

深入浅出C# (影印版)

涵蓋  
C# 3.0 和  
Visual Studio 2008

# Head First C#



Boss your  
data around  
with LINQ

**A Learner's Guide to  
Real-World Programming  
with C# and .NET**

Discover the  
secrets of  
abstraction and  
inheritance



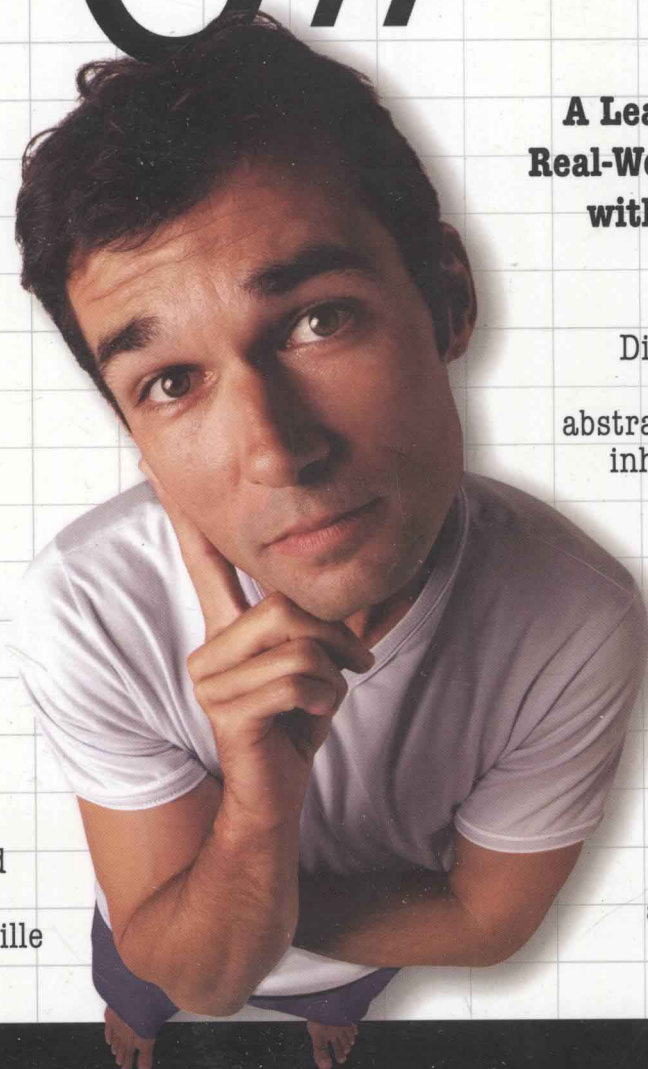
Build a fully  
functional  
retro classic  
arcade game



Learn how  
extension  
methods helped  
Sue bend the  
rules in Objectville



See how Jim used  
generic collections to  
wrangle his data

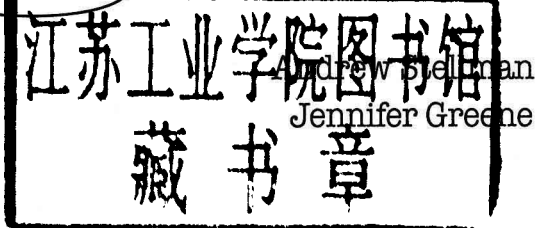


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Andrew Stellman  
& Jennifer Greene 著

深入浅出C#(影印版)  
Head First C#

Wouldn't it be dreamy if  
there was a C# book that was  
more fun than endlessly debugging  
code? It's probably nothing  
but a fantasy...



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## 深入浅出 C# (影印版)

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## **Praise for other *Head First* books**

“I received the book yesterday and started to read it...and I couldn’t stop. This is definitely très ‘cool.’ It is fun, but they cover a lot of ground and they are right to the point. I’m really impressed.”

— **Erich Gamma, IBM Distinguished Engineer, and co-author of *Design Patterns***

“One of the funniest and smartest books on software design I’ve ever read.”

— **Aaron LaBerge, VP Technology, ESPN.com**

“What used to be a long trial and error learning process has now been reduced neatly into an engaging paperback.”

— **Mike Davidson, CEO, Newsvine, Inc.**

“Elegant design is at the core of every chapter here, each concept conveyed with equal doses of pragmatism and wit.”

— **Ken Goldstein, Executive Vice President, Disney Online**

“I ♥ Head First HTML with CSS & XHTML—it teaches you everything you need to learn in a ‘fun coated’ format.”

— **Sally Applin, UI Designer and Artist**

“Usually when reading through a book or article on design patterns, I’d have to occasionally stick myself in the eye with something just to make sure I was paying attention. Not with this book. Odd as it may sound, this book makes learning about design patterns fun.

“While other books on design patterns are saying ‘Buehler... Buehler... Buehler...’ this book is on the float belting out ‘Shake it up, baby!’”

— **Eric Wuehler**

“I literally love this book. In fact, I kissed this book in front of my wife.”

— **Satish Kumar**

## Advance Praise for *Head First C#*

“I’ve never read a computer book cover to cover, but this one held my interest from the first page to the last. If you want to learn C# in depth and have fun doing it, this is THE book for you.”

—**Andy Parker, fledgling C# programmer**

“Head First C# is a great book for hobbyist programmers. It provides examples and guidance on a majority of the things [those] programmers are likely to encounter writing applications in C#.”

—**Peter Ritchie, Microsoft MVP (2006-2007), Visual Developer, C#**

“With Head First C#, Andrew and Jenny have presented an excellent tutorial on learning C#. It is very approachable while covering a great amount of detail in a unique style. If you’ve been turned off by more conventional books on C#, you’ll love this one.”

—**Jay Hilyard, Software Developer, co-author of *C# 3.0 Cookbook***

“Head First C# is perfect blend of unique and interesting ways covering most of the concepts of programming. Fun exercises, bullet points, and even comic strips are some of the catchy and awesome works that this book has. The game-based labs are something that you really don’t want to miss. [This book is] a great work.. the novice as [well as the] well-experienced will love this book. GREAT JOB!”

—**Aayam Singh, .NET professional**

“Head First C# is a highly enjoyable tutorial, full of memorable examples and entertaining exercises. Its lively style is sure to captivate readers—from the humorously annotated examples, to the Fireside Chats, where the abstract class and interface butt heads in a heated argument! For anyone new to programming, there’s no better way to dive in.”

—**Joseph Albahari, C# Design Architect at Egton Medical Information Systems, the UK’s largest primary healthcare software supplier, co-author of *C# 3.0 in a Nutshell***

“[Head First C#] was an easy book to read and understand. I will recommend this book to any developer wanting to jump into the C# waters. I will recommend it to the advanced developer that wants to understand better what is happening with their code. [I will recommend it to developers who] want to find a better way to explain how C# works to their less-seasoned developer friends.”

—**Giuseppe Turitto, C# and ASP.NET developer for Cornwall Consulting Group**

“Andrew and Jenny have crafted another stimulating Head First learning experience. Grab a pencil, a computer, and enjoy the ride as you engage your left brain, right brain, and funny bone.”

—**Bill Mietelski, Software Engineer**

“Going through this Head First C# book was a great experience. I have not come across a book series which actually teaches you so well... This is a book I would definitely recommend to people wanting to learn C#”

—**Krishna Pala, MCP**

## **Praise for other *Head First* books**

“Kathy and Bert’s *Head First Java* transforms the printed page into the closest thing to a GUI you’ve ever seen. In a wry, hip manner, the authors make learning Java an engaging ‘what’re they gonna do next?’ experience.”

—**Warren Keuffel, Software Development Magazine**

“Beyond the engaging style that drags you forward from know-nothing into exalted Java warrior status, *Head First Java* covers a huge amount of practical matters that other texts leave as the dreaded “exercise for the reader...” It’s clever, wry, hip and practical—there aren’t a lot of textbooks that can make that claim and live up to it while also teaching you about object serialization and network launch protocols. ”

—**Dr. Dan Russell, Director of User Sciences and Experience Research  
IBM Almaden Research Center (and teaches Artificial Intelligence at Stanford University)**

“It’s fast, irreverent, fun, and engaging. Be careful—you might actually learn something!”

—**Ken Arnold, former Senior Engineer at Sun Microsystems  
Co-author (with James Gosling, creator of Java), *The Java Programming Language***

“I feel like a thousand pounds of books have just been lifted off of my head.”

—**Ward Cunningham, inventor of the Wiki and founder of the Hillside Group**

“Just the right tone for the geeked-out, casual-cool guru coder in all of us. The right reference for practical development strategies—gets my brain going without having to slog through a bunch of tired stale professor-speak.”

—**Travis Kalanick, Founder of Scour and Red Swoosh  
Member of the MIT TR100**

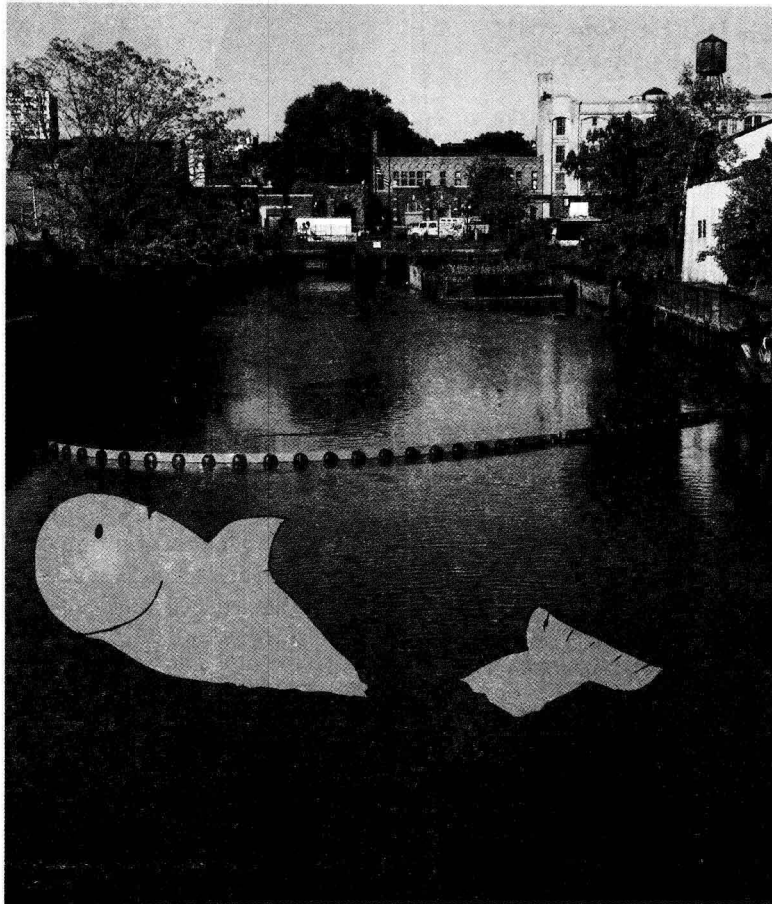
“There are books you buy, books you keep, books you keep on your desk, and thanks to O’Reilly and the *Head First* crew, there is the penultimate category, *Head First* books. They’re the ones that are dog-eared, mangled, and carried everywhere. *Head First SQL* is at the top of my stack. Heck, even the PDF I have for review is tattered and torn.”

— **Bill Sawyer, ATG Curriculum Manager, Oracle**

“This book’s admirable clarity, humor and substantial doses of clever make it the sort of book that helps even non-programmers think well about problem-solving.”

— **Cory Doctorow, co-editor of *Boing Boing*  
Author, *Down and Out in the Magic Kingdom*  
and *Someone Comes to Town, Someone Leaves Town***

*This book is dedicated to the loving memory of Sludgie the Whale,  
who swam to Brooklyn on April 17, 2007.*



*You were only in our canal for a day,  
but you'll be in our hearts forever.*

Thanks for buying our book! We really love writing about this stuff, and we hope you get a kick out of reading it...

Andrew

This photo (and the photo of the Gowanus Canal) by Nisha Sondhe



... because we know you're going to have a great time learning C#.

Jenny

**Andrew Stellman**, despite being raised a New Yorker, has lived in Pittsburgh *twice*. The first time was when he graduated from Carnegie Mellon's School of Computer Science, and then again when he and Jenny were starting their consulting business and writing their first book for O'Reilly.

When he moved back to his hometown, his first job after college was as a programmer at EMI-Capitol Records—which actually made sense, since he went to LaGuardia High School of Music and Art and the Performing Arts to study cello and jazz bass guitar. He and Jenny first worked together at that same financial software company, where he was managing a team of programmers. He's had the privilege of working with some pretty amazing programmers over the years, and likes to think that he's learned a few things from them.

When he's not writing books, Andrew keeps himself busy writing useless (but fun) software, playing music (but video games even more), studying taiji and aikido, having a girlfriend named Lisa, and owning a pomeranian.

Jenny and Andrew have been building software and writing about software engineering together since they first met in 1998. Their first book, *Applied Software Project Management*, was published by O'Reilly in 2005. They published their first book in the Head First series, *Head First PMP*, in 2007.

They founded Stellman & Greene Consulting in 2003 to build a really neat software project for scientists studying herbicide exposure in Vietnam vets. When they're not building software or writing books, they do a lot of speaking at conferences and meetings of software engineers, architects and project managers.

Check out their blog, *Building Better Software*: <http://www.stellman-greene.com>

**Jennifer Greene** studied philosophy in college but, like everyone else in the field, couldn't find a job doing it. Luckily, she's a great software tester, so she started out doing it at an online service, and that's the first time she really got a good sense of what project management was.

She moved to New York in 1998 to test software at a financial software company. She managed a team of testers at a really cool startup that did artificial intelligence and natural language processing.

Since then, she's traveled all over the world to work with different software teams and build all kinds of cool projects.

She loves traveling, watching Bollywood movies, reading the occasional comic book, waiting for her Xbox to be repaired, drinking carloads of carbonated beverages, and owning a whippet.



# C# Lab 1

## A Day at the Races

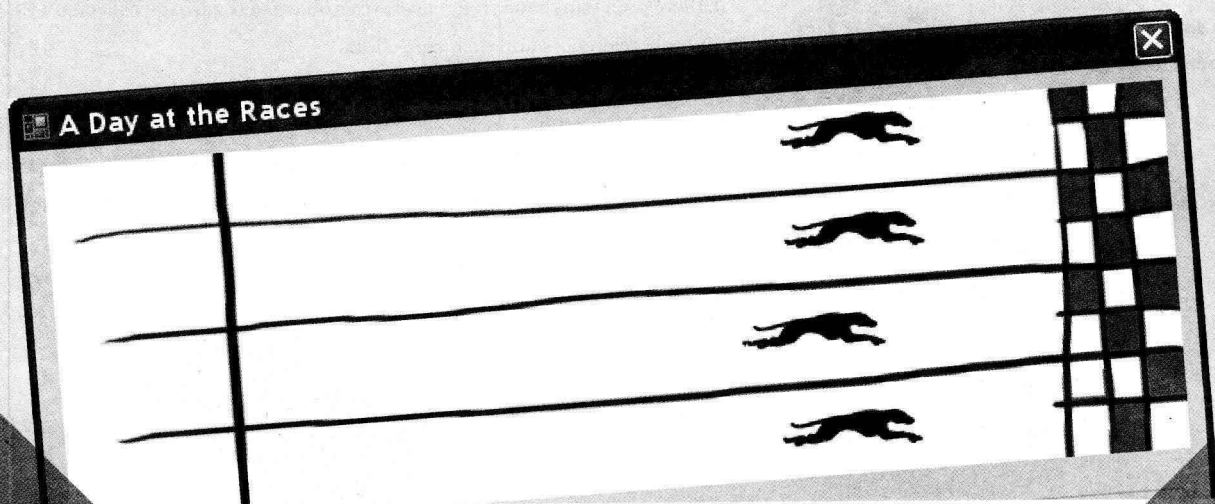
Joe, Bob, and Al love going to the track, but they're tired of losing all their money. They need you to build a simulator for them so they can figure out winners before they lay their money down. And, if you do a good job, they'll cut you in on their profits.

The Spec: Build a Racetrack Simulator

164

The Finished Product

172

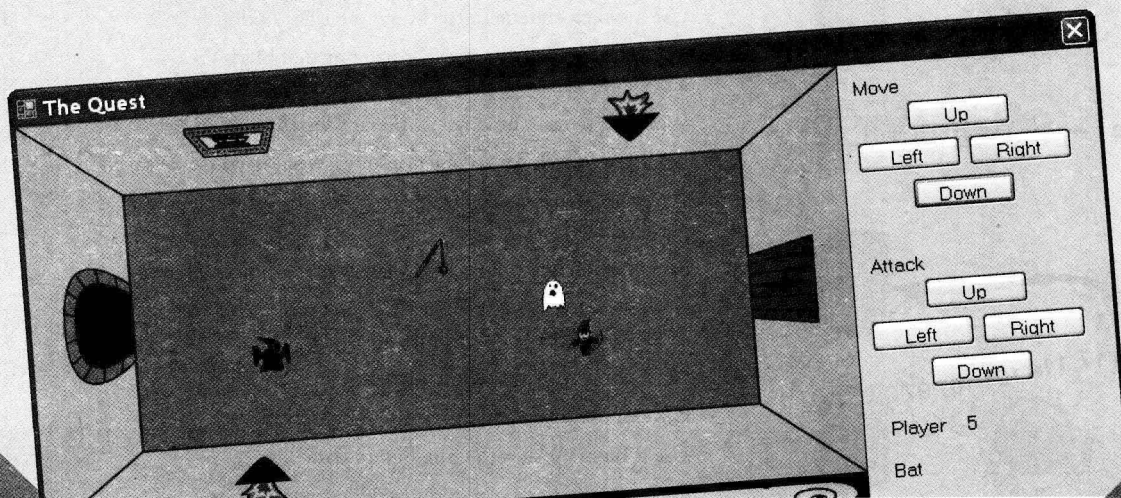


# C# Lab 2

## The Quest

Your job is to build an adventure game where a mighty adventurer is on a quest to defeat level after level of deadly enemies. You'll build a turn-based system, which means the player makes one move and then the enemies make one move. The player can move or attack, and then each enemy gets a chance to move and attack. The game keeps going until the player either defeats all the enemies on all seven levels or dies.

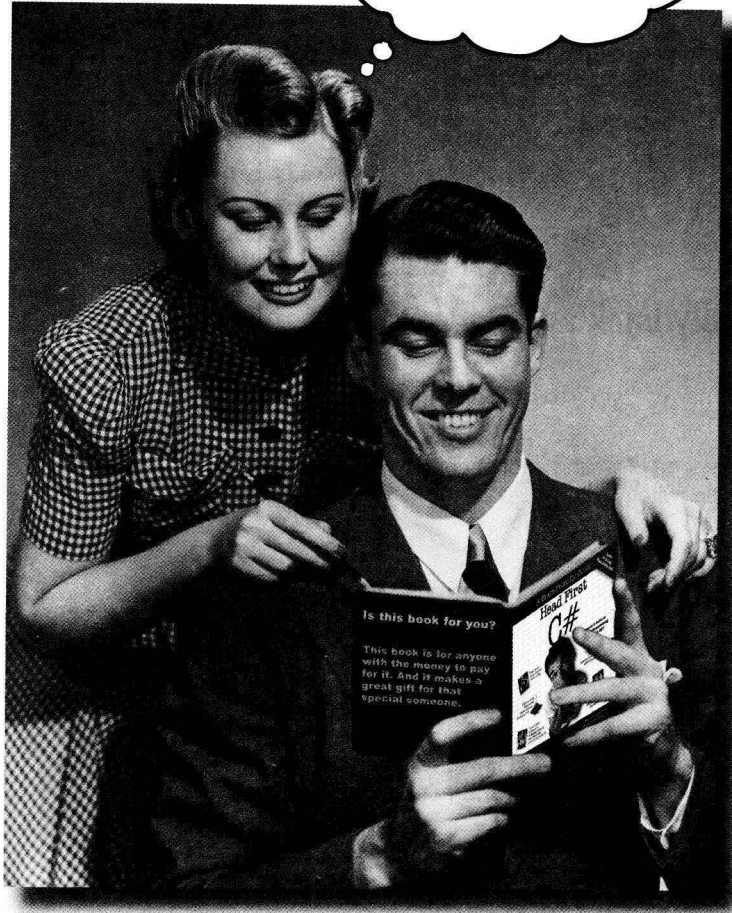
The spec: build an adventure game	364
The fun's just beginning!	484



# how to use this book

## Intro

I can't believe they put *that* in a C# programming book!



In this section, we answer the burning question:  
"So why DID they put that in a C# programming book?"

## Who is this book for?

If you can answer “yes” to all of these:

- ① Do you want to **learn C#**?
- ② Do you like to tinker—do you learn by doing, rather than just reading?
- ③ Do you prefer **stimulating dinner party conversation** to **dry, dull, academic lectures**?

this book is for you.

## Who should probably back away from this book?

If you can answer “yes” to any of these:

- ① Does the idea of writing a lot of code make you bored and a little twitchy?
- ② Are you a kick-butt C++ or Java programmer looking for a reference book?
- ③ Are you **afraid to try something different**? Would you rather have a root canal than mix stripes with plaid? Do you believe that a technical book can't be serious if C# concepts are anthropomorphized?

this book is not for you.



[Note from marketing: this book is for anyone with a credit card.]

## We know what you're thinking.

“How can *this* be a serious C# programming book?”

“What’s with all the graphics?”

“Can I actually *learn* it this way?”

## And we know what your *brain* is thinking.

Your brain craves novelty. It’s always searching, scanning, *waiting* for something unusual. It was built that way, and it helps you stay alive.

So what does your brain do with all the routine, ordinary, normal things you encounter? Everything it *can* to stop them from interfering with the brain’s *real* job—recording things that *matter*. It doesn’t bother saving the boring things; they never make it past the “this is obviously not important” filter.

How does your brain *know* what’s important? Suppose you’re out for a day hike and a tiger jumps in front of you, what happens inside your head and body?

Neurons fire. Emotions crank up. *Chemicals surge.*

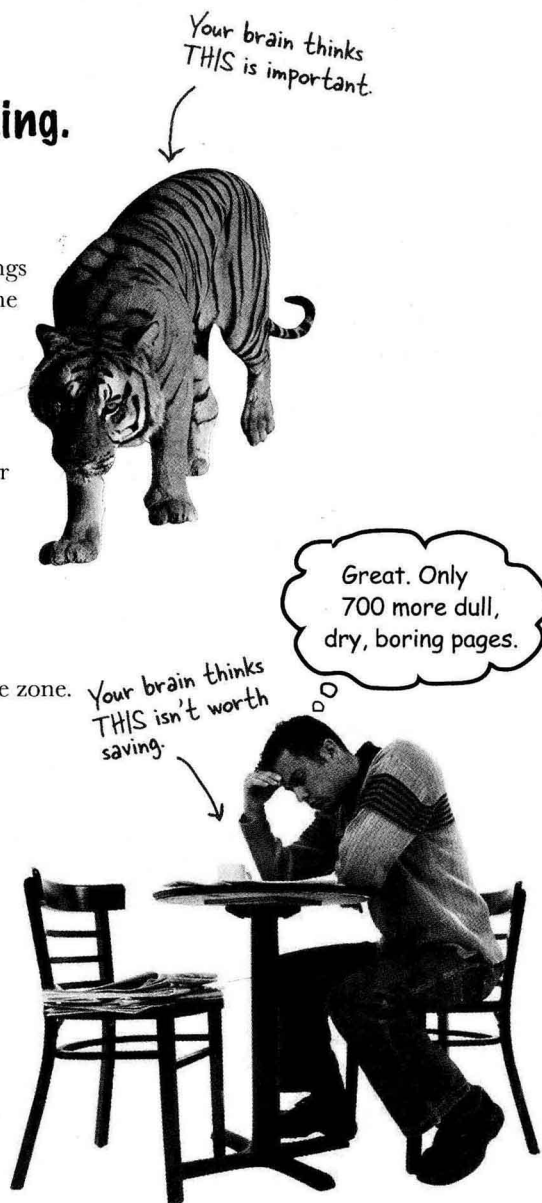
And that’s how your brain knows...

### **This must be important! Don’t forget it!**

But imagine you’re at home, or in a library. It’s a safe, warm, tiger-free zone. You’re studying. Getting ready for an exam. Or trying to learn some tough technical topic your boss thinks will take a week, ten days at the most.

Just one problem. Your brain’s trying to do you a big favor. It’s trying to make sure that this *obviously* non-important content doesn’t clutter up scarce resources. Resources that are better spent storing the really *big* things. Like tigers. Like the danger of fire. Like how you should never have posted those “party” photos on your Facebook page.

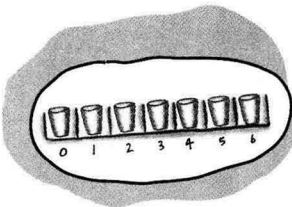
And there’s no simple way to tell your brain, “Hey brain, thank you very much, but no matter how dull this book is, and how little I’m registering on the emotional Richter scale right now, I really *do* want you to keep this stuff around.”



## We think of a “Head First” reader as a learner.

So what does it take to *learn* something? First, you have to *get* it, then make sure you don't *forget* it. It's not about pushing facts into your head. Based on the latest research in cognitive science, neurobiology, and educational psychology, *learning* takes a lot more than text on a page. We know what turns your brain on.

### Some of the Head First learning principles:



**Make it visual.** Images are far more memorable than words alone, and make learning much more effective (up to 89% improvement in recall and transfer studies). It also makes things more understandable. **Put the words within or near the graphics** they relate to, rather than on the bottom or on another page, and learners will be up to *twice* as likely to solve problems related to the content.

**Use a conversational and personalized style.** In recent studies, students performed up to 40% better on post-learning tests if the content spoke directly to the reader, using a first-person, conversational style rather than taking a formal tone. Tell stories instead of lecturing. Use casual language. Don't take yourself too seriously. Which would *you* pay more attention to: a stimulating dinner party companion, or a lecture?

**Get the learner to think more deeply.** In other words, unless you actively flex your neurons, nothing much happens in your head. A reader has to be motivated, engaged, curious, and inspired to solve problems, draw conclusions, and generate new knowledge. And for that, you need challenges, exercises, and thought-provoking questions, and activities that involve both sides of the brain and multiple senses.

**Get—and keep—the reader's attention.** We've all had the “I really want to learn this but I can't stay awake past page one” experience. Your brain pays attention to things that are out of the ordinary, interesting, strange, eye-catching, unexpected. Learning a new, tough, technical topic doesn't have to be boring. Your brain will learn much more quickly if it's not.



**Touch their emotions.** We now know that your ability to remember something is largely dependent on its emotional content. You remember what you care about. You remember when you *feel* something. No, we're not talking heart-wrenching stories about a boy and his dog. We're talking emotions like surprise, curiosity, fun, “what the...?”, and the feeling of “I Rule!” that comes when you solve a puzzle, learn something everybody else thinks is hard, or realize you know something that “I'm more technical than thou” Bob from engineering *doesn't*.



## Metacognition: thinking about thinking

If you really want to learn, and you want to learn more quickly and more deeply, pay attention to how you pay attention. Think about how you think. Learn how you learn.

Most of us did not take courses on metacognition or learning theory when we were growing up. We were *expected* to learn, but rarely *taught* to learn.

But we assume that if you're holding this book, you really want to learn how to build programs in C#. And you probably don't want to spend a lot of time. If you want to use what you read in this book, you need to *remember* what you read. And for that, you've got to *understand* it. To get the most from this book, or *any* book or learning experience, take responsibility for your brain. Your brain on *this* content.

The trick is to get your brain to see the new material you're learning as Really Important. Crucial to your well-being. As important as a tiger. Otherwise, you're in for a constant battle, with your brain doing its best to keep the new content from sticking.

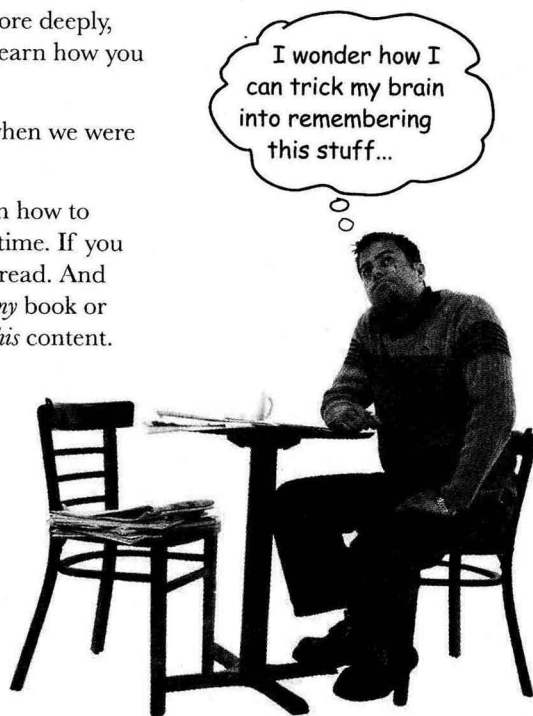
### So just how **DO** you get your brain to treat C# like it was a hungry tiger?

There's the slow, tedious way, or the faster, more effective way. The slow way is about sheer repetition. You obviously know that you *are* able to learn and remember even the dullest of topics if you keep pounding the same thing into your brain. With enough repetition, your brain says, "This doesn't *feel* important to him, but he keeps looking at the same thing *over* and *over* and *over*, so I suppose it must be."

The faster way is to do **anything that increases brain activity**, especially different *types* of brain activity. The things on the previous page are a big part of the solution, and they're all things that have been proven to help your brain work in your favor. For example, studies show that putting words *within* the pictures they describe (as opposed to somewhere else in the page, like a caption or in the body text) causes your brain to try to make sense of how the words and picture relate, and this causes more neurons to fire. More neurons firing = more chances for your brain to *get* that this is something worth paying attention to, and possibly recording.

A conversational style helps because people tend to pay more attention when they perceive that they're in a conversation, since they're expected to follow along and hold up their end. The amazing thing is, your brain doesn't necessarily *care* that the "conversation" is between you and a book! On the other hand, if the writing style is formal and dry, your brain perceives it the same way you experience being lectured to while sitting in a roomful of passive attendees. No need to stay awake.

But pictures and conversational style are just the beginning.



## Here's what WE did:

We used **pictures**, because your brain is tuned for visuals, not text. As far as your brain's concerned, a picture really *is* worth a thousand words. And when text and pictures work together, we embedded the text *in* the pictures because your brain works more effectively when the text is *within* the thing the text refers to, as opposed to in a caption or buried in the text somewhere.

We used **redundancy**, saying the same thing in *different* ways and with different media types, and **multiple senses**, to increase the chance that the content gets coded into more than one area of your brain.

We used concepts and pictures in **unexpected** ways because your brain is tuned for novelty, and we used pictures and ideas with at least *some* **emotional content**, because your brain is tuned to pay attention to the biochemistry of emotions. That which causes you to *feel* something is more likely to be remembered, even if that feeling is nothing more than a little **humor, surprise, or interest**.

We used a personalized, **conversational style**, because your brain is tuned to pay more attention when it believes you're in a conversation than if it thinks you're passively listening to a presentation. Your brain does this even when you're *reading*.

We included more than 80 **activities**, because your brain is tuned to learn and remember more when you *do* things than when you *read* about things. And we made the exercises challenging-yet-do-able, because that's what most people prefer.

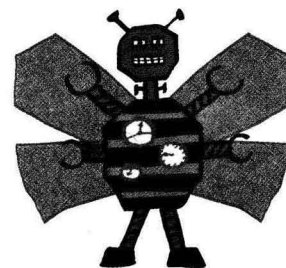
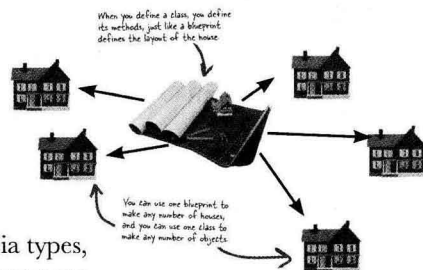
We used **multiple learning styles**, because *you* might prefer step-by-step procedures, while someone else wants to understand the big picture first, and someone else just wants to see an example. But regardless of your own learning preference, *everyone* benefits from seeing the same content represented in multiple ways.

We include content for **both sides of your brain**, because the more of your brain you engage, the more likely you are to learn and remember, and the longer you can stay focused. Since working one side of the brain often means giving the other side a chance to rest, you can be more productive at learning for a longer period of time.

And we included **stories** and exercises that present **more than one point of view**, because your brain is tuned to learn more deeply when it's forced to make evaluations and judgments.

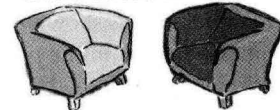
We included **challenges**, with exercises, and by asking **questions** that don't always have a straight answer, because your brain is tuned to learn and remember when it has to *work* at something. Think about it—you can't get your *body* in shape just by *watching* people at the gym. But we did our best to make sure that when you're working hard, it's on the *right* things. That **you're not spending one extra dendrite** processing a hard-to-understand example, or parsing difficult, jargon-laden, or overly terse text.

We used **people**. In stories, examples, pictures, etc., because, well, because *you're* a person. And your brain pays more attention to *people* than it does to *things*.

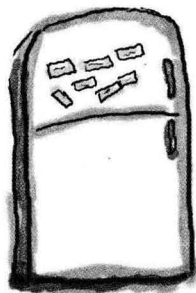


### BULLET POINTS

### Fireside Chats







Cut this out and stick it on your refrigerator.

## Here's what YOU can do to bend your brain into submission

So, we did our part. The rest is up to you. These tips are a starting point; listen to your brain and figure out what works for you and what doesn't. Try new things.

### 1 Slow down. The more you understand, the less you have to memorize.

Don't just *read*. Stop and think. When the book asks you a question, don't just skip to the answer. Imagine that someone really *is* asking the question. The more deeply you force your brain to think, the better chance you have of learning and remembering.

### 2 Do the exercises. Write your own notes.

We put them in, but if we did them for you, that would be like having someone else do your workouts for you. And don't just *look* at the exercises. **Use a pencil.** There's plenty of evidence that physical activity *while* learning can increase the learning.

### 3 Read the "There are No Dumb Questions"

That means all of them. They're not optional sidebars—**they're part of the core content!** Don't skip them.

### 4 Make this the last thing you read before bed. Or at least the last challenging thing.

Part of the learning (especially the transfer to long-term memory) happens *after* you put the book down. Your brain needs time on its own, to do more processing. If you put in something new during that processing time, some of what you just learned will be lost.

### 5 Drink water. Lots of it.

Your brain works best in a nice bath of fluid. Dehydration (which can happen before you ever feel thirsty) decreases cognitive function.

### 6 Talk about it. Out loud.

Speaking activates a different part of the brain. If you're trying to understand something, or increase your chance of remembering it later, say it out loud. Better still, try to explain it out loud to someone else. You'll learn more quickly, and you might uncover ideas you hadn't known were there when you were reading about it.

### 7 Listen to your brain.

Pay attention to whether your brain is getting overloaded. If you find yourself starting to skim the surface or forget what you just read, it's time for a break. Once you go past a certain point, you won't learn faster by trying to shove more in, and you might even hurt the process.

### 8 Feel something.

Your brain needs to know that this *matters*. Get involved with the stories. Make up your own captions for the photos. Groaning over a bad joke is *still* better than feeling nothing at all.

### 9 Write a lot of software!

There's only one way to learn to program: **writing a lot of code**. And that's what you're going to do throughout this book. Coding is a skill, and the only way to get good at it is to practice. We're going to give you a lot of practice: every chapter has exercises that pose a problem for you to solve. Don't just skip over them—a lot of the learning happens when you solve the exercises. We included a solution to each exercise—don't be afraid to **peek at the solution** if you get stuck! (It's easy to get snagged on something small.) But try to solve the problem before you look at the solution. And definitely get it working before you move on to the next part of the book.