

■ Contents

■ Preface	v
■ About This Book	
■ About the Examples in this Book	ix
■ Contents of the Chapters	x
■ References to the <i>Mathematica</i> Book	xi
■ Trying Out the Examples	xi
■ Which Version of <i>Mathematica</i> is Described?	xii
■ Notation and Terminology	xiii
■ Teaching <i>Mathematica</i> Programming	xiii
■ Changes from the First Edition	xiv
■ 1 From Interactive Commands to a Package	
■ 1.1 Collecting Commands in a Package	3
■ 1.2 The Basic Ingredients of a Package	7
■ 1.3 Adding Another Function to the Package	11
■ 1.4 Adding Defaults and Options	14
■ 1.5 Another Way to Add Defaults	18
■ 1.6 Passing Options to Another Function	20
■ 1.7 Advanced Topic: Dealing with Singularities	22
■ 1.8 Parameter Type Checking	27
■ 2 Encapsulation Mechanisms for Packages	
■ 2.1 All about Contexts	31
■ 2.2 Packages that Use Other Packages	35
■ 2.3 Protection of Symbols in a Package	41
■ 2.4 A Skeletal Package	45
■ 2.5 Special Cases	47
■ 2.6 Procedures and Local Variables	51
■ 3 Defaults and Options	
■ 3.1 Simple Default Values for Arguments of Functions	57
■ 3.2 Computed Defaults	59
■ 3.3 Defining Options for Functions	62
■ 3.4 Filtering Options	65
■ 4 Functional and Procedural Programming	
■ 4.1 Loops	73
■ 4.2 Structured Iteration	79
■ 4.3 Function Application Instead of Iteration	83
■ 4.4 Map and Apply	90
■ 4.5 Application: The Platonic Solids	93
■ 4.6 Operations on Lists and Matrices	99
■ 5 Evaluation	
■ 5.1 Evaluation of the Body of a Rule	109
■ 5.2 Pure Functions	112

■ 5.3 Evaluation of Arguments of Functions	115
■ 5.4 Application: Programmed Definition of Functions	121
■ 5.5 Assigning Values to Expressions	125
■ 5.6 Advanced Topic: Scopes of Names	130
■ 6 Building Rule Sets	
■ 6.1 Introduction to Simplification Rules and Normal Forms	137
■ 6.2 Trigonometric Simplifications	141
■ 6.3 Globally Defined Rules	147
■ 6.4 Pattern Matching for Rules	149
■ 6.5 Traversing Expressions	155
■ 7 Numerical Computations	
■ 7.1 Numbers	161
■ 7.2 Numerical Evaluation	167
■ 7.3 Application: Solution of Differential Equations	171
■ 8 Overriding Built-in Rules	
■ 8.1 User-Defined Rules Take Precedence	179
■ 8.2 Modifying the Main Evaluation Loop	182
■ 8.3 Adding to a System Function	186
■ 8.4 Advanced Topic: Introducing a New Mathematical Function	188
■ 9 Input and Output	
■ 9.1 Output Formatting	195
■ 9.2 Input from Files and Programs	198
■ 9.3 Running <i>Mathematica</i> Unattended	203
■ 9.4 Session Logging	208
■ 10 Notebooks	
■ 10.1 Packages and Notebooks	215
■ 10.2 Conversion between Notebooks and Packages	217
■ 11 More Graphics Programming	
■ 11.1 Graphics Packages	223
■ 11.2 The Cover Picture	227
■ 11.3 Animated Graphics	232
■ Appendix A Exercises	
■ A.1 Programming Exercises	237
■ A.2 Solutions to Exercises	238
■ Appendix B Bibliography	
■ B.1 Background Information and Further Reading	245
■ B.2 References	247
■ Appendix C Program Listings	
■ C.1 Index to Complete Listings of All Packages	251
■ C.2 Additional Program Listings	252
■ Index	269