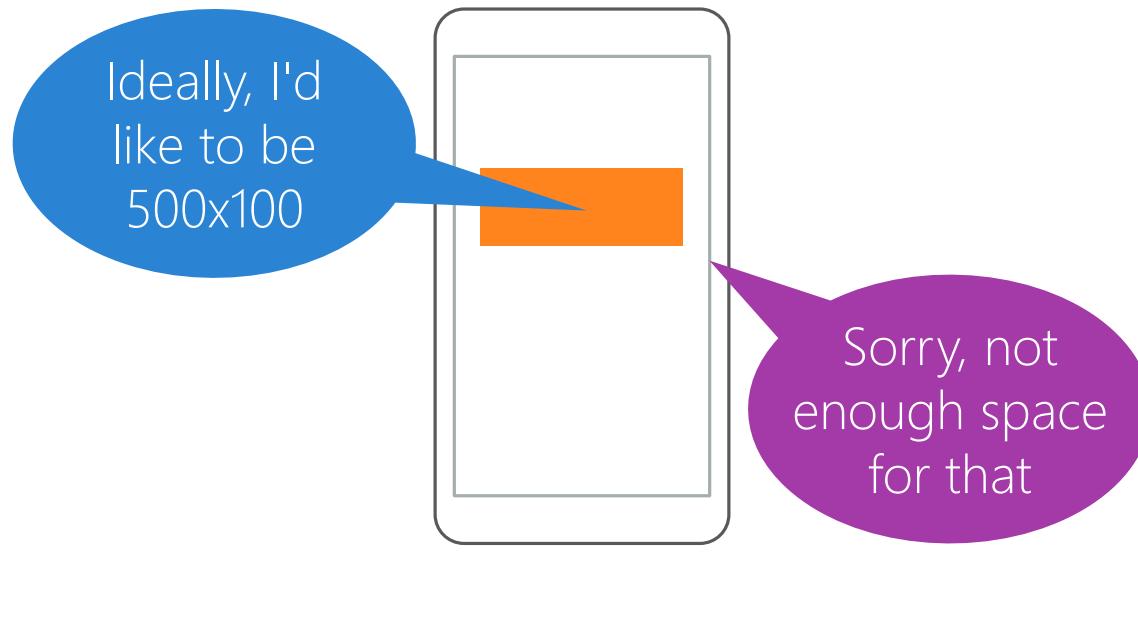
AbsoluteLayout



RelativeLayout

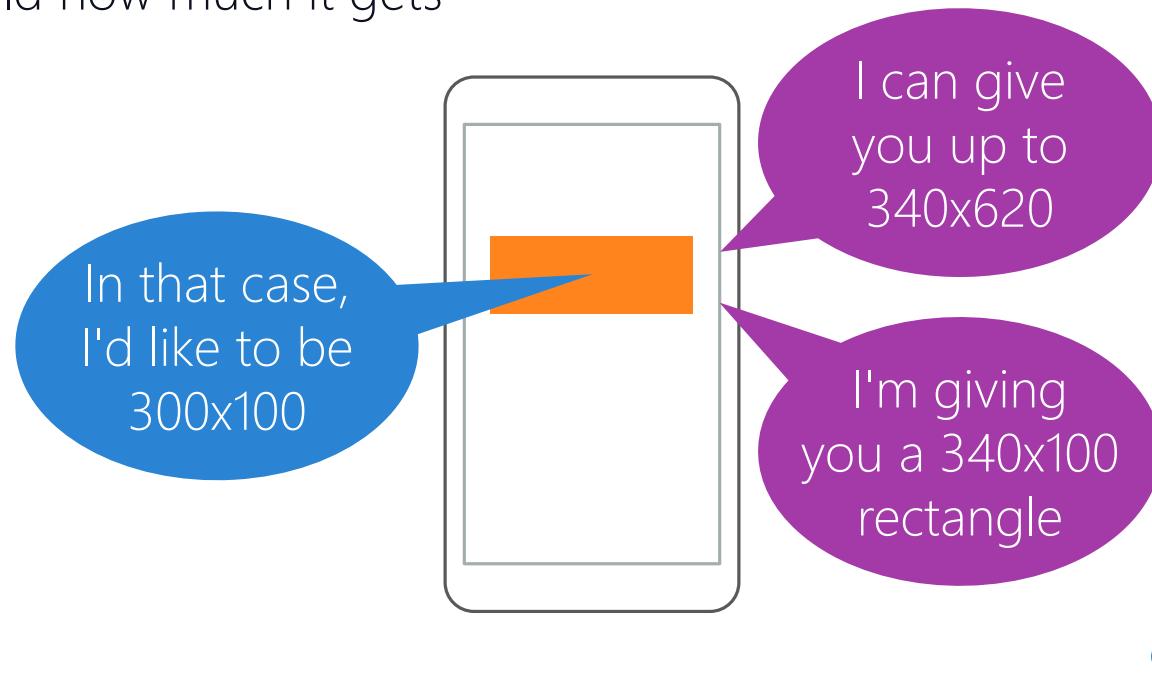
# Sizing collaboration

- ❖ The rendered size of a view is a collaboration between the view itself and its layout container



# Layout algorithm

- ❖ Layout panel asks each child how much room it would like, but then tells each child how much it gets



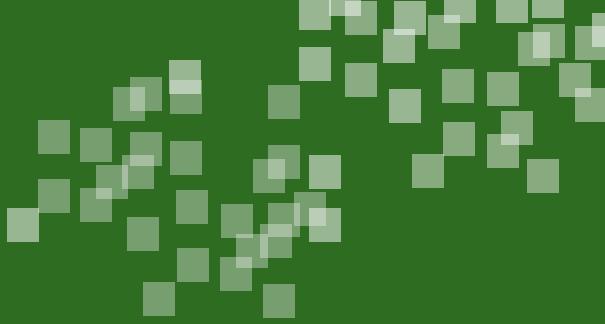


# Specify the size of a view

# Tasks

1. Specify preferred size of an Element
2. Set layout options



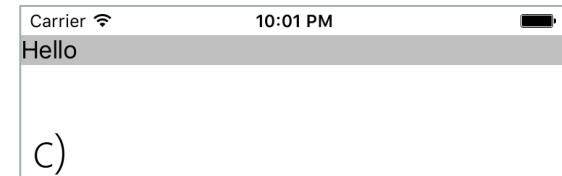
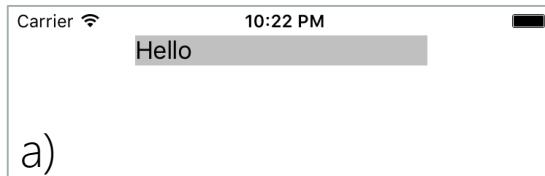


# Flash Quiz

# Flash Quiz

- ① How would the following code be displayed at runtime?

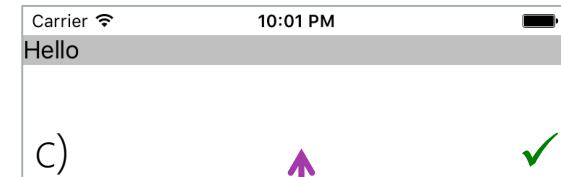
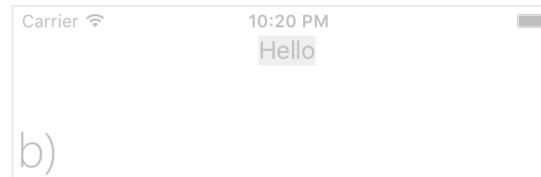
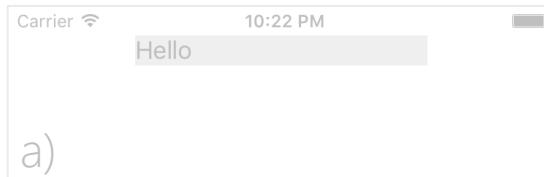
```
<StackLayout>
    <Label Text="Hello" WidthRequest="200" BackgroundColor="Silver" />
</StackLayout>
```



# Flash Quiz

- ① How would the following code be displayed at runtime?

```
<StackLayout>
    <Label Text="Hello" WidthRequest="200" BackgroundColor="Silver" />
</StackLayout>
```



a)

b)

c)

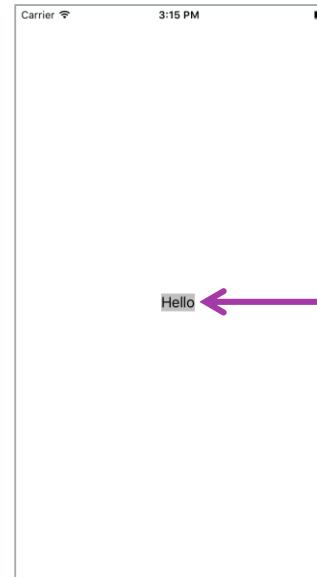


Default **HorizontalOptions** of **Fill** causes **WidthRequest** to be ignored.

# Default view sizing

- ❖ By default, most views try to size themselves just large enough to hold their content (we will see other factors that influence size)

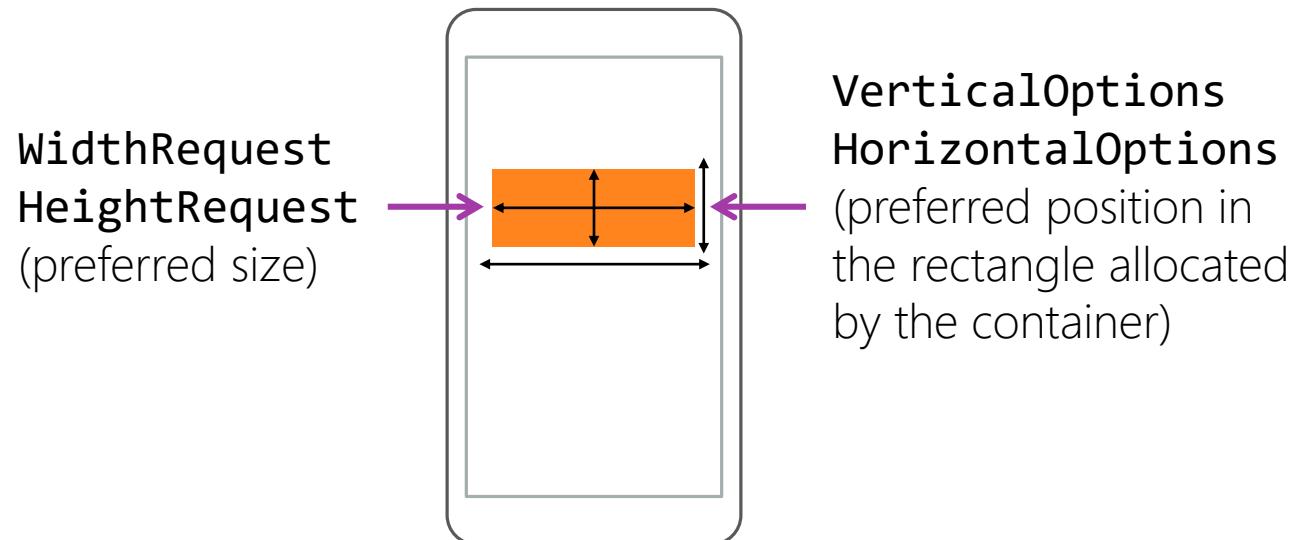
```
<Label  
    Text="Hello"  
    BackgroundColor="Silver"  
    VerticalOptions="Center"  
    HorizontalOptions="Center"  />
```



E.g. by default **Labels** are sized based on their text

# View preferences

- ❖ A view has four properties that influence its rendered size; they are all requests and may be overruled by the layout container



# Sizing requests

- ❖ A view can request a desired width and height

Preferred size is stored in the view, but read and interpreted by its layout container

```
<Label  
    Text="Hello"  
    WidthRequest="100"  
    HeightRequest="300"  
    BackgroundColor="Silver" />
```



# Size units

- ❖ Explicit sizes in Xamarin.Forms have no intrinsic units; the values are interpreted by each platform according to that platform's rules

*Effective pixels*  
in UWP

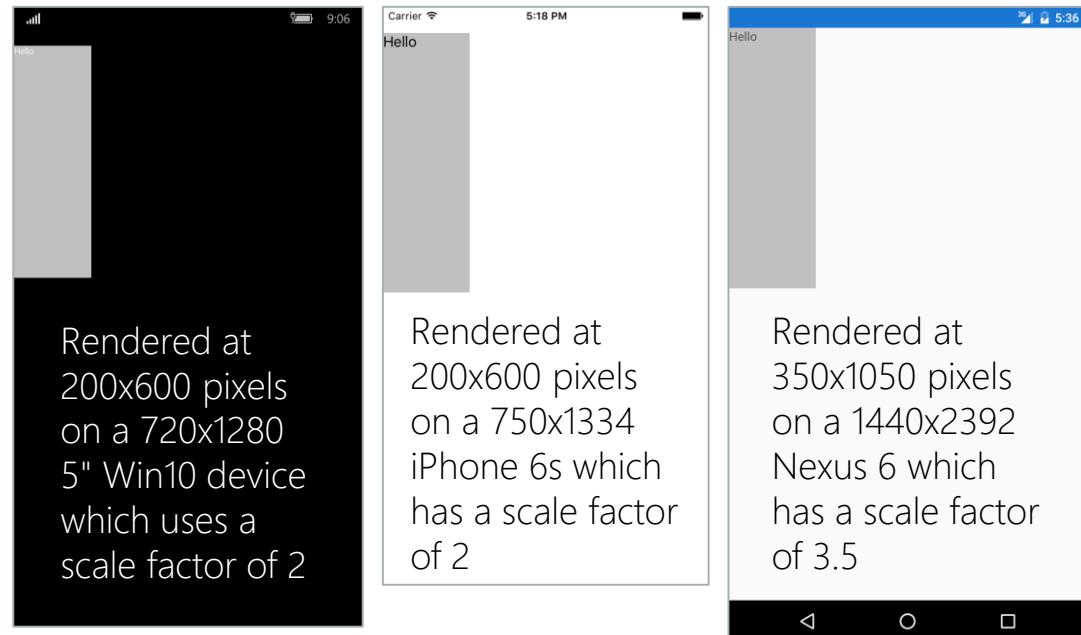
*Points* in iOS

*Density-independent pixels* in Android

# Platform rendering

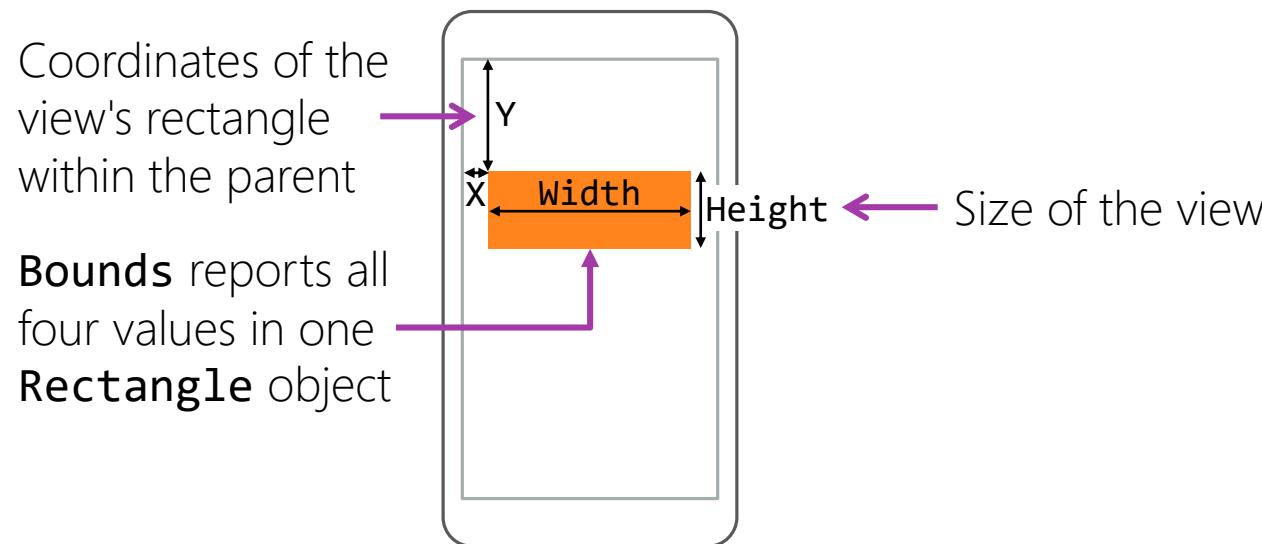
- ❖ Sizes set in Xamarin.Forms are passed to the underlying platform; the platform will scale the values based on screen size and resolution

```
<Label  
    Text="Hello"  
    WidthRequest="100"  
    HeightRequest="300"  
    BackgroundColor="Silver" />
```



# Reported sizes

- ❖ Visual elements report their size/location via properties that are set during layout; the values are expressed in platform-independent units



# Layout requests

- ❖ A view can specify layout requests

```
public class View : ...
{
    public LayoutOptions HorizontalOptions { get; set; }
    public LayoutOptions VerticalOptions { get; set; }
    ...
}
```



Layout preferences are stored  
in the view, but read and  
interpreted by the layout container

# What are LayoutOptions?

- ❖ The `LayoutOptions` struct encapsulates two layout preferences

Location within  
the rectangle  
given by the  
container

```
public struct LayoutOptions
{
    public LayoutAlignment Alignment { get; set; }
    public bool Expands { get; set; }
    ...
}

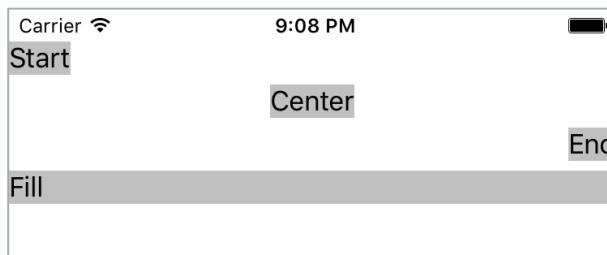
public enum LayoutAlignment
{
    Start, Center, End, Fill
}
```

Used only by `StackLayout`,  
indicates if the view would  
like extra space if available

# Alignment

- ❖ A view's preferred alignment determines its position and size within the rectangle allocated for it by its container

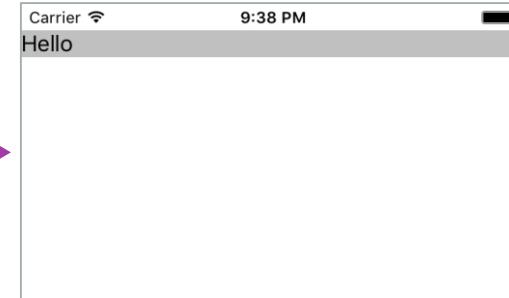
```
<StackLayout>
  <Label Text="Start" HorizontalOptions="Start" BackgroundColor="Silver" />
  <Label Text="Center" HorizontalOptions="Center" BackgroundColor="Silver" />
  <Label Text="End" HorizontalOptions="End" BackgroundColor="Silver" />
  <Label Text="Fill" HorizontalOptions="Fill" BackgroundColor="Silver" />
</StackLayout>
```



# Size requests vs. Fill

- ❖ The **Fill** layout option generally overrides size preferences

```
<StackLayout>
    <Label Text="Hello"
        WidthRequest="100"
        HorizontalOptions="Fill"
        BackgroundColor="Silver" />
</StackLayout>
```



Fill causes  
**WidthRequest** to  
be ignored here

# Alignment default

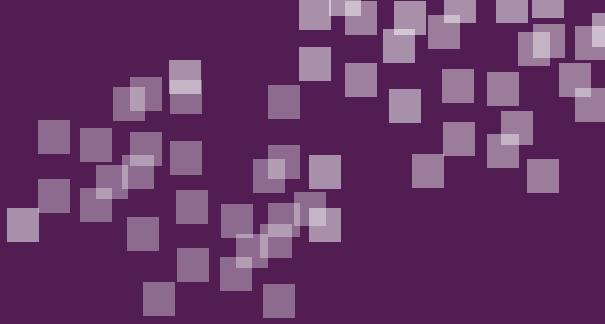
- ❖ Horizontal and vertical alignment options generally default to **Fill**

```
<Label Text="Hello" HorizontalOptions="Fill" VerticalOptions="Fill" />
```

```
<Label Text="Hello" />
```

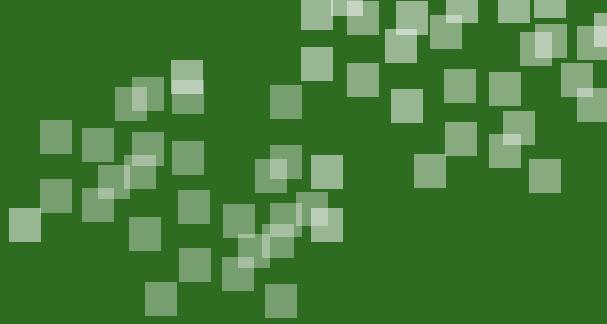


The declaration of these labels is equivalent because of the defaults



# Group Exercise

Explore alignment options

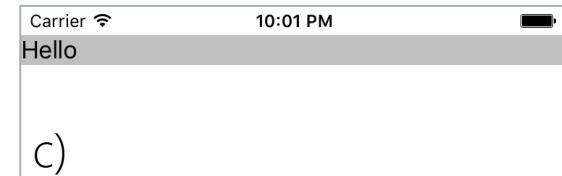
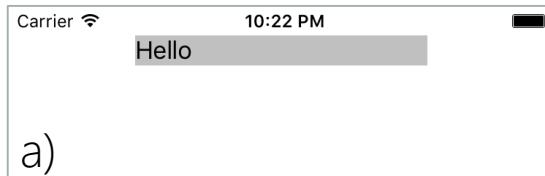


# Flash Quiz

# Flash Quiz

- ① How would the following code be displayed at runtime?

```
<StackLayout>
    <Label Text="Hello" WidthRequest="200" BackgroundColor="Silver" />
</StackLayout>
```



a)

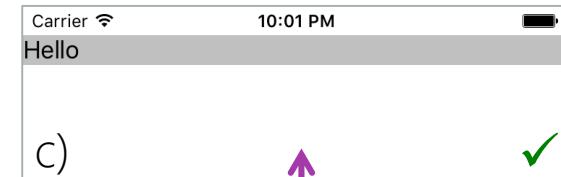
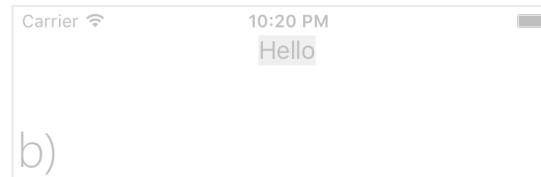
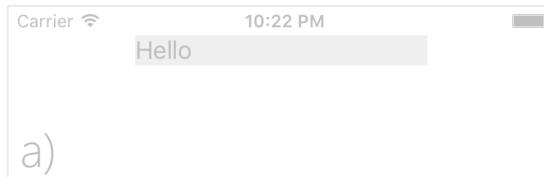
b)

c)

# Flash Quiz

- ① How would the following code be displayed at runtime?

```
<StackLayout>
    <Label Text="Hello" WidthRequest="200" BackgroundColor="Silver" />
</StackLayout>
```



a)

b)

c)



Default **HorizontalOptions** of **Fill** causes **WidthRequest** to be ignored.

# Flash Quiz

② Which XAML will produce the output shown in the image below?

a)

```
<StackLayout>
    <Label Text="Hello" HorizontalOptions="Fill" BackgroundColor="Silver" />
</StackLayout>
```

b)

```
<StackLayout>
    <Label Text="Hello" HorizontalOptions="Center" BackgroundColor="Silver" />
</StackLayout>
```

c)

```
<StackLayout>
    <Label Text="Hello" WidthRequest="200" BackgroundColor="Silver" />
</StackLayout>
```



# Flash Quiz

② Which XAML will produce the output shown in the image below?

- a) 

```
<StackLayout>
    <Label Text="Hello" HorizontalOptions="Fill" BackgroundColor="Silver" />
</StackLayout>
```
- b) 

```
<StackLayout>
    <Label Text="Hello" HorizontalOptions="Center" BackgroundColor="Silver" />
</StackLayout>
```
- c) 

```
<StackLayout>
    <Label Text="Hello" WidthRequest="200" BackgroundColor="Silver" />
</StackLayout>
```

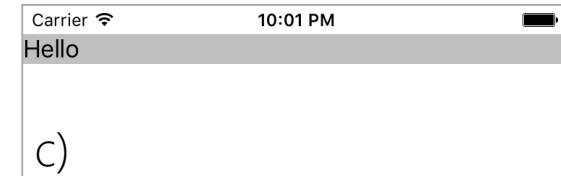
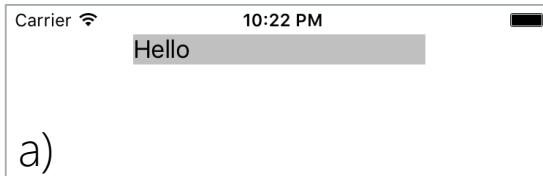


HorizontalOptions is not **Fill** so it's not a)  
and the **WidthRequest** in c) is too large

# Flash Quiz

- ③ How would the following code be displayed at runtime?

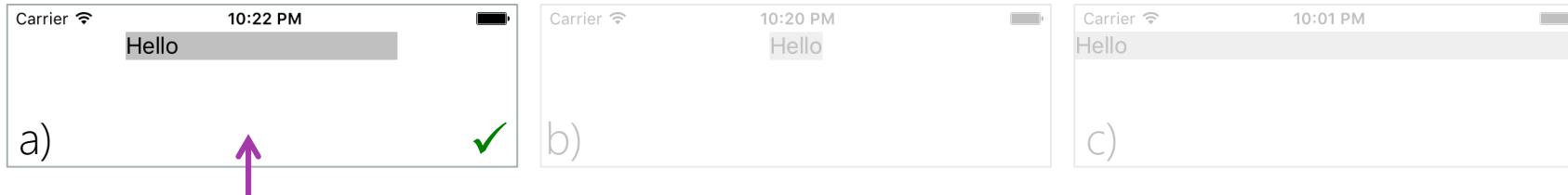
```
<StackLayout>
    <Label Text="Hello" HorizontalOptions="Center" WidthRequest="200" BackgroundColor="Silver" />
</StackLayout>
```



# Flash Quiz

- ③ How would the following code be displayed at runtime?

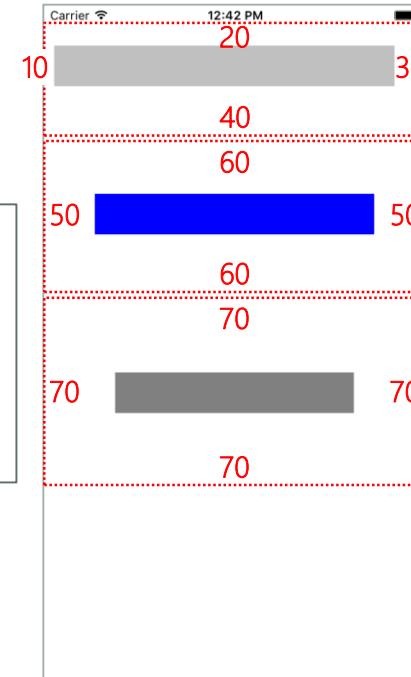
```
<StackLayout>
    <Label Text="Hello" HorizontalOptions="Center" WidthRequest="200" BackgroundColor="Silver" />
</StackLayout>
```



**HorizontalOptions** is not **Fill**  
so **WidthRequest** is respected

# Margin

- ❖ *Margin* is extra space around the outside of a view (available in all views, including containers)



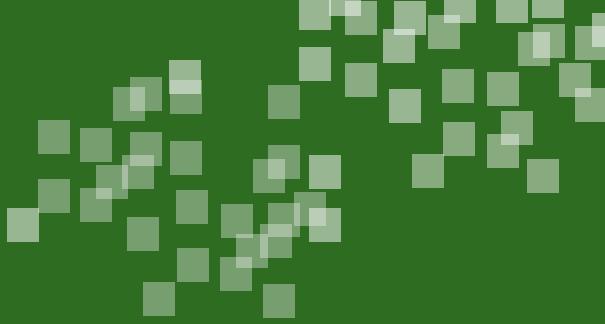
```
<StackLayout>
  <BoxView Color="Silver" Margin="10,20,30,40"/>
  <BoxView Color="Blue"    Margin="50,60"/>
  <BoxView Color="Gray"   Margin="70"/>
</StackLayout>
```

# Padding

- ❖ *Padding* is extra space on the inside of a layout that creates a gap between the children and the layout itself (applicable only to layouts)

```
<StackLayout Padding="20,40,60,80">  
    ...  
</StackLayout>
```



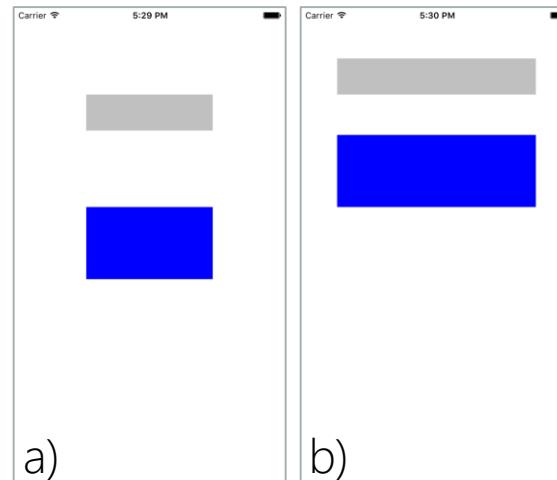


# Flash Quiz

# Flash Quiz

- ① How would the following code be displayed at runtime?

```
<StackLayout Padding="50">
    <BoxView Color="Silver" Margin="50" HeightRequest="50" />
    <BoxView Color="Blue"    Margin="50" HeightRequest="100" />
</StackLayout>
```



# Flash Quiz

- ① How would the following code be displayed at runtime?

```
<StackLayout Padding="50">
    <BoxView Color="Silver" Margin="50" HeightRequest="50" />
    <BoxView Color="Blue"    Margin="50" HeightRequest="100" />
</StackLayout>
```

Layout padding and view margin yield 100 here

Each view has a margin of 50 and they are additive so the gap here is 100



# Summary

1. Specify preferred size of an Element
2. Set layout options





# Arrange views with StackLayout

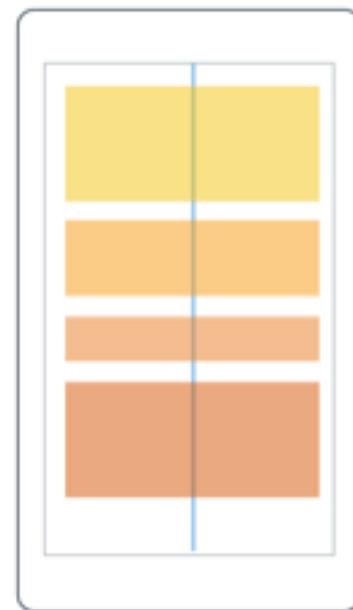
# Tasks

1. Add views to a **StackLayout** in code and XAML
2. Specify layout orientation
3. Use **Expands** to request extra space



# What is StackLayout?

- ❖ **StackLayout** arranges its children in a single column or a single row



# StackLayout children

- ❖ **StackLayout** holds a collection of child views

The views this panel will display

```
public abstract class Layout<T> : ...  
{  
    → public IList<T> Children { get { ... } }  
}
```

```
public class StackLayout : Layout<View>  
{  
}
```

Stores **Views**

# Adding children [code]

- ❖ You can add/remove children from a **StackLayout** using code

```
<StackLayout x:Name="stack" />
```

```
var a = new BoxView() { BackgroundColor = Color.Silver };
var b = new BoxView() { BackgroundColor = Color.Blue };
var c = new BoxView() { BackgroundColor = Color.Gray };

stack.Children.Add(a);
stack.Children.Add(b);
stack.Children.Add(c);
```

↑  
Dynamically add views to the panel



# Adding children [XAML]

- ❖ You can add children to a **StackLayout** in XAML

Views are added to the **Children** collection because that is the Content property

```
<StackLayout>  
    → <BoxView Color="Silver" />  
    <BoxView Color="Blue" />  
    <BoxView Color="Gray" />  
</StackLayout>
```



This course will prefer XAML because it is more common than code.

# Child ordering

- ❖ Child layout order is determined by the order they were added to the **Children** collection (applies to both code and XAML)

Textual  
order  
determines  
layout  
order

```
<StackLayout>
    <BoxView Color="Silver" />
    → <BoxView Color="Blue" />
    <BoxView Color="Gray" />
</StackLayout>
```

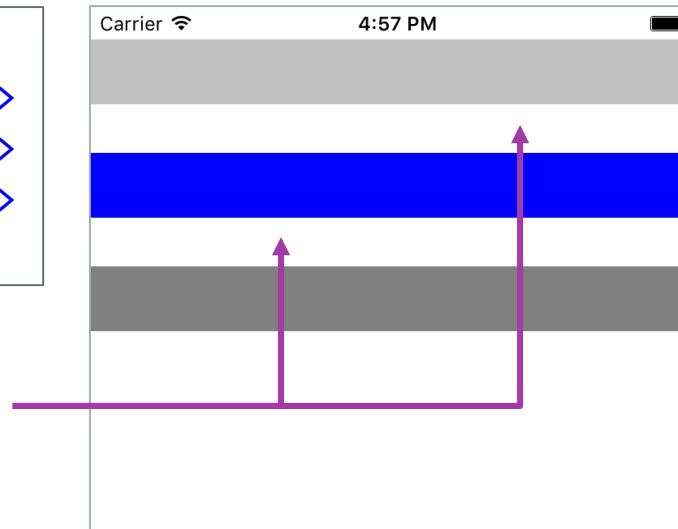


# StackLayout child spacing

- ❖ **StackLayout's Spacing** separates the children (the default is 6)

```
<StackLayout Spacing="30">
    <BoxView Color="Silver" />
    <BoxView Color="Blue" />
    <BoxView Color="Gray" />
</StackLayout>
```

Space added  
between  
every child



# StackLayout orientation

- ❖ **StackLayout's Orientation** property lets you choose a vertical column or a horizontal row

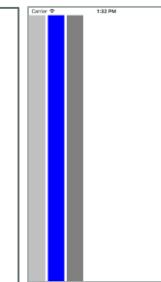
Vertical is  
the default



```
<StackLayout Orientation="Vertical">
    <BoxView Color="Silver" />
    <BoxView Color="Blue" />
    <BoxView Color="Gray" />
</StackLayout>
```

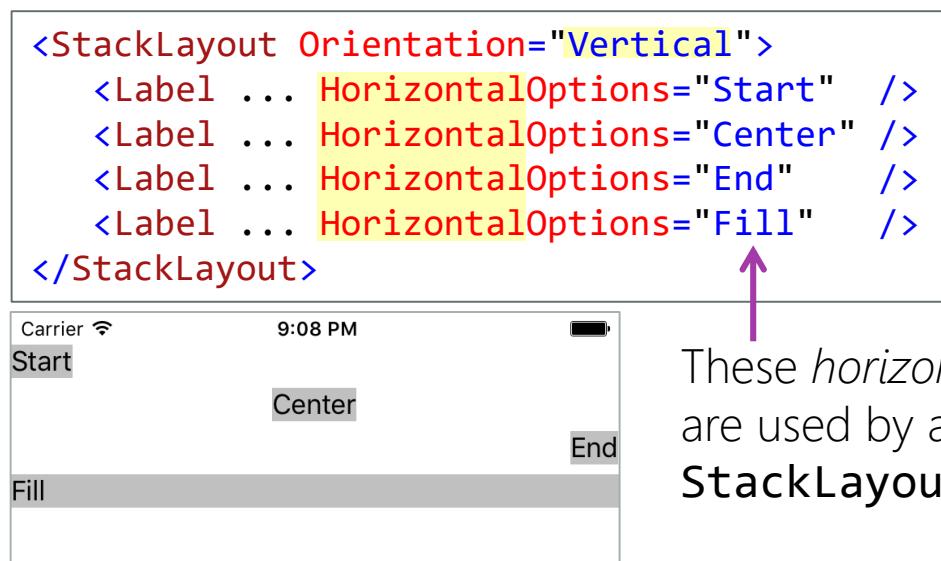


```
<StackLayout Orientation="Horizontal">
    <BoxView Color="Silver" />
    <BoxView Color="Blue" />
    <BoxView Color="Gray" />
</StackLayout>
```



# LayoutOptions against orientation

- ❖ In the direction *opposite* of its orientation, **StackLayout** uses the **Start**, **Center**, **End**, and **Fill** layout options



# LayoutOptions with orientation

- ❖ In the direction of its orientation, **StackLayout** ignores the **Start**, **Center**, **End**, and **Fill** layout options

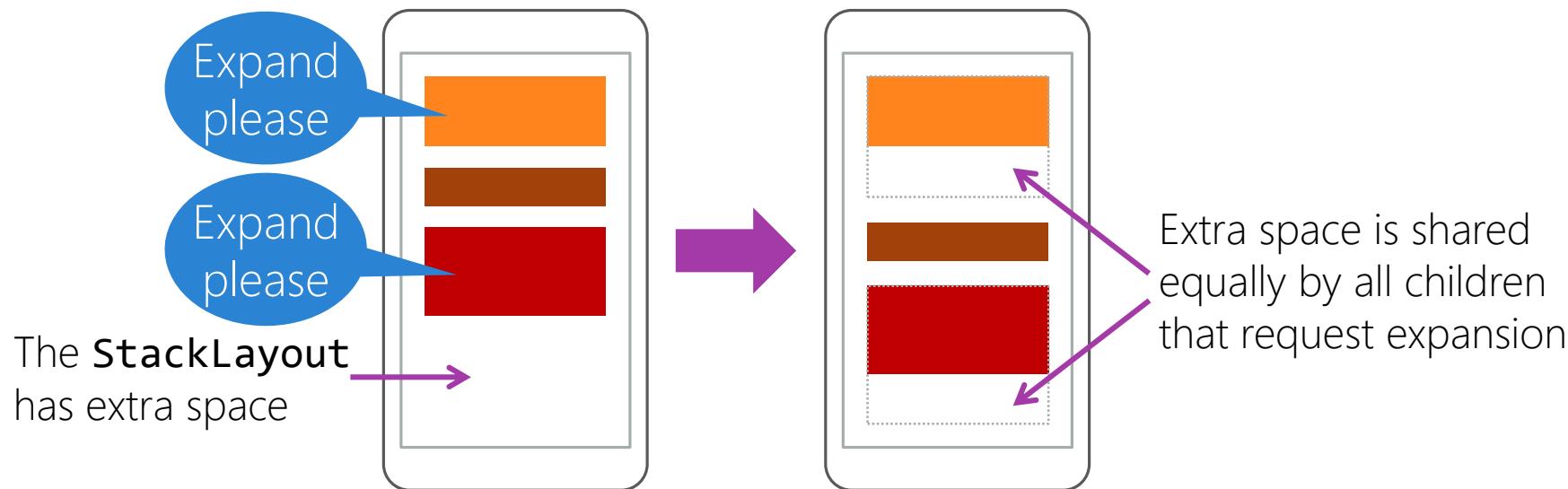
```
<StackLayout Orientation="Vertical">
    <Label ... VerticalOptions="Start" />
    <Label ... VerticalOptions="Center" />
    <Label ... VerticalOptions="End" />
    <Label ... VerticalOptions="Fill" />
</StackLayout>
```



These *vertical* options  
are ignored by a  
*vertical* **StackLayout**

# What is expansion?

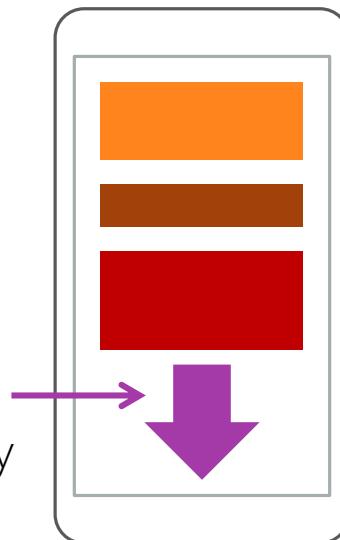
- ❖ A view's *expansion* setting determines whether it would like the **StackLayout** to allocate available extra space to its rectangle



# Expansion direction

- ❖ **StackLayout** expands children only in the direction of its orientation

E.g. a vertical  
**StackLayout**  
expands vertically



# How much extra space?

- ❖ **StackLayout** determines the amount of extra space using its standard layout calculation as if there were no expansion

```
<StackLayout Orientation="Vertical">
    <Label Text="One"    HeightRequest="100" ... />
    <Label Text="Two"   ... />
    <Label Text="Three" HeightRequest="50" ... />
</StackLayout>
```

Uses requested size if provided  
or "default" size if not

# How to specify expansion?

- ❖ To request expansion, use the "...AndExpand" version of the layout options in the direction of the **StackLayout**'s orientation

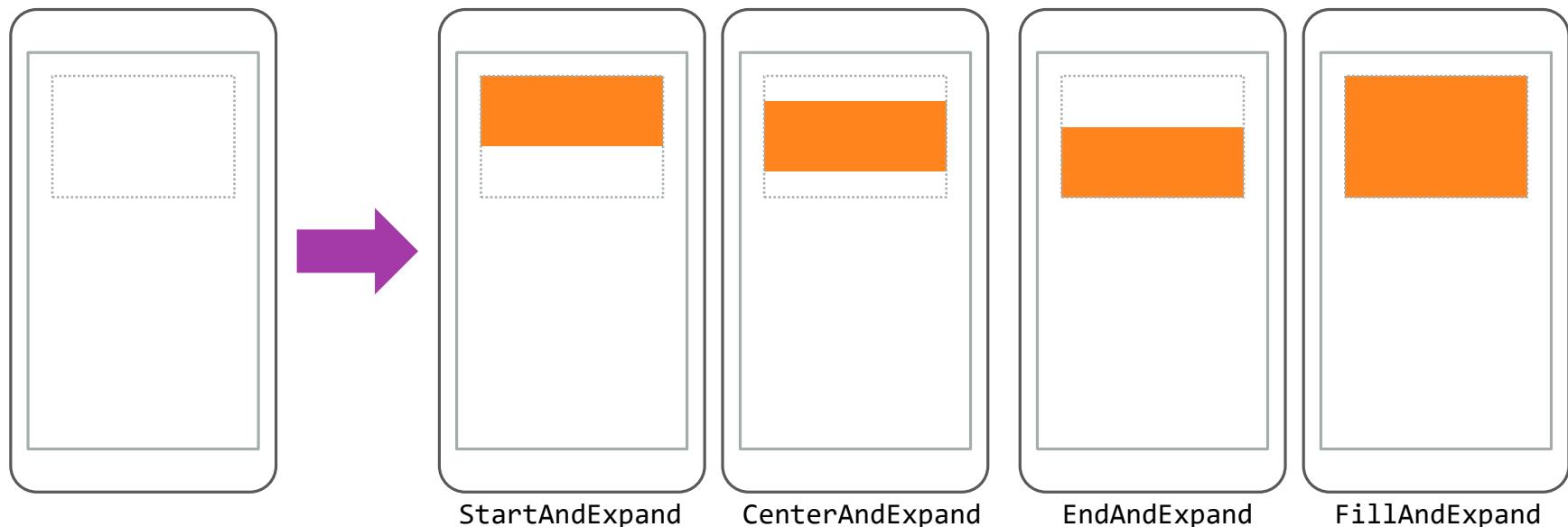
```
<StackLayout Orientation="Vertical">
    <Label ... VerticalOptions="StartAndExpand" />
    <Label ... VerticalOptions="CenterAndExpand" />
    <Label ... VerticalOptions="EndAndExpand" />
    <Label ... VerticalOptions="FillAndExpand" />
</StackLayout>
```



These settings give a **LayoutOptions** instance with **Expands** set to **true**

# Expansion vs. view size

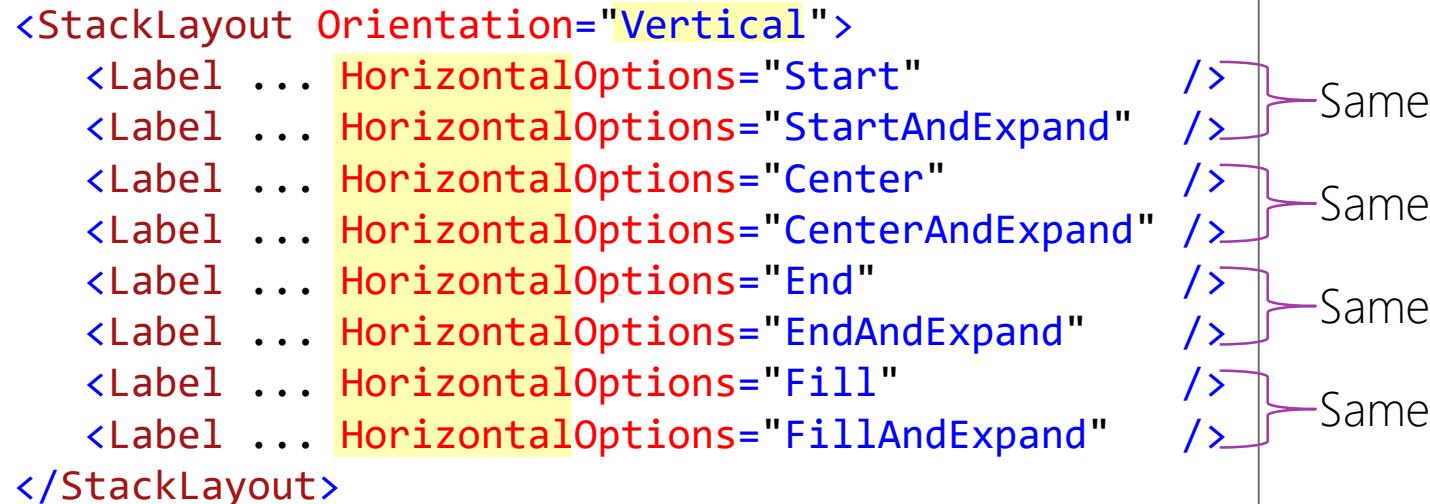
- ❖ Enabling expansion can change the size of the view's layout rectangle, but doesn't change the size of the view unless it uses **FillAndExpand**

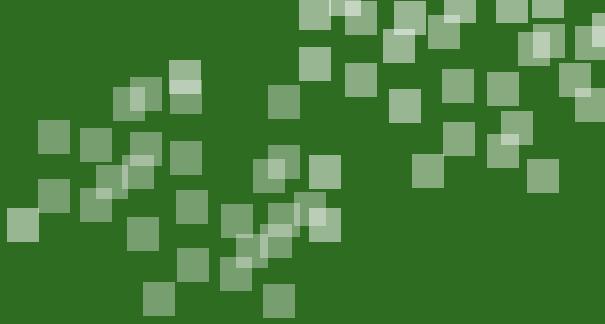


# No expansion against orientation

- ❖ In the direction *opposite* of its orientation, adding "...AndExpand" to the layout options has no effect (there is no expansion in that direction)

```
<StackLayout Orientation="Vertical">
    <Label ... HorizontalOptions="Start" />
    <Label ... HorizontalOptions="StartAndExpand" /> Same
    <Label ... HorizontalOptions="Center" /> Same
    <Label ... HorizontalOptions="CenterAndExpand" /> Same
    <Label ... HorizontalOptions="End" /> Same
    <Label ... HorizontalOptions="EndAndExpand" /> Same
    <Label ... HorizontalOptions="Fill" /> Same
    <Label ... HorizontalOptions="FillAndExpand" /> Same
</StackLayout>
```



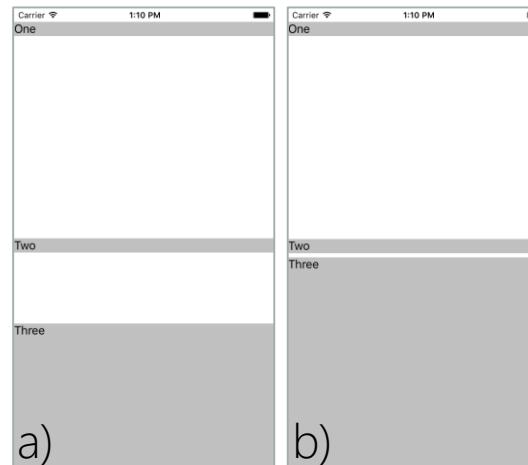


# Flash Quiz

# Flash Quiz

- ① How would the following code be displayed at runtime?

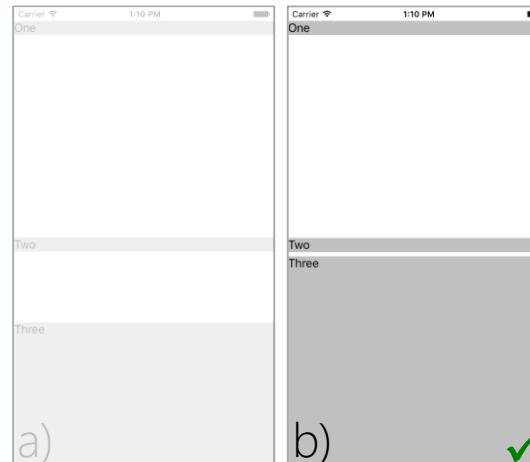
```
<StackLayout>
    <Label Text="One"    VerticalOptions="StartAndExpand"  BackgroundColor="Silver" />
    <Label Text="Two"    VerticalOptions="Center"           BackgroundColor="Silver" />
    <Label Text="Three"   VerticalOptions="FillAndExpand"   BackgroundColor="Silver" />
</StackLayout>
```



# Flash Quiz

- ① How would the following code be displayed at runtime?

```
<StackLayout>
    <Label Text="One"    VerticalOptions="StartAndExpand" BackgroundColor="Silver" />
    <Label Text="Two"    VerticalOptions="Center"          BackgroundColor="Silver" />
    <Label Text="Three"   VerticalOptions="FillAndExpand"  BackgroundColor="Silver" />
</StackLayout>
```

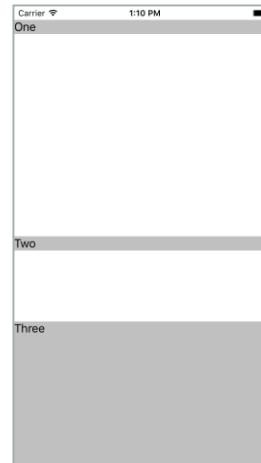


"One" and "Three" split the extra space equally, ← the rectangle allocated to "One" goes all the way to the top of "Two"

# Flash Quiz

- ② What would you replace the **????** with to achieve the output shown?

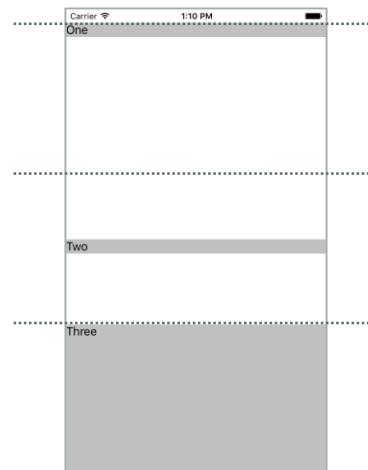
```
<StackLayout>
    <Label Text="One"    VerticalOptions="StartAndExpand"    BackgroundColor="Silver" />
    <Label Text="Two"    VerticalOptions="?????"           BackgroundColor="Silver" />
    <Label Text="Three"   VerticalOptions="FillAndExpand"    BackgroundColor="Silver" />
</StackLayout>
```



# Flash Quiz

- ② What would you replace the **????** with to achieve the output shown?

```
<StackLayout>
    <Label Text="One"    VerticalOptions="StartAndExpand"  BackgroundColor="Silver" />
    <Label Text="Two"    VerticalOptions="CenterAndExpand"  BackgroundColor="Silver" />
    <Label Text="Three"  VerticalOptions="FillAndExpand"    BackgroundColor="Silver" />
</StackLayout>
```



All labels share the extra space equally, but only **Three** grows since it uses **FillAndExpand**



# Individual Exercise

Use StackLayout to build a UI

# Summary

1. Add views to a **StackLayout** in code and XAML
2. Specify layout orientation
3. Use **Expands** to request extra space



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# Apply Attached Properties

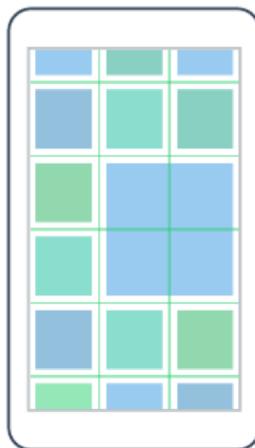
# Tasks

1. Apply an Attached Property in code
2. Apply an Attached Property in XAML

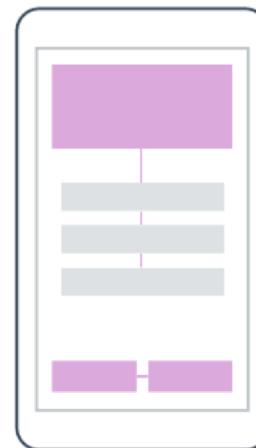


# Motivation

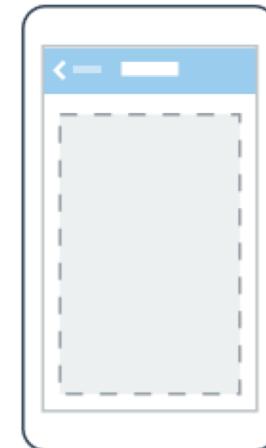
- ❖ Some properties are only needed in specific situations



Row/column needed  
when in a **Grid**



Constraints needed when  
in a **RelativeLayout**



Request for a back  
button needed when  
in a **NavigationPage**

# Union is a bad solution

- ❖ Do not mix all potential properties into a base class; it would make each object larger and the base class harder to understand

Needed when  
in a **Grid** layout

```
public class MyBaseClass
{
    public int Row { get; set; }
    public int Column { get; set; }
}
```



Needed when in a  
**RelativeLayout**

```
public Constraint WidthConstraint { get; set; }
public Constraint HeightConstraint { get; set; }
```

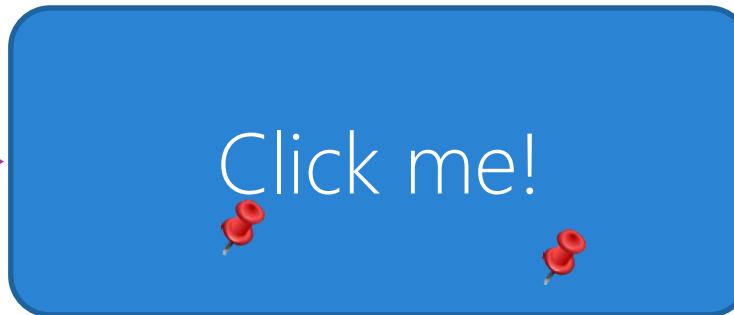
Needed when in a  
**NavigationPage**

```
public bool HasBackButton { get; set; }
}
```

# What is an attached property?

- ❖ An *attached property* is a property that is defined in one class but set on objects of other types

Button does not have  
Row/Column properties

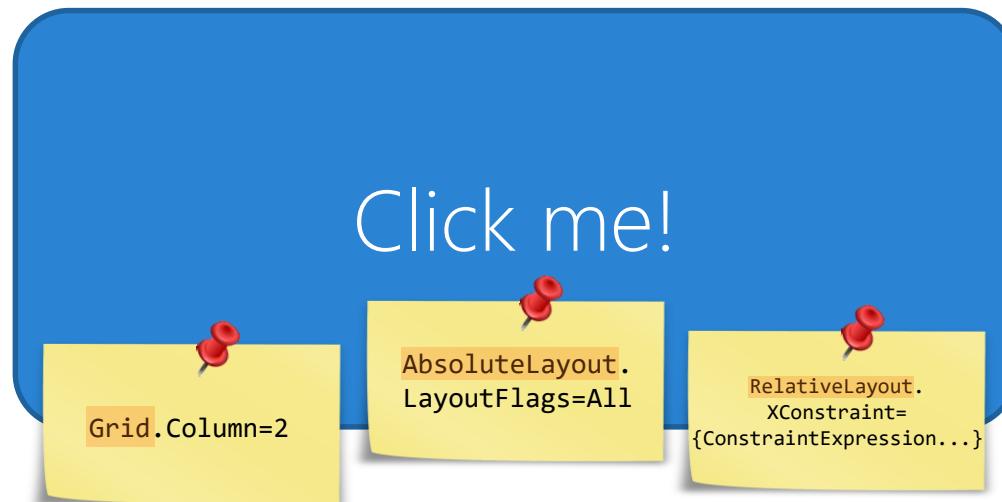


They are defined in **Grid**  
and attached to objects →  
of other types as needed



# Multiple attached properties

- ❖ You can attach properties from multiple classes to an object



# Who consumes attached properties?

- ❖ Typically, a container will look for attached properties on its children

When this  
button is →  
in **Grid**...



...the grid reads the attached properties it needs...and ignores the others

# Attached property infrastructure

- ❖ Support for creating attached properties is built-in to Xamarin.Forms

Registration

```
public sealed class BindableProperty
{
    ...
    public static BindableProperty CreateAttached(...) { ... }
}
```

Value storage

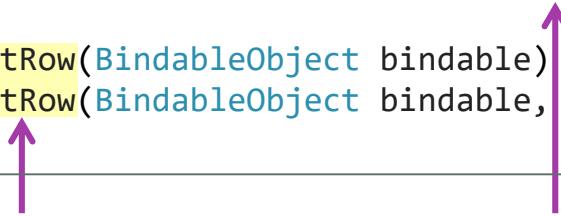
```
public abstract class BindableObject : ...
{
    ...
    public object GetValue(BindableProperty property) { ... }
    public void SetValue(BindableProperty property, object value) { ... }
}
```

# How to define an attached property

- ❖ The owner of an attached property defines the property and access methods

```
public partial class Grid : Layout<View>
{
    ...
    public static readonly BindableProperty RowProperty = BindableProperty.CreateAttached(...);

    public static int GetRow(BindableObject bindable) { ... }
    public static void SetRow(BindableObject bindable, int value) { ... }
}
```



Get/set methods

The property definition  
(the **Property** suffix  
is used by convention)

# Apply an attached property in code

- ❖ In code, use the static **Set** method to apply an attached property

Attach row  
and column  
settings to  
a button

```
var button = new Button();  
  
Grid.SetRow(button, 1);  
Grid.SetColumn(button, 2);
```



```
public partial class Grid : Layout<View>  
{ ...  
    public static readonly BindableProperty RowProperty = BindableProperty.CreateAttached(...);  
  
    public static int GetRow(BindableObject bindable) { ... }  
    public static void SetRow(BindableObject bindable, int value) { ... }  
}
```

# Apply an attached property in XAML

- ❖ In XAML, use the owning class name and the attached property name (without the **Property** suffix)

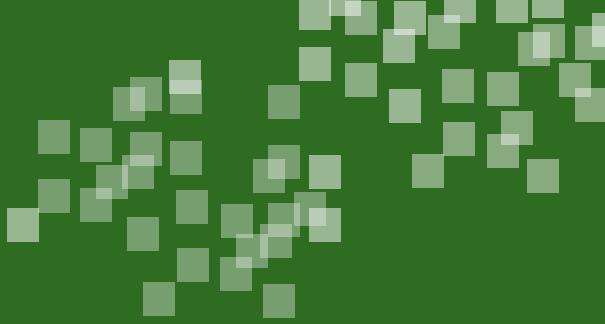
Attach row  
and column  
settings to  
a button



```
<Button Grid.Row="1" Grid.Column="2" ... />
```

```
public partial class Grid : Layout<View>
{
    ...
    public static readonly BindableProperty RowProperty = BindableProperty.CreateAttached(...);

    public static int GetRow(BindableObject bindable) { ... }
    public static void SetRow(BindableObject bindable, int value) { ... }
}
```



# Flash Quiz

# Flash Quiz

- ① How would you apply the attached property shown below in XAML?
- a) `<ContentPage HasBackButton="True" ... >`
  - b) `<ContentPage NavigationPage.HasBackButtonProperty="True" ... >`
  - c) `<ContentPage NavigationPage.HasBackButton="True" ... >`

Xamarin.Forms ▶ NavigationPage

## Xamarin.Forms.NavigationPage Class

A [Page](#) that manages the navigation and user-experience of a stack of other pages.

static  
readonly

[HasBackButtonProperty](#)

[BindableProperty](#). Backing store for the HasBackButton property.

# Flash Quiz

- ① How would you apply the attached property shown below in XAML?
- a) <ContentPage HasBackButton="True" ... >
  - b) <ContentPage NavigationPage.HasBackButtonProperty="True" ... >
  - c) <ContentPage **NavigationPage.HasBackButton="True"** ... >

Xamarin.Forms ▶ NavigationPage

## Xamarin.Forms.NavigationPage Class

A [Page](#) that manages the navigation and user-experience of a stack of other pages.

static  
readonly

[HasBackButtonProperty](#)

[BindableProperty](#). Backing store for the HasBackButton property.

# Summary

1. Apply an Attached Property in code
2. Apply an Attached Property in XAML





# Arrange views with Grid

# Tasks

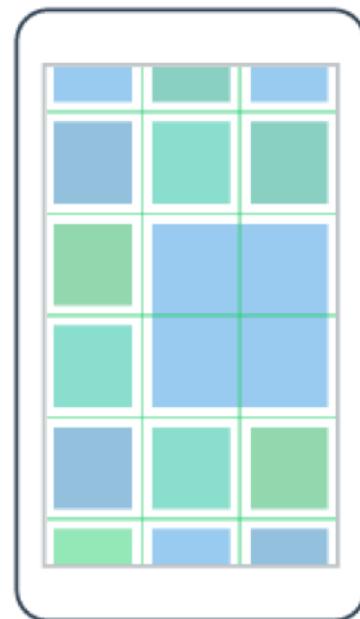
1. Specify grid row and column sizes
2. Add children to grid cells



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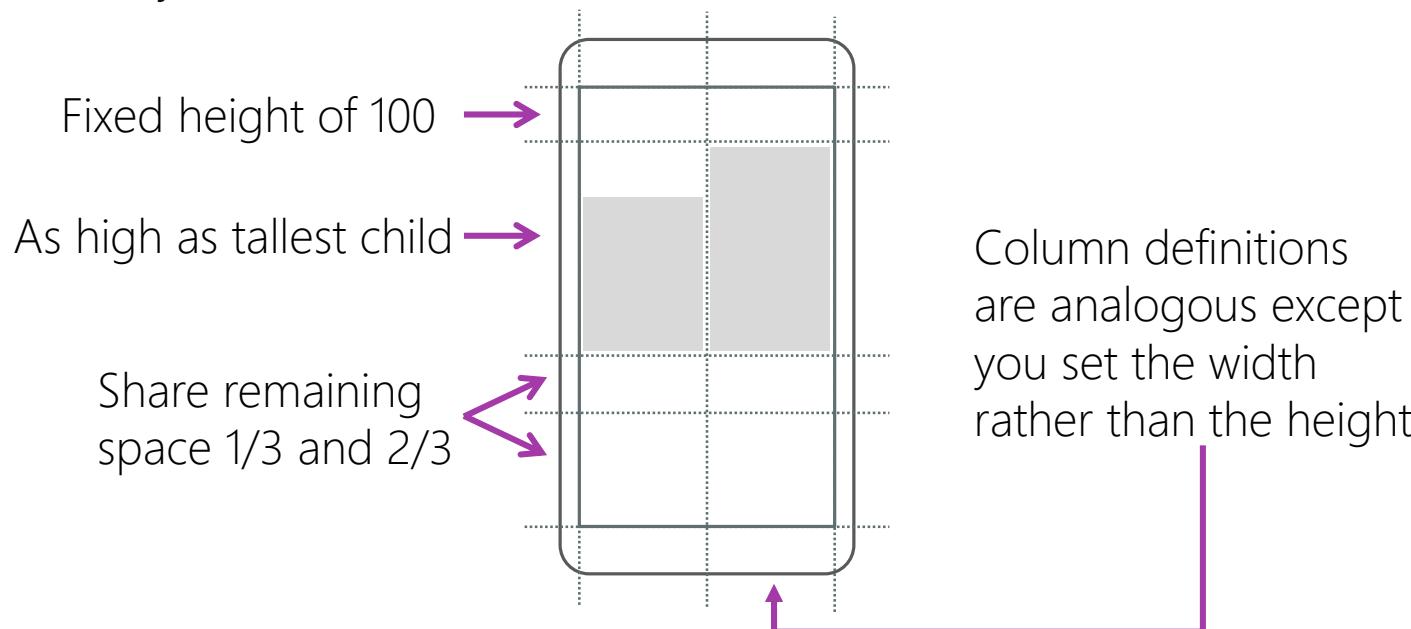
# What is Grid?

- ❖ **Grid** places its children into cells formed from rows and columns



# Grid rows/columns

- ❖ You specify the shape of the grid by defining each row and column individually



# Row/column definitions

- ❖ There are dedicated classes that define a row or a column

Specify  
row  
height

```
public sealed class RowDefinition : ...
{
    ...
    → public GridLength Height { get; set; }
}
```

Specify  
column  
width

```
public sealed class ColumnDefinition : ...
{
    ...
    → public GridLength Width { get; set; }
}
```

# What is GridLength?

- ❖ **GridLength** encapsulates two things: unit and value

```
public struct GridLength
{
    ...
    public GridUnitType GridUnitType { get; }
    public double Value { get; }
}
```



Units can be: **Absolute, Auto, Star**

# Absolute GridLength

- ❖ **Absolute GridLength** specifies a fixed row height or column width

```
var row = new RowDefinition() { Height = new GridLength(100) };
```

```
<RowDefinition Height="100" />
```



Value is in platform-independent units

# Auto GridLength

- ❖ **Auto GridLength** lets the row height or column width adapt, it automatically becomes the size of the largest child

```
var row = new RowDefinition() {Height = new GridLength(1, GridUnitType.Auto)};
```

```
<RowDefinition Height="Auto" />
```



Value is irrelevant for **Auto**, it is typical to use 1 as the value when creating in code

# Star GridLength

- ❖ **Star GridLength** shares the available space proportionally among all rows/columns that use star sizing

```
var row = new RowDefinition() { Height = new GridLength(2.5, GridUnitType.Star) };
```

```
<RowDefinition Height="2.5*" />
```



XAML type converter uses **\*** instead of the **Star** used in code.

Note: **"1\*"** and **"\*"** are equivalent in XAML.

# Grid row/column collections

- ❖ **Grid** contains collections for the row and column definitions

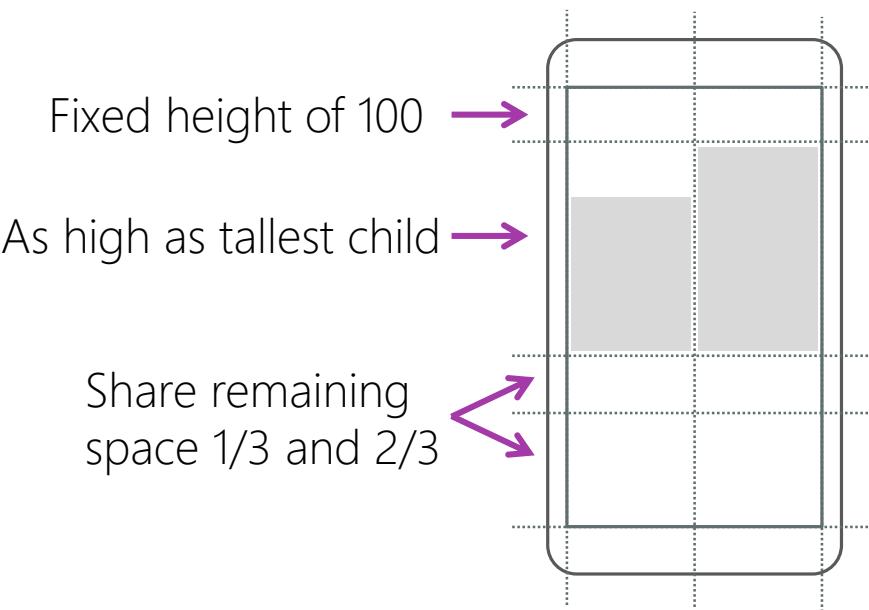
```
public partial class Grid : Layout<View>
{
    ...
    public ColumnDefinitionCollection ColumnDefinitions { get; set; }
    public RowDefinitionCollection RowDefinitions { get; set; }
}
```



You add items to these collections  
to create the rows/columns

# Grid example

- ❖ It is common to mix different **GridLength** settings in the same grid



```
<Grid>
  <Grid.RowDefinitions>
    <RowDefinition Height="100" />
    <RowDefinition Height="Auto" />
    <RowDefinition Height="1*" />
    <RowDefinition Height="2*" />
  </Grid.RowDefinitions>
  ...
</Grid>
```

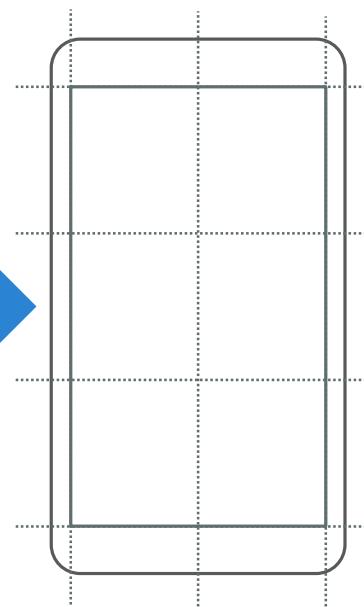
# Default size

- ❖ Rows and columns default to "**1\***" size

```
<Grid>
  <Grid.RowDefinitions>
    <RowDefinition />
    <RowDefinition />
    <RowDefinition />
  </Grid.RowDefinitions>

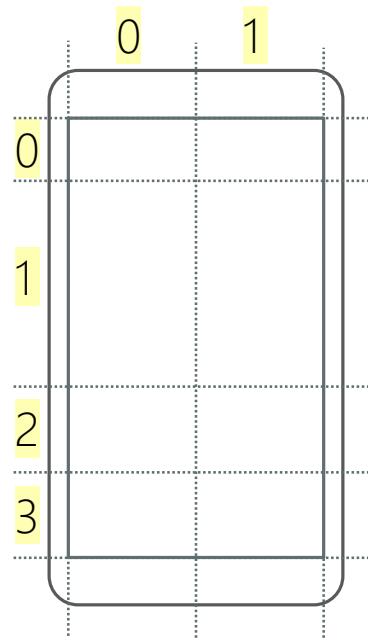
  <Grid.ColumnDefinitions>
    <ColumnDefinition />
    <ColumnDefinition />
  </Grid.ColumnDefinitions>
  ...
</Grid>
```

Yields a uniform  
3x2 grid



# Row/column numbering

- ❖ The row/column numbering starts at 0



# Grid positioning properties

- ❖ **Grid** defines four attached properties used to position children

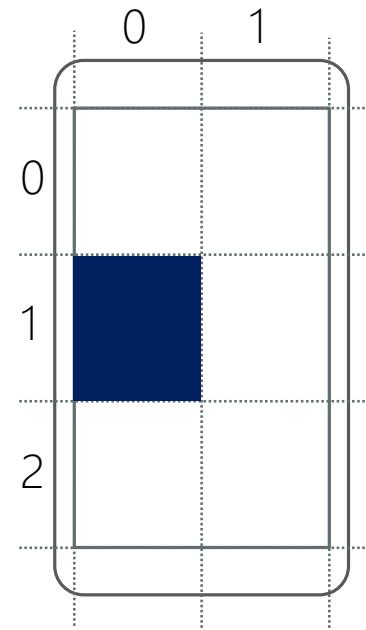
ATTACHED PROPERTY	VALUE
Column	An integer that represents the Column in which the item will appear.
ColumnSpan	An integer that represents the number of Columns that the item will span.
Row	An integer that represents the row in which the item will appear.
RowSpan	An integer that represents the number of rows that the item will span.

# Cell specification

- ❖ Apply the **Row** and **Column** attached properties to each child

Specify row/  
column

```
<Grid>
  <Grid.RowDefinitions>
    <RowDefinition />
    <RowDefinition />
    <RowDefinition />
  </Grid.RowDefinitions>
  <Grid.ColumnDefinitions>
    <ColumnDefinition />
    <ColumnDefinition />
  </Grid.ColumnDefinitions>
  <BoxView Grid.Row="1" Grid.Column="0"
           BackgroundColor="Navy" />
</Grid>
```



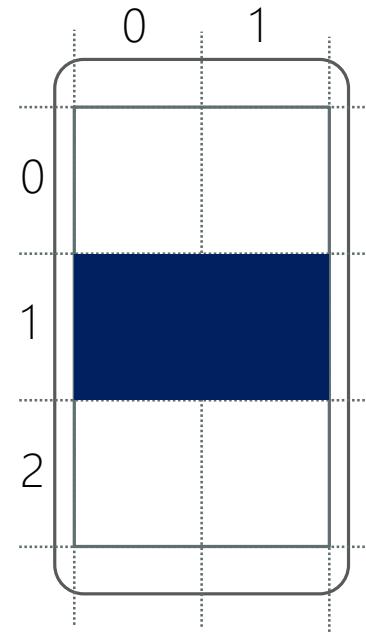
# Span specification

- ❖ Apply **RowSpan** and **ColumnSpan** to each child as needed

Specify  
span

```
<Grid>
  <Grid.RowDefinitions>
    <RowDefinition />
    <RowDefinition />
    <RowDefinition />
  </Grid.RowDefinitions>
  <Grid.ColumnDefinitions>
    <ColumnDefinition />
    <ColumnDefinition />
  </Grid.ColumnDefinitions>

  <BoxView Grid.Row="1" Grid.Column="0" Grid.ColumnSpan="2" BackgroundColor="Navy" />
</Grid>
```

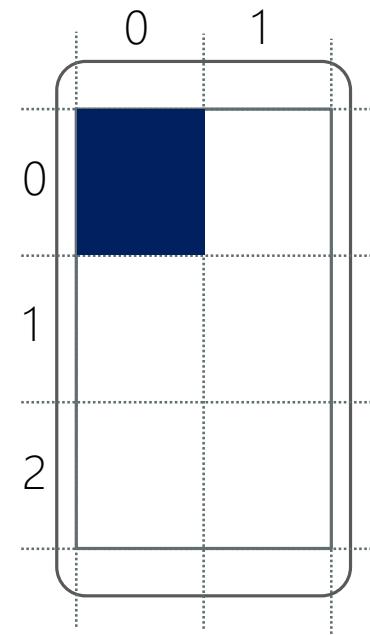


# Cell and span defaults

- ❖ Cell locations default to 0 and spans default to 1

Placed in cell (0,0) 

```
<Grid>
    <Grid.RowDefinitions>
        <RowDefinition />
        <RowDefinition />
        <RowDefinition />
    </Grid.RowDefinitions>
    <Grid.ColumnDefinitions>
        <ColumnDefinition />
        <ColumnDefinition />
    </Grid.ColumnDefinitions>
    <BoxView BackgroundColor="Navy" />
</Grid>
```

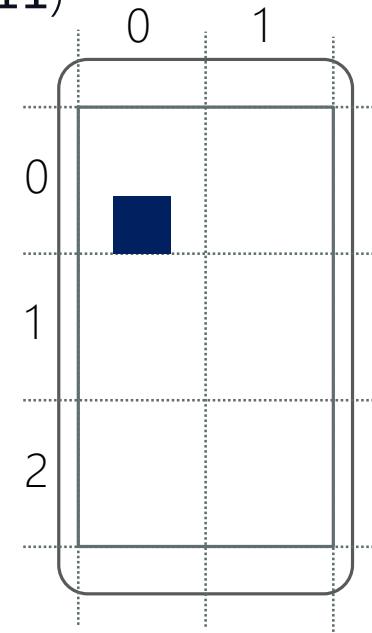


# Layout options

- ❖ A view's horizontal and vertical layout options control how it is sized and positioned within its grid cell (the default is **Fill**)

Position  
within  
the cell

```
<Grid>
  ...
  <BoxView HorizontalOptions="Center"
           VerticalOptions="End"
           BackgroundColor="Navy"
           WidthRequest="50"
           HeightRequest="50" />
</Grid>
```



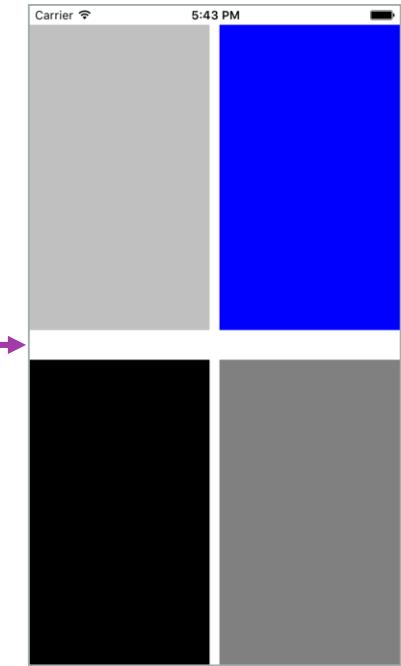
# Grid child spacing

- ❖ **Grid's RowSpacing and ColumnSpacing properties** separate the children (they both default to 6)

```
<Grid RowSpacing="30" ColumnSpacing="10">
    <BoxView Color="Silver" Grid.Row="0" Grid.Column="0" />
    <BoxView Color="Blue"    Grid.Row="0" Grid.Column="1" />
    <BoxView Color="Black"   Grid.Row="1" Grid.Column="0" />
    <BoxView Color="Gray"   Grid.Row="1" Grid.Column="1" />
</Grid>
```

Row spacing

Column spacing



# Grid Children

- ❖ **Grid** redefines its **Children** to use a custom list that provides several overloaded **Add** methods

```
public partial class Grid : Layout<View>
{
    ...
    public new IGridList<View> Children { get { ... } }
```

This property hides  
the inherited one

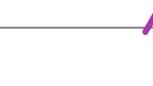
Can specify row/column  
when adding children

# Add children programmatically

- ❖ **IGridList** provides several **Add** methods that are more specialized than typically found in a list

```
var grid = new Grid();
int row, column;
...
grid.Children.Add(label, column, row);

grid.Children.Add(button, column, column+1, row, row+2);
```



Yields a  
**ColumnSpan**  
of 1



Yields a  
**RowSpan**  
of 2

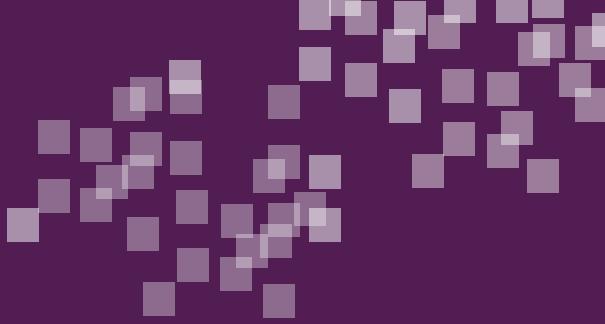
# Auto-generated rows/columns

- ❖ **Grid** will automatically generate equal-sized rows/columns based on the position of the children you add

```
<Grid>
  <Button Grid.Row="1" Grid.Column="1" Text="OK"      />
  <Button Grid.Row="2" Grid.Column="0" Text="Cancel" />
</Grid>
```

↑  
Maximum index is 2 so  
the grid will have 3 rows

↑  
Maximum index is 1 so  
the grid will have 2 columns



# Individual Exercise

Use Grid to build a UI

# Summary

1. Specify grid row and column sizes
2. Add children to grid cells



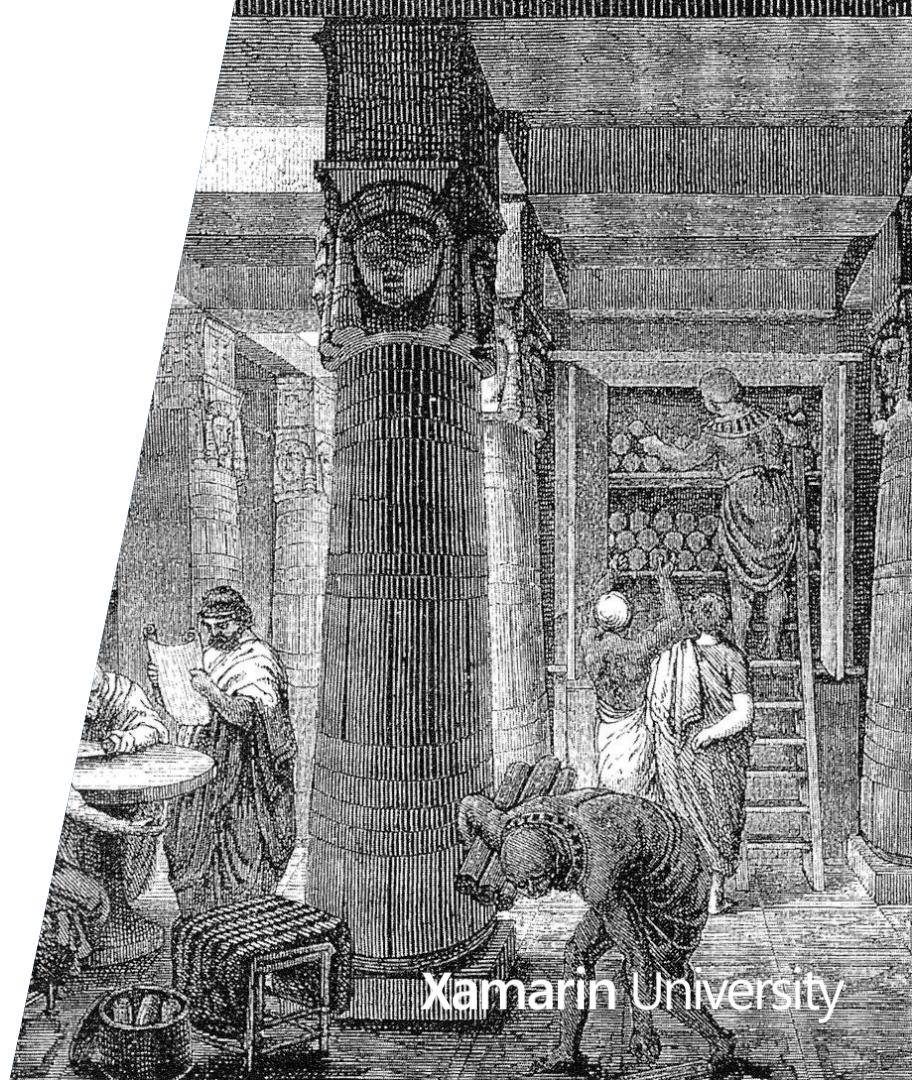
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# Scroll a layout with ScrollView

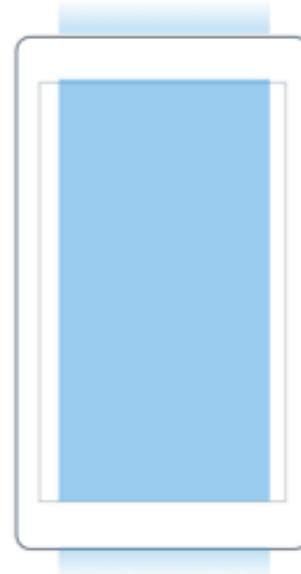
# Tasks

1. Use **ScrollView** to add scrolling
2. Set the scroll direction



# What is ScrollView?

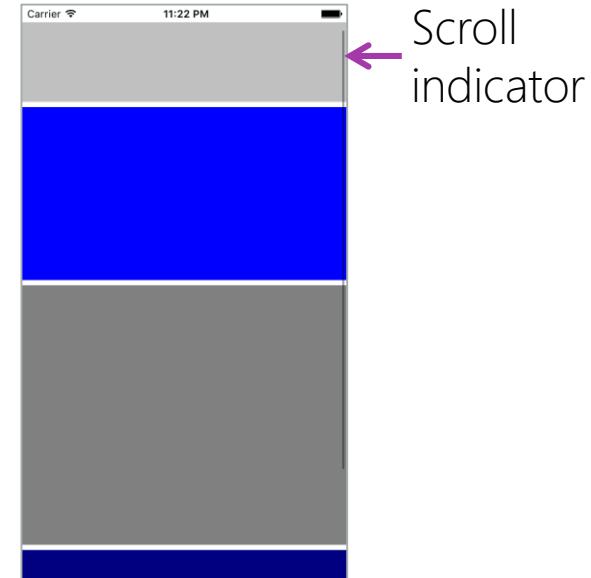
- ❖ **ScrollView** adds scrolling to a single piece of content; the content can be an individual view or a layout container



# How to use ScrollView

- ❖ Wrap a **ScrollView** around a single element to add scrolling

```
<ScrollView>
  <StackLayout>
    <BoxView Color="Silver" HeightRequest="100" />
    <BoxView Color="Blue" HeightRequest="200" />
    <BoxView Color="Gray" HeightRequest="300" />
    <BoxView Color="Navy" HeightRequest="200" />
  </StackLayout>
</ScrollView>
```

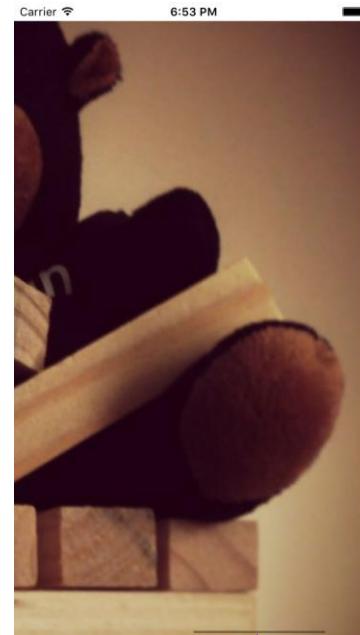


# ScrollView orientation

- ❖ **ScrollView** lets you control the scroll direction: **Vertical** (the default), **Horizontal**, or **Both**

```
<ScrollView Orientation="Both">  
  <Image Source="monkey.jpg"  
        HeightRequest="1000"  
        WidthRequest="1000" />  
</ScrollView>
```

↑  
Image is larger  
than its container

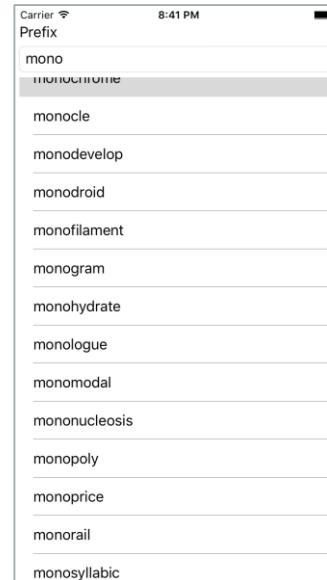


← Vertical indicator  
Horizontal indicator

# Do not nest scrolling views

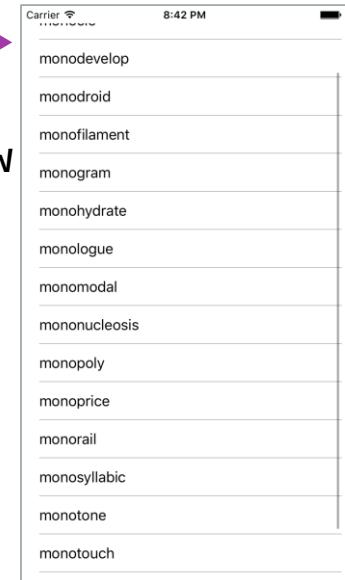
- ❖ Generally, do not nest **ScrollViews** or a **ListView** in a **ScrollView**, it often creates non-intuitive behavior

```
<ScrollView>
  <StackLayout>
    <Label Text="Prefix" />
    <Entry x:Name="prefix" />
    <ListView x:Name="listView" />
  </StackLayout>
</ScrollView>
```



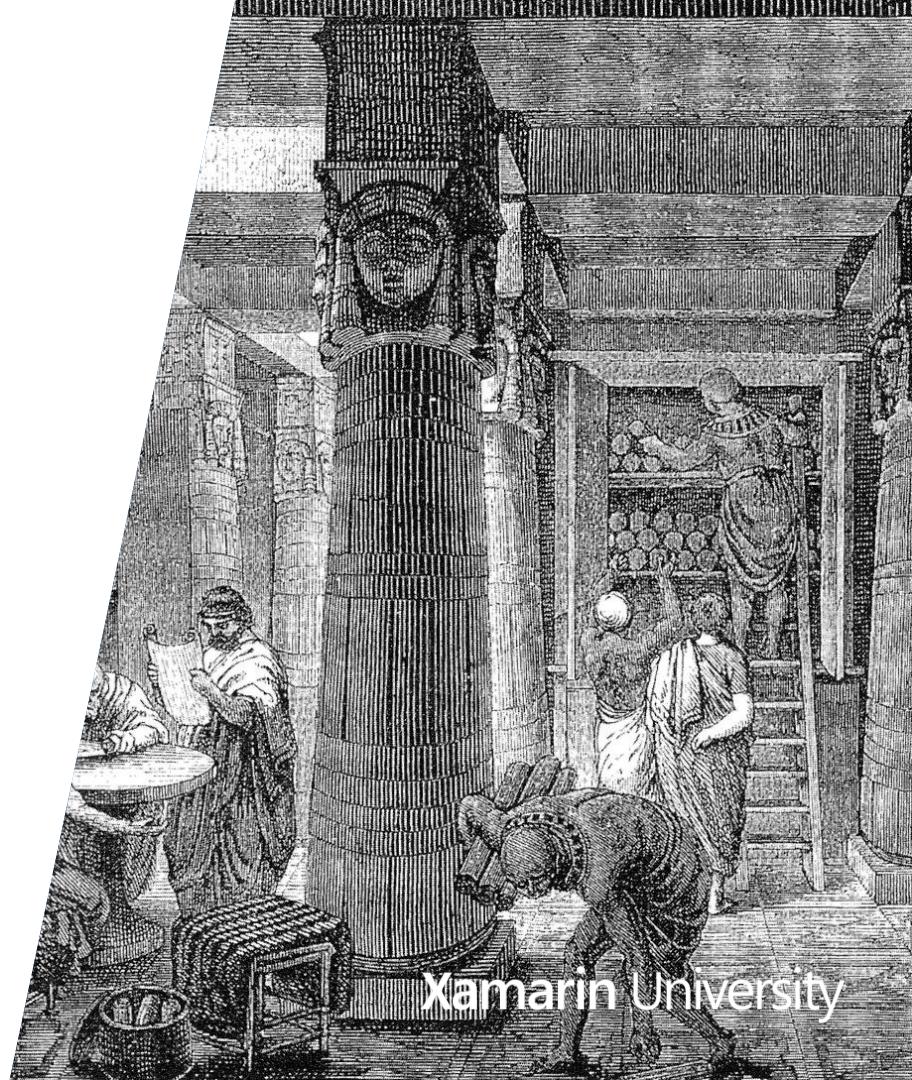
Can scroll →  
the entire  
**ScrollView**

← Can scroll  
just the  
**ListView**  
content



# Summary

1. Use **ScrollView** to add scrolling
2. Set the scroll direction



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# Thank You!

Please complete the class survey in your profile:  
[university.xamarin.com/profile](http://university.xamarin.com/profile)