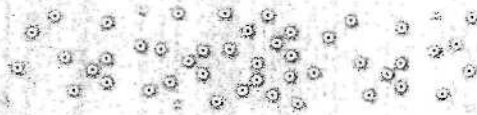


C++ Programming: An Object-Oriented Approach

Behrouz A. Forouzan
Richard F. Gilberg





Contents

Preface	xv
What Is the C++ Language?	xv
Why This Book?	xv
Appendices	xvi
Instructor Resources	xvii
Acknowledgments	xvii

1 Introduction to Computers and Programming Languages 1

1.1	Computer System	1
1.2	Computer Languages	5
1.3	Language Paradigms	7
1.4	Program Design	10
1.5	Program Development	13
1.6	Testing	15
	Key Terms	16
	Summary	17
	Problems	17

2 Basics of C++ Programming 19

2.1	C++ Programs	19
2.2	Variable, Value, and Constant	26
2.3	Components of a C++ Program	32
2.4	Data Types	36
	Key Terms	52
	Summary	52
	Problems	52
	Programming Projects	57

3	Expressions and Statements	59
3.1	Expressions	59
3.2	Type Conversion	71
3.3	Order of Evaluation	76
3.4	Overflow and Underflow	81
3.5	Formatting Data	85
3.6	Statements	93
3.7	Program Design	98
	Key Terms	105
	Summary	105
	Problems	106
	Programs	110
4	Selection	112
4.1	Simple Selection	112
4.2	Complex Decisions	126
4.3	Decisions on Specific Values	134
4.4	Conditional Expressions	142
4.5	Program Design	144
	Key Terms	152
	Summary	153
	Problems	153
	Programs	156
5	Repetition	158
5.1	Introduction	158
5.2	The <i>while</i> Statement	161
5.3	The <i>for</i> Statement	175
5.4	The <i>do-while</i> Statement	180
5.5	More About Loops	184
5.6	Other Related Statements	188
5.7	Program Design	191
	Key Terms	203
	Summary	203
	Problems	204
	Programs	206

6**Functions****208**

6.1	Introduction	208
6.2	Library Functions	213
6.3	User-Defined Functions	224
6.4	Data Exchange	233
6.5	More About Parameters	244
6.6	Scope and Lifetime	248
6.7	Program Design	256
	Key Terms	265
	Summary	265
	Problems	266
	Programs	269

7**User-Defined Types: Classes****273**

7.1	Introduction	273
7.2	Classes	275
7.3	Constructors and Destructors	283
7.4	Instance Members	294
7.5	Static Members	302
7.6	Object-Oriented Programming	311
7.7	Designing Classes	320
	Key Terms	332
	Summary	332
	Problems	333
	Programs	335

8**Arrays****338**

8.1	One-Dimensional Arrays	338
8.2	More on Arrays	349
8.3	Multidimensional Arrays	363
8.4	Program Design	369
	Key Terms	376
	Summary	376
	Problems	376
	Programs	378

9 **References, Pointers, and Memory Management** **380**

9.1	References	380
9.2	Pointers	391
9.3	Arrays and Pointers	405
9.4	Memory Management	414
9.5	Program Design	425
	Key Terms	437
	Summary	437
	Problems	437
	Programs	442

10 **Strings** **443**

10.1	C Strings	443
10.2	The C++ String Class	460
10.3	Program Design	484
	Key Terms	492
	Summary	492
	Problems	493
	Programs	494

11 **Relationships among Classes** **496**

11.1	Inheritance	496
11.2	Association	519
11.3	Dependency	528
11.4	Program Design	532
	Key Terms	546
	Summary	546
	Problems	547
	Programs	550

12 **Polymorphism and Other Issues** **553**

12.1	Polymorphism	553
12.2	Other Issues	567

Key Terms	594
Summary	594
Problems	594
Programs	596

13 Operator Overloading **597**

13.1	Three Roles of an Object	597
13.2	Overloading Principles	602
13.3	Overloading as a Member	605
13.4	Overloading as a Nonmember	621
13.5	Type Conversion	625
13.6	Designing Classes	626
	Key Terms	652
	Summary	653
	Problems	653
	Programs	654

14 Exception Handling **657**

14.1	Introduction	657
14.2	Exceptions in Classes	675
14.3	Standard Exception Classes	682
	Key Terms	688
	Summary	688
	Problems	689
	Programs	692

15 Generic Programming: Templates **693**

15.1	Function Template	693
15.2	Class Template	703
	Key Terms	713
	Summary	713
	Problems	714
	Programs	715

16 Input/Output Streams 716

16.1	Introduction	716
16.2	Console Streams	720
16.3	File Streams	729
16.4	String Streams	751
16.5	Formatting Data	755
16.6	Program Design	766
	Key Terms	773
	Summary	773
	Problems	774
	Programs	774

17 Recursion 776

17.1	Introduction	776
17.2	Recursive Sort and Search	792
17.3	Program Design	803
	Key Terms	808
	Summary	808
	Problems	809
	Programs	811

18 Introduction to Data Structures 813

18.1	Introduction	813
18.2	Singly Linked List	815
18.3	Stacks and Queues	825
18.4	Binary Search Trees	841
	Key Terms	849
	Summary	850
	Problems	850
	Programs	851

19 Standard Template Library (STL) 852

19.1	Introduction	852
19.2	Iterators	853
19.3	Sequence Containers	856
19.4	Container Adapters	877
19.5	Associative Containers	884
19.6	Using Functions	894
19.7	Algorithms	899
	Key Terms	910
	Summary	910
	Problems	911
	Programs	911

20 Design Patterns Online

20.1	Introduction
20.2	Creational Patterns
20.3	Structural Patterns
20.4	Behavioral Patterns
	Key Terms
	Summary
	Problems
	Programs

Online Appendices

Appendix A	Unicode
Appendix B	Positional Numbering System
Appendix C	C++ Expressions and Operators
Appendix D	Bitwise Operations
Appendix E	Bit Fields
Appendix F	Preprocessing

Appendix G	Namespaces
Appendix H	Ratios
Appendix I	Time
Appendix J	Lambda Expressions
Appendix K	Regular Expressions
Appendix L	Smart Pointers
Appendix M	Random Number Generation
Appendix N	References
Appendix O	Move versus Copy
Appendix P	A Brief Review of C++ 11
Appendix Q	Unified Modeling Language (UML)
Appendix R	Bitset

CheckPoints	Available online
True/False Questions	Available online
Review Questions	Available online
Glossary	Available online
Index	915