
Internet & World Wide Web

HOW TO PROGRAM

FOURTH EDITION

Deitel® Series Page

How To Program Series

Internet & World Wide Web How to Program, 4/E

Java How to Program, 7/E

C++ How to Program, 6/E

C How to Program, 5/E

Visual Basic® 2005 How to Program, 3/E

Visual C#® 2005 How to Program, 2/E

Small Java™ How to Program, 6/E

Small C++ How to Program, 5/E

Advanced Java™ 2 Platform How to Program

XML How to Program

Visual C++® .NET How to Program

Perl How to Program

Python How to Program

Simply Series

Simply C++: An Application-Driven
Tutorial Approach

Simply C#: An Application-Driven
Tutorial Approach

Simply Java™ Programming: An
Application-Driven Tutorial
Approach

Simply Visual Basic® 2005, 2/E: An
Application-Driven Tutorial
Approach

SafariX Web Books

www.deitel.com/books/SafariX.html

C++ How to Program, 5/E & 6/E

Small C++ How to Program, 5/E

Java How to Program, 6/E & 7/E

Small Java How to Program, 6/E

Simply C++: An Application-Driven
Tutorial Approach

Visual Basic 2005 How to Program, 3/E

Simply Visual Basic 2005: An Application-
Driven Tutorial Approach, 2/E

Visual C# 2005 How to Program, 2/E

To follow the Deitel publishing program, please register for the free *Deitel® Buzz Online* e-mail newsletter at:

www.deitel.com/newsletter/subscribe.html

To communicate with the authors, send e-mail to:

deitel@deitel.com

For information on corporate on-site seminars offered by Deitel & Associates, Inc. worldwide, visit:

www.deitel.com/training/

or write to

deitel@deitel.com

For continuing updates on Prentice Hall/Deitel publications visit:

www.deitel.com

www.prenhall.com/deitel

www.InformIT.com/deitel

Check out our Resource Centers for valuable web resources that will help you master C++, other important programming languages, software and Web 2.0 topics:

www.deitel.com/ResourceCenters.html

Library of Congress Cataloging-in-Publication Data
On file

Vice President and Editorial Director, ECS: **Marcia J. Horton**
Associate Editor: **Carole Snyder**
Supervisor/Editorial Assistant: **Dolores Mars**
Director of Team-Based Project Management: **Vince O'Brien**
Senior Managing Editor: **Scott Disanno**
Managing Editor: **Robert Engelhardt**
Production Editor: **Marta Samsel**
A/V Production Editor: **Greg Dulles**
Art Studio: **Artworks, York, PA**
Art Director: **Kristine Carney**
Cover Design: **Abbey S. Deitel, Harvey M. Deitel, Francesco Santalucia, Kristine Carney**
Interior Design: **Harvey M. Deitel, Kristine Carney**
Manufacturing Manager: **Alexis Heydt-Long**
Manufacturing Buyer: **Lisa McDowell**
Director of Marketing: **Margaret Waples**



© 2008 by Pearson Education, Inc.
Upper Saddle River, New Jersey 07458

The authors and publisher of this book have used their best efforts in preparing this book. These efforts include the development, research, and testing of the theories and programs to determine their effectiveness. The authors and publisher make no warranty of any kind, expressed or implied, with regard to these programs or to the documentation contained in this book. The authors and publisher shall not be liable in any event for incidental or consequential damages in connection with, or arising out of, the furnishing, performance, or use of these programs.

Many of the designations used by manufacturers and sellers to distinguish their products are claimed as trademarks and registered trademarks. Where those designations appear in this book, and Prentice Hall and the authors were aware of a trademark claim, the designations have been printed in initial caps or all caps. All product names mentioned remain trademarks or registered trademarks of their respective owners.

All rights reserved. No part of this book may be reproduced, in any form or by any means, without permission in writing from the publisher.

Printed in the United States of America

10 9 8 7 6 5 4 3 2 1

ISBN 0-13-175242-1

Pearson Education Ltd., *London*
Pearson Education Australia Pty. Ltd., *Sydney*
Pearson Education Singapore, Pte. Ltd.
Pearson Education North Asia Ltd., *Hong Kong*
Pearson Education Canada, Inc., *Toronto*
Pearson Educación de México, S.A. de C.V.
Pearson Education—Japan, *Tokyo*
Pearson Education Malaysia, Pte. Ltd.
Pearson Education, Inc., *Upper Saddle River, New Jersey*

Internet & World Wide Web

HOW TO PROGRAM

FOURTH EDITION

P. J. Deitel

Deitel & Associates, Inc.

H. M. Deitel

Deitel & Associates, Inc.



Upper Saddle River, New Jersey 07458

Trademarks

DEITEL, the double-thumbs-up bug and DIVE INTO are registered trademarks of Deitel & Associates, Inc.

Adobe, Dreamweaver, Flex and Flash are either registered trademarks or trademarks of Adobe Systems, Inc.

Apache is a trademark of The Apache Software Foundation.

CSS, DOM, XHTML and XML are registered trademarks of the World Wide Web Consortium.

Del.icio.us and Flickr are trademarks of Yahoo! Inc.

Digg is a trademark of Digg Inc.

Firefox is a registered trademark of the Mozilla Foundation.

Google is a trademark of Google, Inc.

JavaScript, Java and all Java-based marks are trademarks or registered trademarks of Sun Microsystems, Inc. in the United States and other countries.

Microsoft, Internet Explorer, Silverlight and the Windows logo are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

MySpace is a registered trademark of MySpace.com.

UNIX is a registered trademark of The Open Group.

Ruby on Rails is a trademark of David Heinemeier Hansson.

MySQL is a registered trademark of MySQL AB.

Second Life is a registered trademark of Linden Research, Inc.

Skype is a trademark of eBay, Inc.

Web 2.0 is a service mark of CMP Media.

Wikipedia is a registered trademark of Wikimedia.

Throughout this book, trademarks are used. Rather than put a trademark symbol in every occurrence of a trademarked name, we state that we are using the names in an editorial fashion only and to the benefit of the trademark owner, with no intention of infringement of the trademark.

To Tim O'Reilly and John Battelle:

*For your extraordinary efforts in
bringing Web 2.0 to the world through
the annual Web 2.0 Summit conference
and so much more.*

Paul and Harvey Deitel

Deitel Resource Centers

Our Resource Centers focus on the vast amounts of free content available online. Start your search here for resources, downloads, tutorials, documentation, books, e-books, journals, articles, blogs, RSS feeds and more on many of today's hottest programming and technology topics. For the most up-to-date list of our Resource Centers, visit:

www.deitel.com/ResourceCenters.html

Let us know what other Resource Centers you'd like to see! Also, please register for the free *Deitel® Buzz Online* e-mail newsletter at:

www.deitel.com/newsletter/subscribe.html

Programming	Web3D Technologies	Attention Economy	Wikis
.NET	XHTML	Blogging	
.NET 3.0	XML	Building Web Communities	Internet Business
Adobe Flex	Software	Community-Generated Content	Affiliate Programs
Ajax	Apache	Google AdSense	Google AdSense
Apex On-Demand Programming Language	DotNetNuke (DNN)	Google Analytics	Google Analytics
ASP.NET	Eclipse	Google Base	Google Services
ASP.NET Ajax	Firefox	Google Services	Internet Advertising
C	Flash CS3 (Flash 9)	Google Video	Internet Business Initiative
C#	Internet Explorer 7	Google Web Toolkit	Internet Public Relations
C++	Linux	Internet Advertising Initiative	Link Building
C++ Boost Libraries	MySQL	Internet Business Initiative	Podcasting
C++ Game Programming	Open Source	Internet Public Relations	Search Engine Optimization
Code Search Engines and Code Sites	Search Engines	Internet Video	Sitemaps
Computer Game Programming	Web Servers	Joost	Web Analytics
CSS 2.1	Wikis	Link Building	Website Monetization
Dojo Toolkit	Windows Vista	Location-Based Services	Open Source
Flash 9	Microsoft	Mashups	Apache
Flex	.NET	Microformats	DotNetNuke (DNN)
Java	.NET 3.0	Podcasting	Eclipse
Java Certification and Assessment Testing	ASP.NET	Recommender Systems	Firefox
Java Design Patterns	ASP.NET Ajax	RSS	Linux
Java EE 5	C#	Search Engine Optimization	MySQL
Java SE 6	DotNetNuke (DNN)	Search Engines	Open Source
JavaFX	Internet Explorer 7	Selling Digital Content	Perl
JavaScript	Silverlight	Skype	PHP
JSON	Visual Basic	Social Media	Python
OpenGL	Visual C++	Social Networking	Ruby
Perl	Windows Vista	Software as a Service (SaaS)	Ruby on Rails
PHP	Java	Virtual Worlds	Other Topics
Programming Projects	Java	Web 2.0	Computer Games
Python	Java Certification and Assessment Testing	Web 3.0	Computing Jobs
Ruby	Java Design Patterns	Web Analytics	Gadgets and Gizmos
Ruby on Rails	Java EE 5	Website Monetization	Sudoku
Silverlight	Java SE 6	Widgets	
Visual Basic	JavaFX		
Visual C++	Web 2.0 and Internet Business		
Web Services	Affiliate Programs		
	Alert Services		

Contents

Preface	xxi
Before You Begin	xxxii
Part I: Introduction	I
1 Introduction to Computers and the Internet	2
1.1 Introduction	3
1.2 What Is a Computer?	7
1.3 Computer Organization	7
1.4 Machine Languages, Assembly Languages and High-Level Languages	8
1.5 History of the Internet and World Wide Web	10
1.6 World Wide Web Consortium (W3C)	11
1.7 Web 2.0	12
1.8 Personal, Distributed and Client/Server Computing	13
1.9 Hardware Trends	14
1.10 Key Software Trend: Object Technology	15
1.11 JavaScript: Object-Based Scripting for the Web	16
1.12 Browser Portability	17
1.13 C, C++ and Java	17
1.14 BASIC, Visual Basic, Visual C++, C# and .NET	18
1.15 Software Technologies	18
1.16 Notes about <i>Internet & World Wide Web How to Program, 4/e</i>	20
1.17 Web Resources	20
2 Web Browser Basics: Internet Explorer and Firefox	28
2.1 Introduction to the Internet Explorer 7 and Firefox 2 Web Browsers	29
2.2 Connecting to the Internet	29
2.3 Internet Explorer 7 and Firefox 2 Features	30
2.4 Customizing Browser Settings	36
2.5 Searching the Internet	37
2.6 Keeping Track of Your Favorite Sites	40
2.7 File Transfer Protocol (FTP)	40
2.8 Online Help	42

2.9	Other Web Browsers	44
2.10	Wrap-Up	44
2.11	Web Resources	44

3 Dive Into® Web 2.0 50

3.1	Introduction	51
3.2	What Is Web 2.0?	52
3.3	Search	55
3.4	Content Networks	60
3.5	User-Generated Content	61
3.6	Blogging	64
3.7	Social Networking	67
3.8	Social Media	71
3.9	Tagging	74
3.10	Social Bookmarking	76
3.11	Software Development	77
3.12	Rich Internet Applications (RIAs)	80
3.13	Web Services, Mashups, Widgets and Gadgets	82
3.14	Location-Based Services	85
3.15	XML, RSS, Atom, JSON and VoIP	87
3.16	Web 2.0 Monetization Models	88
3.17	Web 2.0 Business Models	89
3.18	Future of the Web	93
3.19	Wrap-Up	96
3.20	Where to Go for More Web 2.0 Information	97
3.21	Web 2.0 Bibliography	97
3.22	Web 2.0 Glossary	104

Part 2: The Ajax Client 117

4 Introduction to XHTML 118

4.1	Introduction	119
4.2	Editing XHTML	120
4.3	First XHTML Example	120
4.4	W3C XHTML Validation Service	123
4.5	Headings	123
4.6	Linking	124
4.7	Images	127
4.8	Special Characters and Horizontal Rules	130
4.9	Lists	132
4.10	Tables	135
4.11	Forms	139
4.12	Internal Linking	146
4.13	meta Elements	149
4.14	Wrap-Up	150
4.15	Web Resources	151

5	Cascading Style Sheets™ (CSS)	159
5.1	Introduction	160
5.2	Inline Styles	161
5.3	Embedded Style Sheets	162
5.4	Conflicting Styles	165
5.5	Linking External Style Sheets	168
5.6	Positioning Elements	170
5.7	Backgrounds	174
5.8	Element Dimensions	176
5.9	Box Model and Text Flow	177
5.10	Media Types	181
5.11	Building a CSS Drop-Down Menu	184
5.12	User Style Sheets	186
5.13	CSS 3	189
5.14	Wrap-Up	190
5.15	Web Resources	190
6	JavaScript: Introduction to Scripting	197
6.1	Introduction	198
6.2	Simple Program: Displaying a Line of Text in a Web Page	199
6.3	Modifying Our First Program	202
6.4	Obtaining User Input with <code>prompt</code> Dialogs	207
6.4.1	Dynamic Welcome Page	207
6.4.2	Adding Integers	211
6.5	Memory Concepts	214
6.6	Arithmetic	215
6.7	Decision Making: Equality and Relational Operators	217
6.8	Wrap-Up	223
6.9	Web Resources	223
7	JavaScript: Control Statements I	234
7.1	Introduction	235
7.2	Algorithms	235
7.3	Pseudocode	236
7.4	Control Structures	236
7.5	<code>if</code> Selection Statement	239
7.6	<code>if...else</code> Selection Statement	240
7.7	<code>while</code> Repetition Statement	245
7.8	Formulating Algorithms: Counter-Controlled Repetition	246
7.9	Formulating Algorithms: Sentinel-Controlled Repetition	250
7.10	Formulating Algorithms: Nested Control Statements	256
7.11	Assignment Operators	260
7.12	Increment and Decrement Operators	261
7.13	Wrap-Up	265
7.14	Web Resources	265

8	JavaScript: Control Statements II	278
8.1	Introduction	279
8.2	Essentials of Counter-Controlled Repetition	279
8.3	for Repetition Statement	281
8.4	Examples Using the for Statement	286
8.5	switch Multiple-Selection Statement	290
8.6	do...while Repetition Statement	295
8.7	break and continue Statements	297
8.8	Labeled break and continue Statements	299
8.9	Logical Operators	302
8.10	Summary of Structured Programming	306
8.11	Wrap-Up	311
8.12	Web Resources	311
9	JavaScript: Functions	321
9.1	Introduction	322
9.2	Program Modules in JavaScript	322
9.3	Programmer-Defined Functions	324
9.4	Function Definitions	324
9.5	Random Number Generation	329
9.6	Example: Game of Chance	334
9.7	Another Example: Random Image Generator	341
9.8	Scope Rules	342
9.9	JavaScript Global Functions	345
9.10	Recursion	346
9.11	Recursion vs. Iteration	349
9.12	Wrap-Up	350
9.13	Web Resources	351
10	JavaScript: Arrays	362
10.1	Introduction	363
10.2	Arrays	363
10.3	Declaring and Allocating Arrays	365
10.4	Examples Using Arrays	365
10.5	Random Image Generator Using Arrays	373
10.6	References and Reference Parameters	374
10.7	Passing Arrays to Functions	375
10.8	Sorting Arrays	378
10.9	Searching Arrays: Linear Search and Binary Search	380
10.10	Multidimensional Arrays	386
10.11	Building an Online Quiz	390
10.12	Wrap-Up	393
10.13	Web Resources	393
11	JavaScript: Objects	403
11.1	Introduction	404

11.2	Introduction to Object Technology	404
11.3	Math Object	407
11.4	String Object	409
11.4.1	Fundamentals of Characters and Strings	409
11.4.2	Methods of the String Object	410
11.4.3	Character-Processing Methods	411
11.4.4	Searching Methods	413
11.4.5	Splitting Strings and Obtaining Substrings	415
11.4.6	XHTML Markup Methods	417
11.5	Date Object	419
11.6	Boolean and Number Objects	425
11.7	document Object	426
11.8	window Object	427
11.9	Using Cookies	432
11.10	Final JavaScript Example	436
11.11	Using JSON to Represent Objects	444
11.12	Wrap-Up	445
11.13	Web Resources	445
12	Document Object Model (DOM): Objects and Collections	458
12.1	Introduction	459
12.2	Modeling a Document: DOM Nodes and Trees	459
12.3	Traversing and Modifying a DOM Tree	462
12.4	DOM Collections	473
12.5	Dynamic Styles	475
12.6	Summary of the DOM Objects and Collections	481
12.7	Wrap-Up	482
12.8	Web Resources	483
13	JavaScript: Events	487
13.1	Introduction	488
13.2	Registering Event Handlers	488
13.3	Event onload	491
13.4	Event onmousemove, the event Object and this	492
13.5	Rollovers with onmouseover and onmouseout	497
13.6	Form Processing with onfocus and onblur	502
13.7	More Form Processing with onsubmit and onreset	505
13.8	Event Bubbling	507
13.9	More Events	509
13.10	Wrap-Up	510
13.11	Web Resources	511
14	XML and RSS	515
14.1	Introduction	516
14.2	XML Basics	516

14.3	Structuring Data	519
14.4	XML Namespaces	526
14.5	Document Type Definitions (DTDs)	529
14.6	W3C XML Schema Documents	533
14.7	XML Vocabularies	540
14.7.1	MathML™	540
14.7.2	Other Markup Languages	544
14.8	Extensible Stylesheet Language and XSL Transformations	544
14.9	Document Object Model (DOM)	553
14.10	RSS	570
14.11	Wrap-Up	578
14.12	Web Resources	578

15 Ajax-Enabled Rich Internet Applications 588

15.1	Introduction	589
15.2	Traditional Web Applications vs. Ajax Applications	590
15.3	Rich Internet Applications (RIAs) with Ajax	592
15.4	History of Ajax	594
15.5	“Raw” Ajax Example Using the XMLHttpRequest Object	594
15.6	Using XML and the DOM	600
15.7	Creating a Full-Scale Ajax-Enabled Application	604
15.8	Dojo Toolkit	617
15.9	Wrap-Up	626
15.10	Web Resources	627

Part 3: Rich Internet Application Client Technologies 635

16 Adobe® Flash® CS3 636

16.1	Introduction	637
16.2	Flash Movie Development	638
16.3	Learning Flash with Hands-On Examples	640
16.3.1	Creating a Shape with the Oval Tool	642
16.3.2	Adding Text to a Button	644
16.3.3	Converting a Shape into a Symbol	645
16.3.4	Editing Button Symbols	647
16.3.5	Adding Keyframes	648
16.3.6	Adding Sound to a Button	649
16.3.7	Verifying Changes with Test Movie	650
16.3.8	Adding Layers to a Movie	651
16.3.9	Animating Text with Tweening	652
16.3.10	Adding a Text Field	654
16.3.11	Adding ActionScript	655
16.4	Publishing Your Flash Movie	656

16.5	Creating Special Effects with Flash	657
16.5.1	Importing and Manipulating Bitmaps	657
16.5.2	Creating an Advertisement Banner with Masking	658
16.5.3	Adding Online Help to Forms	661
16.6	Creating a Website Splash Screen	669
16.7	ActionScript	675
16.8	Wrap-Up	675
16.9	Web Resources	676
17	Adobe® Flash® CS3: Building an Interactive Game	683
17.1	Introduction	684
17.2	Object-Oriented Programming	686
17.3	Objects in Flash	686
17.4	Cannon Game: Preliminary Instructions and Notes	688
17.5	Adding a Start Button	689
17.6	Creating Moving Objects	689
17.7	Adding the Rotating Cannon	694
17.8	Adding the Cannonball	696
17.9	Adding Sound and Text Objects to the Movie	699
17.10	Adding the Time Counter	700
17.11	Detecting a Miss	702
17.12	Adding Collision Detection	703
17.13	Finishing the Game	706
17.14	ActionScript 3.0 Elements Introduced in This Chapter	707
18	Adobe® Flex™ 2 and Rich Internet Applications	711
18.1	Introduction	712
18.2	Flex Platform Overview	713
18.3	Creating a Simple User Interface	714
18.4	Accessing XML Data from Your Application	725
18.5	Interacting with Server-Side Applications	739
18.6	Customizing Your User Interface	748
18.7	Creating Charts and Graphs	752
18.8	Connection-Independent RIAs on the Desktop: Adobe Integrated Runtime (AIR)	760
18.9	Flex 3 Beta	761
18.10	Wrap-Up	761
18.11	Web Resources	761
19	Microsoft® Silverlight™ and Rich Internet Applications	770
19.1	Introduction	771
19.2	Platform Overview	772

19.3	Silverlight 1.0 Installation and Overview	772
19.4	Creating a Movie Viewer for Silverlight 1.0	773
19.4.1	Creating a User Interface In XAML Using Expression Blend	773
19.4.2	Using Storyboards	775
19.4.3	Creating Controls	776
19.4.4	Using JavaScript for Event Handling and DOM Manipulation	785
19.5	Embedding Silverlight in HTML	793
19.6	Silverlight Streaming	794
19.7	Silverlight 1.1 Installation and Overview	798
19.8	Creating a Cover Viewer for Silverlight 1.1 Alpha	798
19.9	Building an Application with Third-Party Controls	807
19.10	Consuming a Web Service	812
19.10.1	Consuming the HugeInteger Web Service	815
19.11	Silverlight Demos, Games and Web Resources	820
19.12	Wrap-Up	823

20 Adobe® Dreamweaver® CS3 830

20.1	Introduction	831
20.2	Adobe Dreamweaver CS3	831
20.3	Text Styles	835
20.4	Images and Links	841
20.5	Symbols and Lines	842
20.6	Tables	843
20.7	Forms	846
20.8	Scripting in Dreamweaver	849
20.9	Spry Framework for Creating Ajax Applications	850
20.10	Site Management	852
20.11	Wrap-Up	852
20.12	Web Resources	852

Part 4: Rich Internet Application Server Technologies 857

21 Web Servers (IIS and Apache) 858

21.1	Introduction	859
21.2	HTTP Transactions	859
21.3	Multitier Application Architecture	863
21.4	Client-Side Scripting versus Server-Side Scripting	864
21.5	Accessing Web Servers	865
21.6	Microsoft Internet Information Services (IIS)	865
21.6.1	Microsoft Internet Information Services (IIS) 5.1 and 6.0	865
21.6.2	Microsoft Internet Information Services (IIS) 7.0	868
21.7	Apache HTTP Server	870
21.8	Requesting Documents	872
21.9	Web Resources	873

22	Database: SQL, MySQL, ADO.NET 2.0 and Java DB	879
22.1	Introduction	880
22.2	Relational Databases	881
22.3	Relational Database Overview: A books Database	882
22.4	SQL	885
22.4.1	Basic SELECT Query	885
22.4.2	WHERE Clause	886
22.4.3	ORDER BY Clause	888
22.4.4	Combining Data from Multiple Tables: INNER JOIN	890
22.4.5	INSERT Statement	891
22.4.6	UPDATE Statement	892
22.4.7	DELETE Statement	893
22.5	MySQL	894
22.6	Instructions for Installing MySQL	894
22.7	Instructions for Setting Up a MySQL User Account	895
22.8	Creating a Database in MySQL	896
22.9	ADO.NET Object Model	896
22.10	Java DB/Apache Derby	898
22.11	Wrap-Up	898
22.12	Web Resources	898
23	PHP	905
23.1	Introduction	906
23.2	PHP Basics	907
23.3	String Processing and Regular Expressions	917
23.3.1	Comparing Strings	917
23.3.2	Regular Expressions	918
23.4	Form Processing and Business Logic	922
23.5	Connecting to a Database	929
23.6	Using Cookies	933
23.7	Dynamic Content	939
23.8	Operator Precedence Chart	948
23.9	Wrap-Up	950
23.10	Web Resources	950
24	Ruby on Rails	956
24.1	Introduction	957
24.2	Ruby	957
24.3	Rails Framework	964
24.4	ActionController and ActionView	966
24.5	A Database-Driven Web Application	969
24.6	Case Study: Message Forum	974
24.6.1	Logging In and Logging Out	974
24.6.2	Embellishing the Models	978

24.6.3	Generating Scaffold Code	980
24.6.4	Forum Controller and Forum Views	981
24.6.5	Message Controller and Message Views	986
24.6.6	Ajax-Enabled Rails Applications	990
24.7	Script.aculo.us	995
24.8	Wrap-Up	1003
24.9	Web Resources	1003

25 ASP.NET 2.0 and ASP.NET Ajax 1009

25.1	Introduction	1010
25.2	Creating and Running a Simple Web Form Example	1011
25.2.1	Examining an ASPX File	1012
25.2.2	Examining a Code-Behind File	1014
25.2.3	Relationship Between an ASPX File and a Code-Behind File	1015
25.2.4	How the Code in an ASP.NET Web Page Executes	1015
25.2.5	Examining the XHTML Generated by an ASP.NET Application	1016
25.2.6	Building an ASP.NET Web Application	1017
25.3	Web Controls	1025
25.3.1	Text and Graphics Controls	1025
25.3.2	AdRotator Control	1030
25.3.3	Validation Controls	1035
25.4	Session Tracking	1046
25.4.1	Cookies	1047
25.4.2	Session Tracking with HttpSessionState	1055
25.5	Case Study: Connecting to a Database in ASP.NET	1062
25.5.1	Building a Web Form That Displays Data from a Database	1063
25.5.2	Modifying the Code-Behind File for the Guestbook Application	1072
25.6	Case Study: Secure Books Database Application	1074
25.6.1	Examining the Completed Secure Books Database Application	1074
25.6.2	Creating the Secure Books Database Application	1078
25.7	ASP.NET Ajax	1102
25.8	Wrap-Up	1106
25.9	Web Resources	1107

26 JavaServer™ Faces Web Applications 1118

26.1	Introduction	1119
26.2	Java Web Technologies	1120
26.2.1	Servlets	1120
26.2.2	JavaServer Pages	1121
26.2.3	JavaServer Faces	1122
26.2.4	Web Technologies in Netbeans	1122
26.3	Creating and Running a Simple Application in Netbeans	1123
26.3.1	Examining a JSP File	1124
26.3.2	Examining a Page Bean File	1126
26.3.3	Event-Processing Life Cycle	1130
26.3.4	Relationship Between the JSP and Page Bean Files	1131

26.3.5	Examining the XHTML Generated by a Java Web Application	1131
26.3.6	Building a Web Application in Netbeans	1133
26.4	JSF Components	1140
26.4.1	Text and Graphics Components	1140
26.4.2	Validation Using Validator Components and Custom Validators	1145
26.5	Session Tracking	1153
26.5.1	Cookies	1154
26.5.2	Session Tracking with the <code>SessionBean</code> Object	1166
26.6	Wrap-Up	1176
26.7	Web Resources	1177

27 Ajax-Enabled JavaServer™ Faces Web Applications **I 187**

27.1	Introduction	1188
27.2	Accessing Databases in Web Applications	1189
27.2.1	Building a Web Application That Displays Data from a Database	1189
27.2.2	Modifying the Page Bean File for the <code>AddressBook</code> Application	1198
27.3	Ajax-Enabled JSF Components	1201
27.4	AutoComplete Text Field and Virtual Forms	1202
27.4.1	Configuring Virtual Forms	1203
27.4.2	JSP File with Virtual Forms and an AutoComplete Text Field	1204
27.4.3	Providing Suggestions for an AutoComplete Text Field	1208
27.5	Google Maps Map Viewer Component	1210
27.5.1	Obtaining a Google Maps API Key	1211
27.5.2	Adding a Map Viewer Component to a Page	1211
27.5.3	JSP File with a Map Viewer Component	1212
27.5.4	Page Bean That Displays a Map in the Map Viewer Component	1216
27.6	Wrap-Up	1219
27.7	Web Resources	1220

28 Web Services **I 225**

28.1	Introduction	1226
28.2	Java Web Services Basics	1228
28.3	Creating, Publishing, Testing and Describing a Web Service	1228
28.3.1	Creating a Web Application Project and Adding a Web Service Class in Netbeans	1229
28.3.2	Defining the <code>HugeInteger</code> Web Service in Netbeans	1229
28.3.3	Publishing the <code>HugeInteger</code> Web Service from Netbeans	1234
28.3.4	Testing the <code>HugeInteger</code> Web Service with Sun Java System Application Server's <code>Tester</code> Web page	1234
28.3.5	Describing a Web Service with the Web Service Description Language (WSDL)	1238
28.4	Consuming a Web Service	1239
28.4.1	Creating a Client in Netbeans to Consume the <code>HugeInteger</code> Web Service	1239
28.4.2	Consuming the <code>HugeInteger</code> Web Service	1242

28.5	SOAP	1248
28.6	Session Tracking in Web Services	1249
28.6.1	Creating a Blackjack Web Service	1250
28.6.2	Consuming the Blackjack Web Service	1254
28.7	Consuming a Database-Driven Web Service from a Web Application	1265
28.7.1	Configuring Java DB in Netbeans and Creating the Reservation Database	1265
28.7.2	Creating a Web Application to Interact with the Reservation Web Service	1268
28.8	Passing an Object of a User-Defined Type to a Web Service	1273
28.9	REST-Based Web Services in ASP.NET	1283
28.9.1	REST-Based Web Service Functionality	1284
28.9.2	Creating an ASP.NET REST-Based Web Service	1288
28.9.3	Adding Data Components to a Web Service	1291
28.10	Wrap-Up	1294
28.11	Web Resources	1295

Part 5: Appendices **I303**

A XHTML Special Characters **I304**

B XHTML Colors **I305**

C JavaScript Operator Precedence Chart **I308**

D ASCII Character Set **I310**

E Number Systems **I311**

E.1	Introduction	1312
E.2	Abbreviating Binary Numbers as Octal and Hexadecimal Numbers	1315
E.3	Converting Octal and Hexadecimal Numbers to Binary Numbers	1316
E.4	Converting from Binary, Octal or Hexadecimal to Decimal	1317
E.5	Converting from Decimal to Binary, Octal or Hexadecimal	1318
E.6	Negative Binary Numbers: Two's Complement Notation	1319

F Unicode® **I325**

F.1	Introduction	1326
F.2	Unicode Transformation Formats	1327
F.3	Characters and Glyphs	1328
F.4	Advantages/Disadvantages of Unicode	1328
F.5	Unicode Consortium's Website	1329
F.6	Using Unicode	1330
F.7	Character Ranges	1334

Index **I338**

Preface

*Science and technology and the various forms of art,
all unite humanity in a single and interconnected system.*

—Zhores Aleksandrovich Medvede

Welcome to Internet and web programming and *Internet & World Wide Web How to Program, Fourth Edition*! At Deitel & Associates, we write programming language textbooks and professional books for Prentice Hall, deliver corporate training worldwide and develop Web 2.0 Internet businesses. The book has been substantially reworked to reflect today's Web 2.0 Rich Internet Application-development methodologies. We have significantly tuned each of the chapters and added new chapters on some of the latest technologies.

New and Updated Features

Here's a list of updates we've made to the fourth edition of *Internet & World Wide Web How to Program*:

- Substantially reworked to reflect today's Web 2.0 Rich Internet Application-development methodologies.
- Coverage of the two leading web browsers—Internet Explorer 7 and Firefox 2. All client-side applications in the book run correctly on both browsers.
- New focus on Web 2.0 technologies and concepts.
- New chapter on Web 2.0 and Internet Business (reviewed by leaders in the Web 2.0 community).
- New focus on building Rich Internet Applications with the interactivity of desktop applications.
- New chapter on building Ajax-enabled web applications, with applications that demonstrate partial-page updates and type-ahead capabilities.
- New chapter on Adobe Flex—a Rich Internet Application framework for creating scalable, cross-platform, multimedia-rich applications for delivery within the enterprise or across the Internet.
- New chapter on Microsoft Silverlight (a competitor to Adobe Flash and Flex)—a cross-browser and cross-platform plug-in for delivering .NET-based Rich Internet Applications that include audio, video and animations over the web.
- New chapter on rapid applications development of database-driven web applications with Ruby on Rails; also, discusses developing Ajax applications with the included Prototype and Script.aculo.us libraries.
- Updated chapter on Adobe Dreamweaver CS3 (Creative Suite 3), including new sections on CSS integration and the Ajax-enabled Spry framework.

- Updated chapters on Adobe Flash CS3, including a chapter on building a computer game.
- Significantly enhanced treatments of XHTML DOM manipulation and JavaScript events.
- Significantly enhanced treatment of XML DOM manipulation with JavaScript.
- New chapter on building SOAP-based web services with Java and REST-based web services with ASP.NET (using Visual Basic).
- Upgraded and enhanced the PHP chapter to PHP 5.
- Updated ASP.NET 1.1 coverage to ASP.NET 2.0, featuring ASP.NET Ajax.
- New JavaServer Faces (JSF) coverage emphasizing building Ajax-enabled JSF applications (replaces Servlets and JavaServer Pages).
- Client-side case studies that enable students to interact with preimplemented server-side applications and web services that we host at `test.deitel.com`.
- Several new and updated case studies including Deitel Cover Viewer (JavaScript/DOM), Address Book (Ajax), Cannon Game (Flash), Weather/Yahoo! Maps Mashup (Flex), Movie Player (Silverlight), Mailing List (PHP/MySQL), Message Forum and Flickr Photo Viewer (Ruby on Rails), Guest Book and Secure Books Database (ASP.NET), Address Book with Google Maps (JavaServer Faces) and Blackjack (JAX-WS web services).
- The Perl 5 and Python chapters from the previous edition of this book are posted in PDF form at `www.deitel.com/books/iw3http4/`.

All of this has been carefully reviewed by distinguished academics and industry developers.

We believe that this book and its support materials will provide students and professionals with an informative, interesting, challenging and entertaining Internet and web programming educational experience. The book includes a suite of ancillary materials that help instructors maximize their students' learning experience.

If you have questions as you read this book, send an e-mail to `deitel@deitel.com`—we'll respond promptly. For updates on the book and the status of all supporting software, and for the latest news on Deitel publications and services, visit `www.deitel.com`. Sign up at `www.deitel.com/newsletter/subscribe.html` for the free *Deitel® Buzz Online* e-mail newsletter and check out `www.deitel.com/ResourceCenters.html` for our growing list of Internet and web programming, Internet business, Web 2.0 and related Resource Centers. Each week we announce our latest Resource Centers in the newsletter. Please let us know of other Resource Centers you'd like to see.

Dependency Chart

Figure 1 illustrates the dependencies that exist between chapters in the book. An arrow pointing into a chapter indicates that the chapter depends on the content of the chapter from which the arrow points. For example, Chapter 28, Web Services, depends on both Chapters 25 and 27. We recommend that you study all of a given chapter's dependencies before studying that chapter, though other orders are certainly possible. Some of the dependencies apply only to sections of chapters, so we advise readers to browse the material before designing a course of study. We've also commented on some additional dependen-

- [Bunter The Sportsman \(Billy Bunter, Book 37\) book](#)
- [read The Moon and Sixpence for free](#)
- [The Girl Who Kicked the Hornet's Nest \(Millennium Trilogy, Book 3\) book](#)
- [download Why Iceland?: How One of the World's Smallest Countries Became the Meltdown's Biggest Casualty](#)
- [Pomodoro!: A History of the Tomato in Italy \(Arts and Traditions of the Table: Perspectives on Culinary History\) online](#)

- <http://bestarthritiscare.com/library/The-Fellowship-of-the-Ring--The-Lord-of-the-Rings--Book-1-.pdf>
- <http://test.markblaustein.com/library/The-Moon-and-Sixpence.pdf>
- <http://academialanguagebar.com/?ebooks/The-Girl-Who-Kicked-the-Hornet-s-Nest--Millennium-Trilogy--Book-3-.pdf>
- <http://wind-in-herleshausen.de/?freebooks/Unspeakable-Practices--Unnatural-Acts.pdf>
- <http://cavaldecartro.highlandagency.es/library/Christmas-Carol-Murder--Lucy-Stone--Book-21-.pdf>