Autodesk® Maya® 2022
BASICS GUIDE

Kelly L. Murdock

SDC PUBLICATIONS
Better Textbooks. Lower Prices.
www.SDCpublications.com

ACCESS CODE
UNIQUE CODE INSIDE

Visit the following websites to learn more about this book:

Contents

Contents i

CHAPTER 1 1

Learning the Maya Interface 1

Lesson 1.1: Work with Menus 2
Changing Menu Sets 2
Viewing Keyboard Hotkeys 2
Accessing Option Dialog Boxes 3
Using Tear-Off Menus 4
Understanding Tools versus Actions 4
Lesson 1.1-Tutorial 1: Use a Menu Command to Create a Polygon Sphere 5
Lesson 1.2: Use the Status Line Buttons 6
Using Pop-up Help 7
Watching for Cursor Clues 8
Expanding and Collapsing Icon Button Groups 8
Opening and Saving a Scene 8
Opening Editors 9
Showing and Hiding Interface Elements 10
Lesson 1.2-Tutorial 1: Open a File 10
Lesson 1.2-Tutorial 2: Save a File 11
Lesson 1.2-Tutorial 3: Maximize the Workspace Interface 11
Lesson 1.3: Access the Shelf 12
Using the Shelf Menu 13
Creating and Deleting Shelves 13
Adding Icons and Menu Commands to a Shelf 13
Adding Layouts and Scripts to a Shelf 14
Using the Shelf Editor 14
Lesson 1.3-Tutorial 1: Create a New Shelf 15
Lesson 1.3-Tutorial 2: Populate a New Shelf 15
Lesson 1.4: Explore the Channel Box and Layer Editor 16
Selecting Attributes 17
Changing Attributes with the Mouse 17
Locking Attributes 18
Adding and Deleting Layers 18
Adding Objects to a Layer 19
Hiding All Layer Objects 19
Freezing All Layer Objects 19
Lesson 1.4-Tutorial 1: Change Channel Box Attributes 20
Lesson 1.4-Tutorial 2: Create and Rename a New Layer 21
Lesson 1.4-Tutorial 3: Add Objects to a New Layer 21
Lesson 1.5: Identify the Animation Controls, the Command Line, and the Help Line 21
Selecting an Animation Frame 22
Setting an Animation Range 22

Playing an Animation 22
Accessing the Animation Preferences 23
Using the Command Line 23
Viewing the Help Line 24
Lesson 1.5-Tutorial 1: Play an Animation 24
Lesson 1.5-Tutorial 2: Enter a Command 25
Lesson 1.6: Use the Toolbox 25
Selecting Objects 26
Using the Transform Tools 26
Understanding Manipulators 27
Lesson 1.6-Tutorial 1: Select Objects 28
Lesson 1.6-Tutorial 2: Transform an Object 29
Lesson 1.7: Discover the Marking Menus 29
Accessing the Marking Menus 29
Customizing Marking Menus 30
Using the Hotbox 31
Customizing the Hotbox 32
Lesson 1.7-Tutorial 1: Access a Marking Menu 32
Lesson 1.7-Tutorial 2: Use the Hotbox 32
Chapter Summary 33
What You Have Learned 33
Key Terms From This Chapter 34

CHAPTER 2 35

Controlling the View Panel 35

Lesson 2.1: Change the View 35
Using the Tumble, Track, Dolly, and Camera Tools 35
Framing an Object 36
Moving Through Views 37
Tearing Off Panels 38
Using Heads-Up Displays 38
Accessing Grids 39
Opening Other Interfaces Within a Panel 39
Lesson 2.1-Tutorial 1: Change the Object's View 40
Lesson 2.2: Change Display Options 43
Changing Resolution 43
Changing Shading 44
Displaying Textures 45
Enabling Backface Culling and Improving Wireframes 45
Isolating Objects 46
Hiding and Showing Objects 46
Changing Object Name and Color 46
Lesson 2.2-Tutorial 1: Change the Object's Resolution 47
Lesson 2.2-Tutorial 2: Change the Object's Name and Color 49
Lesson 2.3: Change the Layout 49
Switching Layouts 49
Customizing Layouts 50

Resizing and Editing View Panels....50
Using the Outliner....51
Accessing Help....52
Lesson 2.3-Tutorial 1: Change the Interface Layout....52
Chapter Summary....53
What You Have Learned....54
Key Terms From This Chapter....54

CHAPTER 3 55

Starting with Primitive Objects 55
Lesson 3.1: Use Polygon Primitives....55
Creating Polygon Primitives....56
Creating Gears....57
Creating Abstract Objects....58
Lesson 3.1-Tutorial 1: Create Polygon Primitives....59
Lesson 3.2: Learn the NURBS Primitives....60
Creating Spheres and Cubes....61
Creating Cylinders and Cones....62
Creating a Plane and a Torus....62
Inserting Isoparms....62
Lesson 3.2-Tutorial 1: Create a Candle from Primitives....63
Lesson 3.2-Tutorial 2: Add Isoparms....64
Lesson 3.3: Draw 2D Primitives....65
Creating Circles and Squares....65
Creating Arcs....66
Lesson 3.3-Tutorial 1: Create an Eye Using Arcs and Primitive Shapes....67
Lesson 3.4: Create 3D Type....68
Generating Text Curves....68
Changing Extrusion Depth....69
Creating Beveled Type....69
Lesson 3.4-Tutorial 1: Create and Bevel Text....70
Lesson 3.4-Tutorial 2: Create a Sign....71
Lesson 3.5: Use Construction Aid Objects....72
Placing Contruction Planes....72
Placing Free Image Planes....73
Marking position with Locators....73
Annotating objects....73
Using the Measure Tools....73
Lesson 3.5-Tutorial 1: Test Pythagoras....74
Lesson 3.6: Access the Content Browser....74
Browsing the mesh categories....75
Loading meshes from the Content Browser....75
Lesson 3.6-Tutorial 1: Load a mesh from the Content Browser....75
Lesson 3.7: Import Objects....76
Importing 3D meshes....76
Importing 2D....76
Creating 3D meshes from 2D outlines....77

Lesson 3.7-Tutorial 1: Import a 3D mesh 77
Lesson 3.7-Tutorial 2: Import Adobe Illustrator content 78
Lesson 3.7-Tutorial 3: Import SVG content 79
Chapter Summary 80
What You Have Learned 80
Key Terms From This Chapter 81

CHAPTER 4 83

Working with Objects 83
Lesson 4.1: Select Objects 83
Selecting Multiple Objects 84
Understanding the Key Object 84
Using Selection Masks 85
Selecting by Menu 86
Saving a Selection Set 86
Lesson 4.1-Tutorial 1: Select Multiple Objects 86
Lesson 4.2: Select Components 87
Switching to Component Mode 88
Selecting Components 89
Growing and Shrinking Selections 89
Selecting Edges 89
Lesson 4.2-Tutorial 1: Select Components 90
Lesson 4.3: Transform, Group, and Parent Objects 91
Understanding Pivot Points 91
Transforming Objects Along an Axis 92
Transforming Objects Within a Plane 92
Constrained Rotations 93
Uniform and Non-Uniform Scaling 94
Grouping Objects Together 95
Parenting Objects 96
Viewing Hierarchy in the Outliner 96
Using Undo, Redo, and Repeat 97
Lesson 4.3-Tutorial 1: Move Pivot Point 98
Lesson 4.3-Tutorial 2: Transform Car Wheels 99
Lesson 4.3-Tutorial 3: Parent an Object 100
Lesson 4.4: Snap and Align Objects 101
Using Grids 101
Duplicating with Transform 102
Replacing Objects 102
Snapping Objects 102
Snapping to a Live Object 103
Aligning Objects 103
Aligning Points 104
Snapping Surfaces Together 104
Lesson 4.4-Tutorial 1: Snap Objects to Grid Points 105
Lesson 4.4-Tutorial 2: Snap to a Curve 106
Lesson 4.4-Tutorial 3: Snap to a Live Object 107

Lesson 4.4-Tutorial 4: Align Letters 108
Lesson 4.5: Understand Nodes and Attributes 109
Understanding the Various Node Types 110
Viewing Nodes in the Attribute Editor 111
Viewing construction history 113
Deleting construction history 114
Editing Attributes 114
Working with Nodes 115
Viewing Dependency with Node Editor 115
Adding Nodes 116
Connecting Nodes 117
Lesson 4.5-Tutorial 1: Explore Dependent Nodes 117
Lesson 4.5-Tutorial 2: Delete Construction History 119
Lesson 4.5-Tutorial 3: Building Node Dependency 119
Chapter Summary 121
What You Have Learned 121
Key Terms From This Chapter 121

CHAPTER 5 123

Creating and Editing Polygon Objects 123
Lesson 5.1: Learn Normals and Manually Create Polygons 124
Understanding Normals 124
Determining Normal Direction 124
Showing Normals 124
Reversing and Controlling Normals 125
Softening and Hardening Edges 125
Using the Vertex Normal Edit Tool 125
Creating Polygon Objects by Hand 126
Appending to a Polygon 126
Combining Polygons 127
Mirroring Polygon Objects 127
Cleaning Up and Reducing Polygons 127
Lesson 5.1-Tutorial 1: Conform Normals 128
Lesson 5.1-Tutorial 2: Create a Polygon 128
Lesson 5.1-Tutorial 3: Append to a Polygon 129
Lesson 5.1-Tutorial 4: Mirror an Object 130
Lesson 5.2: Edit Polygons 131
Selecting Polygon Components 131
Subdividing and Splitting Polygon Faces 133
Cutting Faces 134
Merging Vertices 135
Merging and Collapsing Edges 136
Bridging Edges 137
Deleting Components 138
Lesson 5.2-Tutorial 1: Create a Mushroom 138
Lesson 5.2-Tutorial 2: Bridge Edges 139
Lesson 5.2-Tutorial 3: Merge Vertices and Edges 140

Lesson 5.3: Use Polygon Operations 141
Duplicating Faces 141
Extruding Components 142
Chamfer a Vertex 144
Beveling an Edge 145
Poking a Face 146
Creating a Wedge 147
Using Symmetry 148
Lesson 5.3-Tutorial 1: Offset Faces 148
Lesson 5.3-Tutorial 2: Extrude Cube Vertices 149
Lesson 5.3-Tutorial 3: Extrude Cube Edges and Faces 150
Lesson 5.3-Tutorial 4: Chamfer Vertices 151
Lesson 5.3-Tutorial 5: Bevel Edges 152
Lesson 5.3-Tutorial 6: Poke Faces 153
Lesson 5.3-Tutorial 7: Wedge Faces 154
Lesson 5.3-Tutorial 8: Symmetrical Editing 155
Lesson 5.4: Smooth Polygon Edges 156
Smoothing Polygons with Subdivisions 156
Creating a Smooth Proxy 157
Adding a Crease to a Smoothed Polygon 157
Smoothing Polygons with Vertex Averaging 158
Lesson 5.4-Tutorial 1: Smooth Faces 158
Lesson 5.4-Tutorial 2: Smooth Proxy Turtle 159
Lesson 5.4-Tutorial 3: Smooth Faces with Vertex Averaging 160
Lesson 5.5: Use Polygon Booleans and Triangulate Polygons 161
Combining Polygon Objects 162
Finding the Difference Between Objects 162
Creating an Intersection Object 162
Triangulating Polygon Faces 162
Switching Polygon Faces to Rectangles 163
Flipping Triangle Edges 163
Lesson 5.5-Tutorial 1: Create a Button from Booleans 163
Lesson 5.5-Tutorial 2: Triangulate Non-Planar Polygons 164
Lesson 5.6: Create Holes in Polygons 165
Detaching a Vertex 165
Detaching Faces 166
Using the Make Hole Tool 167
Filling Holes 168
Lesson 5.6-Tutorial 1: Add Holes to a Cube 168
Lesson 5.7: Work with Edge Loops, Rings, and Borders 169
Selecting Edge Loops, Rings, and Borders 170
Converting Selections 170
Using the Insert Loop Tool 170
Creating Custom Edge Loops 171
Lesson 5.7-Tutorial 1: Add Edge Loops to a Face 172
Lesson 5.8: Learn the Modeling Toolkit 173
Selecting Components 174
Setting Constraints 175
Using Soft Selection 175

Using Polygon Tools....175
Using the Target Weld Tool....176
Making Shapes with the Connect Tool....176
Lesson 5.8-Tutorial 1: Modeling with Constraints and Soft Select....177
Lesson 5.8-Tutorial 2: Adding Arms to a Torso....178
Lesson 5.9: Model with the Quad Draw Tool....179
Creating Polygons with the Quad Draw Tool....180
Moving Components with the Quad Draw Tool....181
Relaxing Components with the Quad Draw Tool....181
Adding Edge Loops with the Quad Draw Tool....181
Extending Edges with the Quad Draw Tool....182
Deleting Components with the Quad Draw Tool....183
Accessing the Quad Draw Tool Options....183
Lesson 5.9-Tutorial 1: Adding Arms to a Torso....184
Chapter Summary....185
What You Have Learned....186
Key Terms From This Chapter....186

CHAPTER 6 189

Working with NURBS Surfaces 189
Lesson 6.1: Edit NURBS Surfaces....190
Selecting Components....190
Using the Surface Editing Tool....191
Using the Sculpt Geometry Tool....191
Simplifying Surfaces....192
Breaking and Smoothing Tangents....193
Lesson 6.1-Tutorial 1: Edit NURBS Components....193
Lesson 6.1-Tutorial 2: Use the Surface Editing Tool....193
Lesson 6.1-Tutorial 3: Use the Sculpt Geometry Tool....194
Lesson 6.1-Tutorial 4: Create a Hard Edge....195
Lesson 6.2: Apply Surface Operators....196
Attaching and Detaching Surfaces....196
Aligning Surfaces....197
Closing and Opening NURBS Surfaces....198
Extending Surfaces....199
Offsetting a Surface....199
Filleting Surfaces....199
Blending Surfaces....200
Lesson 6.2-Tutorial 1: Attach Surfaces....201
Lesson 6.2-Tutorial 2: Detach Surfaces....202
Lesson 6.2-Tutorial 3: Open and Close a Surface....203
Lesson 6.2-Tutorial 4: Offset Surface....204
Lesson 6.2-Tutorial 5: Add a Circular Fillet....205
Lesson 6.2-Tutorial 6: Blend Two Surfaces....206
Lesson 6.3: Trim NURBS Surfaces....207
Drawing Curves on a NURBS Surface....207
Projecting Curves onto a NURBS Surface....208

Marking Intersecting Surfaces 208
Trimming a Surface 209
Lesson 6.3-Tutorial 1: Draw and Trim a Surface 210
Lesson 6.3-Tutorial 2: Project and Trim a Curve 211
Lesson 6.4: Use Boolean Tools 212
Combining Surfaces with the Union Tool 213
Removing Surface Parts with the Difference Tool 213
Creating a Surface Intersection with the Intersect Tool 213
Lesson 6.4-Tutorial 1: Create Boolean Union Surfaces 213
Lesson 6.4-Tutorial 2: Create Boolean Difference Surfaces 214
Lesson 6.4-Tutorial 3: Create Boolean Intersect Surfaces 215
Lesson 6.5: Stitch Surfaces Together 216
Applying Global Stitch 217
Stitching Surface Points Together 217
Stitching Surface Edges Together 217
Lesson 6.5-Tutorial 1: Apply Global Stitch 217
Lesson 6.6: Convert Objects 218
Converting NURBS to Polygons 219
Converting to Subdivision Surfaces 219
Converting Subdivision Surfaces to NURBS and Polygons 219
Lesson 6.6-Tutorial 1: Convert NURBS to Polygons 220
Lesson 6.6-Tutorial 2: Convert NURBS to Polygons and Back 221
Chapter Summary 222
What You Have Learned 222
Key Terms From This Chapter 223

CHAPTER 7 225

Drawing and Editing Curves 225

Lesson 7.1: Create Curves 226
Creating Smooth Curves 226
Creating Straight Line Curves 226
Drawing Freehand Curves 227
Simplifying and Smoothing Curves 227
Lesson 7.1-Tutorial 1: Draw and Compare CV, EP, and Freehand Curves 228
Lesson 7.1-Tutorial 2: Simplify Freehand Curves 229
Lesson 7.2: Edit Curve Details 231
Using the Edit Curve Tool 231
Altering Tangents 232
Adding Sharp Points to a Curve 232
Adding Points to the End of a Curve 233
Closing and Opening Curves 233
Lesson 7.2-Tutorial 1: Create and Edit a Star Shape 234
Lesson 7.2-Tutorial 2: Use the Edit Curve Tool 235
Lesson 7.2-Tutorial 3: Create Sharp Points 236
Lesson 7.2-Tutorial 4: Close a Curve 237
Lesson 7.3: Modify Curves 238
Locking Length 238

Straightening Curves 238
Smoothing Curves....238
Curling and Bending Curves....239
Scaling Curvature....240
Lesson 7.3-Tutorial 1: Curl a Curve....240
Lesson 7.4: Apply Curve Operators....242
Attaching Curves....243
Aligning Curves 244
Detaching and Cutting Curves 245
Finding Curve Intersections 245
Offsetting Curves 245
Filleting Curves 245
Lesson 7.4-Tutorial 1: Connect Cursive Letters 246
Lesson 7.4-Tutorial 2: Align Flower Petals 247
Lesson 7.4-Tutorial 3: Offset Curves 248
Lesson 7.4-Tutorial 4: Fillet Curves 249
Lesson 7.5: Create Sweep Mesh Objects 250
Changing the cross-section....251
Creating a group of sweeps 251
Adding twist and taper 252
Optimizing a sweep mesh....252
Lesson 7.5-Tutorial 1: Sweep a bugle....252
Lesson 7.6: Create Simple Surfaces from Curves....253
Revolving a Curve 254
Lofting a Set of Curves....254
Creating Planar Curves 254
Creating a Surface from Boundary Curves 255
Extruding Curves....255
Using the Birail Tools 255
Lesson 7.5-Tutorial 1: Revolve a Baseball Bat 256
Lesson 7.5-Tutorial 2: Loft a Banana 256
Lesson 7.5-Tutorial 3: Create a Planar Surface 257
Lesson 7.5-Tutorial 4: Extrude a Circle 258
Lesson 7.5-Tutorial 5: Create a Birail Surface....259
Chapter Summary....260
What You Have Learned 260
Key Terms From This Chapter....261

CHAPTER 8 263

Using Deformers.... 263

Lesson 8.1: Use nonlinear deformers 263
Bending objects 263
Flaring objects 264
Squashing objects....265
Twisting objects....266
Adding waves....267
Lesson 8.1-Tutorial 1: Bending a hammer 268

Lesson 8.1-Tutorial 2: Adding a wave to a table 269
Lesson 8.2: Working with Deformers 270
Adding object density 270
Using manipulator handles 271
Removing the deformer 272
Making the changes permanent 272
Transforming the manipulator 272
Painting Deformer Weights 272
Lesson 8.2-Tutorial 1: Painting Deformer Weights 273
Lesson 8.3: Modifying with the Lattice and Wire Deformers 273
Using the Lattice deformer 274
Using the Wire deformer 274
Lesson 8.3-Tutorial 1: Using a Lattice deformer 275
Lesson 8.3-Tutorial 2: Using a Wire deformer 276
Lesson 8.4: Conforming with the Shrinkwrap Deformer 277
Lesson 8.4-Tutorial 1: Wrapping a road to a terrain 279
Lesson 8.5: Deforming Components 280
Using Component Tags 280
Moving component groups with the Cluster deformer 281
Preventing movement with the Solidify deformer 282
Smoothing with the Delta Mush deformer 283
Lesson 8.5-Tutorial 1: Carving a river through a terrain. 284
Lesson 8.6: Creating Softbody Objects 285
Lesson 8.6-Tutorial 1: Creating a softbody 286
Lesson 8.7: Use the Texture deformer 287
Lesson 8.7-Tutorial 1: Deforming with a texture. 288
Chapter Summary 289
What You Have Learned 290
Key Terms From This Chapter 290

CHAPTER 9 293

Assigning Materials and Textures 293
Lesson 9.1: Apply Materials 294
Applying New Materials 294
Renaming Materials 295
Applying Existing Materials 295
Applying Materials to Selected Faces 295
Changing Material Attributes 296
Moving Between Nodes 297
Rendering Materials 297
Lesson 9.1-Tutorial 1: Apply a Material 298
Lesson 9.1-Tutorial 2: Apply a Material to Face Selection 299
Lesson 9.1-Tutorial 3: Apply and Render a Texture 300
Lesson 9.2: Use the Hypershade 301
Using the Create Bar 302
Using the tabbed panes 303
Using the Work Area 304

Working with Nodes 305
Connecting Nodes 305
Using the Material Viewer 306
Dragging Materials to Objects 307
Lesson 9.2-Tutorial 1: Create a Custom Material 307
Lesson 9.2-Tutorial 2: Create a Custom Cloth Material 308
Lesson 9.3: Work with Materials 309
Learning the Surface Materials 309
Changing Material Color 310
Changing Material Transparency 311
Using Other Material Attributes 311
Layering Materials 311
Using the Ramp Shader 313
Using the Shading Map 314
Lesson 9.3-Tutorial 1: Change Color and Transparency 315
Lesson 9.3-Tutorial 2: Layer Materials 316
Lesson 9.3-Tutorial 3: Use a Shading Map 317
Lesson 9.4: Work with Textures 318
Connecting Texture Nodes 320
Applying Textures as Color 320
Mapping Textures to Attributes 321
Using Bump Maps 321
Loading File Textures 322
Layering Textures 323
Lesson 9.4-Tutorial 1: Apply Textures 324
Lesson 9.4-Tutorial 2: Load an Image Texture 325
Lesson 9.5: Position Textures 326
Using Default Mapping 326
Using Projection Mapping 327
Placing 2D Textures 328
Placing 3D Textures 328
Lesson 9.5-Tutorial 1: Position 2D Textures 329
Lesson 9.5-Tutorial 2: Position 3D Textures 330
Lesson 9.6: Use Displacement Maps 331
Bump Maps vs. Displacement Maps 331
Adding Relief with Displacement Maps 332
Converting Displacement Maps to Geometry 333
Lesson 9.6-Tutorial 1: Use a Displacement map 334
Lesson 9.6-Tutorial 2: Convert a Displacement map 335
Lesson 9.7: Use Utilities Nodes 336
Using the General Utilities 336
Using the Color Utilities 337
Using the Switch Utilities 337
Lesson 9.7-Tutorial 1: Blend Colors 337
Lesson 9.8: Paint in 3D 338
Assigning a Paint Texture 338
Selecting a Brush 339
Applying Color 340
Using Different Paint Operations 340

Painting Other Attributes 341
Lesson 9.8-Tutorial 1: Use the 3D Paint Tool 342
Lesson 9.9: Edit UVs 343
Understanding UVs 343
Accessing the UV Editor 343
Selecting and Editing UV Components 344
Working with UVs and Shells 345
Using Different Mappings 346
Unfolding UV Shells 347
Cutting and Sewing UVs 348
Arranging UV Shells 349
Generating a UV Snapshot 350
Lesson 9.9-Tutorial 1: Edit UVs 350
Lesson 9.9-Tutorial 2: Work with UV Shells 352
Chapter Summary 354
What You Have Learned 354
Key terms From This Chapter 355

CHAPTER 10 357

Adding Paint Effects 357

Lesson 10.1: Use the Preset Brushes 357
Accessing the Paint Effects Panel 358
Using the Paint Effects Tool 358
Using Preset Brushes 358
Introducing the Content Browser 359
Blending Presets 360
Redrawing the View 361
Clearing the View 361
Lesson 10.1-Tutorial 1: Use a Paint Effects Brush 361
Lesson 10.1-Tutorial 2: Use a Content Browser Brush 362
Lesson 10.1-Tutorial 3: Blend Brushes 363
Lesson 10.2: Create Custom Brushes 364
Changing Template Brush Settings 364
Using the Various Brush Types 365
Changing Brush Size 367
Changing Brush Color 368
Enabling Illumination and Shadows 369
Enabling Glows 370
Creating and Saving Custom Brushes 371
Lesson 10.2-Tutorial 1: Change Brush Size 372
Lesson 10.2-Tutorial 2: Change Brush Color 373
Lesson 10.2-Tutorial 3: Add Shadows 374
Lesson 10.2-Tutorial 4: Add a Glow 375
Lesson 10.3: Paint in 2D 376
Introducing the Paint Effects Canvas 376
Changing the Canvas Size 377
Creating Seamless Textures 377

Saving Textures....378
Undoing the Last Stroke....378
Saving the Alpha Channel....378
Lesson 10.3-Tutorial 1: Create a Seamless Texture....379
Lesson 10.3-Tutorial 2: Save an Image and Alpha Channel....380
Lesson 10.4: Paint on 3D Objects....382
Painting in a View Panel....382
Painting on Objects....383
Auto-Painting an Object....384
Saving Depth as a Grayscale Map....385
Lesson 10.4-Tutorial 1: Paint on Objects....385
Lesson 10.4-Tutorial 2: Auto-Paint on Objects....386
Lesson 10.5: Edit Paint Effects....387
Selecting Strokes....387
Editing Strokes....388
Converting Strokes to Polygons....388
Changing the Default Light....389
Lesson 10.5-Tutorial 1: Select and Edit Strokes....389
Lesson 10.5-Tutorial 2: Convert Paint Effects to Polygons....390
Chapter Summary....391
What You Have Learned....391
Key Terms From This Chapter....392

CHAPTER 11 393

Using Cameras and Lights 393
Lesson 11.1: Work with Cameras....394
Creating Cameras....394
Changing Camera Settings....394
Selecting a Camera....395
Positioning Cameras....395
Looking Through a New Camera....395
Setting View Guidelines....396
Changing the Depth of Field....397
Lesson 11.1-Tutorial 1: Create a Camera....398
Lesson 11.1-Tutorial 2: Aim a Camera....398
Lesson 11.1-Tutorial 3: Create a Depth-of-Field Effect....399
Lesson 11.2: Create a Background....400
Setting the Background Color....400
Adding an Image Plane....401
Creating a Textured Background....401
Loading a Background Image....402
Positioning the Background....403
Lesson 11.2-Tutorial 1: Change Background Color....403
Lesson 11.2-Tutorial 2: Change Background Texture....404
Lesson 11.2-Tutorial 3: Add and Position a Background Image....405
Lesson 11.3: Create and Position Lights....406
Using Default Lights....406

Understanding the Light Types....406
Creating Lights....407
Manipulating Lights....407
Manipulating Spot Lights....408
Lesson 11.3-Tutorial 1: Create and Manipulate a Light....409
Lesson 11.4: Change Light Settings....411
Changing Light Color....411
Changing Light Intensity and Decay....411
Enabling Shadows....412
Lesson 11.4-Tutorial 1: Change Light Color and Intensity....413
Lesson 11.4-Tutorial 2: Enable Shadows....414
Lesson 11.5: Create Light Effects....415
Creating Light Fog....415
Creating Glows and Halos....416
Creating Lens Flares....417
Lesson 11.5-Tutorial 1: Enable Light Fog....418
Lesson 11.5-Tutorial 2: Enable a Halo Light Effect....420
Chapter Summary....421
What You Have Learned....421
Key Terms From This Chapter....422

CHAPTER 12 423

Animating with Keyframes 423
Lesson 12.1: Set Keyframes....423
Setting Keys....424
Using Auto Key....424
Selecting Keys....425
Copying Keys....426
Deleting Keys....426
Snapping Keys....426
Lesson 12.1-Tutorial 1: Set Keys....426
Lesson 12.1-Tutorial 2: Use Auto Key....427
Lesson 12.1-Tutorial 3: Move Keys....428
Lesson 12.2: View an Animation....429
Previewing Animation....429
Setting Frame Rate....430
Looping an Animation....430
Accessing Animation Preferences....430
Enabling Ghosting....431
Creating Motion Trails....433
Enabling Cached Playback....434
Using Playblast....434
Lesson 12.2-Tutorial 1: Preview an Animation....435
Lesson 12.2-Tutorial 2: Use Playblast....436
Lesson 12.3: Animate Using Motion Paths....437
Creating Motion Path Keys....437
Drawing a Motion Path....438

Attaching an Object to a Motion Path....438
Adjusting an Attached Motion Path....439
Deforming an Object as it Follows a Motion Path....440
Lesson 12.3-Tutorial 1: Create a Motion Path....441
Lesson 12.3-Tutorial 2: Draw a Motion Path and Attach an Object....442
Lesson 12.4: Edit Animation Curves....443
Using the Graph Editor....443
Framing Curves....444
Editing Keys....444
Editing Curves....445
Setting Infinity Conditions....446
Working with Tangents....447
Adding Keys....448
Lesson 12.4-Tutorial 1: Edit Animation Curves....448
Lesson 12.4-Tutorial 2: Repeat Motion....449
Lesson 12.5: Control Animation Timing and Adding Sound....450
Using the Dope Sheet....450
Using the Dope Sheet Manipulator....451
Adding Sound....452
Lesson 12.5-Tutorial 1: Use the Dope Sheet....452
Lesson 12.5-Tutorial 2: Add Sound....454
Chapter Summary....455
What You Have Learned....455
Key Terms From This Chapter....456

CHAPTER 13 457

Working with Characters 457
Lesson 13.1: Build a Skeleton....457
Creating Joints....458
Inserting a Joint....458
Connecting a Joint Chain....459
Removing and Disconnecting Joints....460
Mirroring Joints....460
Resetting the Root Joint....461
Naming Joints....461
Lesson 13.1-Tutorial 1: Create a Skeleton....461
Lesson 13.1-Tutorial 2: Add a Tail to the Skeleton....462
Lesson 13.2: Edit Joint Attributes....463
Inheriting Transforms....463
Orienting Joints....463
Labeling Joints....464
Showing and Hiding Labels....464
Limiting Joints....464
Displaying Joints....465
Lesson 13.2-Tutorial 1: Label Joints....466
Lesson 13.2-Tutorial 2: Limit Joint Motion....467
Lesson 13.3: Add Inverse Kinematics....468

Using the Create IK Handle Command 468
Using the Create IK Spline Handle Command 469
Posing the IK Handles 470
Switching Between FK and IK 471
Lesson 13.3-Tutorial 1: Add IK to a Skeleton 471
Lesson 13.3-Tutorial 2: Add IK Spline to the Skeleton Tail 472
Lesson 13.4: Skin a Character 473
Creating Effective Skin 473
Positioning a Skeleton 474
Using X-Ray Mode 474
Binding Skin 474
Binding Interactive Skin 475
Returning to Default Pose 476
Unbinding Skin 476
Animating Joints 476
Lesson 13.4-Tutorial 1: Position a Skin 476
Lesson 13.4-Tutorial 2: Bind Skin 477
Lesson 13.4-Tutorial 3: Animate Joints 478
Lesson 13.5: Edit a Skin 479
Adding Influence Objects 479
Understanding Skin Weights 480
Using the Interactive Bind Skin Tool 481
Painting and Smoothing Skin Weights 482
Mirroring Skin Weights 483
Resetting Skin Weights 483
Lesson 13.5-Tutorial 1: Add Influence Object 483
Lesson 13.5-Tutorial 2: Paint Weights 484
Lesson 13.6: Automatic Rigging 485
Creating a Rig with One-Click 485
Creating a Step-by-Step Rig 486
Controlling the Human IK Rig 487
Animating with Motion Capture data 488
Lesson 13.6-Tutorial 1: Creating a Quick Rig 489
Lesson 13.6-Tutorial 1: Animate with Motion Capture 489
Lesson 13.7: Add Hair and Fur 490
Adding preset hair to an object 490
Creating hair 491
Style hair 492
Making hair dynamic 492
Creating and editing hair attributes 493
Rendering hair and fur 494
Creating Hair with XGen 495
Opening the XGen Editor 495
Sculpting Hair with Modifiers 496
Lesson 13.7-Tutorial 1: Add hair 497
Lesson 13.7-Tutorial 1: Add XGen grass 498
Chapter Summary 499
What You Have Learned 499
Key Terms From This Chapter 500

CHAPTER 14 503

Animating with Dynamics 503

Lesson 14.1: Use Particles 504
Viewing Particle Examples 504
Creating Particles 504
Creating Surface Particles 505
Viewing Particle Attributes and Count 506
Setting Particle Lifespan 507
Changing Particle Render Type 507
Using Instances 508
Cycling Instances 509
Lesson 14.1-Tutorial 1: Add Clouds to a Sphere 510
Lesson 14.1-Tutorial 2: Use an Instance 511
Lesson 14.1-Tutorial 3: Cycle Instances 512
Lesson 14.2: Create an Emitter 513
Using an Emitter 513
Using a Directional Emitter 514
Using a Volume Emitter 515
Using an Object as an Emitter 516
Changing Emitter Attributes 517
Lesson 14.2-Tutorial 1: Create an Omni Emitter 518
Lesson 14.2-Tutorial 2: Create a Directional Emitter 519
Lesson 14.2-Tutorial 3: Create an Object Emitter 520
Lesson 14.3: Create Fields and Goals 521
Understanding Fields 521
Connecting Objects to a Field 522
Changing Field Attributes 522
Regulating Field Forces 523
Establishing Goals 524
Lesson 14.3-Tutorial 1: Create a Vortex Field 525
Lesson 14.3-Tutorial 2: Create a Goal 526
Lesson 14.4: Animating Rigid Body Collisions 527
Adding rigid body objects 527
Adding Passive body objects 528
Adding a force 528
Seeing the collisions 528
Using MASH Dynamics 529
Creating a MASH Network 529
Opening the MASH Editor and enabling dynamics 529
Adding collision objects and fields 531
Lesson 14.4-Tutorial 1: Enable rigid body collisions 531
Lesson 14.4-Tutorial 1: Using MASH dynamics 532
Lesson 14.5: Manage Particle Collisions 533
Enabling Particle Collisions 533
Enabling Particle Collisions 534
Setting Particle Attributes 534
Defining New Events 535
Assigning a Solver 536

Creating Soft Body Objects....536
Lesson 14.5-Tutorial 1: Enable Particle Collisions....536
Lesson 14.5-Tutorial 2: Add a Collision Event....537
Lesson 14.5-Tutorial 3: Filling a Container with Particles....538
Lesson 14.5-Tutorial 4: Create Soft Body Objects....539
Lesson 14.6: Use Cloth....540
Viewing Cloth Examples....540
Creating Cloth....541
Creating a Cloth Collision Object....542
Setting Cloth Object Properties....543
Lesson 14.6-Tutorial 1: Drape a Tablecloth....544
Lesson 14.7: Constrain Motion....545
Adding Constraints....545
Creating Component Constraints....546
Locking Components in Space....547
Creating Springs....547
Lesson 14.7-Tutorial 1: Constrain a Flag to a Pole....547
Lesson 14.8: Use Fluids....548
Creating a Fluid Container....548
Creating a Fluid Emitter....549
Changing Fluid Properties....549
Creating Oceans and Ponds....550
Lesson 14.8-Tutorial 1: Fill a Container....550
Lesson 14.8-Tutorial 2: Create a Pond with Ripples....551
Lesson 14.9: Create Effects....552
Creating Fire and Smoke....552
Creating Fireworks....554
Creating Lightning....554
Shattering Objects....555
Flowing Along a Curve....556
Lesson 14.9-Tutorial 1: Create a Fire Effect....557
Lesson 14.9-Tutorial 2: Create Fireworks....558
Lesson 14.9-Tutorial 3: Create Lightning....559
Lesson 14.9-Tutorial 4: Create Curve Flow....560
Chapter Summary....561
What You Have Learned....561
Key Terms From This Chapter....562

CHAPTER 15 565

Rendering a Scene 565

Lesson 15.1: Configure the Render Process....566
Choosing a Renderer....567
Saving Render Presets....567
Changing a File Name....567
Changing File Format....567
Changing Camera View and Resolution....567
Using render layers....568

Lesson 15.1-Tutorial 1: Set Render Settings....568
Lesson 15.1-Tutorial 2: Change the Rendering Path....568
Lesson 15.2: Use Special Rendering Features....569
Adjusting Render Quality....569
Enabling Raytracing....571
Enabling Motion Blur....571
Lesson 15.2-Tutorial 1: Change the Render Quality....572
Lesson 15.2-Tutorial 2: Enable Raytracing....572
Lesson 15.2-Tutorial 3: Enable Motion Blur....573
Lesson 15.2-Tutorial 4: Add Environment Fog....574
Lesson 15.3: Use the Render View Window....575
Opening the Render View....575
Rendering a Region....576
Using Interactive Photorealistic Rendering (IPR)....577
Saving Rendered Images....577
Lesson 15.3-Tutorial 1: Render a Region....577
Lesson 15.3-Tutorial 2: Use IPR Rendering....578
Lesson 15.4: Create a Final Render....579
Rendering a Single Frame....579
Rendering an Animation Sequence....579
Using Batch Rendering....580
Lesson 15.4-Tutorial 1: Render an Animation....580
Lesson 15.5: Render with Maya Vector and Arnold....581
Using Maya Vector....581
Using Arnold....583
Using Arnold Materials....585
Using Arnold Lights....586
Lesson 15.5-Tutorial 1: Render Using Vectors....586
Lesson 15.5-Tutorial 2: Render with Arnold....587
Chapter Summary....588
What You Have Learned....588
Key Terms From This Chapter....589

CHAPTER 16 591

Using MEL Scripting 591
Lesson 16.1: Use the Command Line....591
Using MEL in the Command Line....591
Repeating Command Line Commands....592
Using the MEL Scripting Commands....592
Lesson 16.1-Tutorial 1: Enter MEL Commands in the Command Line....593
Lesson 16.2: Use the Script Editor....594
Executing Script Commands....595
Viewing Interface Commands....595
Reusing Interface Commands....595
Saving Scripts....596
Adding Scripts to the Shelf....596
Lesson 16.2-Tutorial 1: Use the Script Editor....597

Lesson 16.2-Tutorial 2: View Interface Commands and Save a Script 597
Lesson 16.2-Tutorial 3: Execute a Custom Script 598
Chapter Summary.....599
What You Have Learned.....599
Key Terms From This Chapter.....600