web222

WEB222 - Week 9

Suggested Readings

- CSS Box Model
- CSS Layout
- Learn CSS Layout

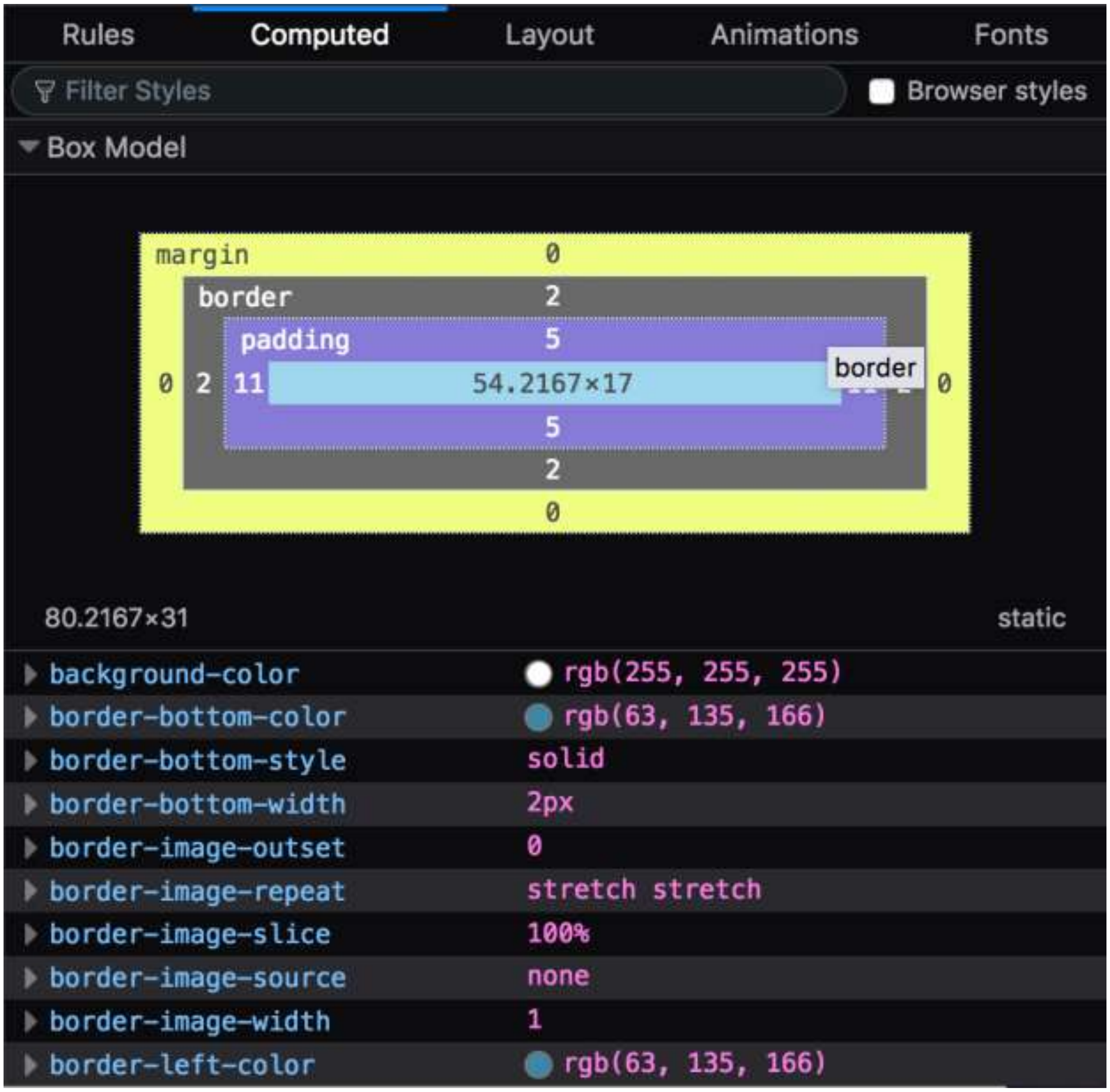
CSS Continued

Box Model

All elements in the DOM can be considered to be a box. The Box Model is a specification for how all the various attributes of an element's sizing relate to each other. A "box" is made up of four distinct parts:

- margin - area (whitespace) between this element and other surrounding elements
- border - a line (or lines) surrounding this element
- padding - area (whitespace) between the border and the inner content of the element
- content - the actual content of the element (e.g., text)

The easiest way to visual this is using your browser's dev tools, which have tools for viewing and altering each of these parts.



```
background-color       rgb(255, 255, 255)
border-bottom-color    rgb(63, 135, 166)
border-bottom-style    solid
border-bottom-width    2px
border-image-outset    0
border-image-repeat    stretch stretch
border-image-slice     100%
border-image-source    none
border-image-width     1
border-left-color      rgb(63, 135, 166)
```

The sizes of each of these can be controlled through CSS properties:

- `margin`
  - `margin-top`
  - `margin-right`
  - `margin-bottom`
  - `margin-left`
- `border`
  - `border-style`
    - `border-top-style`
    - `border-right-style`
    - `border-bottom-style`
    - `border-left-style`
  - `border-width`
    - `border-top-width`

        - border-right-width
        - border-bottom-width
        - border-left-width
    - border-color
        - border-top-color
        - border-right-color
        - border-bottom-color
        - border-left-color
- padding
    - padding-top
    - padding-right
    - padding-bottom
    - padding-left

Each of these is a shorthand property that lets you specify multiple CSS properties at the same time. For example, the following are equivalent:

```
/* Use separate properties for all aspects */
.example1 {
    border-width: 1px;
    border-style: solid;
    border-color: #000;

    margin-top: 5px;
    margin-right: 10px;
    margin-bottom: 15px;
    margin-left: 20px;
}

/* Use shorthand properties to do everything at once */
.example2 {
    border: 1px solid #000;
    margin: 5px 10px 15px 20px;
}
```

In the code above for `margin`, notice how the the different portions of the `margin` get translated into a single line. The order we use follows the same order as a clockface, the numbers begin at the `top` and go *clockwise* around:

```
.example2 {
    /*      top right bottom left */
    margin: 5px 10px  15px   20px;
}
```

We often shorten our lists when multiple properties share the same values:

```
.example3 {
    /* Everything is different, specify them all */
    margin: 10px 5px 15px 20px;
}

.example4 {
    /* Top and bottom are both 10px, right and left are both 5px */
    margin: 10px 5px;
}

.example5 {
    /* Top, bottom, left, and right are all 5px */
    margin: 5px;
}
```

When two elements that specify a `margin` at the top and bottom are stacked, the browser will *collapse* (i.e., combine) the two into a single margin, whose size is the largest of the two. Consider the following CSS:

```
<style>
    h1 {
        margin-bottom: 25px;
    }

    p {
        margin-top: 20px;
    }
</style>
<h1>Heading</h1>
<p>Paragraph</p>
```

Here the stylesheet calls for a `<p>` element to have `20px` of whitespace above it. However, since the `<h1>` has `25px` of whitespace below it, when the two are placed in the DOM one after the other, the distance between them will be `25px` vs. `45px` (i.e., the browser won't apply both margins, but just make sure that both margins are honoured).

`display` Property

CSS lets us control how an element gets displayed in the DOM. This is a large topic, and we'll give an overview of some of the most common display types. Further study is required to fully appreciate the subtleties of each layout method.

Up to this point we've been talking a lot about the DOM, a tree of nodes for every element in our document. At this stage it's also useful to understand that in addition to the DOM tree, a browser also creates a *render tree*, which is a tree of nodes as they will should be rendered based on CSS. A node may exist in the DOM tree but not in the render tree, for example. The nodes in the DOM tree can also have very different rendering applied based on the type of display we specify.

Perhaps the easiest way to get started understanding display types is to look at what `display: none;` does:

```
<style>
    .hidden {
        display: none
    }

    .error-msg {
        /* styles for error message UI */
    }
</style>
<div class="hidden error-msg">
    <h1>Error!</h1>
    <p>There was an error completing your request.</p>
</div>
```

When an element uses a display type of `none`, nothing will be painted to the screen. This includes the element itself, but also any of its children. This allows us to create UI or aspects of a page but not display them...yet. For example, we might want to reveal a dialog box, information message, image, or the like only in response to the user performing some action (e.g., clicking a button). Or, we might want to remove something like a loading screen when the web page is fully loaded:

```
<style>
    /* Place a semi-transparent box over the entire screen at startup */
    #loading {
        position: fixed; /* position this element by specifying top, left, etc */
        padding: 0;
        margin: 0;
        top: 0;
        left: 0;
        width: 100%;
        height: 100%;
        background: rgba(255, 255, 255, 0.5); /* make it a bit see through */
        z-index: 500; /* put this on top of other content */
    }
</style>
<div id="loading">
    <p>Loading...</p>
</div>
<main>
    <!-- rest of page content here -->
</main>
<script>
window.onload = function() {
    // Remove the spinner now that the page is loaded
    var loadingDiv = document.querySelector('#loading')
    loadingDiv.style.display = "none";
};
</script>
```

If elements don't have a display type of `none`, they get included in the render tree and eventually painted to the screen. If we don't specify a display type, the default is `inline`. With `inline`, boxes are laid out horizontally (typically left to right, unless we are doing rtl), starting at the top corner of the parent.

We can also specify that an element should be `display: block;`, which will layout blocks in a vertical way, using `margin` to determine the space between them. To understand the difference, try this using this snippet of code an HTML page, and change the `display` from `block` to `inline`:

```
<style>
    h1 {
        display: block; /* try changing to `inline` */
    }
</style>
<h1>One</h1>
<h1>Two</h1>
<h1>Three3</h1>
```

We can also control the way that elements are laid out *within* an element (i.e., its children). Some of the display types for inside layout options include:

- `table` - make elements behave as though they were part of a `<table>`
- `flex` - lays out the contents according to the flexbox model
- `grid` - lays out the contents according to the grid model

A great way to learn a bit about the latter two is to work through the following online CSS learning games:

- Flexbox Froggy
- Flexbox Defense
- Grid Garden

Common Layout Tasks

1. How do I centre inline text horizontally?

```
p { text-align: center; }
```

3. How do I centre a block element’s contents?

```
.center {
    width: 400px;   /* set a fixed width */
    margin: 0 auto; /* allow the browser to split the margin evenly */
}
```

8. How do I centre something vertically?

```
.vertical-center {
    display: table-cell;    /* make the element work like a cell in a table */
    vertical-align: middle; /* align to the centre vertically */
    text-align: center;     /* align to centre horizontally */
}
```

`position` Property

Many web interface designs require more sophisticated element positioning than simply allowing everything to flow. Sometimes we need very precise control over where things end up, and how the page reacts to scrolling or movement.

To accomplish this kind of positioning we can use the CSS `position` property to override the defaults provided by the browser.

- `static` - the default, where elements are positioned according to the normal flow of the document
- `relative` - elements are positioned according to the normal flow, but with extra offsets (`top, bottom, left, right`), allowing content to overlap
- `absolute` - elements are positioned separate from normal flow, in their own “layer” relative to their ancestor element, and don’t affect other elements. Useful for things like popups, dialog boxes, etc.
- `fixed` - elements are positioned separate from normal flow, and get positioned relative to the viewport.
- `sticky` - a hybrid of `relative` and `fixed`, allowing an element to be positioned relatively, but then “stick” when scrolling or resizing the viewport. This is often used for headings, which can be scrolled up, but then stay in place as you continue down into the document.

`z-index` Property

In addition to controlling how elements are positioned in the X and Y planes, we can also *stack* elements on top of each other in different layers. We achieve this through the use of the `z-index` property.

The `z-index` is a value positive or negative integer, indicting which stack level the element should be placed within. The default stack level is `0`, so using a `z-index` higher than `0` will place the content on top of anything below it.

The `z-index` is often used with `position` to place content in arbitrary positions overtop of other content. For example, a lightbox that appears over a site’s content to show an image.

`overflow` Property

When the contents on an element are too large to be displayed, we have options as to how the browser will display the overflowing content. To do this, we work with the `overflow`, `overflow-x`, `overflow-y` properties

- `visible` - default. No scroll bars provided, content is not clipped.
- `scroll` - always include scroll bars, content is clipped and and scroll if required
- `auto` - only include scroll bars when necessary, content is clipped and and scroll if required
- `hidden` - content is clipped, no scroll bars provided.

Layout Example

In this in-class example we'll create a simple blog post style layout using HTML and CSS.

- Initial HTML with no CSS

https://web222.ca/weeks/week09/layout/no-css.html

- Final version with CSS

https://web222.ca/weeks/week09/layout/with-css.html