Contents

Preface ix
Acknowledgments xi

Part I Using and making maps

Chapter 1: Introduction 1
Tutorial 1-1 Opening and saving a map document 2
Tutorial 1-2 Working with map layers 5
Tutorial 1-3 Navigating in a map document 13
Tutorial 1-4 Measuring distances 20
Tutorial 1-5 Working with feature attributes 23
Tutorial 1-6 Selecting features 27
Tutorial 1-7 Changing selection options 28
Tutorial 1-8 Working with attribute tables 33
Tutorial 1-9 Labeling features 39
Assignment 1-1 Analyze population by race in the top 10 US states 42
Assignment 1-2 Produce a crime map 44

Chapter 2: Map design 47
Tutorial 2-1 Creating point and polygon maps using qualitative attributes 48
Tutorial 2-2 Creating point and polygon maps using quantitative attributes 58
Tutorial 2-3 Creating custom classes for a map 62
Tutorial 2-4 Creating custom colors for a map 66
Tutorial 2-5 Creating normalized and density maps 69
Tutorial 2-6 Creating dot density maps 74
Tutorial 2-7 Creating fishnet maps 76
Tutorial 2-8 Creating group layers and layer packages 83
Assignment 2-1 Create a map showing schools in New York City by type 88
Assignment 2-2 Create maps for military sites and congressional districts 90
Assignment 2-3 Create maps for US veteran unemployment status 92

Chapter 3: GIS outputs 95
Tutorial 3-1 Building an interactive GIS 96
Tutorial 3-2 Creating map layouts 103
Tutorial 3-3 Reusing a custom map layout 110
Tutorial 3-4 Creating a custom map template with two maps 112
Tutorial 3-5 Adding a report to a layout 118
Tutorial 3-6 Adding a graph to a layout 120
Tutorial 3-7 Building a map animation 122
Tutorial 3-8 Using ArcGIS Online 126
Assignment 3-1 Create a dynamic map of historic buildings in downtown Pittsburgh 136
Assignment 3-2 Create a layout comparing 2010 elderly and youth population compositions in Orange County, California 138
Assignment 3-3 Create an animation for an auto theft crime time series 140
Assignment 3-4 Create a shared map on ArcGIS Online 142

Part II Working with spatial data

Chapter 4: File geodatabases 145

Tutorial 4-1 Building a file geodatabase 146
Tutorial 4-2 Using ArcCatalog utilities 149
Tutorial 4-3 Modifying an attribute table 152
Tutorial 4-4 Joining tables 155
Tutorial 4-5 Creating centroid coordinates in a table 157
Tutorial 4-6 Aggregating data 161
Assignment 4-1 Investigate educational attainment 166
Assignment 4-2 Compare serious crime with poverty in Pittsburgh 168

Chapter 5: Spatial data 171

Tutorial 5-1 Examining metadata 172
Tutorial 5-2 Working with world map projections 175
Tutorial 5-3 Working with US map projections 178
Tutorial 5-4 Working with rectangular coordinate systems 180
Tutorial 5-5 Learning about vector data formats 185
Tutorial 5-6 Downloading US Census Bureau boundary maps 191
Tutorial 5-7 Downloading and processing Census SF 1 data tables 193
Tutorial 5-8 Downloading and processing American Community Survey (ACS) Census data 201
Tutorial 5-9 Exploring raster basemaps from Esri web services 204
Tutorial 5-10 Downloading raster maps from the USGS 206
Tutorial 5-11 Exploring sources of GIS data from government websites 210
Assignment 5-1 Compare heating fuel types by US counties 214
Assignment 5-2 Create a map of Maricopa County, Arizona, voting districts, schools, and voting-age population using downloaded data and a web service image 216

Chapter 6: Geoprocessing 219

Tutorial 6-1 Extracting features for a study area 220
Tutorial 6-2 Clipping features 224
Tutorial 6-3 Dissolving features 226
Tutorial 6-4 Merging features 229
Tutorial 6-5 Intersecting layers 231
Tutorial 6-6 Unioning layers 234
Tutorial 6-7 Automating geoprocessing with ModelBuilder 239
Assignment 6-1 Build a study region for Colorado counties 248
Assignment 6-2 Dissolve property parcels to create a zoning map 250
Assignment 6-3 Build a model to create a fishnet map layer for a study area 252

Chapter 7: Digitizing 255
Tutorial 7-1 Digitizing polygon features 256
Tutorial 7-2 Digitizing line features 264
Tutorial 7-3 Digitizing point features 268
Tutorial 7-4 Using advanced editing tools 271
Tutorial 7-5 Spatially adjusting features 276
Assignment 7-1 Digitize police beats 280
Assignment 7-2 Use GIS to track campus information 282

Chapter 8: Geocoding 285
Tutorial 8-1 Geocoding data by ZIP Code 286
Tutorial 8-2 Geocoding data by street address 292
Tutorial 8-3 Correcting source addresses using interactive rematch 297
Tutorial 8-4 Correcting street reference layer addresses 299
Tutorial 8-5 Using an alias table 304
Assignment 8-1 Geocode household hazardous waste participants to ZIP Codes 306
Assignment 8-2 Geocode immigrant-run businesses to Pittsburgh streets 308
Assignment 8-3 Examine match option parameters for geocoding 310

Part III Analyzing spatial data

Chapter 9: Spatial analysis 313
Tutorial 9-1 Buffering points for proximity analysis 315
Tutorial 9-2 Conducting a site suitability analysis 320
Tutorial 9-3 Using multiple ring buffers for calibrating a gravity model 323
Tutorial 9-4 Using data mining with cluster analysis 329
Assignment 9-1 Analyze population in California cities at risk for earthquakes 334
Assignment 9-2 Analyze visits to the Jack Stack public pool in Pittsburgh 336
Assignment 9-3 Use data mining with crime data 338

Chapter 10: ArcGIS 3D Analyst for Desktop 341

Tutorial 10-1 Creating a 3D scene 342
Tutorial 10-2 Creating a TIN (triangulated irregular network) from contours 344
Tutorial 10-3 Draping features onto a TIN 348
Tutorial 10-4 Navigating scenes 353
Tutorial 10-5 Creating an animation 357
Tutorial 10-6 Using 3D effects 359
Tutorial 10-7 Using 3D symbols 362
Tutorial 10-8 Editing 3D objects 365
Tutorial 10-9 Using ArcGIS 3D Analyst for landform analysis 368
Tutorial 10-10 Exploring ArcGlobe 372
Assignment 10-1 Develop a 3D presentation for downtown historic sites 376
Assignment 10-2 Topographic site analysis 378
Assignment 10-3 3D animation of conservatory study area 380

Chapter 11: ArcGIS Spatial Analyst for Desktop 383

Tutorial 11-1 Processing raster map layers 384
Tutorial 11-2 Creating a hillshade raster layer 389
Tutorial 11-3 Making a kernel density map 391
Tutorial 11-4 Extracting raster value points 396
Tutorial 11-5 Conducting a raster-based site suitability study 399
Tutorial 11-6 Using ModelBuilder for a risk index 405
Assignment 11-1 Create a mask and hillshade for suburbs 416
Assignment 11-2 Estimate heart-attack fatalities outside of hospitals by gender 418

Appendix A Task index 421
Appendix B Data source credits 425
Appendix C Data license agreement 439
Appendix D Installing the data and software 443