HTML

What is HTML?

- HTML(Hyper Text Markup Language)
  - is a language for describing web pages.
  - not a programming language
  - uses markup tags to describe web pages.
- Most Web documents are created using HTML.
  - Documents are saved with extension .html or .htm.

- Markup?
  - Markup Tags are strings in the language surrounded by a < and a > sign.
  - Opening tag: <html> Ending tag: </html>
  - Not case sensitive.
  - Can have attributes which provide additional information about HTML elements on your page. Example
    - <body bgcolor="red">
    - <table border="0">

HTML

- An HTML document appears as follows:

```
<!DOCTYPE HTML>
<html>
  <head>
      <title>Title of page</title>
  </head>
  <body>
       This is my first homepage. <b>This text is bold</b>
   </body>
</html>
```

DOCTYPE tells type, version, language of particular document.

- **HTML Head Section**: contain information about the document. The browser does not display this information to the user. Following tags can be in the head section: <base>, <link>, <meta>, <script>, <style>, and <title>.
- **HTML Body Section**: defines the document's body. Contains all the contents of the document (like text, images, colors, graphics, etc.).
- Each document can have at most one <body> element

Document (Body) Contents

- Body Text
  - HTML truncates spaces in your text.
  - Use
 to insert new lines.
  - Use <p> tag to create paragraphs.
  - Use to hold division or a section in an HTML document
  - Use as an inline container to mark up a part of a text, or a part of a document

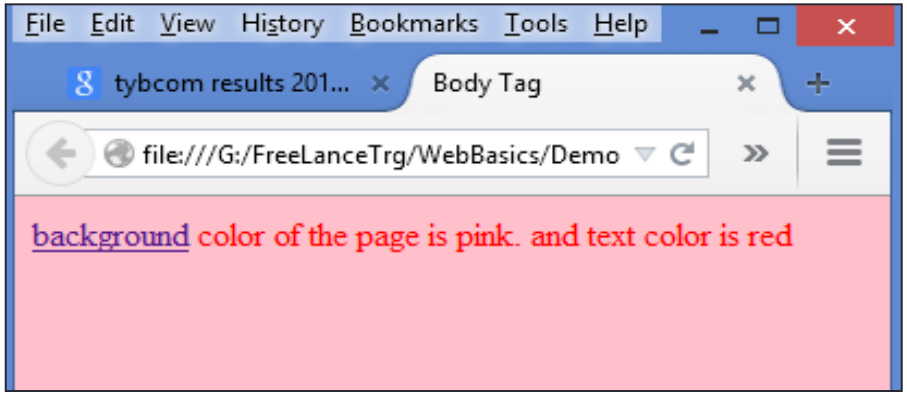
- Comments in HTML Document
  - Increase code readability; Ignored by the browser.
  - Example of HTML comment: <!-- This is a Sample HTML Comment -->

- … : Creates divisions in Web pages. Can be used to set the alignment/class for an entire section of the page. Eg:
  - This text is at the centre of the browser window

Attributes

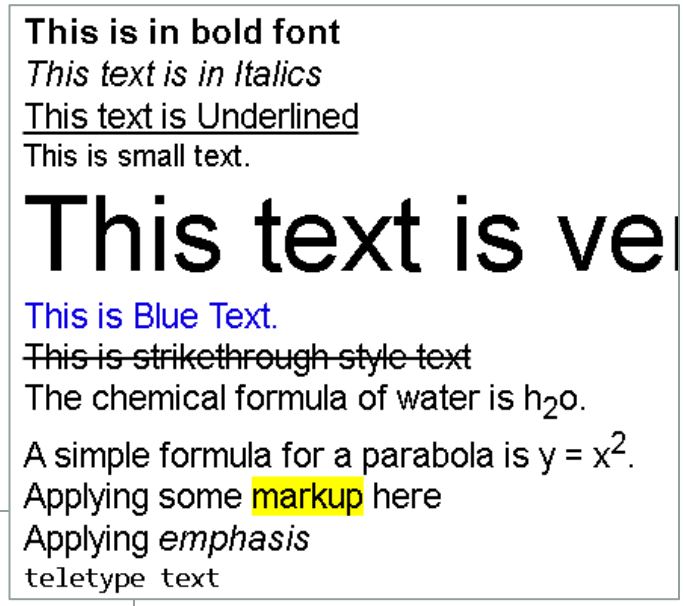
- HTML attributes are special words which provide additional information about the elements or attributes are the modifier of the HTML element.
- Eg of attributes used in <body> element :
  - BGCOLOR: Gives a background color to HTML page.
  - BACKGROUND: Use to specify images to the BACKGROUND.
  - TEXT: Specifies text color throughout the browser window
  - LINK, ALINK, VLINK: Used to specify link color, active link color & visited link color
- Examples:
  - <body text="red"> OR <body text="#FF0000">
  - <body link="red" alink="blue" vlink="purple">
  - <body bgcolor="black"> OR <body bgcolor="#000000">
  - <body background="http://www.mysite.edu/img1.gif">

```
<HTML>
 <HEAD>
   <TITLE>Body Tag</TITLE>
 </HEAD>
 <BODY  BGCOLOR="pink" text="red"
            alink="green" link="yellow">
    <a href="body.html">background</a>
       color of the page is pink. and text color is red
 </BODY>
</HTML>
```



Formatting tags

- Bold Font: …
- Italic: …
- Underline: <u>…</u>
- Strikethrough: <strike> or <s>
- Subscript: <sub>
- Superscript: <sup>

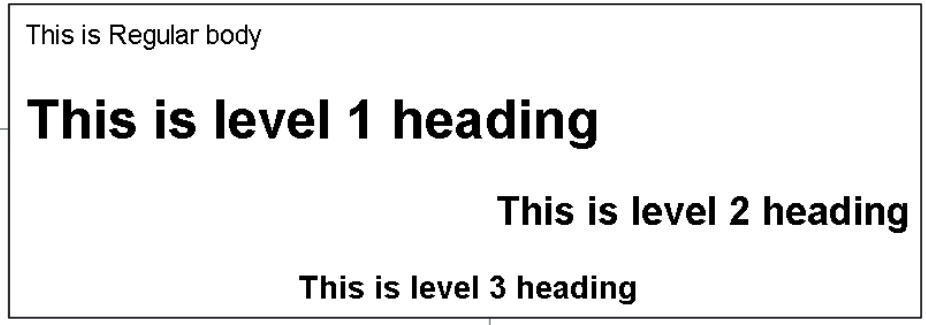



```
<b>This is in bold font</b><br>
<i>This text is in Italics</i><br>
<u>This text is Underlined</u><br>
<small>This is small text.</small><br>
<font size=7>This text is very large</font><br>
<font color=”Blue”>This is Blue Text.</font><br>
<strike>This is strikethrough style text</strike><br>
The chemical formula of water is h<sub>2</sub>o.<br>
A simple formula for a parabola is y = x<sup>2</sup>.<br>
Applying some <mark>markup</mark> here<br>
Applying <em>emphasis</em><br>
<tt>teletype text</tt>
```

Layout tags

- Heading Styles:
  - **<hn>…….</hn>**
    - Value of n can range from **1 to 6**
  - <h1 align="center">This is level 1 heading</h1>

```
<html>
<head>
   <title>Header Demo</title>
</head>
<body>
   This is Regular body
   <h1 align="left">This is level 1 heading</h1>
   <h2 align="right">This is level 2 heading</h2>
   <h3 align="center">This is level 3 heading</h3>
</body>
</html>
```



Special Characters in HTML

- Character Entities
  - Comprise following parts:
    - Ampersand (&),
    - Entity name or a #
    - Character code
    - Semicolon (;)
  - Included in HTML page using:
    - To display “>” symbol, use character code 62 i.e. &#62 or >
    - For space, use

Result	Description	Entity Name	Entity Number
	non-breaking space		
<	less than	<	<
>	greater than	>	>
&	ampersand	&	&
¢	cent	¢	¢
£	pound	£	£
¥	yen	¥	¥
€	euro	€	€
©	copyright	©	©
®	registered trademark	®	®

Horizontal Lines in a Web Page

- <hr> - horizontal Rule. Attributes:
  - Size: Line thickness <hr size="5">
  - Width: Line width either in pixels or % of browser window
    - <hr width="100"> or <hr width="60%">
  - Align: Alignment values can be left, center or right <hr align="center">
  - Color: to display colored horizontal lines. Eg <hr color="red">

```
<body> <p>
      This paragraph contains a lot of lines
      in the source code,
      but the browser ignores it.  </p>
      <hr size="2" width="50%" color="blue" align = "left" >
      <p>Notice the horizontal rule occupying 50 % of the window width.
      <p>This paragraph contains <br> line breaks in the
      source code <br>
      so this  is the third line displayed  within the paragraph.
</body>
```

This paragraph contains a lot of lines in the source code, but the browser ignores it.

Notice the horizontal rule occupying 50 % of the window width.

This paragraph contains
line breaks in the source code
so this is the third line displayed within the paragraph.

Numbered List (Ordered List)

- Automatically generate numbers in front of each item in the list
  - Number placed against an item depends on the location of the item in the list.
  - Example:

```
<body>
   <ol>
     <li>INDIA</li>
     <li>SRILANKA</li>
   </ol>
</body>
```

1. INDIA
2. SRILANKA

  - To start an ordered list at a number other than 1, use **START** attribute:

Example : <ol start=11>

11. INDIA
12. SRILANKA

- Select the type of numbering system with the **type** attribute. Example:
  - A-Uppercase letters. <OL TYPE=A>
  - a-Lowercase letters. <OL TYPE=a>
  - I-Uppercase Roman letters
  - i-Lowercase Roman letters
  - 1-Standard numbers, default

```
<ol type="a">
   <li>INDIA</li>
   <li>SRILANKA</li>
</ol>
```

a. INDIA
b. SRILANKA

Bulleted List (Unordered List)

- Example:

```
<ul>
   <li>Latte</li>
   <li>Expresso</li>
   <li>Mocha</li>
</ul>
```

- Latte
- Expresso
- Mocha

- To change the type of bullet used throughout the list, place the TYPE attribute in the <UL> tag at the beginning of the list.
  - DISC (default) gives bullet in disc form.
  - SQUARE gives bullet in square form.
  - CIRCLE gives bullet in circle form.

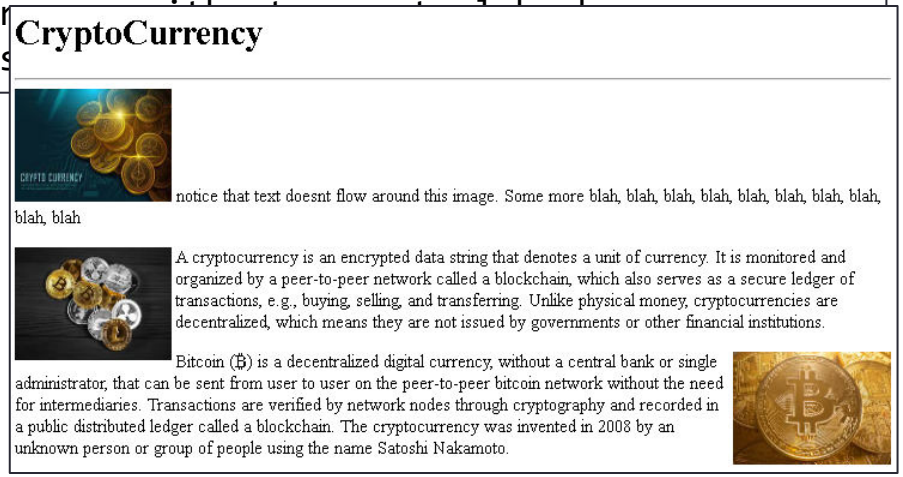
```
<ul>
   <li type='disc'>Latte</li>
   <li type='square'>Expresso</li>
   <li type='circle'>Mocha</li>
</ul>
```

- Latte
- Expresso
- Mocha

Adding Image

- Images are added into a document using <img> tag.
- Attributes :
  - alt: holds a text description of the image; its optional, but is incredibly useful for accessibility - screen readers read this description out to their users so they know what the image means
  - align: Image horizontal alignment; and also flow of text around image. Valid values: left, right
  - width/Height: Sets the width and height of the image.
  - src: Specifies the image path or source.

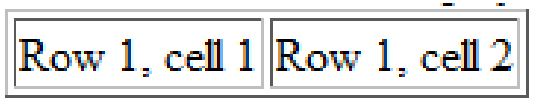
```
<h1>CryptoCurrency</h1><hr>
<img src="crypto.jfif" height="100" width="140"> notice that text doesnt flow aro ...
<p><img src="bitcoin2.jfif" align="left" height="100" width="140">
<p>A cryptocurrency is an encrypted data string that denotes a unit of currency.
 ...
<p><img src="bitcoin1.jfif" align="right" height="100" width="140">
<p>Bitcoin (₿) is a decentralized digital curr
single administrator, that can be sent from us
```



Table

- Use <table> tag to create a table.
- Table Attributes:
  - Border: applies border to table. Eg : <table border="2">……</table>
  - Align: defines the horizontal alignment of the table element.
    - Values of the align attribute are right, left and center. <table align="center">
  - Width: defines the width of the table element.
    - <table width="75%">……</table>
    - <table width="400">……</table>
  - Example:

```
<table border="1">
   <tr>
     <td>Row-1, cell-1</td>
     <td>Row-1, cell-2</td>
   </tr>
</table>
```



- To add a caption to a table, use the <caption> tag:
  - The <caption> tag must be inserted immediately after the <table> tag

```
<table style="width:100%">
  <caption>Monthly savings</caption>
  <tr><th>Month</th><th>Savings</th></tr>
  …
</table>
```

Table Data

- An HTML table has two kinds of cells:
  - Header Cells <th>: Contain header information; The text is bold and centered.
  - Standard Cells <td>: Contain data; The text is regular and left-aligned.

```
<table>
   <tr> <th>Column1 Header</th> <th>Column2 Header</th></tr>
   <tr> <td>Cell 1,1</td> <td>Cell 1,2</td> </tr>
   <tr> <td>Cell 2,1</td> <td>Cell 2,2</td> </tr>
</table>
```

Column1 Header	Column2 Header
Cell 1,1	Cell 1,2
Cell 2,1	Cell 2,2

- You can insert a bgcolor attribute in a <table>, <td>, <th> or <tr> tag to set the color of the particular element.

```
<table bgcolor="cyan">
   <tr bgcolor="blue">
       <th bgcolor="red">Header 1</th><th>Header 2</th>
   </tr>
   <tr>
      <td bgcolor="green">data 1</td><td>data 2</td>
   </tr>
</table>
```

Header 1	Header 2
data 1	data 2

Cell Spanning

- colspan="number of columns"
  - By default, the number of columns in a table is defined by the number of table data cells appearing in the table row that contains the most data.
  - Ideally, place the same number of data cells in each table row. If a table row does not contain the requisite number of table cells, then it will essentially be in 'error' and will be displayed with a missing cell.
- rowspan="number of rows"
  - Forces a table cell to span the number of rows specified by the given value.

```
<table border=1>
      <tr>
          <th>Column 1</th><th>Column 2</th><th>Column 3</th>
      </tr>
      <tr>
         <td rowspan=2>Column 1 Data</td>
         <td align=center colspan=2>Col 2, Row 1 Data</td>
      </tr>
      <tr>
         <td>Col 2, Row 2 Data</td><td>Col 3, Row 2 Data</td>
      </tr>
</table>
```

Column 1	Column 2	Column 3
Column 1 Data	Col 2, Row 1 Data	
	Col 2, Row 2 Data	Col 3, Row 2 Data

Hyperlink

- Hyperlinks access resources on the internet.
- Create a link with <a href=“”> (anchor)

```
<a href="http://www.mysite.com/login.htm">Login Here</a>
Hello, Welcome to  <a href="welcome.htm">My Site</a>
I have some <a href="http://www.state.edu/info/info.htm"> older information</a> about this subject.
```

Login Here
Hello, Welcome to My Site
I have some older information about this subject.

```
<ul>
   <li><a href='home.html'>mumbai</a></li>
   <li><a href='home.html'>pune</a></li>
   <li><a href='home.html'>nasik</a></li>
</ul>
```

- mumbai
- pune
- nasik

```
<table border=1>
  <tr><th>team<th>points<th>grade</tr>
  <tr> <td><a href='home.html'>mumbai</a></td><td>90</td><td>a</td> </tr>
  <tr> <td><a href='home.html'>pune</a></td><td>86</td><td>b</td>  </tr>
  <tr> <td><a href='home.html'>nasik</a></td><td>80</td><td>c</td>  </tr>
</table>
```

team	points	grade
mumbai	90	a
pune	86	b
nasik	80	c

Use of Image as a Hyperlink

- Images used as hyperlinks:
  - <A href="image1.html"><img src="home.gif">
- Images contained within a table:

```
<table align="center" border="2">
   <tr><th>Product</th><th>Cost</th><th>Image</th></tr>
   <tr>
      <td>Pencil</td>
      <td>$8</td>
      <td><img src="pencil.gif"></td>
   </tr>
   <tr>
      <td>Brush</td>
      <td>$15</td>
      <td><img src="paintbrush.gif"></td>
   </tr>
   <tr>
      <td>Pin</td>
      <td>$3</td>
      <td><img src="pin.gif"></td>
   </tr>
</table>
```

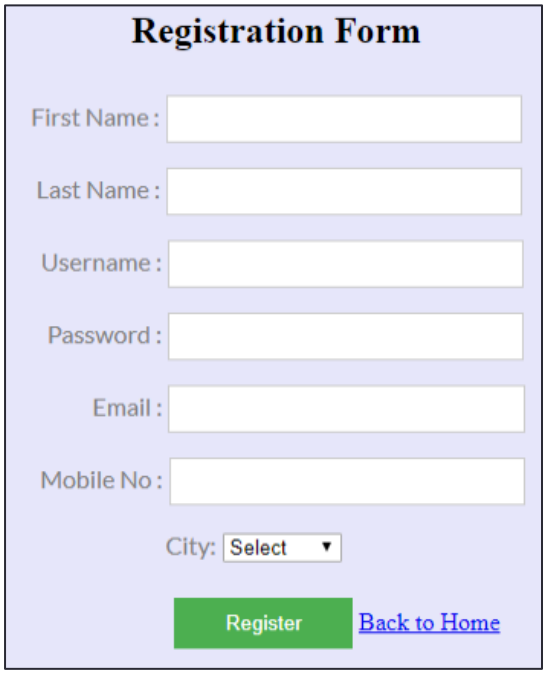
Product	Cost	Image
Pencil	$8	
Brush	$15	
Pin	$3	

HTML Forms for User Input

- Data Submission using a Form
  - HTML forms are used to accept of user input.
  - A form contains form elements.
  - Form elements are elements that allow users to enter information in a form.
  - Define a form with the <form> tag.</form>

```
<form method="get/post" action="URL">
        Field definitions
</form>
```

- <input> tag is used to create form input fields.
  - Type attribute of <input> tag specifies the field type
    - Single line text box <input type="text">
    - Password field <input type="password">
    - Hidden field <input type="hidden">
    - Radio button <input type="radio">
    - Checkbox <input type="checkbox">
    - File selector dialog box <input type="file">
    - Button <input type="button">
    - Submit/Reset <input type="submit/reset">
- <textarea>
- <select>
- <button>



Form elements

- Text fields: **Single Line** : used to type letters, numbers, etc. in a form.
  - <INPUT TYPE=”type” NAME=”name” SIZE=”number” VALUE=”value” maxlength=n>
  - Eg:

```
<form>
      First name: <input type="text" name="firstname“ value=“fname>
      Last name:<input type="text" name="lname">
</form>
```

- Text Area (Multiple Line Text Field)
  - A text area can hold an unlimited number of characters. Text renders in a fixed-width font (usually Courier).
  - You can specify text area size with cols and rows attributes.

```
<textarea name=“name” rows=“10” cols=“50” [disabled] [readonly]>
            Default-Text
</textarea>
```

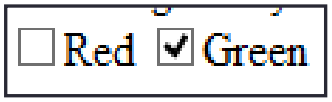
```
<textarea name=“address” rows=5 cols=10>
                Please write your address
</textarea>
<textarea rows=“4” cols=“20”>
```

- Password
  - <input type=“password” name=“name” size=n value=“value” [disabled]>
  - Eg: Enter the password:<input type=“password” name=“passwd” size=20 value=“abc”>

Form elements

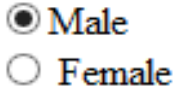
- Check box - Lets you select one or more options from a limited number of choices.
  <input type="checkbox" name="name" value="value" [checked] [disabled]> Checkbox Label
  - Content of value attribute is sent to the form's action URL.

```
<input type="checkbox" name="color1" value="0"/>Red
<input type="checkbox" name="color3" value="1" checked/>Green
```



- Radio Buttons
  - <input type="radio" name="name" value="value" [checked] [disabled]> Radio Button Label
  - *Content of the value attribute is sent to the form's action URL*.

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



- Hidden form field - Allows to pass information between forms:
  - <input type="hidden" name="name" size="n" value="value"/>
  - <input type="hidden" name="valid_user" size="5" value="yes"/>

Form elements

- File Selector Dialog Box
  - <input type="file" name="name" size="width of field" value="value">

```
<FORM>
  Select file to upload:
   <INPUT name="file" type="file"> <BR>
   <INPUT type="submit" >
</FORM>
```

- Buttons:
  - To add a button to a form use:
  - <input type="button" name="btnCalculate" value="Calculate"/>
  - To submit the contents of the form use:
  - <input type="submit" name="btnSubmit" value="Submit"/>
  - To reset the field contents use:
  - <input type="reset" name="btnReset" value="Reset"/>

  - You can also create button using <button> tag ; defines a push button. Inside this element you can put content, such as text or images.
  - <button type="button">Click Me!</button>

Drop-Down List

<select name="name" multiple="true/false" size=n [disabled]>
<option [selected] [disabled] [value]>Option 1</option>…
</select>

- Multiple: States if multiple element selection is allowed.
- Size: Number of visible elements.
- Disabled: States if the option is to be disabled after it first loads.

```
<form>
<select multiple size="3" name="pref">
  <option value="ih"   selected>Internet-HTML</option>
  <option value="js">Javascript</option>
  <option   value="vbs">VBscript</option>
  <option value="as">ASP</option>
</select>
</form>
```

- Forms with labels

```
<form>
  <label for="uname">User name : </label>
  <input id="uname" name="username">
  <button>Submit</button>
</form>
```

<fieldset> and <legend>

- Group related elements in a form

```
<form>
 <fieldset>
   <legend>Personal Details:</legend>
    Name: <input type="text"><br><br>
    Email: <input type="text"><br>
  </fieldset>
</form>
```

Personal Details:

Name:

Email:

Your details

1. Name First and last name
2. Email example@domain.com
3. Phone Eg. +447500000000

Delivery address

1. Address
2. Post code
3. Country

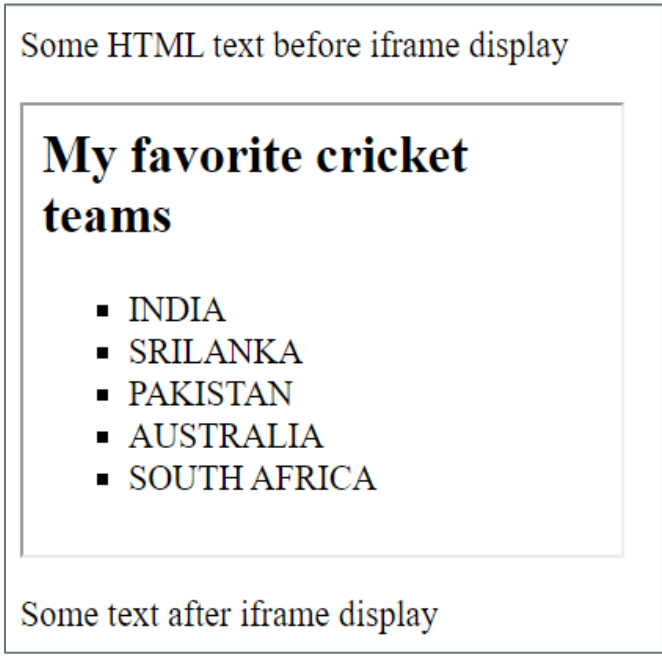
Card details

1. Card type
   1. VISA
   2. AmEx
   3. Mastercard
2. Card number
3. Security code
4. Name on card Exact name as on the card

iFrame

- An HTML iframe is used to display a web page within a web page.
  - specifies an inline frame.
  - Use the height and width attributes to specify the size of the iframe
  - With CSS, you can also change the size, style and color of the iframe's border
    Eg <iframe src=“” style="border:none;“>
  - Alternatively use the frameborder attribute : 1 (yes) or 0 (no)

```
<html>
  <body>
    <p>Some HTML text before iframe display</p>
    <iframe src="numberedList.html"
                  width="20%" height="200">
       Your browser doesn’t support inline frames.
    </iframe>
   <p> Some text after iframe display </p>
  </body>
</html>
```



Formatting tags

Tag	Example	Results
	Bold Text	An example of **Bold Text**
<big>	<big>Big Text</big>	An example of Big Text
	Center Text	An example of Center Text
	Emphasized Text	An example of *Emphasized Text*
	Italic Text	An example of *Italic Text*
<small>	Small Text	An example of Small Text
	Strong Text	An example of **Strong Text**
<sub>	_{Subscript Text}	An example of Subscript Text
<sup>	^{Superscript Text}	An example of Superscript Text
<del> <s> <strike>	~~Delete Text~~ <s>Strike Text</s> <strike>Strike Text</strike>	An example of ~~Delete Text~~ An example of ~~Strike Text~~ An example of ~~Strike Text~~
<u>	<u>Underline Text</u>	An example of Underline Text
<tt>	<tt>Teletype Text</tt>	An example of `Teletype Text`

HTML5

What's new in HTML5?

- HTML5 offers new enhanced set of tags
  - New Content Tags : <nav>,<section>,<header>,<article>,<aside>,<summary>
  - New Media Tags : <video>,<audio>
  - New Dynamic drawing : <canvas>graphic tag
  - New form controls, like calendar, date, time, email, url, search

- Support for JavaScript APIs
  - Canvas element for 2D drawing API
  - Video and audio APIs
  - APIs to support offline storages
  - The Drag & Drop APIs
  - The Geolocation API
  - Web workers, WebSQL etc

- The DOCTYPE tells the browser which type and version of document to expect.
  - The DOCTYPE announcement is not a HTML label; it is a guideline to the web program about what variant of HTML the page is composed in.

```
<!DOCTYPE  html>
```

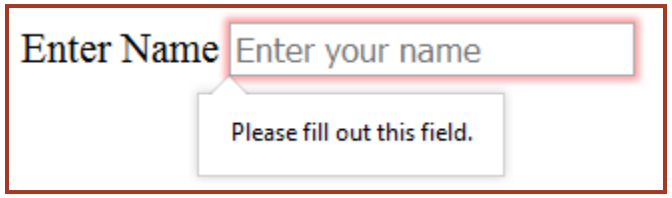
HTML5 Attributes for <input>

- A Form is one of the most basic and essential feature of any web site
  - HTML5 brings 13 new input types and 14 new attributes
  - HTML5 introduces these data types via the <input type="_NEW_TYPE_HERE_"/> format

- **Placeholder** - A placeholder is a textbox that hold a text in lighter shade when there is no value and not focused
  - <input id="first_name" placeholder="This is a placeholder">
  - Once the textbox gets focus, the text goes off and you shall input your own text

- **AutoFocus** - Autofocus is a Boolean attribute of form field that make browser set focus on it when a page is loaded
  - <input id ="Text2" type="text" autofocus/>

- **Required** - A "Required Field" is a field that must be filled in with value before submission of a form
- <input name="name" type="text" required />



New Form elements

- **Email** - Checks whether the string entered by the user is valid email id or not.
  - <input id="email" name="email" type="email" />
- **Search** - used for search fields (behaves like a regular text field).
  - <input id="mysearch" type="search" />
- **Tel** - used for input fields that should contain a telephone number.
  - <input type="tel" name="usrtel">
  - <input type="tel" name="phone“ pattern**="[2-9][0-9]{2}-[0-9]{3}-[0-9]{4}“** title="North American format: XXX-XXX-XXXX">
- **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.
- **color** – displays a color palette
- **Number** - used for input fields that should contain a numeric value.
  - Min and max parameters provided to limit the values.
  - Browser will treat it as simple textfield if it doesn’t support this type.
  - <input id="movie" type="number" value="0"/>
  - <input type="number“ min="0“ max="50“ step="2“ value="6">

New Form elements

- **Range** - used for input fields that should contain a value within a range
  - Browser will treat it as simple textfield if it doesn't support this type
  - <input id="test" type="range"/>
  - <input type="range" min="1" max="20" value="0">

- **Date** - used for input fields that should contain a date.
  - Depending on browser support, a date picker can show up in the input field.
  - <input id="meeting" type="date" />

- **month** - Selects month and year
- **week** - Selects week and year
- **time** - Selects time (hour and minute)
- **datetime** - Selects time, date, month and year
- **datetime-local** - Selects time, date, month and year (local time)

```
•<input type="button">
•<input type="checkbox">
•<input type="color">
•<input type="date">
•<input type="datetime-local">
•<input type="email">
•<input type="file">
•<input type="hidden">
•<input type="image">
•<input type="month">
•<input type="number">
•<input type="password">
•<input type="radio">
•<input type="range">
•<input type="reset">
•<input type="search">
•<input type="submit">
•<input type="tel">
•<input type="text">
•<input type="time">
•<input type="url">
•<input type="week">
```

Built-in form validation

- required: Specifies whether a form field needs to be filled in before the form can be submitted.
- minlength and maxlength: Specifies the minimum and maximum length of textual data (strings).
- min and max: Specifies the minimum and maximum values of numerical input types.
- type: Specifies whether the data needs to be a number, an email address, or some other specific preset type.
- pattern: Specifies a regular expression that defines a pattern the entered data needs to follow.

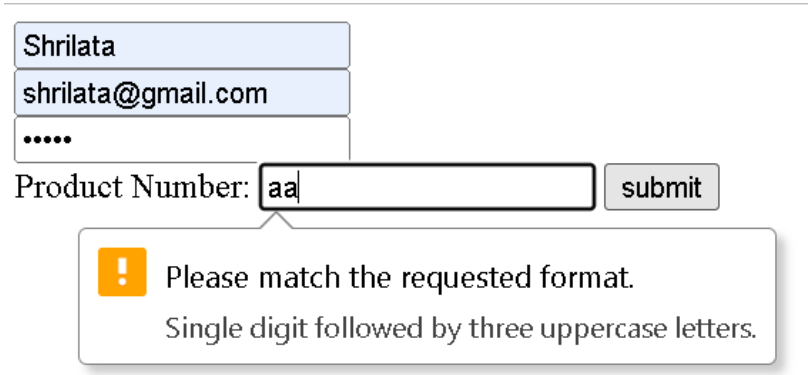
```
<form>
    <label for="uname">User Name</label>
    <input id="uname" name="uname" required pattern="[a-zA-Z]*">
    <button>Submit</button>
  </form>
```

HTML5 Attributes for <input>

- **Pattern** : specifies a JavaScript regular expression for the field's value to be checked against. pattern makes it easy for us to implement specific validation for product codes, invoice numbers, and so on.

```
<label>Product Number:</label>
<input type="text"
        name="product"
        pattern="[0-9][A-Z]{3}"
        title="Single digit followed by three uppercase letters.“
/>
```

  - The title attribute **specifies extra information about an element**. The information is most often shown as a tooltip text when the mouse moves over the element.



Audio and video

- Until now, there has never been a standard for playing audio on a web page.
  - Today, most audio is played through a audio plugin (like Microsoft Windows Media player, Microsoft Silverlight ,Apple QuickTime and the famous Adobe Flash).
  - However, not all browsers have the same plugins.
  - HTML5 the audio element to play sound files, or an audio stream.
  - Other properties like auto play, loop, preload area also available

```
<audio controls>
  <source src="vincent.mp3" type="audio/mpeg"/>
  <source src="vincent.ogg" type="audio/ogg"/>
</audio>
```

- Today, most videos are shown through a plugin (like Flash). However, not all browsers have the same plugins.
  - HTML5 provides <video> element to include video
  - Supported video formats for the video element : Ogg, MP4, WebM, .flv, .avi
  - Attributes : width, height, poster, autoplay, controls, loop, src

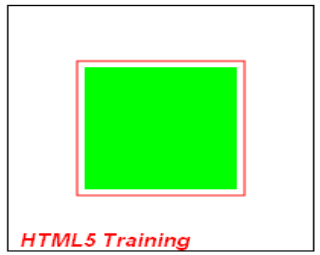
```
<video controls="controls" width="640" height="480" src="bunny.mp4" />
  Your browser does not support the video element.
</video>
```

Canvas

- A canvas is a rectangle in your web page within which you can use JavaScript to draw shapes
  - Canvas can be used to represent something visually in your browser like Simple Diagrams, Fancy user interfaces, Animations, Charts and graphs, Embedded drawing applications, Working around CSS limitations
  - The canvas element has several methods for drawing paths, boxes, circles, characters, and adding images.
  - The canvas element has no drawing abilities of its own. All drawing must be done inside a JavaScript

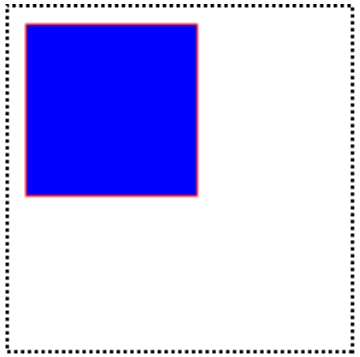
```
<canvas id="myCanvas" width="200" height="100">
</canvas>
```

```
<canvas id="myCanvas"></canvas>
<script type="text/javascript">
  var canvas=document.getElementById('myCanvas');
  var ctx=canvas.getContext('2d');
  ctx.fillStyle='#FF0000';
  ctx.fillRect(0,0,80,100);
</script>
```

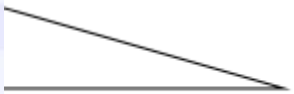


Canvas examples

```
<script>
function draw(){
    var canvas=document.getElementById('myCanvas');
    var context=canvas.getContext('2d');
    context.strokeStyle = "red";
    context.fillStyle = "blue";
    context.fillRect(10,10,100,100);
    context.strokeRect(10,10,100,100);
}
</script>
```



```
var ctx=c.getContext("2d");
ctx.moveTo(10,10);
ctx.lineTo(150,50);
ctx.lineTo(10,50);
ctx.stroke();
```

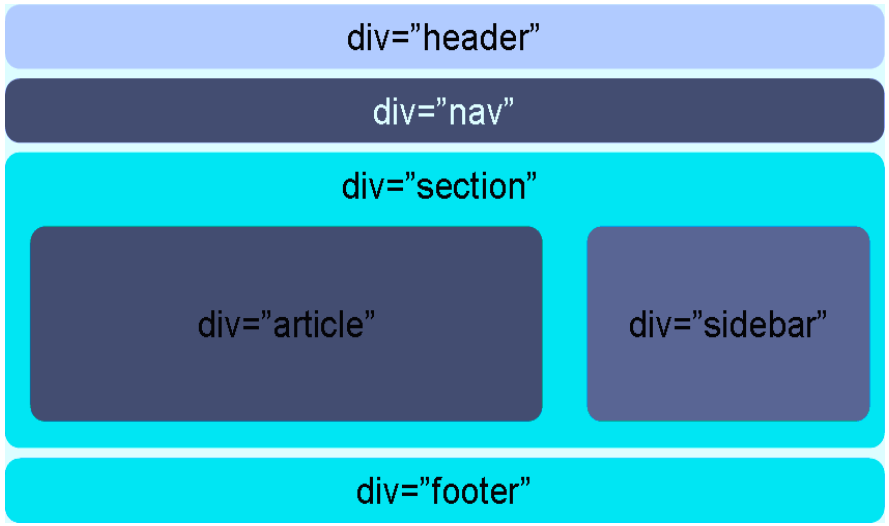


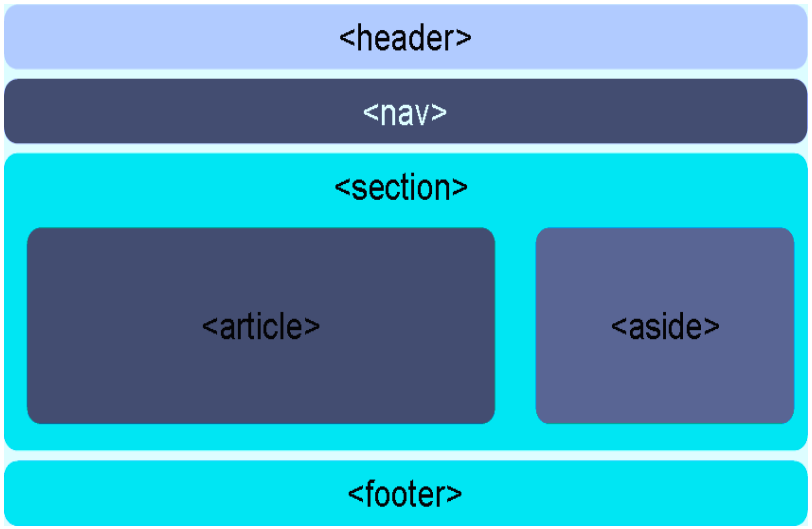
```
var ctx=c.getContext("2d");
ctx.fillStyle="#FF0000";
ctx.beginPath();
ctx.arc(70,18,15,0,Math.PI*2,true);
ctx.closePath();
ctx.fill();
```

```
var ctx=c.getContext("2d");
var grd=ctx.createLinearGradient(0,0,175,50);
grd.addColorStop(0,"#FF0000");
grd.addColorStop(1,"#00FF00");
ctx.fillStyle=grd;
ctx.fillRect(0,0,175,50);
```

Laying out a page with HTML5

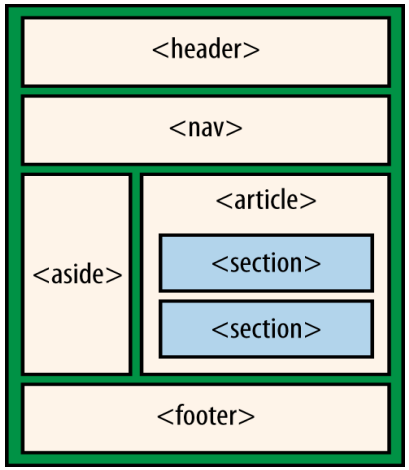
- Most HTML 4 pages include a variety of common structures, such as headers, footers and columns
- It's common to mark them up using div elements, giving each a descriptive id or class
- HTML 5 addresses this issue by introducing new elements for representing each of these different sections
- Elements that make it much easier to structure pages

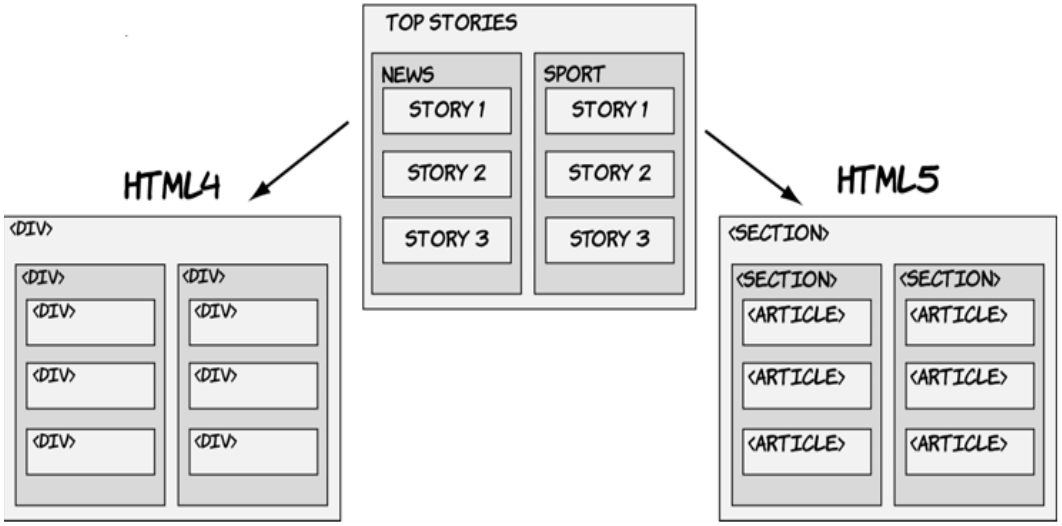




New Semantic Elements

- **<section> :** can be used to thematically group content, typically with a heading.

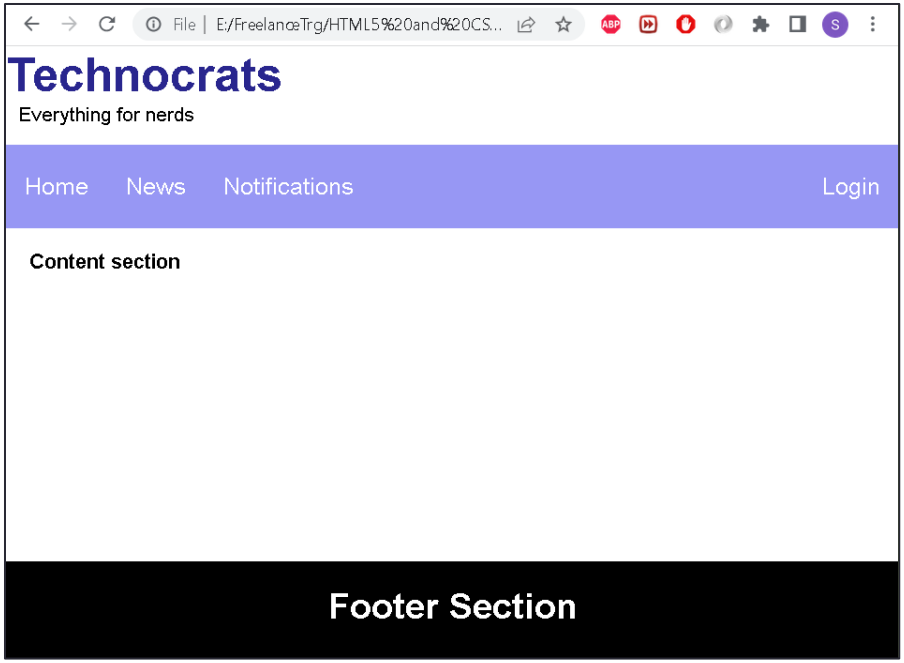




- **<article>:** element represents a self-contained composition in a document, page, application, or site that is intended to be independently distributable or reusable
  - Eg a forum post, a magazine or newspaper article, a blog entry, a user-submitted comment

- **<nav>**: Represents a major navigation block. It groups links to other pages or to parts of the current page.

```html
<body>
    <!-- Header Section -->
    <header>
        <div class="head1">
            Technocrats
        </div>
        <div class="head2">
            Everything for nerds
        </div>
    </header>
    <!-- Menu Navigation Bar -->
    <nav class="menu">
        <a href="#home">Home</a>
        <a href="#news">News</a>
        <a href="#notification">
            Notifications
        </a>
        <div class="menu-log">
            <a href="#login">Login</a>
        </div>
    </nav>
    <!-- Body section -->
    <main class="body_sec">
        <section id="Content">
            <h3>Content section</h3>
        </section>
    </main>
    <!-- Footer Section -->
    <footer>Footer Section</footer>
</body>
```



blocking elements2.html

New Semantic Elements

- **<Header>:** tag specifies a header for a document or section. Can also be used as a heading of an blog entry or news article as every article has its title and published date and time

- **<aside>:** The "aside" element is a section that somehow related to main content, but it can be separate from that content header and footer element in an article.
- **<footer>:** Similarly to "header" element, "footer" element is often referred to the footer of a web page.
  - However, you can have a footer in every section, or every article too

- **<figure>:** The <figure> tag specifies self-contained content, like illustrations, diagrams, photos, code listings, etc.
  - This element can optionally contain a figcaption element to denote a caption for the figure.

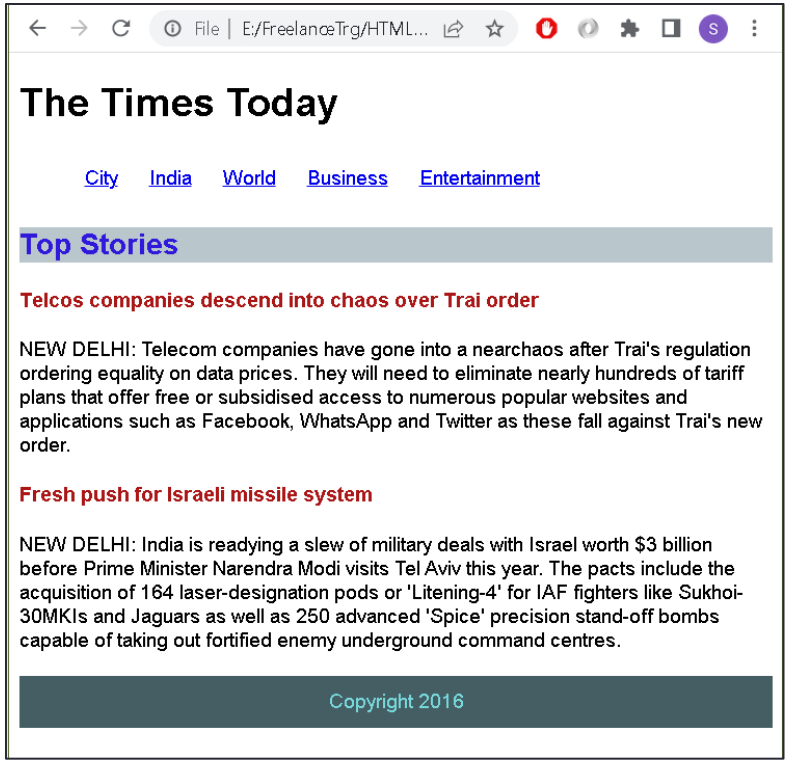
```
<figure>
  <img src="fruits.png" alt="Picture of the fave fruits" height="100" width="100">
  <figcaption>Picture of the fave fruits</figcaption>
</figure>
```

Picture of the fave fruits

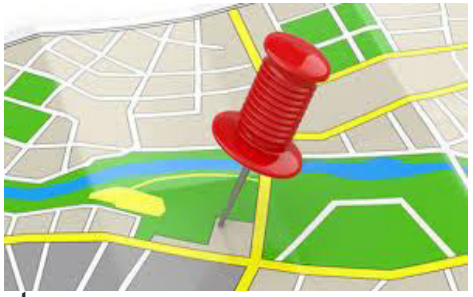
sectionarticle-eg

```
<body>
  <header><h1>The Times Today</h1>
  <nav>
      <ul>
          <li><a href="#">City</a></li>
          <li><a href="#">India</a></li>
          <li><a href="#">World</a></li>
          <li><a href="#">Business</a></li>
          <li><a href="#">Entertainment</a></li>
      </ul>
  </nav>
  </header>

  <section>
      <header style = "background-color: #607d8b70;">
          <h1 style = "color: #2a13dbf6;">Top Stories</h1>
      </header>

      <article>
          <h4 style = "color: #a80f0ff6;">Telcos companies de
              NEW DELHI: Telecom companies have gone into a nea
      </article>

      <article>
          <h4 style = "color: #a80f0ff6;">Fresh push for Isra
              NEW DELHI: India is readying a slew of military d
              The pacts include the acquisition of 164 laser-de
      </article>
  <br>
      <footer class="footer"> Copyright 2016</footer>
  </section>
```


```
<style>
    li{
      display: inline-flex;
      padding: 10px
    }
    .footer{
      height: 30px;
      color: rgb(118, 216, 219);
      background-color: #455e64;
      text-align: center;
      padding-top: 10px;
    }
  </style>
```

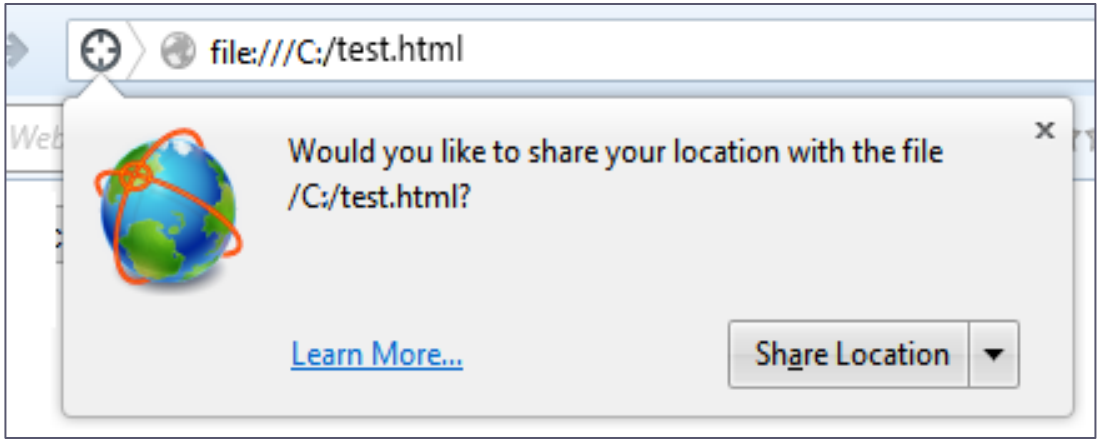


Geo Location API



- geolocation is best described as the determination of the geographic position of a person, place, or thing
- Geolocation API is used to locate a user's position
  - It also keeps the track of as they move around, always with the user's consent
  - The API is device-agnostic; it doesn't care how the browser determines location, so long as clients can request and receive location data in a standard way
    - The underlying mechanism might be via GPS, wifi, or simply asking the user to enter their location manually
    - Since any of these lookups is going to take some time, the API is asynchronous; you pass it a callback method whenever you request a location

- Since the nature of the API exposes the user's location, it could compromise their privacy.
- So the user's permission to attempt to obtain the geolocation information must be sought before proceeding



Using the Geolocation API

- Test for the presence of the geolocation object:

```
if (navigator.geolocation) // check for Geolocation support
        console.log('Geolocation is supported!');
 else   console.log('Geolocation is not supported for this Browser/OS version yet.');
```

- Obtain the geolocation object

```
var geolocation = navigator.geolocation;
```

- Geolocation Methods
  - getCurrentPosition() : retrieves the current geographic location of the user.
  - watchPosition() : retrieves periodic updates about the current geographic location of the device.
  - clearWatch() : cancels an ongoing watchPosition call.

```
function getLocation() {
   var geolocation = navigator.geolocation;
   geolocation.getCurrentPosition(showLocation, errorHandler);
}
```

showLocation and errorHandler are callback methods which would be used to get actual position

Using the Geolocation API

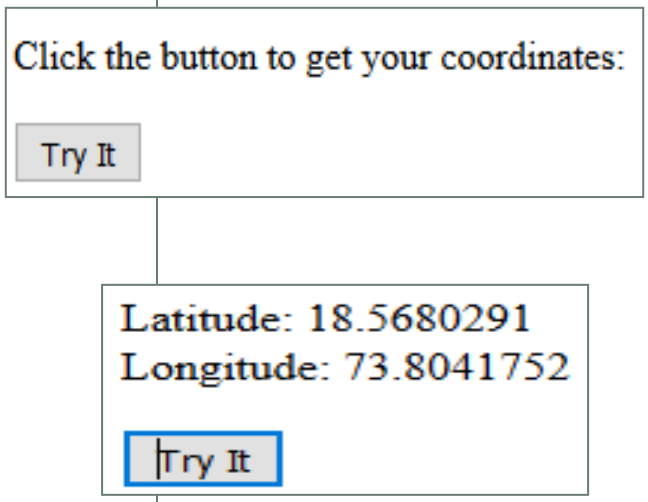
- getCurrentPosition() method is called asynchronously with an object **Position** which stores the complete location information.
  - The **Position** object specifies the current geographic location of the device

```
function showLocation( position ) {
   var latitude = position.coords.latitude;
   var longitude = position.coords.longitude;
   ...
}
```

```
function errorHandler( err ) {
   if (err.code == 1) {
      // access is denied
   }
   ...
}
```

We need to catch any error and handle it gracefully

```
<body>
<p id="demo">Click the button to get your coordinates:</p>
<button onclick="getLocation()">Try It</button>
<script>
var x=document.getElementById("demo");
function getLocation()  {
    if (navigator.geolocation)
        navigator.geolocation.getCurrentPosition(showPosition);
    else{
        x.innerHTML="Geolocation is not supported by this browser.";
 }
function showPosition(position) {
    x.innerHTML = "Latitude: " + position.coords.latitude +
                  "<br />Longitude: " + position.coords.longitude;
 }
</script>
```



(CSS) Cascading Style Sheets

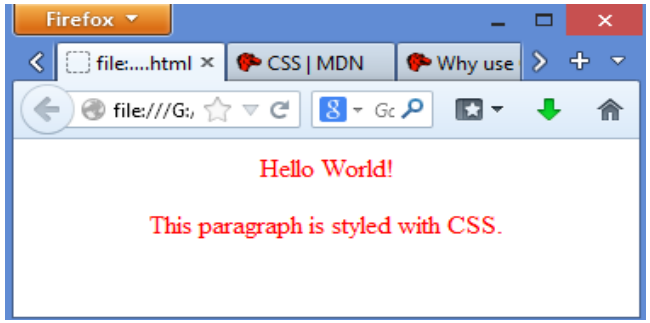
What is CSS?

- Cascading Styles Sheets - a way to style and present HTML.
  - HTML deals with content & structure, stylesheet deals with formatting & presentation of that document.
  - Allows to control the style and layout of multiple Web pages all at once.
- Why CSS?
  - saves time
  - Pages load faster
  - Easy maintenance
  - Superior styles to HTML

- A CSS rule has two parts: a selector, and one or more declarations:
- "HTML tag" { "CSS Property" : "Value" ; }
- The selector is normally the HTML element you want to style.
- Example:

```
<head>
<style>
p { color:red; text-align:center;   }
</style>
</head>
<body>
<p>Hello World!</p>
<p>This paragraph is styled with CSS.</p>
</body>
```

```
body{ background-color: gray;}
p { color: blue; }
h3{ color: white; }
```



Three Ways to Insert CSS

- Embedded Style Sheets
  - Style defined between <STYLE>..</STYLE> tags. <STYLE> tags appear either in <HEAD> section or between </HEAD> and <BODY> tags.

- Linked Style Sheets
  - Separate files (extn .CSS) that are linked to a page with the <LINK> tag. Are referenced with a URL. Placing a single <LINK> tag within the <HEAD> tags links the page that needs these styles.

```
<head>
  <link rel="stylesheet" type="text/css" href="mystyle.css">
</head>
```

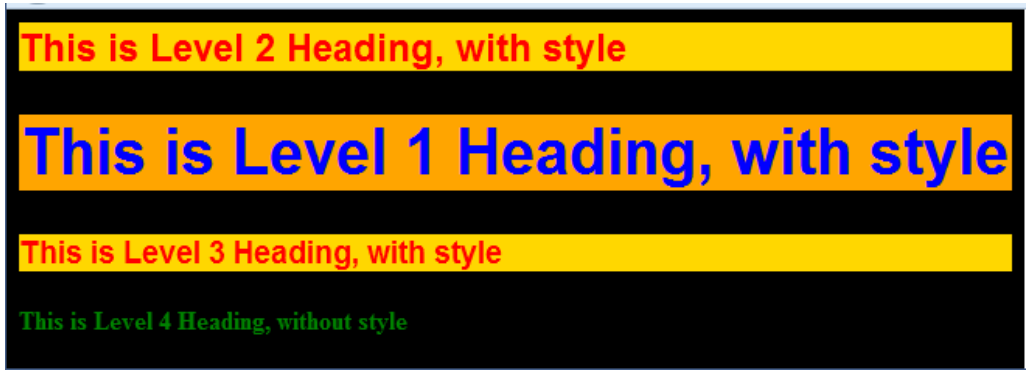
- Inline Style Sheets
  - Only applies to the tag contents that contain it. Used to control a single tag element. Tag inherits style from its parent. Egs.
  - This is a paragraph.
  - A new background and font color with inline CSS

Demo: Link Style Sheet

```
<html>
<head>
<link rel=stylesheet href="linked_ex.css"
type="text/css">
</head>
<body>
<h2>This is Level 2 Heading, with style</h2>
<h1>This is Level 1 Heading, with style</h1>
<h3>This is Level 3 Heading, with style</h3>
<h4>This is Level 4 Heading, without style</h4>
</body>
</html>
```

```
body {   background: black;
         color:green
       }
h1 {    background: orange;
        font-family: Arial, Impact;
        color: blue;
        font-size:30pt;
         text-align: center
    }
h2, h3 {   background: gold;
           font-family: Arial, Impact;
           color:red   }
```

linked_ex.css



Inline Style Sheet

- All style attribute are specified in the tag it self. It gives desired effect on that tag only. Doesn't affect any other HTML tag.

```
<body style="background: white; color:green">
<h2 style="background: gold; font-family: Arial, Impact; color:red">
This is Level 2 Heading, with style</h2>
<h1 style="background: orange; font-family: Arial, Impact; color: blue;font-size:30pt; text-align:
center">This is Level 1 Heading, with style</h1>
<h3 style="background: gold; font-family: Arial, Impact;color:red">
This is Level 3 Heading, with style</h3>
<h4>This is Level 4 Heading, without style</h4>
<h1>This is again Level 1 heading with default styles</h1>
</body>
```

Multiple Style Sheets

- If some properties have been set for the same selector in different style sheets, the values will be inherited from the more specific style sheet.
  - For example, an external style sheet has these properties for the h3 selector, & an internal style sheet has these:

```
H3 {  color:red;
      text-align:left;
       font-size:8pt;
   }
```

```
H3  {  text-align:right;
       font-size:20pt;
    }
```

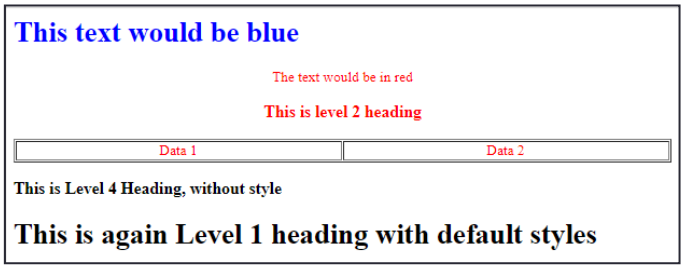
  - If the page with the internal style sheet also links to the external style sheet the properties for h3 will be:
  - color:red;
    text-align:right;
    font-size:20pt;

The color is inherited from the external style sheet and the text-alignment and the font-size is replaced by the internal style sheet.

- Grouping Selectors
  - In style sheets there are often elements with the same style.
    - H1 { color:green; }
    - h2 { color:green; }
    - P { color:green; }
  - To minimize the code, you can group selectors by separating each selector with a comma. Example
    - h1,h2,p { color:green; }

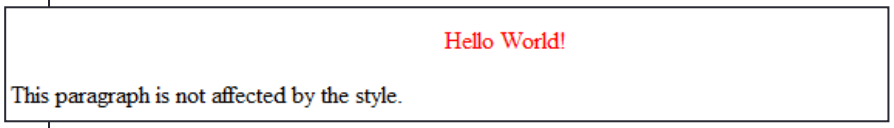
Types of selectors

- HTML selectors <tag>
  - Used to define styles associated to HTML tags. – already seen!!!!
- Class selectors (.)
  - Used to define styles that can be used without redefining plain HTML tags.
- ID selectors (#)
  - Used to define styles relating to objects with a unique id




```
<head>
   <style>
      H1.myClass {color: blue}
      .myOtherClass { color: red; text-align:center}
 </style>
 <body style="background: white; color:green">
    <H1 class="myClass">This text would be blue</H1>
    <p class="myOtherClass">The text would be in red</P>
    <H3 class="myOtherClass">This is level 2 heading</H3>
    <table class=myotherClass border width=100%>
        <td>Data 1</td><td>Data 2</td>
    </table>
    <h3>This is Level 4 Heading, without style</h3>
    <h1>This is again Level 1 heading with default styles</h1>
```

```
<head>
 <style>
   #para1 {
   text-align:center;
   color:red;
   }
 </style>
</head>
<body>
   <p id="para1">Hello World!</p>
   <p>This paragraph is not affected by the style.</p>
</body>
```



class Selector

- The class selector is used to specify a style for a group of elements.
  - The class selector uses the HTML class attribute, and is defined with a "."
  - Can also affect only specific HTML elements. Ex. all p elements with class="center" will be center-aligned (see below)

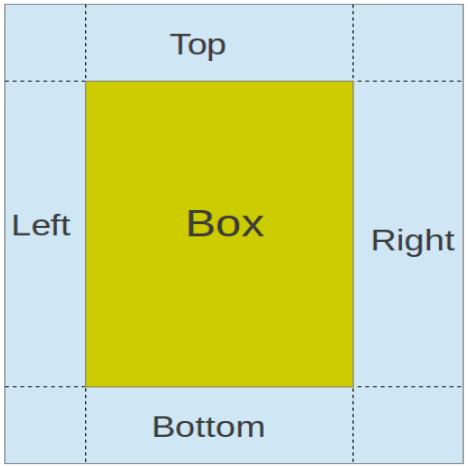
```
<head>
  <style>
     .center {  text-align:center; }
   </style>
</head>
<body>
  <h1 class="center">Center-aligned heading</h1>
  <p class="center">Center-aligned paragraph.</p>
</body>
```


```
<style>
   p.center { text-align:center; }
</style>
</head>
<body>
  <h1 class="center">This heading will not be affected</h1>
   <p class="center">This paragraph will be center-aligned.</p>
```

CSS Box Model

- All HTML elements can be considered as boxes.
- The CSS box model is essentially a box that wraps around HTML elements, and it consists of:
  - Margin - Clears an area around the border. The margin does not have a background color, it is completely transparent
  - Border - A border that goes around the padding and content. The border is affected by the background color of the box
  - Padding - Clears an area around the content. The padding is affected by the background color of the box
  - Content - The content of the box, where text and images appear

```
<h1>Header 1</h1>
<p> paragraph 1</p>
```



CSS Border

- The border property is a shorthand for the following individual border properties: border-width, border-style (required), border-color

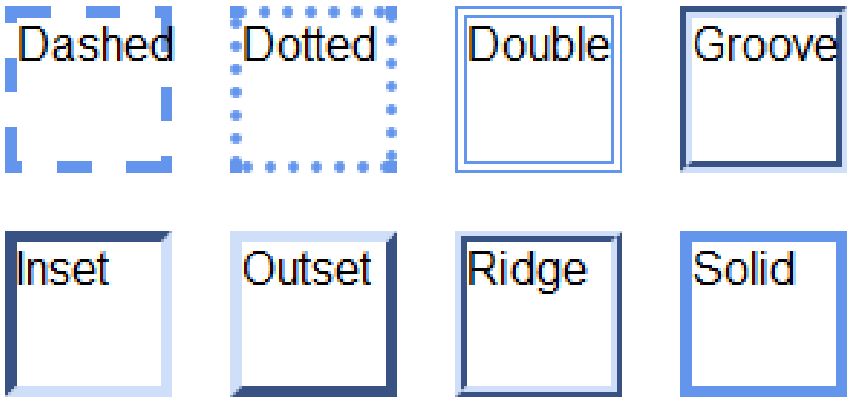
```
p { border: 5px  solid   red; }
```

This is some text in a paragraph.

```
<style type="text/css">
.box {
    width: 100px;
    height: 100px;
    border-color: Blue;
    border-width: 2px;
    border-style: solid;
}
</style>

<div class="box">
        Hello, world!
</div>
```

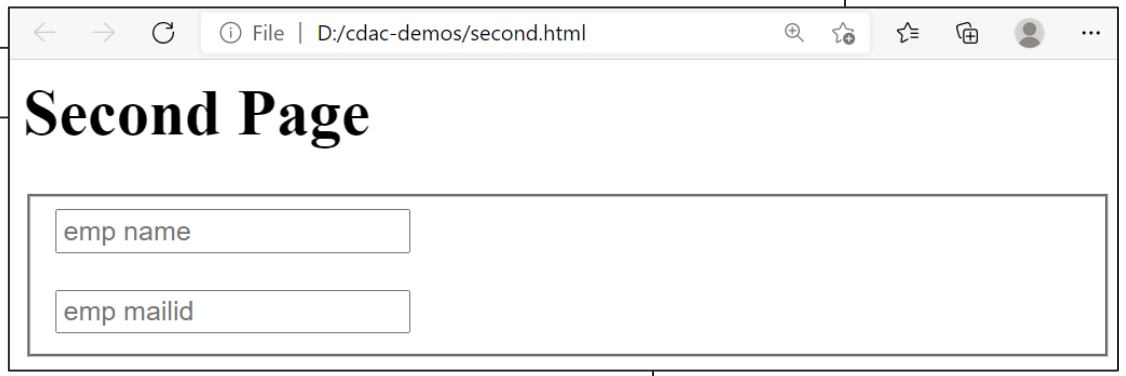
Hello, world!

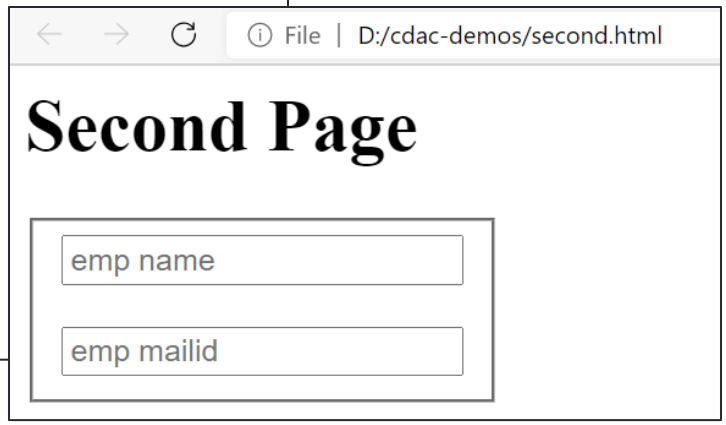
```
<div class="box" style="border-style: dashed;">Dashed</div>
<div class="box" style="border-style: dotted;">Dotted</div>
<div class="box" style="border-style: double;">Double</div>
<div class="box" style="border-style: groove;">Groove</div>
<div class="box" style="border-style: inset;">Inset</div>
<div class="box" style="border-style: outset;">Outset</div>
<div class="box" style="border-style: ridge;">Ridge</div>
<div class="box" style="border-style: solid;">Solid</div>
```



```
<form>
   <fieldset>
         <input type="text" placeholder="emp name"><br><br>
         <input type="text" placeholder="emp mailid"><br>
   </fieldset>
</form>
```

```
<html>
<head>
  <style>
     fieldset{width:100px}
  </style>
</head>
   <body>
      <h1> Second Page</h1>
       <form>
          <fieldset>
             <input type="text" placeholder="emp name">
             <input type="text" placeholder="emp mailid">
          </fieldset>
       </form>
   </body>
</html>
```





Collapsing borders on table

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

```
<table border="1">
    <tr><th>First Name</th><th>Last Name</th></tr>
    <tr><td>Anita</td><td>Patil</td></tr>
    <tr><td>Kartik</td><td>Rao</td></tr>
    <tr><td>Veena</td><td>Deshmukh</td></tr>
  </table>
```

First Name	Last Name
Anita	Patil
Kartik	Rao
Veena	Deshmukh

```
<head>
    <style>
      table, th, td{border:1px solid black; border-collapse:collapse;}
    </style>
  </head>
<body>
  <table border="1">
    <tr><th>First Name</th><th>Last Name</th></tr>
    <tr><td>Anita</td><td>Patil</td></tr>
    <tr><td>Kartik</td><td>Rao</td></tr>
    <tr><td>Veena</td><td>Deshmukh</td></tr>
  </table>
```

First Name	Last Name
Anita	Patil
Kartik	Rao
Veena	Deshmukh

CSS3 border

- CSS 3 defines “border radius”, giving developers the possibility to make rounded corners on their elements.

```
<style>
#rcorners1 {
    border-radius: 25px;
    background: #8AC007;
    padding: 20px;
    width: 100px;
    height: 100px;
}
#rcorners2 {
    border-radius: 25px;
    border: 2px solid #8AC007;
    padding: 20px;
    width: 100px;
    height: 100px;
}
```

```
#rcorners3 {
    border-radius: 25px;
    background: url(paper.gif);
    background-position: left top;
    background-repeat: repeat;
    padding: 20px;
    width: 100px;
    height: 100px;
}
</style>
<p id="rcorners1">Rounded corners!</p>
<p id="rcorners2">Rounded corners!</p>
<p id="rcorners3">Rounded corners!</p>
```

CSS Styling

CSS Background

- CSS background properties are used to define the background effects of an element.
- CSS properties used for background effects:

background-color	Sets the background color of an element
background-image	Sets the background image for an element
background-position	Sets the starting position of a background image
background-repeat	Sets how a background image will be repeated

With CSS, a color is specified by:
- *a HEX value - like "#ff0000"*
- *an RGB value - like "rgb(255,0,0)"*
- *a color name - like "red"*

- Example:
  - div {background-color:#b0c4de;}
  - body {background-image:url('paper.gif');}
  - body {background-image:url('gradient2.png');background-repeat:repeat-x;}
  - body {background-image:url('img_tree.png'); background-repeat:no-repeat;
    background-position:right top; }

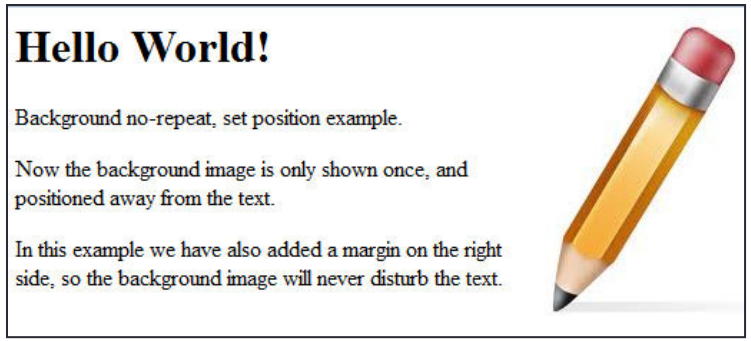
- The background-repeat property sets if/how a background image will be repeated.
  - By default, (repeat) : a background-image is repeated both vertically and horizontally.
  - no-repeat : The background-image is not repeated. The image will only be shown once

Demo : CSS Background

```
body {
    background-image: url("img_tree.gif"), url("img_flwr.gif");
    background-color: #cccccc;
}
```

```
body {
     background: #00ff00 url("smiley.gif") no-repeat fixed center;
}
```

```
<html>
<head><style>
body {
background-image:url('img_tree.png');
background-repeat:no-repeat;
background-position:right top;
margin-right:200px;
}
</style> </head>
<body>
<h1>Hello World!</h1>
<p>Background no-repeat, set position example.</p>
<p>Now the background image is only shown once, and positioned away from the text.</p>
<p>In this example we have also added a margin on the right side, so the background image will never disturb the text.</p>
</body></html>
```

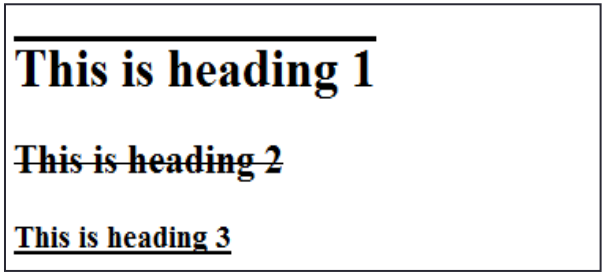


CSS Text

- CSS Text Properties

color	Sets the color of text
direction	Specifies the text direction/writing direction
letter-spacing	Increases or decreases the space between characters in a text
text-align	Specifies the horizontal alignment of text
text-decoration	Specifies the decoration added to text
text-indent	Specifies the indentation of the first line in a text-block
text-shadow	Specifies the shadow effect added to text
text-transform	Controls the capitalization of text
white-space	Specifies how white-space inside an element is handled
word-spacing	Increases or decreases the space between words in a text

```
<style>
h1 {text-decoration:overline;}
h2 {text-decoration:line-through;}
h3 {text-decoration:underline;}
</style>
<body>
<h1>This is heading 1</h1>
<h2>This is heading 2</h2>
<h3>This is heading 3</h3>
```



Demo :

```
<style>
p.uppercase {text-transform:uppercase;}
p.lowercase {text-transform:lowercase;}
p.capitalize {text-transform:capitalize;}
</style>
<body>
<p class="uppercase">This is some text.</p>
<p class="lowercase">This is some text.</p>
<p class="capitalize">This is some text.</p>
</body>
```

THIS IS SOME TEXT.

this is some text.

This Is Some Text.

```
<head> <style>
h1 {text-align:center;color:#00ff00;}
p.date {text-align:right;}
p.main {text-align:justify;}
p.ex {color:rgb(0,0,255);}
p.indent {text-indent:50px;}
</style> </head>
<body>
<h1>Hello World!</h1>
<p class="date"> Sep 2013</p>
<p class="main indent">The CSS property text-align corresponds to the attribute align used in old versions of HTML. Text can either be aligned to the left, to the right or centred. In addition to this, the value justify will stretch each line so that both the right and left margins are straight. You know this layout from for example newspapers and magazines. </p>
<p class="ex">The property text-decoration makes it is possible to add different "decorations" or "effects" to text. </p>
</body>
```

Hello World!

Sep 2013

The CSS property text-align corresponds to the attribute align used in old versions of HTML. Text can either be aligned to the left, to the right or centred. In addition to this, the value justify will stretch each line so that both the right and left margins are straight. You know this layout from for example newspapers and magazines.

The property text-decoration makes it is possible to add different "decorations" or "effects" to text.

CSS : Styling Fonts

- CSS font properties define the font family, boldness, size, and the style of a text.

font-family	Specifies the font family for text
font-size	Specifies the font size of text
font-style	Specifies the font style for text
font-variant	Specifies if a text should be displayed in a small-caps font
font-weight	Specifies the weight of a font

- Example:
  - p.normal {font-weight:normal;}
  - p{font-family:"Times New Roman", Times;}
  - p.italic {font-style:italic;}
  - h1 {font-size:40px;}
  - p.small { font-variant:small-caps; }

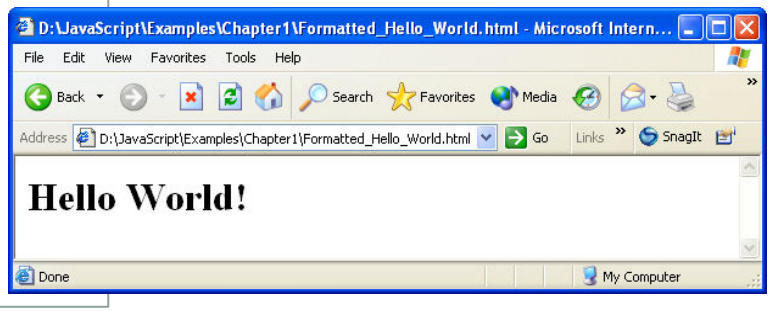
JAVASCRIPT

Overview

- JavaScript is Netscape's cross-platform, object-based scripting language
  - JavaScript code is embedded into HTML pages
  - It is a lightweight programming language
  - Client-side JavaScript extends the core language by supplying objects to control a browser and its Document Object Model
- Why use Javascript?
  - Provides HTML designers a programming tool :
  - Puts dynamic text into an HTML page
  - Reacts to events
  - Reads and writes to HTML elements :
  - Can be used to perform Client side validation
  - The <SCRIPT> tag

```
<SCRIPT>
    JavaScript statements …
</SCRIPT>
```

```
<html>
<head> </head>
<body>
<script type="text/javascript">
      document.write("<H1>Hello World!</H1>");
      alert("some message");
      console.log("some message");
</script>
</body></html>
```



Embedding JavaScript in HTML

- Where to Write JavaScript?
  - Head Section
  - Body Section
  - External File

```
<html>
<head>
<script type="text/javascript">
  function message()  {
        alert("Hello World")
   }
</script>
</head>
<body onload="message()">
</body>
</html>
```

```
<html>
<head></head>
<body >
<script language="javascript">
            document.write("Hello World!")
</script>
</body>
</html>
```

```
<head>
<script src="common.js">
      <!– no javascript statements →
   </ script>
</head>
<body>
   <script>
       document.write("display value of a variable"+msg)
   </script>
</body>
```

```
//common.js file contents
var msg
msg="<h1>in external file</h1>"
```

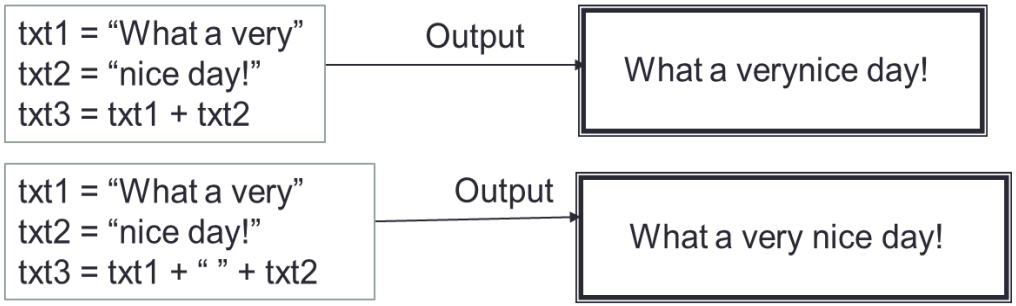
Data Types in JavaScript

- JavaScript is a free-form language. Need not declare all variables, classes, and methods
- Variables in JavaScript can be of type:
  - Number (4.156, 39)
  - String (“This is JavaScript”)
  - Boolean (true or false)
  - Null (null) → usually used to indicate the absence of a value

- Defining variables. var variableName = value
- JavaScript variables are said to be un-typed or loosely typed
  - letters of the alphabet, digits 0-9 and the underscore (_) character and is case-sensitive.
  - Cannot include spaces or any other punctuation characters.
  - First character of name must be either a letter or the underscore character.
  - No official limit on the length of a variable name, but must fit within a line.

Javascript operators:

- Arithmetic Operators (+ , -, * , / , %)
- Assignment Operators(=,+=,-=,*=,/=,%=)
- Comparison Operators (==,!=,<,<=,>,>=)
- Boolean Operators(&&,||,!)
- Bitwise Operators(&,|,!,^,<<,>>,>>>)
- String Operators(=,+,+=)



Typeof Operator

x	typeof x
undefined	"undefined"
null	"object"
true or false	"boolean"
any number or NaN	"number"
any string	"string"
any function	"function"
any nonfunction native object	"object"

typeof	undefinedvariable	“undefined”
typeof	33	“number”
typeof	“abcdef”	“string”
typeof	true	“boolean”
typeof	null	“object”

```
typeof "John"                 // Returns "string"
typeof 3.14                   // Returns "number"
typeof NaN                    // Returns "number"
typeof false                  // Returns "boolean"
typeof [1,2,3,4]              // Returns "object"
typeof {name:'John', age:34}  // Returns "object"
typeof new Date()             // Returns "object"
typeof function () {}         // Returns "function"
typeof myCar                  // Returns "undefined"
typeof null                   // Returns "object"
```

```
<SCRIPT LANGUAGE="JavaScript">

  var num1=20
  var str1="abc"
  var bool1=true
  var num2=null
  var var1;
  document.write("type of str1 : "+typeof(str1)+"<BR>")
  document.write("type of num1 : "+typeof(num1)+"<BR>")
  document.write("type of bool1 : "+typeof(bool1)+"<BR>")
  document.write("type of num2 : "+typeof(num2)+"<BR>")
  document.write("type of var1 : "+typeof(var1)+"<BR>")
</SCRIPT>
```

type of str1 : string
type of num1 : number
type of bool1 : boolean
type of num2 : object
type of var1 : undefined

Control Structures and Loops

- JavaScript supports the usual control structures:
  - the conditionals:
    - if,
    - if...else
    - If … else if … else
    - Switch

```
if(condition) {
      statement 1
} else {
       statement 2
}
```

```
if(a>10) {
document.write("Greater than 10")
} else {
document.write("Less than 10")
}
```

```
document.write( (a>10) ? "Greater than 10" : "Less than 10" );
```

```
<script>
   var n=20;
   switch(n){
      case 10: document.write("Ten");
                  break;
      case 20: document.write("Twenty");
                  break;
      case 30: document.write("Thirty");
                  break;
      default: document.write("Invalid!");
    }
</script>
```

```
switch (variable) {
      case outcome1 :{
            //stmts for outcome 1
             break; }
      case outcome2 :{
            //stmts outcome 2
              break; }
       default: {
            //none of the outcomes is chosen
          }
}
```

  - iterations:
    - for
    - while

```
for( [initial expression;][condition;][increment expression] )  {
                statements
}
```

```
for(var i=0;i<10;i++)
{
        document.write("Hello");
}
```

```
while(condition) {
      statements
}
```

```
while(i<10) {
     document.write("Hello");
       i++;
}
```

JavaScript Functions

```
function myFunction (arg1, arg2, arg3)  {
        statements
            return
}
```

```
Calling the function :
 myFunction( “abc”, “xyz”, 4 )
 myFunction()
```

```
function area(w1, w2, h) {
    var area=(w1+w2)*h/2;
    alert(area+" sq ft");
}
area(2,3,7);  //calling the function
```

```
function diameter(radius){
    return radius * 2;
}

var d=diameter(5); //calling the function
```

- **Function expressions -** functions are assigned to variables

```
var myFunction = function() {
   statements
}
```

```
var area = function (radius) {
      return Math.PI * radius * radius;
  };
alert(area(5));        // => 78.5
```

- **Global and Local Variables**

```
<script language=“Javascript”>
  var companyName=“TechnoFlo”
  function f(){
     var empName=“Henry”
     document.write(“Welcome to ”+companyName+ ”, “ +empName)
  }
</script>
```

Global Variable

Local Variable

- Variables that exist only inside a function are called Local variables - they can’t be changed by main code or other functions
- Within the body of a function, a local variable takes precedence over a global variable with the same name.
- Variables that exist throughout the script are called Global variables - Their values can be changed anytime in the code and even by other functions

Closures

- The closure is an inner function which always has access to the variables and parameters of its outer function, even when the outer function has returned.
  - The closure has three scope chains: it has access to its own scope (variables defined between its curly brackets), it has access to the outer function's variables, and it has access to the global variables.

```
Global Execution Context
1  var x = 10;
2
3  function foo() {
4      Execution Context (foo)
5      var y = 20; // free variable
6
7      function bar() {
8          Execution Context (bar)
9          var z = 15; // free variable
10         var output = x + y + z;
11         return output;
12     }
13
14     return bar;
15 }
```

```
function a(){

  let x = 10;

  function b(){

    console.log(x);

  }

 b();

}

a();
```

Calling inner function

```
function a(){

   let x = 10;

  function b(){

     function c(){

       function d(){

         console.log(x);

       }

      d();

     }

     c();

   }

  b();

}

a();
```

Closures : Example-1

```
1.  function sayHello() {

2.      var say = function() {
3.          console.log(hello);
4.      }

5.    // Local variable that goes into closure
6.    var hello = 'Hello, world!';
7.    return say;
8.  }
9.
10. var sayHelloClosure = sayHello();
11. sayHelloClosure(); // 'Hello, world!'
```

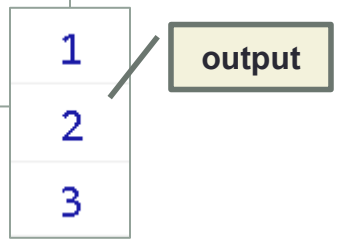
- Focus on lines 10 and 11.
- At line number 10 we are done with the execution of **function sayHello()** and the entire body of **function say()** is returned and stored in **var sayHelloClosure**, due to the line 7 **return say**.
- ***The return statement does not execute the inner function - function is executed only when followed by (), but rather the return statement returns the reference to the function as a function in JavaScript is also an object.***

- We can access the variable hello which is defined in **function sayHello()** through **function say()**
- This is closure in action - that is inner function (say()) can have access to the outer function variables as well as all the global variables.
- closure is created when a child function keep the environment of the parent scope even after the parent function has already executed

Closures : Example-2

```
1.  <html>
2.      <body>
3.          <script>
4.              function outer() {
5.                  var i = 1;
6.                    function inner(){
7.                        return i++;
8.                    }
9.                  return inner;
10.              }

11.             var getInner = outer();
12.
13.             console.log(getInner());
14.             console.log(getInner());
15.             console.log(getInner());
16.         </script>
17.     </body>
18. </html>
```

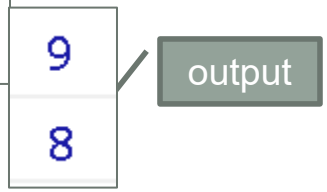
- Focus on lines 11 to 15.
- At line number 11 we are done with the execution of **function outer()** and the entire body of **function inner()** is returned and stored in **var get_func_inner**, due to the line 9 **return inner**.
- ***The return statement does not execute the inner function - function is executed only when followed by (), but rather the return statement returns the reference to the function as a function in JavaScript is also an object.***



Closures : Example-3

```
<script>
      console.log("--------example-3------")
      function outer(outer_arg) {

        function inner(inner_arg) {
            return outer_arg + inner_arg;
         }
        return inner;
      }

      var getInner = outer(5);

      console.log(getInner(4));
      console.log(getInner(3));
</script>
```

we used a parameter function rather than a default one. Note even when we are done with the execution of **outer(5)** we can access the **outer_arg** variable from the inner function. And on execution of inner function produce the summation of **outer_arg** and **inner_arg** as desired.



Predefined Functions

- isFinite: evaluates an argument to determine if it is a finite number.
- If needed, the parameter is first converted to a number.

```
isFinite (number)       //where number is the number to evaluate
```

```
var a = isFinite(123) + "<br>";         //true
var b = isFinite(-1.23) + "<br>";       //true
var d = isFinite(0) + "<br>";           //true
var e = isFinite("123") + "<br>";       //true
var f = isFinite("Hello") + "<br>";     //false
```

- isNaN : Evaluates an argument to determine if it is “NaN” (not a number)

```
isNaN(0)                  //false
isNaN('123')              //false
isNaN('Hello')            //true
isNaN('2005/12/12') //true
```

- Parseint and parsefloat
  - Returns a numeric value for string argument.
  - parseInt (str)
  - parseFloat (str)

```
parseInt("3 blind mice")          // => 3
parseFloat(" 3.14 meters")        // => 3.14
```

ES6 - Next gen Javascript

- **const** : from JS 1.5 onwards.- to define constants
  - Eg :

```
const myBirthday = '18.04.1982';
myBirthday = '01.01.2001';   // error, can't reassign the constant!
```

```
const LANGUAGES = ['Js', 'Ruby', 'Python', 'Go'];
LANGUAGES = "Javascript";   // shows error.
LANGUAGES.push('Java');     // Works fine.
console.log(LANGUAGES);     // ['Js', 'Ruby', 'Python', 'Go', 'Java']
```

- **let** : to define block-scoped variables; can be used in four ways:
  - as a variable declaration like var; in a for or for/in loop, as a substitute for var;
  - as a block statement, to define new variables and explicitly delimit their scope
  - to define variables that are scoped to a single expression.
  - Eg : let message = 'Hello!';
  - Eg : let user = 'John', age = 25, message = 'Hello';

```
if (true) {
    let a = 40;
    console.log(a); //40
   }
   console.log(a); // undefined
```

```
let a = 50;  let b = 100;
if (true) {
   let a = 60;
   var c = 10;
   console.log(a/c); // 6
   console.log(b/c); // 10
}
console.log(c); // 10
console.log(a); // 50
```

ES6 - Next gen Javascript

- Arrow functions : allows you to create functions in a cleaner way compared to regular functions
  - is a compact alternative to a traditional function expression, but is limited and can't be used in all situations.

```
<script>
//non lambda
    function greet(name){
        console.log(name);
    }
    greet("shrilata");

    //lambda-eg1
    const greet1 = name => console.log(name);
    greet1("sandeep");

    //lambda-eg2
    const add = (a,b) => a + b;

    console.log(add(10,20));

    //lambda-eg3
    const strOp = str => {
                        console.log(str.length);
                        console.log(str.toUpperCase());
                        console.log(str.charAt(0));
                        };
     strOp("Hello");
```

Predefined Core Objects

String Objects

- Creating a string object:
  - var myString = new String(“characters”)
  - var myString = “fred”

- Properties of a string object:
  - length: returns the number of characters in a string.

- “Lincoln”.length // result = 7
- “Four score”.length // result = 10
- “One\ntwo”.length // result = 7
- “”.length // result = 0

- String Object methods:
  - charAt(index) : returns the character at a specified position.
  - Eg : var str = "Hello world!";
    - str.charAt(0); //returns H
    - str.charAt(str.length-1)); //returns !
  - concat() : joins two or more strings
  - stringObject.concat(stringX,stringX,...,stringX)
  - Eg: var str1="Hello ";
    var str2="world!";
    document.write(str1.concat(str2));

String functions

- indexOf () : returns the position of the first occurrence of a specified string value in a string.
  - index values start their count with 0.
  - If no match occurs within the main string, the returned value is -1.
  - string.indexOf(searchString [, startIndex])

```
Eg : var str="Hello world, welcome";
str.indexOf("Hello");  //returns 0
str.indexOf("wor"));  //returns 6
str.indexOf("e",5); //returns 14
```

- toLowerCase() / toUpperCase()

```
Eg: var str="Hello World!";
str.toLowerCase()  //returns hello world
str.toUpperCase()  //returns HELLO WORLD
```

- slice(startIndex [, endIndex])
  - Extracts a part of a string and returns the extracted part in a new string

```
Eg : var str="Hello World";
     str.slice(6)  //returns World
     str.slice(0,1)  //returns H
```

String functions

- split(“delimiterCharacter”[, limitInteger]) - Splits a string into array of strings
  - string.split(“delimiterCharacter”[, limitInteger])

```
var str = "zero one two three four";
var arr = str.split(" ");
for(i = 0; i < str.length; i++){  document.write(“<br>” + arr[i]); }
```

Output :

zero
one
two
three
four

```
var myString = “Anderson,Smith,Johnson,Washington”
var myArray = myString.split(“,”)
var itemCount = myArray.length // result: 4
```

  - Complete Example:

```
var s = "hello, world"          // Start with some text.
s.charAt(0)                     // => "h": the first character.
s.charAt(s.length-1)            // => "d": the last character.
s.substring(1,4)                // => "ell": the 2nd, 3rd and 4th characters.
s.slice(1,4)                    // => "ell": same thing
s.slice(-3)                     // => "rld": last 3 characters
s.indexOf("l")                  // => 2: position of first letter l.
s.lastIndexOf("l")              // => 10: position of last letter l.
s.indexOf("l", 3)               // => 3: position of first "l" at or after 3
s.split(", ")                   // => ["hello", "world"] split into substrings
s.replace("h", "H")             // => "Hello, world": replaces all instances
s.toUpperCase()                 // => "HELLO, WORLD"
```

String property : Prototype

- A prototype is a property or method that becomes a part of every new object created after the prototype items have been added.
  - Sometimes you want to add new properties/methods to all existing objects of a given type.
  - For strings, as an example, you may want to define a new method for converting a string into a new type of HTML font tag not already defined by JavaScript's string object.
  - A function definition (makeItHot()) accumulates string data to be returned to the object when the function is invoked as the object's method.
  - The this keyword extracts the object making the call, which you convert to a string for concatenation with the rest of the strings to be returned.
- prototype
  - Allows you to add properties and methods to an object.
  - Syntax : object.prototype.name=value

```
function makeItHot() {
    return "<FONT COLOR='red'>" + this.toString() + "</FONT>“
}

String.prototype.hot = makeItHot
document.write("<H1>This site is on " + "FIRE".hot() + "!!</H1>")
```

Math Properties

Property	Value	Description
Math.E	2.718281828459045091	Euler's constant
Math.LN	0.6931471805599452862	Natural log of 2
Math.LN10	2.302585092994045901	Natural log of 10
Math.LOG2E	1.442695040888963387	Log base-2 of E
Math.LOG10E	0.4342944819032518167	Log base-10 of E
Math.PI	3.1415926535897931 16	PI
Math.SQRT1_2	0.7071067811865475727	Square root of 0.5
Math.SQRT2	1.4142135623730951 45	Square root of 2

```
<script>
    document.write(Math.PI + "<br>");
    document.write(Math.SQRT2 + "<br>");
    document.write(Math.SQRT1_2 + "<br>");
    document.write(Math.E + "<br>");
</script>
```

3.141592653589793
1.4142135623730951
0.7071067811865476
2.718281828459045

Math Objects (Methods)

Method syntax	Returns
Math.abs(val)	Absolute value of *val*
Math.acos(val)	Arc cosine (in radians) of *val*
Math.asin(val)	Arc sine (in radians) of *val*
Math.atan(val)	Arc tangent (in radians) of *val*
Math.atan2(val1, val2)	Angle of polar coordinates *x* and *y*
Math.ceil(val)	Returns the value of x rounded up to its nearest integer
Math.cos(val)	Cosine of *val*
Math.exp(val)	Euler's constant to the power of *val*
Math.floor(val)	Next integer less than or equal to *val*
Math.max(val1, val2)	The greater of *val1* or *val2*
Math.min(val1, val2)	The lesser of *val1* or *val2*
Math.pow(val1, val2)	*Val1* to the *val2* power
Math.random()	Random number between 0 and 1
Math.round(val)	returns the nearest integer: N+1 when *val* >= n.5; otherwise N
Math.sin(val)	Sine (in radians) of *val*
Math.sqrt(val)	Square root of *val*
Math.tan(val)	Tangent (in radians) of *val*
Math.log(val)	Natural logarithm (base e) of val

Date

- Date object allows the handling of date and time information.
  - All dates are in milliseconds from January 1, 1970, 00:00:00.
  - Dates before 1970 are invalid dates.
- There are different ways to define a new instance of the date object:

```
var d = new Date()        //Current date
var d = new Date(milliseconds)
var d = new Date(dateString)
var d = new Date(year, month, day, hours, minutes, seconds, milliseconds)
```

```
<script>
    var d=new Date();
    document.write(d);
</script>
```

Tue Sep 24 2013 12:48:39 GMT+0530 (India Standard Time)

```
var d = new Date(86400000);
var d = new Date(99,5,24,11,33,30,0);
```

Date Object - Methods

getDate( )	Date of the month (1 - 31)
getDay( )	Day of the week (0 - 6, 0-Sunday)
getMonth( )	The month (0 - 11, 0 - Jan.)
getFullYear( )	The year (4 digits)
getHours( )	Hour of the day (0 - 23)
getMinutes( )	Minutes (0 - 59)
getSeconds( )	Seconds (0 - 59)
getTime( )	Milliseconds since 1/1/1970
getTimezoneOffset( )	Offset between local time and GMT
setDate(dayValue)	1-31
setHours(hoursValue)	0-23
setMinutes(minutesValue)	0-59
setMonth(monthValue)	0-11
setSeconds(secondsValue)	0-59
setTime(timeValue)	>=0
setYear(yearValue)	>=1970
valueOf()	returns number of millisecond since 1 jan 1970
Date.now()	same as valueOf()

Array

- An array is data structure for storing and manipulating ordered collections of data.
- An array can be created in several ways.
  - Eg1: Regular

```
var cars=new Array();
cars[0]="Spark";
cars[1]="Volvo";
cars[2]="BMW";
```

  - Eg 2: Condensed: var cars=new Array("Spark","Volvo","BMW");
  - Eg 3: Literal: var cars=["Spark","Volvo","BMW"];
  - Eg 4: var matrix = [[1,2,3], [4,5,6], [7,8,9]];
  - Eg 5 : var sparseArray = [1,,,,5];

- Iterating thru array

```
var arr = [44,55,34,21,89];
for(var i=0; i < arr.length; i++)
    console.log(arr[i]);

for(var i in arr)
    console.log(i,arr[i]);

for(var i of arr)
    console.log(i)
```

```
44
55
34
21
89
0 44
1 55
2 34
3 21
4 89
44
55
34
21
89
```

Array Object Methods

- arrayObject.reverse()
- arrayObject.slice(startIndex, [endIndex])
- arrayObject.join(separatorString) : array contents will be joined and placed into arrayText by using the comma separator“
- arrayObject.push(): add one or more values to the end of an array

```
arrayObject.slice(startIndex [, endIndex])          //Returns: Array
var solarSys = new Array (“Mercury”,”Venus”,”Earth”,”Mars”,”Jupiter”,”Saturn”)
var nearby = solarSys.slice(1,4)
// result: new array of “Venus”, “Earth”, “Mars”
```

```
Andrew|Monica|Catie|Jenna
joinedarr type :  string
```

```
arrayObject.concat(array2)
var a1 = new Array(1,2,3)
var a2 = new Array(“a”,”b”,”c”)
var a3 = a1.concat(a2)
// result: array with values 1,2,3,”a”,”b”,”c”
```

```
var names = ["Andrew","Monica","Catie","Jenna"];
var joined_arr = names.join("|")
console.log(joined_arr)
console.log("joinedarr type :",typeof(joined_arr))
```

```
a = []; // Start with an empty array
a.push("zero") // Add a value at the end. a = ["zero"]
a.push("one", "two") // Add two more values. a = ["zero", "one", "two"]
```

Number

- The **Number** object is a wrapper object allowing you to work with numerical values.
  - A Number object is created using the Number() constructor or as a literal
  - JavaScript creates Number objects when a variable is set to a number value, for example **var num = 255.336**;. It is seldom necessary to create Number objects explicitly.

Property	**Description**
constructor	Returns the function that created JavaScript's Number prototype
MAX_VALUE	Returns the largest number possible in JavaScript
MIN_VALUE	Returns the smallest number possible in JavaScript
NEGATIVE_INFINITY	Represents negative infinity (returned on overflow)
NaN	Represents a "Not-a-Number" value
POSITIVE_INFINITY	Represents infinity (returned on overflow)
prototype	Allows you to add properties and methods to an object
Number.MAX_SAFE_INTEGER	The maximum safe integer in JavaScript (2^{53} - 1).

Number Methods and properties

```
console.log(Number.MIN_VALUE)
console.log(Number.MAX_VALUE)
console.log(Number.NEGATIVE_INFINITY)
console.log(Number.POSITIVE_INFINITY)
console.log(Number.prototype)
console.log(Number.MIN_SAFE_INTEGER)
console.log(Number.MAX_SAFE_INTEGER)
```

```
5e-324
1.7976931348623157e+308
-Infinity
Infinity
▶ Number {0, constructor: ƒ,
-9007199254740991
9007199254740991
```

Method	Description
isFinite()	Checks whether a value is a finite number
isInteger()	Checks whether a value is an integer (new in ES6)
isNaN()	Checks whether a value is Number
isSafeInteger()	Checks whether value can be safely represented in JavaScript.
toExponential(x)	Converts a number into an exponential notation
toFixed(x)	Formats a number with x numbers of digits after the decimal point
toPrecision(x)	Formats a number to x length
valueOf()	Returns the primitive value of a number
toString()	Converts a number to a string
parseFloat()/parseInt()	Same as global counterparts

```
let num = new Number('18.907');
console.log(num.toExponential()); //Converts a number into an Exponential notation.
console.log(num.toFixed());
console.log(num.toFixed(2)); //Rounds up a number to x digits after the decimal.
console.log(num.toPrecision());
console.log(num.toPrecision(3));  //Rounds up a number to a length of x digits.
console.log(typeof num.toString()); //toString() Returns a String value of a number
object.
console.log(num.valueOf());   //Returns the primitive value of the Number object
```

```
1.8907e+1
19
18.91
18.907
18.9
string
18.907
```

```
let numObj = 5.123456

console.log(numObj.toPrecision())    // logs '5.123456'
console.log(numObj.toPrecision(5))   // logs '5.1235'
console.log(numObj.toPrecision(2))   // logs '5.1'
console.log(numObj.toPrecision(1))   // logs '5'

let numObj = 53.123456

console.log(numObj.toPrecision())    // logs '5.123456'
console.log(numObj.toPrecision(5))   // logs '53.123'
console.log(numObj.toPrecision(2))   // logs '53'
console.log(numObj.toPrecision(1))   // logs '5e+1'
```

Boolean Object

- The Boolean object represents two values, either "true" or "false".
- The following syntax creates a boolean object. var val = new Boolean(value);
  - If value parameter is omitted or is 0, -0, null, false, NaN, undefined, or the empty string (""), the object has an initial value of false.
  - Everything else is true; including any object, an empty array ([]), or the string "false", create an object with an initial value of true.
  - Ie, Everything With a "Value" is True and Everything Without a "Value" is False
- Boolean Methods:
  - toString() : Returns a string of either "true" or "false" depending upon the value of the object.
  - valueOf() : Returns the primitive value of the Boolean object.

```
▶ Boolean {false}
▶ Boolean {false}
▶ Boolean {false}
▶ Boolean {false}
▶ Boolean {false}
▶ Boolean {true}
▶ Boolean {true}
```

```
<script language="javascript">

        var bool1 = new Boolean("");
        console.log(bool1);

        var bool2 = new Boolean(0);
        console.log(bool2);

        var bool3 = new Boolean(undefined);
        console.log(bool3);

        var bool4 = new Boolean(null);
        console.log(bool4);

        var bool5 = new Boolean(NaN);
        console.log(bool5);

        var bool6 = new Boolean("some text");
        console.log(bool6);

        var bool7 = new Boolean(1);
        console.log(bool7);

    </script>
```

User defined Objects

- **Objects can be created in several ways:**
  1. Using the Object() constructor:
  2. Using Object.create() method:
  3. Using the bracket's syntactic sugar. eg : var b = {};
  4. Using a function constructor
  5. Using class (ES6)

- **Using Object Initializers**
  - Syntax : objName = {property1:value1, property2:value2, … }
  - Eg

```
var empty = {}; // An object with no properties
var point = { x:0, y:0 };
var person = { "name ":"amit", "age":23};
var emp = {"name":"Amit",
           "age": 37.5,
           "married": true,
           "address":{ "city":"Pune" , "state":"Mah" },
           "hobbies":["swimming","reading","music"]
}
```

Examples : Using Object Initializers

```
// Example 1
var myFirstObject = {};
myFirstObject.firstName = "Andrew";
myFirstObject.lastName = "Grant";
console.log(myFirstObject.firstName);
```

```
// Example 2
var mySecondObject = {
    firstName: "Andrew",
    lastName: "Grant"
};
console.log(mySecondObject.firstName);
```

```
// Example 3
var myThirdObject = new Object();
myThirdObject.firstName = "Andrew";
myThirdObject.lastName = "Grant";
console.log(myThirdObject.firstName);
```

```
var myFirstObject = {};
myFirstObject.firstName = "Andrew";
console.log(myFirstObject.firstName);
myFirstObject.firstName = "Monica";
console.log(myFirstObject.firstName);
myFirstObject["firstName"] = "Catie";
console.log(myFirstObject["firstName"]);
```

```
//Adding Methods to Objects
var person= {
  name: "Andrew",
  age: 21,
  info: function () {
    console.log("Name" + this.name );
    console.log("Age" + this.age );
   }
};
person.info();
for (var prop in person) {
     console.log(person[prop]);
}
```

Creating New Objects

- **Using function Constructors**

```
function person(name, age) {
    this.name = name
    this.age = age
}
p1 = new person( "Ken" , 33 )
console.log(p1.age, p1.name)
```

```
function car(make, year, owner) {
    this.make = make
    this.year = year
    this.owner = owner
}
c1 = new car( "Tiago", 2022, p1 )
console.log(c1.make, c1.year, c1.owner.name)
```

- Accessing properties

```
var name = p1.name
c1.make = "Baleno"
var  age = c1.owner.age

console.log(name, age, c1.make) //Ken 33 Baleno
```

Creating New Objects

- You **cannot** add a new property to an existing object constructor
  - Eg : Car.price = null → gives error
- The **prototype** property allows you to add new properties to object constructors:

```
car.prototype.model = "Tiago"
car.prototype.price = 730000
console.log(c1.make, c1.model, c1.price)
//Tata Tiago 730000
```

Only modify your own prototypes. Never modify the prototypes of standard JavaScript objects.

```
c2 = new car("Maruti",2020,p1)
c2.model = "Suzuki"
c2.price = 500000
console.log(c2.make, c2.model, c2.price)
//Maruti Suzuki 500000
```

- Defining methods

```
function Person(name, age){
    this.name = name
    this.age = age
    this.display = function(){
        console.log(this.name, this.age)
    }
}
p1 = new Person("Soha", 30)
p1.display()  //Soha 30
```

Newer Javascript – Javascript classes

```
<script>
class Person {
  constructor(firstname, lastname) {
    this.firstname = firstname;
    this.lastname = lastname;
  }
  getName() {
    return this.firstname + ' ' + this.lastname;
  }
}

var me = new Person('Shrilata', 'T');
console.log(me.getName());
</script>
```

constructor method is always defined with the name "constructor"

Classes can have methods, which defined as functions, albeit without needing to use the function keyword.

```
class Emp extends Person {
  getJob() {
    return 'Programmer';
  }
}

var me = new Emp('Anil', 'Patil');
console.log(me.getName());
console.log(me.getJob());
```

Inheritance

```
class Car {
  constructor(brand) {
    this.carname = brand;
  }
  present() {
    return 'I have a ' + this.carname;
  }
}

class Model extends Car {
  constructor(brand, mod) {
    super(brand);
    this.model = mod;
  }
  show() {
    return this.present() + ', it is a ' + this.model;
  }
}

let myCar = new Model("Ford", "Mustang");
console.log(myCar.show()); //I have a Ford, it is a Mustang
```

Inheritance ensures code reuse.

Polymorphism

```
class Animal {
    speak() {
        console.log("Animal makes a sound");
    }
}

class Dog extends Animal {
    speak() {
        console.log("Dog barks");
    }
}

class Cat extends Animal {
    speak() {
        console.log("Cat meows");
    }
}
```

Polymorphism allows objects to behave differently using the same interface

```
const animal = new Animal()
animal.speak()

const dog = new Dog();
dog.speak();

const cat = new Cat();
cat.speak();
```

```
Animal makes a sound
Dog barks
Cat meows
```

Encapsulation

- Encapsulation wraps up data and information under a single unit.
  - In OOP, it means binding together the data and the functions that manipulate them together in a class

```
class Person{
    constructor(name, age) {
        this.name = name;
        this.age = age;
    }
    getDetails() {
        return `${this.name} is ${this.age} years old.`;
    }
}
const p1 = new Person("Soha", 30);
console.log(p1.getDetails()); //Soha is 30 years old.
```

Different ways to achieve encapsulation in JavaScript?

- JavaScript is a loosely typed language and does not have traditional access modifiers like private, protected, and public which are common in other object-oriented programming languages.
- However, we can achieve encapsulation in JavaScript through the following methods:
  - Closures
  - Constructor functions
  - Class syntax

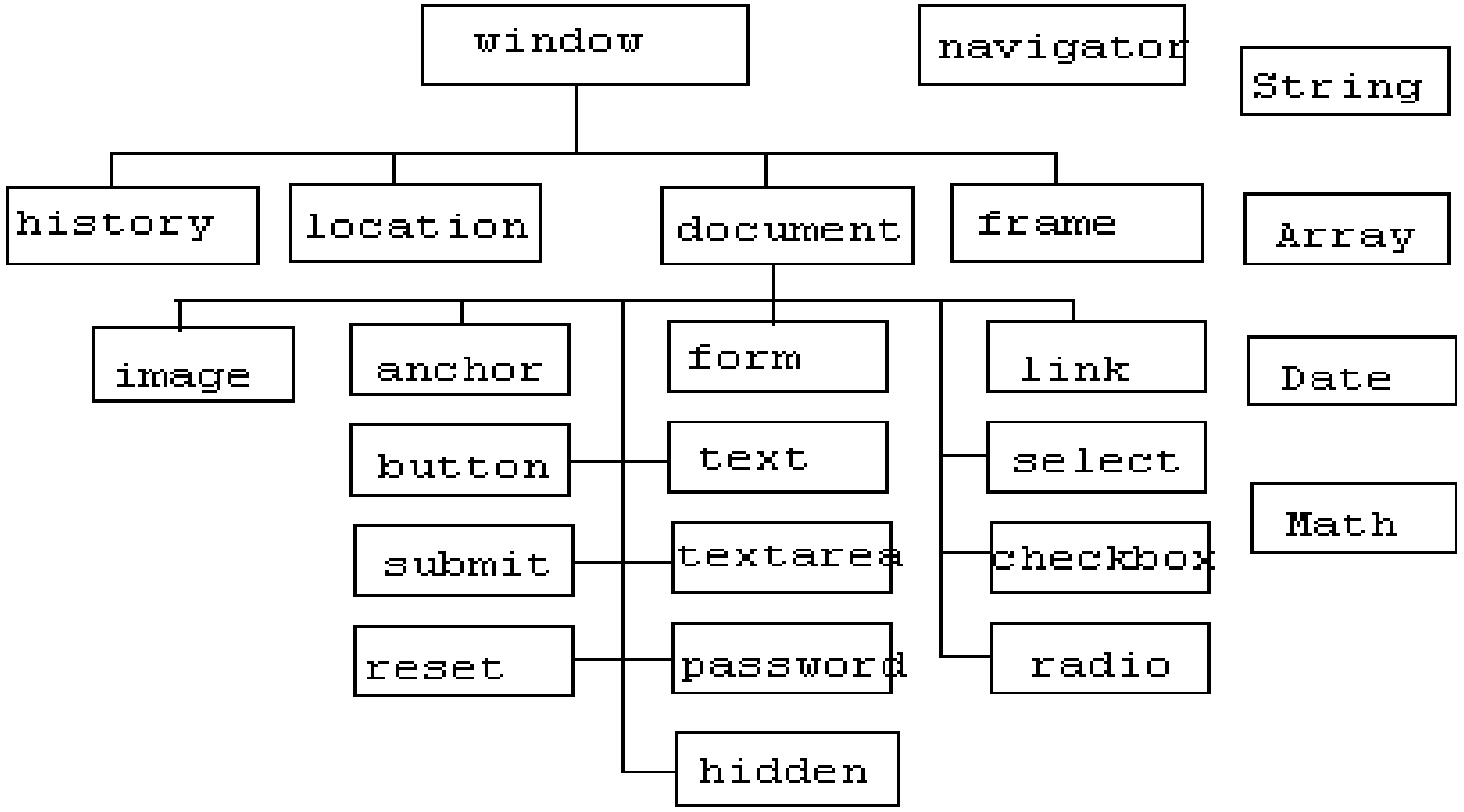
```
function Person(name) {
  let _name = name;
  this.getName = function () {
            return _name;
      };
  this.setName = function (newName) {
          _name = newName;
      };
 }
 const person = new Person('John Doe');
 console.log(person.getName()); // outputs ‘John Doe’
 person.setName('Jane Doe');
 console.log(person.getName()); // outputs ‘Jane Doe’
 console.log(person._name)  //undefined
```

```
class Student{

    #sid;
    #sname;

    constructor(sid, sname){
        this.#sid = sid;
        this.#sname = sname;
    }

    displayStudDetails(){
        console.log(this.#sid, this.#sname)
    }
}

var s1 = new Student(1001, "Kartik")
var s2 = new Student(1002, "Neha")
var s3 = new Student(1003, "Ravi")

s1.displayStudDetails()
s2.displayStudDetails()
s3.displayStudDetails()

s1.sid = 999
s1.sname = "aaa"
s1.displayStudDetails()
```

The class syntax supports the creation of private properties and methods with the **#** symbol, although this is a proposed feature that may not be widely supported yet.

```
1001 'Kartik'
1002 'Neha'
1003 'Ravi'
1001 'Kartik'
```

JavaScript Document Object Model



Navigator Object Hierarchy

Window Object Methods

- alert(message)
  - window.alert(“Display Message”)
- confirm(message)
  - window.confirm(“Exit Application ?”)
- prompt(message,[defaultReply])
  - var input=window.prompt(“Enter value of X”)

setInterval and setTimeout methods

```
<body>
<input type="text" id="clock" size="35" />
<script language=javascript>
var int=self.setInterval("clock()",50)
function clock() {
   var ctime=new Date()
   document.getElementById("clock").value=ctime
 }
</script>
<button onclick="int=window.clearInterval(int)">Stop interval</button>
</body>
```

```
<head> <script type="text/javascript">
function timedMsg()  {
    var t=setTimeout("alert('5 seconds!')",5000)
}
</script> </head>
<body> <p>Click on the button. An alert box will be displayed after 5 seconds.</p>
<form>
<input type="button" value="Display timed alertbox!“ onClick="timedMsg()">
</form>
</body>
```

Document Object

- When an HTML document is loaded into a web browser, it becomes a document object; root node of the HTML document and owns all other nodes

document.anchors	Returns a collection of all the anchors in the document
document.baseURI	Returns the absolute base URI of a document
document.cookie	Returns all name/value pairs of cookies in the document
document.forms	Returns a collection of all the forms in the document
document.getElementById()	Returns the element that has the ID attribute with the specified value
document.getElementsByName()	Accesses all elements with a specified name
document.getElementsByTagName()	Returns a NodeList containing all elements with the specified tagname
document.images	Returns a collection of all the images in the document
document.lastModified	Returns the date and time the document was last modified
document.links	Returns a collection of all the links in the document
document.referrer	Returns the URL of document that loaded current document
document.title	Sets or returns the title of the document
document.URL	Returns the full URL of the document
document.write()	Writes HTML expressions or JavaScript code to a document
document.writeln()	Same as write(), but adds a newline character after each statement

Examples:

```
<html>
<body>
<p id="intro">Hello World!</p>
<p>This example demonstrates the <b>getElementById</b> method!</p>
<script>
    x=document.getElementById("intro");
document.write("<p>The text from the intro paragraph: " + x.innerHTML + "</p>");
</script>
</body>
</html>
```

Hello World!

This example demonstrates the **getElementById** method!

The text from the intro paragraph: Hello World!

```
<body>
<p id="p1">Hello World!</p>
<p id="p2">Hello World!</p>

<script>
document.getElementById("p2").style.color = "blue";
document.getElementById("p2").style.fontFamily = "Arial";
document.getElementById("p2").style.fontSize = "larger";
</script>

<p>The paragraph above was changed by a script.</p>
</body>
```

Hello World!

Hello World!

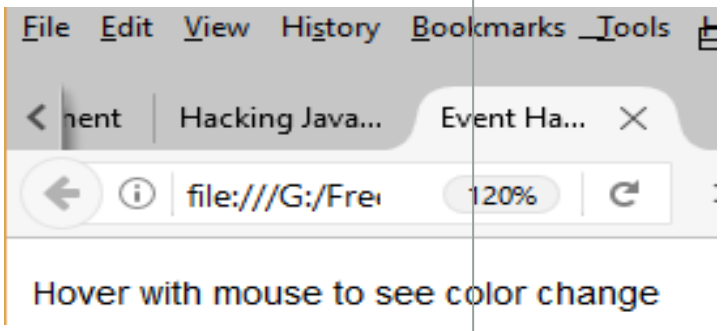
The paragraph above was changed by a script.

Examples

```
<script>
    function f1(){
        var str = "";
        var plist = document.getElementsByName("c1");
        for(i=0;i<plist.length;i++){
                if(plist[i].checked)
                   str = plist[i].value + "  " + str ;
         }
        document.getElementById("s1").innerHTML = "Skills : " + str;
     }
</script>
</head>
<body>
    <H1> Welcome to Javascript </H1>
   Skills:
    <input type="checkbox" name="c1" value="java">Java
    <input type="checkbox" name="c1" value="JS">JavaScript
    <input type="checkbox" name="c1" value="JSP">JSP

  <input type="button" value="click" onclick="f1()"><br>
  <span id="s1"></span>
</body>
```

Mouse events

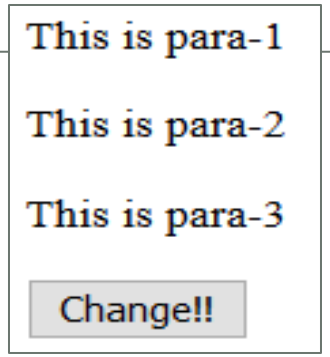
```
<html>
  <head>
    <SCRIPT>
      function changeColor(){
         var para = document.getElementById("p1");
        para.style.color="blue";
        para.style.backgroundColor = "lightgray";
        para.style.font = "italic bold 30px arial,serif";
      }
      function revertColor(){
        var para = document.getElementById("p1");
        para.style.color="black";
        para.style.backgroundColor = "white";
        para.style.font = "12px arial,serif";
      }
       </SCRIPT>
  </head>
<body>
  <div>
    <p id="p1" onmouseover="changeColor()"
               onmouseout="revertColor()"
               onclick="f1()" >
          Hover with mouse to see color change
    </p>
    </div>
</body></html>
```

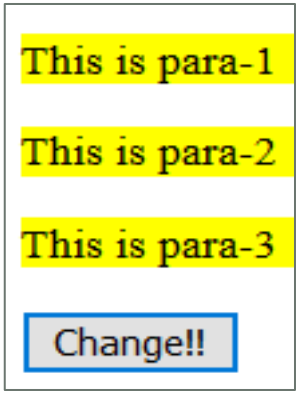


Hover with mouse to see color change

DOM manipulation using javascript

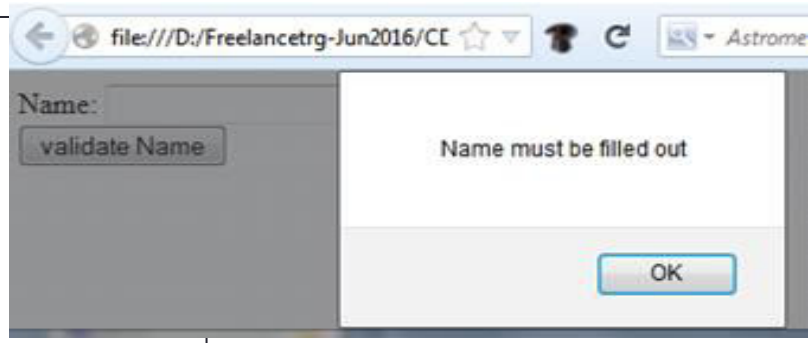
```
<!DOCTYPE html>
<html>
<body>
<p>This is para-1</p>
<p>This is para-2</p>
<p>This is para-3</p>
<button onclick="myFunction()">Change!!</button>
<script>
function myFunction() {
     var  nodelist = document.getElementsByTagName("p");
     var i;
    for (i = 0; i < nodelist.length; i++) {
       nodelist[i].style.backgroundColor = "yellow";
    }
}
</script>
</body>
</html>
```



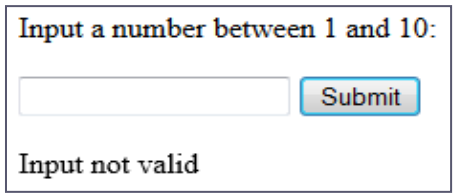


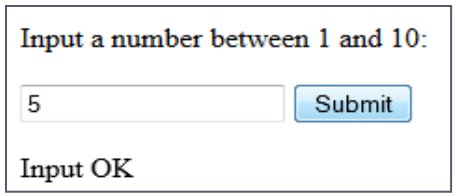
Form validation

```
<html>
<head>
<script >
function validate(){
    var x=document.getElementById("fname").value;
    if (x == null || x == "") {
        alert("Name must be filled out");
        return false;
    }
}
</script>
</head>
<body>
<form id="form1"  onsubmit="return validate()">
Name: <input type="text" name="fname" id="fname" />
<input type="submit" value="validate Name"  />
</form>
</body></html>
```



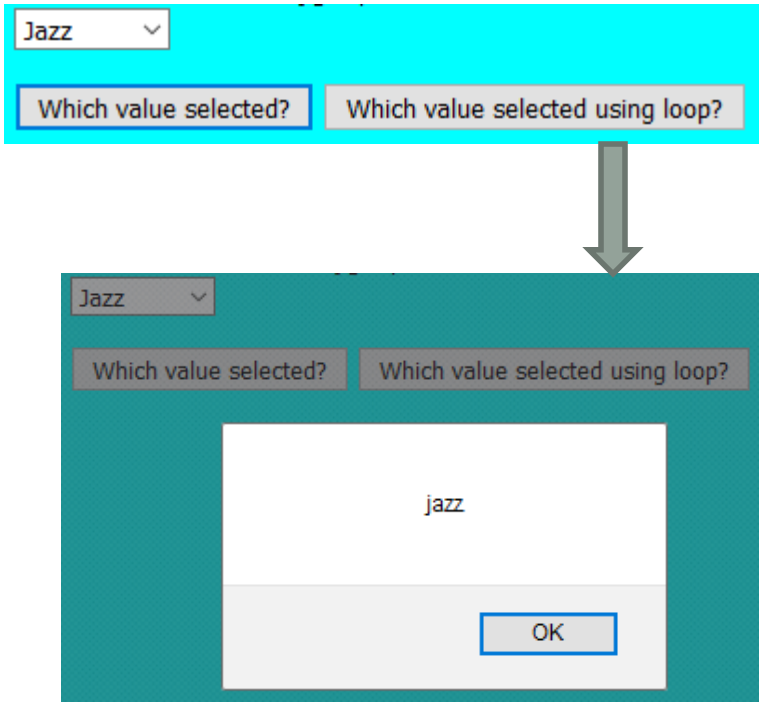

```
<body>
< Input a number between 1 and 10:</p>
<input id="numb">
<button type="button" onclick="myFunction()">Submit</button>
<p id="demo"></p>
<script>
function myFunction() {
    var x, text;
   x = document.getElementById("numb").value;
   if (isNaN(x) || x < 1 || x > 10) {
        text = "Input not valid";
    } else {
        text = "Input OK";
    }
    document.getElementById("demo").innerHTML = text;
}
</script>
</body>
```



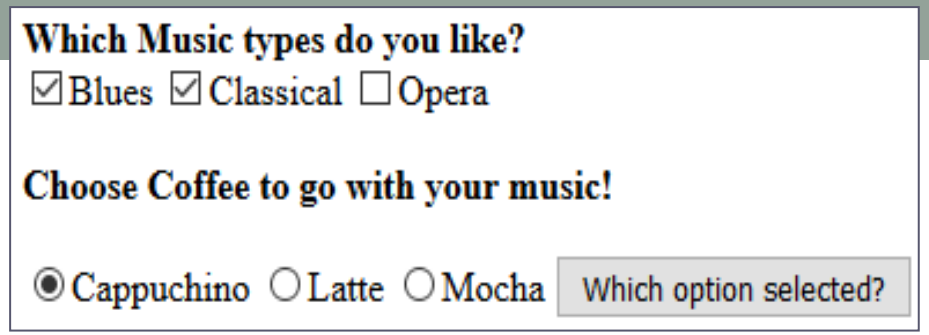


Example

```
<SCRIPT>
function valSelected1(){
  var sel = document.getElementById("musicTypes");
  alert(sel.value);       // prints value, not text
  var opt = sel.options[sel.selectedIndex];
  alert(opt.text);      //option.text prints text
}
function valSelected3(){
  var sel = document.getElementById("musicTypes");   var opt;
    for ( var i = 0, len =; i < sel.options.length; i++ ) {
        opt = sel.options[i];
        if ( opt.selected == true ) {   break;   }
    }
    alert(opt.value);
}
</SCRIPT>
<FORM NAME="selectForm">
  <SELECT name="musicTypes" id="musicTypes">
    <OPTION VALUE="rnb" SELECTED> R&B </OPTION>
    <OPTION VALUE="jazz"> Jazz </OPTION>
    <OPTION VALUE="blues"> Blues </OPTION>
</SELECT>
<INPUT TYPE="button" VALUE="value selected?"onClick="valSelected1()">
<INPUT TYPE="button" VALUE="value selected using loop?"onClick="valSelected3()">
</FORM>
</BODY>
```



Example



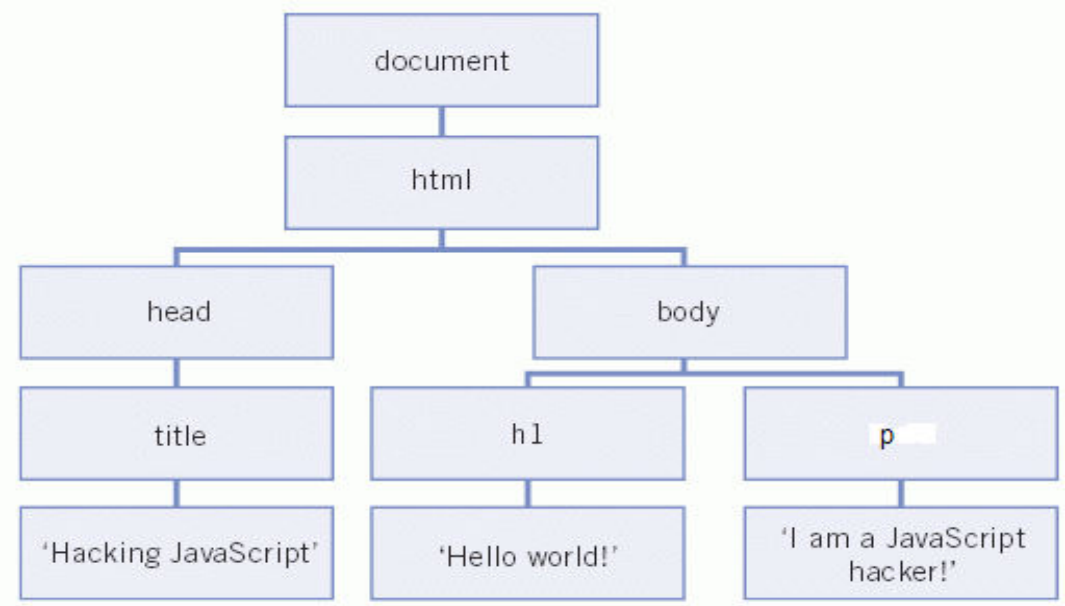

```
coffee selected : cappuchino
Music selected : blues
Music selected : classical
```

```
<SCRIPT>
 function valSelected(){
    var radio = document.getElementsByName("coffee");
    for(var i = 0; i < radio.length; i++){
        if(radio[i].checked)  console.log("coffee selected : " + radio[i].value);
    }
    var checklist = document.getElementsByClassName("c1");
    for(i=0;  i<checklist.length; i++){
         if (checklist[i].checked == true)  console.log("Music selected : " + checklist[i].value);
 }
</SCRIPT>

<FORM NAME="selectForm">
 <B>Which Music types do you like?</B>
 <input type="checkbox" class="c1" id="c1" value="blues">Blues</input>
 <input type="checkbox" class="c1" id="c2" value="classical">Classical</input>
 <input type="checkbox" class="c1" id="c3" value="opera">Opera</input>

 <b>Choose Coffee to go with your music!</b><br>
 <INPUT TYPE="radio" name="coffee"  id="coffee" VALUE="cappuchino">Cappuchino</input>
 <INPUT TYPE="radio" name="coffee"  id="coffee" VALUE="latte">Latte</input>
 <INPUT TYPE="radio" name="coffee"  id="coffee" VALUE="Mocha">Mocha</input>
 <INPUT TYPE="button" VALUE="Which option selected?"   onClick="valSelected()">
</FORM>
```

Documents As Trees of Nodes

- The Document object, its Element objects, and Text objects are all Node objects. Node defines the following important properties:
  - parentNode : node that is the parent of this one, or null for nodes like the Document object that have no parent.
  - childNodes : read-only NodeList that is a representation of a Node's child nodes.
  - firstChild, lastChild: first & last child nodes of a node; null if node has no children.
  - nextSibling, previousSibling : The next and previous sibling node of a node.
  - nodeValue : textual content of a Text or Comment node.
  - nodeName : tag name of an Element, converted to uppercase.
  - nodeType : kind of node this is.

Node type	value
Document	9
Element	1
Text	3
Comments	8



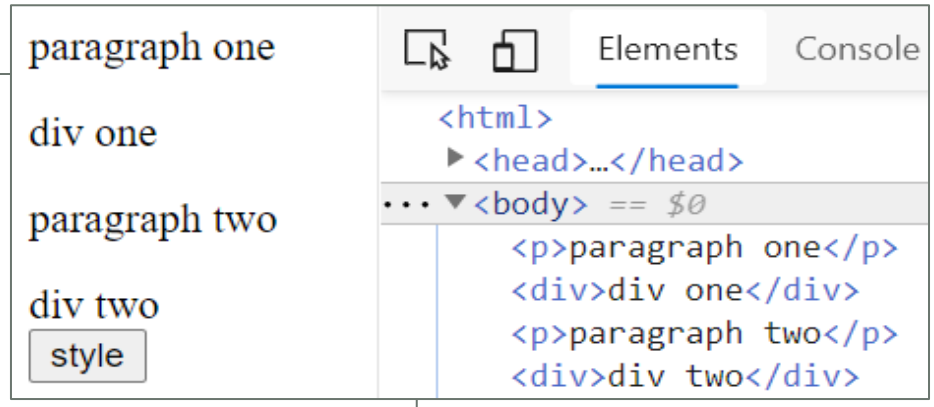
DOM manipulation using javascript

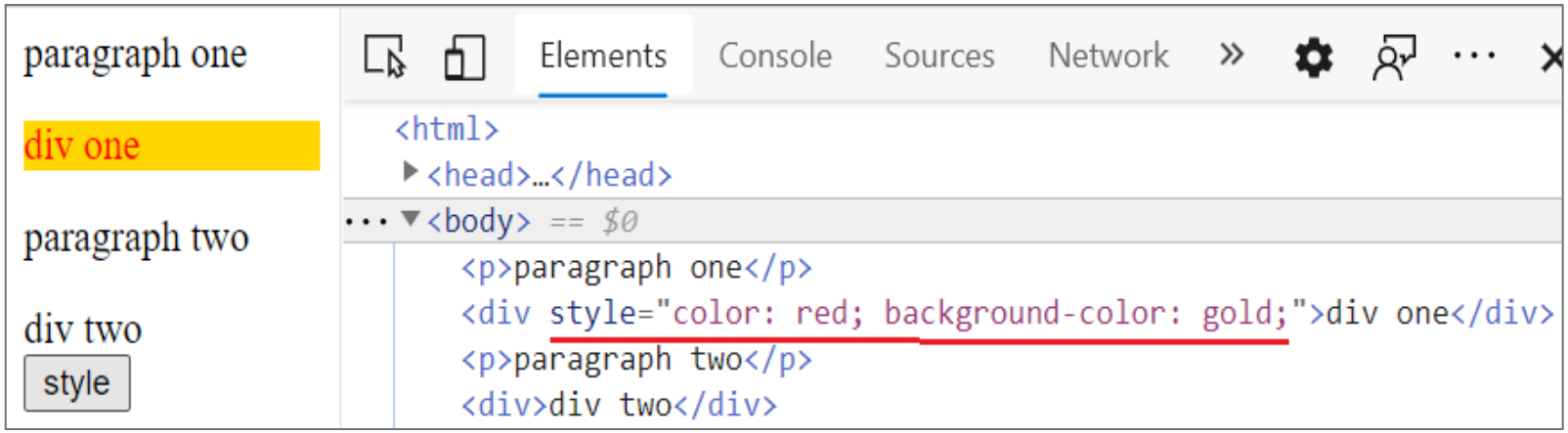
- The **querySelector()** method returns the first element that matches one or more CSS selectors. If no match is found, it returns null.
  - Its equivalent to getElementById()
  - However, querySelector() and querySelectorAll() are newer methods; with these we are free to target elements based on any CSS selector, thus we have more flexibility.
  - Syntax : var ele = document.querySelector(selector);
  - ele – First matching element or null (if no element matches the selectors)
  - selector – one or more CSS selectors, such as "#fooId", ".fooClass" etc
  - Eg : let e = document.querySelector("p"); //selects the first paragraph in html doc

- **querySelectorAll()** returns a NodeList representing a list of the document's elements that match the specified group of selectors.
  - Syntax : elementList = parentNode.querySelectorAll(selectors);
  - Eg : To obtain a NodeList of all of the <p> elements in the document:
  - const matches = document.querySelectorAll("p");
  - Eg To return a list of all elements within the document with a class of either note or alert:
  - const matches = document.querySelectorAll("div.note, div.alert");

DOM manipulation using javascript : querySelector()

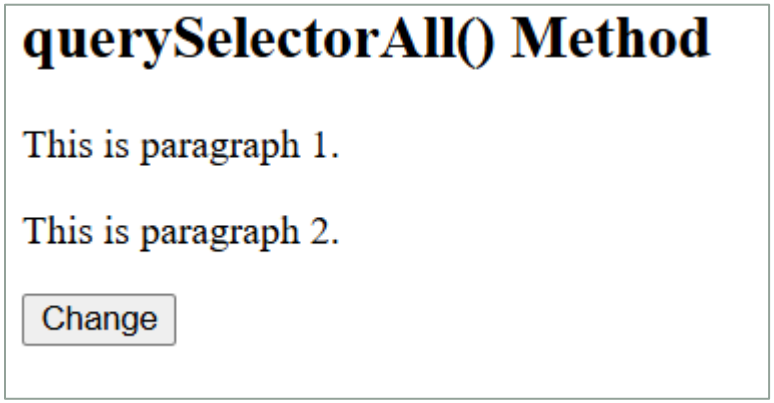
```
<p>paragraph one</p>
<div>div one</div>
<p>paragraph two</p>
<div>div two</div>
<input type="button" value="style"
       onclick="f1()">
<script>
   function f1() {
      var firstDiv = document.querySelector('div');
      firstDiv.style.color = 'red';
      firstDiv.style.backgroundColor = 'gold’;
   }
</script>
```

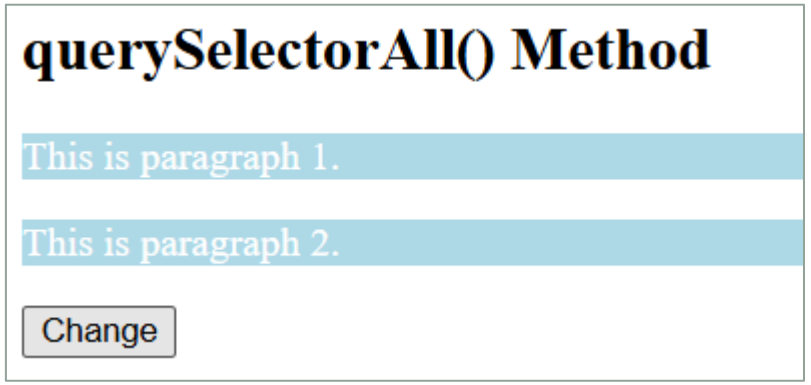




DOM manipulation using javascript : querySelectorAll()

```
<h2>querySelectorAll() Method</h2>
<p>This is paragraph 1.</p>
<p>This is paragraph 2.</p>
<button onclick="f1()">Change</button>
<script>
    function f1() {
        let plist = document.querySelectorAll("p");
        let i;
        for (i = 0; i < plist.length; i++) {
            plist[i].style.backgroundColor = "lightblue";
            plist[i].style.color = "white";
        }
    }
</script>
```

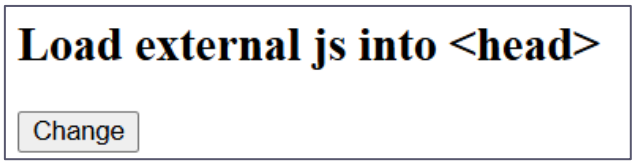




Creating, Inserting, and Deleting Nodes

- **createElement()** : create new Element nodes
- **createTextNode()** : Creates text nodes
- **cloneNode()** : returns a new copy of the node
- **appendChild()** or **insertBefore()** : insert new node into the document
- **removeChild():** removes a node from the document tree
  - this method isn't invoked on the node to be removed but on parent of that node
  - Eg : To remove the node n from the document : n.parentNode.removeChild(n);

```
<h2>Load external js into &lt;head&gt;</h2>
<button onclick="loadasync('myscript.js')">Change</button>
<script>
    function loadasync(url) {
        var head = document.getElementsByTagName("head")[0]; // Find <head>
        var s = document.createElement("script");  // Create a <script> element
        s.src = url;                               // Set its src attribute
        head.appendChild(s);                       // Insert the <script> into head
    }
```

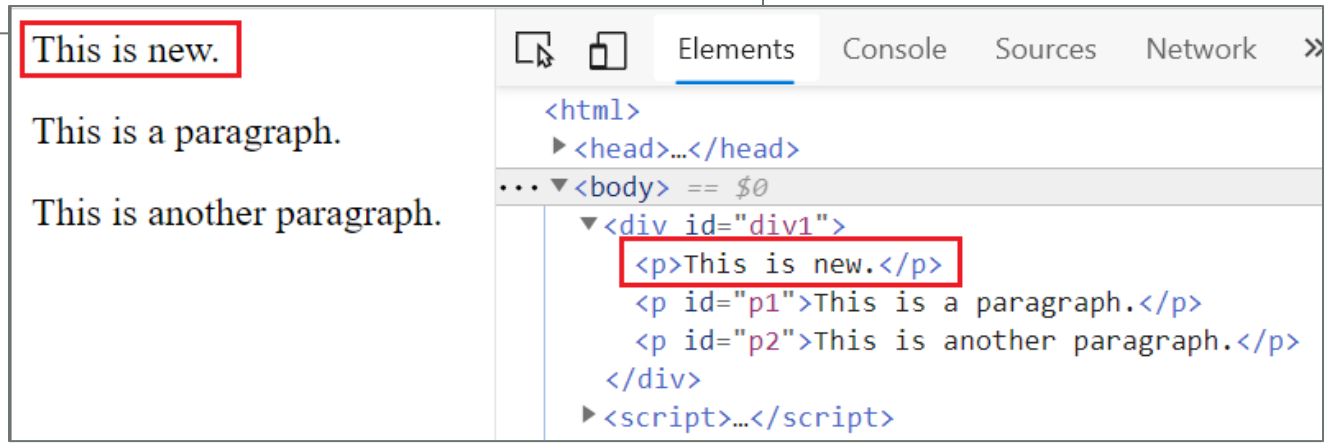



```
<html lang="en">
  <head></head>
```

```
<head> == $0
  <script src="myscript.js"></script>
</head>
```

DOM manipulation using javascript : insertBefore()

```
<div id="div1">
    <p id="p1">This is a paragraph.</p>
    <p id="p2">This is another paragraph.</p>
</div>

<script>
    var newpara = document.createElement("p");
    var node = document.createTextNode("This is new.");
    newpara.appendChild(node);

    var parent = document.getElementById("div1");
    var oldpara = document.getElementById("p1");
    parent.insertBefore(newpara, oldpara);
</script>
```



DOM manipulation using javascript : removeChild()

```
<body>
The title of the document is:
<div id="div1">
  <p id="p1">This is a paragraph.</p>
  <p id="p2">This is another paragraph.</p>
</div>

<script>
var parent = document.getElementById("div1");
var child = document.getElementById("p1");
parent.removeChild(child);
</script>
```

this method isn't invoked on the node to be removed but on parent of that node

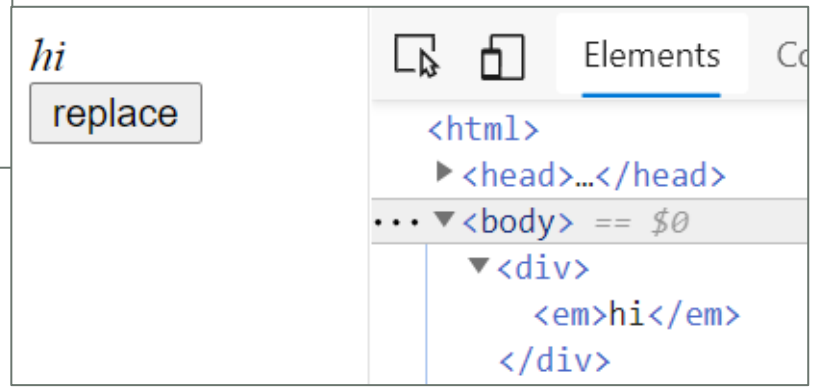
The title of the document is:

This is another paragraph.

DOM manipulation using javascript

- The **replaceChild()** method replaces a child element with another one belonging to the parent element that calls this method.
- In this example the child element belonging to the parent element is replaced with a newly created tag.

```
<div>
  <strong>hello</strong>
</div>
<input type="button" value="replace"
       onclick="fReplace()">
<script>
function fReplace(){
  var em = document.createElement('em');
  var strong = document.querySelector('strong');
  var div = document.querySelector('div');
  em.textContent = 'hi';
  div.replaceChild(em, strong);
}
</script>
```



Regular Expressions

- A regular expression is an object that describes a pattern of characters.
  - Its matched against a text string, when you perform searches & replacements
  - Perform client-side data validations or any other extensive text entry parsing
  - RegExp objects may be created either with the RegExp() constructor or using a special literal syntax.
  - regular expression literals are specified as characters within a pair of slash (/)

var re = / / → simple pattern to match the space character

var re = / /g → matching a string on a global basis

var re = /web/i → a case-insensitive match

var re = /web/gi → expression is both case-insensitive and global

- Eg

```
str = "I love JavaScript!";
regexp = /love/;
alert( str.search(regexp) ); // 2
```

i	Perform case-insensitive matching
g	Perform a global match (find all matches rather than stopping after the first match)
m	Perform multiline matching

RegEx – Special Characters (Contd.)

- \d Numeral: Find any single digit 0 through 9
  - /\d\d\d/ matches “212” and “415” but not “B17”
- \D Non-numeral: Find any non-digit
  - /\D\D\D/ matches “ABC” but not “212” or “B17”
- \s Single White Space: Find any single space character
  - /over\sbite/ matches “over bite” but not “overbite” or “over bite”
- \S Single Non-White Space:
  - /over\Sbite/ matches “over-bite” but not “overbite” or “over bite”
- \w Letter, Numeral, or Underscore:
  - /A\w/ matches “A1” and “AA” but not “A+”
- \W Not letter, Numeral, or Underscore:
  - /A\W/ matches “A+” but not “A1” and “AA”

RegEx – Special Characters (Contd.)

- “.” Any Character Except Newline:
  - /…/ matches “ABC”, “1+3”, “A 3” or any 3 characters
- […] Character Set: any character in the specified character set
  - /[AN]BC/ matches “ABC” and “NBC”
- [^…] Negated Character Set: any character not in the specified character set
  - /[^AN]BC/ matches “BBC” and “CBC” but not “ABC” or “NBC”
- **Positional Metacharacters**
- “^” - At the beginning of a string or line
  - /^Fred/ matches “Fred is OK” but not “I’m with Fred” or “Is Fred here?”
- “$” - At the end of a string or line
  - /Fred$/ matches “I’m with Fred” but not “Fred is OK” or “Is Fred here?”

RegEx – Counting Metacharacters

- “*” - Zero or More Times:
  - /Ja*vaScript/ matches “JvaScript”, “JavaScript” & “JaaavaScript” but not “JovaScript”
- “?” - Zero or One Time:
  - /Ja?vaScript/ matches “JvaScript” or “JavaScript” but not “JaaavaScript”
- “+” - One or More Times:
  - /Ja+vaScript/ matches “JavaScript” or “JaavaScript” but not “JvaScript”
- {n} - Exactly n Times:
  - /Ja{2}vaScript/ matches “JaavaScript” but not “JvaScript” or “JavaScript”
- {n,} - N or More Times:
  - /Ja{2,}vaScript/ matches “JaavaScript” or “JaaavaScript” but not “JavaScript”
- {n,m} - At Least n, At Most m Times:
  - /Ja{2,3}vaScript/ matches “JaavaScript” or “JaaavaScript” but not “JavaScript”

Regular Expression Object

- Create Regular Expression:

  regExpObject = /pattern/ [g | i | gi]

  regExpObject = new RegExp(pattern, flag)

  - Eg: re = new RegExp("pushing", "g");
  - Eg: var zipcode = new RegExp("\\d{6}", "g");

- Methods that use regular expressions

Method	Description
exec()	executes a search for a match in a string. It returns an array of information or null on a mismatch.
test()	tests for a match in a string. It returns true or false
match()	executes a search for a match in a string. It returns an array of information or null on a mismatch.
search()	tests for a match in a string; returns the index of the match, or -1 if search fails
replace()	executes a search for a match in a string, and replaces the matched substring with a replacement substring.
split()	uses a reg exp or a fixed string to break a string into an array of substrings.

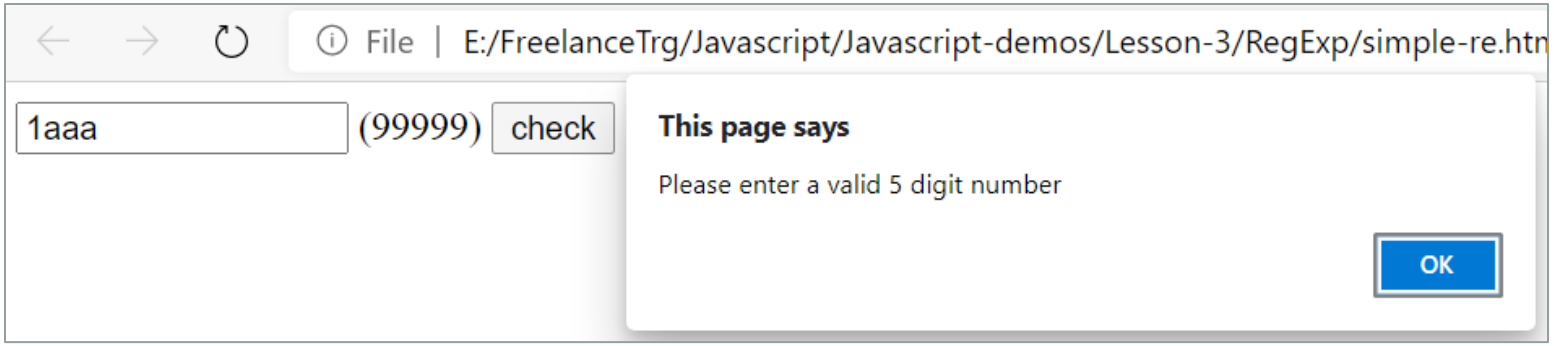
```
var pattern = /java/g;
var text = "JavaScript is more fun than java!";
var result = pattern.exec(text)
console.log(result)   //["java", index: 28, input: "JavaScript is more fun than java!"]
```

When there's a "g" flag, then str.match returns an array of all matches. There are no additional properties in that array, and parentheses do not create any elements.
With no "g" flag, looks for the first match only.

```
let str = "HO-Ho-ho!";
let result = str.match( /ho/ig );  //global search
alert( result ); // HO, Ho, ho (all matches, case-insensitive)
```

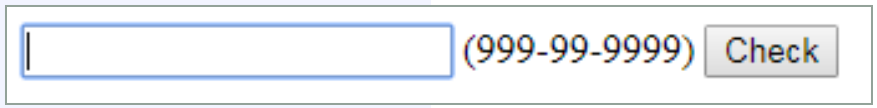
```
s1 = "how are you all doing";
var re = new RegExp("o","g");
console.log(s1.replace(re,"z"));  //hzw are yzu all dzing
```

```
<script >
function checkpostal(){
var re5digit=/^\d{5}$/
//regular expression defining a 5 digit number
if (document.myform.myinput.value.search(re5digit)==-1)
  alert("Please enter a valid 5 digit number")
}
</script>
<form name="myform">
    <input type="text" name="myinput" size=15> (99999)
    <input type="button" onClick="checkpostal()" value="check">
</form>
```



Demo

```
<head>
<title>ssn Checker</title>
<script type="text/javascript">
var RE_SSN = /^[0-9]{3}[\- ]?[0-9]{2}[\- ]?[0-9]{4}$/;

function checkSsn(ssn){
 if (RE_SSN.test(ssn)) {
  alert("VALID SSN");
 } else {
  alert("INVALID SSN");
 }
}
</script>
</head>
<body>
 <form onsubmit="return false;">
  <input type="text" name="ssn" size="20"> (999-99-9999)
  <input type="button" value="Check"
   onclick="checkSsn(this.form.ssn.value);">
 </form>
</body>
```



JSON

JSON (JavaScript Object Notation)

- JSON is a simple and easy to read and write data exchange format.
  - It is easy for humans to read and write and easy for machines to parse and generate.
  - It is based on a subset of the JavaScript, Standard ECMA-262
  - JSON is a text format that is completely language independent; can be used with most of the modern programming languages.
  - The filename extension is .json
  - JSON Internet Media type is application/json
  - It's popular and implemented in countless projects worldwide, for those don't like XML, JSON is a very good alternative solution.

```
var obj = {
    "name":"Amit",
    "age": 37.5,
    "married": true,
    "address":{ "city":"Pune" , "state":"Mah" },
    "hobbies":["swimming","reading","music"]
}
```

- Values supported by JSON
  - Strings : double-quoted Unicode, with backslash escaping
  - Numbers:
    - double-precision floating-point format in JavaScript
  - Booleans : true or false
  - Objects: an unordered, comma-separated collection of key:value pairs enclosed in curly braces, with the ':' character separating the key and the value; the keys must be strings and should be distinct from each other
  - Arrays : an ordered, comma-separated sequence of values enclosed in square brackets; the values do not need to be of the same type
  - Null : A value that isn't anything

Demo

```
<script language="javascript">
var JSONObject = {  "name" : "Amit",
        "address"  : "B-123 Bangalow",
        "age"  : 23,
        "phone"   : "011-4565763",
        "MobileNo"  : 0981100092
  };
var str =
"<h2><font color='blue'>Name </font>::“        +JSONObject.name+"</h2>“ +
 "<h2><font color='blue'>Address </font>::“   + JSONObject.address+"</h2>“ +
"<h2><font color='blue'>Age </font>::“           +JSONObject.age+"</h2>“ +
"<h2><font color='blue'>Phone No </font>::“  +JSONObject.phone+"</h2>“ +
"<h2><font color='blue'>Mobile No </font>::“  + JSONObject.MobileNo+"</h2>“;

document.write(str);
</script>
```

Name ::Amit

Address ::B-123 Bungalow

Age ::23

Phone No ::011-4565763

Mobile No ::981100092

Demo

```
<script >
var students = {
    "Students": [
            { "Name": "Amit Goenka",
              "Major": "Physics"
            },
            { "Name": "Smita Pallod",
             "Major": "Chemistry"
            },
            { "Name": "Rajeev Sen",
              "Major": "Mathematics"
            }] }
var i=0
document.writeln("students.Students.length : " + students.Students.length);
for(i=1;i<students.Students.length+1;i++)  {
    document.writeln("<b>Name : </b>" + students.Students[i].Name + "    ");
    document.writeln("<b>Majoring in : </b>" + students.Students[i].Major);
    document.writeln("</br>");
}
</script>
```

students.Students.length : 3
Name : Amit Goenka **Majoring in :** Physics
Name : Smita Pallod **Majoring in :** Chemistry
Name : Rajeev Sen **Majoring in :** Mathematics

Serializing Objects

- serialization is the process of converting an object's state to a string from which it can later be restored.
  - Sometimes we receive a raw JSON string, and we need to convert it to an object. And when we want to send a JavaScript object across the network, we need to convert it to JSON (a string) before sending.
  - **JSON.parse():** Accepts a JSON string as a parameter, and returns the corresponding JavaScript object.
  - **JSON.stringify():** Accepts an object as a parameter, and returns the equivalent JSON string.

```
o = {x:1, y:{z:[false,null,""]}};                    // Define a test object
s = JSON.stringify(o);          // s is '{"x":1,"y":{"z":[false,null,""]}}'
p = JSON.parse(s);                                   // p is a deep copy of o
console.log(p.x);                                    //1
```

```
<body>
<script>
//Imagine we received this text from a web server:
  var str = '{ "name":"John", "age":30, "city":"NY"}';
//Use JSON.parse() to convert text into JavaScript object
  var obj = JSON.parse(str);
</script>
<p id="p1"></p>
<script>
document.getElementById("p1").innerHTML = obj.name;
</script>
```

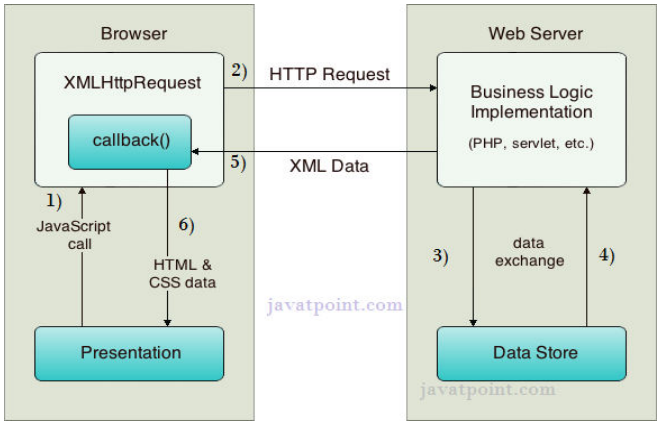
typeof(obj) returns object

What is Ajax ?

- “Asynchronous JavaScript And XML”
  - AJAX is not a programming language, but a technique for making the user interfaces of web applications more responsive and interactive
  - It provide a simple and standard means for a web page to communicate with the server without a complete page refresh.

- **Why Ajax?**
- Intuitive and natural user interaction
  - No clicking required. Call can be triggered on any event
  - Mouse movement is a sufficient event trigger
- "Partial screen update" replaces the "click, wait, and refresh" user interaction model
  - Only user interface elements that contain new information are updated (fast response)
- The rest of the user interface remains displayed as it is without interruption (no loss of operational context)

AJAX architecture



XMLHttpRequest

- JavaScript object - XMLHttpRequest object for asynchronously exchanging the XML data between the client and the server

- XMLHttpRequest Methods
  - open(“method”, “URL”, syn/asyn) : Assigns destination URL, method, mode
  - send(content) : Sends request including string or DOM object data
  - abort() : Terminates current request
  - getAllResponseHeaders() : Returns headers (labels + values) as a string
  - getResponseHeader(“header”) : Returns value of a given header
  - setRequestHeader(“label”,”value”) : Sets Request Headers before sending

- XMLHttpRequest Properties
  - Onreadystatechange : Event handler that fires at each state change
  - readyState values – current status of request
  - Status : HTTP Status returned from server: 200 = OK
  - responseText : get the response data as a string
  - responseXML : get the response data as XML data

0: request not initialized
1: server connection established
2: request received
3: processing request
4: request finished and response is ready

Creating an AJAX application

- Step 1: Get an instance of XHR object

```
xhr = new XMLHttpRequest();
```

- Step 2: Make the request

```
xhr.open('GET', 'http://www.example.org/some.file', true);
xhr.send(null);
```

```
xhr.open("POST", "AddNos.jsp");
xhr.setRequestHeader("Content-type", "application/x-www-form-urlencoded");
xhr.send("tno1=100&tno2=200");
```

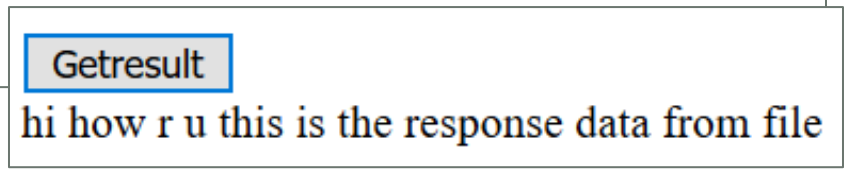
- Step 3 : Attach callback function to xhr object

```
function loadDoc() {
  var xhttp = new XMLHttpRequest();
  xhttp.onreadystatechange = function() {
      if (this.readyState == 4 && this.status == 200) {
          document.getElementById("demo").innerHTML = this.responseText;
      }
  };
  xhttp.open("GET", "ajax_info.txt", true);
  xhttp.send();
}
```

Ajax Demo

```
<script >
var xhr;
function getData(){
   xhr = new XMLHttpRequest();

   if(xhr){
      xhr.open("GET", "Sample.txt", true);
      xhr.send();

      xhr.onreadystatechange = function(){
          if(xhr.readyState == 4 &&  xhr.status == 200){
              document.getElementById("lblresult").innerHTML=xhr.responseText;
           }
      }  //end of callback function
}}

</script> <body>
    <input type="button" onclick="getData()"  value="Getresult"/>
    <div id="lblresult"></div>
</body>
```

```
//sample.txt
hi how r u this is the
response data from file
```



AJAX Demo with JSON

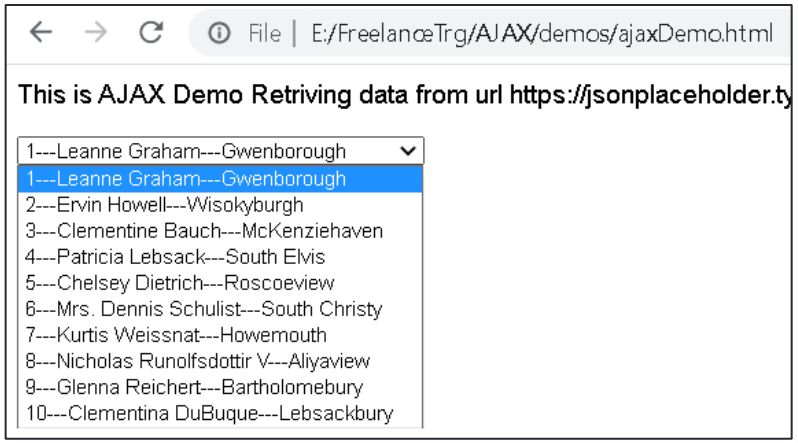
```
<script >
 var xmlhttp;
 function getData(){
   getHTTPRequestObject();
   if(xmlhttp){
      xmlhttp.open("GET", "EmpJSONData.txt", true);
     xmlhttp.onreadystatechange = function(){
       if(xmlhttp.readyState == 4 && xmlhttp.status == 200){
            var obj = JSON.parse(xmlhttp.responseText);
            var displaytext = "";
            displaytext += "Emp name : " + obj.name + "<br>" +
                        "Designation : " + obj.desig + "<br>" +
                        "Age : " + obj.age + "<br>" +
                        "Salary : " + obj.sal;
          document.getElementById("lblres").innerHTML = displaytext;
       }
} }
</script><body>
<h3 id="lblres">Result</h3>
<input type="button" id="btngetjsondata" onclick="getData()"  value="GetData">
</body>
```

```
{ "name":"Kapil Verma",
  "desig":"ASE",
  "age":23,
  "sal":22000
}
```

Emp name : Kapil Verma
Designation : ASE
Age : 23
Salary : 22000

GetJsonData

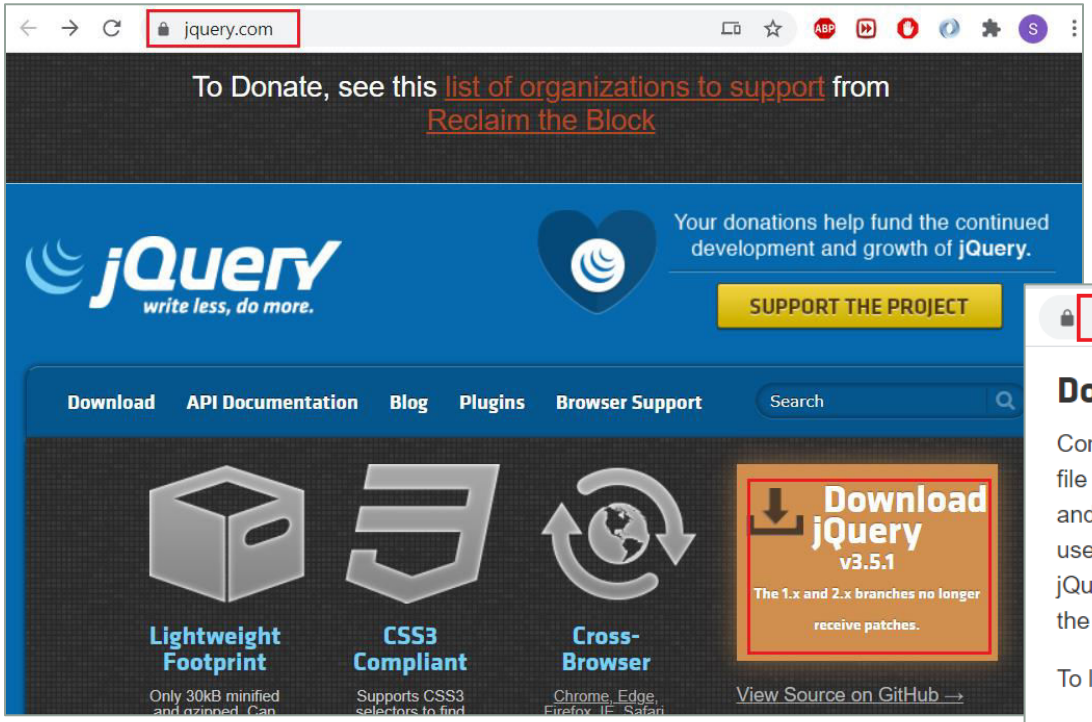
```
<html>
<head>
<script>
 function sendRequest(){
     //step 1: create XHR object
     var xhr=new XMLHttpRequest();
     //step 2: Generate Request
     var url="https://jsonplaceholder.typicode.com/users";
     xhr.open("GET",url,true);
     //step 2: Define onreadystatechange function
     xhr.onreadystatechange=function(){
          if(xhr.readyState==4){
              var data=xhr.responseText;
              var jsdata=JSON.parse(data);
             // alert(jsdata.length);
              var str="<select>";
              for(var i=0;i<jsdata.length;i++){
                  str+="<option value='"+jsdata[i].id+"'>"+jsdata[i].id+"---"+jsdata[i].name+"---"+jsda
              }  //end of for
              str+="</select>";
              document.getElementById("mydiv").innerHTML=str;
          }
     }  // end of onreadystatechange function
     xhr.send();
 }
</script>
</head>
```

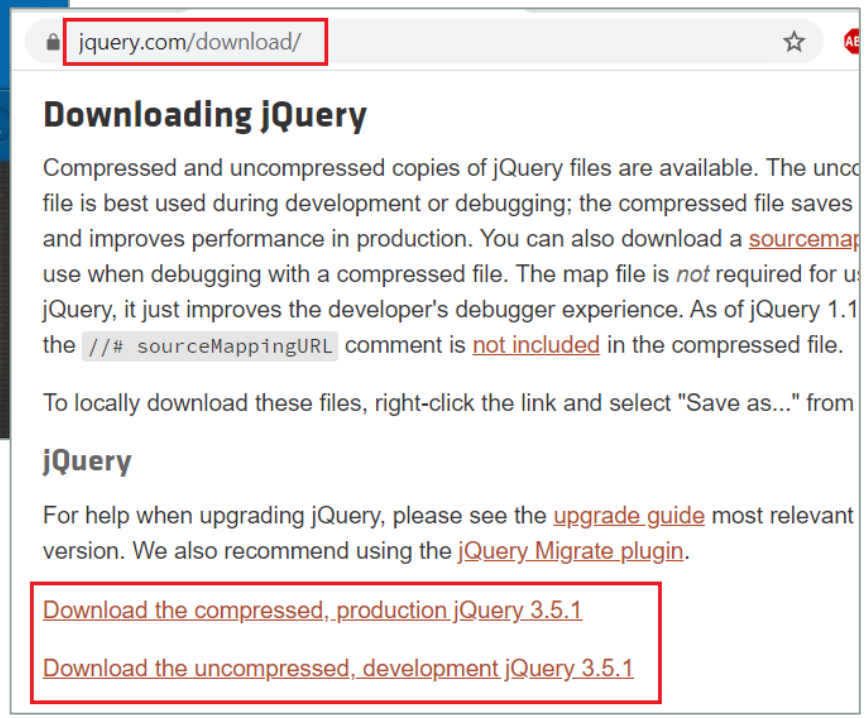



```
<body>
<p>This is AJAX Demo Retriving data from url
    https://jsonplaceholder.typicode.com/users</p>
<div id="mydiv"></div>
<button type="button" onclick="sendRequest()">GetData</button>
</body>
</html>
```

JQUERY

Software





- **Choosing a Text Editor**
  - Text editors that support jQuery include Brackets, Sublime Text, Kwrite, Gedit, Notepad++, PSPad, or TextMate.

jQuery Introduction

- jQuery is a lightweight, cross browser and feature-rich JavaScript library which is used to manipulate DOM
  - Originally created by John Resig in early 2006.
  - The jQuery project is currently run and maintained by a distributed group of developers as an open-source project.

- Why jQuery
  - JavaScript is great for a lot of things especially manipulating the DOM but it's pretty complex stuff. jQuery abstracts away a lot of the complexity involved in dealing with the DOM, and makes creating effects super easy.
  - It can locate elements with a specific class
  - It can apply styles to multiple elements
  - It solves the cross browser issues
  - It supports method chaining
  - It makes the client side development very easy

Including jQuery in HTML Document

- jQuery library can be included in a document by linking to a local copy or to one of the versions available from public servers.
- Eg : include a local copy of the jQuery library

```
<html>
<head>
<title>Test jQuery</title>
<script src="../scripts/jquery-3.5.1.min.js"></script>
</head>
<body>
   <!-- bidy of HTML -->
</body>
</html>
```

- Eg : include the library from a publicly available repository
  - There are several well-known public repositories for jQuery; these repositories are also known as Content Delivery Networks (CDNs).

```
<script src="https://code.jquery.com/jquery-3.1.1.min.js"></script>
<script src="http://ajax.aspnetcdn.com/ajax/jQuery/jquery-3.1.1.min.js"></script>
<script src="https://ajax.googleapis.com/ajax/libs/jquery/3.1.1/jquery.min.js"></script>
```

Using jQuery

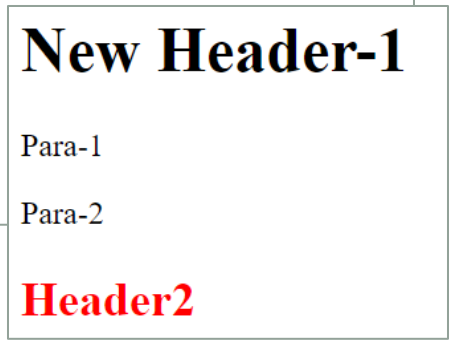
```
<html>
<head>
<title>Test jQuery</title>
<script type="text/javascript" src="jquery-3.5.1.js"></script>
<script type="text/javascript">
  $(document).ready(function()  {
       alert('Hi');
  });
</script>
</head>
<body>
      Welcome to jQuery
</body>
</html>
```

```
//shortcut…
$(function() {
    // jQuery code
});
```

Introduction to selectors

- jQuery uses same CSS selectors used to style html page to manipulate elements
  - CSS selectors select elements to add style to those elements where as jQuery selectors select elements to add behavior to those elements.
  - Selectors allow page elements (Single or Multiple) to be selected.
- Selector Syntax
  - $(selectorExpression)
  - jQuery(selectorExpression)
  - $(selector).action()

```
<html>
<head>
<title>Test jQuery</title>
<script src="../scripts/jquery-3.5.1.min.js"></script>
<script>
$(document).ready(function(){
        $("h2").css("color","red");
        jQuery("h1").html("New Header-1");
    });
</script>
</head>
<body>
     <h1>jQuery Enabled</h1>
    <p>Para-1</p>
    <p>Para-2</p>
    <h2>Header2</h2>
</body>
</html>
```



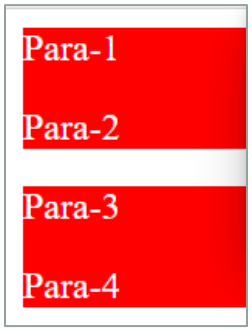
Selectors

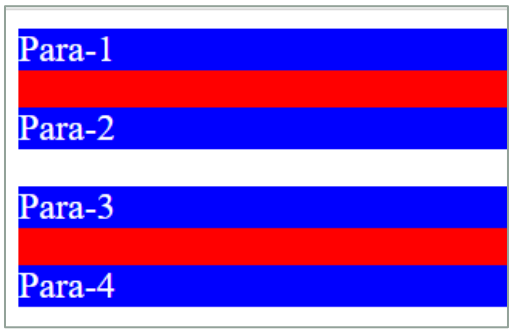
- **Selecting by Tag Name:**
- Selecting single tag takes the following syntax
  - $('p') – selects all <p> elements
  - $('a') – selects all <a> elements
- To reference multiple tags, use the (,) to separate the elements
  - $('p, a, span') - selects all paragraphs, anchors and span elements

- **Selecting Descendants**
- $('ancestor descendant') - selects all the descendants of the ansector
  - $('table tr') - Selects all tr elements that are the descendants of the table element
- Descendants can be children, grand children etc of the designated ancestor element.

Demo

```
<style type="text/css">
.redDiv{background-color:red; color:white;}
</style>
<script src="..\Scripts\jquery-3.5.1.js"></script>
<script>
$(document).ready(function() {
    var paragraphs = $('p');
    alert(paragraphs.length);   //4
    paragraphs.css('background-color','blue');
    paragraphs.each(function(){
       alert($(this).html());
    });
    var collections = $('div,p');
    alert(collections.length);    //6
    var bodydivs = $('body div');
    alert(bodydivs.length);    //2
});
</script>
</head>
<body>
<div class="redDiv" >
<p>Para-1</p>
<p>Para-2</p>
</div>
<div  class="redDiv">
<p>Para-3</p>
<p>Para-4</p>
</div>
</body>
```

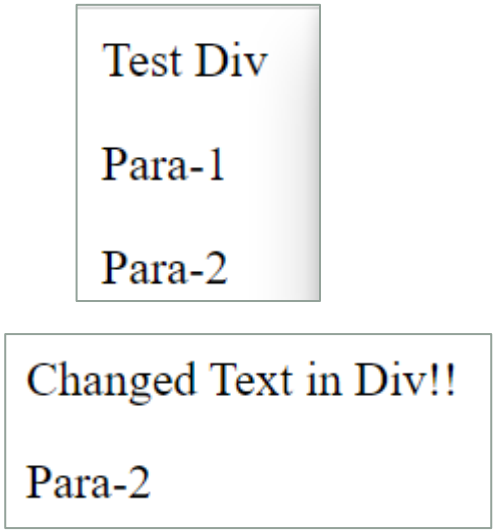




Selecting by Element ID

- It is used to locate the DOM element very fast.
- Use the # character to select elements by ID
  - $("#first") — selects the element with id="first"
  - $('#myID') – selects the element with id=" myID "

```
<script src="..\Scripts\jquery-3.5.1.js"></script>
<script>
$(document).ready(function()
{
    alert($('#testDiv').html());
    $('#testDiv').html("Changed Text in Div!!");
    $("#p1").hide();
});
</script>
</head>
<body>
<div id="testDiv">Test Div</div>
<p id="p1"> Para-1</p>
<p>Para-2</p>
</body>
```



Selecting Elements by Class Name

- Use the (.) character to select elements by class name
  - $(".intro") — selects all elements with class="intro"
- To reference multiple tags, use the (,) character to separate class name.
  - $('.blueDiv, .redDiv') - selects all elements containing class blueDiv and redDiv
- Tag names can be combined with elements name as well.
  - $('div.myclass') – selects only those tags with class="myclass"

```
<script>
$(document).ready(function(){
    $(".bold").css("font-weight", "bold");
});
</script>
</head>
<body>
<ul>
   <li class="bold">Test 1</li>
   <li>Test 2</li>
   <li class="bold">Test 3</li>
</ul>
</body>
```

- **Test 1**
- Test 2
- **Test 3**

```
<style type="text/css">
.blueDiv{background-color:lightblue; color:darkblue;}
.redDiv{background-color:orange; color:red;}
</style>
<script src="..\Scripts\jquery-3.5.1.js"></script>
<script>
$(document).ready(function(){
    var collection = $('.blueDiv');
    collection.css('border','5px solid blue');
    collection.css('padding','10px');
});
</script>
</head>
<body>
<div class="blueDiv">
<p>para-1</p>
</div>
<div class="redDiv">
<p>para-2</p>
</div>
<div class="blueDiv">
<p>para-3</p>
</div>
</body>
```

para-1

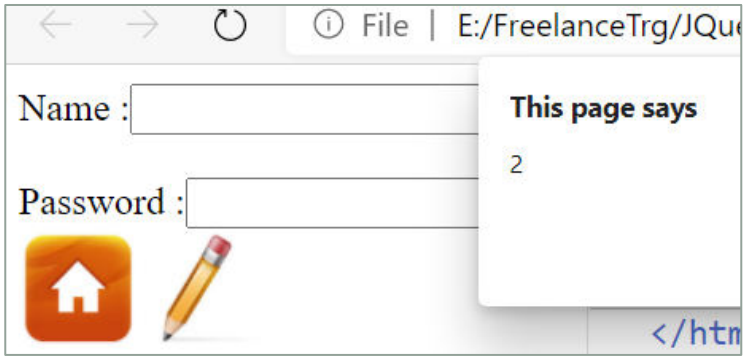
para-2

para-3

Selecting by attribute values

- Use brackets [attribute] to select on attribute name and/or attribute value
  - $('a[title]') - selects all anchor elements that have a title attribute
  - $('a[title="trainer"]') – selects all <a> elements that have a "trainer" title attribute value

```
<script src="..\Scripts\jquery-3.5.1.js"></script>
<script>
$(document).ready(function()
{
    var list = $('div[title="first"],img[height]' );
    alert(list.length);    //2
});
</script>
</head>
<body>
<div title="first">
Name :<input type="text"/>
</div><br>
<div title="second" >
Password :<input type="password"/>
</div>
<img src="a.png" height="50" width="50">
<img src="b.png"  width="50">
</body>
```



Selecting by input elements

- To select input elements of type : <input>:
  - $('input[type="text"]').css("background", "yellow");

- To select all input elements
  - $(‘:input’) - Selects all form elements (input, select, textarea, button).
  - $(‘:input[type=“radio”]’) – selects all radio buttons

  - $(":text") - All input elements with type="text"
  - $(":password") - All input elements with type="password"
  - $(":radio") - All input elements with type="radio"
  - $(":checkbox") - All input elements with type="checkbox"
  - $(":submit") - All input elements with type="submit"
  - $(":reset") - All input elements with type="reset"
  - $(":button") - All input elements with type="button"
  - $(":file") - All input elements with type="file"

```
<script src="..\Scripts\jquery-3.5.1.js"></script>
<script>
$(document).ready(function()
{
    var inputs = $(':input');
    alert($(inputs[2]).val());  //Chennai
    $( ":text" ).css({ background: "yellow", border: "3px red solid" });
});
</script>
</head>
<body>
Name : <input id="txtName" type="text" value="Karthik"><br>
Age : <input id="txtAge" type="text" /><br>
City :
<select id="city">
<option value="Bangalore">Bangalore</option>
<option value="Chennai" selected="selected">Chennai</option>
<option value="Mumbai">Mumbai</option>
</select><br>
</body>
```

Filters

- The index-related selectors (:eq(), :lt(), :gt(), :even, :odd) filter the set of elements that have matched the expressions that precede them.
  - They narrow the set down based on the order of the elements within this matched set.
  - Eg, if elements are first selected with a class selector (.myclass) and four elements are returned, these elements are given indices 0 through 3
- eq() - Select the element at index n within the matched set.
  - Eg : $("p:eq(1)") - Select the second <p> element
  - Eg : $("element:eq(0)") is same as $('element:first-child')
- $('element:odd') and $('element:even') selects odd and even positions respectively. 0 based indexing
  - Odd returns (1,3,5…) and Even returns (0,2,4…)
- :gt() and lt() - Select all elements at an index > or < index within the matched set
  - Eg : $("tr:gt(3)") : Select all <tr> elements after the 4 first
  - Eg : $("tr:lt(4)") : Select the 4 first <tr> elements

```
<table border="1">
  <tr><td>TD #0</td><td>TD #1</td><td>TD #2</td></tr>
  <tr><td>TD #3</td><td>TD #4</td><td>TD #5</td></tr>
  <tr><td>TD #6</td><td>TD #7</td><td>TD #8</td></tr>
</table>
<script>
  $( "td:eq( 2 )" ).css( "color", "red" );
  //$( "tr:first" ).css( "font-style", "italic" );  //is same as below line
  $( "tr:eq(0)" ).css( "font-style", "italic" );
  $( "td:gt(4)" ).css( "backgroundColor", "yellow" );
</script>
```

TD #0	*TD #1*	*TD #2*
TD #3	TD #4	TD #5
TD #6	TD #7	TD #8

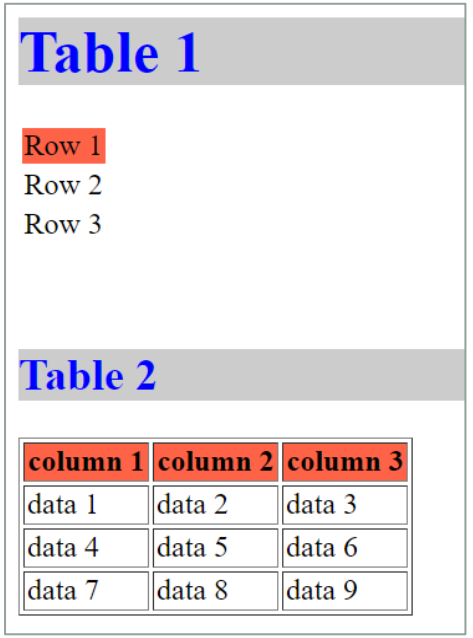
```
<script type="text/javascript">
$(document).ready(function() {
    $('tr:odd').css('background-color','tomato');
    $('tr:even').css('background-color','bisque');
});
</script>
<table border=1 cellspacing=5 cellpadding=5>
  <th>column 1<th>column 2<th>column 3
  <tr><td>data 1</td><td>data 2</td><td>data 3
  <tr><td>data 4<td>data 5<td>data 6
  <tr><td>data 7<td>data 8<td>data 9
  <tr><td>data 10<td>data 11<td>data 12
</table>
```

column 1	column 2	column 3
data 1	data 2	data 3
data 4	data 5	data 6
data 7	data 8	data 9
data 10	data 11	data 12

Basic Filters continued

- :first , :last - Selects the first/last matched element.
  - :first is equivalent to :eq(0) and :lt(1). This matches only a single element, whereas, :first-child can match more than one; one for each parent.
- :header - Selects all elements that are headers, like h1, h2, etc

```
<script>
$(document).ready(function() {
    $( ":header" ).css({ background: "#ccc", color: "blue" });
    $('tr:first-child').css('background-color','tomato');
});
</script>
</head>
<body>
<h1>Table 1</h1>
<table>
  <tr><td>Row 1</td></tr>
  <tr><td>Row 2</td></tr>
  <tr><td>Row 3</td></tr>
</table>
<br/><br/>
<h2>Table 2</h2>
<table border=1>
<th>column 1<th>column 2<th>column 3
<tr><td>data 1</td><td>data 2</td><td>data 3
```



Child Filter

- $('element:first-child') and $('element:last-child') selects the first child & last child of its parent.
  - $('span:first-child') returns the span which is a first child for all the groups
- :nth-child() - Selects all elements that are the nth-child of their parent. 1-based indexing
  - Eg : $("p:nth-child(3)") - Select each <p> element that is the third child of its parent

```
  <style>
  span {color: blue; }
  </style>
</head>
<body>
  <ul>
    <li>John</li>
    <li>Karl</li>
    <li>Brandon</li>
  </ul> <hr>
  <ul><li>Sam</li></ul> <hr>
  <ul>
    <li>Glen</li>
    <li>Tane</li>
  </ul>
 <script>
$( "ul li:nth-child(2)" ).append( "<span> - 2nd!</span>" );
</script>
```

- John
- Karl - 2nd!
- Brandon

- Sam

- Glen
- Tane - 2nd!

```
 <style>
   span {color: #008;}
   span.sogreen { color: green; font-weight: bolder;}
   span.solast {text-decoration: line-through;}
</style>
<script src="..\Scripts\jquery-3.5.1.min.js"></script>
</head>
<body>
<div> <span>John,</span><span>Karl,</span><span>Brandon</span></div>
<div> <span>Glen,</span> <span>Tane,</span><span>Ralph</span> </div>
<script>
$( "div span:first-child" ) .css( "text-decoration", "underline" )
     .hover(function() {
          $( this ).addClass( "sogreen" );
        }, function() {
            $( this ).removeClass( "sogreen" );
       });
$( "div span:last-child" ).css({ color:"red", fontSize:"80%" })
.hover(function() {
      $( this ).addClass( "solast" );
   }, function() {
      $( this ).removeClass( "solast" );
    });
$("div span:nth-child(2)").css("background-color","yellow");
</script>
```

John,Karl,Brandon
Glen, Tane,Ralph

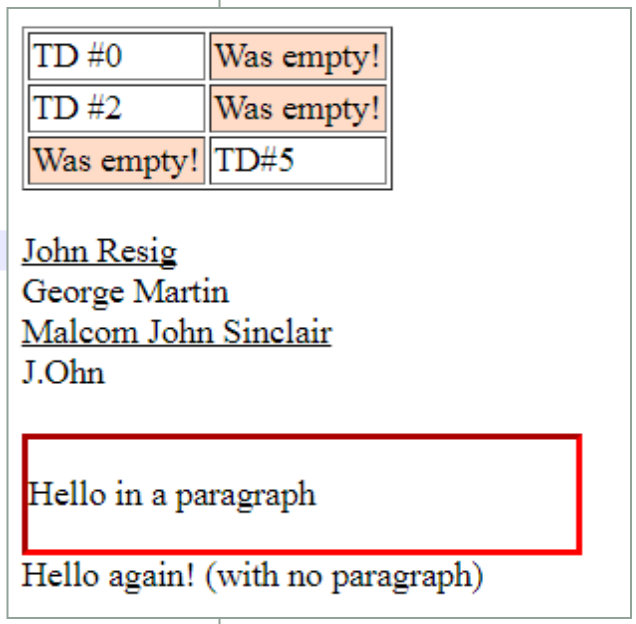
John,Karl,Brandon
Glen, Tane,Ralph

John,Karl,Brandon
Glen, Tane,~~Ralph~~

Content Filters

- :contains() will select elements that match the contents.
  - $(‘div:contains(“hello”)’) - selects div’s which contains the text hello (match is case sensitive)
- :empty - Select all elements that have no children (incl text nodes)
- :has : Selects elements which contain at least one element that matches the specified selector.
  - Eg : $("p:has(span)") - Select all <p> elements that have a element inside of them
  - Eg : $("div:has(p,span,li)").css("border","solid red"); - Select all elements that have at least one of the given elements inside
- :parent - Select all elements that have at least one child node (either an element or text).
  - Eg : $("td:parent") - Select all <td> elements with children, including text

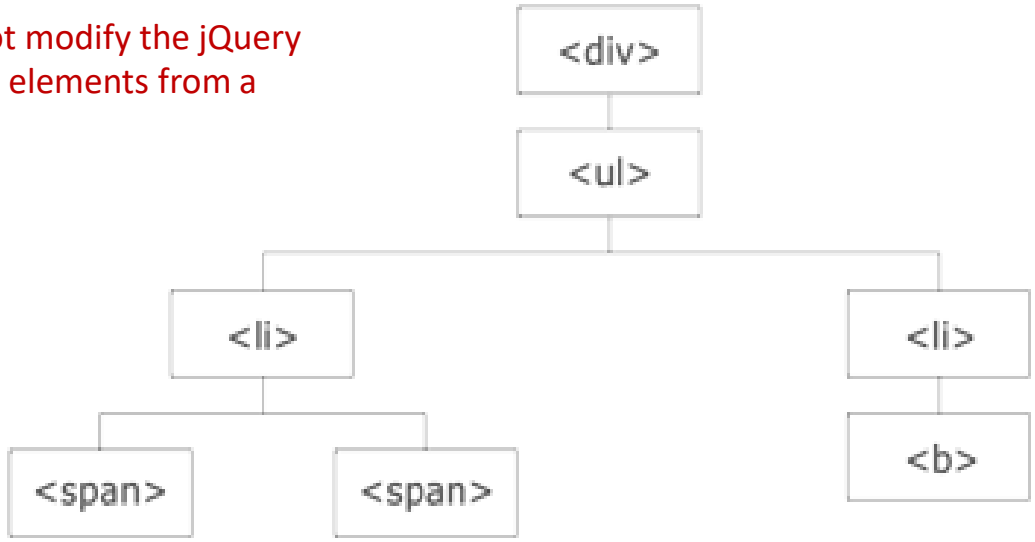
```
 <style>
.test { border: 3px inset red; width:250px }
</style>
</head>
<body>
 <table border="1">
  <tr><td>TD #0</td><td></td></tr>
  <tr><td>TD #2</td><td></td></tr>
  <tr><td></td><td>TD#5</td></tr>
 </table>
 <br>
 <div>John Resig</div>
 <div>George Martin</div>
 <div>Malcom John Sinclair</div>
 <div>J.Ohn</div>
 <br>
 <div><p>Hello in a paragraph</p></div>
 <div>Hello again! (with no paragraph)</div>
 <script>
   $( "td:empty" ).text( "Was empty!" )
       .css( "background", "rgb(255,220,200)" );
   $( "div:contains('John')" ).css( "text-decoration", "underline" );
   $( "div:has(p)" ).addClass( "test" );
</script>
```



jQuery Traversing

- jQuery traversing, which means "move through", are used to "find" (or select) HTML elements based on their relation to other elements.
  - Start with one selection and move through that selection until you reach the elements you desire.

Most of the DOM Traversal Methods do not modify the jQuery DOM object and they are used to filter out elements from a document based on given conditions

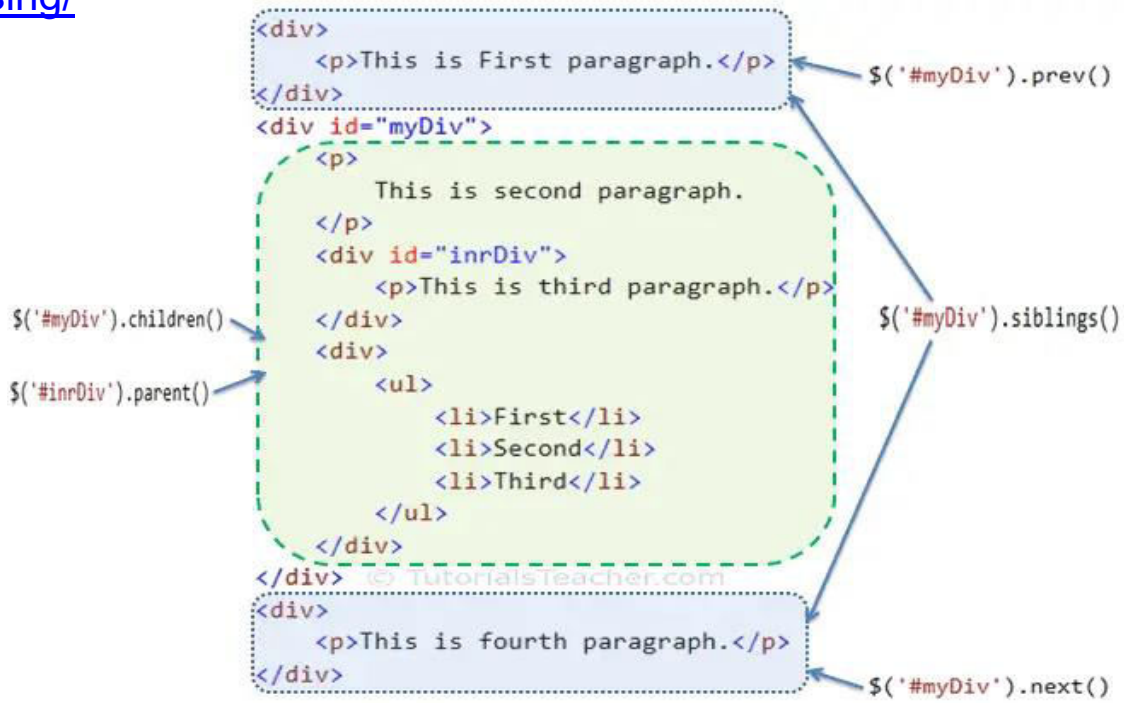


- The element is the **parent** of <ul>, and an **ancestor** of everything inside of it
- The <ul> element is the **parent** of both <li> elements, and a **child** of
- The left <li> element is the **parent** of , **child** of <ul> and a **descendant** of
- The element is a **child** of the left <li> and a **descendant** of <ul> and
- And so on….

Methods	Description
children()	Get all the child elements of the specified element(s)
each()	Iterate over specified elements and execute specified call back function for each element.
find()	Get all the specified child elements of each specified element(s).
first()	Get the first occurrence of the specified element.
next()	Get the immediately following sibling of the specified element.
parent()	Get the parent of the specified element(s).
prev()	Get the immediately preceding sibling of the specified element.
siblings()	Get the siblings of each specified element(s)

jQuery methods for traversing DOM elements

https://api.jquery.com/category/traversing/



jQuery Traversing -> filtering

- .eq() - Reduce the set of matched elements to the one at the specified index.
  - Eg : $("p").eq(1).css("background-color","yellow") - Select the second <p> element (index number 1)

- .filter() - Reduce the set of matched elements to those that match the selector or pass the function's test
  - Eg : $("p").filter(".intro") - Return all <p> elements with class "intro“

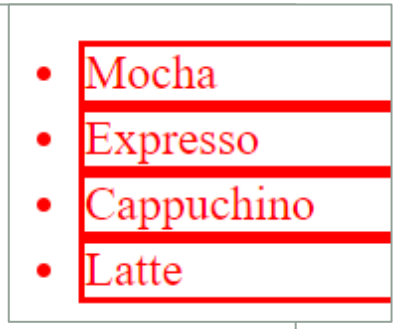
- .first() / last()
  - Eg : $("div p").first() - Select first <p> element inside first element

- .has() - Reduce the set of matched elements to those that have a descendant that matches the selector or DOM element.
  - Eg : $("p").has("span") - Return all <p> elements that have element inside

jQuery Traversing -> Tree Traversal

- .children() - Returns all direct children of the selected element
  - Eg : $("ul").children().css({"color":"red","border":"2px solid red"}) - Return elements that are direct children of

```
<ul class="ulclass">
  <li>Mocha</li>
  <li>Expresso</li>
  <li>Cappuchino</li>
  <li>Latte</li>
</ul>
<script>
$(".ulclass").children().css({"color":"red","border":"2px solid red"})
</script>
```

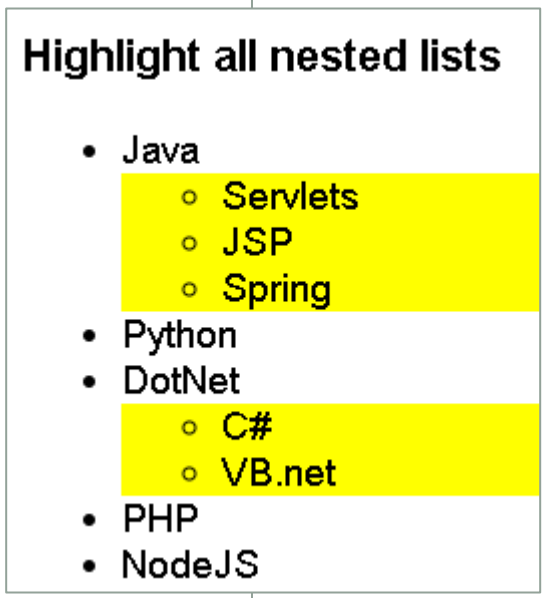


- .find() - Returns descendant elements of the selected element
- .next() / prev() - Returns the next / previous sibling element of the selected element
- nextAll() - returns all next sibling elements of the selected element
- parent() - Returns the direct parent element of the selected element

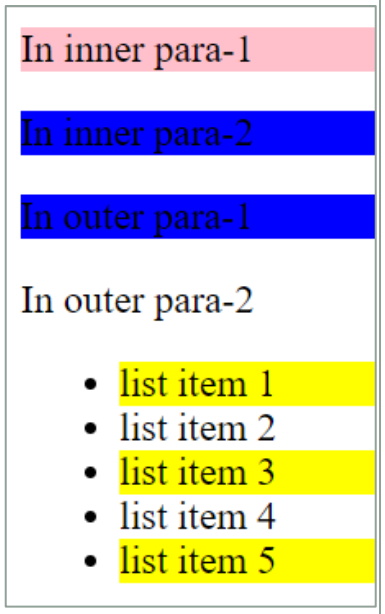
```
<body>
   <div class="great-grand-parent">
      <div class="grand-parent">
         <ul class="parent">
            <li class="child-one">Child One</li>
            <li class="child-two">Child Two</li>
         </ul>
      </div>
   </div>
<script>
$( ".child-two" ).parent().css( "border", "2px solid red" );
</script>
```

```
<body>
   <h3>Highlight all nested lists</h3>
   <ul>
     <li>Java
       <ul>
         <li>Servlets</li>
         <li>JSP</li>
         <li>Spring</li>
       </ul>
     </li>
     <li>Python</li>
     <li>DotNet
       <ul>
         <li>C#</li>
         <li>VB.net</li>
       </ul>
     </li>
     <li>PHP</li>
     <li>NodeJS</li>
   </ul>
<script>
  $( "ul" ).find( "li ul" ).css( "background-color", "yellow" );
</script>
```

- children() - returns all the direct children of the matched element.
- find() - returns all the descendant elements of the matched element.



```
 <style>
  .blue {background: blue;}
  .highlight{background-color: pink}
</style>
<script src="..\Scripts\jquery-3.5.1.min.js"></script>
</head>
<body>
  <div>
    <p>In inner para-1</p>
    <p class="intro">In inner para-2</p>
  </div>
  <p id="outro">In outer para-1</p>
  <p>In outer para-2</p>
  <ul>
    <li>list item 1</li>
    <li>list item 2</li>
    <li>list item 3</li>
    <li>list item 4</li>
    <li>list item 5</li>
  </ul>
<script>
 $( "li" ).eq(4).css( "background-color", "red" );
 $( "body" ).find( "li" ).eq( 2 ).addClass( "blue" );
 $("li").filter(":even").css("background-color","yellow");
 $("p").filter(".intro,#outro").css("background-color","blue");
 $( "div p" ).first().addClass( "highlight" );
</script>
```



Method Chaining

- Chaining is a good way to avoid selecting elements more than once. Eg:
  - $("div").fadeOut();
  - $("div").css("color", "red");
  - $("div").text("hello world");

- Instead of doing that and running $(“div”) three times, you could do this:
  - $("div").fadeOut().css("color", "red").text("hello world");

ATTRIBUTES AND TEMPLATES

Working with Attributes

- Object attributes can be used using attr():
  - var val = $('#customDiv').attr('title'); - Retrieves the title attribute value

- .attr(attributeName,value) : accesses an object's attributes and modifies the values.
  - $('img').attr('title','Image title'); - changes the title attribute value to Image title.

- To modify multiple attributes, pass JSON object.

```
$("img").attr({
          "title":  "image title",
          "style" : "border:5px dotted red"

    });
```

```
<img src="paintbrush.gif" title="image
title" style="border:5px dotted red">
```

- You can also remove attributes entirely using .removeAttr().

jQuery Templates

- Template is a form, model, sample or predefined shape used to provide consistent look and feel to information presented on a website
  - jQuery Templates are client-side based templates.
  - JQuery templating let you render JSON to HTML elements.

- The benefits of using jQuery Templates are:
  - Easily convert JSON object to HTML without need for parsing
  - Reusability
  - Rendered and cached on client-side
  - Templates are written in pure HTML with Template Tags and simple jQuery code for magic to happen
  - Maximize the separation of UI and DATA

  - jQuery Templates is an official plugin for the jQuery Library. We need to add reference to the jQuery Templates library.
  - `<script src=http://ajax.microsoft.com/ajax/jquery.templates/beta1/jquery.tmpl.min.js />`
  -

```
<script>
$(document).ready(function() {
  var studList = [
    { Name: "Anil", Surname: "Patil", Grade: 'A' },
    { Name: "Soha", Surname: "Kumari", Grade: 'B' },
    { Name: "Arnav", Surname: "Rao", Grade: 'A' },
    { Name: "Vanita", Surname:"Kapoor", Grade: 'B'}
  ];

  $("#studTemplate").tmpl(studList).appendTo("#students");

});
</script>

<script id="studTemplate" type="text/html">
  <tr><td>${Name}</td><td>${Surname}</td>
    {{if Grade=='A'}}
      (<td style='color:red'>First Class</td>)
  {{else}}
      (<td style='color:blue'>Second-class</td>)
  {{/if}}
  </tr>
</script>

<body>
   <table border="1" id="students"></table>
</body>
</html>
```

Anil	Patil	First Class
Soha	Kumari	Second-class
Arnav	Rao	First Class
Vanita	Kapoor	Second-class

Getting Content

- text() - Sets or returns the text content of selected elements
- html() - Sets or returns the content of selected elements (including HTML markup)
- val() - Sets or returns the value of form fields

```
<script>
$(document).ready(function(){
    $("#div1").html('<a href="example.html">Link</a><b>hello</b>');
    $("#div2").text('<a href="example.html">Link</a><b>hello</b>');
});
</script>
</head>
<body>
<div id="div1"></div>
<div id="div2"></div>
</body>
```

Linkhello

Linkhello

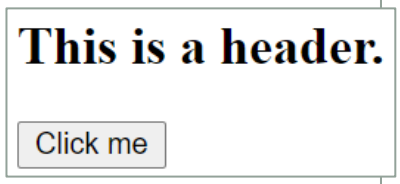
```
<div id="div1">
  <a href="example.html">Link</a>
  <b>hello</b>
</div>
<br>
<div id="div2"><a href="example.html">Link</a><b>hello</b>
</div>
```

$.html() treats the string as HTML, $.text() treats the content as text

Adding and Removing Nodes

- In traditional approach adding and removing nodes is tedious.
- To insert nodes four methods available:
- Appending adds children at the end of the matching elements
  - .append()
  - .appendTo()
- Prepending adds children at the beginning of the matching elements
  - .prepend()
  - .prependTo()
- To wrap the elements use .wrap()
  - Eg: $(“p”).wrap(“<h1></h1>”) //wraps “p” in <h1> tags
- To remove nodes from an element use .remove()

```
<script>
$(document).ready(function() {
   $("button").click(function(){
      $("h2").append("<p>Surprise text!</p>");
   });
});
</script>
</head>
<body>
   <h2>This is a header.</h2>
   <button>Click me</button>
</body>
```




```
<body> == $0
  <h2>This is a header.</h2>
  <button>Click me</button>
</body>
```

```
<body> == $0
▼ <h2>
    "This is a header."
    <p>Surprise text!</p>
  </h2>
  <button>Click me</button>
</body>
```

```
<script>
$(document).ready(function() {
   $("button").click(function(){
      $("h2").prepend("<p>Surprise text!</p>");
   });
});
</script>
```


```
▼ <body>
  ▼ <h2> == $0
      <p>Surprise text!</p>
      "This is a header."
    </h2>
    <button>Click me</button>
</body>
```

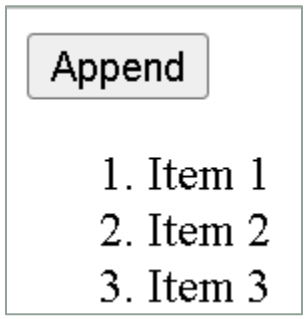
```
<script>
$(document).ready(function() {
  $('button').click(function() {
  //append can be a element, but can be simple text too
    $('#hello').append(' world!');
  });
});
</script>
</head>
<body>
   <p id="hello">Hello</p>
   <button>Click me</button>
</body>
```

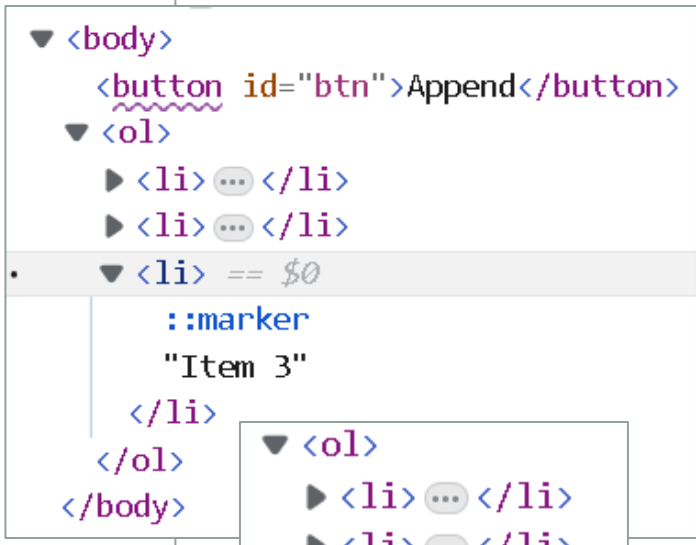

```
▼<body> == $0
    <p id="hello">Hello</p>
    <button>Click me</button>
  </body>
```

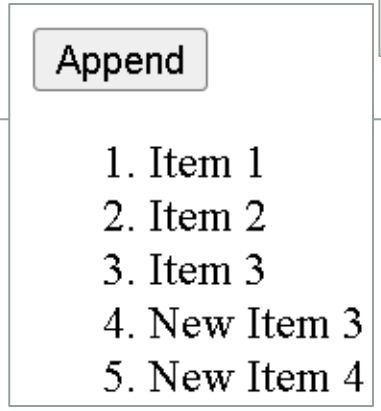
```
▼<body>
  ▼<p id="hello"> == $0
      "Hello"
      " world!"
    </p>
    <button>Click me</button>
  </body>
```

```
<script>
$(document).ready(function() {
  $("#btn").click(function(){
        $("h2").remove();
  });
});
</script>
<body>
  <button id="btn">Remove</button><br>
  <h2>Press the button to remove this heading</h2>
</body>
```

```
<script type="text/javascript">
$(document).ready(function(){
    var i=3;
    $("#btn").click(function(){
        $("ol").append("<li>New Item " + i++ + "</li>");
      });
});
</script>
</head>
<body>
    <button id="btn">Append</button>
    <ol>
      <li>Item 1</li>
      <li>Item 2</li>
      <li>Item 3</li>
    </ol>
</body>
```







```
<script>
$(document).ready(function() {
  $("#btn").click(function(){
    $("div").wrap($("<h3 style='text-align:center;color:blue'></h3>"));
  });
});
</script>
<body>
  <div>Hello</div>
  <button id="btn">Wrap</button><br>
</body>
```


```
<body> == $0
  <div>Hello</div>
  <button id="btn">Wrap</button>
  <br>
</body>
```


```
<body>
  <h3 style="text-align:center;color:blue"> == $0
    <div>Hello</div>
  </h3>
  <button id="btn">Wrap</button>
  <br>
</body>
```

```
<script>
$(document).ready(function() {
  $("#btn").click(function(){
        $("h2").empty();
        $(".d1").empty();
  });
});
</script>
<body>
  <button id="btn">Remove</button><br>
  <h2>Remove contents of this heading</h2>
  <div class="d1">
     <p>Para-1</p>
     <p>Para-2</p>
  </div>
</body>
```

This method removes not only child (and other descendant) elements, but also any text within the set of matched elements.

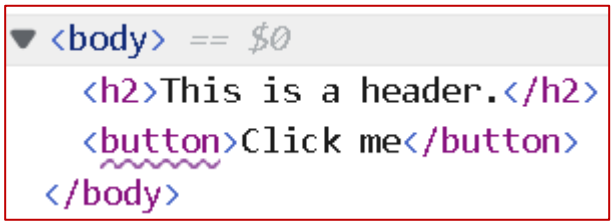
```
<body>
  <button id="btn">Remove</button>
  <br>
  <h2>Remove contents of this heading</h2>
  <div class="d1"> == $0
    <p>Para-1</p>
    <p>Para-2</p>
  </div>
</body>
```

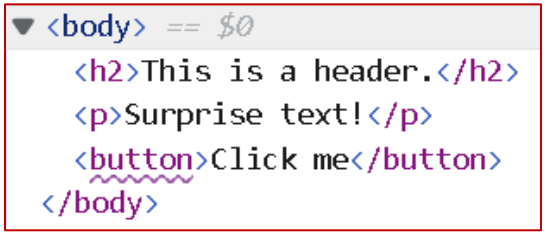

```
<body>
  <button id="btn">Remove</button>
  <br>
  <h2></h2>
  <div class="d1"></div> == $0
</body>
```

Other DOM manipulation methods

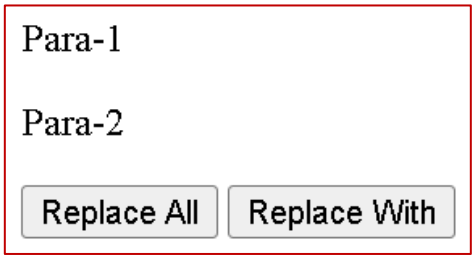
- Methods that allow us to insert new content outside an existing element:
  - .after() : Insert content after each element in the set of matched elements.
  - .before() : Insert content before each element in the set of matched elements.
  - .insertAfter() : Insert every element in the set of matched elements after the target.
  - .insertBefore() : Insert every element in the set of matched elements before the target.
  - .replaceAll() : Replace each target element with the set of matched elements.
  - .replaceWith() : Replace each element in the set of matched elements with the provided new content and return the set of elements that was removed.

```
<script>
$(document).ready(function() {
   $("button").click(function(){
      $("h2").after("<p>Surprise text!</p>");
   });
});
</script>
</head>
<body>
   <h2>This is a header.</h2>
   <button>Click me</button>
</body>
```

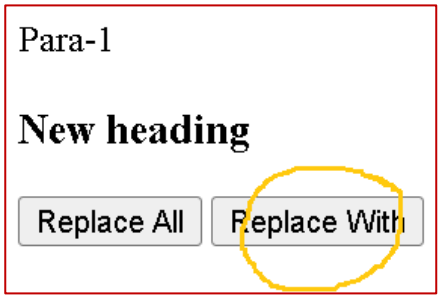




```
<script>
$(document).ready(function() {
  $("#btn1").click(function(){
    $("<h3>New content</h3>").replaceAll("p");
  });
  $("#btn2").click(function(){
    $("p.p2").replaceWith("<h3>New heading</h3>");
  });
});
</script>
</head>
<body>
  <p class="p1">Para-1</p>
  <p class="p2">Para-2</p>
  <button id="btn1">Replace All</button>
  <button id="btn2">Replace With</button>
</body>
```




```
<body> == $0
  <h3>New content</h3>
  <h3>New content</h3>
  <button id="btn1">Replace All</button>
  <button id="btn2">Replace With</button>
```



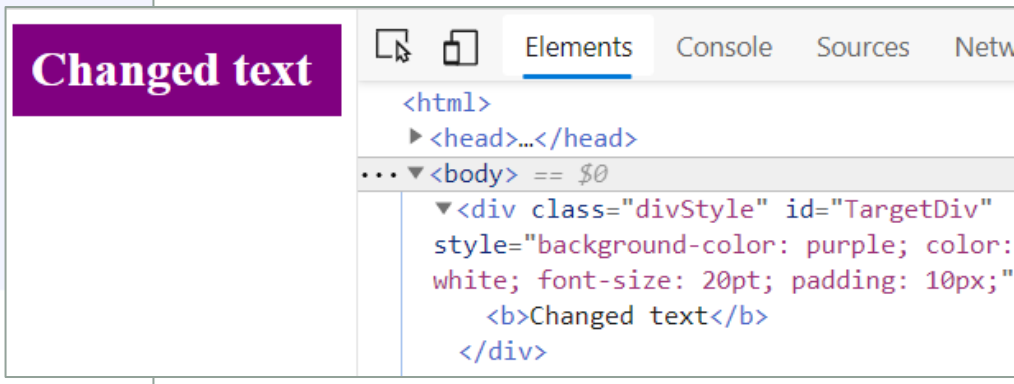

```
<body> == $0
  <p class="p1">Para-1</p>
  <h3>New heading</h3>
  <button id="btn1">Replace All</button>
  <button id="btn2">Replace With</button>
</body>
```

Modifying Styles

- .css() function is used to modify an object's style
  - $('div').css('color','red');
- Multiple styles can be modified by passing a JSON Object

```
$('div').css({
   "color":"red",
   "font-weight":"bold"
});
```

```
<script>
$(document).ready(function(){
      $('#TargetDiv').css({
            'background-color':'purple',
            'color':'white',
            'font-size':'20pt',
            'padding':'10px'
      })
      .html('<b>Changed text</b>');
});
</script>
</head>
<body>
<div id="TargetDiv">Target Div</div>
</body>
```



jQuery DOM utility functions

- The jQuery library defines a number of utility functions that are namespaced by jQuery/$ and that don't operate on a jQuery object.
- Some of them are:
  - **$.each()** : is used to iterate over arrays and objects

```
$.each([ 33,44,55 ], function( index, value ) {
     console.log( index + ": " + value );
  });
  $.each(['Dia', 'Ria','Nia'], function( index, value ) {
     console.log( index + ": " + value );
  });
  var person = {
    "name": "shrilata",
    "email": "shri@gmail.com",
   };
  $.each( person, function( key, value ) {
    console.log( key + ": " + value );  });
```

```
0: 33
1: 44
2: 55
0: Dia
1: Ria
2: Nia
name: shrilata
email: shri@gmail.com
```

  - **$.isArray(obj)** : determine whether the argument is an array.
  - **$.inArray()** : is used to returns a value's index in an array, or -1 if the value is not in the array.

```
console.log($.isArray([1,2,3])) //true
```

```
var arr = [22,33,44,55];
  console.log($.inArray(44,arr)) //2
```

jQuery DOM utility functions

- **$.extend(target, object1 [, objectN])** : Merge the contents of two or more objects together into the first object.

```
var emp = {
  fname: 'Anita',
  lname: 'Patil',
  skills: ['Java','Spring']
};
var project = {
  details: { name: 'Claims', client:'SCE' },
  duration: 100
};

// Merge object2 into object1
$.extend( emp, project );
console.log(emp)
```

```
▶ details: {name: 'Claims', client: 'SCE'}
  duration: 100
  fname: "Anita"
  lname: "Patil"
▶ skills: (2) ['Java', 'Spring']
```

- **$.merge(first, second) :** merges the contents of two arrays together into the first array.

```
var first = [ "a", "b", "c" ];
var second = [ "d", "e", "f" ];
$.merge(first, second);
console.log(first)  //['a', 'b', 'c', 'd', 'e', 'f']
```

Working with Classes

- The four methods for working with css class attributes are
- .addClass() : adds one or more classes to the class attribute of each element.
  - $(‘p’).addClass(‘classOne’);
  - $(‘p’).addClass(‘classOne classTwo’);
- .hasClass() : returns true if the selected element has a matching class
  - if($('p').hasClass('classOne')) { //perform operation}
- removeClass() remove one or more classes
  - $(‘p’).removeClass(‘classOne classTwo’);
- To remove all class attributes for the matching selector
  - $(‘p’).removeClass();
- .toggleClass() : alternates adding or removing a class based on the current presence or absence of the class.
  - $(‘#targetDiv’).toggleClass('highlight');

```
<style>
.important{
  font-weight:bold;
  font-size:xx-large;
  color:red;
}
.blue {color:blue;}
</style>
<script>
$(document).ready(function() {
    $("button").click(function(){
        $("h1,h2,p").addClass("blue");
        $("div").addClass("important");
  });
});
</script>
</head>
<body>
<h1>Heading 1</h1>
<h2>Heading 2</h2>
<p>This is a paragraph.</p>
<p>This is another paragraph.</p>
<div>This is some important text!</div>
<button>Add classes to elements</button>
```

Heading 1

Heading 2

This is a paragraph.

This is another paragraph.

This is some important text!

Add classes to elements

Heading 1

Heading 2

This is a paragraph.

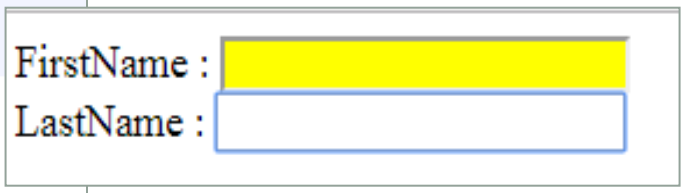
This is another paragraph.

This is some

Add classes to elements

Working with Classes (Contd)

```
<style type="text/css">
.highlight{ background-color:yellow; };
</style>
<script>
  $(document).ready(function() {
    $('input[type="text"]').addClass('highlight');
    //$('#txtLastName').removeClass('highlight');
  });
  function FocusBlur(element){
    $(element).toggleClass('highlight');
  }
</script>
</head>
<body>
<table>
<tr>
<td>FirstName : </td>
<td><input id="txtFirstName" onFocus="FocusBlur(this)"
        onBlur="FocusBlur(this)" /></td>
</tr>
<tr>
<td>LastName : </td>
<td><input id="txtLastName" onFocus="FocusBlur(this)"
        onBlur="FocusBlur(this)"/></td>
</tr>
</table>
```



jQuery Event Model Benefits

- Events notify a program that a user performed some type of action
- jQuery Events
  - click()
  - blur()
  - focus()
  - dblclick()
  - mousedown()
  - mouseup()
  - mouseover()
  - keydown()
  - keypress()
  - hover() : hover() method takes two functions and is a combination of the mouseenter() and mouseleave() methods.

```
$("img").mouseover(function () {
        $(this).css("opacity", "0.3");
 });
 $("img").mouseout(function () {
         $(this).css("opacity", "1.0");
 });
```

```
$("#p1").hover(function(){
  alert("You entered p1!");
},
function(){
  alert("Bye! You now leave p1!");
});
```

Handling Click Events

- .click(handler([eventObject])) is used to listen for a click event or trigger a click event on an element
  - $('#submitButton').click(function() { alert('Clicked') });

```
<script>
$(document).ready(function(){
    $('#SubmitButton').click(function(){
        var fName = $('#txtFirstName').val();
        var lName = $('#txtLastName').val();
        $('#tgtDiv').html("<b>"+fName+" "+lName+"</b>");
    });
});
</script>
</head>
<body>
FirstName : <input id="txtFirstName" type="text" /><br>
LastName : <input id="txtLastName" type="text" /><br>
<input id="SubmitButton" type="submit" value="Submit"/><br>
<div id="tgtDiv" />
</body>
```

FirstName : Anil

LastName : Patil

Submit

Anil Patil

```
<style>
  p {
    color: red;
    margin: 5px;
    cursor: pointer;
  }
  p:hover {background: yellow;}
  </style>
</head>
<body>
<p>First Paragraph</p>
<p>Second Paragraph</p>
<p>Yet one more Paragraph</p>

<script>
 $( "p" ).click(function() {
   $( this ).slideUp();
});
</script>
</body>
```

First Paragraph

Second Paragraph

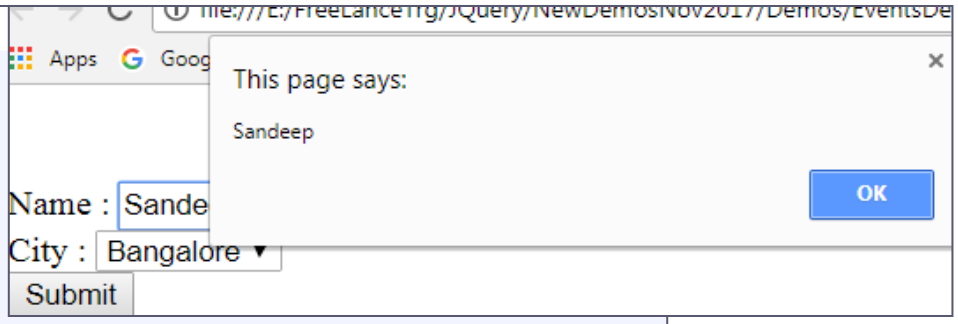
Yet one more Paragraph

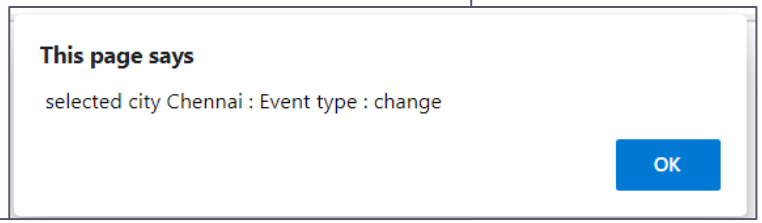
```
<style type="text/css">
.highlight{background-color:yellow;};
</style>
<script src="..\Scripts\jquery-3.5.1.js"></script>
<script>
        $(document).ready(function(){
            $('#targetDiv').mouseenter(function(){
                toggle(this);
            });
            $('#targetDiv').mouseleave(function(){
                toggle(this);
            });
            $('#targetDiv').mouseup(function(e){
                $(this).text('X : '+e.pageX+' Y :'+e.pageY );
            });
        });
        function toggle(element){
            $(element).toggleClass('highlight');
        }
</script>
</head>
<body>
<div id="targetDiv">Welcome to events</div>
</body>
```

Welcome to events

X : 123 Y :17

```
<script>
$(document).ready(function() {
    $('.testClass').change(function(){
        alert($(this).val());
    });
    $('#City').change(disp);

    function disp(e){
       alert(" selected city " + $(this).val() + " : Event type : " + e.type)
    }
});
</script>
</head>
<body><BR><BR>
Name : <input id="txtName" class="testClass" autofocus/>
City :
<select id="City" >
  <option value="Bangalore">Bangalore</option>
  <option value="Chennai" >Chennai</option>
  <option value="Mumbai">Mumbai</option>
</select><br>
<input type="submit" value="Submit"/></td>
</body>
```





Using on() and off()

- The on() method attaches one or more event handlers for the selected elements.

```
$( "#dataTable tbody tr" ).on( "click", function() {
    console.log( $( this ).text() );
});
```

```
<script>
$(document).ready(function() {
  $("#div1").on("click",function(){
     $(this).css("background-color","pink");
  });
  $("h2").on("mouseover mouseout",function(){
     $(this).toggleClass("intro");
  });
  $("#div2").on({
    mouseover: function(){
      $(this).css("background-color", "lightgray");
    },
    mouseout: function(){
      $(this).css("background-color", "lightblue");
    },
    click: function(){
      $(this).hide();
    }
  });
});
</script>
```

Header-2

Text within h4 element

Text within para

This is Div-2

Header-2

Text within h4 element

Text within para

```
<body>
<h2>Header-2</h2>
<div id="div1">
 <h4>Text within h4 element</h4>
 <p>Text within para</p>
</div>
<div id="div2"> This is Div-2 </div>
</body>
```

ANIMATIONS

Showing and Hiding Elements

- To set a duration and a callback function
  - show(duration, callback)
  - duration is the amount of time taken (in milliseconds), and callback is a callback function jQuery will call when the transition is complete.
- The corresponding version of hide( )
  - hide(duration, callback)
- To toggle an element from visible to invisible or the other way around with a specific speed and a callback function, use this form of toggle( )
  - toggle(duration, callback)

```
<style type="text/css">
.blueDiv{
  background-color:blue;
  color:white;font-size:30pt;
  display:none
  }
</style>
<script src="..\Scripts\jquery-3.5.1.js"></script>
<script>
$(document).ready(function(){
   $('#btnShow').click(function(){
      //fast(200),normal(400) and slow(600) can also be s
      $('.blueDiv').show(5000,function(){
         $('#results').text('Show Animation Completed');
      });
    });
    $('#btnHide').click(function(){
      $('.blueDiv').hide(5000,function(){
        $('#results').text('Hide Animation Completed');
       });
    });
    $('#btnSH').click(function(){
      $('.blueDiv').toggle(5000,function(){
        $('#results').text('Animation Completed');
      });
    });
});
</script>
```


```
<body>
<input id="btnShow" type="button" value="Show"/>
<input id="btnHide" type="button" value="Hide"/>
<input id="btnSH" type="button" value="Show/Hide"/>
<div class="blueDiv">
<p>Welcome to animations!!</p>
</div>
<div id="results"></div>
</body>
```

jQuery Sliding Effects

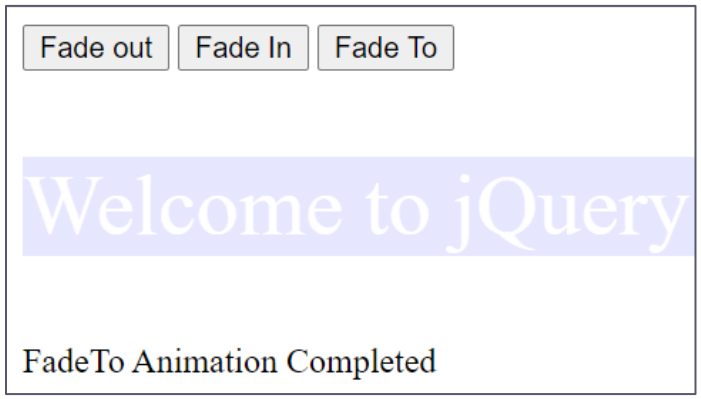
- The jQuery slide methods slide elements up and down.
- jQuery has the following slide methods:
  - $(selector).slideDown(speed,callback) : *Display the matched elements with a sliding motion*
  - $(selector).slideUp(speed,callback) : *Hide the matched elements with a sliding motion.*
  - $(selector).slideToggle(speed,callback)
- The speed parameter can take the following values: "slow", "fast", "normal", or milliseconds.
- The callback parameter is the name of a function to be executed after the function completes.

```
$("#flip").click(function(){
    $("#panel").slideDown();
});
```

jQuery Fading Effects

- The jQuery fade methods gradually change the opacity for selected elements.
- jQuery has the following fade methods:
  - $(selector).fadeIn(speed,callback)
  - $(selector).fadeOut(speed,callback)
  - $(selector).fadeTo(speed,opacity,callback)
- The speed parameter can take the following values: "slow", "fast", "normal", or milliseconds.
  - The opacity parameter in the fadeTo() method allows fading to a given opacity.
  - The callback parameter is the name of a function to be executed after the function completes.

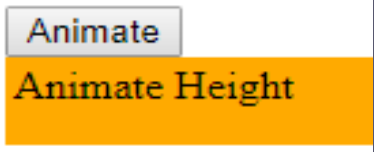
```
$('.blueDiv').fadeTo(1000,0.1,function(){
        $('#results').text('FadeTo Animation Completed');
});
```

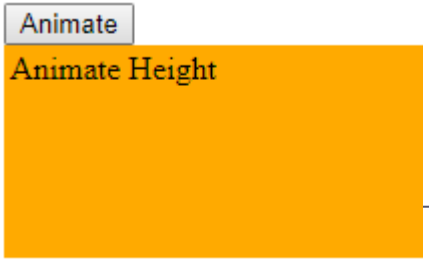


Creating Custom Animation

- Custom animation can be created in jQuery with the animate() function
  - animate(params, duration, callback)
    - params contains the properties of the object you're animating, such as CSS properties, duration is the optional time in milliseconds that the animation should take and callback is an optional callback function.

```
<style type="text/css">
#content { background-color:#ffaa00; width:300px; height:30px; padding:3px; }
</style>
<script type="text/javascript">
$(document).ready(function() {
      $("#animate").click(function() {
          $("#content").animate({"height": "100px", "width": "350px"}, "slow");
       });
});
</script>
</head>
<body>
<input type="button" id="animate" value="Animate"/>
<div id="content">Animate Height</div> </body>
```



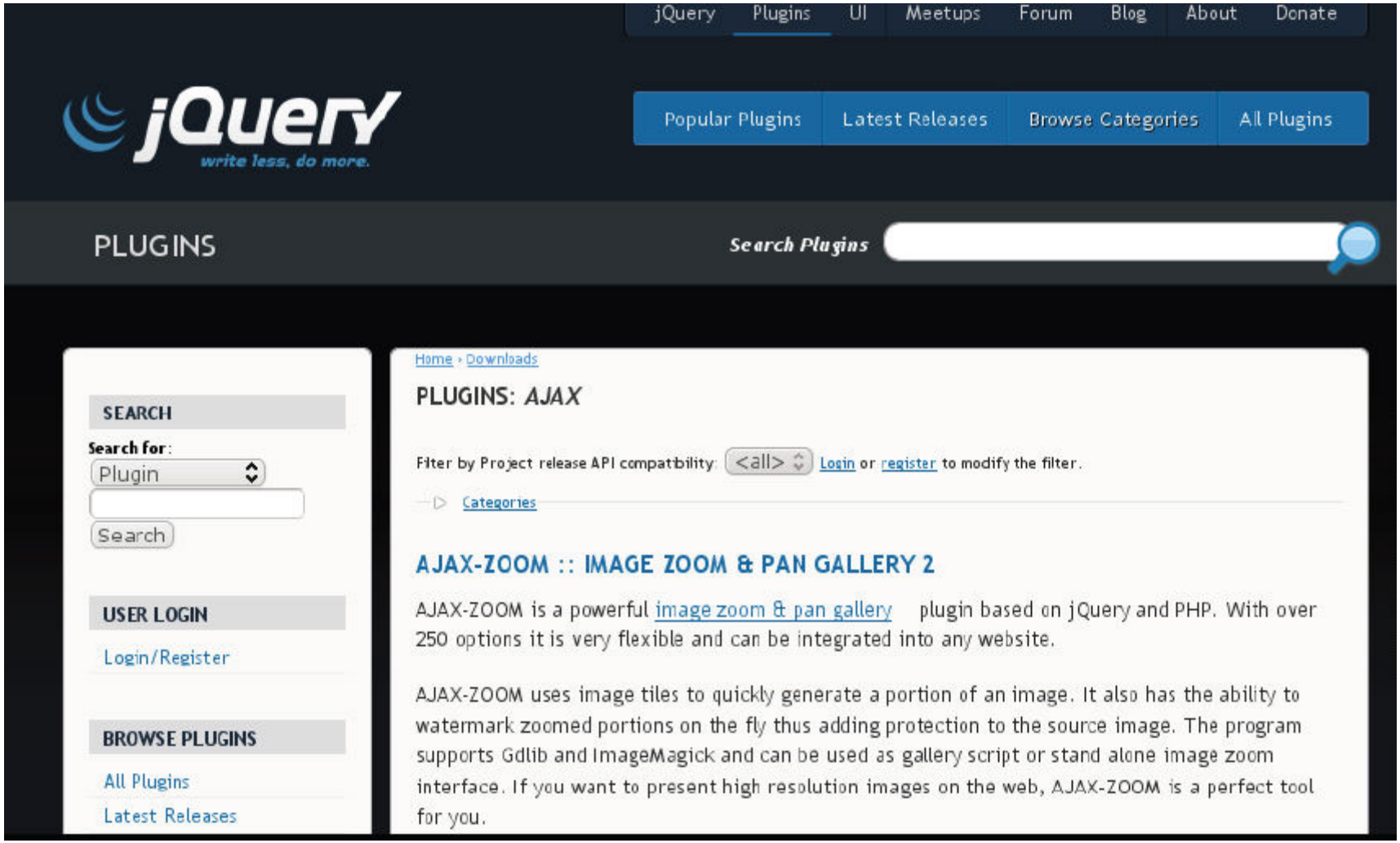


Jquery plugins

- A jQuery plugin is a method that we use to extend jquery's prototype object.
  - It is a piece of code written in a JavaScript file that enables all jQuery objects to inherit any methods that need to be added.
- Plugin is used to work with a collection of elements.
  - In fact, we can consider each method that comes with jQuery core as a plugin, eg .css(), .hide(), .fadeout(), .addClass() etc
- There are a large number of ready to use plugins available which you can download from repository link at https://plugins.jquery.com/tag/jquery/
  - This is official jQuery plug-in repository, where jQuery plug-in developers submit their plug-ins.
  - We can look for the best plug-ins from this repository.

- We can create our own custom plugins; jQuery comes with all the necessary hooks to build plugins easily
  - A plug-in is piece of code written in a standard JavaScript file.
  - These files provide useful jQuery methods which can be used along with jQuery library methods.

plugins.jquery.com



jQuery Ajax features

- jQuery provides several functions that can be used to send and receive data

Method	Description
$.ajax()	Performs an async AJAX request
$.ajaxPrefilter()	Handle custom Ajax options or modify existing options before each request is sent and before they are processed by $.ajax()
$.ajaxSetup()	Sets the default values for future AJAX requests
$.ajaxTransport()	Creates an object that handles the actual transmission of Ajax data
$.get()	Loads data from a server using an AJAX HTTP GET request
$.getJSON()	Loads JSON-encoded data from a server using a HTTP GET request
$.parseJSON()	Deprecated in version 3.0, use JSON.parse() instead. Takes a well-formed JSON string and returns the resulting JavaScript value
$.getScript()	Loads (and executes) a JavaScript from a server using an AJAX HTTP GET request
$.param()	Creates a serialized representation of an array or object (can be used as URL query string for AJAX requests)
$.post()	Loads data from a server using an AJAX HTTP POST request

Using get()

- $.get(url [, data] [, success] [, dataType]) : retrieve data from a server using GET
  - datatype can be html, xml, json

```
<!-- AjaxGet.html -->
<html>
<head>
<title>Hello there</title>
<script src="https://ajax.googleapis.com/ajax/libs/jquery/3.6.4/jquery.min.js">
<script>
$(document).ready(function()  {
    $('#btn1').click(function(){
        $.get('/sample.txt',function(data){
            $('#targetDiv').html(data);
        });
    });
});
</script>
</head>
<body>
<h3>Welcome to Node!
<input id="btn1" type="button" value="get!" />
<div id="targetDiv"/>
</body>
</html>
```

sample.txt

```
1   This is sample txt
2   Sending some response to
3   our AJAX application
```

MYEXPRESSAPP

- node_modules
- AjaxGet.html
- First.js
- package-lock.json
- package.json
- sample.txt

```
//First.js
var express = require('express');
var app = express()

app.get("/sample.txt",function(req, resp){
    resp.sendFile("sample.txt", { root : __dirname})
})

app.get("/",function(req, resp){
    resp.sendFile("AjaxGet.html", { root : __dirname})
})
app.listen(3000, function(){
    console.log("server started at http://localhost:3000")
})
```

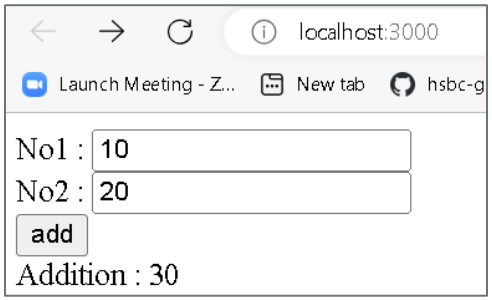
Welcome to Node! get!

Welcome to Node! get!
This is sample txt Sending some response to our AJAX application

$.get(url [, data] [, success] [, dataType])

```
<!-- AjaxGet.html -->
<html>
<head>
<script src="https://ajax.googleapis.com/ajax/libs/jquery/3.
<script>
$(document).ready(function()  {
   $('#btn1').click(function(){
      $.get('/add',
            { no1 : $('#n1').val(), no2: $('#n2').val() },
            function(data){
               $('#targetDiv').html(data);
            });
    });
});
</script>
</head>
<body>
   No1 : <input id="n1"><br>
   No2 : <input id="n2"><br>
   <input type="button" id="btn1" value="add">
<div id="targetDiv"/>
</body>
</html>
```

```
//adder.js
var express = require('express');
var app = express()

app.get("/",function(req, resp){
    resp.sendFile("AjaxGet1.html", { root : __dirname})
})

app.get('/add', function (req, res) {
    let n1 = parseInt(req.query.no1);
    let n2 = parseInt(req.query.no2);
    res.send("Addition : " + (n1 + n2));
});

app.listen(3000, function(){
    console.log("server started at http://localhost:3000")
})
```

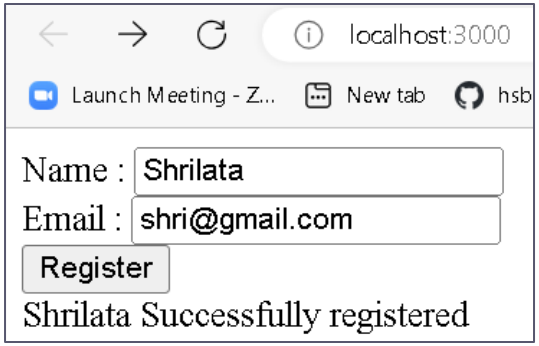


Using post()

- $.post(url [, data] [, success] [, dataType]) : Send data to the server using a HTTP POST request.

```
//Register.js
var express = require('express');
var app = express()

var bodyParser = require("body-parser");
app.use(bodyParser.urlencoded({ extended: false }));

app.get("/",function(req, resp){
    resp.sendFile("AjaxPost.html", { root : __dirname})
})

app.post('/register', function (req, res) {
    let username = req.body.username ;
    let email = req.body.email ;
    //registering user....
    res.send(username);
});

app.listen(3000, function(){
    console.log("server started at http://localhost:3000")
})
```

```
<!-- AjaxPost.html -->
<html>
<head>
<script src="https://ajax.googleapis.com/ajax/libs/jque
<script>
$(document).ready(function()  {
   $('#btn1').click(function(){
        $.post('/register',
               { username : $('#uname').val(), email: $('#email').val() },
               function(data){
                 $('#targetDiv').html(data + "Successfully registered");
               });
    });
});
</script>
</head>
<body>
   Name : <input id="uname"><br>
   Email : <input id="email"><br>
   <input type="submit" id="btn1" value="Register">
   <div id="targetDiv"/>
</body>
</html>
```



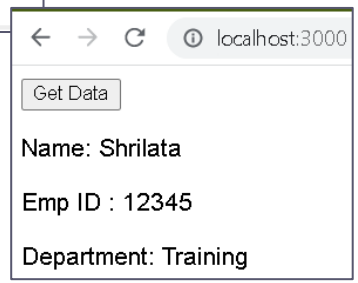
Getting JSON data

- $.getJSON(url [, data] [, success]) can retrieve data from a server

```
<!-- AjaxJson.html -->
<html>
<head>
<title>Hello there</title>
<script src="https://ajax.googleapis.com/ajax/libs/jquery/3.6.4/
<script>
$(document).ready(function()  {
    $('#btn1').click(function(){
        $.getJSON('/empData',function(data){
            $('#outputDiv').html('<p> Name: ' + data.empname + '</p>');
            $('#outputDiv').append('<p>Emp ID : ' + data.empid+ '</p>');
            $('#outputDiv').append('<p> Department: ' + data.dept+ '</p>');
        });
    });
});
</script>
</head>
<body>
<input id="btn1" type="button" value="Get Data" />
<div id="outputDiv"/>
</body>
</html>
```

emp.json > ...

```
{
    "empname":"Shrilata",
    "empid" : 12345,
    "dept":"Training"
}
```




```
//FetchJson.js
var express = require('express');
var app = express()

app.get("/empData",function(req, resp){
    resp.sendFile("emp.json", { root : __dirname})
})

app.get("/",function(req, resp){
    resp.sendFile("AjaxJson.html", { root : __dirname})
})
app.listen(3000, function(){
    console.log("server started at http://localhost:3000")
})
```

Using ajax() function

- ajax() function is configured by assigning values to JSON properties

```
<!-- Ajax.html -->
<html>
<head>
<title>Hello there</title>
<script src="https://ajax.googleapis.
<script>
$(document).ready(function()  {
    $('#btn1').click(function(){
        $.ajax({
            url: "sampleData",
            success: function(result){
                $("#targetDiv").html(result);
            }
        });
    });
});
</script>
</head>
<body>
<h3>Welcome to Node!
<input id="btn1" type="button" value="
<div id="targetDiv"/>
</body>
</html>
```

sample.txt

```
1   This is sample txt
2   Sending some response to
3   our AJAX application
```

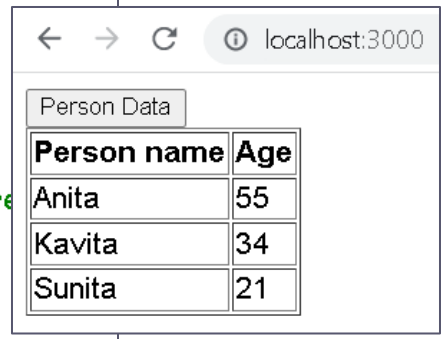
```
//MainAjax.js
var express = require('express');
var app = express()

app.get("/sampleData",function(req, resp){
    resp.sendFile("sample.txt", { root : __dirname})
})

app.get("/",function(req, resp){
    resp.sendFile("Ajax.html", { root : __dirname})
})
app.listen(3000, function(){
    console.log("server started at http://localhost:3000")
})
```

```html
<!-- Ajax1.html -->
<html>
<head>
<script src="https://ajax.googleapis.com/ajax/libs/jquery/3.6.4/
<script>
$(document).ready(function()  {
    $('#btn1').click(function(){
        $.ajax({
            type : "GET",
            url: "personData",
            datatype : "json", // type of data expected back from the server
            success : function(data, status, xhr) {     //data contains entire re
                var str = "<table border='1'>";
                str += "<tr><th>Person name</th><th>Age</th></tr>"
                for(p of data){
                    str += "<tr><td>" + p.pname + "</td><td>" + p.age + "</td></tr>"
                }
                str += "</table>"
                $("#targetDiv").html(str);
            },
            error : function(xhr, status, error) {
                $("#targetDiv").html(xhr.statusText);
            }
        });
    });
});
```

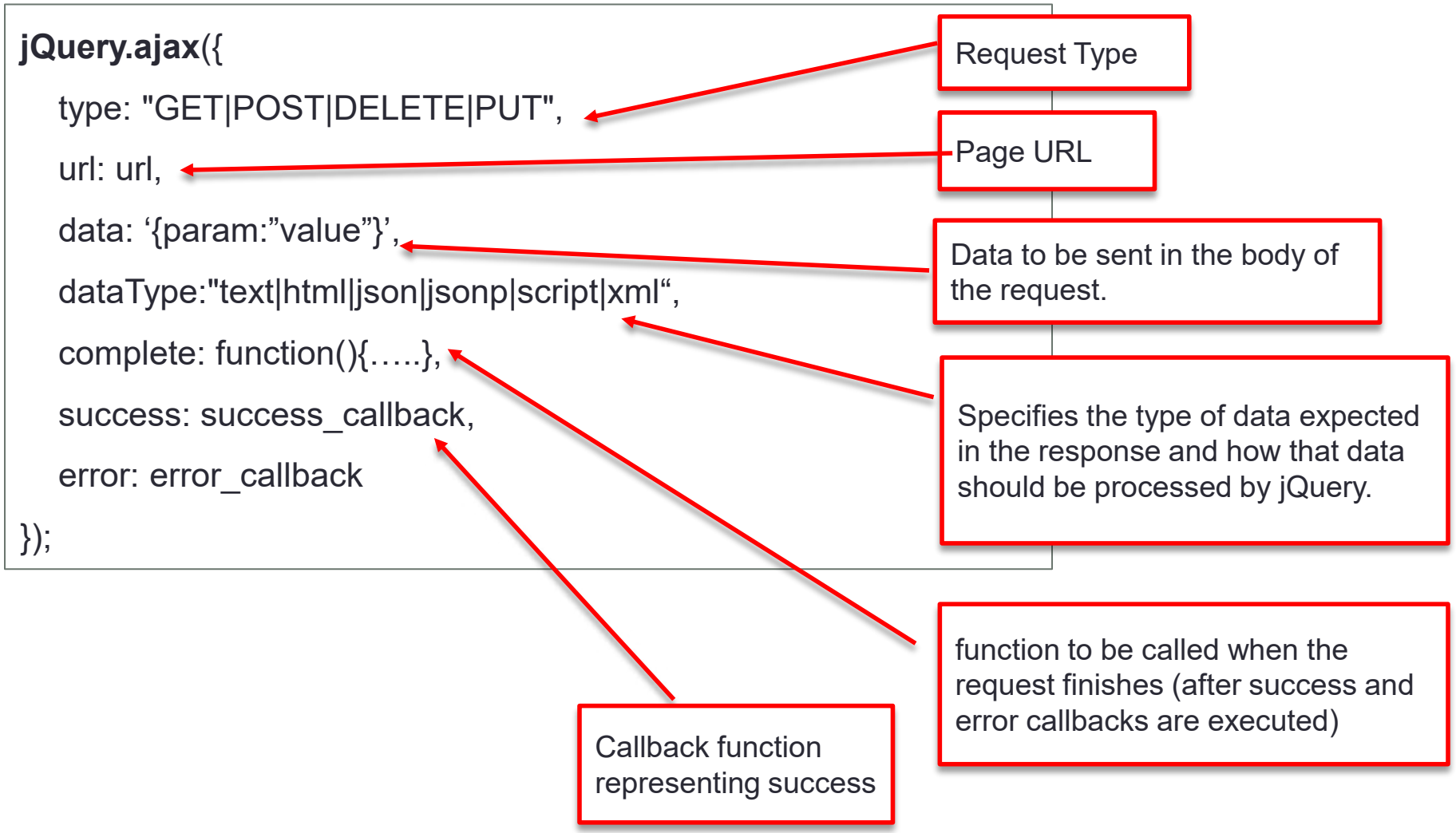
```html
<body>
<input id="btn1" type="button" value="Person Data" />
<div id="targetDiv"/>
</body>
</html>
```

person.json > ...

```json
[
    {"pname":"Anita","age":55},
    {"pname":"Kavita","age":34},
    {"pname":"Sunita","age":21}
]
```




```javascript
//MainAjax1.js
var express = require('express');
var app = express()

app.get("/personData",function(req, resp){
    resp.sendFile("person.json", { root : __dirname})
})

app.get("/",function(req, resp){
    resp.sendFile("Ajax1.html", { root : __dirname})
})
app.listen(3000, function(){
    console.log("server started at http://localhost:3000")
})
```


jQuery.ajax({
type: "GET|POST|DELETE|PUT",
url: url,
data: '{param:"value"}',
dataType:"text|html|json|jsonp|script|xml",
complete: function(){…..},
success: success_callback,
error: error_callback
});
Request Type
Page URL
Data to be sent in the body of the request.
Specifies the type of data expected in the response and how that data should be processed by jQuery.
function to be called when the request finishes (after success and error callbacks are executed)
Callback function representing success

Loading HTML content from server

- $(selector).load(url,data,callback) allows HTML content to be loaded from a server and added into DOM object.
  - $("#targetDiv").load('GetContents.html');
- A selector can be added after the URL to filter the content that is returned from the calling load().
  - $("#targetDiv").load('GetContents.html #Main');
- Data can be passed to the server using load(url,data)
  - $('#targetDiv').load('Add.aspx',{firstNumber:5,secondNumber:10})
- load () can be passed a callback function

```
$('#targetDiv').load('Notfound.html', function (res,status,xhr) {
        if (status == "errror") {
            alert(xhr.statusText);
        }
});
```

Using get(), getJSON() & post()

- $.get(url,data,callback,datatype) can retrieve data from a server.
  - datatype can be html, xml, json

```
$.get('GetContents.html',function(data){
                $('#targetDiv').html(data);
},'html');
```

- $.getJSON(url,data,callback) can retrieve data from a server.

```
$.getJSON('GetContents.aspx,{id:5},function(data){
                $('#targetDiv').html(data);
});
```

- $.post(url,data,callback,datatype) can post data to a server and retrieve results.

Using ajax() function

- ajax() function is configured by assigning values to JSON properties

```
$.ajax({
  url: “employee.asmx/GetEmployees",
  data : null,
  contentType: "application/json; charset=utf-8",
  datatype: ‘json’,
  success: function(data,status,xhr){
     //Perform success operation
  },
error: function(xhr,status,error) {
       //show error details
}
});
```

```
$("button").click(function(){
    $.ajax({
        url: "demo_test.txt",
        success: function(result){
            $("#div1").html(result);
        }
     });
});
```

BOOTSTRAP 5

Pre-reqs:

- HTML
- CSS
- JavaScript

Introduction

- Bootstrap is an opensource frontend framework developed by Twitter.
  - It is the most popular ***HTML, CSS, and JavaScript*** framework for developing responsive, mobile first web sites.
  - Bootstrap is a free and open source collection of tools for creating websites and web applications.
  - Bootstrap contains a set of CSS- and HTML-based templates for styling forms, elements, buttons, navigation, typography, and a range of other UI components.
  - It also comes with optional JavaScript plugins to add interactivity to components.

- Bootstrap is promoted as being **One framework, every device**.
  - This is because websites built with Bootstrap will automatically scale between devices — whether the device is a mobile phone, tablet, laptop, desktop computer, screen reader, etc.

- Responsive web design is about creating web sites which automatically adjust themselves to look good on all devices, from small phones to large desktops.
  - Developers can then create a single design that works on any kind of device: mobiles, tablets, smart TVs, and PCs

Where to Get Bootstrap 5?

- There are three ways to start using Bootstrap 5 on your own web site.
  - Download Bootstrap 5 from getbootstrap.com : https://getbootstrap.com/docs/5.0/getting-started/download/
  - Using CDN (Content Delivery Network).
  - The https://getbootstrap.com/docs/5.0/getting-started/introduction/ page gives CDN links for CSS and js files
  - Install bootstrap vis package managers like NPM or YARN

```
<link
href="https://cdn.jsdelivr.net/npm/bootstrap@5.0.2/dist/css/bootstrap.min.css"
rel="stylesheet"
integrity="sha384-EVSTQN3/azprG1Anm3QDgpJLIm9Nao0Yz1ztcQTwFspd3yD65VohhpuuCOmLASjC"
crossorigin="anonymous">

<script src="https://cdn.jsdelivr.net/npm/bootstrap@5.0.2/dist/js/bootstrap.bundle.min.js" integrity="sha384-
MrcW6ZMFYlzcLA8Nl+NtUVF0sA7MsXsP1UyJoMp4YLEuNSfAP+JcXn/tWtIaxVXM"
crossorigin="anonymous">
</script>
```

The attributes integrity and crossorigin have been added to CDN links to implement Subresource Integrity (SRI). It is a security feature that enables you to mitigate the risk of attacks originating from compromised CDNs, by ensuring that the files your website fetches (from a CDN or anywhere) have been delivered without unexpected or malicious modifications. It works by allowing you to provide a cryptographic hash that a fetched file must match.

Create First Web Page With Bootstrap 5

- Bootstrap 5 requires a containing element to wrap site contents.
  - There are two container classes to choose from:
    - The .container class provides a responsive fixed width container
    - The .container-fluid class provides a full width container, spanning the entire width of the viewport

```
<!DOCTYPE html>
<html lang="en">
<head>
  <title>Bootstrap Example</title>
  <meta charset="utf-8">
  <meta name="viewport" content="width=device-width, initial-scale=1">
  <link href="https://cdn.jsdelivr.net/npm/bootstrap@5.0.2/dist/css/boo
  <script src="https://cdn.jsdelivr.net/npm/bootstrap@5.0.2/dist/js/boo
</head>
<body>
  <div class="container-fluid">
    <h1>My First Bootstrap Page</h1>
    <p>This part is inside a container class.</p>
  </div>
</body>
</html>
```

To ensure proper rendering and touch zooming, add this <meta> tag

- 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 part sets the initial zoom level when the page is first loaded by the browser.

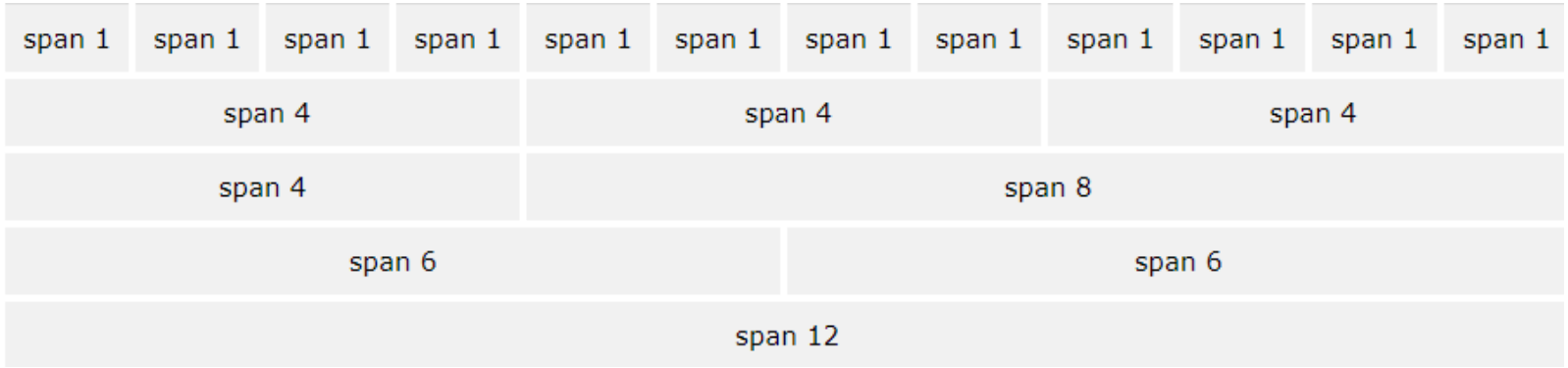
Bootstrap Container

- Bootstrap container is basically used in order to create a centered area that lies within the page and generally deals with the margin of the content and the behaviors that are responsible for the layout.
  - It contains the grid system (row elements, which in turn are the container of columns).
- There are two container classes in Bootstrap:
  - .container: provides a fixed width container with responsiveness. It will not take the complete width of its viewport.
  - .container-fluid: provides a full width container of the viewport and its width will change (expand or shrink) on different screen sizes.

```
<body>
   <div class="container">
      <h1>Container</h1>
   </div>
</body>
```

Bootstrap Grid System

- Bootstrap **grid system** allows to properly house the website's content.
  - Grid system divides the screen into columns—up to 12 in each row. (rows are infinite) ; that can be used to create various types of layouts.
  - The column widths vary according to the size of screen they're displayed in.
  - Hence, Bootstrap's grid system is **responsive**, as the columns resize themselves dynamically when the size of browser window changes.
  - If you do not want to use all 12 columns individually, you can group the columns together to create wider columns



If the sum of the cols in your row doesn't get to 12, then they don't fill the whole row. And if it goes beyond 12 then it will move to the next line (it will only display the sum of the first elements <=12 on the first line).

Building a Basic Grid

- Recommended: place all the rows and columns inside a container to ensure proper alignment and padding.
  - Container creates a fixed width container in the browser window, while container-fluid creates a full-width fluid container.
  - Hence, it is a good practice to wrap all the contents within a container.
  - To create a container in our HTML page: …
  - Next, create a row inside a container, then start creating the columns.
  - Bootstrap has a class row for creating rows:

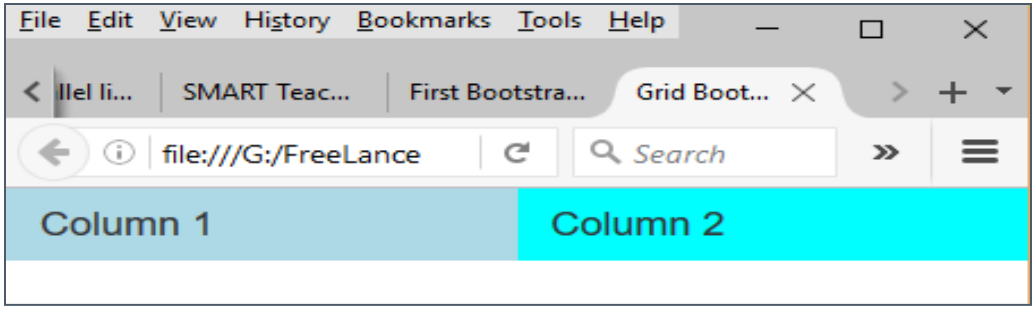
```
<div class="container">
    <div class="row">
      //add desired number of cols here
    </div>
</div>
```

Grid Classes

- The Bootstrap 5 grid system has 6 classes:
  - .col-xs (extra small devices - screen width less than 576px)
  - .col-sm- (small devices - screen width equal to or greater than 576px)
  - .col-md- (medium devices - screen width equal to or greater than 768px)
  - .col-lg- (large devices - screen width equal to or greater than 992px)
  - .col-xl- (xlarge devices - screen width equal to or greater than 1200px)
  - .col-xxl(Extra extra large- screen width equal to or greater than 1400px)

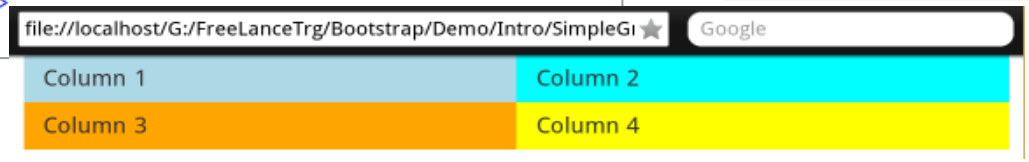
```
  <style>
    .mycol1{ background: lightblue;}
    .mycol2{ background: cyan;}
  </style>
</head>

    <body>
        <div class="container-fluid">
            <div class="row">
                <div class="col mycol1">
                    <h4>Column 1</h4>
                </div>
                <div class="col mycol2">
                    <h4>Column 2</h4>
                </div>
            </div>
        </div>

    </body>
```

Example

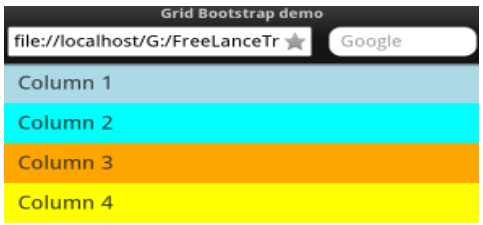


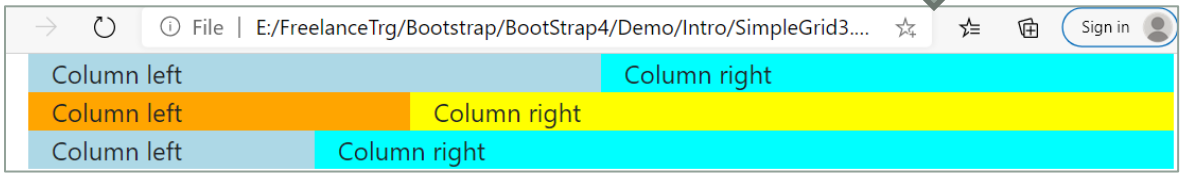
Building a Basic Grid

```
  <style>
        .col1{ background: lightblue;}
        .col2{ background: cyan;}
        .col3{ background: orange;}
        .col4{ background: yellow;}
        </style>
</head>
<body>
  <div class="container">
    <div class="row">
      <div class="col-12 col-sm-6 col1">
        <h4>Column 1</h4>
      </div>
      <div class="col-12 col-sm-6 col2">
        <h4>Column 2</h4>
      </div>
      <div class="col-12 col-sm-6 col3">
        <h4>Column 3</h4>
      </div>
      <div class="col-12 col-sm-6 col4">
        <h4>Column 4</h4>
      </div>
    </div>
  </div>
```




```
  <style>
        .col1{ background: lightblue;}
        .col2{ background: cyan;}
        .col3{ background: orange;}
        .col4{ background: yellow;}
        </style>
    </head>
<body>
<div class="container">
    <!--Row with two equal columns-->
    <div class="row">
        <div class="col-md-6 col1">Column left</div>
        <div class="col-md-6 col2">Column right</div>
    </div>

    <!--Row with two columns divided in 1:2 ratio-->
    <div class="row">
        <div class="col-md-4 col3">Column left</div>
        <div class="col-md-8 col4">Column right</div>
    </div>

    <!--Row with two columns divided in 1:3 ratio-->
    <div class="row">
        <div class="col-md-3 col1">Column left</div>
        <div class="col-md-9 col2">Column right</div>
    </div>
</div>
```

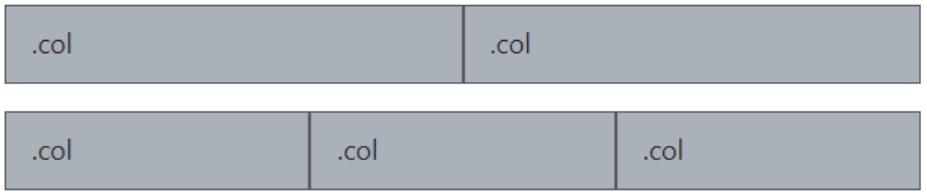




Bootstrap Auto-layout Columns

- You can create equal width columns for all devices (xs, sm, md, lg, and xl) through simply using the class .col, without specifying any column number.

```
<body>
    <div class="container">
        <!--Row with two equal columns-->
        <div class="row">
            <div class="col">col-1</div>
            <div class="col">col-2</div>
          </div>
        </div>
        <!--Row with three equal columns-->
        <div class="row">
            <div class="col">col-3</div>
            <div class="col">col-4</div>
            <div class="col">col-5</div>
          </div>
        </div>
    </div>
</body>
```



MISC COMPONENTS

Bootstrap Typography

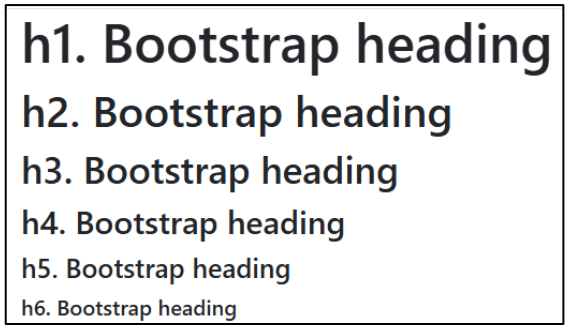
- Typography ? The style and appearance of printed matter.
  - Typography refers to the various styles present in Bootstrap style sheets which define how various text elements will appear on the web page.
  - It shows how certain text elements are rendered when we use Bootstrap without including the style classes.
  - Typography includes colors, fonts, headings, text alignment, background color, etc

- HTML uses default font and style to create headings, paragraphs, lists and other inline elements.
  - Bootstrap overrides default and provides consistent styling across browsers for common typographic elements.
  - Eg, Bootstrap provides its own style for all six standard heading levels
  - Bootstrap 5 uses a default font-size of 16px, and its line-height is 1.5.

Typography

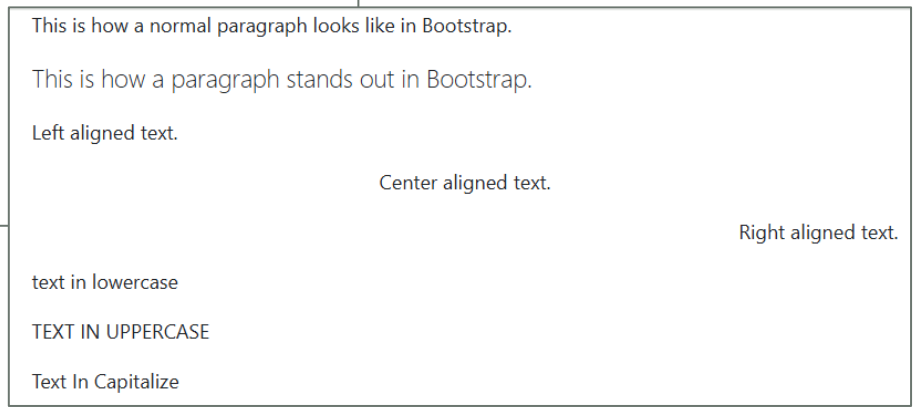
- Bootstrap 5 styles HTML headings (<h1> to <h6>) with a bolder font-weight and an increased font-size

```
<h1>h1. Bootstrap heading</h1>
<h2>h2. Bootstrap heading</h2>
<h3>h3. Bootstrap heading</h3>
<h4>h4. Bootstrap heading</h4>
<h5>h5. Bootstrap heading</h5>
<h6>h6. Bootstrap heading</h6>
```



- You can make a content stand out by adding one of several classes.
- You can also transform the text to lowercase, uppercase or make them capitalize.

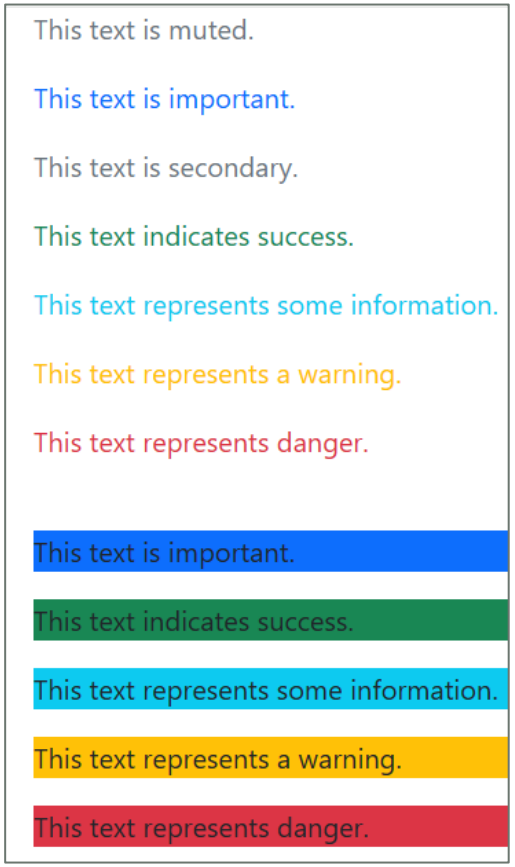
```
<p>This is how a normal paragraph looks like in Bootstrap.</p>
<p class="lead">This is how a paragraph stands out in Bootstrap.</p>
<p class="text-start">Left aligned text.</p>
<p class="text-center">Center aligned text.</p>
<p class="text-end">Right aligned text.</p>
<p class="text-lowercase">Text in lowercase</p>
<p class="text-uppercase">Text in uppercase</p>
<p class="text-capitalize">Text in capitalize</p>
```



Working with content : Text Coloring

- Colors are the powerful method of conveying important information in website design.
- Bootstrap has handful of emphasis utility classes that can be used for this purpose such as showing success message in green color, warning or error message in red color, etc.

```
<p class="text-muted">This text is muted.</p>
<p class="text-primary">This text is important.</p>
<p class="text-secondary">This text is secondary.</p>
<p class="text-success">This text indicates success.</p>
<p class="text-info">This text represents some information.</p>
<p class="text-warning">This text represents a warning.</p>
<p class="text-danger">This text represents danger.</p>

<p class="bg-primary">This text is important.</p>
<p class="bg-success">This text indicates success.</p>
<p class="bg-info">This text represents some information.</p>
<p class="bg-warning">This text represents a warning.</p>
<p class="bg-danger">This text represents danger.</p>
```



Tables

- Bootstrap provides an efficient layout to build elegant tables
  - You can create tables with basic styling that has horizontal dividers and small cell padding, by just adding the Bootstrap's class .table to the <table> element.

```
<table class="table">
    <tr><th>Name</th><th>Age</th></tr>
    <tr><td>Kavita</td><td>23</td></tr>
    <tr><td>Anita</td><td>33</td></tr>
</table>
```

Name	Age
Kavita	23
Anita	33

  - The .table-striped class adds zebra-stripes to a table
  - The .table-bordered class adds borders on all sides of the table and cells
  - The .table-sm class makes a table more compact by cutting cell padding in half
  - The .table-dark class create inverted version of this table, i.e. table with light text on dark backgrounds

```
<table class="table table-dark">
    <tr><th>Name</th><th>Age</th></tr>
    <tr><td>Kavita</td><td>23</td></tr>
    <tr><td>Anita</td><td>33</td></tr>
</table>
```

Name	Age
Kavita	23
Anita	33

Tables

```
<table class = "table table-striped table-bordered table-sm">
    <caption>Basic Table Layout</caption>
    <thead class="thead-light">
        <tr><th>Name</th><th>City</th></tr>
    </thead>
    <tbody>
        <tr><td>Soha</td><td>Bangalore</td></tr>
        <tr><td>Shrilata</td><td>Pune</td></tr>
        <tr><td>Sandeep</td><td>Mumbai</td></tr>
        <tr class="table-success">
            <td>Sheela</td>
            <td>Delhi</td>
        </tr>
    </tbody>
</table>
```

Name	City
Soha	Bangalore
Shrilata	Pune
Sandeep	Mumbai
Sheela	Delhi

```
<table class="table table-bordered table-sm">
    <thead class="thead-dark">
      <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><td>Sum</td><td>$180</td></tr>
    </tfoot>
  </table>
```

Month	Savings
January	$100
February	$80
Sum	$180

Jumbotron

- A jumbotron indicates a big box for calling extra attention to some special content or information.
  - Jumbotrons are no longer supported in Bootstrap 5. However, you can use a element and add special helper classes together with a color class to achieve the same effect
  - Tip: Inside a jumbotron you can put nearly any valid HTML, including other Bootstrap elements/classes.

```
<div class="mt-4 p-5 bg-info text-white rounded">
  <h1>Bootstrap Tutorial</h1>
  <p>Bootstrap is the most popular HTML, CSS, and JS framework for developing
    responsive, mobile-first projects on the web.</p>
</div>
```

images

- To add images on the webpage use element <img> , it has **three** classes to apply simple styles to images.
  - .rounded: This adds rounded corners to our image.
  - .rounded-circle: This turns our images into a circle.
  - .img-thumbnail: This adds borders to our image thus shaping it into a thumbnail.
- Alignment : These classes decide the floating attribute of images:
  - .float-end: This floats our image to the right.
  - .float-start: This floats it to the left.
  - Center an image by adding the utility classes .mx-auto (margin:auto) and .d-block (display:block) to the image

```
<img src="taj.jpg" class="rounded-circle">
<img src="taj.jpg" class="rounded">
<img src="taj.jpg" class="img-thumbnail">
<img src="taj.jpg" class="float-end rounded-circle">
<p>… </p>
```

Images are essential part of a website because they convey a lot of information and make websites attractive. But adding images and making them responsive can be a tiring task using CSS. Bootstrap 4 comes with predefined images classes for making our responsive. The img tag is used to include an image in our website. We can style this tag with the Bootstrap 4 classes that are categorized in terms of the functions

BOOTSTRAP ICONS

Bootstrap Icons

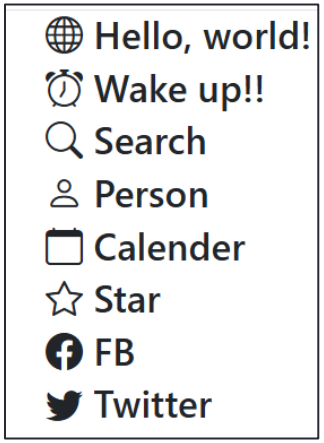
- Bootstrap 5 has released a new SVG icon library which was undertaken by the co-founder of Bootstrap Mark Otto.

  https://icons.getbootstrap.com/
- Bootstrap Icons are SVGs, so you can include them into your HTML in a few ways depending on how your project is setup.
- The simplest way to include Bootstrap icons in a web page is using the CDN link.
  - This link points to a CSS file that has all the necessary classes to generate font icons.

```
<link rel="stylesheet" href="https://cdn.jsdelivr.net/npm/bootstrap-icons@1.5.0/font/bootstrap-icons.css">
```

  - To use Bootstrap icons in your code you'll require an tag with an individual icon class **.bi-*** applied on it. The general syntax for using Bootstrap icons is:
  - Where class-name is the name of the icon class, e.g. search, person

```
<h1><i class="bi-globe"></i> Hello, world!</h1>
<h1><i class="bi-alarm"></i> Wake up!! </h1>
<h1><i class="bi-search"></i> Search</h1>
<h1><i class="bi-person"></i> Person</h1>
<h1><i class="bi-calendar"></i> Calender</h1>
<h1><i class="bi-star"></i> Star</h1>
<h1><i class="bi-facebook"></i> FB</h1>
<h1><i class="bi-twitter"></i> Twitter</h1>
```



Using Icons in Bootstrap 5

- Placing icons inside buttons:

```
<button type="submit" class="btn btn-primary">
    <span class="bi-search"></span> Search
</button>
<button type="submit" class="btn btn-warning">
    <span class="bi-save"></span> Save
</button>
```

- Similarly, you can place icons inside the navs, forms, tables, paragraphs or anywhere you want

Alerts

- Bootstrap comes with a very useful component for displaying alert messages in various sections of our website
  - You can use them for displaying a success message, a warning message etc
  - These messages can be annoying to visitors, hence they should have dismiss functionality added to give visitors the ability to hide them.
  - Alerts are created with the **.alert** class, followed by one of the contextual classes like .alert-success, .alert-info

```
<div class="alert alert-warning">
    Amount has been transferred successfully.
</div>
<div class="alert alert-success alert-dismissible">
    <button type="button" class="btn-close" data-bs-dismiss="alert"></button>
   Amount has been transferred successfully.
</div>
```

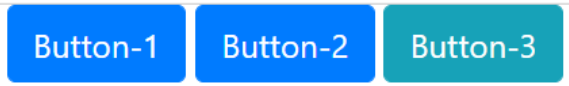
Amount has been transferred successfully.

Amount has been transferred successfully. ×

contextual classes for alert messages:
alert-success
alert-info
alert-danger
alert-warning

Standing Out : Buttons

- Its easy to convert an a, button, or input element into a fancy bold button in Bootstrap; just have to add the btn class




```
<a href="#" class="btn btn-primary">Button-1</a>
<button type="button" class="btn btn-primary">Button-2</button>
<input type="button" class="btn btn-info" value="Button-3">
```

  - You can also create outline buttons by replacing the button modifier classes


```
<button type="button" class="btn btn-outline-primary">Primary</button>
<button type="button" class="btn btn-outline-warning">Warning</button>
```

- Buttons come in various color options:
  - btn-primary for dark blue
  - btn-secondary for dark gray
  - btn-success for green
  - btn-info for teal blue
  - btn-warning for orange
  - btn-danger for red
  - btn-dark for dark

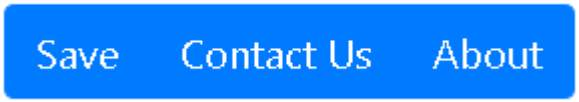
- And in various sizes:
  - btn-lg for large buttons
  - btn-sm for small buttons


```
<button type="button" class="btn btn-primary btn-lg">
Large</button>
<button type="button" class="btn btn-primary">
Default</button>
<button type="button" class="btn btn-primary btn-sm
btn-success"> Small</button>
```

Standing Out : Buttons

- Button groups allow multiple buttons to be stacked together
  - To create a button groups just wrap a series of buttons with .btn class in a element and apply the class .btn-group on it

```
<div class="btn-group">
 <button class="btn btn-primary">Save</button>
 <button class="btn btn-primary">Contact Us</button>
 <button class="btn btn-primary">About</button>
</div>
```



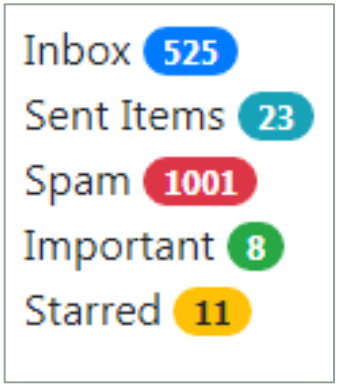
  - Use the class .btn-group-vertical to create a vertical button group
  - `<div class="btn-group-vertical">`

  - Use class .btn-group-lg for a large button group or .btn-group-sm for a small button group

```
<div class="btn-group btn-group-lg">
 <button class="btn btn-primary">1</button>
 <button class="btn btn-primary">2</button>
 <button class="btn btn-primary">3</button>
</div>
<div class="btn-group btn-group-sm">
 <button class="btn btn-primary">1</button>
 <button class="btn btn-primary">2</button>
 <button class="btn btn-primary">3</button>
</div>
```

Standing Out : badges

- Badges are generally used to indicate some valuable information on the web pages such as important heading, warning messages, notification counter, etc.
  - They are mostly used to display numbers such as unread items, notifications, and so on, rather than text
  - Use the .badge class together with a contextual class (like .bg-secondary) within elements to create badges.
  - Badges are **self-collapsing** components, ie when there's no content inside the badge it will not be visible on the website



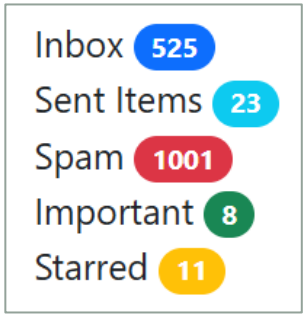

```
<a href="#" class="btn btn-primary btn-lg">Inbox
    <span class="badge">23</span>
</a>
```


```
<span class="badge bg-primary">Primary</span>
 <span class="badge bg-secondary">Secondary</span>
 <span class="badge bg-success">Success</span>
 <span class="badge bg-danger">Danger</span>
```

Standing Out : badges

`.rounded-pill`: for creating rounded badges

```
<div>Inbox <span class="badge rounded-pill bg-primary">525</span></div>
<div>Sent Items <span class="badge rounded-pill bg-info">23</span></div>
<div>Spam <span class="badge rounded-pill bg-danger">1001</span></div>
<div>Important <span class="badge rounded-pill bg-success">8</span></div>
<div>Starred <span class="badge rounded-pill bg-warning">11</span></div>
```




```
<button type="button" class="btn btn-primary">
    Inbox <span class="badge bg-warning">4</span>
</button>
<button type="button" class="btn btn-info">
    Sent <span class="badge rounded-pill bg-dark">4</span>
</button>
<button type="button" class="btn btn-danger">
    Spam <span class="badge bg-success">4</span>
</button>
```

Progress bar

- A progress bar is a visual representation to show the progress of a task or an operation.
  - Used in many web applications to show the progress of action to users.
  - Bootstrap offers different progress bars, depending upon multiple parameters like color, height, shape, or style.
  - To create a default progress bar, use the **.progress** class with a **.progress-bar** nested inside
  - To create progress bars with different colors and styles, use utility (contextual) classes

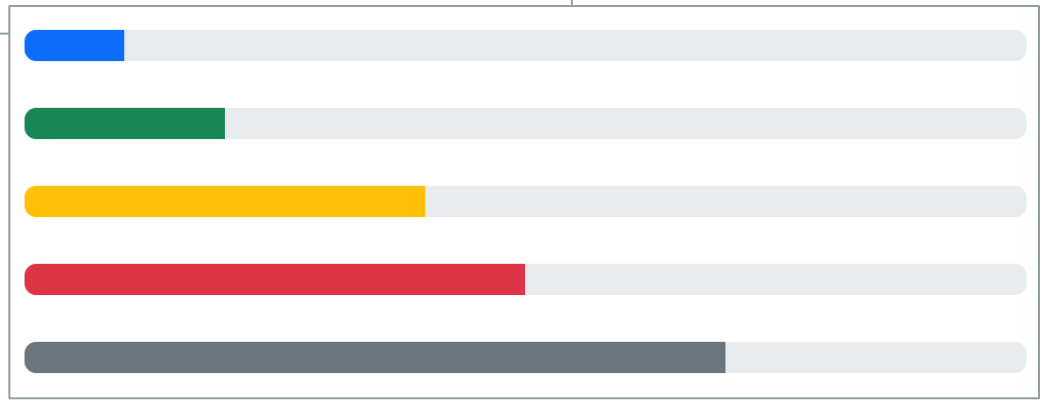
```
<div class="progress">
    <div class="progress-bar" style="width:70%"></div>
<div>
```

- You can include a label that displays a percentage value on the progress bar (to explicitly state, in percentage terms, the completeness of the task).
  - To display a label on the progress bar, insert text as contents of the element that has the .progress-bar class applied.

```
<div class="progress">
    <div class="progress-bar" role="progressbar" style="width:70%">
        <span >70% Complete</span>
    </div>
</div>
```

Progress bar

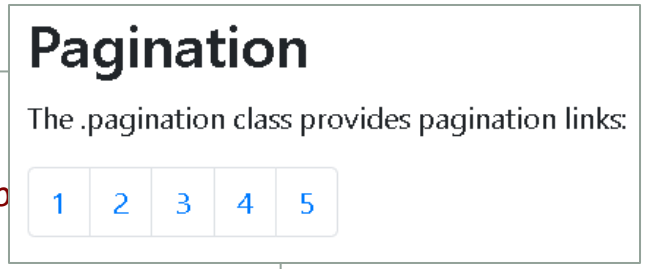
```
<div class="progress"> <!-- Blue -->
  <div class="progress-bar" style="width:10%"></div>
</div>

<div class="progress"> <!-- Green -->
  <div class="progress-bar bg-success" style="width:20%"></div>
</div>

<div class="progress"> <!-- Orange -->
   <div class="progress-bar bg-warning" style="width:40%"></div>
</div>

<div class="progress"> <!-- Red -->
  <div class="progress-bar bg-danger" style="width:50%"></div>
</div>

<div class="progress"> <!-- Grey -->
  <div class="progress-bar bg-secondary" style="width:70%"></div>
</div>
```



Pagination

- Pagination are those numbered links we find either below a webpage or on top of a webpage.
  - They are used to select pages between pages of a website.
- Pagination is used to enable navigation between pages in a website.
  - The pagination used in Bootstrap has a large block of connected links that are hard to miss and are easily scalable.
- To create a basic pagination, add the .pagination class to an <ul> element.
- Then add the .page-item to each <li> element and a .page-link class to each link inside
  - The .pagination class is used to specify pagination on a list group.
  - The .page-item class is used to specify each pagination item in the group.
  - The .page-link class is used to specify the link in the pagination item.

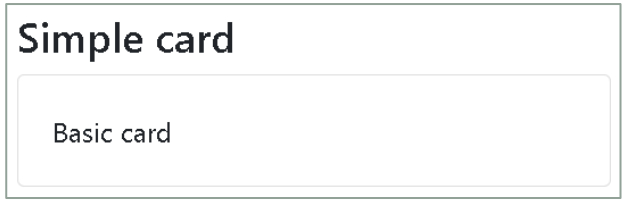
```
<div class="container">
    <h2>Pagination</h2>
    <p>The .pagination class provides pagination links:</p>
    <ul class="pagination">
      <li class="page-item"><a href="#" class="page-link">1</a></li>
      <li class="page-item"><a href="#" class="page-link">2</a></li>
      <li class="page-item"><a href="#" class="page-link">3</a></li>
      <li class="page-item"><a href="#" class="page-link">4</a></li>
      <li class="page-item"><a href="#" class="page-link">5</a></li>
  </ul>
  </div>
```



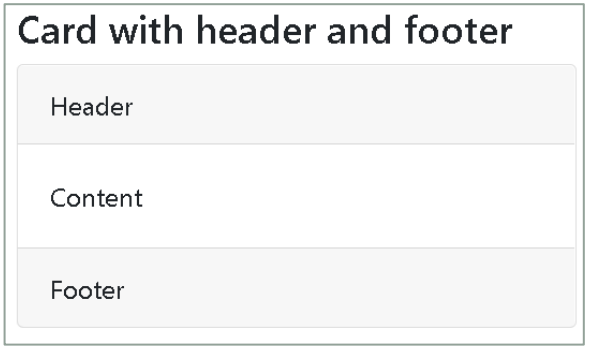
Bootstrap card

- A card in bootstrap is a bordered box with some padding around its content
  - It includes options for headers and footers, a wide variety of content, contextual background colors, and powerful display options.
  - If you're familiar with Bootstrap 3, cards replace old panels, wells, and thumbnails.
  - Cards support a wide variety of content, including text, list groups, links, and more within a box with rounded corners
  - The card div also can have optional parts like header, footer etc.
  - A basic card is created with the .card class. Content inside the card has a .card-body class

```
<h4>Simple card</h4>
<div class="card">
    <div class="card-body">Basic card</div>
</div>
```



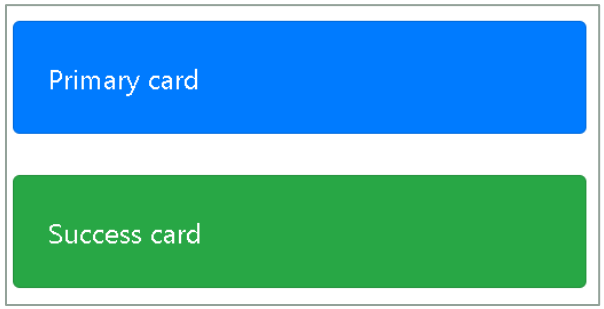

```
<h4>Card with header and footer</h4>
<div class="card">
    <div class="card-header">Header</div>
    <div class="card-body">Content</div>
    <div class="card-footer">Footer</div>
  </div>
```



Bootstrap card

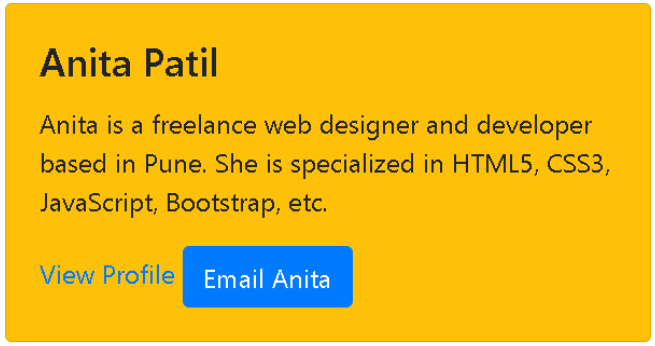
- To add a background color the card, use contextual classes (.bg-primary, .bg-success, .bg-info, .bg-warning, .bg-danger, .bg-secondary, .bg-dark and .bg-light.

```
<div class="card bg-primary text-white">
  <div class="card-body">Primary card</div>
</div>
<br>
<div class="card bg-success text-white">
  <div class="card-body">Success card</div>
</div>
```



- Titles, text, and links
  - Use .card-title to add card titles to any heading element.
  - The .card-text class is used to remove bottom margins for a <p> element if it is the last child (or the only one) inside .card-body.
  - The .card-link class adds a blue color to any link, and a hover effect.

```
<div class="card bg-warning" style="width:400px">
  <div class="card-body">
    <h4 class="card-title">Anita Patil</h4>
    <p class="card-text">Anita is a freelance web designer
    <a href="#" class="card-link">View Profile</a>
    <a href="#" class="btn btn-primary">Email Anita</a>
  </div>
</div>
```



Bootstrap Lists

- Unstyled Ordered and Unordered Lists
  - Sometimes you might need to remove the default styling form the list items. You can do this by simply applying the class .list-unstyled to the respective <ul> or <ol> elements

```
<!-- normal HTML List -->
<ul>
  <li>Home</li>
  <li>Products
    <ul>
      <li>Gadgets</li>
      <li>Accessories</li>
    </ul>
  </li>
  <li>About Us</li>
  <li>Contact</li>
</ul>
```

- Home
- Products
  - Gadgets
  - Accessories
- About Us
- Contact

```
<ul class="list-unstyled">
  <li>Home</li>
  <li>Products
    <ul>
      <li>Gadgets</li>
      <li>Accessories</li>
    </ul>
  </li>
  <li>About Us</li>
  <li>Contact</li>
</ul>
```

Home
Products
- Gadgets
- Accessories

About Us
Contact

- If you want to create a horizontal menu using ordered or unordered list you need to place all list items in a single line i.e. side by side.
  - You can do this by simply applying the class .list-inline to the respective <ul> or <ol>, and the class .list-inline-item to the <li> elements.

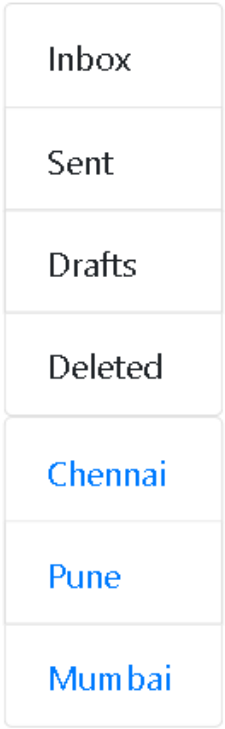
```
<ul class="list-inline">
   <li class="list-inline-item">Home</li>
   <li class="list-inline-item">Products</li>
   <li class="list-inline-item">About Us</li>
   <li class="list-inline-item">Contact</li>
</ul>
```

Home Products About Us Contact

Page Components : List Group

- List group is used for creating lists, like a list of useful resources/ list of recent activities.
  - You can also use it for a complex list of large amounts of textual content.
  - Add class list-group to a <ul> or element to make its children appear as a list.
  - The children can be li or a element, depending on your parent element choice.
  - The child should always have the class list-groupitem.

```
<!-- List group -->
<ul class="list-group">
    <li class="list-group-item">Inbox</li>
    <li class="list-group-item">Sent</li>
    <li class="list-group-item">Drafts</li>
    <li class="list-group-item">Deleted</li>
</ul>

<div class="list-group">
    <a href="#" class="list-group-item">Chennai</a>
    <a href="#" class="list-group-item">Pune</a>
    <a href="#" class="list-group-item">Mumbai</a>
</div>
```



Page Components : List Group

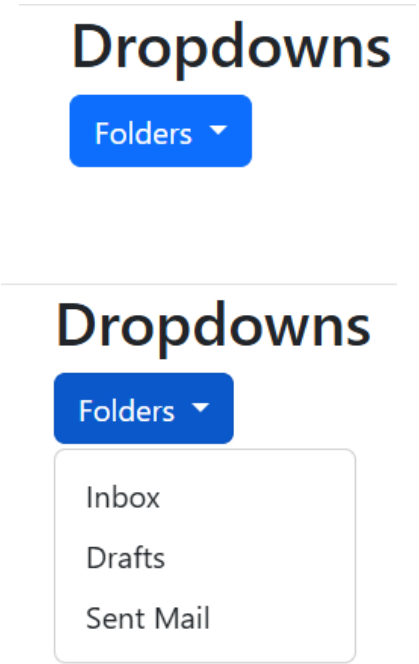
- We can also apply various colors to each list item by adding list-group-item-* classes along with list-group-item.

```
<ul class="list-group">
    <li class="list-group-item list-group-item-success">Success item</li>
    <li class="list-group-item list-group-item-secondary">Secondary item</li>
    <li class="list-group-item list-group-item-info">Info item</li>
    <li class="list-group-item list-group-item-warning">Warning item</li>
    <li class="list-group-item list-group-item-danger">Danger item</li>
    <li class="list-group-item list-group-item-primary">Primary item</li>
    <li class="list-group-item list-group-item-dark">Dark item</li>
    <li class="list-group-item list-group-item-light">Light item</li>
</ul>
```

Dropdowns

- A dropdown is a toggleable menu allowing user to choose one value from a predefined list
  - .dropdown class indicates a dropdown menu.
  - To open the dropdown menu, use a button or a link with a class of .dropdown-toggle and the data-bs-toggle="dropdown" attribute.
  - Add the .dropdown-menu class to a <ul> element to actually build the dropdown menu.

```
<div class="dropdown">
    <button type="button"
            class="btn btn-primary dropdown-toggle"
            data-bs-toggle="dropdown">
            Folders
    </button>
    <ul class="dropdown-menu">
      <li><a class="dropdown-item" href="#">Inbox</a></li>
      <li><a class="dropdown-item" href="#">Drafts</a></li>
      <li><a class="dropdown-item" href="#">Sent Mail</a></li>
    </ul>
</div>
```

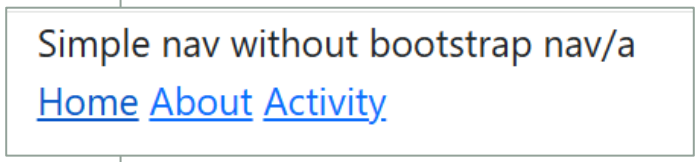


BOOTSTRAP NAVIGATION BAR

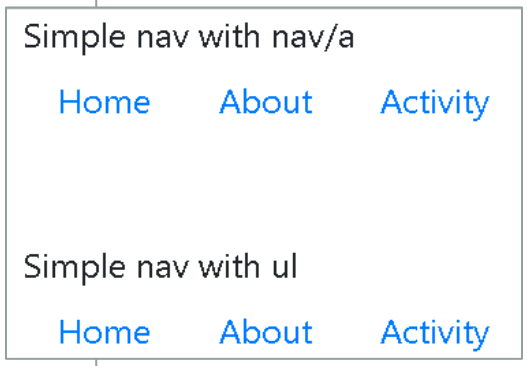
Bootstrap 5 Navs

- If you want to create a simple horizontal menu, add the .nav class to a **<ul>/ /<nav>** element, followed by .nav-item for each /<a> and add the .nav-link class to their links

```
<div> Simple nav without bootstrap  nav/a </div>
<nav>
   <a href="#">Home</a>
   <a href="#">About</a>
   <a href="#">Activity</a>
</nav>
```



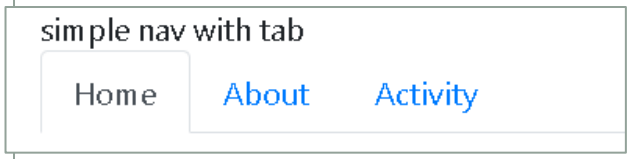

```
<div> Simple nav with nav/a </div>
<nav class="nav">
   <a href="#" class="nav-item nav-link">Home</a>
   <a href="#" class="nav-item nav-link">About</a>
   <a href="#" class="nav-item nav-link">Activity</a>
</nav>

<div> Simple nav with ul</div>
<ul class="nav">
    <li><a href="#" class="nav-item nav-link">Home</a></li>
    <li><a href="#" class="nav-item nav-link">About</a></li>
    <li><a href="#" class="nav-item nav-link">Activity</a></li>
</ul>
```



Bootstrap 4 Navs

- Add the class **.nav-tabs** to the basic nav to generate a tabbed navigation.

```
<!--  simple nav with tab  -->
<nav class="nav nav-tabs">
    <a href="#" class="nav-item nav-link active">Home</a>
    <a href="#" class="nav-item nav-link">About</a>
    <a href="#" class="nav-item nav-link">Activity</a>
</nav>
```

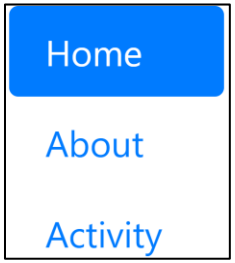


- Similarly, you can create pill based navigation by adding the class **.nav-pills** on the basic nav instead of class .nav-tabs

```
<!--  simple nav  with pills -->
    <div class="container">simple nav  with pills
      <nav class="nav nav-pills">
        <a href="#" class="nav-item nav-link active">Home</a>
        <a href="#" class="nav-item nav-link">About</a>
        <a href="#" class="nav-item nav-link">Activity</a>
      </nav>
```

- Vertically stack these pills by attaching an additional class `flex-column`

```
<!--  simple nav  with pills and stacked with flex -->
<nav class="nav nav-pills flex-column">
    ...
</nav>
```



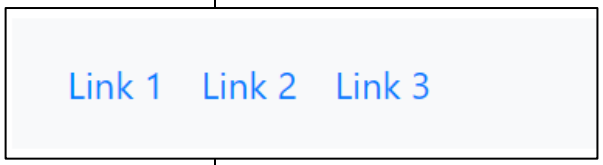
Navbar

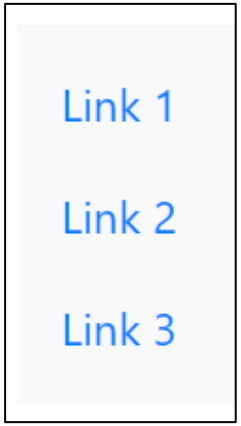
- The .nav class is for simple navigation. Whereas .nav-bar is intended for the main page navigation on top of the page and has a whole bunch of styling attributes available.

- First build a or <nav> element, with class navbar.
  - A standard navigation bar is created with the .navbar class, followed by a responsive collapsing class: .navbar-expand-xxl|xl|lg|md|sm (becomes vertical on small screens).
  - To add links inside the navbar, use a <ul> element with class .navbar-nav
  - Then add the usual <li> and <a> elements with a .nav-item and a .nav-link class

```
<div class="navbar">
</div>
```

```
<div>A grey horizontal navbar that becomes vertical on small screens</div>
<nav class="navbar navbar-expand-sm bg-light">
<!-- Links -->
    <ul class="navbar-nav">
        <li class="nav-item">
            <a class="nav-link" href="#">Link 1</a>
        </li>
        <li class="nav-item">
            <a class="nav-link" href="#">Link 2</a>
        </li>
        <li class="nav-item">
            <a class="nav-link" href="#">Link 3</a>
        </li>
    </ul>
</nav>
```

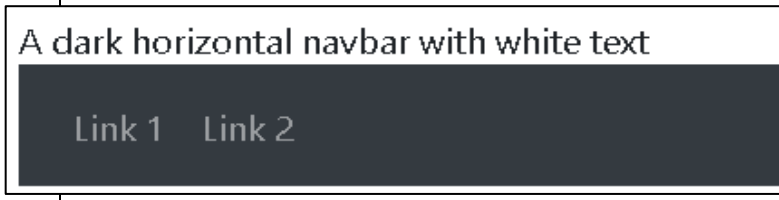




Colored Navbar

- Use any of the .bg-color classes to change the background color of the navbar (.bg-primary, .bg-success, .bg-info, .bg-warning, .bg-danger, .bg-secondary, .bg-dark and .bg-light)
- Tip: Add a white text color to all links in the navbar with the .navbar-dark class, or use the .navbar-light class to add a black text color.

```
<div>A dark horizontal navbar with white text</div>
<nav class="navbar navbar-expand-sm bg-dark navbar-dark">
    <ul class="navbar-nav">
        <li class="nav-item">
            <a class="nav-link" href="#">Link 1</a>
        </li>
        <li class="nav-item">
            <a class="nav-link" href="#">Link 2</a>
        </li>
    </ul>
</nav>
```




```
<nav class="navbar navbar-expand-sm bg-light navbar-light">
```

Navbar with brand/logo

- The .navbar-brand class is used to highlight the brand/logo/project name of your page

```
<!-- navbar with text logo -->
<nav class="navbar navbar-dark bg-secondary">
   <a class="navbar-brand">Pawsome</a>
</nav>
```

navbar with text logo

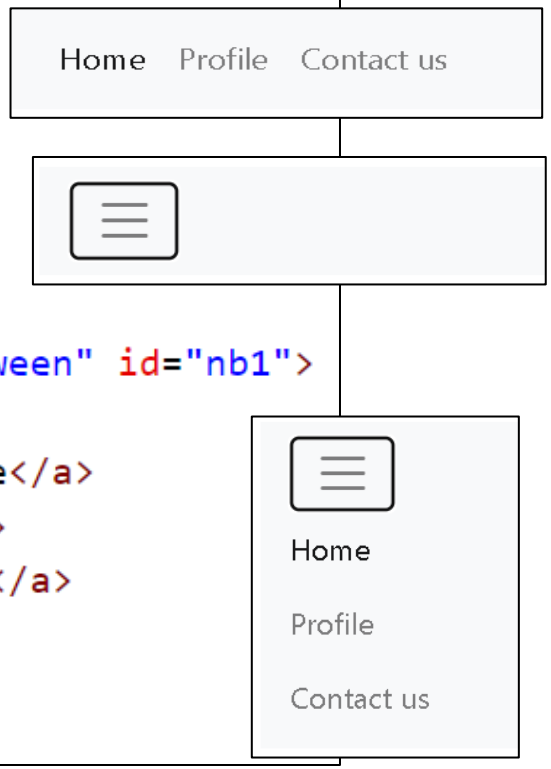

```
<!-- navbar with image logo -->
<nav class="navbar navbar-dark bg-secondary">
   <a href="#" class="navbar-brand">
      <img src="paws.png" height="28" alt="CoolBrand">
   </a>
</nav>
```

navbar with image logo

Collapsing The Navigation Bar

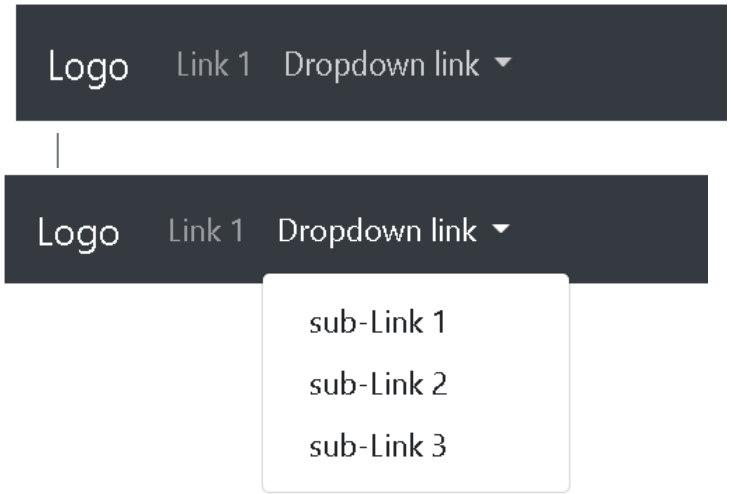
- Very often, especially on small screens, you want to hide the navigation links and replace them with a button that should reveal them when clicked on.
- To create a collapsible navigation bar, use a button with class="navbar-toggler", data-bs-toggle="collapse" and data-bs-target="#thetarget".
- Then wrap the navbar content (links, etc) inside a div element with class="collapse navbar-collapse", followed by an id that matches the data-target of the button: "thetarget".

```
<nav class="navbar navbar-expand-md navbar-light bg-light">
    <button type="button"
            class="navbar-toggler"
            data-bs-toggle="collapse"
            data-bs-target="#nb1">
           <span class="navbar-toggler-icon"></span>
    </button>  <!-- when navbar collapses on small dev-->
    <div class="collapse navbar-collapse justify-content-between" id="nb1">
        <div class="navbar-nav">
            <a href="#" class="nav-item nav-link active">Home</a>
            <a href="#" class="nav-item nav-link">Profile</a>
            <a href="#" class="nav-item nav-link">Contact us</a>
        </div>
    </div>
</nav>
```



Navbar With Dropdown

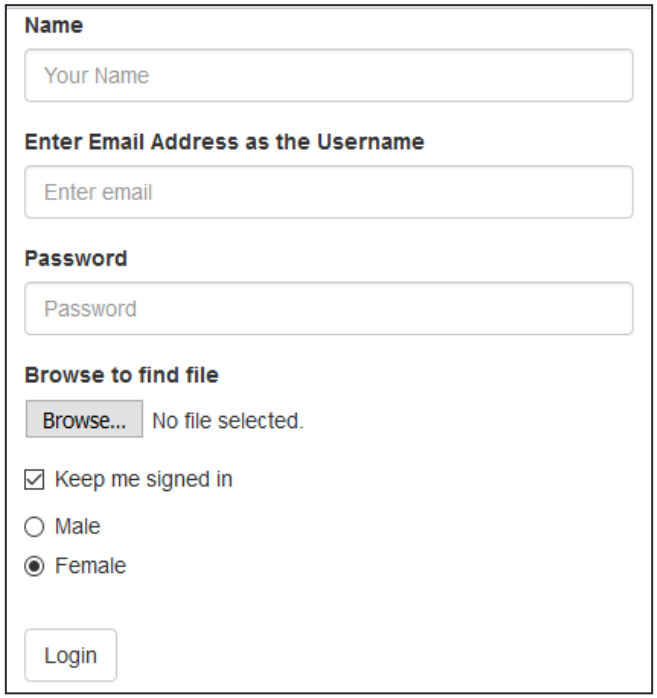
```
<!-- Navbar With Dropdown -->
<div>Navbar With Dropdown</div><br>
<nav class="navbar navbar-expand-sm bg-dark navbar-dark">
    <a class="navbar-brand" href="#">Logo</a>
    <ul class="navbar-nav">
      <li class="nav-item">
        <a class="nav-link" href="#">Link 1</a>
      </li>
      <!-- Dropdown -->
      <li class="nav-item dropdown">
        <a class="nav-link dropdown-toggle"
           href="#" id="navbardrop"
           data-toggle="dropdown">
          Dropdown link
        </a>
        <div class="dropdown-menu">
          <a class="dropdown-item" href="#">sub-Link 1</a
          <a class="dropdown-item" href="#">sub-Link 2</a
          <a class="dropdown-item" href="#">sub-Link 3</a>
        </div>
      </li>
    </ul>
  </nav>
```



FORMS

Creating Forms

- By default, forms are aligned vertically as the default value for display is block and is set to 100%.
- We can use additional classes to change this default placement



- There are no classes to make a layout form but we can use some classes to change the alignment of forms.
- Syntax:

```
<form>
    <div class = row|mb-*|col-*>
        <label for="exampleInput"
               class="form-label">
            ...
        </label>
        <input type="text"
               class="form-control"
               id="exampleInput">
    </div>
</form>
```

add a .form-label class to each label element to ensure correct padding

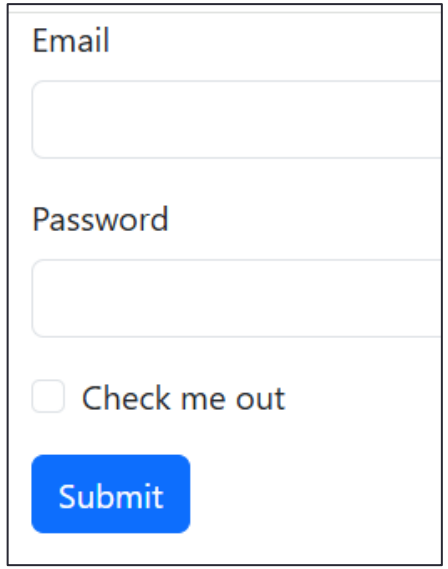
Creating Forms : Vertical Form Layout

- The form controls in this layout are stacked with left-aligned labels on the top.

add a .form-label class to each label element to ensure correct padding

Add class .form-control get proper form styling

```
<div  class="container">
<form>
    <div class="mb-3">
      <label for="mail" class="form-label">Email</label>
      <input type="email" class="form-control" id="mail" >
    </div>
    <div class="mb-3">
      <label for="pass" class="form-label">Password</label>
      <input type="password" class="form-control" id="pass">
    </div>
    <div class="mb-3 form-check">
      <input type="checkbox" class="form-check-input" id="c1">
      <label class="form-check-label" for="c1">Check me out</label>
    </div>
    <button type="submit" class="btn btn-primary">Submit</button>
  </form>
</div>
```



Inline Forms

- In an inline form, form elements to appear side by side.
  - Add class .row and .col

```
<div  class="container">
  <div class="row">
    <div class="col col-md-6 col-sm-12">
      <input type="text" class="form-control" placeholder="First name">
    </div>
    <div class="col col-md-6 col-sm-12">
      <input type="text" class="form-control" placeholder="Last name">
    </div>
  </div>
</div>
```

Bootstrap theme

- bootstrap.css is the core css for BootStrap that defines all the style for various controls/components, where as bootstrap-theme.css defines the themes (gradient/animation) for buttons, dropdown, menu, navbar, progressbar, panels.
  - Most of the times adding bootstrap.css is enough for bootstrap to work, but for gradient/animation, you should use bootstrap-theme.css