HTML

~ Web designing beyond your imaginations ~

Hyper Text Markup Language

Content From: www.w3schools.com

HTML Introduction

What is HTML?

HTML is the standard markup language for creating Web pages.

- HTML stands for Hyper Text Markup Language
- HTML describes the structure of Web pages using markup
- HTML elements are the building blocks of HTML pages
- HTML elements are represented by tags
- HTML tags label pieces of content such as "heading", "paragraph", "table", and so on
- Browsers do not display the HTML tags, but use them to render the content of the page

```
<!DOCTYPE html>
<html>
<head>
<title>Page Title</title>
</head>
<body>

<h1>My First Heading</h1>
<p>My first paragraph.</p>

</body>
</html>
```

Example Explained

- The `<!DOCTYPE html>` declaration defines this document to be HTML5
- The `<html>` element is the root element of an HTML page
- The `<head>` element contains meta information about the document
- The `<title>` element specifies a title for the document
- The `<body>` element contains the visible page content
- The `<h1>` element defines a large heading
- The `<p>` element defines a paragraph

HTML Tags

HTML tags are element names surrounded by angle brackets:

<tagname>content goes here...</tagname>

- HTML tags normally come **in pairs** like `<p>` and `</p>`
- The first tag in a pair is the **start tag,** the second tag is the **end tag**
- The end tag is written like the start tag, but with a **forward slash** inserted before the tag name

Tip: The start tag is also called the **opening tag**, and the end tag the **closing tag**.

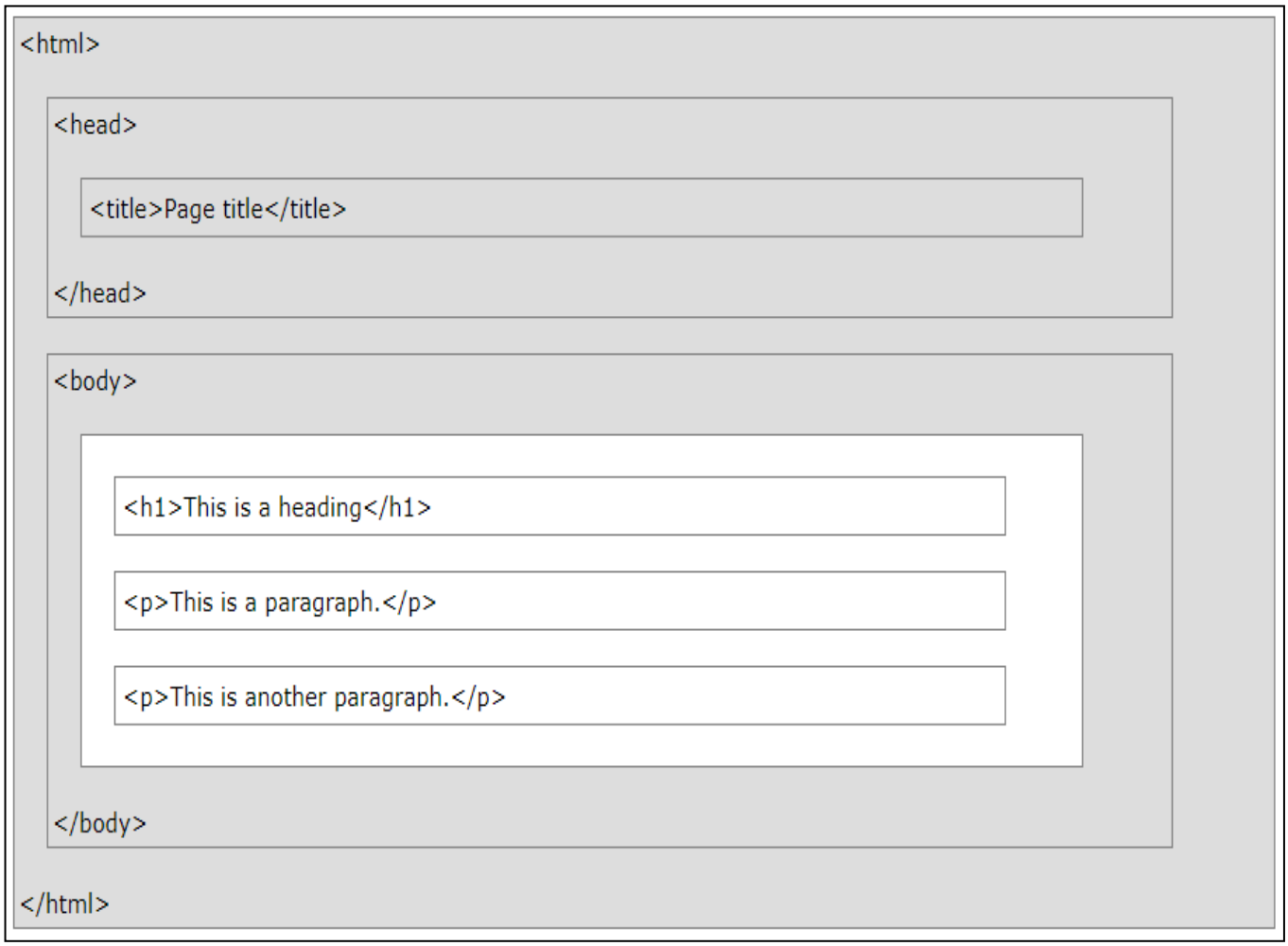
Web Browsers

The purpose of a web browser (Chrome, IE, Firefox, Safari) is to read HTML documents and display them.

The browser does not display the HTML tags, but uses them to determine how to display the document:

HTML Page Structure

Below is a visualization of an HTML page structure:



Note: Only the content inside the <body> section (the white area above) is displayed in a browser.

The <!DOCTYPE> Declaration

The `<!DOCTYPE>` declaration represents the document type, and helps browsers to display web pages correctly.

It must only appear once, at the top of the page (before any HTML tags).

The `<!DOCTYPE>` declaration is not case sensitive.

The `<!DOCTYPE>` declaration for HTML5 is:

```
<!DOCTYPE html>
```

HTML Versions

Since the early days of the web, there have been many versions of HTML:

Version	Year
HTML	1991
HTML 2.0	1995
HTML 3.2	1997
HTML 4.01	1999
XHTML	2000
HTML5	2014

HTML Editors

Write HTML Using Notepad or TextEdit

Web pages can be created and modified by using professional HTML editors.

However, for learning HTML we recommend a simple text editor like Notepad (PC) or TextEdit (Mac).

We believe using a simple text editor is a good way to learn HTML.

Follow the four steps below to create your first web page with Notepad or TextEdit.

Step 1: Open Notepad (PC)

Windows 8 or later:

Open the **Start Screen** (the window symbol at the bottom left on your screen). Type **Notepad**.

Windows 7 or earlier:

Open **Start** > **Programs > Accessories > Notepad**

Step 1: Open TextEdit (Mac)

Open **Finder > Applications > TextEdit**

Also change some preferences to get the application to save files correctly. In **Preferences > Format >** choose**"Plain Text"**

Then under "Open and Save", check the box that says "Display HTML files as HTML code instead of formatted text".

Then open a new document to place the code.

Step 2: Write Some HTML

Write or copy some HTML into Notepad.

```
<!DOCTYPE html>
<html>
<body>

<h1>My First Heading</h1>

<p>My first paragraph.</p>
```

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

Step 3: Save the HTML Page

Save the file on your computer. Select **File > Save as** in the Notepad menu.

Name the file **"index.htm"** and set the encoding to **UTF-8** (which is the preferred encoding for HTML files).

Step 4: View the HTML Page in Your Browser

Open the saved HTML file in your favorite browser (double click on the file, or right-click - and choose "Open with").

HTML Basic Examples

HTML Documents

All HTML documents must start with a document type declaration: `<!DOCTYPE html>`.

The HTML document itself begins with `<html>` and ends with `</html>`.

The visible part of the HTML document is between `<body>` and `</body>`.

HTML Headings

HTML headings are defined with the `<h1>` to `<h6>` tags.

`<h1>` defines the most important heading. `<h6>` defines the least important heading:

```
<h1>This is heading 1</h1>
<h2>This is heading 2</h2>
<h3>This is heading 3</h3>
```

HTML Paragraphs

HTML paragraphs are defined with the `<p>` tag:

```
<p>This is a paragraph.</p>
<p>This is another paragraph.</p>
```

HTML Links

HTML links are defined with the `<a>` tag:

```
<a href="https://www.w3schools.com">This is a link</a>
```

The link's destination is specified in the `href` attribute.

Attributes are used to provide additional information about HTML elements.

You will learn more about attributes in a later chapter

HTML Images

HTML images are defined with the `<img>` tag.

The source file (`src`), alternative text (`alt`), `width`, and `height` are provided as attributes:

```
<img src="w3schools.jpg" alt="W3Schools.com" width="104" height="142">
```

HTML Buttons

HTML buttons are defined with the `<button>` tag:

```
<button>Click me</button>
```

HTML Lists

HTML lists are defined with the `<ul>` (unordered/bullet list) or the `<ol>` (ordered/numbered list) tag, followed by `<li>` tags (list items):

```
<ul>
  <li>Coffee</li>
  <li>Tea</li>
  <li>Milk</li>
</ul>
```

HTML Elements

HTML Elements

An HTML element usually consists of a **start** tag and **end** tag, with the content inserted in between:

<tagname>Content goes here...</tagname>

The HTML **element** is everything from the start tag to the end tag:

My first paragraph.

Start tag	Element content	End tag
<h1>	My First Heading	</h1>
	My first paragraph.	

HTML elements with no content are called empty elements. Empty elements do not have an end tag, such as the
 element (which indicates a line break).

Nested HTML Elements

HTML elements can be nested (elements can contain elements).

All HTML documents consist of nested HTML elements.

This example contains four HTML elements:

```
<!DOCTYPE html>
<html>
<body>

<h1>My First Heading</h1>
<p>My first paragraph.</p>

</body>
</html>
```

Example Explained

The `<html>` element defines the **whole document**.

It has a **start** tag <html> and an **end** tag </html>.

The element **content** is another HTML element (the `<body>` element).

```
<html>
<body>

<h1>My First Heading</h1>
<p>My first paragraph.</p>

</body>
</html>
```

The `<body>` element defines the **document body**.

It has a **start** tag <body> and an **end** tag </body>.

The element **content** is two other HTML elements (`<h1>` and `<p>`).

```
<body>

<h1>My First Heading</h1>
<p>My first paragraph.</p>

</body>
```

The `<h1>` element defines a **heading**.

It has a **start** tag <h1> and an **end** tag </h1>.

The element **content** is: My First Heading.

```
<h1>My First Heading</h1>
```

The `<p>` element defines a **paragraph**.

It has a **start** tag and an **end** tag .

The element **content** is: My first paragraph.

Do Not Forget the End Tag

Some HTML elements will display correctly, even if you forget the end tag:

```
<html>
<body>

<p>This is a paragraph
<p>This is a paragraph

</body>
</html>
```

The example above works in all browsers, because the closing tag is considered optional.

Never rely on this. It might produce unexpected results and/or errors if you forget the end tag.

Empty HTML Elements

HTML elements with no content are called empty elements.

`<br>` is an empty element without a closing tag (the `<br>` tag defines a line break).

Empty elements can be "closed" in the opening tag like this:
.

HTML5 does not require empty elements to be closed. But if you want stricter validation, or if you need to make your document readable by XML parsers, you must close all HTML elements properly.

Use Lowercase Tags

HTML tags are not case sensitive: <P> means the same as <p>.

The HTML5 standard does not require lowercase tags, but W3C **recommends** lowercase in HTML, and **demands** lowercase for stricter document types like XHTML.

HTML Attributes

Attributes provide additional information about HTML elements.

HTML Attributes

- All HTML elements can have **attributes**
- Attributes provide **additional information** about an element
- Attributes are always specified in **the start tag**
- Attributes usually come in name/value pairs like: **name="value"**

Syntax

<start tag attribute=”value” attribute=”value” attribute=”value” > Content </end tag>

The title Attribute

Here, a `title` attribute is added to the `<p>` element. The value of the title attribute will be displayed as a tooltip when you mouse over the paragraph:

```
<p title="I'm a tooltip">
This is a paragraph.
</p>
```

We Suggest: Use Lowercase Attributes

The HTML5 standard does not require lowercase attribute names.

The title attribute can be written with uppercase or lowercase like **title** or **TITLE**.

W3C **recommends** lowercase in HTML, and **demands** lowercase for stricter document types like XHTML.

We Suggest: Quote Attribute Values

The HTML5 standard does not require quotes around attribute values.

The `href` attribute, demonstrated above, *can* be written without quotes:

W3C **recommends** quotes in HTML, and **demands** quotes for stricter document types like XHTML.

Sometimes it is **necessary** to use quotes. This example will not display the title attribute correctly, because it contains a space:

```
<p title=About W3Schools>
```

Single or Double Quotes?

Double quotes around attribute values are the most common in HTML, but single quotes can also be used.

In some situations, when the attribute value itself contains double quotes, it is necessary to use single quotes:

```
<p title='John "ShotGun" Nelson'>
```

Or vice versa:

```
<p title="John 'ShotGun' Nelson">
```

HTML Headings

HTML Headings

Headings are defined with the `<h1>` to `<h6>` tags.

`<h1>` defines the most important heading. `<h6>` defines the least important heading.

Headings Are Important

Search engines use the headings to index the structure and content of your web pages.

Users skim your pages by its headings. It is important to use headings to show the document structure.

`<h1>` headings should be used for main headings, followed by `<h2>` headings, then the less important `<h3>`, and so on.

Bigger Headings

Each HTML heading has a default size. However, you can specify the size for any heading with the `style` attribute, using the CSS `font-size` property:

```
<h1 style="font-size:60px;">Heading 1</h1>
```

HTML Horizontal Rules

The `<hr>` tag defines a thematic break in an HTML page, and is most often displayed as a horizontal rule.

The `<hr>` element is used to separate content (or define a change) in an HTML page:

```
<h1>This is heading 1</h1>
<p>This is some text.</p>
<hr>
<h2>This is heading 2</h2>
<p>This is some other text.</p>
<hr>
```

The HTML <head> Element

The HTML `<head>` element has nothing to do with HTML headings.

The `<head>` element is a container for metadata. HTML metadata is data about the HTML document. Metadata is not displayed.

The `<head>` element is placed between the `<html>` tag and the `<body>` tag:

```
<!DOCTYPE html>
<html>
<head>
  <title>My First HTML</title>
  <meta charset="UTF-8">
</head>

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

How to View HTML Source?

Have you ever seen a Web page and wondered "Hey! How did they do that?"

View HTML Source Code:

Right-click in an HTML page and select "View Page Source" (in Chrome) or "View Source" (in IE), or similar in other browsers. This will open a window containing the HTML source code of the page.

Inspect an HTML Element:

Right-click on an element (or a blank area), and choose "Inspect" or "Inspect Element" to see what elements are made up of (you will see both the HTML and the CSS). You can also edit the HTML or CSS on-the-fly in the Elements or Styles panel that opens.

HTML Paragraphs

The HTML `<p>` element defines a **paragraph**:

```
<p>This is a paragraph.</p>
<p>This is another paragraph.</p>
```

Note: Browsers automatically add some white space (a margin) before and after a paragraph.

HTML Display

You cannot be sure how HTML will be displayed.

Large or small screens, and resized windows will create different results.

With HTML, you cannot change the output by adding extra spaces or extra lines in your HTML code.

The browser will remove any extra spaces and extra lines when the page is displayed:

```
<p>
This paragraph
contains a lot of lines
in the source code,
but the browser
ignores it.
</p>

<p>
This paragraph
contains         a lot of spaces
in the source         code,
but the        browser
ignores it.
</p>
```

Don't Forget the End Tag

Most browsers will display HTML correctly even if you forget the end tag:

```
<p>This is a paragraph.
<p>This is another paragraph.
```

The example above will work in most browsers, but do not rely on it.

Note: Dropping the end tag can produce unexpected results or errors.

HTML Line Breaks

The HTML `<br>` element defines a **line break**.

Use `<br>` if you want a line break (a new line) without starting a new paragraph:

```
<p>This is<br>a paragraph<br>with line breaks.</p>
```

The `<br>` tag is an empty tag, which means that it has no end tag.

The Poem Problem

This poem will display on a single line:

```
<p>
  My Bonnie lies over the ocean.

  My Bonnie lies over the sea.

  My Bonnie lies over the ocean.

  Oh, bring back my Bonnie to me.
</p>
```

The HTML <pre> Element

The HTML `<pre>` element defines preformatted text.

The text inside a `<pre>` element is displayed in a fixed-width font (usually Courier), and it preserves both spaces and line breaks:

```
<pre>
  My Bonnie lies over the ocean.

  My Bonnie lies over the sea.

  My Bonnie lies over the ocean.

  Oh, bring back my Bonnie to me.
</pre>
```

HTML Styles

The HTML Style Attribute

Setting the style of an HTML element, can be done with the `style` attribute.

The HTML `style` attribute has the following **syntax**:

```
<tagname style="property:value;">
```

The ***property*** is a CSS property. The ***value*** is a CSS value.

You will learn more about CSS later in this tutorial.

HTML Background Color

The `background-color` property defines the background color for an HTML element.

This example sets the background color for a page to powderblue:

```
<body style="background-color:powderblue;">

<h1>This is a heading</h1>
<p>This is a paragraph.</p>

</body>
```

HTML Text Color

The `color` property defines the text color for an HTML element:

```
<h1 style="color:blue;">This is a heading</h1>
<p style="color:red;">This is a paragraph.</p>
```

HTML Fonts

The `font-family` property defines the font to be used for an HTML element:

```
<h1 style="font-family:verdana;">This is a heading</h1>
<p style="font-family:courier;">This is a paragraph.</p>
```

HTML Text Size

The `font-size` property defines the text size for an HTML element:

```
<h1 style="font-size:300%;">This is a heading</h1>
<p style="font-size:160%;">This is a paragraph.</p>
```

HTML Text Alignment

The `text-align` property defines the horizontal text alignment for an HTML element:

```
<h1 style="text-align:center;">Centered Heading</h1>
<p style="text-align:center;">Centered paragraph.</p>
```

HTML Text Formatting

HTML Formatting Elements

In the previous chapter, you learned about the HTML **style attribute**.

HTML also defines special **elements** for defining text with a special **meaning**.

HTML uses elements like `<b>` and `<i>` for formatting output, like **bold** or *italic* text.

Formatting elements were designed to display special types of text:

- `<b>` - Bold text
- `<strong>` - Important text
- `<i>` - Italic text
- `<em>` - Emphasized text
- `<mark>` - Marked text
- `<small>` - Small text
- `<del>` - Deleted text
- `<ins>` - Inserted text
- `<sub>` - Subscript text
- `<sup>` - Superscript text

HTML <b> and Elements

The HTML `<b>` element defines **bold** text, without any extra importance.

```
<b>This text is bold</b>
```

The HTML `<strong>` element defines **strong** text, with added semantic "strong" importance.

```
<strong>This text is strong</strong>
```

HTML <i> and Elements

The HTML `<i>` element defines *italic* text, without any extra importance.

```
<i>This text is italic</i>
```

The HTML `<em>` element defines *emphasized* text, with added semantic importance.

```
<em>This text is emphasized</em>
```

Note: Browsers display `<strong>` as `<b>`, and `<em>` as `<i>`. However, there is a difference in the meaning of these tags: `<b>` and `<i>` defines bold and italic text, but `<strong>` and `<em>` means that the text is "important".

HTML <small> Element

The HTML `<small>` element defines smaller text:

```
<h2>HTML <small>Small</small> Formatting</h2>
```

HTML <mark> Element

The HTML `<mark>` element defines marked or highlighted text:

```
<h2>HTML <mark>Marked</mark> Formatting</h2>
```

HTML <del> Element

The HTML `<del>` element defines delete (removed) text.

```
<p>My favorite color is <del>blue</del> red.</p>
```

HTML <ins> Element

The HTML `<ins>` element defines inserted (added) text.

```
<p>My favorite <ins>color</ins> is red.</p>
```

HTML <sub> Element

The HTML `<sub>` element defines subscripted text.

```
<p>This is <sub>subscripted</sub> text.</p>
```

HTML <sup> Element

The HTML `<sup>` element defines superscripted text.

```
<p>This is <sup>superscripted</sup> text.</p>
```

HTML Quotation and Citation Elements

HTML <q> for Short Quotations

The HTML `<q>` element defines a short quotation.

Browsers usually insert quotation marks around the `<q>` element.

```
<p>WWF's goal is to: <q>Build a future where people live in harmony with nature.</q></p>
```

HTML <blockquote> for Quotations

The HTML `<blockquote>` element defines a section that is quoted from another source.

Browsers usually indent `<blockquote>` elements.

```
<p>Here is a quote from WWF's website:</p>
<blockquote cite="http://www.worldwildlife.org/who/index.html">
For 50 years, WWF has been protecting the future of nature.
The world's leading conservation organization,
WWF works in 100 countries and is supported by
1.2 million members in the United States and
close to 5 million globally.
</blockquote>
```

HTML <abbr> for Abbreviations

The HTML `<abbr>` element defines an abbreviation or an acronym.

Marking abbreviations can give useful information to browsers, translation systems and search-engines.

```
<p>The <abbr title="World Health Organization">WHO</abbr> was founded in 1948.</p>
```

HTML <address> for Contact Information

The HTML `<address>` element defines contact information (author/owner) of a document or an article.

The `<address>` element is usually displayed in italic. Most browsers will add a line break before and after the element.

```
<address>
Written by John Doe.<br>
Visit us at:<br>
Example.com<br>
Box 564, Disneyland<br>
USA
</address>
```

HTML <cite> for Work Title

The HTML `<cite>` element defines the title of a work.

Browsers usually display `<cite>` elements in italic.

```
<p><cite>The Scream</cite> by Edvard Munch. Painted in 1893.</p>
```

HTML <bdo> for Bi-Directional Override

The HTML `<bdo>` element defines bi-directional override.

The `<bdo>` element is used to override the current text direction:

```
<bdo dir="rtl">This text will be written from right to left</bdo>
```

HTML Comments

Comment tags are used to insert comments in the HTML source code.

HTML Comment Tags

You can add comments to your HTML source by using the following syntax:

```
<!-- Write your comments here -->
```

Notice that there is an exclamation point (!) in the opening tag, but not in the closing tag.

Note: Comments are not displayed by the browser, but they can help document your HTML source code.

With comments you can place notifications and reminders in your HTML:

```
<!-- This is a comment -->

<p>This is a paragraph.</p>

<!-- Remember to add more information here -->
```

Comments are also great for debugging HTML, because you can comment out HTML lines of code, one at a time, to search for errors:

```
<!-- Do not display this at the moment
<img border="0" src="pic_trulli.jpg" alt="Trulli">
-->
```

HTML Colors

HTML colors are specified using predefined color names, or RGB, HEX, HSL, RGBA, HSLA values.

Color Names

In HTML, a color can be specified by using a color name:

Tomato

Orange

DodgerBlue

MediumSeaGreen

Gray

SlateBlue

Violet

Background Color

You can set the background color for HTML elements:

```
<h1 style="background-color:DodgerBlue;">Hello World</h1>
<p style="background-color:Tomato;">Lorem ipsum...</p>
```

Text Color

You can set the color of text:

```
<h1 style="color:Tomato;">Hello World</h1>
<p style="color:DodgerBlue;">Lorem ipsum...</p>
<p style="color:MediumSeaGreen;">Ut wisi enim...</p>
```

Color Values

In HTML, colors can also be specified using RGB values, HEX values, HSL values, RGBA values, and HSLA values:

Same as color name "Tomato":

```
<h1 style="background-color:rgb(255, 99, 71);">...</h1>
<h1 style="background-color:#ff6347;">...</h1>
<h1 style="background-color:hsl(9, 100%, 64%);">...</h1>

<h1 style="background-color:rgba(255, 99, 71, 0.5);">...</h1>
<h1 style="background-color:hsla(9, 100%, 64%, 0.5);">...</h1>
```

RGB Value

In HTML, a color can be specified as an RGB value, using this formula:

rgb(*red, green, blue*)

Each parameter (red, green, and blue) defines the intensity of the color between 0 and 255.

For example, rgb(255, 0, 0) is displayed as red, because red is set to its highest value (255) and the others are set to 0.

To display the color black, all color parameters must be set to 0, like this: rgb(0, 0, 0).

To display the color white, all color parameters must be set to 255, like this: rgb(255, 255, 255).

HEX Value

In HTML, a color can be specified using a hexadecimal value in the form:

#rrggbb

Where rr (red), gg (green) and bb (blue) are hexadecimal values between 00 and ff (same as decimal 0-255).

For example, #ff0000 is displayed as red, because red is set to its highest value (ff) and the others are set to the lowest value (00).

HSL Value

In HTML, a color can be specified using hue, saturation, and lightness (HSL) in the form:

hsl(*hue, saturation, lightness*)

Hue is a degree on the color wheel from 0 to 360. 0 is red, 120 is green, and 240 is blue.

Saturation is a percentage value, 0% means a shade of gray, and 100% is the full color.

Lightness is also a percentage, 0% is black, 50% is neither light or dark, 100% is white

Saturation

Saturation can be described as the intensity of a color.

100% is pure color, no shades of gray

50% is 50% gray, but you can still see the color.

0% is completely gray, you can no longer see the color.

Lightness

The lightness of a color can be described as how much light you want to give the color, where 0% means no light (black), 50% means 50% light (neither dark nor light) 100% means full lightness (white).

RGBA Value

RGBA color values are an extension of RGB color values with an alpha channel - which specifies the opacity for a color.

An RGBA color value is specified with:

rgba(*red, green, blue, alpha*)

The alpha parameter is a number between 0.0 (fully transparent) and 1.0 (not transparent at all):

HSLA Value

HSLA color values are an extension of HSL color values with an alpha channel - which specifies the opacity for a color.

An HSLA color value is specified with:

hsla(*hue, saturation, lightness, alpha*)

The alpha parameter is a number between 0.0 (fully transparent) and 1.0 (not transparent at all):

HTML Styles - CSS

CSS stands for **C**ascading **S**tyle **S**heets.

CSS describes **how HTML elements are to be displayed on screen, paper, or in other media**.

CSS **saves a lot of work**. It can control the layout of multiple web pages all at once.

CSS can be added to HTML elements in 3 ways:

- **Inline** - by using the style attribute in HTML elements
- **Internal** - by using a `<style>` element in the `<head>` section
- **External** - by using an external CSS file

The most common way to add CSS, is to keep the styles in separate CSS files. However, here we will use inline and internal styling, because this is easier to demonstrate, and easier for you to try it yourself.

Inline CSS

An inline CSS is used to apply a unique style to a single HTML element.

An inline CSS uses the style attribute of an HTML element.

This example sets the text color of the `<h1>` element to blue:

```
<h1 style="color:blue;">This is a Blue Heading</h1>
```

Internal CSS

An internal CSS is used to define a style for a single HTML page.

An internal CSS is defined in the `<head>` section of an HTML page, within a `<style>` element:

```
<!DOCTYPE html>
<html>
<head>
<style>
body {background-color: powderblue;}
h1   {color: blue;}
p    {color: red;}
</style>
</head>
<body>

<h1>This is a heading</h1>
<p>This is a paragraph.</p>

</body>
</html>
```

External CSS

An external style sheet is used to define the style for many HTML pages.

With an external style sheet, you can change the look of an entire web site, by changing one file!

To use an external style sheet, add a link to it in the `<head>` section of the HTML page:

```
<!DOCTYPE html>
<html>
<head>
  <link rel="stylesheet" href="styles.css">
</head>
<body>

<h1>This is a heading</h1>
<p>This is a paragraph.</p>

</body>
</html>
```

An external style sheet can be written in any text editor. The file must not contain any HTML code, and must be saved with a .css extension.

Here is how the "styles.css" looks:

```
body {
  background-color: powderblue;
}
h1 {
  color: blue;
}
p {
  color: red;
}
```

CSS Fonts

The CSS `color` property defines the text color to be used.

The CSS `font-family` property defines the font to be used.

The CSS `font-size` property defines the text size to be used.

```
<!DOCTYPE html>
<html>
<head>
<style>
h1 {
  color: blue;
  font-family: verdana;
  font-size: 300%;
}
p  {
  color: red;
  font-family: courier;
  font-size: 160%;
}
</style>
</head>
<body>

<h1>This is a heading</h1>
<p>This is a paragraph.</p>

</body>
</html>
```

CSS Border

The CSS `border` property defines a border around an HTML element:

```
p {
  border: 1px solid powderblue;
}
```

CSS Padding

The CSS `padding` property defines a padding (space) between the text and the border:

```
p {
  border: 1px solid powderblue;
  padding: 30px;
}
```

CSS Margin

The CSS `margin` property defines a margin (space) outside the border:

```
p {
  border: 1px solid powderblue;
  margin: 50px;
}
```

The id Attribute

To define a specific style for one special element, add an `id` attribute to the element:

```
<p id="p01">I am different</p>
```

then define a style for the element with the specific id:

```
#p01 {
  color: blue;
}
```

The class Attribute

To define a style for special types of elements, add a `class` attribute to the element:

```
<p class="error">I am different</p>
```

then define a style for the elements with the specific class:

```
p.error {
  color: red;
}
```

HTML Links

Links are found in nearly all web pages. Links allow users to click their way from page to page.

HTML Links - Hyperlinks

HTML links are hyperlinks.

You can click on a link and jump to another document.

When you move the mouse over a link, the mouse arrow will turn into a little hand.

Note: A link does not have to be text. It can be an image or any other HTML element.

HTML Links - Syntax

In HTML, links are defined with the `<a>` tag:

```
<a href="url">link text</a>
```

```
<a href="https://www.html.com">Visit our HTML tutorial</a>
```

The `href` attribute specifies the destination address (https://www.html.com) of the link.

The **link text** is the visible part (Visit our HTML tutorial).

Clicking on the link text will send you to the specified address.

Note: Without a forward slash at the end of subfolder addresses, you might generate two requests to the server. Many servers will automatically add a forward slash to the end of the address, and then create a new request.

Local Links

The example above used an absolute URL (a full web address).

A local link (link to the same web site) is specified with a relative URL (without https://www....).

```
<a href="html_images.asp">HTML Images</a>
```

HTML Link Colors

By default, a link will appear like this (in all browsers):

- An unvisited link is underlined and blue
- A visited link is underlined and purple
- An active link is underlined and red

You can change the default colors, by using CSS:

```
<style>
a:link {
  color: green;
  background-color: transparent;
  text-decoration: none;
}

a:visited {
  color: pink;
  background-color: transparent;
  text-decoration: none;
}

a:hover {
  color: red;
  background-color: transparent;
  text-decoration: underline;
}

a:active {
  color: yellow;
  background-color: transparent;
  text-decoration: underline;
}
</style>
```

HTML Links - The target Attribute

The `target` attribute specifies where to open the linked document.

The target attribute can have one of the following values:

- _blank - Opens the linked document in a new window or tab
- _self - Opens the linked document in the same window/tab as it was clicked (this is default)
- _parent - Opens the linked document in the parent frame
- _top - Opens the linked document in the full body of the window
- *framename* - Opens the linked document in a named frame

HTML Links - The target Attribute

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- _parent - Opens the linked document in the parent frame
- _top - Opens the linked document in the full body of the window
- *framename* - Opens the linked document in a named frame

HTML Links - Create a Bookmark

HTML bookmarks are used to allow readers to jump to specific parts of a Web page.

Bookmarks can be useful if your webpage is very long.

To make a bookmark, you must first create the bookmark, and then add a link to it.

When the link is clicked, the page will scroll to the location with the bookmark.

Example

First, create a bookmark with the `id` attribute:

```
<h2 id="C4">Chapter 4</h2>
```

Then, add a link to the bookmark ("Jump to Chapter 4"), from within the same page:

```
<a href="#C4">Jump to Chapter 4</a>
```

Or, add a link to the bookmark ("Jump to Chapter 4"), from another page:

```
<a href="html_demo.html#C4">Jump to Chapter 4</a>
```

HTML Images

Images can improve the design and the appearance of a web page.

```
<img src="pic_trulli.jpg" alt="Italian Trulli">
```

HTML Images Syntax

In HTML, images are defined with the `<img>` tag.

The `<img>` tag is empty, it contains attributes only, and does not have a closing tag.

The `src` attribute specifies the URL (web address) of the image:

```
<img src="url">
```

The alt Attribute

The `alt` attribute provides an alternate text for an image, if the user for some reason cannot view it (because of slow connection, an error in the src attribute, or if the user uses a screen reader).

The value of the `alt` attribute should describe the image:

```
<img src="img_chania.jpg" alt="Flowers in Chania">
```

If a browser cannot find an image, it will display the value of the `alt` attribute:

```
<img src="wrongname.gif" alt="Flowers in Chania">
```

Image Size - Width and Height

You can use the `style` attribute to specify the width and height of an image.

```
<img src="img_girl.jpg" alt="Girl in a jacket" style="width:500px;height:600px;">
```

Alternatively, you can use the `width` and `height` attributes:

```
<img src="img_girl.jpg" alt="Girl in a jacket" width="500" height="600">
```

The `width` and `height` attributes always defines the width and height of the image in pixels.

Images in Another Folder

If not specified, the browser expects to find the image in the same folder as the web page.

However, it is common to store images in a sub-folder. You must then include the folder name in the `src` attribute:

```
<img src="/images/html5.gif" alt="HTML5 Icon" style="width:128px;height:128px;">
```

Image Maps

The `<map>` tag defines an image-map. An image-map is an image with clickable areas.

In the image below, click on the computer, the phone, or the cup of coffee:

```
<img src="workplace.jpg" alt="Workplace" usemap="#workmap">

<map name="workmap">
  <area shape="rect" coords="34,44,270,350" alt="Computer" href="computer.htm">
  <area shape="rect" coords="290,172,333,250" alt="Phone" href="phone.htm">
  <area shape="circle" coords="337,300,44" alt="Coffee" href="coffee.htm">
</map>
```

The `name` attribute of the `<map>` tag is associated with the `<img>`'s usemap attribute and creates a relationship between the image and the map.

The `<map>` element contains a number of `<area>` tags, that define the clickable areas in the image-map.

Background Image

To add a background image on an HTML element, use the CSS property `background-image`:

```
<body style="background-image:url('clouds.jpg')">

<h2>Background Image</h2>

</body>
```

The <picture> Element

HTML5 introduced the `<picture>` element to add more flexibility when specifying image resources.

The `<picture>` element contains a number of <source> elements, each referring to different image sources. This way the browser can choose the image that best fits the current view and/or device.

Each `<source>` element have attributes describing when their image is the most suitable.

The browser will use the first `<source>` element with matching attribute values, and ignore any following `<source>`elements.

```
<picture>
  <source media="(min-width: 650px)" srcset="img_pink_flowers.jpg">
  <source media="(min-width: 465px)" srcset="img_white_flower.jpg">
  <img src="img_orange_flowers.jpg" alt="Flowers" style="width:auto;">
</picture>
```

Note: Always specify an `<img>` element as the last child element of the `<picture>` element. The `<img>`element is used by browsers that do not support the `<picture>` element, or if none of the `<source>` tags matched.

HTML Tables

Defining an HTML Table

An HTML table is defined with the `<table>` tag.

Each table row is defined with the `<tr>` tag. A table header is defined with the `<th>` tag. By default, table headings are bold and centered. A table data/cell is defined with the `<td>` tag.

```
<table style="width:100%">
  <tr>
    <th>Firstname</th>
    <th>Lastname</th>
    <th>Age</th>
  </tr>
  <tr>
    <td>Jill</td>
    <td>Smith</td>
    <td>50</td>
  </tr>
  <tr>
    <td>Eve</td>
    <td>Jackson</td>
    <td>94</td>
  </tr>
</table>
```

HTML Table - Adding a Border

If you do not specify a border for the table, it will be displayed without borders.

A border is set using the CSS `border` property:

```
table, th, td {
  border: 1px solid black;
}
```

HTML Table - Collapsed Borders

If you want the borders to collapse into one border, add the CSS `border-collapse` property:

```
table, th, td {
  border: 1px solid black;
  border-collapse: collapse;
}
```

HTML Table - Adding Cell Padding

Cell padding specifies the space between the cell content and its borders.

If you do not specify a padding, the table cells will be displayed without padding.

To set the padding, use the CSS `padding` property:

```
th, td {
  padding: 15px;
}
```

HTML Table - Left-align Headings

By default, table headings are bold and centered.

To left-align the table headings, use the CSS `text-align` property:

```
th {
  text-align: left;
}
```

HTML Table - Adding Border Spacing

Border spacing specifies the space between the cells.

To set the border spacing for a table, use the CSS `border-spacing` property:

```
table {
  border-spacing: 5px;
}
```

HTML Table - Cells that Span Many Columns

To make a cell span more than one column, use the `colspan` attribute:

```
<table style="width:100%">
  <tr>
    <th>Name</th>
    <th colspan="2">Telephone</th>
  </tr>
  <tr>
    <td>Bill Gates</td>
    <td>55577854</td>
    <td>55577855</td>
  </tr>
</table>
```

HTML Table - Cells that Span Many Rows

To make a cell span more than one row, use the `rowspan` attribute:

```
<table style="width:100%">
  <tr>
    <th>Name:</th>
    <td>Bill Gates</td>
  </tr>
  <tr>
    <th rowspan="2">Telephone:</th>
    <td>55577854</td>
  </tr>
  <tr>
    <td>55577855</td>
  </tr>
</table>
```

HTML Table - Adding a Caption

To add a caption to a table, use the `<caption>` tag:

```
<table style="width:100%">
  <caption>Monthly savings</caption>
  <tr>
    <th>Month</th>
    <th>Savings</th>
  </tr>
  <tr>
    <td>January</td>
    <td>$100</td>
  </tr>
  <tr>
    <td>February</td>
    <td>$50</td>
  </tr>
</table>
```

A Special Style for One Table

To define a special style for a special table, add an `id` attribute to the table:

```
<table id="t01">
  <tr>
    <th>Firstname</th>
    <th>Lastname</th>
    <th>Age</th>
  </tr>
  <tr>
    <td>Eve</td>
    <td>Jackson</td>
    <td>94</td>
  </tr>
</table>
```

```
table#t01 {
  width: 100%;
  background-color: #f1f1c1;
}
```

HTML Lists

Unordered HTML List

An unordered list starts with the `<ul>` tag. Each list item starts with the `<li>` tag.

The list items will be marked with bullets (small black circles) by default:

```
<ul>
  <li>Coffee</li>
  <li>Tea</li>
  <li>Milk</li>
</ul>
```

Unordered HTML List - Choose List Item Marker

Value	Description
disc	Sets the list item marker to a bullet (default)
circle	Sets the list item marker to a circle
square	Sets the list item marker to a square
none	The list items will not be marked

Ordered HTML List

An ordered list starts with the `<ol>` tag. Each list item starts with the `<li>` tag.

The list items will be marked with numbers by default:

```
<ol>
  <li>Coffee</li>
  <li>Tea</li>
  <li>Milk</li>
</ol>
```

Ordered HTML List - The Type Attribute

The `type` attribute of the `<ol>` tag, defines the type of the list item marker:

Type	Description
type="1"	The list items will be numbered with numbers (default)
type="A"	The list items will be numbered with uppercase letters
type="a"	The list items will be numbered with lowercase letters
type="I"	The list items will be numbered with uppercase roman numbers
type="i"	The list items will be numbered with lowercase roman numbers

HTML Description Lists

HTML also supports description lists.

A description list is a list of terms, with a description of each term.

The `<dl>` tag defines the description list, the `<dt>` tag defines the term (name), and the `<dd>` tag describes each term:

```
<dl>
  <dt>Coffee</dt>
  <dd>- black hot drink</dd>
  <dt>Milk</dt>
  <dd>- white cold drink</dd>
</dl>
```

Nested HTML Lists

List can be nested (lists inside lists):

```
<ul>
  <li>Coffee</li>
  <li>Tea
    <ul>
      <li>Black tea</li>
      <li>Green tea</li>
    </ul>
  </li>
  <li>Milk</li>
</ul>
```

Control List Counting

By default, an ordered list will start counting from 1. If you want to start counting from a specified number, you can use the `start` attribute:

```
<ol start="50">
  <li>Coffee</li>
  <li>Tea</li>
  <li>Milk</li>
</ol>
```

HTML Block and Inline Elements

Every HTML element has a default display value depending on what type of element it is. The default display value for most elements is block or inline.

Block-level Elements

A block-level element always starts on a new line and takes up the full width available (stretches out to the left and right as far as it can).

```
<div>Hello</div>
<div>World</div>
```

Block level elements in HTML:

<address>	<article>	<aside>	<blockquote>	<canvas>	<dd>
	<dl>	<dt>	<fieldset>	<figcaption>	<figure>
<footer>	<form>	<h1>-<h6>	<header>	<hr>	
<main>	<nav>	<noscript>		<output>	<p>
<pre>	<section>	<table>	<tfoot>		<video>

Inline Elements

An inline element does not start on a new line and only takes up as much width as necessary.

```
<span>Hello</span>
<span>World</span>
```

Inline elements in HTML:

<a>	<abbr>	<acronym>	<b>	<bdo>	<big>
 	<button>	<cite>	<code>	<dfn>	
<i>	<img>	<input>	<kbd>	<label>	<map>
<object>	<q>	<samp>	<script>	<select>	<small>
		<sub>	<sup>	<textarea>	<time>
<tt>	<var>				

The Element

The `<div>` element is often used as a container for other HTML elements.

The `<div>` element has no required attributes, but `style`, `class` and `id` are common.

When used together with CSS, the `<div>` element can be used to style blocks of content:

Example

```
<div style="background-color:black;color:white;padding:20px;">
  <h2>London</h2>
  <p>London is the capital city of England. It is the most populous city in the United Kingdom,
with a metropolitan area of over 13 million inhabitants.</p>
</div>
```

The Element

The `<span>` element is often used as a container for some text.

The `<span>` element has no required attributes, but `style`, `class` and `id` are common.

When used together with CSS, the `<span>` element can be used to style parts of the text:

Example

```
<h1>My <span style="color:red">Important</span> Heading</h1>
```

Iframe Syntax

An HTML iframe is defined with the `<iframe>` tag:

```
<iframe src="URL"></iframe>
```

The `src` attribute specifies the URL (web address) of the inline frame page.

```
<iframe src="demo_iframe.htm" height="200" width="300"></iframe>
```

Try it Yourself »

Iframe - Remove the Border

By default, an iframe has a border around it.

To remove the border, add the `style` attribute and use the CSS `border` property:

```
<iframe src="demo_iframe.htm" style="border:none;"></iframe>
```

Iframe - Set Height and Width

Use the `height` and `width` attributes to specify the size of the iframe.

The attribute values are specified in pixels by default, but they can also be in percent (like "80%").

HTML File Paths

Path	Description
<img src="picture.jpg">	picture.jpg is located in the same folder as the current page
<img src="images/picture.jpg">	picture.jpg is located in the images folder in the current folder
<img src="/images/picture.jpg">	picture.jpg is located in the images folder at the root of the current web
<img src="../picture.jpg">	picture.jpg is located in the folder one level up from the current folder

HTML File Paths

A file path describes the location of a file in a web site's folder structure.

File paths are used when linking to external files like:

- Web pages
- Images
- Style sheets
- JavaScripts

Absolute File Paths

An absolute file path is the full URL to an internet file:

```
<img src="https://www.w3schools.com/images/picture.jpg" alt="Mountain">
```

Relative File Paths

A relative file path points to a file relative to the current page.

In this example, the file path points to a file in the images folder located at the root of the current web:

```
<img src="/images/picture.jpg" alt="Mountain">
```

In this example, the file path points to a file in the images folder located in the current folder:

In this example, the file path points to a file in the images folder located in the folder one level above the current folder:

```
<img src="../images/picture.jpg" alt="Mountain">
```

Best Practice

It is best practice to use relative file paths (if possible).

When using relative file paths, your web pages will not be bound to your current base URL. All links will work on your own computer (localhost) as well as on your current public domain and your future public domains.

HTML Head

The HTML <head> Element

The `<head>` element is a container for metadata (data about data) and is placed between the `<html>` tag and the `<body>` tag.

HTML metadata is data about the HTML document. Metadata is not displayed.

Metadata typically define the document title, character set, styles, links, scripts, and other meta information.

The following tags describe metadata: `<title>`, `<style>`, `<meta>`, `<link>`, `<script>`, and `<base>`.

The HTML <title> Element

The `<title>` element defines the title of the document, and is required in all HTML/XHTML documents.

The `<title>` element:

- defines a title in the browser tab
- provides a title for the page when it is added to favorites
- displays a title for the page in search engine results

A simple HTML document:

```
<html>

<head>
  <title>Page Title</title>
</head>

<body>
The content of the document......
</body>

</html>
```

The HTML <style> Element

The `<style>` element is used to define style information for a single HTML page:

```
<style>
  body {background-color: powderblue;}
  h1 {color: red;}
  p {color: blue;}
</style>
```

The HTML <link> Element

The `<link>` element is used to link to external style sheets:

```
<link rel="stylesheet" href="mystyle.css">
```

The HTML <meta> Element

The `<meta>` element is used to specify which character set is used, page description, keywords, author, and other metadata.

Metadata is used by browsers (how to display content), by search engines (keywords), and other web services.

Define the character set used:

```
<meta charset="UTF-8">
```

Define a description of your web page:

```
<meta name="description" content="Free Web tutorials">
```

Define keywords for search engines:

```
<meta name="keywords" content="HTML, CSS, XML, JavaScript">
```

Define the author of a page:

```
<meta name="author" content="John Doe">
```

Refresh document every 30 seconds:

```
<meta http-equiv="refresh" content="30">
```

Example of `<meta>` tags:

```
<meta charset="UTF-8">
<meta name="description" content="Free Web tutorials">
<meta name="keywords" content="HTML,CSS,XML,JavaScript">
<meta name="author" content="John Doe">
```

Setting The Viewport

HTML5 introduced a method to let web designers take control over the viewport, through the `<meta>` tag.

The viewport is the user's visible area of a web page. It varies with the device, and will be smaller on a mobile phone than on a computer screen.

You should include the following `<meta>` viewport element in all your web pages:

```
<meta name="viewport" content="width=device-width, initial-scale=1.0">
```

A `<meta>` viewport element gives the browser instructions on how to control the page's dimensions and scaling.

The width=device-width part sets the width of the page to follow the screen-width of the device (which will vary depending on the device).

The initial-scale=1.0 part sets the initial zoom level when the page is first loaded by the browser.

Here is an example of a web page *without* the viewport meta tag, and the same web page *with* the viewport `<meta>`tag:

The HTML <base> Element

The `<base>` element specifies the base URL and base target for all relative URLs in a page:

```
<base href="https://www.w3schools.com/images/" target="_blank">
```

Omitting <html>, <head> and <body>?

According to the HTML5 standard; the `<html>`, the `<body>`, and the `<head>` tag can be omitted.

The following code will validate as HTML5:

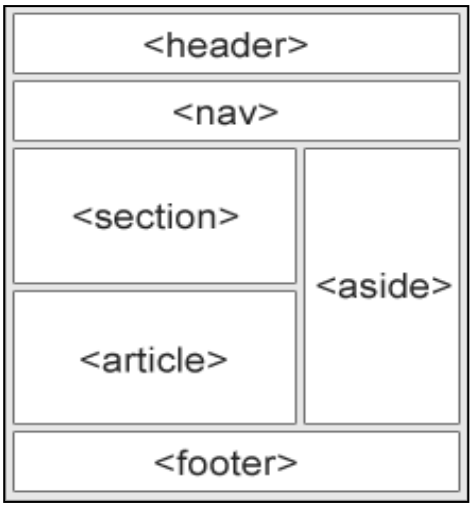
```
<title>Page Title</title>

<h1>This is a heading</h1>
<p>This is a paragraph.</p>
```

HTML Layouts

Websites often display content in multiple columns (like a magazine or newspaper).

HTML5 offers new semantic elements that define the different parts of a web page:

- <header> - Defines a header for a document or a section
- <nav> - Defines a container for navigation links
- <section> - Defines a section in a document
- <article> - Defines an independent self-contained article
- <aside> - Defines content aside from the content (like a sidebar)
- <footer> - Defines a footer for a document or a section
- <details> - Defines additional details
- <summary> - Defines a heading for the <details> element



HTML Layout Techniques

There are five different ways to create multicolumn layouts. Each way has its pros and cons:

- HTML tables (not recommended)
- CSS float property
- CSS flexbox
- CSS framework
- CSS grid

Which One to Choose?

HTML Tables

The <table> element was not designed to be a layout tool! The purpose of the <table> element is to display tabular data. So, do not use tables for your page layout! They will bring a mess into your code. And imagine how hard it will be to redesign your site after a couple of months.

CSS Grid View

The CSS Grid Layout Module offers a grid-based layout system, with rows and columns, making it easier to design web pages without having to use floats and positioning.

HTML Responsive Web Design

What is Responsive Web Design?

Responsive Web Design is about using HTML and CSS to automatically resize, hide, shrink, or enlarge, a website, to make it look good on all devices (desktops, tablets, and phones):

Note: A web page should look good on **any device**!

Setting The Viewport

When making responsive web pages, add the following `<meta>` element in all your web pages:

```
<meta name="viewport" content="width=device-width, initial-scale=1.0">
```

This will set the viewport of your page, which will give the browser instructions on how to control the page's dimensions and scaling.

HTML Computer Code Elements

```
<code>
x = 5;<br>
y = 6;<br>
z = x + y;
</code>
```

HTML <kbd> For Keyboard Input

The HTML `<kbd>` element represents user input, like keyboard input or voice commands.

Text surrounded by `<kbd>` tags is typically displayed in the browser's default monospace font:

```
<p>Save the document by pressing <kbd>Ctrl + S</kbd></p>
```

HTML <samp> For Program Output

The HTML <samp> element represents output from a program or computing system.

Text surrounded by <samp> tags is typically displayed in the browser's default monospace font:

```
<p>If you input wrong value, the program will return <samp>Error!</samp></p>
```

HTML <code> For Computer Code

The HTML `<code>` element defines a fragment of computer code.

Text surrounded by `<code>` tags is typically displayed in the browser's default monospace font:

```
<code>
x = 5;
y = 6;
z = x + y;
</code>
```

Notice that the `<code>` element does not preserve extra whitespace and line-breaks.

To fix this, you can put the `<code>` element inside a `<pre>` element:

```
<pre>
<code>
x = 5;
y = 6;
z = x + y;
</code>
</pre>
```

HTML <var> For Variables

The HTML `<var>` element defines a variable.

The variable could be a variable in a mathematical expression or a variable in programming context:

```
Einstein wrote: <var>E</var> = <var>mc</var><sup>2</sup>.
```

HTML Entities

Reserved characters in HTML must be replaced with character entities.

Characters that are not present on your keyboard can also be replaced by entities.

HTML Entities

Some characters are reserved in HTML.

If you use the less than (<) or greater than (>) signs in your text, the browser might mix them with tags.

Character entities are used to display reserved characters in HTML.

A character entity looks like this:

&*entity_name*;

OR

&#*entity_number*;

To display a less than sign (<) we must write: **<** or **<**

Advantage of using an entity name: An entity name is easy to remember.
Disadvantage of using an entity name: Browsers may not support all entity names, but the support for numbers is good.

Non-breaking Space

A common character entity used in HTML is the non-breaking space: ** **

A non-breaking space is a space that will not break into a new line.

Two words separated by a non-breaking space will stick together (not break into a new line). This is handy when breaking the words might be disruptive.

Examples:

- § 10
- 10 km/h
- 10 PM

Another common use of the non-breaking space is to prevent browsers from truncating spaces in HTML pages.

If you write 10 spaces in your text, the browser will remove 9 of them. To add real spaces to your text, you can use the ** ** character entity.

Some Other Useful HTML Character Entities

Result	Description	Entity Name	Entity Number
	non-breaking space		
<	less than	<	<
>	greater than	>	>
&	ampersand	&	&
"	double quotation mark	"	"
'	single quotation mark (apostrophe)	'	'
¢	cent	¢	¢
£	pound	£	£
¥	yen	¥	¥
€	euro	€	€
©	copyright	©	©
®	registered trademark	®	®

HTML Symbols

HTML Symbol Entities

HTML entities were described in the previous chapter.

Many mathematical, technical, and currency symbols, are not present on a normal keyboard.

To add such symbols to an HTML page, you can use an HTML entity name.

If no entity name exists, you can use an entity number, a decimal, or hexadecimal reference.

Example

```
<p>I will display &euro;</p>
<p>I will display &#8364;</p>
<p>I will display &#x20AC;</p>
```

HTML Encoding (Character Sets)

To display an HTML page correctly, a web browser must know which character set (character encoding) to use.

What is Character Encoding?

ASCII was the first **character encoding standard** (also called character set). ASCII defined 128 different alphanumeric characters that could be used on the internet: numbers (0-9), English letters (A-Z), and some special characters like ! $ + - ( ) @ < > .

ANSI (Windows-1252) was the original Windows character set, with support for 256 different character codes.

ISO-8859-1 was the default character set for HTML 4. This character set also supported 256 different character codes.

Because ANSI and ISO-8859-1 were so limited, HTML 4 also supported UTF-8.

UTF-8 (Unicode) covers almost all of the characters and symbols in the world.

The default character encoding for HTML5 is UTF-8.

The HTML charset Attribute

To display an HTML page correctly, a web browser must know the character set used in the page.

This is specified in the `<meta>` tag:

For HTML4:

```
<meta http-equiv="Content-Type" content="text/html;charset=ISO-8859-1">
```

For HTML5:

```
<meta charset="UTF-8">
```

The ASCII Character Set

ASCII uses the values from 0 to 31 (and 127) for control characters.

ASCII uses the values from 32 to 126 for letters, digits, and symbols.

ASCII does not use the values from 128 to 255.

The ANSI Character Set (Windows-1252)

ANSI is identical to ASCII for the values from 0 to 127.

ANSI has a proprietary set of characters for the values from 128 to 159.

ANSI is identical to UTF-8 for the values from 160 to 255.

The ISO-8859-1 Character Set

8859-1 is identical to ASCII for the values from 0 to 127.

8859-1 does not use the values from 128 to 159.

8859-1 is identical to UTF-8 for the values from 160 to 255.

The UTF-8 Character Set

UTF-8 is identical to ASCII for the values from 0 to 127.

UTF-8 does not use the values from 128 to 159.

UTF-8 is identical to both ANSI and 8859-1 for the values from 160 to 255.

UTF-8 continues from the value 256 with more than 10 000 different characters.

The @charset CSS Rule

You can use the CSS `@charset` rule to specify the character encoding used in a style sheet:

Example

Set the encoding of the style sheet to Unicode UTF-8:

```
@charset "UTF-8";
```

HTML Uniform Resource Locators

A URL is another word for a web address.

A URL can be composed of words (w3schools.com), or an Internet Protocol (IP) address (192.68.20.50).

Most people enter the name when surfing, because names are easier to remember than numbers.

Web browsers request pages from web servers by using a URL.

A Uniform Resource Locator (URL) is used to address a document (or other data) on the web.

A web address like https://www.w3schools.com/html/default.asp follows these syntax rules:

```
scheme://prefix.domain:port/path/filename
```

Explanation:

- **scheme** - defines the **type** of Internet service (most common is **http or https**)
- **prefix** - defines a domain **prefix** (default for http is **www**)
- **domain** - defines the Internet **domain name** (like w3schools.com)
- **port** - defines the **port number** at the host (default for http is **80**)
- **path** - defines a **path** at the server (If omitted: the root directory of the site)
- **filename** - defines the name of a document or resource

Common URL Schemes

The table below lists some common schemes:

Scheme	Short for	Used for
http	HyperText Transfer Protocol	Common web pages. Not encrypted
https	Secure HyperText Transfer Protocol	Secure web pages. Encrypted
ftp	File Transfer Protocol	Downloading or uploading files
file		A file on your computer

URL Encoding

URLs can only be sent over the Internet using the ASCII character-set. If a URL contains characters outside the ASCII set, the URL has to be converted.

URL encoding converts non-ASCII characters into a format that can be transmitted over the Internet.

URL encoding replaces non-ASCII characters with a "%" followed by hexadecimal digits.

URLs cannot contain spaces. URL encoding normally replaces a space with a plus (+) sign, or %20.

HTML and XHTML

XHTML is HTML written as XML.

What Is XHTML?

- XHTML stands for E**X**tensible **H**yper**T**ext **M**arkup **L**anguage
- XHTML is almost identical to HTML
- XHTML is stricter than HTML
- XHTML is HTML defined as an XML application
- XHTML is supported by all major browsers

Why XHTML?

Many pages on the internet contain "bad" HTML.

This HTML code works fine in most browsers (even if it does not follow the HTML rules):

```
<html>
<head>
  <title>This is bad HTML</title>

<body>
  <h1>Bad HTML
  <p>This is a paragraph
</body>
```

Today's market consists of different browser technologies. Some browsers run on computers, and some browsers run on mobile phones or other small devices. Smaller devices often lack the resources or power to interpret "bad" markup.

XML is a markup language where documents must be marked up correctly (be "well-formed").

XHTML was developed by combining the strengths of HTML and XML.

XHTML is HTML redesigned as XML.

The Most Important Differences from HTML:

Document Structure

- XHTML DOCTYPE is **mandatory**
- The xmlns attribute in <html> is **mandatory**
- <html>, <head>, <title>, and <body> are **mandatory**

XHTML Elements

- XHTML elements must be **properly nested**
- XHTML elements must always be **closed**
- XHTML elements must be in **lowercase**
- XHTML documents must have **one root element**

XHTML Attributes

- Attribute names must be in **lower case**
- Attribute values must be **quoted**
- Attribute minimization is **forbidden**

<!DOCTYPE ….> Is Mandatory

An XHTML document must have an XHTML DOCTYPE declaration.

The <html>, <head>, <title>, and <body> elements must also be present, and the xmlns attribute in <html> must specify the xml namespace for the document.

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">

<html xmlns="http://www.w3.org/1999/xhtml">

<head>
  <title>Title of document</title>
</head>

<body>
  some content
</body>

</html>
```

XHTML Elements Must Be Properly Nested

In HTML, some elements can be improperly nested within each other, like this:

```
<b><i>This text is bold and italic</b></i>
```

In XHTML, all elements must be properly nested within each other, like this:

```
<b><i>This text is bold and italic</i></b>
```

XHTML Elements Must Always Be Closed

This is wrong:

```
<p>This is a paragraph
<p>This is another paragraph
```

This is correct:

```
<p>This is a paragraph</p>
<p>This is another paragraph</p>
```

Empty Elements Must Also Be Closed

This is wrong:

```
A break: <br>
A horizontal rule: <hr>
An image: <img src="happy.gif" alt="Happy face">
```

This is correct:

```
A break: <br />
A horizontal rule: <hr />
An image: <img src="happy.gif" alt="Happy face" />
```

XHTML Elements Must Be In Lower Case

This is wrong:

```
<BODY>
<P>This is a paragraph</P>
</BODY>
```

This is correct:

```
<body>
<p>This is a paragraph</p>
</body>
```

XHTML Attribute Names Must Be In Lower Case

This is wrong:

```
<table WIDTH="100%">
```

This is correct:

```
<table width="100%">
```

Attribute Values Must Be Quoted

This is wrong:

```
<table width=100%>
```

This is correct:

```
<table width="100%">
```

Attribute Minimization Is Forbidden

Wrong:

```
<input type="checkbox" name="vehicle" value="car" checked />
```

Correct:

```
<input type="checkbox" name="vehicle" value="car" checked="checked" />
```

Wrong:

```
<input type="text" name="lastname" disabled />
```

Correct:

```
<input type="text" name="lastname" disabled="disabled" />
```

How to Convert from HTML to XHTML

1. Add an XHTML <!DOCTYPE> to the first line of every page
2. Add an xmlns attribute to the html element of every page
3. Change all element names to lowercase
4. Close all empty elements
5. Change all attribute names to lowercase
6. Quote all attribute values

HTML Forms

The <form> Element

The HTML `<form>` element defines a form that is used to collect user input:

```
<form>
.
form elements
.
</form>
```

An HTML form contains **form elements**.

Form elements are different types of input elements, like text fields, checkboxes, radio buttons, submit buttons, and more.

The <input> Element

The `<input>` element is the most important form element.

The `<input>` element can be displayed in several ways, depending on the **type** attribute.

Here are some examples:

Type	Description
<input type="text">	Defines a one-line text input field
<input type="radio">	Defines a radio button (for selecting one of many choices)
<input type="submit">	Defines a submit button (for submitting the form)

Text Input

`<input type="text">` defines a one-line input field for **text input**:

```
<form>
  First name:<br>
  <input type="text" name="firstname"><br>
  Last name:<br>
```

```
  <input type="text" name="lastname">
</form>
```

Radio Button Input

`<input type="radio">` defines a **radio button**.

Radio buttons let a user select ONE of a limited number of choices:

```
<form>
  <input type="radio" name="gender" value="male" checked> Male<br>
  <input type="radio" name="gender" value="female"> Female<br>
  <input type="radio" name="gender" value="other"> Other
</form>
```

The Submit Button

`<input type="submit">` defines a button for **submitting** the form data to a **form-handler**.

The form-handler is typically a server page with a script for processing input data.

The form-handler is specified in the form's **action** attribute:

```
<form action="/action_page.php">
  First name:<br>
  <input type="text" name="firstname" value="Mickey"><br>
  Last name:<br>
  <input type="text" name="lastname" value="Mouse"><br><br>
  <input type="submit" value="Submit">
</form>
```

The Action Attribute

The `action` attribute defines the action to be performed when the form is submitted.

Normally, the form data is sent to a web page on the server when the user clicks on the submit button.

In the example above, the form data is sent to a page on the server called "/action_page.php". This page contains a server-side script that handles the form data:

```
<form action="/action_page.php">
```

The Target Attribute

The `target` attribute specifies if the submitted result will open in a new browser tab, a frame, or in the current window.

The default value is "`_self`" which means the form will be submitted in the current window.

To make the form result open in a new browser tab, use the value "_blank":

```
<form action="/action_page.php" target="_blank">
```

The Method Attribute

The `method` attribute specifies the HTTP method (**GET** or **POST**) to be used when submitting the form data:

```
<form action="/action_page.php" method="get">
```

or:

```
<form action="/action_page.php" method="post">
```

When to Use GET?

The default method when submitting form data is GET.

However, when GET is used, the submitted form data will be **visible in the page address field**:

Notes on GET:

- Appends form-data into the URL in name/value pairs
- The length of a URL is limited (about 3000 characters)
- Never use GET to send sensitive data! (will be visible in the URL)
- Useful for form submissions where a user wants to bookmark the result
- GET is better for non-secure data, like query strings in Google

When to Use POST?

Always use POST if the form data contains sensitive or personal information. The POST method does not display the submitted form data in the page address field.

Notes on POST:

- POST has no size limitations, and can be used to send large amounts of data.
- Form submissions with POST cannot be bookmarked

The Name Attribute

Each input field must have a `name` attribute to be submitted.

If the `name` attribute is omitted, the data of that input field will not be sent at all.

This example will only submit the "Last name" input field:

```
<form action="/action_page.php">
  First name:<br>
  <input type="text" value="Mickey"><br>
```

```
  Last name:<br>
  <input type="text" name="lastname" value="Mouse"><br><br>
  <input type="submit" value="Submit">
</form>
```

Grouping Form Data with <fieldset>

The `<fieldset>` element is used to group related data in a form.

The `<legend>` element defines a caption for the `<fieldset>` element.

```
<form action="/action_page.php">
  <fieldset>
    <legend>Personal information:</legend>
    First name:<br>
    <input type="text" name="firstname" value="Mickey"><br>
    Last name:<br>
    <input type="text" name="lastname" value="Mouse"><br><br>
    <input type="submit" value="Submit">
  </fieldset>
</form>
```

HTML Form Elements

The <input> Element

The most important form element is the `<input>` element.

The `<input>` element can be displayed in several ways, depending on the `type` attribute.

```
<input name="firstname" type="text">
```

The <select> Element

The `<select>` element defines a **drop-down list**:

```
<select name="cars">
  <option value="volvo">Volvo</option>
  <option value="saab">Saab</option>
  <option value="fiat">Fiat</option>
  <option value="audi">Audi</option>
</select>
```

The `<option>` elements defines an option that can be selected.

By default, the first item in the drop-down list is selected.

To define a pre-selected option, add the `selected` attribute to the option:

```
<option value="fiat" selected>Fiat</option>
```

Visible Values:

Use the `size` attribute to specify the number of visible values:

```
<select name="cars" size="3">
  <option value="volvo">Volvo</option>
  <option value="saab">Saab</option>
  <option value="fiat">Fiat</option>
  <option value="audi">Audi</option>
</select>
```

Allow Multiple Selections:

Use the `multiple` attribute to allow the user to select more than one value:

```
<select name="cars" size="4" multiple>
  <option value="volvo">Volvo</option>
  <option value="saab">Saab</option>
  <option value="fiat">Fiat</option>
```

```
  <option value="audi">Audi</option>
</select>
```

The <textarea> Element

The `<textarea>` element defines a multi-line input field (**a text area**):

```
<textarea name="message" rows="10" cols="30">
The cat was playing in the garden.
</textarea>
```

The `rows` attribute specifies the visible number of lines in a text area.

The `cols` attribute specifies the visible width of a text area.

The <button> Element

The `<button>` element defines a clickable **button**:

```
<button type="button" onclick="alert('Hello World!')">Click Me!</button>
```

HTML5 Form Elements

HTML5 added the following form elements:

- `<datalist>`
- `<output>`

Note: Browsers do not display unknown elements. New elements that are not supported in older browsers will not "destroy" your web page.

HTML5 <datalist> Element

The `<datalist>` element specifies a list of pre-defined options for an `<input>` element.

Users will see a drop-down list of the pre-defined options as they input data.

The `list` attribute of the `<input>` element, must refer to the `id` attribute of the `<datalist>` element.

```
<form action="/action_page.php">
  <input list="browsers">
  <datalist id="browsers">
    <option value="Internet Explorer">
    <option value="Firefox">
    <option value="Chrome">
    <option value="Opera">
    <option value="Safari">
  </datalist>
</form>
```

HTML5 <output> Element

The `<output>` element represents the result of a calculation (like one performed by a script).

```
<form action="/action_page.php"
  oninput="x.value=parseInt(a.value)+parseInt(b.value)">
  0
  <input type="range"  id="a" name="a" value="50">
  100 +
  <input type="number" id="b" name="b" value="50">
  =
  <output name="x" for="a b"></output>
  <br><br>
  <input type="submit">
</form>
```

Input Type Password

`<input type="password">` defines a **password field**:

```
<form>
  User name:<br>
  <input type="text" name="username"><br>
  User password:<br>
  <input type="password" name="psw">
</form>
```

Input Type Submit

`<input type="submit">` defines a button for **submitting** form data to a **form-handler**.

The form-handler is typically a server page with a script for processing input data.

The form-handler is specified in the form's `action` attribute:

```
<form action="/action_page.php">
  First name:<br>
  <input type="text" name="firstname" value="Mickey"><br>
  Last name:<br>
  <input type="text" name="lastname" value="Mouse"><br><br>
  <input type="submit" value="Submit">
</form>
```

Input Type Reset

`<input type="reset">` defines a **reset button** that will reset all form values to their default values:

```
<form action="/action_page.php">
  First name:<br>
  <input type="text" name="firstname" value="Mickey"><br>
  Last name:<br>
  <input type="text" name="lastname" value="Mouse"><br><br>
  <input type="submit" value="Submit">
  <input type="reset">
</form>
```

Input Type Radio

`<input type="radio">` defines a **radio button**.

Radio buttons let a user select ONLY ONE of a limited number of choices:

```
<form>
  <input type="radio" name="gender" value="male" checked> Male<br>
  <input type="radio" name="gender" value="female"> Female<br>
  <input type="radio" name="gender" value="other"> Other
</form>
```

Input Type Checkbox

`<input type="checkbox">` defines a **checkbox**.

Checkboxes let a user select ZERO or MORE options of a limited number of choices.

```
<form>
  <input type="checkbox" name="vehicle1" value="Bike"> I have a bike<br>
  <input type="checkbox" name="vehicle2" value="Car"> I have a car
</form>
```

HTML5 Input Types

HTML5 added several new input types:

- color
- date
- datetime-local
- email
- month
- number
- range
- search
- tel
- time
- url

- week

Input Type Color

The `<input type="color">` is used for input fields that should contain a color.

Depending on browser support, a color picker can show up in the input field.

Example

```
<form>
  Select your favorite color:
  <input type="color" name="favcolor">
</form>
```

Input Type Date

The `<input type="date">` is used for input fields that should contain a date.

Depending on browser support, a date picker can show up in the input field.

Example

```
<form>
  Birthday:
  <input type="date" name="bday">
</form>
```

ou can also use the `min` and `max` attributes to add restrictions to dates:

Example

```
<form>
  Enter a date before 1980-01-01:
  <input type="date" name="bday" max="1979-12-31"><br>
  Enter a date after 2000-01-01:
  <input type="date" name="bday" min="2000-01-02"><br>
</form>
```

Input Type Datetime-local

The `<input type="datetime-local">` specifies a date and time input field, with no time zone.

Depending on browser support, a date picker can show up in the input field.

Example

```
<form>
  Birthday (date and time):
```

```
  <input type="datetime-local" name="bdaytime">
</form>
```

Input Type Email

The `<input type="email">` is used for input fields that should contain an e-mail address.

Depending on browser support, the e-mail address can be automatically validated when submitted.

Some smartphones recognize the email type, and adds ".com" to the keyboard to match email input.

Example

```
<form>
  E-mail:
  <input type="email" name="email">
</form>
```

Input Type File

The `<input type="file">` defines a file-select field and a "Browse" button for file uploads.

Example

```
<form>
  Select a file: <input type="file" name="myFile">
</form>
```

Input Type Month

The `<input type="month">` allows the user to select a month and year.

Depending on browser support, a date picker can show up in the input field.

Example

```
<form>
  Birthday (month and year):
  <input type="month" name="bdaymonth">
</form>
```

Input Type Number

The `<input type="number">` defines a **numeric** input field.

You can also set restrictions on what numbers are accepted.

The following example displays a numeric input field, where you can enter a value from 1 to 5:

```
<form>
  Quantity (between 1 and 5):
  <input type="number" name="quantity" min="1" max="5">
</form>
```

Input Restrictions

Here is a list of some common input restrictions (some are new in HTML5):

Attribute	Description
disabled	Specifies that an input field should be disabled
max	Specifies the maximum value for an input field
maxlength	Specifies the maximum number of character for an input field
min	Specifies the minimum value for an input field
pattern	Specifies a regular expression to check the input value against
readonly	Specifies that an input field is read only (cannot be changed)
required	Specifies that an input field is required (must be filled out)
size	Specifies the width (in characters) of an input field
step	Specifies the legal number intervals for an input field
value	Specifies the default value for an input field

The following example displays a numeric input field, where you can enter a value from 0 to 100, in steps of 10. The default value is 30:

```
<form>
  Quantity:
  <input type="number" name="points" min="0" max="100" step="10" value="30">
</form>
```

Input Type Range

The `<input type="range">` defines a control for entering a number whose exact value is not important (like a slider control). Default range is 0 to 100. However, you can set restrictions on what numbers are accepted with the `min`, `max`, and `step` attributes:

```
<form>
  <input type="range" name="points" min="0" max="10">
</form>
```

Input Type Search

The `<input type="search">` is used for search fields (a search field behaves like a regular text field).

```
<form>
  Search Google:
  <input type="search" name="googlesearch">
</form>
```

Input Type Tel

The `<input type="tel">` is used for input fields that should contain a telephone number.

Note: The tel type is currently only supported in Safari 8.

```
<form>
  Telephone:
  <input type="tel" name="usrtel">
</form>
```

Input Type Time

The `<input type="time">` allows the user to select a time (no time zone).

Depending on browser support, a time picker can show up in the input field.

```
<form>
  Select a time:
  <input type="time" name="usr_time">
</form>
```

Input Type Url

The `<input type="url">` is used for input fields that should contain a URL address.

Depending on browser support, the url field can be automatically validated when submitted.

Some smartphones recognize the url type, and adds ".com" to the keyboard to match url input.

```
<form>
  Add your homepage:
  <input type="url" name="homepage">
</form>
```

Input Type Week

The `<input type="week">` allows the user to select a week and year.

Depending on browser support, a date picker can show up in the input field.

```
<form>
  Select a week:
  <input type="week" name="week_year">
</form>
```

HTML Input Attributes

The value Attribute

The `value` attribute specifies the initial value for an input field:

Example

```
<form action="">
  First name:<br>
  <input type="text" name="firstname" value="John">
</form>
```

The readonly Attribute

The `readonly` attribute specifies that the input field is read only (cannot be changed):

Example

```
<form action="">
  First name:<br>
  <input type="text" name="firstname" value="John" readonly>
</form>
```

The disabled Attribute

The `disabled` attribute specifies that the input field is disabled.

A disabled input field is unusable and un-clickable, and its value will not be sent when submitting the form:

Example

```
<form action="">
  First name:<br>
  <input type="text" name="firstname" value="John" disabled>
</form>
```

The size Attribute

The `size` attribute specifies the size (in characters) for the input field:

Example

```
<form action="">
  First name:<br>
  <input type="text" name="firstname" value="John" size="40">
</form>
```

The maxlength Attribute

The `maxlength` attribute specifies the maximum allowed length for the input field:

Example

```
<form action="">
  First name:<br>
  <input type="text" name="firstname" maxlength="10">
</form>
```

With a `maxlength` attribute, the input field will not accept more than the allowed number of characters.

The `maxlength` attribute does not provide any feedback. If you want to alert the user, you must write JavaScript code.

HTML5 Attributes

HTML5 added the following attributes for `<input>`:

- autocomplete
- autofocus
- form
- formaction
- formenctype
- formmethod
- formnovalidate
- formtarget
- height and width
- list
- min and max
- multiple
- pattern (regexp)
- placeholder
- required
- step

and the following attributes for `<form>`:

- autocomplete
- novalidate

The autocomplete Attribute

The `autocomplete` attribute specifies whether a form or input field should have autocomplete on or off.

When autocomplete is on, the browser automatically completes the input values based on values that the user has entered before.

Tip: It is possible to have autocomplete "on" for the form, and "off" for specific input fields, or vice versa.

The `autocomplete` attribute works with `<form>` and the following `<input>` types: text, search, url, tel, email, password, datepickers, range, and color.

Example

An HTML form with autocomplete on (and off for one input field):

```
<form action="/action_page.php" autocomplete="on">
  First name:<input type="text" name="fname"><br>
  Last name: <input type="text" name="lname"><br>
  E-mail: <input type="email" name="email" autocomplete="off"><br>
  <input type="submit">
</form>
```

Tip: In some browsers you may need to activate the autocomplete function for this to work.

The novalidate Attribute

The `novalidate` attribute is a `<form>` attribute.

When present, novalidate specifies that the form data should not be validated when submitted.

Example

Indicates that the form is not to be validated on submit:

```
<form action="/action_page.php" novalidate>
  E-mail: <input type="email" name="user_email">
  <input type="submit">
</form>
```

The autofocus Attribute

The `autofocus` attribute specifies that the input field should automatically get focus when the page loads.

Example

Let the "First name" input field automatically get focus when the page loads:

```
First name:<input type="text" name="fname" autofocus>
```

The form Attribute

The `form` attribute specifies one or more forms an `<input>` element belongs to.

Tip: To refer to more than one form, use a space-separated list of form ids.

Example

An input field located outside the HTML form (but still a part of the form):

```
<form action="/action_page.php" id="form1">
  First name: <input type="text" name="fname"><br>
  <input type="submit" value="Submit">
</form>

Last name: <input type="text" name="lname" form="form1">
```

The formaction Attribute

The `formaction` attribute specifies the URL of a file that will process the input control when the form is submitted.

The formaction attribute overrides the action attribute of the `<form>` element.

The formaction attribute is used with `type="submit"` and `type="image"`.

Example

An HTML form with two submit buttons, with different actions:

```
<form action="/action_page.php">
  First name: <input type="text" name="fname"><br>
  Last name: <input type="text" name="lname"><br>
  <input type="submit" value="Submit"><br>
  <input type="submit" formaction="/action_page2.php"
  value="Submit as admin">
</form>
```

The formenctype Attribute

The `formenctype` attribute specifies how the form data should be encoded when submitted (only for forms with method="post").The `formenctype` attribute overrides the enctype attribute of the `<form>` element.
The `formenctype` attribute is used with `type="submit"` and `type="image"`.

Example

Send form-data that is default encoded (the first submit button), and encoded as "multipart/form-data" (the second submit button):

```
<form action="/action_page_binary.asp" method="post">
  First name: <input type="text" name="fname"><br>
  <input type="submit" value="Submit">
  <input type="submit" formenctype="multipart/form-data"
  value="Submit as Multipart/form-data">
</form>
```

The formmethod Attribute

The `formmethod` attribute defines the HTTP method for sending form-data to the action URL.

The `formmethod` attribute overrides the method attribute of the `<form>` element.

The `formmethod` attribute can be used with `type="submit"` and `type="image"`.

Example

The second submit button overrides the HTTP method of the form:

```
<form action="/action_page.php" method="get">
  First name: <input type="text" name="fname"><br>
  Last name: <input type="text" name="lname"><br>
  <input type="submit" value="Submit">
  <input type="submit" formmethod="post" value="Submit using POST">
</form>
```

The formnovalidate Attribute

The `formnovalidate` attribute overrides the novalidate attribute of the `<form>` element.

The `formnovalidate` attribute can be used with `type="submit"`.

Example

A form with two submit buttons (with and without validation):

```
<form action="/action_page.php">
  E-mail: <input type="email" name="userid"><br>
  <input type="submit" value="Submit"><br>
  <input type="submit" formnovalidate value="Submit without validation">
</form>
```

The formtarget Attribute

The `formtarget` attribute specifies a name or a keyword that indicates where to display the response that is received after submitting the form.

The `formtarget` attribute overrides the target attribute of the `<form>` element.

The `formtarget` attribute can be used with `type="submit"` and `type="image"`.

Example

A form with two submit buttons, with different target windows:

```
<form action="/action_page.php">
  First name: <input type="text" name="fname"><br>
  Last name: <input type="text" name="lname"><br>
  <input type="submit" value="Submit as normal">
  <input type="submit" formtarget="_blank"
  value="Submit to a new window">
</form>
```

The height and width Attributes

The `height` and `width` attributes specify the height and width of an `<input type="image">` element.

Always specify the size of images. If the browser does not know the size, the page will flicker while images load.

Example

Define an image as the submit button, with height and width attributes:

```
<input type="image" src="img_submit.gif" alt="Submit" width="48" height="48">
```

The list Attribute

The `list` attribute refers to a `<datalist>` element that contains pre-defined options for an <input> element.

Example

An <input> element with pre-defined values in a <datalist>:

```
<input list="browsers">

<datalist id="browsers">
  <option value="Internet Explorer">
  <option value="Firefox">
  <option value="Chrome">
  <option value="Opera">
  <option value="Safari">
</datalist>
```

The min and max Attributes

The `min` and `max` attributes specify the minimum and maximum values for an `<input>` element.

The `min` and `max` attributes work with the following input types: number, range, date, datetime-local, month, time and week.

Example

<input> elements with min and max values:

```
Enter a date before 1980-01-01:
<input type="date" name="bday" max="1979-12-31">

Enter a date after 2000-01-01:
<input type="date" name="bday" min="2000-01-02">

Quantity (between 1 and 5):
<input type="number" name="quantity" min="1" max="5">
```

The multiple Attribute

The `multiple` attribute specifies that the user is allowed to enter more than one value in the `<input>` element.

The `multiple` attribute works with the following input types: email, and file.

Example

A file upload field that accepts multiple values:

```
Select images: <input type="file" name="img" multiple>
```

The pattern Attribute

The `pattern` attribute specifies a regular expression that the `<input>` element's value is checked against.

The `pattern` attribute works with the following input types: text, search, url, tel, email, and password.

Tip: Use the global title attribute to describe the pattern to help the user.

Tip: Learn more about regular expressions in our JavaScript tutorial.

Example

An input field that can contain only three letters (no numbers or special characters):

```
Country code: <input type="text" name="country_code" pattern="[A-Za-z]{3}" title="Three letter
country code">
```

The placeholder Attribute

The `placeholder` attribute specifies a hint that describes the expected value of an input field (a sample value or a short description of the format).

The hint is displayed in the input field before the user enters a value.

The `placeholder` attribute works with the following input types: text, search, url, tel, email, and password.

Example

An input field with a placeholder text:

```
<input type="text" name="fname" placeholder="First name">
```

The required Attribute

The `required` attribute specifies that an input field must be filled out before submitting the form.

The `required` attribute works with the following input types: text, search, url, tel, email, password, date pickers, number, checkbox, radio, and file.

Example

A required input field:

```
Username: <input type="text" name="usrname" required>
```

The step Attribute

The `step` attribute specifies the legal number intervals for an `<input>` element.

Example: if step="3", legal numbers could be -3, 0, 3, 6, etc.

The `step` attribute works with the following input types: number, range, date, datetime-local, month, time and week.

Example

An input field with a specified legal number intervals:

```
<input type="number" name="points" step="3">
```

HTML5 Introduction

What is New in HTML5?

The DOCTYPE declaration for HTML5 is very simple:

```
<!DOCTYPE html>
```

The character encoding (charset) declaration is also very simple:

```
<meta charset="UTF-8">
```

HTML5 Example:

```
<!DOCTYPE html>
<html>
<head>
<meta charset="UTF-8">
<title>Title of the document</title>
</head>

<body>
Content of the document......
</body>

</html>
```

New HTML5 Elements

The most interesting new HTML5 elements are:

New **semantic elements** like `<header>`, `<footer>`, `<article>`, and `<section>`.

New **attributes of form elements** like number, date, time, calendar, and range.

New **graphic elements**: `<svg>` and `<canvas>`.

New **multimedia elements**: `<audio>` and `<video>`.

New HTML5 API's (Application Programming Interfaces)

The most interesting new API's in HTML5 are:

- HTML Geolocation
- HTML Drag and Drop
- HTML Local Storage
- HTML Application Cache
- HTML Web Workers
- HTML SSE

Removed Elements in HTML5

The following HTML4 elements have been removed in HTML5:

Removed Element	**Use Instead**
<acronym>	<abbr>
<applet>	<object>
<basefont>	CSS
<big>	CSS
	CSS
<dir>	
<font>	CSS
<frame>	
<frameset>	
<noframes>	
<strike>	CSS, <s>, or <del>

HTML History

Since the early days of the World Wide Web, there have been many versions of HTML:

Year	Version
1989	Tim Berners-Lee invented www
1991	Tim Berners-Lee invented HTML
1993	Dave Raggett drafted HTML+
1995	HTML Working Group defined HTML 2.0
1997	W3C Recommendation: HTML 3.2
1999	W3C Recommendation: HTML 4.01
2000	W3C Recommendation: XHTML 1.0
2008	WHATWG HTML5 First Public Draft
2012	WHATWG HTML5 Living Standard
2014	W3C Recommendation: HTML5
2016	W3C Candidate Recommendation: HTML 5.1

2017	W3C Recommendation: HTML5.1 2nd Edition
2017	W3C Recommendation: HTML5.2

From 1991 to 1999, HTML developed from version 1 to version 4.

In year 2000, the World Wide Web Consortium (W3C) recommended XHTML 1.0. The XHTML syntax was strict, and the developers were forced to write valid and "well-formed" code.

In 2004, W3C's decided to close down the development of HTML, in favor of XHTML.

In 2004, WHATWG (Web Hypertext Application Technology Working Group) was formed. The WHATWG wanted to develop HTML, consistent with how the web was used, while being backward compatible with older versions of HTML.

In 2004 - 2006, the WHATWG gained support by the major browser vendors.

In 2006, W3C announced that they would support WHATWG.

In 2008, the first HTML5 public draft was released.

In 2012, WHATWG and W3C decided on a separation:

WHATWG wanted to develop HTML as a "Living Standard". A living standard is always updated and improved. New features can be added, but old functionality cannot be removed.

The WHATWG HTML5 Living Standard was published in 2012, and is continuously updated.

W3C wanted to develop a definitive HTML5 and XHTML standard.

The W3C HTML5 Recommendation was released 28 October 2014.

The W3C HTML5.1 2nd Edition Recommendation was released 3 October 2017.

The W3C HTML5.2 Recommendation was released 14 December 2017.

HTML5 Browser Support

You can teach older browsers to handle HTML5 correctly.

HTML5 Browser Support

HTML5 is supported in all modern browsers.

In addition, all browsers, old and new, automatically handle unrecognized elements as inline elements.

Because of this, you can "teach" older browsers to handle "unknown" HTML elements.

Define Semantic Elements as Block Elements

HTML5 defines eight new **semantic** elements. All these are **block-level** elements.

To secure correct behavior in older browsers, you can set the CSS **display** property for these HTML elements to **block**:

```
header, section, footer, aside, nav, main, article, figure {
  display: block;
}
```

Add New Elements to HTML

You can also add new elements to an HTML page with a browser trick. This example adds a new element called `<myHero>` to an HTML page, and defines a style for it:

```
<!DOCTYPE html>
<html>
<head>
<script>document.createElement("myHero")</script>
<style>
myHero {
  display: block;
  background-color: #dddddd;
  padding: 50px;
  font-size: 30px;
}
</style>
</head>
<body>
<h1>A Heading</h1>
<myHero>My Hero Element</myHero>
</body>
</html>
```

HTML5 New Elements

New Elements in HTML5

Below is a list of the new HTML5 elements, and a description of what they are used for.

New Semantic/Structural Elements

HTML5 offers new elements for better document structure:

Tag	Description
<article>	Defines an article in a document
<aside>	Defines content aside from the page content
<bdi>	Isolates a part of text that might be formatted in a different direction from other text outside it
<details>	Defines additional details that the user can view or hide
<dialog>	Defines a dialog box or window
<figcaption>	Defines a caption for a <figure> element
<figure>	Defines self-contained content
<footer>	Defines a footer for a document or section

<header>	Defines a header for a document or section
<main>	Defines the main content of a document
<mark>	Defines marked/highlighted text
<meter>	Defines a scalar measurement within a known range (a gauge)
<nav>	Defines navigation links
<progress>	Represents the progress of a task
<rp>	Defines what to show in browsers that do not support ruby annotations
<rt>	Defines an explanation/pronunciation of characters (for East Asian typography)
<ruby>	Defines a ruby annotation (for East Asian typography)
<section>	Defines a section in a document
<summary>	Defines a visible heading for a <details> element
<time>	Defines a date/time
<wbr>	Defines a possible line-break

New Input Types

New Input Types	New Input Attributes
• color • date • datetime • datetime-local • email • month • number • range • search • tel • time • url • week	• autocomplete • autofocus • form • formaction • formenctype • formmethod • formnovalidate • formtarget • height and width • list • min and max • multiple • pattern (regexp) • placeholder • required • step

HTML5 - New Attribute Syntax

HTML5 allows four different syntaxes for attributes.

This example demonstrates the different syntaxes used in an `<input>` tag:

Type	Example
Empty	<input type="text" value="John" **disabled**>
Unquoted	<input type="text" **value=John**>
Double-quoted	<input type="text" **value="John Doe"**>
Single-quoted	<input type="text" **value='John Doe'**>

In HTML5, all four syntaxes may be used, depending on what is needed for the attribute.

HTML5 Semantic Elements

Semantics is the study of the meanings of words and phrases in a language.

Semantic elements = elements with a meaning.

What are Semantic Elements?

A semantic element clearly describes its meaning to both the browser and the developer.

Examples of **non-semantic** elements: `<div>` and `<span>` - Tells nothing about its content.

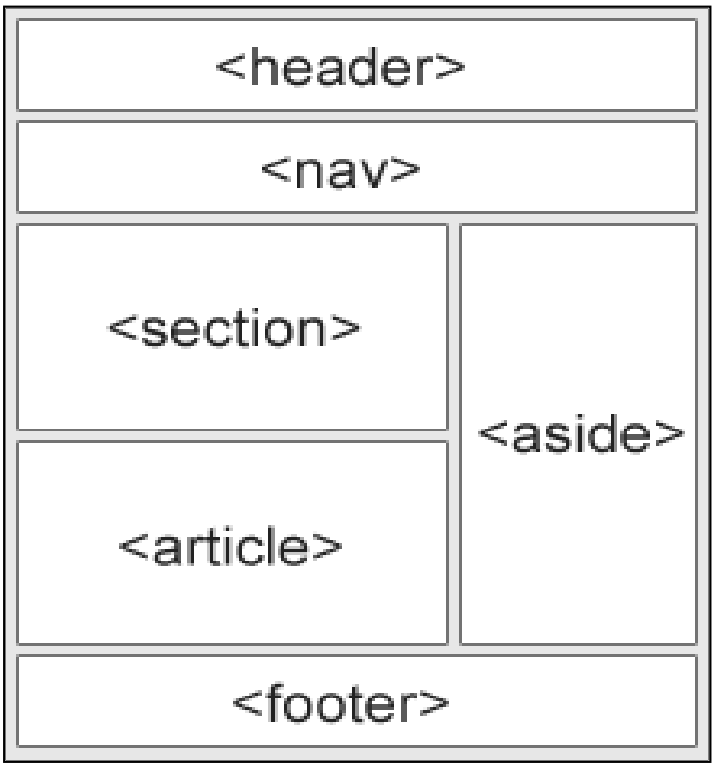
Examples of **semantic** elements: `<form>`, `<table>`, and `<article>` - Clearly defines its content.

New Semantic Elements in HTML5

Many web sites contain HTML code like: to indicate navigation, header, and footer.

HTML5 offers new semantic elements to define different parts of a web page:

- <article>
- <aside>
- <details>
- <figcaption>
- <figure>
- <footer>
- <header>
- <main>
- <mark>
- <nav>
- <section>
- <summary>
- <time>



HTML5 <section> Element

The `<section>` element defines a section in a document.

According to W3C's HTML5 documentation: "A section is a thematic grouping of content, typically with a heading."

A home page could normally be split into sections for introduction, content, and contact information.

Example

```
<section>
  <h1>WWF</h1>
  <p>The World Wide Fund for Nature (WWF) is....</p>
</section>
```

HTML5 <article> Element

The `<article>` element specifies independent, self-contained content.

An article should make sense on its own, and it should be possible to read it independently from the rest of the web site.

Examples of where an `<article>` element can be used:

- Forum post
- Blog post
- Newspaper article

Example

```
<article>
  <h1>What Does WWF Do?</h1>
  <p>WWF's mission is to stop the degradation of our planet's natural environment,
  and build a future in which humans live in harmony with nature.</p>
</article>
```

Nesting <article> in <section> or Vice Versa?

The`<article>` element specifies independent, self-contained content.

The `<section>` element defines section in a document.

Can we use the definitions to decide how to nest those elements? No, we cannot!

So, on the Internet, you will find HTML pages with `<section>` elements containing `<article>` elements, and `<article>` elements containing `<section>` elements.

You will also find pages with `<section>` elements containing `<section>` elements, and `<article>` elements containing `<article>` elements.

Example for a newspaper: The sport `<article>` in the sport **section**, may have a technical **section** in each `<article>`.

HTML5 <header> Element

The `<header>` element specifies a header for a document or section.

The `<header>` element should be used as a container for introductory content.

You can have several `<header>` elements in one document.

The following example defines a header for an article:

Example

```
<article>
  <header>
    <h1>What Does WWF Do?</h1>
    <p>WWF's mission:</p>
  </header>
  <p>WWF's mission is to stop the degradation of our planet's natural environment,
  and build a future in which humans live in harmony with nature.</p>
</article>
```

HTML5 <footer> Element

The `<footer>` element specifies a footer for a document or section.

A `<footer>` element should contain information about its containing element.

A footer typically contains the author of the document, copyright information, links to terms of use, contact information, etc.

You may have several `<footer>` elements in one document.

Example

```
<footer>
  <p>Posted by: Hege Refsnes</p>
  <p>Contact information: <a href="mailto:someone@example.com">
  someone@example.com</a>.</p>
</footer>
```

HTML5 <nav> Element

The `<nav>` element defines a set of navigation links.

Notice that NOT all links of a document should be inside a `<nav>` element. The `<nav>` element is intended only for major block of navigation links.

Example

```
<nav>
  <a href="/html/">HTML</a> |
  <a href="/css/">CSS</a> |
  <a href="/js/">JavaScript</a> |
  <a href="/jquery/">jQuery</a>
</nav>
```

HTML5 <aside> Element

The `<aside>` element defines some content aside from the content it is placed in (like a sidebar).

The `<aside>` content should be related to the surrounding content.

Example

```
<p>My family and I visited The Epcot center this summer.</p>

<aside>
  <h4>Epcot Center</h4>
  <p>The Epcot Center is a theme park in Disney World, Florida.</p>
</aside>
```

HTML5 <figure> and <figcaption> Elements

The purpose of a figure caption is to add a visual explanation to an image.

In HTML5, an image and a caption can be grouped together in a `<figure>` element:

Example

```
<figure>
  <img src="pic_trulli.jpg" alt="Trulli">
  <figcaption>Fig1. - Trulli, Puglia, Italy.</figcaption>
</figure>
```

The `<img>` element defines the image, the `<figcaption>` element defines the caption.

Why Semantic Elements?

With HTML4, developers used their own id/class names to style elements: header, top, bottom, footer, menu, navigation, main, container, content, article, sidebar, topnav, etc.

This made it impossible for search engines to identify the correct web page content.

With the new HTML5 elements (`<header> <footer> <nav> <section> <article>`), this will become easier.

According to the W3C, a Semantic Web: "Allows data to be shared and reused across applications, enterprises, and communities."

HTML5 Migration

Migration from HTML4 to HTML5

This chapter is entirely about how to **migrate** from **HTML4** to **HTML5**.

This chapter demonstrates how to convert an HTML4 page into an HTML5 page, without destroying anything of the original content or structure.

Typical HTML4	Typical HTML5
	<header>
	<nav>
	<section>
	<article>
	<footer>

HTML5 Style Guide and Coding Conventions

HTML Coding Conventions

Web developers are often uncertain about the coding style and syntax to use in HTML.

Between 2000 and 2010, many web developers converted from HTML to XHTML.

With XHTML, developers were forced to write valid and "well-formed" code.

HTML5 is a bit more sloppy when it comes to code validation.

Be Smart and Future Proof

A consistent use of style makes it easier for others to understand your HTML.

In the future, programs like XML readers may want to read your HTML.

Using a well-formed-"close to XHTML" syntax can be smart.

Always keep your code tidy, clean and well-formed.

Use Correct Document Type

Always declare the document type as the first line in your document:

```
<!DOCTYPE html>
```

If you want consistency with lower case tags, you can use:

```
<!doctype html>
```

Use Lower Case Element Names

HTML5 allows mixing uppercase and lowercase letters in element names.

We recommend using lowercase element names because:

- Mixing uppercase and lowercase names is bad
- Developers normally use lowercase names (as in XHTML)
- Lowercase look cleaner
- Lowercase are easier to write

Bad:

```
<SECTION>
  <p>This is a paragraph.</p>
</SECTION>
```

Very Bad:

```
<Section>
  <p>This is a paragraph.</p>
</SECTION>
```

Good:

```
<section>
  <p>This is a paragraph.</p>
</section>
```

Close All HTML Elements

In HTML5, you don't have to close all elements (for example the `<p>` element).

We recommend closing all HTML elements.

Bad:

```
<section>
  <p>This is a paragraph.
  <p>This is a paragraph.
</section>
```

Good:

```
<section>
  <p>This is a paragraph.</p>
  <p>This is a paragraph.</p>
</section>
```

Close Empty HTML Elements

In HTML5, it is optional to close empty elements.

Allowed:

```
<meta charset="utf-8">
```

Also Allowed:

```
<meta charset="utf-8" />
```

However, the closing slash (/) is REQUIRED in XHTML and XML.

If you expect XML software to access your page, it is a good idea to keep the closing slash!

Use Lower Case Attribute Names

HTML5 allows mixing uppercase and lowercase letters in attribute names.

We recommend using lowercase attribute names because:

- Mixing uppercase and lowercase names is bad
- Developers normally use lowercase names (as in XHTML)
- Lowercase look cleaner
- Lowercase are easier to write

Bad:

```
<div CLASS="menu">
```

Good:

```
<div class="menu">
```

Quote Attribute Values

HTML5 allows attribute values without quotes.

We recommend quoting attribute values because:

- Mixing uppercase and lowercase values is bad
- Quoted values are easier to read
- You MUST use quotes if the value contains spaces

Very bad:

This will not work, because the value contains spaces:

```
<table class=table striped>
```

Bad:

```
<table class=striped>
```

Good:

```
<table class="striped">
```

Image Attributes

Always add the `alt` attribute to images. This attribute is important when the image for some reason cannot be displayed. Also, always define image width and height. It reduces flickering because the browser can reserve space for the image before loading.

Bad:

```
<img src="html5.gif">
```

Good:

```
<img src="html5.gif" alt="HTML5" style="width:128px;height:128px">
```

Spaces and Equal Signs

HTML5 allows spaces around equal signs. But space-less is easier to read and groups entities better together.

Bad:

```
<link rel = "stylesheet" href = "styles.css">
```

Good:

```
<link rel="stylesheet" href="styles.css">
```

Avoid Long Code Lines

When using an HTML editor, it is inconvenient to scroll right and left to read the HTML code.

Try to avoid code lines longer than 80 characters.

Blank Lines and Indentation

Do not add blank lines without a reason.

For readability, add blank lines to separate large or logical code blocks.

For readability, add two spaces of indentation. Do not use the tab key.

Do not use unnecessary blank lines and indentation. It is not necessary to indent every element:

Unnecessary:

```
<body>

  <h1>Famous Cities</h1>

  <h2>Tokyo</h2>

  <p>
    Tokyo is the capital of Japan, the center of the Greater Tokyo Area,
    and the most populous metropolitan area in the world.
    It is the seat of the Japanese government and the Imperial Palace,
    and the home of the Japanese Imperial Family.
  </p>

</body>
```

Better:

```
<body>

<h1>Famous Cities</h1>

<h2>Tokyo</h2>
<p>Tokyo is the capital of Japan, the center of the Greater Tokyo Area,
and the most populous metropolitan area in the world.
It is the seat of the Japanese government and the Imperial Palace,
and the home of the Japanese Imperial Family.</p>
</body>
```

Table Example:

```
<table>
  <tr>
    <th>Name</th>
    <th>Description</th>
  </tr>
  <tr>
    <td>A</td>
    <td>Description of A</td>
  </tr>
  <tr>
    <td>B</td>
    <td>Description of B</td>
  </tr>
</table>
```

List Example:

```
<ul>
  <li>London</li>
  <li>Paris</li>
  <li>Tokyo</li>
</ul>
```

Omitting <html> and <body>?

In HTML5, the `<html>` tag and the `<body>` tag can be omitted.

The following code will validate as HTML5:

Example

```
<!DOCTYPE html>
<head>
  <title>Page Title</title>
</head>

<h1>This is a heading</h1>
<p>This is a paragraph.</p>
```

However, we do not recommend omitting the `<html>` and the `<body>` tag.

The `<html>` element is the document root. It is the recommended place for specifying the page language:

```
<!DOCTYPE html>
<html lang="en-US">
```

Declaring a language is important for accessibility applications (screen readers) and search engines.

Omitting `<html>` or `<body>` can crash DOM and XML software.

Omitting `<body>` can produce errors in older browsers (IE9).

Omitting <head>?

In HTML5, the <head> tag can also be omitted.

By default, browsers will add all elements before `<body>` to a default `<head>` element.

You can reduce the complexity of HTML by omitting the `<head>` tag:

Example

```
<!DOCTYPE html>
<html>
<title>Page Title</title>

<body>
  <h1>This is a heading</h1>
  <p>This is a paragraph.</p>
</body>

</html>
```

However, we do not recommend omitting the `<head>` tag.

Meta Data

The `<title>` element is required in HTML5. Make the title as meaningful as possible:

```
<title>HTML5 Syntax and Coding Style</title>
```

To ensure proper interpretation and correct search engine indexing, both the language and the character encoding should be defined as early as possible in a document:

```
<!DOCTYPE html>
<html lang="en-US">
<head>
  <meta charset="UTF-8">
  <title>HTML5 Syntax and Coding Style</title>
</head>
```

Setting The Viewport

HTML5 introduced a method to let web designers take control over the viewport, through the `<meta>` tag.

The viewport is the user's visible area of a web page. It varies with the device, and will be smaller on a mobile phone than on a computer screen.

You should include the following `<meta>` viewport element in all your web pages:

```
<meta name="viewport" content="width=device-width, initial-scale=1.0">
```

A `<meta>` viewport element gives the browser instructions on how to control the page's dimensions and scaling.

The width=device-width part sets the width of the page to follow the screen-width of the device (which will vary depending on the device).

The initial-scale=1.0 part sets the initial zoom level when the page is first loaded by the browser.

Here is an example of a web page *without* the viewport meta tag, and the same web page *with* the viewport meta tag:

HTML Comments

Short comments should be written on one line, like this:

```
<!-- This is a comment -->
```

Comments that spans more than one line, should be written like this:

```
<!--
  This is a long comment example. This is a long comment example.
  This is a long comment example. This is a long comment example.
-->
```

Long comments are easier to observe if they are indented two spaces.

Style Sheets

Use simple syntax for linking to style sheets (the type attribute is not necessary):

```
<link rel="stylesheet" href="styles.css">
```

Short rules can be written compressed, like this:

```
p.intro {font-family: Verdana; font-size: 16em;}
```

Long rules should be written over multiple lines:

```
body {
  background-color: lightgrey;
  font-family: "Arial Black", Helvetica, sans-serif;
  font-size: 16em;
  color: black;
}
```

- Place the opening bracket on the same line as the selector
- Use one space before the opening bracket
- Use two spaces of indentation
- Use semicolon after each property-value pair, including the last
- Only use quotes around values if the value contains spaces
- Place the closing bracket on a new line, without leading spaces
- Avoid lines over 80 characters

Use Lower Case File Names

Some web servers (Apache, Unix) are case sensitive about file names: "london.jpg" cannot be accessed as "London.jpg".

Other web servers (Microsoft, IIS) are not case sensitive: "london.jpg" can be accessed as "London.jpg" or "london.jpg".

If you use a mix of upper and lower case, you have to be extremely consistent.

If you move from a case insensitive to a case sensitive server, even small errors will break your web!

To avoid these problems, always use lower case file names.

File Extensions

HTML files should have a **.html** or **.htm** extension.

CSS files should have a **.css** extension.

JavaScript files should have a **.js** extension.

Differences Between .htm and .html

There is no difference between the .htm and .html extensions. Both will be treated as HTML by any web browser or web server.

The differences are cultural:

.htm "smells" of early DOS systems where the system limited the extensions to 3 characters.

.html "smells" of Unix operating systems that did not have this limitation.

Technical Differences

When a URL does not specify a filename (like https://www.w3schools.com/css/), the server returns a default filename. Common default filenames are index.html, index.htm, default.html and default.htm.

If your server is configured only with "index.html" as default filename, your file must be named "index.html", not "index.htm."

However, servers can be configured with more than one default filename, and normally you can set up as many default filenames as needed.

Anyway, the full extension for HTML files is .html, and there's no reason it should not be used.

HTML5 Canvas

The HTML `<canvas>` element is used to draw graphics on a web page.

The graphic to the left is created with `<canvas>`. It shows four elements: a red rectangle, a gradient rectangle, a multicolor rectangle, and a multicolor text.

What is HTML Canvas?

The HTML `<canvas>` element is used to draw graphics, on the fly, via JavaScript.

The `<canvas>` element is only a container for graphics. You must use JavaScript to actually draw the graphics.

Canvas has several methods for drawing paths, boxes, circles, text, and adding images.

HTML Canvas Can Draw Text

Canvas can draw colorful text, with or without animation.

HTML Canvas Can Draw Graphics

Canvas has great features for graphical data presentation with an imagery of graphs and charts.

HTML Canvas Can be Animated

Canvas objects can move. Everything is possible: from simple bouncing balls to complex animations.

HTML Canvas Can be Interactive

Canvas can respond to JavaScript events.

Canvas can respond to any user action (key clicks, mouse clicks, button clicks, finger movement).

HTML Canvas Can be Used in Games

Canvas' methods for animations, offer a lot of possibilities for HTML gaming applications.

HTML Canvas Drawing

Draw on the Canvas With JavaScript

All drawing on the HTML canvas must be done with JavaScript:

Example

```
<script>
var canvas = document.getElementById("myCanvas");
var ctx = canvas.getContext("2d");
ctx.fillStyle = "#FF0000";
ctx.fillRect(0, 0, 150, 75);
</script>
```

Step 1: Find the Canvas Element

First of all, you must find the <canvas> element.

This is done by using the HTML DOM method getElementById():

```
var canvas = document.getElementById("myCanvas");
```

Step 2: Create a Drawing Object

Secondly, you need a drawing object for the canvas.

The getContext() is a built-in HTML object, with properties and methods for drawing:

```
var ctx = canvas.getContext("2d");
```

Step 3: Draw on the Canvas

Finally, you can draw on the canvas.

Set the fill style of the drawing object to the color red:

```
ctx.fillStyle = "#FF0000";
```

The fillStyle property can be a CSS color, a gradient, or a pattern. The default fillStyle is black.

The fillRect(*x,y,width,height*) method draws a rectangle, filled with the fill style, on the canvas:

```
ctx.fillRect(0, 0, 150, 75);
```

HTML Canvas Coordinates

Canvas Coordinates

The HTML canvas is a two-dimensional grid.

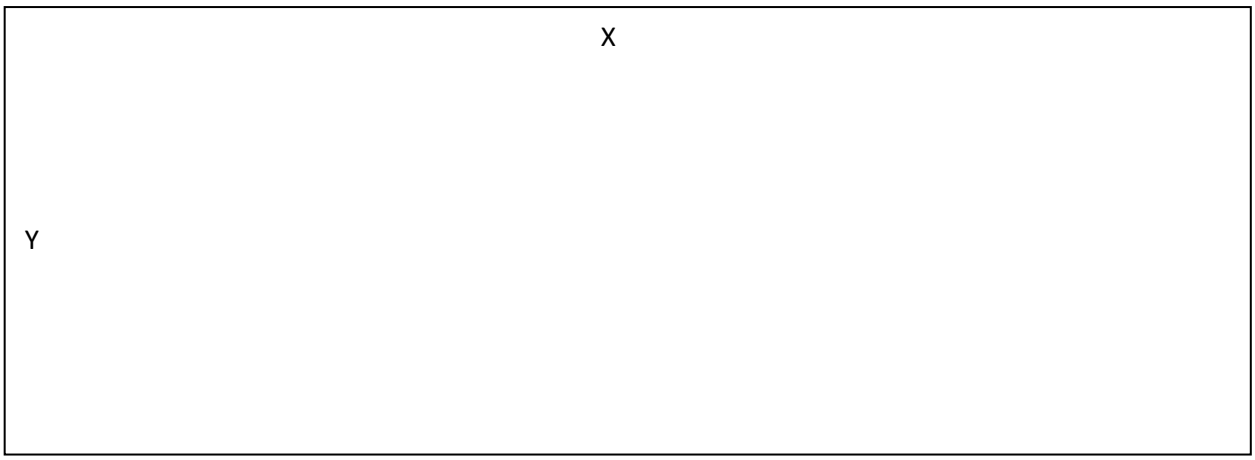
The upper-left corner of the canvas has the coordinates (0,0)

In the previous chapter, you saw this method used: fillRect(0,0,150,75).

This means: Start at the upper-left corner (0,0) and draw a 150x75 pixels rectangle.

Coordinates Example

Mouse over the rectangle below to see its x and y coordinates:



Draw a Line

To draw a straight line on a canvas, use the following methods:

- moveTo(*x,y*) - defines the starting point of the line
- lineTo(*x,y*) - defines the ending point of the line

To actually draw the line, you must use one of the "ink" methods, like stroke().

Draw a Circle

To draw a circle on a canvas, use the following methods:

- beginPath() - begins a path
- arc(x,y,r,startangle,endangle) - creates an arc/curve. To create a circle with arc(): Set start angle to 0 and end angle to 2*Math.PI. The x and y parameters define the x- and y-coordinates of the center of the circle. The r parameter defines the radius of the circle.

Drawing Text on the Canvas

To draw text on a canvas, the most important property and methods are:

- font - defines the font properties for the text
- fillText(*text,x,y*) - draws "filled" text on the canvas
- strokeText(*text,x,y*) - draws text on the canvas (no fill)

Using fillText()

Example

Set font to 30px "Arial" and write a filled text on the canvas:

```
var canvas = document.getElementById("myCanvas");
var ctx = canvas.getContext("2d");
ctx.font = "30px Arial";
ctx.fillText("Hello World", 10, 50);
```

Canvas Examples

A canvas is a rectangular area on an HTML page. By default, a canvas has no border and no content.

The markup looks like this:

```
<canvas id="myCanvas" width="200" height="100"></canvas>
```

Note: Always specify an `id` attribute (to be referred to in a script), and a `width` and `height` attribute to define the size of the canvas. To add a border, use the `style` attribute.

Here is an example of a basic, empty canvas:

Example

```
<canvas id="myCanvas" width="200" height="100" style="border:1px solid #000000;">
</canvas>
```

Draw a Line

```
var c = document.getElementById("myCanvas");
var ctx = c.getContext("2d");
ctx.moveTo(0, 0);
ctx.lineTo(200, 100);
ctx.stroke();
```

Draw a Circle

```
var c = document.getElementById("myCanvas");
var ctx = c.getContext("2d");
ctx.beginPath();
ctx.arc(95, 50, 40, 0, 2 * Math.PI);
ctx.stroke();
```

Draw a Text

```
var c = document.getElementById("myCanvas");
var ctx = c.getContext("2d");
ctx.font = "30px Arial";
ctx.fillText("Hello World", 10, 50);
```

Stroke Text

```
var c = document.getElementById("myCanvas");
var ctx = c.getContext("2d");
ctx.font = "30px Arial";
ctx.strokeText("Hello World", 10, 50);
```

Draw Linear Gradient

```
var c = document.getElementById("myCanvas");
var ctx = c.getContext("2d");

// Create gradient
var grd = ctx.createLinearGradient(0, 0, 200, 0);
grd.addColorStop(0, "red");
grd.addColorStop(1, "white");

// Fill with gradient
ctx.fillStyle = grd;
ctx.fillRect(10, 10, 150, 80);
```

Draw Circular Gradient

```
var c = document.getElementById("myCanvas");
var ctx = c.getContext("2d");
// Create gradient
var grd = ctx.createRadialGradient(75, 50, 5, 90, 60, 100);
grd.addColorStop(0, "red");
grd.addColorStop(1, "white");

// Fill with gradient
ctx.fillStyle = grd;
ctx.fillRect(10, 10, 150, 80);
```

Draw Image

```
var c = document.getElementById("myCanvas");
var ctx = c.getContext("2d");
var img = document.getElementById("scream");
ctx.drawImage(img, 10, 10);
```

HTML5 SVG

What is SVG?

- SVG stands for Scalable Vector Graphics
- SVG is used to define graphics for the Web
- SVG is a W3C recommendation

The HTML <svg> Element

The HTML `<svg>` element is a container for SVG graphics.

SVG has several methods for drawing paths, boxes, circles, text, and graphic images.

SVG Circle

```
<!DOCTYPE html>
<html>
<body>

<svg width="100" height="100">
  <circle cx="50" cy="50" r="40" stroke="green" stroke-width="4" fill="yellow" />
</svg>

</body>
</html>
```

SVG Rectangle

```
<svg width="400" height="100">
  <rect width="400" height="100" style="fill:rgb(0,0,255);stroke-
width:10;stroke:rgb(0,0,0)" />
</svg>
```

SVG Rounded Rectangle

```
<svg width="400" height="180">
  <rect x="50" y="20" rx="20" ry="20" width="150" height="150"
  style="fill:red;stroke:black;stroke-width:5;opacity:0.5" />
</svg>
```

SVG Star

```
<svg width="300" height="200">
  <polygon points="100,10 40,198 190,78 10,78 160,198"
  style="fill:lime;stroke:purple;stroke-width:5;fill-rule:evenodd;" />
</svg>
```

Differences Between SVG and Canvas

SVG is a language for describing 2D graphics in XML.

Canvas draws 2D graphics, on the fly (with a JavaScript).

SVG is XML based, which means that every element is available within the SVG DOM. You can attach JavaScript event handlers for an element.

In SVG, each drawn shape is remembered as an object. If attributes of an SVG object are changed, the browser can automatically re-render the shape.

Canvas is rendered pixel by pixel. In canvas, once the graphic is drawn, it is forgotten by the browser. If its position should be changed, the entire scene needs to be redrawn, including any objects that might have been covered by the graphic.