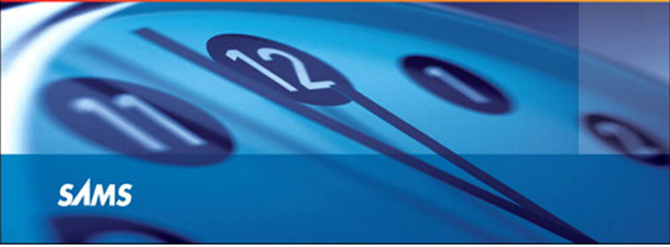
Adam Nathan

In **Full Color**

Learn how to build great Windows Store apps! Figures and code appear as they do in Visual Studio.

Sams **Teach Yourself**

Windows® 8.1 Apps with XAML and C# in 24 Hours



SAMS

FREE SAMPLE CHAPTER

SHARE WITH OTHERS

Adam Nathan

Sams Teach Yourself Windows® 8.1 Apps with XAML and C# in 24 Hours

SAMS 800 East 96th Street, Indianapolis, Indiana, 46240 USA

Sams Teach Yourself Windows® 8.1 Apps with XAML and C# in 24 Hours

Copyright © 2014 by Pearson Education

All rights reserved. No part of this book shall be reproduced, stored in a retrieval system, or transmitted by any means, electronic, mechanical, photocopying, recording, or otherwise, without written permission from the publisher. No patent liability is assumed with respect to the use of the information contained herein. Although every precaution has been taken in the preparation of this book, the publisher and author assume no responsibility for errors or omissions. Nor is any liability assumed for damages resulting from the use of the information contained herein.

ISBN-13: 978-0-672-33836-6
ISBN-10: 0-672-33836-X

Library of Congress Control Number: 2014931708

Printed in the United States of America

First Printing June 2014

Trademarks

All terms mentioned in this book that are known to be trademarks or service marks have been appropriately capitalized. Sams Publishing cannot attest to the accuracy of this information. Use of a term in this book should not be regarded as affecting the validity of any trademark or service mark.

Warning and Disclaimer

Every effort has been made to make this book as complete and as accurate as possible, but no warranty or fitness is implied. The information provided is on an “as is” basis. The author and the publisher shall have neither liability nor responsibility to any person or entity with respect to any loss or damages arising from the information contained in this book or from the use of the programs accompanying it.

Special Sales

For information about buying this title in bulk quantities, or for special sales opportunities (which may include electronic versions; custom cover designs; and content particular to your business, training goals, marketing focus, or branding interests), please contact our corporate sales department at corpsales@pearsoned.com or (800) 382-3419.

For government sales inquiries, please contact governmentsales@pearsoned.com.

For questions about sales outside the U.S., please contact international@pearsoned.com.

Editor-in-Chief
Greg Wiegand

Executive Editor
Loretta Yates

Development Editor
Mark Renfrow

Managing Editor
Kristy Hart

Senior Project Editor
Betsy Gratner

Indexer
Tim Wright

Proofreader
Kathy Ruiz

Technical Editor
J. Boyd Nolan

Publishing Coordinator
Cindy Teeters

Cover Designer
Mark Shirar

Compositor
Nonie Ratcliff

Contents at a Glance

Introduction 1

Part I: Getting Started

HOUR 1 Preparing for Development 5

2 Discovering the XAML Language 23

Part II: Building an App

3 Arranging UI Elements 57

4 Mastering Layout 79

5 Handling Input: Touch, Mouse, Pen, and Keyboard 113

6 Managing the App Lifecycle 159

7 Threading, Windows, and Pages 181

Part III: Understanding Controls

8 Content Controls 201

9 Items Controls 233

10 Text 259

11 Images 293

12 Audio, Video, and Speech 335

13 Other Controls 371

Part IV: Leveraging the Richness of XAML

14 Vector Graphics 411

15 Animation 447

16 Styles, Templates, and Visual States 493

17 Data Binding 525

Part V: Exploiting Windows 8.1

18 Working with Data 551
19 Supporting Charms 579
20 Leveraging Contracts 611
21 Reading from Sensors 647
22 Controlling Devices 665
23 Live Tiles, Notifications, and the Lock Screen 693
24 Earning Money 733
Index 763

Table of Contents

Introduction **1**

Part I: Getting Started

HOUR 1 Preparing for Development **5**

- Creating, Deploying, and Profiling an App 5
- Understanding the App Package 8
- Submitting to the Windows Store 18
- Further Exploration 20
- Summary 20
- Q&A 21
- Workshop 22

HOUR 2 Discovering the XAML Language **23**

- What Is XAML, Exactly? 23
- Elements and Attributes 25
- Namespaces 25
- Property Elements 27
- Type Converters 28
- Markup Extensions 29
- Children of Object Elements 31
- Mixing XAML with C# 35
- Updating the `Hour1` Project 35
- Making Your App World-Ready 42
- Making Your App Accessible 48
- Further Exploration 53
- Summary 54
- Q&A 54
- Workshop 54
- Exercises 55

Part II: Building an App

HOUR 3 Arranging UI Elements 57
Controlling Size 58
Controlling Position 60
Applying 2D Transforms 64
Applying 3D Transforms 70
Further Exploration 73
Summary 73
Q&A 73
Workshop 77
Exercises 77

HOUR 4 Mastering Layout 79
Discovering Your Window Size and Location 80
`Panels` 84
Handling Content Overflow 97
Further Exploration 110
Summary 110
Q&A 110
Workshop 112

HOUR 5 Handling Input: Touch, Mouse, Pen, and Keyboard 113
Touch Input 114
Mouse Input 138
Pen Input 141
Keyboard Input 150
Further Exploration 156
Summary 156
Q&A 156
Workshop 158

HOUR 6 Managing the App Lifecycle 159
Killing 161
Suspending 162
Resuming 164

Terminating ... 165
Launching ... 165
Activating ... 169
Managing Session State with `SuspensionManager` ... 171
Programmatically Launching Apps ... 174
Further Exploration ... 177
Summary ... 178
Q&A ... 179
Workshop ... 180

HOUR 7 Threading, Windows, and Pages ... **181**
Understanding the Threading Model ... 181
Displaying Multiple Windows ... 186
Navigating Between Pages ... 190
Further Exploration ... 198
Summary ... 198
Q&A ... 198
Workshop ... 199

Part III: Understanding Controls

HOUR 8 Content Controls ... **201**
`Button` ... 204
`AppBarButton` ... 207
`HyperlinkButton` ... 214
`RepeatButton` ... 215
`ToggleButton` ... 215
`AppBarToggleButton` ... 216
`CheckBox` ... 217
`RadioButton` ... 217
`ToolTip` ... 219
App Bars ... 222
Summary ... 229
Q&A ... 229
Workshop ... 231
Exercises ... 231

HOUR 9 Items Controls 233
Items in the Control 234
Items Panels 236
`ComboBox` 239
`ListBox` 241
`ListView` 242
`GridView` 246
`FlipView` 248
`SemanticZoom` 251
`MenuFlyout` 255
Summary 256
Q&A 256
Workshop 257
Exercises 258

HOUR 10 Text 259
`TextBlock` 259
`RichTextBlock` 272
`TextBox` 277
`RichEditBox` 284
`PasswordBox` 287
Further Exploration 289
Summary 289
Q&A 289
Workshop 291
Exercises 291

HOUR 11 Images 293
The `Image` Element 294
Multiple Files for Multiple Environments 302
Decoding Images 308
Encoding Images 318
Rendering PDF Content as an Image 326
Further Exploration 331
Summary 331

Q&A 332
Workshop 332
Exercises 333

HOUR 12 Audio, Video, and Speech 335
Playing Media 336
Capturing Media 347
Transcoding Media 359
Speech Synthesis 364
Further Exploration 366
Summary 367
Q&A 368
Workshop 369

HOUR 13 Other Controls 371
Range Controls 371
`SearchBox` 374
Popup Controls 381
`Hub` 391
Date and Time Controls 397
`ProgressRing` 400
`ToggleSwitch` 400
`WebView` 402
Further Exploration 408
Summary 408
Workshop 408

Part IV: Leveraging the Richness of XAML

HOUR 14 Vector Graphics 411
`Shape`s 411
Geometries 419
`Brush`es 427
Further Exploration 443
Summary 443

Q&A 444
Workshop 445
Exercises 445

HOUR 15 Animation 447
Theme Transitions 448
Theme Animations 459
Custom Animations 464
Custom Keyframe Animations 475
Easing Functions 480
Manual Animations 484
Further Exploration 486
Summary 488
Q&A 488
Workshop 490
Exercises 491

HOUR 16 Styles, Templates, and Visual States 493
Styles 494
Templates 503
Visual States 512
Summary 522
Q&A 522
Workshop 523
Exercises 523

HOUR 17 Data Binding 525
Introducing `Binding` 525
Controlling Rendering 533
Customizing the View of a Collection 541
High-Performance Rendering with `ListView` and `GridView` 545
Summary 549
Q&A 550
Workshop 550

Part V: Exploiting Windows 8.1

HOUR 18 Working with Data **551**
An Overview of Files and Folders 551
App Data 553
User Data 559
Networking 564
Further Exploration 575
Summary 576
Q&A 576
Workshop 576

HOUR 19 Supporting Charms **579**
The Search Charm 580
The Share Charm 585
The Devices Charm 592
The Settings Charm 603
Summary 608
Workshop 609
Exercises 609

HOUR 20 Leveraging Contracts **611**
Account Picture Provider 613
AutoPlay Content and AutoPlay Device 616
File Type Associations 619
Protocol 621
File Open Picker 622
File Save Picker 626
Contact Picker 627
The Contact Contract 630
The Appointments Provider Contract 634
Background Tasks 636
Further Exploration 645
Summary 646
Q&A 646
Workshop 646

HOUR 21 Reading from Sensors 647
Accelerometer 647
Gyrometer 651
Inclinometer 651
Compass 651
Light Sensor 652
Orientation 652
Location 653
Proximity 660
Summary 663
Workshop 663

HOUR 22 Controlling Devices 665
Fingerprint Readers 666
Image Scanners 666
Barcode Scanners 670
Magnetic Stripe Readers 674
Custom Bluetooth Devices 676
Custom Bluetooth Smart Devices 679
Custom USB Devices 682
Custom HID Devices 686
Custom Wi-Fi Direct Devices 688
Further Exploration 690
Summary 690
Workshop 691
Exercises 691

HOUR 23 Live Tiles, Notifications, and the Lock Screen 693
Live Tiles 693
Badges 708
Secondary Tiles 710
Toast Notifications 713
Setting Up Push Notifications 718
The Lock Screen 726
Further Exploration 729

Summary 730
Workshop 730
Exercises 731

HOUR 24 Earning Money 733
Adding Advertisements to Your App 734
Supporting a Free Trial 740
Supporting In-App Purchases 744
Validating Windows Store Receipts 753
Testing Windows Store Features 755
Further Exploration 760
Summary 761
Q&A 761
Workshop 762

Index 763

About the Author

Adam Nathan is a principal software architect for Microsoft and a best-selling technical author. He introduced XAML to countless developers through his books on a variety of Microsoft technologies. Currently a part of the Windows division, Adam has previously worked on Visual Studio and the Common Language Runtime. He was the founding developer and architect of Popfly, Microsoft's first Silverlight-based product, named by *PCWorld* as one of its year's most innovative products. He is also the founder of PINVOKE.NET, the online resource for .NET developers who need to access Win32. His apps have been featured on Lifehacker, Gizmodo, ZDNet, ParentMap, and other enthusiast sites.

Adam's books are considered required reading by many inside Microsoft and throughout the industry. Adam is the author of *Windows 8.1 Apps with XAML and C# Unleashed* (Sams, 2013), *101 Windows Phone 7 Apps* (Sams, 2011), *Silverlight 1.0 Unleashed* (Sams, 2008), *WPF Unleashed* (Sams, 2006), *WPF 4 Unleashed* (Sams, 2010), *WPF 4.5 Unleashed* (Sams, 2013), and *.NET and COM: The Complete Interoperability Guide* (Sams, 2002); a coauthor of *ASP.NET: Tips, Tutorials, and Code* (Sams, 2001); and a contributor to books including *.NET Framework Standard Library Annotated Reference, Volume 2* (Addison-Wesley, 2005) and *Windows Developer Power Tools* (O'Reilly, 2006). You can find Adam online at www.adamnathan.net, or @adamnathan on Twitter.

Dedication

To Rose Rudberg.

Acknowledgments

First, I thank Eileen Chan for the encouragement and patience that enabled me to complete this book. I'd also like to give special thanks to J. Boyd Nolan, Ashish Shetty, Tim Heuer, Mark Rideout, Jonathan Russ, Joe Duffy, Chris Brumme, Eric Rudder, Loretta Yates, Neil Rowe, Betsy Gratner, Ginny Munroe, Bill Chiles, and Valery Sarkisov. As always, I thank my parents for having the foresight to introduce me to Basic programming on our IBM PCjr when I was in elementary school.

[illegible]

We Want to Hear from You!

As the reader of this book, *you* are our most important critic and commentator. We value your opinion and want to know what we're doing right, what we could do better, what areas you'd like to see us publish in, and any other words of wisdom you're willing to pass our way.

We welcome your comments. You can email or write to let us know what you did or didn't like about this book—as well as what we can do to make our books better.

Please note that we cannot help you with technical problems related to the topic of this book.

When you write, please be sure to include this book's title and author as well as your name and email address. We will carefully review your comments and share them with the author and editors who worked on the book.

Email: consumer@samspublishing.com

Mail: Sams Publishing
ATTN: Reader Feedback
800 East 96th Street
Indianapolis, IN 46240 USA

Reader Services

Visit our website and register this book at informit.com/register for convenient access to any updates, downloads, or errata that might be available for this book.

Introduction

If you ask me, it has never been a better time to be a software developer. Not only are programmers in high demand—due in part to an astonishingly low number of computer science graduates each year—but app stores make it easier than ever to broadly distribute your own software and even make money from it!

When I was in junior high school, I released a few shareware games and asked for $5 donations. I earned $15 total. One of the three donations was from my grandmother, who didn't even own a computer! These days, of course, adults and kids alike can make money on simple apps and games without relying on kind and generous individuals going to the trouble of mailing a check!

The Windows Store is an app store like no other, and it keeps getting better. When you consider the number of people who use Windows 8.1 (and Windows RT) compared to the number of people who use any other operating system on the planet, you realize what a unique and enormous opportunity the Windows Store provides. That's one of the reasons that the Windows Store is the fastest-growing app store in history.

When you write a Windows Store app, you have three main choices for programming language and UI framework pairings:

- JavaScript with an HTML user interface
- C#, Visual Basic, or C++ with a XAML user interface
- C++ with a DirectX user interface

You can also leverage a number of features and componentization techniques to mix and match these languages and UI frameworks within the same app.

C# and XAML has been a very popular choice for writing Windows Store apps. It is the choice for apps such as Netflix, Hulu Plus, Fresh Paint, SkyDrive, Evernote Touch, Reader, Alarms, Movie Moments, Maps, OneNote, Lync, and many, many more. It is also the implementation choice for many core experiences in Windows, such as the PC Settings app, the Search app, and Contact/Calendar functionality in Windows 8.1. The XAML team has stated that their goal is to be the high fidelity, high performance framework for *any* scenario.

Then why does Microsoft provide so many choices? The idea is to enable you to work with whatever is most comfortable for you, or whatever best leverages your existing assets, or whatever most naturally consumes the third-party SDK you must use.

Your choice can have other benefits. HTML tends to be the best choice if you need to support versions of your app on non-Microsoft platforms or a website. XAML is best at interoperability, as it's easy to mix both HTML and DirectX content in a XAML app. DirectX, the best choice for hardcore games, provides the most potential for getting the highest performance.

Although your choice of language is generally dictated by your choice of UI Framework, each language has its strengths. JavaScript benefits from a large community that produces interesting libraries. C# has the best features for writing concise asynchronous code. C++ can provide high performance.

The key to the multiple language support is the Windows Runtime, or WinRT for short. WinRT APIs are automatically *projected* into the programming language you use, so they look natural for that language. Projections are more than just exposing the raw APIs, however. Core WinRT data types such as `String`, collection types, and a few others are mapped to appropriate data types for the target environment. For C# or other .NET languages, this means exposing them as `System.String`, `System.Collections.Generic.IList<T>`, and so on. To match conventions, member names are even morphed to be Camel-cased for JavaScript and Pascal-cased for other languages, which makes the MSDN reference documentation occasionally look goofy.

In the set of APIs exposed by Windows:

- Everything under the **`Windows.UI.Xaml`** namespace is XAML-specific.
- Everything under the **`Windows.UI.WebUI`** namespace is for HTML apps.
- Everything under **`System`** is .NET-specific.
- Everything else (which is under **`Windows`**) is general-purpose WinRT functionality.

As you dig into the framework, you notice that the XAML-specific and .NET-specific APIs are indeed the most natural to use from C# and XAML.

Who Should Read This Book?

This book is for software developers who are interested in creating apps for the Windows Store, whether they are for tablets, laptops, or desktops. It does not teach you how to program, nor does it teach the basics of the C# language. However, it is designed to be understandable even for folks who are new to .NET, and does not require previous experience with XAML.

HOUR 3
Arranging UI Elements

What You'll Learn in This Hour:

- ▶ The basics of layout
- ▶ How to customize an element's size
- ▶ How to customize an element's position
- ▶ Rotating, scaling, and skewing elements with 2D and 3D Transforms

When building an app, one of the first things you must do is arrange a bunch of elements in its window. This sizing and positioning of elements is called *layout*. XAML apps are provided a feature-rich layout system that covers everything from placing elements at exact coordinates to building experiences that scale and rearrange across a wide range of screen resolutions and aspect ratios. This is essential for handling the diversity of Windows devices, as well as intelligently handling when your app isn't the only one on the screen.

In XAML apps, layout boils down to interactions between parent elements and their child elements. Parents and their children work together to determine their final sizes and positions. Parent elements that support the arrangement of multiple children are known as *panels*, and they derive from a class called `Panel`. All the elements involved in the layout process (both parents and children) derive from `UIElement`.

Because layout is such an important topic, the next two hours are dedicated to it. This hour focuses on the children, examining the common ways that you can control layout on a child-by-child basis. Several properties control these aspects, most of which are summarized in Figure 3.1 for an arbitrary element inside an arbitrary panel. Size-related properties are shown in blue, and position-related properties are shown in red. In addition, elements can have transforms applied to them (shown in green) that can affect both size and position.

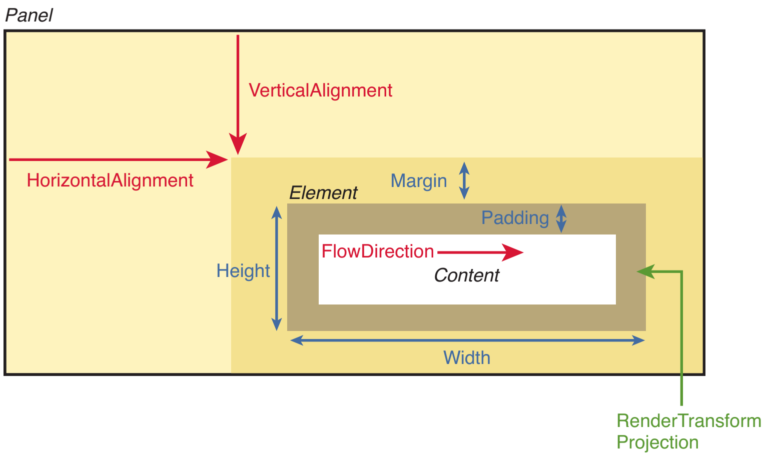


FIGURE 3.1
The main child layout properties examined in this hour

The next hour continues the layout story by examining the variety of built-in parent panels, each of which arranges its children in unique ways.

Controlling Size

Every time layout occurs, such as when an app's window is resized or the screen is rotated, child elements tell their parent panel their desired size. Elements tend to *size to their content*, meaning that they try to be large enough to fit their content and no larger. This size can be influenced on individual instances of children via several straightforward properties.

`Height` and `Width`

All `FrameworkElements` have simple `Height` and `Width` properties (of type `double`), and they also have `MinHeight`, `MaxHeight`, `MinWidth`, and `MaxWidth` properties that can be used to specify a range of acceptable values. Any or all of these can be easily set on elements in C# or in XAML.

An element naturally stays as small as possible, so if you use `MinHeight` or `MinWidth`, it is rendered at that height/width unless its content forces it to grow. In addition, that growth can be limited by using `MaxHeight` and `MaxWidth`—as long as these values are larger than their `Min` counterparts. When using an explicit `Height` and `Width` at the same time as their `Min` and `Max` counterparts, `Height` and `Width` take precedence as long as they are in the range from `Min` to `Max`. The default value of `MinHeight` and `MinWidth` is `0`, and the default value of

MaxHeight and MaxWidth is Double.PositiveInfinity (which can be set in XAML as simply "Infinity").

CAUTION

Avoid setting explicit sizes!

Giving controls explicit sizes makes it difficult to adapt to different screen sizes and orientations, and could cause text to be cut off if you ever translate it into other languages, as demonstrated in the preceding hour. Therefore, you should avoid setting explicit sizes unless absolutely necessary. Fortunately, setting explicit sizes is rarely necessary, thanks to the panels described in the next hour.

Unlike the six properties that are *input* to the layout process, FrameworkElement exposes read-only ActualHeight and ActualWidth properties representing *output* from the layout process: the final size of the element after layout is complete. That's right—whether an element specified an explicit size, specified a range of acceptable sizes, or didn't specify anything at all, the behavior of the parent can alter an element's final size on the screen. These properties are, therefore, useful for advanced scenarios in which you need to programmatically act on an element's size. The values of the other size-related properties, on the other hand, aren't very interesting to base logic on. For example, when not set explicitly, the value of Height and Width are Double.NaN, regardless of the element's true size.

CAUTION

Be careful when writing code that uses ActualHeight and ActualWidth!

Every time the layout process occurs, it updates the values of each element's ActualHeight and ActualWidth. However, you can't rely on the values of these properties at all times. It's safe to rely on their values within an event handler for the LayoutUpdated event defined on FrameworkElement. At the same time, you must not alter layout from within a LayoutUpdated hander. If you do, an exception will be thrown pointing out that you introduced a cycle.

UIElement defines an UpdateLayout method to force any pending layout updates to occur, but you should avoid using this method. Besides the fact that frequent calls to UpdateLayout can harm performance because of the excess layout processing, there's no guarantee that the elements you're using properly handle the potential reentrancy in their layout-related methods.

Margin and Padding

Margin and Padding are two similar properties that are also related to an element's size. All FrameworkElements have a Margin property, and all Controls (plus many other elements) have a Padding property. Their only difference is that Margin controls how much extra space gets placed around the *outside* edges of the element, whereas Padding controls how much extra space gets placed around the *inside* edges of the element.

Both Margin and Padding are of type Thickness, an interesting class that can represent one, two, or four double values. Here is how the values are interpreted when set in XAML:

- When set to a list of **four values**, the numbers represent the left, top, right, and bottom edges, respectively.
- When set to a list of **two values**, the first number is used for the left and right edges and the second number is used for the top and bottom edges. So "12,24" is a shortcut for "12,24,12,24".
- When set to a **single value**, it is used for all four sides. So "12" is a shortcut for "12,12", which is a shortcut for "12,12,12,12".
- Negative values may be used for margins (and often are), but are not allowed for padding.
- The commas are optional. You can use spaces instead of, or in addition to, commas. "12,24" is the same as "12 24" and "12, 24".

When creating a Thickness in C#, you can use its constructor that accepts either a single value or all four values:

```
this.TextBox.Margin = new Thickness(12);           // Margin="12" in XAML
this.TextBox.Margin = new Thickness(12,24,12,24); // Margin="12,24" in XAML
```

Note that the handy two-number syntax is a shortcut only available through XAML. Thickness does not have a two-parameter constructor.

Controlling Position

This section doesn't discuss positioning elements with (X,Y) coordinates, as you might expect. Parent panels define their own unique mechanisms for enabling children to position themselves, and those are discussed in the next hour. A few mechanisms are common to all FrameworkElement children, however, and that's what this section examines. These mechanisms are related to alignment and a concept called *flow direction*.

Alignment

The HorizontalAlignment and VerticalAlignment properties enable an element to control what it does with any extra space that its parent panel gives it. Each property has a corresponding enumeration with the same name, giving the following options:

- **HorizontalAlignment**—Left, Center, Right, and Stretch
- **VerticalAlignment**—Top, Center, Bottom, and Stretch

Stretch is the default value for both properties, although various controls override the setting. The effects of HorizontalAlignment can easily be seen by placing a few Buttons in a StackPanel (a panel described further in the next hour) and marking them with each value from the enumeration:

```
<StackPanel>
  <Button HorizontalAlignment="Left" Content="Left" Background="Red"/>
  <Button HorizontalAlignment="Center" Content="Center" Background="Orange"/>
  <Button HorizontalAlignment="Right" Content="Right" Background="Green"/>
  <Button HorizontalAlignment="Stretch" Content="Stretch" Background="Blue"/>
</StackPanel>
```

Notice that an enumeration value such as HorizontalAlignment.Left is able to be specified in XAML as simply Left. This is thanks to a type converter that is able to handle any enumeration. The rendered result appears in Figure 3.2.

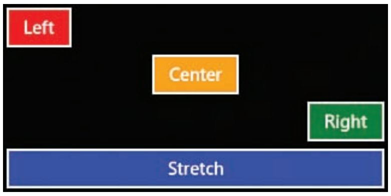


FIGURE 3.2
The effects of HorizontalAlignment on Buttons in a StackPanel

These two properties are useful only when a parent panel gives the child element more space than it needs. For example, adding VerticalAlignment values to elements in the StackPanel used in Figure 3.2 would make no difference, because each element is already given the exact amount of height it needs (no more, no less).

NOTE

When an element uses Stretch alignment (horizontally or vertically), an explicit Height or Width setting still takes precedence. MaxHeight and MaxWidth also take precedence, but only when their values are smaller than the natural stretched size. Similarly, MinHeight and MinWidth take precedence only when their values are *larger* than the natural stretched size. When Stretch is used in a context that constrains the element's size, it acts like an alignment of Center (or Left if the element is too large to be centered in its parent).

Content Alignment

In addition to HorizontalAlignment and VerticalAlignment properties, the Control class also has Horizontal**Content**Alignment and Vertical**Content**Alignment properties. These properties determine how a control's *content* fills the space *within* the control. (Therefore, the relationship between alignment and content alignment is somewhat like the relationship between `Margin` and `Padding`.)

The content alignment properties are of the same enumeration types as the corresponding alignment properties, so they provide the same options. However, the default value for `HorizontalContentAlignment` is `Left`, and the default value for `VerticalContentAlignment` is `Top`. Some elements implicitly choose different defaults. `Button`s, for example, center their content in both dimensions by default.

Figure 3.3 demonstrates the effects of `HorizontalContentAlignment`, simply by taking the previous XAML snippet and changing the property name as follows:

```
<StackPanel>
  <Button HorizontalContentAlignment="Left" HorizontalAlignment="Stretch"
          Content="Left" Background="Red"/>
  <Button HorizontalContentAlignment="Center" HorizontalAlignment="Stretch"
          Content="Center" Background="Orange"/>
  <Button HorizontalContentAlignment="Right" HorizontalAlignment="Stretch"
          Content="Right" Background="Green"/>
  <Button HorizontalContentAlignment="Stretch" HorizontalAlignment="Stretch"
          Content="Stretch" Background="Blue"/>
</StackPanel>
```

Each `Button` also has its `HorizontalAlignment` set to `Stretch` rather than its default of `Left` so the differences in `HorizontalContentAlignment` are visible. Without this, each `Button` would auto-size to its content and there would be no extra space for the content to move within.

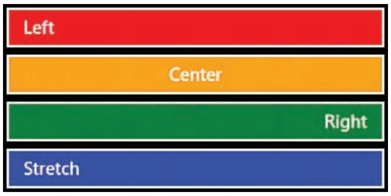


FIGURE 3.3
The effects of `HorizontalContentAlignment` on `Button`s in a `StackPanel`

In Figure 3.3, the `Button` with `HorizontalContentAlignment="Stretch"` might not appear as you expected. Its inner `TextBlock` is technically stretched, but it's meaningless because `TextBlock` (which is not a `Control`) doesn't have the same notion for stretching its inner text. For other types of content, `Stretch` can indeed have the intended effect.

FlowDirection

FlowDirection is a property on FrameworkElement (and several other classes) that can reverse the way an element's inner content flows. It applies to some panels and their arrangement of children, and it also applies to the way content is aligned inside child controls. The property is of type FlowDirection, with two values: LeftToRight (FrameworkElement's default) and RightToLeft.

The idea of FlowDirection is that it should be set to RightToLeft when the current culture corresponds to a language that is read from right to left. This reverses the meaning of left and right for settings such as content alignment. The following XAML demonstrates this, with Buttons that force their content alignment to Top and Left but then apply each of the two FlowDirection values:

```
<StackPanel>
  <Button FlowDirection="LeftToRight"
          HorizontalContentAlignment="Left" Width="320"
          Background="Red">LeftToRight</Button>
  <Button FlowDirection="RightToLeft"
          HorizontalContentAlignment="Left" Width="320"
          Background="Orange">RightToLeft</Button>
</StackPanel>
```

The result is shown in Figure 3.4.

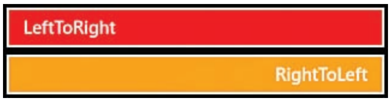


FIGURE 3.4
The effects of FlowDirection on Buttons with Left content alignment

Notice that FlowDirection does not affect the flow of letters within these Buttons. English letters always flow left to right, and Arabic letters always flow right to left, for example. But FlowDirection reverses the notion of left and right for other pieces of the user interface, which typically need to match the flow direction of letters.

You must explicitly set FlowDirection to match the current culture, but fortunately you can do this on a single, top-level element. Windows doesn't automatically change FlowDirection on your behalf in order for the behavior to be predictable and easily testable. The idea is that you should specify FlowDirection appropriately inside the .resw file for each distinct culture you support. For example, if you include a resource with the name Root.FlowDirection, then you can mark a Page's root element with x:Uid="Root" to control FlowDirection on a per-culture basis. The resource just needs to be given the value of LeftToRight or RightToLeft.

Applying 2D Transforms

The XAML UI Framework contains a handful of built-in two-dimensional transform classes (derived from `Transform`) that enable you to change the size and position of elements independently from the previously discussed properties. Some also enable you to alter elements in more exotic ways, such as by rotating or skewing them.

All `UIElements` have a `RenderTransform` property that can be set to any `Transform` in order to change its appearance *after* the layout process has finished (immediately before the element is rendered). They also have a handy `RenderTransformOrigin` property that represents the starting point of the transform (the point that remains stationary). Figure 3.5 demonstrates the impact of setting `RenderTransformOrigin` to five different (x,y) values when used with one of the `Transform` objects that performs rotation.

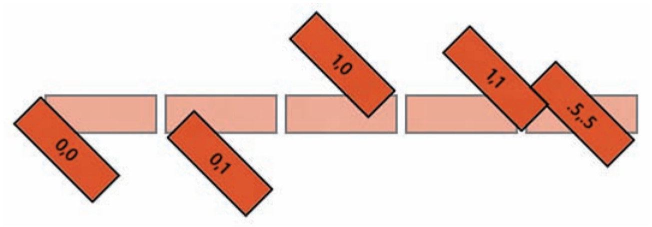


FIGURE 3.5
Five common `RenderTransformOrigins` used on rotated `Buttons` rendered on top of unrotated `Buttons`

`RenderTransformOrigin` can be set to a `Windows.Foundation.Point`, with (0,0) being the default value. This represents the top-left corner, shown by the first button in Figure 3.5. An origin of (0,1) represents the bottom-left corner, (1,0) is the top-right corner, and (1,1) is the bottom-right corner. You can use numbers greater than 1 to set the origin to a point outside the bounds of an element, and you can use fractional values. Therefore, (.5,.5) represents the middle of the object. The reason the corner-pivoting appears slightly off in Figure 3.5 is an artifact of the default appearance of `Buttons`. They have an invisible three-pixel-wide region around their visible rectangle. If you imagine each button extending three pixels in each direction, the pivoting of the first four buttons would be exactly on each corner.

The value for `RenderTransformOrigin` can be specified in XAML with two comma-delimited numbers (and no parentheses). For example, a `Button` rotated around its center, like the one at the far right of Figure 3.5, can be created as follows:

```
<Button RenderTransformOrigin=".5,.5">
  <Button.RenderTransform>
    <RotateTransform Angle="45"/>
  </Button.RenderTransform>
</Button>
```

This section looks at all the built-in 2D transforms, all in the Windows.UI.Xaml.Media namespace:

- RotateTransform
- ScaleTransform
- SkewTransform
- TranslateTransform
- CompositeTransform
- TransformGroup
- MatrixTransform

RotateTransform

RotateTransform, which was just demonstrated, rotates an element according to the values of three double properties:

- **Angle**—Angle of rotation, specified in degrees (default value = 0)
- **CenterX**—Horizontal center of rotation (default value = 0)
- **CenterY**—Vertical center of rotation (default value = 0)

The default (CenterX,CenterY) point of (0,0) represents the top-left corner.

Whereas Figure 3.5 shows rotated Buttons, Figure 3.6 demonstrates what happens when RotateTransform is applied *to the inner content* of a Button. To achieve this, the simple string that typically appears inside a Button is replaced with an explicit TextBlock as follows:

```
<Button Background="Orange">
  <TextBlock RenderTransformOrigin=".5,.5">
  <TextBlock.RenderTransform>
    <RotateTransform Angle="45"/>
  </TextBlock.RenderTransform>
    45°
  </TextBlock>
</Button>
```

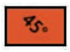


FIGURE 3.6
Using RotateTransform on the content of a Button

ScaleTransform

ScaleTransform enlarges or shrinks an element horizontally, vertically, or in both directions. This transform has four straightforward double properties:

- **ScaleX**—Multiplier for the element's width (default value = 1)
- **ScaleY**—Multiplier for the element's height (default value = 1)
- **CenterX**—Origin for horizontal scaling (default value = 0)
- **CenterY**—Origin for vertical scaling (default value = 0)

A ScaleX value of 0.5 shrinks an element's rendered width in half, whereas a ScaleX value of 2 doubles the width. CenterX and CenterY work the same way as with RotateTransform.

Listing 3.1 applies ScaleTransform to three Buttons in a StackPanel, demonstrating the ability to stretch them independently in height or in width. Figure 3.7 shows the result.

LISTING 3.1 Applying ScaleTransform to Buttons in a StackPanel

```
<StackPanel Width="200">
  <Button Background="Red">No Scaling</Button>
  <Button Background="Orange">
  <Button.RenderTransform>
    <ScaleTransform ScaleX="2"/>
  </Button.RenderTransform>
    X</Button>
  <Button Background="Yellow">
  <Button.RenderTransform>
    <ScaleTransform ScaleX="2" ScaleY="2"/>
  </Button.RenderTransform>
    X + Y</Button>
  <Button Background="Lime">
  <Button.RenderTransform>
    <ScaleTransform ScaleY="2"/>
  </Button.RenderTransform>
    Y</Button>
</StackPanel>
```

Figure 3.8 displays the same Buttons from Listing 3.1 (and Figure 3.7) but with explicit CenterX and CenterY values set. The point represented by each pair of these values is displayed in each Button's text. Notice that the lime Button isn't moved to the left like the orange Button, despite being marked with the same CenterX of 70. That's because CenterX is relevant only when ScaleX is a value other than 1, and CenterY is relevant only when ScaleY is a value other than 1.

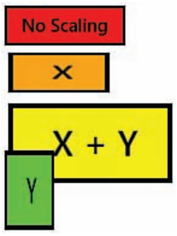


FIGURE 3.7
The scaled `Buttons` from Listing 3.1

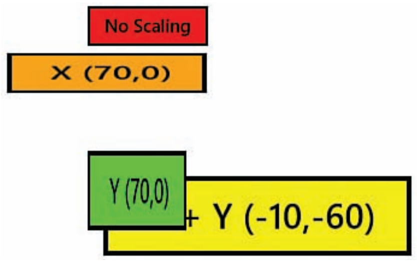


FIGURE 3.8
The `Buttons` from Listing 3.1 but with explicit scaling centers

`SkewTransform`

`SkewTransform` slants an element according to the values of four `double` properties:

- **`AngleX`**—Amount of horizontal skew (default value = `0`)
- **`AngleY`**—Amount of vertical skew (default value = `0`)
- **`CenterX`**—Origin for horizontal skew (default value = `0`)
- **`CenterY`**—Origin for vertical skew (default value = `0`)

These properties behave much like the properties of the previous transforms. Figure 3.9 demonstrates `SkewTransform` applied as a `RenderTransform` on several `Buttons`, using the default center of the top-left corner.

`TranslateTransform`

`TranslateTransform` simply moves an element according to two `double` properties:

- **`X`**—Amount to move horizontally (default value = `0`)
- **`Y`**—Amount to move vertically (default value = `0`)

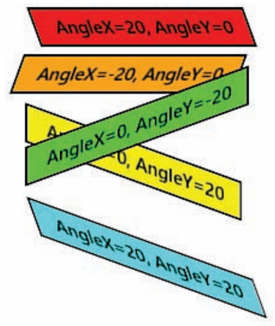


FIGURE 3.9
SkewTransform applied to Buttons in a StackPanel

TranslateTransform is an easy way to "nudge" elements one way or another. Most likely, you'd do this dynamically based on user actions (and perhaps in an animation). With all the panels described in the next hour, it's unlikely that you'd need to use TranslateTransform to arrange a static user interface.

Combining Transforms

If you want to transform an element multiple ways simultaneously, such as rotate *and* scale it, a few different options are available:

- CompositeTransform
- TransformGroup
- MatrixTransform

CompositeTransform

The CompositeTransform class is the easiest way to combine transforms. It has all the properties of the previous four transforms, although some have slightly different names: Rotation, ScaleX, ScaleY, SkewX, SkewY, TranslateX, TranslateY, CenterX, and CenterY.

Figure 3.10 shows several transforms being applied to a single Button as follows:

```
<Button Background="Orange">
  <Button.RenderTransform>
    <!-- The composite transform order is always
         scale, then skew, then rotate, then translate -->
    <CompositeTransform Rotation="45" ScaleX="5" ScaleY="1" SkewX="30"/>
  </Button.RenderTransform>
  OK
</Button>
```

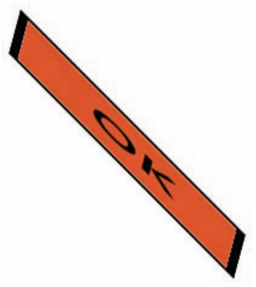


FIGURE 3.10
A `Button` scaled, skewed, and rotated with a single `CompositeTransform`

It can be handy to always use `CompositeTransform` instead of the previous transforms, even if you're only performing one type of transform.

`TransformGroup`

`CompositeTransform` always applies its transforms in the same order: scale, skew, rotate, and then translate. If you require a nonstandard order, you can use a `TransformGroup` instead then put its child transforms in any order. For example, the following XAML looks like it might have the same effect as the previous XAML, but Figure 3.11 shows that the result is much different:

```
<Button Background="Orange">
  <Button.RenderTransform>
    <TransformGroup>
      <!-- First rotate, then scale, then skew! -->
      <RotateTransform Angle="45"/>
      <ScaleTransform ScaleX="5" ScaleY="1"/>
      <SkewTransform AngleX="30"/>
    </TransformGroup>
  </Button.RenderTransform>
  OK
</Button>
```

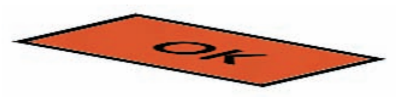


FIGURE 3.11
This time, the `Button` is rotated, scaled, and then skewed.

`TransformGroup` is just another `Transform`-derived class, so it can be used wherever any transform is used.

For maximum performance, the system calculates a combined transform out of a TransformGroup's children and applies it as a single transform, much as if you had used CompositeTransform. Note that you can apply multiple instances of the same transform to a TransformGroup. For example, applying two separate 45° RotateTransforms would result in a 90° rotation.

MatrixTransform

MatrixTransform is a low-level mechanism that can be used to represent all combinations of rotation, scaling, skewing, and translating. MatrixTransform has a single Matrix property (of type Matrix) representing a 3x3 affine transformation matrix. (*Affine* means that straight lines remain straight.) Its Matrix property has the following subproperties representing 6 values in a 3x3 matrix:

$$\begin{bmatrix} \texttt{M11} & \texttt{M12} & \texttt{0} \\ \texttt{M21} & \texttt{M22} & \texttt{0} \\ \texttt{OffsetX} & \texttt{OffsetY} & \texttt{1} \end{bmatrix}$$

The final column's values cannot be changed.

NOTE

MatrixTransform is the only transform that can be specified as a simple string in XAML. For example, you can translate a Button 10 units to the right and 20 units down with the following syntax:

```
<Button RenderTransform="1,0,0,1,10,20"/>
```

The comma-delimited list represents the M11, M12, M21, M22, OffsetX, and OffsetY values, respectively. The values 1, 0, 0, 1, 0, 0 give you the identity matrix (meaning no transform is done), so making MatrixTransform act like TranslateTransform is as simple as starting with the identity matrix and then using OffsetX and OffsetY as TranslateTransform's X and Y values. Scaling can be done by treating the first and fourth values (the 1s in the identity matrix) as ScaleX and ScaleY, respectively. Rotation and skewing are more complicated because they involve sin, cos, and angles specified in radians.

If you're comfortable with the matrix notation, representing transforms with this concise (and less-readable) syntax can be a time saver when you're writing XAML by hand.

Applying 3D Transforms

Although you can integrate DirectX into a XAML app to work with a full 3D graphics engine, the XAML UI Framework does not directly expose full 3D capabilities. It does, however, enable you to perform the most common 3D effects with *perspective transforms*. These transforms escape the limitations of the 2D transforms by enabling you to rotate and translate an element in any or all of the three dimensions.

Perspective transforms are normally done with a class called `PlaneProjection`, which defines `RotationX`, `RotationY`, and `RotationZ` properties. The X and Y dimensions are defined as usual, and the Z dimension extends into and out of the screen, as illustrated in Figure 3.12. X increases from left-to-right, Y increases from top-to-bottom, and Z increases from back-to-front.

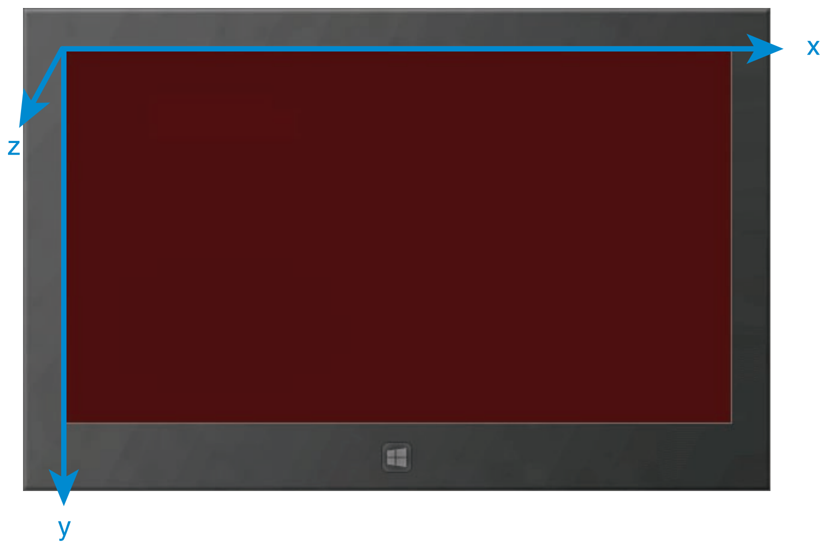


FIGURE 3.12
The three dimensions, relative to the screen

Although plane projections act like transforms, they derive from a class called `Projection` rather than `Transform`. Therefore, one cannot be assigned to an element via its `RenderTransform` property, but rather a separate property called `Projection`. The following plane projections are marked on playing card images, producing the result in Figure 3.13:

```
<StackPanel Orientation="Horizontal">
  <Image Source="Images/CardHA.png" Width="150" Margin="12">
    <Image.Projection>
      <PlaneProjection RotationX="55"/>
    </Image.Projection>
  </Image>
  <Image Source="Images/CardH2.png" Width="150">
    <Image.Projection>
      <PlaneProjection RotationY="55"/>
    </Image.Projection>
  </Image>
  <Image Source="Images/CardH3.png" Width="150" Margin="36">
```

```
    <Image.Projection>
      <PlaneProjection RotationZ="55"/>
    </Image.Projection>
  </Image>
  <Image Source="Images/CardH4.png" Width="150" Margin="48">
    <Image.Projection>
      <PlaneProjection RotationX="30" RotationY="30" RotationZ="30"/>
    </Image.Projection>
  </Image>
</StackPanel>
```

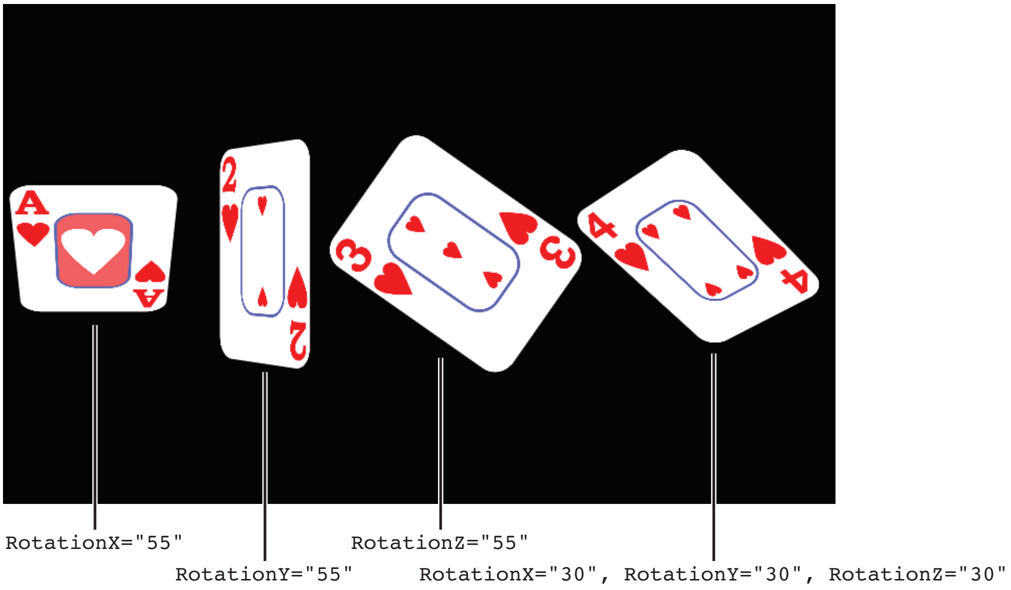


FIGURE 3.13
Using a plane projection to rotate the card around the X, Y, and Z axes, then all three axes

Notice that rotating around only the Z axis is like using a 2D `RotateTransform`, although the direction is reversed.

Much like the 2D transform classes, `PlaneProjection` defines additional properties for changing the center of rotation: `CenterOfRotationX`, `CenterOfRotationY`, and `CenterOfRotationZ`. The first two properties are relative to the size of the element, on a scale from 0 to 1. The `CenterOfRotationZ` property is always in terms of absolute pixels, as elements never have any size in the Z dimension to enable a relative specification.

`PlaneProjection` defines six properties for translating an element in any or all dimensions. `GlobalOffsetX`, `GlobalOffsetY`, and `GlobalOffsetZ` apply the translation after the rotation, so the offsets are relative to the global screen coordinates. `LocalOffsetX`, `LocalOffsetY`, and `LocalOffsetZ` apply the translation before the rotation, causing the rotation to be relative to the rotated coordinate space.

NOTE

One other type of projection exists that can be assigned to an element's `Projection` property: `Matrix3DProjection`, which also derives from the `Projection` base class. This is a low-level construct that enables you to specify the projection as a 4x4 3D transformation matrix. This can be handy if you are already working with 3D transformation matrices, otherwise the simpler `PlaneProjection` is all you need to use.

Further Exploration

Probably the best way to get a feel for the various layout properties is to experiment with them in the Visual Studio XAML designer. You can create a simple `StackPanel` with `Buttons`, such the ones shown in this hour, then watch how things change as you experiment with different properties and values. This can be especially helpful for understanding complicated properties such as `RenderTransform` and `Projection`.

Summary

That concludes our tour of the layout properties that child elements can use to influence the way they appear on the screen. The most important part of layout, however, is the parent panels. This hour repeatedly uses a simple `StackPanel` for simplicity, but the next hour formally introduces this panel and all the other panels as well.

Q&A

Q. What unit of measurement is used by XAML?

A. The various length properties use units of pixels, although they are considered *logical pixels* because they do not always map directly to physical pixels on the screen. Windows automatically scales your app content to either 100%, 140%, or 180% of its natural size based on the size and resolution (and therefore dots-per-inch, or DPI) of the screen. This is why Visual Studio provides different screen size options for the same resolutions in both the simulator and the designer. The latter can be controlled via the Device tool window shown in Figure 3.14.

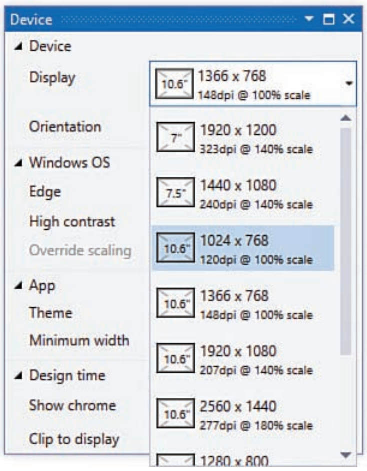

Device
Device
Display
Orientation
Windows OS
Edge
High contrast
Override scaling
App
Theme
Minimum width
Design time
Show chrome
Clip to display
10.6" 1366 x 768 148dpi @ 100% scale
7" 1920 x 1200 323dpi @ 140% scale
7.5" 1440 x 1080 240dpi @ 140% scale
10.6" 1024 x 768 120dpi @ 100% scale
10.6" 1366 x 768 148dpi @ 100% scale
10.6" 1920 x 1080 207dpi @ 140% scale
10.6" 2560 x 1440 277dpi @ 180% scale
1280 x 800

FIGURE 3.14
Size matters when it comes to the device's screen, due to the automatic scaling called out in the "Display" dropdown.

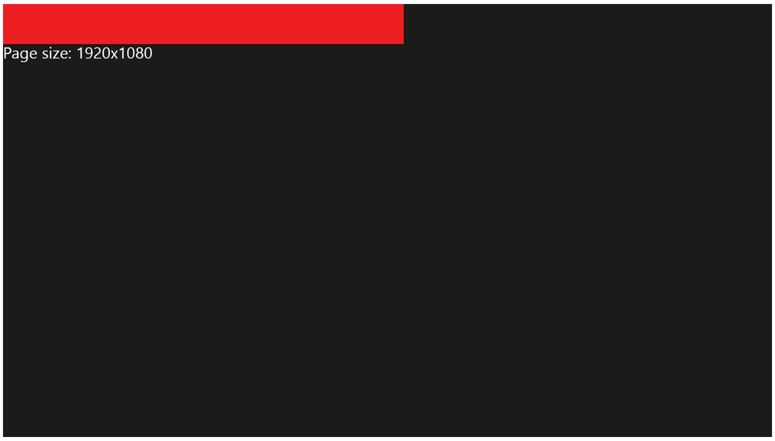
The effect of this scaling can be easily seen with the following XAML placed in a `Page`:

```
<StackPanel HorizontalAlignment="Left">
  <Rectangle Fill="Red" Height="100" Width="1000"/>
  <TextBlock Name="textBlock" FontSize="40"/>
</StackPanel>
```

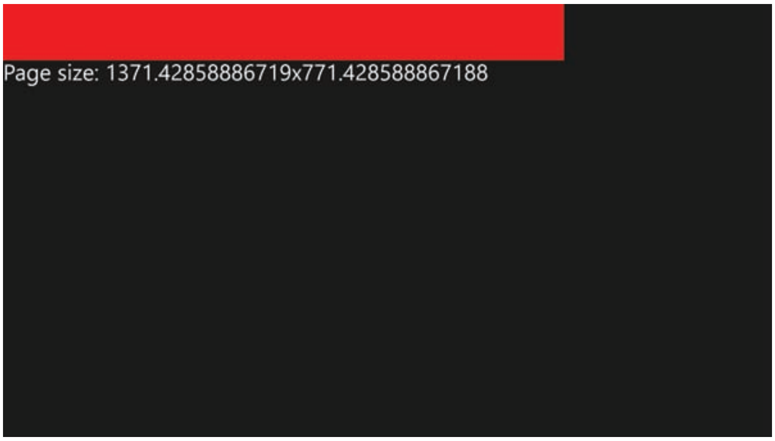
with code-behind that sets the `TextBlock`'s `Text` to the `Page`'s current dimensions as reported by the XAML UI Framework:

```
this.textBlock.Text = "Page size: " + this.ActualWidth + "x" +
    this.ActualHeight;
```

Figure 3.15 shows the result on two different simulator settings. In both cases, the red `Rectangle` is 1,000 units long as far as your code is concerned. However, it gets scaled larger on the smaller screen (and the `Page`'s reported bounds are now smaller than the true resolution). Depending on the screen, a user can also bump up the scale from 100% to 140% or 140% to 180% by selecting the "Change the size of apps on the displays that can support it" option in the "Display" section of the PC Settings app.


Page size: 1920x1080

23" screen at
1920x1080
(100% scale)


Page size: 1371.42858886719x771.428588867188

10.6" screen at
1920x1080
(140% scale)

FIGURE 3.15
The same page at the same resolution, but under two different simulator screen sizes

Q. What's the difference between using the `CenterX` and `CenterY` properties on transforms such as `RotateTransform` versus using the `RenderTransformOrigin` property on `UIElement`?

A. When a transform is applied to a `UIElement`, the `CenterX` and `CenterY` properties at first appear to be redundant with `RenderTransformOrigin`. Both mechanisms control the origin of the transform.

However, `CenterX` and `CenterY` enable absolute positioning of the origin rather than the relative positioning of `RenderTransformOrigin`. Their values are specified as logical pixels, so the top-right corner of an element with a `Width` of `20` would be specified with `CenterX` set to `20` and `CenterY` set to `0` rather than the point (1,0). Also, when multiple

`RenderTransforms` are grouped together (described later in this hour), `CenterX` and `CenterY` on individual transforms enable more fine-grained control.

That said, `RenderTransformOrigin` is generally more useful than `CenterX` and `CenterY`. For the common case of transforming an element around its middle, the relative (.5,.5) `RenderTransformOrigin` is easy to specify in XAML, whereas accomplishing the same thing with `CenterX` and `CenterY` would require writing some C# code to calculate the absolute offsets.

Note that you can use `RenderTransformOrigin` on an element simultaneously with using `CenterX` and `CenterY` on its transform. In this case, the two `X` values and two `Y` values are combined to calculate the final origin point.

Q. How do transforms such as `ScaleTransform` affect `FrameworkElement`'s `ActualHeight` and `ActualWidth` properties?

A. Applying a transform to `FrameworkElement` never changes the values of these properties. Therefore, because of transforms, these properties can "lie" about the size of an element on the screen. For example, all the `Button`s in Figures 3.9 and 3.10 have the same `ActualHeight` and `ActualWidth`.

Such "lies" might surprise you, but they're usually for the best. The point of transforms is to alter an element's appearance without the element's knowledge. Giving elements the illusion that they are being rendered normally enables arbitrary controls to be plugged in and transformed without special handling.

Q. How does `ScaleTransform` affect `Margin` and `Padding`?

A. `Padding` is scaled along with the rest of the content (because `Padding` is internal to the element), but `Margin` does not get scaled. As with `ActualHeight` and `ActualWidth`, the numeric `Padding` property value does not change, despite the visual scaling.

Q. Given the impact of transforms, how can I easily get the true position and size of an element?

A. Sometimes you do really need to know an element's final position and size, taking into account the effects from transforms. For example, several Windows Runtime APIs require the position or bounds of an on-screen element so Windows can display system UI in the right spot.

You can get a window-relative position that accounts for all transforms as follows:

```
static Point GetPositionInWindow(FrameworkElement element)
{
  GeneralTransform transform = element.TransformToVisual(null);
  return transform.TransformPoint(new Point() /* Represents 0,0 */);
}
```

You can get the bounding rectangle as follows:

```
static Rect GetBoundsInWindow(FrameworkElement element)
{
  GeneralTransform transform = element.TransformToVisual(null);
  return transform.TransformBounds(
    new Rect(0, 0, element.ActualWidth, element.ActualHeight));
}
```

Workshop

Quiz

1. What event on `FrameworkElement` is raised its layout has been triggered?
2. When specifying four values for a `Thickness` value such as `Margin`, what is the meaning of each value, in order?
3. What property can be set on an element to reverse its notion of left and right?

Answers

1. `LayoutUpdated`.
2. Left, Top, Right, and then Bottom.
3. `FlowDirection`.

Exercises

1. Place a `Button` within a `Page` and choose a `Margin` for the `Button`. Then try to produce the same result by replacing the `Margin` with a `TranslateTransform` instead. Then try to produce the same result by replacing the `TranslateTransform` with a `MatrixTransform`.
2. Visualize a playing card positioned in 3D space. Then take the playing card example from Figure 3.13, and try to update one of the card's `PlaneProjection`s to match the angle you're picturing.

This page intentionally left blank

Index

Symbols & Numerics

{ (open curly braces), escaping, 30

2D transforms
- RenderTransform property, 64
- RotateTransform, 65
- ScaleTransform, 66
- SkewTransform, 67-68
- TranslateTransform, 67-68

3D transforms, 70-73

A

AAMVA (American Association of Motor Vehicle Administrators) cards, 675

absolute sizing, 92

accelerometer, reading from, 647-651
- shaking, 650
- tossing motion, 649-650

accessibility
- handling high contrast themes, 51-53
- improving screen reading, 49-50
- UI Accessibility Checker, 49

accessing known folders, 563

Account Picture Provider contract, 613-615

activating apps, 165, 169-171

activation contracts. *See* contracts

AddDeleteThemeTransition, 455-456

adding
- ads to pages, 736-738
- advertisements to apps, 734-739
  - advanced AdControl behaviors, 738-739
  - defining ad units in pubCenter, 734-739
- effects to media playback, 340-341
- key/value pairs to dictionaries, 33-34

adjusting camera settings (MediaCapture), 355-357

advanced AdControl behaviors, 738-739

advertisements, adding to apps, 734-739
- adding ads to pages, 736-738
- advanced AdControl behaviors, 738-739
- defining ad units in pubCenter, 734-739

alignment
- content alignment, 61-63
- FlowDirection property, 63
- HorizontalAlignment property (FrameworkElement), 60-61
- VerticalAlignment property (FrameworkElement), 60-61

animation
- custom animations, 464-475
  - controlling duration, 467
  - independent versus dependent animations, 465-466
  - From property, 467-469
  - To property, 467-469
  - property paths, 473-475
  - Storyboards with multiple animations, 472-473
  - Timeline properties, 469-472
- easing functions, power easing functions, 481
- keyframes, 475-480
  - discrete keyframes, 478-480
  - easing, 480
  - linear keyframes, 475-477
  - spline keyframes, 477-478
- manual animations, 484-486
- theme animations, 459-464
  - tweaking, 463-464
- theme transitions, 448-459
  - AddDeleteTheme-Transition, 455-456
  - applying to elements, 448-449
  - ContentTheme-Transition, 452-453
  - EdgeUIThemeTransition, 453
  - EntranceTheme-Transition, 450-451
  - PaneThemeTransition, 453-454
  - PopupThemeTransition, 452
  - ReorderThemeTransition, 458-459
  - RepositionTheme-Transition, 457-459

APIs
- device scenario APIs, 665
- mouse-specific, 139
- WinRT, 2

app bars, 222-229

app data, 553-559
- app files, 556-559
  - local files, 557
  - packaged files, 557
  - roaming files, 558-559
- app settings, 554-556
  - local settings, 554-555
  - roaming settings, 555-556

app files
- local files, 557
- packaged files, 557
- roaming files, 558-559

app settings, 554-556
- local settings, 554-555
- roaming settings, 555-556

app themes, 202

AppBar control, 224-225
AppBarButton control, 207-214
- icons, 208-214
  - BitmapIcon, 212-214
  - PathIcon, 211-212
  - SymbolIcon, 208-209
- properties, 207

AppBarToggleButton control, 216
Application class, methods, 169-170
Application tab (package manifest), 8
applying
- borders to windows, 195-197
- theme transitions to elements, 448-449

Appointment Provider contract, 634-636
- Appointment Provider sources, 635
- Appointment Provider targets, 635-636

apps
- accessibility
  - handling high contrast themes, 51-53
  - improving screen reading, 49-50
  - UI Accessibility Checker, 49
- activating, 165
- advertising, 734-739
  - adding ads to pages, 736-738
  - advanced AdControl behaviors, 738-739
  - defining ad units in pubCenter, 734-739
- capabilities, restricting, 14-15
- execution states, 160-161
- free trials
  - feature-differentiated trials, 740-742
  - time-based trials, 740
- globalization, 42
- Hour1 project, updating, 39-42
- in-app purchases, 744-753
- launching
  - LaunchActivatedEventArgs, 166-167
  - programmatically launching apps, 174-177
- lifecycle, 159-161
  - activating apps, 169-171
  - killing apps, 161-162
  - launching apps, 165-169
  - resuming apps, 164-165
  - session state, managing, 171-174
  - session state, representing, 171-172
  - suspending apps, 162-164
  - terminating apps, 165
- listings, 19-20
- localization, 42-48
  - Pseudo Language, 45-48
- promotional images, 20
- running in background, 161
- splash screen, customizing, 9
- submitting to Windows Store, 18-20
- supporting full license purchases, 742-744
- suspended, 159
- Visual Studio
  - launching, 5-7
  - troubleshooting, 7
- windows displaying multiple windows, 186-189

artifacts (image), 302
asynchronous methods, 182-184
attached properties, 85-86
- VariableSizedWrapGrid panel, 95-96

attributes, XAML, 25
audio
- background audio, 636-640
- capturing, 358-359
- custom media formats, 345-347
- customizing playback, 338-339
- MediaElement, 341-343
- MediaPlayer, 343-344
- playing
  - adding effects, 340-341
  - markers, 339-340
  - media content, 337-338

automated Windows Store testing, 759-760

AutoPlay contract, 616-617
AutoPlay Device contract, 616-617
AutoReverse property (Timeline), 470
autosizing, 92
awaiting a method, 183
awaiting an asynchronous operation, 182-184

B

BackEase function, 481
background color, specifying for tile images, 12-13
background tasks, 636-645
- background audio, 636-640
- custom background tasks, 641-645

background threads, 181-182
background transfers, 569-572
badges, 708-710
bank cards, 675
barcode scanners, 670-674
- BarcodeScanner instance, obtaining, 671
- claiming the device, 671-673
- enabling the device, 673
- retrieving data, 673-674

BarcodeScanner instance, obtaining, 671
BeginTime property (Timeline), 469-470
behaviors
- advanced AdControl behaviors, 738-739
- ButtonBase behaviors, 206-207

Bézier curves, 420
Binding markup extension, 525-527
- in C#, 527

bitmap-based brushes, 435-442
- ImageBrush, 435-438
- WebViewBrush, 437-442

BitmapDecoder class, decoding images, 308-317
- getting pixel data, 310-313

BitmapEncoder class, 318-325
- writing pixel data, 319-321

BitmapIcon, 212-214
BitmapProperties reading metadata, 315-316
Blend, 24
Bluetooth devices, 676-679
- communicating with, 678-679
- connecting to, 677-678
- declaring right device capability, 676-677

Bluetooth Smart devices
- communicating with, 681-682
- connecting to, 680-681
- declaring the right capability, 679-680

borders, applying to windows, 195-197
BounceEase function, 481
Brushes
- bitmap-based brushes, 435-442
  - ImageBrush, 435-438
  - WebViewBrush, 437-442
- color brushes, 428-435
  - LinearGradientBrush, 429-435
  - SolidColorBrush, 428-429

built-in controls, 203
- content controls
  - AppBar control, 224-225
  - AppBarButton control, 207-214
  - AppBarToggleButton control, 216
  - Button control, 204-207
  - CheckBox control, 217
  - CommandBar control, 226-229
  - HyperlinkButton control, 214
  - RadioButton control, 217-219
  - RepeatButton control, 215
  - ToggleButton control, 215-216
  - ToolTip control, 219-222
- items controls, 233-234
  - ComboBox control, 239-241
  - GridView control, 246-247

ItemsControl control, 234-236
ListBox control, 241-242
ListView control, 242-246
MenuFlyout control, 255
panels, 236-239
text controls, 259
PasswordBox control, 287-289
RichEditBox control, 284-287
RichTextBlock control, 272-277
TextBlock control, 259-271
TextBox control, 277-284
built-in panels, 84-97
Canvas, 84-86
Grid, 87-94
StackPanel panel, 86-87
VariableSizedWrapGrid panel, 94-97
bulk transfers, 684-685
Button control, 204-207
ButtonBase behaviors, 206-207
Flyouts, associating, 204-206
ButtonBase behaviors, 206-207
buttons, 203-204
AppBarButton control, 207-214
icons, 208-214
Button control, 204-207
Flyouts, associating, 204-206
HyperlinkButton control, 214

C

C#
Binding markup extension, 527
combining with XAML, 35
comparing to XAML, 25
composing JavaScript, 406-407
cached composition, 443-444
caching
controlling, 568-569
Pages, 193-194
camera settings, adjusting, 355-357
CameraCaptureUI, capturing media
photos, 348-350
video, 350-351
Canvas panel, 84-86
attached properties, 85-86
hit testing, 124
capabilities
device capabilities, 15-16
identity capabilities, 17
Location capability, 653-660
geofencing, 657-660
getting current location, 653-656
MouseCapabilities class, 139
network capabilities, 16
restricting, 14-15
Capabilities tab (package manifest), 13-17
file capabilities, 15
CaptureElement, 351
capturing
audio, 358-359
media, 347-359
photos, 348-350
video, 350-351
photos, 354-355
Pointers, 120-122
video, 357-358
web content with WebView control, 407-408
certification process, Windows Store, 19-20
charms, 579
Devices charm, 592-603
customizing projection, 603
Play To feature, 601-603
printing, 593-601
Search charm, 580-585
customizing the Search pane, 581-584
showing Search pane programmatically, 585
Windows 8 Search contract, 580-581
Settings charm, 603-608
handling links with SettingsPane, 605-608
showing links, 604

Share charm, 585-592
share sources, 585-589
share targets, 589-592

CheckBox control, 217

child elements, layout, 57-58

child object elements
clipping, 98-100
collection items, 32-34
content property, 31-32
stacking, 86-87
type converted values, 34

CircleEase function, 481

classes
Application class, 169-170
Control class, 53
DependencyObject class, 53
Frame class, 191-193
FrameworkElement class, 53
FlowDirection property, 63
Height properties, 58-59
Margin property, 59-60
Padding property, 59-60
VerticalAlignment property, 60-61
Width properties, 58-59
Geolocator class, 653-660
GestureRecognizer class (WinRT), 128-131
InkManager class (WinRT), 142–150
MouseCapabilities class, 139
MouseDevice class, 139
NavigationHelper class, 194-195
.NET, using in XAML, 34
Object class, 53
Page class, 53
Pointer class, 115
PointerDevice class, 114-115
PointerPoint class, 115-116
properties, 116
RenderTargetBitmap class, 302
SuspensionManager class, 172-174
Thickness class, 60
UIElement class, 53
gesture events, 133
WriteableBitmap class, 299-302

clipping, 98-100

code-behind files
combining C# and XAML, 35
Hour1 project, 37-41

collections, 32-34
data binding, 530-533
dictionaries, 33-34
view, customizing, 541-545
grouping, 542-545
navigating, 545

color, handling high contrast themes, 51-53

color brushes, 428-435
LinearGradientBrush, 429-435
SolidColorBrush, 428-429

columns
arranging children objects with Grid panel, 87-94
sizing, 92-94

combining
C# and XAML, 35
transforms
CompositeTransform, 68-69
MatrixTransform, 70
TransformGroup, 69-70

ComboBox control, 239-241

CommandBar control, 226-229

communicating with NFC peer device, 662-663

comparing
C# and XAML, 25
gestures and manipulations, 133-134
independent and dependent animations, 465-466

compass, 651-652

composing
HTML with XAML, 405-406
JavaScript with C#, 406-407

CompositeTransform, 68-69

conditions for suspending apps, 163

configuring scan sources, 669

connecting to Bluetooth devices, 677-678

constructors, sizing Grid panel, 93-94

consumable products, in-app purchases, 748-753

Contact contract, 630-634
  contact sources, 630-632
  contact targets, 632-634
Contact Manager, 630-634
Contact Picker contract, 627-630
  contact sources, 627-629
  contact targets, 629-630
content alignment, 61-63
content controls, 203
  AppBar control, 224-225
  AppBarButton control, 207-214
    icons, 208-214
    properties, 207
  AppBarToggleButton control, 216
  Button control
    ButtonBase behaviors, 206-207
    Flyouts, associating, 204-207
  buttons, 203-204
  CheckBox control, 217
  CommandBar control, 226-229
  HyperlinkButton control, 214
  RadioButton control, 217-219
  RepeatButton control, 215
  ToggleButton control, 215-216
  ToolTip control, 219-222
content overflow, handling, 97-109
  clipping, 98-100
  scaling, 105-109
    interactive zooming, 109
    Viewbox, 106-108
  scrolling, 99-105
    snap points, 104-105
content property, 31-32
Content URIs tab (package manifest), 17
ContentThemeTransition, 452-453
contracts, 611-613
  Account Picture Provider contract, 613-615
  Appointment Provider contract, 634-636
    Appointment Provider sources, 635
    Appointment Provider targets, 635-636
  AutoPlay contract, 616-617
  AutoPlay Device contract, 616-617
  background tasks, 636-645
    background audio, 636-640
    custom background tasks, 641-645
  Contact contract, 630-634
    contact sources, 630-632
    contact targets, 632-634
  Contact Picker contract, 627-630
    contact sources, 627-629
    contact targets, 629-630
  File Open Picker declaration, 622-626
  File Save Picker contract, 626-627
  File Type Associations declarations, 619-620
  Protocol contract, 621-622
  Windows 8 Search contract, 580-581
Control class, 53
control templates, 503-505
  dependency properties, hijacking, 511
  inserting property values, 505-507
control transfers, 684
controlling
  caching, 568-569
  duration for custom animations, 467
  rendering with data binding, 533-541
    data templates, 534-537
    value converters, 537-541
controls. *See also* control templates
  built-in controls, 203
  content controls
    AppBar control, 224-225
    AppBarButton control, 207-214

AppBarToggleButton control, 216
Button control, 204-207
CheckBox control, 217
CommandBar control, 226-229
RadioButton control, 217-219
RepeatButton control, 215
ToggleButton control, 215-216
ToolTip control, 219-222
date and time controls, 397-399
DatePicker control, 397-398
TimePicker control, 399
explicit sizing, 59
Hub, 391-397
Hub control, HubSections, 394-397
items controls, 233-234
ComboBox control, 239-241
FlipView control, 248-250
GridView control, 246-247
ItemsControl control, 234-236
ListBox control, 241-242
ListView control, 242-246
MenuFlyout control, 255
panels, 236-239
popup controls, 381-391
CoreWindowDialog control, 381-385
CoreWindowFlyout control, 385-386
MessageDialog control, 386-387
Popup control, 389-391
PopupMenu control, 387-389
ProgressRing control, 400
range controls, 371-374
ProgressBar control, 371-372
Slider control, 372-374
ScrollViewer
customizing, 101-104
SearchBox control, 374-380
history suggestions, 375-376
local content suggestions, 379
query suggestions, 377
result suggestions, 380
text controls, 259
PasswordBox control, 287-289
RichEditBox control, 284-287
RichTextBlock control, 272-277
TextBlock control, 259-271
TextBox control, 277-284
ToggleSwitch control, 400-402
Viewbox, 106-108
visual states, 512-521
responding to changes, 513-516
visual transitions, 516-521
WebView control, 402-408
capturing web content, 407-408
composing HTML with XAML, 405-406
composing JavaScript with C#, 406-407
navigation, 403-405
cookies, manipulating, 568
CoreDispatcher mechanism, 185
CoreWindowDialog control, 381-385
CoreWindowFlyout control, 385-386
CPU Sampling tool (Visual Studio), 7
crashes, handling, 162
CreateWindowAsync method, 186-189
CrossSliding event, 128
curly braces ({}), escaping, 30
current location, obtaining, 653-656
CurrentAppSimulator, 756-759
curves, Bézier curves, 420
custom animations, 464-475
controlling duration, 467
independent versus dependent animations, 465-466

keyframes, 475-480
discrete keyframes, 478-480
easing, 480
linear keyframes, 475-477
spline keyframes, 477-478
From property, 467-469
To property, 467-469
property paths, 473-475
Storyboards with multiple animations, 472-473
Timeline properties, 469-472
custom background tasks, 641-645
custom Bluetooth devices, 676-679
communicating with, 678-679
connecting to, 677-678
declaring right device capability, 676-677
custom HID devices
communicating with, 687-688
connecting to, 687
declaring the right capability, 686
custom media formats, 345-347
custom USB devices, 682-685
communicating with, 684-685
bulk transfers, 684-685
control transfers, 684
interrupt transfers, 685
connecting to, 683-684
declaring the right capability, 682-683
customizing
app launch, 175-177
collection view, 541-545
grouping, 542-545
navigating, 545
logo images for apps, 10-13
media playback, 338-339
page rendering, 328-331
ScrollViewer, 101-104
Search pane, 581-584
splash screen for apps, 9
text rendering, 261-265

D

dark themes, 201
data
app data, 553-559
app settings, 554-556
fetching over networks, 564-575
background transfers, 569-572
HTTP requests, 565-569
sockets, 572
syndication, 572-574
user data, 559-564
file picker, 560
folder picker, 561-562
known folders, accessing, 563
libraries, 563-564
data binding, 525
app data, app files, 556-559
Binding markup extension, 525-527
in C#, 527
to collections, 530-533
controlling rendering, 533-541
value converters, 537-541
customizing the data flow, 528-529
to plain properties, 527-528
sharing source with DataContext, 529-530
data templates, 534-537
data virtualization, 246
DataContext, sharing data binding source with, 529-530
date and time controls, 397-399
DatePicker control, 397-398
TimePicker control, 399
DatePicker control, 397-398
Declarations tab (package manifest), 17
declaring
Bluetooth device capability, 676-677
XAML elements, 25
XML namespaces, 26

decoding images, 308-317
- getting pixel data, 310-313
- reading metadata, 313-317
  - BitmapProperties, 315-316
  - ImageProperties, 314-315
  - raw metadata, 317

deferrals, handling suspended apps, 164

defining ad units in pubCenter, 734-739

DependencyObject class, 53

detecting
- gestures, 128-131
- keyboard input, 150-156
- manipulations, 133-138
- mouse input, 138-141
- orientation, 652-653
- pen input, 141-150
- shaking with accelerometer, 650
- tossing motion with accelerometer, 649-650

developer tools used in this book, downloading, 3

device capabilities, 15-16

device scenario APIs, 665
- barcode scanners, 670-674
  - BarcodeScanner instance, obtaining, 671
  - claiming the device, 671-673
  - enabling the device, 673
  - retrieving data, 673-674
- Bluetooth Smart devices
  - communicating with, 681-682
  - connecting to, 680-681
  - declaring the right capability, 679-680
- custom Bluetooth devices, 676-679
  - communicating with, 678-679
  - connecting to, 677-678
  - declaring right device capability, 676-677
- custom HID devices
  - communicating with, 687-688
  - connecting to, 687
  - declaring the right capability, 686
- custom USB devices, 682-685
  - communicating with, 684-685
  - connecting to, 683-684
  - declaring the right capability, 682-683
- fingerprint readers, 666
- image scanners, 666-670
  - configuring scan sources, 669
  - ImageScanner instance, obtaining, 667
  - performing scans, 667-668
  - previews, displaying, 669-670
- magnetic stripe readers, 674-676
- Wi-Fi devices, 688-690

Devices charm, 592-603
- customizing projection, 603
- Play To feature, 601-603
- printing, 593-601
  - adding custom options, 600-601
  - changing default options, 599
  - configuring displayed options, 599-600

dictionaries, 33-34

digitizers, 141

discovering
- window orientation, 82-84
- window size, 80-81

discrete keyframes, 478-480

Dispatcher, 185

displaying multiple windows, 186-189

downloading
- developer tools used in this book, 3
- source code examples in this book, 3
- Visual Studio, 5

drag-and-drop support, enabling for UIElements, 120-122

Dragging events, 140-141

DragItemThemeAnimation, 463

DragOverThemeAnimation, 463

DropTargetItemTheme-Animation, 463

durable products, in-app purchases, 746-748

duration, controlling for custom animations, 467

dynamic color, handling high contrast themes, 51-53

dynamic images

generating with RenderTargetBitmap class, 302

generating with WriteableBitmap, 299-302

E

easing functions, 480-484

power easing functions, 481

easing keyframes, 480

EdgeGesture, 132-133

EdgeUIThemeTransition, 453

effects, adding to media playback, 340-341

ElasticEase function, 481

elements

applying theme transitions, 448-449

hit testing, 123-124

wrapping, 94-97

XAML, 25

property elements, 27-28

Z order, 86

ellipses, 413

embedding, UIElements, 273-274

enabling

barcode scanners, 673

drag-and-drop support for UIElements, 120-122

incremental item rendering, 547

encoding

images, 318-325

writing metadata, 321-322

writing pixel data, 319-321

transcoding, 322-325

Energy Consumption tool (Visual Studio), 7

enlarging elements, ScaleTransform, 66

EntranceThemeTransition, 450-451

escaping curly braces, 30

event bubbling, 117-119

halting, 119-120

event handlers

LayoutUpdated event handler, 80

OnSuspending event handler, 163-164

for routed events, 118

events. *See also* event handlers

Dragging events, 140-141

gesture events, 128

UIElement class, 133

manipulation events, 134-138

inertia, 138

media, 339

pointer events, 116-119

keyboard modifiers, 154

Resuming event, 164-165

Suspending event, handling, 163-164

execution states of apps, 160-161

explicit sizing of controls, 59

ExponentialEase function, 483

extended splash screens, 42

F

FadeInThemeAnimation, 462

FadeOutThemeAnimation, 462

feature-differentiated trials, 740-742

fetching data over networks, 564-575

background transfers, 569-572

HTTP requests, 565-569

controlling caching, 568-569

GET requests, 565-567

HTTP filters, 567

HTTP prefetching, 569

manipulating cookies, 568

sockets, 572

syndication, 572-574

file capabilities, 15

File Open Picker declaration, 622-626

file picker, 560

File Save Picker contract, 626-627
File Type Associations declarations, 619-620
files, 551-553
- app files, 556-559
  - local files, 557
  - packaged files, 557
  - roaming files, 558-559
- custom media formats, 345-347
- loading
  - automatic loading, 303-306
  - manual loading, 306-307
- programmatically launching apps for, 174
- referencing with URIs, 294-296
- trimming, 363-364

FillBehavior property (Timeline), 472
FillRule, 423
filters, HTTP, 567
fingerprint readers, 666
FlipView control, 248-250
flow direction, 60
FlowDirection property (FrameworkElement), 63
Flyouts, 204-206
focus, 155-156
folder picker, 561-562
folders, 551-553
- known folders, accessing, 563

foreign languages
- localization, 42-48
- Microsoft Local Language Portal, 48
- Microsoft Translator service, 46

Frame class, 195-197
- navigating between Pages, 191-193

FrameworkElement class, 53
- Height properties, 58-59
- HorizontalAlignment property, 60-61
- Padding property, 59-60
- RequestedTheme property, 202
- VerticalAlignment property, 60-61
- Width properties, 58-59

free trials
- feature-differentiated trials, 740-742
- time-based trials, 740

full license purchases, supporting, 742-744
functions, easing functions, 480-484
- power easing functions, 481

G

generating dynamic images with WriteableBitmap class, 299-302
geofencing, 657-660
Geolocator class, 653-660
Geometries, 419-427
- Bézier curves, 420
- FillRule, 423
- GeometryGroup, 423-425
- PathFigures, 420-422
- PathSegments, 420-422
- representing as strings, 425-427

GeometryGroup, 423-425
GestureRecognizer class (WinRT), 128-131
- interacting with, 129-131
- mouse dragging events, recognizing, 140

gestures, 127-133
- EdgeGesture, 132-133
- events, 128
- manipulations, 133-138
  - inertia, 138
- UIElement gesture events, 133

GET requests, 565-567
GetAsyncKeyState method, 152-154
GetIntermediatePoints method, 118
GetKeyState method, 152-154
GetPosition method, 118
globalization, 42
Grid panel, 87-94
GridView control, 246-247
- high-performance rendering, 545-549

gyrometer, 651

H

halting, event bubbling, 119-120

handling

- content overflow, 97-109
  - clipping, 98-100
  - interactive zooming, 109
  - scaling, 105-109
  - scrolling, 99-105
  - snap points, 104-105
  - Viewbox, 106-108
- crashes, 162
- high contrast themes, 51-53
- keyboard input, 150-156
  - focus, 155-156
  - key states, retrieving, 152-154
- keyboard input, keyboard modifiers in pointer events, 154
- links with SettingsPane, 605-608
- mouse input, 138-141
  - mouse-specific APIs, 139
- pen input, 141-150
  - digitizers, 141
  - palm rejection, 141
- Suspending event, 163-164
- touch input, 114-138
  - gestures, 127-133
  - manipulations, 133-138
  - pointers, 114-127

handwriting

- recognizing, 147-150
- rendering, 142-148

hardcoded color, handling high contrast themes, 51-53

Height properties, 58-59

HID devices

- communicating with, 687-688
- connecting to, 687
- declaring the right capability, 686

high contrast themes, handling, 51-53

high-performance rendering, 545-549

hijacking dependency properties, 511

history suggestions (SearchBox), 375-376

hit testing, 123-124

Holding event, 128

HorizontalAlignment property (FrameworkElement), 60-61

HorizontalContentAlignment property (Control class), 61-62

Hour1 project

- application definition, updating, 39-42
- main page, code-behind, 37-38
- main page logic, updating, 35-42

HTML, composing with XAML, 405-406

HTTP requests

- controlling caching, 568-569
- GET requests, 565-567
- HTTP filters, 567
- HTTP prefetching, 569
- manipulating cookies, 568

Hub control, 391-397

- HubSections, 394-397

HubSections, 394-397

HyperlinkButton control, 214

I

IconElement, 208. ***See also*** **icons**

icons (AppBarButton control), 208-214

- BitmapIcon, 212-214
- PathIcon, 211-212
- SymbolIcon, 208-209

identity capabilities, 17

Image element (XAML), 294-302

- artifacts, 302
- leveraging resource packages, 307
- loading file variations
  - automatic loading, 303-306
  - manual loading, 306-307
- nine-grid, custom stretching, 296-299
- referencing files with URIs, 294-296
- RenderTargetBitmap class, generating dynamic images, 302
- scaling, 302-303
- WriteableBitmap class, generating dynamic images, 299-302

image scanners, 666-670
- configuring scan sources, 669
- ImageScanner instance, obtaining, 667
- performing scans, 667-668
- previews, displaying, 669-670

image-based large tile templates, 705-706

ImageBrush, 435-438

ImageProperties, reading metadata, 314-315

images
- decoding, 308-317
  - getting pixel data, 310-313
  - reading metadata, 313-317
- encoding, 318-325
  - writing metadata, 321-322
  - writing pixel data, 319-321
- logos, customizing for apps, 10-13
- manipulating, 135-138
- PDF pages, rendering, 326-328
- promotional app images, 20
- tile images, specifying background color, 12-13
- transcoding, 322-325

ImageScanner instance, obtaining, 667

implicit styles, 499-500

improving screen reading, 49-50

in-app purchases, 744-753
- consumable products, 748-753
- durable products, 746-748

inclinometer, 651

incremental item rendering, 246, 546

independent versus dependent animations, 465-466

inertia, 138

inheritance, styles, 497-499

InkManager class (WinRT)
- recognizing handwriting, 147-150
- rendering handwriting, 142-148

input, 113
- keyboard input, handling, 150-156
- mouse input, handling, 138-141
- pen input, handling, 141-150
- touch input, handling, 114-138

inserting property values in control templates, 505-507

intended audience for this book, 2

interacting with GestureRecognizer, 129-131

interrupt transfers, 685

IsColorFontEnabled property (TextBlock), 264-265

items controls, 233-234
- ComboBox control, 239-241
- FlipView control, 248-250
- GridView control, 246-247
- ItemsControl control, 234-236
- ListBox control, 241-242
- ListView control, 242-246
  - data virtualization, 246
  - incremental item rendering, 246
  - reordering items, 245
  - ScrollIntoView method, 243
  - selection methods, 244-245
- MenuFlyout control, 255
- panels, 236-239
- SemanticZoom, 251-254

ItemsControl control, 234-236

J-K

JavaScript, 2
- composing with C#, 406-407

jumping to HubSections, 396-397

key states, retrieving, 152-154

keyboard input, handling, 150-156
- focus, 155-156
- key states, retrieving, 152-154
- keyboard modifiers in pointer events, 154
- TextBox control, 277-284

keyframes, 475-480
- discrete keyframes, 478-480
- easing, 480
- linear keyframes, 475-477
- spline keyframes, 477-478

key/value pairs, adding to dictionaries, 33-34

killing apps, 161-162
- versus terminating, 165

known folders, accessing, 563

L

landscape screen orientation, discovering, 82-84

languages
- localization, 42-48
- Microsoft Local Language Portal, 48
- Microsoft Translator service, 46
- Multilingual App Toolkit, 45
- Pseudo Language, 45-48

large tile templates, 703

LaunchActivatedEventArgs, 166-167

launching
- apps, 165-169
  - customizing launch, 175-177
  - LaunchActivatedEvent Args, 166-167
  - programmatically launching apps, 174-177
  - reacting to PreviousExecutionState, 167-169
- Visual Studio apps, 5-7

layout, 57-58, 79-80
- clipping, 98-100
- panels, 84-97
  - Canvas, 84-86
  - Grid, 87-94
  - StackPanel, 86-87
- sizing
  - absolute sizing, 92
  - autosizing, 92
  - proportional sizing, 92
- window orientation, discovering, 82-84
- window size, discovering, 80-81

LayoutUpdated event handler, 80

leveraging resource packages, 307

libraries, 563-564

lifecycle of apps, 159-161
- activating apps, 169-171
- killing apps, 161-162
- launching apps, 165-169
  - customizing launch, 175-177
  - LaunchActivatedEvent Args, 166-167
  - programmatically launching apps, 174-177
  - reacting to PreviousExecutionState, 167-169
- resuming apps, 164-165
- session state
  - managing, 171-174
  - representing, 171-172
- suspended apps
  - deferrals, 164
  - OnSuspending event handler, 163-164
- suspending apps, 162-164
- terminating apps, 165

light sensor, 652

linear keyframes, 475-477

LinearGradientBrush, 429-435

LineHeight property (TextBlock), 261

links
- handling with SettingsPane, 605-608
- showing, 604

ListBox control, 241-242

listings, 19-20

ListView control, 242-246
- data virtualization, 246
- high-performance rendering, 545-549
- incremental item rendering, 246
- reordering items, 245
- ScrollIntoView method, 243
- selection methods, 244-245

live regions, 50
live tiles
  badges, 708-710
  secondary tiles, 710-713
  tile templates, 693-706
    image-based large templates, 705-706
    large templates, 703
    medium tile templates, 696
    peek medium templates, 697-700
    peek wide templates, 700
    static image-based wide templates, 700
    static medium templates, 696
    static text-only wide templates, 700
    text-only large templates, 703-705
    wide templates, 700
  updating, 706-708
    local updates, 707
    pull updates, 707-708
    push notifications, 708
    scheduled updates, 707
loading file variations
  automatic loading, 303-306
  manual loading, 306-307
local content suggestions (SearchBox), 379
local files, 557
local settings, 554-555
localization, 42-48
  Microsoft Translator service, 46
  Pseudo Language, 45-48
Location capability, 653-660
  geofencing, 657-660
  getting current location, 653-656
lock screen, 726-728
logic for Hour1 project, 37-38
logo images, customizing for apps, 10-13

M

magnetic stripe readers, 674-676
managing session state, 171-174
manifest, 8-18
  Application tab, 8
  Capabilities tab, 13-17
    device capabilities, 15-16
    file capabilities, 15
    identity capabilities, 17
    network capabilities, 16
  Content URIs tab, 17
  Declarations tab, 17
  File Open Picker declaration, 622-626
  File Type Associations declarations, 619-620
  Packaging tab, 17-18
  Visual Assets tab, 9-13
    logo images, customizing, 10-13
manipulation events, inertia, 138
ManipulationCompleted event, 134
ManipulationDelta event, 134
ManipulationInertiaStarting event, 134
manipulations, 133-138
ManipulationStarted event, 134
ManipulationStarting event, 134
manual animations, 484-486
Margin property, 59-60
markers (media), 339-340
markup extensions, 29-31
MatrixTransform, 70
media, 335
  audio
    background audio, 636-640
    capturing, 358-359
  capturing, 347-359
  photos, capturing, 348-350, 354-355
  playing, 336-347
    markers, 339-340
    media content, 337-338
    states, 339
  playing media, custom formats, 345-347
  speech synthesis, 364-366
    SSML, 365-366

transcoding, 359-364
adding effects, 364
changing format, 362-363
changing quality, 359-362
trimming files, 363-364
video, capturing, 350-351, 357-358

media extensions, 366-367

Media Foundation components, 366-367

media players
MediaElement as, 341-343
MediaPlayer, 343-344

MediaCapture, adjusting camera settings, 355-357

MediaElement, 341-343
states, 339

MediaPlayer, 343-344

medium tile templates, 696

MenuFlyout control, 255

MessageDialog control, 386-387

metadata
reading, 313-317
BitmapProperties, 315-316
ImageProperties, 314-315
raw metadata, 317
writing, 321-322

methods
for Application class, 169-170
asynchronous methods, 182-184
awaiting an asynchronous operation, 182-184
CreateWindowAsync method, 186-189
GetAsyncKeyState method, 152-154
GetIntermediatePoints method, 118
GetKeyState method, 152-154
GetPosition method, 118
OnWindowCreated method, 170
Pointer method, 118
ScrollIntoView method, 243
for ScrollViewer, 102-104

Microsoft Local Language Portal, 48

Microsoft Translator service, 46

minimum window width, selecting, 81-82

motivation for XAML, 23-24

mouse input, handling, 138-141
mouse-specific APIs, 139

MouseCapabilities class, 139

MouseDevice class, 139

moving elements, TranslateTransform, 67-68

Multilingual App Toolkit, 45

multiple pointers
handling, 118-119
tracking, 124-127

multiple windows, displaying, 186-189

multithreading, 181-185

multitouch, 114

N

namespaces, XML, 25-27

Narrator, 48
improving screen reading, 49-50

navigating
between Pages, 190-197
NavigationHelper class, 194-195
WebView control, 403-405

NavigationHelper class, 194-195

.NET classes, using in XAML, 34

network capabilities, 16

networks, fetching data over, 564-575
background transfers, 569-572
HTTP requests, 565-569
controlling caching, 568-569
GET requests, 565-567
HTTP filters, 567
HTTP prefetching, 569
manipulating cookies, 568
sockets, 572
syndication, 572-574

NFC (Near Field Communication) chip, 660-663
communicating with peer device, 662-663
sending and receiving messages, 661-662

How can we make this index more useful? Email us at indexes@samspublishing.com

nine-grid, custom stretching, 296-299
not running state, transitioning to running state, 165

O

Object class, 53
object elements, child object elements
  collection items, 32-34
  content property, 31-32
OnSuspending event handler, 163-164
OnWindowCreated method, 170
open curly braces ({), escaping, 30
OpticalMarginAlignment property (TextBlock), 263
orientation
  OrientationSensor, 653
  SimpleOrientationSensor, 652-653
  of windows, discovering, 82-84
OrientationSensor, 653

P

package manifest, 8-18
  Application tab, 8
  Capabilities tab, 13-17
    device capabilities, 15-16
    file capabilities, 15
    identity capabilities, 17
    network capabilities, 16
  Content URIs tab, 17
  Declarations tab, 17
  Packaging tab, 17-18
  Visual Assets tab, 9-13
    logo images, customizing, 10-13
    splash screen, customizing, 9
packaged files, 557
Packaging tab (package manifest), 17-18
Padding property (FrameworkElement), 59-60
Page class, 53
pages, adding ads, 736-738
Pages
  caching, 193-194
  navigating between, 190-197
    NavigationHelper class, 194-195
PAINT.NET website, 3
palm rejection, 141
panels, 57, 84-97
  Canvas, 84-86
    attached properties, 85-86
    hit testing, 124
  clipping, 98-100
  Grid, 87-94
  items controls, 236-239
  snap points, 104-105
  StackPanel, 86-87
  VariableSizedWrapGrid, 94-97
PaneThemeTransition, 453-454
parent elements, 57. *See also* panels
PasswordBox control, 287-289
PathFigures, 420-422
PathIcon, 211-212
Paths, 416
PathSegments, 420-422
PDF pages, rendering, 326-328
peek medium tile templates, 697-700
peek wide tile templates, 700
pen input, handling, 141-150
  digitizers, 141
  handwriting
    recognizing, 147-150
    rendering, 142-148
  palm rejection, 141
  PointerPointProperties object, pen-specific properties, 141-142
performance
  cached composition, 443-444
  Windows Performance Toolkit, 7
Performance and Diagnostics page (Visual Studio), 7
performing scans, 667-668
permissions. *See* capabilities
perspective transforms, 71-73
photos
  camera settings, adjusting, 355-357
  capturing, 348-350, 354-355
  previewing, 352-354

pixels
- retrieving data, 310-313
- scale factor, 84
- writing data, 319-321

plane projections, 71-73
Play To feature (Devices charm), 601-603
playing media, 336-347
- adding effects, 340-341
- custom formats, 345-347
- customizing playback, 338-339
- events, 339
- markers, 339-340
- media content, 337-338
- MediaElement, 341-343
- MediaPlayer, 343-344
- states, 339

Pointer class, 115
pointer events, 116-119
- keyboard modifiers, 154

Pointer method, 118
PointerCanceled event, 117
PointerCaptureLost event, 117
PointerDevice class, 114-115
PointerDownThemeAnimation, 462
PointerEntered event, 117
PointerExited event, 117
PointerMoved event, 117
PointerPoint class, 115-116
- properties, 116

PointerPointProperties object, 139-140
- pen-specific properties, 141-142

PointerPressed event, 117
PointerReleased event, 117
pointers, 114-127
- hit testing, 123-124
- multiple pointers, tracking, 124-127
- PointerPointProperties object, 139-140

PointerUpThemeAnimation, 462
PointerWheelChanged event, 139-140
Polygons, 415-416
Polylines, 414-415
PopInThemeAnimation, 462
PopOutThemeAnimation, 462
popup controls, 381-391
- CoreWindowDialog control, 381-385
- CoreWindowFlyout control, 385-386
- MessageDialog control, 386-387
- Popup control, 389-391
- PopupMenu control, 387-389

PopupMenu control, 387-389
PopupThemeTransition, 452
portrait screen orientation, discovering, 82-84
positioning elements, HorizontalAlignment property (FrameworkElement), 60-61
power easing functions, 481
preventing content overflow with clipping, 98-100
previewing
- photos and video, 352-354
- scanned images, 669-670

PreviousExecutionState, reacting to, 167-169
primary XML namespaces, 27
printing with Devices charm, 593-601
- adding custom options, 600-601
- changing default options, 599
- configuring displayed options, 599-600

programmatically launching apps, 174-177
- for files, 174
- for URIs, 175

programming languages, Windows Store app options, 1-2
ProgressBar control, 371-372
ProgressRing control, 400
projections, 71-73, 603
projects
- Hour1 project
  - main page logic, 37-38
  - updating, 35-42
- Visual Studio, 7
  - package manifest, 8-18

promotional app images, 20
properties
- AppBarButton control, 207
- attached properties, 85-86
- data binding, 527-528
- dependency properties, hijacking, 511
- FlowDirection property (FrameworkElement), 63

Height property (FrameworkElement), 58-59
HorizontalAlignment property (FrameworkElement), 60-61
of LaunchActivated-EventArgs, 166-167
Margin property (FrameworkElement), 59-60
Padding property (FrameworkElement), 59-60
PointerPoint class, 116
PointerPointProperties object, 139-140
pen-specific properties, 141-142
property element syntax, 28
RenderTransform property, 64
RequestedTheme property (FrameworkElement), 202
ScrollViewer property, 101-104
Stroke property (Shapes), 417-419
TextBlock control, 260-261
VariableSizedWrapGrid panel, 96-97
VerticalAlignment property (FrameworkElement), 60-61
Width property (FrameworkElement), 58-59
Window.Current.Bounds property, 80
property elements (XAML), 27-28
property paths, 473-475
proportional sizing, 92
Protocol contract, 621-622
proximity, detecting with NFC chip, 660-663
communicating with NFC peer device, 662-663
sending and receiving messages, 661-662
Pseudo Language, 45-48
pubCenter, defining ad units, 734-739
pull updates (live tiles), 707-708
Push Notification Wizard, 719-720
push notifications, 708
configuring, 718-726
client-side code, 724-726
Push Notification Wizard, 719-720
server-side code, 720-724

Q-R

quality of media, changing, 359-362
query suggestions (SearchBox), 377
RadioButton control, 217-219
range controls, 371-374
ProgressBar control, 371-372
Slider control, 372-374
raw metadata, reading, 317
reacting to PreviousExecutionState, 167-169
reading
metadata, 313-317
BitmapProperties, 315-316
ImageProperties, 314-315
raw metadata, 317
from sensors
accelerometer, 647-651
compass, 651-652
gyrometer, 651
inclinometer, 651
light sensor, 652
OrientationSensor, 653
SimpleOrientationSensor, 652-653
receipts, validating, 753-755
recognizing
gestures, 128-131
handwriting, 147-150
keyboard input, 150-156
manipulations, 133-138
mouse input, 138-141
pen input, 141-150
Rectangles, 412-413
registering this book, 3
Remote Machine options, launching Visual Studio apps with, 6

rendering
- controlling with data binding, 533-541
  - data templates, 534-537
  - value converters, 537-541
- handwriting, 142-148
- high-performance rendering, 545-549
- nine-grid, 296-299
- page rendering, customizing, 328-331
- PDF pages, 326-328
- text rendering, customizing, 261-265

RenderTargetBitmap class, generating dynamic images, 302

RenderTransform property, 64

RenderTransformOrigin property, 64

reordering items with ListView control, 245

ReorderThemeTransition, 458-459

RepeatBehavior property (Timeline), 470-472

RepeatButton control, 215

RepositionThemeAnimation, 462

RepositionThemeTransition, 457-459

representing
- Geometries as strings, 425-427
- session state, 171-172

RequestedTheme property (FrameworkElement), 202

requirements
- for keyboard input focus, 155-156
- for Windows Store certification, 19-20

resolution, scale factor, 84

resource lookup, 502-503

resource packages, leveraging, 307

responding to visual state changes, 513-516

restoring session state with SuspensionManager, 172-174

restricting capabilities, 14-15

result suggestions (SearchBox), 380

resuming apps, 164-165

retrieving
- key states, 152-154
- network connection info, 575
- pixel data, 310-313

RichEditBox control, 284-287

RichTextBlock control, 272-277
- text overflow, 274-277
- UIElements, embedding, 273-274

RightTapped event, 128

roaming files, 558-559

roaming settings, 555-556

RotateTransform, 65

routed events, 116-119
- handlers, 118
- for keyboard input, 150-151
- mouse-specific events, 140-141

rows
- arranging children objects with Grid panel, 87-94
- sizing, 92-94

running apps in background, 161

S

saving session state with SuspensionManager, 172-174

scale factor, 84

scale sizes of logos, 10-11

ScaleTransform, 66

scaling
- handling content overflow, 105-109
- interactive zooming, 109
- Viewbox, 106-108

scanners, 666-670

scheduled live tile updates, 707

screen orientation, discovering, 82-84

screen reading, improving, 49-50

screenshots, promotional app images, 20

scrolling, 99-105
- snap points, 104-105

ScrollIntoView method, 243

ScrollViewer
- methods, 102-104
- properties, 101-104

Search charm, 580-585
- customizing the Search pane, 581-584
- showing Search pane programmatically, 585
- Windows 8 Search contract, 580-581

Search pane
- customizing, 581-584
- showing programmatically, 585

SearchBox control, 374-380
- history suggestions, 375-376
- local content suggestions, 379
- query suggestions, 377
- result suggestions, 380

secondary tiles, 710-713

selecting
- minimum window width, 81-82
- text, 270-271, 280-284

Selectors, 233-234
- ComboBox control, 239-241
- FlipView control, 248-250
- GridView control, 246-247
- ListBox control, 241-242
- ListView control, 242-246

SemanticZoom, 251-254

sensors, 647
- accelerometer, reading from, 647-651
  - shaking, 650
  - tossing motion, 649-650
- compass, 651-652
- gyrometer, 651
- inclinometer, 651
- light sensor, 652
- NFC chip, 660-663
  - communicating with peer device, 662-663
  - sending and receiving messages, 661-662
- OrientationSensor, 653

session state
- managing, 171-174
- representing, 171-172
- restoring with SuspensionManager, 172-174

setting up push notifications, 718-726
- client-side code, 724-726
- Push Notification Wizard, 719-720
- server-side code, 720-724

Settings charm, 603-608
- handling links with SettingsPane, 605-608
- showing links, 604

Shapes
- Ellipses, 413
- Paths, 416
- Polygons, 415-416
- Polylines, 414-415

shapes, Rectangles, 412-413

Shapes, Stroke property, 417-419

Share charm, 585-592
- share sources, 585-589
- share targets, 589-592

share sources (Share charm), 585-589

sharing data binding source with DataContext, 529-530

showing toast notifications, 716-717

shrinking elements, ScaleTransform, 66

signing up for Windows Store developer account, 5

SimpleOrientationSensor, 652-653

simulator (Visual Studio), 7

Simulator option, launching Visual Studio apps with, 6

SineEase function, 483

sizes of logos, 10-11

sizing
- absolute sizing, 92
- autosizing, 92
- columns, 92-94
- discovering window size, 80-81
- Height properties, 58-59
- Margin property, 59-60
- proportional sizing, 92
- rows, 92-94
- Width properties, 58-59

SkewTransform, 67-68

slanting elements, SkewTransform, 67-68

Slider control, 372-374

snap points, 104-105
- zoom snap points, 106-108

sockets, 572

software keyboard input, handling, 150-156
  TextBox control, 277-284
SolidColorBrush, 428-429
source code examples in this book, downloading, 3
speech synthesis, 364-366
  SSML, 365-366
SpeedRatio property (Timeline), 470
spelling prediction, TextBox control, 279-280
splash screen, customizing, extended splash screens, 42
splash screen, customizing for apps, 9
spline keyframes, 477-478
SplitCloseThemeAnimation, 463
SplitOpenThemeAnimation, 463
SSML (Speech Synthesis Markup Language), 365-366
StackPanel panel, 86-87
Start screen, semantic zooming, 251-254
states of media, 339
static image-based wide tile templates, 700
static medium tile templates, 696
static text-only wide tile templates, 700
stopping event bubbling, 119-120
storage objects
  files, 551-553
  folders, 552
    known folders, accessing, 563
Storyboards, 460-461
  with multiple animations, 472-473
stretching images with nine-grid, 296-299
strings
  Geometries represented as, 425-427
  Pseudo Language strings, 46
  type converted strings, 34
  type converters, 28-29
Stroke property, 417-419
styles, 494-503
  base TargetType, 497
  implicit styles, 499-500
  inheritance, 497-499
  resource lookup, 502-503
  theme resources, 500-502
stylus. *See* pen input, handling
submitting apps to Windows Store, 18-20
suggestions, providing to SearchBox users
  history suggestions, 375-376
  local content suggestions, 379
  query suggestions, 377
  result suggestions, 380
supporting
  full license purchases, 742-744
  scale sizes of logos, 11-12
suspended apps, 159
  conditions for, 163
  deferrals, 164
SuspensionManager class, 172-174
SwipeBackThemeAnimation, 462
SwipeHintThemeAnimation, 462
SymbolIcon, 208-209
syndication, 572-574
syntax
  markup extensions, 29-31
  property elements, 28

T

tap and send, 660
Tapped event, 128
templates, 503-512
  control templates, 503-505
    dependency properties, hijacking, 511
    inserting property values, 505-507
  data templates, 534-537
  tile templates, 693-706
    image-based large templates, 705-706
    large templates, 703
    medium tile templates, 696
    peek medium templates, 697-700
    peek wide templates, 700
    static image-based wide templates, 700
    static medium templates, 696

How can we make this index more useful? Email us at indexes@samspublishing.com

static text-only wide templates, 700
text-only large templates, 703-705
wide templates, 700
toast templates, 713-716
terminating apps, 165
testing Windows Store features, 755-760
automated testing, 759-760
CurrentAppSimulator, 756-759
text controls, 259
PasswordBox control, 287-289
RichEditBox control, 284-287
RichTextBlock control, 272-277
text overflow, 274-277
UIElements, embedding, 273-274
TextBlock control, 259-271
customizing text rendering, 261-265
properties, 260-261
text content, 265-267
text elements, 267-270
text selection, 270-271
TextBox control, 277-284
text selection, 280-284
TextBlock control, 259-271
customizing text rendering, 261-265
properties, 260-261
text content, 265-267
text elements, 267-270
text selection, 270-271
TextBox control, 277-284
spelling prediction, 279-280
text prediction, 279-280
text selection, 280-284
TextLineBounds property (TextBlock), 262-263
text-only large tile templates, 703-705
TextReadingOrder property (TextBlock), 264
text-to-speech. *See* speech synthesis
theme animations, 459-464
Storyboards, 460-461
tweaking, 463-464
theme resources, 500-502
theme transitions, 448-459
AddDeleteThemeTransition, 455-456
applying to elements, 448-449
ContentThemeTransition, 452-453
EdgeUIThemeTransition, 453
EntranceThemeTransition, 450-451
PaneThemeTransition, 453-454
PopupThemeTransition, 452
ReorderThemeTransition, 458-459
RepositionThemeTransition, 457-459
ThemeResource, 501
themes
app themes, 202
dark themes, 201
high contrast, handling, 51-53
user themes, 202
Thickness class, 60
threads
background threads, 181-182
transitioning between, 185
UI threads, 181-182
awaiting an asynchronous operation, 182-184
tile images
background color, specifying, 12-13
customizing for apps, 10-13
tile templates, 693-706
image-based large templates, 705-706
large templates, 703
medium templates, 696
peek medium templates, 697-700
peek wide templates, 700
static image-based wide templates, 700
static medium templates, 696
static text-only wide templates, 700
text-only large templates, 703-705
wide templates, 700

time-based trials, 740

Timeline properties, 469-472

TimePicker control, 399

toast notifications, 713-717

- options for showing, 716-717
- responding to, 716
- toast templates, 713-716

toast templates, 713-716

ToggleButton control, 215-216

ToggleSwitch control, 400-402

ToolTip control, 219-222

tossing motion, detecting, 649-650

touch input, handling, 114-138

- gestures, 127-133
  - EdgeGesture, 132-133
  - GestureRecognizer class (WinRT), 128-131
  - UIElement gesture events, 133
- manipulations, 133-138
  - inertia, 138
- pointers, 114-127
  - hit testing, 123-124
  - multiple pointers, 118-119
  - multiple pointers, tracking, 124-127
  - Pointer class, 115
  - pointer events, 116-119
  - PointerDevice class, 114-115
  - PointerPoint class, 115-116
  - PointerPointProperties object, 139-140
  - Pointers, capturing, 120-122

tracking multiple pointers, 124-127

transcoding

- adding effects, 364
- media, 359-364
  - changing format, 362-363
  - changing quality, 359-362
  - images, 322-325
  - trimming, 363-364

TransformGroup, 69-70

transforms

- 2D transforms
  - RotateTransform, 65
  - ScaleTransform, 66
  - SkewTransform, 67-68
  - TranslateTransform, 67-68
- 3D transforms, 70-73
- combining
  - CompositeTransform, 68-69
  - MatrixTransform, 70
  - TransformGroup, 69-70
- perspective transforms, 71-73

transitioning

- from not running to running state, 165
- between threads, 185

TranslateTransform, 67-68

translating Microsoft Local Language Portal, 48

trimming, 98

trimming media files, 363-364

troubleshooting Visual Studio apps, 7

tweaking theme animations, 463-464

type converters, 28-29

- type converted strings, 34

U

UI Accessibility Checker, 49

UI elements, layout, 57-58

UI frameworks, Windows Store app options, 1-2

UI threads, 181-182

- awaiting an asynchronous operation, 182-184
- transitioning between, 185
- views, displaying multiple views, 186-189

UIElement class, 53. *See also* FrameworkElement class

- embedding elements, 273-274
- gesture events, 133
- RenderTransform property, 64

updating
Hour1 project
application definition, 39-42
main page logic, 35-42
live tiles, 706-708
local updates, 707
pull updates, 707-708
push notifications, 708
scheduled updates, 707
URIs
programmatically launching apps for, 175
referencing files with, 294-296
USB devices, 682-685
communicating with, 684-685
bulk transfers, 684-685
control transfers, 684
interrupt transfers, 685
connecting to, 683-684
declaring the right capability, 682-683
user data, 559-564
file picker, 560
folder picker, 561-562
known folders, accessing, 563
libraries, 563-564
user themes, 202

V

validating receipts, 753-755
value converters, 537-541
VariableSizedWrapGrid panel, 94-97
vector graphics, 411
Brushes, 427-442
bitmap-based brushes, 435-442
color brushes, 428-435
Geometries, 419-427
Bézier curves, 420
FillRule, 423
GeometryGroup, 423-425
PathFigures, 420-422
PathSegments, 420-422
representing as strings, 425-427
Shapes
Ellipses, 413
Paths, 416
Polygons, 415-416
Polylines, 414-415
Rectangle, 412-413
Stroke property, 417-419
VerticalAlignment property (FrameworkElement), 60-61
VerticalContentAlignment property (Control class), 61-62
video
capturing, 350-351, 357-358
custom media formats, 345-347
customizing playback, 338-339
MediaElement, 341-343
MediaPlayer, 343-344
playing
adding effects, 340-341
markers, 339-340
media content, 337-338
previewing, 352-354
video stabilization, 340-341
Viewbox, 106-108
views
of collections, customizing, 541-545
grouping, 542-545
navigating, 545
GridView, 545-549
ListView, 545-549
multiple, displaying, 186-189
Visual Assets tab (package manifest), 9-13
logo images, customizing, 10-13
splash screen, customizing, 9
Visual State Manager, 512-521
responding to changes, 513-516
visual transitions, 516-521
visual states, 512-521
responding to changes, 513-516
visual transitions, 516-521

Visual Studio
apps
launching, 5-7
submitting to Windows Store, 18-20
troubleshooting, 7
Performance and Diagnostics page, 7
projects, 7
package manifest, 8-18
simulator, 7
website, 5, 20
visual transitions, 516-521
VisualStateManager, 512-521
responding to changes, 513-516
visual transitions, 516-521
VSM, 512-521
responding to changes, 513-516
visual transitions, 516-521

W

web content, capturing with WebView control, 407-408
websites
PAINT.NET, 3
Visual Studio, 5, 20
Windows Dev Center, 3
WebView control, 402-408
capturing web content, 407-408
composing HTML with XAML, 405-406
composing JavaScript with C#, 406-407
navigation, 403-405
WebViewBrush, 437-442
wide tile templates, 700
width, selecting minimum window width, 81-82
Width properties, 58-59
Wi-Fi devices, 688-690
Window.Current.Bounds property, 80
windows
borders, applying, 195-197
Frames, 195-197
minimum width, selecting, 81-82
multiple windows, displaying, 186-189
orientation, discovering, 82-84
Pages, navigating between, 190-197
scale factor, 84
size, discovering, 80-81
zooming in/out, 106-108
Windows 8 Search contract, 580-581
Windows Dev Center website, 3
Windows Media, 366-367
Windows Performance Toolkit, 7
Windows Store
apps
programming language/ UI framework pairing options, 1-2
submitting, 18-20
certification process, 19-20
developer account, signing up for, 5
features, testing, 755-760
automated testing, 759-760
CurrentAppSimulator, 756-759
in-app purchases, 744-753
consumable products, 748-753
durable products, 746-748
receipts, validating, 753-755
Windows.Graphics.Display. DisplayProperties. CurrentOrientation property, 83
Windows.System.Launcher class, 174-177
WinRT
APIs, 2
asynchronous methods, 182-184
displaying multiple views, 186-189
GestureRecognizer class, 128-131
InkManager class, 142-148
wrapping elements, VariableSizedWrapGrid panel, 94-97
WriteableBitmap class, generating dynamic images, 299-302
writing
metadata, 321-322
pixel data, 319-321

X

XAML, 23-24
- attributes, 25
- base TargetType, 497
- child object elements
  - collection items, 32-34
  - content property, 31-32
  - type converted values, 34
- combining with C#, 35
- comparing with C#, 25
- composing HTML, 405-406
- elements, 25
- Hour1 project
  - application definition, 39-42
  - updating, 35-42
- markup extensions, 29-31
- motivation for, 23-24
- .NET classes, 34
- parent elements, 57
- property elements, 27-28
- styles, 494-503
  - implicit styles, 499-500
  - inheritance, 497-499
  - resource lookup, 502-503
  - theme resources, 500-502
- type converters, 28-29
- XML namespaces, 25-27

XAML UI Responsiveness tool (Visual Studio), 7

XML namespaces, 25-27

Y-Z

Z order, 86

zooming in/out windows, 106-108
- semantic zooming, 251-254