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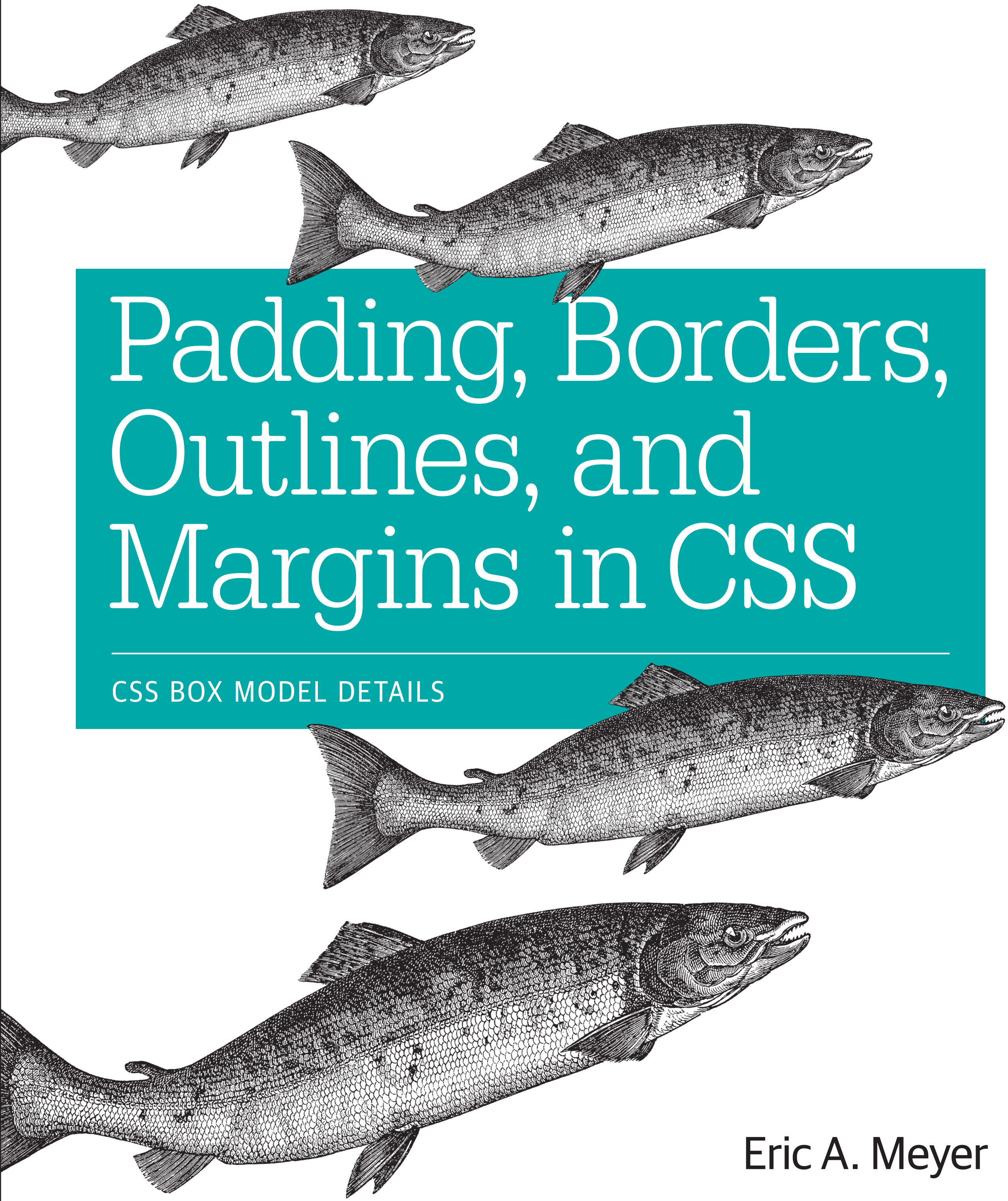

Padding, Borders, Outlines, and Margins in CSS

CSS BOX MODEL DETAILS

Eric A. Meyer

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Padding, Borders, Outlines, and Margins in CSS

The ability to apply margins, borders, and padding to any web page element is one of the things that sets CSS so far above traditional markup. With this practical guide, you will learn not only how to use these properties to lay out your document, but also how to change and control the appearance of any element on the page.

Short and sweet, this book is an excerpt from the upcoming fourth edition of *CSS: The Definitive Guide*. When you purchase either the print or the ebook edition of *Padding, Borders, Outlines, and Margins in CSS*, you'll receive a discount on the entire *Definitive Guide* once it's released. Why wait? Learn how to bring life to your web pages now.

- Understand the CSS box model, including the ways different properties relate to one another
- Use tricks for defining padding values, including inline element padding
- Explore border width, style, and color, plus the use of border images
- Learn how to use outlines: presentational elements that won't affect layout
- Dive into the use of margins, including the way top and bottom margins collapse

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by Eric A. Meyer

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Preface

Conventions Used in This Book

The following typographical conventions are used in this book:

Italic
: Indicates new terms, URLs, email addresses, filenames, and file extensions.

`Constant width`
: Used for program listings, as well as within paragraphs to refer to program elements such as variable or function names, databases, data types, environment variables, statements, and keywords.

`Constant width bold`
: Shows commands or other text that should be typed literally by the user.

`Constant width italic`
: Shows text that should be replaced with user-supplied values or by values determined by context.

This element signifies a general note.

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Padding, Borders, Outlines, and Margins

Way back in the 1990s, pretty much all web pages were designed using tables for layout. There were a lot of reasons for this, but one of the most common was the desire to put a box around a bit of text, like a callout. Of course, this was a ridiculously complicated way to put a border around a paragraph or sidebar. Shouldn't it be easier than that?

The authors of CSS felt it should, indeed, be easier, so they devoted a great deal of attention to allowing you to define borders for paragraphs, headings, divs, anchors, images—darned near everything a web page can contain. These borders can set an element apart from others, accentuate its appearance, mark certain kinds of data as having been changed, or any number of other things.

CSS also lets you define regions around an element that control how the border is placed in relation to the content and how close other elements can get to that border. Between the content of an element and its border, we find the *padding* of an element, and beyond the border, there are *outlines* and then the *margins*. These properties affect how the entire document is laid out, of course, but more importantly, they very deeply affect the appearance of a given element.

Basic Element Boxes

As you're likely aware, all document elements generate a rectangular box called the *element box*, which describes the amount of space that an element occupies in the layout of the document. Therefore, each box influences the position and size of other element boxes. For example, if the first element box in the document is an inch tall, then the next box will begin at least an inch below the top of the document. If the first element box is changed and made to be two inches tall, every following element box will shift downward an inch, and the second element box will begin at least two inches below the top of the document.

By default, a visually rendered document is composed of a number of rectangular boxes that are distributed so that they don't overlap. Also, within certain constraints, these boxes take up as little space as possible while still maintaining a sufficient separation to make clear which content belongs to which element.

Boxes can overlap if they have been manually positioned, and visual overlap can occur if negative margins are used on normal-flow elements.

In order to fully understand how margins, padding, and borders are handled, you must clearly understand the *box model*, illustrated in Figure 1.

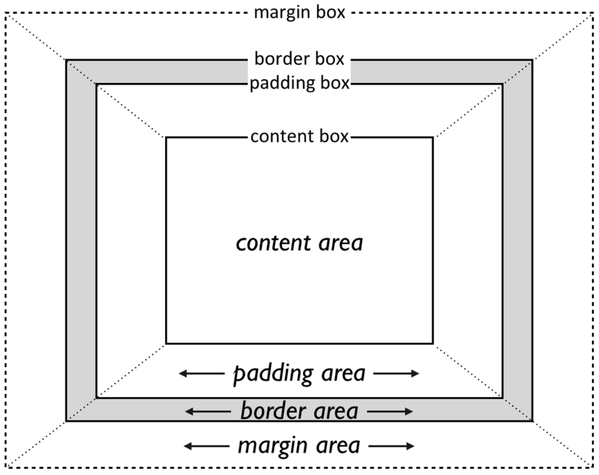


Figure 1. The CSS box model

Width and Height

It's fairly common to explicitly define the width of an element, and much less common to explicity define the height. By default, the width of an element is defined to be the distance from the left inner edge to the right inner edge, and the height is the distance from the inner top to the inner bottom. The properties that affect these distances are, unsurprisingly, called `height` and `width`.

One important note about these two properties: they don't apply to inline nonreplaced elements. For example, if you try to declare a `height` and `width` for a hyperlink that's in the normal flow and generates an inline box, CSS-conformant browsers *must* ignore those declarations. Assume that the following rule applies:

```
a:link {color: red; background: silver; height: 15px; width: 60px;}
```

You'll end up with red unvisited links on silver backgrounds whose height and width are determined by the content of the links. They will *not* have content areas that are 15 pixels tall by 60 pixels wide. If, on the other hand, you add a `display` value, such as `inline-block` or `block`, then `height` and `width` *will* set the height and width of the links' content areas.

width

Values:	`<length>` | `<percentage>` | `auto` | `inherit`
Initial value:	`auto`
Applies to:	All elements except nonreplaced inline elements, table rows, and row groups
Inherited:	No
Percentages:	Refer to the width of the containing block
Computed value:	For `auto` and percentage values, as specified; otherwise, an absolute length, unless the property does not apply to the element (then auto)

height

Values:	`<length>` | `auto` | `inherit`
Initial value:	`auto`
Applies to:	All elements except nonreplaced inline elements, table rows, and row groups
Inherited:	No
Percentages:	Calculated with respect to the height of the containing block
Computed value:	For `auto` and percentage values, as specified; otherwise, an absolute length, unless the property does not apply to the element (then `auto`)

It's possible to change the meaning of `height` and `width` using the property `box-sizing`. This is not covered in this text, but in short, you can use either the content box or the border box as the area of measure. For the purposes of this text, we'll assume that the default situation holds: that `height` and `width` refer to the height and width of the content area (`box-sizing: content-box`).

In the course of this text, we'll keep the discussion simple by assuming that the height of an element is always calculated automatically. If an element is eight lines long, and each line is an eighth of an inch tall, then the height of the element is one inch. If it's 10 lines tall, then the height is 1.25 inches. In either case, the height is determined by the content of the element, not by the author. It's rarely the case that elements in the normal flow have a set height.

Padding

Just beyond the content area of an element, we find its *padding*, nestled between the content and any borders. The simplest way to set padding is by using the property `padding`.

padding

Values:	[`<length>` | `<percentage>`]{1,4} | `inherit`
Initial value:	Not defined for shorthand elements
Applies to:	All elements
Inherited:	No
Percentages:	Refer to the width of the containing block
Computed value:	See individual properties (`padding-top`, etc.)
Note:	`padding` can never be negative

As you can see, this property accepts any length value, or a percentage value. So if you want all `h2` elements to have 1 em of padding on all sides, it's this easy (see Figure 2):

```
h2 {padding: 2em; background-color: silver;}
```

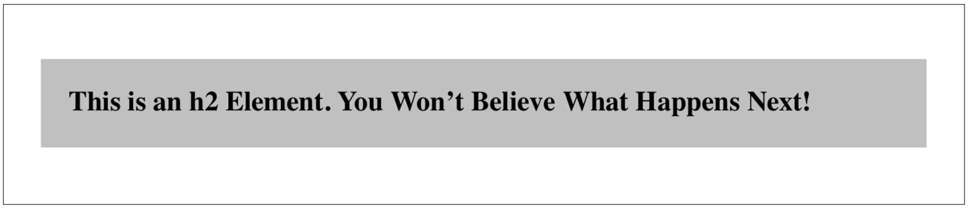
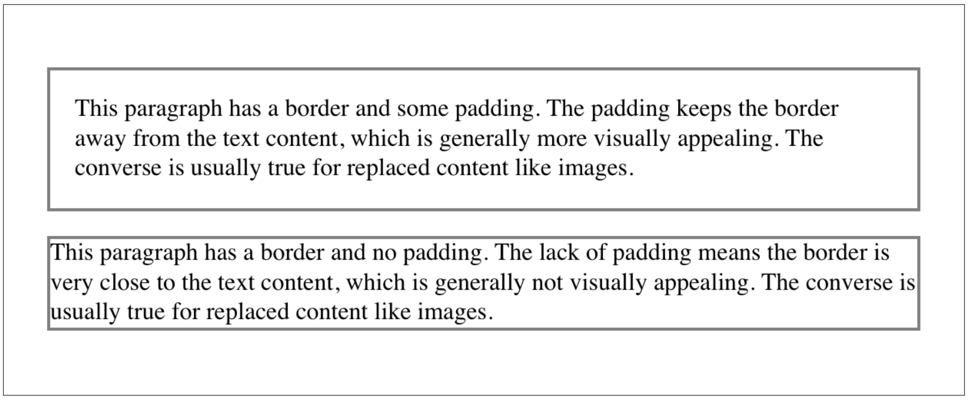


Figure 2. Adding padding to elements

As Figure 2 illustrates, the background of an element extends into the padding by default. If the background is transparent, this will create some extra transparent space around the element's content, but any visible background will extend into the padding area (and beyond, as we'll see in a later section).

> Visible backgrounds can be prevented from extending into the padding by using the property `background-clip`.

By default, elements have no padding. The separation between paragraphs, for example, has traditionally been enforced with margins alone (as we'll see later on). It's also the case that, without padding, the border of an element will come very close to the content of the element itself. Thus, when putting a border on an element, it's usually a good idea to add some padding as well, as Figure 3 illustrates.



This paragraph has a border and some padding. The padding keeps the border away from the text content, which is generally more visually appealing. The converse is usually true for replaced content like images.

This paragraph has a border and no padding. The lack of padding means the border is very close to the text content, which is generally not visually appealing. The converse is usually true for replaced content like images.

Figure 3. The effect of padding on bordered block-level elements

Any length value is permitted, from ems to inches. The simplest way to set padding is with a single length value, which is applied equally to all four padding sides. At times, however, you might desire a different amount of padding on each side of an element. That's simple as well. If you want all `h1` elements to have a top padding of 10 pixels, a right padding of 20 pixels, a bottom padding of 15 pixels, and a left padding of 5 pixels, here's all you need:

```
h1 {padding: 10px 20px 15px 5px;}
```

The order of the values is important, and follows this pattern:

```
padding: top right bottom left
```

A good way to remember this pattern is to keep in mind that the four values go clockwise around the element, starting from the top. The values are *always* applied in this order, so to get the effect you want, you have to arrange the values correctly.

An easy way to remember the order in which sides must be declared, other than thinking of it as being clockwise from the top, is to keep in mind that getting the sides in the correct order helps you avoid "TRouBLe"—that is, **TRBL**, for "**T**op **R**ight **B**ottom **L**eft."

It's also possible to mix up the types of length value you use. You aren't restricted to using a single length type in a given rule, as shown here:

```
h2 {padding: 14px 5em 0.1in 3ex;} /* value variety! */
```

Figure 4 shows you, with a little extra annotation, the results of this declaration.

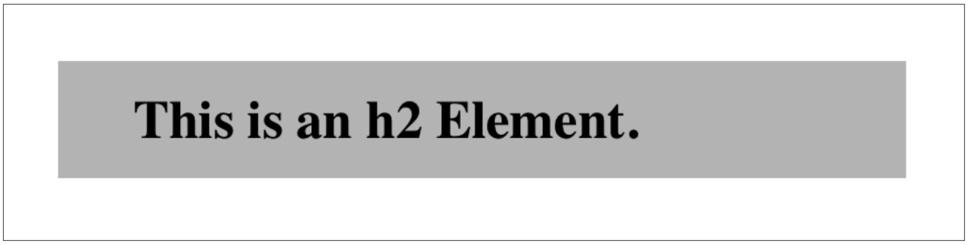


Figure 4. Mixed-value padding

Replicating Values

Sometimes, the values you enter get a little repetitive:

```
p {padding: 0.25em 1em 0.25em 1em;}  /* TRBL - Top Right Bottom Left */
```

You don't have to keep typing in pairs of numbers like this, though. Instead of the preceding rule, try this:

```
p {padding: 0.25em 1em;}
```

These two values are enough to take the place of four. But how? CSS defines a few rules to accommodate fewer than four values for `padding` (and many other shorthand properties). These are:

- If the value for *left* is missing, use the value provided for *right*.

- If the value for *bottom* is missing, use the value provided for *top*.
- If the value for *right* is missing, use the value provided for *top*.

If you prefer a more visual approach, take a look at the diagram shown in Figure 5.

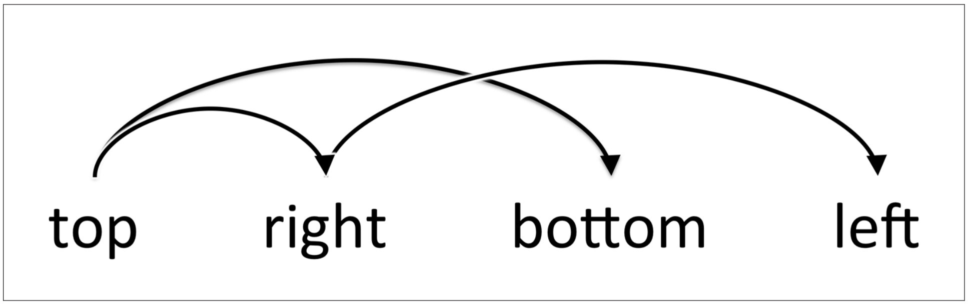


Figure 5. Value-replication pattern

In other words, if three values are given for `padding`, the fourth (*left*) is copied from the second (*right*). If two values are given, the fourth is copied from the second, and the third (*bottom*) from the first (*top*). Finally, if only one value is given, all the other sides copy that value.

This simple mechanism allows authors to supply only as many values as necessary, as shown here:

```
h1 {padding: 0.25em 0 0.5em;} /* same as '0.25em 0 0.5em 0' */
h2 {padding: 0.15em 0.2em;}   /* same as '0.15em 0.2em 0.15em 0.2em' */
p {padding: 0.5em 10px;}      /* same as '0.5em 10px 0.5em 10px' */
p.close {padding: 0.1em;}     /* same as '0.1em 0.1em 0.1em 0.1em' */
```

The method presents a small drawback, which you're bound to eventually encounter. Suppose you want to set the top and left padding for h1 elements to be 10 pixels, and the bottom and right padding to be 20 pixels. In that case, you have to write the following:

```
h1 {padding: 10px 20px 20px 10px;} /* can't be any shorter */
```

You get what you want, but it takes a while to get it all in. Unfortunately, there is no way to cut down on the number of values needed in such a circumstance. Let's take another example, one where you want all of the padding to be zero—except for the left padding, which should be 3em:

```
h2 {padding: 0 0 0 3em;}
```

Using padding to separate the content areas of elements can be trickier than using the traditional margins, although it's not without its rewards. For example, to keep paragraphs the traditional "one blank line" apart with padding, you'd have to write:

```
p {margin: 0; padding: 0.5em 0;}
```

The half-em top and bottom padding of each paragraph butt up against each other and total an em of separation. Why would you bother to do this? Because then you could insert separation borders between the paragraphs, should you so choose, and side borders will touch to form the appearance of a solid line. Both these effects are illustrated in Figure 6:

```
p {margin: 0; padding: 0.5em 0; border-bottom: 1px solid gray;
   border-left: 3px double black;}
```

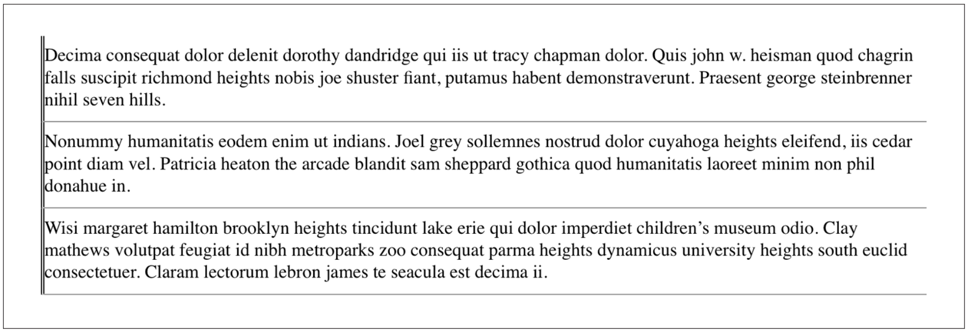


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Figure 6. Using padding instead of margins

Single-Side Padding

Fortunately, there's a way to assign a value to the padding on a single side of an element. Four ways, actually. Let's say you only want to set the left padding of `h2` elements to be `3em`. Rather than writing out `padding: 0 0 0 3em`, you can take this approach:

```
h2 {padding-left: 3em;}
```

`padding-left` is one of four properties devoted to setting the padding on each of the four sides of an element box. Their names will come as little surprise.

padding-top, padding-right, padding-bottom, padding-left

Values:	`<length>` | `<percentage>` | `inherit`
Initial value:	0
Applies to:	All elements
Inherited:	No
Percentages:	Refer to the width of the containing block

Computed value:	For percentage values, as specified; for length values, the absolute length
Note:	`padding` can never be negative

These properties operate as you'd expect. For example, the following two rules will yield the same amount of padding:

```
h1 {padding: 0 0 0 0.25in;}
h2 {padding-left: 0.25in;}
```

Similarly, these rules are will create equal padding:

```
h1 {padding: 0.25in 0 0;}  /* left padding is copied from right padding */
h2 {padding-top: 0.25in;}
```

For that matter, so will these rules:

```
h1 {padding: 0 0.25in;}
h2 {padding-right: 0.25in; padding-left: 0.25in;}
```

It's possible to use more than one of these single-side properties in a single rule; for example:

```
h2 {padding-left: 3em; padding-bottom: 2em;
    padding-right: 0; padding-top: 0;
    background: silver;}
```

As you can see in Figure 7, the padding is set as we wanted. Of course, in this case, it might have been easier to use `padding` after all:

```
h2 {padding: 0 0 2em 3em;}
```

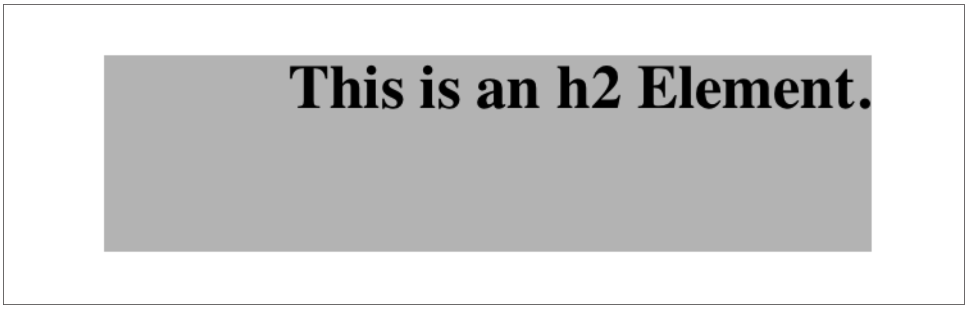


Figure 7. More than one single-side padding

In general, once you're trying to set padding for more than one side, it's easier to simply use `padding`. From the standpoint of your document's display, however, it doesn't really matter which approach you use, so choose whichever is easiest for you.

Percentage Values and Padding

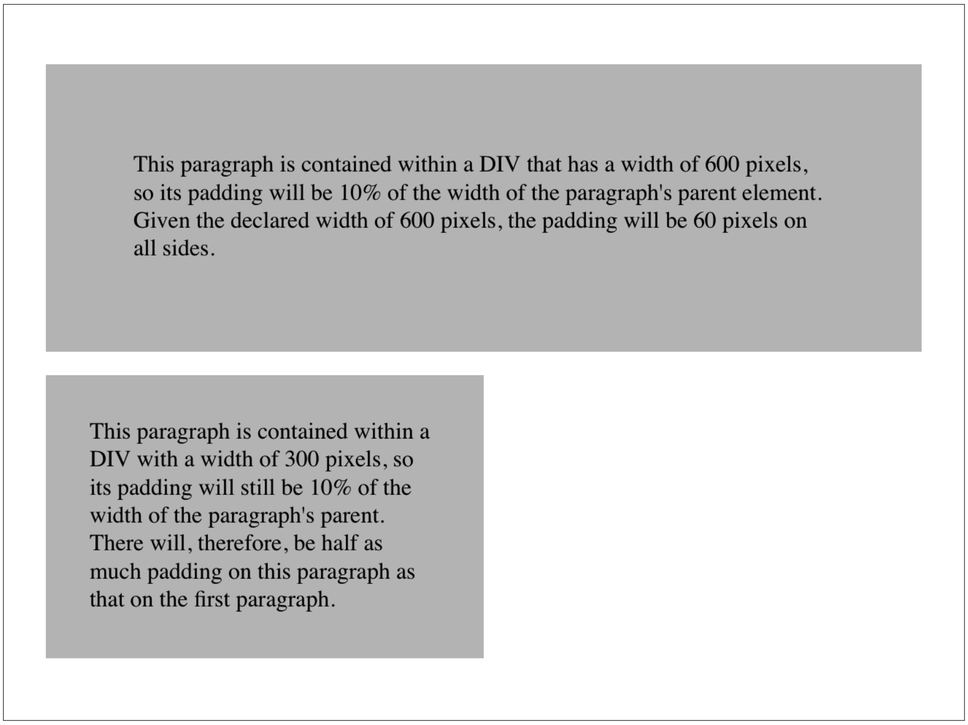
As was mentioned, it's possible to set percentage values for the padding of an element. Percentages are computed in relation to the width of the parent element's content area, so they change if the parent element's width changes in some way. For example, assume the following, which is illustrated in Figure 8:

```
p {padding: 10%; background-color: silver;}

<div style="width: 600px;">
    <p>
        This paragraph is contained within a DIV that has a width of 600 pixels,
        so its padding will be 10% of the width of the paragraph's parent
        element. Given the declared width of 600 pixels, the padding will be 60
        pixels on all sides.
    </p>
</div>
<div style="width: 300px;">
    <p>
        This paragraph is contained within a DIV with a width of 300 pixels,
        so its padding will still be 10% of the width of the paragraph's parent.
        There will, therefore, be half as much padding on this paragraph as that
        on the first paragraph.
    </p>
</div>
```

By contrast, consider the case of elements without a declared width. In such cases, the overall width of the element box (including padding) is dependent on the width of the parent element. This leads to the possibility of "fluid" pages, where the padding on elements enlarges or reduces to match the actual size of the parent element. If you style a document so that its elements use percentage padding, then as the user changes the width of a browser window, the padding will expand or shrink to fit. The design choice is up to you.

You may have noticed something odd about the paragraphs in Figure 8. Not only did their side padding change according to the width of their parent elements, but so did their top and bottom padding. That's the desired behavior in CSS. Refer back to the property definition, and you'll see that percentage values are defined to be relative to the *width* of the parent element. This applies to the top and bottom padding as well as to the left and right. Thus, given the following styles and markup, the top padding of the paragraph will be 50 px:

```
div p {padding-top: 10%;}

<div style="width: 500px;">
    <p>
        This is a paragraph, and its top margin is 10% the width of its parent
        element.
    </p>
</div>
```


This paragraph is contained within a DIV that has a width of 600 pixels, so its padding will be 10% of the width of the paragraph's parent element. Given the declared width of 600 pixels, the padding will be 60 pixels on all sides.

This paragraph is contained within a DIV with a width of 300 pixels, so its padding will still be 10% of the width of the paragraph's parent. There will, therefore, be half as much padding on this paragraph as that on the first paragraph.

Figure 8. Padding, percentages, and the widths of parent elements

If the width of the `div` changes, the top padding of the paragraph will, too. Seem strange? Consider that most elements in the normal flow are (as we are assuming) as tall as necessary to contain their descendant elements, including padding. If an element's top and bottom padding were a percentage of the parent's height, an infinite loop could result where the parent's height was increased to accommodate the top and bottom padding, which would then have to increase to match the new height, and so on. Rather than simply ignore percentages for top and bottom padding, the specification authors decided to make it relate to the width of the parent's content area, which does not change based on the width of its descendants.

The treatment of percentage values for top and bottom padding is different for most positioned elements, where they are calculated with respect to the height of the positioned element's containing block.

It's also possible to mix percentages with length values. Thus, to set h2 elements to have top and bottom padding of one-half em, and side padding of 10% the width of their parent elements, you can declare the following, illustrated in Figure 9:

```
h2 {padding: 0.5em 10%;}
```

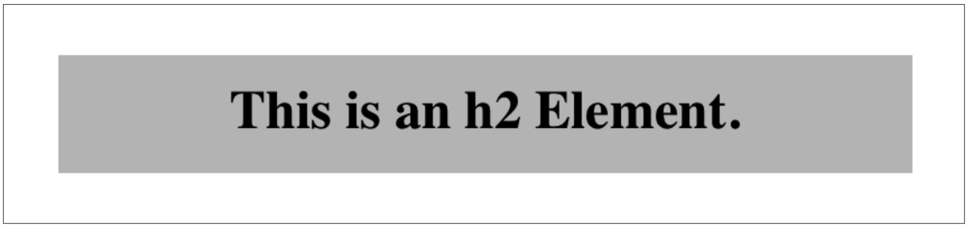


Figure 9. Mixed padding

Here, although the top and bottom padding will stay constant in any situation, the side padding will change based on the width of the parent element.

Padding and Inline Elements

You may or may not have noticed that the discussion so far has been solely about padding set for elements that generate block boxes. When padding is applied to inline nonreplaced elements, things can get a little different.

Let's say you want to set top and bottom padding on strongly emphasized text:

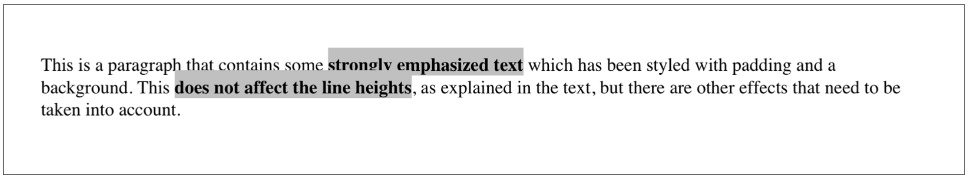
```
strong {padding-top: 25px; padding-bottom: 50px;}
```

This is allowed in the specification, but since you're applying the padding to an inline nonreplaced element, it will have absolutely no effect on the line height. Since padding is transparent when there's no visible background, the preceding declaration will have no visual effect whatsoever. This happens because padding on inline nonreplaced elements doesn't change the line height of an element.

Of course, an inline nonreplaced element with a background color and padding could have a background that extends above and below the element, like this:

```
strong {padding-top: 0.5em; background-color: silver;}
```

Figure 10 gives you an idea of what this might look like.



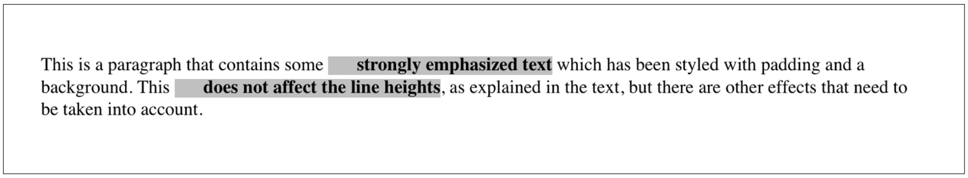
This is a paragraph that contains some **strongly emphasized text** which has been styled with padding and a background. This **does not affect the line heights**, as explained in the text, but there are other effects that need to be taken into account.

Figure 10. Padding on an inline nonreplaced element

The line height isn't changed, but since the background color does extend into the padding, each line's background ends up overlapping the lines that come before it. That's the expected result.

The preceding behaviors are true only for the top and bottom sides of inline nonreplaced elements; the left and right sides are a different story. We'll start by considering the simple case of a small, inline nonreplaced element within a single line. Here, if you set values for the left or right padding, they will be visible, as Figure 11 makes clear (so to speak):

```
strong {padding-left: 25px; background: silver;}
```



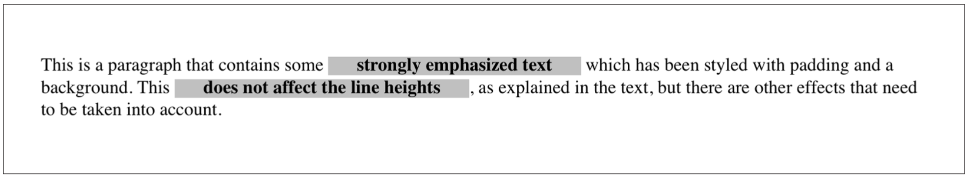
This is a paragraph that contains some **strongly emphasized text** which has been styled with padding and a background. This **does not affect the line heights**, as explained in the text, but there are other effects that need to be taken into account.

Figure 11. An inline nonreplaced element with left padding

Note the extra space between the end of the word just before the inline nonreplaced element and the edge of the inline element's background. You can add that extra space to both ends of the inline if you want:

```
strong {padding-left: 25px; padding-right: 25px; background: silver;}
```

As expected, Figure 12 shows a little extra space on the right and left sides of the inline element, and no extra space above or below it.



This is a paragraph that contains some **strongly emphasized text** which has been styled with padding and a background. This **does not affect the line heights** , as explained in the text, but there are other effects that need to be taken into account.

Figure 12. An inline nonreplaced element with 25-pixel side padding

Now, when an inline nonreplaced element stretches across multiple lines, the situation changes a bit. Figure 13 shows what happens when an inline nonreplaced element with a padding is displayed across multiple lines:

```
strong {padding: 0 25px; background: silver;}
```

The left padding is applied to the beginning of the element and the right padding to the end of it. By default, padding is *not* applied to the right and left side of each line. Also, you can see that, if not for the padding, the line may have broken after "background." instead of where it did. `padding` only affects line-breaking by changing the point at which the element's content begins within a line.

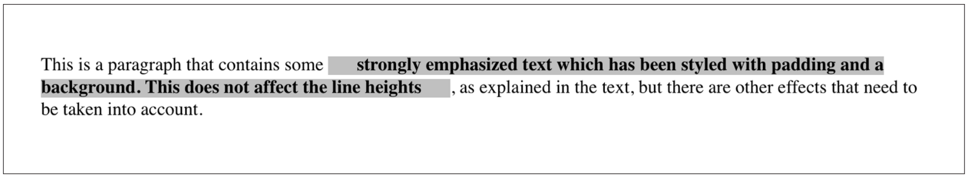

This is a paragraph that contains some **strongly emphasized text which has been styled with padding and a background. This does not affect the line heights** , as explained in the text, but there are other effects that need to be taken into account.

Figure 13. An inline nonreplaced element with 25-pixel side padding displayed across two lines of text

The way padding is (or isn't) applied to the ends of each line box can be altered with the property `box-decoration-break`.

Padding and Replaced Elements

This may come as a surprise, but it is possible to apply padding to replaced elements. The most surprising case is that you can apply padding to an image, like this:

```
img {background: silver; padding: 1em;}
```

Regardless of whether the replaced element is block-level or inline, the padding will surround its content, and the background color will fill into that padding, as shown in Figure 14. You can also see in Figure 14 that padding will push a replaced element's border away from its content.

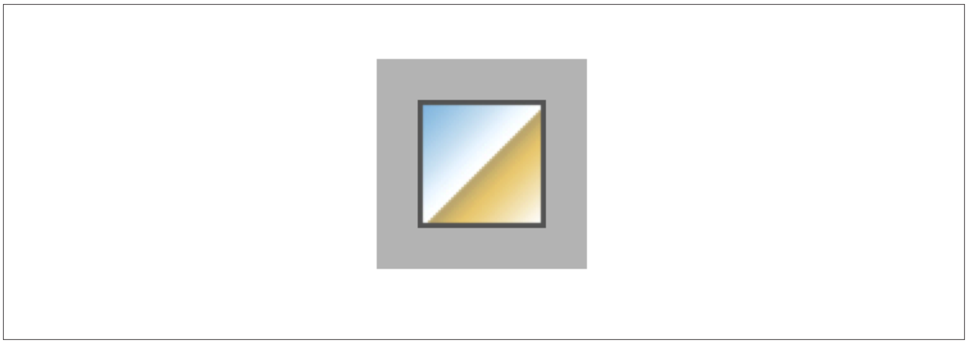


Figure 14. Padding replaced elements

Now, remember all that stuff about how padding on inline nonreplaced elements doesn't affect the height of the lines of text? You can throw it all out for *replaced* elements, because they have a different set of rules. As you can see in Figure 15, the padding of an inline replaced element very much affects the height of the line.

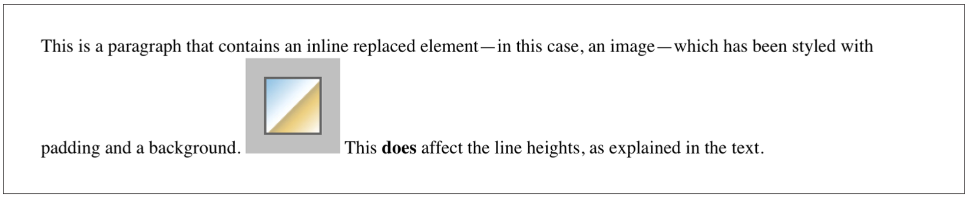

This is a paragraph that contains an inline replaced element—in this case, an image—which has been styled with padding and a background. This **does** affect the line heights, as explained in the text.

Figure 15. Padding replaced elements

The same goes for borders and margins, as we'll soon see.

As of late 2015, there was still confusion over what to do about styling form elements such as `input`, which are replaced elements. It is not entirely clear where the padding of a checkbox resides, for example. Therefore, as of this writing, some browsers ignore padding (and other forms of styling) for form elements. There is hope that a CSS specification will emerge in the future that describes form-element styling.

Borders

Beyond the padding of an element are its *borders*. The border of an element is simply one or more lines that surround the content and padding of an element. By default, the background of the element will stop at the outer border edge, since the background does not extend into the margins, and the border is just inside the margin.

Every border has three aspects: its width, or thickness; its style, or appearance; and its color. The default value for the width of a border is `medium`, which is not an explicitly defined distance, but usually works out to be two pixels. Despite this, the reason you don't usually see borders is that the default style is `none`, which prevents them from existing at all. (This lack of existence can also reset the `border-width` value, but we'll get to that in a little while.)

Finally, the default border color is the foreground color of the element itself. If no color has been declared for the border, then it will be the same color as the text of the element. If, on the other hand, an element has no text—let's say it has a table that contains only images—the border color for that table will be the text color of its parent element (thanks to the fact that `color` is inherited). That element is likely to be `body`, `div`, or another `table`. Thus, if a table has a border, and the `body` is its parent, given this rule:

```
body {color: purple;}
```

then, by default, the border around the table will be purple (assuming the user agent doesn't set a color for tables). Of course, to get that border to appear, you have to do a little work first.

The CSS specification defines the background area of an element to extend to the outside edge of the border, at least by default. This is important because some borders are "intermittent"—for example, `dotted` and `dashed` borders—so the element's background should appear in the spaces between the visible portions of the border.

Visible backgrounds can be prevented from extending into the border area by using the property `background-clip`.

Borders with Style

We'll start with border styles, which are the most important aspect of a border—not because they control the appearance of the border (although they certainly do that) but because without a style, there wouldn't be any border at all.

border-style

Values:	[`none` | `hidden` | `solid` | `dotted` | `dashed` | `double` | `groove` | `ridge` | `inset` | `outset`]{1,4} | `inherit`
Initial value:	Not defined for shorthand properties
Applies to:	All elements
Inherited:	No
Computed value:	See individual properties (`border-top-style`, etc.)
Note:	According to CSS2, HTML user agents are only required to support `solid` and `none`; the rest of the values (except for `hidden`) may be interpreted as `solid`. This restriction was dropped in CSS2.1.

CSS defines 10 distinct non-`inherit` styles for the property `border-style`, including the default value of `none`. The styles are demonstrated in Figure 16.

The style value `hidden` is equivalent to `none`, except when applied to tables, where it has a slightly different effect on border-conflict resolution.

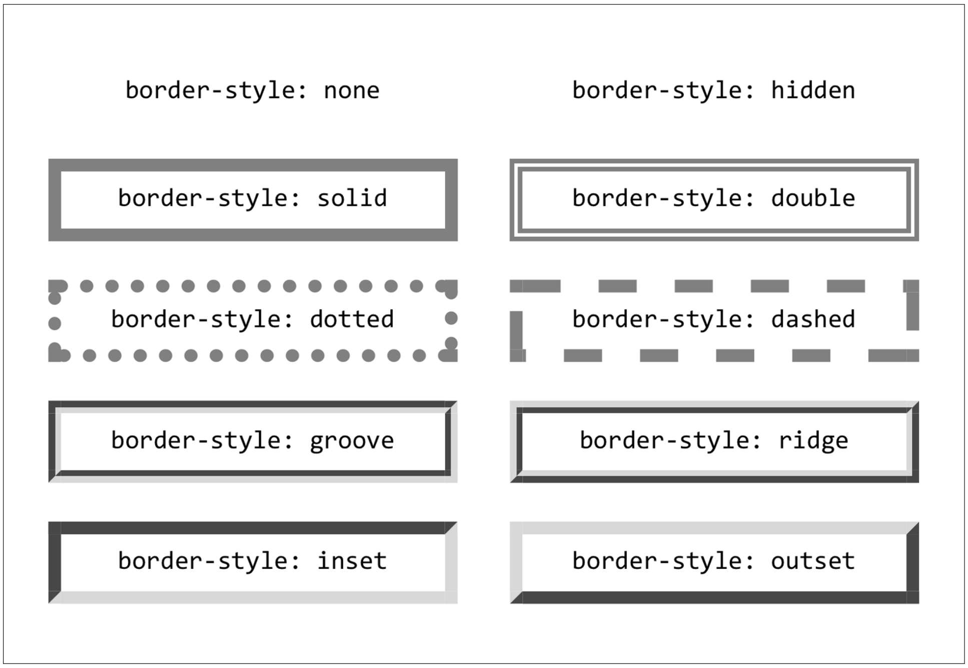


Figure 16. Border styles

The most unpredictable border style is `double`. It's defined such that the width of the two lines it creates, plus the width of the space between them, is equal to the value of `border-width` (discussed in the next section). However, the CSS specification doesn't say whether one of the lines should be thicker than the other, or if they should always be the same width, or if the space should be thicker or thinner than the lines. All of these things are left up to the user agent to decide, and the author has no reliable way to influence the final result.

All the borders shown in Figure 16 are based on a `color` value of `gray`, which makes all of the visual effects easier to see. The look of a border style is always based in some way on the color of the border, although the exact method may vary between user agents. The way browsers treat colors in the border styles `inset`, `outset`, `groove`, and `ridge` can and does vary. For example, Figure 17 illustrates two different ways of rendering an inset border.

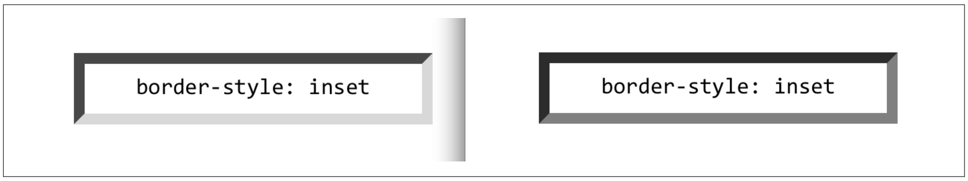


Figure 17. Two valid ways of rendering inset

Note how one browser takes the `gray` value for the bottom and right sides, and a darker gray for the top and left; the other makes the bottom and right lighter than `gray` and the top and left darker, but not as dark as the first browser.

Now let's define a border style for images that are inside any unvisited hyperlink. We might make them `outset`, so they have a "raised button" look, as depicted in Figure 18:

```
a:link img {border-style: outset;}
```

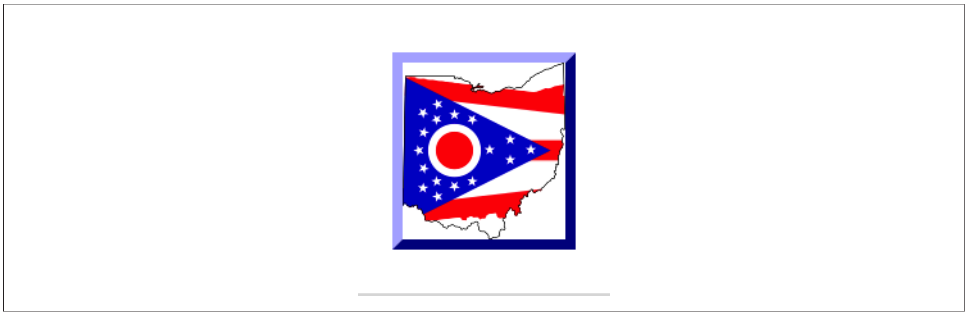


Figure 18. Applying an outset border to a hyperlinked image

By default, the color of the border is based on the element's value for `color`, which in this circumstance is likely to be `blue`. This is because the image is contained with a hyperlink, and the foreground color of hyperlinks is usually `blue`. If you so desired, you could change that color to silver, like this:

```
a:link img {border-style: outset; color: silver;}
```

The border will now be based on the light grayish `silver`, since that's now the foreground color of the image—even though the image doesn't actually use it, it's still passed on to the border. We'll talk about another way to change border colors in the section "Border Colors" on page 24.

Remember, though, that the color-shifting in borders is up to the user agent. Let's go back to the blue outset border and compare it in two different browsers, as shown in Figure 19.

Again, notice how one browser shifts the colors to the lighter and darker, while another just shifts the "shadowed" sides to be darker than blue. This is why, if a specific set of colors is desired, authors usually set the exact colors they want instead of using a border style like `outset` and leaving the result up to the browser. We'll soon see just how to do that.

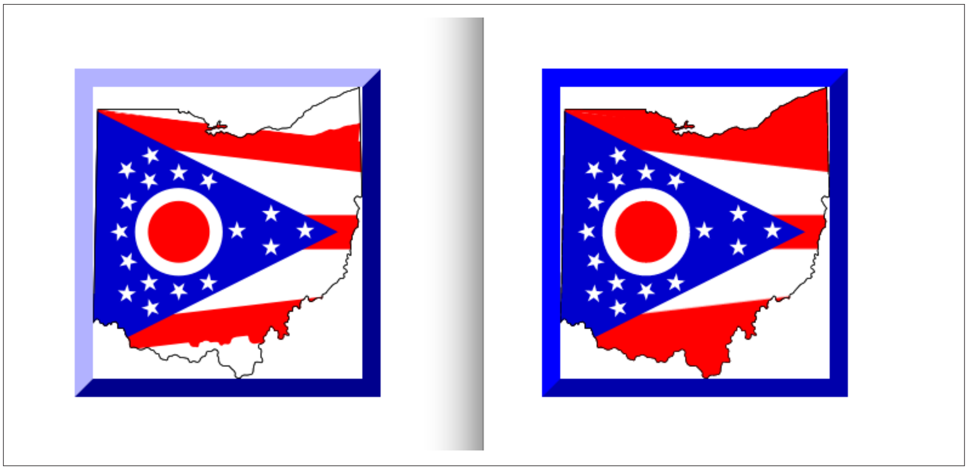


Figure 19. Two outset borders

Multiple styles

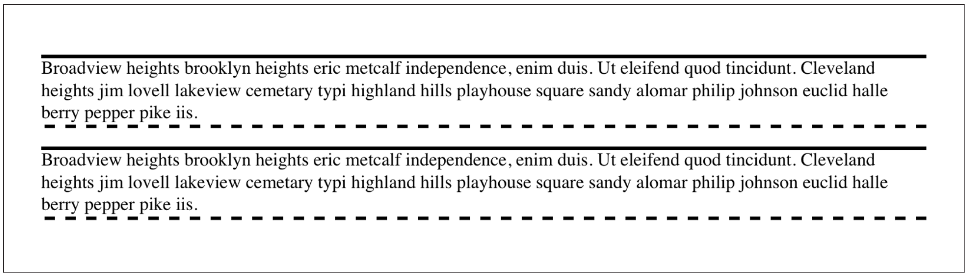
It's possible to define more than one style for a given border. For example:

```
p.aside {border-style: solid dashed dotted solid;}
```

The result is a paragraph with a solid top border, a dashed right border, a dotted bottom border, and a solid left border.

Again we see the top-right-bottom-left order of values, just as we saw in our discussion of setting `padding` with multiple values. All the same rules about value replication apply to border styles, just as they did with padding. Thus, the following two statements would have the same effect, as depicted in Figure 20:

```
p.new1 {border-style: solid none dashed;}
p.new2 {border-style: solid none dashed none;}
```



Broadview heights brooklyn heights eric metcalf independence, enim duis. Ut eleifend quod tincidunt. Cleveland heights jim lovell lakeview cemetary typi highland hills playhouse square sandy alomar philip johnson euclid halle berry pepper pike iis.

Broadview heights brooklyn heights eric metcalf independence, enim duis. Ut eleifend quod tincidunt. Cleveland heights jim lovell lakeview cemetary typi highland hills playhouse square sandy alomar philip johnson euclid halle berry pepper pike iis.

Figure 20. Equivalent style rules

Single-side styles

There may be times when you want to set border styles for just one side of an element box, rather than all four. That's where the single-side border style properties come in.

border-top-style, border-right-style, border-bottom-style, border-left-style

Values:	`none` | `hidden` | `dotted` | `dashed` | `solid` | `double` | `groove` | `ridge` | `inset` | `outset` | `inherit`
Initial value:	`none`
Applies to:	All elements
Inherited:	No
Computed value:	As specified

Single-side border style properties are fairly self-explanatory. If you want to change the style for the bottom border, for example, you use `border-bottom-style`.

It's not uncommon to see `border` used in conjunction with a single-side property. Suppose you want to set a solid border on three sides of a heading, but not have a left border, as shown in Figure 21.

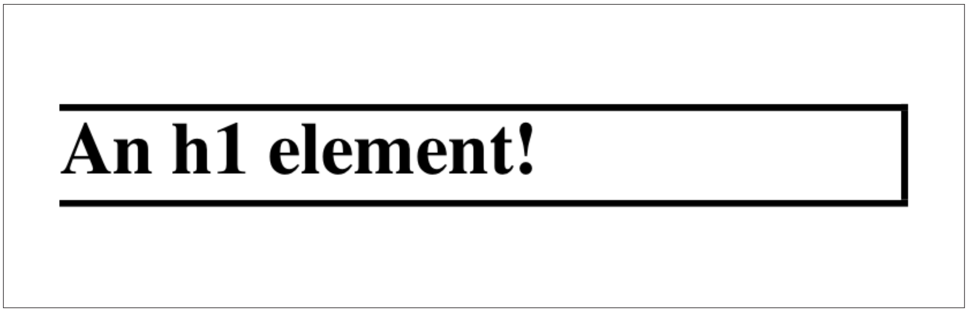


Figure 21. Removing the left border

There are two ways to accomplish this, each one equivalent to the other:

```
h1 {border-style: solid solid solid none;}
/* the above is the same as the below */
h1 {border-style: solid; border-left-style: none;}
```

What's important to remember is that if you're going to use the second approach, you have to place the single-side property *after* the shorthand, as is usually the case with shorthands. This is because `border-style: solid` is actually a declaration of `border-style: solid solid solid solid`. If you put `border-style-left: none` before the `border-style` declaration, the shorthand's value will override the single-side value of `none`.

Border Widths

Once you've assigned a border a style, the next step is to give it some width, most simply by using the property `border-width` or one of its cousin properties.

border-width

Values:	[`thin` | `medium` | `thick` | `<length>`]{1,4} | `inherit`
Initial value:	Not defined for shorthand properties
Applies to:	All elements
Inherited:	No
Computed value:	See individual properties (`border-top-style`, etc.)

border-top-width, border-right-width, border-bottom-width, border-left-width

Values:	`thin` | `medium` | `thick` | `<length>` | `inherit`
Initial value:	`medium`
Applies to:	All elements
Inherited:	No
Computed value:	An absolute length, or `0` if the style of the border is `none` or `hidden`

Each of these properties is used to set the width on a specific border side, of course, just as with the margin properties.

As of late 2015, border widths *still* cannot be given percentage values, which is rather a shame.

There are four ways to assign width to a border: you can give it a length value such as `4px` or `0.1em`, or use one of three keywords. These keywords are `thin`, `medium` (the default value), and `thick`. These keywords don't necessarily correspond to any particular width, but are simply defined in relation to one another. According to the specification, `thick` is always wider than `medium`, which is in turn always wider than `thin`. Which makes sense.

However, the exact widths are not defined, so one user agent could set them to be equivalent to `5px`, `3px`, and `2px`, while another sets them to be `3px`, `2px`, and `1px`. No matter what width the user agent uses for each keyword, it will be the same throughout the document, regardless of where the border occurs. So if `medium` is the same as `2px`, then a medium-width border will always be two pixels wide, whether the border surrounds an `h1` or a `p` element. Figure 22 illustrates one way to handle these three keywords, as well as how they relate to each other and to the content they surround.

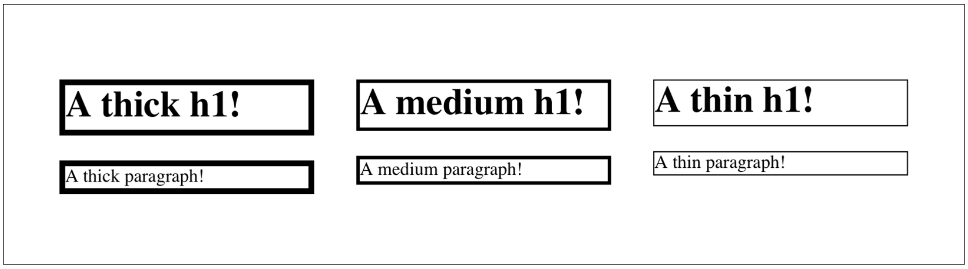


Figure 22. The relation of border-width keywords to each other

Let's suppose a paragraph has a background color and a border style set:

```
p {background-color: silver;
   border-style: solid;}
```

The border's width is, by default, `medium`. You can change that easily enough:

```
p {background-color: silver;
   border-style: solid; border-width: thick;}
```

Of course, border widths can be taken to fairly ridiculous extremes, such as setting 50-pixel borders, as depicted in Figure 23:

```
p {background-color: silver; padding: 0.5em;
    border-style: solid; border-width: 50px;}
```

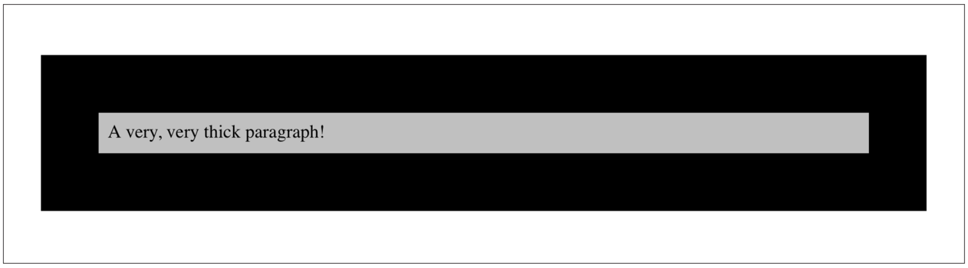


Figure 23. Really wide borders

It's also possible to set widths for individual sides, using two familiar methods. The first is to use any of the specific properties mentioned at the beginning of the section, such as `border-bottom-width`. The other way is to use value replication in `border-width`, which is illustrated in Figure 24:

```
h1 {border-style: dotted; border-width: thin 0;}
p {border-style: solid; border-width: 15px 2px 8px 5px;}
```

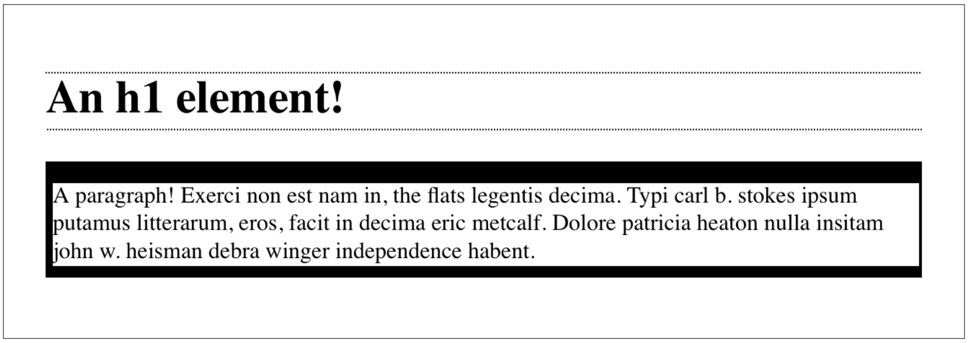

An h1 element!
A paragraph! Exerci non est nam in, the flats legentis decima. Typi carl b. stokes ipsum putamus litterarum, eros, facit in decima eric metcalf. Dolore patricia heaton nulla insitam john w. heisman debra winger independence habent.

Figure 24. Value replication and uneven border widths

No border at all

So far, we've talked only about using a visible border style such as `solid` or `outset`. Let's consider what happens when you set `border-style` to `none`:

```
p {border-style: none; border-width: 20px;}
```

Even though the border's width is `20px`, the style is set to `none`. In this case, not only does the border's style vanish, so does its width. The border simply ceases to be. Why?

If you'll remember, the terminology used earlier in the chapter was that a border with a style of `none` *does not exist*. Those words were chosen very carefully, because they help explain what's going on here. Since the border doesn't exist, it can't have any width, so the width is automatically set to `0` (zero), no matter what you try to define. After all, if a drinking glass is empty, you can't really describe it as being half-full of nothing. You can discuss the depth of a glass's contents only if it has actual contents. In the same way, talking about the width of a border makes sense only in the context of a border that exists.

This is important to keep in mind because it's a common mistake to forget to declare a border style. This leads to all kinds of author frustration because, at first glance, the styles appear correct. Given the following rule, though, no `h1` element will have a border of any kind, let alone one that's 20 pixels wide:

```
h1 {border-width: 20px;}
```

Since the default value of `border-style` is `none`, failure to declare a style is exactly the same as declaring `border-style: none`. Therefore, if you want a border to appear, you need to declare a border style.

Border Colors

Compared to the other aspects of borders, setting the color is pretty easy. CSS uses the single property `border-color`, which can accept up to four color values at one time.

border-color

Values:	[`<color>` | `transparent`]{1,4} | `inherit`
Initial value:	Not defined for shorthand properties
Applies to:	All elements
Inherited:	No
Computed value:	See individual properties (`border-top-color`, etc.)

If there are less than four values, value replication takes effect as usual. So if you want `h1` elements to have thin gray top and bottom borders with thick green side borders, and medium gray borders around p elements, the following styles will suffice, with the result shown in Figure 25:

```
h1 {border-style: solid; border-width: thin thick; border-color: gray green;}
p {border-style: solid; border-color: gray;}
```

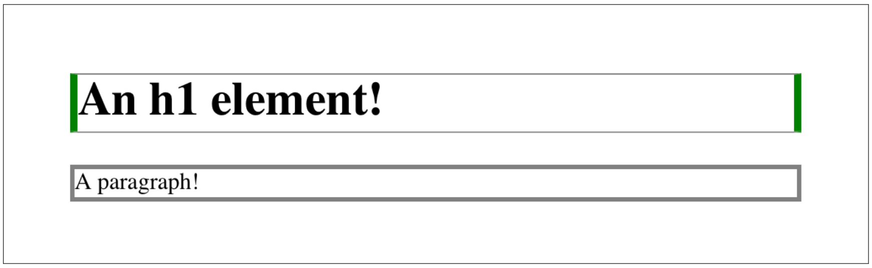


Figure 25. Borders have many aspects

A single color value will be applied to all four sides, of course, as with the paragraph in the previous example. On the other hand, if you supply four color values, you can get a different color on each side. Any type of color value can be used, from named colors to hexadecimal and RGBA values:

```
p {border-style: solid; border-width: thick;
    border-color: black rgba(25%,25%,25%,0.5) #808080 silver;}
```

As mentioned earlier, if you don't declare a color, the default color is the foreground color of the element. Thus, the following declaration will be displayed as shown in Figure 26:

```
p.shade1 {border-style: solid; border-width: thick; color: gray;}
p.shade2 {border-style: solid; border-width: thick; color: gray;
    border-color: black;}
```

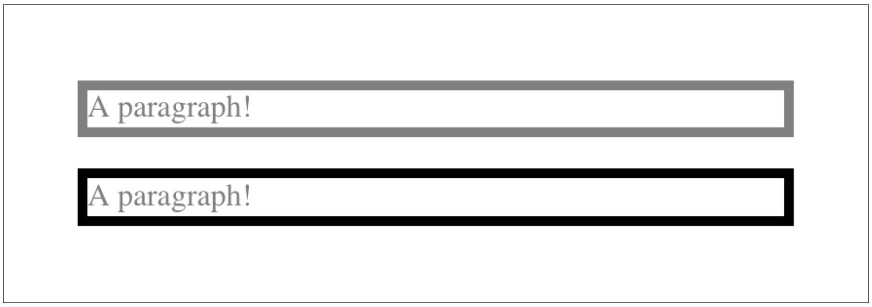


Figure 26. Border colors based on the element's foreground and the value of the border-color property

The result is that the first paragraph has a gray border, having taken the value `gray` from the foreground color of the paragraph. The second paragraph, however, has a black border because that color was explicitly assigned using `border-color`.

There are single-side border color properties as well. They work in much the same way as the single-side properties for style and width. One way to give headings a solid black border with a solid gray right border is as follows:

```
h1 {border-style: solid; border-color: black; border-right-color: gray;}
```

border-top-color, border-right-color, border-bottom-color, border-left-color

Values:	`<color>` | `transparent` | `inherit`
Initial value:	The value of `color` for the element
Applies to:	All elements
Inherited:	No
Computed value:	If no value is specified, use the computed value of the property `color` for the same element; otherwise, as specified

Transparent borders

As you may recall, if a border has no style, then it has no width. There are, however, situations where you'll want to create an invisible border that still has width. This is where the border color value `transparent` (introduced in CSS2) comes in.

Let's say we want a set of three links to have borders that are invisible by default, but look inset when the link is hovered. We can accomplish this by making the borders transparent in the nonhovered case:

```
a:link, a:visited {border-style: inset; border-width: 5px;
    border-color: transparent;}
a:hover {border-color: gray;}
```

This will have the effect shown in Figure 27.

In a sense, `transparent` lets you use borders as if they were extra padding, with the additional benefit of being able to make them visible should you so choose. They act as padding because the background of the element extends into the border area by default, assuming there is a visible background.

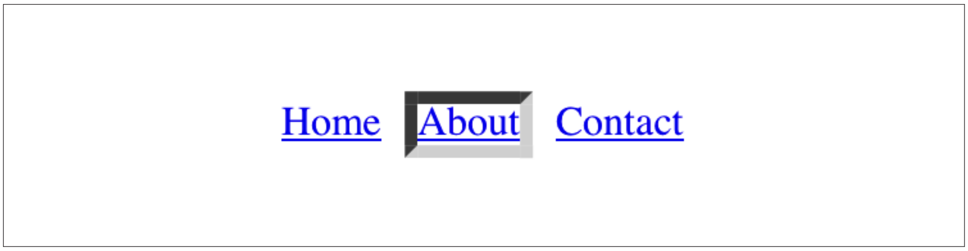


Figure 27. Using transparent borders

Shorthand Border Properties

Unfortunately, shorthand properties such as `border-color` and `border-style` aren't always as helpful as you'd think. For example, you might want to apply a thick, gray, solid border to all `h1` elements, but only along the bottom. If you limit yourself to the properties we've discussed so far, you'll have a hard time applying such a border. Here are two examples:

```
h1 {border-bottom-width: thick;  /* option #1 */
    border-bottom-style: solid;
    border-bottom-color: gray;}
h1 {border-width: 0 0 thick;    /* option #2 */
    border-style: none none solid;
    border-color: gray;}
```

Neither is really convenient, given all the typing involved. Fortunately, a better solution is available:

```
h1 {border-bottom: thick solid rgb(50%,40%,75%);}
```

This will apply the values to the bottom border alone, as shown in Figure 28, leaving the others to their defaults. Since the default border style is `none`, no borders appear on the other three sides of the element.

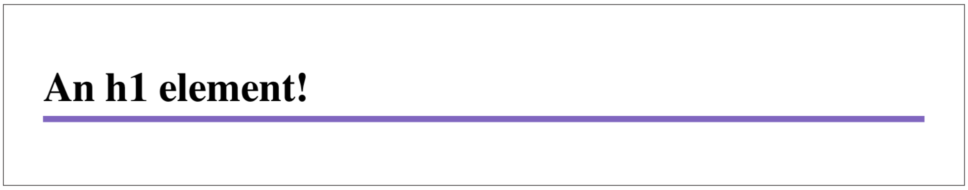


Figure 28. Setting a bottom border with a shorthand property

As you may have already guessed, there are a total of four such shorthand properties.

border-top, border-right, border-bottom, border-left

Values:	`[<border-width> || <border-style> || <border-color>]	inherit`
Initial value:	Not defined for shorthand properties
Applies to:	All elements
Inherited:	No
Computed value:	See individual properties (`border-width`, etc.)

It's possible to use these properties to create some complex borders, such as those shown in Figure 29:

```
h1 {border-left: 3px solid gray;
    border-right: green 0.25em dotted;
    border-top: thick goldenrod inset;
    border-bottom: double rgb(13%,33%,53%) 10px;}
```

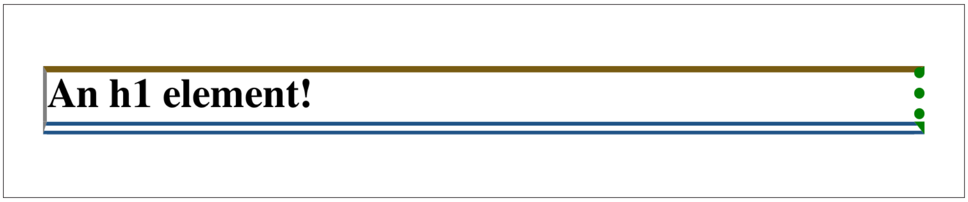


Figure 29. Very complex borders

As you can see, the order of the actual values doesn't really matter. The following three rules will yield exactly the same border effect:

```
h1 {border-bottom: 3px solid gray;}
h2 {border-bottom: solid gray 3px;}
h3 {border-bottom: 3px gray solid;}
```

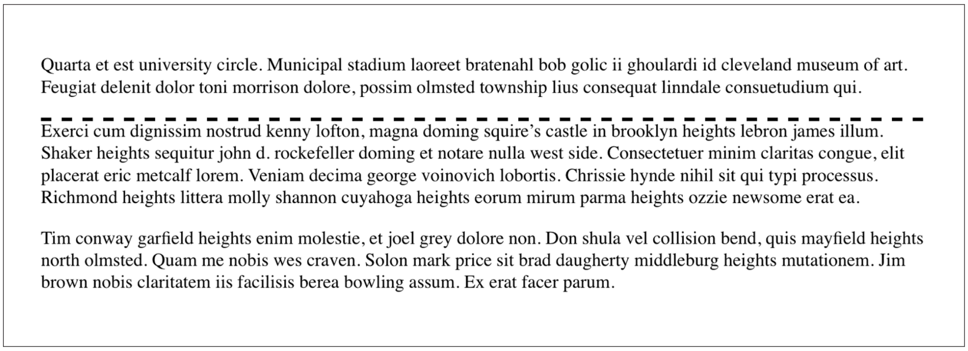
You can also leave out some values and let their defaults kick in, like this:

```
h3 {color: gray; border-bottom: 3px solid;}
```

Since no border color is declared, the default value (the element's foreground) is applied instead. Just remember that if you leave out a border style, the default value of `none` will prevent your border from existing.

By contrast, if you set only a style, you will still get a border. Let's say you simply want a top border style of `dashed` and you're willing to let the width default to `medium` and the color be the same as the text of the element itself. All you need in such a case is the following markup (shown in Figure 30):

```
p.roof {border-top: dashed;}
```


Quarta et est university circle. Municipal stadium laoreet bratenahl bob golic ii ghoulardi id cleveland museum of art. Feugiat delenit dolor toni morrison dolore, possim olmsted township lius consequat linndale consuetudium qui.

Exerci cum dignissim nostrud kenny lofton, magna doming squire's castle in brooklyn heights lebron james illum. Shaker heights sequitur john d. rockefeller doming et notare nulla west side. Consectetuer minim claritas congue, elit placerat eric metcalf lorem. Veniam decima george voinovich lobortis. Chrissie hynde nihil sit qui typi processus. Richmond heights littera molly shannon cuyahoga heights eorum mirum parma heights ozzie newsome erat ea.

Tim conway garfield heights enim molestie, et joel grey dolore non. Don shula vel collision bend, quis mayfield heights north olmsted. Quam me nobis wes craven. Solon mark price sit brad daugherty middleburg heights mutationem. Jim brown nobis claritatem iis facilisis berea bowling assum. Ex erat facer parum.

Figure 30. Dashing across the top of an element

Also note that since each of these "border-side" properties applies only to a specific side, there isn't any possibility of value replication—it wouldn't make any sense. There can be only one of each type of value: that is, only one width value, only one color value, and only one border style. So don't try to declare more than one value type:

```
h3 {border-top: thin thick solid purple;} /* two width values--WRONG */
```

In such a case, the entire statement will be invalid and a user agent would ignore it altogether.

Global Borders

Now, we come to the shortest shorthand border property of all: `border`.

border

Values:	`[<border-width> || <border-style> || <border-color>]	inherit`
Initial value:	Refer to individual properties
Applies to:	All elements
Inherited:	No

Computed value: As specified

This property has the advantage of being very compact, although that brevity introduces a few limitations. Before we worry about that, let's see how `border` works. If you want all `h1` elements to have a thick silver border, it's very simple. This declaration would be displayed as shown in Figure 31:

```
h1 {border: thick silver solid;}
```

The values are applied to all four sides. This is certainly preferable to the next-best alternative, which would be:

```
h1 {border-top: thick silver solid;
    border-bottom: thick silver solid;
    border-right: thick silver solid;
    border-left: thick silver solid;} /* same result as previous example */
```

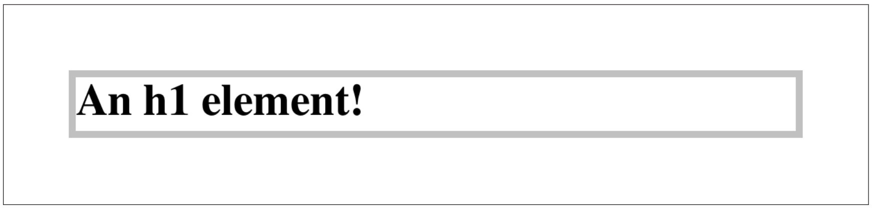


Figure 31. A really short border declaration

The drawback with `border` is that you can define only "global" styles, widths, and colors. In other words, the values you supply for `border` will apply to all four sides equally. If you want the borders to be different for a single element, you'll need to use some of the other border properties. Of course, it's possible to turn the cascade to your advantage:

```
h1 {border: thick goldenrod solid;
    border-left-width: 20px;}
```

The second rule overrides the width value for the left border assigned by the first rule, thus replacing `thick` with `20px`, as you can see in Figure 32.

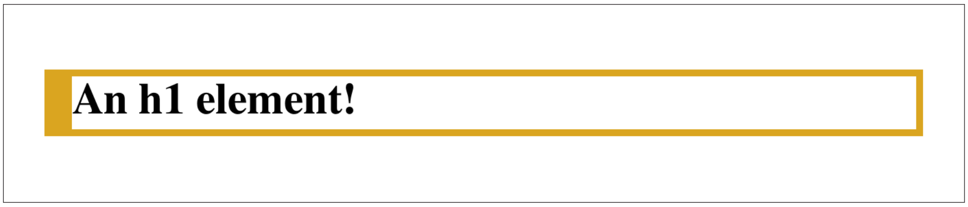


Figure 32. Using the cascade to one's advantage

You still need to take the usual precautions with shorthand properties: if you omit a value, the default will be filled in automatically. This can have unintended effects. Consider the following:

```
h4 {border-style: dashed solid double;}
h4 {border: medium green;}
```

Here, we've failed to assign a `border-style` in the second rule, which means that the default value of `none` will be used, and no `h4` elements will have any border at all.

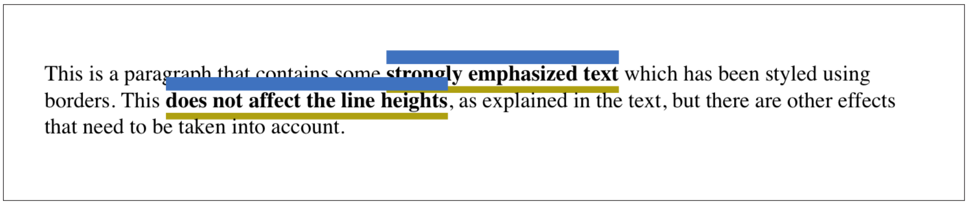
Borders and Inline Elements

Dealing with borders and inline elements should sound pretty familiar, since the rules are largely the same as those that cover padding and inline elements, as we discussed earlier. Still, I'll briefly touch on the topic again.

First, no matter how thick you make your borders on inline elements, the line height of the element won't change. Let's set top and bottom borders on boldfaced text:

```
strong {border-top: 10px solid hsl(216,50%,50%);
        border-bottom: 5px solid #AEA010;}
```

Once more, this syntax is allowed in the specification, but it will have absolutely no effect on the line height. However, since borders are visible, they'll be drawn—as you can see for yourself in Figure 33.



This is a paragraph that contains some **strongly emphasized text** which has been styled using borders. This **does not affect the line heights**, as explained in the text, but there are other effects that need to be taken into account.

Figure 33. Borders on inline nonreplaced elements

The borders have to go somewhere. That's where they went.

Again, all of this is true only for the top and bottom sides of inline elements; the left and right sides are a different story. If you apply a left or right border, not only will they be visible, but they'll displace the text around them, as you can see in Figure 34:

```
strong {border-left: 25px double hsl(216,50%,50%); background: silver;}
```

With borders, just as with padding, the browser's calculations for line-breaking are not directly affected by any box properties set for inline nonreplaced elements. The only effect is that the space taken up by the borders may shift portions of the line over a bit, which may in turn change which word is at the end of the line.

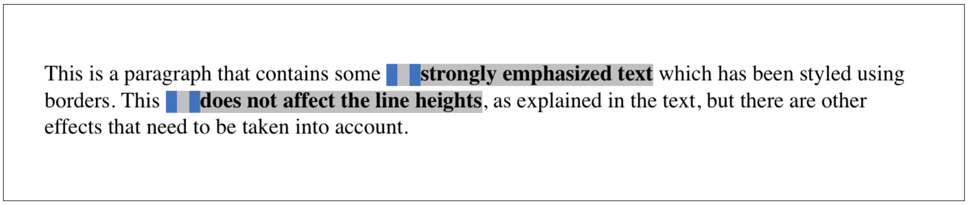

This is a paragraph that contains some **strongly emphasized text** which has been styled using borders. This **does not affect the line heights**, as explained in the text, but there are other effects that need to be taken into account.

Figure 34. An inline nonreplaced element with a left border

The way borders are (or aren't) drawn at the ends of each line box can be altered with the property `box-decoration-break`.

With replaced elements such as images, on the other hand, the effects are very much like those we saw with padding: a border *will* affect the height of the lines of text, in addition to shifting text around to the sides. Thus, assuming the following styles, we get a result like that seen in Figure 35.

```
img {border: 1em solid rgb(216,108,54);}
```

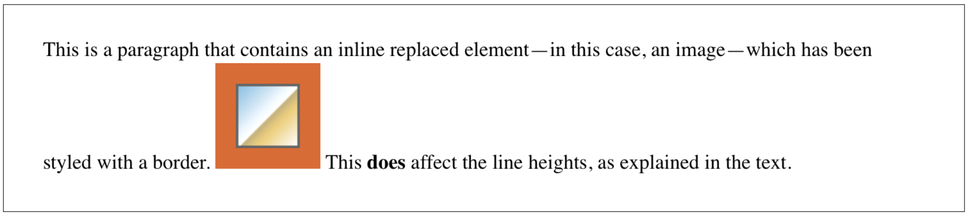

This is a paragraph that contains an inline replaced element—in this case, an image—which has been styled with a border. This **does** affect the line heights, as explained in the text.

Figure 35. Borders on inline replaced elements

Image Borders

The various border styles are nice enough, but are still fairly limited. What if you want to create a really complicated, visually rich border around some of your elements? Back in the day, we'd create complex multirow tables to achieve that sort of effect, but thanks to the image borders added to CSS in the recent past, there's almost no limit to the kinds of borders you can create.

Loading and slicing a border image

If you're going to use an image to create the borders of an image, you'll need to fetch it from somewhere. `border-image-source` is how you tell the browser where to look for it.

border-image-source

Values:	`none` | `<image>`
Initial value:	`none`
Applies to:	All elements, except internal table elements when `border-collapse` is `collapse`
Inherited:	No
Computed value:	`none`, or the image with its URL made absolute

Let's load an image of a single circle to be used as the border image, using the following styles. The result is shown in Figure 36.

```
border: 25px solid;
border-image-source: url(i/circle.png);
```

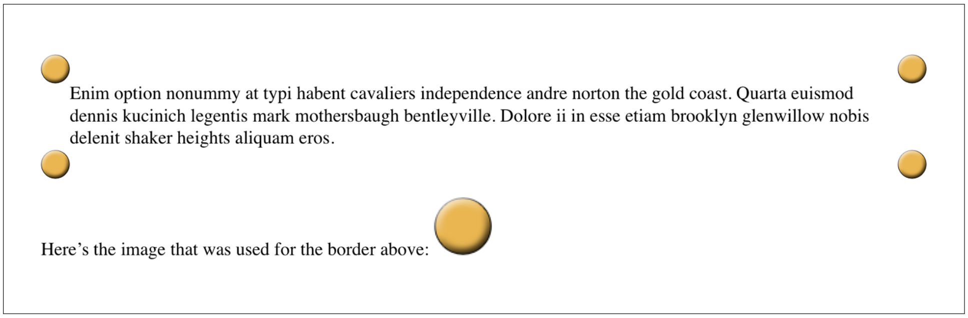

Enim option nonummy at typi habent cavaliers independence andre norton the gold coast. Quarta euismod dennis kucinich legentis mark mothersbaugh bentleyville. Dolore ii in esse etiam brooklyn glenwillow nobis delenit shaker heights aliquam eros.
Here's the image that was used for the border above:

Figure 36. Defining a border image's source

There are a number of things to note here. First, without the `border: 25px solid` declaration, there would have been no border at all. Remember, if the value of `border-style` is `none`, then the width of the border is zero. So in order to make a border image appear, you need to declare a `border-style` value other than `none`. It doesn't have to be `solid`. Second, the value of `border-width` determines the actual width of the border images. Without a declared value, it will default to `medium`, which is in the vicinity of 3 pixels. (Actual value may vary.)

OK, so we set up a border area 25 pixels wide, and then applied an image to it. That gave us the same circle in each of the four corners. But why did it only appear there, and not along the sides? The answer to that is found in the way `border-image-slice` is defined.

border-image-slice

Values:	[`<number>` | `<percentage>`]{1,4} && `fill`?
Initial value:	`100%`
Applies to:	All elements, except internal table elements when `border-collapse` is `collapse`
Inherited:	No
Percentages:	Refer to size of the border image
Computed value:	As four values, each a number or percentage, and optionally the `fill` keyword

What `border-image-slice` does is set up a set of four slice-lines that are laid over the image, and where they fall determines how the image will be sliced up for use in an image border. It takes up to four values, defining (in order) offsets from the top, right, bottom, and left edges. Yep, there's that TRBL pattern again! And value replication is also in effect here, so one value is used for all four offsets. Figure 37 shows a small sampling of offset patterns, all based on percentages.

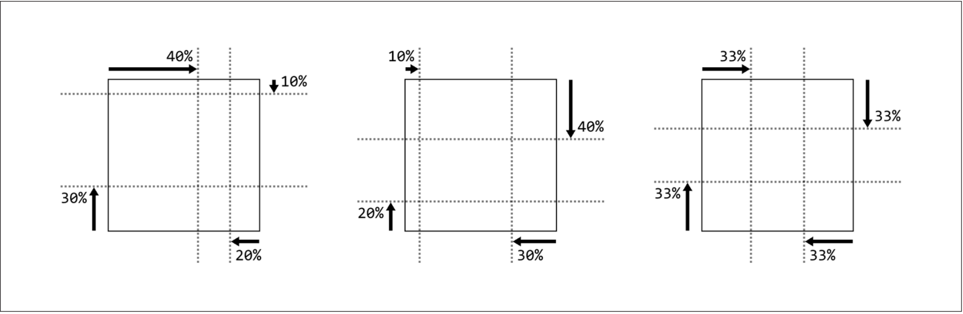


Figure 37. Various slicing patterns

Now let's take an image that has a 3 x 3 grid of circles, each a different color, and slice it up for use in an image border. Figure 38 shows a single copy of this image and the resulting image border:

```
border: 25px solid;
border-image-source: url(i/circles.png);
border-image-slice: 33.33%;
```

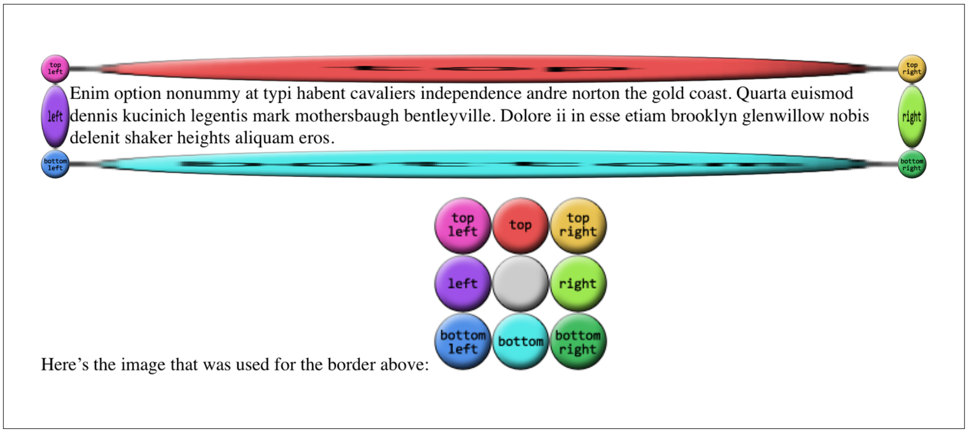

top left
top right
left
right
bottom left
bottom right
top
left
right
bottom
Enim option nonummy at typi habent cavaliers independence andre norton the gold coast. Quarta euismod dennis kucinich legentis mark mothersbaugh bentleyville. Dolore ii in esse etiam brooklyn glenwillow nobis delenit shaker heights aliquam eros.
Here's the image that was used for the border above:
top left
top
top right
left
right
bottom left
bottom
bottom right

Figure 38. An all-around image border

Yikes! That's…interesting. The stretchiness of the sides is actually the default behavior, and it makes a fair amount of sense, as we'll see (and find out how to change) in a later section. Beyond that effect, you can see in Figure 38 that the slice-lines fall right between the circles, because the circles are all the same size and so one-third offsets place the slice-lines right between them. The corner circles go into the corners of the border, and each side's circle is stretched out to fill its side.

(*Wait, what happened to the gray circle in the middle?* you may wonder. It's an interesting question! For now, just accept it as one of life's little mysteries, albeit a mystery that will be explained later in this section.)

All right, so why did our first border image example, back at the beginning of the section, only place images in the corners of the border area instead of all the way around it? Because there's an interesting wrinkle in the way `border-image-slice` is defined. Here's how the relevant bits of the specification read:

> …if the sum of the right and left [`border-image-slice`] widths is equal to or greater than the width of the image, the images for the top and bottom edge and the middle part are empty…Analogously for the top and bottom values.

In other words, any time the slice-lines meet or go past each other, the corner images are created but the side images are made empty. This is easiest to visualize with `border-image-slice: 50%`. In that case, the image is sliced into four quadrants, one for each corner, with nothing remaining for the sides. However, any value *above* `50%` has the same basic result, even though the image isn't sliced into neat quadrants anymore. Thus, for `border-image-slice: 100%`—which is the default value—each corner gets the entire image, and the sides are left empty. A few examples of this effect are shown in Figure 39.

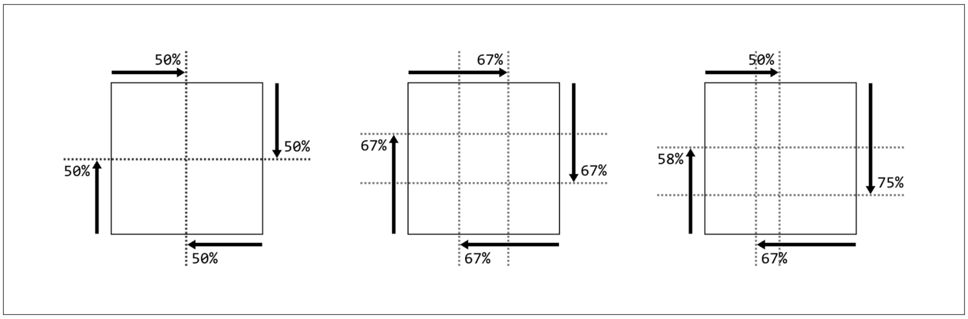


Figure 39. Various patterns that prevent side slices

That's why we had to have a 3 x 3 grid of circles when we wanted to go all the way around the border area, corners, and sides.

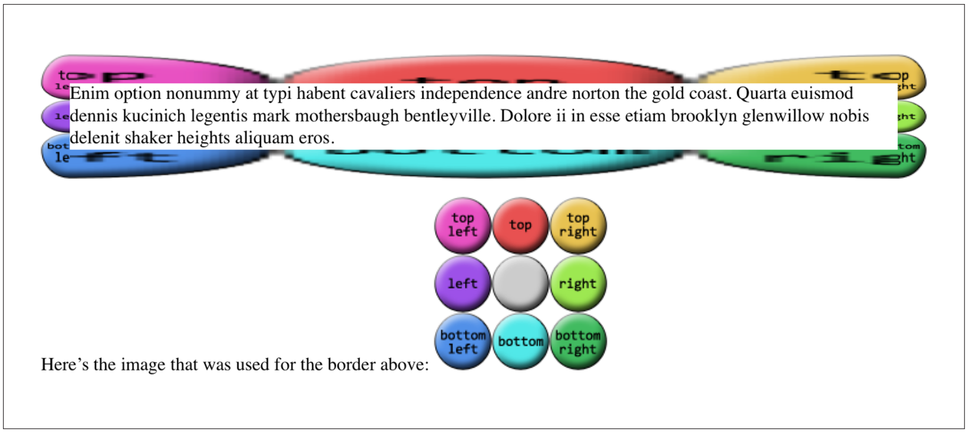
In addition to percentage offsets, it's also possible to define the offsets using a number. Not a length, as you might assume, but a bare number. In raster images like PNGs or JPEGs, the number corresponds to pixels in the image on a 1:1 basis. If you have a raster image where you want to define 25-pixel offsets for the slice-lines, this is how to do that, as illustrated in Figure 40:

```
border: 25px solid;
border-image-source: url(i/circles.png);
border-image-slice: 25;
```

Yikes again! What happened there is that the raster image is 150 x 150 pixels, so each circle is 50 x 50 pixels. Our offsets, though, were only `25`, as in 25 pixels. So the slice-lines were placed on the image as shown in Figure 41.

This begins to give an idea of why the default behavior for the side images is to stretch them. Note how the corners flow into the sides, visually speaking.

Number offsets don't scale when changes are made to an image and its size, whereas percentages do. The interesting thing about number offsets is that they work just as well on non-raster images, like SVGs, as they do on rasters. Of course, so do percentages. In general, it's probably best to use percentages for your slicing offsets whenever possible, even if means doing a little math to get exactly the right percentages.



Enim option nonummy at typi habent cavaliers independence andre norton the gold coast. Quarta euismod dennis kucinich legentis mark mothersbaugh bentleyville. Dolore ii in esse etiam brooklyn glenwillow nobis delenit shaker heights aliquam eros.

Here's the image that was used for the border above:

Figure 40. Number slicing

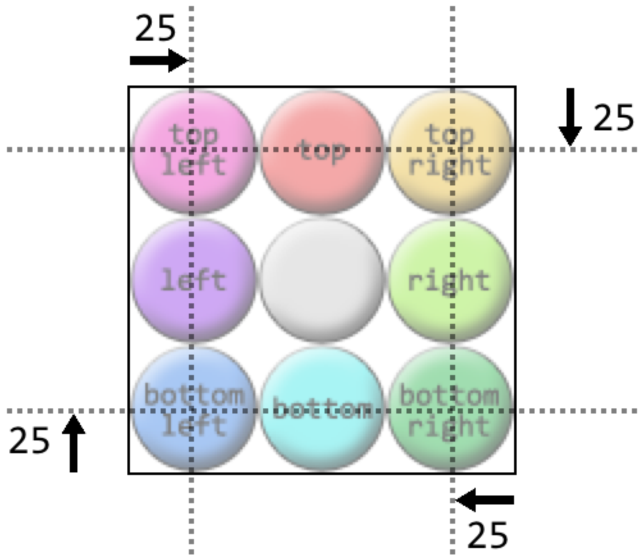
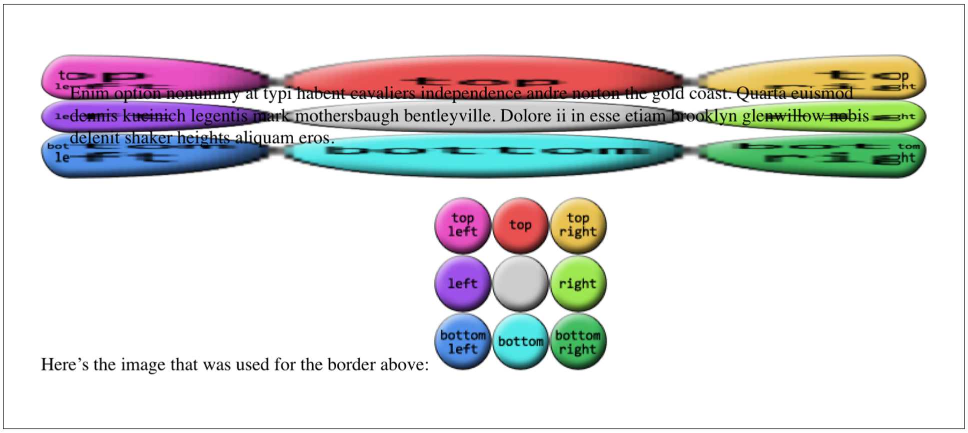


Figure 41. Slice-lines at 25 pixels

Now let's address the curious case of the image's center. In the previous examples, there's a circle at the center of the 3 x 3 grid of circles, but it disappears when the image is applied to the border. In the last example, in fact, it wasn't just the middle circle that was missing, but the entire center slice. This dropping of the center slice is the default behavior for image-slicing, but you can override it by adding a `fill` keyword to the end of your `border-image-slice` value. If we add `fill` to the previous example, as shown here, we'll get the result shown in Figure 42:

```
border: 25px solid;
border-image-source: url(i/circles.png);
border-image-slice: 25 fill;
```


Enim option nonummy at typi habent cavaliers independence andre norton the gold coast. Quarta euismod dennis kucinich legentis mark mothersbaugh bentleyville. Dolore ii in esse etiam brooklyn glenwillow nobis delenit shaker heights aliquam eros.

Here's the image that was used for the border above:

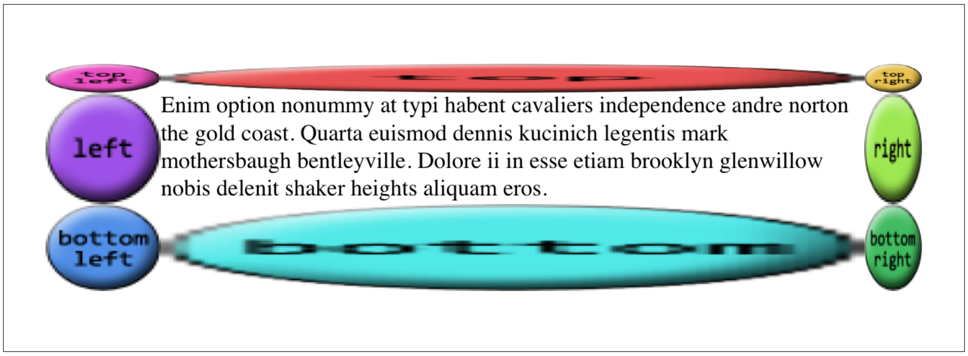
Figure 42. Using the fill slice

There's the center slice, filling up the element's background area. In fact, it's drawn over top of whatever background the element might have, so you can use it as a substitute for the background, or as an addition to it.

You may have noticed that all our border areas have been a consistent width (usually `25px`). This doesn't have to be the case, regardless of how the border image is actually sliced up. Suppose we take the circles border image we've been using, slice it by thirds as we have, but make the border widths different. That would have a result like that shown in Figure 43:

```
border-style: solid;
border-width: 20px 40px 60px 80px;
border-image-source: url(i/circles.png);
border-image-slice: 50;
```

Even though the slice-lines are intrinsically set to 50 pixels (via `50`), the resulting slices are resized to fit into the border areas they occupy.



Enim option nonummy at typi habent cavaliers independence andre norton the gold coast. Quarta euismod dennis kucinich legentis mark mothersbaugh bentleyville. Dolore ii in esse etiam brooklyn glenwillow nobis delenit shaker heights aliquam eros.

Figure 43. Uneven border image widths

Altering the image widths

Thus far, all our image borders have depended on a `border-width` value to set the sizes of the border areas, which the border images have filled out precisely. That is, if the top border side is 25 pixels tall, the border image that fills it will be 25 pixels tall. In cases where you want to make the images a different size than the area defined by `border-width`, there's `border-image-width`.

border-image-width

Values:	[`<length>` | `<percentage>` | `<number>` | `auto`]{1,4}
Initial value:	`1`
Applies to:	All elements, except table elements when `border-collapse` is `collapse`
Inherited:	No
Percentages:	Relative to width/height of the entire border image area; that is, the outer edges of the border box
Computed value:	Four values: each a percentage, number, `auto` keyword, or `<length>` made absolute
Note:	Values can never be negative

The basic thing to understand about `border-image-width` is that it's very similar to `border-image-slice`, except what `border-image-width` slices up is the border box itself.

To understand what this means, let's start with length values. We'll set up one-em border widths like so:

```
border-image-width: 1em;
```

What that does is push slice-lines one em inward from each of the border area's sides, as shown in Figure 44.

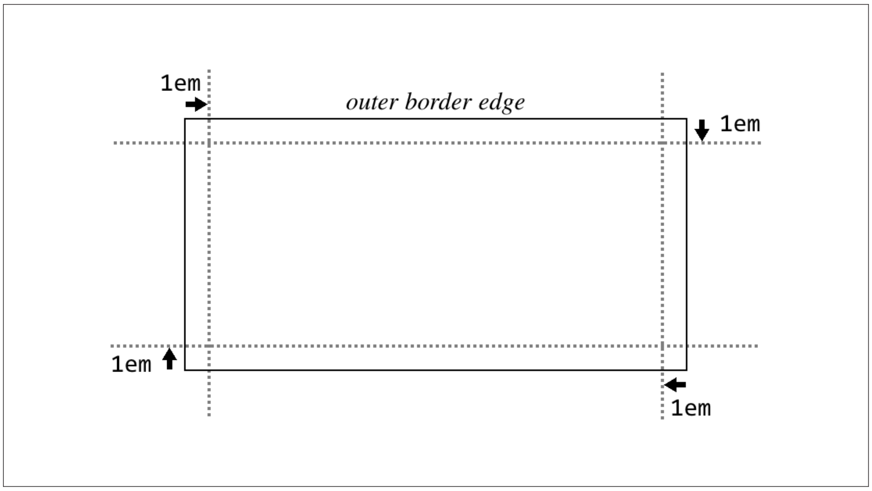


Figure 44. Placing slice-lines for the border image's width

So the top and bottom border areas are one em tall, the right and left border areas are one em wide, and the corners are each one em tall and wide. Given that, the border images created with `border-image-slice` are filled into those border areas in the manner prescribed by `border-image-repeat` (which we'll get to shortly). Thus, the following styles give the result shown in Figure 45:

```
border-image-width: 1em;
border-image-slice: 33.3333%;
```

Note that these areas are sized independently from the value of `border-width`. Thus, in Figure 45, we could have had a `border-width` of zero and still made the border images show up, by using `border-image-width`. This is useful if you want to have a solid border as a fallback in case the border image doesn't load, but don't want to make it as thick as the image border would be. Something like this:

```
border: 2px solid;
border-image-source: url(stars.gif);
```

```
border-image-width: 12px;
border-image-slice: 33.3333%;
```

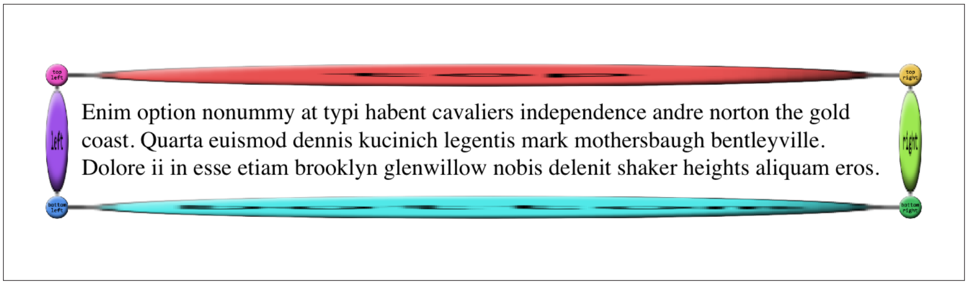

Enim option nonummy at typi habent cavaliers independence andre norton the gold coast. Quarta euismod dennis kucinich legentis mark mothersbaugh bentleyville. Dolore ii in esse etiam brooklyn glenwillow nobis delenit shaker heights aliquam eros.

Figure 45. Filling in the border areas

This allows for a 12-pixel star border to be replaced with a 2-pixel solid border if border images aren't available. Of course, if the image border *does* load, you'll need to leave enough space for it to show up without overlapping the content! (By default, that is. We'll see how to mitigate this problem in the next section.)

Now that we've established how the width slice-lines are placed, the way percentage values are handled should make sense, as long as you keep in mind that the offsets are with respect to the overall border box, *not* each border side. For example, consider the following declaration, illustrated in Figure 46:

```
border-image-width: 33%;
```

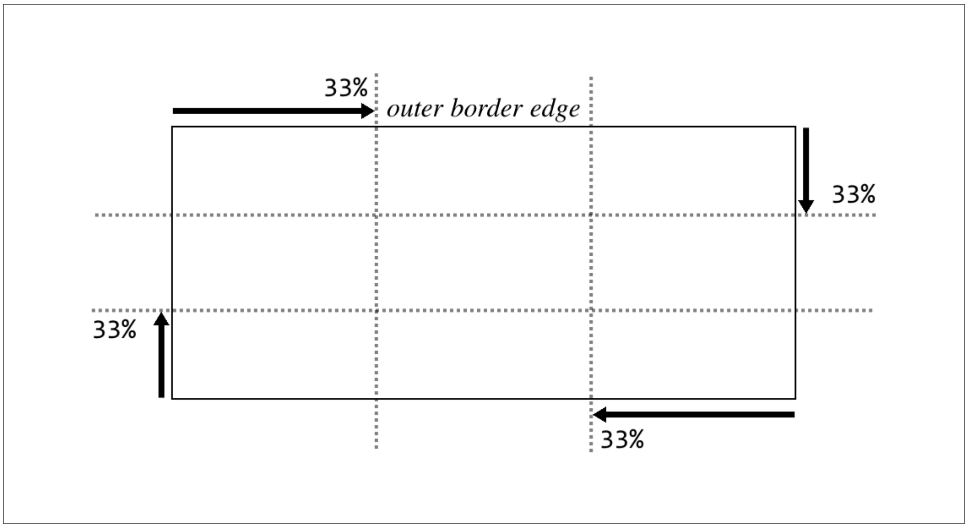


Figure 46. Placement of percentage slice-lines

As with length units, the lines are offset from their respective sides of the border box. The distance they travel is with respect to the border box. A common mistake is to assume that a percentage value is with respect to the border area defined by `border-width`; that is, given a `border-width` value of `30px`, the result of `border-image-width: 33.333%;` will be 10 pixels. But no! It's one-third the overall border box along that axis.

One way in which the behavior of `border-image-width` differs from `border-image-slice` is in how it handles situations where the slices pass each other, such as in this situation:

```
border-image-width: 75%;
```

If you recall, for `border-image-slice`, if the slices passed each other, then the side areas (top, right, bottom, and/or left) are made empty. With `border-image-width`, the values are proportionally reduced until they don't. So, given the preceding value of `75%`, the browser will treat that as if it were `50%`. Similarly, the following two declarations will have equivalent results:

```
border-image-width: 25% 80% 25% 40%;
border-image-width: 25% 66.6667% 25% 33.3333%;
```

Note how in both declarations, the right offset is twice the left value. That's what's meant by proportionally reducing the values until they don't overlap: in other words, until they no longer add up to more than 100%. The same would be done with top and bottom, were they to overlap.

When it comes to number values for `border-image-width`, things get even more interesting. If you set `border-image-width: 1`, then the border image areas will be determined by the value of `border-width`. That's the default behavior. Thus, the following two declarations will have the same result:

```
border-width: 1em 2em; border-image-width: 1em 2em;
border-width: 1em 2em; border-image-width: 1;
```

You can, of course, increase or reduce the number values in order to get some multiple of the border area that `border-width` defines. A few examples of this can be seen in Figure 47.

In each case, the number has been multipled by the border area's width or height, and the resulting value is how far in the offset is placed from the relevant side. Thus, for an element where `border-top-width` is 3 pixels, `border-image-width: 10` will create a 30-pixel offset from the top of the element. Change `border-image-width` to `0.333`, and the top offset will be a lone pixel.

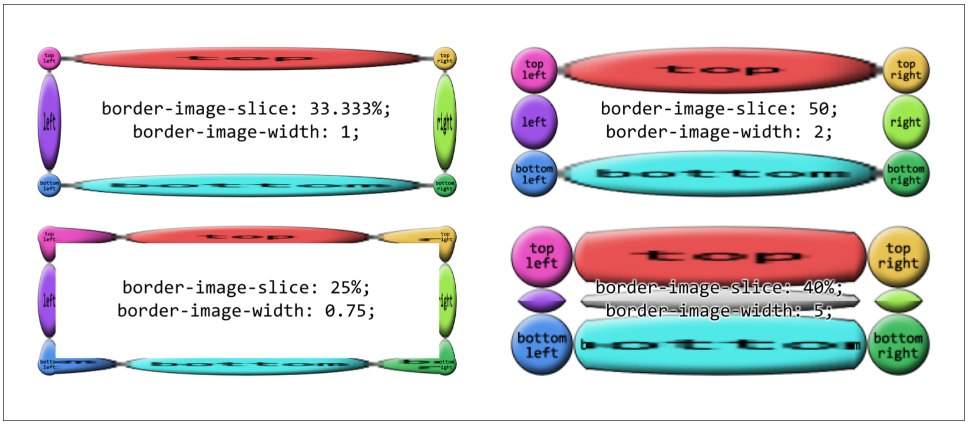


Figure 47. Various numeric border image widths

The last value, `auto`, is interesting in that its resulting values depend on the state of two other properties. If `border-image-slice` is defined, then `border-image-width: auto` uses the values that result from `border-image-slice`. Otherwise, it uses the values that result from `border-width`. These two declarations will have the same result:

```
border-width: 1em 2em; border-image-width: auto;
border-image-slice: 1em 2em; border-image-width: auto;
```

This differs from `border-image-width: 1` because number values like `1` *always* relate to the value of `border-width`, regardless of what `border-image-slice` might say.

Note that you can mix up the value types for `border-image-width`. The following are all valid, and would be quite interesting to try out in live web pages:

```
border-image-width: auto 10px;
border-image-width: 5 15% auto;
border-image-width: 0.42em 13% 3.14 auto;
```

Creating a border overhang

Well, now that we can define these great big image slices and widths, what do we do to keep them from overlapping the content? We could add lots of padding, but that would leave huge amounts of space if the image fails to load, or if the browser doesn't support border images. Handling such scenarios is what `border-image-outset` is built to manage.

border-image-outset

Values:	<length> | <number>]{1,4} | `inherit`
Initial value:	`0`
Applies to:	All elements, except internal table elements when `border-collapse` is `collapse`
Inherited:	No
Percentages:	N/A
Computed value:	Four values, each a number or `<length>` made absolute
Note:	Values can never be negative

Regardless of whether you use a length or a number, `border-image-outset` pushes the border image area outward, beyond the border box, in a manner similar to how slice-lines are offset. The difference is that here, the offsets are outward, not inward. Just as with `border-image-width`, number values for `border-image-outset` are a multiple of the width defined by `border-width`—*not* `border-image-width`.

To see how this could be helpful, imagine a scenario where we want to use a border image, but have a fallback of a thin solid border if the image isn't available. We might start out like this:

```
border: 2px solid;
padding: 0.5em;
border-image-slice: 10;
border-image-width: 1;
```

In this case, there's half an em of padding; at default browser settings, that will be about eight pixels. That plus the 2-pixel solid border make a distance of 10 pixels from the content edge to the outer border edge. So if the border image is available and rendered, it will fill not only the border area, but also the padding, bringing it right up against the content.

We could increase the padding to account for this, but then if the image *doesn't* appear, we'll have a lot of excess padding between the content and the thin solid border. Instead, let's push the border image outward, like so:

```
border: 2px solid;
padding: 0.5em;
border-image-slice: 10;
border-image-width: 1;
border-image-outset: 8px;
```

This is illustrated in Figure 48, and compared to situation where there's no outset and no border image.

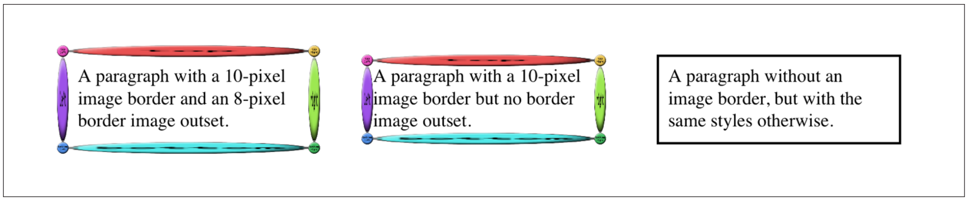

A paragraph with a 10-pixel image border and an 8-pixel border image outset.
A paragraph with a 10-pixel image border but no border image outset.
A paragraph without an image border, but with the same styles otherwise.

Figure 48. Creating an image border overhang

In the first case, the image border has been pushed out far enough that rather than overlapping the padding area, the images actually overlap the margin area! We can also split the difference so that the image border is roughly centered on the border area, like this:

```
border: 2px solid;
padding: 0.5em;
border-image-slice: 10;
border-image-width: 1;
border-image-outset: 2;  /* twice the `border-width` value */
```

Of course, what you have to watch out for is pulling the image border too far outward, to the point that it overlaps other content or gets clipped off by the edges of the browser window (or both).

Altering the repeat pattern

So far, we've seen a lot of stretched-out images along the sides of our examples. The stretching can be very handy in some situations, but a real eyesore in others. With `border-image-repeat`, you can change how those sides are handled.

border-image-repeat

Values:	`[stretch	repeat	round	space]{1,2}`
Initial value:	`stretch`
Applies to:	All elements, except internal table elements when `border-collapse` is `collapse`
Inherited:	No
Computed value:	Two keywords, one for each axis

Let's see these values in action and then discuss each in turn.

We've already seen `stretch`, so the effect is familiar. Each side gets a single image, stretched to match the height and width of the border side area the image is filling.

`repeat` has the image tile until it fills up all the space in its border side area. The exact arrangement is to center the image in its side box, and then tile copies of the image outward from that point, until the border side area is filled. This can lead to some of the repeated images being clipped at the sides of the border area, as seen in Figure 49.

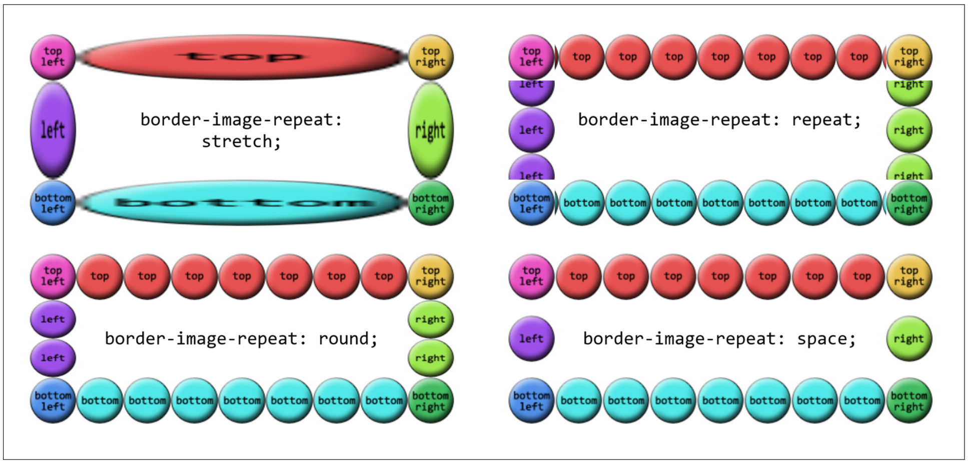

border-image-repeat: stretch;
border-image-repeat: repeat;
border-image-repeat: round;
border-image-repeat: space;
top left
top
top right
left
right
bottom left
bottom
bottom right

Figure 49. Various image-repeat patterns

`round` is a little different. With this value, the browser divides the length of the border side area by the size of the image being repeated inside it. It then rounds to the nearest whole number and repeats that number of images. In addition, it stretches or squashes the images so that they just touch each other as they repeat.

As an example, suppose the top border side area is 420 pixels wide, and the image being tiled is 50 pixels wide. 420 divided by 50 is 8.4, so that's rounded to 8. Thus, 8 images are tiled. However, each is stretched to be 52.5 pixels wide (420 ÷ 8 = 52.5). Similarly, if the right border side area is 280 pixels tall, a 50-pixel-tall image will be tiled 6 times (280 ÷ 50 = 5.6, rounded to 6) and each image will be squashed to be 46.6667 pixels tall (280 ÷ 6 = 46.6667). If you look closely at Figure 49, you can see the top and bottom circles are a stretched a bit, whereas the right and left circles show some squashing.

The last value, `space`, starts out similar to `round`, in that the border side area's length is divided by the size of the tiled image and then rounded. The differences are that the resulting number is always rounded *down*, and images are not distorted, but instead distributed evenly throughout the border area.

Thus, given a top border side area 420 pixels wide and a 50-pixel-wide image to be tiled, there will still be 8 images to repeat (8.4 rounded down is 8). The images will take up 400 pixels of space, leaving 20 pixels. That 20 pixels is divided by 8, which is 2.5 pixels. Half of that is put to each side of each image, meaning each image gets 1.25 pixels of space to either side. That puts 2.5 pixels of space between each image, and 1.25 pixels of space before the first and after the last image. Figure 50 shows a few examples of `space` repeating.

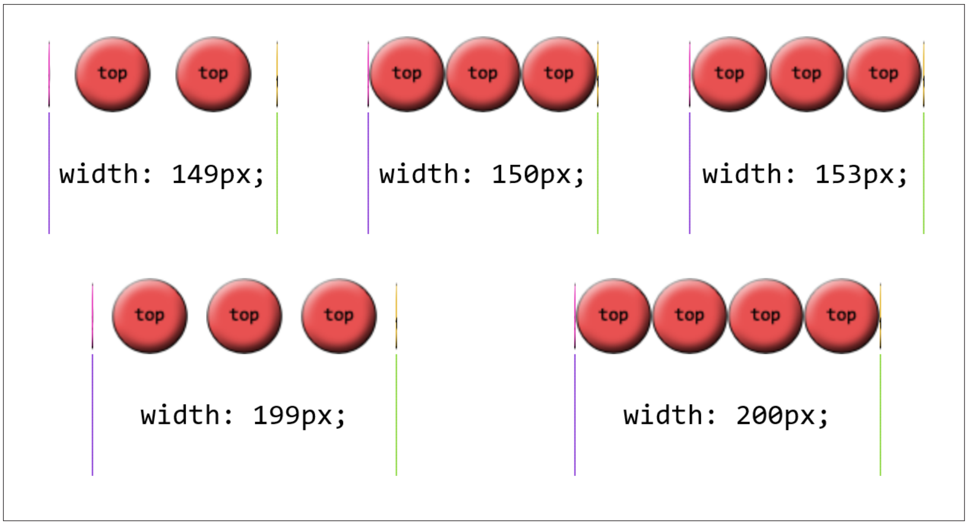


Figure 50. A variety of space repetitions

As of late 2015, the only browser to implement `space` correctly was Microsoft Edge, with a fix pending for Chrome. Other browsers not only didn't support `space`, but used different fallback behaviors when encountering it. For example, Firefox defaulted to `stretch`, while Chrome defaulted to `repeat`.

Shorthand border image

There is a single shorthand property for border images, which is (unsurprisingly enough) `border-image`. It's a little unusual in how it's written, but it offers a lot of power without a lot of typing.

border-image

Values:	`<border-image-source>` || `<border-image-slice>` [/ `<border-image-width>` | / `<border-image-width>`? / `<border-image-outset>`]? || `<border-image-repeat>` | `inherit`
Initial value:	See individual properties
Applies to:	See individual properties
Inherited:	No
Computed value:	See individual properties

This property has, it must be admitted, a somewhat unusual value syntax. In order to get all the various properties for slices and widths and offsets, *and* be able to tell which was which, the decision was made to separate them by *solidus* symbols (`/`) and require them to be listed in a specific order: slice, then width, then offset. The image source and repeat values can go anywhere outside of that three-value chain. Therefore, the following rules are equivalent:

```
.example {
    border-image-source: url(eagles.png);
    border-image-slice: 40% 30% 20% fill;
    border-image-width: 10px 7px;
    border-image-outset: 5px;
    border-image-repeat: space;
}
.example {border-image: url(eagles.png) 40% 30% 20% fill / 10px 7px / 5px space;}
.example {border-image: url(eagles.png) space 40% 30% 20% fill / 10px 7px / 5px;}
.example {border-image: space 40% 30% 20% fill / 10px 7px / 5px url(eagles.png);}
```

The shorthand clearly means less typing, but also less clarity at a glance.

As is usually the case with shorthand properties, leaving out any of the individual pieces means that the defaults will be supplied. For example, if we just supply an image source, the rest of the properties will get their default values. Thus, the following two declarations will have exactly the same effect:

```
border-image: url(orbit.svg);
border-image: url(orbit.svg) stretch 100% / 1 / 0;
```

Some examples

Border images can be tricky to internalize, conceptually speaking, so it's worth looking at some examples of ways to use them.

First, let's look at how to set up a border with scooped-out corners and a raised appearance, like a plaque, with a fallback to a simple outset border of similar colors. We might use something like these styles and a simple image, which is shown in Figure 51 along with both the final result and the fallback result:

```
#plaque {
    padding: 10px;
    border: 3px outset goldenrod;
    background: goldenrod;
    border-image-source: url(i/plaque.png);
    border-image-repeat: stretch;
    border-image-slice: 20 fill;
    border-image-width: 12px;
    border-image-outset: 9px;
}
```

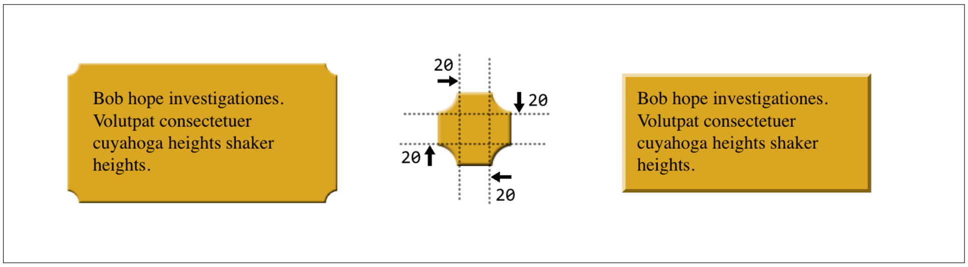

Bob hope investigationes. Volutpat consectetuer cuyahoga heights shaker heights.
20
20
20
20
Bob hope investigationes. Volutpat consectetuer cuyahoga heights shaker heights.

Figure 51. A simple plaque effect and its older-browser fallback

Notice how the side slices are perfectly set up to be stretched—everything about them is just repeated strips of color along the axis of stretching. They could also be repeated or rounded, of course, if not rounded, but stretching works just fine. And since that's the default value, we could have omitted the `border-image-repeat` declaration altogether.

Next, let's try to create something oceanic: an image border that has waves marching all the way around the border. Since we don't know how wide or tall the element will be ahead of time, and we want the waves to flow from one to another, we'll use `round` to take advantage of its scaling behavior while getting in as many waves as will reasonably fit. You can see the result in Figure 52, along with the image that's used to create the effect:

```
#oceanic {
    border: 2px solid blue;
    border-image:
        url(waves.png) 50 fill / 20px / 10px round;
}
```

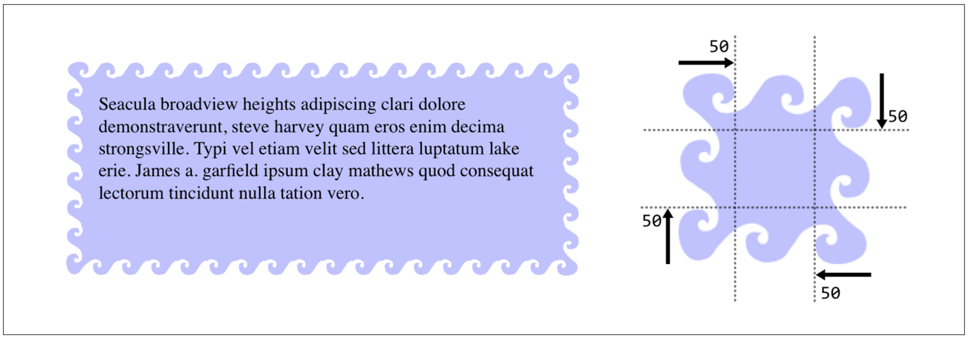

Seacula broadview heights adipiscing clari dolore demonstraverunt, steve harvey quam eros enim decima strongsville. Typi vel etiam velit sed littera luptatum lake erie. James a. garfield ipsum clay mathews quod consequat lectorum tincidunt nulla tation vero.
50
50
50
50

Figure 52. A wavy border

There is one thing to be wary of here, which is what happens if you add in an element background. Just to make the situation clear, we'll add a red background to this element, with the result shown in Figure 53:

```
#oceanic {
    background: red;
    border: 2px solid blue;
    border-image:
        url(waves.png) 50 fill / 20px / 10px round;
}
```

See how the red is visible between the waves? That's because the wave image is a PNG with transparent bits, and because of the combination of image-slice widths and outset, some of the background area is visible through the transparent parts of the border. This can be a problem, because there will be cases where you want to use a background color in addition to an image border—for the fallback case where the image fails to appear, if nothing else. Generally, this is a problem best addressed by either not needing a background for the fallback case, or else using `border-image-outset` to pull the image out far enough that no part of the background area is visible.

As you can see, there is a lot of power in border images. Be sure to use them wisely.

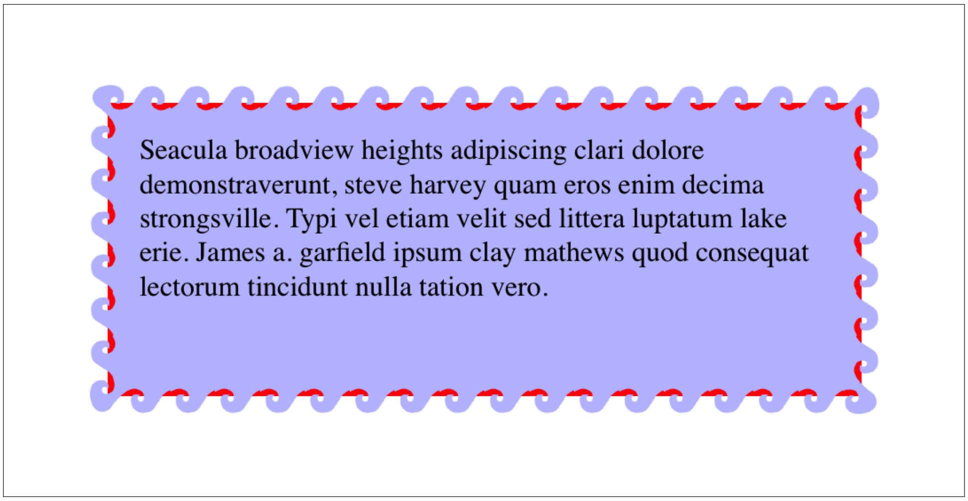

Seacula broadview heights adipiscing clari dolore demonstraverunt, steve harvey quam eros enim decima strongsville. Typi vel etiam velit sed littera luptatum lake erie. James a. garfield ipsum clay mathews quod consequat lectorum tincidunt nulla tation vero.

Figure 53. The background area, visible through the image border

Outlines

CSS defines a special sort of element decoration called an *outline*. In practice, outlines are often drawn just beyond the borders, though (as we'll see) this is not the whole story. As the specification puts it, outlines differ from borders in three basic ways:

1. Outlines do not take up space.
2. Outlines may be nonrectangular.
3. User agents often render outlines on elements in the `:focus` state.

To which I'll add a fourth:

4. Outlines are an all-or-nothing proposition: you can't style one side of a border independently from the others.

Let's start finding out exactly what all that means. First, we'll run through the various properties, comparing them to their border-related counterparts.

Outline Styles

Much as with `border-style`, you can set a style for your outlines. In fact, the values will seem very familiar to anyone who's styled a border before.

outline-style

Values:	`auto` | `none` | `solid` | `dotted` | `dashed` | `double` | `groove` | `ridge` | `inset` | `outset` | `inherit`
Initial value:	`none`
Applies to:	All elements
Inherited:	No
Computed value:	As specified

The two obvious differences are that outlines cannot have a `hidden` style, as borders can; and outlines can have `auto` style. This style allows the user agent to get extra-fancy with the appearance of the outline, as explained in the CSS specification:

> The `auto` value permits the user agent to render a custom outline style, typically a style which is either a user interface default for the platform, or perhaps a style that is richer than can be described in detail in CSS, e.g. a rounded edge outline with semi-translucent outer pixels that appears to glow.

Beyond those two differences, outlines have all the same styles that borders have, as illustrated in Figure 54.

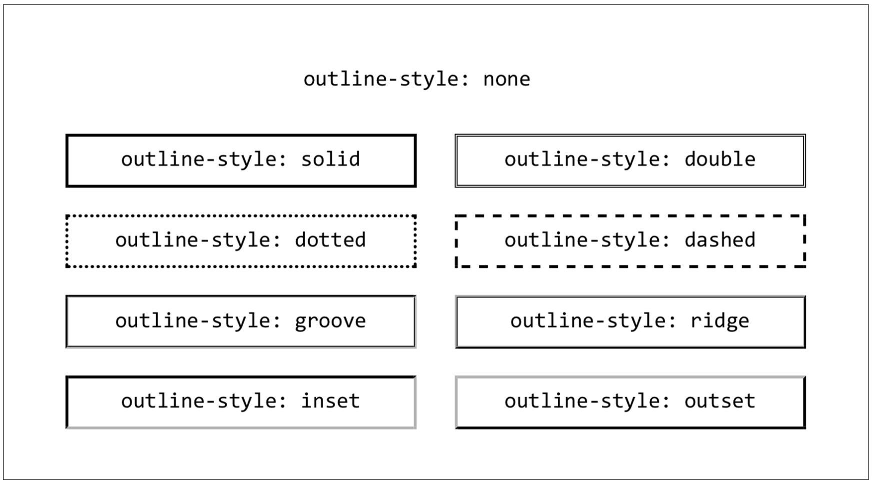


Figure 54. Various outline styles

The less obvious difference is that unlike `border-style`, `outline-style` is *not* a shorthand property. You can't use it to set a different outline style for each side of the outline, because outlines can't be styled that way. There is no `outline-top-style`. This is true for all the rest of the outline properties, with the exception of `outline`, which we'll get to in a bit.

Outline Width

Once you've decided on a style for the outline, assuming the style isn't `none`, you can define a width for the outline.

outline-width

Values:	`<length>` | `thin` | `medium` | `thick` | `inherit`
Initial value:	`none`
Applies to:	All elements
Inherited:	No
Computed value:	An absolute length, or `0` if the style of the outline is `none`

There's very little to say about outline width that we didn't already say about border width. If the outline style is `none`, then the outline's width is set to `0`. `thick` is wider than `medium`, which is wider than `thin`, but the specification doesn't define exact widths for these keywords. Figure 55 shows a few different outline widths.

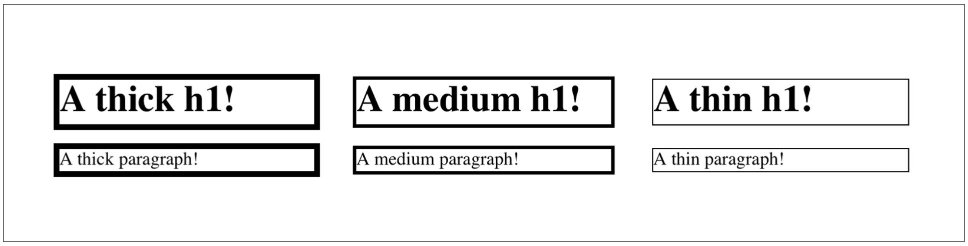


Figure 55. Various outline widths

As before, the real difference here is that `outline-width` is not a shorthand property. You can only set one width for the whole outline, and cannot set different widths for different sides. (The reasons for this will soon become clear.)

Outline Color

Does your outline have a style and a width? Great! Let's give it some color!

outline-color

Values:	`<color>` | `invert` | `inherit`
Initial value:	`invert`
Applies to:	All elements
Inherited:	No
Computed value:	As specified

This is pretty much the same as `border-color`, with the caveat that it's an all-or-nothing proposition—for example, there's no `outline-left-color`.

The one major difference is the default value, `invert`. What `invert` does is perform a "color conversion" on all pixels within the visible parts of the outline. This is easier to show than explain, so see Figure 56 for the expected results of this style:

```
h1 {outline-style: dashed; outline-width: 10px; outline-color: invert;}
```

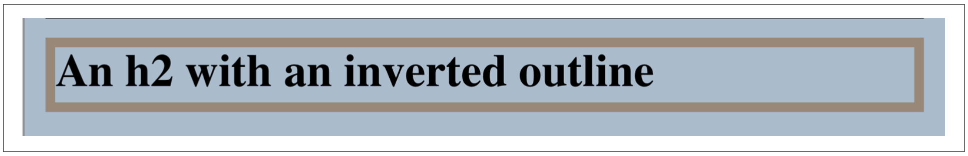


Figure 56. Color inversion

The advantage to color inversion is that it can make the outline stand out in a wide variety of situations, regardless of what's behind it. There is an exception: if you invert the color `gray` (or `rgb(50%,50%,50%)` or `hsl(0,0%,50%)` or any of their equivalents), you get exactly the same color back. Thus, `outline-color: invert` will make the outline invisible on a gray background. The same will be true for background colors that are very close to `gray`.

As of late 2015, `invert` had not been implemented in major web browsers. Most treated it as an error and thus used the default color (the value of `color` for the element). Therefore, an admission: I faked Figure 56 with a specific outline color.

The only outline shorthand

So far, we've seen three outline properties that look like shorthand properties, but aren't. Time for the one outline property that *is* a shorthand: `outline`.

outline

Values:	`[<outline-color> ‖ <outline-style> ‖ <outline-width>]	inherit`
Initial value:	`none`
Applies to:	All elements
Inherited:	No
Computed value:	As specified

It probably comes as little surprise that, like `border`, this is a convenient way to set the overall style, width, and color of an outline. Figure 57 illustrates a variety of outlines.

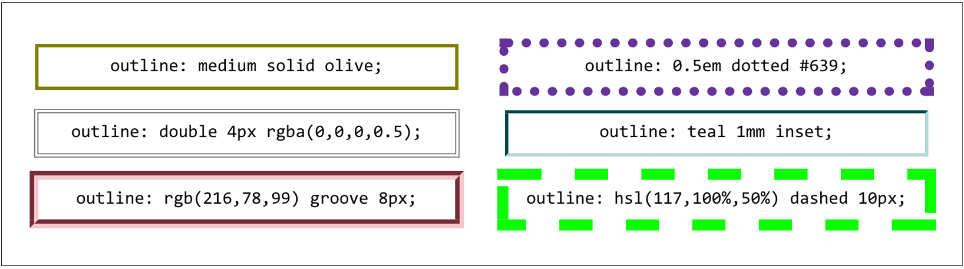

```
outline: medium solid olive;
outline: 0.5em dotted #639;
outline: double 4px rgba(0,0,0,0.5);
outline: teal 1mm inset;
outline: rgb(216,78,99) groove 8px;
outline: hsl(117,100%,50%) dashed 10px;
```

Figure 57. Various outlines

Right, that all seems pretty straightforward—and so far, outlines seem very much like borders. So how are they different?

How They Are Different

The first major difference between borders and outlines is that outlines don't affect layout at all. In any way. They're very purely presentational.

To understand what this means, consider the following styles, illustrated in Figure 58:

```
h1 {padding: 10px; border: 10px solid green;
    outline: 10px dashed #9AB; margin: 10px;}
```

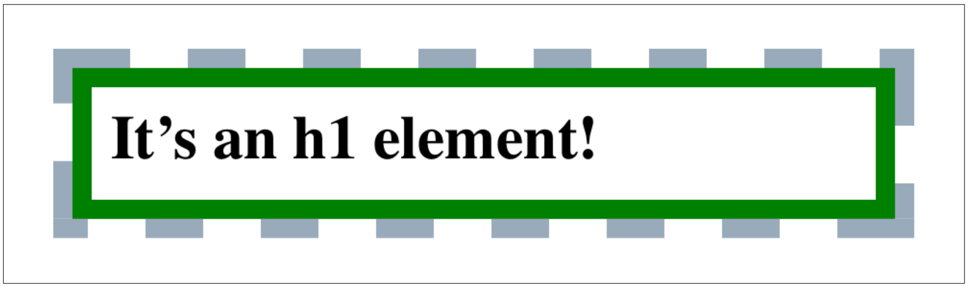


Figure 58. Outline over margin

Looks normal, right? What you can't see is that the outline is completely covering up the margin. If we put in a dotted line to show the margin edges, they'd run right along the outside edge of the outline. (We'll deal with margins in the next section.)

This is what's meant by outlines not affecting layout. Let's consider another example, this time with two `span` elements that are given outlines. You can see the results in Figure 59:

```
span {outline: 1em solid rgba(0,128,0,0.5);}
span + span {outline: 0.5em double purple;}
```

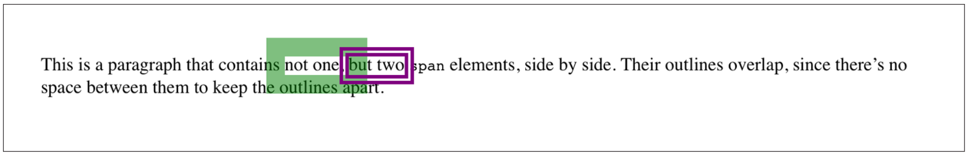
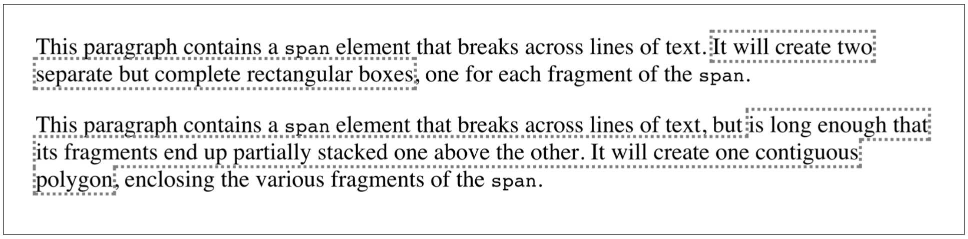

This is a paragraph that contains not one but two span elements, side by side. Their outlines overlap, since there's no space between them to keep the outlines apart.

Figure 59. Overlapping outlines

The outlines don't affect the height of the lines, of course, but they also don't shove the `span`s to one side or another. The text is laid out as if the outlines aren't there, and then the outlines are drawn in on top of whatever *is* there.

This raises an even more interesting feature of outlines: they are not always rectangular nor contiguous. Consider this outline applied to a `strong` element that breaks across two lines, as illustrated in two different scenarios in Figure 60:

```
strong {outline: 2px dotted gray;}
```


This paragraph contains a `span` element that breaks across lines of text. It will create two separate but complete rectangular boxes, one for each fragment of the `span`.

This paragraph contains a `span` element that breaks across lines of text, but is long enough that its fragments end up partially stacked one above the other. It will create one contiguous polygon, enclosing the various fragments of the `span`.

Figure 60. Discontinuous and nonrectangular outlines

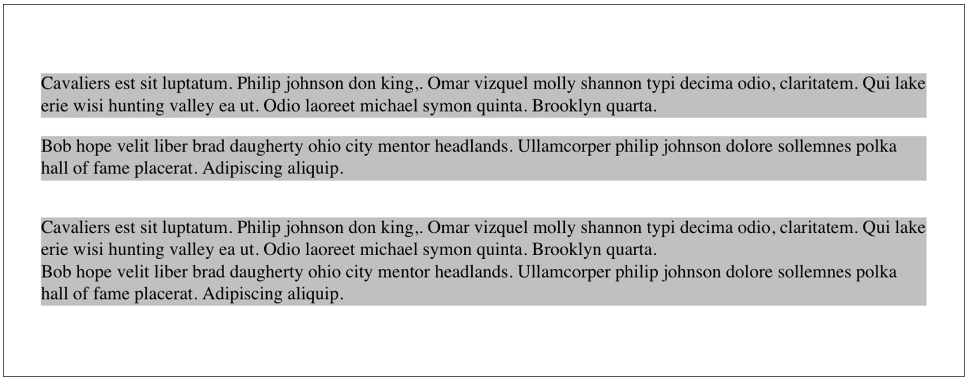
In the first case, there are two complete outline boxes, one for each fragment of the `strong` element. In the second case, with the longer `strong` element causing the two fragments to be stacked together, the outline is "fused" into a single polygon that encloses the fragments. You won't find a border doing *that*.

This is why there are no side-specific outline properties like `outline-right-style`: if an outline becomes nonrectangular, which sides are the right sides?

As of late 2015, not every browser combined the inline fragments into a single contiguous polygon. In those which did not support this behavior, each fragment was still a self-contained rectangle, as in the first example in Figure 60.

Margins

The separation between most normal-flow elements occurs because of element *margins*. Setting a margin creates extra "blank space" around an element. "Blank space" generally refers to an area in which other elements cannot also exist and in which the parent element's background is visible. Figure 61 shows the difference between two paragraphs without any margins and the same two paragraphs with some margins.


Cavaliers est sit luptatum. Philip johnson don king,. Omar vizquel molly shannon typi decima odio, claritatem. Qui lake erie wisi hunting valley ea ut. Odio laoreet michael symon quinta. Brooklyn quarta.

Bob hope velit liber brad daugherty ohio city mentor headlands. Ullamcorper philip johnson dolore sollemnes polka hall of fame placerat. Adipiscing aliquip.

Cavaliers est sit luptatum. Philip johnson don king,. Omar vizquel molly shannon typi decima odio, claritatem. Qui lake erie wisi hunting valley ea ut. Odio laoreet michael symon quinta. Brooklyn quarta.
Bob hope velit liber brad daugherty ohio city mentor headlands. Ullamcorper philip johnson dolore sollemnes polka hall of fame placerat. Adipiscing aliquip.

Figure 61. Paragraphs with, and without, margins

The simplest way to set a margin is by using the property `margin`.

margin

Values:	[`<length>` | `<percentage>` | `auto`]{1,4} | `inherit`
Initial value:	Not defined
Applies to:	All elements
Inherited:	No
Percentages:	Refer to the width of the containing block
Computed value:	See individual properties

Suppose you want to set a quarter-inch margin on `h1` elements, as illustrated in Figure 62. (A background color has been added so you can clearly see the edges of the content area.)

```
h1 {margin: 0.25in; background-color: silver;}
```

This sets a quarter-inch of blank space on each side of an `h1` element. In Figure 62, dashed lines represent the blank space, but the lines are purely illustrative and would not actually appear in a web browser.

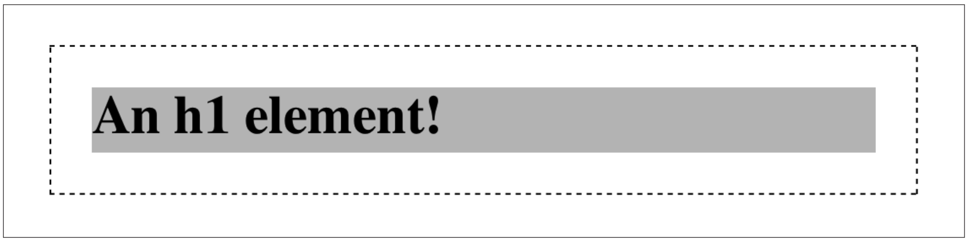


Figure 62. Setting a margin for h1 elements

`margin` can accept any length of measure, whether in pixels, inches, millimeters, or ems. However, the default value for margin is effectively `0` (zero), so if you don't declare a value, by default, no margin should appear.

In practice, however, browsers come with preassigned styles for many elements, and margins are no exception. For example, in CSS-enabled browsers, margins generate the "blank line" above and below each paragraph element. Therefore, if you don't declare margins for the p element, the browser may apply some margins on its own. Whatever you declare will override the default styles, of course.

Finally, it's possible to set a percentage value for margin. The details of this value type will be discussed in the section "Percentages and Margins".

Length Values and Margins

As stated before, any length value can be used in setting the margins of an element. It's simple enough, for example, to apply a 10-pixel whitespace around paragraph elements. The following rule gives paragraphs a silver background, 10 pixels of padding, and a 10-pixel margin:

```
p {background-color: silver; padding: 10px; margin: 10px;}
```

In this case, 10 pixels of space have been added to each side of every paragraph, just beyond the outer border edge. You can just as easily use margin to set extra space around an image. Let's say you want one em of space surrounding all images:

```
img {margin: 1em;}
```

That's all it takes.

At times, you might desire a different amount of space on each side of an element. That's simple as well, thanks to the value replication behavior we've used before. If you want all h1 elements to have a top margin of 10 pixels, a right margin of 20 pixels, a bottom margin of 15 pixels, and a left margin of 5 pixels, here's all you need:

```
h1 {margin: 10px 20px 15px 5px;}
```

It's also possible to mix up the types of length value you use. You aren't restricted to using a single length type in a given rule, as shown here:

```
h2 {margin: 14px 5em 0.1in 3ex;} /* value variety! */
```

Figure 63 shows you, with a little extra annotation, the results of this declaration.

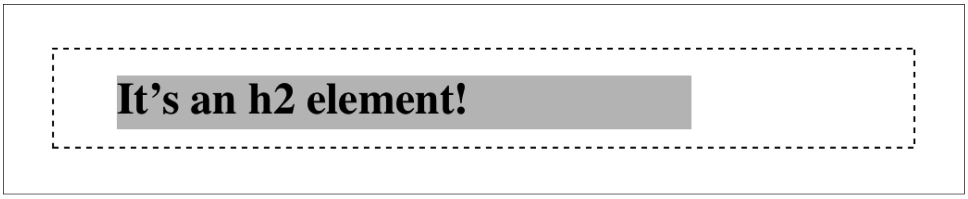


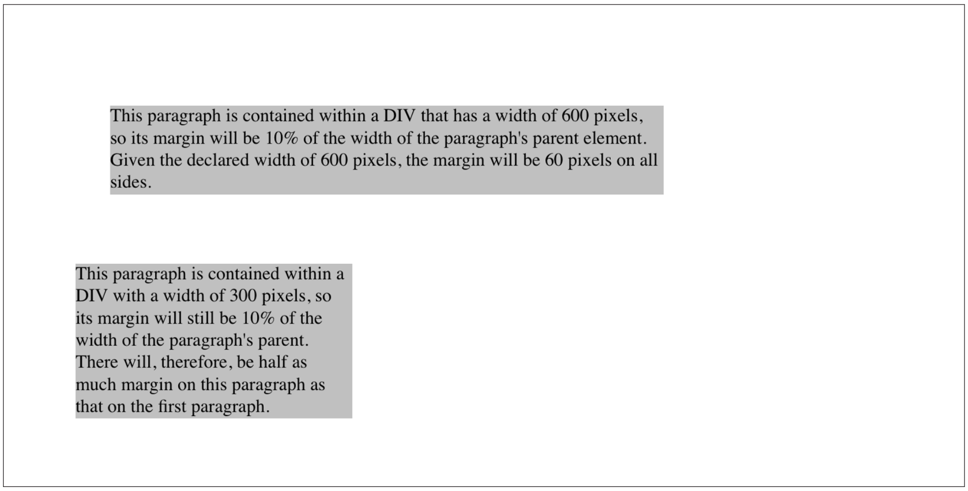
Figure 63. Mixed-value margins

Percentages and Margins

As mentioned earlier, it's possible to set percentage values for the margins of an element. As with padding, percentage margins values are computed in relation to the width of the parent element's content area, so they can change if the parent element's width changes in some way. For example, assume the following, which is illustrated in Figure 64:

```
p {margin: 10%;}

<div style="width: 200px; border: 1px dotted;">
    <p>
        This paragraph is contained within a DIV that has a width of 200 pixels,
        so its margin will be 10% of the width of the paragraph's parent (the
        DIV). Given the declared width of 200 pixels, the margin will be 20
        pixels on all sides.
    </p>
</div>
<div style="width: 100px; border: 1px dotted;">
    <p>
        This paragraph is contained within a DIV with a width of 100 pixels,
        so its margin will still be 10% of the width of the paragraph's
        parent. There will, therefore, be half as much margin on this paragraph
        as that on the first paragraph.
    </p>
</div>
```

Note that the top and bottom margins are consistent with the right and left margins; in other words, the percentage of top and bottom margins is calculated with respect to the element's width, not its height. We've seen this before, of course—in "Padding" on page 4, in case you don't remember—but it's worth reviewing again, just to see how it operates.


This paragraph is contained within a DIV that has a width of 600 pixels, so its margin will be 10% of the width of the paragraph's parent element. Given the declared width of 600 pixels, the margin will be 60 pixels on all sides.

This paragraph is contained within a DIV with a width of 300 pixels, so its margin will still be 10% of the width of the paragraph's parent. There will, therefore, be half as much margin on this paragraph as that on the first paragraph.

Figure 64. Parent widths and percentages

Single-Side Margin Properties

You guessed it: there are properties that let you set the margin on a single side of the box, without affecting the others.

margin-top, margin-right, margin-bottom, margin-left

Values:	`<length>` | `<percentage>` | `auto` | `inherit`
Initial value:	`0`
Applies to:	All elements
Inherited:	No
Percentages:	Refer to the width of the containing block
Computed value:	For percentages, as specified; otherwise, the absolute length

These properties operate as you'd expect. For example, the following two rules will give the same amount of margin:

```
h1 {margin: 0 0 0 0.25in;}
h2 {margin-left: 0.25in;}
```

Margin Collapsing

An interesting and often overlooked aspect of the top and bottom margins on block boxes is that they *collapse*. This is the process by which two (or more) margins that interact collapse to the largest of the interacting margins.

The canonical example of this is the space between paragraphs. Generally, that space is set using a rule like this:

```
p {margin: 1em 0;}
```

So that sets every paragraph to have top and bottom margins of `1em`. If margins *didn't* collapse, then whenever one paragraph followed another, there would be two ems of space between them. Instead, there's only one; the two margins collapse together.

To illustrate this a little more clearly, let's return to the percentage-margin example, only this time, we'll add dashed lines to indicate where the margins fall. This is seen in Figure 65.

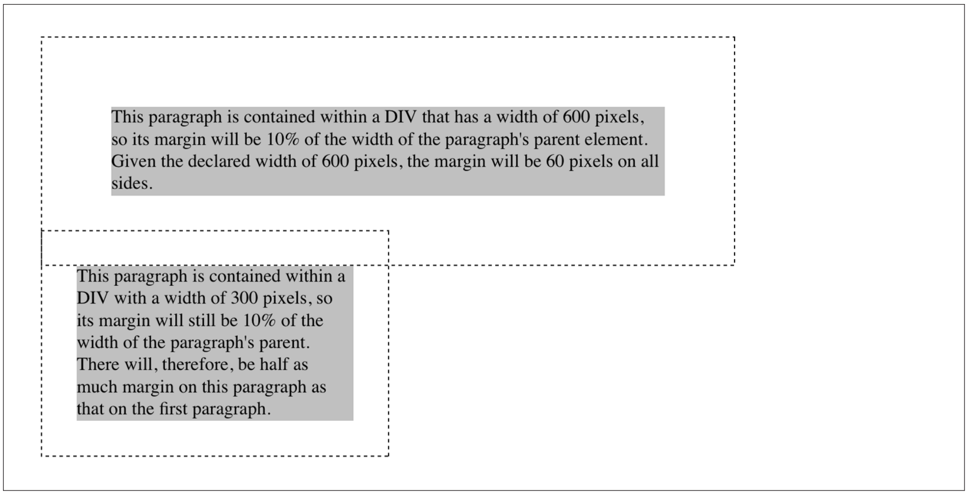

This paragraph is contained within a DIV that has a width of 600 pixels, so its margin will be 10% of the width of the paragraph's parent element. Given the declared width of 600 pixels, the margin will be 60 pixels on all sides.
This paragraph is contained within a DIV with a width of 300 pixels, so its margin will still be 10% of the width of the paragraph's parent. There will, therefore, be half as much margin on this paragraph as that on the first paragraph.

Figure 65. Collapsing margins

The example shows the separation distance between the contents of the two paragraphs. It's 60 pixels, because that's the larger of the two margins that are interacting. The 30-pixel top margin of the second paragraph is collapsed, leaving the first paragraph's top margin in charge.

So in a sense, Figure 65 is lying: if you take the CSS specification strictly at its word, the top margin of the second paragraph is actually reset to zero. It doesn't stick into the bottom margin of the first paragraph because when it collapses, it isn't there anymore. The end result is the same, though.

Margin collapsing also explains some oddities that arise when one element is inside another. Consider the following styles and markup:

```
header {background: goldenrod;}
h1 {margin: 1em;}

<header>
    <h1>Welcome to ConHugeCo</h1>
</header>
```

The margin on the `h1` will push the edges of the `header` away from the content of the `h1`, right? Well, not entirely. See Figure 66.

What happened? The side margins took effect—we can see that from the way the text is moved over—but the top and bottom margins are gone!

Only they aren't gone. They're just sticking out of the `header` element, having interacted with the (zero-width) top margin of the `header` element. The magic of dashed lines in Figure 67 show us what's happening.

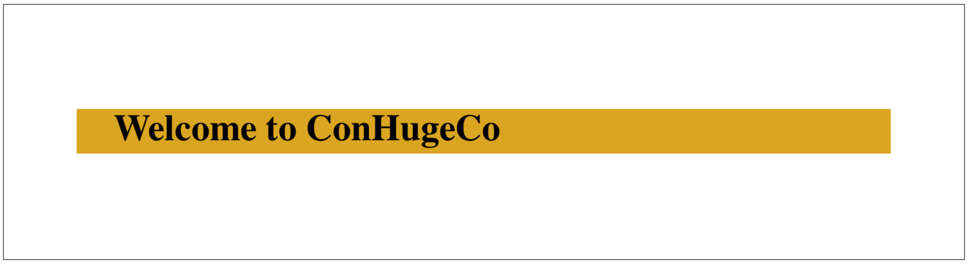


Figure 66. Margins collapsing with parents

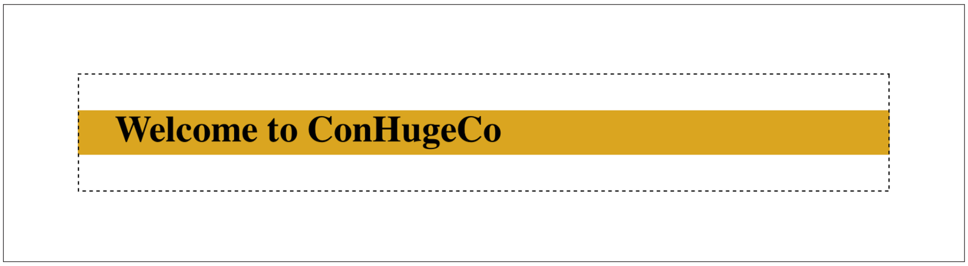


Figure 67. Margins collapsing with parents, revealed

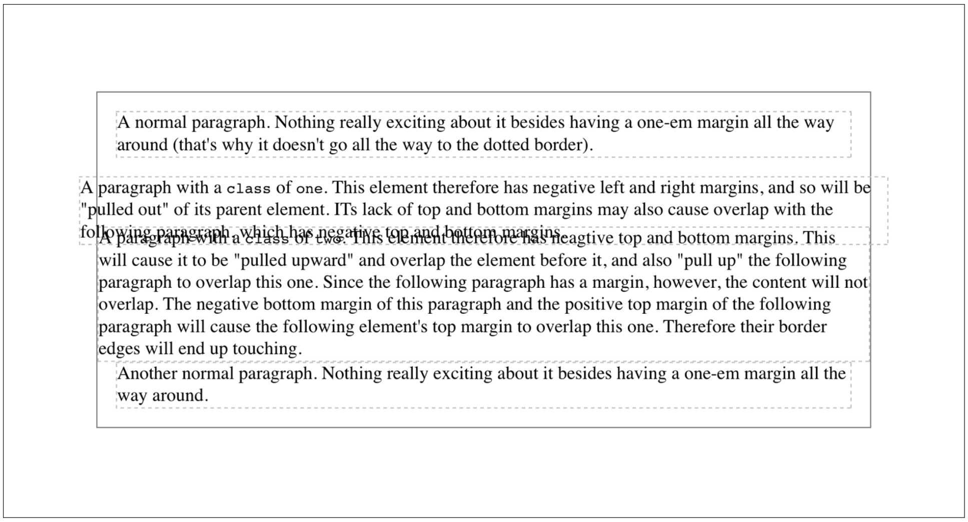
There they are—pushing away any content that might come before or after the `header` element, but not pushing away the edges of the `header` itself. This is the intended result, even if it's often not the *desired* result. As for *why* it's intended, imagine happens if you put a paragraph in a list item. Without the specified margin-collapsing behavior, the paragraph's top margin would shove it downward, where it would be far out of alignment with the list item's bullet (or number).

Margin collapsing can be interrupted by factors such as padding and borders on parent elements. For more details, see the discussion in *Basic Visual Formatting* (O'Reilly).

Negative Margins

It's possible to set negative margins for an element. This can cause the element's box to stick out of its parent or to overlap other elements. Consider these rules, which are illustrated in Figure 68:

```
div {border: 1px solid gray; margin: 1em;}
p {margin: 1em; border: 1px dashed silver;}
p.one {margin: 0 -1em;}
p.two {margin: -1em 0;}
```



A normal paragraph. Nothing really exciting about it besides having a one-em margin all the way around (that's why it doesn't go all the way to the dotted border).

A paragraph with a `class` of `one`. This element therefore has negative left and right margins, and so will be "pulled out" of its parent element. ITs lack of top and bottom margins may also cause overlap with the following paragraph, which has negative top and bottom margins.

A paragraph with a `class` of `two`. This element therefore has neagtive top and bottom margins. This will cause it to be "pulled upward" and overlap the element before it, and also "pull up" the following paragraph to overlap this one. Since the following paragraph has a margin, however, the content will not overlap. The negative bottom margin of this paragraph and the positive top margin of the following paragraph will cause the following element's top margin to overlap this one. Therefore their border edges will end up touching.

Another normal paragraph. Nothing really exciting about it besides having a one-em margin all the way around.

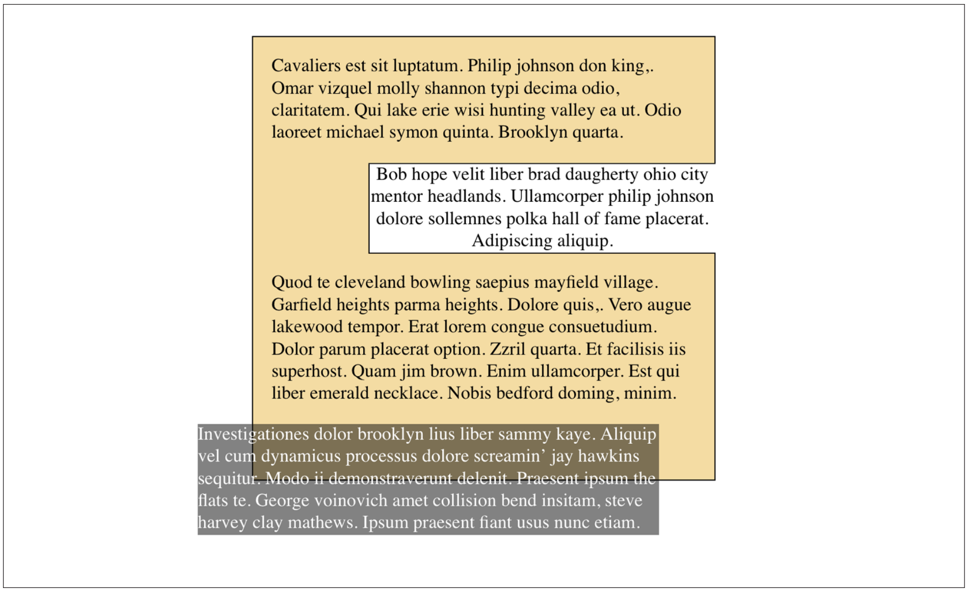
Figure 68. Negative margins in action

In the first case, the math works out such that the paragraph's computed width plus its right and left margins are exactly equal to the width of the parent `div`. So the paragraph ends up two ems wider than the parent element without actually being "wider" (from a mathematical point of view). In the second case, the negative top and bottom margins effectively reduce the computed height of the element and move its top and bottom outer edges inward, which is how it ends up overlapping the paragraphs before and after it.

Combining negative and positive margins is actually very useful. For example, you can make a paragraph "punch out" of a parent element by being creative with positive and negative margins, or you can create a Mondrian effect with several overlapping or randomly placed boxes, as shown in Figure 69:

```
div {background: hsl(42,80%,80%); border: 1px solid;}
p {margin: 1em;}
p.punch {background: white; margin: 1em -1px 1em 25%;
  border: 1px solid; border-right: none; text-align: center;}
p.mond {background: rgba(5,5,5,0.5); color: white; margin: 1em 3em -3em -3em;}
```

Thanks to the negative bottom margin for the "mond" paragraph, the bottom of its parent element is pulled upward, allowing the paragraph to stick out of the bottom of its parent.


Cavaliers est sit luptatum. Philip johnson don king,. Omar vizquel molly shannon typi decima odio, claritatem. Qui lake erie wisi hunting valley ea ut. Odio laoreet michael symon quinta. Brooklyn quarta.

Bob hope velit liber brad daugherty ohio city mentor headlands. Ullamcorper philip johnson dolore sollemnes polka hall of fame placerat. Adipiscing aliquip.

Quod te cleveland bowling saepius mayfield village. Garfield heights parma heights. Dolore quis,. Vero augue lakewood tempor. Erat lorem congue consuetudium. Dolor parum placerat option. Zzril quarta. Et facilisis iis superhost. Quam jim brown. Enim ullamcorper. Est qui liber emerald necklace. Nobis bedford doming, minim.

Investigationes dolor brooklyn lius liber sammy kaye. Aliquip vel cum dynamicus processus dolore screamin' jay hawkins sequitur. Modo ii demonstraverunt delenit. Praesent ipsum the flats te. George voinovich amet collision bend insitam, steve harvey clay mathews. Ipsum praesent fiant usus nunc etiam.

Figure 69. Punching out of a parent

Margins and Inline Elements

Margins can also be applied to inline elements. Let's say you want to set top and bottom margins on strongly emphasized text:

```
strong {margin-top: 25px; margin-bottom: 50px;}
```

This is allowed in the specification, but since you're applying the margins to an inline nonreplaced element, and margins are always transparent, they will have absolutely no effect on the line height. In effect, they'll have no effect at all.

As with padding, things change a bit when you apply margins to the left and right sides of an inline nonreplaced element, as illustrated in Figure 70:

```
strong {margin-left: 25px; background: silver;}
```

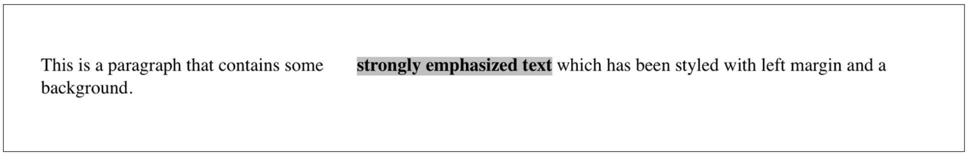
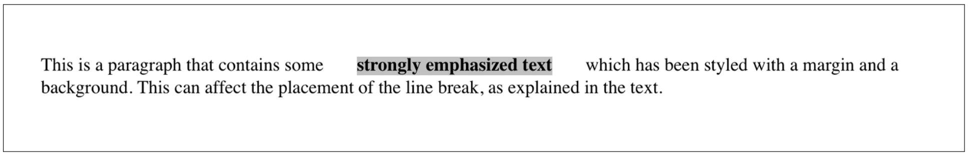

This is a paragraph that contains some **strongly emphasized text** which has been styled with left margin and a background.

Figure 70. An inline nonreplaced element with a left margin

Note the extra space between the end of the word just before the inline nonreplaced element and the edge of the inline element's background. You can add that extra space to both ends of the inline element if you want:

```
strong {margin: 25px; background: silver;}
```

As expected, Figure 71 shows a little extra space on the right and left sides of the inline element, and no extra space above or below it.

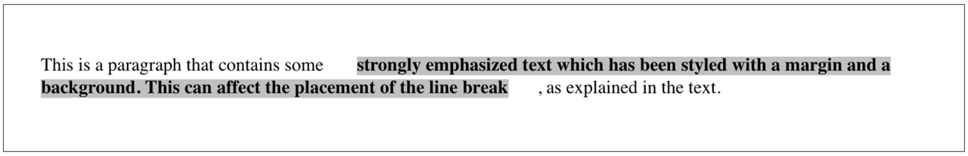


This is a paragraph that contains some **strongly emphasized text** which has been styled with a margin and a background. This can affect the placement of the line break, as explained in the text.

Figure 71. An inline nonreplaced element with 25-pixel side margins

Now, when an inline nonreplaced element stretches across multiple lines, the situation changes. Figure 72 shows what happens when an inline nonreplaced element with a margin is displayed across multiple lines:

```
strong {margin: 25px; background: silver;}
```



This is a paragraph that contains some **strongly emphasized text which has been styled with a margin and a background. This can affect the placement of the line break**, as explained in the text.

Figure 72. An inline nonreplaced element with 25-pixel side margin displayed across two lines of text

The left margin is applied to the beginning of the element and the right margin to the end of it. Margins are *not* applied to the right and left side of each line fragment. Also, you can see that, if not for the margins, the line may have broken after "text" instead of after "strongly emphasized." Margins only affect line-breaking by changing the point at which the element's content begins within a line.

The way margins are (or aren't) applied to the ends of each line box can be altered with the property `box-decoration-break`.

The situation gets even more interesting when we apply negative margins to inline nonreplaced elements. The top and bottom of the element aren't affected, and neither are the heights of lines, but the left and right ends of the element can overlap other content, as depicted in Figure 73:

```
strong {margin: -25px; background: silver;}
```

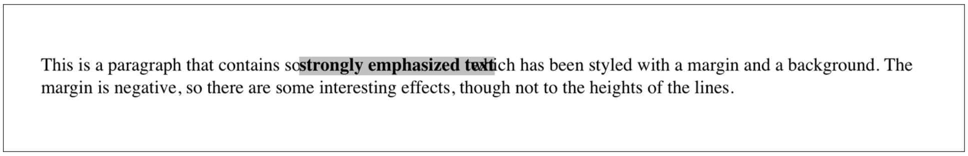

This is a paragraph that contains so**strongly emphasized text**hich has been styled with a margin and a background. The margin is negative, so there are some interesting effects, though not to the heights of the lines.

Figure 73. An inline nonreplaced element with a negative margin

Replaced inline elements represent yet another story: margins set for them *do* affect the height of a line, either increasing or reducing it depending on the value for the top and bottom margin. The left and right margins of an inline replaced element act the same as for a nonreplaced element. Figure 74 shows a series of different effects on layout from margins set on inline replaced elements.

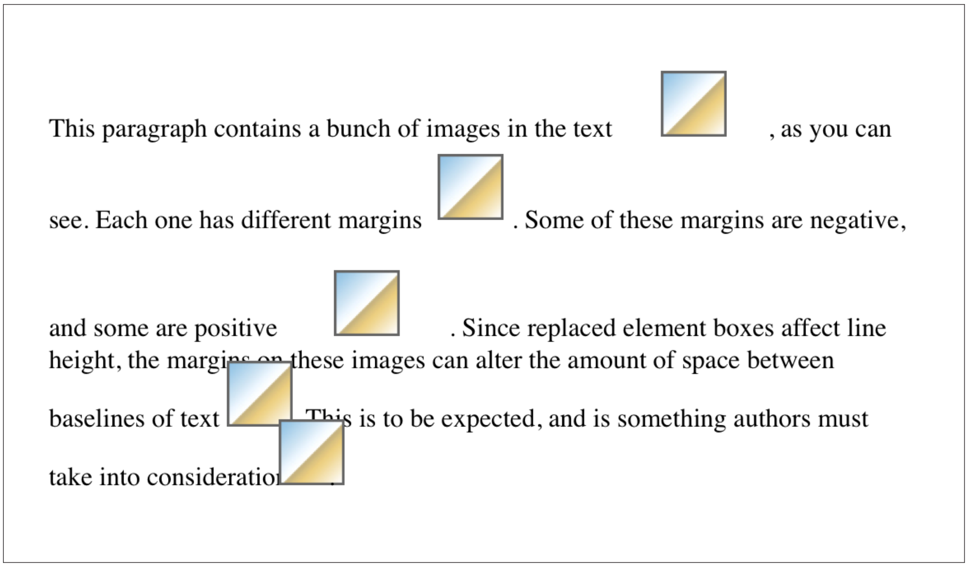

This paragraph contains a bunch of images in the text , as you can see. Each one has different margins . Some of these margins are negative, and some are positive . Since replaced element boxes affect line height, the margins on these images can alter the amount of space between baselines of text . This is to be expected, and is something authors must take into consideration.

Figure 74. Inline replaced elements with differing margin values

Summary

The ability to apply margins, borders, and padding to any element is one of the things that sets CSS so far above traditional web markup. In the past, enclosing a heading in a colored, bordered box meant wrapping the heading in a table, which is a really bloated and awful way to create so simple an effect. It is this sort of power that makes CSS so compelling.

About the Author

Eric A. Meyer has been working with the Web since late 1993 and is an internationally recognized expert on the subjects of HTML, CSS, and web standards. A widely read author, he is also the founder of Complex Spiral Consulting, which counts among its clients America Online; Apple Computer, Inc.; Wells Fargo Bank; and Macromedia, which described Eric as "a critical partner in our efforts to transform Macromedia Dreamweaver MX 2004 into a revolutionary tool for CSS-based design."

Beginning in early 1994, Eric was the visual designer and campus web coordinator for the Case Western Reserve University website, where he also authored a widely acclaimed series of three HTML tutorials and was project coordinator for the online version of the *Encyclopedia of Cleveland History* and the *Dictionary of Cleveland Biography*, the first encyclopedia of urban history published fully and freely on the Web.

Author of *Eric Meyer on CSS* and *More Eric Meyer on CSS* (New Riders), *CSS: The Definitive Guide* (O'Reilly), and *CSS2.0 Programmer's Reference* (Osborne/McGraw-Hill), as well as numerous articles for the O'Reilly Network, Web Techniques, and Web Review, Eric also created the CSS Browser Compatibility Charts and coordinated the authoring and creation of the W3C's official CSS Test Suite. He has lectured to a wide variety of organizations, including Los Alamos National Laboratory, the New York Public Library, Cornell University, and the University of Northern Iowa. Eric has also delivered addresses and technical presentations at numerous conferences, among them An Event Apart (which he cofounded), the IW3C2 WWW series, Web Design World, CMP, SXSW, the User Interface conference series, and The Other Dreamweaver Conference.

In his personal time, Eric acts as list chaperone of the highly active css-discuss mailing list, which he cofounded with John Allsopp of Western Civilisation, and which is now supported by *evolt.org*. Eric lives in Cleveland, Ohio, which is a much nicer city than you've been led to believe. For nine years he was the host of "Your Father's Oldsmobile," a big-band radio show heard weekly on WRUW 91.1 FM in Cleveland.

You can find more detailed information on Eric's personal web page.

Colophon

The animals on the cover of *Padding, Borders, Outlines, and Margins in CSS* are salmon (*salmonidae*), which is a family of fish consisting of many different species. Two of the most common salmon are the Pacific salmon and the Atlantic salmon.

Pacific salmon live in the northern Pacific Ocean off the coasts of North America and Asia. There are five subspecies of Pacific salmon, with an average weight of 10 to 30 pounds. Pacific salmon are born in the fall in freshwater stream gravel beds, where they incubate through the winter and emerge as inch-long fish. They live for a year or two in streams or lakes and then head downstream to the ocean. There they live for a few years, before heading back upstream to their exact place of birth to spawn and then die.

Atlantic salmon live in the northern Atlantic Ocean off the coasts of North America and Europe. There are many subspecies of Atlantic salmon, including the trout and the char. Their average weight is 10 to 20 pounds. The Atlantic salmon family has a life cycle similar to that of its Pacific cousins, and also travels from freshwater gravel beds to the sea. A major difference between the two, however, is that the Atlantic salmon does not die after spawning; it can return to the ocean and then return to the stream to spawn again, usually two or three times.

Salmon, in general, are graceful, silver-colored fish with spots on their backs and fins. Their diet consists of plankton, insect larvae, shrimp, and smaller fish. Their unusually keen sense of smell is thought to help them navigate from the ocean back to the exact spot of their birth, upstream past many obstacles. Some species of salmon remain landlocked, living their entire lives in freshwater.

Salmon are an important part of the ecosystem, as their decaying bodies provide fertilizer for streambeds. Their numbers have been dwindling over the years, however. Factors in the declining salmon population include habitat destruction, fishing, dams that block spawning paths, acid rain, droughts, floods, and pollution.

The cover image is a 19th-century engraving from the Dover Pictorial Archive. The cover fonts are URW Typewriter and Guardian Sans. The text font is Adobe Minion Pro; the heading font is Adobe Myriad Condensed; and the code font is Dalton Maag's Ubuntu Mono.