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COS10011/60004

Creating Web Applications

HTML Part 1

Everything in the Cloud

Desktop

- MS Office 2007, 2010, 2013
- Photoshop CS5, CS6
- Desktop Gaming
- Hard Disk Drive, Flash Drive, Solid State Drive
- Windows XP, Vista, 7, 8, 10

Web

- MS Office 365, Google Docs
- Photoshop Online
- Google Stadia, PlayStation Now, Assassin's Creed
- Google Drive, OneDrive, Dropbox
- Chrome OS

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Introduction to the Web

- The Web
- Clients and Servers
- Web Documents
- HTML

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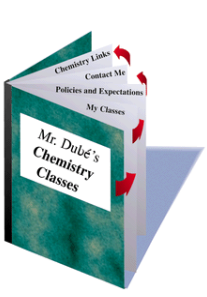
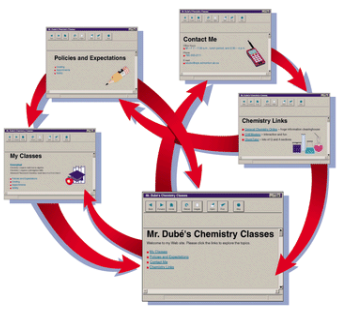
The Web – Its History

- In late 1990 and early 1991,Tim Berners-Lee created the **World Wide Web** at the European Laboratory for Particle Physics (CERN) in Geneva, Switzerland
- The original purpose of the World Wide Web (WWW) was to provide easy access to cross-referenced documents that existed on the CERN computer network
- Hypertext allows you to quickly link to and open other pages/resources.
- HTML for marking up docs as hypertext
- HTTP for transferring HTML docs over the Internet



Reading a linear document



Reading a hypertext document

More on this later…

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The Web – What is it now?

- The Web has evolved into much more than a set of hyperlinked passive documents read by humans

→ "Web 2.0"

- ☐ Dynamic, Location aware, Mobile
- ☐ Big Data, Searchable, Programmable
- ☐ User generated content

→ "Web 3.0"

- ☐ Artificial intelligence
- ☐ Semantic web
- ☐ Ubiquitous

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The Web – Its Consortium

The **World Wide Web Consortium** (**W3C**), is a group of Web developers, programmers, authors, formed in 1994.

- Purpose of the W3C is to lead, create and recommend **standards** that everyone can use to help bring the web "to its full potential".
- The W3C has no enforcement power, however the recommendations of the W3C are usually followed since a uniform approach is in the best interest of everyone.
- The Web is based on the HTTP internet application protocol
- The standards they recommend cover many web areas and include: HTML, CSS, XML, RDF, SVG, SMIL, PNG and more!

See http://www.w3.org *(Note: there is no "c" like w3c)*

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Example - HTML

```
<!DOCTYPE html>
<html lang="en">
  <head>
      <meta charset="utf-8" />
      <meta name="description" content="cat"/>
     <meta name="keywords" content="cat, cute"/>
     <meta name="author"   content="C. DeVille" />
     <title> My Cat </title>
</head>
 <body>
    <h1>
          My Cat
    </h1>
    <img src="cat.png" alt="My Cat" />
</body>
 </html>
```

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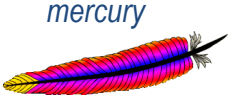
Clients and Servers

- **Web Clients / Browsers** (or user agents)
  - ☐ Manage and make HTTP requests
  - ☐ Receive HTTP responses
  - ☐ Interpret and render/display completed Web Documents

We will use **Mozilla Firefox**

- **Web Servers (HTTP Servers)**
  - ☐ Receive HTTP requests
  - ☐ Retrieve Web Documents
  - ☐ Manage and make HTTP responses

We use **Apache HTTP server** running on a host called *mercury*



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Web Browsers

- Web Browser software is available for most platforms.
- The appearance of a Web page may differ between browsers.
- Commonly used Web Browsers:

Microsoft **Internet Explorer**

Mozilla **Firefox**

Apple **Safari**

Google **Chrome**

Opera

… and many others …
http://en.wikipedia.org/wiki/List_of_web_browsers

Comparison of Web Browsers : See
http://en.wikipedia.org/wiki/Comparison_of_web_browsers

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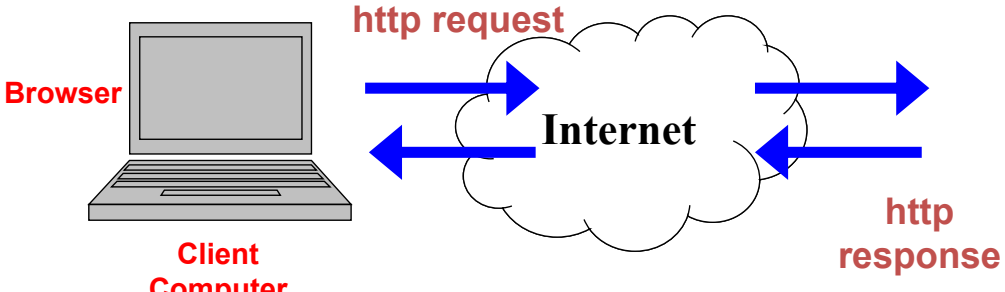
Web Browsers

- Web browser:
  - **Software application** that **lays out** or **renders mark-up**: displaying text, images, and other information typically located in a Web page.
  - **Users interact** with the Web browser, *requesting web pages by URL*, clicking on hyperlinks or *submitting forms* within the Web page.
  - Web pages are usually located on a **Web Server** on the Internet, but can be located on the local computer, or on a local area network.
  - Web browsers format and send HTTP requests, and receive, analyse and layout or render HTTP responses.



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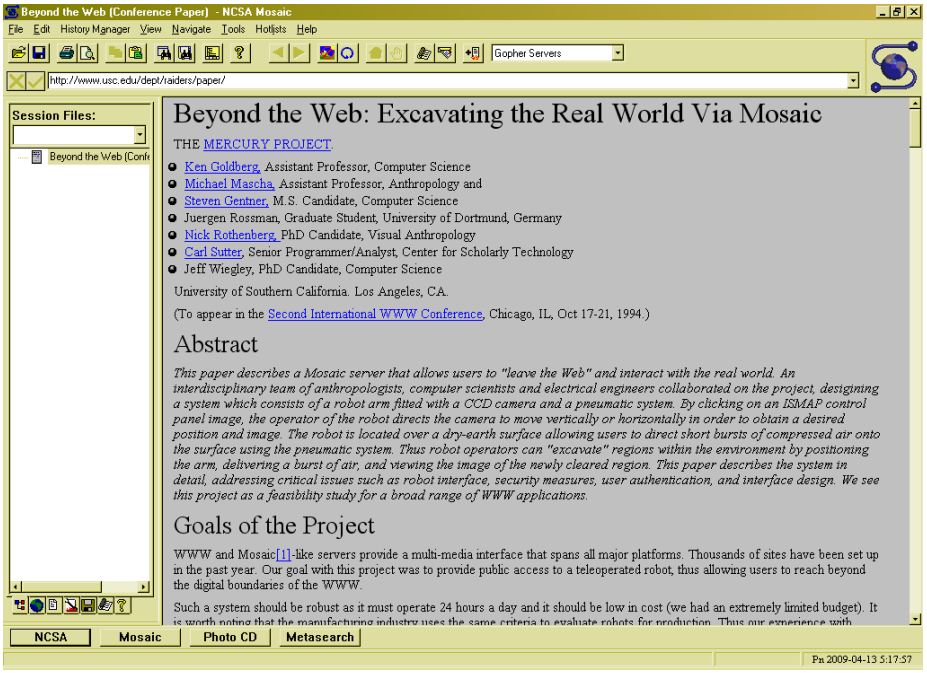
Web Browsers - 1994



- https://en.wikipedia.org/wiki/Mosaic_(web_browser)

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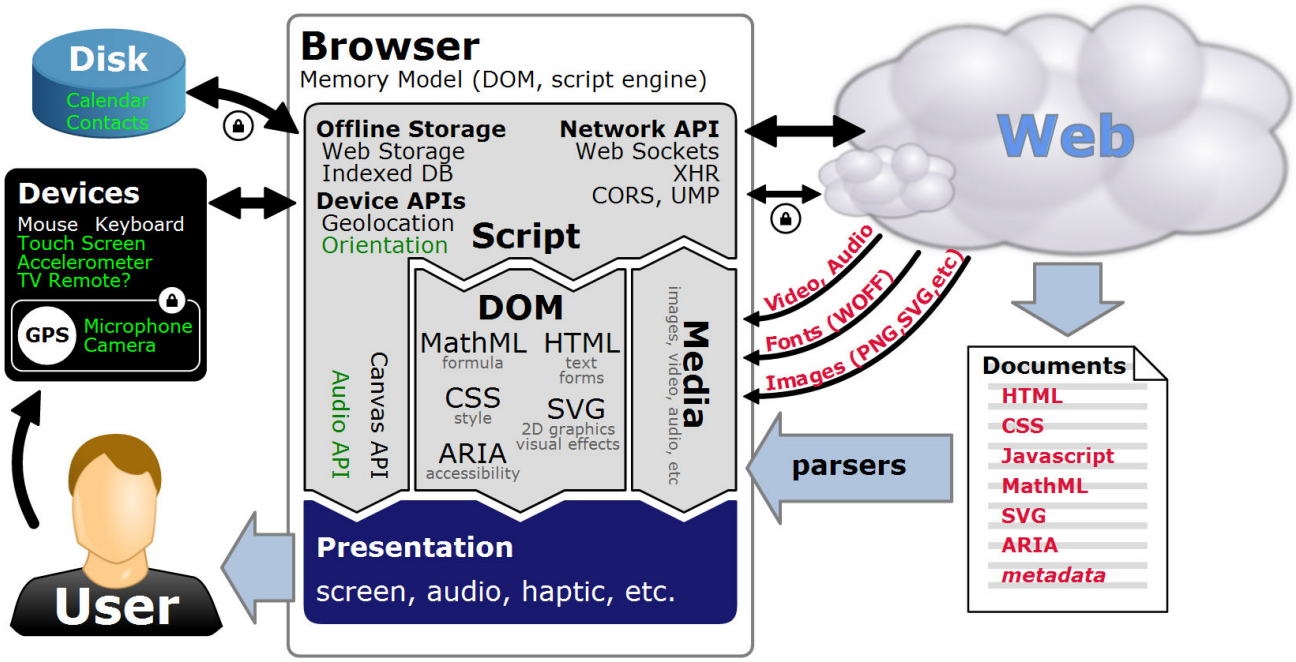
Web Browser Technology – Now



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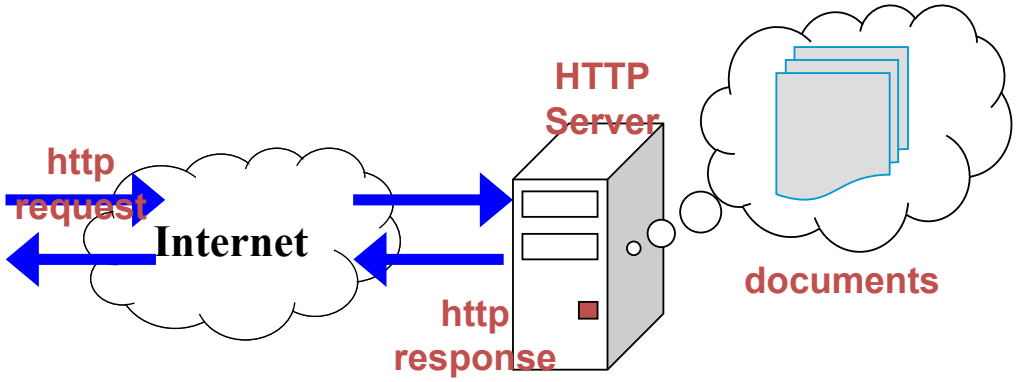
Web Server Features

- A Web server is made up of several components:
  - A **computer** with an **Internet connection** and **operating system**.
    - The server program usually ***runs continuously***.
  - **Web server software** to receive and respond to HTTP requests.
    - Handles ***multiple requests***
  - **Information**: a collection of documents to be served.
    - Careful ***access control*** to server content should be a feature



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Web Servers & Scripting

- Servers can support a ***variety of executable scripts*** so that if a particular URL is requested, the server executes the script and then returns its output to the browser.
- Examples of this concept:
  - Built-in interpreters for ***embedded scripting*** – ASP, PHP, Perl, etc
  - Standard CGI scripts
  - Server-side includes (SSI)
  - Database interfaces
  - Integrated development environments (IDE)

... More about CGI, SSI, embedded scripting, later ...

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Documents of the Web
HTML (and Others)

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Web Documents

Web Pages (Web documents) are text files with

- ***HyperText Markup Language (HTML)*** or ***Extensible HyperText Markup Language (XHTML)*** used to mark-up page ***structure*** and ***content***
- ***Cascading Style Sheets (CSS)*** **applied** to HTML mark-up page ***presentation***
- ***Images / graphics*** and other ***media***, added to provide ***visual content*** and to ***enrich*** web pages
- ***JavaScript*** (for client-side scripting) to ***enhance*** web user ***interaction***.

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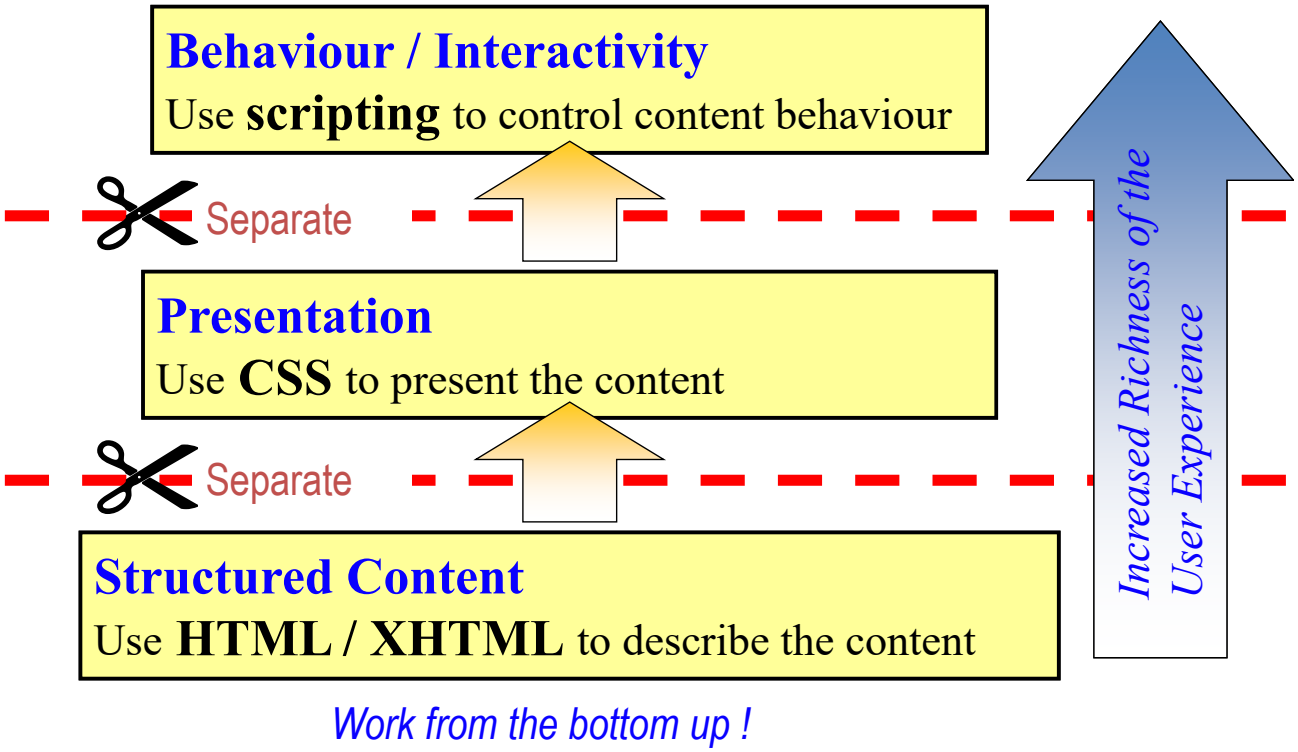
Build your webpages using the correct tools



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HTML Documents

- **HTML Structure and elements**
  - HTML and XML elements
  - HTML Head (meta information) and body (content)
- **HTML Head elements**
  - Meta tags
  - Title
- **HTML Body elements (page content)**
  - Headings and Paragraph
  - Phrase tags and Special Characters
  - Lists and Table
  - Image and Anchor
  - … (more next week) Attributes and Form Elements
- HTML Structure

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- **HTML Structure**

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First HTML5 Example

```
<!DOCTYPE html >
<html lang="en" >
<head>
  <meta charset="utf-8" />
  <title>First HTML Example</title>
</head>
<body>
  <h1>Welcome to HTML!</h1>
  <hr />
  <p>HTML is <em>really</em> easy. It is just simple text with
   <strong>meaning</strong>.</p>
  <p>In fact, we can just keep adding text and keep typing and adding
  more characters and more typing and just go on and on.</p>
</body>
</html>
```

doctype standard

Character encoding

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HTML5 Compliance

- Browsers will make a “best effort” to render a file even if it is not HTML!

→ *You can’t judge the quality of a page just by looking at what a particular browser manages to display (or not).*

- W3C provides a tool to check that checks compliance to the standard https://validator.w3.org/nu/
- Developer tools also enable some checking
  - ☐ e.g View source in Firefox; Web Dev toolbar; …
  - ☐ Set the Web Dev Toolbar extension to https://checker.html5.org/?doc=

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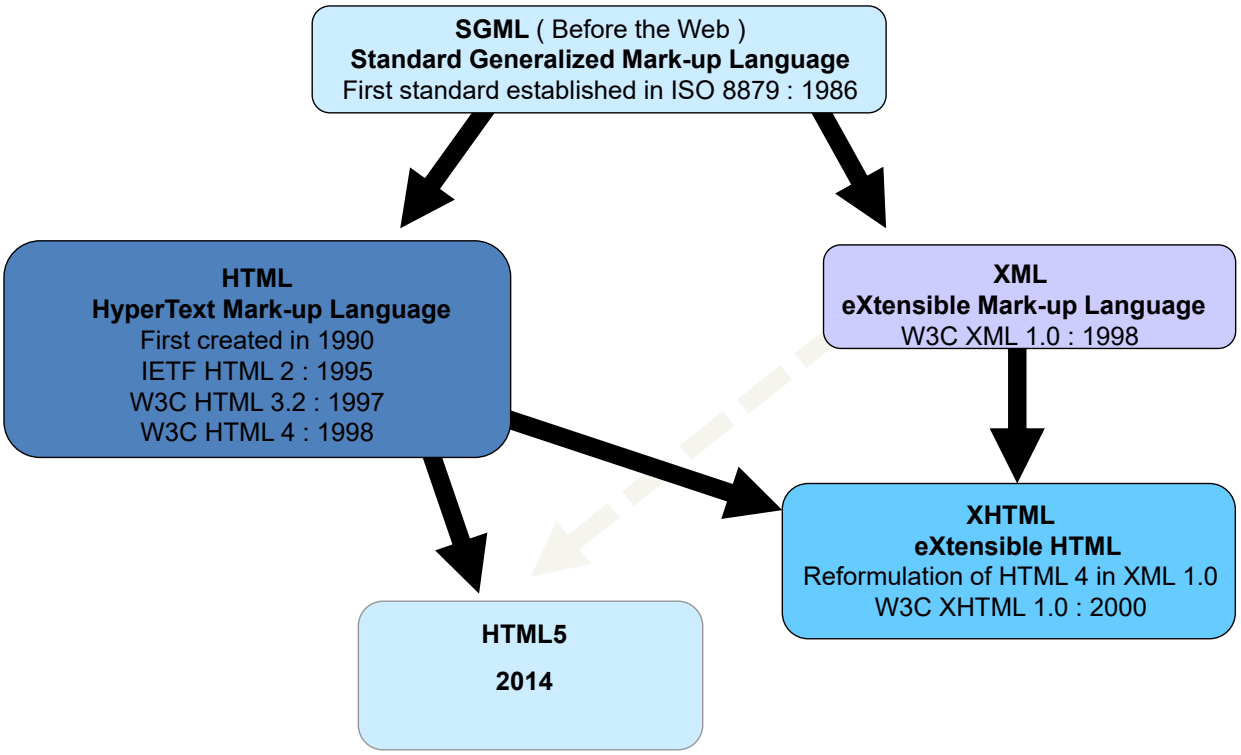
Mark-up Languages and the Web



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XML – eXtensible Markup Language

- XML widely used for marking up ***any structured data,*** is
  - Human readable / Machine understandable
  - Device-independent and application-independent
  - Plain text
- XML is hierarchy of data elements:
  - A "**parent**" element contains the "**children**" elements
  - Children elements of the same parent element are called "**siblings**"

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XML – Simple structured data

Any structured data can be marked up with XML:

Document type

Element start tag

Element attribute

Element content

Element end tag

```
<?xml version="1.0" encoding="utf-8"?>
<booklist>
    <book stock_level="5" >
        <name> ... </name>
        <author> ... </author>
        <publisher> ... </publisher>
        <ISBN> ... </ISBN>
        <date> ... </date>
    </book>
    <book>
        ...
    </book>
</booklist>
```

Element must be:

- **Nested (no overlapping tags)**
- **Closed**

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HTML and XML

- HTML is closely related to XML. The data elements ("markup") represent content on a Web page.
- Why make HTML5 well-formed XML sometimes?
  - the document tree is well-formed, and the webpage can be tested for well-formed-ness.
  - the webpage can be easily be parsed and read by a program, and hence website 'knowledge' dataset can be created, and webpages can be transformed into other electronic formats (print, ereader, etc.)
  - other XML mark-ups (MathML, SVG, Maps, etc.) can be embedded seamlessly. Thus more powerful / complex web apps are possible. SVG is now widely used in printed publication layout.

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First HTML5 Example as XML

```
<!DOCTYPE html >
<html lang="en" >
<head>
  <meta charset="utf-8" />
  <title>First HTML Example</title>
</head>
<body>
  <h1>Welcome to HTML!</h1>
  <hr />
  <p>HTML is <em>really</em> easy. It is just simple text with
   <strong>meaning</strong>.</p>
  <p>In fact, we can just keep adding text and keep typing and adding
  more characters and more typing and just go on and on.</p>
</body>
</html>
```

Is this XML?

Void element: HTML5 will also accept <hr> but it is not XML!

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Checking HTML is well-formed XML

- Change the extension of the files to .xml
  – does it display in the browser?
- Change the mime type from `text/html` to `application/xhtml+xml` by setting the namespace attribute of the <html> tag to

```
<html xmlns="http://www.w3.org/1999/xhtml"
xml:lang="en" lang="en">
```


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HTML: Syntax References

Syntax references:

http://www.w3.org/

The W3C HTML Standards / References

http://reference.sitepoint.com/

HTML Tutorials / References

http://www.htmlhelp.com/

HTML References

http://www.w3schools.com/

HTML Tutorials / References

See also: ***Web Links on Canvas***

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HTML: Document Structure

- ***The structure of HTML documents is defined by the nesting of HTML elements to form a hierarchy:***

```
<!DOCTYPE html>
<html lang="en">
  <head>
      <meta ..... />
      <title>...</title>
  </head>
  <body>
      ... body content
      goes here ...
  </body>
</html>
```

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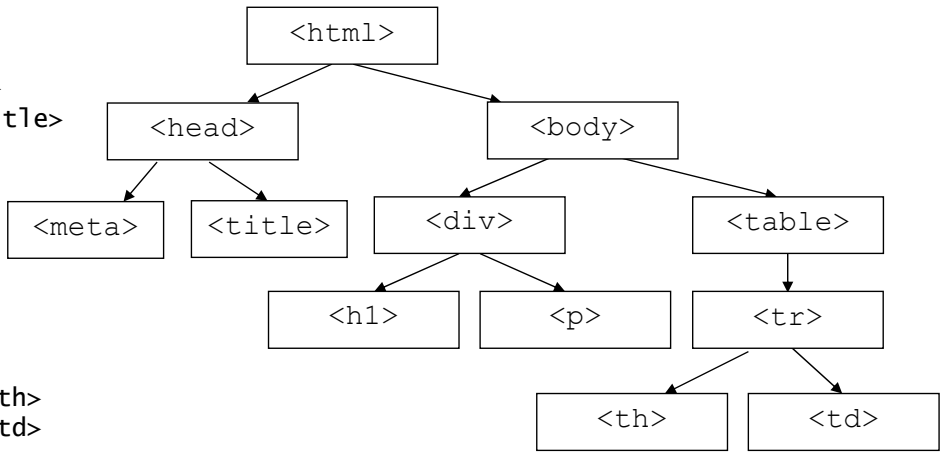
HTML: Doc Structure – Tree View

- The "**root**" element of any html document, is the **`html`** element, which usually contains only two children **`head`** and **`body`**
  - The **`head`** then contains the **`title`**, and other 'head' elements.
  - The **`body`** can contain many other elements

```
<html lang="en">
<head>
    <meta .... />
    <title>...</title>
</head>
<body>
  <div>
    <h1>...</h1>
    <p>...</p>
  </div>
  <table>
    <tr>
        <th>...</th>
        <td>...</td>
    </tr>
  </table>
</body>
</html>
```



You need to know the basic tree structure of web pages.

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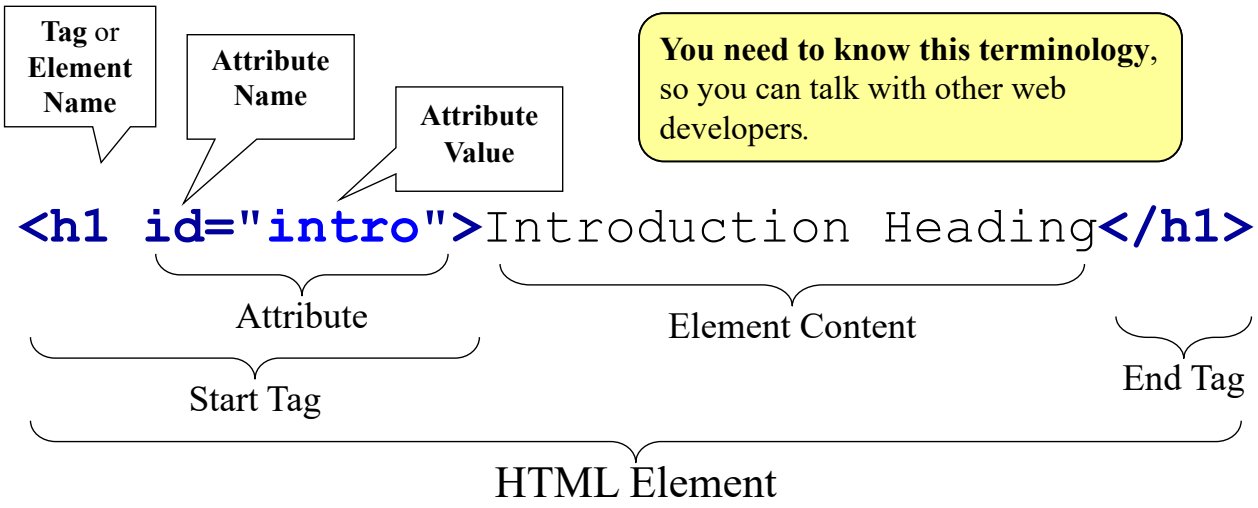
HTML Elements

- A HTML **element structure** includes: **start tag**, **tag name**, an attribute name (eg. **id**) with an **attribute value** (eg. **"intro"**), the **element content** (the text affected by the tag meaning), and finally the **end tag** of the element.



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HTML Element Attributes

Start tag can contain **attributes**

attribute *name="attribute value"*

- **attributes** *modify* the meaning of a tag.

```
<input type="text" … />
<input type="submit" … />
```

Here the attribute "type" provides different "states" for input elements.

- **attribute values *should* be surrounded in a pair of quotes**
  - Either double "..." or single '...',
    eg. `id="intro"` or `id='intro'`

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HTML Elements – Content and End tags

- **Elements** that can hold *content* begin with a **start tag** and *usually* finish with an **end tag**
- For example:

Element content

```
<h1>This is a major heading</h1>
<p>This is a paragraph</p>
<em>This is text that is emphasised</em>
<strong>This is really important text</strong>
```

- A **tag pair** fully encloses the **element contents**
- **Elements** *might* ***contain*** *other elements*

```
<p>content .. <em> .. Content .. </em> ..content</p>
```

(i.e. elements might be nested)

Some **end tags** are optional in HTML5 when the end tag is implied by the prescience of another tag.

- e.g. </head> ,

However

- In HTML it is ***good practice*** to: ***'close all tags'***
- **Not optional in XHTML:** ***'must close all tags'***

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HTML Doc: Void Element Structure

- Void elements are elements with no content or end tag
  - All information (if any) is contained in the attributes
- In HTML5

```
<meta charset=utf-8>
<hr>
<br>
<img … >
```

- In XHTML, all void elements must be properly closed

```
<meta charset="utf-8" />
<hr />
<br />
<img … />
```

To be XML compliant ***void elements must self-close***:
- the **start tag** ***must*** finish with /> syntax

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HTML Elements

Elements are either:

block-level elements or

inline elements.

- **Block-level** elements, like `<h1>` headings and `<p>` paragraphs, are usually presented by the browser with ***line breaks*** to separate them visually from other elements.
- **Inline** elements, like `<strong>` and `<em>` occur in the context inside block-level elements, and usually do not introduce any "visual" breaks.

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HTML Documents

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- **HTML Head elements**
  - Meta tags
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- HTML Body elements (page content)
  - Headings and Paragraph
  - Phrase tags and Special Characters
  - Lists and Table
  - Image and Anchor
  - … (more next week) Attributes and Form Elements
- HTML Structure

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HTML5: Head Template

```
<!DOCTYPE html>

<!- First HTML5 Example -->
<html lang="en">
<head>
 <meta charset="utf-8" />
 <meta name="description" content="
  [description of what the doc is about] " />
 <meta name="keywords" content="
      [keywords description the document]" />
 <meta name="author"   content="[your name]" />
 <title> [title to show on status bar] </title>
</head>
<body>
  …
</body>
</html>
```

DOCTYPE declaration – not HTML
Must be the first line of the document

HTML root element

Web Page CONTENT

Replace the *[italicized text]* with your code.
Do not forget to validate you code.
Remember: we will be using XML compliant HTML5 code

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HTML Doc: HTML Tag

- represents the root of an HTML document.
- is the container for all other HTML elements
- In HTML 5,

```
<html lang="en">
…
</html>
```

- In XHTML,

```
<html xmlns="http://www.w3.org/1999/xhtml"
   lang="en" xml:lang="en">
…
</html>
```


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Lecture - overview

- **HTML Documents**
  - HTML and XML elements AC3
  - HTML Head (meta information) and body (content)
- **HTML Body elements (page content)**
  - Headings and Paragraph
  - Phrase tags and Special Characters
  - Lists
  - Table
  - Image and Anchor
  - Form, Form Attributes and Form Elements
- **HTML Structure**

'Containers' for text, images etc.

Allow content to be set out on the page into meaningful blocks. (Next week)

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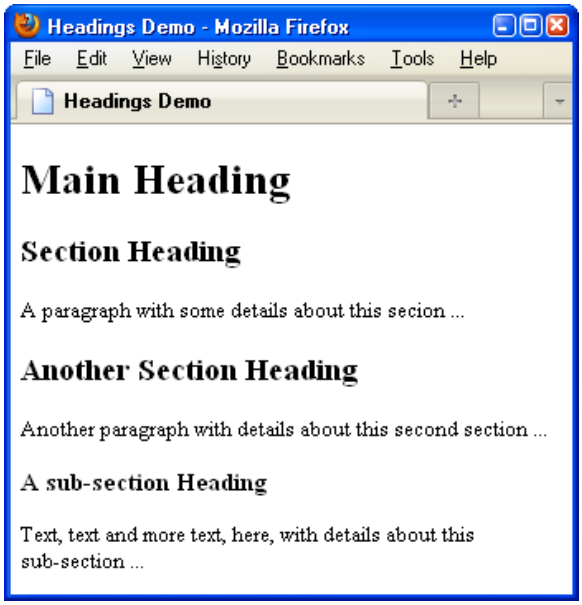
Slide 39

AC3 include comments
Alan Colman, 8/6/2015

Headings

- Example:



Headings are logical markup, used to convey the order of importance of content.

```
...
<h1>Main Heading</h1>
<h2>Section Heading</h2>
   <p>A paragraph with some details
   about this secion ...</p>
<h2>Another Section Heading</h2>
   <p>Another paragraph with details
   about this second section ...</p>
   <h3>A sub-section Heading</h3>
     <p>Text, text and more text, here,
     with details about this sub-section
     ...</p>
...
```

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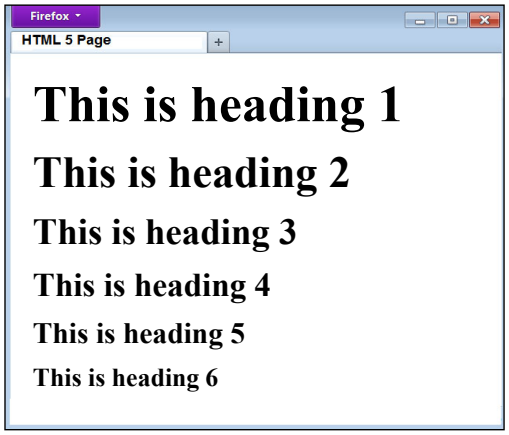
Headings

```
<h1>This is heading 1</h1>
<h2>This is heading 2</h2>
<h3>This is heading 3</h3>
<h4>This is heading 4</h4>
<h5>This is heading 5</h5>
<h6>This is heading 6</h6>
```

Default Firefox rendering



- There are **six (6)** levels of **importance** from the **most** important **<h1>** to the **least** important **<h6>**.
  - ***Do not*** *skip heading levels. If the next heading is one level below the last heading, only use the next heading level.*
- Browsers display all headings larger and/or bolder than normal text,
  - ***Do not*** *use headings simply as a way to increase font size and make the text bold (use CSS instead)*

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Paragraph Element

- ** … ** is a logical block level element used to mark **paragraphs**.
  - Note: *cannot contain other block-level elements*
  - Browsers will generally place white space before and after a paragraph – it is a block level element.
- **
** an empty / void inline element used to insert a single line break.
  - ***Do not*** *use line breaks to separate paragraphs.*

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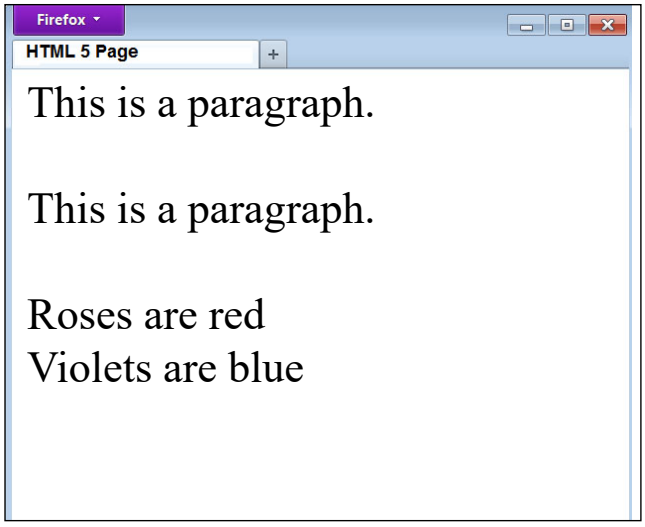
Paragraph (continued)

```
<p>This is a paragraph.</p>
<p>This is a paragraph.</p>
<p>Roses are red<br />Violets are blue</p>
```



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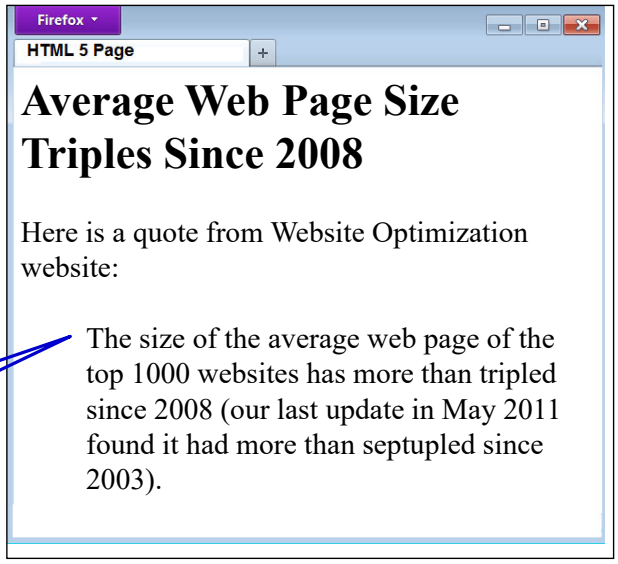
HTML Content

Block Quote

- **<blockquote>…</blockquote >** a logical block level element used to specify a section that is quoted from another source.
- Cite the source of quote using a 'cite' attribute

```
<body>
<h1>Average Web Page Size Triples Since
2008</h1>
<p>Here is a quote from Website
Optimization website:</p>
<blockquote
cite="http://www.websiteoptimization.co
m/speed/tweak/average-web-page/">
The size of the average web page of the
top 1000 websites has more than tripled
since 2008 (our last update in May 2011
found it had more than septupled since
2003).
</blockquote>
</body>
```

Browsers usually indent <blockquote> elements



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HTML Content

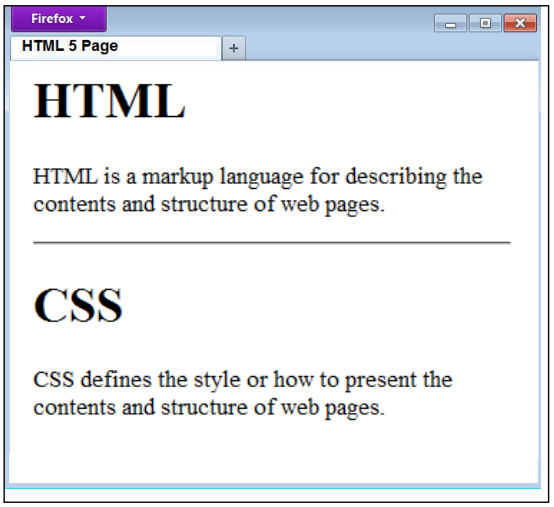
Horizontal Rule

- **<hr />** an empty / void block level element used to define a thematic break in an HTML page, or a shift of topic. It is used to separate content in an HTML page.

```
<h1>HTML</h1>
<p>HTML is a markup language for
describing the contents and
structure of web pages.</p>

<hr />

<h1>CSS</h1>
<p>CSS defines the style or how
to present the contents and
structure of web pages.</p>
```



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Phrase Elements

- ** <dfn> <code> <samp> <kbd> <var>**
  are logical ***inline*** phrase elements that define the meaning of the enclosed text

	Defines emphasized text – *renders as italics*
	Defines important text – *renders as bold*
<dfn>	Defines a definition term
<code>	Defines a piece of computer code
<samp>	Defines sample output from a computer program
<kbd>	Defines keyboard code
<var>	Defines a variable

- *Do not use just for presentation*

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Phrase Elements (continued)

- **…** *should be avoided*. Use
  Defines a part of text in an alternate voice or mood.
  The content of the tag is usually rendered in italics
  - The tag can be used to indicate a technical term, a phrase from another language (eg. scientific name), a thought, or a ship name, etc.
- **…** *should be avoided*. Use
  According to the HTML 5 specification, use only as a **LAST** resort, when no other tag is more appropriate

Deductions if used in Assignments

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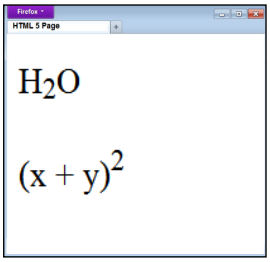
Phrase Elements (continued)

Superscript and Subscript

- **_{...}** defines subscript text.
  - It appears as a half character below the baseline e.g. H_2O

```
<p>H<sub>2</sub>O</p>
```



- **[…]** defines superscript text
  - It appears as a half character above the baseline, e.g. $(x + y)^2$ or a footnote / citation reference.

```
<p>(x + y)<sup>2</sup></p>
```

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Special Characters

- To encode reserved characters in HTML into the contents, special characters **&…;** are used
- A more descriptive term is entity encoding
- Some of the common codes are listed below:

Character	Decimal Entity Number	Named Entity	Description
"	&#34;	&quot;	quotation mark
'	&#39;	&apos;	apostrophe
&	&#38;	&amp;	ampersand
<	&#60;	&lt;	less-than
>	&#62;	&gt;	greater-than

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HTML: Special Characters (continued)

Character	Decimal Entity Number	Named Entity	Description
			non-breaking space
©	©	©	copyright
			soft hyphen
®	®	®	registered trademark
¯	¯	¯	spacing macron
°	°	°	degree
±	±	±	plus-or-minus
×	×	×	multiplication
÷	÷	÷	division

These named not XML compliant

http://en.wikipedia.org/wiki/List_of_XML_and_HTML_character_entity_references
Character Codes: http://character-code.com/
http://www.html-5.com/cheat-sheet/html-character-codes.html

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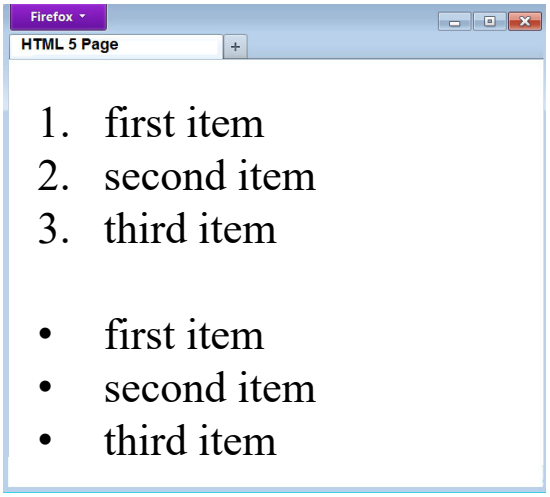
Lists

- **Ordered** list example

```
<ol>
  <li>first item</li>
  <li>second item</li>
  <li>third item</li>
</ol>
```

- **Unordered** list example

```
<ul>
  <li>first item</li>
  <li>second item</li>
  <li>third item</li>
</ul>
```



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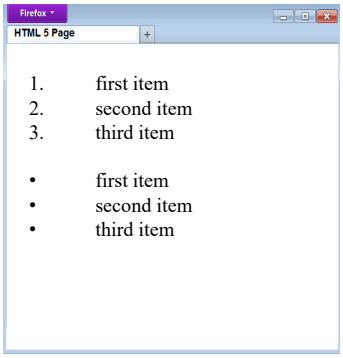
List elements

- **
...
** is used to mark each list item.
  <li> *is the only element that is allow directly in an ordered* **<ol>** *or unordered* **<ul>** *list.*

```
<ul>
  <li>item 1
    <p>Paragraph</p>
  </li>
  <li>item 2</li>
</ul>
```




```
<ul>
  <li>item 1</li>
  <p>Paragraph</p>
  <li>item 2</li>
</ul>
```

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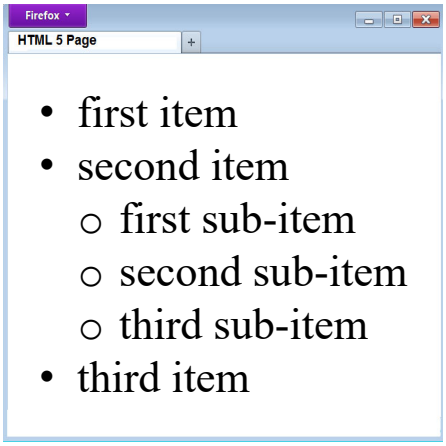
Nested Lists

- **Nested** list example:

```
<ul>
  <li>first item</li>
  <li>second item
    <ul>
      <li>first sub-item</li>
      <li>second sub-item</li>
      <li>third sub-item</li>
    </ul>
  </li>
  <li>third item</li>
</ul>
```



Nested list must be inside a list item

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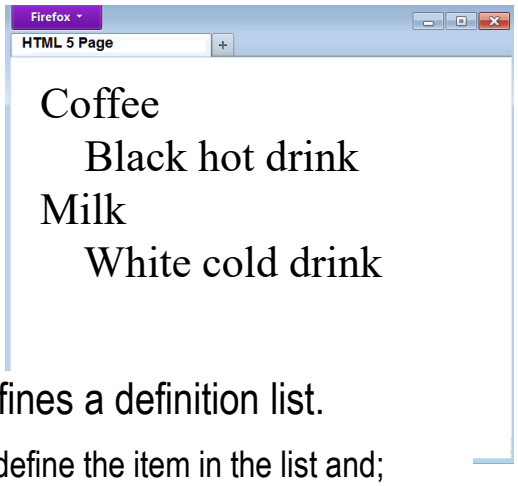
Definition List

```
<dl>
  <dt>Coffee</dt>
  <dd>Black hot drink</dd>
  <dt>Milk</dt>
  <dd>White cold drink</dd>
</dl>
```



- **<dl>…</dl>** element defines a definition list.
  - **<dt>…</dt>** is used to define the item in the list and;
  - **<dd>…</dd>** is used to describe the item in the list
- The browser will render the item and the definition on separate lines, and the definition will be indented
- **Do not** use definition list to create second level indentation

Vey useful element for coding dialog, or name / value pairs. Use CSS to style on one line.

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Table (continued)

Deprecated attribute border = can now be "1" (show a border) or "0" (do not show a border). Can style better in CSS.

```
<table>
  <caption>Table of Monthly Savings</caption>
  <tr>
    <th>Month</th>
    <th>Savings</th>
  </tr>
  <tr>
    <td>January</td>
    <td>$100</td>
  </tr>
  <tr>
    <td>February</td>
    <td>$80</td>
  </tr>
  <tr>
    <td>Total</td>
    <td>$180</td>
  </tr>
</table>
```

Note: by default the <th> cells are presented bold and centred !

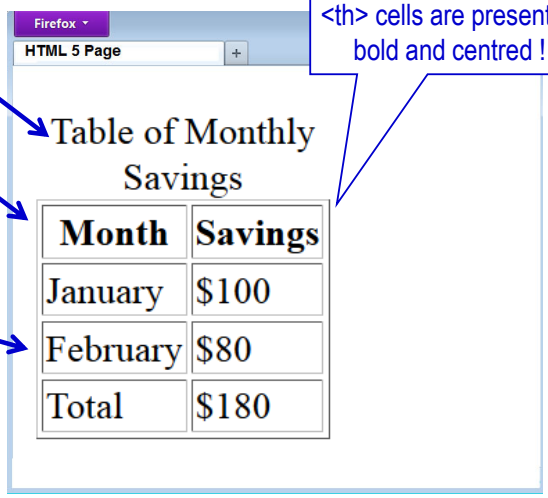

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Table element

- **<table> …</table>** block level element offers a powerful way to organise *data* in a *tabular format*.
  - ***Do not*** *used table for page layout presentation.*
  - **border** is the only specific attribute supported in HTML5
- Table elements:

<table> … </table>	declares a table
<caption> … </caption>	captions a table's contents
<tr> … </tr>	defines a table ***row***
<th> … </th>	defines a table header ***cell***
<td> … </td>	defines a table data ***cell***
<thead>, <tbody>, <tfoot>	defines table ***sections***

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Table (continued)

```
<table>
  <caption>Table of Monthly Savings</caption>
  <thead>
    <tr>
      <th>Month</th>
      <th>Savings</th>
    </tr>
  </thead>
<tbody>
    <tr>
      <td>January</td>
      <td>$100</td>
    </tr>
    <tr>
      <td>February</td>
      <td>$80</td>
    </tr>
  </tbody>
 <tfoot>
    <tr>
      <th>Total</th>
      <td>$180</td>
    </tr>
  </tfoot>
</table>
```

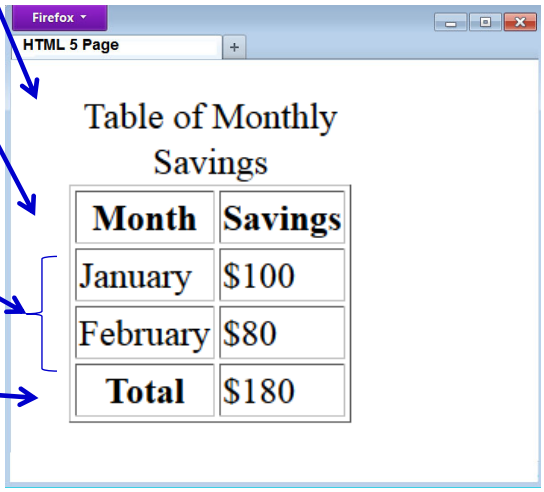

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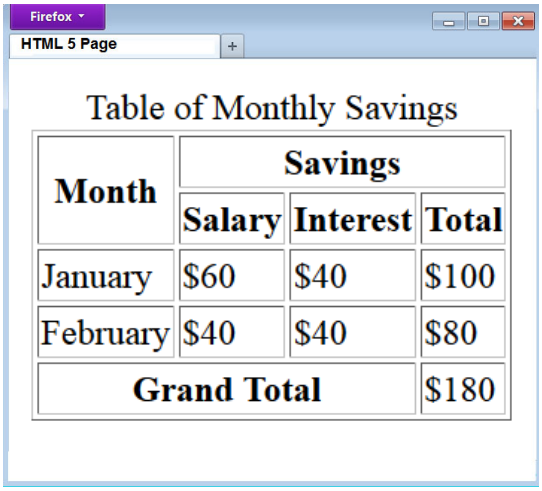
Table (continued)

```
<table>
  <caption>Table of Monthly Savings</caption>
  <thead>
    <tr>
      <th rowspan="2">Month</th>
      <th colspan="3">Savings</th>
    </tr>
    <tr>
      <th>Salary</th>
      <th>Interest</th>
      <th>Total</th>
    </tr>
  </thead>
<tbody>
    <tr>
      <td>January</td>
      <td>$60</td>
      <td>$40</td>
      <td>$100</td>
    </tr>
    <tr>
      <td>February</td>
      <td>$40</td>
      <td>$40</td>
      <td>$80</td>
    </tr>
  </tbody>
 <tfoot>
    <tr>
      <th colspan="3"> Grand Total</th>
      <td>$180</td>
    </tr>
  </tfoot>
</table>
```



rowspan and **colspan** attributes for <td> and <th> allows a more complex table to be built.

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HTML: Quick Start Elements

- ***Here is a quick start list of some common elements to get you going.***

headings: `<h1>…</h1>` `<h2>…</h2>` to `<h6>…</h6>`

paragraphs: `<p>…</p>`

line breaks: `<br />`

horizontal rule: `<hr />`

inline image: `<img src="url" alt="" height="" width="" />`

strong or *emphasized* text: `<strong>…</strong>` and `<em>…</em>`

unordered / ordered list: `<ul>…</ul>` and `<ol>…</ol>`

list items: `<li>…</li>`

hypertext link: `<a href="url">…</a>`

The URL value can be relative or start with `http://`, `ftp://`, `mailto:` etc.

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