

CS193X: Web Programming Fundamentals

Spring 2017

Victoria Kirst
(vrk@stanford.edu)

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.

Font-related CSS review

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

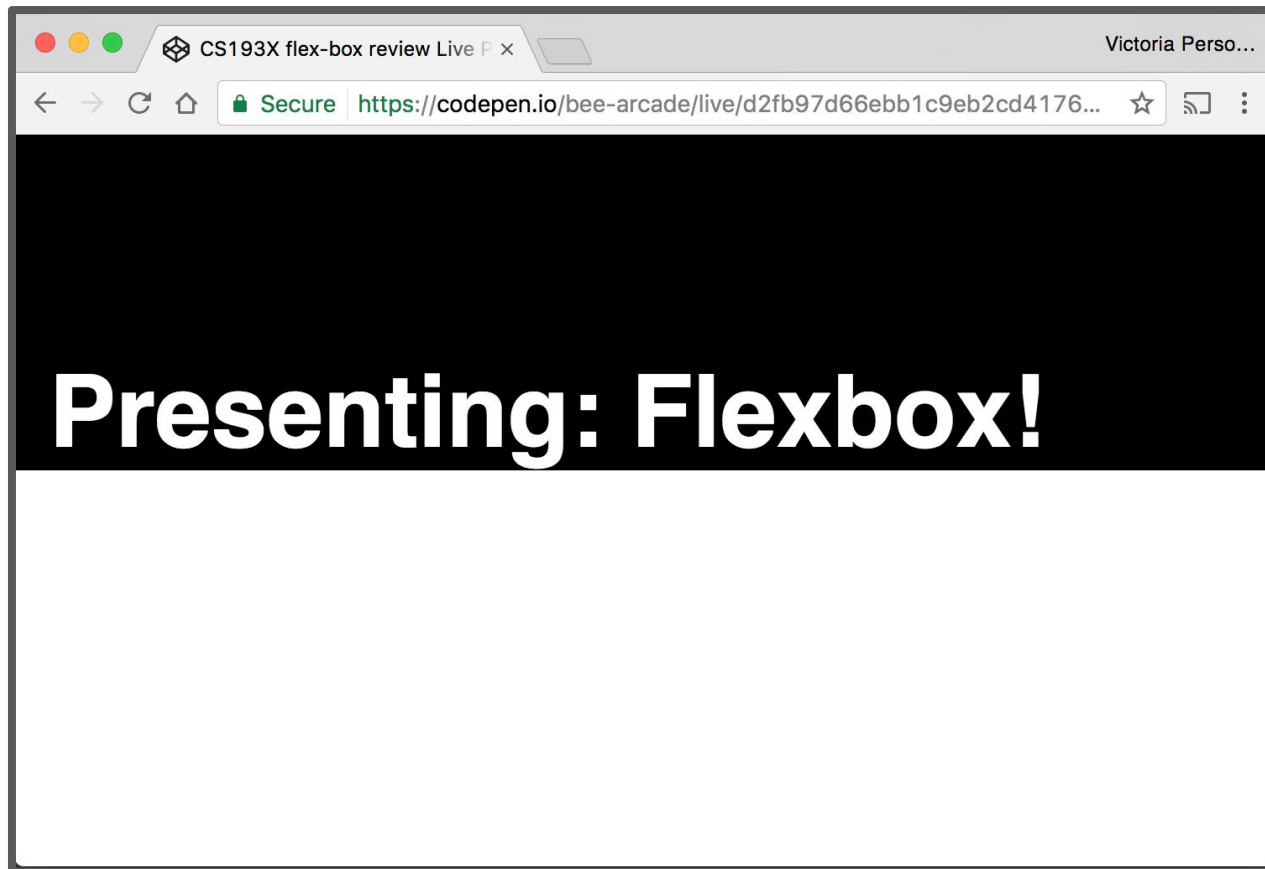
More font-related CSS

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) (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

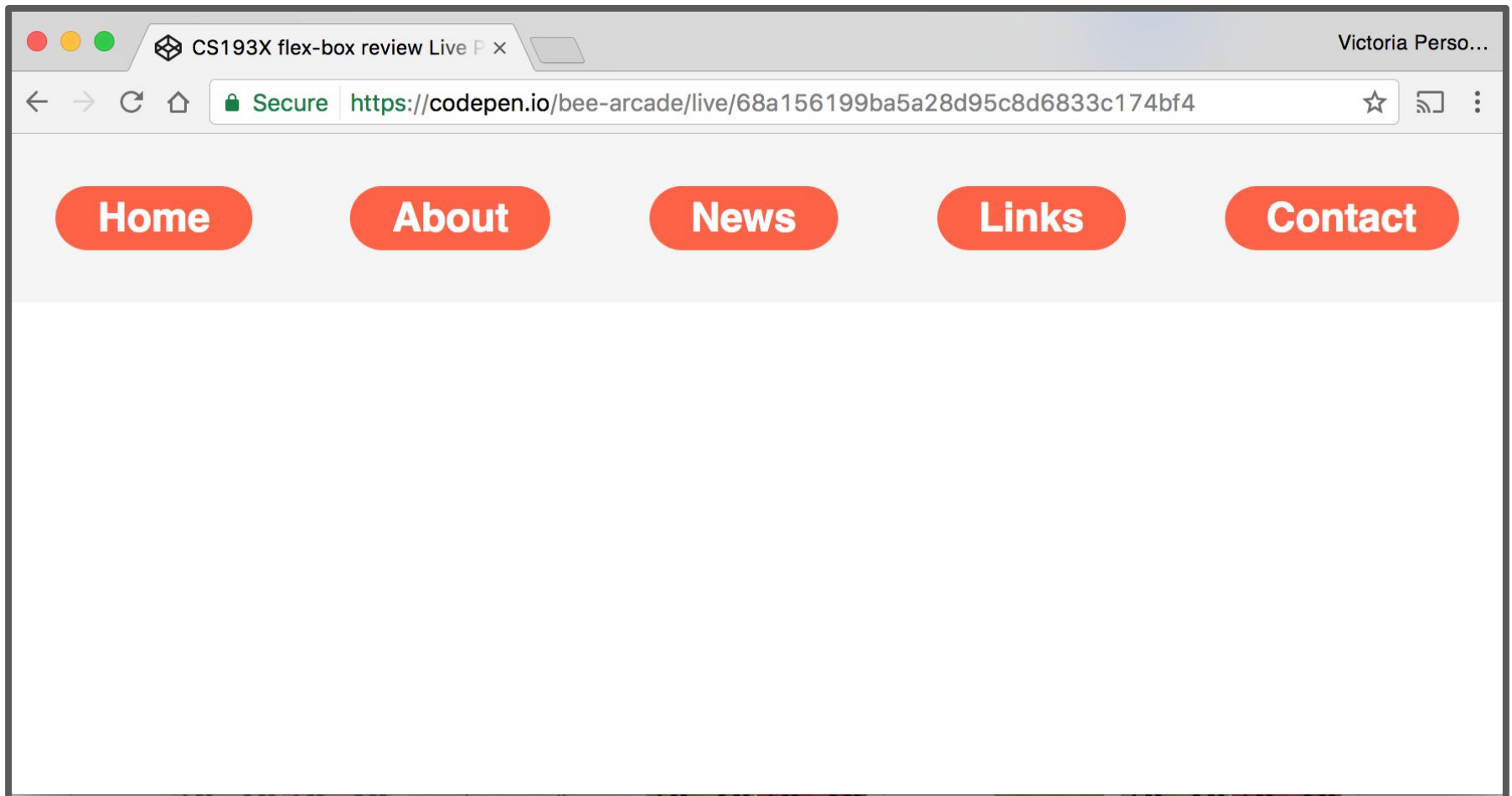
Review: Flexbox

How do we create this look? ([Codepen](#))



Review: Flexbox

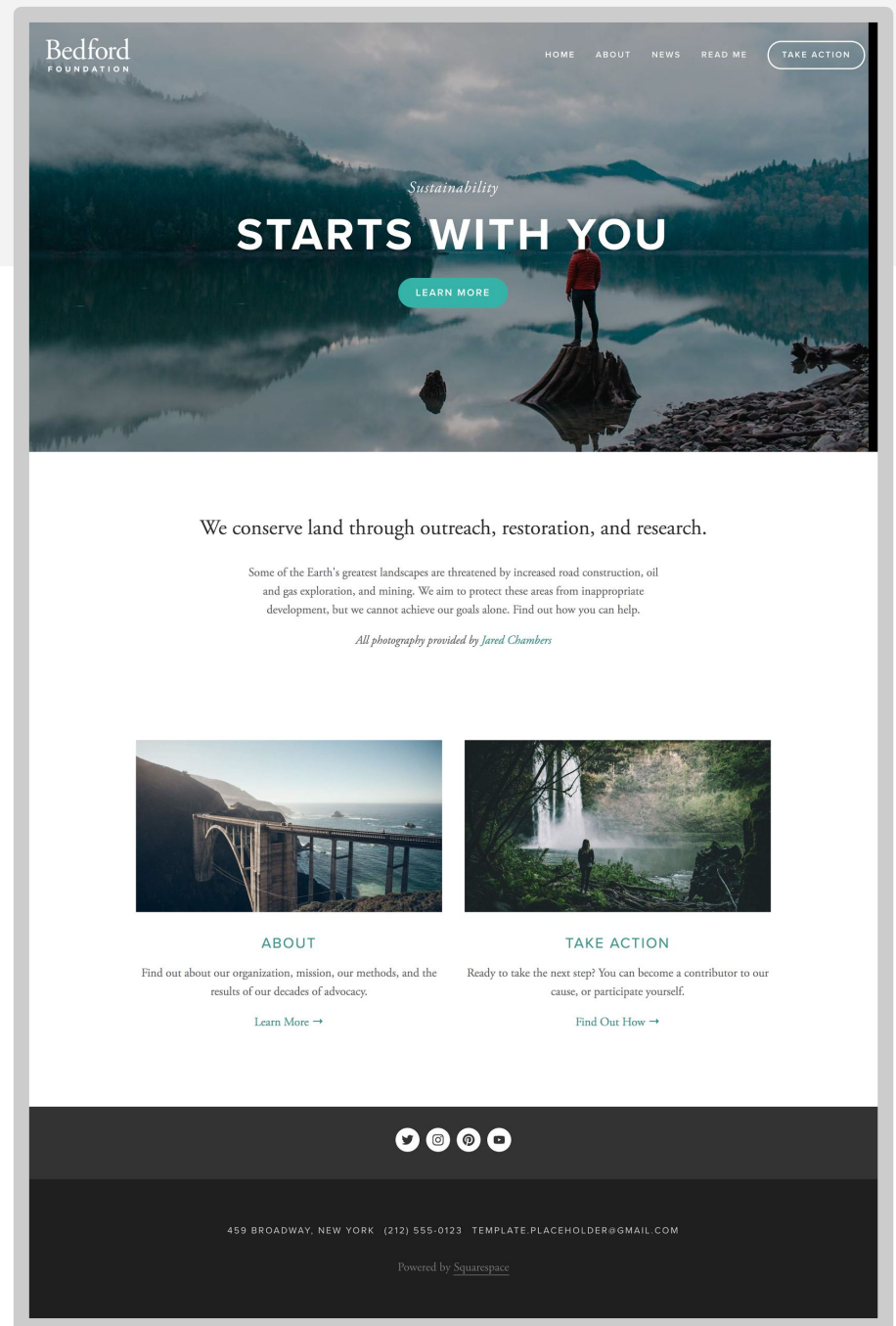
How do we create this look? ([Codepen](https://codepen.io/bee-arcade/live/68a156199ba5a28d95c8d6833c174bf4))



Continuing where
we left off!

Goal

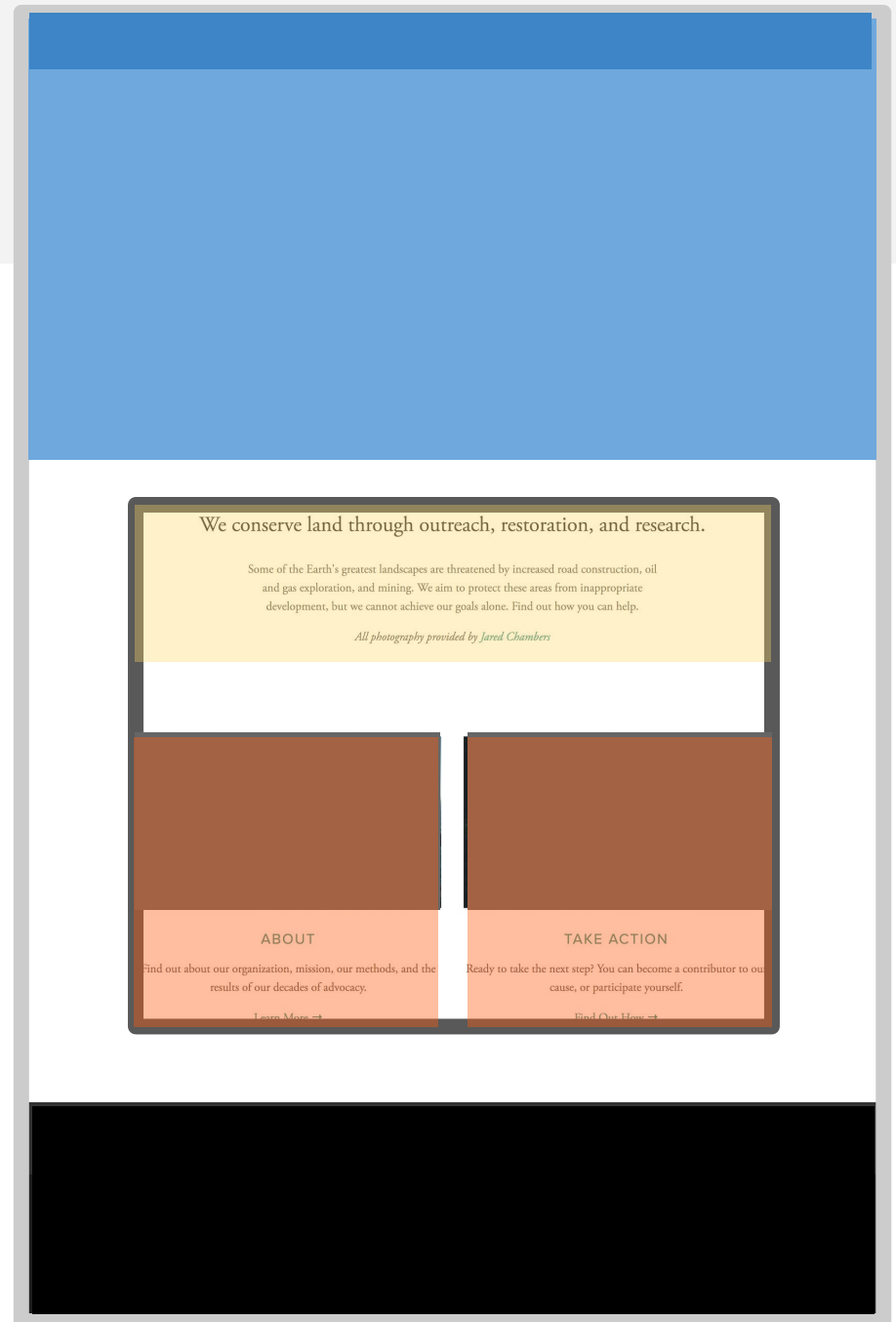
We were trying to create
a layout that looks sort
of like this:



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:



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!)



(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;
}
```



Flex layouts



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:



The image shows a code editor with two panels. The left panel is titled 'HTML' and contains the following code:

```
<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>
```

The right panel is titled 'CSS' and contains the following code:

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

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

Below the code editor, there is a large empty rectangular box with a black border, intended for a visual representation of the flexbox layout.

flex-shrink

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

flex-shrink:

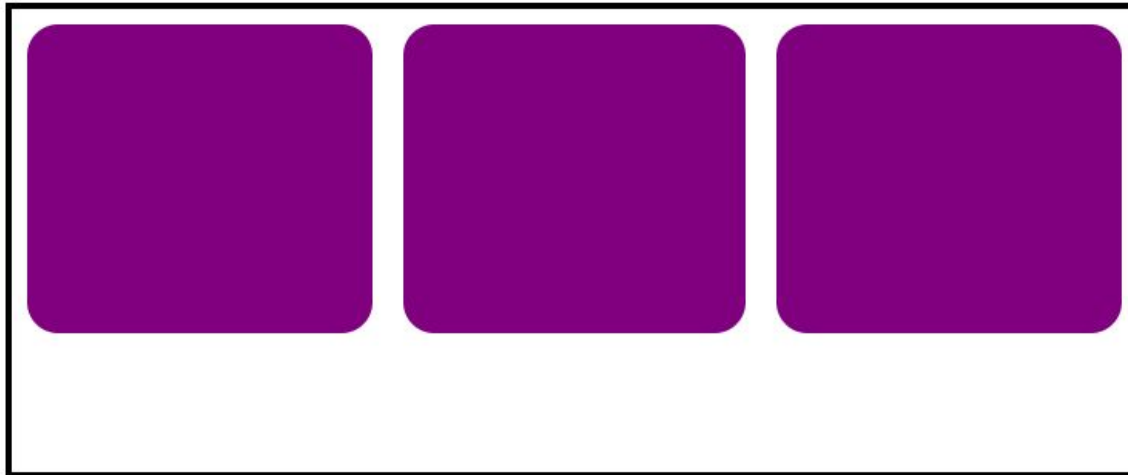
- If set to 1, the flex item shrinks itself as small as it can in the space available.
- If set to 0, the flex item does not shrink.

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

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

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

```
.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.

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

```
.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:

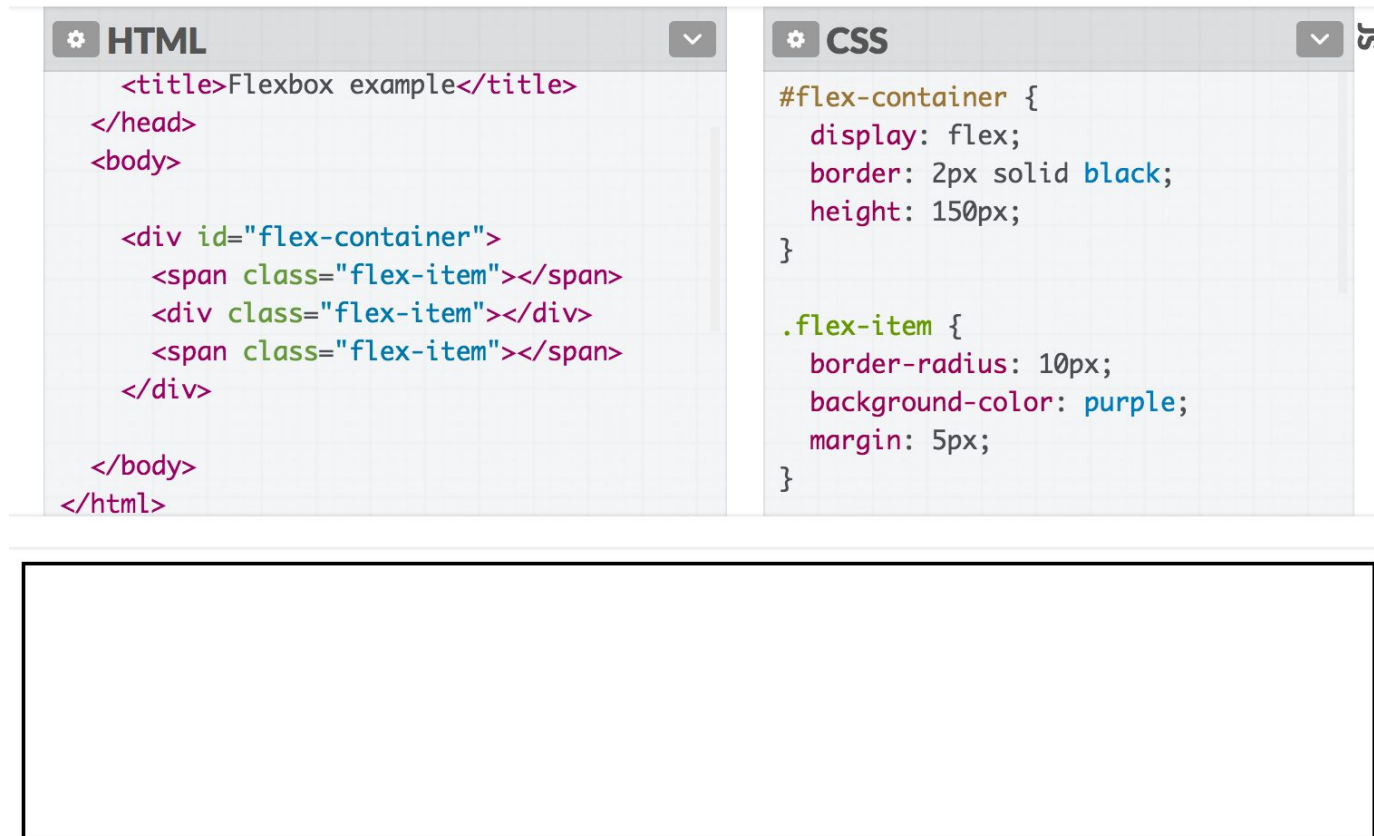
- If set to 1, the flex item grows itself as large as it can in the space remaining.
- If set to 0, the flex-item does not grow.

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>

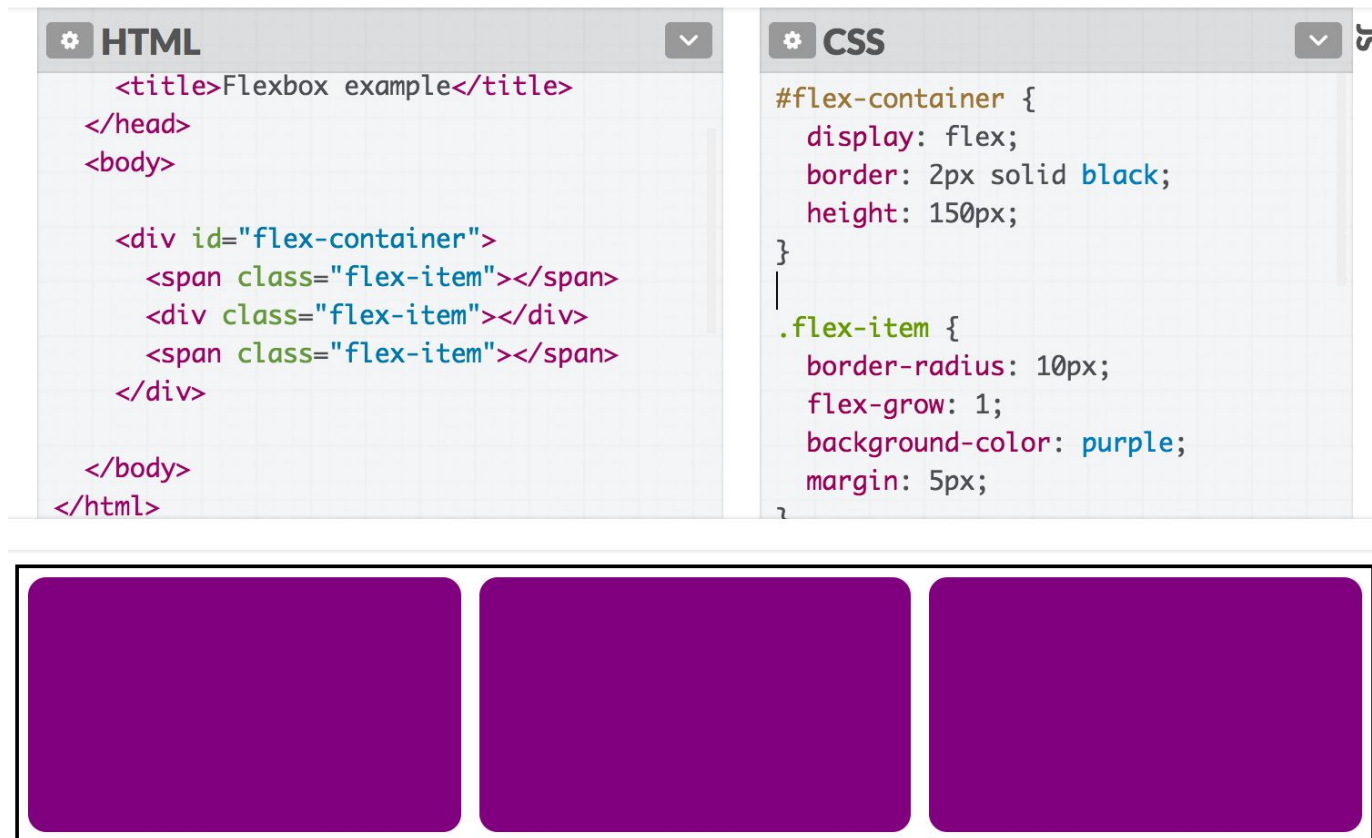
</body>
</html>

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

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

flex-grow example

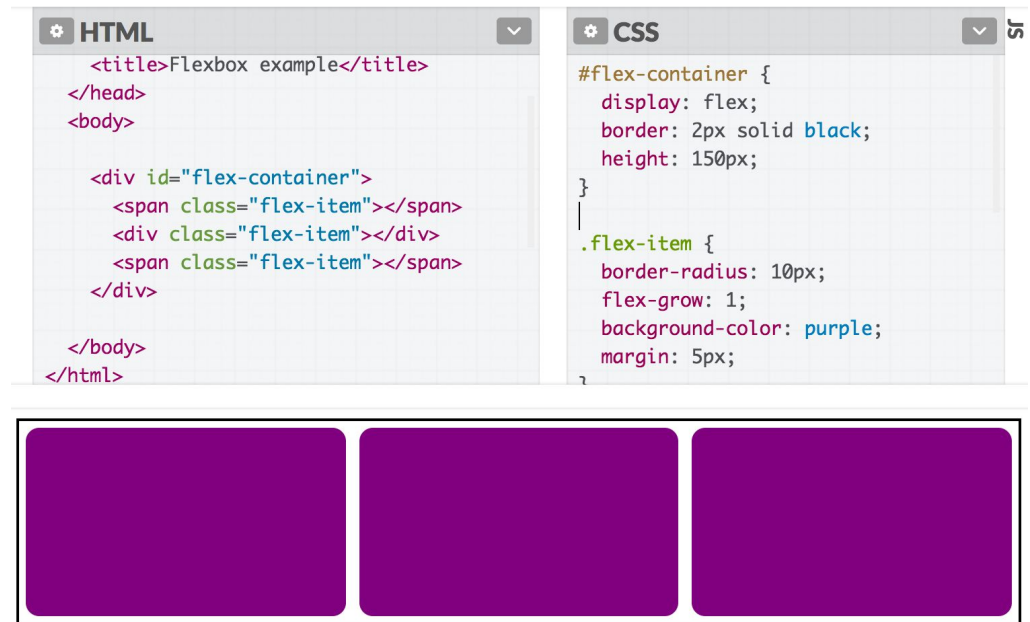
If we set `flex-grow: 1`, the flex items fill the empty space:



Flex item height**?!

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

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

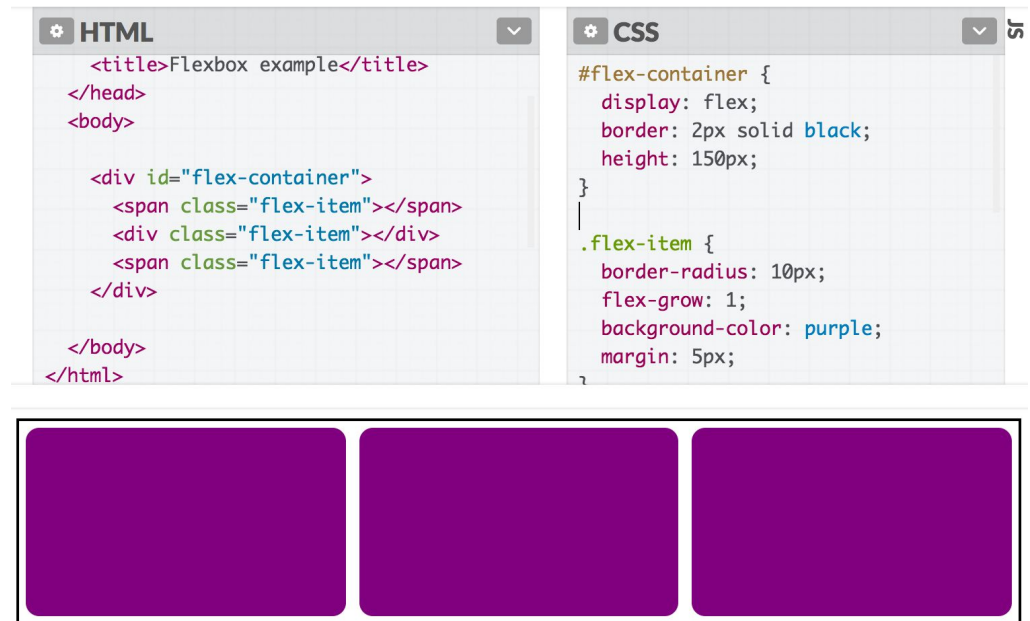


*width in the case of rows; height in the case of columns

**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.



*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:



The screenshot shows a code editor with two panels: HTML and CSS. The HTML panel contains the following code:

```
<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>
```

The CSS panel contains the following code:

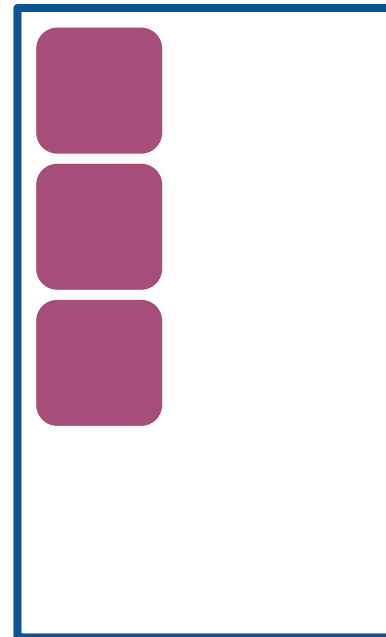
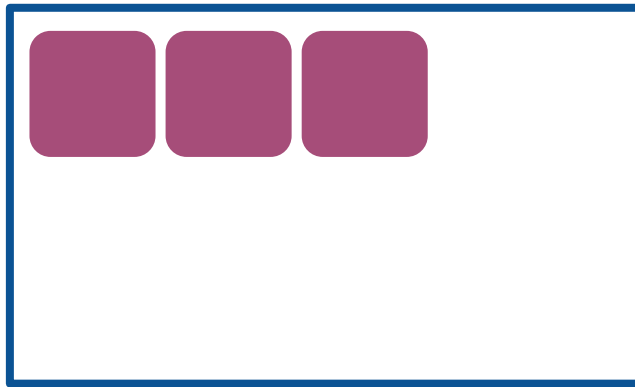
```
#flex-container {
  display: flex;
  align-items: flex-start;
  border: 2px solid black;
  height: 150px;
}

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



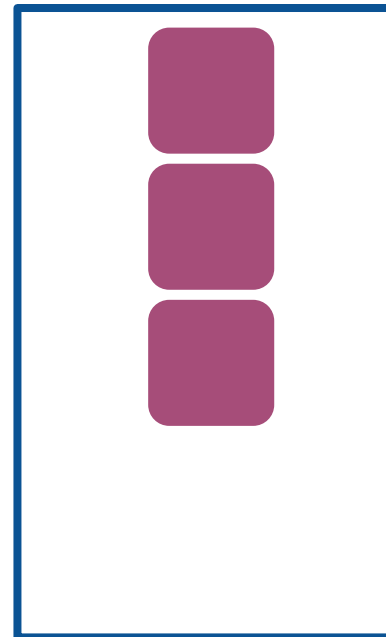
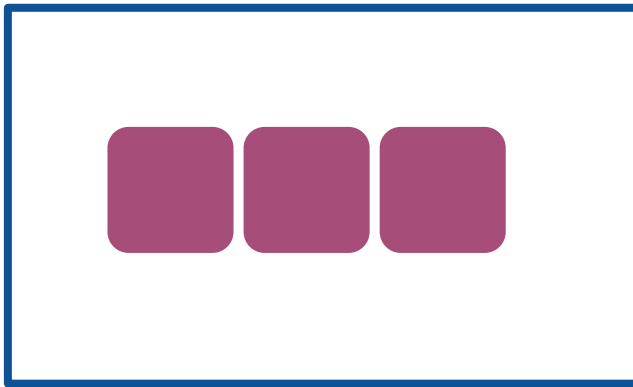
Flex layout recap

- 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

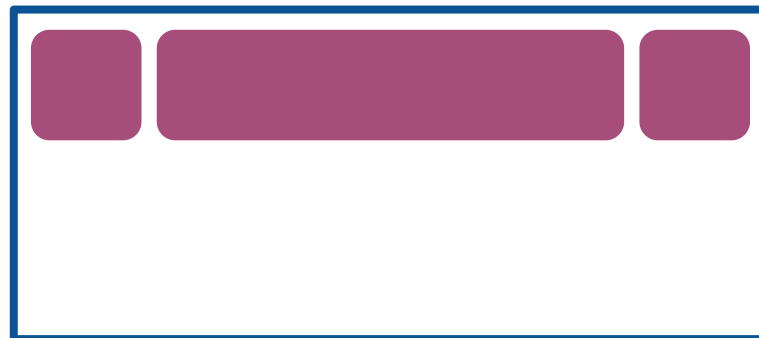
- **justify-content** distributes the items horizontally for flex-direction: row, vertically for column
- **align-items** distributes the items vertically for flex-direction: row, horizontally for column



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`:

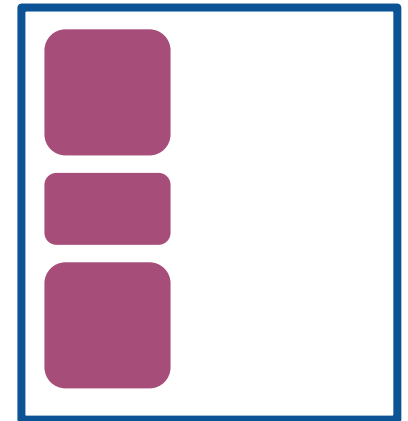
- The height of a flex item is either:
 - the explicitly set `height` on the item, or
 - the content height on the item, or
 - the height of the container if the container's `align-items: stretch`;



Flex layout recap

For flex-direction: column:

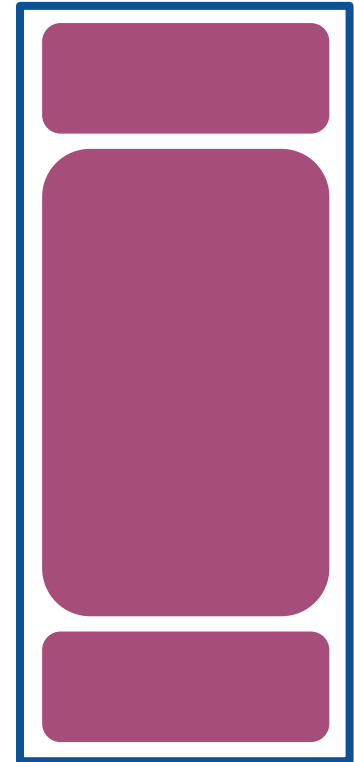
- The **flex basis** is the initial height of a flex item
 - This is either the explicitly set height, the explicitly set flex-basis, or the content height
- The height of a flex item will **shrink** to fit the container if flex-shrink is set to 1 (disabled if 0)
- The height of a flex item will **grow**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

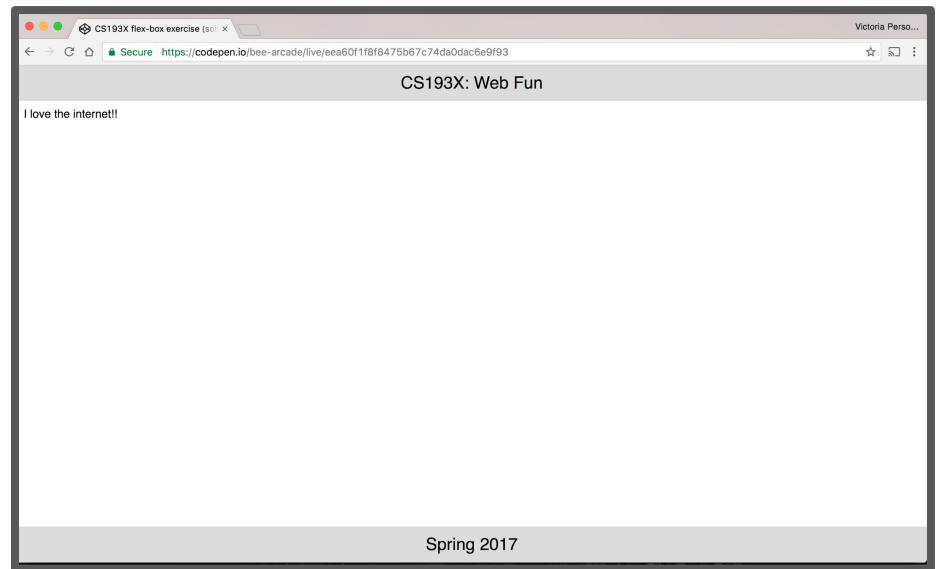
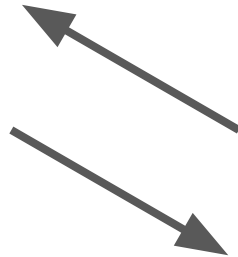
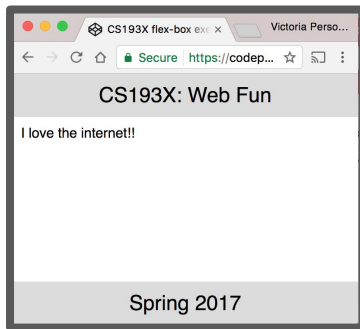


Follow along on [Codepen](#)

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

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

CSS

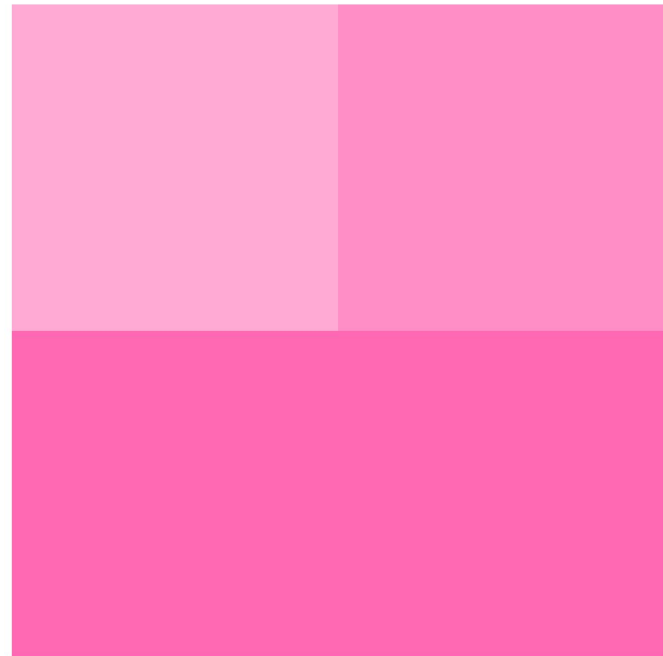
```
#box {
  height: 500px;
  width: 500px;
  background-color: hotpink;
}
```

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

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

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

OUTPUT

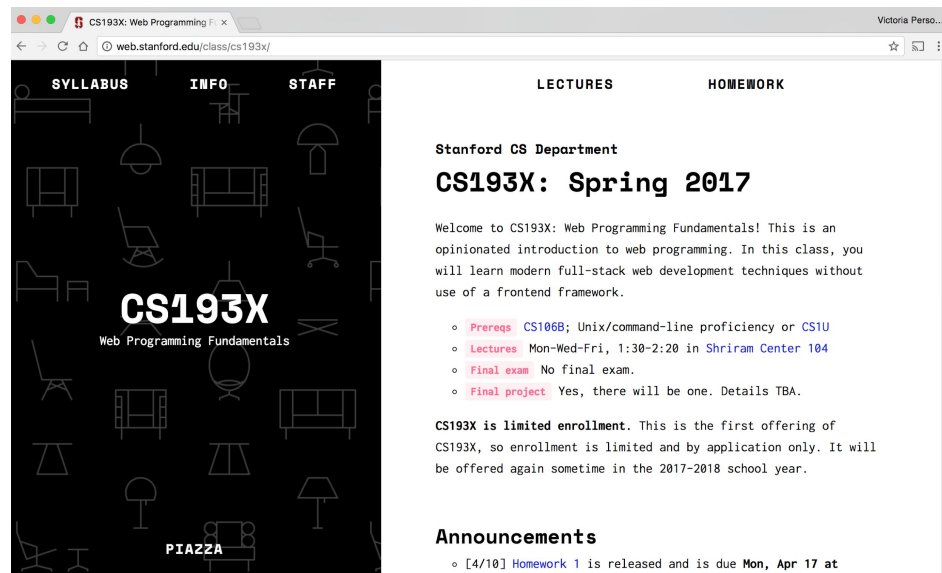


([Codepen](#))

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

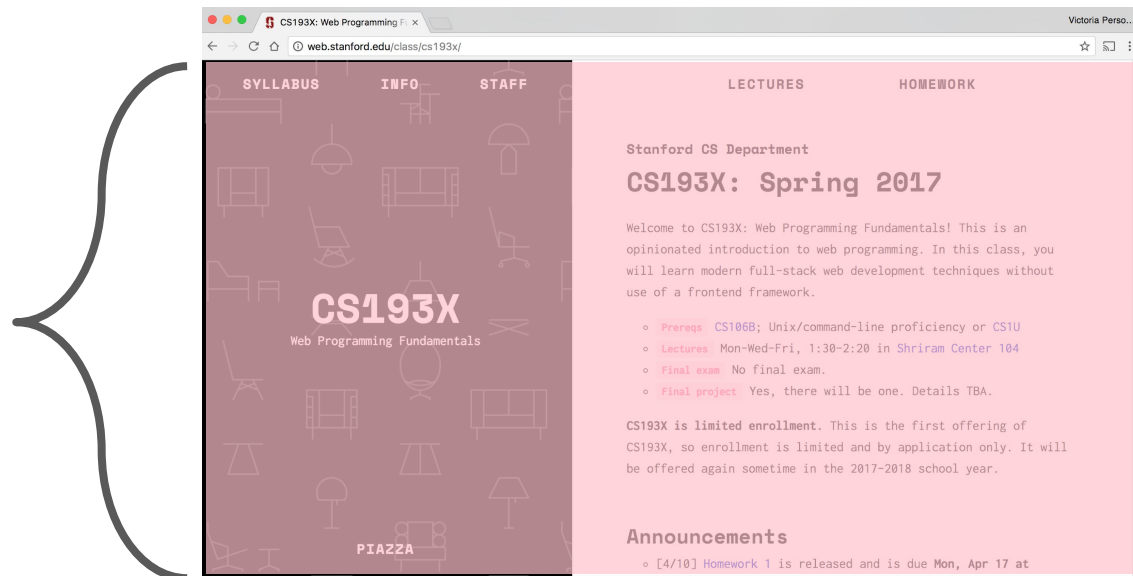


Viewport?

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

The
viewport

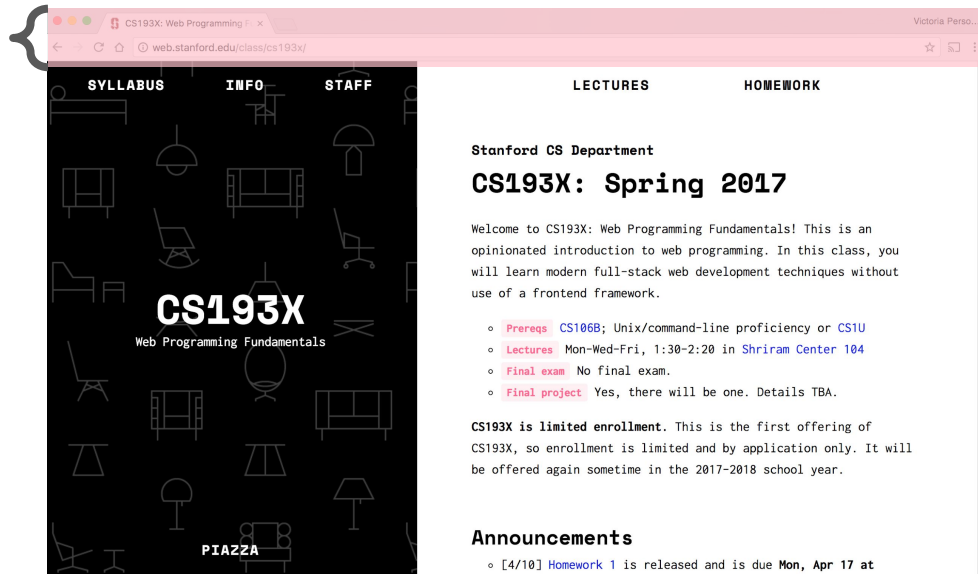


Viewport?

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

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](#))
- $1\text{vh} = 1/100\text{th}$ of the viewport height
- $1\text{vw} = 1/100\text{th}$ of the viewport width

Example:

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

Flexbox example, solved

HTML

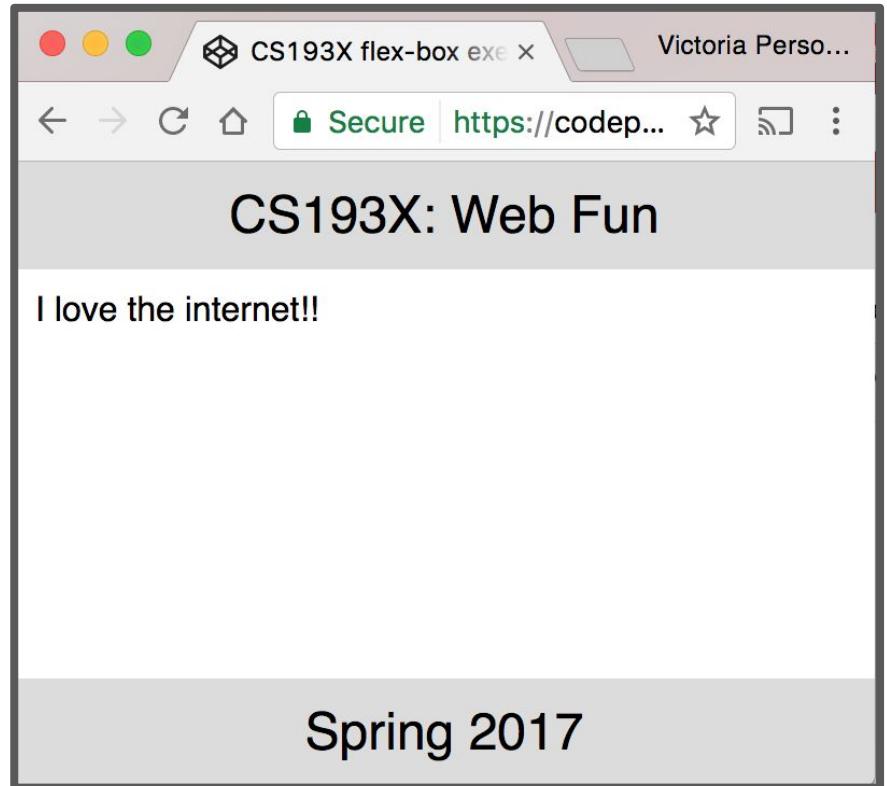
```
<article>
  <header>CS193X: Web Fun</header>
  <section>
    <p>I love the internet!!</p>
  </section>
  <footer>Spring 2017</footer>
</article>
```

CSS

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

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

([rest of the CSS](#))



([CodePen](#))

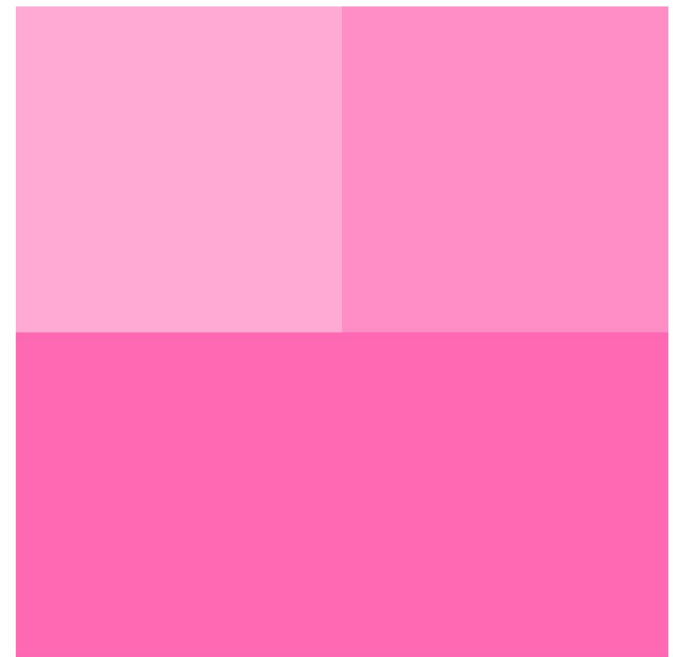
Aside: sizing

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%;
}
```

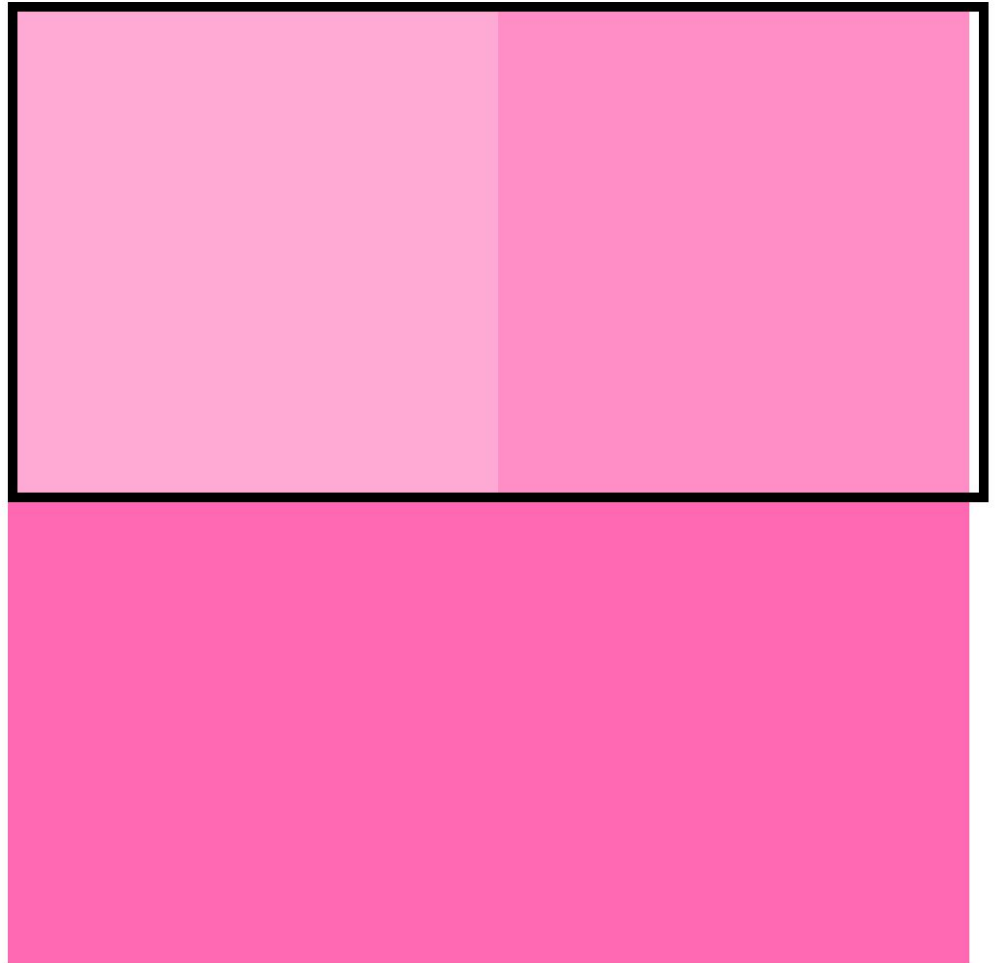
([rest of the css](#))



???

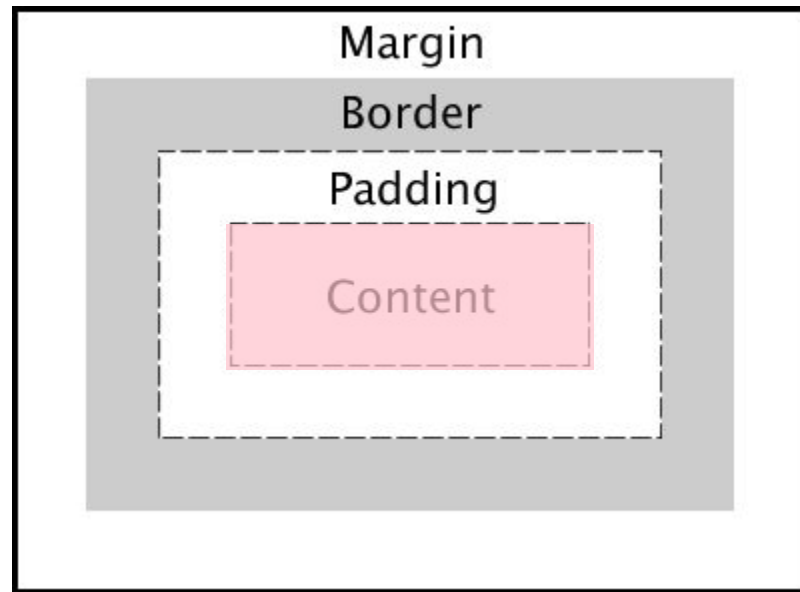
```
#upper-half {  
  height: 50%;  
  width: 100%;  
  border: 5px solid black;  
}
```

([rest of the CSS](#))



CSS box model width and height

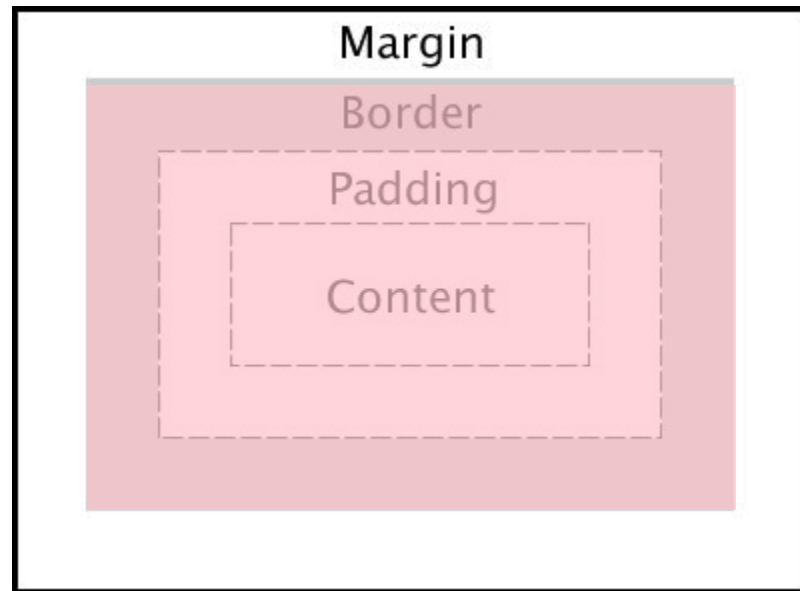
The box model defines CSS `width` and `height` properties to refer to the element's **content** width and height:



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;`



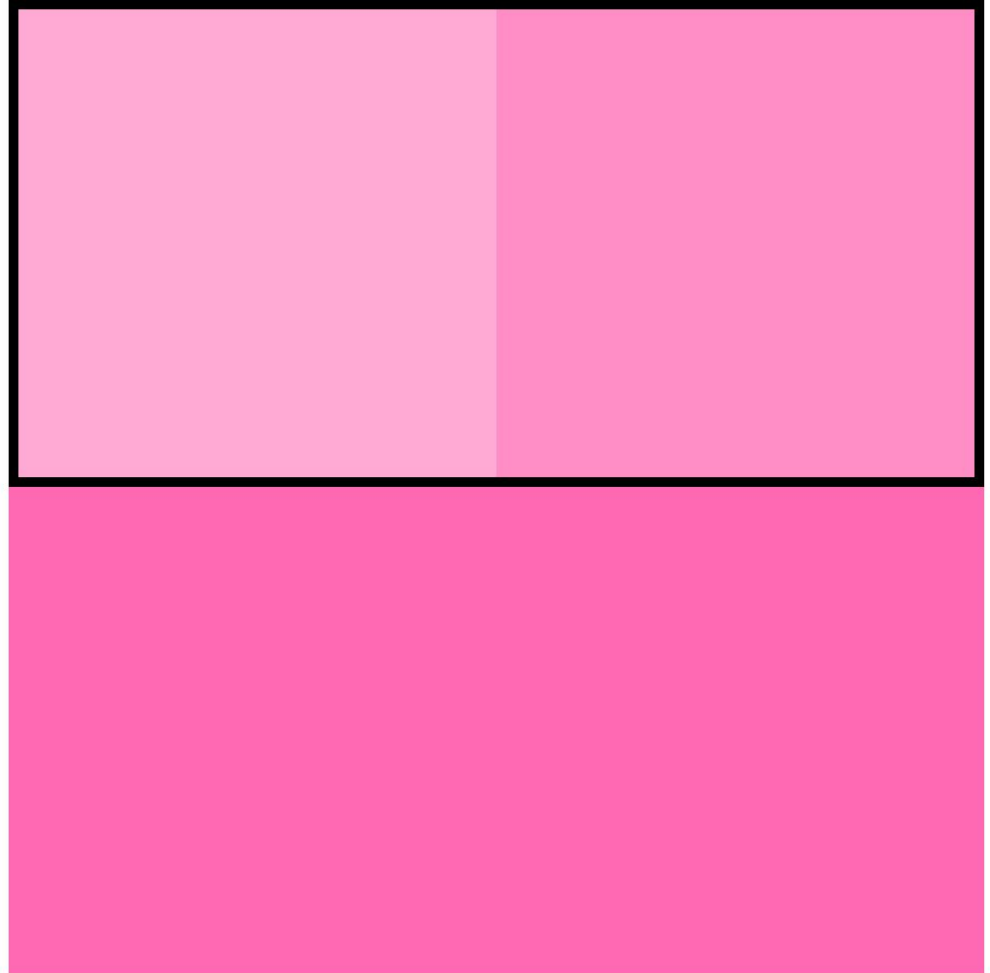
Note: Using border-box will include padding in the width and height as well.

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;
}
```

Puppy

A puppy is a juvenile dog. Some puppies can weigh 1–3 lb up to 15–23 lb (6.8–10.4 kg). All healthy puppies grow quickly as the puppy grows older, as is commonly seen in vernacular English, puppy refers specifically to dogs, while such as seals, giraffes, guinea pigs, or even rats.

Development

At first, puppies spend the large majority of their time sleeping pile together into a heap, and become distressed if separated by even a short distance.

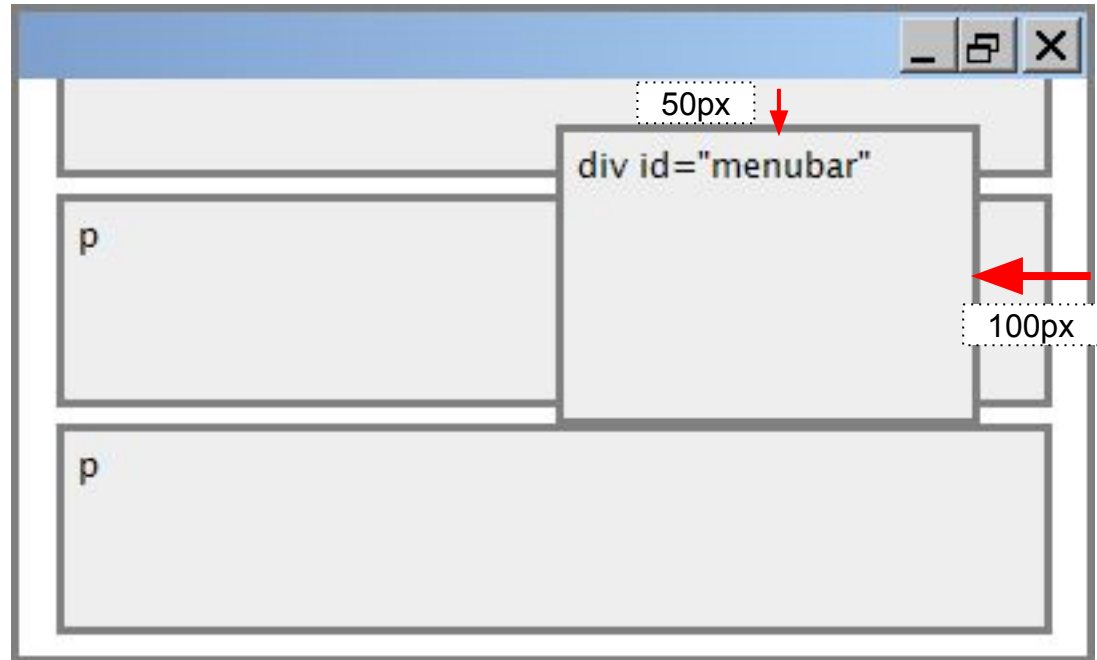


([CodePen](#))

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](#))

vernacular English, puppy refers specifically to dogs, while pup may often be used for other mammals such as seals, giraffes, guinea pigs, or even rats.

Development

At first, puppies spend the large majority of their time sleeping and the rest feeding. They instinctively pile together into a heap, and become distressed if separated from physical contact with their littermates, by even a short distance.

Puppies are born with a fully functional sense of smell but can't open their eyes. During their first two weeks, a puppy's senses all develop rapidly. During this stage the nose is the primary sense organ used by puppies to find their mother's teats, and to locate their littermates, if they become separated by a short distance. Puppies open their eyes about nine to eleven days following birth. At first, their retinas are poorly developed and their vision is poor. Puppies are not able to see as well as adult dogs. In addition, puppies' ears remain sealed until about thirteen to seventeen days after birth, after which they respond more actively to sounds. Between two and four weeks old, puppies usually begin to growl, bite, wag their tails, and bark.

Puppies develop very quickly during their first three months, particularly after their eyes and ears open and they are no longer completely dependent on their mother. Their coordination and strength improve, they spar with their littermates, and begin to explore the world outside the nest. They play wrestling, chase, dominance, and tug-of-war games.

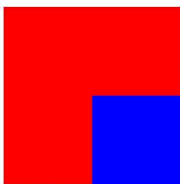
Development

Puppies are highly social animals and spend most of their waking hours interacting with either their mother or littermates. When puppies are socialized with humans, particularly between the ages of eight and twelve weeks, they

position: absolute

```
#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](#))



the dog. Some puppies can weigh 1–3 lb (0.45–1.36 kg), while larger ones can weigh up to 23 lb (6.8–10.4 kg). All healthy puppies grow quickly after birth. A puppy's coat color changes as the puppy grows older, as is commonly seen in breeds such as the Yorkshire Terrier. In vernacular English, puppy refers specifically to dogs, while pup may often be used for other mammals such as seals, giraffes, guinea pigs, or even rats.

Development

At first, puppies spend the large majority of their time sleeping and the rest feeding. They instinctively pile together into a heap, and become distressed if separated from physical contact with their littermates, by even a short distance.

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](#))

Puppy

A puppy is a juvenile dog. Some puppies can weigh 1–3 lb (0.45–1.36 kg), while larger ones can weigh up to 15–23 lb (6.8–10.4 kg). All healthy puppies grow quickly after birth. A puppy's coat color may change as the puppy grows older, as is commonly seen in breeds such as the Yorkshire Terrier. In vernacular English, puppy refers specifically to dogs, while pup may often be used for other mammals such as seals, giraffes, guinea pigs, or even rats.

Development

At first, puppies spend the large majority of their time sleeping and the rest feeding. They instinctively pile together into a heap, and become distressed if separated from physical contact with their littermates, by even a short distance.



Relative absolute positioning

Let's revisit the definition of absolute positioning:

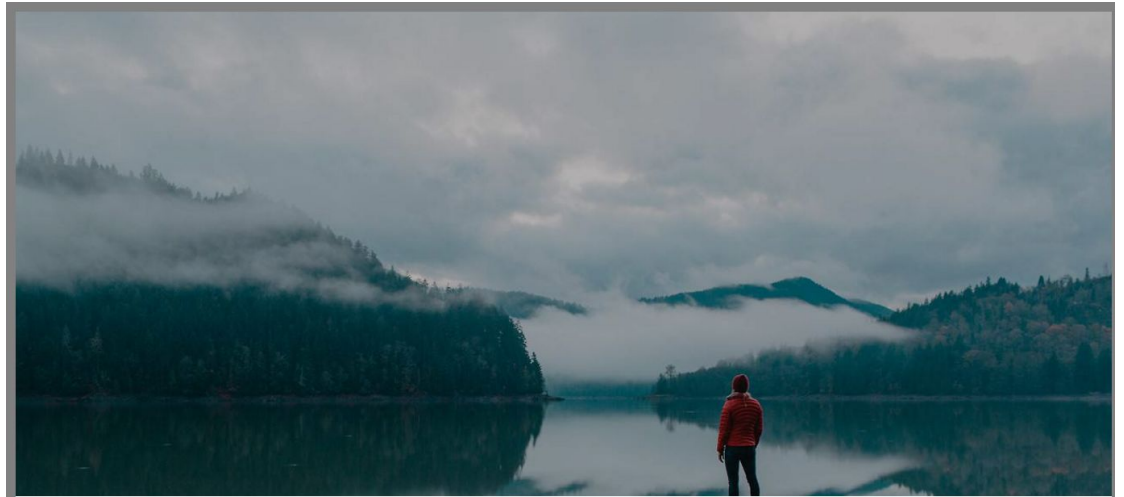
- **absolute**: a fixed position within its "containing element"
- The containing element is the viewport by default

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

Common use case: Overlay

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

```
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);
```



([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;
```

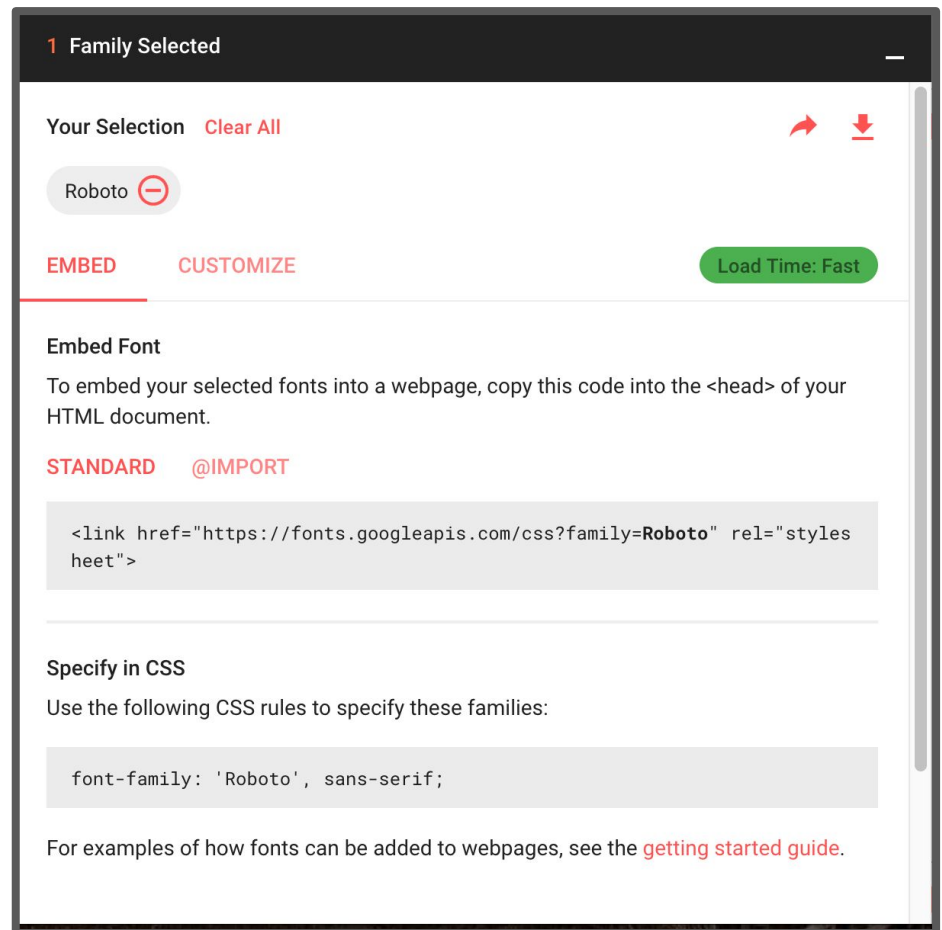
([CodePen](#): Try resizing the window)

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.