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Fifth Edition
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Head First

C#

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

Andrew Stellman
& Jennifer Greene

Animal Match Boss Battle

This is the downloadable
project for Chapter 12.



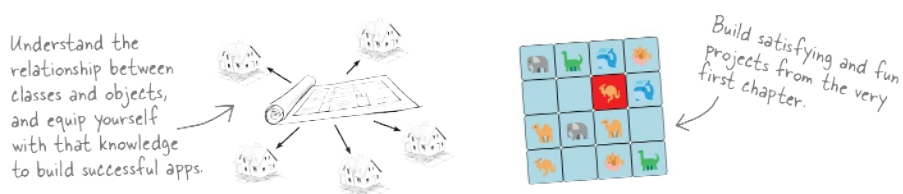
A Brain-Friendly Guide

Head First

C#

What will you learn from this book?

Create apps, games, and more using this engaging, highly visual introduction to C#, .NET, and software development. You'll learn how to use classes and object-oriented programming, create 3D games in Unity, and query data with LINQ. And you'll do it all by solving puzzles, completing hands-on exercises, and building real-world applications. Interested in a development career? You'll learn important development techniques and ideas—just like many others who've learned to code with this book and are now professional developers, team leads, coding streamers, and more. There's no experience required except the desire to learn. And this is the best place to start.



What's so special about this book?

If you've read a Head First book, you know what to expect: a visually rich format designed for the way your brain works. If you haven't, you're in for a treat. With this book, you'll learn C# through a multisensory experience that engages your mind—rather than a text-heavy approach that puts you to sleep.

"Thank you so much! Your books have helped me to launch my career."

—Ryan White
Game Developer

"In a sea of dry technical manuals, *Head First C#* stands out as a beacon of brilliance. Its unique teaching style not only imparts essential knowledge but also sparks curiosity and fuels passion for coding. An indispensable resource for beginners!"

—Gerald Versluis
Senior Software Engineer
at Microsoft

"Andrew and Jennifer have written a concise, authoritative, and, most of all, fun introduction to C# development."

—Jon Galloway
Senior Program Manager on
the .NET Community Team
at Microsoft

C#/.NET

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Praise for Head First C#

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—**Gerald Versluis, Senior Software Engineer at Microsoft**

“*Head First C#* started my career as a software engineer and backend developer. I am now leading a team in a tech company and an open source contributor.”

—**Zakaria Soleymani, Development Team Lead**

“Thank you so much! Your books have helped me to launch my career.”

—**Ryan White, Game Developer**

“If you’re a new C# developer (welcome to the party!), I highly recommend *Head First C#*. Andrew and Jennifer have written a concise, authoritative, and most of all, fun introduction to C# development. I wish I’d had this book when I was first learning C#!”

—**Jon Galloway, Senior Program Manager on the .NET Community Team, Microsoft**

“Not only does *Head First C#* cover all the nuances it took me a long time to understand, it has that Head First magic going on where it is just a super fun read.”

—**Jeff Counts, Senior C# Developer**

“*Head First C#* is a great book with fun examples that keep learning interesting.”

—**Lindsey Bieda, Lead Software Engineer**

“*Head First C#* is a great book, both for brand-new developers and developers like myself coming from a Java background. No assumptions are made as to the reader’s proficiency, yet the material builds up quickly enough for those who are not complete newbies—a hard balance to strike. This book got me up to speed in no time for my first large-scale C# development project at work—I highly recommend it.”

—**Shalewa Odusanya, Principal**

“*Head First C#* is an excellent, simple, and fun way of learning C#. It’s the best piece for C# beginners I’ve ever seen—the samples are clear, the topics are concise and well written. The mini-games that guide you through the different programming challenges will definitely stick the knowledge to your brain. A great learn-by-doing book!”

—**Johnny Halife, Partner**

“*Head First C#* is a comprehensive guide to learning C# that reads like a conversation with a friend. The many coding challenges keep it fun, even when the concepts are tough.”

—**Rebeca Dunn-Krahn, Founding Partner, Sempahore Solutions**

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**

“It’s hard to really learn a programming language without good, engaging examples, and this book is full of them! *Head First C#* will guide beginners of all sorts to a long and productive relationship with C# and the .NET Framework.”

—**Chris Burrows, Software Engineer**

“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, Director and Software Security Architect, and author of
*C# 6.0 Cookbook***

“I’d recommend this book to anyone looking for a great introduction into the world of programming and C#. From the first page onward, the authors walk the reader through some of the more challenging concepts of C# in a simple, easy-to-follow way. At the end of some of the larger projects/labs, the reader can look back at their programs and stand in awe of what they’ve accomplished.”

—**David Sterling, Principal Software Developer**

“*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, inventor of LINQPad, and coauthor of *C# 12 in a Nutshell* and
*C# 12 Pocket Reference***

“[*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, Director of Engineering**

“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, Advanced Systems Analyst**

“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 the Head First Approach

“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 coauthor of *Design Patterns***

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

—**Aaron LaBerge, SVP Technology & Product Development, ESPN**

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

—**Mike Davidson, former VP of Design, Twitter, and founder of Newsvine**

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

—**Ken Goldstein, Executive VP & Managing Director, Disney Online**

“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 ‘Bueller...Bueller...Bueller...’ 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**

Head First C#

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



Andrew Stellman
Jennifer Greene

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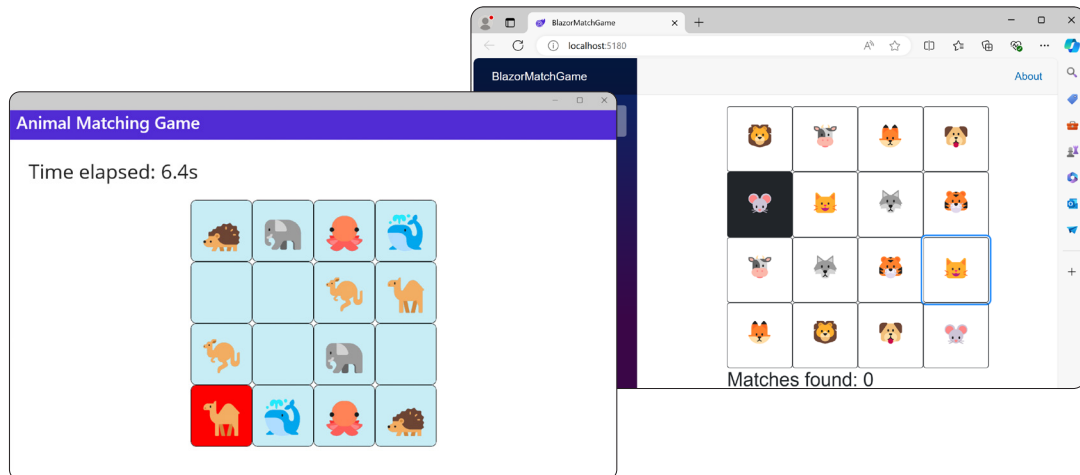
PDF



Downloadable exercise: Animal match boss battle

If you've played a lot of video games (and we're pretty sure that you have!), then you've had to play through a whole lot of boss battles—those fights at the end of a level or section where you face off against an opponent that's bigger and stronger than what you've seen so far. We have one last challenge for you before the end of the book—consider it the *Head First C#* boss battle.

In Chapter 1 you built an animal matching game. It was a great start, but it's missing... something. Can you figure out how to turn your animal matching game into a memory game? Go to our GitHub page and download the PDF for this project—or if you want to play this boss battle in Hard mode, just dive right in and see if you can do it on your own.



The rules of the boss battle

Your job is to turn your animal matching game from Chapter 1 into a memory game. Here's how it will work:

1. When the game starts, all of the animals are hidden. The timer works exactly like it did in Chapter 1.
2. The player clicks pairs of hidden animals. When the first hidden animal is clicked, the game reveals it.
3. When player clicks the second animal, if it's a match then both animals stay displayed. If it's not a match, then both animals are hidden again.
4. The game is over when all pairs have been found and displayed. At the end of the game, all of the animals will be displayed.
5. When the player starts a new game, the animals are shuffled and hidden again.

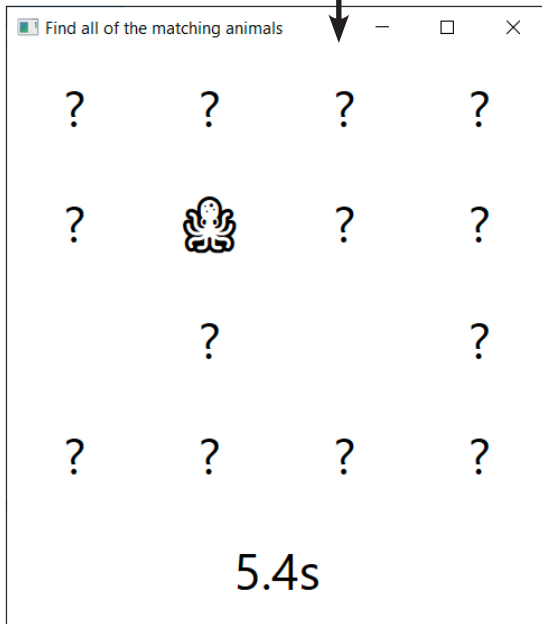
This is a project for you to do on your own!

If you go to the GitHub page for the book, you won't see any code for this project, because we want to give you the freedom to tackle this project in any way that you see fit.

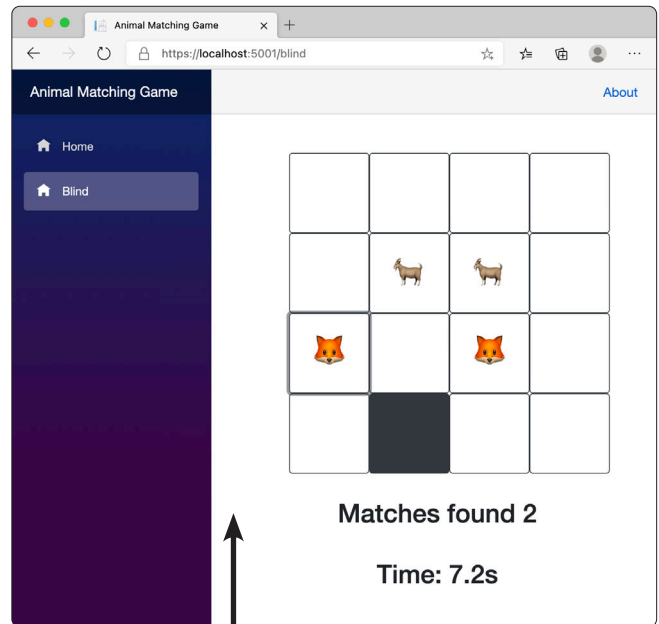
However...

Sometimes it really helps to have some hints. Luckily, we have some very creative readers! Here are two of the great solutions we've seen.

Here's a really innovative version of the game from one of our 4th edition readers. GitHub user [charl4ee](https://github.com/charl4ee/ImageMatch) turned the WPF version of the game into a memory game, and also adding a great effect where unmatched animals are displayed for an extra second before disappearing. You can get the source code here: <https://github.com/charl4ee/ImageMatch>



↑
The 4th edition of the book used a different technology, WPF, that uses XAML to create Windows desktop apps, which is why this screenshot looks a little different.



Here's an Blazor version from another one of our readers. GitHub user Pan (bodow) made some significant improvements to the Blazor version of the game. In the default mode, it keeps track of the high score, encouraging you to beat your best time. And more importantly, they also added a "memory" version where the animals are hidden, and only appear when you click them. You can get the source code here: <https://github.com/bodow/BlazorMatchGame>

If you come up with your own innovative solution, we'd love to see it! Publish the code to GitHub and get in touch with us on our GitHub page, YouTube channel, or social media.

Tips for tackling the challenge

Doing this project on your own is a great way to kickstart the next stage of your learning. While we want you to **solve this on your own**, here are some things to think about that might help you along the way.

Think About State

How will you keep track of which animals are hidden and which are revealed?

What information does your game need to remember between clicks?

When do you need to update the state of your game?

Break It Down

Try tackling **one new feature at a time**.

Start by figuring out how to hide all animals at the beginning...

...then work on revealing animals when clicked...

...and finally, implement the logic for matching pairs.

Hmm... Every time a button gets clicked, I need to think about what should happen next. Does it reveal an animal? Hide animals? Check for a match? There's a lot to think about!

Debug Strategically

Use `Debug.WriteLine` or the debugger to track game state.

Add temporary visual indicators while testing.

Test each new feature thoroughly before moving on.

Some Pitfalls to Avoid

Don't try to change everything at once.

Remember to handle **edge cases** (like clicking the same animal twice).

Make sure your timer still works with the new game mechanics.

Make it Look Good!

Consider using button background colors or opacity to “hide” animals.

Think about how to visually indicate selected animals.

Plan how to show/hide animals smoothly.

Remember: There's no single “right” solution. Focus on making your code clear and easy to maintain. If you get stuck, try breaking the problem down into smaller pieces.



Get creative!

We started the book with the animal matching game because it's a great platform for you to get creative. There are so many "even-better-ifs" that you can try out. Here are a few ideas:

- ★ Can you figure out how to add rows or columns to your game?
- ★ Create a version where the player has to match three animals, not two.
- ★ Make the timer count down, not up. Add extra rounds with shorter timers.
- ★ Instead of matching animals, try matching pairs of related icons (like a fish 🐟 and a fishing rod 🎣).
- ★ Make the game more challenging by hiding some of the pairs the player previously found if too much time has elapsed.


Looking for more inspiration? Check out this blog on the Visual Studio Blog written by one of our authors, Andrew Stellman, that highlights creative work by other *Head First C#* readers from the 4th edition: <https://devblogs.microsoft.com/visualstudio/head-first-csharp-contest-got-some-truly-creative-entries/>

Did you come up with a creative or interesting version of the animal matching game? If you did, then we want to hear from you! Publish your code to GitHub, then reach out to us through GitHub or on social media. We may even include it in this PDF to help provide inspiration and encouragement to other readers.

And finally... thank you for reading our book!

It means so much to us that we've helped you on your C# learning journey. If you feel like this book helped you, we hope you consider leaving a five-star review for our book on Amazon:

<https://www.amazon.com/Head-First-CSharp/dp/1098141784/>



Even a short, one-sentence review with five stars makes a big difference in helping us reach more readers, so we'd really appreciate it! (Oddly enough, four-star reviews can hurt our rankings a bit.) We love our readers, and we're grateful for your time!

— Jenny and Andrew