# CS193X: Web Programming Fundamentals

Spring 2017

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# Today's schedule

**Today**

- Squarespace Layout
  - Single row/column flexbox
  - Misc helpful CSS
- position?

**Friday**

- Multi-row/column flexbox
- Mobile layouts
- CSS wrap-up

**Monday**

- Intro to JavaScript

# Announcements

🚨 **Homework 1 deadline extended!** 🚨

- Due ~~Mon Apr 17~~ **Wed Apr 19!**
- Details here

Homework 2 will go out Wed Apr 19 as well.
See syllabus for adjusted schedule.

**Victoria's Office Hours --> Friday**

- Due to a meeting, my office hours will be Friday after class this week instead of today.

**Amy / Cindy's Office Hours canceled** this afternoon

- Email if you want to meet me at 4 in my office

# Font-related CSS review

| Name | Description |
| --- | --- |
| `font-family` | Font face (mdn) |
| `color` | Font color (and always font color) (mdn) |
| `font-size` | Font size (mdn) |
| `line-height` | Line height (mdn) |
| `text-align` | Alignment of text (mdn) |

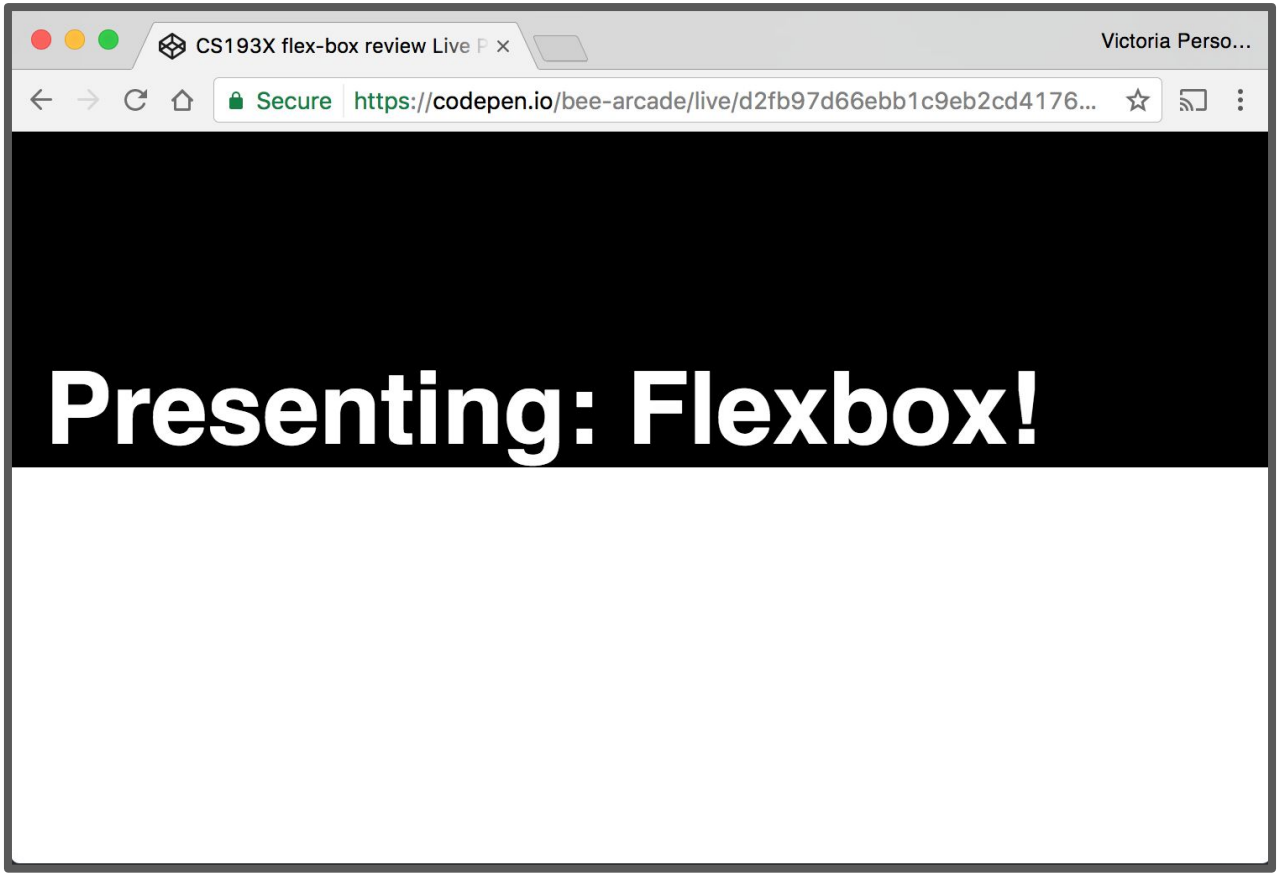
# More font-related CSS

| Name | Description |
| --- | --- |
| `text-decoration` | Can set `underline`, `line-through` (strikethrough) or `none` (e.g. to unset underline on hyperlinks) (mdn) |
| `text-transform` | Can change font **case**, i.e. `uppercase`, `lowercase`, `capitalize`, `none` (mdn) |
| `font-style` | Can set to `italic` or `normal` (e.g. to unset italic on `<em>`) (mdn) |
| `font-weight` | Can set to `bold` or `normal` (e.g. to unset bold on `h1` - `h6`) (mdn) |
| `letter-spacing` | Controls the space between letters (mdn) |

# Flexbox

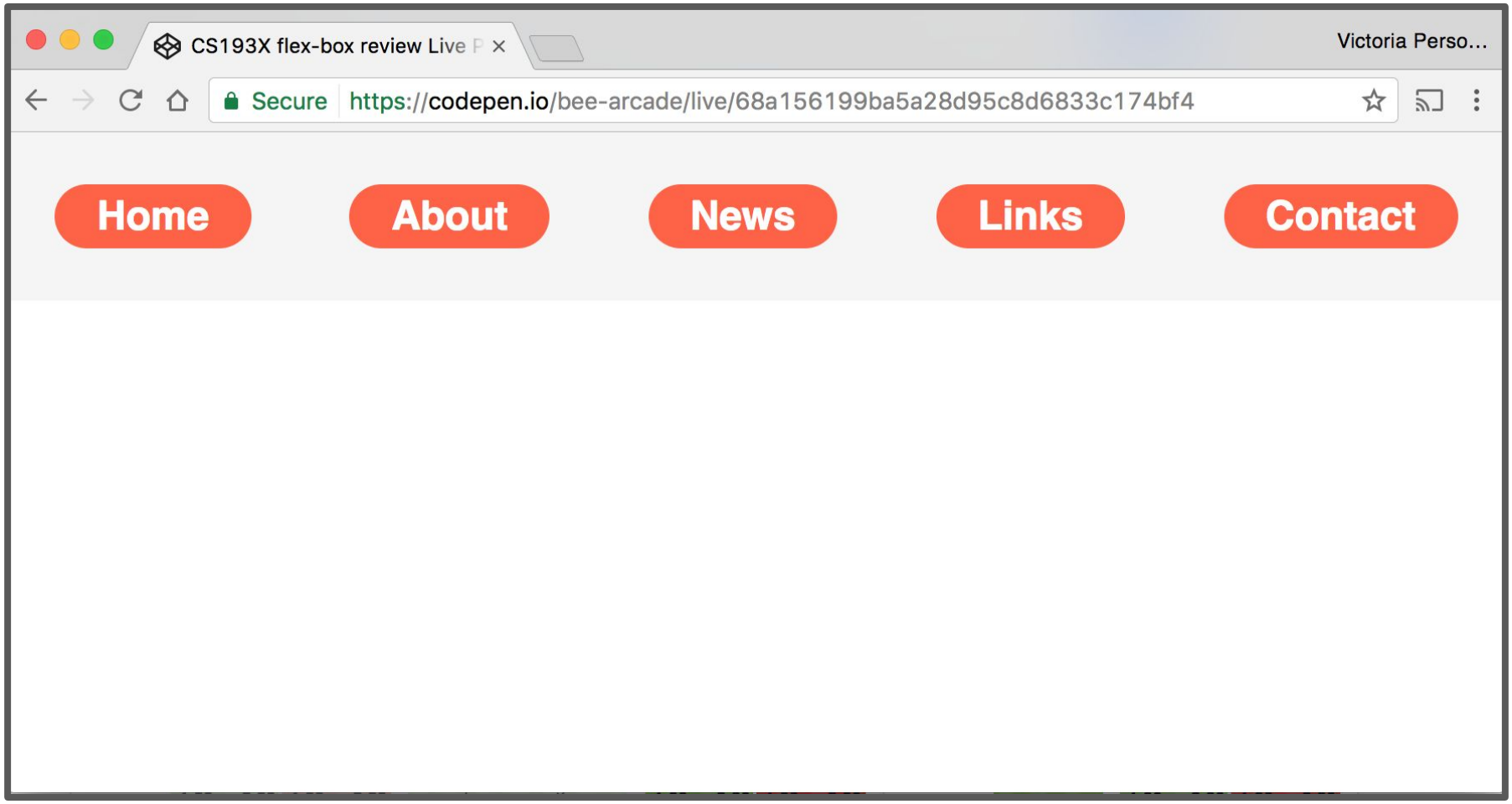
# Review: Flexbox

How do we create this look? (Codepen)



# Review: Flexbox

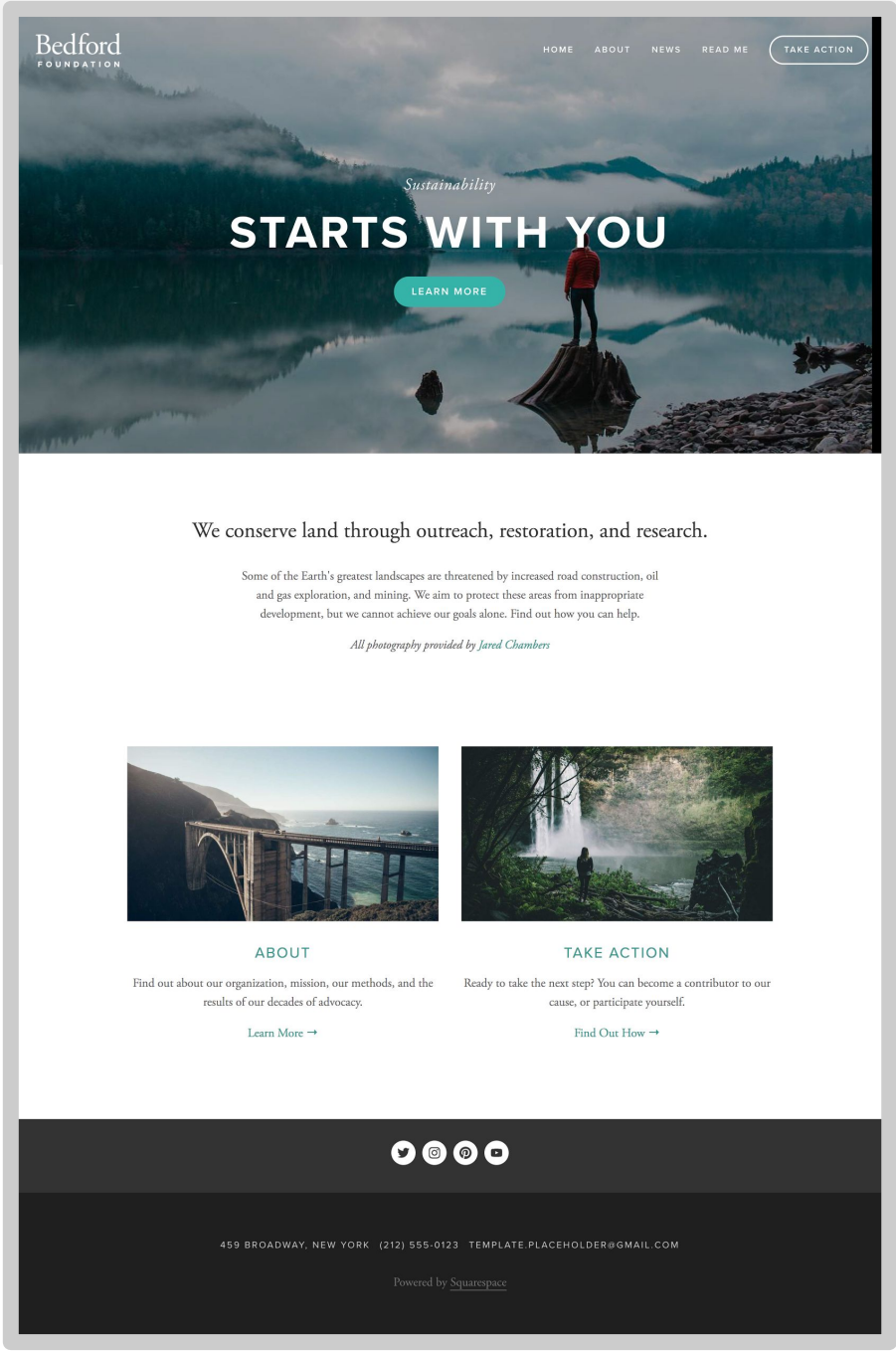
How do we create this look? (Codepen)



Continuing where we left off!

# Goal

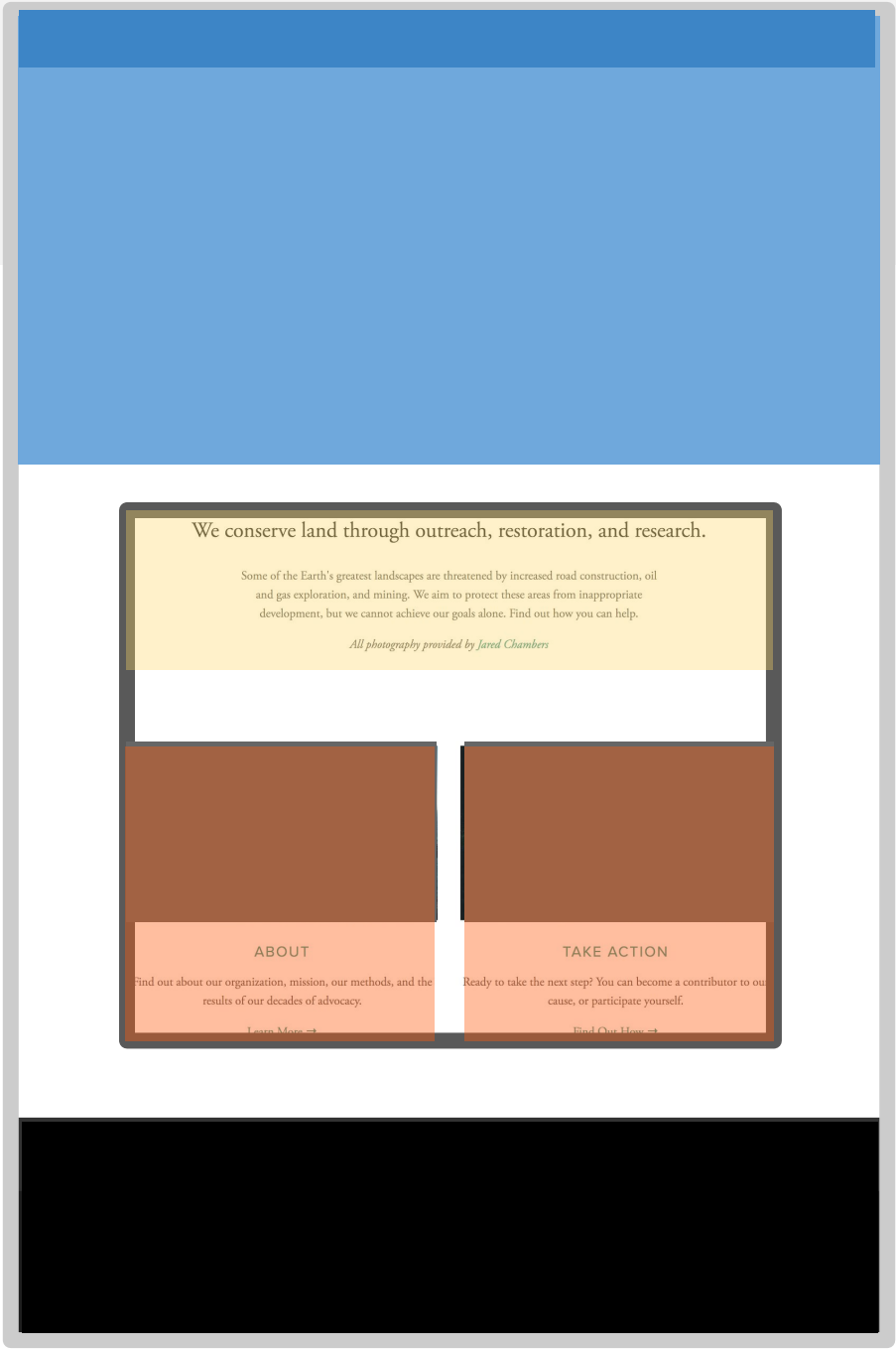
We were trying to create a layout that looks sort of like this:



# Status

We broke up the layout into a bunch of colored boxes:

And we got kind of stuck trying to position the orange boxes.



# Recall: block layouts

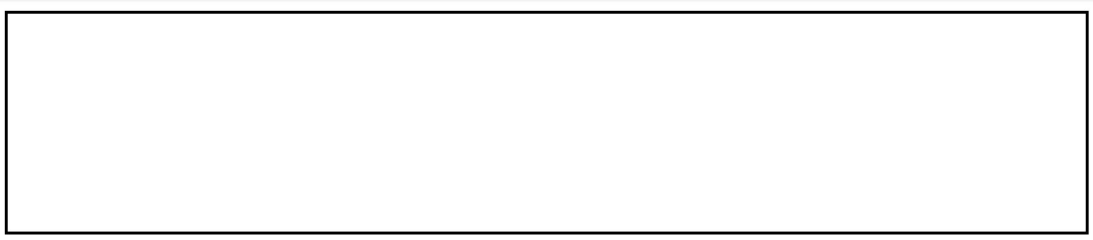
If `#flex-container` was **not** `display: flex`:

HTML

```
<html>
  <head>
    <meta charset="utf-8">
    <title>Flexbox example</title>
  </head>
  <body>

    <div id="flex-container">
      <span class="flex-item"></span>
      <span class="flex-item"></span>
      <span class="flex-item"></span>
    </div>

  </body>
</html>
```

CSS

```
#flex-container {
  border: 2px solid black;
  height: 150px;
}

.flex-item {
  border-radius: 10px;
  background-color: purple;
  height: 50px;
  width: 50px;
  margin: 5px;
}
```



Then the span `flex-items` would not show up because span elements are inline, which don't have a height and width

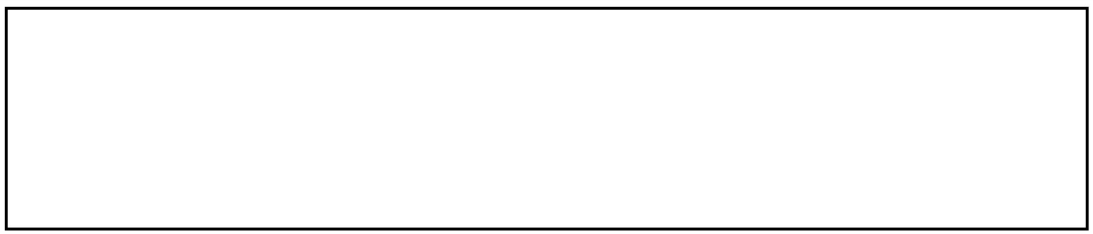
# (Review block and inline!)

HTML

```
<html>
  <head>
    <meta charset="utf-8">
    <title>Flexbox example</title>
  </head>
  <body>

    <div id="flex-container">
      <span class="flex-item"></span>
      <span class="flex-item"></span>
      <span class="flex-item"></span>
    </div>

  </body>
</html>
```

CSS

```
#flex-container {
  border: 2px solid black;
  height: 150px;
}

.flex-item {
  border-radius: 10px;
  background-color: purple;
  height: 50px;
  width: 50px;
  margin: 5px;
}
```



(Please make sure you completely understand why the  elements do not show up!)

Check out **block vs inline guide**

# What happens if the flex item is an inline element?

HTML

```
<html>
  <head>
    <meta charset="utf-8">
    <title>Flexbox example</title>
  </head>
  <body>

    <div id="flex-container">
      <span class="flex-item"></span>
      <span class="flex-item"></span>
      <span class="flex-item"></span>
    </div>

  </body>
```

CSS

```
#flex-container {
  display: flex;
  border: 2px solid black;
  height: 150px;
}

.flex-item {
  border-radius: 10px;
  background-color: purple;
  height: 50px;
  width: 50px;
  margin: 5px;
}
```

JS

# ???

HTML

```
<html>
  <head>
    <meta charset="utf-8">
    <title>Flexbox example</title>
  </head>
  <body>

    <div id="flex-container">
      <span class="flex-item"></span>
      <span class="flex-item"></span>
      <span class="flex-item"></span>
    </div>

  </body>
```

CSS

```
#flex-container {
  display: flex;
  border: 2px solid black;
  height: 150px;
}

.flex-item {
  border-radius: 10px;
  background-color: purple;
  height: 50px;
  width: 50px;
  margin: 5px;
}
```

JS

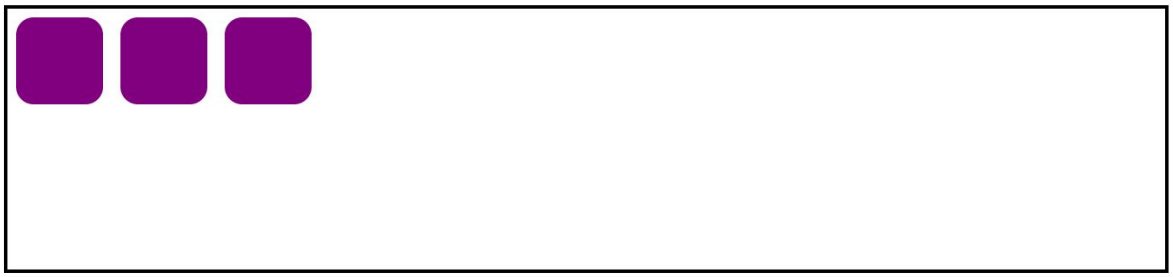
# Flex layouts

HTML

```
<html>
  <head>
    <meta charset="utf-8">
    <title>Flexbox example</title>
  </head>
  <body>

    <div id="flex-container">
      <span class="flex-item"></span>
      <span class="flex-item"></span>
      <span class="flex-item"></span>
    </div>

  </body>
```

CSS

```
#flex-container {
  display: flex;
  border: 2px solid black;
  height: 150px;
}

.flex-item {
  border-radius: 10px;
  background-color: purple;
  height: 50px;
  width: 50px;
  margin: 5px;
}
```



**Why does this change when `display: flex`?**

Why do inline elements suddenly seem to have height and width?

# Flex: A different rendering mode

- When you set a container to `display: flex`, the direct children in that container are **flex items** and follow a new set of rules.
- **Flex items are not block or inline;** they have different rules for their height, width, and layout.
  - The *contents* of a flex item follow the usual block/inline rules, relative to the flex item's boundary.
- The **height** and **width** of flex items are… complicated.

**Follow along on CodePen**

# Flex item sizing

# Flex basis

Flex items have an initial width*, which, by default is either:

- The content width, or
- The explicitly set **`width`** property of the element, or
- The explicitly set **`flex-basis`** property of the element

This initial width* of the flex item is called the **flex basis**.

*width in the case of rows; height in the case of columns

# Flex basis

If we unset the height and width, our flex items disappears, because the **flex basis** is now the content size, which is empty:

HTML

```
    <title>Flexbox example</title>
  </head>
  <body>

    <div id="flex-container">
      <span class="flex-item"></span>
      <div class="flex-item"></div>
      <span class="flex-item"></span>
    </div>

  </body>
</html>
```

CSS

```
#flex-container {
  display: flex;
  border: 2px solid black;
  height: 150px;
}

.flex-item {
  border-radius: 10px;
  background-color: purple;
  margin: 5px;
}
```

# `flex-shrink`

The width* of the flex item can automatically shrink **smaller than the flex basis** via the **`flex-shrink`** property:

**`flex-shrink`:**

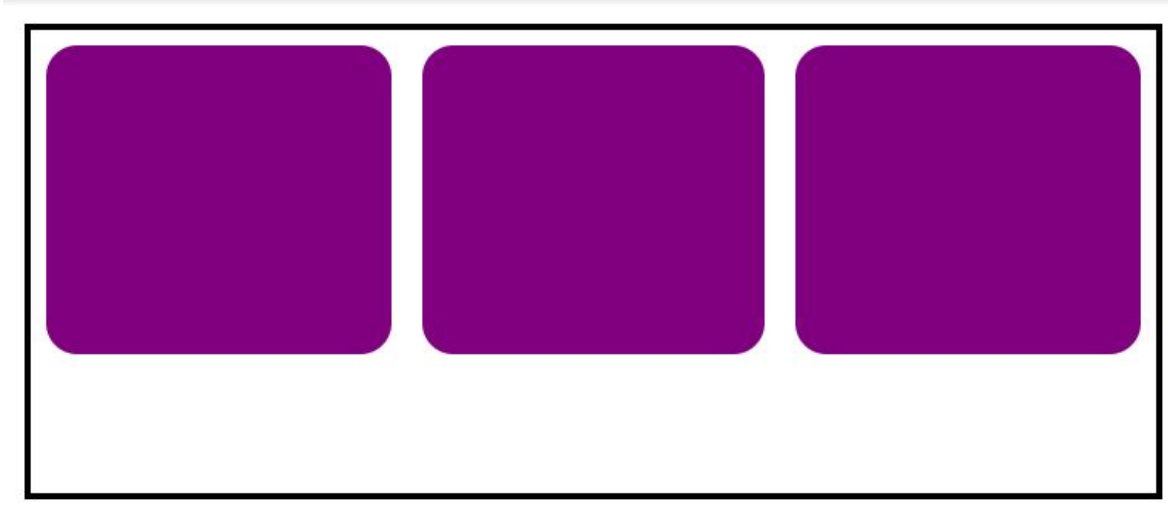
- If set to 1, the flex item shrinks itself as small as it can in the space available.
- If set to 0, the flex item does not shrink.

**Flex items have `flex-shrink`: 1 by default.**

*width in the case of rows; height in the case of columns

```css
#flex-container {
  display: flex;
  align-items: flex-start;
  border: 2px solid black;
  height: 150px;
}
```

```css
.flex-item {
  width: 500px;
  height: 100px;

  border-radius: 10px;
  background-color: purple;
  margin: 5px;
}
```



The flex items' widths all shrink to fit within the container.

```css
#flex-container {
  display: flex;
  align-items: flex-start;
  border: 2px solid black;
  height: 150px;
}
```

```css
.flex-item {
  width: 500px;
  height: 100px;
  flex-shrink: 0;

  border-radius: 10px;
  background-color: purple;
  margin: 5px;
}
```

Setting `flex-shrink: 0;` undoes the shrinking behavior, and the flex items do not shrink in any circumstance:

# `flex-grow`

The width* of the flex item can automatically **grow larger than the flex basis** via the `flex-grow` property:

**`flex-grow`:**

- If set to 1, the flex item grows itself as large as it can in the space remaining.
- If set to 0, the flex-item does not grow.

**Flex items have `flex-grow: 0` by default.**

*width in the case of rows; height in the case of columns

# `flex-grow` example

Let's unset the height and width of our flex items again:

HTML

```
    <title>Flexbox example</title>
  </head>
  <body>

    <div id="flex-container">
      <span class="flex-item"></span>
      <div class="flex-item"></div>
      <span class="flex-item"></span>
    </div>

  </body>
</html>
```

CSS

```
#flex-container {
  display: flex;
  border: 2px solid black;
  height: 150px;
}

.flex-item {
  border-radius: 10px;
  background-color: purple;
  margin: 5px;
}
```

# `flex-grow` example

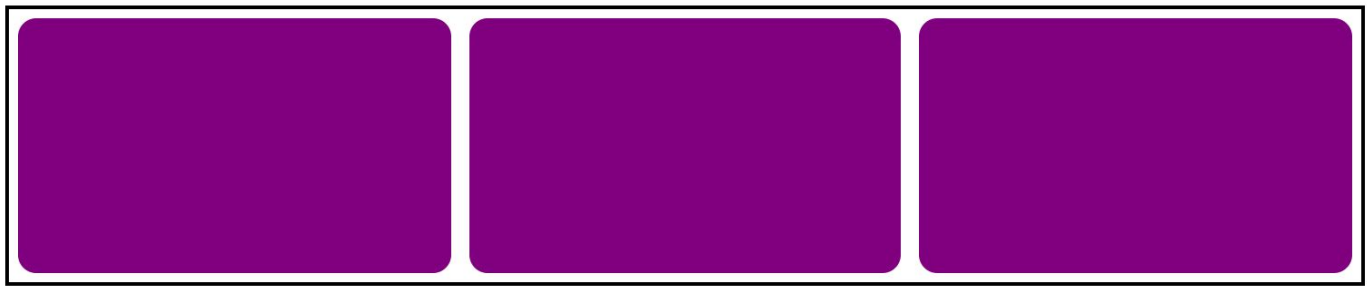
If we set `flex-grow: 1`, the flex items fill the empty space:

HTML

```
    <title>Flexbox example</title>
  </head>
  <body>

    <div id="flex-container">
      <span class="flex-item"></span>
      <div class="flex-item"></div>
      <span class="flex-item"></span>
    </div>

  </body>
</html>
```

CSS

```
#flex-container {
  display: flex;
  border: 2px solid black;
  height: 150px;
}

.flex-item {
  border-radius: 10px;
  flex-grow: 1;
  background-color: purple;
  margin: 5px;
}
```



# Flex item height**?!

Note that `flex-grow` only controls width*.

So why does the height** of the flex items seem to "grow" as well?

HTML

```
    <title>Flexbox example</title>
  </head>
  <body>

    <div id="flex-container">
      <span class="flex-item"></span>
      <div class="flex-item"></div>
      <span class="flex-item"></span>
    </div>

  </body>
</html>
```

CSS

```
#flex-container {
  display: flex;
  border: 2px solid black;
  height: 150px;
}

.flex-item {
  border-radius: 10px;
  flex-grow: 1;
  background-color: purple;
  margin: 5px;
}
```

*width in the case of rows; height in the case of columns

**height in the case of rows; width in the case of columns

# `align-items: stretch;`

The default value of `align-items` is `stretch`, which means every flex item grows vertically* to fill the container by default.

HTML

```
    <title>Flexbox example</title>
  </head>
  <body>

    <div id="flex-container">
      <span class="flex-item"></span>
      <div class="flex-item"></div>
      <span class="flex-item"></span>
    </div>

  </body>
</html>
```

CSS

```
#flex-container {
  display: flex;
  border: 2px solid black;
  height: 150px;
}

.flex-item {
  border-radius: 10px;
  flex-grow: 1;
  background-color: purple;
  margin: 5px;
}
```

*vertically in the case of rows;
horizontally in the case of columns

# `align-items: stretch;`

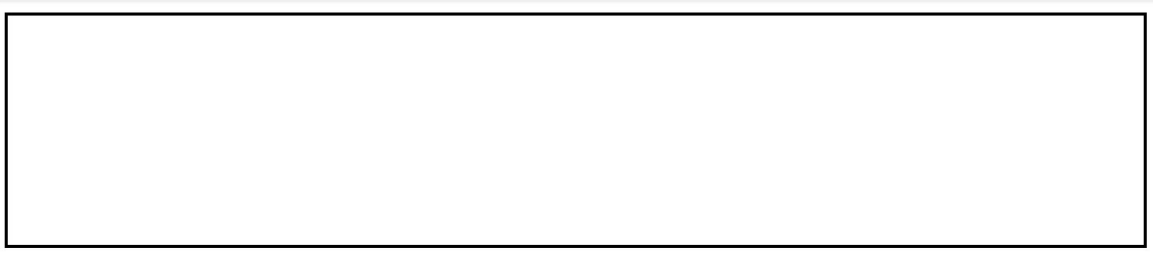
If we set another value for `align-items`, the flex items disappear again because the height is now content height, which is 0:

HTML

```
    <title>Flexbox example</title>
  </head>
  <body>

    <div id="flex-container">
      <span class="flex-item"></span>
      <div class="flex-item"></div>
      <span class="flex-item"></span>
    </div>

  </body>
</html>
```

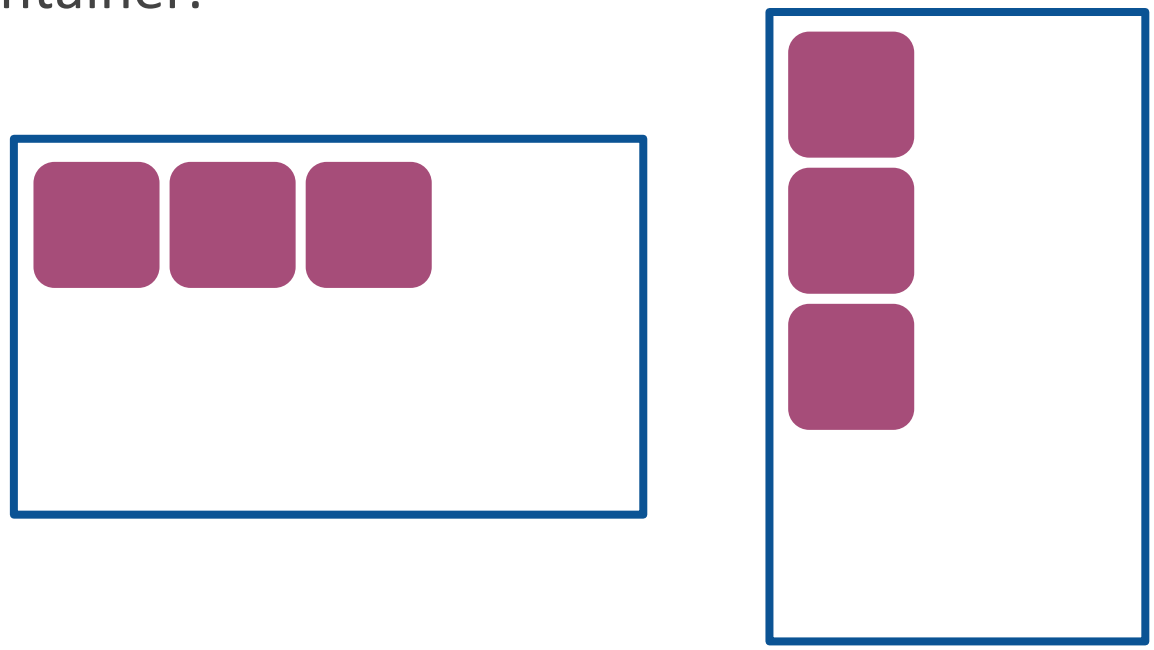
CSS

```
#flex-container {
  display: flex;
  align-items: flex-start;
  border: 2px solid black;
  height: 150px;
}

.flex-item {
  border-radius: 10px;
  flex-grow: 1;
  background-color: purple;
  margin: 5px;
}
```



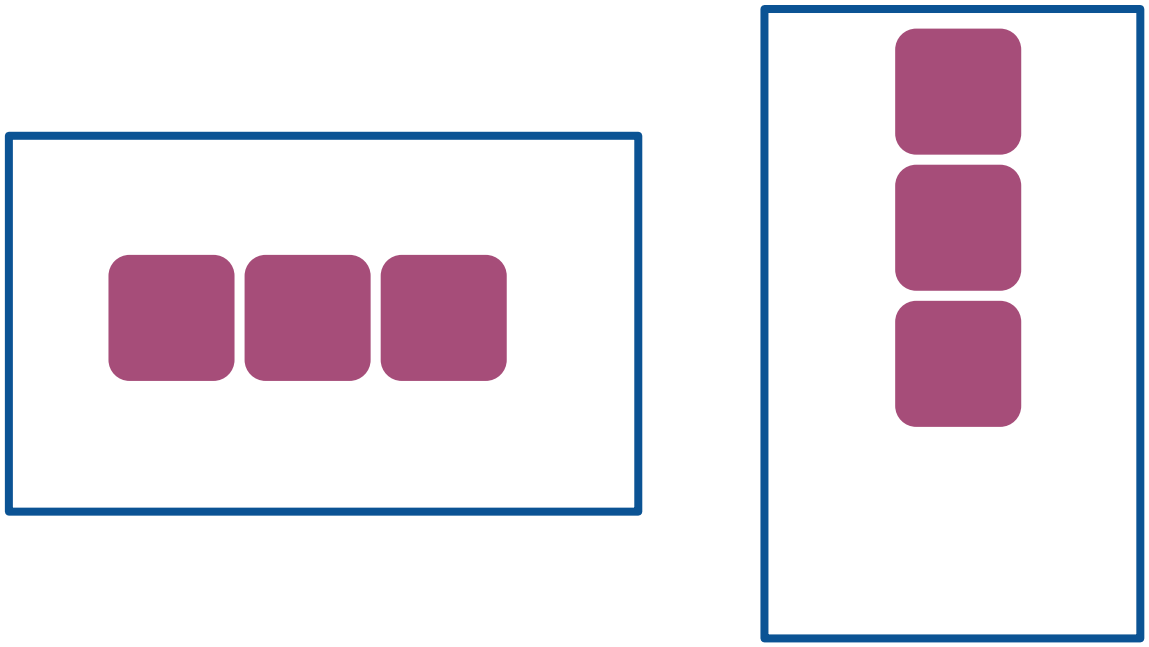
# Flex layout recap

- If you set `display: flex`, the element is now a **flex container** and its direct children are **flex items**.
- The items in a flex container will layout in a `row` or `column` depending on the `flex-direction` of the container.



# Flex layout recap

- **`justify-contents`** distributes the items horizontally for `flex-direction: row`, vertically for `column`
- **`align-items`** distributes the items vertically for `flex-direction: row`, horizontally for `column`



# Flex layout recap

For `flex-direction: row`:

- The **flex basis** is the initial width of a flex item
  - This is either the explicitly set `width`, the explicitly set `flex-basis`, or the content width
- The width of a flex item will **shrink** to fit the container if `flex-shrink` is set to 1 (disabled if 0)
- The width of a flex item will **grow** to fit the remaining space if `flex-grow` is set to 1 (disabled if 0)

# Flex layout recap

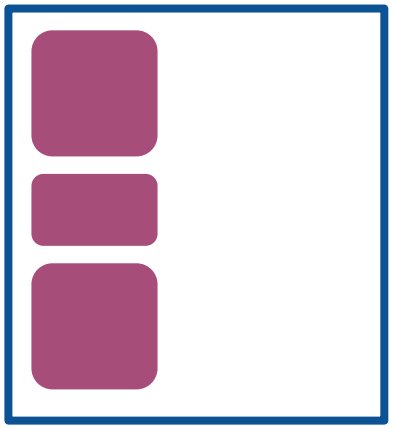
For `flex-direction: row`:

- The height of a flex item is either:
  - the explicitly set `height` on the item, or
  - the content height on the item, or
  - the height of the container if the container's `align-items: stretch;`

# Flex layout recap

For `flex-direction: column`:

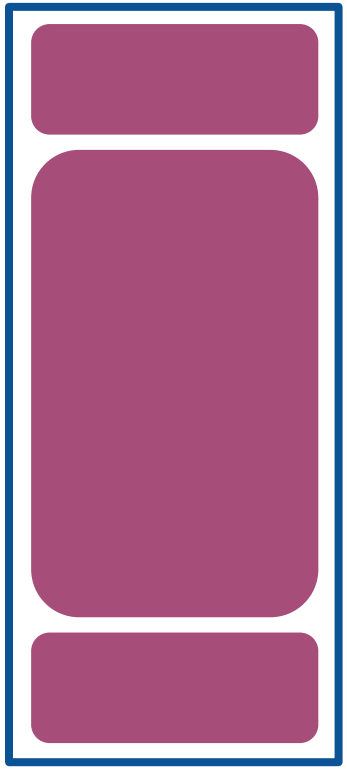
- The **flex basis** is the initial height of a flex item
  - This is either the explicitly set `height`, the explicitly set `flex-basis`, or the content height
- The height of a flex item will **shrink** to fit the container if `flex-shrink` is set to 1 (disabled if 0)
- The height of a flex item will **grow** to fit the remaining space if `flex-grow` is set to 1 (disabled if 0)



# Flex layout recap

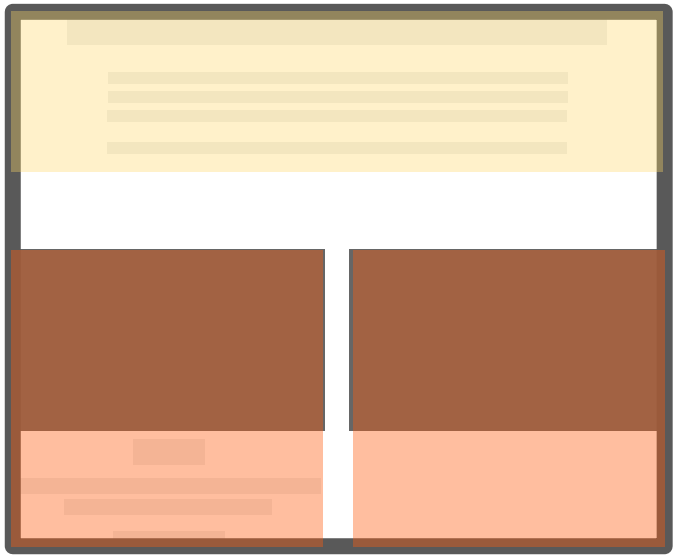
For `flex-direction: column`:

- The width of a flex item is either:
  - the explicitly set `width` on the item,
    or
  - the content width on the item,
    or
  - the width of the container if the container's `align-items: stretch;`



That's still just scratching the surface of flex box...

# ...but we now know enough to continue our layout!

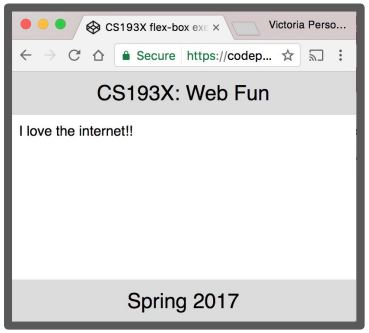


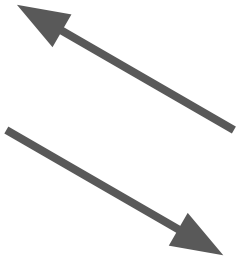
**Follow along on Codepen**

# Height and width quirks:
# vh, vw, `box-sizing`

# Flexbox example

How do we make a layout that looks like this? (Codepen)




The header and footer stay at the top and bottom of the viewport. (Live example)

# `height` and `width` percentages

When `width` is defined as a percentage:

- `width` is specified as a percentage of the **containing block's** `width`.

When `height` is defined as a percentage:

- `height` is specified as a percentage of the **containing block's** `height`.

In other words, `height` and `width` are defined **relative to their parent element** when defined as a percentage.

# height and width percentages

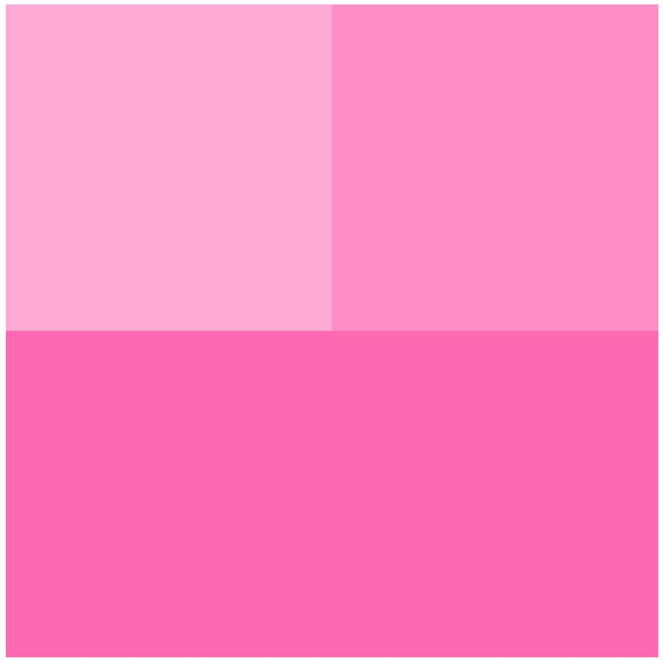
HTML

```html
<div id="box">
  <div id="upper-half">
    <div id="upper-quarter"></div>
  </div>
</div>
```

CSS

```css
#box {
  height: 500px;
  width: 500px;
  background-color: hotpink;
}

#upper-half {
  height: 50%;
  width: 100%;
}

#upper-quarter {
  height: 100%;
  width: 50%;
}

#box div {
 background-color: rgba(255, 255, 255, 0.25);
}
```

OUTPUT

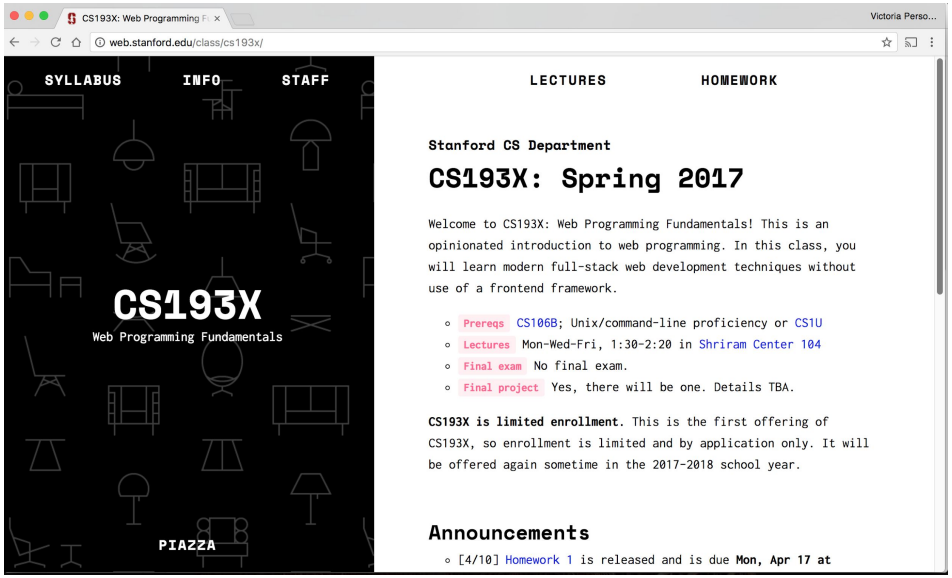


(Codepen)

# Viewport?

Browser vocabulary:

- **viewport:** the rectangle where the webpage shows up, scrollable via a scrollbar
- **chrome:** all the UI that's *not* the webpage, i.e. everything but the viewport



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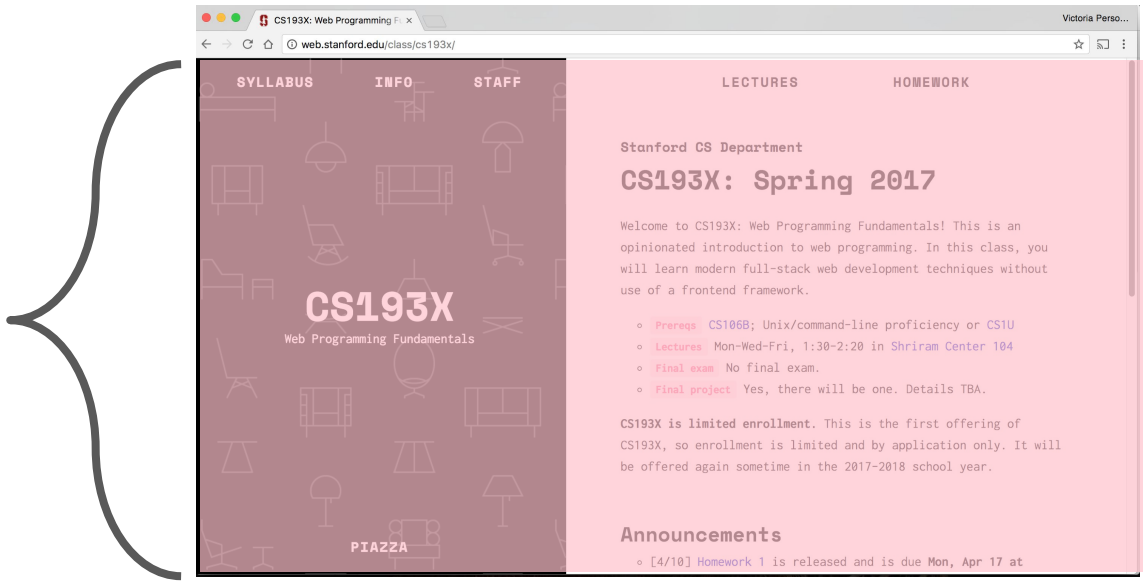
The viewport



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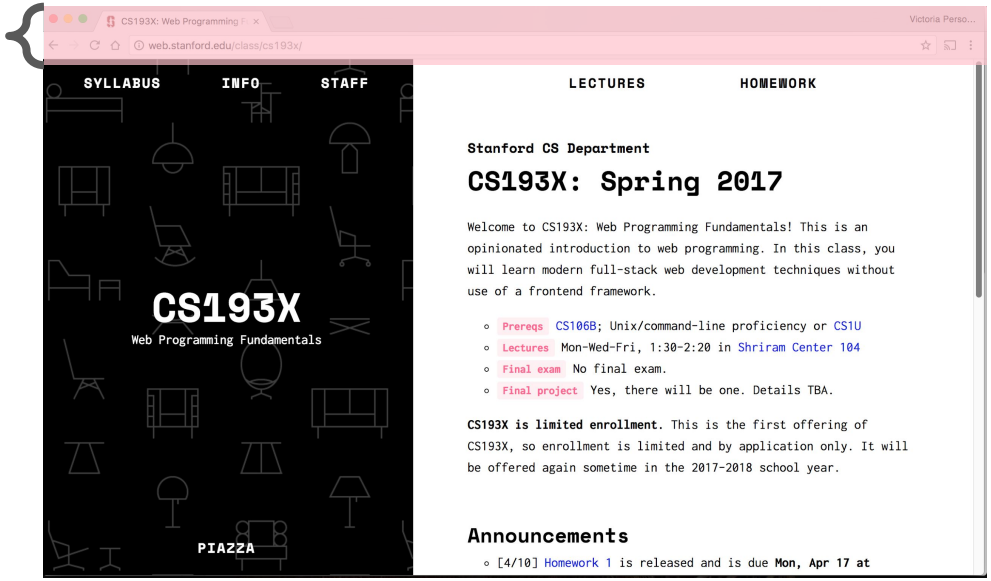
- **chrome:** all the UI that's *not* the webpage, i.e. everything but the viewport

The chrome



# vh and vw

You can define `height` and `width` in terms of the viewport

- Use units `vh` and `vw` to set `height` and `width` to the percentage of the viewport's height and width, respectively (mdn)
- `1vh` = 1/100th of the viewport height
- `1vw` = 1/100th of the viewport width

Example:

- `height: 100vh;`
- `width: 100vw;`

# Flexbox example, solved

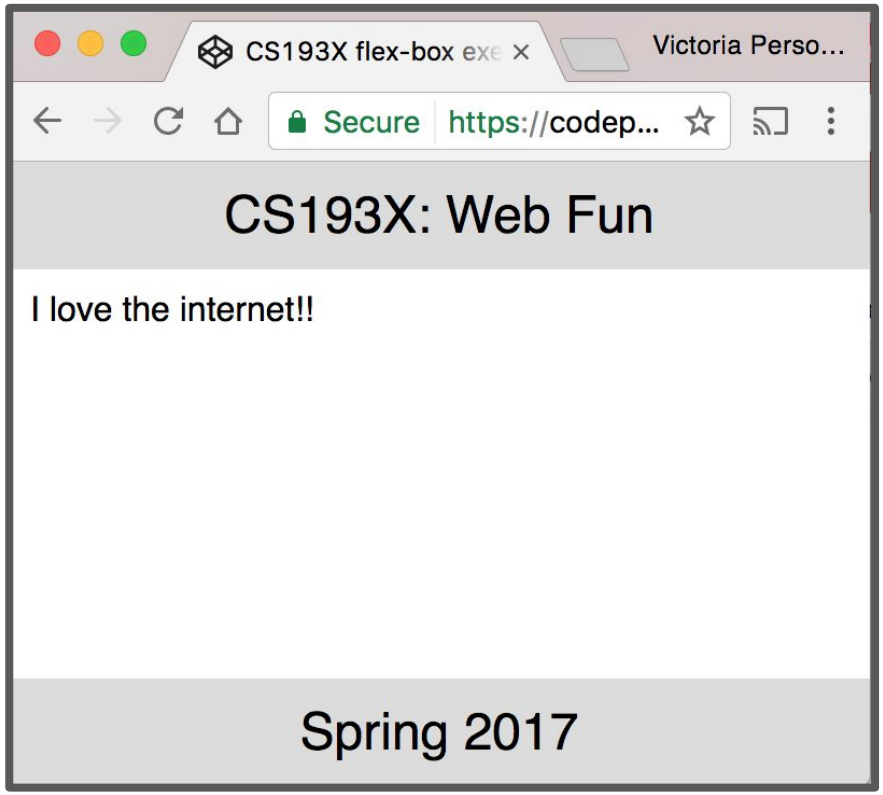
HTML

```
<article>
  <header>CS193X: Web Fun</header>
  <section>
    <p>I love the internet!!</p>
  </section>
  <footer>Spring 2017</footer>
</article>
```

CSS

```
article {
  display: flex;
  flex-direction: column;
  height: 100vh;
  width: 100%;
}

section {
  flex-grow: 1;
  padding: 10px;
}
```

(rest of the CSS)




(CodePen)

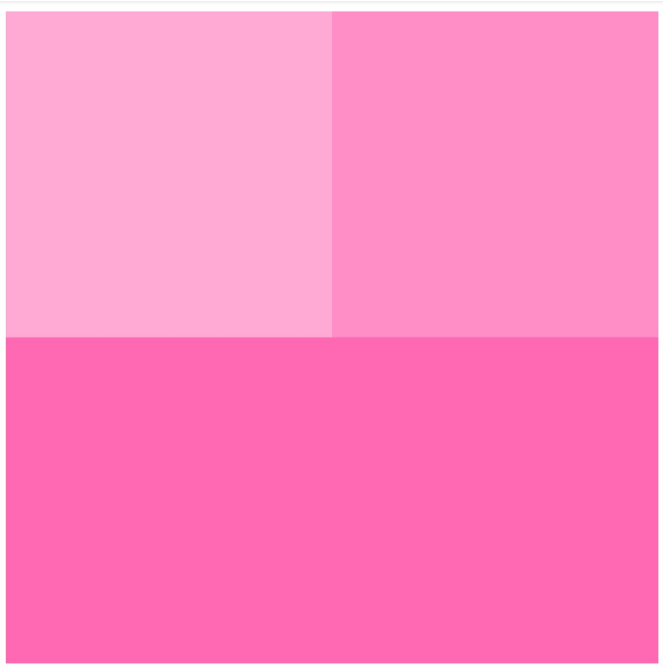
# Aside: sizing

**Q: What happens if we add a border to `#upper-half`?**

```
<div id="box">
  <div id="upper-half">
    <div id="upper-quarter"></div>
  </div>
</div>
```

```
#upper-half {
  height: 50%;
  width: 100%;
}
```

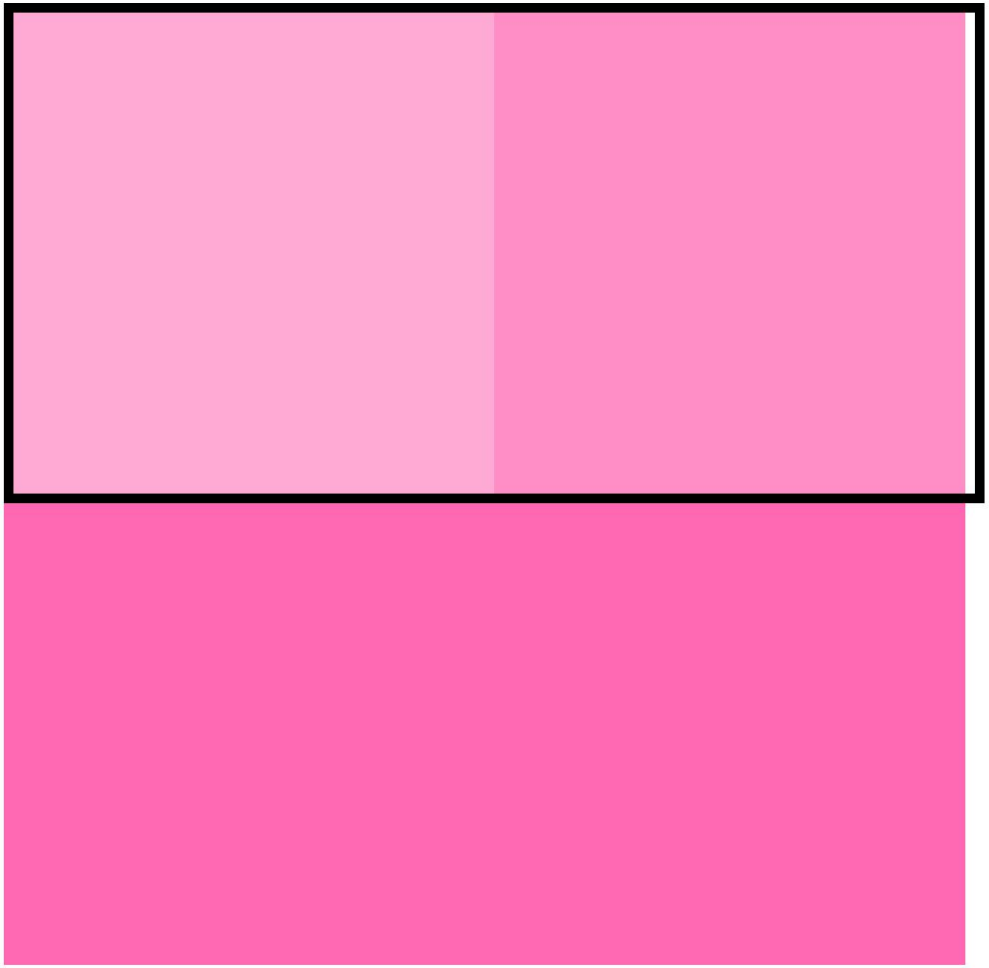
(rest of the css)



???

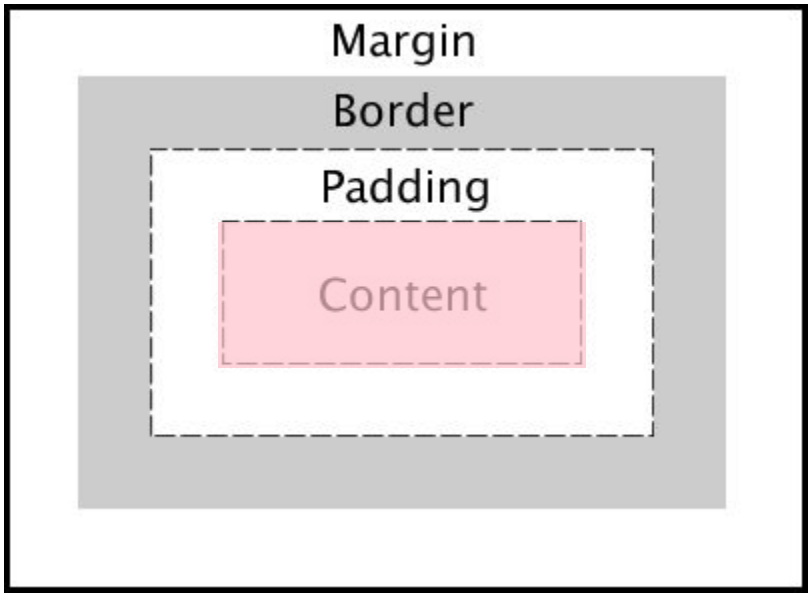
```
#upper-half {
  height: 50%;
  width: 100%;
  border: 5px solid black;
}
```

(rest of the CSS)



# CSS box model width and height

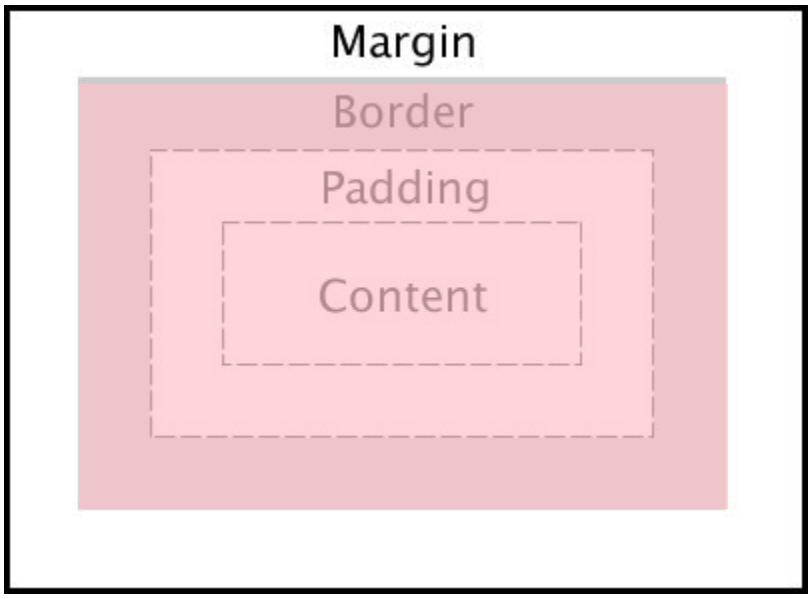
The box model defines CSS `width` and `height` properties to refer to the element's **content** width and height:



# box-sizing

If you want to have `width` and `height` refer to the element's **border** width and height, use `box-sizing`:

- `box-sizing: border-box;`

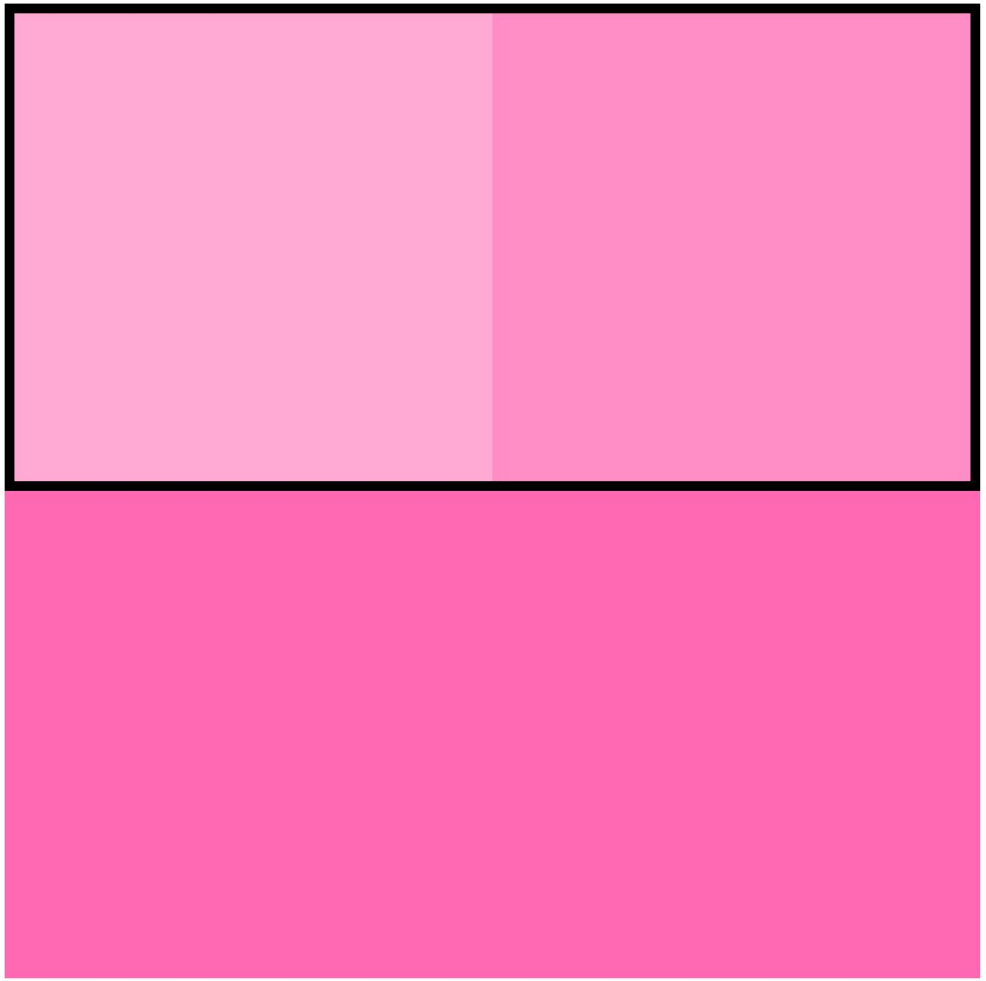



Note: Using `border-box` will include padding in the `width` and `height` as well.
Note: You **cannot** select padding-box or margin-box.

# Fixed example

```
#upper-half {
  height: 50%;
  width: 100%;
  border: 5px solid black;
  box-sizing: border-box;
}
```

(rest of the CSS)



Before we finish Squarespace...

# Another rendering mode: `position`

# Moving things with `position`

**Positioned layout** lets you define precisely where an element should be in the page (mdn).

You can use positioned layout doing the following:

1. Define a **`position`** method:
   `Static, fixed, absolute, relative`
2. Define **`offsets`**: `top, left, bottom,` and `right`
3. (optional) Define **`z-index`** for overlapping layers

**Let's check it out!**

# Moving things with `position`

To specify exactly where an element goes, set its **`top, left, bottom,`** and/or **`right`** offset.

The meaning of these offset values depend on the reference point set by **`position`**:

- **`static`**: no reference point; static block can't move *(this is the default style for every element)*
- **`fixed`**: a fixed position within the viewport
- **`absolute`**: a fixed position within its "containing element"
- **`relative`**: offset from its normal static position

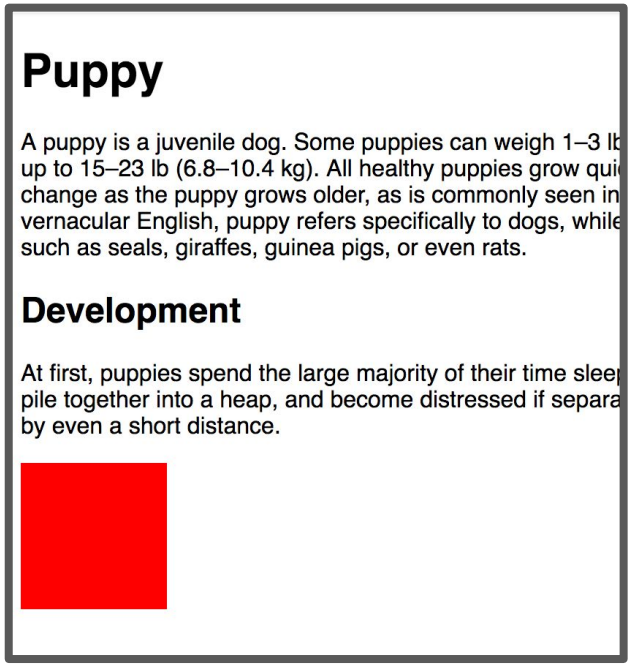
# `position: static`

(nothing happens!)

- `static` is the default value for `position`
- If you use `top` / `left` / `bottom` / `right` without setting a non-static `position`, nothing will happen

```
<body>
  <h1>Puppy</h1>
  <p>A puppy is a juvenile dog. Some puppies
  <h2>Development</h2>
  <p>At first, puppies spend the large major
  <div id="box1"></div>
</body>
```

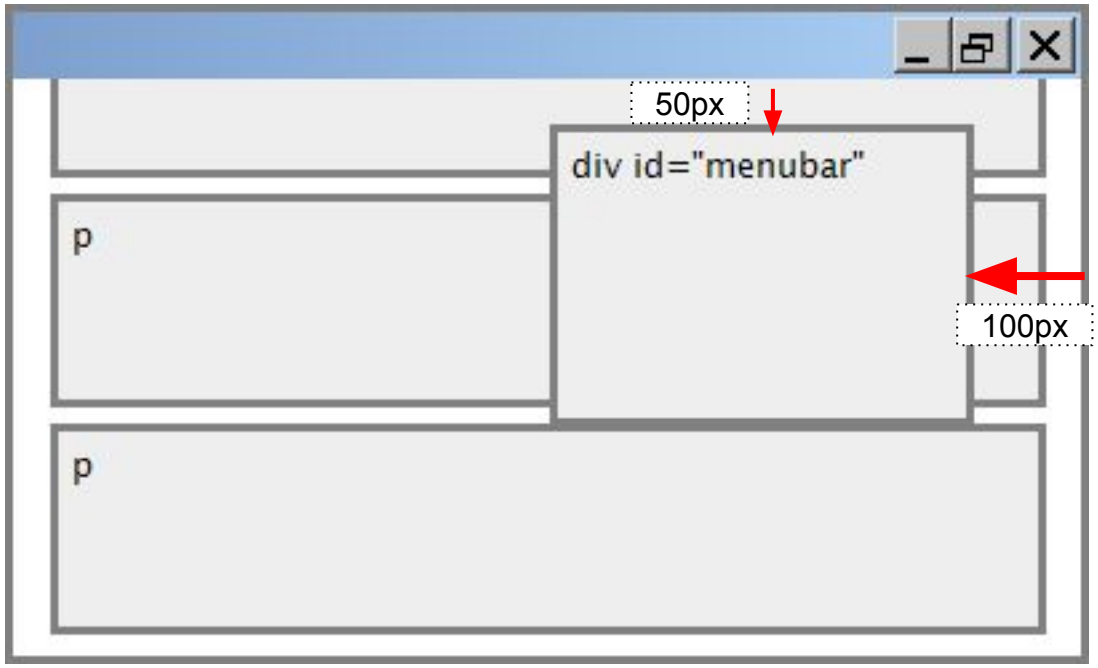
```
#box1 {
  height: 100px;
  width: 100px;
  background-color: red;

  top: 0;
  left: 0;
}
```




(CodePen)

# position: fixed

```
#menubar {
  position: fixed;
  top: 50px;
  right: 100px;
}
```



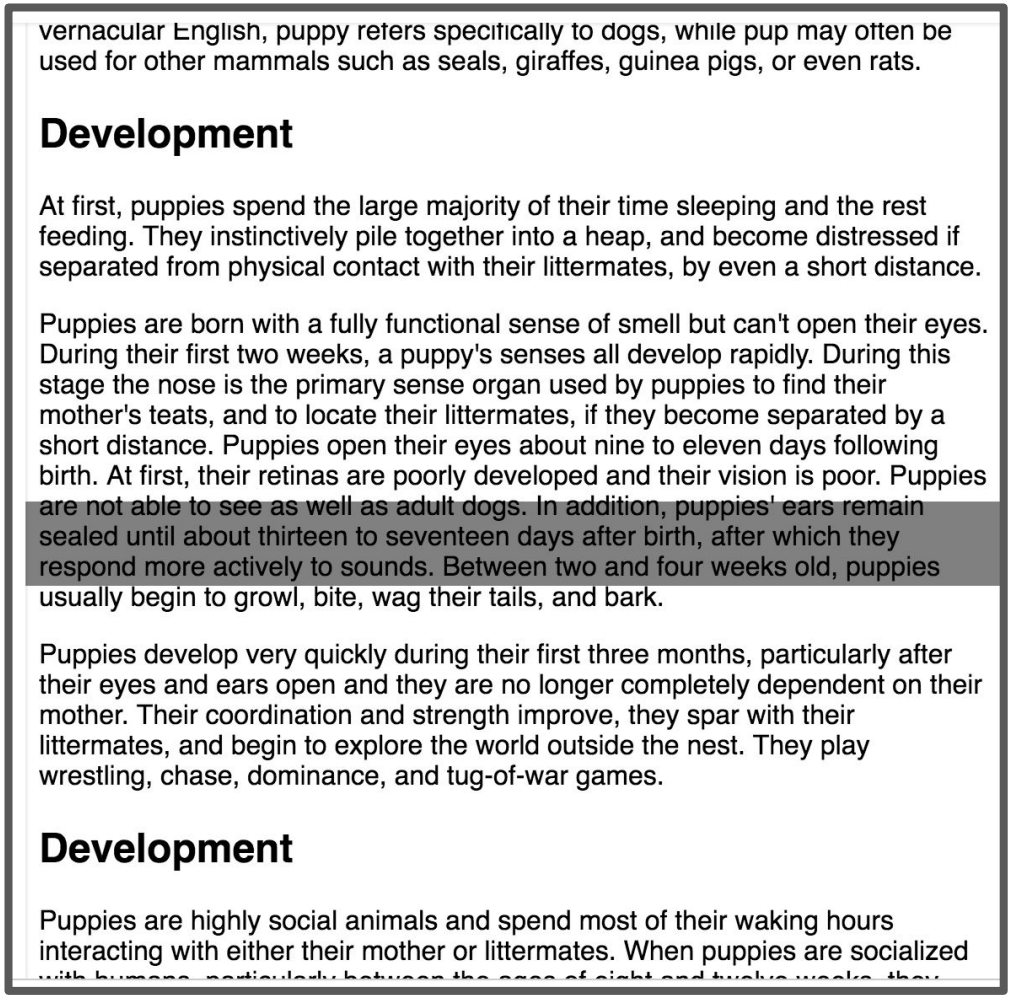

- For **fixed positioning**, the offset is the distance positioned relative to the viewport.
- The element does not move when scrolled.
- Element is removed from normal document flow, positioned on its own layer

Often used to implement UIs; control bars that shouldn't go away

# position: fixed

```
#box1 {
  height: 50px;
  background-color:
    rgba(0, 0, 0, 0.5);

  position: fixed;
  top: 50%;
  left: 0;
  right: 0;
}
```

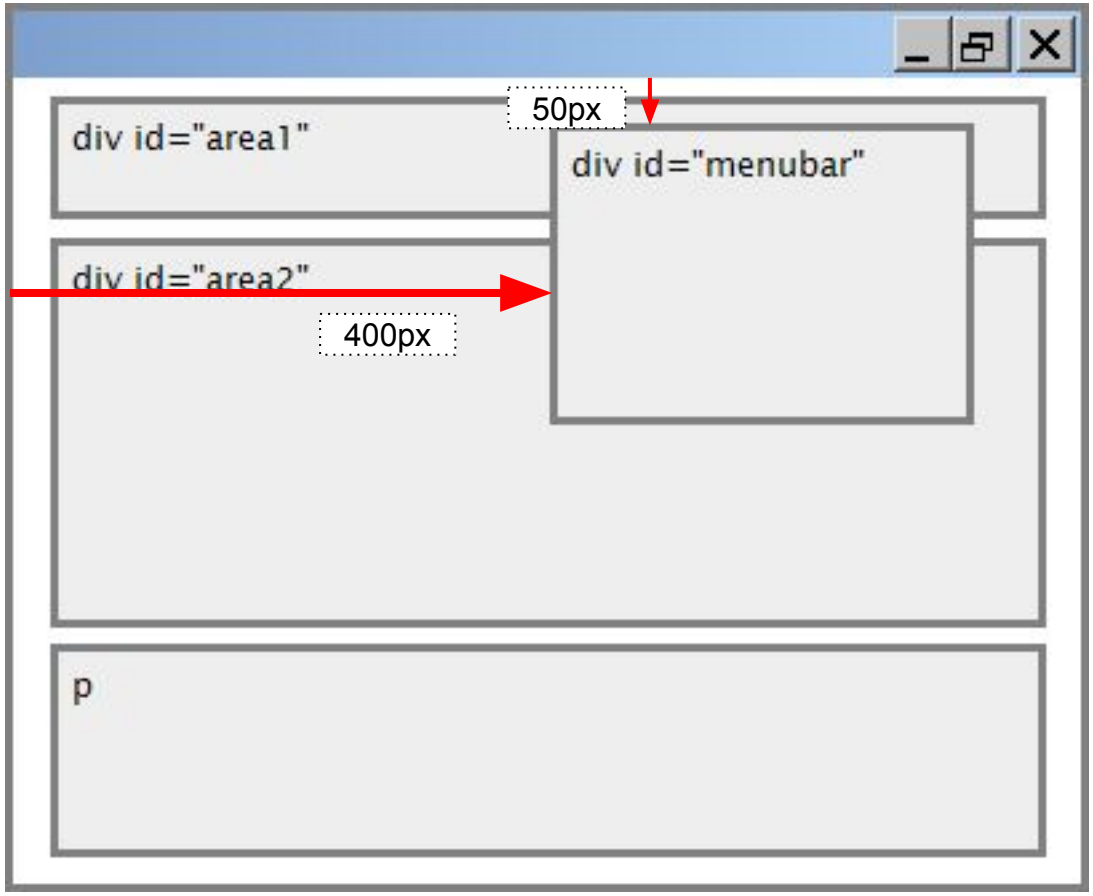
(CodePen)



# position: absolute

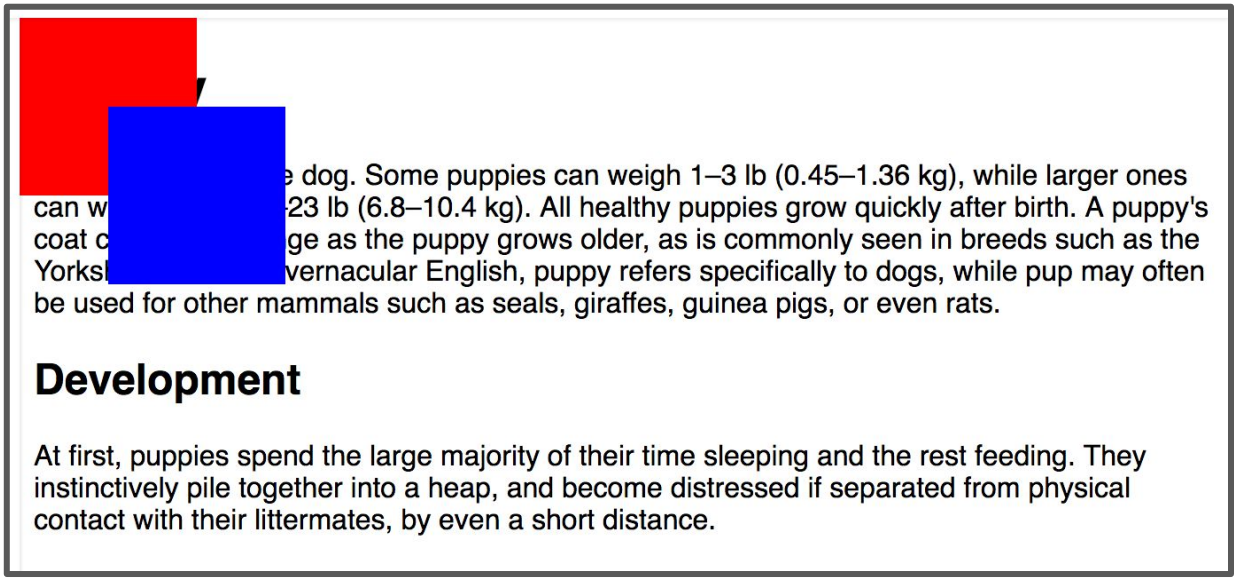
```
#menubar {
   position: absolute;
   left: 400px;
   top: 50px;
}
```

- For **absolute positioning**, the offset is the distance from the "containing element", which is the viewport by default
- Element is removed from normal document flow, positioned on its own layer



# position: absolute

```css
#box1 {
  height: 100px;
  width: 100px;
  background-color: red;

  position: absolute;
  top: 0;
  left: 0;
}

#box2 {
  height: 100px;
  width: 100px;
  background-color: blue;

  position: absolute;
  top: 50px;
  left: 50px;
}
```



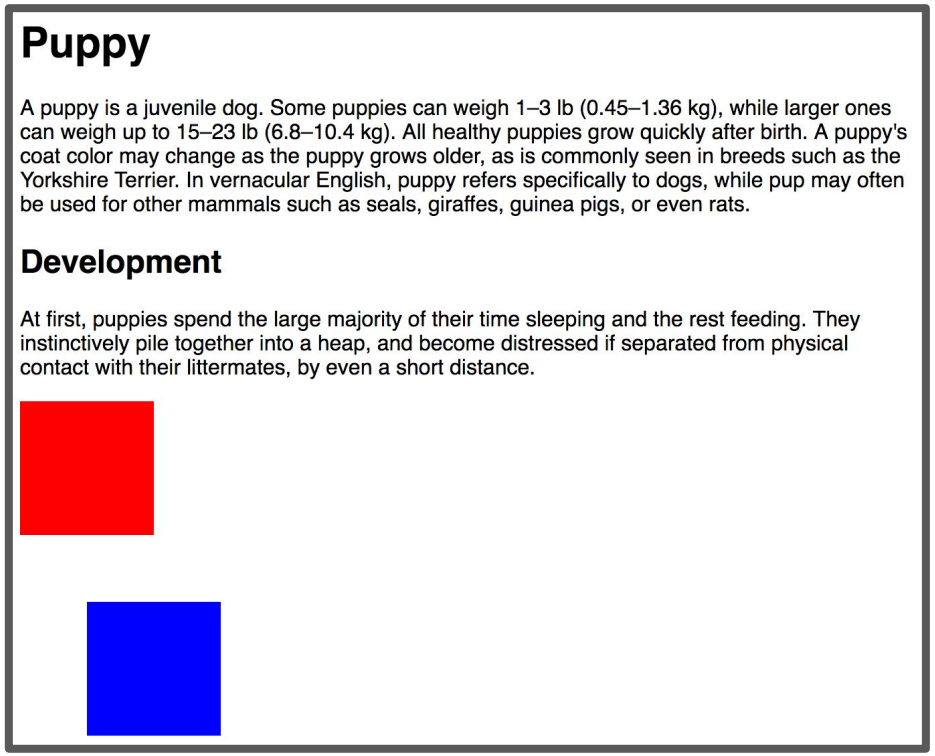

(CodePen)

# position: relative

For `position: relative;` the element is placed where it would normally be placed in the layout of the page, but shifted by the `top / left / bottom / right` values.

```
#box2 {
  height: 100px;
  width: 100px;
  background-color: blue;

  position: relative;
  top: 50px;
  left: 50px;
}
```

(CodePen)



# Relative absolute positioning

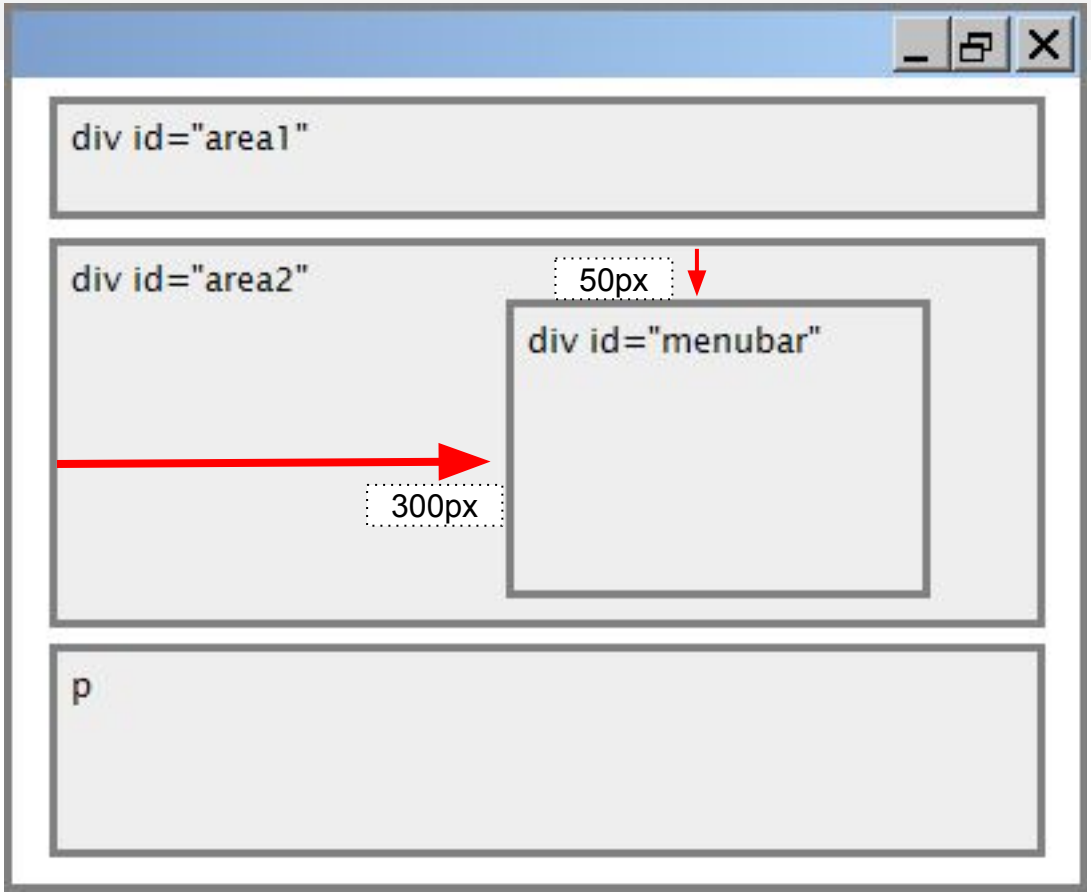
Let's revisit the definition of absolute positioning:

- **`absolute`**: a fixed position within its "containing element"
- The containing element is the viewport by default

You can change the containing element by setting "**`position: relative;`**" on some parent of your absolutely positioned element!

# Relative absolute positioning

```
#area2 {
  position: relative;
}

#menubar {
  position: absolute;
  left: 400px;
  top: 50px;
}
```

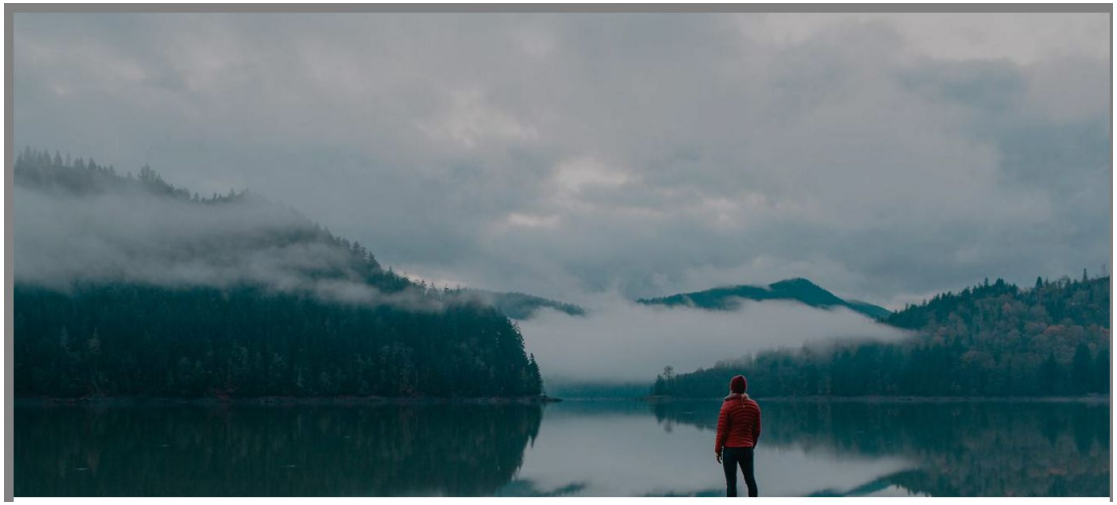



Offsets are relative to the first parent element that has **`position: relative`** which in this case is **`#area2`**

# Common use case: Overlay

```html
<header>
  <div id="overlay"></div>
</header>
```

```css
header {
  background-image: url(https://
  background-size: cover;
  height: 300px;
  position: relative;
}

#overlay {
  background-color:
    rgba(0, 0, 0, 0.3);
  position: absolute;
  top: 0;
  bottom: 0;
  height: 100%;
  width: 100%;
}
```



(CodePen)

Let's revisit Squarespace again!
(link to solution)

# Random useful CSS

# calc

You can use the `calc` CSS function to define numeric values in terms of expressions:

```
width: calc(50% - 10px);
```

# background properties

An easy way to render images stretched and cropped to a given size: set it as a background image for an element.

```
background-image: url(background.png);
```

HTML

```
  <body>
    <header></header>
  </body>
</html>
```

CSS

```
header {
  background-image: url(https://s3-us-west-2.amazonaws.com/s.cdpn.io/1083533/header.jpg);
  height: 200px;
}
```

(CodePen)

# background properties

You can then use additional background properties to further style it:

```
background-size: cover;
background-size: contain;
background-repeat: no-repeat;
background-position: top;
background-position: center;
```

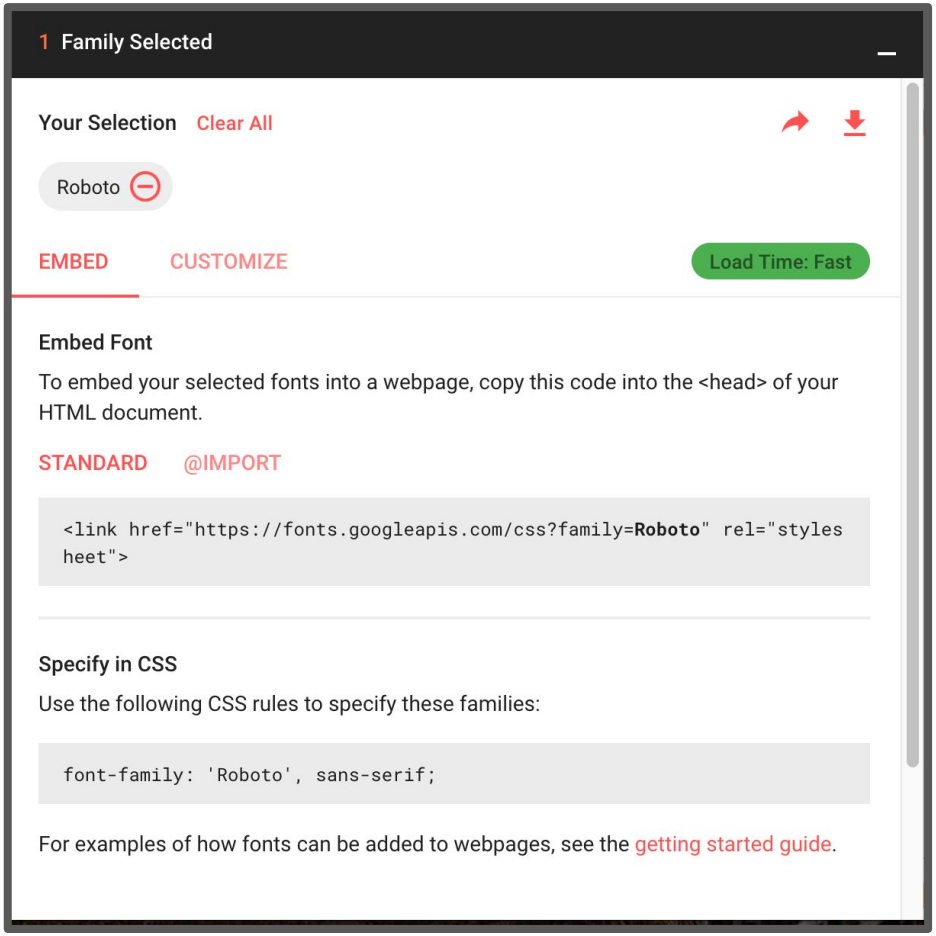
(CodePen: Try resizing the window)

# Web Fonts

You can use Google Fonts to choose from better fonts:

The instructions are pretty self-explanatory.

You can also load a totally custom font via `font-face@` (which we won't go over in class).



# Aside: Fallback fonts

Notice that the Google Font example shows a comma-separated list of values for `font-family`:

```
font-family: 'Roboto', sans-serif;
```

- Each successive font listed is a fallback, i.e. the font that will be loaded if the previous font could not be loaded
- There are also six generic font names, which allows the browser to choose the font based on intent + fonts available on the OS.
- It's good practice to list a generic font at the end of all your `font-family` declarations.