

For my good friend

Masayuki Ida #田昌之

Thank you for good advice about  
the Java language and  
internationalization!

The Java™  
Language Specification

Guy Steele  
ガイステール

9 Sept 1996

James Gosling

Bill Joy

Guy Steele



**ADDISON-WESLEY**

An imprint of Addison Wesley Longman, Inc.

Reading, Massachusetts • Harlow, England • Menlo Park, California  
Berkeley, California • Don Mills, Ontario • Sydney  
Bonn • Amsterdam • Tokyo • Mexico City

# **The Java™ Series**

*Lisa Friendly, Series Editor*

*Bill Joy, Technical Advisor*

## **The Java™ Programming Language**

Ken Arnold and James Gosling

ISBN 0-201-63455-4

## **The Java™ Language Specification**

James Gosling, Bill Joy, and Guy Steele

ISBN 0-201-63451-1

## **The Java™ Virtual Machine Specification**

Tim Lindholm and Frank Yellin

ISBN 0-201-63452-X

## **The Java™ Application Programming Interface, Volume 1: Core Packages**

James Gosling, Frank Yellin, and the Java Team

ISBN 0-201-63453-8

## **The Java™ Application Programming Interface, Volume 2: Window Toolkit and Applets**

James Gosling, Frank Yellin, and the Java Team

ISBN 0-201-63459-7

## **The Java™ Tutorial: Object-Oriented Programming for the Internet**

Mary Campione and Kathy Walrath

ISBN 0-201-63454-6

## **The Java™ Class Libraries: An Annotated Reference**

Patrick Chan and Rosanna Lee

ISBN 0-201-63458-9

## **The Java™ FAQ: Frequently Asked Questions**

Jonni Kanerva

ISBN 0-201-63456-2

"When I use a word," Humpty Dumpty said, in rather a scornful tone, "it means just what I choose it to mean—neither more nor less."

"The question is," said Alice, "whether you *can* make words mean so many different things."

"The question is," said Humpty Dumpty, "which is to be master—that's all."

—Lewis Carroll, *Through the Looking Glass*

Make sure you  
continue to:

"Write Once and Run Everywhere!"  
Alan E. Hill

Copyright © 1996 Sun Microsystems, Inc.  
2550 Garcia Avenue, Mountain View, California 94043-1100 U.S.A.  
All rights reserved.

**RESTRICTED RIGHTS LEGEND:** Use, duplication, or disclosure by the United States Government is subject to the restrictions set forth in DFARS 252.227-7013 (c)(1)(ii) and FAR 52.227-19.

The release described in this manual may be protected by one or more U.S. patents, foreign patents, or pending applications.

Sun Microsystems, Inc. (SUN) hereby grants to you a fully-paid, nonexclusive, nontransferable, perpetual, worldwide limited license (without the right to sublicense) under SUN's intellectual property rights that are essential to practice this specification. This license allows and is limited to the creation and distribution of clean room implementations of this specification that (i) include a complete implementation of the current version of this specification without subsetting or supersetting, (ii) implement all the interfaces and functionality of the standard `java.*` packages as defined by SUN, without subsetting or supersetting, (iii) do not add any additional packages, classes or methods to the `java.*` packages (iv) pass all test suites relating to the most recent published version of this specification that are available from SUN six (6) months prior to any beta release of the clean room implementation or upgrade thereto, (v) do not derive from SUN source code or binary materials, and (vi) do not include any SUN binary materials without an appropriate and separate license from SUN.

Sun, Sun Microsystems, Sun Microsystems Computer Corporation, the Sun logo, the Sun Microsystems Computer Corporation logo, Java, JavaSoft, JavaScript and HotJava are trademarks or registered trademarks of Sun Microsystems, Inc. UNIX® is a registered trademark in the United States and other countries, exclusively licensed through X/Open Company, Ltd. Apple and Dylan are trademarks of Apple Computer, Inc. All other product names mentioned herein are the trademarks of their respective owners.

THIS PUBLICATION IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT.

THIS PUBLICATION COULD INCLUDE TECHNICAL INACCURACIES OR TYPOGRAPHICAL ERRORS. CHANGES ARE PERIODICALLY ADDED TO THE INFORMATION HEREIN; THESE CHANGES WILL BE INCORPORATED IN NEW EDITIONS OF THE PUBLICATION. SUN MICROSYSTEMS, INC. MAY MAKE IMPROVEMENTS AND/OR CHANGES IN THE PRODUCT(S) AND/OR THE PROGRAM(S) DESCRIBED IN THIS PUBLICATION AT ANY TIME.

Credits and permissions for quoted material appear in a separate section on page 823.

Text printed on recycled and acid-free paper

ISBN 0-201-63451-1  
1 2 3 4 5 6 7 8 9-MA-99989796  
First printing, August 1996

# Table of Contents

---

Series Foreword .....	xxi
Preface .....	xxiii
<b>1 Introduction.....</b>	<b>1</b>
1.1 Example Programs .....	5
1.2 References .....	6
<b>2 Grammars .....</b>	<b>7</b>
2.1 Context-Free Grammars .....	7
2.2 The Lexical Grammar .....	7
2.3 The Syntactic Grammar .....	8
2.4 Grammar Notation .....	8
<b>3 Lexical Structure.....</b>	<b>11</b>
3.1 Unicode .....	11
3.2 Lexical Translations .....	12
3.3 Unicode Escapes .....	12
3.4 Line Terminators .....	13
3.5 Input Elements and Tokens .....	14
3.6 White Space .....	15
3.7 Comments .....	15
3.8 Identifiers .....	17
3.9 Keywords .....	18
3.10 Literals .....	19
3.10.1 Integer Literals .....	19
3.10.2 Floating-Point Literals .....	22
3.10.3 Boolean Literals .....	23
3.10.4 Character Literals .....	24
3.10.5 String Literals .....	25
3.10.6 Escape Sequences for Character and String Literals .....	26
3.10.7 The Null Literal .....	27
3.11 Separators .....	27
3.12 Operators .....	28