

Third AP Edition

# *Java*

# *Methods*

Object-Oriented Programming  
and  
Data Structures

Maria Litvin

Phillips Academy, Andover, Massachusetts

Gary Litvin

Skylight Software, Inc.

Skylight Publishing  
Andover, Massachusetts

Skylight Publishing  
9 Bartlet Street, Suite 70  
Andover, MA 01810

web: <http://www.skylit.com>  
e-mail: [sales@skylit.com](mailto:sales@skylit.com)  
[support@skylit.com](mailto:support@skylit.com)

**Copyright © 2015 by Maria Litvin, Gary Litvin, and  
Skylight Publishing**

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the authors and Skylight Publishing.

Library of Congress Control Number: 2014922396

ISBN 978-0-9824775-6-4

\* AP and Advanced Placement are registered trademarks of The College Board, which was not involved in the production of and does not endorse this book.

The names of commercially available software and products mentioned in this book are used for identification purposes only and may be trademarks or registered trademarks owned by corporations and other commercial entities. Skylight Publishing and the authors have no affiliation with and disclaim any sponsorship or endorsement by any of these product manufacturers or trademark owners.

Oracle, Java, and Java logos are trademarks or registered trademarks of Oracle Corporation and/or its affiliates in the U.S. and other countries.

SCRABBLE® is the registered trademark of HASBRO in the United States and Canada and of J.W. Spear and Sons, PLC, a subsidiary of Mattel, Inc., outside the United States and Canada.

1 2 3 4 5 6 7 8 9 10      20 19 18 17 16 15

Printed in the United States of America

## How to Use This Book

---

The *Java Methods* companion web site —

`http://www.skylit.com/javamethods`

— is an integral part of this book. It contains six chapters and several appendices. It also has downloadable student files for case studies, labs, and exercises, assembled together in what we call *Student Files*. Also on the book’s web site are links, errata, supplemental papers, and syllabi and technical support information for teachers.

We have chosen to place Chapters 1, 16, 17, 18, 27, and 28 and the appendices on the web either because they rely on many web links or because the material they cover is less theoretical and handy to have online for reference.

 The web symbol indicates a “webnote”; you will find it in the alphabetical list of webnote links on the book’s web site.

JM refers to *Java Methods Student Files*. For example, “you can find HelloWorld.java in JM\Ch02\Hello” means the HelloWorld.java file is located in the Ch02\Hello subfolder in the StudentFiles folder.



This icon draws your attention to a lab exercise or a hands-on exploration of an example.



“Parentheses” like these, in the margin, mark supplementary material intended for a more inquisitive reader. This material either gives a glimpse of things to come in subsequent chapters or adds technical details.

1.▪, 2.♦ In exercises, a square indicates an “intermediate” question that may require more thought or work than an ordinary question or exercise. A diamond indicates an “advanced” question that could be treacherous or lead to unexplored territory — proceed at your own risk.

- (MC) We have included a few multiple-choice questions in the exercises. These are marked (MC).
- ✓ A checkmark at the end of a question in an exercise means that a solution is included in `JM\SolutionsToExercises.pdf`. We have included solutions to about one-third of the exercises.

The *Teacher Files* folder, which contains complete solutions to all the exercises and labs, is available for downloading free of charge to teachers who use this book as a textbook in their schools. Go to [skylit.com/javamethods](http://skylit.com/javamethods) and click on the “Teachers’ Room” link for details.



(To a slightly different subject...)

How you use this book will depend on your background in computers. If you are familiar with computers and programming, you can glance quickly at Chapters 1 and 2 to see whether they fill any gaps.

Chapters 3, Java Syntax and Style, and 4, Objects and Classes, can be covered in any order, depending on your taste.

If you know C++, Chapters 5, 6, and 7 will be easy for you. But do still read them for the sake of the case studies and labs, which cover broader concepts than the chapter headings imply. Chapters 15, Streams and Files, 16, Graphics, 17, GUI Components and Events, and 18, Mouse, Keyboard, Sounds, and Images, are optional as far as the AP exams are concerned. Chapter 19 begins the discussion of more advanced topics: big-O, the Java collections framework, and data structures. These chapters can be read after the AP exam is behind you. Chapter 27, Design Patterns, aims to inspire you to continue studying object-oriented design. Chapter 28, Computing in Context, is an important introduction to social and ethical issues involved in computer use. This chapter can be read after the AP exam.