Box Model

Darkhan Zhursin
daratechn@gmail.com

Introduction to the Box Model

Browsers load HTML elements with default position values. This often leads to an unexpected and unwanted user experience while limiting the views you can create. In this lesson, you will learn about the *box model*, an important concept to understand how elements are positioned and displayed on a website.

If you have used HTML and CSS, you have unknowingly seen aspects of the box model. For example, if you have set the background color of an element, you may have noticed that the color was applied not only to the area directly behind the element but also to the area to the right of the element. Also, if you have aligned text, you know it is aligned relative to something. What is that something?

All elements on a web page are interpreted by the browser as “living” inside of a box. This is what is meant by the box model.

For example, when you change the background color of an element, you change the background color of its entire box.

In this lesson, you’ll learn about the following aspects of the box model:

- The dimensions of an element’s box.
- The borders of an element’s box.
- The paddings of an element’s box.
- The margins of an element’s box.

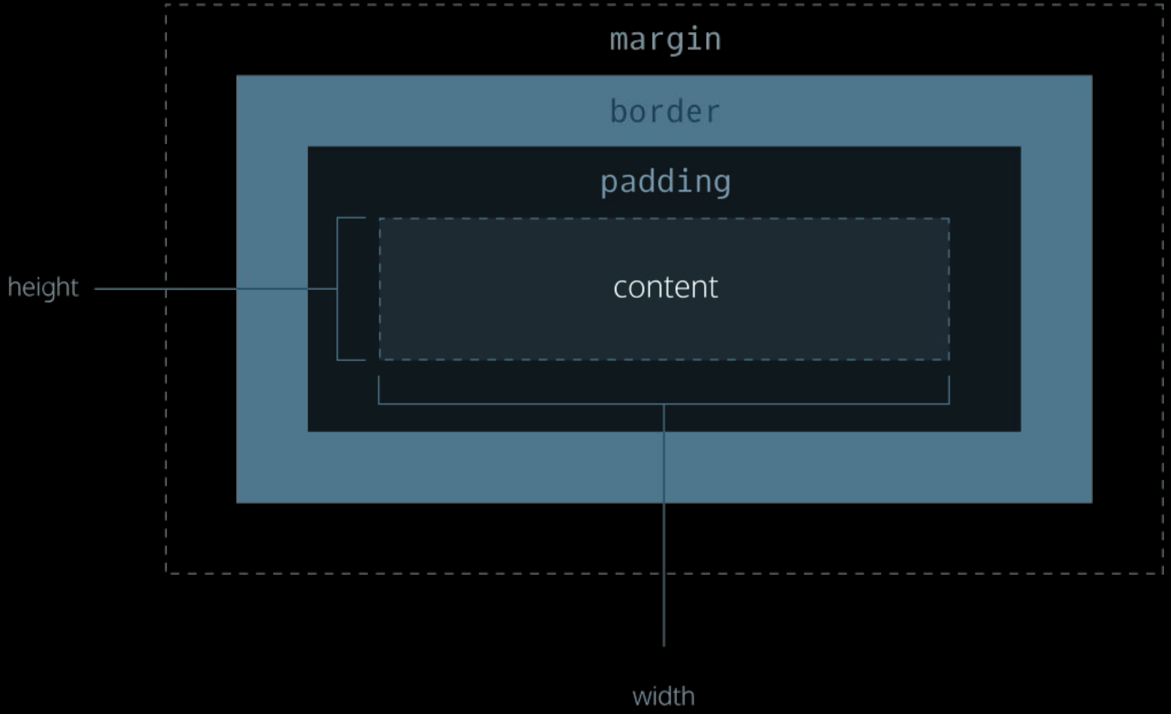
Let’s begin!

The Box Model

The box model comprises the set of properties that define parts of an element that take up space on a web page. The model includes the content area's size (*width* and *height*) and the element's *padding*, *border*, and *margin*. The properties include:

1. `width` and `height`: The width and height of the content area.
2. `padding`: The amount of space between the content area and the border.
3. `border`: The thickness and style of the border surrounding the content area and padding.
4. `margin`: The amount of space between the border and the outside edge of the element.

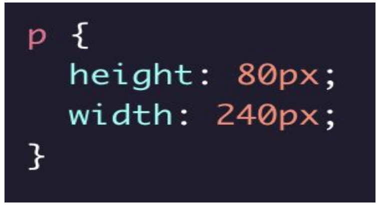
The Box Model



Height and Width

An element's content has two dimensions: a height and a width. By default, the dimensions of an HTML box are set to hold the raw contents of the box.

The CSS `height` and `width` properties can be used to modify these default dimensions.



```css
p {
  height: 80px;
  width: 240px;
}
```

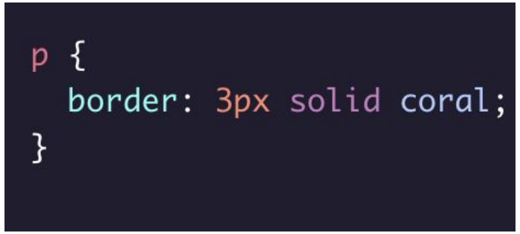
In this example, the `height` and `width` of paragraph elements are set to 80 pixels and 240 pixels, respectively — the `px` in the code above stands for *pixels*.

Pixels allow you to set the exact size of an element's box (width and height). When the width and height of an element are set in pixels, it will be the same size on all devices — an element that fills a laptop screen will overflow a mobile screen.

Borders

A *border* is a line that surrounds an element, like a frame around a painting. Borders can be set with a specific `width`, `style`, and `color`:

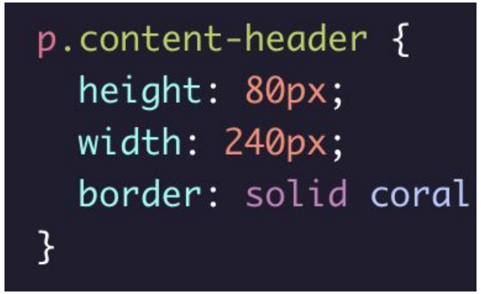
- `width`—The thickness of the border. A border's thickness can be set in pixels or with one of the following keywords: `thin`, `medium`, or `thick`.
- `style`—The design of the border. Web browsers can render any of [10 different styles](). Some of these styles include: `none`, `dotted`, and `solid`.
- `color`—The color of the border. Web browsers can render colors using a few different formats, including [140 built-in color keywords]().



```
p {
  border: 3px solid coral;
}
```

In the example above, the border has a width of 3 pixels, a style of `solid`, and a color of `coral`. All three properties are set in one line of code.

The default border is `medium none color`, where `color` is the current color of the element. If `width`, `style`, or `color` are not set in the CSS file, the web browser assigns the default value for that property.



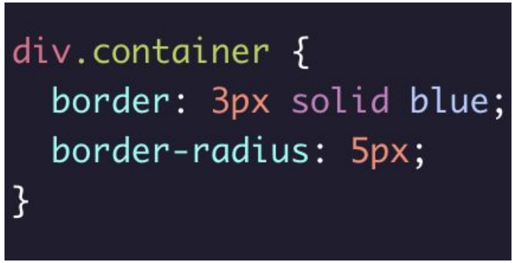
```
p.content-header {
  height: 80px;
  width: 240px;
  border: solid coral
}
```

In this example, the border style is set to `solid` and the color is set to `coral`. The width is not set, so it defaults to `medium`.

Border Radius

Ever since we revealed the borders of boxes, you may have noticed that the borders highlight the true shape of an element's box: square. Thanks to CSS, a border doesn't have to be square.

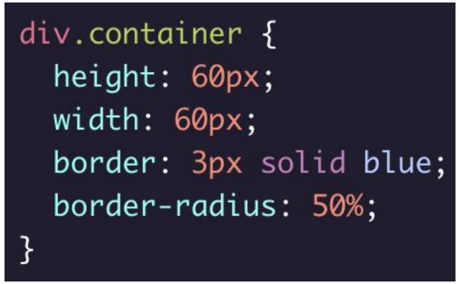
You can modify the corners of an element's border box with the `border-radius` property.



```
div.container {
  border: 3px solid blue;
  border-radius: 5px;
}
```

The code in the example above will set *all four corners* of the border to a radius of 5 pixels (i.e. the same curvature that a circle with a radius of 5 pixels would have).

You can create a border that is a perfect circle by first creating an element with the same width and height, and then setting the radius equal to half the width of the box, which is 50%.

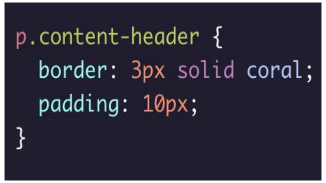


```css
div.container {
  height: 60px;
  width: 60px;
  border: 3px solid blue;
  border-radius: 50%;
}
```

The code in the example above creates a `<div>` that is a perfect circle.

Padding

The space between the contents of a box and the borders of a box is known as *padding*. Padding is like the space between a picture and the frame surrounding it. In CSS, you can modify this space with the `padding` property.



```
p.content-header {
  border: 3px solid coral;
  padding: 10px;
}
```

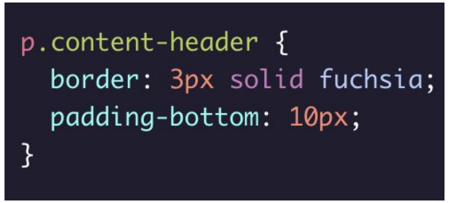
The code in this example puts 10 pixels of space between the content of the paragraph (the text) and the borders, on all four sides.

The `padding` property is often used to expand the background color and make the content look less cramped.

If you want to be more specific about the amount of padding on each side of a box's content, you can use the following properties:

- `padding-top`
- `padding-right`
- `padding-bottom`
- `padding-left`

Each property affects the padding on only one side of the box's content, giving you more flexibility in customization.



```
p.content-header {
  border: 3px solid fuchsia;
  padding-bottom: 10px;
}
```

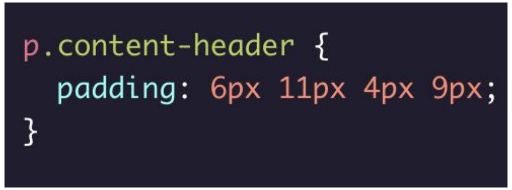
In the example above, only the bottom side of the paragraph's content will have a `padding` of 10 pixels.

Padding Shorthand

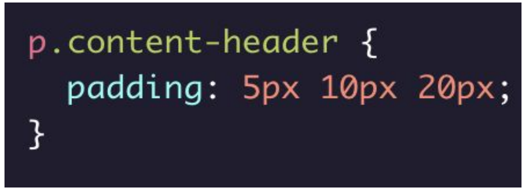
Another implementation of the `padding` property lets you specify exactly how much padding there should be on each side of the content in a single declaration. A declaration that uses multiple properties as values is known as a *shorthand property*.

Padding shorthand lets you specify all of the `padding` properties as values on a single line:

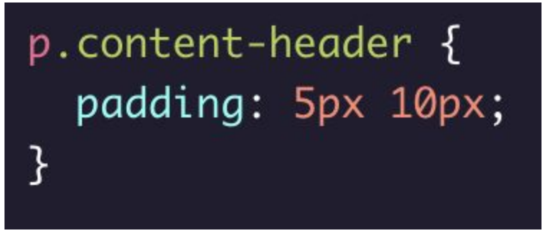
- `padding-top`
- `padding-right`
- `padding-bottom`
- `padding-left`



```css
p.content-header {
  padding: 6px 11px 4px 9px;
}
```



```css
p.content-header {
  padding: 5px 10px 20px;
}
```

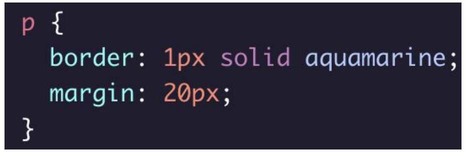


```css
p.content-header {
  padding: 5px 10px;
}
```

Margin

So far you've learned about the following components of the box model: content, borders, and padding. The fourth and final component of the box model is *margin*.

Margin refers to the space directly outside of the box. The `margin` property is used to specify the size of this space.

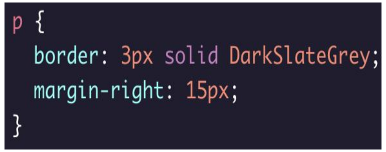


```css
p {
  border: 1px solid aquamarine;
  margin: 20px;
}
```

The code in the example above will place 20 pixels of space on the outside of the paragraph's box on all four sides. This means that other HTML elements on the page cannot come within 20 pixels of the paragraph's border.

If you want to be even more specific about the amount of margin on each side of a box, you can use the following properties:

- `margin-top`
- `margin-right`
- `margin-bottom`
- `margin-left`

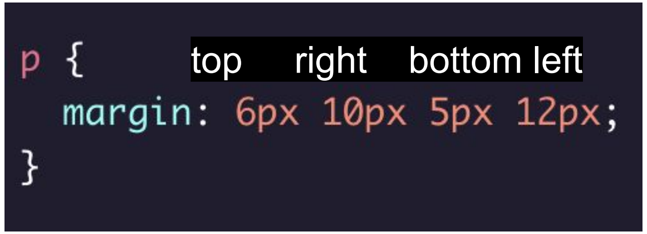


```css
p {
  border: 3px solid DarkSlateGrey;
  margin-right: 15px;
}
```

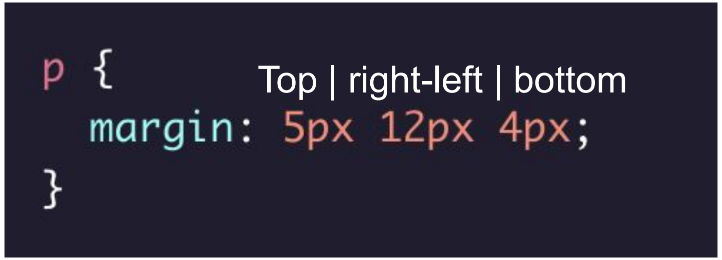
Each property affects the margin on only one side of the box, providing more flexibility in customization.

In the example above, only the right side of the paragraph's box will have a margin of 15 pixels. It's common to see margin values used for a specific side of an element.

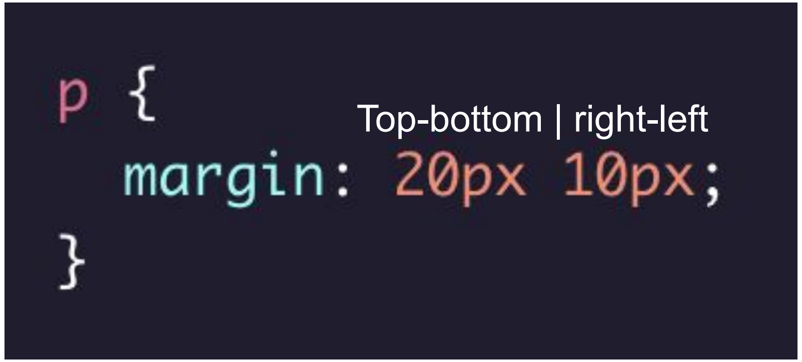
Margin Shorthand



```
p {        top     right     bottom left
  margin: 6px 10px 5px 12px;
}
```



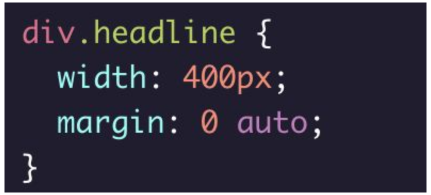
```
p {            Top | right-left | bottom
  margin: 5px 12px 4px;
}
```



```
p {          Top-bottom | right-left
  margin: 20px 10px;
}
```

Auto

The `margin` property also lets you center content. However, you must follow a few syntax requirements. Take a look at the following example:



```css
div.headline {
  width: 400px;
  margin: 0 auto;
}
```

In the example above, `margin: 0 auto;` will center the divs in their containing elements. The 0 sets the top and bottom margins to 0 pixels. The `auto` value instructs the browser to adjust the left and right margins until the element is centered within its containing element.

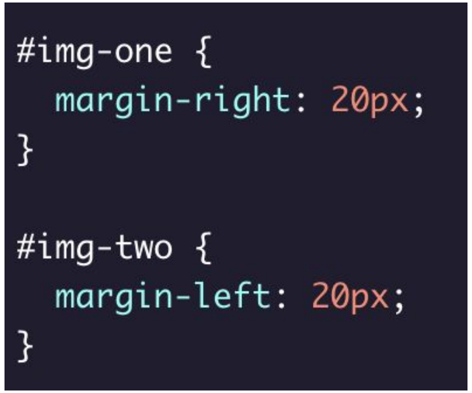
In order to center an element, a width must be set for that element. Otherwise, the width of the div will be automatically set to the full width of its containing element, like the `<body>`, for example. It’s not possible to center an element that takes up the full width of the page, since the width of the page can change due to display and/or browser window size.

In the example above, the width of the `div` is set to 400 pixels, which is less than the width of most screens. This will cause the div to center within a containing element that is greater than 400 pixels wide.

Margin Collapse

As you have seen, padding is space added inside an element's border, while margin is space added outside an element's border. One additional difference is that top and bottom margins, also called vertical margins, *collapse*, while top and bottom padding does not.

Horizontal margins (left and right), like padding, are always displayed and added together. For example, if two divs with ids `#div-one` and `#div-two`, are next to each other, they will be as far apart as the sum of their adjacent margins.

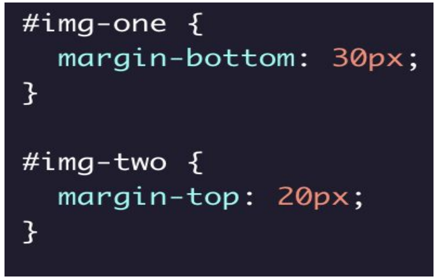


```
#img-one {
  margin-right: 20px;
}

#img-two {
  margin-left: 20px;
}
```

In this example, the space between the `#img-one` and `#img-two` borders is 40 pixels. The right margin of `#img-one` (`20px`) and the left margin of `#img-two` (`20px`) add to make a total margin of 40 pixels.

Unlike horizontal margins, vertical margins do not add. Instead, the larger of the two vertical margins sets the distance between adjacent elements.



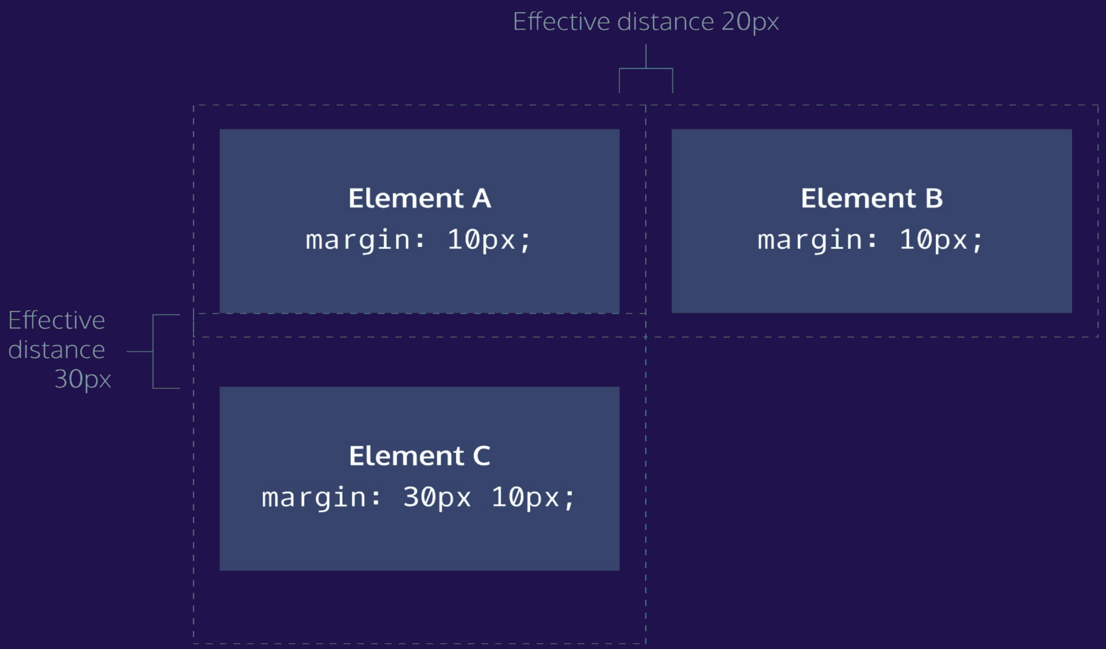
```
#img-one {
  margin-bottom: 30px;
}

#img-two {
  margin-top: 20px;
}
```

In this example, the vertical margin between the `#img-one` and `#img-two` elements is 30 pixels. Although the sum of the margins is 50 pixels, the margin collapses so the spacing is only dependent on the `#img-one` bottom margin.

It may be helpful to think of collapsing vertical margins as a short person trying to push a taller person. The tall person has longer arms and can easily push the short person, while the person with short arms cannot reach the person with long arms.

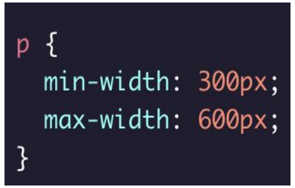
Vertical Margins Collapse



Minimum and Maximum Height and Width

Because a web page can be viewed through displays of differing screen size, the content on the web page can suffer from those changes in size. To avoid this problem, CSS offers two properties that can limit how narrow or how wide an element's box can be sized to:

- `min-width`—this property ensures a minimum width of an element's box.
- `max-width`—this property ensures a maximum width of an element's box.

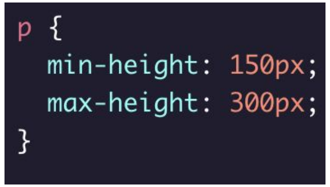


```
p {
  min-width: 300px;
  max-width: 600px;
}
```

In the example above, the width of all paragraphs will not shrink below 300 pixels, nor will the width exceed 600 pixels.

Content, like text, can become difficult to read when a browser window is narrowed or expanded. These two properties ensure that content is legible by limiting the minimum and maximum widths of an element.

You can also limit the minimum and maximum *height* of an element:



```
p {
  min-height: 150px;
  max-height: 300px;
}
```

- `min-height` — this property ensures a minimum height for an element's box.
- `max-height` — this property ensures a maximum height of an element's box.

Overflow

All of the components of the box model comprise an element’s size. For example, an image that has the following dimensions is 364 pixels wide and 244 pixels tall.

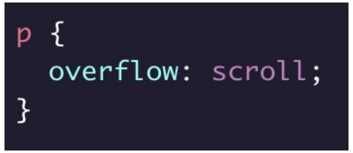
- 300 pixels wide
- 200 pixels tall
- 10 pixels padding on the left and right
- 10 pixels padding on the top and bottom
- 2 pixels border on the left and right
- 2 pixels border on the top and bottom
- 20 pixels margin on the left and right
- 10 pixels margin on the top and bottom

The total dimensions (364px by 244px) are calculated by adding all of the vertical dimensions together and all of the horizontal dimensions together. Sometimes, these components result in an element that is larger than the parent’s containing area.

How can we ensure that we can view all of an element that is larger than its parent's containing area?

The `overflow` property controls what happens to content that spills, or overflows, outside its box. The most commonly used values are:

- `hidden`—when set to this value, any content that overflows will be hidden from view.
- `scroll`—when set to this value, a scrollbar will be added to the element's box so that the rest of the content can be viewed by scrolling.
- `visible`—when set to this value, the overflow content will be displayed outside of the containing element. Note, this is the default value.



```
p {
  overflow: scroll;
}
```

In the example above, if any of the paragraph content overflows (perhaps a user resizes their browser window), a scrollbar will appear so that users can view the rest of the content.

The overflow property is set on a parent element to instruct a web browser on how to render child elements. For example, if a div's overflow property is set to `scroll`, all children of this div will display overflowing content with a scroll bar.

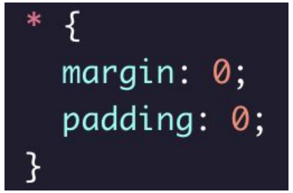
For a more in-depth look at `overflow`, including additional properties like `overflow-x` and `overflow-y` that separate out the horizontal and vertical values, head over to the MDN documentation.

Resetting Defaults

All major web browsers have a default stylesheet they use in the absence of an external stylesheet. These default stylesheets are known as *user agent stylesheets*. In this case, the term *user agent* is a technical term for the browser.

User agent stylesheets often have default CSS rules that set default values for padding and margin. This affects how the browser displays HTML elements, which can make it difficult for a developer to design or style a web page.

Many developers choose to reset these default values so that they can truly work with a clean slate.



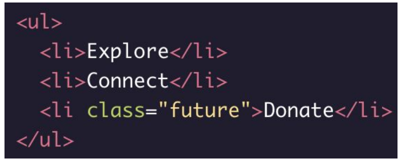
```
* {
  margin: 0;
  padding: 0;
}
```

The code in the example above resets the default margin and padding values of all HTML elements. It is often the first CSS rule in an external stylesheet.

Note that both properties are set to `0`. When these properties are set to `0`, they do not require a unit of measurement.

Visibility

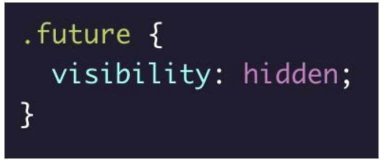
Elements can be hidden from view with the `visibility` property.



```html
<ul>
  <li>Explore</li>
  <li>Connect</li>
  <li class="future">Donate</li>
</ul>
```

The `visibility` property can be set to one of the following values:

- `hidden` — hides an element.
- `visible` — displays an element.
- `collapse` — collapses an element.



```css
.future {
  visibility: hidden;
}
```

In the example above, the list item with a class of `future` will be hidden from view in the browser.

Keep in mind, however, that users can still view the contents of the list item (e.g., `Donate`) by viewing the source code in their browser. Furthermore, the web page will *only* hide the contents of the element. It will still leave an empty space where the element is intended to display.

Note: What's the difference between `display: none` and `visibility: hidden`? An element with `display: none` will be completely removed from the web page. An element with `visibility: hidden`, however, will not be visible on the web page, but the space reserved for it will.