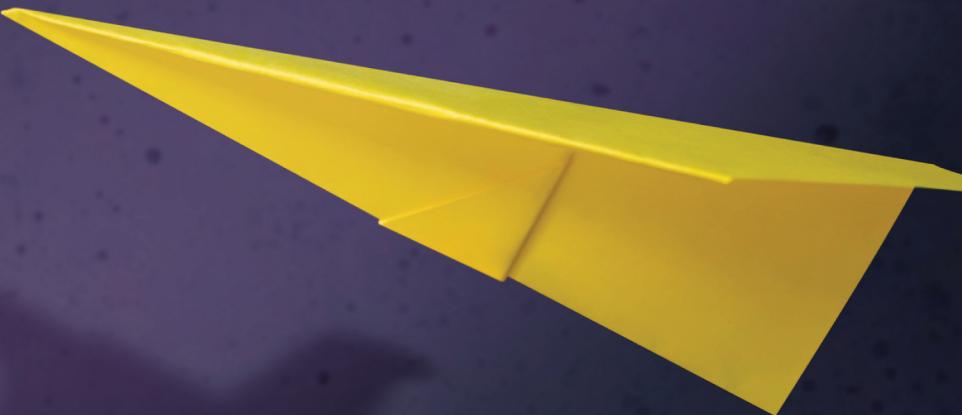


The  
Pragmatic  
Programmers

Pragmatic  
exP<sub>r</sub>ess

# Modern CSS with Tailwind

Flexible Styling Without the Fuss



Noel Rappin  
*edited by Katharine Dvorak*



## **Early praise for *Modern CSS with Tailwind: Flexible Styling Without the Fuss***

This book is a great introduction to the Tailwind utility CSS framework. Having used Tailwind on a project for the first time after reading the book, it helped to prime knowledge I needed to use Tailwind successfully, and also served as a valuable reference guide.

► **Kevin Murphy**  
Software Developer

I think this book is a wonderful resource and will give many readers the insight they need to be proficient with TailwindCSS.

► **John Saltarelli**  
Chief Technology Officer, Unit 5 Ventures, Inc.



We've left this page blank to  
make the page numbers the  
same in the electronic and  
paper books.

We tried just leaving it out,  
but then people wrote us to  
ask about the missing pages.

Anyway, Eddy the Gerbil  
wanted to say "hello."

# Modern CSS with Tailwind

Flexible Styling Without the Fuss

Noel Rappin

The Pragmatic Bookshelf

Raleigh, North Carolina



Many of the designations used by manufacturers and sellers to distinguish their products are claimed as trademarks. Where those designations appear in this book, and The Pragmatic Programmers, LLC was aware of a trademark claim, the designations have been printed in initial capital letters or in all capitals. The Pragmatic Starter Kit, The Pragmatic Programmer, Pragmatic Programming, Pragmatic Bookshelf, PragProg and the linking *g* device are trademarks of The Pragmatic Programmers, LLC.

Every precaution was taken in the preparation of this book. However, the publisher assumes no responsibility for errors or omissions, or for damages that may result from the use of information (including program listings) contained herein.

For our complete catalog of hands-on, practical, and Pragmatic content for software developers, please visit <https://pragprog.com>.

The team that produced this book includes:

CEO: Dave Rankin

COO: Janet Furlow

Managing Editor: Tammy Coron

Development Editor: Katharine Dvorak

Copy Editor: Corina Lebegioara

Layout: Gilson Graphics

Founders: Andy Hunt and Dave Thomas

For sales, volume licensing, and support, please contact [support@pragprog.com](mailto:support@pragprog.com).

For international rights, please contact [rights@pragprog.com](mailto:rights@pragprog.com).

Copyright © 2021 The Pragmatic Programmers, LLC.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form, or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior consent of the publisher.

ISBN-13: 978-1-68050-818-5

Encoded using the finest acid-free high-entropy binary digits.

Book version: P1.0—May 2021

# Contents

<b>Acknowledgments</b>	vii
<b>Introduction</b>	ix
<b>1. Getting Started with Tailwind</b>	1
Installing Tailwind	1
Quick Start	3
<b>2. Tailwind Basics</b>	9
Utilities	10
Preflight	11
Duplication	12
Prefixes	15
CSS Units	16
<b>3. Typography</b>	17
Size and Shape	17
Color and Opacity	19
Alignment and Spacing	21
Lists	22
Typography Plugin	22
Tailwind Forms	23
<b>4. The Box</b>	25
Can You See the Box?	25
What's in the Box?	26
Padding and Margins	27
Borders	28
Background Color	31
Background Images	33
Height and Width	35

<b>5.</b>	<b>Page Layout</b>	<b>37</b>
	Containers	37
	FLOATS AND CLEARS	38
	POSITION AND Z-INDEX	39
	TABLES	39
	GRIDS	39
	FLEXBOX	43
	BOX ALIGNMENT	47
<b>6.</b>	<b>ANIMATION</b>	<b>49</b>
	HELPFUL SMALL ANIMATIONS	49
	TRANSITIONS	50
	TRANSFORMATION	51
	OTHER APPEARANCE THINGS	52
<b>7.</b>	<b>RESPONSIVE DESIGN</b>	<b>53</b>
	TAILWIND SCREEN WIDTHS AND BREAKPOINTS	53
	HIDE BASED ON SIZE	55
	FEWER GRID COLUMNS ON SMALL DEVICES	56
	Flex on Larger Devices	56
<b>8.</b>	<b>CUSTOMIZING TAILWIND</b>	<b>59</b>
	CONFIGURATION FILE BASICS	60
	CHANGE DEFAULT VALUES	60
	CHANGE GENERATED CLASSES	67
	CONFIGURE VARIANT PREFIXES	68
	INTEGRATE WITH EXISTING CSS	70
	ACCESS TAILWIND FROM JAVASCRIPT	70
	PURGE CSS	71
	THE END	72

# Acknowledgments

---

This book was a surprise. I didn't intend to write it, but I got excited about the subject and had an unusual window of time to get this done.

Thanks to Katharine Dvorak, who edited this book and has now edited several of my books. Katie was very supportive of this from my initial suggestion. We've been working together for years now, and her observations have been a tremendous help in structuring and planning this book.

Dave Rankin at The Pragmatic Bookshelf was enthusiastic about this book when I first suggested it, and then he was flexible in approach when the original plan for the book's structure didn't seem like the best way to present the material.

Thanks to Adam Wathan for creating Tailwind and to all the people who have contributed to its development.

Gary Bernhardt and Dave Copeland both in different ways helped me see the value in utility-based CSS, and Aly Fluckey showed me that CSS could be beautiful.

This book was reviewed by Erik Benoist, Matouš Borák, Kevin Murphy, John Saltarelli, and Jonathan Yeong. Thanks for their input and advice. The book is better because of it.

Thanks always to my family. Amit and Elliot continue to be amazing and delightful. Erin makes everything I do easier, better, and more fun.

# Introduction

---

Many web developers underrate CSS.

Cascading Style Sheets (CSS) enable you to control the display of your information and enhance your page with visual effects. CSS is powerful, as a quick glance at a site like <http://www.csszengarden.com> shows. With CSS, you can do amazing things to the basic text and images on your site, and with a little bit of client-side code to add and remove CSS classes, you can do exponentially more.

CSS can also be hard to debug, complicated to write, and difficult to control.

But it doesn't have to be.

Enter Tailwind. Tailwind CSS—a “utility-first CSS framework for rapidly building custom designs”<sup>1</sup>—can make the CSS for your site easier to control and debug. In this book, we’ll dive into the Tailwind CSS framework, taking a look at its typography, page layout, responsive design, and more.

## Why Tailwind?

Bootstrap or similar CSS frameworks provide CSS classes whose names describe how they are to be used, like “button” or “card” or “nav.” These classes tend to define a number of CSS styles together.

Tailwind is different.

Nearly all of the basic Tailwind classes are thin wrappers around a single CSS style setting, like using “m-4” to provide a “margin: 1rem” or “text-lg” to change the text size to “font-size: 1.125rem.”

For example, a button in the Bulma framework would be styled like this:

```
<button class="button is-primary">Click Me</button>
```

---

1. <https://tailwindcss.com>

But in Tailwind, you'd use something more like this:

```
<button class="bg-green-500 text-white font-bold  
py-3 px-4 rounded-lg text-center">  
  Click Me  
</button>
```

In the Tailwind version, each individual style of the button—the green background, the white text, the bold font, the padding, the rounded corners, and the text centering—gets its own class in the class list.

Now, if you're like me, your first reaction to seeing that list of classes may be something along the lines of, and I quote, "ugh." It certainly takes some time to get used to having all those small class names in the HTML markup. If that's your reaction, I get it. All I ask is that you give it a chance and see how you feel after you've tried it out.

The Tailwind code is extremely explicit and makes it possible to understand the display simply by looking at the HTML markup. It works well with the Stimulus framework's aesthetic of putting a bunch of JavaScript relationships in the markup. If you want to package this collection of classes for reuse, Tailwind provides an `@apply` directive that you can use to build new CSS classes out of Tailwind's utilities, or you can use the features of the web programming language and framework to manage the duplication.

One advantage of the Tailwind setup is that it's extremely easy to prototype, iterate, and customize the display. If you want to change the horizontal padding on a button, you can do so by changing `px-4` to, say, `px-6`. You don't need to guess about the scope of the change or what other parts of your page might be affected. You can keep making small changes until you get the display just right. And you don't need to continually come up with names for CSS property combinations that might not be reused.

Another advantage is that Tailwind offers a set of prefixes that allow you to specify behavior in particular cases. For example, you could add a class such as `hover:bg-blue-500`, where the `hover` prefix would apply the class and change the background color when the user hovers over the button. Tailwind also provides a set of prefixes that allow you to specify different behaviors at different screen sizes. These prefixes are one reason why using a Tailwind class like `bg-blue-500` is better than using the document object model (DOM) style attribute directly, as in `style="background-color: #cdcdcd"`.

And last but not least, a Tailwind app requires less CSS to be written, with most of the design coming from the composition of Tailwind utilities. This means you spend less time naming CSS and managing global CSS, allowing

you to spend more effort on the actual display of your site. Tailwind makes it easy to make incremental changes, see the results, and understand the scope of your changes, which makes it especially useful when prototyping a new site.

## About This Book

In this book, we’re going to look at how to design web pages using Tailwind CSS. We’ll start with the typography of individual elements, and then we’ll get to “the box”—the rectangle of space each element takes up—and how to manipulate it. Once we have our elements in boxes, we’ll take a look at page layout with flexbox or grids.

After that, we’ll look at turning individual pages into full sites. We’ll also look at common site-wide page layouts, managing a design on different screen sizes, and handling a site-wide amount of styles and CSS.

This book uses Tailwind 2.0. Tailwind has been evolving pretty quickly, so there’s a good chance new features have been added since I wrote this. The Tailwind documentation includes pages for release notes and upgrade guides. (Sorry, the release notes’ URLs change with each release, but they’re linked from the main Tailwind documentation at <https://tailwindcss.com/docs>.) Check those out for the latest changes.

## Who This Book Is For

To keep this book short and right to the point, I’ve made some assumptions:

- I’m assuming you already know the basics of CSS syntax and concepts. This book focuses on Tailwind, not raw CSS. If you want to get better grounded in CSS and its quirks, you might want to try the zine, *Hell Yes! CSS!* by Julia Evans.<sup>2</sup>
- I’m assuming you’re able to access the Tailwind reference documentation.<sup>3</sup> The Tailwind documentation is very complete and easy to navigate. This book isn’t going to be a complete reference on all of Tailwind’s features; instead, it’ll focus on the most common ones and how to use them successfully.

---

2. <https://wizardzines.com/zines/css>

3. <https://tailwindcss.com/docs>

## Running the Sample App

The sample code we'll use in the book for our application is primarily HTML. I've given you two ways to load the HTML: a Rails app and a simple app built with React Create App.

To run the sample code, you need to download it from the book's page on the Pragmatic Bookshelf website.<sup>4</sup>

For the Rails version, which is in the main directory, you need to have Ruby 3.0 and SQLite installed on your system. Running `bin/setup` in the sample code directory will load the Rails-specific parts, and then `rails server` will load the application itself—you should be able to access the site at `http://localhost:3000`. The samples are at `http://localhost:3000/intro`, `http://localhost:3000/box`, and `http://localhost:3000/page`.

For the React version, which is in the `react_create_app` directory, you need to have `npm` and `yarn` installed. With those in place, `yarn install` will install all the needed modules, and `yarn start` will start the development server. All the samples can be accessed from `http://localhost:3000`, and you can see the basic HTML inside the component at `src/App.js`.

Please note that there's no real application here. You should be able to start from scratch and install Tailwind in a blank project of the build tool of your choice and follow along with the HTML examples.

Now, let's install Tailwind and get started.

---

4. <https://www.pragprog.com/titles/tailwind>

# Getting Started with Tailwind

Before we go deep into Tailwind's utilities, let's take a quick tour to get a feel for how Tailwind CSS works. First, we'll install Tailwind and then try to build a small component on our page.

## Installing Tailwind

Tailwind is both a set of utility classes and a CSS preprocessor that generates those CSS classes and allows the use of additional CSS tools like the `@apply` directive. We need to install the framework itself and also patch it into our CSS processing tool chain.

## Installing the Sample Code

This book has a small amount of sample code associated with it. It's mostly HTML markup that builds the Tailwind images throughout. If you want to run it on your own, you have two options available: a React version and a Rails version.

For most of you, the code found in the `react-create-app` folder may be the easiest to run. This code runs a small app created with `react-create-app` and is adjusted to deal with Tailwind using the instructions at <https://tailwindcss.com/docs/guides/create-react-app>. The code also adds all the sample HTML to the `App.js` file.

To run it with Node and either npm or Yarn installed, go into the directory, run `npm install` or `yarn install`, then run `npm start` or `yarn start`, and then enter `http://localhost:3000` in a browser.

If you're comfortable setting up a Rails project and you're on a MacOS or Linux machine, a Rails version of the sample app is available in the main directory. You need Ruby and SQLite installed for this to work. You can install the app by going to the main directory, running `bin/setup`, and then running `rails`

server and entering `http://localhost:3000/intro`, `http://localhost:3000/box`, and `http://localhost:3000/page` in a browser.

Because the sample app is quite small, you can easily pull the HTML markup from the `App.js` file in the React version or the `app/views/home` directory in the Rails version and add it to any kind of server setup you've installed Tailwind into.

## Adding Tailwind to Your App

The process of installing Tailwind depends on how your project is managing client-side assets. As such, a complete guide to installing Tailwind is outside the scope of this book and probably would quickly become outdated. The golden source is the Tailwind documentation itself.<sup>1</sup> Please check there if you have difficulty installing Tailwind in your specific setup. This section gives a general overview of how Tailwind is installed for most projects.

The Tailwind developers recommend that Tailwind be installed in most projects as a plugin for PostCSS, which is a general CSS processing tool.<sup>2</sup> Use your package manager to install `tailwindcss`, `postcss`, and `autoprefixer`:

```
$ yarn add tailwindcss postcss autoprefixer
```

Next, go into your PostCSS configuration file, which for Rails is `postcss.config.js`, but it might also be `.postcssrc` in other setups. You need to add `tailwindcss` and `autoprefixer` as plugins:

```
main/postcss.config.js
module.exports = {
  plugins: [
    require('postcss-import'),
    require('postcss-flexbugs-fixes'),
    require('postcss-preset-env')({
      autoprefixer: {
        flexbox: 'no-2009'
      },
      stage: 3
    }),
    require('tailwindcss'),
    require('autoprefixer')
  ]
}
```

Next, run the following command to create a Tailwind configuration file:

```
$ npx tailwind init
```

- 
1. <https://tailwindcss.com/docs/installation>
  2. <https://postcss.org>

This creates the following empty configuration file:

```
main/tailwind.config.js
module.exports = {
  purge: [],
  darkMode: false, // or 'media' or 'class'
  theme: {
    extend: {},
  },
  variants: {
    extend: {},
  },
  plugins: [],
}
```

Technically, you don't need the configuration file—at least, not yet—but it's not going to hurt, and if you're using Visual Studio Code, the Tailwind extension uses the configuration file to determine if the project uses Tailwind. Other integrated development environments (IDEs) and editors also have various plugins and other forms of Tailwind support.

Finally, we need to add Tailwind to our CSS files. In general, if you're using webpack, you'd put the following lines in a CSS file that's being imported. In Rails, that file is app/javascript/packs/application.css by default, and we want it to look like this:

```
main/app/javascript/packs/application.scss
@import "tailwindcss/base";
@import "tailwindcss/components";
@import "tailwindcss/utilities";
```

Here we're importing Tailwind in three layers. The base contains Tailwind's reset classes, components is a small layer containing Tailwind's component class, and most of what I'll be talking about in this book is in the utilities layer. The layers become important as you customize Tailwind—if you want to compose your classes with Tailwind prefixes, they need to be defined before the utilities layer.

Other build systems might use `@tailwind` instead of `@install` as the command (check the official docs as a final source).

That should get you started. Let's now see what Tailwind can do.

## Quick Start

We'll quickly run through styling a hero segment for a sample page for a concert series called NorthBy. The sample page in the code shows all the versions one after the other. This is only a page in the public HTML of our

server app, so there's no server-side information needed to explain this. (If you're running the sample code, the page should be visible at <http://localhost:3000>.)

Here's our first version:

```
main/app/views/home/intro.html.erb
<h1>Welcome to NorthBy</h1>
```

Welcome to NorthBy

You should see no styling applied to the text at all, not even the normal size and bold styling you'd usually associate with an HTML h1 tag. This is a good test of whether Tailwind is installed. If you see any styling applied to the text, then Tailwind isn't loading and you should walk through the installation steps again.

Let's go back and forth between the code and the view to start adding features here with Tailwind. I'm not going to explore the syntax or other options in depth. All I want is to give a sense of what it's like to work with Tailwind as best as I can in a book format.

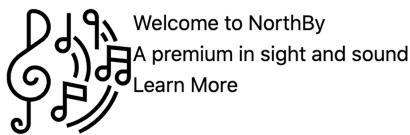
And, I have to add up front that I'm not a designer.

Here's a first pass at getting a basic layout with text, subtext, and a logo:

```
main/app/views/home/intro.html.erb
<div class="flex">
  <div>
    <%= image_pack_tag("media/images/music.svg", size: "100x100") %>
  </div>
  <div>
    <h1>Welcome to NorthBy</h1>
    <h2>A premium in sight and sound</h2>
    <button>Learn More</button>
  </div>
</div>
```

The `image_pack_tag` method is a Rails and Webpacker thing. Your build system likely has a different way of accessing the URL of a file. For example, JavaScript files using webpack can usually import the file as though it was a module and use the imported value as the URL.

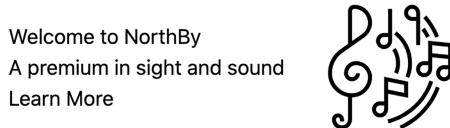
This code gives us the following result:



This isn't too different from our first version. There's still no styling applied to the text, and there's no spacing or anything.

Let's add more changes. We can center the text, put a little bit of distance between the two parts, vertically center the text against the logo, and put the logo on the right. The Tailwind classes I'm using do a pretty good job of representing my intent:

```
main/app/views/home/intro.html.erb
<div class="flex justify-center">
  <div class="mx-4 order-last">
    <%= image_pack_tag("media/images/music.svg", size: "100x100") %>
  </div>
  <div class="mx-4 self-center">
    <h1>Welcome to NorthBy</h1>
    <h2>A premium in sight and sound</h2>
    <button>Learn More</button>
  </div>
</div>
```



We've added classes here. The outer div now has two Tailwind classes: flex justify-center. The image has another two classes, mx-4 order-last, and the text block also has mx-4 self-center. The mx-4 classes specify horizontal margin, while the rest of the classes all deal with layout using the CSS flexbox structure, which we'll look at later in [Flexbox, on page 43](#).

Now, let's go after that text. Let's make the header big, the subhead less big, and all the lines centered. And let's give the whole thing a background:

```
main/app/views/home/intro.html.erb
<div class="flex justify-center bg-gray-300">
  <div class="mx-4 order-last">
    <%= image_pack_tag("media/images/music.svg", size: "100x100") %>
  </div>
  <div class="mx-4 self-center text-center">
    <h1 class="text-6xl font-bold text-blue-700">Welcome to NorthBy</h1>
    <h2 class="text-3xl font-semibold text-blue-300">
      A premium in sight and sound
    </h2>
    <button>Learn More</button>
  </div>
</div>
```

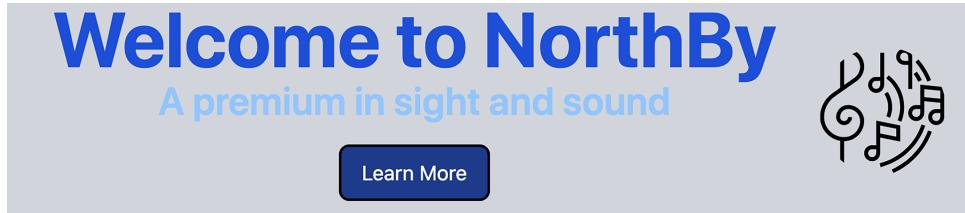
This adds a new class to the outer div, bg-gray-300, which specifies a background color. We've added a bunch of classes to the text elements, including a text-center class surrounding them. The title element is now marked with text-6xl font-bold text-blue-700, which specifies text size, font weight, and color. The sub-head is smaller, less bold, and a lighter shade of blue: text-3xl font-semibold text-blue-300.



Next, let's make the button look more like a button, realign the image, and while we're at it, make the image rounder, too:

```
main/app/views/home/intro.html.erb
<div class="flex justify-center bg-gray-300">
  <div class="mx-4 order-last self-center">
    <%= image_pack_tag("media/images/music.svg",
      class: "rounded-full",
      size: "100x100") %>
  </div>
  <div class="mx-4 self-center text-center">
    <h1 class="text-6xl font-bold text-blue-700">Welcome to NorthBy</h1>
    <h2 class="text-3xl font-semibold text-blue-300">
      A premium in sight and sound
    </h2>
    <button class="my-4 px-4 py-2 border-2 border-black rounded-lg
      text-white bg-blue-900">
      Learn More
    </button>
  </div>
</div>
```

The image tag now has a class of rounded-full, which makes the whole thing appear in a circle (admittedly quite a subtle effect on this image). The button has grown a lot of classes: my-4 px-4 py-2 specifies a vertical margin and horizontal and vertical padding; border-2 border-black rounded-lg specifies the size, color, and shape of the border; and text-white bg-blue-900 gives us the text and background colors:



Not too bad to start. In each step we were able to incrementally change the display of the code by adding more Tailwind classes to the markup, ending up with a pretty elaborate, if still not finished, design.

And that's only the beginning. We can make this logo look better on smaller screens, we can make the background a gradient (or we can make the text color a gradient), and on and on.

A key point here that's hard to get across in print: this is fun. It's easy to make the incremental changes, see the results, and understand the scope of your changes. Yes, you're seeing snapshots of a process, but the process didn't involve us putting a Tailwind class in and being surprised that it affected something on the page we weren't expecting.

Now, let's look at how Tailwind works and start with some of the basics.

# Tailwind Basics

---

Tailwind seems like a counter-intuitive solution to the problem of managing CSS for a complex site. Tailwind is made up of many, many small utility CSS class names, most of which set one specific CSS property to one specific value. The preferred way to get complex behavior in Tailwind is to compose multiple CSS classes together on the HTML element.

This goes against a lot of CSS naming conventions that have been developed over the years. Many CSS frameworks and naming conventions suggest using names that reflect the semantic meaning of the element on the page—names like button, nav-bar, or menu-item.

Tailwind classes aren't semantic at all. They're all utility classes, meaning a Tailwind class represents a specific element on a page, like font-bold for text formatting or m-6 for margin. Many CSS frameworks include utility classes but consider the semantic class names more important. Using Tailwind and utility classes suggests a lot of duplication, as Tailwind utility classes are often repeated on multiple DOM elements.

Despite the potential duplication, Tailwind can work on larger sites.

When you apply a Tailwind class at any particular point, both the nature of the styling change and the scope of that change are exceptionally clear. Tailwind's short names may seem cryptic at first, but the naming patterns are strong and become easier to read. Also, Tailwind's prefixes make it easy to define special behavior in the HTML, such as hover and responsive behaviors on differently sized screens. The prefixes also make what's going on clearer from just the HTML.

Because the Tailwind classes are endlessly combinable, you write far less external CSS code in Tailwind than you might in another CSS style. You don't need to name as many custom CSS classes when using Tailwind. And because

the Tailwind changes are so closely tied to the HTML markup, it's easier to predict the result of making a change.

Tailwind allows you to extract a own CSS class from a list of Tailwind utilities and to give it a more semantic name. Rather than create your own classes, Tailwind recommends taking advantage of the same tools you use in your front-end stack to reduce duplication. For example, rather than create a separate CSS class for button styles, Tailwind suggests that you create a reusable React component or a Rails partial or helper method, and you define the CSS styles only once for that reusable item.

Tailwind is made up of a few different pieces: the utility classes that we'll spend the bulk of our time working with in this book, a reset stylesheet, and functions that make working with Tailwind easier.

## Utilities

Tailwind's utility classes are the most important part of Tailwind to understand. Here's how they work and how I'll talk about them in the book.

Tailwind is made up of hundreds and hundreds of utility classes, most of which set the value of a single CSS property. For example, the `.font-bold` Tailwind utility class is an alias for the CSS property, `font-weight: 700`. You'd use that utility in an HTML element as part of the `class` attribute, as in `class=font-bold`.

The Tailwind system generates a set of utility CSS classes based on the Tailwind configuration file, and you have a great deal of freedom over which classes are included and even the names Tailwind uses. Unless I clearly say otherwise, in this book I'll be talking about the default set of classes generated by a minimal configuration, and in [Chapter 8, Customizing Tailwind, on page 59](#), I'll talk about how to adjust which classes are available.

### The Leading Dot



When you see Tailwind utilities outside their context in an HTML element, sometimes they may be written with a leading dot to indicate that they're referring to a CSS class, as you saw earlier with `.font-bold`. When they're used in HTML, though, the leading dot isn't used. In this book, I'll use the leading dot to indicate a Tailwind utility.

Tailwind utilities often come in families with a common pattern of beginnings or endings. When I talk about those, I'll use syntax like this: `.text-{size}`, to indicate a family of utilities that include `.text-xs`, `.text-sm`, `.text-xl`, and so on.

When this syntax is used, the dash is only needed if the part in braces is there, so you'll see `text-sm` but also `text`.

The variable part of the utility name doesn't have to be at the end of the name. For example, in margin sizing utilities, `.m{direction}-{size}` indicates a family of utilities such as `.m-0` or `.mt-10`. As you'll see, the variable part of utilities is often consistent across different parts of Tailwind. For example, the options for `{size}` and `{direction}` in the margin utilities are shared by the padding utilities and several other utility families.

## Preflight

When you install Tailwind, you need to import three different files with the commands: `@tailwind base`, `@tailwind components`, and `@tailwind utilities`. Each of these files contains a different set of CSS rules. (In the webpack-based installation, you import with `@import` as the command name rather than `@tailwind`.)

`@tailwind base` contains Tailwind's reset stylesheet called *Preflight*. A reset stylesheet is a restyling of all the base HTML elements to a minimal set of styling properties. Without a reset stylesheet, each browser defines its own default set of style properties for how to render individual HTML elements that don't have further CSS properties. Using a reset stylesheet gives our application control over this baseline, eliminating differences between browsers and providing a more minimal backdrop into which we insert our own custom styling.

You can see the full set of reset styles Tailwind uses by looking at the file, `node_modules/tailwindcss/dist/base.css`. Essentially, though, Preflight does a few things:

- It overrides all styling from headers, so, say, an `h1` is visually identical to the base text.
- It removes styling from `ul` and `ol` lists, resulting in no bullets by default, which is an ironic thing to mention in a bulleted list.
- It sets all margins to zero for elements that would normally have margins.
- It sets all borders to a 0-pixel width, solid, and the defined border color by default.
- It sets images and image-like objects to `display: block` rather than `display: inline`, meaning they'll set themselves up as separate paragraphs (as if they were `div` tags), rather than `inline` (as if they were `span` tags).

If you only use the Preflight styles, you'll get a pretty boring page. But that's the point. Using Preflight ensures that any change to the display properties are affirmatively and explicitly added by us.

The @tailwind components file is quite small, and it only consists of the definitions of the container CSS classes, which are usually used at the top level of a page to define the box that the whole page is drawn in. I'll talk about this more in [Chapter 5, Page Layout, on page 37](#).

The bulk of what's considered to be Tailwind is in the @tailwind utilities file, which defines all the utilities and their prefixed variants. I'll spend most of this book describing the contents of this file.

## Duplication

A common concern when looking at Tailwind and the long sets of class lists you often need to accomplish your design goals is how to manage duplication. That is, if you need to type class="text-6xl font-bold text-blue-700" for every h1, as we did in the [Introduction, on page ix](#), isn't that a lot of typing that needs to be consistent every time you need an h1? What if your h1 design changes?

### Managing Duplication in Code

Tailwind does have a way to manage CSS class list duplication, but you're also encouraged to see the duplication issue as part of your larger code setup, not only as a CSS issue. No matter what tool you're using to build your HTML markup, it likely has component or function mechanisms you're already using to reduce code duplication. When using Tailwind, it's a great idea to see your CSS class lists as part of that code.

For example, if you're using React, you have components. Many other client-side frameworks offer components as well. Rather than manage duplication in CSS, you could create React components with the common CSS:

```
export const Header = ({children}) => {
  return (
    <div className="text-6xl font-bold text-blue-700">
      {children}
    </div>
  )
}

export const SubHeader = ({children}) => {
  return (
    <div className="text-4xl font-semibold">
      {children}
    </div>
  )
}
```

```
export const SubSubHeader = ({children}) => {
  return (
    <div className="text-lg font-medium italic">
      {children}
    </div>
  )
}
```

Then you'd use this:

```
<Header>Cool Text</Header>
<SubHeader>Less Cool Text</SubHeader>
<SubSubHeader>Kind of boring text</SubSubHeader>
```

In plain JavaScript, you could also create a function that returns the list of Tailwind classes:

```
const title = () => { return "text-6xl font-bold text-blue-700" }
```

And in React you'd use this:

```
<Component className={title}>Cool Text</Component>
```

In Ruby on Rails, you can similarly define helper methods for lists of Tailwind classes:

```
def title
  "text-6xl font-bold text-blue-700"
end
```

Or you can define an ERB partial with a name like app/views/partials/\_title.erb:

```
<div className="text-6xl font-bold text-blue-700">
  <%= yield %>
</div>
```

The yield is important here because it allows you to call the partial with a block containing children. The syntax is a little weird:

```
<%= render partial: "partials/_title" do %>
  <h2>Whatever</h2>
<%= end %>
```

The inside of the block contains arbitrary ERB code that's inserted in place of the yield.

If you don't like any of these syntax options and would rather have a CSS-based solution for duplication, Tailwind provides a CSS directive called `@apply` and a directive called `@layer`, which we'll take a look at next.

## Using @apply for Duplication

The `@apply` directive lets you use Tailwind classes in the definition of other CSS selectors. So we can redefine our header classes in CSS like this:

```
@layer components {
  .title { @apply text-6xl font-bold }
  .subtitle { @apply text-4xl font-semibold }
  .subsubtitle { @apply text-lg font-medium italic }
}
```

And you can then use those like any other CSS classes:

```
<div class="title">Title</div>
```

The `@layer` directive can either be `base`, `components`, or `utilities`. As far as the browser is concerned, if you use `@layer`, the selectors are defined as part of whatever layer you declare, no matter where in your CSS files the selector definitions are actually located.

Using `@layer components` defines the selector as part of the `components` and before the `utilities`. This means if you combine one of our own definitions with a Tailwind utility, the utility wins, which is what we want. So we can define, say, an extra big title with:

```
<div class="title text-5xl">Title</div>
```

To understand why `@layer` is important, you need to know a general principle of CSS: all else being equal, if two CSS classes are trying to adjust the same underlying properly, the one defined last wins. (If you're familiar with CSS, you know that there's also a principle of *specificity*, where the most specific definition wins, but because all the Tailwind utilities have the same specificity, that's not an issue here.)

In a CSS file, if you have two definitions for the same CSS selector that define the same property, the selector defined later in the file wins. In Tailwind, if you have two utility classes that define the same property, the one that's later in the list wins, so `class="text-xl text-2xl"` will give you text that's sized `2xl`.

By defining a custom selector inside a layer, the selector is loaded at the end of that layer and before the next layer. This has some consequences for how custom CSS might interact with other Tailwind utilities or CSS. For example, we can make our definitions part of the HTML by using `@apply` on tags, not class selectors. In this case, we put the definition in the base layer:

```
@layer base {
  h1 { @apply text-4xl font-bold }
  h2 { @apply text-2xl font-semibold }
  h3 { @apply text-lg font-medium italic }
}
```

Here, we're redefining the `h1`, `h2`, and `h3` elements directly, so we can use this:

```
<h1>Title</h1>
```

By being in the base layer, these definitions are before all utilities, so that `<h1 class="text-6xl">` behaves as you'd want, with the `6xl` taking precedence. If the `h1` was defined in the utilities layer, then the `h1` would have precedence because it'd be defined later than the `text-6xl`. And because we've moved the layer to base, Tailwind will consider this part of the Preflight styles and define it before any components. Again, this placement allows you to mix tags, components, and utilities as expected.

This is all quite useful, and it allows you to effectively build up your own framework using Tailwind utilities as building blocks. But it helps to realize that you're, in fact, building up a framework and taking upon yourself all the attendant naming and maintenance responsibilities.

## Prefixes

We have to deal with one more special feature before we get to more utility classes. It's common to want objects to display differently when the user drags a mouse over them, which corresponds to the CSS pseudo-class, `hover`.

In Tailwind, you can define most CSS pseudo-classes by adding prefixes to other tailwind utilities. If you want an anchor tag to have an underline when the mouse goes over it, you could do this:

```
<a class="hover:underline">Click me</a>
```

That's compact, reasonably straightforward to read, and defined along with the HTML so it's clear when it applies. You can use `hover:` with any Tailwind utility.

As you'll see in [Chapter 7, Responsive Design, on page 53](#), Tailwind also uses prefixes to allow different utilities to be invoked based on the width of the screen, so you could write `class="sm:m-2 lg:m-4"`, and your element would grow a bigger margin as the screen gets wider.

There's one gotcha: while you can write a `hover:` prefix to any Tailwind utility, by default, Tailwind only generates the prefixed utilities for certain CSS properties. Happily for us, `text-decoration`, which covers underlining, is one of

those. You'll see in [Chapter 8, Customizing Tailwind, on page 59](#) how to turn on the prefixes for other properties and for other prefixes. Tailwind defines over a dozen,<sup>1</sup> but you have to explicitly turn on the ones you need.

You can even use the prefixes in conjunction with @apply. So @apply hover:underline is a legal way to define a new CSS class.

## CSS Units

Most values in CSS that define length or width can take a number with a unit. Height and width definitions can also take a percentage. CSS defines two kinds of units: *absolute* and *relative*.

Absolute units are defined in terms of real world units, so you could define a width as, say, 5in for inches. More commonly, you'll see px for pixels. In the long-ago time, a px represented one actual display pixel, but computer and phone displays are much denser now, and a CSS pixel is defined as 1/96 of an inch. (You know, the commonly used split of an inch into 96ths.) For fonts you'll often see points, as in font-size: 20pt. A point is 1/72 of an inch, which is actually a measurement that well predates computers.

In CSS, you're more likely to see relative units, of which the most common is em, which is the size of the element, as in width: 10em. It's quite common to define font size in relative terms, but because font-size: 1.5em would be a circular definition, for the purposes of typographical properties, em refers to the font-size of the parent, rather than the element being matched.

If that's confusing—which it is—it's also unstable, because changing a font size can have weird downstream effects on anything defined with an em. A more stable alternative is rem, which is the font size of the root element and which defaults to 16 points in the Tailwind reset system. Most distances in Tailwind are either defined as a percentage or in terms of rem.

Now, let's look at what Tailwind gives us for our typographic styling needs.

---

1. <https://tailwindcss.com/docs/hover-focus-and-other-states>

# Typography

Odds are you’re using your web application to display text to a reader. So much of the design of a web site is about the placement, size, weight, and layout of text. In this chapter, we’ll look at how Tailwind lets you control the display of text.

## Size and Shape

Perhaps the first thing you notice about text on a web page is its size and styling. Tailwind provides a series of utilities for each.

The effective default for text size is the `.text-base` class, which defines the CSS properties `font-size: 1rem` and `line-height: 1.5rem`, meaning the font size for `.text-base` is the same as the font size for the root element of your page, and the line height is 1.5 times that size. Tailwind provides a family of utilities, `.text-{size}`, which includes two smaller steps, 10 larger ones, and the base class, giving us 13 sizes overall. Each step defines a font size and a line height, as listed in the [table on page 18](#).

This is our first encounter with one of Tailwind’s explicit design goals, which is to provide a consistent set of steps for a potentially infinite set of values. With the `.text-{size}` family of utilities, Tailwind makes it easy to keep sizing and spacing consistent throughout the site.

Font styling—your basic bold, italic, underline—is covered by a few different CSS properties, but from Tailwind’s perspective, these styles are just utility classes: `.italic` and `.not-italic`, and `.underline` and `.no-underline`. You’d only use `.not-italic` and `.no-underline` if you want the text to have different characteristics under different states. This is usually tied to responsive behavior at different screen sizes, which we’ll look at later in [Chapter 7, Responsive Design, on page 53](#).

Class	Font Size	Line Height
.text-xs	0.75rem	1rem
.text-sm	0.875rem	1.25rem
.text-base	1rem	1.5rem
.text-lg	1.125rem	1.75rem
.text-xl	1.25rem	1.75rem
.text-2xl	1.5rem	2rem
.text-3xl	1.875rem	2.25rem
.text-4xl	2.25rem	2.5rem
.text-5xl	3rem	1
.text-6xl	3.75rem	1
.text-7xl	4.5rem	1
.text-8xl	6rem	1
.text-9xl	8rem	1

For bold fonts, CSS provides nine grades of boldness from 100 to 900, with normal text being 400. Tailwind provides nine different utility classes, one for each grade:

```
.font-hairline
.font-thin
.font-light
.font-normal
.font-medium
.font-semibold
.font-bold
.font-extrabold
.font-black
```

Not all fonts will have distinct lettering at all weights, but commonly used web fonts should. I don't know why Tailwind doesn't use `.font-weight-100`, which would seem to be more consistent with other naming. You can get it to do so by changing the configuration, though (see [Chapter 8, Customizing Tailwind, on page 59](#)).

You might also want to ensure the case of the text. For example, you might want a header to be all uppercase. Tailwind provides four utility classes for case, all of which wrap the CSS `text-transform` property to provide the behavior the utility name describes:

```
.uppercase
.lowercase
.capitalize
.normal-case
```

With these in hand, we can start to build up styles for our actual headers. This is, more or less, the default styling for a popular CSS framework's title and subtitle defaults:

```
<h1 class="text-3xl font-semibold">Title</h1>
<h2 class="text-xl">Subtitle</h2>
```

This gives us a title that's 1.875rem (30-point type) with a line height of 2.5rem (36 points) and semibold, and a subtitle that's 1.25rem (20 points) at normal weight and a line height of 1.75rem. I often like my headers to be a little more attention-grabbing, so I might do something like this:

```
<h1 class="text-4xl font-bold">Title</h1>
<h2 class="text-2xl font-semibold">Subtitle</h2>
<h3 class="text-lg font-medium italic">Header</h3>
```

This gives us a slightly bolder and bigger title and subtitle, plus a third-level header that's a little bit bigger than regular text, a little bit bolder, and also italic. I might also add some spacing around the headers, which we'll look at how to do in [Chapter 4, The Box, on page 25](#).

Remember that Tailwind's reset styles make it so that h1, h2, and so on have no default styling, so using those tags with Tailwind is a semantic note that the text is a header of some kind. It has no stylistic effect.

Right now, there's a good chance you're asking whether I'm seriously telling you it's a good idea to have to type text-lg font-medium italic every time you want a header. That's a lot of typing, it's on the cryptic side, and it's a lot of typing. See [Duplication, on page 12](#) for ideas on how to manage duplication in Tailwind.

## Color and Opacity

Tailwind lets you adjust the color and opacity of text.

Let's talk about color first. Tailwind offers 90-some-odd color utilities out of the box. Two of them are special: .text-transparent and .text-current. The text-transparent class makes the text transparent, meaning you can see the background color through it. You can sometimes use this class for effect, especially with bg-clip-text, which makes the background match the shape of the text. You can use .text-current as a reset if a different setting changes the color; it sets to the

color of the parent element. Then you have `.text-black`, which sets the color to `#000000`, and `.text-white`, which sets the color to `#ffffff`.

We then get combined classes: `.text-{color}-{level}`. Tailwind sets eight different colors by default at 10 different levels, from the lightest at 50 and then every multiple of 100 from 100 to the darkest at 900. These are the eight default colors:

- Blue
- Gray
- Green
- Indigo
- Pink
- Purple
- Red
- Yellow

Any combination of color and level can be used, like `.text-yellow-400` or `.text-blue-200`. I'm not going to put the exact RGB hex values for all 80 combinations, but you can see them online in the Tailwind documentation.<sup>1</sup> The Tailwind documentation describes the levels as "expertly-crafted," which I take to mean they aren't automatically calculated. Tailwind defines color breakdowns from light to dark for 22 different colors, and you can mix in some or all of the non-default 14, as you'll see in [Chapter 8, Customizing Tailwind, on page 59](#).

You can count on the default colors getting darker as the numbers increase. You can take advantage of this for some subtle effects:

```
<div class="text-gray-300 hover:text-gray-700">
  Hi
</div>
```

This gives you lighter gray text that darkens when the user hovers over it. You can even turn this into a function that returns a string of classes. Here's the JavaScript version:

```
const hoverDarker = (color) => {
  return `text-${color}-300 hover:text-${color}-700`
```

Now, let's talk about opacity. Changing the opacity makes colors lighter or darker. Tailwind gives you `.text-opacity-{level}`. The list of opacity levels is a little weird—it's every multiple of 10 between 0 and 100, plus 5, 25, 75, and 95.

---

1. <https://tailwindcss.com/docs/customizing-colors#default-color-palette>

The number represents a percentage, for example, `.text-opacity-20` for 20% or `.text-opacity-95` for 95%.

Because of the way the underlying CSS works, the text color must be defined on the same element as the opacity. Specifying the color on a parent element and then specifying the opacity in the child element won't work. (But using `.text-current` will work without adjusting the color.)

---

#### Color Patterns



You'll see this pattern a few different times in Tailwind: a class name made up of a prefix followed by the same set of color and opacity options. You'll see this for borders (`.border-`), background colors (`.bg-`), and many other color-based CSS properties. Later, in [Chapter 8, Customizing Tailwind, on page 59](#), you'll see that colors can be customized in one place, and the change will apply to all of the properties that use colors.

## Alignment and Spacing

Several Tailwind classes are used to specify the horizontal alignment of text:

- `.text-left`
- `.text-center`
- `.text-right`
- `.text-justify`

They all change the CSS `text-align` property. The exact bounds of the alignment depend on the box the text is in. (I'll talk more about that in [Chapter 4, The Box, on page 25](#).)

The CSS property for vertical alignment is `vertical-align`, and these are the Tailwind classes:

- `.align-baseline`
- `.align-top`
- `.align-middle`
- `.align-bottom`
- `.align-text-top`
- `.align-text-bottom`

As with the horizontal alignment, exact positioning depends on the text box.

For line spacing, Tailwind has both a relative and an absolute option. The relative option starts with `.leading-none`, which makes the line height exactly

the size of the font. (“Leading” is the printing term for line height, and it rhymes with “wedding,” not “beading.”) That’s normally going to feel a little tightly packed, and Tailwind lets you separate the line height with the following classes in order from most closely packed to farthest apart:

```
.leading-tight  
.leading-snug  
.leading-normal (1.5 times the font size, usually your default)  
.leading-relaxed  
.leading-loose
```

The absolute option is based on rem, meaning it’s derived from the root element size, not the size of the DOM element it’s attached to. You’ve got `.leading-3` through `.leading-10`, which takes us from 0.75rem to 2.5rem in 0.25 increments.

Next is the property that CSS calls letter-spacing and Tailwind calls tracking. You’ve got `.tracking-normal`, then two utilities for pushing the text closer together:

```
.tracking-tight  
.tracking-tighter
```

Also, you have three utilities for making the letter spacing wider:

```
.tracking-wide  
.tracking-wider  
.tracking-widest
```

These utilities can add nice effects on headers with big text.

## Lists

Tailwind includes two sets of classes to manage `<li>` tags. The first is the style of the list: you’ve got `.list-disc` (bulleted), `.list-decimal` (numbered), and `.list-none`. You can also choose whether the bullet or number is inside or outside the text box with `.list-inside` and `.list-outside`.

## Typography Plugin

If you want some legible defaults for basic typography of long text on your page, Tailwind provides an official typography plugin.<sup>2</sup>

---

2. <https://tailwindcss.com/docs/typography-plugin>

To install the plugin, you first add the package:

```
$ yarn add @tailwindcss/typography
```

Then add it to the Tailwind configuration file, which now should have this plugins section:

```
module.exports = {
  plugins: [
    require('@tailwindcss/typography'),
  ],
}
```

You use the typography plugin by adding the CSS class `.prose` to any element, like this:

```
<article class="prose">
  All your text
</article>
```

If you want to see what this looks like in more detail, you can visit my very own blog at <https://noelrappin.com/blog>, which uses this plugin.

To change the size, you use size modifiers, which you must use in conjunction with a class that already uses `.prose`, like this:

```
<article class="prose prose-sm">
  All your text
</article>
```

The base size is 1rem or 16 points. These are the size modifiers:

-sm	14pt
-lg	18pt
-xl	20pt
-2xl	40pt

Any Tailwind utilities you use will override the typography defaults.

## Tailwind Forms

Tailwind provides a series of useful defaults for forms using the `@tailwindcss/forms` plugin.<sup>3</sup> As with the typography plugin described earlier, install the plugin:

```
$ yarn add @tailwindcss/forms
```

---

3. <https://github.com/tailwindlabs/tailwindcss-forms>

Then add `require('@tailwindcss/forms')` to the Tailwind configuration file:

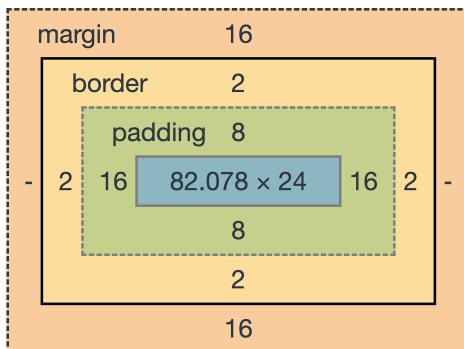
```
module.exports = {
  plugins: [
    require('@tailwindcss/forms'),
  ],
}
```

This will give reasonable styles to the basic form elements. (See <https://tailwindcss-forms.vercel.app> for a demonstration.) For input forms, the plugin uses the `type` attribute to affect sizing, so you do need to have `type="text"` even for basic inputs for the styling to work. Note that the Tailwind forms aren't designed to be a finished work by themselves, but rather a better reset to start from when adding styling to your custom page.

Now that we've seen how typography works, let's place that text inside a box.

# The Box

Each HTML element in the DOM takes up a rectangle of space on the screen. Every browser's developer tools include a representation of that rectangle that looks like this:



If you don't make any customizations, the size of the box is determined by the content of the element. Tailwind gives you control over every aspect of the box.

## Can You See the Box?

Perhaps the most important feature of any DOM element is whether the user can see it. By manipulating this feature with a little JavaScript, you can add interaction cheaply. A common pattern is to load a lot of potential DOM elements at the initial page load, but have many of them start off as hidden, manipulating visibility to change the page without needing to call the server for more data.

Most of the time when you want to have a DOM element the user can't see, you'll want to use the `.hidden` Tailwind utility, which wraps the CSS property, `display: none`. In Tailwind, the opposite of `.hidden` is usually `.block`. While many other potential values for `display` are available, Tailwind's Preflight makes many elements use the `block` value. The other common value is `inline`, but in Tailwind, you're more likely to construct `inline` behavior using a flexbox or grid layout (more on this in [Chapter 5, Page Layout, on page 37](#)).

Tailwind also has `.visible` and `.invisible` utilities. The difference between `.invisible` and `.hidden` is that a `.hidden` element doesn't display and also isn't part of the DOM layout, and so its existence doesn't affect the layout of other elements. In contrast, an `.invisible` element doesn't display its contents, but does affect the layout of the rest of the page—it'll show up as a gap in the page, still sized, but empty.

## What's in the Box?

The CSS box model has four parts. From inside out, they are:

- *Content*—Content is the text or media inside the element. (We looked at content in the previous chapter.)
- *Padding*—The padding is the space around the content but inside the border. You can specify the padding separately in each of the four directions, only horizontally, only vertically, or in all directions at once. I don't know you or your website, but odds are pretty good that a lot of your site could use more padding.
- *Border*—The border is the edge around your padding. The only thing that distinguishes border from padding is that you can use a color and a pattern to draw a border around the padding and content.
- *Margin*—The margin is outside the border and between this element and all the other elements. You can specify the margin in all directions the same way you can specify padding.

You can also specify the height and width of the box, either in absolute sizes or as a percentage of the available width and height. If you explicitly specify a width or height, any unused space is considered part of the content. If you do limit the size of the element, you can also tell the page what to do with any content that overflows that amount of size. Finally, you can do quite a few things with the background of an element.

Okay, let's talk about the parts of the box.

## Padding and Margins

Padding and margins aren't next to each other—they're always separated by the border. But Tailwind handles them similarly enough that it's easy to talk about them together.

Tailwind provides, if I'm counting correctly, 245 different classes to manage padding. I'm not going to list them all here (though the Tailwind documentation<sup>1</sup> does), because there's a pattern to them: `.p{direction}-{size}`.

All the padding classes start with `p`, followed by an optional character for the direction. Six directions exist: `t`, `b`, `l`, and `r` for top, bottom, left, and right, respectively; `x` for horizontal (meaning left and right); and `y` for vertical (meaning top and bottom). If there's no direction character, the padding appears in all directions.

By default, Tailwind defines 34 numerical sizes that can be used for padding and margins:

0, 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, 64, 72, 80, 96

Each number corresponds to 0.25rem—or one-fourth of the size of the root element of the page.

A special size, `.px`, is equal to 1 pixel. The goal here is to give you more fine-grained control at small sizes and then a consistent set of values for higher amounts of padding. For example, `.p-10` is 2.5rem of padding in all directions, `.px-4` is 1rem of padding horizontally, `.pr-1.5` is 0.375rem of padding on the right, and `.pt-px` is 1 pixel of padding on top. You can have multiple padding classes for different directions, such as `class="px-10 py-20"`.

---

### Sizing Pattern



This sizing pattern is another Tailwind pattern that's used for several different properties. We see it here for padding as in `.p-24`, but it's also used for margin (`.m-24`), height (`.h-24`), and width (`.w-24`).

Margins follow the same basic structure as padding with a few changes:

- Margin classes start with an `m`, and the pattern is `.m{direction}-{size}`. Like padding, you can specify multiple margins in different directions.
- All directions have an additional size option: `-auto`. Auto is the margin option that horizontally centers the element within its parent container.

---

1. <https://tailwindcss.com/docs/padding>

You can do an auto on the top and bottom, but it doesn't have any effect. (We'll look at how to vertically center elements in [Chapter 5, Page Layout, on page 37.](#))

- Margins can be negative, which moves an element closer to the next element than it otherwise would be, rather than farther away, placing it inside the margin of the element next to it. A negative margin starts with `.-m` instead of `.m` and has the same direction and size options as regular margins.

## Borders

Borders are similar to margins and padding but are more complicated because they can have their own color and style.

The size options for borders are more limited because you don't typically want borders as big as margins might get. More importantly, the size options for borders are measured in pixels, not rem. The most basic border option is simply `.border`, which gives you a 1-pixel border in all four directions.

After that you have `.border-{side}-{size}`. But unlike padding and margins, a dash is included before the side. The side options are: `-b`, `-t`, `-l`, and `-r`. Not including a side applies the size to all four sides. The size is also optional: `-0`, `-2`, `-4`, and `-8`, which is the width of the border in pixels. No specified size means a size of 1.

If either the side or the size isn't included, you don't need the prefixing dash. For example, valid border width classes include: `.border-2`, which doesn't specify a side and gives you a 2-pixel border on all sides; `.border-b`, which doesn't specify a size and gives you a 1-pixel bottom border; and `border-r-4`, which results in a 4-pixel right border. Unlike margins or padding, Tailwind doesn't provide paired horizontal or vertical options for border width; you need to specify both sides separately as in `class="border-t border-b"`.

Border lines may have a style, for which you'd use a separate Tailwind utility class. The default is a solid border, which is indicated with `.border-solid`. Tailwind also provides utilities for `.border-dashed`, `.border-dotted`, `.border-double`, and `.border-none`.

Border lines may also have a color and an opacity. The border color and opacity options are exactly the same as the text color options, only prefixed with `.border`. For example, you can specify color with `.border-{color}`, as in `.border-gray-500`, and opacity with `.border-opacity-{level}`, as in `.border-opacity-50`. The colors and opacity levels are the same as for text.

Finally, borders may be round. Tailwind provides the following nine basic rounded options, each of which specifies the radius size in rem:

Class	Radius Size
.rounded-none	Specifies a radius of 0, for no rounding at all
.rounded-sm	0.125rem
.rounded	0.25rem
.rounded-md	0.375rem
.rounded-lg	0.5rem
.rounded-xl	0.75rem
.rounded-2xl	1rem
.rounded-3xl	1.5rem
.rounded-full	Sets the border radius to effectively infinity (okay, 9999 pixels) allowing for something to look like a circle rather than a rounded rectangle

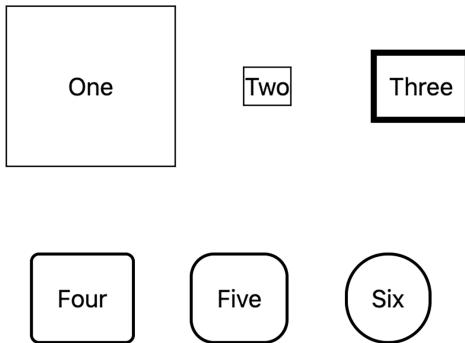
You might want to round only one or two corners. The only case I can think of for this offhand is if you have a lot of elements grouped together into a larger rounded rectangle. If you want, you can insert a direction between .rounded and the size. You can specify both corners on a side with a direction of b, t, l, or r. You can also specify a single corner with tl, tr, bl, or br. Legal options might include .rounded-tr-md or rounded-b-full.

Here's a small example of some of the margin and border options:

```
main/app/views/home/box.html.erb
<div>
  <div class="mb-10">
    <button class="p-10 border border-black">One</button>
    <button class="m-10 border border-black">Two</button>
    <button class="m-2 p-2 border-4 border-black">Three</button>
  </div>
  <div>
    <button class="m-4 p-4 border-2 border-black rounded-md">Four</button>
    <button class="m-4 p-4 border-2 border-black rounded-2xl">Five</button>
    <button class="m-4 p-4 border-2 border-black rounded-full">Six</button>
  </div>
</div>
```

As shown in the [image on page 30](#), in the top row, the first button specifies padding and a border outside the padding. The second button specifies a margin, and the border is inside the margin. The bottom row of buttons shows different rounded radius options.

Tailwind has a different way to specify a border called a *ring*. Rings have big advantages over borders: they actually look good and work well on rounded



elements. Also, rings are implemented using CSS box shadow properties, so they don't affect layout spacing.

Rings can have width, color, opacity, and an optional offset. If color isn't specified, the default color is a not-fully opaque blue, which makes it look like the button has focus. The pattern is `.ring-{width}`, where the width is 0, 1, 2, 4, and 8, corresponding to the pixel width of the ring (like a border). There's also simply `.ring`, which is three pixels, and `.ring-inset`, which draws the ring in the content part of the box, rather than the border part of the box.

The pattern `.ring-{color}` works with any defined color to change the color of the ring, and `.ring-opacity-{level}` changes the opacity, again with the same levels as text opacity. `.ring-offset-{pixels}` offsets the ring slightly, and `.ring-offset-{color}` gives the offset ring a color.

Here's an example:

```
main/app/views/home/box.html.erb
<div>
  <button class="m-4 p-4 rounded-md ring">Four</button>
  <button class="m-4 p-4 rounded-2xl ring-2">Five</button>
  <button
    class="m-4 p-4 rounded-full ring-4 ring-offset-4 ring-offset-black">
    Six
  </button>
</div>
```



## Background Color

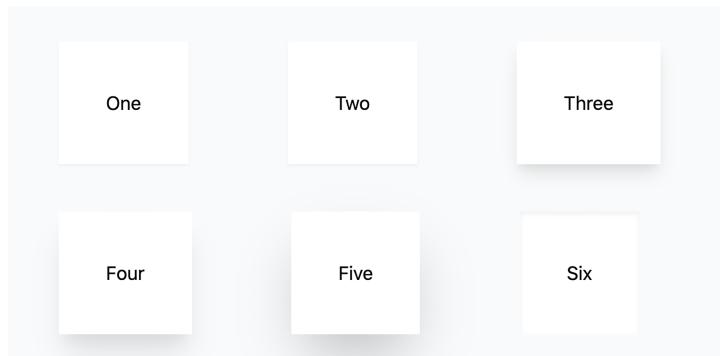
Tailwind's background color is similar to text color and border color: the pattern is `.bg-{color}` with the same color names the other groups use (`.bg-red-700` or `.bg-orange-300`). Tailwind also provides `.bg-opacity-{level}` with the same steps as text opacity.

### Shadows

Technically, a box shadow isn't a background color, but it's sort of used like one. Tailwind provides a few utilities to manage the box shadow. The base utility, `.shadow`, effectively creates a 10% opacity black border that's 1-pixel vertically offset, with a 3-pixel width. You can then make that smaller with the `xs` and `sm` modifiers or bigger with the `md`, `lg`, `xl`, and `2xl` modifiers (`.shadow-sm`, `.shadow-xl`, and so on).

Separately, you can have a small inset shadow with the `.shadow-inner` class, which makes the element look like it's lower than the rest of the screen. (Sorry, no size variants.) And you can cancel all of these with `.shadow-none`. As you can see in the following example, it's a pretty subtle effect unless you make it large:

```
main/app/views/home/box.html.erb
<div class="bg-gray-50 p-10">
  <div class="mb-10">
    <button class="p-10 mx-10 shadow-sm bg-white">One</button>
    <button class="p-10 mx-10 shadow-sm bg-white">Two</button>
    <button class="p-10 mx-10 shadow-lg bg-white">Three</button>
  </div>
  <div>
    <button class="p-10 mx-10 shadow-xl bg-white">Four</button>
    <button class="p-10 mx-10 shadow-2xl bg-white">Five</button>
    <button class="p-10 mx-10 shadow-inner bg-white">Six</button>
  </div>
</div>
```



## Gradients

Tailwind also lets you set the background as a gradient, which requires you to specify multiple classes on the same element. I think this is the first time we've seen a case where you need multiple Tailwind classes to get something to work right, which is a pattern we'll see more frequently as we look at page layout options in the next chapter.

In pure CSS, you specify a gradient by assigning the `background-image`: property a value from a `linear-gradient` function. You specify a direction, a “from” color (which is the starting point of the gradient), and a “to” color (which is the ending point). Optionally, you can specify a “via” color, which is a middle point.

Tailwind provides utilities with the pattern, `.bg-gradient-to-{direction}`, and the four sides as directions: `t`, `b`, `r`, and `l`. So `.bg-gradient-to-t` means the gradient “from” color starts at the bottom and shades to the “to” color, which is at the top, while `.bg-gradient-to-r` means that the “from” color is at the left, and the “to” color is at the right.

You also get four corner directions: `tl`, `tr`, `bl`, and `br`, which combine to provide a diagonal gradient. So `.bg-gradient-to-tr` is a gradient going diagonally from bottom left to top right.

`bg-none` clears the gradient.

With the direction set, we can then add in the colors. We use the same color names we've already seen, but with the prefixes `.from-`, `.to-`, and `.via-`. To go from red to blue and right to left, you'd need three classes:

`bg-gradient-to-l from-red-500 to-blue-500`

If you want to stop at yellow in the middle, you'd add a “via”:

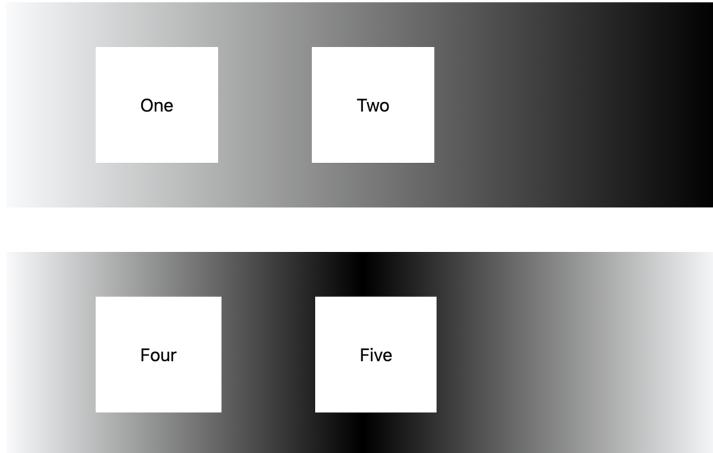
`bg-gradient-to-l from-red-500 to-blue-500 via-yellow-500`

If you specify a “from” or both “from” and “via” without specifying a “to” color, the gradient will shade toward transparent.

Because this book isn't printed in color, I have limited options for showing the true effects of a gradient, but here's an example in grayscale:

```
main/app/views/home/box.html.erb
<div>
  <div class="mb-10 bg-gradient-to-r from-gray-50 to-black p-10 w-1/2">
    <button class="p-10 mx-10 bg-white">One</button>
    <button class="p-10 mx-10 bg-white">Two</button>
  </div>
```

```
<div class="mb-10  
    bg-gradient-to-r from-gray-50 via-black to-gray-50  
    p-10 w-1/2">  
    <button class="p-10 mx-10 bg-white">Three</button>  
    <button class="p-10 mx-10 bg-white">Four</button>  
</div>  
</div>
```



## Background Images

CSS has a lot of properties for displaying a background image, and Tailwind provides utilities for almost all of them.

### Positioning

First and foremost, you can specify how the background image is positioned in the box. This tells CSS which side of the image should touch which side of the box. Tailwind provides nine utilities. The first one centers the image in the center of the box:

.bg-center

Eight directions exist, including four sides:

.bg-left

.bg-right

.bg-top

.bg-bottom

Four corner utilities are also available:

```
.bg-left-top  
.bg-left-bottom  
.bg-right-bottom  
.bg-right-top
```

I'm genuinely not sure why the horizontal side goes first here when the vertical side has gone first in all the other instances when we've talked about corners. Nor do I know why they're spelled out.

## Tiling

If the image is smaller than the box, you have the option to tile it. `.bg-repeat` tiles the image horizontally and vertically. To go in only one direction, you'd use `.bg-repeat-x` or `.bg-repeat-y`. The utility `.bg-no-repeat` resets everything.

Two special options, `.bg-repeat-round` and `.bg-repeat-space`, change how the tiling places the images. The default repeat will put a partial image at the end of the box. If you choose `.bg-repeat-space`, there will be no partial image and any whitespace will be distributed evenly between the tiled images. If you choose `.bg-repeat-round`, there will be no whitespace because each image will be stretched to cover the whitespace.

## Scrolling

A common effect is to hold the background in place when the page scrolls so that the viewport shows a different part of the image as the user scrolls through. Tailwind lets you do this with `.bg-fixed`; the opposite of which is `.bg-local` or `.bg-scroll`, depending on whether you want a scroll bar in the viewport itself or not.

## Location

You can specify the part of the box that will contain the image. The default is `.bg-clip-padding`, where the background image displays in the content and padding parts of the box, but not in the border. You can also make the image cover the border with `.bg-clip-border`, or you can limit the image to only the content and not the padding with `.bg-clip-content`.

More interestingly, `.bg-clip-text` shows only the background image inside the shape of the content text. You'll want to combine this with `.text-transparent` so the text color won't block it, but then you can see the background color or image only in the text. If you combine this with gradients, you get a text gradient as shown in this example:

```
main/app/views/home/box.html.erb
<div class="bg-gray-50">
  <div class="text-6xl font-bold p-10">
    <div class="bg-clip-text text-transparent
      bg-gradient-to-l from-gray-50 to-black
      py-2">
      NorthBy: A Premium in Sight and Sound
    </div>
  </div>
</div>
```

## NorthBy: A Premium in Sight and Sound

### Specifying Images

If you want a background image that comes from a URL, Tailwind provides utilities for how that image is displayed, but not for the URL itself. You have two options for specifying the background image URL: (1) you can use the style= attribute of the DOM element, as in `<div style="background-image: url(whatever)"></div>`, or (2) you can create your own CSS utility classes:

```
.bg-pattern-image {
  background-image: url(whatever);
}
```

### Height and Width

The height and width of elements are notoriously difficult to manage in CSS. Tailwind provides some utilities for sizing, but remember that sizing is also often dependent on the available size based on both the parent elements and the content.

Tailwind uses the patterns `.w-{size}` and `.h-{size}` for the width and height utility classes. For both directions, Tailwind offers a set of fixed size options based on the same sizing scale and the same set of numbers we've seen for padding and margins, with each number corresponding to 0.25rem.

Special options include these:

- auto auto-sizing
- px single pixel
- full 100% of the parent container
- screen 100% of the viewport

For height, those are the only special options. You can use classes like `.h-0`, `.h-8`, or `.h-px`.

For width, you have all those fixed width options like `.w-2`, `.w-auto`, or whatever. But a series of relative width options are also available. Tailwind gives you a series of fractional options, such as `.w-1/2` for 50%. You get fractions for halves, thirds, quarters, fifths, sixths, and twelfths. All of these are actual Tailwind utility classes: `.w-3/4`, `.w-2/6`, `.w-7/12`. You can use these widths to fake a grid layout, but it's easier to use an actual grid layout, as you'll see in [Chapter 5, Page Layout, on page 37](#).

CSS also allows you to specify the minimum and maximum height and width, and Tailwind gives you limited utilities for them. On the minimum side, you have `.min-h-0` and `.min-h-full`, and `.min-w-0` and `min-w-full`, giving you a minimum size of zero or of the entire parent container.

For height, you also have a viewport option: `.min-h-screen`.

On the maximum side, for height, you only have `.max-h-full` and `.max-h-screen` for the full parent container height or the full screen height, respectively.

Maximum width has more options. You still have a 100% of parent option, `.max-w-full`, but the screen option is based on screen size: `.max-w-screen-sm`, `.max-w-screen-md`, `.max-w-screen-lg`, and `.max-w-screen-xl`. (I'll talk more about the screen widths in [Chapter 7, Responsive Design, on page 53](#).)

You also have a series of relative width options, starting with `.max-w-none`, which has no max width, and size options from `-xs` to `6xl` ranging from `20rem` to `72rem`.

Now that we've got our boxes set, let's talk about laying out entire pages.

# Page Layout

In the previous chapter, we looked at ways you can use Tailwind to control the display of a single DOM element. In this chapter, we'll look at how Tailwind can manage the layout of multiple elements.

With Tailwind, you can lay out the elements on an entire page and manage common features like navigation, sidebars, and footers. You can also use Tailwind to put together complex groupings of elements within a page, such as cards or hero blocks.

Let's start with some general utilities Tailwind provides to help place elements on a page: the box-to-box relationships.

## Containers

Many CSS frameworks use a `container` class as the general top-level container to specify page width. While Tailwind does offer a `.container` utility, Tailwind's version does much less than similar classes do in other frameworks. All the `.container` utility does in Tailwind is specify the `max-width` of the element based on the width of the browser viewport. For example, any viewport between 640 and 768 pixels wide would be set to a `max-width` of 640 pixels. Once the viewport goes over 768, the `max-width` stays at 768 pixels until the viewport hits 1024 pixels and then jumps again when the viewport reaches 1280 pixels.

The advantage of using a `container` is that it allows you to only worry about those specific widths in your design rather than having to take into account any possible width the viewport might have.

---

### Viewports



In CSS, the **viewport** is the area of the browser where the user can see content. Usually, the dimension of concern is the width of the viewport, because that determines how much content can be placed across the screen without scrolling horizontally. The HTML meta tag is used to control the viewport width on mobile screens. By default, mobile browsers often assume a wider display than the actual device (often 980 pixels) and scale the content to fit on screen. That usually looks terrible. You should use the `width=device-width,initial-scale=1` attribute for the browser to use the device size as the viewport rather than scaling the display down from a wider size.

If you're familiar with other frameworks, Tailwind's `.container` won't have features you may be expecting. A Tailwind `.container` doesn't automatically horizontally center its child elements. To get centering behavior, you pair the container with `mx-auto`. A Tailwind `.container` also doesn't introduce a padding or margin to pull its elements away from the browser's border. To get this behavior, you pair the container with an `.m-` or `.p-` utility. So a plausible class list for your top-level element might be `class="container mx-auto py-12 px-6"`.

## Floats and Clears

Although a fresh new design will likely use the grid and flexbox tools described in the rest of this chapter to position elements, if you're using Tailwind in a legacy project, you might still need to deal with floats and clearfixes.

In CSS, the `float` property positions content inside its container. Typically, the `float` property is used to position a particular element, often an image, to one side or the other of its container, allowing the rest of the container, often text, to stay completely on the other side, rather than mixing the elements together.

Tailwind provides `.float-left` and `.float-right` for positions, and `.float-none` as a reset option.

The CSS `clear` property forces an element to be placed below any elements it might otherwise overlap with on one or both sides. (Technically, it prevents other elements from floating, which amounts to the same thing.) Tailwind provides utilities to specify a clear behavior on either side, both sides, or no sides: `.clear-left`, `.clear-right`, `.clear-both`, and `.clear-none`.

## Position and Z-Index

In CSS, the `z-index` property is an integer determining how items stack on top of each other along what would be the “z axis” if you ran an axis outward perpendicular to the screen. Tailwind provides the pattern, `.z-[index]`, where the index can be 0, 10, 20, 30, 40, 50, or auto. I’m a little surprised there isn’t a negative option by default, but you can add one in the configuration file (see [Chapter 8, Customizing Tailwind, on page 59](#)).

## Tables

The classic way of spacing HTML pages is the table. Unless you’re actually displaying tabular data, a CSS grid is now preferable for layout purposes, so Tailwind doesn’t provide many specific table utilities.

Tailwind lets you use `.table-auto` to keep the default browser behavior of auto-spacing the columns of a table based on its content. If you want to explicitly specify column widths, you can use `.table-fixed` on the `<table>` element and then put an explicit width helper on each column of the table—the fractional helpers are useful for this:

```
main/app/views/home/page.html.erb
<table class="table-fixed border border-collapse">
  <tr>
    <th class="border border-black w-1/6">Small</th>
    <th class="border border-black w-2/6">Medium</th>
    <th class="border border-black w-3/6">Large</th>
  </tr>
</table>
```

<b>Small</b>	<b>Medium</b>	<b>Large</b>
--------------	---------------	--------------

Tailwind also lets you merge the borders of adjacent table cells with the help of the `.border-collapse` utility, which is reset with `.border-separate`.

As you’ll see in [Chapter 8, Customizing Tailwind, on page 59](#), Tailwind can let you use an `odd:` or `even:` prefix to give tables alternating row colors.

## Grids

One of the great innovations of the first round of CSS frameworks was support for a grid layout where you could easily place things on a 12-column grid. The existence of grid spacing made page layout much easier. Over time, the

frameworks became even more flexible and eventually grid support was built directly into CSS.

Grids are still great for a lot of layout choices, and Tailwind offers useful utilities for setting up a grid layout using the CSS grid properties. First, there's `.grid`, which is a utility for the CSS property, `display: grid`. You need the `.grid` utility as part of the class list at the top level of your grid, above the individual elements of the grid.

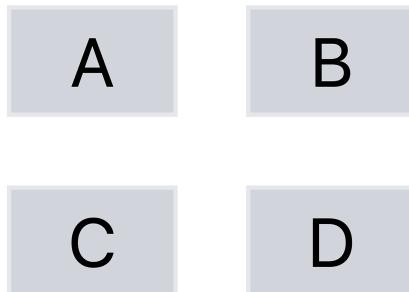
Once you've created a grid element, you can use Tailwind to specify the number of rows or columns in that grid. You can also adjust the behavior of individual elements in the grid. You can specify a start or end point for an element in the grid, you can specify the span of rows or columns the element takes up, or you can change the spacing of each element inside the grid.

The most common use of a grid is to separate the page into a series of columns, which you can do in Tailwind with the `.grid-cols-{count}` helpers. These go from `.grid-cols-1` to `.grid-cols-12`, each of which separates the page into that many columns. The reset out of grid-land is `.grid-cols-none`.

Unlike some other CSS grid frameworks, you don't need to explicitly specify a row. Inside a grid, CSS will autofill down to the next row based on the number of columns you declare. For example, you can use something like this:

```
main/app/views/home/page.html.erb
<div class="grid grid-cols-2 w-1/4 gap-4">
  <div class="border bg-gray-300 text-center">A</div>
  <div class="border bg-gray-300 text-center">B</div>
  <div class="border bg-gray-300 text-center">C</div>
  <div class="border bg-gray-300 text-center">D</div>
</div>
```

You wind up with a 2x2 grid with A and B on the top row and C and D on the bottom row, like this:



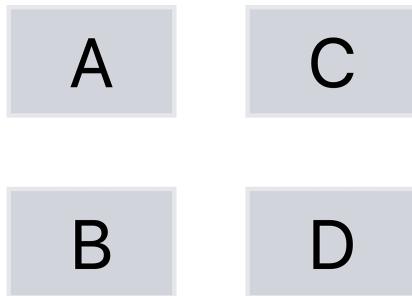
A cool feature of CSS grids that's hard to do in some of the other CSS frameworks is that you can use a 90-degree twist by specifying the number of rows. In Tailwind, this is done with the `.grid-rows-{count}` helper, which can have a suffix of 1 to 12 or none.

You can also specify the direction in which data flows through the grid. The default, `.grid-flow-row`, causes elements inside the grid to flow horizontally in rows, as you saw in the earlier example. This is the normal behavior of DOM elements that you're probably familiar with.

Or you can use `.grid-flow-col`, in which case elements in the grid fill vertically column by column, like so:

```
main/app/views/home/page.html.erb
<div class="grid grid-rows-2 w-1/4 gap-4 grid-flow-col">
  <div class="border bg-gray-300 text-center">A</div>
  <div class="border bg-gray-300 text-center">B</div>
  <div class="border bg-gray-300 text-center">C</div>
  <div class="border bg-gray-300 text-center">D</div>
</div>
```

This gives you a 2x2 grid, but the A and B are the left column, while C and D are the right column, like this:



As you can see in the previous examples, you can add a gap between table cells with the conveniently named `.gap-{size}` helper, which takes a suffix that's the size of the gap, using the same “some numbers from 0 to 96 and also px” measurement scheme we saw for padding and margins. If you want the gap to only be horizontal, you can use `.gap-x-{size}`. And if you want the gap to only be vertical, use `.gap-y-{size}`.

## Span

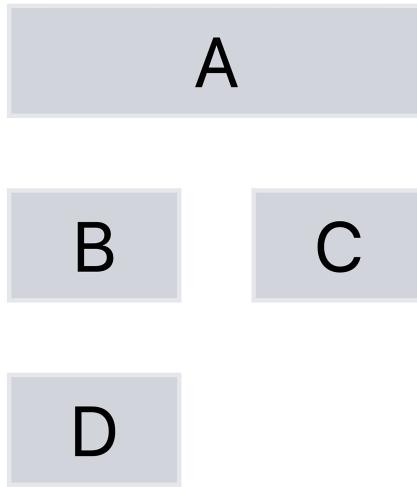
As with CSS tables, sometimes you want a cell to cover more than one row or column. Tailwind offers two ways to manage this: `span` and `start/end`.

Using `span`, you specify the number of columns or rows you want the cell to take up with `.col-span-{count}` or `.row-span-{count}`, where the suffix is the number of columns or rows. The default then is `.col-span-1` or `.row-span-1`. The reset helpers are `.col-span-auto` and `.row-span-auto`.

The important part is that the flow behavior still continues. If you add a `span` to the first element, our four-cell example is this:

```
main/app/views/home/page.html.erb
<div class="grid grid-cols-2 w-1/4 gap-4">
  <div class="border bg-gray-300 text-center col-span-2">A</div>
  <div class="border bg-gray-300 text-center">B</div>
  <div class="border bg-gray-300 text-center">C</div>
  <div class="border bg-gray-300 text-center">D</div>
</div>
```

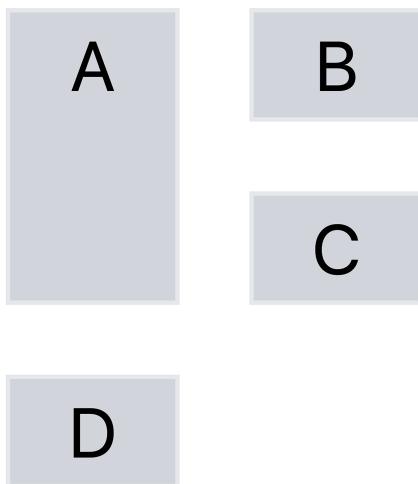
You get this as a result:



You can also span elements row-wise:

```
main/app/views/home/page.html.erb
<div class="grid grid-cols-2 w-1/4 gap-4">
  <div class="border bg-gray-300 text-center row-span-2">A</div>
  <div class="border bg-gray-300 text-center">B</div>
  <div class="border bg-gray-300 text-center">C</div>
  <div class="border bg-gray-300 text-center">D</div>
</div>
```

The result looks like this:



## Start/End

You can adjust the placement of a grid item by specifying its start and end with `.col-start-{column}` and `.col-end-{column}` or `.row-start-{row}` and `.row-end-{row}`, where the suffix is either the number of the location or the reset value, auto. The key points are that the lowest start location is 1 and the end location is exclusive, meaning it's not part of the item. Declaring an item as `class="col-start-2 col-end-4"` means the element will encompass column 2 and column 3, but not column 4.

By default, the start and end locations are automatically determined by the placement of the previous items in the grid, and the span is 1. You can specify any two of the start, end, and span items, and the layout will work. For example, `class="col-span-3, col-end-5"` would take up columns 2, 3, and 4—spanning 3 columns and ending before the fifth column.

## Flexbox

Flexbox is a different way to manage multiple related elements. Where a grid is designed as a two-dimensional layout, a flexbox layout is one-dimensional, placing items one after another in a row or column.

I realize that sounds boring.

But flexbox is likely to be more useful to you than a grid layout for three reasons:

- A flexbox container has better controls for dynamically managing the size of elements.
- Although a flexbox container is conceptually a single row, it can be made to automatically wrap its contents on the screen when the contents get too wide.
- Flexbox containers can be nested, meaning you can start with a flexbox row, but elements inside that row could themselves be flexbox columns, which in turn could contain flexbox rows. Nesting flexboxes gives you a lot of options for controlling layout.

Grids are still useful for managing content that's tabular in nature, which is true of some data display, but not true of every kind of layout.

Think about a common page structure, where you have a full-width header, below that a left and right sidebar with main content in the middle, and below that, a full-width footer.

You could think of that layout as a grid: the header is the first row of the grid that has one element with a column span of three. The second row has three elements for the sidebars and the main content, width-adjusted, and the third row has another element with a column span of three, like this:

```
main/app/views/home/page.html.erb
<div class="grid grid-cols-3 gap-4 w-1/3">
  <div class="text-center col-span-3">Header</div>
  <div class="text-center w-1/5">Left Sidebar</div>
  <div class="text-center w-3/5">Content</div>
  <div class="text-center w-1/5">Right Sidebar</div>
  <div class="text-center col-span-3">Footer</div>
</div>
```

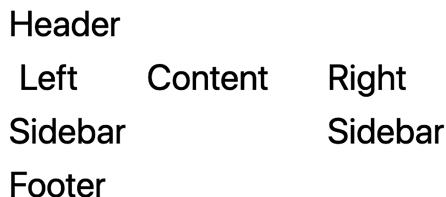
That's not bad, but you can also think of the layout as a flexbox. Your flexbox could be a column with three elements, whose second element is a row with three elements, like this (we'll look at what these utilities mean in a second):

```
main/app/views/home/page.html.erb
<div class="flex flex-col w-1/3">
  <div class="flex-grow">Header</div>
  <div class="flex flex-row">
    <div class="text-center w-1/5">Left Sidebar</div>
    <div class="text-center w-3/5">Content</div>
    <div class="text-center w-1/5">Right Sidebar</div>
  </div>
  <div class="flex-grow">Footer</div>
</div>
```

Or, you can think of the page as a single row that happens to wrap like this:

```
main/app/views/home/page.html.erb
<div class="flex flex-row flex-wrap w-1/3">
  <div class="w-full">Header</div>
  <div class="text-center w-1/5">Left Sidebar</div>
  <div class="text-center w-3/5">Content</div>
  <div class="text-center w-1/5">Right Sidebar</div>
  <div class="w-full">Footer</div>
</div>
```

All three of these approaches will give you more or less this layout:



It turns out that the flexbox is more, well, flexible than a grid. In particular, flexbox layouts are much easier to adapt to different screen sizes.

## Direction and Axis

The foundation of how a flexbox lays out elements is its direction, which you set with Tailwind utilities. The direction can be either horizontal, with `.flex-row`, or vertical, with `.flex-column`. You can go backward in your flow with `.flex-row-reverse` and `.flex-col-reverse`. The axis in the direction of the flow is referred to as the *main axis*, while the other direction is referred to as the *cross axis*.

In Tailwind, the parent flexbox container must include the class, `.flex` (in the same way grids need to have the class, `.grid`).

An important thing to know about the row direction is that it's not necessarily left to right; the rows flow in the direction of the text. So, if you internationalize your text to, say, Hebrew, all your flexboxes will automatically flip direction. The column's main axis is always top to bottom.

## Order and Wrap

The next most important property of the flexbox is whether it'll wrap, which is a property of the parent of the box. The default is not to wrap, `.flex-no-wrap`, but if you specify `.flex-wrap`, then your row container will automatically move items to the next row if the item would overflow the main axis of the container. Normally, that'd be going over the width of a row flexbox, but you could also

explicitly set the height of a column box and have it wrap. If for some reason you're living in the Upside Down, Tailwind provides `.flex-wrap-reverse`.

You can explicitly specify the order of the elements in the flexbox with the `.order-{integer}` utility, where the suffix is any integer from 1 to 12, or you can use `.order-first`, `.order-last`, or `.order-none`. If the order is specified for one or more elements in the flexbox, then that order property determines where in the box that element goes, overriding the order in which the element appears in the source HTML.

One great use of this property is to allow the main content to come before the other elements in the source order, but still display correctly. This code provides the same layout as the snippet shown earlier:

```
main/app/views/home/page.html.erb
<div class="flex flex-row flex-wrap w-1/3">
  <div class="text-center w-3/5 order-3">Content</div>
  <div class="w-full order-1">Header</div>
  <div class="text-center w-1/5 order-2">Left Sidebar</div>
  <div class="text-center w-1/5 order-4">Right Sidebar</div>
  <div class="w-full order-5">Footer</div>
</div>
```

A reason why you might want to do that is to allow an adaptive screen reader to get to the content quickly while still allowing the visual display of the page to place the content in the middle.

## Grow, Shrink...Flex

The “flex” in flexbox comes from the ability of a flexbox container to change the size and placement of its items dynamically. Tailwind gives you access to common defaults. These are properties that are placed on the elements inside a flexbox, not on the parent.

If you don't want an item to grow or shrink, you specify it as `.flex-none`, which will keep it at its default size. If you want the item to be able to grow or shrink as needed to fill the available size of the container, you use `.flex-auto` or `.flex-1`. The difference between the two is that `.flex-auto` starts with each element's default size and then increases or decreases size for each element that's able to grow or shrink, whereas `.flex-1` resets each item to zero size and equally assigns space to all items, regardless of their natural size. In general, using `.flex-1` on a set of items will give you equally sized items, and `.flex-auto` won't.

You can choose to specify shrink behavior without touching grow behavior. To allow shrinking, use `.flex-shrink`, and to prevent shrinking, use `.flex-shrink-0`.

Similarly, `.flex-grow` and `.flex-grow-0` allow and prevent the element growth without affecting shrink behavior.

## Box Alignment

In addition to using flexbox to place items on the page, Tailwind includes utilities that allow you to be more specific about the alignment and justification of elements within the flexbox. These utilities also work for grid layouts, where appropriate.

I talked about how a flexbox container has a main axis and a cross axis. The Tailwind utilities that affect placement along the main axis all start with `justify-`, and utilities that affect placement across the cross axis don't. These names are chosen to match the names of the underlying CSS properties.

### Main Axis

Let's look at the main axis first. Items can be placed along the main axis in two ways: (1) by placing items along the main axis of the entire flexbox, and (2) by placing an individual item along the main axis of its own box within the flexbox container. Both of these placements can be defined separately and include utilities that are properties of the parent flexbox container, not individual elements.

When placing elements along the main axis, Tailwind includes utilities for how items are placed if the total width of the items is less than the width of the flexbox container. These utilities control how the extra spacing is allocated.

Three utilities squeeze the elements together as closely as they can:

- `.justify-start` places the elements against the beginning of the axis, based on the text direction.
- `.justify-end` puts the items against the end of the axis.
- `.justify-center` centers the items—a longstanding CSS frustration.

Three utilities space the elements, and they differ in exactly where the spacing is placed:

- `.justify-between` places the first element against the beginning of the flexbox, the last element against the end of the flexbox, and then even spacing between internal elements. If the flexbox has three items, you get a pattern of AxBxC.

- `.justify-evenly` places an equal amount of space around each item. If the flexbox has three items, four identically sized spaces are placed around them with a pattern of `xAxBxCx`.
- `.justify-around` places identical spacing around each side of each item. In practice, this makes the end spacing less than the internal space because each internal space contains the left space of one element and the right space of the other. If the flexbox has three items, six equally sized spaces are placed around them with a pattern of `xAxBxCx`.

An element's placing within its individual box can be controlled with a class on the container, with the options being `.justify-items-start`, `.justify-items-end`, and `.justify-items-center` for placement. If you want the item to expand to fill its space, you've got `.justify-items-stretch`, and the reset option is `.justify-items-auto`. Note that you'd normally use either a regular `.justify-` to space items or a `.justify-items-` to space items within a space, but you wouldn't normally need to do both. If a single element of the box wants to override the container's justification, you can use `.justify-self-` with the same five options that exist for `.justify-items`.

## Cross Axis

The utilities along the cross axis are all analogous to those of the main axis. Instead of `.justify-`, Tailwind offers `.content-` with the same six options, so `.content-start` pushes items against the top of a multi-row flexbox, while `.content-center` vertically centers them.

For an individual item, you have the same five options as for `.justify-items-`, but the prefix is simply `.items-`. So `.items-center` vertically centers items along the cross axis. Similarly, the same five options exist for a self override, but the prefix is only `.self-`, as in `.self-start` or `.self-center`.

Finally, you can manage both axes at the same time with the prefixes `.place-content-`, `.place-items-`, and `.place-self-`, with the result equivalent to having done both the main and cross axis spacing. So `.place-content-center` is equivalent to the combined `.justify-center` and `.content-center`, while `.place-items-start` is equivalent to `.justify-items-start` and `.items-start`.

Now, let's see how we can make these Tailwind utilities provide more dynamic behavior.

# Animation

---

In this chapter, we’re going to look at animations and transitions, which allow you to move items around the page using CSS properties. Tailwind doesn’t provide a full implementation of CSS animation and transformation behavior—that’d be a lot to ask of a utility framework. It does provide useful defaults for common behaviors, but even the Tailwind documentation admits that these are only suggestions and that most projects that use animation will need to define custom behavior.

## Helpful Small Animations

Tailwind provides four full animation utilities: `.animate-spin`, `.animate-pulse`, `.animate-bounce`, and `.animate-ping`. These classes define the CSS for an animation and a set of keyframes, so you can use them on an element as-is.

The first utility, `.animate-spin`, animates a full rotation of an object 360 degrees in one second. It’s designed to be used for things like a loading status marker. If you have an SVG or image you want to use, add `.animate-spin` to the SVG or image element (not its container), and the element will rotate.

Another common load behavior is to have dummy elements display and be gradually replaced by data as the server provides it. The second Tailwind utility, `.animate-pulse`, gives you a two-second transition between 0.1 opacity and 0.5, which produces a slight fade effect on the element.

The third utility, `.animate-bounce`, describes a one-second transition translating the vertical position down by 25% of the size of the element and then back to the original position, so it gives a slight downward bounce. I think this one works nicely as a `.hover:animate-bounce` to give a “you are here” effect.

You can give a notification effect a little animation with the fourth utility, `.animate-ping`, which is a one-second animation from regular size and opacity to twice the size and 0 opacity, which gives a pretty effective signal pulse effect.

All of these are negated by `.animate-none`.

## Transitions

In CSS, you can specify that one or more properties should gradually transition when they change values, rather than changing instantly. In a full client-side application, you might change values by using JavaScript to modify the CSS classes on an element. In Tailwind, you can use the prefixes to manage some CSS property changes merely in CSS. For example, an element with a class list of "bg-green-500 hover:bg-yellow-500" will change color from green to yellow when the user hovers over it, and the Tailwind transition utilities can make that happen gradually.

In most cases, you'd declare an element to have a class of `.transition`, which causes the element to use transition effects for the CSS properties, `background-color`, `border-color`, `box-shadow`, `color`, `fill`, `opacity`, `stroke`, and `transform`. Often that's all the properties you want to transition, but if you need to transition other properties, you can use `.transition-all` to place all properties under the transition banner.

If you want to limit the transition to certain properties, Tailwind provides several choices. Typically you would use these because there are changes in other properties that you want to happen instantly.

- `.transition-color`
- `.transition-opacity`
- `.transition-shadow`
- `.transition-transform`

For the transition to actually be visible, you need to specify a duration over which the transition will take place. The default is 0 (but can be changed in the Tailwind configuration), and Tailwind provides the `.duration-{milliseconds}` family of utilities, where the suffix is one of 75, 100, 150, 200, 300, 500, 700, or 1000, indicating the number of milliseconds the transition should cover.

You can also delay the start of the transition with `.delay-{milliseconds}` and the same set of numbers, indicating the number of milliseconds before the transition should start.

By default, the transition is applied linearly, meaning the change to the property happens in a series of identically-sized steps. That default is denoted by the Tailwind utility, `.ease-linear`. If you want the property change to start more slowly, speed up, and then slow down as it gets closer to the end, you can use `.ease-in-out`. (Or, you can use either `.ease-in` or `.ease-out` if you only want the slowdown on one side of the change.) The ease difference is subtle, but especially with motion, it can provide a sense of a change accelerating and then decelerating in a way that can look more natural and engaging.

## Transformation

CSS allows you to transform the box of an element in various ways, changing its size, location, rotation, or skew. Tailwind again gives you some reasonable defaults, which when combined with transitions and animation can allow you to build some great effects easily.

All of these transformation utilities need to be combined with `.transform`, which in turn needs to be declared as a class in the same element, as in "transform scale-100".

### Changing the Scale

Tailwind lets you change the scale of an element with the `.scale-{percentage}` family, where the suffix is the percentage to scale. The options are 0, 50, 75, 90, 95, 100, 105, 110, 125, and 150, which are, I think, designed to allow for subtle effects like "transform transition duration-1000 hover:scale-110" (which would make an element get slightly bigger on hover over the course of a second). Add in `hover:box-shadow-lg`, and it'd seem like the element was getting closer to the user on hover.

If you only want to scale in one direction, you can use `.scale-x-{percentage}` or `.scale-y-{percentage}` with the same set of numbers (scale-x-95, scale-y-125, and so on).

### Rotating

You can rotate an element with `.rotate-{degrees}`, which is a clockwise transformation of a number of degrees. The options are 0, 1, 2, 3, 6, 12, 45, 90, and 180. A counter-clockwise rotation is achieved with `.-rotate-{degrees}` and the same numbers.

Again, the design here is to make it easy for small effects. The rotation is, by default, around an axis in the middle of the element, which Tailwind denotes as `.origin-center`. You can move the origin around by adding the suffixes for the

same four directions and four corners that you've seen elsewhere to `.origin-` (for example, `.origin-top`, `.origin-bottom-right`, and so on).

## Skew and Translate

For skew, you have `.skew-x-{degrees}`, `.-skew-x-{degrees}`, `.skew-y-{degrees}`, and `.-skew-y-{degrees}`, which take the numerical suffixes 0, 1, 2, 3, 6, or 12, as the number of degrees in the skew.

You can flat out move an element with `.translate-x-{size}`, `.-translate-x-{size}`, `.translate-y-{size}`, or `.-translate-y-{size}`, each of which takes a numerical suffix. This moves the element along the direction using the same number scale you've seen for padding, margins, and the like, where each number represents 0.25rem. Positive directions are right and down, and negative directions are left and up.

In addition to the number set, you have as suffixes px for a single pixel, full for "move this the exact amount of its size in that dimension," and 1/2 for "move it half the amount of its size in that dimension," as in `translate-x-full` or `translate-y-1/2`.

## Other Appearance Things

You can also do other changes to cursors and text. You can override the cursor the user sees on hover with another standard cursor by using the utilities `.cursor-auto`, `.cursor-default`, `cursor-move`, `cursor-not-allowed`, `.cursor-pointer`, `cursor-text`, and `.cursor-wait`.

You can disallow text selection for copy and paste purposes in an element with `.select-none` and allow it with `.select-text`, or make the entire text autoselect on click with `.select-all`. (Please don't do this. It's somewhat user-hostile, but you may be asked to for certain kinds of perceived security or compliance reasons.)

Next, let's look at how Tailwind allows us to make our site look great at different screen sizes.

# Responsive Design

All the examples we've seen so far in this book have one thing in common: they aren't designed to look good on smaller screens, like on a smartphone or tablet. The process of making a CSS design that works on multiple-sized screens is called *responsive design*.

In plain CSS, responsive design can be a complicated tangle of CSS classes and @media tags. Tailwind provides prefixes that can be applied to any Tailwind utility to control the set of screen sizes.

Tailwind doesn't take away all the complexity of responsive design; you still need to consider many factors when you're designing for multiple sizes. For example, you need to think about which elements of your site are most important and need to be emphasized when the user is looking at a smaller screen. But Tailwind does make it easier to experiment with different designs at different sizes, and to be able to see all the different size designs at a glance. That said, responsive design in Tailwind can lead to extremely long CSS class declarations that can be hard to read.

In this chapter, we'll take a look at the responsive utilities in Tailwind as well as common patterns for applying them.

## Tailwind Screen Widths and Breakpoints

In CSS, various properties may be applied conditionally based on the width of the screen. These conditions are managed with the @media tag. The specific screen widths at which the design changes are often called *breakpoints*. In Tailwind, you can put a prefix on any Tailwind utility to specify the minimum screen width where that utility should be applied. But Tailwind behaves a little differently than other responsive frameworks.

Some important behaviors to note include these:

- Any responsive prefix causes the utility to take effect at the specified screen width or any larger screen width.
- Tailwind utilities define a minimum width to take effect but not a maximum width.
- If no prefix is used, the default minimum width is 0—the utility is always in effect.

If you define something as being for small screen widths, Tailwind applies that behavior all the way up—small, medium, large, and beyond. If you want behavior only on small screens, you define the small-screen behavior without a prefix and the canceling behavior with a mid-screen or wide-screen prefix.

Tailwind defines five screen widths by default. For these five screen widths, the pixel width is the logical width of the screen. On a device with a retina screen, where a logical pixel would be made up of more than one physical pixel, we still use the logical screen. The iPhone 12 is 390 logical pixels wide, for example, even though it's 1170 physical pixels wide.

The five screen widths are:

Small (`sm:`)—640 pixels and up

Medium (`md:`)—768 pixels and up

Large (`lg:`)—1024 pixels and up

Extra large (`xl:`)—1280 pixels and up

Extra extra large (`2xl:`)—1536 pixels and up

The following table offers a partial list of existing device widths<sup>1</sup>:

Device	Logical Pixels
Galaxy S20	360
Galaxy S20 sideways	800
iPhone 12	390
iPhone 12 sideways	844
iPad Air 3	834
iPad Air 3 sideways	1112
iPad Pro 12"	1024
iPad Pro 12" sideways	1366
MacBook Air	2560 (often scaled to 1680)

---

1. <https://ios-resolution.com>

The key point is that if you define something as `sm:` (for example, `sm:m-2`), that `m-2` utility is defined for all screens that are sized 640 pixels and up. If you want to change that margin on a larger screen, you can define a utility with a larger prefix—you are guaranteed that the larger prefixes will take priority over smaller ones. So you could do `sm:m-2 md:m-4 lg:m-8` to have your margin get progressively wider as you have more screen width.

The general way to approach these patterns is this: the utilities that don't have prefixes should describe the behavior you see on the smallest screen, and then you bring in prefixed utilities to adjust behavior as the screen gets bigger. The idea is that you'll define your design for mobile devices first, and then use the prefixes to adjust the design for larger screens.

I've tried to be pretty consistent about pointing out negation or default utilities even when it isn't clear where they might be used. The responsive utilities are where these negation utilities are used. In Tailwind, the width prefixes apply at their size and up. If you want to unapply a utility at a wider width, you need to negate it explicitly at the larger width. For example, something like `sm:shadow-xl md:shadow-none` uses the `.shadow-none` reset utility to undo the `.shadow-xl`. Using both of these on an element would give you a box shadow for a width between 640 and 768 (if for some reason you wanted to do that).

It's worth mentioning that you can combine screen size with other prefixes: `md:hover:font-bold lg:hover:font-black` is perfectly legal.

## Hide Based on Size

One way to make your application fit on a smaller screen is by hiding parts of the user interface on the smaller screen. In this case, because the smallest screen behavior is hidden, the unprefixed property is `.hidden`. At larger sizes, you might want the item to display, so you add in `.lg:block` (or whatever breakpoint you want to start seeing the item at), winding up with `class="hidden lg:block"`.

Sometimes you may want to go the other way and display an element at a smaller size but not at a larger one. It's quite common to have an element for a hamburger menu replace a navigation bar on small size, but then disappear on a device that's large enough to show all the navigation. In that case, the small-size behavior is to display, which is the default, and you add the hiding behavior in as a breakpoint, as in `class="lg:hidden"`.

Similarly, it's common to drop the size of header text on smaller devices. The lower size is the minimal width default, so the resulting DOM classes would look something like `class="text-xl md:text-2xl lg:text-4xl"`. (See [Duplication, on page 12](#) for hints on how to avoid needing to constantly type all that.)

## Fewer Grid Columns on Small Devices

In general terms, the goal of a lot of responsive design is to simultaneously allow information to be stacked at small sizes and spread out into rows when the space exists at larger sizes. Exactly how you want to do this depends on your goal.

One possibility is that you have a set of card-like elements, something like the featured posts on a news site, where the data isn't actually a table but a series of items laid out in a row.

In this case, you might want the items to fill the entire width of the screen but the number of items to vary based on the size of the screen. On a smartphone, you might want only one item across the screen; on a desktop, maybe four. So you can use something like this:

```
<div class="grid items-stretch
      md:grid-cols-2 md:gap-4
      lg:grid-cols-4 lg:gap-4">
  <div class="mb-6 lg:mb-0"></div>
  ...
</div>
```

A couple of things are going on here. The parent div is a grid at all widths, but the default grid size at the narrowest width is 1, growing to 2 on a medium screen and to 4 on a large screen. `items-stretch` means that each individual child element will stretch to fill its portion of the width, which means they'll get bigger as the screen gets bigger until the next breakpoint and then more items will be added to each row. We also increase the gap between items as the screen gets bigger. For the child items, we have margin bottom `mb-6` when only one element is in the row so that there's some spacing, but the margin bottom goes away when the screen gets larger, with `lg:mb-0`.

## Flex on Larger Devices

Another way to adjust between sizes is to have an element use default block spacing on smaller devices and then convert to flex spacing on larger devices. The block spacing on small devices ensures that the items stay in a column, even if some of them are narrow, while the flex spacing at a larger size spreads them out in a row.

The common pattern here is a navigation bar that's spread over the top of the page at a larger size. But at a smaller size, it's a menu column, generally hidden until the menu button is clicked.

Here's a simple example:

```
<div class="w-full hidden lg:flex lg:flex-grow, lg:items-center lg:width-auto
divide-black divide-y lg:divide-y-0"
id="navbar-menu">
<a class="block lg:mr-4 p-2 hover:bg-gray-200">Blog</a>
...
</div>
```

The outer div here is hidden on small screens to start. This is usually paired with JavaScript (which we'll do in a second) to make it not hidden. On a small screen, when it's unhidden it'll use the default display mode of block, meaning columns. At larger sizes, the lg:flex overrides the hidden utility, and the display is flex and .flex-grow, meaning the items will fit across the screen. I've also added a dividing line between items at small scale, .divide-y, but the line goes away at larger sizes. .lg:divide-y-0 makes the items more distinguishable in the small column.

The inner items have a little bit more right margin at large sizes, and they change their background to gray on hover. They need to be explicitly set to block because a tags are inline by default. If I'd made those div tabs, the .block wouldn't be needed.

To make this work as a navbar, you need a little JavaScript. The following snippet, which is vanilla JavaScript without a framework, assumes you have three elements. One is the navbar itself, which we previously discussed, but with a DOM ID of navbar-menu. The other two elements are hidden in the same spacing and are the hamburger menu, navbar-burger, and an x-shaped close element, navbar-close:

```
<nav class="flex items-center font-bold text-grey-600">
<div class="block lg:hidden self-start">
<button id="navbar-burger"
class="px-3 py-2
border rounded border-grey-400
hover:border-black">
<svg xmlns="http://www.w3.org/2000/svg"
fill="none" viewBox="0 0 24 24"
stroke="currentColor">
<path stroke-linecap="round"
stroke-linejoin="round"
stroke-width="2"
d="M4 6h16M4 12h16M4 18h16" />
</svg>
</button>
<button id="navbar-close"
class="px-3 py-2
border rounded border-grey-400
hover:border-black">
```

```

<svg xmlns="http://www.w3.org/2000/svg"
      fill="none"
      viewBox="0 0 24 24"
      stroke="currentColor">
<path stroke-linecap="round"
      stroke-linejoin="round"
      stroke-width="2"
      d="M6 18L18 6M6 6l12 12" />
</svg>
</button>
</div>
<div class="w-full hidden
            lg:flex lg:flex-grow,
            lg:items-center lg:width-auto
            divide-black divide-y
            lg:divide-y-0"
            id="navbar-menu">
<a class="block lg:mr-4 p-2 hover:bg-gray-200">Blog</a>
AND SO ON
</div>
</div>
</nav>
```

The SVG for the hamburger and close icons comes from <https://heroicons.com>, a set of small SVG icons that are also from the makers of Tailwind CSS.

Next, we add an event listener to the navbar burger and navbar close. The burger listener hides the burger and shows the close button and the menu. The close listener hides the close button and menu and shows the burger:

```

document.addEventListener('DOMContentLoaded', () => {
  const $navbarBurger = document.querySelector('#navbar-burger')
  const $navbarClose = document.querySelector('#navbar-close')
  const $navbarMenu = document.querySelector('#navbar-menu')

  $navbarBurger.addEventListener('click', () => {
    $navbarMenu.classList.remove("hidden")
    $navbarBurger.classList.add("hidden")
    $navbarClose.classList.remove("hidden")
  });

  $navbarClose.addEventListener('click', () => {
    $navbarMenu.classList.add("hidden")
    $navbarBurger.classList.remove("hidden")
    $navbarClose.classList.add("hidden")
  });
})
```

And that gives you a basic responsive navigation system. Season to taste.

Next, let's talk about how to customize Tailwind.

# Customizing Tailwind

Throughout this book, I've alluded to the idea that Tailwind is customizable, and here's where I explain how and why. In some ways, Tailwind is an engine that generates a lot of CSS classes, and this engine has a lot of hooks that allow us to alter the set of utilities available to us.

You might want to customize Tailwind for several reasons:

- *Change defaults.* Tailwind provides default step values for most of its utilities, for example, the common steps for margins, padding, and other spacing items. And it has default screen sizes for responsive breakpoints. Tailwind also provides a default set of colors, but you may want to add your own. In the configuration file, you can change these.
- *Change the set of classes.* Tailwind generates a lot of CSS classes. For file-size purposes, you might want to reduce that list. For example, if you know you aren't using flexbox, you can tell Tailwind not to generate any of the flexbox-related utilities. Conversely, Tailwind offers about a dozen prefix modifiers that offer powerful behavior but aren't generated by default.
- *Add new behavior.* Although you can write your own extensions in regular CSS, you can also add new items as plugins that are part of the Tailwind configuration, which can make them easier to share and to integrate with other Tailwind behavior.
- *Integrate with legacy CSS.* You may want to start using Tailwind on a site that already has a lot of CSS. Tailwind provides configuration options that allow you to ensure that Tailwind utilities don't conflict with existing CSS or with the limitations of your HTML templating tool.

Let's take a look at how to customize Tailwind to your liking, starting with the configuration file.

## Configuration File Basics

The configuration file is optionally generated as part of your Tailwind installation. You can also create it at any time after you install the Tailwind npm package with the command, `npx tailwindcss init`. The minimal configuration file looks like this:

```
module.exports = {
  future: {},
  purge: [],
  theme: {
    extend: {},
  },
  variants: {},
  plugins: [],
}
```

If for some reason you want a configuration file with the entire default configuration explicitly listed, you can get it with `npx tailwindcss init --full`. Most of what we're going to be looking at will go in the theme and variants sections.

Tailwind considers each family of utilities to be a *core plugin*; you can see a complete list in the Tailwind documentation.<sup>1</sup> The theme object references these core plugin names to allow you to customize the core plugins—most of the core plugins have customization options.

## Change Default Values

In the configuration file, the theme object has keys that are the names of each core plugin and values that are the configuration options for that plugin. The three special configuration options, screen, color, and spacing, aren't core plugins themselves but are the basis for the configuration of many other core plugins.

It's worth mentioning here that Tailwind's use of the word "theme" is different than the way you might see it used in other places, where "theme" refers to a set of colors, as in "dark theme" versus "light theme." For Tailwind, the theme is the entire set of defaults, and there's only one. If you want to change color schemes, you need to either use CSS variables or use the `dark:` prefix to specify behavior under dark mode. (You can see the entire default theme on GitHub.<sup>2</sup> This is the theme in the main branch of Tailwind, so it may be slightly ahead of the released version.)

---

1. <https://tailwindcss.com/docs/configuration#core-plugins>

2. <https://github.com/tailwindlabs/tailwindcss/blob/master/stubs/defaultConfig.stub.js>

You can customize the theme in two ways: (1) override entire options or (2) extend options.

To override, you provide a new set of values for an entire object—either a core plugin or one of the special values—in the theme object. This example changes the entire set of screen breakpoints. Overriding the theme object this way completely replaces the default values:

```
theme: {
  screens: {
    'phone': '640px',
    'landscape': '768px',
    'tablet': '1024px',
    'laptop': '1280px',
  }
}
```

If you want to preserve the existing default values but add new ones on top, you can use theme#extend. This configuration adds an extra, extra-wide screen breakpoint:

```
theme: {
  extend: {
    screens: {
      '3xl': '2440px',
    }
  }
}
```

## Screen Widths

The screens object inside the key generates the breakpoints used for the responsive prefixes. The default looks like this:

```
module.exports = {
  theme: {
    screens: {
      'sm': '640px',
      'md': '768px',
      'lg': '1024px',
      'xl': '1280px',
      '2xl': '1536px',
    }
  }
}
```

You can modify this in many ways, but note that if you modify the values here, you need to provide the entire range of sizes. If you only want to add a new size, you need to go to the extend subject of themes:

```
module.exports = {
  theme: {
    screens: {
      extend: {
        3xl: '2440px',
      }
    }
  }
}
```

These breakpoints are a reasonable set of defaults, but if you only want to move the values around and about, you can do that here.

You can also change the names of the keys to something like phone, landscape, tablet, and desktop. Those keys then become the names of your prefixes, so you'd no longer write sm:m-0; you'd write phone:m-0.

If the value you provide for the screen-width keys is a string, it's considered the min-width of the breakpoint when generating the CSS. You can also pass an object with min and max keys if you want to specify the breakpoints differently. If you only specify max values, then the responsive behavior is reversed. Unprefixed utilities apply at the largest size, and prefixes take effect as the screen gets smaller:

```
module.exports = {
  theme: {
    screens: {
      '2xl': {'max': '9999px'},
      'xl': {'max': '1535px'},
      'lg': {'max': '1023px'},
      'md': {'max': '767px'},
      'sm': {'max': '639px'},
    }
  }
}
```

You can also supply a min value to those objects, which limits each breakpoint to a specific range and means that you need to completely specify all properties at each breakpoint.

Media queries aren't only based on size. If you want to base a prefix on something else, you can do so with a raw option.

Here's a configuration that adds a print mode:

```
module.exports = {
  theme: {
    extend: {
      screens: { 'print': {'raw': 'print'} },
    }
  }
}
```

You can then use this configuration like any other screen with `class="print:bg-white"`.

## Default Colors

Tailwind has a common set of colors that's used as a suffix for many utility families, including `.text-`, `.bg-`, and others. Tailwind provides 22 colors, although only eight are actually enabled by default. If you want to change that set, you can reach them via a `colors` object:

```
module.exports = {
  theme: {
    colors: {
      gray: colors.warmGray,
      red: colors.red,
      green: colors.green,
    }
  }
}
```

The complete list of colors is in the Tailwind documentation.<sup>3</sup>

While you can completely replace the set of colors in `theme#colors`, you're more likely to want to add your own extra colors in `theme#extend#colors`, like this:

```
module.exports = {
  theme: {
    extend: {
      colors: {
        "company-orange": "#ff5715",
        "company-dark-blue": "#323C64",
        "company-grey": "#DADADA",
      }
    }
  }
}
```

Now you can use `.text-company-orange` or `.bg-company-grey`. You can also add color families by using the same `colors` object as the value to any key.

---

3. <https://tailwindcss.com/docs/customizing-colors>

You can also nest the colors to remove duplication:

```
module.exports = {
  theme: {
    extend: {
      colors: {
        "company": {
          "orange": "#ff5715",
          "dark-blue": "#323C64",
          "grey": "#DADADA",
        }
      }
    }
  }
}
```

The resulting classes are still the same as the unnested colors were, like `.text-company-orange`, for example. If you only want `.text-company`, then using the key `default` will stand in for the unsuffixed value.

If you extend colors with an existing color, for example if you provide `red: { '100': "#WHATEVER" }`, you'll replace the existing `red` family with your new set.

If you want to extend a color with a new level, you can use the spread operator:

```
module.exports = {
  theme: {
    extend: {
      colors: {
        "red": {
          ...colors.red,
          "450": "#CC0000",
        }
      }
    }
  }
}
```

## But What if I Really Want Color Themes?

The closest you can get to color themes in standard Tailwind is by using the `dark:` prefix. To enable the `dark:` prefix, you need to add this line to your Tailwind configuration:

```
module.exports = {
  darkMode: "media",
}
```

With that in place, you can now use the prefix `dark:` to specify behavior that changes when the browser is in dark mode. So, you can have a class list that's something like `class="bg-grey-100 dark:bg-grey-900 text-grey-700 dark:text-grey-100"`.

The `dark:` prefix can be stacked with other prefixes like `hover:` and with responsive prefixes like `sm::`.

If `darkMode` is set to `media`, then Tailwind uses the `prefers-color-scheme` media setting of the browser. If you'd rather control the mode setting yourself, you can set `darkMode` to `class`, and then Tailwind adds a utility class `.dark`, which changes any element inside that class to dark mode. Typically, you'd put that at the top of your DOM tree and use JavaScript so you can change the entire tree at once:

```
<body class="container mx-auto py-12 px-6 dark">
  <div class="bg-grey-100 dark:bg-black">
    </div>
</body>
```

By default, dark mode applies to the core plugins that manage color. If you want to add other core plugins (for example, to change opacity in dark mode) or see the default list, see [Configure Variant Prefixes, on page 68](#).

You can do more elaborate things with custom themes and CSS variables. You can find a good overview at dev.to.<sup>4</sup>

## Spacing

Spacing, as used for padding, margins, width, height, and other properties, can also be overridden by using `theme#spacing` or extended with `theme#extend#spacing`. So you could simply replace the spacing like this:

```
module.exports = {
  theme: {
    spacing: {
      'small': 4px,
      'medium': 12px,
      'large': 36px
    }
  }
}
```

These new suffixes would apply anywhere spacing goes, so you'd now have `.p-small`, `.h-medium`, `.gap-large`, or other possibilities.

---

4. <https://dev.to/ohitslaurence/creating-dynamic-themes-with-react-tailwindcss-59cl>

If you like the existing scale but want more options, then use the `extends` option:

```
module.exports = {
  theme: {
    extend: {
      spacing: {
        '15': '60rem',
        '17': '76rem'
      }
    }
  }
}
```

## Other Core Plugins

Nearly every Tailwind utility has a series of suffixes off of a base pattern. And nearly all of them allow you to override or extend them the same way you do for spacing and colors.

I'll pick one example, as doing all of them is outside the scope of this book. Every core plugin's page in the Tailwind documentation explains how to modify that plugin.

Back in [Chapter 4, The Box, on page 25](#), I mentioned that I thought it was odd that the `z-index` didn't have negative options. I can easily add them in the configuration file with `theme#extend`:

```
module.exports = {
  theme: {
    extend: {
      zIndex: {
        "-1": "-1",
        "-5": "-5",
        "-1000": "-1000"
      }
    }
  }
}
```

Note that in this case, Tailwind generates the negative classes consistent with negative margins, so the negative classes here are `.z-1`, `.z-5`, and `.z-1000`.

If I want my own complete set of `z-index` options, then I wouldn't use `extend`:

```
module.exports = {
  theme: {
    zIndex: {
      "1": "1",
      "5": "5",
      "1000": "1000"
    }
  }
}
```

```

    "-1": "-1",
    "-5": "-5",
    "-1000": "-1000"
  }
}
}

```

Now I have `.z-1`, `.z-5`, and `.z-100` alongside `.-z-1`, `.-z-5`, and `.-z-1000`, but the original classes are no longer generated. Every core plugin with multiple options allows for similar replacement or extension of the options. Again, the Tailwind documentation has a full listing.

## Change Generated Classes

Tailwind generates a lot of CSS classes, and you may want to limit that list for performance reasons, to make the CSS bundle smaller, or to make it easier to understand the set of possibilities.

You can specify what set of core plugins Tailwind should generate in either of two ways. Most likely, you'll only want to eliminate a few core plugins, and you can then create a block list by passing an object to the `corePlugins` key of the configuration. The keys of this object are the name of core plugins you want to eliminate, and the values are all `false`:

```

module.exports = {
  corePlugins: {
    flex: false,
    flexDirection: false,
    flexGrow: false,
    flexShrink: false,
    flexWrap: false,
  }
}

```

This configuration gets rid of all the flexbox-related tools, though I don't recommend doing that. Flexbox is pretty useful.

If you want an inclusion list instead, simply pass an array of the list of core plugins you want. This configuration includes only the `flex` utilities in Tailwind:

```

module.exports = {
  corePlugins: [
    flex,
    flexDirection,
    flexGrow,
    flexShrink,
    flexWrap,
  ]
}

```

I don't recommend you do exactly that, either—the other utilities are also useful.

## Configure Variant Prefixes

We've seen variant prefixes in Tailwind like `hover` and `focus`, and Tailwind defines about a dozen or so potential prefixes, but most of them aren't enabled by default. The screen-size prefixes work with all core plugins. The `hover`, `focus`, and `dark` prefixes are enabled on a subset of core plugins that are the most likely ones you'd use. In most cases, you'll never notice that they aren't enabled everywhere. The full list of variants by plugin is available in the Tailwind documentation.<sup>5</sup>

### A Tour of the Prefixes

Here's a quick tour of Tailwind prefixes (I've left out a couple that don't have full browser support):

- `active`: Applies when the element is active.
- `checked`: Applies if the checkbox or radio button has been checked.
- `dark`: Applies if Tailwind thinks it's in dark mode.
- `disabled`: Applies when the element is disabled.
- `focus`: Applies when the element has focus, as in a text field.
- `focus-within`: Applies to a parent class when any child inside that parent has focus. It's enabled by default wherever `hover` is enabled.
- `hover`: Applies when the user is hovering the pointer over the element.
- `motion-reduce`: Applies if the user has enabled reduce motion on the system. It's often applied with `hover`, and you'd often have a `motion-reduce` and a `motion-safe` variant.
- `motion-safe`: Applies if the user has *not* enabled reduce motion on the system. It's often applied with `hover`, and you'd often have a `motion-reduce` and a `motion-safe` variant.
- `visited`: Applies if a link has been visited.

Two group properties work by declaring a parent element with the class `.group`. These variant properties apply when any element in the parent is targeted, not only the element in question:

- `group-focus`: Applies to any child when any child under the parent gets the focus.

---

5. <https://tailwindcss.com/docs/configuring-variants#default-variants-reference>

- `group-hover`: Applies to any child when the parent is hovered over. It's enabled by default wherever `hover` is enabled.

A few properties are applied based on the order of the elements within their parent. These variants would go on the child element, not the parent element, and are particularly helpful if your template language is generating an entire loop:

- `even`: Applies if the element is an even-numbered child (second, fourth, sixth, and so on).
- `first-child`: Applies if the element is the first (top-most) child of its parent element.
- `last-child`: Applies if the element is the last (bottom-most) child of its parent element.
- `odd`: Applies if the element is an odd-numbered child (first, third, fifth, and so on).

## Declaring Variants

The easiest way to change the set of variants for any core plugin is to write out the entire list of the variants you want for the core plugin. For example, alternating row patterns can be applied with the `odd` or `even` property. Here we want the `odd` and `even` variants for background color:

```
module.exports = {
  variants: {
    backgroundColor: [
      'responsive', 'dark', 'group-hover',
      'hover', 'focus', 'odd', 'even'
    ]
  }
}
```

As written, this list overrides the existing list—it doesn't extend it—which is why I've included all the existing default values in the list. Also, the order is important, as utilities are generated in the order specified in this list. Because of the way CSS works, the ordering means that variants at the end of the list will supersede variants at the beginning of the list if both appear in the same element. So, as written, `even:bg-color-gray-500`, will take effect over `hover:bg-color-gray-900`. That may not be what you want, so order carefully.

There's an exception to the precedence rule. Responsive variants are generated separately. In fact, Tailwind generates a complete set of other variants for each responsive variant, so we also have `.sm:even:bg-color-gray-500`, and so on.

I highly recommend explicitly including the entire list in your configuration. Tailwind does have utilities that allow you to add a single variant at a specific place in the existing list, but they seem overly complex and hard to read. If it's up to me, I'd stick with the array list.

## Integrate with Existing CSS

One problem you might have if you're using Tailwind in conjunction with a lot of existing CSS is name conflict. Your existing CSS might already define hidden, flex-grow, or (admittedly less likely) mx-64. Tailwind gives you a way to prevent this problem by offering you the ability to put a common prefix in front of all Tailwind utilities: `prefix: "<SOMETHING>"`. If you declare `prefix: "twind"`, then all the Tailwind utilities are transformed, so you end up with `twind-hidden`, `twind-flex-grow`, and even `twind-mx-64`. If you have a prefix, it attaches normally, as in `hover:twind-text-black`.

A different problem is that your existing CSS may be set up in such a way that all the existing CSS selectors have high specificity and thus override all of the Tailwind utilities. You can get around this with a configuration of `important: true`, which adds the CSS marker `!important` to all the Tailwind utilities, which should give them precedence over existing CSS. This can have unwanted side effects if you're using a lot of different CSS libraries, so be careful with it.

Some template tools don't allow you to use the colon (:) character in class names, making Tailwind's prefixes illegal. You can specify a `separator:` option to choose your own separator, so `separator: "--"` means prefixes would look like `hover--text-black` or `lg--m0-4`. (I think I like the look of that more than the colon.)

## Access Tailwind from JavaScript

You can access Tailwind configuration from JavaScript. This is useful if you want to use those values to create dynamic behavior in your JavaScript framework. You might have some kind of custom animation that needs to respect existing colors or spacing, or who knows what.

Whatever you want to do, Tailwind provides a `resolveConfig` method that takes as an argument the Tailwind configuration object and allows you to query the configuration—the full configuration, not only your overrides in the file:

```
import resolveConfig from 'tailwindcss/resolveConfig'
import myConfig from './tailwind.config.js'

const tailwindConfig = resolveConfig(myConfig)
tailwindConfig.theme.colors
```

The resulting object from `resolveConfig` merges your configuration overrides with the defaults and provides an object you can query.

## Purge CSS

Tailwind generates an enormous number of classes that you probably won't use. For example, Tailwind generates hundreds of color variants for many different utility families, and you'll likely use a few dozen at most. You can get pretty far by using the `corePlugins` option to remove unused plugins, and especially by limiting the color options to colors you actually use, but there's a more automated way available. Tailwind uses a tool called PurgeCSS<sup>6</sup> to identify which classes you actually use and remove unused classes from your build.

To enable purging, change the array in the tailwind configuration file to contain a list of file patterns for any file in your project that might reference a Tailwind utility. This includes your static `.html` files, but also your `.jsx` files for a React project or `.erb` files for a Rails project. It even includes other files that might reference Tailwind utilities that are called by template files. So, if you use the strategies in [Duplication, on page 12](#) to define lists of Tailwind classes in JavaScript or Ruby or whatever, those files also need to be listed in the purge array. You might wind up with something like this for a React project:

```
module.exports = {
  future: {},
  purge: [
    "./src/**/*.{html,jsx,tsx}",
  ],
  theme: {
    extend: {},
  },
  variants: {},
  plugins: [],
}
```

A Rails project might look like this:

```
module.exports = {
  future: {},
  purge: [
    "./app/views/**/*.{html,erb}",
    "./app/helpers/**/*.rb"
  ],
}
```

---

6. <https://purgecss.com>

```
theme: {
  extend: {},
},
variants: {},
plugins: [],
}
```

If the purge key isn't empty, when Tailwind is compiled and the NODE\_ENV is production, the purge list will be used to generate a list of used classes and other classes will be purged.

The mechanism PurgeCSS uses is simple by design. All it does is try to match this regular expression:

```
/[^<"'`\s]*[^<"'`\s:/g
```

This results, more or less, in a list of all the words in your files. A Tailwind utility is purged if it's not in that list. This is a somewhat expansive list of classes in that it might capture class names not being used as class names, which is generally fine. What it won't catch is a class name that's dynamically created via string concatenation.

In [Chapter 3, Typography, on page 17](#), we looked at the following example for creating a hover effect:

```
const hoverDarker = (color) => {
  return `text-${color}-300 hover:text-${color}-700`
}
```

This function, because it creates a class name dynamically, would prevent those classes from being found by PurgeCSS, so you'd either need to list those classes elsewhere or find another way to create this feature.

For a more complete list of purge options to optimize this behavior, check out the Tailwind documentation.<sup>7</sup>

## The End

And with that, we've reached the end of our Tailwind journey. Tailwind changes frequently, so you should check out the Tailwind blog at <https://blog.tailwindcss.com> for up-to-date changes. Also, you can find a lot of great screencasts, sample components, and other resources linked in the Tailwind documentation at <https://tailwindcss.com>.

Now, go design something great!

---

7. <https://tailwindcss.com/docs/optimizing-for-production>

## Thank you!

How did you enjoy this book? Please let us know. Take a moment and email us at [support@pragprog.com](mailto:support@pragprog.com) with your feedback. Tell us your story and you could win free ebooks. Please use the subject line “Book Feedback.”

Ready for your next great Pragmatic Bookshelf book? Come on over to <https://pragprog.com> and use the coupon code BUYANOTHER2021 to save 30% on your next ebook.

Void where prohibited, restricted, or otherwise unwelcome. Do not use ebooks near water. If rash persists, see a doctor. Doesn’t apply to *The Pragmatic Programmer* ebook because it’s older than the Pragmatic Bookshelf itself. Side effects may include increased knowledge and skill, increased marketability, and deep satisfaction. Increase dosage regularly.

And thank you for your continued support

The Pragmatic Bookshelf



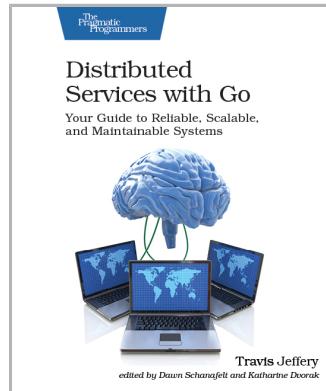
## Distributed Services with Go

This is the book for Gophers who want to learn how to build distributed systems. You know the basics of Go and are eager to put your knowledge to work. Build distributed services that are highly available, resilient, and scalable. This book is just what you need to apply Go to real-world situations. Level up your engineering skills today.

Travis Jeffery

(258 pages) ISBN: 9781680507607. \$45.95

<https://pragprog.com/book/tjgo>



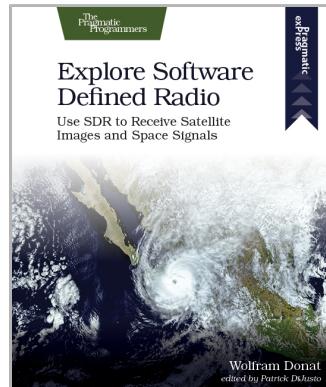
## Explore Software Defined Radio

Do you want to be able to receive satellite images using nothing but your computer, an old TV antenna, and a \$20 USB stick? Now you can. At last, the technology exists to turn your computer into a super radio receiver, capable of tuning in to FM, shortwave, amateur "ham," and even satellite frequencies, around the world and above it. Listen to police, fire, and aircraft signals, both in the clear and encoded. And with the book's advanced antenna design, there's no limit to the signals you can receive.

Wolfram Donat

(78 pages) ISBN: 9781680507591. \$19.95

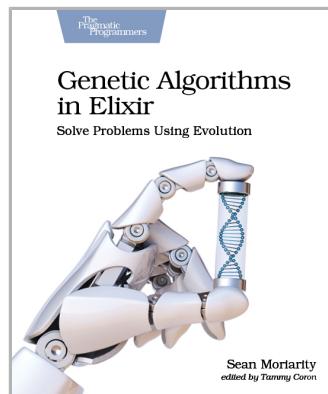
<https://pragprog.com/book/wdradio>



## Genetic Algorithms in Elixir

From finance to artificial intelligence, genetic algorithms are a powerful tool with a wide array of applications. But you don't need an exotic new language or framework to get started; you can learn about genetic algorithms in a language you're already familiar with. Join us for an in-depth look at the algorithms, techniques, and methods that go into writing a genetic algorithm. From introductory problems to real-world applications, you'll learn the underlying principles of problem solving using genetic algorithms.

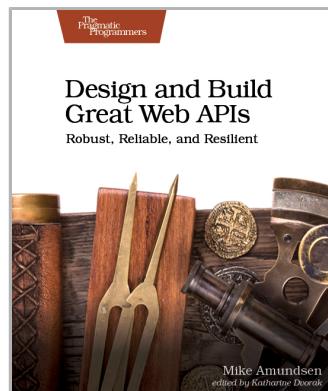
Sean Moriarity  
(242 pages) ISBN: 9781680507942. \$39.95  
<https://pragprog.com/book/smgaelixir>



## Design and Build Great Web APIs

APIs are transforming the business world at an increasing pace. Gain the essential skills needed to quickly design, build, and deploy quality web APIs that are robust, reliable, and resilient. Go from initial design through prototyping and implementation to deployment of mission-critical APIs for your organization. Test, secure, and deploy your API with confidence and avoid the “release into production” panic. Tackle just about any API challenge with more than a dozen open-source utilities and common programming patterns you can apply right away.

Mike Amundsen  
(330 pages) ISBN: 9781680506808. \$45.95  
<https://pragprog.com/book/maapis>

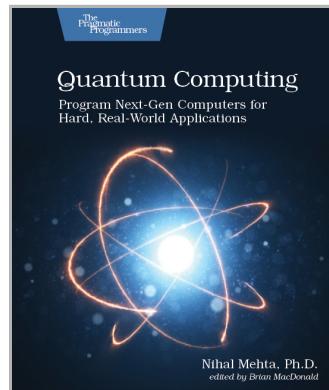


# Quantum Computing

---

You've heard that quantum computing is going to change the world. Now you can check it out for yourself. Learn how quantum computing works, and write programs that run on the IBM Q quantum computer, one of the world's first functioning quantum computers. Develop your intuition to apply quantum concepts for challenging computational tasks. Write programs to trigger quantum effects and speed up finding the right solution for your problem. Get your hands on the future of computing today.

Nihal Mehta, Ph.D.  
(580 pages) ISBN: 9781680507201. \$45.95  
<https://pragprog.com/book/nmquantum>

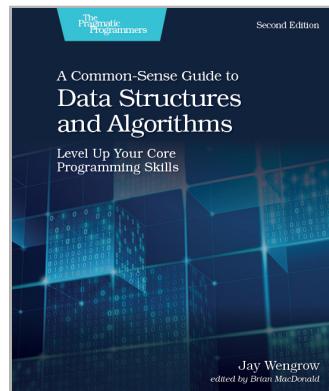


# A Common-Sense Guide to Data Structures and Algorithms, Second Edition

---

If you thought that data structures and algorithms were all just theory, you're missing out on what they can do for your code. Learn to use Big O notation to make your code run faster by orders of magnitude. Choose from data structures such as hash tables, trees, and graphs to increase your code's efficiency exponentially. With simple language and clear diagrams, this book makes this complex topic accessible, no matter your background. This new edition features practice exercises in every chapter, and new chapters on topics such as dynamic programming and heaps and tries. Get the hands-on info you need to master data structures and algorithms for your day-to-day work.

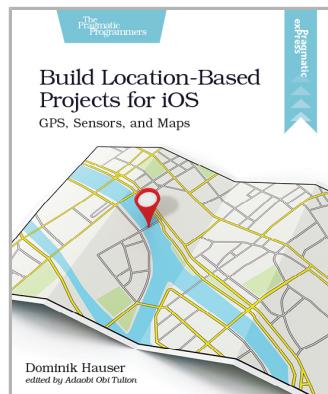
Jay Wengrow  
(506 pages) ISBN: 9781680507225. \$45.95  
<https://pragprog.com/book/jwdsal2>



# Build Location-Based Projects for iOS

Coding is awesome. So is being outside. With location-based iOS apps, you can combine the two for an enhanced outdoor experience. Use Swift to create your own apps that use GPS data, read sensor data from your iPhone, draw on maps, automate with geofences, and store augmented reality world maps. You'll have a great time without even noticing that you're learning. And even better, each of the projects is designed to be extended and eventually submitted to the App Store. Explore, share, and have fun.

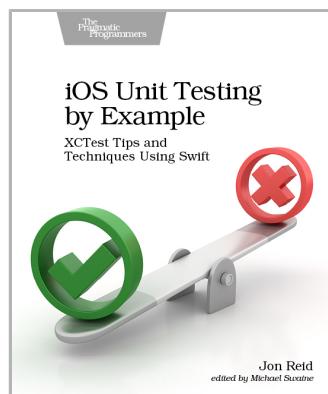
Dominik Hauser  
(154 pages) ISBN: 9781680507812. \$26.95  
<https://pragprog.com/book/dhios>



# iOS Unit Testing by Example

Fearlessly change the design of your iOS code with solid unit tests. Use Xcode's built-in test framework XCTest and Swift to get rapid feedback on all your code — including legacy code. Learn the tricks and techniques of testing all iOS code, especially view controllers (UIViewController), which are critical to iOS apps. Learn to isolate and replace dependencies in legacy code written without tests. Practice safe refactoring that makes these tests possible, and watch all your changes get verified quickly and automatically. Make even the boldest code changes with complete confidence.

Jon Reid  
(300 pages) ISBN: 9781680506815. \$47.95  
<https://pragprog.com/book/jrlegios>



# The Pragmatic Bookshelf

---

The Pragmatic Bookshelf features books written by professional developers for professional developers. The titles continue the well-known Pragmatic Programmer style and continue to garner awards and rave reviews. As development gets more and more difficult, the Pragmatic Programmers will be there with more titles and products to help you stay on top of your game.

## Visit Us Online

---

### This Book's Home Page

<https://pragprog.com/book/tailwind>

Source code from this book, errata, and other resources. Come give us feedback, too!

### Keep Up to Date

<https://pragprog.com>

Join our announcement mailing list (low volume) or follow us on twitter @pragprog for new titles, sales, coupons, hot tips, and more.

### New and Noteworthy

<https://pragprog.com/news>

Check out the latest pragmatic developments, new titles and other offerings.

## Buy the Book

---

If you liked this ebook, perhaps you'd like to have a paper copy of the book. Paperbacks are available from your local independent bookstore and wherever fine books are sold.

## Contact Us

---

Online Orders: <https://pragprog.com/catalog>

Customer Service: [support@pragprog.com](mailto:support@pragprog.com)

International Rights: [translations@pragprog.com](mailto:translations@pragprog.com)

Academic Use: [academic@pragprog.com](mailto:academic@pragprog.com)

Write for Us: <http://write-for-us.pragprog.com>

Or Call: +1 800-699-7764