

原版风暴 · 深入 C++ 系列



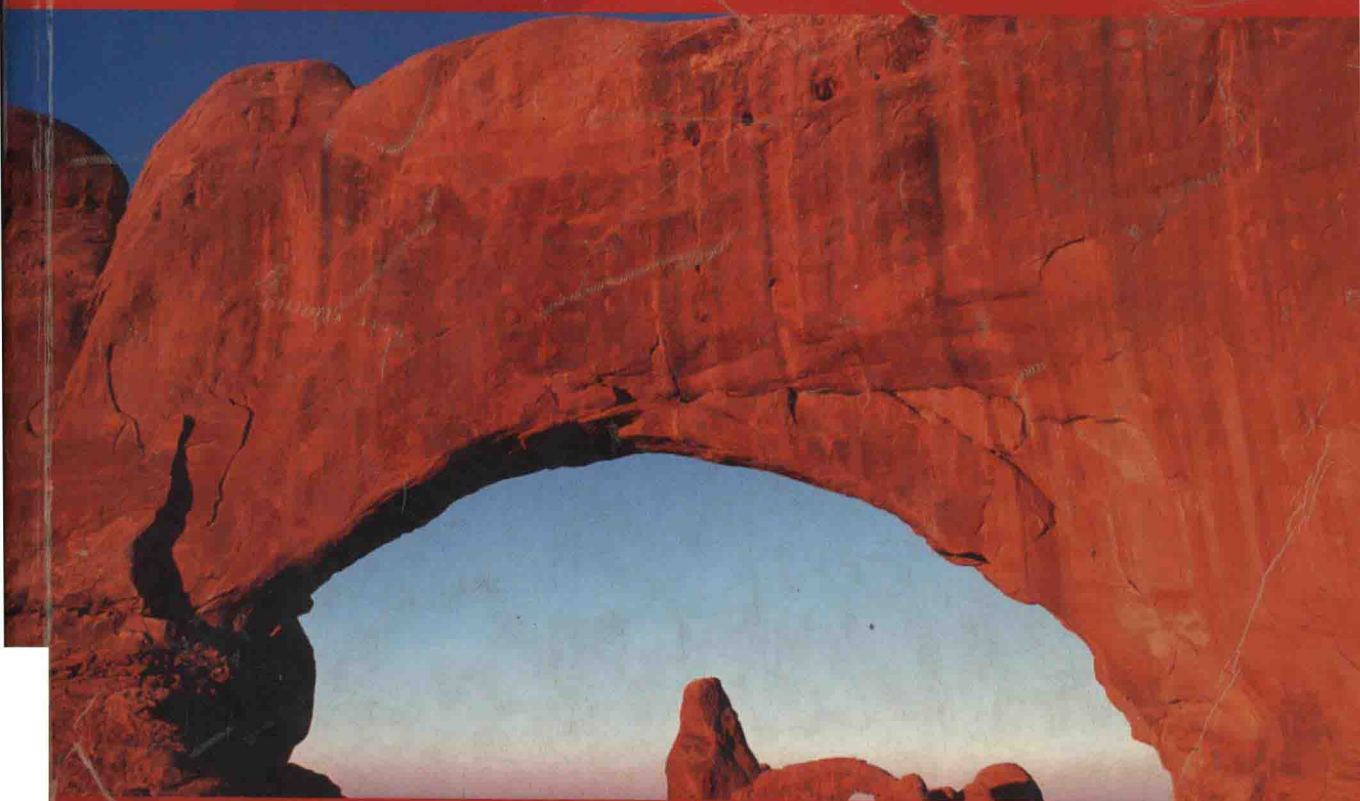
与《C++ Primer》配套使用

C++ Primer Answer Book

C++ Primer 题解

(影印版)

[美] Clovis L. Tondo, Bruce P. Leung 著



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C++ Primer Answer Book

C++ Primer 题解 (影印版)

很显然,学习C++的最佳方法就是解决问题和进行实际操作,这里说的学习不只是学习其语言架构,还包括学习如何应用。在Stanley Lippman和Josée Lajoie所著的畅销书《C++ Primer (第三版)》中给出了许多习题,旨在帮助C++程序员获得实际经验,并能更深刻地理解这一语言的精髓。

但是,当你的学习进程由于其中某些难题而受阻时,你将如何是好?现在,你可以打开这本《C++ Primer 题解》。这是和《C++ Primer》配套使用的,书中提供了《C++ Primer》中所有习题的解答,使你可以学会如何面对并解决程序设计上的挑战。拥有了这本题解,你就拥有了技术性详解、实用技巧和实际代码。它是挫败感的终结者。有了这些解答,你的工作会更加顺利。

本书是更新后的版本,覆盖了最终的ANSI/ISO C++ Standard、扩展、标准库和STL。这些习题和相应的解答囊括了众多C++主题,其中包括:

- 数据类型
- 抽象容器类型
- 泛型算法
- 类模板
- 多重和虚拟继承
- iostream库以及更多

C++程序员在阅读《C++ Primer》的同时使用本书有助于更好地理解C++的概念,并且能够通过本书的解决方案开拓你的视野。

Clovis L. Tondo 是T&T TechWorks, Inc.的总裁,该公司负责为各大公司提供关于C、C++和UNIX工具的技术培训,并为科技类出版社撰稿。Dr. Tondo 还是《The C Answer Book》的作者,同时与人合著了关于C、设备驱动、MAKE和数据结构的8本书。

Bruce P. Leung 是Connected Components Corporation的软件工程师,他在那里参与了一个开发state-of-the-art C++编译器的团队。在过去的12年里,他进行了各种研究和商业编译器的开发。他还与Dr. Tondo合著过一本数据结构的教材。

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GETTING STARTED
問題解決 (影身版)

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Clovis L. Tondo, Bruce P. Leung

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C++ Primer
Answer Book

Foreword

For more than a decade, readers of *C++ Primer* pursued Stan down conference halls, cornering him in elevators, surrounding him at book signings, and inundating him with e-mail asking where, when, why, and — well then — why aren't the answers to the exercises available?

Well. Hmm. Eyes fixed on his shoelaces. "It's a tradition," he finally answered. "Within Bell Laboratories, I mean. No answers to the exercises. At least, not within the text." Silence. He knew what many people were thinking: yep, Kernighan and Ritchie (K&R) had an answer book. So did Bjarne. "Well. Hey." (Diffident shrug.) Stan never dreamed he'd ever see an independent answer book for the *Primer*.

Well, that was then. Now with great satisfaction — voilà — we introduce *C++ Primer Answer Book*!

The involvement of Clovis Tondo is something of a tradition for both *C++ Primer* and *Inside the Object Model*. He first reviewed the *Primer* in 1986 during an early draft of the first edition; his comments were both helpful and encouraging. (The value of encouragement for a newbie author should not be underestimated!) He followed that up with an excellent critique of the second edition as well as many helpful comments and encouragement on *Inside the Object Model*. (Hey, the value of encouragement for a veteran author should not be underestimated!) Finally, as a reviewer of the third edition, he provided an exceptionally in-depth reading.

When it was suggested to us that Dr. Tondo, together with Bruce Leung, might author an answer book for the third edition, it felt like a perfect fit, as if he had been preparing for just this book these past ten years. Of course, he had done *The C Answer Book* for the K&R text as well, so this makes for a second tradition. It's one that we are thrilled to be a part of.

The exercises within *C++ Primer* are intended (a) to reinforce the key elements of the material presented within the preceding section, (b) to provide a concrete set of design and programming tasks to allow the reader to exercise his or her new-won expertise, and in some few occasions (c) to provoke consideration of *C++* as a language invention in which theoretical concerns at times take a back seat to practical considerations. These latter exercises do not call so much for an answer as a more or less well-articulated position.

Are all the exercises we presented in the *Primer* absolutely the best we could have done? Reading through the answers presented here, it is clear that a small number of the exercises could have undergone some revision. And so we appreciate the forbearance of the authors.

In one case, we accidentally requested that an `OrQuery` binary operator be derived from an abstract `UnaryOperator` class. Sorry! Stan was sure he wrote `NotQuery`! That was certainly the class he intended to have revised.

C++ Primer Answer Book, then, can be grouped into two primary categories. The first is answers to the exercises in which an item is either correct or incorrect. This material provides a useful summary of the salient points of each section in addition to providing the solutions. The second category covers solutions to the design and programming tasks. These are our favorites, in general, perhaps because they offer the most surprises. After all, we know category 1 pretty well. This latter category allowed the authors to exercise their expertise. The programs in Chapters 6, 12, and 17 are particularly impressive.

We think you'll both enjoy and learn from *C++ Primer Answer Book*. And we extend a warm thanks to the two authors for their work.

Stanley B. Lippman
José Lajoie

Preface

C++ has proven to be a popular programming language, and *C++ Primer* has proven to be just as popular among those wishing to learn the language. Learning a programming language, however, requires more than just reading about the language constructs. You must program, write your own code, and study code written by those who are more experienced with the use of the language.

To this end, Lippman and Lajoie (L&L) have provided exercises throughout *C++ Primer* to encourage their readers to test their understanding of the material. Our book provides the solutions to those exercises.

C++ Primer Answer Book is intended to be used in conjunction with *C++ Primer*. We assume that you have read the material in L&L preceding each exercise. We present our solution along with an explanation, but we do not repeat the material found in L&L. Only those concepts and constructs that have already been introduced are used in the solutions.

When the solution involves a complete program, we generally include the entire source code so that each solution stands on its own. All programs have been compiled using Microsoft Visual C++ Version 5.0. In some instances when the compiler did not meet the standard, a workaround was used and an explanation given.

We recommend that you use L&L to learn C++, work the exercises, and study the solutions presented here. We hope *C++ Answer Book* will aid you in understanding C++ while eliminating the frustration of being stuck without an answer to a problem.

Acknowledgments

Special thanks go to Stan Lippman and Josée Lajoie for having the faith to allow us to write this answer book and for their careful review of the text.

Sean Davey, Steve Edwards, S. Rollins Guild, Cay Horstmann, and Jeffrey Oldham provided many helpful comments on the manuscript.

Clovis thanks George Edmunds, Sam Hsu, Mohammad Ilyas, Mahesh Neelakanta, and Cyril Párkányi for their continued support; Sean Davey for the C++ review, for the \LaTeX macros, and for his technical support; Andrew Nathanson for his friendship and software/hardware support; S. Rollins Guild for the C++ review and his friendship; A. Carlos

Tondo, Julia Mistrello, and Luiz and Elizabete T. Biavatti for helping our company succeed; and Caren E. Tondo for her love, patience, and sense of humor.

Bruce thanks Andrew Bellezza, Jodi Solomon, and Mary Walstrom for their friendship and encouragement; Zahira Ammarguellat, Luddy Harrison, Sandra Loosemore, and Cotton Seed — one couldn't ask for better co-workers; and Misty and Buddy for their boundless patience.

Last, but certainly not least, we thank the staff at Addison-Wesley. We are especially grateful to our associate editor, Debbie Lafferty, for her patience and knowing when and how hard to push; the production editor, Maureen Willard, for guiding us through the editing, proofs, and final pages; the production manager, John Fuller, for getting the macros approved and improved early in the process; and the freelancer, Diane Freed, for assisting with the production of this book. We appreciate your kind help.

Clovis L. Tondo
Bruce P. Leung

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chapter one

Getting Started

Chapter 1 of the C++ *Primer* does not contain any exercises.

chapter two

A Tour of C++

Exercise 2.1

Why do you think the built-in array does not support the assignment of one array with another? What information is required to support this operation?

The name of a built-in array is a synonym for an address, so assigning one array to another is similar to assigning the constant 5 to the constant 3. This is syntactically correct but semantically generates an error message.

The language was not designed to handle array assignments. The compiler would have to know the length of the arrays at run-time to generate code to support the assignment of one array with another.

Exercise 2.2

What operations should a first class array support?

“Although C++ provides built-in support for an array type, that support is limited to the mechanics required to read and write individual elements. C++ does not support the *abstraction* of an array; there is no support for the operations one might wish to perform on an array, such as the assignment of one array to another, the comparison of two arrays for equality, or asking an array its size” (L&L, page 26). That is, a first class array support should allow us to treat the array as a unit as well as allow us to access the individual elements of the array.

The operations that a first class array should support include

- Array initialization
- Array assignment
- Comparison of arrays

- Array size
- Index range check

Exercise 2.3

Explain the difference between the four objects defined below.

- (a) `int ival = 1024;` (c) `int *pi2 = new int(1024);`
(b) `int *pi = &ival;` (d) `int *pi3 = new int[1024];`

(a) `int ival = 1024;`

The object `ival` has static or automatic memory allocation. The declaration “instructs the compiler to allocate sufficient storage to hold any value of type `int`, associate the name `ival` with that storage, and then place an initial value of 1024 in that storage” (L&L, page 27).

(b) `int *pi = &ival;`

The object `pi` has a pointer type that may hold the memory address of an `int`. The *address-of* operator (`&`) returns the address of the `int` object `ival`. So `pi` is a pointer to an `int`, and it has been initialized with the address of the `int` object `ival`.

(c) `int *pi2 = new int(1024);`

The object `pi2` has a pointer type that may hold the memory address of an `int`. The `new` expression allocates a single unnamed object of type `int`, initializes that object to a value of 1024, and then returns the address of the object in memory, and `pi2` is initialized with that address.

(d) `int *pi3 = new int[1024];`

The object `pi3` has a pointer type that may hold the memory address of an `int`. The `new` expression allocates an array of 1024 integer elements (it does not initialize the elements of the array) and then returns the address of the first element of the array in memory, and `pi3` is initialized with that address.

The object `ival` is of type `int` and may hold any positive or negative integer value that can be contained in the underlying machine support of an `int`. So (a) holds a value, whereas the others ((b), (c), and (d)) are pointers that hold addresses.

Exercise 2.4

What does the following code fragment do? What is its significant error? (Note that the use of the subscript operator with the pointer `pia`, below, is correct; the reason we can do this is explained in Section 3.9.2.)

```
int *pi = new int( 10 );  
int *pia = new int[ 10 ];
```