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### **Lesson 3: Cascading Style Sheets**

#### **Instructional Objectives:**

By the end of this task, you should be able to:

- Explain how CSS only describes the presentation of a web page and not its structure or contents
- Use the link> tag to associate a web page to a CSS style sheet
- Identify the rules, selectors, declarations and properties that are present in a given CSS style sheet
- Use an element selector to limit effect of a CSS rule to a particular element type
- Use an id attribute in HTML and an id selector in CSS to limit effect of a CSS rule to a single element
- State that it is an error for a web page to have more than one HTML element with the same id attribute
- Use a class attribute in HTML and a class selector in CSS to limit effect of a CSS rule to elements with the specified class
- Use a descendent selector in CSS to limit the effect of a CSS rule to elements that are nested in a particular order
- Distinguish between elements that have a block appearance by default and elements that have an inline appearance by default
- Identify and distinguish between the margin, border and padding of elements that have a block appearance
- Use the <div> tag to represent structural elements that should have a block appearance by default and are not represented by other HTML tags
- Use the <span> tag to represent structural elements that should have an inline appearance by default and are not represented by other HTML tags
- Use the display, background, color, height, width, border, border-bottom, border-left, border-right, border-top, margin, margin-bottom, margin-left, margin-right, margin-top, padding, padding-bottom, padding-left, padding-right, padding-top, font-family, font-size, font-style, font-weight, text-align and text-decoration properties to control the presentation of a web page without producing any syntax errors

#### Part 1: Why Another Language?

So far, the web pages we have created look rather plain:

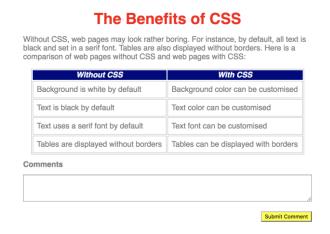
#### The Benefits of CSS

Without CSS, web pages may look rather boring. For instance, by default, all text is black and set in a serif font. Tables are also displayed without borders. Here is a comparison of web pages without CSS and web pages with CSS:

Background is white by default Text is black by default Text is black by default Text color can be customised Text uses a serif font by default Text font can be customised Tables are displayed without borders Tables can be displayed with borders

Comments

However, with the help of CSS, we can improve the appearance of such web pages greatly with almost no change to the HTML:



You may wonder why we need CSS to control a web page's appearance. The answer lies in a computer science principle called **separation of concerns**, where a program is divided into distinct sections such that each section only deals with one aspect of the final product and has minimal knowledge of the other parts.

In general, a web page's structure (how the content is organized) and presentation (how the content is displayed) are largely independent of each other and therefore should be handled separately. In particular, we define the web page's structure using HTML in one file and its presentation using CSS in a separate file. Separating these two components lets us lets us modify the web page's structure without affecting its presentation and vice versa. Thus, as an example, a person can be in charge of the content of the website, while another person can design how the website is presented without worrying over the content of the website. It also lets us specialise the HTML and CSS languages so that each language is more suited for its purpose.

To demonstrate, open Google Chrome and visit www.csszengarden.com. Click on any of the available designs to see how changing CSS style sheets can dramatically affect the appearance of a web page without modifying its HTML. This is possible because the web page's structure and presentation are controlled separately. (You may view the source code by pressing Ctrl-U to check that the HTML is exactly the same for each design.)

#### Part 2: Anatomy of a CSS Style Sheet

Open Google Chrome, visit www.example.com and press Ctrl-U. Notice that the first part of the HTML document includes some CSS inside a <style> tag:

```
<!doctype html>
<html>
<head>
  <title>Example Domain</title>
    <meta charset="utf-8" />
<meta http-equiv="Content-type" content="text/html; charset=utf-8" /
<meta name="viewport" content="width-device-width, initial-scale=1"
<style type="text/css">
          background-color: #f0f0f2;
          font-family: "Open Sans", "Helvetica Neue", Helvetica, Arial, sans-serif;
    div {
width: 600px;
         margin: 5em auto;
          padding: 50px;
background-color: #fff;
         border-radius: 1em:
     a:link, a:visited {
         body {
   background-color: #fff;
         }
div {
    width: auto;
    margin: 0 auto;
    border-radius: 0;
    padding: lem;
}
</head>
<body>
```

For simplicity, this web page has chosen to include its style sheet inside the HTML file using a <style> tag. However, in general we write our style sheet in a separate .css file and link it to a HTML file using a link> tag. We will learn how to do this in the next part of this practical task.

Focusing on the CSS between the <style> and </style> tags, we see that the style sheet is made of multiple **rules**. Each rule starts with one or more **selectors** separated by commas, followed by curly braces surrounding a number of **declarations**. These terms are illustrated for a single rule as follows:

```
Rule  

h1, h2, h3 {
    font-family: sans-serif;
    font-style: italic;
}

Property Value
```

Each declaration is made of two parts: a **property** name and one or more values separated by spaces. Multiple declarations in a rule are separated by semicolons.

1 Circle all selectors and underline all properties in the following style sheet:

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

Version: Nov 2018

3

```
h1, h2, #danger {
   border: 1px solid red;
}
```

For each code snippet below, place a tick in the corresponding box if the snippet is valid CSS. Note that background and color are both valid CSS property names.

```
Code Snippet

body (
    background: white;
)

body {
    background: white
    color: black
}

body {
    background: white;
    color: black;
}

{ color: black; }

body { color: black; }
```

#### Part 3: Your Own Style Sheet

Now that we know about the basics of CSS, it is time to create our own style sheet. Like HTML documents, CSS style sheets are just text files with a .css extension. You may wish to use Notepad++ to edit CSS files as it offers syntax highlighting. Open a text editor, create a new file and save it in your user directory as example.css. Then enter the following style sheet:

```
h1 { color: red; font-family: sans-serif; }
p { color: blue; font-style: italic; }
```

To use a stylesheet, we need an accompanying document. Create a new file and save it as example.html in the same directory as example.css. Then enter the following HTML document:

```
<!doctype html>
<html>
<head>
    <title>CSS Example</title>
        dink rel="stylesheet" href="example.css">
</head>
<body>
        <h1>CSS Example</h1>
        This is an example of using CSS to style a web page.
</body>
</html>
```

Notice that we have added a <link> tag under the head element. The rel attribute (short for "relationship") has a value of "stylesheet", which indicates that the href attribute (short for "hyperlink") contains the URL of a CSS style sheet. This is how we normally associate HTML documents with style sheets.

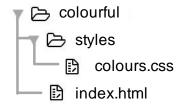
Now, double-click example.html in Windows Explorer to open it in a web browser. You should see something similar to the following:

# **CSS Example**

This is an example of using CSS to style a web page.

Congratulations! You have just used CSS to control the presentation of a web page.

Use a text editor to create a HTML document and CSS style sheet using the following directory structure and contents. Open index.html and add a link> tag so that the web page is styled using colours.css. Use relative paths so the style sheet is always linked correctly even if the colourful directory and its contents are moved to another location.



```
colours.css
body { background: cyan; }
h1 { color: blue; }
p {
    background: yellow;
    color: red;
}
index.html
<!doctype html>
<html>
     <head>
           <title>Colourful</title>
     </head>
     <body>
           <h1>Welcome</h1>
           This is a colourful document!
     </body>
</html>
```

#### Part 4: Types of Selectors

The elements which are affected by each CSS rule are determined by the selectors at the start of that rule. Each selector picks out (i.e., selects) a set of elements from the HTML document to be affected by the rule's declarations.

We shall organize selectors into four groups: element selectors, id selectors, class selectors and descendent selectors.

#### Element Selectors

An element selector picks out *all* elements of a particular type from the HTML document. To use an element selector, we simply enter the name of a tag or element type (e.g., body, h1, table, etc.). For instance, the second rule in example.css uses an element selector for p elements:

```
p { color: blue; font-style: italic; }
```

Based on this rule, all p elements on the web page will appear as blue italic text.

Sometimes, however, we do not want to select *all* the elements of a particular type. In such cases, we can fine-tune our selection by making use of two special attributes that are valid for all HTML tags: id and class.

#### id Selectors

An id selector picks out the unique element that has a particular value for its id attribute. To use an id selector, we enter a hex symbol (#) followed immediately by the desired element's id attribute value. Since id attributes on a web page cannot be repeated, an id selector will always pick out exactly *one* element if it exists.

For instance, suppose we have the following HTML and CSS files in the same folder:

If we open id-example.html, we see that only the second p element with an id of special is formatted as red.

This is a normal paragraph.

This paragraph is special.

This is a normal paragraph.

#### class Selectors

A class selector picks out all elements that are associated with a particular class. To use a class selector, we enter a period (.) followed immediately by class name we wish to reference.

For instance, suppose we have the following HTML and CSS files in the same folder:

If we open class-example.html, we see that only the second and third p elements with a class of info are formatted as silver. These p elements also have additional classes (i.e., "major" and "minor" respectively), but these have no effect as they do not match any of the selectors used in the style sheet.

### This is the main paragraph.

This is some major information.

This is some minor information.

To summarise the use of id and class attributes:

- The id attribute is used to *uniquely* identify an element in a HTML document. If set, its value must be unique within the document and cannot contain any whitespace. A web page cannot have more than one element with the same id attribute.
- The class attribute, on the other hand, is used to associate an element with one or more classes (i.e., categories). If set, its value must be a space-separated list of class names. Unlike id attributes, multiple elements on a web page can have the same value for their class attributes.

#### Descendent Selectors

Sometimes, element selectors, id selectors and class selectors are not sufficient and it is necessary to select an element only if the element has a parent element that matches another selector. This can be achieved using the descendent selector. To use a descendent selector, separate any two selectors using a space: the corresponding rule will only be applied for elements that match the selector on the right *and* have a parent element that matches the selector on the left.

For instance, suppose we have the following HTML and CSS files in the same folder:

If we open descendent-example.html, we see that only the p element has its italics portion formatted as red. The other i elements remain unformatted as they do not match the specific requirements of the selector, which requires the i element to be a descendent of a p element.

9

# Heading with *Italics*

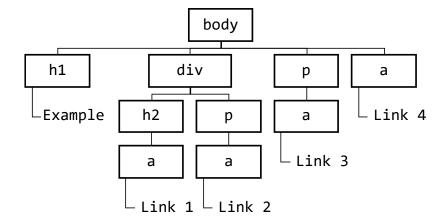
This paragraph has *italics*.

Bare italics

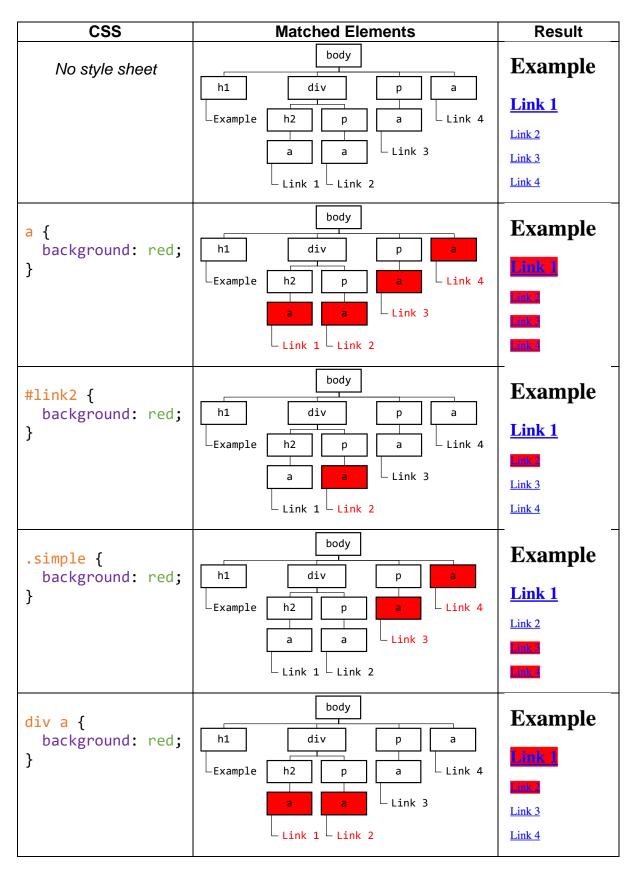
To further illustrate how the different selector types work, consider the following HTML document. In this example, we introduce a new <div> tag that is used as a generic element for grouping other elements. We will learn more about the <div> tag later in this practical task.

```
multiple-example.html
<!doctype html>
<html>
     <head><title>Example</title></head>
     <body>
           <h1>Example</h1>
           <div>
                <h2><a id="link1" href="link1.html">
                     Link 1
                </a></h2>
                <a id="link2" href="link2.html">
                     Link 2
                </a>
           </div>
           <a class="simple" href="link3.html">Link 3</a>
           <a class="simple" href="link4.html">Link 4</a>
     </body>
</html>
```

This HTML describes the following tree structure of elements:



Based on this HTML document, the following table shows which elements from the tree are matched for different CSS selectors:



Note that an element may be selected for more than one rule in the style sheet. If these rules have conflicting declarations, the rule with a selector that is most specific to the element has priority. The CSS language defines an algorithm for calculating the **specificity** of a selector. However, we can avoid worrying about specificity by crafting our style sheets to avoid rule conflicts in the first place.

Now that we know how CSS determines which elements are affected by each rule, let us focus on the various properties that can be set by rule declarations. We shall organize the properties into three groups: common properties, box model properties and typography properties.

Use a text editor to create the following HTML document. Without changing the HTML, add a CSS file such that only the text "RED" is coloured in red:

#### **Part 5: Common Properties**

A number of properties can be used with *any* element. For instance, in many of the CSS examples so far, we have been using the background and color properties to set the background and text color of elements respectively.

The following are some of the color names that can be used with the background and color properties:

red	orange	yellow	green	blue	purple
black	gray	silver	white	transparent	
				(no color)	

If a desired color does not match any of the above names, we can also specify a color in terms of its red, green and blue components. Each component is expressed as an integer between 0 to 255 (inclusive) and the color is written as rgb(R, G, B), where R is the red component integer, G is the green component integer and B is the blue component integer. For example, the following CSS sets the page background to a shade of pale yellow:

```
body { background: rgb(255, 255, 128); }
```

The same color can be expressed as three hexadecimal numbers of 2 digits each (including a leading zero if needed). The color can thus be written as #RRGGBB, where RR is the red component in hexadecimal, GG is the green component in hexadecimal and BB is the blue component in hexadecimal. For example, the shade of pale yellow shown previously can also be written as:

```
body { background: #ffff80; }
```

Notice that ff is the integer 255 in hexadecimal, while 80 is the integer 128 in hexadecimal. Also note that hexadecimal digits are not case sensitive.

For convenience, if each of the three hexadecimal numbers is made of repeated digits (e.g. 00, 11, 22, ..., FF), then the color can be shortened to #RGB, where R is the repeated hexadecimal digit for red, G is the repeated hexadecimal digit for green and B is the repeated hexadecimal digit for blue. For example, while #FFFF80 cannot be shortened, the color #00FFCC can be shortened to \$0FC.

Besides colors, we can also use a repeating image as the background by using url(PATH), where PATH is the path and filename of the background image. For instance, the following CSS uses pattern.png (which is located in the same folder with the style sheet) as a repeating background image for the page.

```
body { background: url(pattern.png); }
```

The following HTML and pattern.png image demonstrates this:

HTML	pattern.png	Result
<body> Hello, World </body>	*	Hello,,Warld

Finally, all elements have a display property that can be used to hide the element by setting its value to none. The display property can also be set to either block or inline. These settings will be explained in the next part of this task.

#### **Part 6: Box Model Properties**

#### Block and Inline Appearance

You may have noticed that some HTML tags such as <h1> and always start on a new line and force the following element to also start on a new line. On the other hand, tags such as <b> and <i> do not:

HTML	Result
<h1>h1</h1> p <bb< b=""></bb<>	<b>h1</b>
<i>i&gt;i</i>	p
	<b>b</b> <i>i</i>

This is because the <h1> and tags have a block appearance by default while <b> and <i> have an inline appearance by default. However, we can use the display property to override these defaults. For instance, the following CSS changes all the elements to use a block appearance instead:

CSS	Result
<pre>h1, p, b, i { display: block; }</pre>	<b>h1</b>
	p
	<b>b</b> <i>i</i>

Similarly, the following CSS changes all the elements to use an inline appearance:

CSS	Result
<pre>h1, p, b, i { display: inline; }</pre>	<b>h1</b> p b i

Experiment with the HTML tags you have learnt previously. For each tag in the table below, circle "Block" if it creates a block element by default and circle "Inline" if it creates an inline element by default:

Tag	Default Appearance		
<h1></h1>	Block / Inline		
<h2></h2>	Block / Inline		
<h3></h3>	Block / Inline		
	Block / Inline		
<b></b>	Block / Inline		
<i>&gt;</i>	Block / Inline		

Tag	Default Appearance		
<a>&gt;</a>	Block / Inline		
<img/>	Block / Inline		
	Block / Inline		
<form></form>	Block / Inline		
<input/>	Block / Inline		
<textarea>&lt;/th&gt;&lt;th&gt;Block / Inline&lt;/th&gt;&lt;/tr&gt;&lt;/tbody&gt;&lt;/table&gt;</textarea>			

#### <div> and <span> Tags

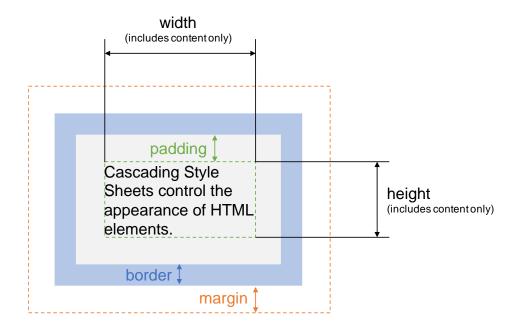
Sometimes, we may need a generic block or inline element to represent some structural feature of a document that the built-in HTML tags do not provide. The <div> and <span> tags can be used to create block and inline elements respectively for this purpose. These tags are generally used in combination with the id and class attributes to help clarify their purpose.

For instance, the following HTML document on Python syntax uses <div> and <span> tags so that Python's rules and keywords are marked out and styled:

HTML	CSS	Result
<h1>Functions</h1> <div class="rule"> Python functions are defined using the <span class="keyword"> def</span> keyword. </div>	<pre>.rule {   background: silver; } .keyword {   color: red; }</pre>	Functions  Python functions are defined using the def keyword.

#### Margin, Border, Padding, Width and Height

Besides background and text colour, block elements have a number of additional properties that can be specified. In particular, the margin, border, padding, width and height properties determine how the box surrounding the element is sized and displayed. This **box model** is illustrated below:



The various box model properties are summarized in the following table:

<b>Property Name</b>	Description
border	Specifies the thickness of the optionally-coloured border around the element
margin	Specifies the thickness of the transparent space surrounding the border
padding	Specifies the thickness of the space between the content and the border that is filled with the element's background colour or pattern
width	Specifies the element content's width, regardless of the surrounding margin, border and padding
height	Specifies the element content's height, regardless of the surrounding margin, border and padding

When setting a box's width and height or the thickness of its margin, border and padding, we must specify a unit of measurement. One common unit of measurement is pixels, represented by the px suffix. For instance, to set the padding of p elements to 10 pixels, we would use the following CSS:

CSS	Result
<pre>p {   background: silver;   padding: 10px; }</pre>	This is an example of a paragraph with additional padding written using the  tag.

To specify that a border should be drawn with a solid colour, we use the value of a thickness, followed by a space, the word "solid", another space and finally the colour we wish to use for the border. For instance, the following CSS gives p elements a 5 pixel thick red border:

CSS	Result
<pre>p { border: 5px solid red; }</pre>	This is an example of a paragraph with a 5 pixel thick red border written using the  tag.

By default, the margin, border and padding properties control the appearance for all four sides of the element's box. However, we can append -bottom, -left, -top or -right to any of these properties so that we control the appearance for only one side of the box. For instance, the following table shows how the border-bottom, border-left, border-top and border-right properties can be used to draw a line on only one side of a p element:

CSS	Result
<pre>p { border-bottom: 1px solid gray; }</pre>	This is an example of a paragraph.
<pre>p { border-left: 1px solid gray; }</pre>	This is an example of a paragraph.
<pre>p { border-top: 1px solid gray; }</pre>	This is an example of a paragraph.
<pre>p { border-right: 1px solid gray; }</pre>	This is an example of a paragraph.

Finally, if a box's width is less than the document's width, we can center the box horizontally by setting its margin-left and margin-right properties to auto:

```
CSS

Result

P {
    background: silver;
    margin-left: auto;
    margin-right: auto;
    width: 100px;

}

This is an
    example of a
    paragraph that
    is forced to be
    only 100 pixels
    wide and
    centered.
```

For each HTML document below, create a CSS file so that the completed web page appears as closely to the required appearance as possible.

HTML	Required Appearance
<h1>Introduction</h1>	
This is an example of using borders to make headings prettier. <h1>Explanation</h1> Each heading has a line below it that extends across the entire screen.	Introduction  This is an example of using borders to make headings prettier.  Explanation  Each heading has a line below it that extends across the entire screen.
<pre>Printing documents can be a very tricky business. There are many things to look out for. <pre><b>Tip:</b> Make sure the printer has paper before printing! However, if you get the process right, you will be rewarded with a marvelous- looking printout.</pre></pre>	Printing documents can be a very tricky business. There are many things to look out for.  Tip: Make sure the printer has paper before printing!  However, if you get the process right, you will be rewarded with a marvelous-looking printout.
<h1>Heading</h1> This is an example of a paragraph that has both margin and padding set.	Heading  This is an example of a paragraph that has both margin and padding set.

#### **Part 7: Typography Properties**

Besides controlling the size and spacing of box elements, you can also specify how text in each element is displayed using the font-family, font-size, font-style, font-weight, text-align and text-decoration properties.

The font-family property specifies which typeface is used to display the text. Its value is most often a comma-separated list of font names, ending with either serif or sans-serif. Note that if a font name has spaces, it must be enclosed in quotes (e.g., "Times New Roman"). The browser will use the first font in the list that is installed. However, if none of the named fonts are installed, it will fall back to using a generic serif or sans-serif font instead.

A serif font such as "Times New Roman" has lines extending from the ends of each letter stroke. Such fonts are traditionally used for long pieces of printed text. A sansserif font such as "Arial", however, does not have these additional lines. The following examples illustrate how to set a serif or sans-serif font using CSS:

CSS	Result
<pre>p { font-family: serif; }</pre>	This is an example of a paragraph.
<pre>p { font-family: sans-serif; }</pre>	This is an example of a paragraph.

The font-size property can be used to specify text size in pixels:

CSS	Result
<pre>p { font-size: 24px; }</pre>	This is an example of a paragraph.

The font-style property specifies whether an italic font is used. The most common values for this property are normal and italic. Similarly, the font-weight property specifies whether a bold font is used. The most common values for this property are normal and bold:

CSS	Result
<pre>p { font-style: italic; }</pre>	This is an example of a paragraph.
<pre>p { font-weight: bold; }</pre>	This is an example of a paragraph.
<pre>p {   font-style: italic;   font-weight: bold; }</pre>	This is an example of a paragraph.

The text-align property specifies how the text is aligned in its box. The most common values for this property are left, center, right and justify:

CSS	Result
<pre>p { text-align: left; }</pre>	This is an example of a paragraph with enough content to see how text-align works.

<pre>p { text-align: center; }</pre>	This is an example of a paragraph with enough content to see how text-align works.
<pre>p { text-align: right; }</pre>	This is an example of a paragraph with enough content to see how text-align works.
<pre>p { text-align: justify; }</pre>	This is an example of a paragraph with enough content to see how text-align works.

Finally, the text-decoration property specifies whether additional elements of the font are displayed. The most common values of this property are none, underline and line-through. The line-through value causes text to appear cancelled or struck through using a horizontal line:

CSS	Result
<pre>p {   text-decoration: underline; }</pre>	This is an example of a paragraph.
<pre>p {   text-decoration: line-through; }</pre>	This is an example of a paragraph.

For each HTML document below, create a CSS file so that the completed web page appears as closely to the required appearance as possible. However, there is no need to match the required appearance exactly, so if a font size is needed, use an approximate value.

HTML	Required Appearance
<pre><h1>Reminder</h1> This is an <span class="expanded">important </span> reminder to try new &amp; different ideas.</pre>	Reminder  This is an important reminder to try new & different ideas.
<h1>Heading 1</h1>	Heading 1
<h2>Heading 2</h2>	Heading 2
Paragraph	Paragraph
<pre>This is a <a href="/"&gt;link to the root of your web site.</a </pre>	This is a link to the root of your web site.