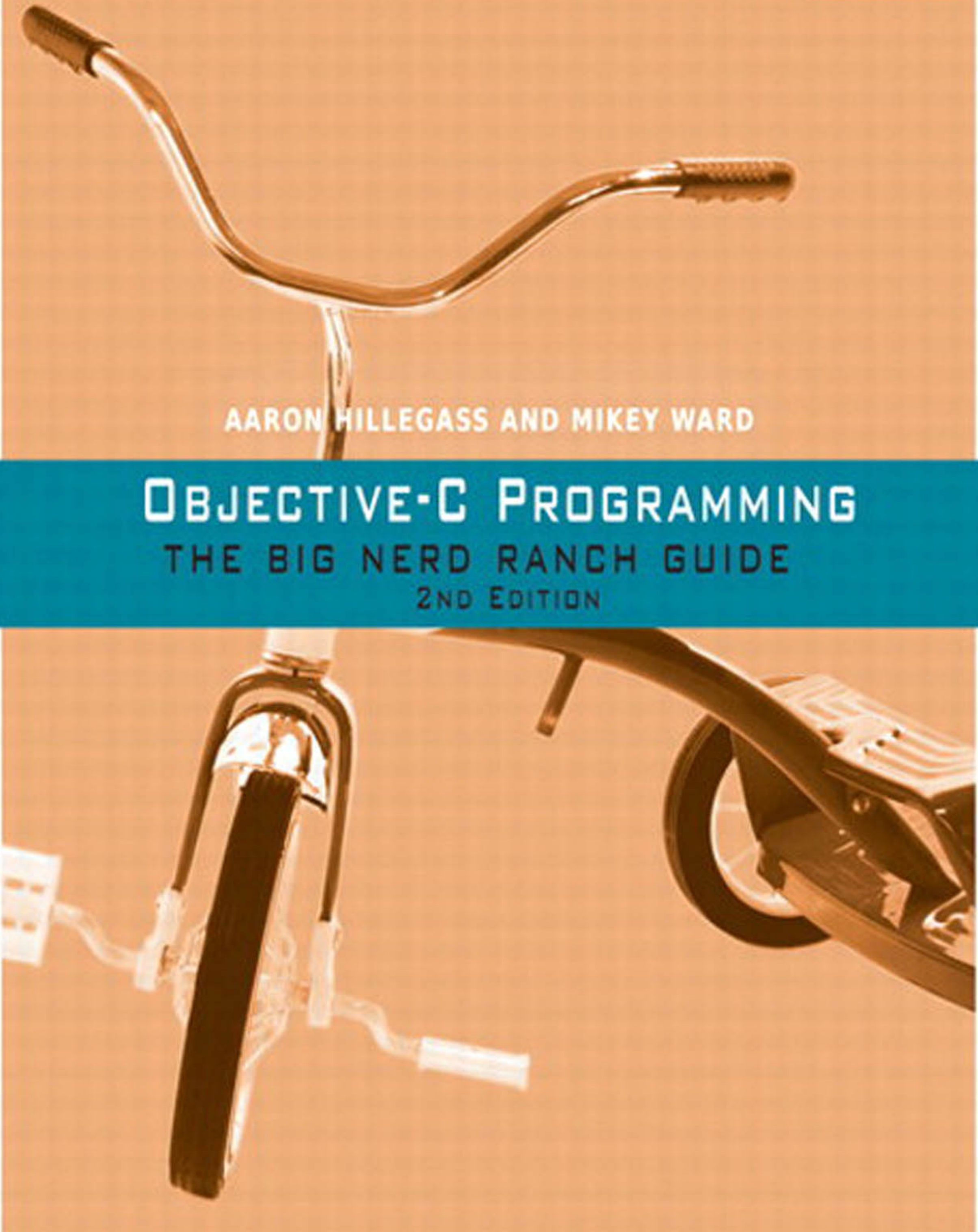

AARON HILLEGASS AND MIKEY WARD

OBJECTIVE-C PROGRAMMING

THE BIG NERD RANCH GUIDE

2ND EDITION

BIG NERD RANCH

Objective-C Programming

THE BIG NERD RANCH GUIDE

AARON HILLEGASS & MIKEY WARD

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Objective-C Programming: The Big Nerd Ranch Guide

by Aaron Hillegass and Mikey Ward

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Table of Contents

I. Getting Started 1
- 1. You and This Book 3
  - C and Objective-C 3
  - How this book works 4
  - How the life of a programmer works 4
- 2. Your First Program 7
  - Installing Apple's developer tools 7
  - Getting started with Xcode 7
  - Where do I start writing code? 9
  - How do I run my program? 14
  - So, what is a program? 15
  - Don't stop 16

II. How Programming Works 19
- 3. Variables and Types 21
  - Types 21
  - A program with variables 22
  - Challenge 24
- 4. if/else 25
  - Boolean variables 27
  - When curly braces are optional 27
  - else if 27
  - For the more curious: conditional operators 28
  - Challenge 28
- 5. Functions 29
  - When should I use a function? 29
  - How do I write and use a function? 29
  - How functions work together 31
    - Standard libraries 32
  - Local variables, frames, and the stack 33
  - Scope 34
  - Recursion 35
  - Looking at frames in the debugger 38
  - return 40
  - Global and static variables 41
  - Challenge 42
- 6. Format Strings 43
  - Using tokens 43
  - Escape sequences 44
  - Challenge 45
- 7. Numbers 47
  - Integers 47
    - Tokens for displaying integers 48
    - Integer operations 49
  - Floating-point numbers 52
    - Tokens for displaying floating-point numbers 52

            The math library 52
        Challenge 53
        A note about comments 53
    8. Loops 55
        The while loop 56
        The for loop 57
        break 58
        continue 59
        The do-while loop 60
        Challenge: counting down 60
        Challenge: user input 61
    9. Addresses and Pointers 65
        Getting addresses 65
        Storing addresses in pointers 66
        Getting the data at an address 67
        How many bytes? 67
        NULL 68
        Stylish pointer declarations 69
        Challenge: how much memory? 70
        Challenge: how much range? 70
    10. Pass-By-Reference 71
        Writing pass-by-reference functions 72
        Avoid dereferencing NULL 74
        Challenge 74
    11. Structs 75
        Challenge 77
    12. The Heap 79
III. Objective-C and Foundation 83
    13. Objects 85
        Objects 85
            Classes 85
            Creating your first object 86
        Methods and messages 88
            Message sends 88
            Another message 89
            Class methods vs. instance methods 90
            Sending bad messages 91
            A note on terminology 93
        Challenge 94
    14. More Messages 95
        A message with an argument 95
        Multiple arguments 96
        Nesting message sends 98
        alloc and init 99
        Sending messages to nil 99
        id 100
        Challenge 100
    15. Objects and Memory 103

On pointers and their values ... 103
Memory management ... 105
ARC ... 106
16. NSString ... 109
Creating instances of NSString ... 109
NSString methods ... 109
Class references ... 110
Other parts of the documentation ... 116
Challenge: finding more NSString methods ... 117
Challenge: using readline() ... 117
17. NSArray ... 119
Creating arrays ... 119
Accessing arrays ... 120
Iterating over arrays ... 123
NSMutableArray ... 125
Old-style array methods ... 126
Challenge: a grocery list ... 127
Challenge: interesting names ... 127
18. Your First Class ... 129
Accessor methods ... 133
Accessor naming conventions ... 133
self ... 134
Multiple files ... 134
Class prefixes ... 134
Challenge ... 135
19. Properties ... 137
Declaring properties ... 137
Property attributes ... 138
Dot notation ... 139
20. Inheritance ... 141
Overriding methods ... 144
super ... 145
Inheritance hierarchy ... 146
description and %@ ... 147
Challenge ... 148
21. Object Instance Variables and Properties ... 151
Object ownership and ARC ... 153
Creating the BNRAsset class ... 154
Adding a to-many relationship to BNREmployee ... 155
Challenge: holding portfolio ... 159
Challenge: removing assets ... 160
22. Class Extensions ... 161
Hiding mutability ... 162
Headers and inheritance ... 163
Headers and generated instance variables ... 164
Challenge ... 164
23. Preventing Memory Leaks ... 165
Strong reference cycles ... 167

Weak references 170
Zeroing of weak references 171
For the More Curious: manual reference counting and ARC history 173
Retain count rules 174
24. Collection Classes 177
NSSet/NSMutableSet 177
NSDictionary/NSMutableDictionary 180
Immutable objects 183
Sorting arrays 184
Filtering 185
Collections and ownership 186
C primitive types 186
Collections and nil 187
Challenge: reading up 187
Challenge: top holdings 187
Challenge: sorted holdings 187
25. Constants 189
Preprocessor directives 190
#include and #import 191
#define 191
Global variables 192
enum 193
#define vs. global variables 195
26. Writing Files with NSString and NSData 197
Writing an NSString to a file 197
NSError 198
Reading files with NSString 200
Writing an NSData object to a file 200
Reading an NSData from a file 202
Finding special directories 202
27. Callbacks 205
The run loop 206
Target-action 206
Helper objects 209
Notifications 212
Which to use? 214
Callbacks and object ownership 214
For the more curious: how selectors work 215
28. Blocks 217
Using blocks 218
Declaring a block variable 218
Composing a block 219
Passing in a block 220
typedef 222
Blocks vs. other callbacks 223
More on blocks 223
Return values 223
Anonymous blocks 224

External variables 224
Challenge: an anonymous block 227
Challenge: using a block with NSNotificationCenter 227
29. Protocols 229
Calling optional methods 231
30. Property Lists 233
Challenge 236
IV. Event-Driven Applications 237
31. Your First iOS Application 239
GUI-based applications 239
Getting started with iTahDoodle 240
BNRAppDelegate 241
Model-View-Controller 242
The application delegate 244
Setting up views 245
Running on the iOS simulator 248
Wiring up the button 249
Wiring up the table view 251
Saving and loading data 255
Adding a C helper function 255
Saving task data 256
Loading task data 256
For the more curious: what about main()? 257
For the more curious: running iTahDoodle on a device 257
32. Your First Cocoa Application 259
Getting started with TahDoodle 260
Setting up views in Interface Builder 262
Setting up the button 263
Setting up the table view 265
Adding autolayout constraints 268
Making connections 270
File's Owner 270
Setting the button's target-action pair 271
Connecting the table view 273
Implementing NSTableViewDataSource 275
Saving and loading data 277
Challenge 278
V. Advanced Objective-C 279
33. init 281
Writing init methods 281
A basic init method 282
instancetype 282
Using and checking the superclass initializer 283
init methods that take arguments 283
Using accessors 285
Multiple initializers 286
Deadly init methods 289
34. More about Properties 291

More on property attributes 291
Mutability 291
Lifetime specifiers 291
Advice on atomic vs. nonatomic 294
Implementing accessor methods 294
35. Key-Value coding 297
Non-object types 299
Key paths 299
36. Key-Value Observing 301
Using the context in KVO 302
Triggering the notification explicitly 303
Dependent properties 304
37. Categories 305
Challenge 306
VI. Advanced C 307
38. Bitwise Operations 309
Bitwise-OR 310
Bitwise-AND 311
Other bitwise operators 312
Exclusive-OR 312
Complement 313
Left-shift 313
Right-shift 314
Using enum to define bit masks 314
More bytes 315
Challenge 315
39. C Strings 317
char 317
char * 318
String literals 321
Converting to and from NSString 322
Challenge 322
40. C Arrays 323
Challenge 325
41. Running from the Command Line 329
Command-line arguments 330
More convenient running from the command-line 333
42. Switch Statements 335
Appendix: The Objective-C Runtime 337
Introspection 337
Dynamic method lookup and execution 337
Management of classes and inheritance hierarchies 338
How KVO works 342
Final notes 344
Challenge: instance variables 344
Next Steps 345
Index 347

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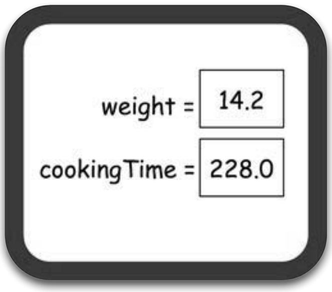
3 Variables and Types

Continuing with the cooking metaphor from the last chapter, sometimes a chef will keep a small blackboard in the kitchen for storing data. For example, when unpacking a turkey, he notices a label that says “14.2 Pounds.” Before he throws the wrapper away, he will scribble “weight = 14.2” on the blackboard. Then, just before he puts the turkey in the oven, he will calculate the cooking time (15 minutes + 15 minutes per pound) by referring to the weight on the blackboard.

Figure 3.1 Keeping track of data with a blackboard



During execution, a program often needs places to store data that will be used later. A place where one piece of data can go is known as a *variable*. Each variable has a name (like `cookingTime`) and a *type* (like a number). In addition, when the program executes, the variable will have a value (like 228.0).

Types

In a program, you create a new variable by *declaring* its type and name. Here is an example of a variable declaration:

```
float weight;
```

The type of this variable is `float` (which we will define in a moment), and its name is `weight`. At this point, the variable does not have a value.

In C, you must declare the type of each variable for two reasons:

- The type lets the compiler check your work for you and alert you to possible mistakes or problems. For instance, say you have a variable of a type that holds text. If you ask for its logarithm, the compiler will tell you something like "It does not make any sense to ask for this variable's logarithm."
- The type tells the compiler how much space in memory (how many bytes) to reserve for that variable.

Here is an overview of the commonly used types. We will return in to each type in more detail in later chapters.

`short`, `int`, `long`	These three types are whole numbers; they do not require a decimal point. A `short` usually has fewer bytes of storage than a `long`, and an `int` is in between. Thus, you can store a much larger number in a `long` than in a `short`.
`float`, `double`	A `float` is a floating point number – a number that can have a decimal point. In memory, a `float` is stored as a mantissa and an exponent. For example, 346.2 is represented as 3.462×10^2 A `double` is a double-precision number, which typically has more bits to hold a longer mantissa and larger exponents.
`char`	A `char` is a one-byte integer that is usually treated as a character, like the letter `'a'`.
pointer	A pointer holds a memory address. It is declared using the asterisk character. For example, a variable declared as `int *` can hold a memory address where an `int` is stored. It does not hold the actual number's value, but if you know the address of the `int`, then you can get to its value. Pointers are very useful, and there will be more on pointers later. Much more.
`struct`	A `struct` (or *structure*) is a type made up of other types. You can also create new `struct` definitions. For example, imagine that you wanted a `GeoLocation` type that contains two float members: `latitude` and `longitude`. In this case, you would define a `struct` type.

These are the types that a C programmer uses every day. It is quite astonishing what complex ideas can be captured in these five simple ideas.

A program with variables

Back in Xcode, you are going to create another project. First, close the AGoodStart project so that you do not accidentally type new code into the old project.

Now create a new project (File → New → Project...). This project will be a C Command Line Tool named Turkey.

In the project navigator, find this project's `main.c` file and open it. Edit `main.c` so that it matches the following code.

```
#include <stdio.h>

int main (int argc, const char * argv[])
{
    // Declare the variable called 'weight' of type float
    float weight;

    // Store a number in that variable
    weight = 14.2;

    // Log it to the user
    printf("The turkey weighs %f.\n", weight);

    // Declare another variable of type float
    float cookingTime;

    // Calculate the cooking time and store it in the variable
    // In this case, '*' means 'multiplied by'
    cookingTime = 15.0 + 15.0 * weight;

    // Log that to the user
    printf("Cook it for %f minutes.\n", cookingTime);

    // End this function and indicate success
    return 0;
}
```

(Wondering about the `\n` that keeps turning up in your code? You will learn what it does in Chapter 6.)

Build and run the program. You can either click the Run button at the top left of the Xcode window or use the keyboard shortcut Command-R. Your output in the console should look like this:

```
The turkey weighs 14.200000.
Cook it for 228.000000 minutes.
```

Back in your code, let's review what you have done. In the line of code that looks like this:

```
    float weight;
```

we say that you are "declaring the variable `weight` to be of type `float`."

In the next line, your variable gets a value:

```
    weight = 14.2;
```

You are copying data into that variable. We say that you are "assigning a value of 14.2 to that variable."

In modern C, you can declare a variable and assign it an initial value in one line, like this:

```
    float weight = 14.2;
```

Here is another assignment:

```
    cookingTime = 15.0 + 15.0 * weight;
```

The stuff on the righthand side of the = is an *expression*. An expression is something that gets evaluated and results in some value. Actually, every assignment has an expression on the righthand side of the =.

For example, in this line:

```
weight = 14.2;
```

the expression is just `14.2`.

An expression can have multiple steps. For example, when evaluating the expression `15.0 + 15.0 * weight`, the computer first multiplies `weight` by `15.0` and then adds that result to `15.0`. Why does the multiplication come first? We say that multiplication has *precedence* over addition.

To change the order in which operations are normally executed, you use parentheses:

```
cookingTime = (15.0 + 15.0) * weight;
```

Now the expression in the parentheses is evaluated first, so the computer first does the addition and then multiplies `weight` by 30.0.

Challenge

Welcome to your first challenge!

Most chapters in this book will finish with a challenge exercise to do on your own. Some challenges (like the one you are about to do) are easy and provide practice doing the same thing you did in the chapter. Other challenges are harder and require more problem-solving. Doing these exercises cements what you have learned and builds confidence in your skills. We cannot encourage you enough to take them on.

(If you get stuck while working on a challenge, take a break and come back and try again fresh. If that does not work, visit the forum for this book at `forums.bignerdranch.com` for help.)

Create a new C Command Line Tool named TwoFloats. In its **`main()`** function, declare two variables of type `float` and assign each of them a number with a decimal point, like 3.14 or 42.0. Declare another variable of type `double` and assign it the sum of the two `float`s. Print the result using **`printf()`**. Refer to the code in this chapter if you need to check your syntax.

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Index

Symbols

! (logical NOT) operator, 26
!= (not equal) operator, 26
\" escape sequence, 318
#define, 189-192, 195
#import, 191
#include, 191
% (tokens), 43, 44
% operator, 50
%= operator, 51
%@, 147
%d, 44
%e, 52
%f, 52
%ld, 49
%lo, 49
%lu, 49
%o, 48
%p, 66
%s, 44
%u, 49
%x, 48
%zu, 68
& operator, retrieving addresses, 65
&& (logical AND) operator, 26
()
  cast operators, 50
  in function names, 15
  for function parameters, 30
  order of operations and, 24
* (asterisk)
  arithmetic operator, 49
  pointer operator, 67
*= operator, 51
+ (plus sign), 49
++ (increment operator), 51
+= operator, 51
- (minus sign), 49
-- (decrement operator), 51
-= operator, 51
-> (dereference) operator, 81
.h files (see header files)
.m (implementation files), 129
.pch (pre-compiled header), 191
.xib (XML Interface Builder) files, 262
/ (division operator), 49
/* ... */ (comments), 13
// (comments), 13
/= operator, 51
; (semicolon), 13
  do-while loop and, 60
< (less than) operator, 26
< > (angle brackets)
  conforming to protocols, 230
  importing files, 191
<< operator, 314
<= operator, 26
= operator, 26
== operator, 26
> (greater than) operator, 26
>= operator, 26
>> operator, 314
? (ternary operator), 28
@
  format string token, 147
@interface
  class extensions, 161
  header files, 130
  visibility of, 162
@property, 137
@selector(), 216
@synthesize, 294
\ (backslash), 318
  escape character, 44
\n, 44
\\ escape sequence, 318
^ (caret)
  exclusive-or operator, 312
  identifying blocks, 217
{ }
  in conditional expressions, 27
  in functions, 13
  scope of, 34
|| (logical OR) operator, 26
~ (tilde), 313

A

abs(), 51
absolute value, 51
accessor methods
  about, 133

dot notation for, 139
implementing, 133, 294, 295
properties and, 137
actions (methods), 205
addObject:, 126
addresses, 65-69
alloc, 99, 281
AND (&&) logical operator, 26
AND (bitwise), 311
angle brackets (< >)
conforming to protocols, 230
importing files, 191
anonymous blocks, 224
anonymous functions, 217
app delegates, 241, 244
application:didFinishLaunchingWithOptions:, 245-252, 257
applications
building, 134
Cocoa, 259-278
Cocoa Touch, 239-257
deploying, 257
designing, 242
desktop, 259-278
document-based, 259, 261, 262
event-driven, 206, 239
GUI-based, 239
iOS, 239-257
MVC and, 242
vs. programs, 7, 206
running from command line, 329
running in Xcode, 14
running on a device, 257
ARC (Automatic Reference Counting), 106-108, 153-159
arguments
command-line, 330-333
in functions, 30
of **init**, 283
arithmetic operations, 49-51
array, 126
arrays, 119-125
accessing, 127
accessing by index, 120
in C, 323-325
creating, 119, 126
filtering, 185, 186
immutable, 120, 183
iterating over, 123, 124, 126
mutable, 125, 126
nesting, 181
out-of-range errors and, 122
primitive types and, 186
sorting, 184
arrayWithContentsOfFile:, 235
arrayWithObjects:, 126
ASCII characters, 197, 317
assembly code, 3
assign (property attribute), 291
asterisk (*)
arithmetic operator, 49
pointer operator, 67
AT&T, 4
atoi(), 63
atomic (property attribute), 294
attributes inspector, 266
auto-completion, 13
autolayout, 268-270
Automatic Reference Counting (ARC), 106-108, 153-159
automatic variables, 79

B

backslash (\), 318
escape character, 44
base-16 (hexadecimal)
integers, 48
number system, 309
base-8 (octal) integers, 48
bits, 65, 309
bitwise AND, 311
bitwise operations, 309-315
bitwise OR, 310
__block keyword, 226
blocking (functions), 32
blocking (functions, methods), 31, 209
blocks, 217-226
anonymous, 224
block variables and, 218
capturing variables, 224
external variables and, 224-226
return values of, 223
self and, 225, 226
typedef and, 222
__block keyword, 226

BOOL (type), 27
boolean variables, 27
braces
  in conditional expressions, 27
  in functions, 13
  in instance variable declarations, 130
  scope of, 34
break statement, 58
breakpoints, 38-40
buffers, 79
bugs, 37
building (Xcode projects), 14, 134
building projects, 155
bytes, 65, 309

C

C programming language, 4
  arrays, 323-325
  described, 3
  strings, 317-322
callbacks
  blocks, 217-226
  deciding between, 223
  delegation, 209-212
  helper objects, 209-212
  memory management and, 214, 215
  notifications, 212, 214
  target-action, 206-208
  types of, 205, 214
captured variables, 224
caret (^)
  exclusive-or operator, 312
  identifying blocks, 217
cast operator, 50
categories, 305, 306
Central Processing Unit (CPU), 65
char (type), 22, 47, 317
char * (type), 43
class extensions, 161-164
class methods, 90, 110
class prefixes, 241
class references, 110-116
classes
  (see also objects, *individual class names*)
  defined, 85
  documentation for, 110-116
  in frameworks, 87
  inheritance and, 141-147, 163
  naming, 93, 134
  subclassing, 141-147, 306
  writing, 129-134
closures, 217
Cocoa development, 259-278
  autolayout uses, 268
  document-based applications, 259, 261, 262
  frameworks for, 237
Cocoa Touch, 237
code
  comments in, 13, 53
  defined, 12, 13
code completion, 13
collection classes, 177-187
  (see also arrays, dictionaries, sets)
command line, running from, 329-334
command-line arguments, 330-333
command-line tools
  in C, 8
  defined, 7
  Foundation, 86
comments (in code), 12, 13, 53
compile-time, 337
compilers, 3, 16
complements, 313
conditional expressions, 25-28
console, 14
constants, 189-195
containsObject:, 179
continue statement, 59
controller objects (MVC), 243
controls, 250
convenience methods, 174
copy (method), 292, 293
copy (property attribute), 292, 293
copyWithZone:, 292
count (**NSArray**), 122
Cox, Brad, 85
CPU (Central Processing Unit), 65
create rule, 339
curly braces
  in conditional expressions, 27
  in functions, 13
  in instance variable declarations, 130
  scope of, 34, 35
currentCalendar, 96

D

daemons, 7
dangling pointers, 292
data sources, 205, 229, 251
data types (see types)
dataOfType:error:, 277
date (**NSDate**), 89
dateByAddingTimeInterval:, 95
dealloc, 154
debug navigator, 38
debugger, 37-40
declarations
  instance variable, 130
  method, 130
  property, 137
  variable, 21
decrement operator (--), 51
#define, 189-192, 195
delegation, 205, 209-212
DeLillo, Don, 325
dereference (->) operator, 81
dereferencing pointers, 67
description (**NSObject**), 147
designated initializers, 288
developer guides, 116
dictionaries, 180-183
directories, writing files to, 198, 202
division (integers), 49
do-while loop, 60
document outline, 268
document-based applications, 259, 261, 262
documentation
  accessing online, 111
  class references, 110-116
  developer guides, 116
  protocol references, 230
  Quick Help, 121, 122
  sample code, 116
  using, 110-117
dot notation, 139
double (type), 22
double-quote escape sequence (\"), 318
Dreaming in Code (Rosenberg), 5

E

editor area (Xcode), 11
else, 25, 27
else if, 27
encodings (string), 197
enum, 193
  bit masks, defining, 314
enumerateObjectsUsingBlock:, 219-221
enumeration, fast, 124, 126
equal objects, 179
error objects, 199
error-handling, 198-200
errors, 13, 14
  (see also warnings)
  "No known method for selector...", 91
  "No visible @interface...", 91, 162
  NSError and, 198-200, 277
  out-of-range, 122
  "...unrecognized selector sent to instance...", 147
  "Use of undeclared identifier...", 35
escape character (\), 44
escape sequences, 44, 318
event-driven applications, 206, 239
events, 239
exclusive-or (XOR), 312
EXC_BAD_ACCESS signal, 321
EXIT_FAILURE, 40
EXIT_SUCCESS, 40
exponents, 52
expressions, 23, 24
  conditional, 25-28
external variables (in blocks), 224-226

F

fast enumeration, 124, 126
File's Owner, 270
files
  (see also property lists)
  class, 129
  importing, 144, 191
  NSData and, 200-202
  NSError and, 198-200
  project, 134
  reading from, 200, 235
  writing to, 197-199, 233
filteredArrayUsingPredicate:, 185
filteredSetUsingPredicate:, 186
filtering, 185, 186
filterUsingPredicate:, 185

first responder, 250
flags (bitwise operators), 312
float (type), 22
  casting and, 50
floating-point numbers, 52, 53
for loop, 57, 123, 124, 126
format strings, 43, 44, 48, 52, 88
Foundation framework, 87, 93, 237
frames, 33-40
frameworks, 83
  defined, 87
  Foundation, 87, 93, 237
  UIKit, 241
free(), 79, 339
function pointers, 225, 340
functions
  (see also methods)
  arguments and, 30
  atoi(), 63
  basics of, 29-32
  benefits of using, 31
  blocking, 31, 32
  calling, 30, 31
  defined, 12
  frames for, 33-40
  helper, 255
  local variables in, 33, 34
  main(), 12, 16
  in math.h, 52
  modf(), 71
  names of, 15
  Objective-C, 338, 344
  parameters of, 30, 31, 33
  printf(), 43
  in programs, 31
  readline(), 61
  recipe metaphor for, 15, 16, 31-33
  recursive, 35-40
  return values of, 40, 41
  runtime, 338, 344
  scope, 34, 35
  uses of, 29
  writing, 29-31

G

get rule, 339
getter methods, 133
global variables, 41, 42, 192-195
GUI (graphical user interface)
  creating in Interface Builder, 262-275, 278
  creating programmatically, 245-252, 278
GUI-based applications, 239

H

.h files (see header files)
header files
  vs. class extensions, 161-164
  defined, 129
  importing, 132
  pre-compiled, 191
heap, 79-81, 105
helper functions, 255
helper objects, 205, 209-212
hexadecimal (base-16)
  integers, 48
  number system, 309
high-level languages, 3
Human Interface Guidelines (HIGs), 265

I

IBAction, 272
IBOutlet, 274
id (type), 100
identical objects, 179
if construct, 25-28
immutable objects, 183
implementation files (.m), 129
#import, 191
importing files, 144, 191
#include, 191
increment operator (++), 51
index (arrays), 120
indices (arrays), 120
inheritance, 141-147, 163
init, 99, 281-290
initializers, 281-290
insertObject:atIndex:, 126
inspectors, 266
instance methods, 90, 110
  (see also methods)
instance variables
  declaring, 130
  inheritance and, 141, 164
  naming, 130

object, 151-159
as private, 133
properties and, 138
`instancetype`, 282
instantiate (objects), 199
`int` (type), 22, 27, 47
casting and, 50
integers, 47-51
`@interface`
class extensions, 161
header files, 130
visibility of, 162
Interface Builder, 260, 262-275, 278
interfaces, 229
(see also user interfaces)
introspection, 337
iOS development, 239-257
app delegates in, 241, 244
autolayout uses, 268
Cocoa Touch and, 237
deploying to a device, 257
frameworks for, 237, 241
memory management in, 159
Objective-C and, 4
simulator, 248
`isa` pointer, 146
`isEqual:`, 179
`isEqualToString:`, 110
iteration (arrays), 123, 124, 126

K

key paths, 299
key-value coding (KVC), 297-300
key-value observing (KVO), 301-304, 342-344
key-value pairs (objects), 180, 183, 297
keyboard shortcuts, 278
KVC (key-value coding), 297-300
KVO (key-value observing), 301-304, 342-344

L

`labs()`, 51
lambdas, 217
left-shifting bits, 313
`length` (**`NSString`**), 110
libraries, 134
linking binary with, 61
math, 52
standard, 32
local variables, 33, 34, 79
logical operators, 26
`long` (type), 22, 47
`long long` (type), 47
loops, 55-60
`for`, 57, 123
`while`, 56
Love, Tom, 85

M

`.m` files, 87, 129
Mac development (see Cocoa development)
machine code, 3
macros, 191
`main()`, 12, 16, 29, 38, 257
`malloc()`, 79, 321, 324, 339
manual reference counting, 173
math library
(see also arithmetic operations, numbers)
`math.h`, 52, 190
memory
addresses, 65-69
ARC and, 106-108
heap, 79-81, 105
management, 105-108
objects in, 103-108
stack, 33-40, 105
memory leaks, 159, 165-172
memory management
Automatic Reference Counting (ARC), 153-159
in C, 79
callbacks and, 214, 215
deallocating objects and, 153
local variables and, 79
manual reference counting, 173
property attributes and, 291-293
strong reference cycles, 167
weak references and, 170-172
messages
anatomy of, 88
arguments of, 95-98
defined, 88
methods and, 88
nesting, 98, 99
sending, 88-92, 95-100

methods
  (see also functions)
  accessor, 133
  arguments of, 95-98
  class, 90, 110
  convenience, 174
  declaring, 130
  defined, 85
  documentation for, 111
  implementing, 131
  instance, 90, 110
  messages and, 88
  naming, 93
  overriding, 144
  protocol, 229-231
minus sign (`-`), 49
misplaced view warning, 265
model objects (MVC), 243
Model-View-Controller (MVC), 242, 243
`modf()`, 71
modulus (`%`) operator, 50
`mutableCopy`, 293
MVC (Model-View-Controller), 242, 243
`M_PI` constant, 189

N

navigators, 11
nesting messages, 98, 99
networking, 200, 202, 209, 211
newline character (`\n`), 44, 318
NeXTSTEP, 93
`nil`, 99, 103, 107, 127, 187
`nonatomic` (property attribute), 294
NOT (`!`) logical operator, 26
notifications, 205, 212, 214
`NS` prefix, 93
`NSArray`, 119-125
  `count`, 122
  `filteredArrayUsingPredicate:`, 185
  immutable objects and, 183
  literal instances of, 119
  `objectAtIndex:`, 127
  property lists and, 233
`NSButton`, 263
`NSCalendar`, 96
`NSData`
  property lists, 233
  reading from files, 202
  writing to files, 200-202
`NSDataWritingAtomic` option (**`NSData`**), 201
`NSDate`, 86, 87, 184
  property lists and, 233
`NSDesktopDirectory`, 202
`NSDictionary`, 180
  property lists and, 233
`NSDocument`, 277
`NSError`, 198-200, 277
`NSInteger` (type), 50
`NSLocale`, 192
`NSLog()`, 88
`NSMutableArray`
  `addObject:`, 126
  `array`, 126
  `arrayWithObjects:`, 126
  described, 125, 126
  `filterUsingPredicate:`, 185
  `insertObject:atIndex:`, 126
  `removeObject:atIndex:`, 126
  `sortUsingDescriptors:`, 184
`NSMutableDictionary`, 180
`NSMutableSet`, 177-179
  `filterUsingPredicate:`, 186
`NSNotificationCenter`, 212, 214
`NSNull`, 187
`NSNumber`, 184, 186, 299
  property lists and, 233
`NSObject`
  `alloc`, 99
  `dealloc`, 154
  `description`, 147
  `init`, 99, 281
  key-value coding and, 297
  as superclass, 146
`NSPredicate`, 185, 186
`NSRange`, 115
`NSRunLoop`, 206
`NSScrollView`, 266
`NSSearchPathForDirectoriesInDomains()`, 255
`NSSet`, 177-179
  `containsObject:`, 179
  `filteredSetUsingPredicate:`, 186
`NSString`, 109-115
  (see also strings)
  from C string, 322
  literal instances of, 109

property, 233
reading files with, 200
writing to files, 197
NSTableView, 260, 266
NSTableViewDataSource, 275
NSTimer, 206
NSUInteger (type), 50
NSURLConnection, 200, 202, 209, 211
NSValue, 186
NS_ENUM(), 194
NULL, 68, 74
numbers
(see also floating-point numbers, integers)
hexadecimal, 48, 309
octal, 48
signed vs. unsigned, 47

O

objc_msgSend(), 338
object encapsulation, 299
object library, 263, 264
object ownership, 153-159
with callbacks, 214
with collections, 186
object-type attributes, 151
objectAtIndex:, 127
objectForKey:, 182
Objective-C, 4, 85, 93
naming conventions, 92, 93
Runtime, 337-344
objects
ARC and, 106-108
creating, 87-89
deallocating, 153
defined, 85
immutable, 183
inheritance and, 141-147, 163
as instance variables, 151-159
in memory, 103-108
pointers to, 103-108
relationships between, 151
vs. structs, 85
octal (base-8) integers, 48
operations, order of, 24, 49
operators (comparison/logical), 26
OR (bitwise), 310
OR (||) logical operator, 26
OS X, 4
(see also Cocoa development)
overriding methods, 144

P

p-lists, 233-236
parameters, 30, 31, 33
parent-child relationships (objects), 154
memory leaks and, 166
parentheses (())
cast operator, 50
in function names, 15
for function parameters, 30
order of operations and, 24
pass-by-reference, 71-74, 198, 199
PATH environment variable, 333
placeholders, 270
plus sign (+), 49
pointers, 65-69
dangling, 292
defined, 22
function, 217
NSMutableArray and, 125
to objects, 103-108
storing addresses in, 66
PostgreSQL database, 317
#pragma mark, 244, 245
pre-compiled header files, 191
precedence (of arithmetic operations), 24, 49
predicates, 185, 186
preprocessor, 190
preprocessor directives, 190-192
primitive types (C), 186
printf(), 43, 52
profiling programs, 168
programming languages, 3, 4
programs
vs. applications, 7, 206
building, 14, 134
compiling, 16
profiling, 168
running (from command line), 330, 333
running (in Xcode), 331
running from command line, 329
running in Xcode, 14, 23
project navigator, 11
projects

building, 134, 155
creating, 8
files in, 134
templates for, 240
properties
(see also accessor methods, instance variables, KVC, KVO)
@synthesize, 294
accessor methods and, 137
attributes, 291-294
declaring, 137
defined, 137
dot notation and, 139
implementing accessors with, 294, 295
inheritance and, 164
instance variables and, 138
@property, 137
property attributes
assign, 291
atomic, 294
copy, 139, 292, 293
default values, 139
defined, 138
nonatomic, 294
readonly, 291
readwrite, 291
strong, 292
unsafe_unretained, 292
weak, 292
property lists, 233-236
protocols, 210, 229-231

Q

Quick Help, 121, 122

R

RAM (Random-Access Memory), 65
rangeOfString:, 114, 115
readFromData:ofType:error:, 277
reading from files, 235
readline(), 61
readonly (property attribute), 291
readwrite (property attribute), 291
receivers, 88
recipe metaphor (functions), 15, 16, 31-33
recursion, 35-40
reference counts, 106
references
(see also ARC, object ownership, pass-by-reference, strong reference cycles)
NSError and, 199
"pointers", 67
removeObject:atIndex:, 126
resignFirstResponder, 250
respondsToSelector:, 231, 337
retain counts, 173, 174
return, 40, 41
in blocks, 223
right-shifting bits, 314
root view controller warning, 250
run loop, 206, 239
runtime, 337
Runtime, Objective-C, 337-344

S

sample code (in documentation), 116
scope, 34, 35
@selector(), 216
selectors, 88, 215, 216
self
in blocks, 225, 226
defined, 134
semicolon (;), 13
do-while loops and, 60
setObject:forKey:, 182
sets, 177-179
filtering, 186
setter methods, 133
setValue:forKey:, 297, 298
shell, 329
short (type), 22
shortcuts, keyboard, 278
signed numbers, 47
simulator (iOS), 248
sizeof(), 67
sleep(), 32, 168
sort descriptors, 184
sorting arrays, 184
sortUsingDescriptors:, 184
special directories, 202
stack, 33-40
vs. heap, 105
standard libraries, 32
static variables, 41, 207

`stdio.h`, 32
string encodings, 197
strings, 109-115
  in C, 317-322
  converting C strings, 322
  creating, 109
  defined, 43
  finding substrings, 112-115
  literals, 109, 321
  `printf()` and, 43
`stringWithFormat:`, 109
`strlen()`, 318
`strong` (property attribute), 292
strong reference cycles, 167-170
  in blocks, 225
  callbacks and, 214
structs, 75-78
  in collection objects, 186
  defined, 22
  vs. objects, 85
structures (see structs)
subclasses, 141, 163, 306
substrings, 112
subviews, 246
`super` directive, 145
superclasses, 141, 163
`switch` statements, 335, 336
syntax (code), 13
syntax (of code), 13
syntax errors, 13
`@synthesize`, 294

T

`\t` escape sequence, 318
table views, 251-254, 266
target-action, 205-208
templates (Xcode), 240
Terminal, 329
ternary operator (`?`), 28
tilde (~), 313
`timeIntervalSince1970`, 89
timers, 206
to-many relationships, 151
to-one relationships, 151, 165
tokens
  `%@`, 147
  `%d`, 44
  `%e`, 52
  `%f`, 52
  `%ld`, 49
  `%lo`, 49
  `%lu`, 49
  `%lx`, 49
  `%o`, 48
  `%s`, 44
  `%u`, 49
  `%x`, 48
  floating-point number, 52
  in format string, 43, 44
  integer, 48, 49
  `NSLog()` and, 88
  pointer, 66
  `printf()` and, 43, 44
`typedef`
  with blocks, 222
  explained, 76
types
  defining, 76
  introduced, 21-24

U

`UIButton`, 249
UIKit framework, 241
`UIKit.h` header file, 241
`UITableView`, 229
`UITableViewDataSource`, 229-231, 251-253
`unistd.h`, 32
Unix, 4, 89
`unsafe_unretained` (property attribute), 292
`unsigned` keyword, 47
unsigned numbers, 47
`__unused` modifier, 208
`uppercaseString`, 110
URLs, connecting to, 200, 202, 209, 211
user interfaces
  creating in Interface Builder, 262-275, 278
  creating programmatically, 245-252, 278
UTF strings, 197
utilities area, 263, 266

V

`valueForKey:`, 297
variables
  (see also instance variables, types)

assigning, 23
automatic, 79
block, 218
boolean, 27
captured, 224
declaring, 21, 23
external (in blocks), 224-226
global, 41, 42, 192-195
instance, 151-159
introduced, 21-24
local, 33, 34
naming, 93
`PATH` environment, 333
static, 41, 207
unused, 208
variables view, 39
view objects (MVC), 243
views
creating in Interface Builder, 262-275, 278
creating programmatically, 245-252, 278
`void`, 30, 40

W

warnings
(see also errors)
"Method definition for ... not found", 242
misplaced view, 265
root view controller, 250
unused variable, 208
`weak` (property attribute), 292
weak references, 170-172
`while` loops, 56
White Noise (DeLillo), 325
`writeToFile:atomically:`, 233
`writeToFile:atomically:encoding:error:`, 199
writing to files, 197-199, 233

X

Xcode
about, 7
application templates, 240
attributes inspector, 266
auto-completion, 13
building programs in, 14, 155
code completion, 13
color-coding in, 14
command-line arguments and, 331
console, 14
creating classes in, 129
debug navigator, 38
debugger, 38-40
documentation in, 110-117
editor area, 11
inspectors, 266
installing, 7
Interface Builder, 260, 262-275
iOS simulator, 248
keyboard shortcuts, 278
navigator area, 11
object library, 263
preferences, 13
project navigator, 11
Quick Help, 121, 122
running programs in, 14, 23, 331
templates, 8
utilities area, 263, 266
variables view, 39
`.xib` (XML Interface Builder) files, 262, 267
`XOR` (exclusive-or), 312

Z

zero (false)
`NULL` and, 68
zero pointer
nil, 99

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