

Programming in Objective-C

Third Edition

Stephen G. Kochan

A Addison-Wesley

Upper Saddle River, NJ • Boston • Indianapolis • San Francisco
New York • Toronto • Montreal • London • Munich • Paris • Madrid
Cape Town • Sydney • Tokyo • Singapore • Mexico City

Table of Contents

1 Introduction 1

- What You Will Learn from This Book 2
- How This Book Is Organized 3
- Support 5
- Acknowledgments 5

Part I The Objective-C 2.0 Language

2 Programming in Objective-C 7

- Compiling and Running Programs 7
 - Using Xcode 8
 - Using Terminal 15
- Explanation of Your First Program 17
- Displaying the Values of Variables 21
- Summary 23

3 Classes, Objects, and Methods 27

- What Is an Object, Anyway? 27
- Instances and Methods 28
- An Objective-C Class for Working with Fractions 30
- The @interface Section 32
 - Choosing Names 33
 - Instance Variables 35
 - Class and Instance Methods 35
- The Implementation Section 37
- The program Section 38
- Accessing Instance Variables and Data Encapsulation 45
- Summary 48

4 Data Types and Expressions 51

- Data Types and Constants 51
 - Type int 51
 - Type float 52
 - Type char 52

Qualifiers: long, long, long, short, unsigned, and signed	53
Type id	54
Arithmetic Expressions	55
Operator Precedence	55
Integer Arithmetic and the Unary Minus Operator	58
The Modulus Operator	60
Integer and Floating-Point Conversions	61
The Type Cast Operator	62
Assignment Operators	63
A Calculator Class	64
5 Program Looping	69
The for Statement	70
Keyboard Input	76
Nested for Loops	78
for Loop Variants	80
The while Statement	81
The do Statement	85
The break Statement	87
The continue Statement	87
Summary	88
6 Making Decisions	91
The if Statement	91
The if-else Construct	95
Compound Relational Tests	98
Nested if Statements	101
The else if Construct	102
The switch Statement	111
Boolean Variables	114
The Conditional Operator	118
7 More on Classes	123
Separate Interface and Implementation Files	123
Synthesized Accessor Methods	128
Accessing Properties Using the Dot Operator	129

Contents

Multiple Arguments to Methods	130
Methods Without Argument Names	132
Operations on Fractions	133
Local Variables	135
Method Arguments	136
The <code>static</code> Keyword	137
The <code>self</code> Keyword	140
Allocating and Returning Objects from Methods	141
Extending Class Definitions and the Interface File	146

8 Inheritance 149

It All Begins at the Root	149
Finding the Right Method	153
Extension Through Inheritance: Adding New Methods	154
A Point Class and Memory Allocation	157
The <code>@class</code> Directive	159
Classes Owning Their Objects	163
Overriding Methods	167
Which Method Is Selected?	169
Overriding the <code>dealloc</code> Method and the Keyword <code>super</code>	171
Extension Through Inheritance: Adding New Instance Variables	173
Abstract Classes	175

9 Polymorphism, Dynamic Typing, and Dynamic Binding 179

Polymorphism: Same Name, Different Class	179
Dynamic Binding and the <code>id</code> Type	182
Compile Time Versus Runtime Checking	184
The <code>id</code> Data Type and Static Typing	185
Argument and Return Types with Dynamic Typing	186
Asking Questions About Classes	187
Exception Handling Using <code>\$try</code>	191

10 More on Variables and Data Types 197

- Initializing Objects 197
- Scope Revisited 200
 - Directives for Controlling Instance Variable Scope 200
 - External Variables 201
 - Static Variables 203
- Enumerated Data Types 205
- The typedef Statement 208
- Data Type Conversions 209
 - Conversion Rules 210
- Bit Operators 211
 - The Bitwise AND Operator 213
 - The Bitwise Inclusive-OR Operator 214
 - The Bitwise Exclusive-OR Operator 214
 - The Ones Complement Operator 215
 - The Left Shift Operator 216
 - The Right Shift Operator 217

11 Categories and Protocols 219

- Categories 219
 - Some Notes About Categories 224
- Protocols and Delegation 225
 - Delegation 228
 - Informal Protocols 228
- Composite Objects 229

12 The Preprocessor 233

- The #define Statement 233
 - More Advanced Types of Definitions 235
- The #import Statement 240
- Conditional Compilation 241
 - The #if def, #endif, #else, and #ifndef Statements 241
 - The #if and #elif Preprocessor Statements 243
 - The #undef Statement 244

13 Underlying C Language Features	247
Arrays	248
Initializing Array Elements	250
Character Arrays	251
Multidimensional Arrays	252
Functions	254
Arguments and Local Variables	255
Returning Function Results	257
Functions, Methods, and Arrays	260
Blocks	261
Structures	265
Initializing Structures	268
Structures Within Structures	269
Additional Details About Structures	271
Don't Forget About Object-Oriented Programming!	273
Pointers	274
Pointers and Structures	277
Pointers, Methods, and Functions	279
Pointers and Arrays	280
Operations on Pointers	290
Pointers and Memory Addresses	291
Unions	292
They're Not Objects!	295
Miscellaneous Language Features	295
Compound Literals	295
The goto Statement	296
The null Statement	296
The Comma Operator	297
The sizeof Operator	297
Command-Line Arguments	298
How Things Work	300
Fact #1: Instance Variables are Stored in Structures	300
Fact #2: An Object Variable is Really a Pointer	301

Fact #3: Methods are Functions, and Message Expressions are Function Calls 301

Fact #4: The id Type is a Generic Pointer Type 302

Part II The Foundation Framework

14 Introduction to the Foundation Framework 305

Foundation Documentation 305

15 Numbers, Strings, and Collections 309

Number Objects 309

A Quick Look at the Autorelease Pool 311

String Objects 314

More on the NSLog Function 314

The description Method 315

Mutable Versus Immutable Objects 316

Mutable Strings 322

Where Are All Those Objects Going? 326

Array Objects 328

Making an Address Book 332

Sorting Arrays 350

Dictionary Objects 356

Enumerating a Dictionary 357

Set Objects 360

NSIndexSet 363

16 Working with Files 369

Managing Files and Directories:

NSFileManager 370

Working with the NSData Class 374

Working with Directories 376

Enumerating the Contents of a Directory 378

Working with Paths: `NSPathUtilities.h` 380

Common Methods for Working with Paths 383

Copying Files and Using the `NSProcessInfo` Class 385

Basic File Operations: `NSFileHandle` 389

The `NSURL` Class 393

The `NSBundle` Class 394

- 17 Memory Management 397**
 - The Autorelease Pool 397
 - Reference Counting 398
 - Reference Counting and Strings 401
 - Instance Variables 403
 - An Autorelease Example 409
 - Summary of Memory-Management Rules 410
 - More on the Event Loop and Memory Allocation 411
 - Finding Memory Leaks 413
 - Garbage Collection 413

- 18 Copying Objects 417**
 - The copy and mutableCopy Methods 418
 - Shallow Versus Deep Copying 420
 - Implementing the <NSCopying> Protocol 422
 - Copying Objects in Setter and Getter Methods 425

- 19 Archiving 429**
 - Archiving with XML Property Lists 429
 - Archiving with NSKeyedArchiver 431
 - Writing Encoding and Decoding Methods 433
 - Using NSData to Create Custom Archives 440
 - Using the Archiver to Copy Objects 443

- Part III Cocoa, Cocoa Touch, and the iOS SDK**

- 20 Introduction to Cocoa and Cocoa Touch 445**
 - Framework Layers 445
 - Cocoa Touch 446

- 21 Writing iOS Applications 449**
 - The iOS SDK 449
 - Your First iPhone Application 449
 - Creating a New iPhone Application Project 452
 - Entering Your Code 455
 - Designing the Interface 458

An iPhone Fraction Calculator	464
Starting the New Fraction_Calculator Project	465
Defining the View Controller	468
The Fraction Class	472
A Calculator Class That Deals with Fractions	475
Designing the UI	477
Summary	478

Appendixes

A Glossary 481

B Address Book Source Code 489

Index 495