

# Index

## NUMBERS

2007 Microsoft Office System, 620

### 2D graphics

- coordinate systems, 420
- drawings, 356-363
- geometries, 359-363
- house example, 416-417
- mapping to 3D graphics, 419

### 3D graphics, 415

- cameras, 419
  - coordinate systems, 420
  - FieldOfView property, 430
  - LookDirection property, 422-424, 427
  - MatrixCamera, 430
  - NearPlaneDistance property, 423
  - OrthographicCameras, 428-430
  - PerspectiveCameras, 428-430
  - Position property, 420-422
  - UpDirection property, 425-427
- coordinate systems, 420

### Geometry3Ds

- MeshGeometry3Ds, 455-457
- Model3DGroups, 461-463
- normals, 459-461
- TextCoordinates, 461
- TriangleIndices, 458

### GeometryModel3Ds, 447-448

- hit testing, 464-465
- house example, 417-419
- lighting, 420
- mapping 2D graphics to, 419
- materials

- AmbientMaterial, 451
- Brush property, 450
- Color property, 452
- combining, 454
- DiffuseMaterial, 448, 451
- EmissiveMaterial, 448, 452
- MaterialGroups, 448
- reflecting color, 450
- SpecularMaterial, 448, 454
- winding order, 456

### meshes, 460

### Model3Ds, 439

- Direction property, 445
- GeometryModel3D subclass, 440
- Light subclass, 440-442, 445-447
- Model3DGroup subclass, 440

- Transform3Ds, 430-432, 437
    - combining, 439
    - MatrixTransform3D subclass, 431, 439
    - RotateTransform3D subclass, 431, 436-438
    - ScaleTransform3D subclass, 431-435
    - Transform3DGroup subclass, 431
    - TranslateTransform3D subclass, 431-433
  - Viewport3D element, 465-468
  - Visual3Ds
    - ModelVisual3Ds, 463-464
    - Viewport3DVisuals, 468
- 3D modeling programs, 440**

## A

- About dialog, XAML, 46
- absolute sizing, 162
- AccelerationRatio property, animation, 481
- access keys, WPF/Win32 interoperability, 555
- ActiveXcontrols, WPF interoperability, 572-576
- ActualHeight, 129-130
- ActualWidth, 129-130
- AddHandler, 66
- AddVisualChild method, 378
- Adobe Flash versus WPF, 15
- Aero Glass, 223-226
- Aero theme, 85
- aggregate geometry, 362-366
- alignment, 134-135
- AllowPartiallyTrustedCallers, 230
- AmbientLights, 441, 446-447
- AmbientMaterial, 451
- anchored blocks, 527-528
- Angle, 138
- AngleX, 143
- AngleY, 143
- animation. *See also graphics*
  - data binding, 494
  - dependency properties, 60
  - keyframes, linear, 492-494, 497
  - layout-to-layout, rotations in, 436
  - path-based, 498
  - procedural code
    - AccelerationRatio property, 481
    - AutoReverse property, 479
    - BeginTime property, 478-479
    - classes, data types, 472
    - classes, 471-476
    - controlling animation durations, 475
    - DecelerationRatio property, 481
    - Duration values, 481
    - FillBehavior property, 482
    - From/To field flexibility, 476-478
    - IsAdditive property, 482
    - IsCumulative property, 482
    - Rendering events, 470
    - RepeatBehavior property, 480
    - reusing animations, 475
    - SpeedRatio property, 479
    - timers and callback functions, 470
- XAML
  - EventTriggers inside styles, 487-489
  - EventTriggers with storyboards, 483-487
  - RepeatBehavior property, 489
  - ScaleTransform, 489
  - starting animations from property triggers, 490
  - TargetProperty attached properties, 494
  - timelines as storyboards, 490-492
  - timing keyframes, 495
  - TranslateTransform, 489
- annotations, adding to flow documents, 532-535
- apartments, COM, 195
- Application class, 195-201
- Application.Current, 199
- Application.GetCookie, 230
- Application.Run, 196
- ApplicationCommands, 76
- ApplicationCommands.Help.Text, 75
- ApplicationDeployment, 237
- ApplicationDeployment.IsNetworkDeployed, 236
- applications
  - creating without Application, 200
  - full-trust XAML browser application, 231
  - gadget style applications, 226-229
  - multithreaded applications, 201
  - navigation-based Windows applications, 207
  - single-instance application, 200
  - standard Windows applications, 191
    - Application class, 195-201
    - ClickOnce, 206-207
    - common dialogs, 202
    - custom dialogs, 203-204
    - dialogs, 202
    - persisting and restoring application state, 204-206
    - Window class, 192-195
    - Windows Vista, 351
    - XAML browser applications. *See* XBAPs
- ArcSegment class (PathSegments), 359
- ArrangeOverride, 609, 612
- AssemblyInfo, 229
- AssemblyReference, accessing binary resources, 244
- AssemblyVersion, 229
- attached events, 71-74
- attached properties, 60-64
- attached property provider, 61-62
- attacks, malicious skins, 346
- audio, 501
  - looping, 505
  - media files as embedded resources, 511
  - MediaElement class, 504-506
  - MediaPlayer class, 503-504
  - MediaTimeline class, 504-506
  - metadata associations, 512

- SoundPlayer class, 502
- SoundPlayerAction class, 502-503
- SpeechSynthesizer class support, 514
- streaming, 510
- WPFsupport, 506
- Auto, 176**
- Automatic, 215**
- automation IDs, ItemsControl, 111**
- AutoReverse** property, animation, 479
- autosizing, 162**
- AxisAngleRotation3D (RotateTransform3D subclass), 436**
- B**
- back/front sides (MeshGeometry3Ds), 457**
- BAML (Binary Application Markup Language), 39-41**
- BeginTime** property, animation, 478-479
- behaviors, creating for**
  - custom controls, 591-597
  - user controls, 583-585
- Bezier curves, 360**
- BezierSegment** class (PathSegments), 359
- Binary Application Markup Language, 39-41**
- binary resources, 239**
  - accessing, 241-245
  - defining, 240-241
  - localization, 246-247
- Binding object**
  - ClearBinding method, 261
  - collections, 267-270
  - dependency properties, 297
  - entire objects, 265-266
  - entire UIElements, 266
  - Mode property, 297
  - NET properties, 263-264
  - procedural code, 259-260
  - RelativeSource property, 263
  - removing, 261
  - SetBinding instance method, 260-261
  - source property, 260-261
  - specifying objects via data context versus, 271
  - target property, 260
  - UpdateSourceTrigger property, 298-299
  - validation, 299-302
  - XAML, 262
- Binding.DoNothing** values (value converters), 278
- bitmap effects. See also color**
  - applying, 411-412
  - customizing, 410
  - performance issues, 411
  - properties list, 412-414
- blocks (documents), 523-524**
  - anchored, 527-528
  - BlockUIContainer, 522
  - list, 521
  - paragraph, 521, 525
  - section, 521
  - table, 521, 525
- BlockUIContainer** blocks, 522
- Blois, Pete, 619**
- BooleanToVisibilityConverter** value converter, 276
- Both, 181**
- BrowserInteropHelper, 229-230**
- Brush** property (materials), 450
- brushes**
  - color
    - color spaces, 393-394
    - LinearGradientBrush, 396-398
    - RadialGradientBrush, 399-400
    - SolidColorBrush, 393-394
    - type converter, 395
  - DrawingBrushes, 403-405, 449
  - GradientBrushes, 449
  - ImageBrushes, 405-406, 449
  - opacity masks, 408
  - tile, 401-410
  - VisualBrushes, 406-410, 449
- bubbling routed events, 67**
- build actions, 240-241**
- BuildWindowCore** method, MyHwndHost subclass, 548-549
- built-in command bindings, controls with, 79-81**
- built-in commands, 75-78**
- Button, 92**
- Button\_Click, 21**
- Button.IsCancel, 88**
- Button.IsDefault, 88**
- ButtonBase** class, 87-88
- buttons, content controls, 87-91**
- C**
- C#**
  - Aero Glass, 223
  - TaskDialog signature and types, 220
- C++/CLI**
  - advantages of, 546
  - compiling, TranslateAccelerator conflicts, 555
  - defining, 545
  - mixing managed/unmanaged code, 545-546
  - upgrading to, 555
- caching, ClickOnce, 228**
- callback functions, animation, 470**
- cameras, 419, 542-551**
  - coordinate systems, 420
  - FieldOfView property, 430
  - LookDirection property, 422-424, 427
  - MatrixCamera, 430
  - NearPlaneDistance property, 423
  - OrthographicCameras, 428-430
  - PerspectiveCameras, 428-430
  - Position property, 420-422
  - UpDirection property, 425-427
- CAML, 39**

- CanGoBack, 215**
- CanGoForward, 215**
- Canvas, 148-149**
  - clipping, 172
  - default Z order, 150
  - interaction with child layout properties, 150-151
  - mimicking with Grid, 169-170
- CenterX, 139-143**
- CenterY, 139-143**
- change notifications, dependency properties, 54-56**
- CheckBox, 90**
- child elements, 33**
- child layout properties**
  - Canvas, 150-151
  - DockPanel, 157-158
  - StackPanel, 152
  - WrapPanel, 154-155
- children of object elements, XAML**
  - collection items, 30-32
  - content property, 30
  - processing rules, 33
  - type converters, 32-34
- Chrome, 192**
- classes**
  - Application, 195-201
  - ButtonBase, 87-88
  - ContentElement class, 81
  - Control class, 81
  - DependencyObject class, 81
  - DispatcherObject class, 81
  - FrameworkContentElement class, 81
  - FrameworkElement class, 81
  - Freezable class, 81
  - hierarchies, 81
  - Object class, 81
  - System.Windows.Controls.Panel, 127
  - UIElement class, 81
  - Visual class, 81
  - Window, 192-195
- Classic theme, 85**
- ClearBinding method, Binding objects, 261**
- clearing local values, 59**
- ClickOnce**
  - caching, 228
  - Windows Installer versus, 206-207
- clip art**
  - geometries, example of, 371-372
  - shapes example, 391-393
- clipping, 172-174**
- ClipToBounds, 173-174**
- clr namespace, 33**
- coerce, dependency properties, 60**
- Collapsed, 133**
- collection items, XAML, 30-32**
- collections**
  - data binding, 267-269
  - disjoint sources, handling, 302-304
- views, 279**
  - creating, 287
  - default view navigation, 285
  - filtering, 285
  - grouping, 281-284, 288-289
  - navigating, 285, 288
  - sorting, 279-281, 288-289
- CollectiveViewSource class, 287-289**
- color. See also bitmap effects**
  - brushes
    - color spaces, 393-394
    - LinearGradientBrush, 396-398
    - RadialGradientBrush, 399-400
    - SolidColorBrush, 393-394
    - type converter, 395
  - custom color space profiles, 394
  - final reflected color formula, 450
  - gradients, 399
  - reflecting, materials, 450
  - system color, themes, 348-349
  - transparent, 399
  - Vista (Windows) schemes, 351
- Color property, 442, 452**
- ColumnDefinition, 159**
- columns**
  - sharing sizes, 166-168
  - sizing, 162-165
- ColumnSpan, 160**
- COM, apartments, 195**
- CombinedGeometry, 362, 366**
- combining**
  - materials, 454
  - Transform3Ds, 439
  - transforms, 145
- ComboBox, 101-106, 108**
- ComboBoxItem, 106-107**
- CommandBinding, 77-78**
- CommandConverter class, 78**
- commands, 74**
  - built-in commands, 75-78
  - controls with built-in command binding, 79-81
  - executing with input gestures, 78-79
  - interactivity, 603-604
- commas ( , )**
  - geometry strings, 369
  - triple-comma syntax, Pack URI, 245
- common dialogs, Windows applications, 202**
- compiler option (Visual C++), 550**
- compiling XAML, 37-42**
- ComponentCommands, 76**
- ComponentResourceKey, 598, 601**
- CompositeCollection class, 302**
- composition, 13**
- consolidating routed event handlers, 72**
- containers, content controls**
  - Expander, 97-98
  - Frame, 95-96
  - GroupBox, 96-97

- Label, 92
  - ToolTip, 92-95
  - Content build action, 240-241**
  - content controls, 86-87**
    - buttons, 87-91
    - containers, 92-98
  - content overflow, 171**
    - clipping, 173-174
    - scaling, 177-182
    - scrolling, 174-177
  - Content property**
    - object elements, XAML, 30
    - templates, 326, 328
  - ContentElement class, 81**
  - ContextMenu, 117-118**
  - Control class, 81**
  - control points, Bezier curves, 360**
  - control templates, 322-323, 339**
  - controls**
    - built-in command bindings, 79-81
    - considerations for sophisticated controls, 601-604
    - content controls, 86
      - buttons, 87-91
      - containers, 92-98
    - custom controls, 579
      - creating, 590-601
      - user controls versus, 580
    - items controls
      - DisplayMemberPath, 99
      - HasItems, 99
      - IsGrouping, 99
      - ListBox, 98
      - menus, 114-118
      - selectors, 100-113
      - StatusBar, 123
      - ToolBar, 120-122
      - Treeview, 118-120
      - TreeViewItem, 119-120
    - range controls, 123-125
    - text and ink controls, 126-129
    - user controls, 579
      - adding, 586-590
      - creating, 581-585
      - custom controls versus, 580
      - protecting from accidental usage, 585
  - Convert method, value converters, 298**
  - ConvertBack method, value converters, 298**
  - converting spoken words to text, 516-517**
  - coordinate systems, 420-421**
  - Corby, Karen, 229**
  - Cube Button style, Viewport3D element, 466-468**
  - cultures (multiple), preparing projects for, 246**
  - curves, Bezier, 360**
  - custom controls, 579**
    - creating, 590
      - behaviors, 591-597
      - user interfaces, 597-601
    - user controls versus, 580
  - custom dialogs, Windows applications, 203-204**
  - custom panels**
    - invalidating layouts, 609
    - manage step (layouts), 608
    - measure step (layouts), 606-609
    - parent/child communications, 606-609
    - RibbonPanels, creating, 609-614
  - customizing, 13. See also styles; templates; skins;**
  - themes**
    - bitmap effects, 410
    - collection views
      - filtering, 285
      - grouping, 281-284
      - navigating, 285
      - sorting, 279-281
    - data display, value converters, 278-279
    - data flows, data binding, 297, 299
    - Grid, 161
    - keyboard navigation, ToolBar, 122
    - reasons for inclusion in WPF, 308
- D**
- DashStyle class (PenLineCaps), 370**
  - data binding**
    - animation, 494
    - Binding object
      - adding validation rules to, 299
      - ClearBinding method, 261
      - collections, 267-270
      - dependency properties, 297
      - entire objects, 265-266
      - entire UIElements, 266
      - exception handling, 301-302
      - Mode property, 297
      - NET properties, 263-264
      - procedural code, 259-260
      - RelativeSource property, 263
      - removing, 261
      - SetBinding instance method, 260-261
      - source property, 260-261
      - specifying objects via data context versus, 271
      - target property, 260
      - UpdateSourceTrigger property, 298-299
      - writing validation rules for, 299-301
      - XAML, 262
    - CompositeCollection class, 302
    - customizing collection views, 279
      - creating new views, 287
      - filtering, 285
      - grouping, 281-284
      - grouping/sorting in XAML, 288-289
      - navigating, 285, 288
      - sorting, 279-281
    - customizing data flows, 297-299

- data providers, 289
  - ObjectDataProvider class, 294-296
  - suppressing automatic unwrapping, 295
  - XmlDataProvider class, 290-294
- data templates, rendering, 272-273
- DataContext, 270-271
- disjoint sources, handling, 302-304
- MultiBinding class, 302-303
- OneWayToSource binding, 296
- PriorityBinding class, 303-304
- pure-XAMLRSSreader example, 305-306
- rendering, 272
- troubleshooting, 277
- two way binding, 296-298
- value converters
  - binding collection items, 278
  - Binding.DoNothing values, 278
  - BooleanToVisibilityConverter, 276
  - canceling data binding temporarily, 278
  - Convert and ConvertBack methods, 298
  - customizing data display, 278-279
  - incompatible data types, handling, 274-277
  - MultiBinding class, 303
  - naming, 275
  - rendering, 274
  - TemplateBinding, 331
- data flows, customizing, 297-299**
- data providers, 289**
  - ObjectDataProvider class, 294-296
  - suppressing automatic unwrapping, 295
  - XmlDataProvider class, 290-294
- data templates, 272-275**
- data triggers, 318-320**
- DataContext, 270-271
- debuggers, Visual C++, 559**
- DecelerationRatio property, animation, 481**
- declarative programming, 13**
- decorators, 177**
- delegate contravariance, 73**
- dependency properties, 51**
  - adding to user controls, 586-589
  - animation classes, 471
  - attached properties, 60-64
  - avoiding implementing logic, 588
  - Binding object, 297
  - change notification, 54-56
  - hijacking for templates, 332
  - implementation, 52-54
  - InkCanvas, Setter behavior, 312
  - .NET property wrappers, 53
  - property inheritance, 56-57
  - support for multiple providers, 57-60
- DependencyObject class, 81**
- DependencyProperty.Register, 589**
- DependencyPropertyHelper.GetValueSource method, 59**
- DesiredSize, 129**
- DestroyWindowCore method, MyHwndHost subclass, 548-549**
- device-independent pixels, 132**
- dialog results, 203**
- dialogs, Windows applications, 202-204**
- dictionaries**
  - collection items, 31
  - themes, 350
- DiffuseMaterial, 448, 451**
- Direction property (Model3Ds), 445**
- DirectionalLights, 441-442**
- DirectX10, WPF**
  - interoperability, 541
  - versus, 14
- Disabled, 176**
- Dispatcher.Run, 200**
- DispatcherObject class, 81**
- DispatcherTimer versus Net timers, 471**
- DisplayMemberBinding property, 112**
- DisplayMemberPath, 99**
- DockPanel, 155-156**
  - child layout properties, 157-158
  - mimicking with Grid, 169
- documents, flow**
  - annotations, adding, 532-535
  - anchored blocks, 527-528
  - blocks, 523-524
  - BlockUIContainer blocks, 522
  - displaying, 530
  - InLines, 525-526, 530
  - list blocks, 521
  - page breaks, 528
  - paragraph blocks, 521, 525
  - section blocks, 521
  - simple document example, 520-521
  - spans, 526-527
  - table blocks, 521, 525
  - XPS, 519
- double data type, animation class usage example, 472-474**
- download group, 234**
- DownloadFileGroupAsync, 237**
- DownloadFileGroupCompleted, 237**
- downloading files on demand, XBAPs, 234-236**
- DownOnly, 180**
- Drawing class, 356-358**
- DrawingBrush object, 357**
- DrawingBrushes, 403-405, 449, 593**
- DrawingContext, 374-376**
- DrawingGroup subclass (Drawing class), 357**
- DrawingImage object, 357-358**
- drawings, 356-357**
  - Bezier curves, 360
  - CombinedGeometry, 362
  - control points, 360
  - GeometryGroup, 362
  - PathGeometry, 359-366
  - StreamGeometry, 363
  - uses of, 359
- DrawingVisual object, 357**

**DrawingVisuals**

- children of DrawingVisuals, 382
- custom rendering option, 378
- filling with content, 373-376

**Duration data type, 476****duration values, animation, 481****DwmExtendFrameIntoClientArea, 223-225****DynamicResource resources**

- defining/applying in procedural code, 254-256
- StaticResource resources versus, 251-252
- system resource interaction, 258

**E****EditingCommands, 76****electric skins example, 345****elements**

- defined, 81
- naming elements without X:Name, 36
- XAML, 21-22, 36-37

**EllipseGeometry subclass (Geometry class), 359****ellipses, 358, 388****EmbeddedResource build action versus Resource build action, 240****embedding controls**

- WPF/ActiveX controls, 572-576
- WPF/Win32, 541
  - access key support, 555
  - HwndSource, 556-559, 562-563
  - keyboard navigation, 552-554
  - launching modal dialogs, 556, 563
  - layout support, 560, 563
  - webcam controls, 542-551
- WPF/Windows Forms
  - applications, 568-572
  - controls, 564-567, 571

**EmissiveMaterial, 448, 452****EraseByPoint, 129****EraseByStroke, 129****events**

- attached events, 71-74
- handling, 69
- processing, XAML, 22
- routed events, 64, 68, 70-71
  - adding to user controls, 589-590
  - bubbling, 67
  - implementation, 65-66
  - tunneling, 67

**EventSetters, styles, 320****EventTriggers, XAML animation**

- inside styles, 487-489
- storyboards in, 483-487

**exception handling, Binding object, 301-302****Expander, 97-98****expressions, 60****Extended, SelectionMode, 108****Extensible Application Markup Language.**

**See XAML**

**F****FieldOfView property (cameras), 430****FileInputBox, 581-584, 587****FileIOPermission, 233****FileName, 586****FileNameChanged, 589-590****Fill, 177****Fill property (shapes), 385-387****FillBehavior property, 482****FillRule property**

- GeometryGroup, 364
- PathGeometry, 362

**Filter property, ICollectionView, 285****filtering collection views, 285****Flat line caps versus Square line caps, 369****flow documents**

- adding annotations, 532-535
- blocks, 523-524
  - anchored, 527-528
  - BlockUIContainer, 522
  - list, 521
  - paragraph, 521, 525
  - section, 521
  - table, 521, 525
- displaying, 530
- InLines, 525-526, 530
- page breaks, placing before line breaks, 528
- simple document example, 520-521
- spans, 526-527
- WPFsupport, XPS, 519

**FlowDirection, 134-137****fonts (system), themes, 348-349****Frame, 95-96, 208-210****frame snapshots (video), 508****FrameworkContentElement, 81****FrameworkElement, 81, 129-130, 145****FrameworkElementAutomationPeer, 603****FrameworkPropertyMetadata, 589****Freezable class, 81****front/back sides (MeshGeometry3Ds), 457****full-trust XAML browser application, 231****G****gadget style applications, 226-229****GDI (graphics device interface), 10****generic dictionaries, themes, 350****geometries, 359**

- Bezier curves, 360
- clip art example, 371-372
- CombinedGeometry, 362, 366
- control points, 360
- GeometryGroup, 362-366
- PathGeometry, 359-366
- PenLineCaps, 369-370
- spaces, commas in strings, 369



- StreamGeometry, 363
- string representations, 367-369
- uses of, 359
- Geometry class, 359**
- Geometry3Ds, MeshGeometry3Ds, 455**
  - front/back sides, 457
  - Model3DGroups, 461-463
  - normals, 458-459
  - positions, 456
  - TextCoordinates, 461
  - TriangleIndices, 457-458
- GeometryDrawing subclass (Drawing class), 356-357**
- GeometryGroup, 362-366**
- GeometryModel3Ds, 440, 447-448**
- GestureOnly, 128**
- GetTemplateChild, 602**
- GetValue, 588**
- GetVisualChild, 377-379**
- GlassHelper.ExtendGlassFrame, 225**
- GlyphRunDrawing subclass (Drawing class), 356**
- GoBack, 215**
- GoForward, 215**
- GradientBrushes, specifying texture coordinates, 449**
- gradients, color, 399**
- GrammarBuilder class, specifying grammar in, 518**
- graphics. See also 2D graphics; 3D graphics; animation**
  - immediate mode systems, 355
  - retained mode systems, 355-356
- graphic device interface, 10**
- Grid, 158-162**
  - comparing to other panels, 168-170
  - customizing, 161
- GridLength, 163-164**
- GridSplitter, 164-166**
- GridView, 111-112**
- GroupBox, 96-97**
- GroupDescriptions property, ICollectionView, 281-284**
- grouping**
  - collection views, 281-284
  - RadioButton, 91

## H

- hardware acceleration, 12**
- HasContent property, 86-87**
- HasItems, 99**
- Header property, ToolBar, 122**
- HeaderedItemsControl, 115**
- headers, containers with, 96-98**
- Height, 128-130**
- HelpExecuted, 78**
- Hidden, 133, 176**
- hijacking dependency properties, templates, 332**

- hit testing**
  - 3D graphics, 464-465
  - receiving detailed information, 464
  - visuals
    - callback mechanisms, 384
    - modifying visual trees in callback methods, 384
    - multiple visuals, 380-383
    - overlapping visuals, 383-385
    - overriding HitTextCore method, 384
    - simple hit testing example, 379
- HitTestResult type, 464**
- HitTextCore method, overriding, 384**
- HorizontalAlignment, 134-135**
- HorizontalContentAlignment, 135**
- HorizontalScrollBarVisibility, 175**
- HTML pages, that navigate WPF pages, 211**
- HwndHost class, MyHwndHost subclass, 548-549**
- HwndSource, WPF/Win32 interoperability, 556-559, 562-563**
- Hyperlinks, 211-212**

## I

- ICollectionView**
  - Filter property, 285
  - GroupDescriptions property, 281-284
  - SortDescriptions property, 279-281
- ICommand interface, 75**
- Icon, 115**
- ILDASM, 620**
- ImageBrushes, 405-406, 449**
- ImageDrawing subclass (Drawing class), 356-358**
- immediate mode graphics systems, 355**
- indices, Windows, 198**
- InitializeComponent, 40-41, 194**
- Ink, 128**
- InkAndGesture, 128**
- InkCanvas**
  - dependency properties, Setter behavior, 312
  - text and ink controls, 128-129
- InLines, flow documents, 525-526, 530**
- input gestures, executing commands, 78-79**
- input hit testing, 379**
- InputGestureText, 116**
- integrated navigation, XBAPs, 234**
- integration**
  - broad, 11
  - journal, 231
- interactivity**
  - commands, 603-604
  - named template parts, 601-602
- Internet 7, journal integration, 231**
- interoperability (WPF)**
  - ActiveX controls, 572-576
  - DirectX, 541
  - Win32, 541
    - access key support, 555
    - HwndSource, 556-559, 562-563



- keyboard navigation, 552-554
- launching modal dialogs, 556, 563
- layout support, 560, 563
- webcam controls, 542-551
- Windows Forms
  - applications, 568-572
  - controls, 564-567, 571
- InvalidOperationException messages, 269**
- IsAdditive property, animation, 482**
- IsBrowserHosted, 229**
- IsCumulative property, animation, 482**
- IsEditable, 102**
- IsGrouping, 99**
- IsInDesignMode, 604**
- IsIndeterminate, 124**
- IsMainMenu property, 114**
- isolated storage, 204
- IsolatedStorageFile, 206**
- IsolatedStorageFileStream, 206**
- IsReadOnly, 102**
- IsSelected, 101**
- IsSelectionActive, 101**
- IsSharedSizeScope, 168**
- IsXPS, 620**
- ItemContainerStyle property, ItemsControl, 315**
- ItemHeight, 153**
- items
  - arranging
    - horizontally, ListBox, 109-110
    - vertically, Menu, 116
  - sorting in ListBox, 111
- items controls
  - DisplayMemberPath, 99
  - HasItems, 99
  - IsGrouping, 99
  - ListBox, 98
  - menus, 114
    - ContextMenu, 117-118
    - Menu, 116
  - selectors, 100
    - ComboBox, 101-108
    - ComboBoxItem, 106-107
    - ListBox, 108-111
    - Listview, 111-113
    - TabControl, 113
  - StatusBar, 123
  - ToolBar, 120-122
  - Treewiew, 118-120
  - TreewiewItem, 119-120
- ItemsControl property**
  - automation IDs, 111
  - built-in group items, 283
  - ItemContainerStyle property, 315
  - modifying, 269
- ItemSource property, modifying, 269**
- ItemsSource, 99**
- ItemWidth, 153**

## J-L

- JIElements, 137**
- JournalEntry.KeepAlive, 212**
- journals, 213**
  - integrating in Internet Explorer 7, 231
  - navigating from page to page via navigation-based Windows applications, 214-215
- keyboards
  - navigation
    - customizing, 122
    - WPF/Win32 interoperability, 552-554
  - shortcuts, MenuItem, 116
- KeyboardNavigation, 122**
- keyframes
  - animation, 492-494, 497
  - timing (XAMLanimation), 495
- keywords, XAML, 42-44**
- Label, 92**
- language neutral (nonlocalizable) resources, 239**
- LastChildFill, 155**
- layout, 127**
- layouts
  - invalidating, 609
  - layout-to-layout animations, rotations in, 436
  - manage step, custom panels, 608
  - measure step, custom panels, 606-609
  - support, WPF/Win32 interoperability, 560, 563
- LayoutTransform, 137, 152**
- light and fluffy skins example, 345-347**
- Light subclass (Model3Ds), 440-447**
- lighting, 440**
  - AmbientLights, 441, 446-447
  - DirectionalLights, 441-442
  - final reflected color formula, 450
  - intensity, controlling via Color property, 442
  - PointLights, 441-444
  - SpotLights, 441, 444-445
- lighting (3D graphics), 420**
- linear interpolation, animation classes, 474**
- linear keyframes, animation, 492-494, 497**
- LinearGradientBrush, 396-398, 409**
- LineGeometry subclass (Geometry class), 359**
- LineJoin class (PenLineCaps), 370**
- lines, 389-390**
- LineSegment class (PathSegments), 359**
- list blocks, 521**
- ListBox, 98**
  - arranging items horizontally, 109-110
  - scrolling, 110
  - SelectionMode property, 108
  - sorting items, 111
- listings
  - About Dialog Supporting the Help Command, The, 77
  - About Dialog with an Event Handler on the Root Window, The, 68

- About Dialog with Font Properties Moved to the Inner StackPanel, The, 61
  - About Dialog with Font Properties Set o the Root Window, The, 56
  - About Dialog with Two Attached Event Handlers on the Root Window, The, 71
  - Applying Padding and Margin Values with 1, 2, or 4 Digits, 130
  - Applying ScaleTransform to Buttons in a StackPanel, 141
  - Buttons Arranged in a Canvas, 149
  - Code-Behind File for Listing 3.11, The, 77
  - Code-Behind File for Listing 3.7, The, 69
  - Code-Behind File for Listing 3.9, The, 73
  - ComboBox with Complex Items, such as a Microsoft Office Gallery, A, 103
  - Complex ToolTip, Similar to Microsoft Office ScreenTip, A, 93
  - FileInputBox.xaml—The User interface for FileInputBox, 581
  - FileInputBox.xaml.cs—An Alternate Version of Listing 16.2, in Which FileName is a Dependency Property, 587
  - FileInputBox.xaml.cs—An Update to Listing 16.2, Making FileNameChanged a Routed Event, 589
  - FileInputBox.xaml.cs—The Logic for FileInputBox, 583
  - First Attempt at a Visual Studio-Like Start Page with a Grid, 158
  - Generic.xaml—The Generic Dictionary Containing PlayingCard's Default Style and Control Template, 598
  - PlayingCard.cs—Logic for the PlayingCard Custom Control, 591
  - PlayingCard.cs—The Final Logic for the PlayingCard Custom Control, 596
  - PlayingCard.xaml—Resource for the PlayingCard Custom Control, 592
  - PlayingCard.xaml.cs—The Code from Listing 16.5, Now as a Code-Behind File, 592
  - Portions of MainWindow.xaml.cs Related to Isolated Storage, 204
  - Portions of MainWindow.xaml.cs Related to Window Management, 193
  - Simple About Dialog in XAML, A, 46
  - Standard Dependency Property Implementation, A, 52
  - Standard Routed Event Implementation, A, 65
  - TaskDialog Signature and Types in C#, 220
  - Typical Menu, with MenuItem and Separator Children, A, 114
  - Using ClickOnce Support for On Demand Download, 235
  - Using Glass in C#, 223
  - VisualStudioLikePanes.xaml—The XAML Implementation of the Application in Figures 6.27 to 6.33, 184
  - VisualStudioLikePanes.xaml.cs—The C# Implementation of the Application in Figures 6.27 to 6.33, 186
  - Walking and Printing the Logical and Visual Trees, 49
  - lists, collection items, 31**
  - ListView, 111-113**
  - live previews, VisualBrushes, 407-410**
  - local values, 58-59**
  - localizable resources, 239**
  - localization, binary resources, 246-247**
  - LocBaml, 247, 619**
  - logical resources, 247-250**
    - accessing directly in source code, 255
    - applying without sharing, 254
    - defining/applying in procedural code, 254-256
    - embedded resources, accessing in other assemblies, 256
    - factoring XAML, 253
    - resource lookups, 251
    - Static versus Dyanmic resources, 251-252
  - logical trees, 45-51**
  - LookDirection property (Camera class), 422-424, 427**
  - looping audio, 505**
  - loose XAML pages, 237**
  - Luna theme, 85**
- ## M
- Main method, 197**
  - MainWindow property, 199**
  - malicious skins, 346**
  - manage step (layouts), custom panels, 608**
  - managing. See navigating**
  - .manifest files, 228**
  - Margin, 130-132**
  - markup extensions, XAML, 27-29**
  - MaterialGroups, 448**
  - materials**
    - AmbientMaterial, 451
    - Brush property, 450
    - color, reflecting, 450
    - Color property, 452
    - combining, 454
    - DiffuseMaterial, 448, 451
    - EmissiveMaterial, 448, 452
    - final reflected color formula, 450
    - MaterialGroups, 448
    - SpecularMaterial, 448, 454
    - winding order, 456
  - MatrixCamera, 430**
  - MatrixTransform, 144-145**
  - MatrixTransform3D subclass (Transform3Ds), 431, 439**
  - MaxHeight, 129**
  - MaxWidth, 129**
  - MDI (Multiple Document Interface), 199**

measure step (layouts), custom panels, 606-609  
 measurements, units of, 132  
**MeasureOverride**  
   custom panel layouts  
     implementing, 612  
     measure step, 606-607  
   invalidating layouts, 609  
**media files as embedded resources, 511**  
**MediaCommands, 76**  
**MediaElement class**  
   audio, 504-505  
   troubleshooting, 511  
   video, 506-508  
**MediaPlayer class**  
   audio, 503-504  
   troubleshooting, 511  
**MediaTimeline class, 504-506**  
**MenuItem, 115-116**  
**menus, 114**  
   ContextMenu, 117-118  
   Menu, arranging items vertically, 116  
**meshes, 460**  
   Model3DGroups, 461-463  
   normals, 458-459  
   TextureCoordinates, 461  
   TriangleIndices, 457-458  
**MeshGeometry3Ds, 455**  
   front/back sides, 457  
   Model3DGroups, 461-463  
   normals, 458-459  
   positions, 456  
   TextureCoordinates, 461  
   TriangleIndices, 457-458  
**MessageBox, 220**  
**metadata, audio/visual associations, 512**  
**metal-looking surfaces, rendering, 453**  
**methods, data binding, 296**  
**Microsoft Expression Blend, 620**  
**Microsoft Expression Design, 620**  
**Microsoft XPS Document Writer, 620**  
**MinHeight, 128**  
**MinWidth, 128**  
**Mixed mode (Visual C++debuggers), 559**  
**modal dialogs**  
   WPF/Win32 interoperability, 556, 563  
   WPF/Windows Forms applications interoperability, 571  
   WPF/Windows Forms controls interoperability, 567  
**Mode property, Binding object, 297**  
**Model3DGroups, 440, 461-463**  
**Model3Ds, 439**  
   Direction property, 445  
   GeometryModel3D subclass, 440  
   Light subclass, 440-447  
   Model3DGroup subclass, 440  
**ModelVisual3Ds, 463-464**

**MSBuild, 618**  
**MultiBinding class, 302-303**  
**Multiple, SelectionMode, 108**  
**multithreaded applications, 201**  
**MyHwndHost subclass, 548-549**

## N

**named styles, 314**  
**named template parts, 601-602**  
**namespaces, 22-24**  
**naming elements, 36-37**  
**Navigate, 210**  
**navigating**  
   collection views, 285, 288  
   from page to page via navigation-based  
     Windows applications, 210, 213  
   Hyperlinks, 212  
   journals, 214-215  
   Navigate, 210  
   navigation events, 215  
**navigation containers, navigation-based Windows applications, 208-210**  
**navigation events, navigating from page to page via navigation-based Windows applications, 215**  
**navigation-based Windows applications, 207**  
   navigating from page to page, 210-215  
   Pages and navigation containers, 208-210  
   passing data between pages, 216-219  
**NavigationCommands, 76**  
**NavigationProgress, 216**  
**NavigationWindow, 207-210**  
**NearPlaneDistance property (cameras), 423**  
**.NET Framework, 16-18**  
**.NET namespaces, 23**  
**.NET properties**  
   Binding objects, 263-264  
   wrappers, dependency properties, 53  
**.NET Reflector, 620**  
**.NET technology, XAML, 20**  
**.NETtimer, DispatcherTimer versus, 471**  
**None, 129, 177**  
**normals (MeshGeometry3Ds), 458-459**

## O

**Object class, 81**  
**object elements, 21**  
   collection items, 30-32  
   content property, 30  
   processing rules, 33  
   type converters, 32-34  
**ObjectDataProvider class, 294-296**  
**OnApplyTemplate method, 602**  
**onCreateAutomationPeer, 603**  
**OneWayToSource data binding, 296**  
**opacity masks, 408-410**  
**OPC (Open Packaging Conventions), 620**

OpenGL, 10

Orientation, 124, 153

OrthographicCameras, 428-430

OwensJournal, 215

## P

Pack URI, triple-comma syntax, 245

Padding, 130-132

page breaks, flow documents, 528

PageFunction, returning data from pages, 217-219

Pages, navigation-based Windows applications, 208-219

panels, 127

Canvas. **See** Canvas

DockPanel, 155-158

Grid, 158-162

primitive panels, 170-171

StackPanel, 137, 151-153

interactions with child layout properties, 152

LayoutTransform, 152

mimicking with Grid, 169

WrapPanel, 153-155

panes (collapsible, dockable, resizable), creating, 182-189

paragraph blocks, 521, 525

parsing XAML at run-time, 35-36

passing data between pages, navigation-based Windows applications, 216-219

PasswordBox, text and ink controls, 127

path-based animation, 498

PathFigures, 359-366

PathGeometry

FillRule property, 362

PathFigures, 359-366

PathSegments, 359-362

paths, 391

PathSegments, 359-362

pausing/resuming video, 509-510

PenLineCaps, 369-370

performance

troubleshooting

bitmap effects, 411

shapes, 386

XML and, 44

Performance Profiling Tools (WpfPerf), 618-619

PerspectiveCameras, 428-430

Photo Gallery, 192

PhotoPage, 217

plastic-looking surfaces, rendering, 453

PlayingCard, 590

creating behaviors, 591-597

creating user interfaces, 597-601

PointLights, 441-444

PolyBezierSegment class (PathSegments), 359

polygons, 390

Polylines, 389-390

PolyLineSegment class (PathSegments), 359

PolyQuadraticBezierSegment class (PathSegments), 360

position, controlling, 134-137

Position property (Camera class), 420-422

positions (MeshGeometry3Ds), 456

PresentationHost.exe, 228

primitive panels, 170-171

PrintDialog, 202

PriorityBinding class, 303-304

procedural code

animation, 470

AccelerationRatio property, 481

AutoReverse property, 479

BeginTime property, 478-479

classes, data types, 472

classes, 471-476

controlling durations of, 475

DecelerationRatio property, 481

Duration values, 481

FillBehavior property, 482

From/To field flexibility, 476-478

IsAdditive property, 482

IsCumulative property, 482

Rendering events, 470

RepeatBehavior property, 480

reusing animations, 475

SpeedRatio property, 479

timers and callback functions, 470

embedding PropertyGrids in, 564-566

video, controlling, 510

XAML, 40

ProgressBar, 124-125

PromptBuilder class, SSML, 513-515

properties. **See also individual property entries**

dependency properties

adding to user controls, 586-589

inheritance, 56-57

paths, 100

triggers, 54-55, 316-320

XAML elements, 24-25

PropertyGrids, 564-566

proportional sizing, 164

ProvideValue method, 29

## Q-R

QuadraticBezierSegment class (PathSegments) 360

QuaternionRotation3D (RotateTransform3D subclass) 436-437

RadialGradientBrush, 399-400

RadioButton, 90-91

range controls, 123-125

RectangleGeometry subclass (Geometry class), 359

rectangles, 387-388

reflecting color, materials, 450

RelativeSource property, Binding objects, 263

RemovedItems, 106

- RemoveFromJournal, 213**
  - RemoveHandler, 66**
  - RenameDialog, 203**
  - rendering**
    - color, final reflected color formula, 450
    - data binding, 272-274
    - metal-looking surfaces, 453
    - plastic-looking surfaces, 453
    - specifying texture coordinates, 449
    - textures, coordinates, 450, 460
    - transforms, exactness of, 457
    - visuals, DrawingVisuals custom rendering
      - option, 378
    - Z-fighting, 423
  - Rendering events, animation, 470**
  - RenderSize, 129**
  - RenderTransform, 137-139**
  - RenderTransformOrigin, 137-140**
  - RepeatBehavior property, animation**
    - procedural code, 480
    - XAML, 489
  - RepeatButton, 89**
  - resolution independence, 11-12**
  - Resource build action, 240**
  - ResourceKey, 598**
  - resources**
    - binary resources, 239
      - accessing, 241-245
      - defining, 240-241
      - localization, 246-247
    - logical resources, 247-250
      - accessing directly in source code, 255
      - applying without sharing, 254
      - defining/applying in procedural code, 254-256
      - embedded resources, accessing in other assemblies, 256
      - factoring XAML, 253
      - resource lookups, 251
      - Static versus Dynamic resources, 251-252
  - restoring application state, 204-206**
  - restyling, support for. See styles; templates; skins; themes**
  - retained mode graphics systems, 355-356**
  - returning data from pages with PageFunction, 217-219**
  - reusing animations, 475**
  - RibbonPanels, creating, 609-614**
  - RichTextBox, text and ink controls, 127**
  - right-hand rule**
    - coordinate systems, 421
    - winding order, 456
  - RotateTransform, 137-140**
  - RotateTransform3D subclass (Transform3Ds), 431, 436-438**
  - rotation**
    - standardized configurations, 436
    - winding order, 456
  - routed events, 64-65, 68-71**
    - adding to user controls, 589-590
    - bubbling, 67
    - consolidating handlers, 72
    - implementation, 65-66
    - tunneling, 67
  - RoutedUICommands, 75**
  - RoutingStrategy, 66**
  - RowDefinition, 159**
  - rows**
    - sharing sizes, 166-168
    - sizing, 162-165
  - RowSpan, 160**
  - Royale theme, 85**
  - RSSReaders, pure-XAMLRSSReader example, 305-306**
  - Run method, applications, 196**
  - run-time, loading and parsing XAML, 35-36**
- S**
- ScaleTransform, 140, 143**
    - Stretch and, 142
    - XAMLAnimation, 489
  - ScaleTransform3D subclass (Transform3Ds), 431-435**
  - ScaleX, 140**
  - ScaleY, 140**
  - scaling, 177-182**
  - scRGB color spaces, 394-395**
  - ScrollBars, 175**
  - scrolling, 110, 174-177**
  - ScrollView, 175-176**
  - section blocks, 521**
  - security**
    - skins, 346
    - XBAP, 232
  - Select, 129**
  - SelectedIndex, 101**
  - SelectedItem, 101**
  - SelectedValue, 101**
  - SelectionChanged event, 106**
  - SelectionMode property, 108**
  - Selector property, 270**
  - selectors, 100**
    - ComboBox, 101-108
    - ComboBoxItem, 106-107
    - ListBox, 108-111
    - ListView, 111-113
    - TabControl, 113
    - TreeView versus, 120
  - sending data to pages, 216**
  - Separator, 115**
  - Settings class, 205**
  - SetValue, 588**
  - shapes, 386**
    - clip art example, 391-393
    - ellipses, 388

- Fill property, 385-387
- lines, 389-390
- operation of, 387-388
- paths, 391
- polygons, 390
- rectangles, 387-388
- Stroke property, 385-387
- troubleshooting performance problems, 386
- SharedSizeGroup, 166-167**
- sharing**
  - row and column sizes, 166-168
  - styles, 311-313
- ShowDialog, 204**
- ShowGridLines, 161**
- shrinking, 172**
- Single, SelectionMode, 108**
- single-instance application, 200**
- SizeToContent property, 128**
- SizeToContent setting, 128**
- sizing**
  - columns, 162-165
  - GridSplitter, 165-166
  - Height and Width, 128-130
  - margin and padding, 130-132
  - rows, 162-165
  - Visibility, 133
- SkewTransform, 143**
- skins, 307, 341**
  - electric skins example, 345
  - light and fluffy skins example, 345-347
  - loading, 344
  - malicious skins, 346
  - procedural codes, 344
  - troubleshooting, defining named styles, 343
- Slider, 125**
- snapshots, video frames, 508**
- Snoop, 619**
- SolidColorBrush, 393-394**
- SortDescriptions property, 113, 279-281**
- sorting**
  - collection views, 279-281
  - items in ListBox, 111
- SoundPlayer class, audio, 502**
- SoundPlayerAction class, audio, 502-503**
- spaces in geometry strings, 369**
- spans, flow documents, 526-527**
- SpecularMaterial, 448, 454**
- speech**
  - recognition, 515-518
  - synthesis, 512-515
- SpeechSynthesizer class, audio file support, 514**
- SpeedRatio property, animation, 479**
- spell checking, TextBox, 127**
- SpotLights, 441, 444-445**
- Square line caps versus Flat line caps, 369**
- sRGB color spaces, 393**
- SRGS (Speech Recognition Grammar Specification), 516-518**
- SSML (Speech Synthesis Markup Language), 513-515**
- StackPanel, 137, 151-153, 169**
- star sizing, 164**
- StartLineCap class (PenLineCaps), 369**
- STAThreadAttribute, 558**
- StaticExtension, 28**
- StaticResource resources, 251-256**
- StatusBar, 123**
- StatusBarItem, 123**
- StopLoading method, 212**
- storyboards**
  - EventTriggers (XAMLAnimation), 483
    - specifying target objects, 486-487
    - specifying target properties, 484-486
  - timelines as (XAMLAnimation), 490-492
- StreamGeometry, 363**
- streaming audio/video, 510**
- Stretch, 134-135, 142**
- StretchDirection, 179**
- strings, 476**
- Stroke property (shapes)**
  - as brush icon, 385
  - setting to view, 387
- styles, 67, 307-310**
  - applying, 314-315
  - data triggers, 318-320
  - EventSetter, 320
  - EventTriggers in (XAMLAnimation), 487-489
  - implicit styles, creating, 314-316
  - keyless resources, 315
  - named styles, 314
  - property triggers, 316-320
  - restricting usage of, 313-314
  - sharing, 311-313
  - Target Type property, 313-314
  - templates, combining with, 338-340
  - themes, 349-352
  - typed styles, 314
- Swanson, Mike, 620**
- synthesis (speech), 512**
  - SpeechSynthesizer class, audio file support, 514
  - SSML, 513-515
  - text handling, 512
- System.ComponentModel.DesignerProperties, 604**
- System.Deployment.Application, 234**
- System.Int32, 33**
- System.IO.IsolatedStorage, 206**
- System.Reflection.Assembly.Load, 33**
- System.Windows.Controls, 147**
- System.Windows.Controls.Panel class, 127**
- System.Windows.Controls.scrollViewer, 174**
- System.Windows.Controls.StretchDirection, 180**



**System.Windows.Controls.VirtualizingStackPanel**, 175

**System.Windows.Media.Stretch**, 177

**System.Windows.Media.Transform**, 137

**System.Windows.PointConverter**, 138

**System.Windows.Thickness**, 130

**System.Windows.UIElement**, 127

**SystemColors** class, themes, 348-349

**SystemFonts** class, 348-349

**SystemParameters** class, 348-349

## T

**TabControl**, 113

**TabItem**, 114

table blocks, 521, 525

**TabPanel**, 170

**Target Type** property, 313

applying styles, 314

templates, restricting in, 325-326

**TargetProperty**, attached properties

(XAMLAnimation), 494

**TaskDialog**, 220-223

**TemplateBinding**

templates, 327

value converters, 331

**templates**, 307, 321

Content property, 326-328

control templates, 322-323, 339

dependency properties, hijacking, 332

named elements in, 324

naming, 337

reusing, 329-331

styles, combining with, 338-340

Target Type property, restricting, 325-326

TemplateBinding, 327, 331

themes, 349-352

triggers, interactivity in, 323-325

visual states, 333, 336-338

**text**

converting spoken words to, 516-517

speech synthesis, 512

**text and ink controls**

InkCanvas, 128-129

PasswordBox, 127

RichTextBox, 127

TextBox, 126

**text-to-speech**. *See* speech synthesis

**TextBlock**, 105

**TextBox**, 126-127

**TextSearch**, 105

**TextSearch.TextPath**, 104

**texture** coordinates, 449-450, 460-461

**TextWrapping** property, 126

**themes**, 85-86, 307

examples of, 349

generic dictionaries, 350

styles/templates, 349-352

system colors, fonts, parameters, 348-349

Vista (Windows), 351

**Thickness**, syntax for, 132

**TickPlacement**, 125

**ticks**, 125

**tile** brushes, 401

DrawingBrushes, 403-405

ImageBrushes, 405-406

VisualBrushes, 406-410

**time** resolution independent animations, 471

**timelines** as storyboards (XAMLAnimation),

490-492

**timers**, 470-471

**TimeSpan** data type, 476

**ToggleButton**, 89-90

**ToolBar**, 120-122

**ToolBarTray**, 121, 171

**ToolOverflowPanel**, 171

**ToolTip**, 92-95

**ToolTipService**, 94

**Transform3DGroup** subclass (Transform3Ds), 431

**Transform3Ds**, 430-431, 437

combining, 439

MatrixTransform3D subclass, 439

RotateTransform3D subclass, 436-438

ScaleTransform3D subclass, 432-435

TranslateTransform3D subclass, 432-433

**transforms**

applying, 137

MatrixTransform, 144

RotateTransform, 138-140

ScaleTransform, 140-143

SkewTransform, 143

TranslateTransform, 143

combining, 145

exactness of, 457

FrameworkElements and, 145

**TranslateAccelerator**, 554-555

**TranslateTransform**, 143, 489

**TranslateTransform3D** subclass (Transform3Ds), 431-433

**translucence**, DiffuseMaterial, 451

**transparencies**, live previews via VisualBrush, 407-410

**transparent** colors, 399

**Treeview**, 118-120

**TreeViewItem**, 119-120

**TriangleIndices** (MeshGeometry3Ds), 457-458

**triangles**, 359, 364, 367

overlapping, 362

rotating, 362

specifying normals, 458

**Trigger**, 55

**triggers**

data, 318-319

logic of, 319-320



- property, 316-318
- templates, interactivity in, 323-325
- triple-comma syntax, Pack URI, 245**
- troubleshooting**
  - data binding errors, 277
  - InvalidOperationException messages, 269
  - MediaElement class, 511
  - MediaPlayer class, 511
  - performance
    - bitmap effects, 411
    - shapes, 386
  - skins
    - defining named styles, 343
    - malicious skins, 346
- tunneling routed events, 67**
- TwoWay data binding, 296-298**
- type converters**
  - color brushes, 395
  - MatrixTransform, 145
  - object elements, XAML, 32-34
  - XAML, 25-27
- typed styles, 314**

**U**

- UI automation, 603**
- UIElement class, 81**
- UIElementCollection, custom panel layouts, 606**
- UIElements, Binding object, 266**
- UISpy, 619**
- Uniform, 177**
- UniformGrid, 171**
- UniformToFill, 179**
- units of measurement, 132**
- UpdateSourceTrigger property, Binding object, 298-299**
- UpDirection property (Camera class), 425-427**
- upgrades, C++/CLI, 555**
- UpOnly, 180**
- user controls, 579**
  - adding
    - dependency properties, 586-589
    - routed events, 589-590
  - creating
    - behaviors, 583-585
    - user interfaces, 581-583
  - custom controls versus, 580
  - protecting from accidental usage, 585
- user interfaces, creating for**
  - custom controls, 597-601
  - user controls, 581-583
- UsesParentJournal, 215**
- utilities, 618-620**
- UIElement, 81**

**V**

- validation**
  - Binding object, 299-302
  - dependency properties, 60
- value converters**
  - binding collection items, 278
  - Binding.DoNothing values, 278
  - BooleanToVisibilityConverter, 276
  - canceling data binding temporarily, 278
  - Convert and ConvertBack methods, 298
  - customizing data display, 278-279
  - incompatible data types, handling, 274-277
  - MultiBinding class, 303
  - rendering, 274
  - TemplateBinding, 331
- vector graphics**
  - brushes
    - color, 393-400
    - opacity masks, 408
    - tile, 401-410
  - custom color space profiles, 394
  - drawings, 356-372
  - geometries, 359-372
  - house example, 416-417
  - mapping to 3D graphics, 419
  - shapes
    - clip art example, 391-393
    - ellipses, 388
    - Fill property, 385-387
    - lines, 389
    - operation of, 387-388
    - paths, 391
    - polygons, 390
    - polylines, 390
    - rectangles, 387-388
    - Stroke property, 385-387
    - troubleshooting performance problems, 386
  - visuals, 372
    - AddVisualChild method, 378
    - displaying on screen, 376-379
    - DrawingContext, 374-376
    - DrawingVisuals, 373-378, 382
    - GetVisualChild, 377-379
    - hit testing, 379-385
    - uses for, 378
    - VisualChildrenCount, 377-379
- VerticalAlignment, 134-135**
- VerticalContentAlignment, 135**
- VerticalScrollBarVisibility, 175**
- video**
  - frame snapshots, 508
  - media files as embedded resources, 511
  - MediaElement class, 506-508

- metadata associations, 512
- pausing/resuming, 509-510
- playing, 509-510
- streaming, 510
- Windows Media Player, 32-bit versus 64-bit, 506
- WPF support, 506
- VideoDrawing** subclass (Drawing class), 356
- View** property, 111
- Viewbox**, 177-179
- Viewport3D** element, 465-468
- Viewport3DVisuals**, 468
- virtualization**, 110
- VirtualizingStackPanel**, 109
- Visibility**, 133
- Visible**, 133, 175
- Vista (Windows)**, themes, 351
- Visual C++**
  - compiler option, 550
  - debuggers, Mixed mode, 559
  - XAML support, 546
- Visual class**, 81
- visual hit testing**, 379
- visual states in templates**, 333, 336-338
- Visual Studio**, 240-241
- Visual Studio 2005**, 617
- Visual Studio Express**, 618
- visual trees**, 46-51
- Visual3Ds**
  - ModelVisual3Ds, 463-464
  - Viewport3DVisuals, 468
- VisualBrush**, 406-410, 449
- VisualChildrenCount**, 377-379
- visuals**, 372
  - AddVisualChild method, 378
  - displaying on screen, 376-379
  - DrawingContext, 374-376
  - DrawingVisuals
    - children of DrawingVisuals, 382
    - custom rendering option, 378
    - filling with content, 373-376
  - GetVisualChild, 377-379
  - hit testing
    - callback mechanisms, 384
    - modifying visual trees in callback methods, 384
    - multiple visuals, 380-383
    - overlapping visuals, 383-385
    - overriding HitTextCore method, 384
    - simple hit testing example, 379
  - uses for, 378
  - VisualChildrenCount, 377-379

## W

- WCF (Windows Communication Foundation)**, 18
- WebBrowser**, 96
- webcams, embedding controls (WPF/Win32 interoperability)**, 542-551
- WICEExplorer**, 619
- Width**, 128-130
- Win32**
  - Common Controls library, Windows Forms controls, 566
  - WPF interoperability, 541
    - access key support, 555
    - HwndSource, 556-559, 562-563
    - keyboard navigation, 552-554
    - launching modal dialogs, 556, 563
    - layout support, 560, 563
    - webcam controls, 542-551
- winding order**, 456
- Window**, 71
- Window class**, 192-195, 198
- Windows applications**, 191
  - Application class, 195-201
  - ClickOnce, 206-207
  - common dialogs, 202
  - custom dialogs, 203-204
  - dialogs, 202
  - persisting and restoring application state, 204-206
  - Window class, 192-195, 198
- Windows Forms**, 15
  - applications, WPF interoperability, 568-572
  - controls
    - Win32 Common controls library, 566
    - WPF interoperability, 564-567, 571
- Windows Installer versus ClickOnce**, 206-207
- Windows Media Player, 32-bit video versus 64-bit video**, 506
- Windows Workflow Foundation (WCF)**, 18
- WPF11 (Windows Presentation Foundation 11)**
  - ActiveX controls interoperability, 572-576
  - Adobe Flash versus, 15
  - audio, support, 506
  - broad integration, 11
  - composition and customization, 13
  - declarative programming, 13
  - deployment, 13
  - DirectX
    - interoperability, 541
    - versus, 14
  - flow document support, XPS519
  - hardware acceleration, 12
  - resolution independence, 11-12
  - retained mode graphics systems, 355-356
  - standardized rotational configurations, 436
  - video, support, 506

- Win32 interoperability, 541
  - access key support, 555
  - HwndSource, 556-559, 562-563
  - keyboard navigation, 552-554
  - launching modal dialogs, 556, 563
  - layout support, 560, 563
  - webcam controls, 542-551
- Windows Forms, 15
  - applications interoperability, 568-572
  - controls interoperability, 564-567, 571

### WPF/E (Windows Presentation Foundation/Everywhere), 15

**WpfPerf (Performance Profiling Tools), 618-619**

**WrapPanel, 153-155**

### wrapping

- items in ComboBoxItem, 106
- Viewbox, 178

## X-Z

- x:Array, 44**
- X:Class, 39, 42**
- x:ClassModifier, 42**
- x:Code, 42**
- x:FieldModifier, 42**
- x:Key, 43**
- x:Name, 36, 43**
- x:Null, 44**
- x:Shared, 43**
- x:Static, 44**
- x:Subclass, 43**
- x:TypeArguments, 43**
- x:Uid, 43**
- x:XData, 43**
- XAML (Extensible Application Markup Language) 13, 18**
  - 3D modeling programs, 440
  - About dialog, 46
  - animation
    - EventTriggers, 483-489
    - RepeatBehavior property, 489
    - ScaleTransform, 489
    - starting animations from property triggers, 490
    - TargetProperty attached properties, 494
    - timelines as storyboards, 490-492
    - timing keyframes, 495
    - TranslateTransform, 489
  - binary resources, defining, 242
  - Binding objects, 262
  - Browser Applications. **See** XBAPs
  - children of object elements, 30-34
  - collection views, grouping/sorting in XAML, 288-289
  - compiling, 37-42
  - data binding, RSS Reader example, 305-306

- defined, 20
- elements and attributes, 21-22
- embedding PropertyGrids in, 566
- event processing, 22
- factoring, logical resources, 253
- keywords, 42-44
- loading and parsing at run-time, 35-36
- loose pages, 237
- markup extensions, 27-29
- namespaces, 22-24
- naming elements, 36-37
- order of property, 22
- procedural code, 40
- processing rules for object element
  - children, 33
- property elements, 24-25
- reasons for using, 19
- type converters, 25-27
- typing, 44
- Visual C++ support, 546

**XamlPad, 47, 618**

**XamlReader, 35**

**XamlWriter, 35, 41**

- XBAPs (XAML browser applications), 228-231**
  - deployment, downloading files on demand, 234-236
  - integrated navigation, 234
  - limited feature sets, 232-233
  - security prompts, 232

**XML, performance and, 44**

**XML Paper Specification (XPS), 620**

**xml:lang, 41**

**xml:space, 41**

**XmlDataProvider class, 290-295**

**XmlnsDefinitionAttribute, 32**

**XPS (XML Paper Specification), 519, 620**

**Z order, Canvas, 150**

**Z-fighting, 423**

**ZAM 3D, 620**