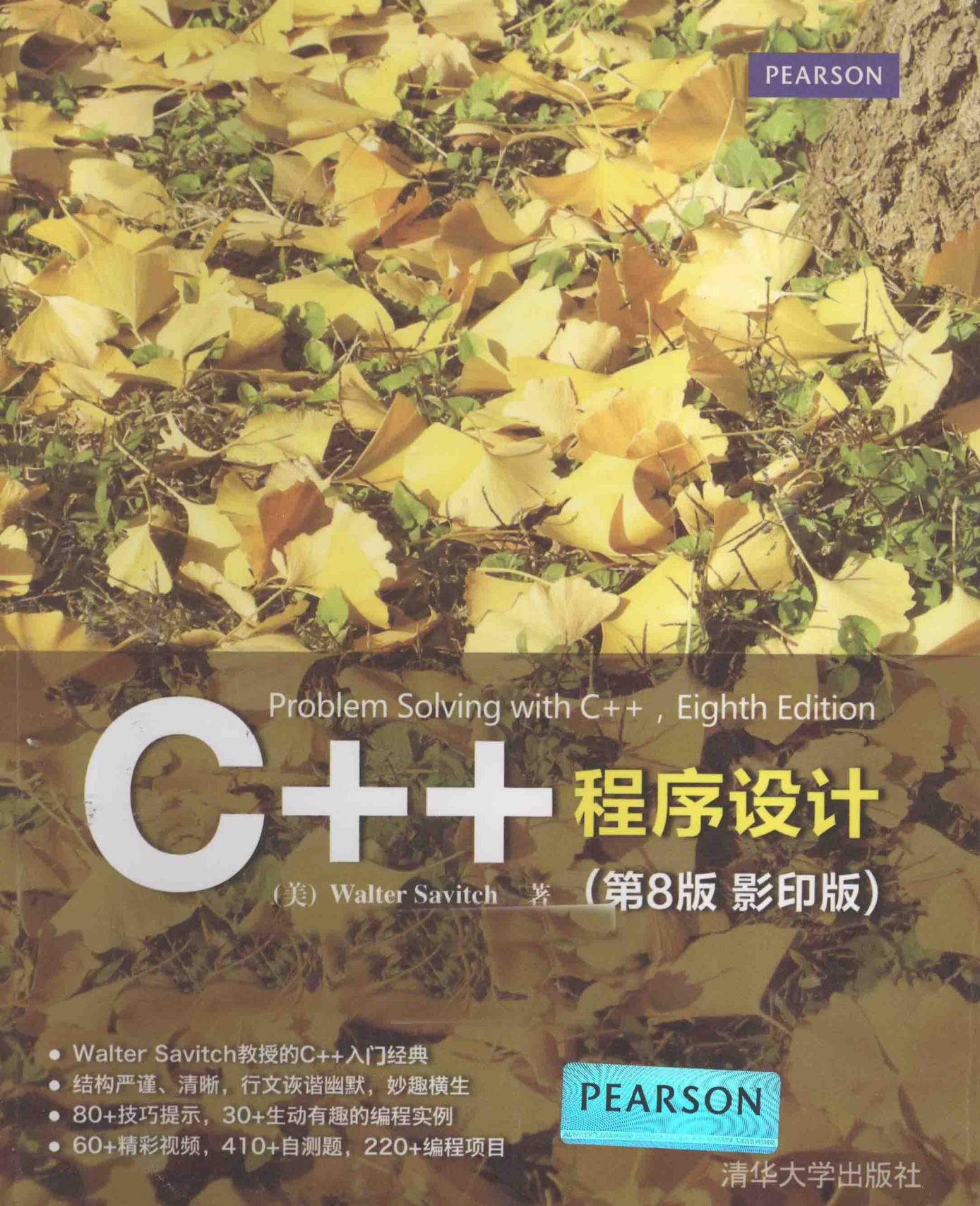
PEARSON
Problem Solving with C++ , Eighth Edition
C++ 程序设计
(第8版 影印版)
(美) Walter Savitch 著
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Problem Solving with C++ , Eighth Edition

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(美) Walter Savitch 著

清华大学出版社
北京

内 容 简 介

本书是最优秀的C++入门教材，深受师生欢迎。作者结合自己多年的教学经验，根据教学大纲精心设计并编写了书中内容。与此同时，本书还采用了很多便于读者巩固所学知识的教学特征，比如各章开始处的小节总览，书中随处可见的总结框、编程提示和编程陷阱，各章结尾处的小结、习题和编程项目等。这些非常适合初学者掌握重要的编程概念。

全书共18章，8个附录。在讲解C++基础知识之后，直接引导学生深入函数、I/O流、类、控制流程、命名空间、数组、字符串、指针和动态数组、递归、模板、指针和链表、派生类、异常以及标准模板库。

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前言

本书适合 C++程序设计和计算机科学入门课程使用。阅读本书不要求读者有任何编程经验，也不要求掌握除了中学代数之外的其他任何数学知识。

本书前几版的读者请阅读关于第 8 版修订内容的小节，前言的其余内容可略过。新读者请阅读前言的全部内容以把握本书脉络。

第 8 版修订内容

第 8 版采用和第 7 版相同的编程体例。第 7 版全部内容予以保留，但进行了以下改进。

- 第 10 章不再使用流类(比如 `ifstream` 和 `ofstream`)介绍继承概念，而是，使用那一章更简单的银行账户例子来介绍。
- 额外添加了有关作用域、参数传递、随机数生成、动态数组的内容，有几章的幻灯片进行了重新制作。
- 新增 25 个编程项目，合并到每章末尾现有的项目中。
- 本书配套网站添加了 15 个新的视频讲解，总数达 54 个。这些视频讲解辅导学生解题和写程序，有助于巩固对关键编程概念的掌握。如果书中某个主题有对应的视频讲解，就会出现一行特殊的注释(视频讲解……)。

用过第 7 版的教师可以沿用以前的教案，几乎不需要进行任何改动。

主题可以灵活排序

本书允许教师自由地重新安排教学顺序。为了演示这一灵活性，下面推荐了两种方式来排列主题顺序。采用任何一种方式阅读本书，都不会影响学习的连贯性。为了在重新排序时确保这种连贯性，可能需要移动个别小节而不是全章。但是，只有较大的、位置便利的小节才需要移动。为了帮助您根据需要自定义一个教学/阅读顺序，图 P.1 展示了一幅依

赖图。另外，每章都有“预备知识”小节，解释了学习那一章的每一节之前需要掌握哪些内容。

重新排序 1：提前学习类

为了有效地设计类，学生需要掌握一些基本的工具，比如控制结构和函数定义。这些基础知识在第 1 章～第 6 章介绍。完成第 6 章的学习后，学生就可以开始编写自己的类了。为了提前学习类的知识，可以像下面这样重新安排各章的顺序。

- **基础知识** 第 1 章、第 2 章、第 3 章、第 4 章、第 5 章和第 6 章。这 6 章全面介绍控制结构、函数定义和基本文件 I/O。第 3 章介绍几种额外的控制结构，如果希望尽早学习类，可以考虑推迟这一章的学习。
- **类和命名空间** 第 10 章、第 11 章的 11.1 节和 11.2 节、第 12 章。这些章节全面介绍了如何定义类、友元、重载操作符和命名空间。
- **数组、字符串和向量** 第 7 章和第 8 章。
- **指针和动态数组** 第 9 章。
- **类中的数组** 第 11 章的 11.3 节和 11.4 节。
- **继承** 第 15 章。
- **递归** 第 14 章(也可以推迟到稍晚的时候学习)。
- **指针和链表** 第 13 章。

可能还要用到以下各章的部分内容。

- **异常处理** 第 16 章。
- **模板** 第 17 章。
- **标准模板库** 第 18 章。

重新排序 2：略微延后类的学习

在“重新排序 2”中，将先学完所有控制结构，再学习有关数组的基本知识，之后才开始学习类。虽然对类的接触要比“重新排序 1”晚，但还是比本书的默认顺序略微提前一些。

- **基础知识** 第 1 章、第 2 章、第 3 章、第 4 章、第 5 章和第 6 章。这 6 章全面介绍了控制结构、函数定义和基本文件 I/O。
- **数组和字符串** 第 7 章、第 8 章的 8.1 节和 8.2 节。
- **类和命名空间** 第 10 章、第 11 章的 11.1 节、11.2 节和第 12 章。这些章节全面介绍了如何定义类、友元、重载操作符和命名空间。
- **指针和动态数组** 第 9 章。
- **类中的数组** 第 11 章的 11.3 节和 11.4 节。
- **继承** 第 15 章。

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- **递归** 第 14 章(也可以推迟到稍晚的时候学习)。
- **向量** 8.3 节。
- **指针和链表** 第 13 章。

可能还要用到以下各章的部分内容。

- **异常处理** 第 16 章。
- **模板** 第 17 章。
- **标准模板库** 第 18 章。

面向学生的易用性

一本书必须按恰当的顺序来讲解恰当的主题，这是最起码的要求。另外，在老师和其他有经验的程序员看来，书中的内容必须清晰而又正确，这是另一个最起码的要求。但是，是不是符合这两项要求的书都是好书呢？答案是否定的。书中的内容必须采取有利于初学者使用的方式来编排。在这本入门教科书中，我尽力让学生觉得清楚和友好。本书以前版本的大量学生反馈证明，这种写作风格确实使内容更清晰，能使学生充分享受到学习的乐趣。

ANSI/ISO C++标准

本书完全兼容于符合最新 ANSI/ISO C++标准的编译器。

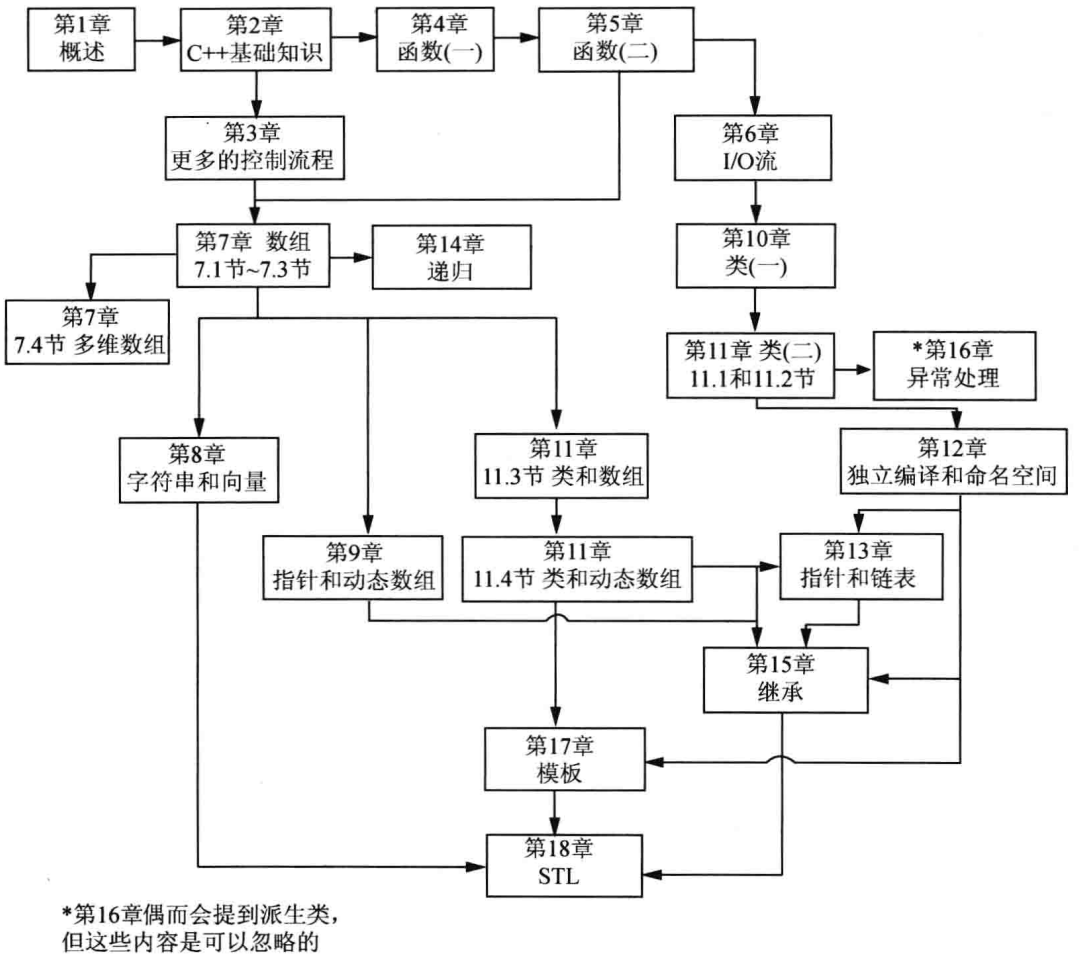
高级主题

许多“高级主题”都成为标准 CS1 课程的一部分。即使它们不是课程的一部分，也最好以补充材料的形式在书中提供。本书提供了大量高级主题，它们既可集成到一门课程中，也可作为自学主题。本书全面讲述了 C++模板、继承(包括虚函数)、异常处理和 STL(Standard Template Library，标准模板库)。虽然本书使用了库，而且教给学生库的重要性，但不要求任何非标准库。本书只使用所有 C++实现都附带的库。

依赖图

依赖图展示了各个章节可能的排序方式。连接两个框的实线表明上部的框必须先于下部的框完成。只要符合这个条件，采用任何阅读顺序都无损连贯性。如果一个框中包含小节编号，表明该框只代表那些小节，不代表全章。

图 P.1 依赖图



小结框

每个要点都用一个有底纹的方框来小结。这些“小结框”散布于每一章。

自测题

每章都在重要位置提供大量自测题。每章末尾都有所有自测题的完整答案。

视频讲解

视频讲解(Video Note)是 Pearson 新推出的可视工具，目的是向学生讲解关键的编程概念和技术。这些短视频演示了从设计到编码来解决问题的过程。视频讲解使学生能方便地自学自己感兴趣的主题，允许选择、播放、倒退、快进和暂停等。每当看到“ 视频讲解……”，都表明当前主题有一段对应的视频讲解。请自行上网观看视频，网址是*http://media.pearsoncmg.com/aw/aw_savitch_cpp_8/videonotes/vn.html*。注意，由于是英文视频，所以为了方便索引，书中保留了这些视频的英文名称。

支持材料

部分支持材料是本书所有读者都能使用的。另一部分仅供有资格的教师使用。

适于本书所有读者的支持材料

- 本书源代码
- PowerPoint 幻灯片
- 视频讲解

为了获取这些材料，请访问本书译者博客(*transbot.blog.163.com*)。

适于有资格的教师的资源

选用本书作为教材的教师，可致函编辑信箱 wenkaiqi@gmail.com 了解详情。

- 教师资源指南(Instructor's Resource Guide)：包括每一章的教学要点、课堂测验/答案和大量编程项目的答案。
- Test Bank 和 Test Generator：用于生成试卷。
- PowerPoint 幻灯片：包括本书的程序和插图。
- Lab Manual(实验手册)。

致谢

在准备本书素材期间，很多个人和团体提供了大量建议和帮助，并和我进行了广泛而深入的探讨。本书第 1 版大部分内容是我在科罗拉多大学(波德分校)计算机系担任客座教授时写就的。其余内容和后续版本则是在加州大学(圣地亚哥分校)计算机科学与工程系完成的。非常感谢这两所学校为本书写作和教学所提供的良好氛围。

特别感谢向这一版和之前各版提供意见或者编程项目的个人，以下人名按字母排序：Joseph Allen，Noah Aydin，Claire Bono,Richard Borie，Andrew Burt，Edward Carr，Karla

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还要感谢用过本书前几版的许多老师，他们的建议相当有价值。最后感谢 Kenrick Mock 帮我实现了这一版的全部修订。他的工作令我和编辑激赏！

Preface

This book is meant to be used in a first course in programming and computer science using the C++ language. It assumes no previous programming experience and no mathematics beyond high school algebra.

If you have used the previous edition of this book, you should read the following section that explains the changes to this eighth edition, the section explaining MyProgrammingLab, and then you can skip the rest of this preface. If you are new to this book, the rest of this preface will give you an overview of the book.

Changes to the Eighth Edition

This eighth edition presents the same programming philosophy as the seventh edition. All of the material from the seventh edition remains, but with the following enhancements:

- The material on stream classes used to introduce the concept of inheritance has been removed from Chapter 10. Instead, inheritance is introduced with the much simpler bank account example used throughout the chapter.
- Additional material on:

  scoping
  parameter passing
  random number generation
  dynamic arrays

has been added and the presentation has been reworked in several chapters.

- Twenty-five new programming projects have been added throughout the book and integrated into the existing projects at the end of each chapter.
- Fifteen new VideoNotes have been added to the book's Companion Website, for a total of fifty-four VideoNotes. These VideoNotes walk students through the process of both problem solving and coding to help reinforce key programming concepts. An icon appears in the margin of the book when a VideoNote is available regarding the topic covered in the text.

If you are an instructor already using the seventh edition, you can continue to teach your course almost without change.

Flexibility in Topic Ordering

This book was written to allow instructors wide latitude in reordering the material. To illustrate this flexibility, we suggest two alternative ways to order

the topics. There is no loss of continuity when the book is read in either of these ways. To ensure this continuity when you rearrange material, you may need to move sections rather than entire chapters. However, only large sections in convenient locations are moved. To help customize a particular order for any class's needs, the end of this preface contains a dependency chart, and each chapter has a "Prerequisites" section that explains what material needs to be covered before each section in that chapter.

Reordering 1: Earlier Classes

To effectively design classes, a student needs some basic tools such as control structures and function definitions. This basic material is covered in Chapters 1 through 6. After completing Chapter 6, students can begin to write their own classes. One possible reordering of chapters that allows for such early coverage of classes is the following:

Basics: Chapters 1, 2, 3, 4, 5, and 6. This material covers all control structures, function definitions, and basic file I/O. Chapter 3, which covers additional control structures, could be deferred if you wish to cover classes as early as possible.

Classes and namespaces: Chapter 10, Sections 11.1 and 11.2 of Chapter 11, and Chapter 12. This material covers defining classes, friends, overloaded operators, and namespaces.

Arrays, strings and vectors: Chapters 7 and 8

Pointers and dynamic arrays: Chapter 9

Arrays in classes: Sections 11.3 and 11.4 of Chapter 11

Inheritance: Chapter 15

Recursion: Chapter 14 (Alternately, recursion may be moved to later in the course.)

Pointers and linked lists: Chapter 13

Any subset of the following chapters may also be used:

Exception handling: Chapter 16

Templates: Chapter 17

Standard Template Library: Chapter 18

Reordering 2: Classes Slightly Later but Still Early

This version covers all control structures and the basic material on arrays before doing classes, but classes are covered later than the previous ordering and slightly earlier than the default ordering.

Basics: Chapters 1, 2, 3, 4, 5, and 6. This material covers all control structures, function definitions, and the basic file I/O.

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Arrays and strings: Chapter 7, Sections 8.1 and 8.2 of Chapter 8

Classes and namespaces: Chapter 10, Sections 11.1 and 11.2 of Chapter 11, and Chapter 12. This material covers defining classes, friends, overloaded operators, and namespaces.

Pointers and dynamic arrays: Chapter 9

Arrays in classes: Sections 11.3 and 11.4 of Chapter 11

Inheritance: Chapter 15

Recursion: Chapter 14. (Alternately, recursion may be moved to later in the course.)

Vectors: Chapter 8.3

Pointers and linked lists: Chapter 13

Any subset of the following chapters may also be used:

Exception handling: Chapter 16

Templates: Chapter 17

Standard Template Library: Chapter 18

Accessibility to Students

It is not enough for a book to present the right topics in the right order. It is not even enough for it to be clear and correct when read by an instructor or other experienced programmer. The material needs to be presented in a way that is accessible to beginning students. In this introductory textbook, I have endeavored to write in a way that students find clear and friendly. Reports from the many students who have used the earlier editions of this book confirm that this style makes the material clear and often even enjoyable to students.

ANSI/ISO C++ Standard

This edition is fully compatible with compilers that meet the latest ANSI/ISO C++ standard.

Advanced Topics

Many "advanced topics" are becoming part of a standard CS1 course. Even if they are not part of a course, it is good to have them available in the text as enrichment material. This book offers a number of advanced topics that can be integrated into a course or left as enrichment topics. It gives thorough coverage of C++ templates, inheritance (including virtual functions), exception handling, and the STL (Standard Template Library). Although this book uses libraries and teaches students the importance of libraries, it does not require any nonstandard libraries. This book uses only libraries that are provided with essentially all C++ implementations.

Dependency Chart

The dependency chart on the next page shows possible orderings of chapters and subsections. A line joining two boxes means that the upper box must be covered before the lower box. Any ordering that is consistent with this partial ordering can be read without loss of continuity. If a box contains a section number or numbers, then the box refers only to those sections and not to the entire chapter.

Summary Boxes

Each major point is summarized in a boxed section. These boxed sections are spread throughout each chapter.

Self-Test Exercises

Each chapter contains numerous Self-Test Exercises at strategic points. Complete answers for all the Self-Test Exercises are given at the end of each chapter.

VideoNote

VideoNotes

VideoNotes are Pearson's new visual tool designed for teaching students key programming concepts and techniques. These short step-by-step videos demonstrate how to solve problems from design through coding. VideoNotes allow for self-paced instruction with easy navigation including the ability to select, play, rewind, fast-forward, and stop within each VideoNote exercise.

myprogramminglab

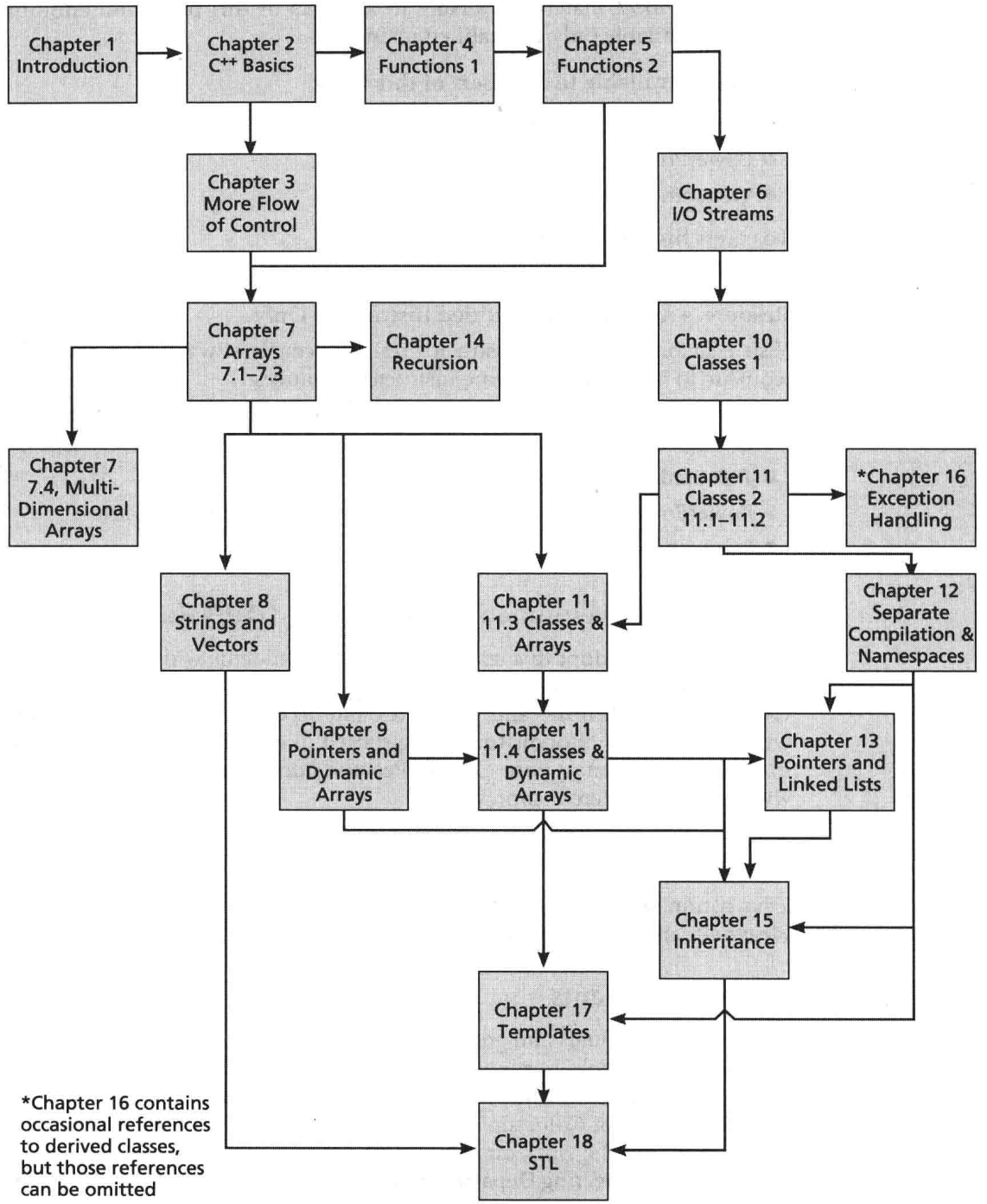
Online Practice and Assessment with MyProgrammingLab

MyProgrammingLab helps students fully grasp the logic, semantics, and syntax of programming. Through practice exercises and immediate, personalized feedback, MyProgrammingLab improves the programming competence of beginning students who often struggle with the basic concepts and paradigms of popular high-level programming languages.

A self-study and homework tool, a MyProgrammingLab course consists of hundreds of small practice problems organized around the structure of this textbook. For students, the system automatically detects errors in the logic and syntax of their code submissions and offers targeted hints that enable students to figure out what went wrong—and why. For instructors, a comprehensive gradebook tracks correct and incorrect answers and stores the code inputted by students for review.

MyProgrammingLab is offered to users of this book in partnership with Turing's Craft, the makers of the CodeLab interactive programming exercise system. For a full demonstration, to see feedback from instructors and students, or to get started using MyProgrammingLab in your course, visit www.myprogramminglab.com.

DISPLAY P.1 Dependency Chart



Support Material

There is support material available to all users of this book and additional material available only to qualified instructors.

Materials Available to All Users of this Book

- Source Code from the book
- PowerPoint slides
- VideoNotes

To access these materials, go to:
www.pearsonhighered.com/savitch

Resources Available to Qualified Instructors Only

Visit Pearson Education's instructor resource center at www.pearsonhighered.com/irc to access the following instructor resources:

- Instructor's Resource Guide—including chapter-by-chapter teaching hints, quiz questions with solutions, and solutions to many programming projects
- Test Bank and Test Generator
- PowerPoint Lectures—including programs and art from the text
- Lab Manual

Integrated Development Environment (IDE) Resource Kits

Instructors who adopt this text can order it for students with a kit containing five popular C++ IDEs (Microsoft® Visual Studio 2010 Express Edition, Dev C++, NetBeans, Eclipse, and CodeLite) and access to a Web site containing written and video tutorials for getting started in each IDE. For ordering information, please contact your campus Pearson Education representative or visit www.pearsonhighered.com/cs.

Contact Us

Your comments, suggestions, questions, and corrections are always welcome. Please e-mail them to savitch.programming.cpp@gmail.com

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Walter Savitch

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