

THE
C
PROGRAMMING
LANGUAGE

Second Edition

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Contents

Preface	ix
Preface to the First Edition	xi
Introduction	1
Chapter 1. A Tutorial Introduction	5
1.1 Getting Started	5
1.2 Variables and Arithmetic Expressions	8
1.3 The For Statement	13
1.4 Symbolic Constants	14
1.5 Character Input and Output	15
1.6 Arrays	22
1.7 Functions	24
1.8 Arguments—Call by Value	27
1.9 Character Arrays	28
1.10 External Variables and Scope	31
Chapter 2. Types, Operators, and Expressions	35
2.1 Variable Names	35
2.2 Data Types and Sizes	36
2.3 Constants	37
2.4 Declarations	40
2.5 Arithmetic Operators	41
2.6 Relational and Logical Operators	41
2.7 Type Conversions	42
2.8 Increment and Decrement Operators	46
2.9 Bitwise Operators	48
2.10 Assignment Operators and Expressions	50
2.11 Conditional Expressions	51
2.12 Precedence and Order of Evaluation	52
Chapter 3. Control Flow	55
3.1 Statements and Blocks	55
3.2 If-Else	55

3.3	Else-If	57
3.4	Switch	58
3.5	Loops—While and For	60
3.6	Loops—Do-while	63
3.7	Break and Continue	64
3.8	Goto and Labels	65
Chapter 4.	Functions and Program Structure	67
4.1	Basics of Functions	67
4.2	Functions Returning Non-integers	71
4.3	External Variables	73
4.4	Scope Rules	80
4.5	Header Files	81
4.6	Static Variables	83
4.7	Register Variables	83
4.8	Block Structure	84
4.9	Initialization	85
4.10	Recursion	86
4.11	The C Preprocessor	88
Chapter 5.	Pointers and Arrays	93
5.1	Pointers and Addresses	93
5.2	Pointers and Function Arguments	95
5.3	Pointers and Arrays	97
5.4	Address Arithmetic	100
5.5	Character Pointers and Functions	104
5.6	Pointer Arrays; Pointers to Pointers	107
5.7	Multi-dimensional Arrays	110
5.8	Initialization of Pointer Arrays	113
5.9	Pointers vs. Multi-dimensional Arrays	113
5.10	Command-line Arguments	114
5.11	Pointers to Functions	118
5.12	Complicated Declarations	122
Chapter 6.	Structures	127
6.1	Basics of Structures	127
6.2	Structures and Functions	129
6.3	Arrays of Structures	132
6.4	Pointers to Structures	136
6.5	Self-referential Structures	139
6.6	Table Lookup	143
6.7	Typedef	146
6.8	Unions	147
6.9	Bit-fields	149
Chapter 7.	Input and Output	151
7.1	Standard Input and Output	151
7.2	Formatted Output—Printf	153

7.3	Variable-length Argument Lists	155
7.4	Formatted Input—Scanf	157
7.5	File Access	160
7.6	Error Handling—Stderr and Exit	163
7.7	Line Input and Output	164
7.8	Miscellaneous Functions	166
Chapter 8.	The UNIX System Interface	169
8.1	File Descriptors	169
8.2	Low Level I/O—Read and Write	170
8.3	Open, Creat, Close, Unlink	172
8.4	Random Access—Lseek	174
8.5	Example—An Implementation of Fopen and Getc	175
8.6	Example—Listing Directories	179
8.7	Example—A Storage Allocator	185
Appendix A.	Reference Manual	191
A1	Introduction	191
A2	Lexical Conventions	191
A3	Syntax Notation	194
A4	Meaning of Identifiers	195
A5	Objects and Lvalues	197
A6	Conversions	197
A7	Expressions	200
A8	Declarations	210
A9	Statements	222
A10	External Declarations	225
A11	Scope and Linkage	227
A12	Preprocessing	228
A13	Grammar	234
Appendix B.	Standard Library	241
B1	Input and Output: <stdio.h>	241
B2	Character Class Tests: <ctype.h>	248
B3	String Functions: <string.h>	249
B4	Mathematical Functions: <math.h>	250
B5	Utility Functions: <stdlib.h>	251
B6	Diagnostics: <assert.h>	253
B7	Variable Argument Lists: <stdarg.h>	254
B8	Non-local Jumps: <setjmp.h>	254
B9	Signals: <signal.h>	255
B10	Date and Time Functions: <time.h>	255
B11	Implementation-defined Limits: <limits.h> and <float.h>	257
Appendix C.	Summary of Changes	259
Index		263

Preface

The computing world has undergone a revolution since the publication of *The C Programming Language* in 1978. Big computers are much bigger, and personal computers have capabilities that rival the mainframes of a decade ago. During this time, C has changed too, although only modestly, and it has spread far beyond its origins as the language of the UNIX operating system.

The growing popularity of C, the changes in the language over the years, and the creation of compilers by groups not involved in its design, combined to demonstrate a need for a more precise and more contemporary definition of the language than the first edition of this book provided. In 1983, the American National Standards Institute (ANSI) established a committee whose goal was to produce “an unambiguous and machine-independent definition of the language C,” while still retaining its spirit. The result is the ANSI standard for C.

The standard formalizes constructions that were hinted at but not described in the first edition, particularly structure assignment and enumerations. It provides a new form of function declaration that permits cross-checking of definition with use. It specifies a standard library, with an extensive set of functions for performing input and output, memory management, string manipulation, and similar tasks. It makes precise the behavior of features that were not spelled out in the original definition, and at the same time states explicitly which aspects of the language remain machine-dependent.

This second edition of *The C Programming Language* describes C as defined by the ANSI standard. Although we have noted the places where the language has evolved, we have chosen to write exclusively in the new form. For the most part, this makes no significant difference; the most visible change is the new form of function declaration and definition. Modern compilers already support most features of the standard.

We have tried to retain the brevity of the first edition. C is not a big language, and it is not well served by a big book. We have improved the exposition of critical features, such as pointers, that are central to C programming. We have refined the original examples, and have added new examples in several chapters. For instance, the treatment of complicated declarations is augmented by programs that convert declarations into words and vice versa. As before, all

examples have been tested directly from the text, which is in machine-readable form.

Appendix A, the reference manual, is not the standard, but our attempt to convey the essentials of the standard in a smaller space. It is meant for easy comprehension by programmers, but not as a definition for compiler writers—that role properly belongs to the standard itself. Appendix B is a summary of the facilities of the standard library. It too is meant for reference by programmers, not implementers. Appendix C is a concise summary of the changes from the original version.

As we said in the preface to the first edition, C “wears well as one’s experience with it grows.” With a decade more experience, we still feel that way. We hope that this book will help you to learn C and to use it well.

We are deeply indebted to friends who helped us to produce this second edition. Jon Bentley, Doug Gwyn, Doug McIlroy, Peter Nelson, and Rob Pike gave us perceptive comments on almost every page of draft manuscripts. We are grateful for careful reading by Al Aho, Dennis Allison, Joe Campbell, G. R. Emlin, Karen Fortgang, Allen Holub, Andrew Hume, Dave Kristol, John Linderman, Dave Prosser, Gene Spafford, and Chris Van Wyk. We also received helpful suggestions from Bill Cheswick, Mark Kernighan, Andy Koenig, Robin Lake, Tom London, Jim Reeds, Clovis Tondo, and Peter Weinberger. Dave Prosser answered many detailed questions about the ANSI standard. We used Bjarne Stroustrup’s C++ translator extensively for local testing of our programs, and Dave Kristol provided us with an ANSI C compiler for final testing. Rich Drechsler helped greatly with typesetting.

Our sincere thanks to all.

Brian W. Kernighan
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Preface to the First Edition

C is a general-purpose programming language which features economy of expression, modern control flow and data structures, and a rich set of operators. C is not a “very high level” language, nor a “big” one, and is not specialized to any particular area of application. But its absence of restrictions and its generality make it more convenient and effective for many tasks than supposedly more powerful languages.

C was originally designed for and implemented on the UNIX operating system on the DEC PDP-11, by Dennis Ritchie. The operating system, the C compiler, and essentially all UNIX applications programs (including all of the software used to prepare this book) are written in C. Production compilers also exist for several other machines, including the IBM System/370, the Honeywell 6000, and the Interdata 8/32. C is not tied to any particular hardware or system, however, and it is easy to write programs that will run without change on any machine that supports C.

This book is meant to help the reader learn how to program in C. It contains a tutorial introduction to get new users started as soon as possible, separate chapters on each major feature, and a reference manual. Most of the treatment is based on reading, writing and revising examples, rather than on mere statements of rules. For the most part, the examples are complete, real programs, rather than isolated fragments. All examples have been tested directly from the text, which is in machine-readable form. Besides showing how to make effective use of the language, we have also tried where possible to illustrate useful algorithms and principles of good style and sound design.

The book is not an introductory programming manual; it assumes some familiarity with basic programming concepts like variables, assignment statements, loops, and functions. Nonetheless, a novice programmer should be able to read along and pick up the language, although access to a more knowledgeable colleague will help.

In our experience, C has proven to be a pleasant, expressive, and versatile language for a wide variety of programs. It is easy to learn, and it wears well as one’s experience with it grows. We hope that this book will help you to use it well.

The thoughtful criticisms and suggestions of many friends and colleagues have added greatly to this book and to our pleasure in writing it. In particular, Mike Bianchi, Jim Blue, Stu Feldman, Doug McIlroy, Bill Roome, Bob Rosin, and Larry Rosler all read multiple versions with care. We are also indebted to Al Aho, Steve Bourne, Dan Dvorak, Chuck Haley, Debbie Haley, Marion Harris, Rick Holt, Steve Johnson, John Mashey, Bob Mitze, Ralph Muha, Peter Nelson, Elliot Pinson, Bill Plauger, Jerry Spivack, Ken Thompson, and Peter Weinberger for helpful comments at various stages, and to Mike Lesk and Joe Ossanna for invaluable assistance with typesetting.

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