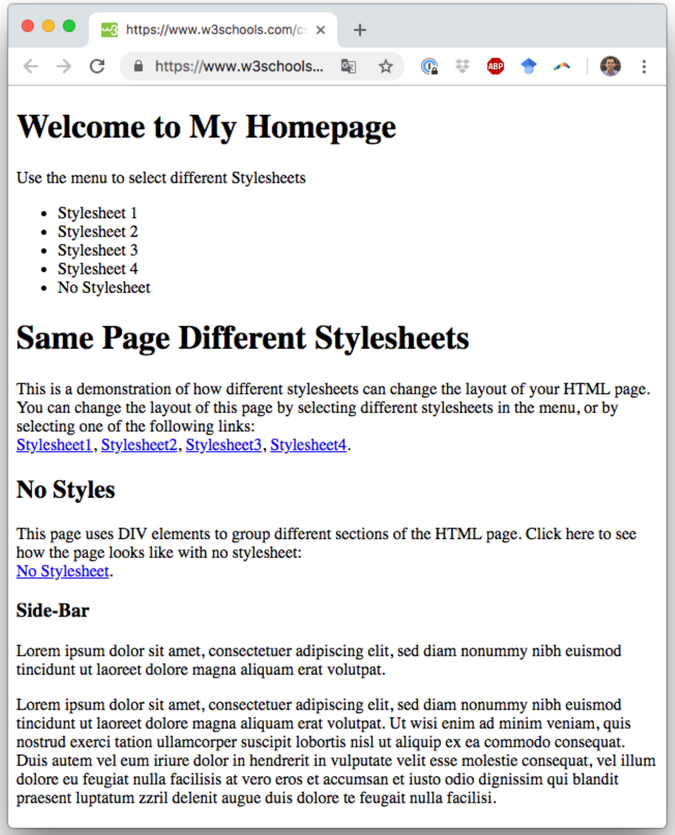
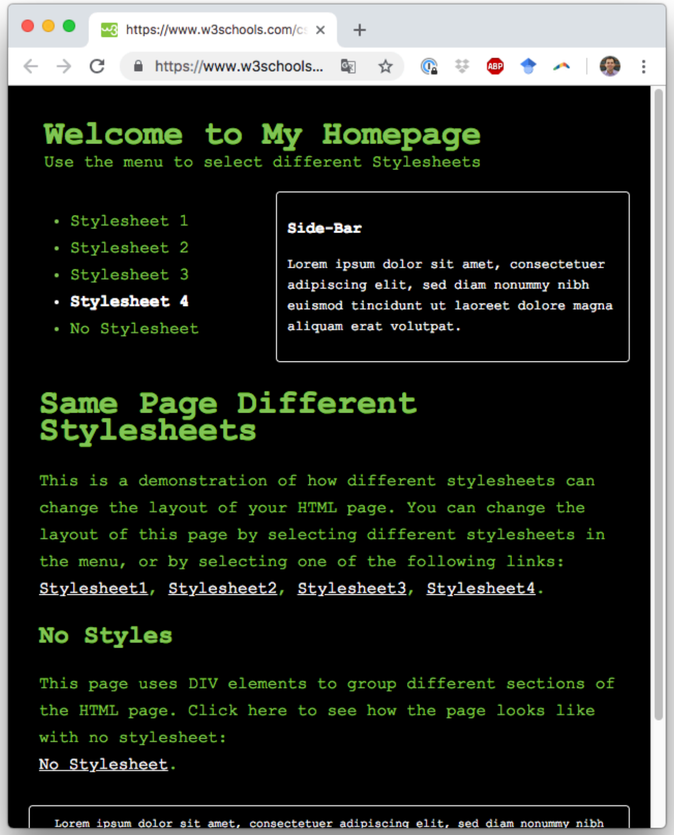
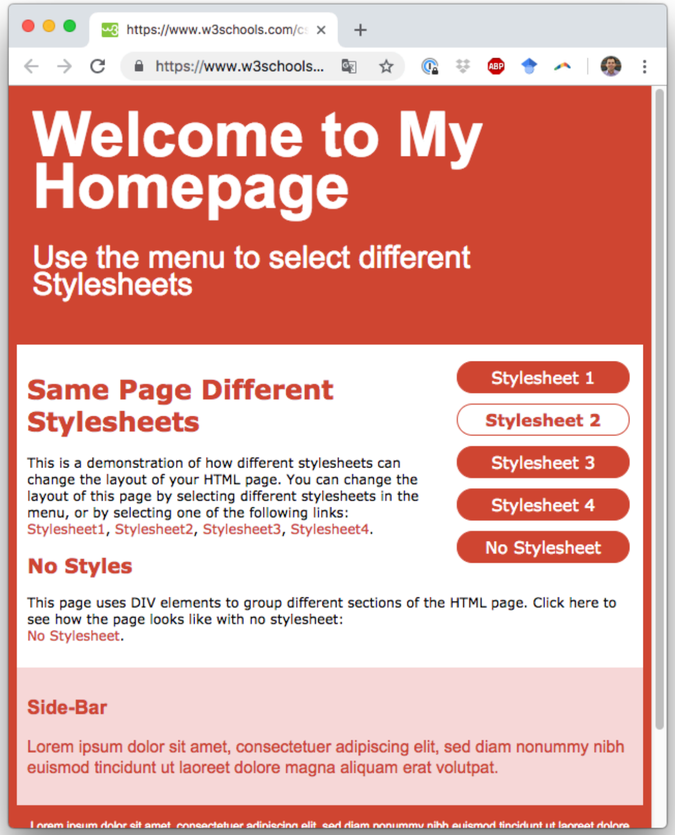
IN4MATX 285: Interactive Technology Studio

Programming: CSS and Design Systems

Same page, different stylesheets







https://www.w3schools.com/css/demo_default.htm

Today’s goals

By the end of today, you should be able to…

- Explain the goals of CSS and why it exists as separate from HTML
- Describe the CSS hierarchy and fallback structure
- Utilize the box model and positioning options to arrange content
- Understand how to get started with a design system for web

CSS

Cascading Style Sheets

- Defines rules for styling
- Differs from HTML, which provides structure for the document

CSS: but why?

- Reusability
  - Apply the same style to multiple web pages
- Modularity
  - Include multiple stylesheets that apply to a single page
- Sane management
  - Files can be version controlled, separate from HTML structural content
- Maintainability
  - Easier to find a page's style

Ok, so how do I write CSS?

CSS syntax

- **Selectors** specify which elements a **rule** applies to

- **Rules** specify what *values* to assign to different formatting **properties**

```
/* CSS Pseudocode */
selector {
  property: value;
  property: value;
  ...
}
```

One rule, many properties

CSS syntax

```
h1 {
  font-family: 'Arial';
  color: blue;
  background-color: #ff0000; /*red*/
}
```

Apply to all h1 tags

"font"

- Link to stylesheets in HTML's **<head>**

```
<head>
  <link rel="stylesheet" href="my-style.css">
</head>
```

relation between
this page and reference

no content,
so no closing tag

Element, ID, and Class selectors

- element: what tag is being styled
- class: a type of element
- id: one specific element

```
p {
  font-family: 'Arial';
  color: red;
}
.emphasize {
  font-family: 'Arial';
  color: red;
}
#redtext {
  font-family: 'Arial';
  color: red;
}
```

HTML Class and ID attributes

```
<div class="widget foo" id="baz"></div>
```

- Variable-value just like any other attribute (`href`, `src`)
- An element can have many classes, only one ID
- Each page can have only one element with a given ID
  - Required to pass validation
- Can use the same class on multiple elements
  - And should; it's useful to apply the same style to many elements

https://css-tricks.com/the-difference-between-id-and-class/

HTML Class and ID attributes

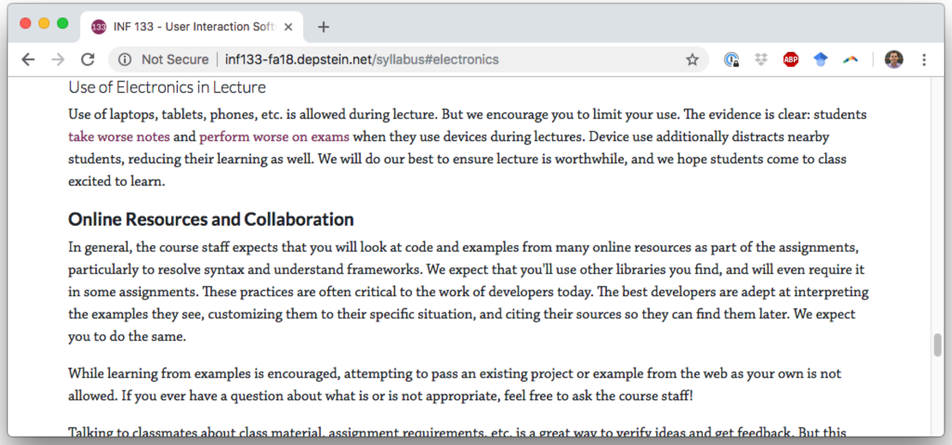
```html
<div class="widget foo" id="baz"></div>
```

```css
div.widget.foo#baz {
  /*can chain selectors together!*/
}
```

https://css-tricks.com/the-difference-between-id-and-class/

HTML Class and ID attributes

- Fun trick: IDs can be used for navigation
- `http://example.com/#id`



https://css-tricks.com/the-difference-between-id-and-class/

CSS properties

- `font-family`: the “font” (fallback alternatives separated by commas)
- `font-size`: the size of the text
- `font-weight`: boldness
- `color`: text color
- `background-color` (element’s background)
- `opacity` (transparency)
- And much, much more!

http://www.w3schools.com/cssref/default.asp

HTML vs. CSS

- HTML specifies the *semantics*
- CSS specifies the *appearance*

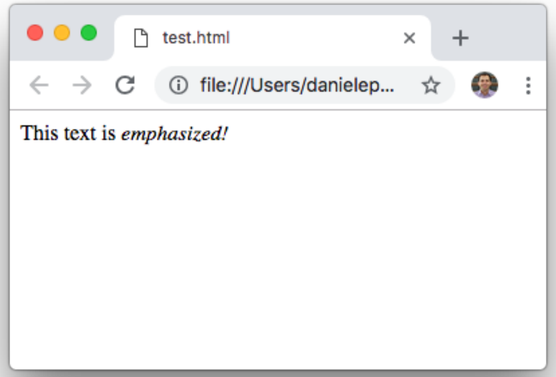
HTML vs. CSS

```
<!--HTML-->
<p> This text is
<i>emphasized!</i></p>
```

Conflates appearance and semantics

```
<!--HTML-->
<p> This text is
<em>emphasized!</em></p>
```

Says nothing about appearance



Cascading Style Sheets

- Multiple rules can apply to the same element (in a “cascade”)

```
<!--HTML-->
<p class="big blue">
 This tag has two classes: "big" and "blue"
 (classes are separated by spaces)
</p>

/* CSS */
p { font-family: 'Verdana'; }
.big { font-size: larger; }
.blue { color: blue; }
```

← Apply to all `<p>` tags

← Apply to all with `class="big"`

← Apply to all with `class="blue"`

Cascading Style Sheets

- CSS rules are also inherited from parent tags

```
<div class="content"> <!-- has own styling -->
  <div class="sub-div"> <!-- has own styling + .content styling -->
    <ol class="my-list"> <!-- own styling + .sub-div + .content -->
                         <!-- own style is ol AND .my-list rules-->

      <!-- li styling + .my-list + .sub-div + .content -->
      <li>Item 1</li>
      <li>Item 2</li>
      <li>Item 3</li>
    </ol>
  </div>
</div>
```

Cascading Style Sheets

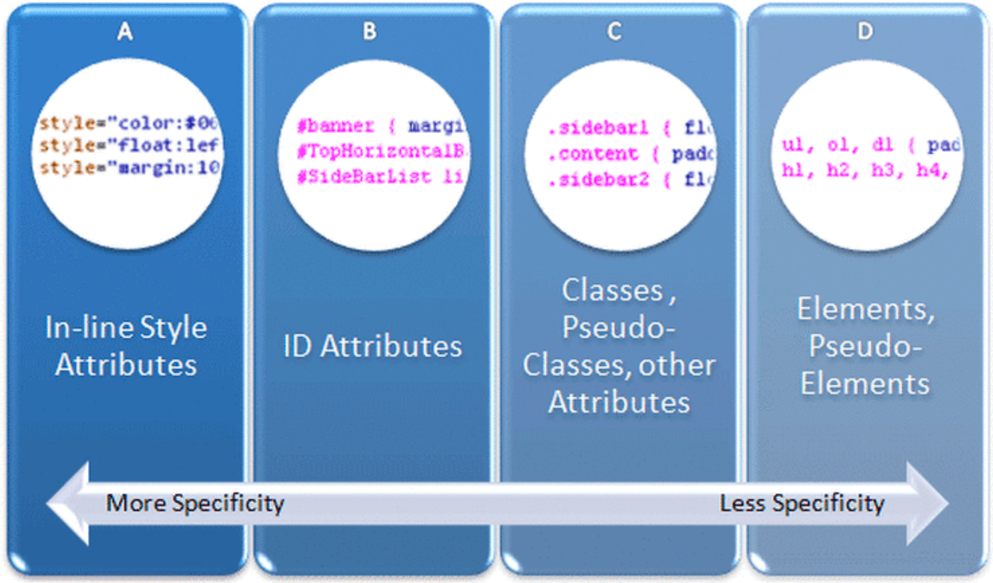
- Rules are applied **in order** (last rule always wins among peer selectors)

```
<!--HTML-->
<p class="red green">
 <em class="blue">Text is blue!</em>
</p>
```

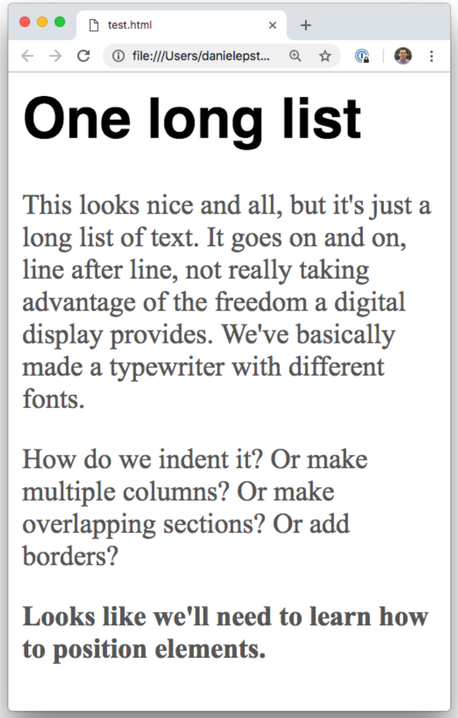
```
/* CSS */
p { font-family: 'Verdana'; }
.red { color: red; }
.green { color: green; }
.blue { color: blue; }
```

Specifying styles

- CSS specificity is *calculated* based on which selector designates it
- General rule: rule that's "closer to the HTML element" applies
- This is difficult stuff, usually trial-and-error resolves most things



Our progress so far...



Positioning

- HTML tags are either*:
  - **Block** elements (line break after them)
  - **Inline** elements (no line break)

```
<p>
 This is on a line.
 <em>This is on the same line.</em>
</p>
<p>This will be on a new line.</p>
```

Block

Inline

- Don’t put block elements inside inline elements!

Positioning

Here are the block-level elements in HTML:

<address>	<article>	<aside>	<blockquote>	<canvas>	<dd>		<dl>
<dt>	<fieldset>	<figcaption>	<figure>	<footer>	<form>	<h1>–<h6>	<header>
<hr>		<main>	<nav>	<noscript>		<p>	<pre>
<section>	<table>	<tfoot>		<video>			

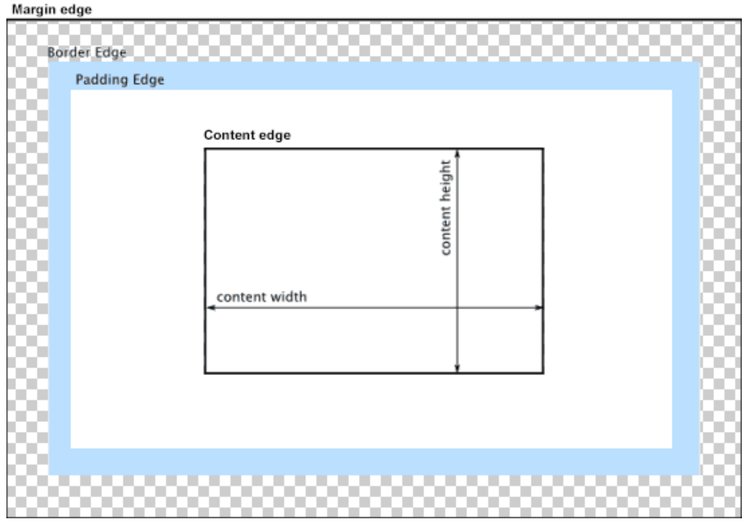
Here are the inline elements in HTML:

<a>	<abbr>	<acronym>	<b>	<bdo>	<big>	 	<button>
<cite>	<code>	<dfn>		<i>	<img>	<input>	<kbd>
<label>	<map>	<object>	<output>	<q>	<samp>	<script>	<select>
<small>			<sub>	<sup>	<textarea>	<time>	<tt>
<var>							

https://www.w3schools.com/html/html_blocks.asp

Positioning: box model

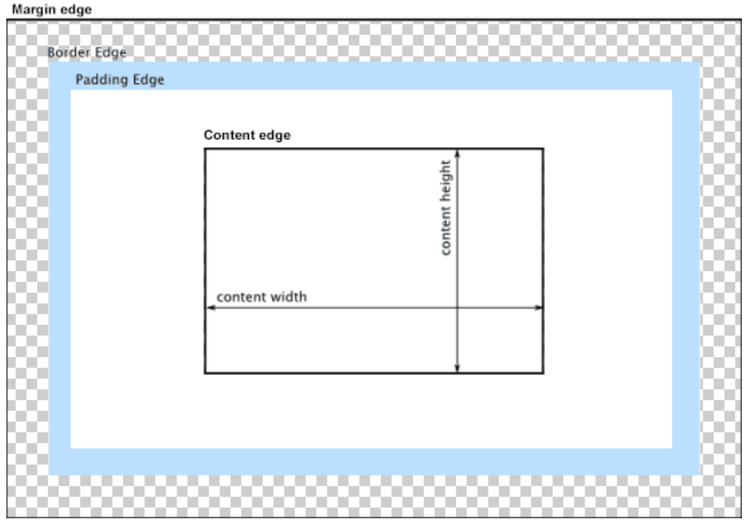
- Content contains “real” content
- Padding extends content area
- Border is similar
- Margin is intended to separate elements
  from neighbors



https://developer.mozilla.org/en-US/docs/Web/CSS/CSS_Box_Model/Introduction_to_the_CSS_box_model

Positioning: box model

- Content dimensions are specified with `width` and `height`
- `padding`, `border`, and `margin` have direction properties (e.g., `padding-top`, `margin-right`, `border-left`)
- `border` can have `border-color`, `border-width`, and `border-style`
- Content color (e.g., `background-color`) extends into padding



https://developer.mozilla.org/en-US/docs/Web/CSS/CSS_Box_Model/Introduction_to_the_CSS_box_model

Positioning

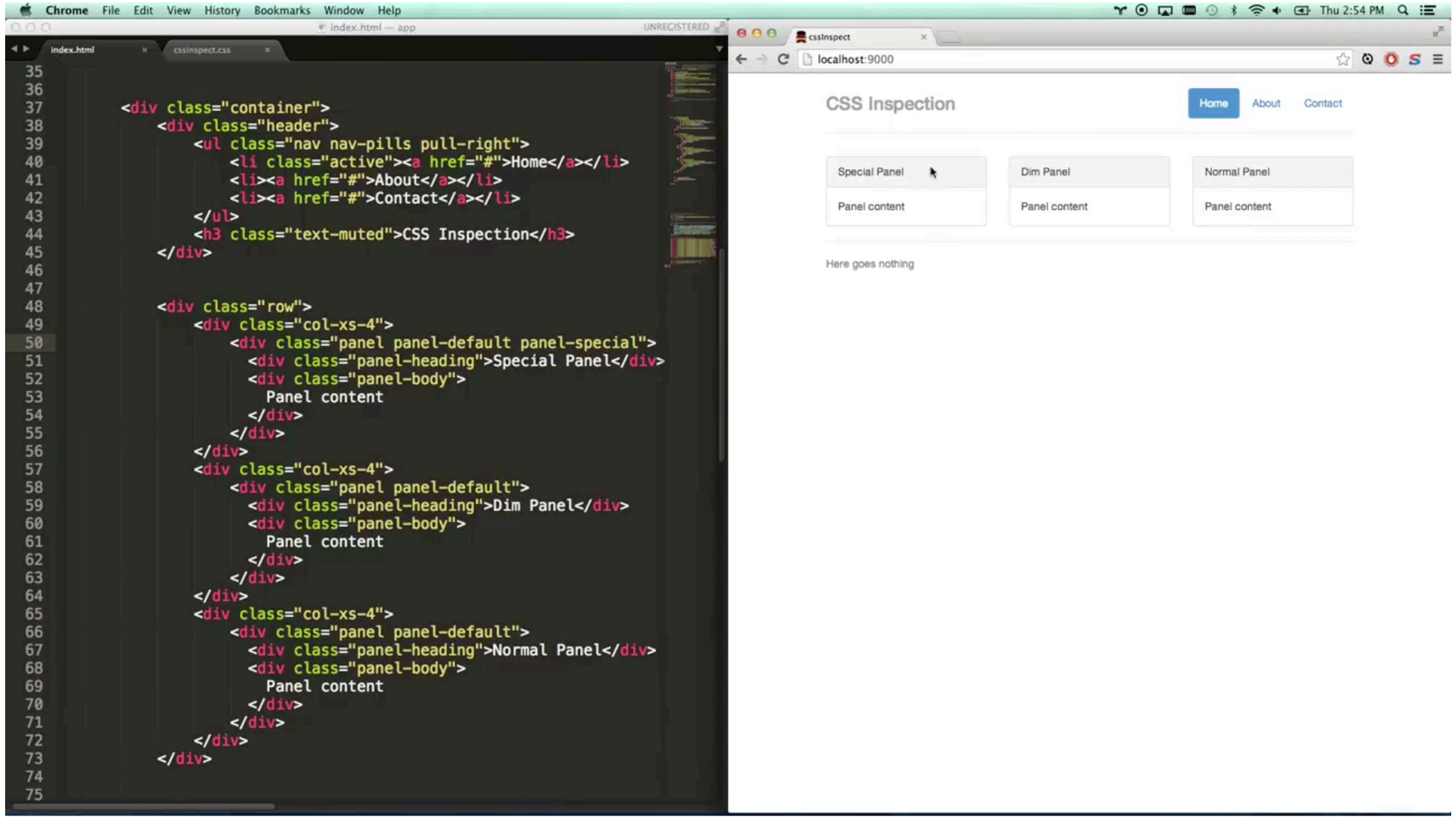
- All positioning is relative to the parent
  - If you nest tags, the child's margins, etc. are all dependent on parent's

There’s a lot to CSS.
I can’t create much from memory alone.

References

- https://www.w3schools.com/cssref/
- https://cssreference.io/
- https://developer.mozilla.org/en-US/docs/Web/CSS/Reference
- https://www.codecademy.com/learn/learn-css

Debugging in browser



https://www.youtube.com/watch?v=Z3HGJsNLQ1E

Design Systems

Design Systems

- Standards, documentation, and reusable components to guide development
- Rules as well as UI components
- Open source systems provide an implementation you can extend

Design Systems

How do you code with one?

- Import it, and you can use its components

```
<head>
  <script src="https://jspm.dev/@spectrum-web-components/
bundle/elements.js" type="module" async></script>
</head>
```

- On web: typically dedicated tags and CSS attributes

Design Systems

How do you code with one?

- Import it, and you can use its components

- For example, on web:

```
<head>
  <script src="https://jspm.dev/@spectrum-web-components/
bundle/elements.js" type="module" async></script>
</head>
```

Design Systems

- New custom tag
- The system adds CSS attributes to render as expected

```
<sp-textfield id="address"
name="address" type="text"
placeholder="“Address">
</sp-textfield>
```

Address

```
:host {                                   constructed stylesheet
  display: inline-flex;
  flex-direction: column;
  inline-size: var(--mod-textfield-width, var(
    --spectrum-textfield-width));
}
:host {                                   constructed stylesheet
  --spectrum-textfield-border-color:
      var(--system-spectrum-textfield-border-color);
  --spectrum-textfield-border-color-hover:
      var(--system-spectrum-textfield-border-color-ho
  --spectrum-textfield-border-color-focus:
      var(--system-spectrum-textfield-border-color-fo
  --spectrum-textfield-border-color-focus-hover:
      var(--system-spectrum-textfield-border-color-fo
  --spectrum-textfield-border-color-keyboard-focus:
      var(--system-spectrum-textfield-border-color-ke
  --spectrum-textfield-border-width: var(
    --system-spectrum-textfield-border-width);
}
```

Design Systems

- Include supported customization options
  - For example, what CSS attributes are supported, and what they do

Attributes and Properties

Property	Attribute	Type	Default	Description
autocomplete	autocomplete	| 'list' | 'none' | HTMLInputElement['autocomplete'] | HTMLTextAreaElement['autocomplete'] | undefined		What form of assistance should be provided when attempting to supply a value to the form control
disabled	disabled	boolean	false	Disable this control. It will not receive focus or events
grows	grows	boolean	false	Whether a form control delivered with the `multiline` attribute will change size vertically to accomodate longer input
invalid	invalid	boolean	false	Whether the `value` held by the form control is invalid.
label	label	string	''	A string applied via `aria-label` to the form control when a user visible label is not provided.
maxlength	maxlength	number	-1	Defines the maximum string length that the user can enter
minlength	minlength	number	-1	Defines the minimum string length that the user can enter

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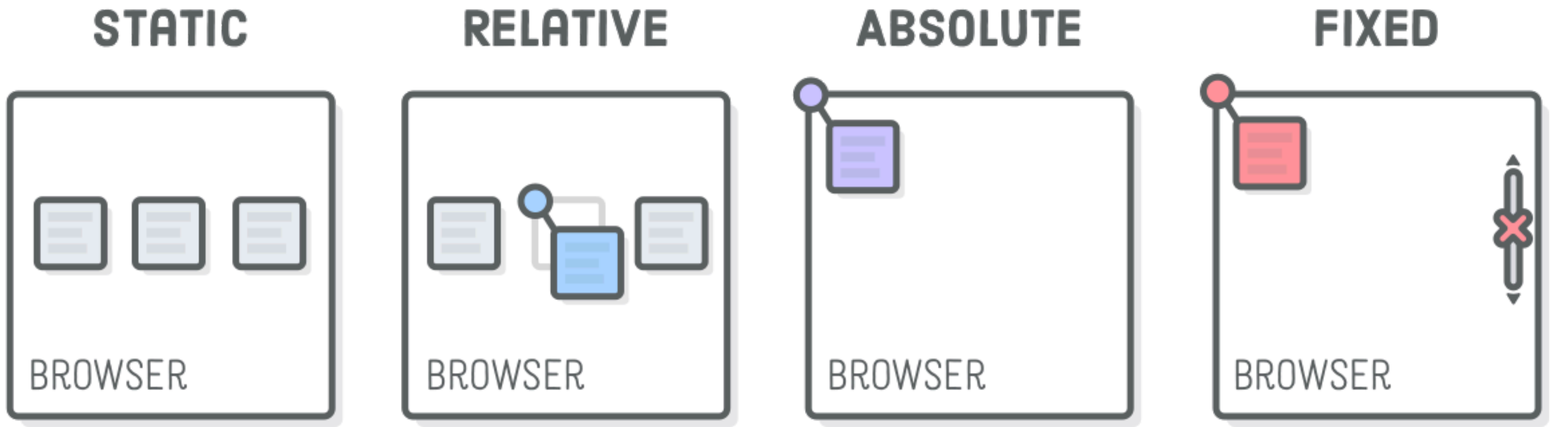
Additional slides

Positioning: types



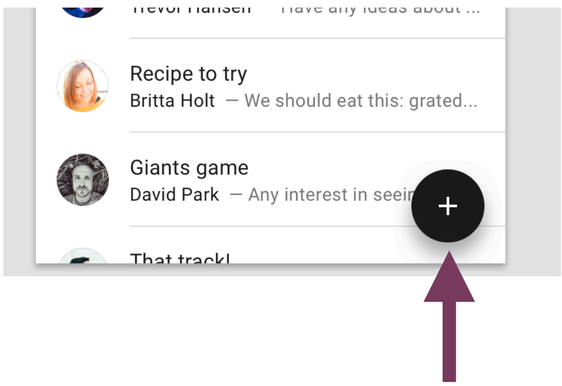
- `static` (default)
- `relative` (offset from default)
- `absolute` (from top-left)
- `fixed` (absolute + floating)

https://internetingishard.com/html-and-css/advanced-positioning/

Positioning: types

- `static` and `relative` follow the overall flow of a page
  - `relative` helps make adjustments to the flow
- `absolute` and `fixed` ignore it entirely
  - But they're helpful in some cases, like floating action buttons (FABs)

Relative position

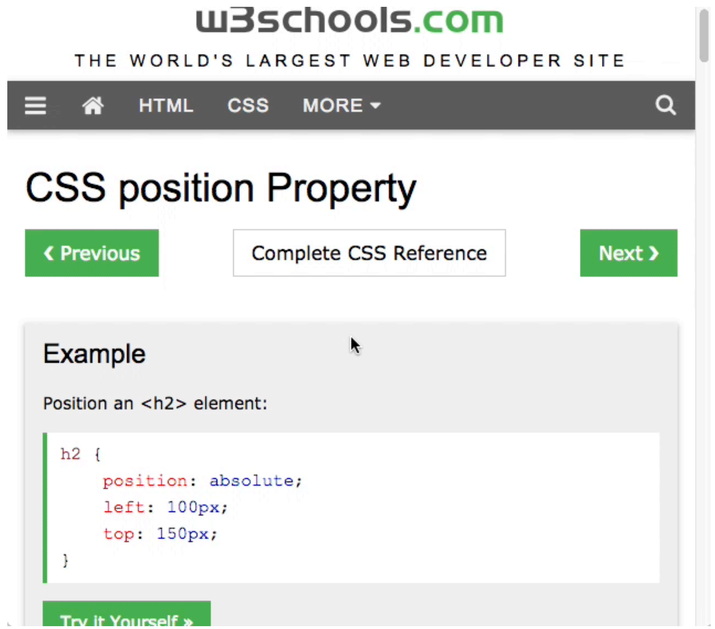


Absolute position

https://css-tricks.com/examples/AbsoluteInsideRelative/

Positioning: types

- `sticky` will stop when a user scrolls past it
  - Useful for menus
  - Not all browsers support it, but getting there



https://css-tricks.com/examples/AbsoluteInsideRelative/

Units

- Pixels (`px`), element units (`em`), percentages (`%`), real-world units (`in`, `cm`)
- Use relative units (`em`, `%`) whenever possible
- Helps accessibility, people with low vision change default size (usually 16px)
  - Em fonts scale from the default, a 30px heading stays 30px
- Also useful to vary based on screen size
  - More on how to do that next lecture

	Recommended	Occasional use	Not recommended
Screen	em, px, %	ex	pt, cm, mm, in, pc
Print	em, cm, mm, in, pt, pc, %	px, ex	

https://engageinteractive.co.uk/blog/em-vs-rem-vs-px

Advanced selectors

- Extremely useful for making clean stylesheets

- Add a top margin for all `h2`s that follow a `p`aragraph

```
p + h2 {
 margin-top: 10px;
}
```

- Or only in a particular `div`

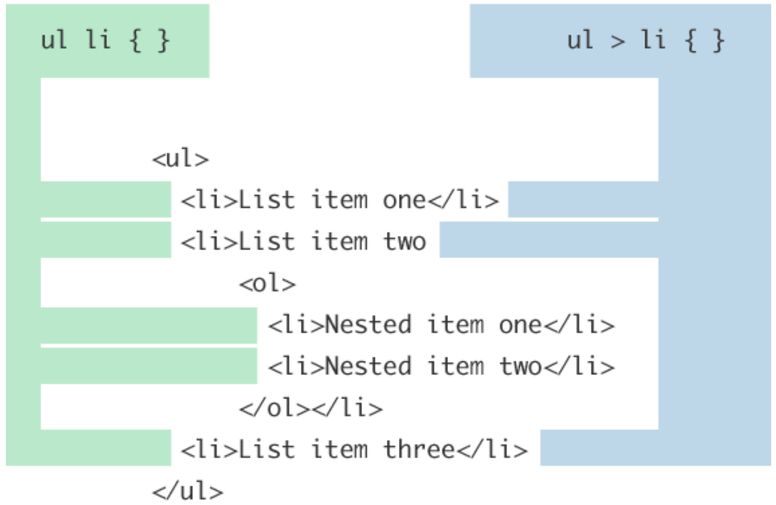
```
div.post p + h2 {
 margin-top: 10px;
}
```

https://www.smashingmagazine.com/2009/08/taming-advanced-css-selectors/

Advanced selectors

Subtitle

- `ul li`
  - Select *all* children and grandchildren
- `ul > li`
  - Select *direct* children (not grandchildren)

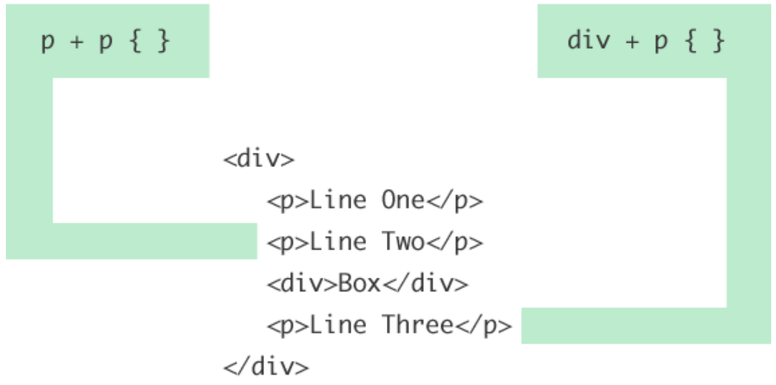


https://css-tricks.com/child-and-sibling-selectors/

Advanced selectors

Subtitle

- `p + p`
- `div + p`
  - Target items immediately next to each other

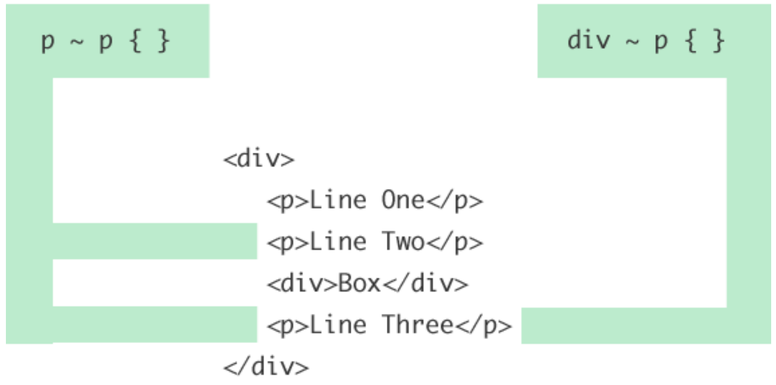


https://css-tricks.com/child-and-sibling-selectors/

Advanced selectors

Subtitle

- `p ~ p`
- `div ~ p`
  - Target items anywhere after the sibling



https://css-tricks.com/child-and-sibling-selectors/

Fonts & fallbacks

- Browsers will try fonts in order

```
p {
    font-family: "Times New Roman", Times, serif;
}
```

- Google Fonts is a great resource

```
<!--HTML-->
<link href="https://fonts.googleapis.com/css?
family=Roboto" rel="stylesheet">
/* CSS */
font-family: 'Roboto', sans-serif;
```

https://fonts.google.com/

Fallbacks in HTML

- Work similarly to CSS

```
<video autoplay>
 <!--webm not supported in IE or Safari-->
 <source src="lecture3.webm" type="video/webm" />
    <!--mp4 supported in modern browsers, but lower
quality-->
    <source src="lecture3.mp4" type="video/mp4" />
    <!--backup important for some old browsers-->
    <img src="lecture3.jpg" title="Your browser does not
support the <video> tag">
</video>
```

Fallbacks: why?

- Format not supported (webm, ogg, flac)
- Font might not support certain characters
- Might take time to load (“flash of unstyled text”)
  - Pick a similar default font

The fox jumped over the lazy dog, the scoundrel.

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

https://css-tricks.com/css-basics-fallback-font-stacks-robust-web-typography/

Specifying styles

Inline Styling

```
<p style="font-family='Arial'; color=red;">
 Red text
</p>
<p style="font-family='Arial'; color=red;">
 More red text
</p>
```

- Supported, but usually bad practice
  - Goes against DRY principles of programming (Don’t Repeat Yourself)

Specifying styles

Internal Styling

```
<head>
 <style type="text/css">
  p {font-family:'Arial'; color:red;}
 </style>
</head>
<body>
 ...
</body>
```

- Just putting CSS into the `<head>` of your HTML

Specifying styles

External Styling

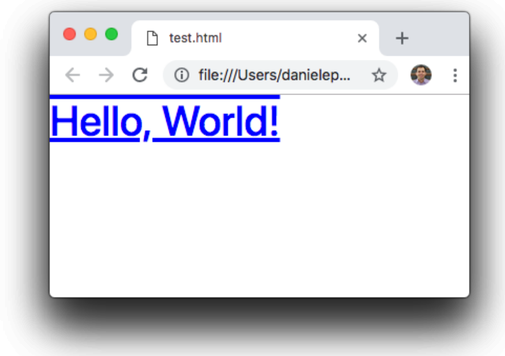
```
<head>
 <link rel="stylesheet" href="./css/style.css">
</head>
<body>
  ...
</body>
```

- Generally a best practice
  - Aligns with the idea of separating structure from style

Specifying styles

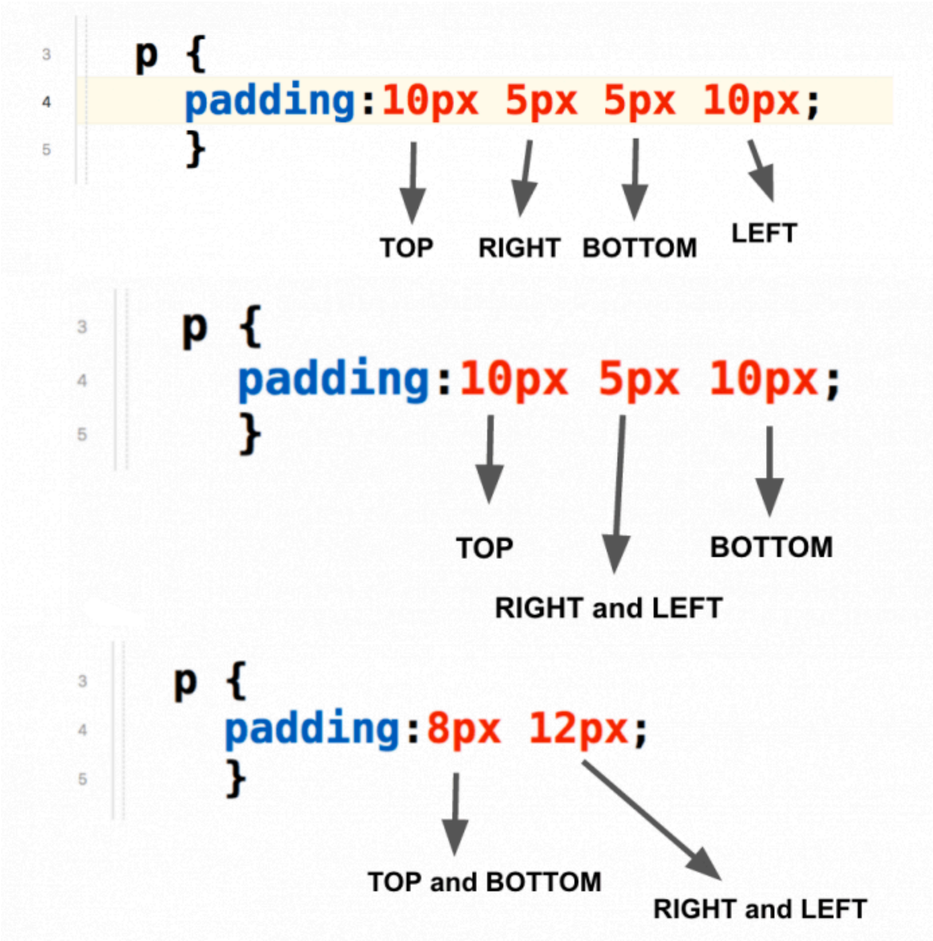
- External styles apply in order, too!

```
<head>
  <link rel="stylesheet"
  href="./css/bootstrap.css">
  <link rel="stylesheet"
  href="./css/style.css">
</head>
<body>
  <h1>Hello, World!</h1>
</body>
```



Positioning: shorthand

- Multiple values can be specified in one line
- Difficult to remember
- Being explicit improves readability at the expense of brevity



https://css-tricks.com/remember-the-order-of-marginpadding-shorthand-with-trouble/

Borders: shorthand

- Multiple values can be specified in one line
- Slightly easier to remember
- Maybe even more readable

```
div {
  border-bottom-width: 3px;
  border-bottom-style: solid;
  border-bottom-color: red;
}

div.equivalent {
  border-bottom: 3px solid red;
}
```

https://www.w3schools.com/css/css_border.asp

Pseudo-classes

- Define a special state of an element

```
/* CSS Pseudocode */
Selector:pseudo-class {
 property: value;
 property: value;
 ...
}
```

Pseudo-classes

```
a:link { /* unvisited link */
    color: #FF0000;
}

a:visited { /* visited link */
    color: #00FF00;
}

a:hover { /* mouse over link */
    color: #FF00FF;
}

a:active { /* selected link */
    color: #0000FF;
}
```

`hover` must be after `link` and `visited`

`active` must be after `hover`

https://www.w3schools.com/Css/css_pseudo_classes.asp