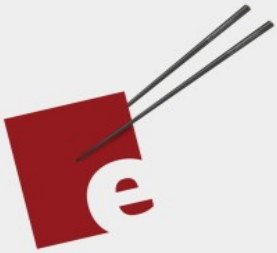

A Functional Programming Kickstart

DANIEL H STEINBERG

Introducing Functional Programming Fundamentals in Swift

Editors Cut

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Legal

Chapter 1: Magic

The Trick

CHAPTER 1

Magic

Sections:

There is something magical about Functional Programming.

Only a secret cabal of wizards understand it and they use words like Monads and Applicative Functors to scare you away.

That's non-sense.

You already know a lot about Functional Programming but you haven't organized your thoughts yet in a way that it is useful to you on a day to day basis.

We'll start with some fundamentals that are probably familiar to you as an experienced Swift developer but we'll emphasize them and look at them in some new ways.

As I will say several times during this book, I'm not asking you to throw out any of the programming practices that currently serve you well.

In this book I just offer you insight into some techniques you may not yet use and show you how you might integrate them into the work you do.

I was recently leading a workshop and one of my students said, "I just think that objects are a more natural way of looking at the world."

I smiled.

The student looked at me quizzically and asked, "what?"

I explained that I'm very old. I'm old enough to remember when we first started to teach Object-Oriented programming and students told us that it wasn't a very natural way to look at the world. They argued that it was contrived.

All of this is contrived.

You need to pick the metaphors that best work for you.

At the end of the book you will have new tools that you can mix and match with your existing tools.

Please don't fight against the new tools before you've tried them out in real world projects.

At the same time, please don't get so excited about a new set of toys that you discard the perfectly-good existing ones.

Functional programming isn't new.

As old as I am, Functional Programming is older. Its roots in mathematics go back one hundred years. Its roots in programming in languages such as LISP go back more than sixty years.

In many ways it is magical.

It will change you.

Let's begin with a magic trick.

The Trick

In order to play along, look in the code download. You'll see one folder for each chapter. This chapter's folder is *01*. Inside *01* you'll find two playgrounds. The starting point for this chapter is the one named *Magic.playground*. The completed version of the *Magic.playground* is in the same directory. It's named *MagicFinal.playground*.

Open *Magic.playground* now in Xcode. You can toggle the navigation using Command - 0. The first playground page is *01TheTrick*.

Start there.

A couple more playground notes.

You should see hyperlinks to `Previous` and `Next` on the top and bottom of the playground page. If instead you see something like this:

01/TheCardTrick.playground/01TheTrick

```
//: [Previous](@previous)


//: [Next](@next)
```

go to the Editor menu and towards the bottom you'll find Show Rendered Markup. Choose that and you should now have the hyperlinked text.

Also, there is some code tucked away in the playground page's *Source* directory and in the *Source* directory for the entire playground. Don't look at either yet.

We'll perform a magic trick together.

The Deck

I have a deck of cards which I have shuffled thoroughly.

Add the following line to the playground page to see the `Deck`.

*01/TheCardTrick.playground/**01TheTrick***

```
let theDeck = MagicDeck()
```

Run the playground.

On the right side of the screen you will see this representation of `theDeck`.

```
[A ♠, 2 ♠, 3 ♠, 4 ♠, 5 ♠, 6 ♠, (...)]
```

I've abbreviated the output with `(...)`. You'll see all of the cards listed, `A` through `K` for each of the four suits: ♠, ♦, ♣, and ♥.

I'll sometimes represent this playground feedback as part of the code listing at the right side of the page like this.

01/TheCardTrick.playground/01TheTrick

```
let theDeck = MagicDeck()
```

```
[A ♠, 2 ♠, 3 ♠, 4 ♠, 5 ♠, 6 ♠, (...)]
```

Let's perform a trick with `theDeck`.

Pick a card - any card

I spread the cards in my deck face down and invite you to pick any card you want.

You are free to choose any one of the fifty-two cards in front of you. You can pick the top card (which is curiously number `0`), the second card (number `1`) and so on. Any card you wish.

Once you've chosen any card from 0 to 51, we'll remove that card from the deck. That's `yourCard`.

You look at your card while I organize the other cards face down into a nice neat pile.

Don't show me your card. I'd like you to memorize it.

01/TheCardTrick.playground/01TheTrick

```
let theDeck = MagicDeck()

let yourCard = theDeck.selectCard(at: 22)
```

```
                                                                10 ♦
```

In this case `yourCard` is the `10 ♦`.

Oops. I guess I've seen your card. No matter, let's continue.

Return the card to the deck

Place `yourCard` face down on the top of `theDeck`.

Notice in this code listing, the existing code is blue and the code you need to add is red. This should make it easier for you to code along with me as we work through the book. I will use the red color to indicate code we are adding or highlighted code I want to discuss with you.

01/TheCardTrick.playground/01TheTrick

```
let theDeck = MagicDeck()
let yourCard = theDeck.selectCard(at: 22)

theDeck
    .top(with: yourCard)
```

Comments will be set off in a light grey.

In the following listing you see existing code, a comment, code to be added, and the playground feedback that shows `yourCard` on top

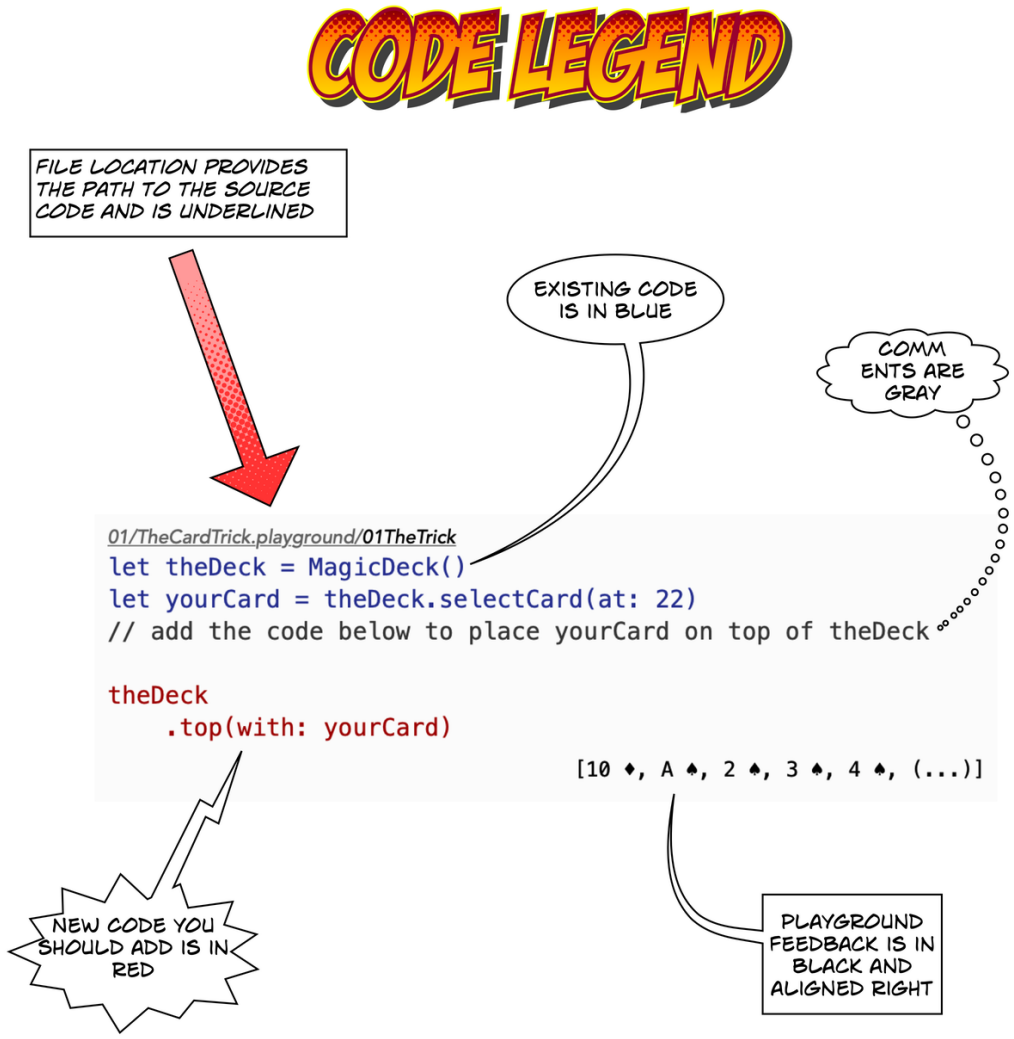
of `theDeck`. Also, at the top of the listing is the location of the code including the path to the file and the particular page or file being modified.

01/TheCardTrick.playground/01TheTrick

```
let theDeck = MagicDeck()
let yourCard = theDeck.selectCard(at: 22)
// add the code below to place yourCard on top of theDeck

theDeck
    .top(with: yourCard)
                                    [10 ♦, A ♠, 2 ♠, 3 ♠, 4 ♠, (...)]
```

Here's is a comic rendering of a summary of the styling I'll use in this book to represent the code in listings.



From "A Functional Programming Kickstart" by Daniel H Steinberg available at editorscut.com

Let's continue with our trick.

The Misdirection

Without looking at `yourCard`, I take the top card off the deck and tear it into little pieces.

You glance over and see from the scraps that the torn up card is the card you selected.

Incidentally, if I don't show you previous code in a listing, you should add the new code below the existing code.

01/TheCardTrick.playground/01TheTrick

```
let topCard = theDeck.topCard
```

```
10 ♦
```

```
let rippedCard = rip(topCard)
```

```
Ripped 10 ♦
```

I put the pieces into a metal bowl, safely pour a fluid over them, and light the fluid on fire.

When the flames burn out we look in the bowl and there's nothing but some burnt, unrecognizable residue.

I cover the bowl with a silk handkerchief and set the bowl and the handkerchief to one side.

01/TheCardTrick.playground/01TheTrick

```
let burnedCard = burn(rippedCard)
```

```
Burned 10 ♦
```

```
let coveredCard = cover(burnedCard)
```

```
Covered Burned 10 ♦
```

It is actually the burned, ripped `10 ♦` but once it's been burned, it hardly matters that it was ripped as well.

The reveal

I tap `theDeck` three times and take the `topCard` off `theDeck` and ask you, "is `this yourCard`?"

To your amazement, it is.

01/TheCardTrick.playground/01TheTrick

```
let this = theDeck.tapThreeTimes.topCard
```

```
10 ♦
```

```
this == yourCard
```

```
true
```

"How did you do that?" you ask.

I could tell you, but you'll be awfully disappointed.

There's not much to the magic you'll see in this chapter. We're reviewing some of what you know about mutating and non-mutating functions in Swift. We're looking at structs and classes, `let`s and `var`s.

Mostly, we're warming up.

Let's begin with mutable objects and the dangers of letting others change our world out from under us.