1. Web fundamentals
    a. TCP/IP protocol – establishes internet communications – contains a suite of protocols including FTP, Telnet, HTTP, HTTPS
    b. Internet protocol – a unique address applied to a computer connected to the internet – defined as four octets (e.g. 123.230.13.38)
    c. DNS – domain name server – used to map the IP address to the web address (e.g. www.cnn.com)
    d. TLD – top level domain – generic: .com, .edu, .gov, .org and international: .ca, .uk, .fr, .tv
    e. Web server – computer containing web server software (e.g. Apache) connected to the internet
    f. Web browser – software running on a computer which accepts HTTP data from the web server

2. HTML
    a. origins
        i. Hypertext Markup Language
        ii. Developed in 1991 by British physicist Tim Berners-Lee
        iii. Allows the formatting of information to be defined separately from the content
        iv. Based on SGML (Standard Generalized Markup Language) – a metalanguage which defines formatting for documents
        v. Browsers understand HTML
        vi. Web servers hold the content and send out HTML to the client (browser)

    b. governing body
        i. W3C – World Wide Web Consortium, an international standards body
        ii. Formed to resolve HTML incompatibility issues among vendors in the 1990's

    c. white space – free format
        i. Any spaces, tabs, new lines are ignored when the browser interprets the HTML
        ii. Use the HTML tag <pre> .. </pre> to maintain the spacing content
        iii. Use <br> to force a new line

    d. comments in HTML
        i. <!-- A comment in HTML and ignored by the browser -->

    e. browser differences
        i. window panel dimensions
            1. Internet Explorer, Mozilla Firefox, Safari
        ii. colour depth

1. the more bits per pixel, the greater the colour palette (e.g. 16 bits per pixel = 2^{16} colours)
2. resolution - how many pixels will fit on a video screen
3. 'websafe' colours
    a. set of 216 colours which will display without dithering on video cards supporting only 256 colours (the '8-bit' cards – now obsolete)
    b. dithering – process of creating the illusion of colour depth by placing alternating pixels of different colours next to each other to make a new colour

f. tags
    i. always enclosed by angle brackets < and >
    ii. no space after the <
    iii. in HTML tags can be lowercase or uppercase
    iv. in HTML tags can drop their end tag

g. structure
    i. file name uses an extension of ".html" or ".htm"
    ii. <!DOCTYPE>
        1. tells the browser which HTML definition type (transitional, strict, frameset) this document uses
    iii. <html>
        1. start of the HTML content … ends with </html>
    iv. <head>
        1. <title>
            a. Show the window title
            b. Text allowed – no HTML allowed in title
        2. <meta>
            a. Information about this HTML document, author
        3. <head> <title> .. </title> </head>
    v. <body>
        1. start of the HTML body .. ends with </body>

h. attributes
    i. HTML attributes have the form attribute=value (for example, <img src= reddot.png>)

i. inline
    i. tags that will not cause automatic line break in the browser window
    ii. <b>, <i>, , , , <img>, <a>, <q>, <cite>, <del>, <sup>, <sub>, <object>, <input>

j. block
    i. tags that will cause automatic line breaks in the browser window

ii. <p>, <dl>, <table>, <ul>, <ol>, , <li>, <h1>, <h2>

k. entities
   i. enable you to specify certain symbols and non-English characters
   ii. < <
   iii. > >
   iv.   space (force a space on the line)
   v. & &

l. image <img>
   i. formats – some proprietary, some free
      1. png
         a. seen as the replacement of gif – has better compression and not limited to 256 colours
      2. bmp
         a. Windows bitmap file
         b. DIB file (device independent bitmap)
      3. jpeg
         a. 'lossy' – uses compression to store image data
         b. allows 16.7 million colours (24 bit)
         c. photorealistic images
         d. does not support transparency
      4. gif
         a. standard gif image can have at most 256 colours from a palette of 16.7M
         b. gifs can be 'animated' by stacking frames of images together
         c. useful for small images having less detail
      5. svg
         a. scalable vector graphics
         b. greater compression of images using formulas not bitmaps
   ii. attributes
      1. alt
         a. show what image represents if the image cannot be displayed
      2. title
         a. pop-up bubble briefly describing the image
      3. border
         a. can define a border surrounding the image
         b. deprecated in favour of CSS
      4. width and height
         a. horizontal and vertical scale factors
         b. can be in measurements of pixels, in, cm, or %
         c. deprecated in favour of CSS

m. table

i. definition
    1. <table> table rows </table>
    2. table rows : <tr> row data </tr>
    3. row data : <td> data </td>
ii. a table may be defined within the cell of another table (nested table)
iii. tables rows usually have the same number of columns; table columns usually have the same number of rows
iv. width
    1. widest cell in the column determines the width of the entire column
    2. the width attribute fixes the width of a table or column
v. border
    1. size of the border around the table
vi. rowspan
    1. when a cell spans two or more rows, specify the rowspan attribute in the <td> tag

vii. colspan
    1. when a cell spans two or more columns, specify the rowspan attribute in the <td> tag
viii. cellspacing
    1. amount of space between cells
ix. cellpadding
    1. amount of space between the cell border its contents
x. thead tfoot tbody
    1. define the table header, table footer, and table body

n. form
i. structure
    1. <form> …. </form>
    2. a form may not be defined within another form
ii. form attributes
    1. name
        a. unique name for the form (for Javascript)
    2. id
        a. unique identifier for form (for CSS)
    3. action
        a. define the script that will run when submit button is pressed
        b. the URL to which the user entered form data will be submitted
    4. method
        a. method= “GET” is default if not defined – encodes the form information in the URL (less secure) – the form values you entered will appear in the URL

b. method= “POST’ is more secure

iii. form elements
    1. attributes
        a. disabled= “true” – form element never receives focus
        b. readonly= “true” – form element information cannot be overridden
        c. accesskey – keyboard shortcut to form element
        d. tabindex – define the form element tab order

iv. textarea
    1. multiline text
    2. rows attribute – number of rows
    3. cols attribute – number of columns

v. select
    1. shows a “dropdown menu list”
    2. option attribute
    3. to specify a default: selected= “selected”
    4. multiple= “multiple”
    5. similar to a listbox
    6. optgroup attribute
        a. <optgroup label= “Country”>
        <option>Canada</option>
        <option>USA</option>
        </optgroup>

vi. input
    1. text
        a. simple one-line text input
        b. value attribute defines a default, pre-entered string
        c. maxlength attribute – maximum characters users may enter
    2. password
        a. inputted text is echoed as asterisks
        b. low level of security
    3. radio
        a. selection of mutually exclusive option
        b. name attribute among options must be defined the same
        c. value attribute may be any text or number
        d. checked attribute
    4. checkbox
        a. selection of multiple options
        b. name attribute among options
        c. value attribute may be any text or number
        d. checked attribute
    5. hidden

a. a form element not displayed but its value is used by the action script

6. HTML 5 attributes for input element
    a. pattern
        i. use a regular expression to validate input data (e.g. \d or [0-9] for a single digit, \d{2} for exactly two digits, \d+ for one or more digits)
    b. required – field may not be left blank upon submit
    c. type= “range” min= “0” max= “100”
7. submit button
    a. value attribute defines the text within the button
    b. name attribute defines the element
    c. click action calls the action script
8. reset button
    a. value attribute defines the text within the button
    b. click action resets all the form information
9. label
    a. text, radio, checkbox form elements need to have a descriptive name on the display form
    b. <label for= “fname”> First name</label> <input type= “text”>

vii. progress – shows a progress bar
viii. meter – shows a bar with a colour range fill
ix. fieldset
    1. define a visual grouping of form elements
    2. <fieldset> <legend>Name of group</legend> … </fieldset>

o. deprecated tags and attributes
    i. HTML tags and attributes no longer meant to be used, e.g.
    ii. Replaced with CSS definitions

 replaced by CSS text-align:center
<u> replaced by CSS text-decoration:underline
<font color= “red”> replaced by color:red
<img src=a.bmp width=100px> replaced by style= “margin:100px”

p. anchor
    i. x
    ii. URL
        1. uniform resource locator, a unique name for a web resource
    iii. image
        1. use image as an anchor
            <img src= “a.png”>
    iv. absolute URL
        1. defines a fully qualified URL
        2. scheme (http, https, ftp, sftp)

3. webserver (www)
4. subdomain (server)
5. domain (com)
6. webserver, subdomain, domain can be replaced with the server's IP address (204.174.65.19)
   http://www.server.com/data/index.html

v. relative
   1. defines the location of the resource relative to the current document
   2. allows for easier relocation of the HTML files and folder to another server or folder
   3. Example:
      href= "work/dd.html" means a link to the subfolder work and its file dd.html
      href= "../dd.html" means a link to the parent folder and its file dd.html
      href= "/work/dd.html" means a link to the web server root folder work and its file dd.html
      href= "./dd.html" means a link in the current folder to file dd.html

vi. name
   1. a name attribute means a named anchor within the document, use the hash character #

    … - defines a named anchor

   … … - links to the above anchor

3. XHTML
   a. Differences with HTML
      i. XHTML tags are always lowercase
      ii. Must have proper nesting (...)
      iii. Must have a closing tag (<br />)
      iv. Attributes must be named (selected= "selected")
      v. Attribute values must be in double quotes
      vi. <!DOCTYPE> is mandatory and is always the first line

   b. Document Type Definition (DTD) – note this is similar to XML's DTD
      i. Transitional
         1. XHTML uses HTML 4 elements (current standard)
      ii. Standard
         1. XHTML uses only XHTML – no HTML
      iii. Frameset
         1. For frames

4. CSS

a. Definitions
    i. cascading style sheet
    ii. define the document styles in a separate, reusable document
    iii. syntax – selector { attribute : value; }
    iv. comments in CSS use /* … */ structure
b. properties
    i. inheritance
        1. CSS styles defined in a parent element apply to its child elements. E.g. a colour text style defined for a <h1> element will apply to the contained tags.
c. selectors
    i. group together
        1. If the selectors share the same style, they can be listed together separated by commas

        h1, h2, p {color: green; font-family: "Times New Roman"; }
    ii. class
        1. If a style is to be shared among some selectors, a class can be defined
        2. class name must be a single word not starting with a number
        3. has a lower precedence than ID named selectors

        .red {color:red;}
        h1.blue {color:blue;}

         appears in red
         appears in black
        <h1 class= "red"> header in red
        <h1 class= "blue"> header in blue </h1>
    iii. ID
        1. If a style is to be defined for a single instance of a tag, an ID can be defined
        2. ID name must be single word not starting with a number
        3. has a higher precedence than class named selectors

        #green {color:green;}
        div#large {font-size:20pt;}

         this text is green
         large text

    iv. Context dependent
        1. descendant
            a. a style that is used only when an element is contained within another – a descendant

b. separate the selectors by a space

p b { color:blue; }

 abc show as blue show as black

2. child
   a. a style that is used when an element is a child of another

div > p {color: yellow; }

  show as yellow show as black

3. sibling
   a. a style that is used when two elements are adjacent

h1 + h2 { margin-bottom: 5mm; }

<h1> abc </h1> add a margin bottom of 5mm
<h2> xyz </h2>

d. Rules
   i. inline
      1. span tag
      2. define a CSS style within a line of text to be used just once

      blue text

   ii. embedded
      1. style tag
      2. define one or more CSS styles used only within this HTML document – usually defined in the <head> section

      <style> CSS definitions </style>

   iii. external
      1. link tag
      2. define one or more CSS styles which are to be shared among other HTML documents
      3. more than one css file can be linked into a document

      <link href= "default.css" type= "text/css" rel= "stylesheet">
      (attributes may be defined in any order)

   iv. precedence
      1. users may define their own custom stylesheet for the browser – these styles have lower precedence than the styles defined by the style author

2. inheritance
    a. many CSS properties are inherited from the parent element to the child element (e.g. font, color are inherited but not border or margin properties)

3. cascade
    a. styles defined in different locations (embedded, external) for the same selectors will cascade – but external styles have lower precedence than embedded styles which have lower precedence than inline styles
4. specificity
    a. those selectors without class name or ID name have lowest precedence; selectors with class name have next higher precedence; selectors with ID name have next higher; styles having !important have highest precedence
    b. a style defined for a descendant element has **precedence**

```
p  {color:blue;}
div p { color:red;}

<div>header
<p> this is red</p>
</div>
```

e. link
    i. pseudo-class uses the colon after the selector

```
a:link    { color: red }
a:visited { color: green; font-size: 85% }
a:active  { color: blue; font-size: 125% }
a:hover   { color: black; font-size: 85% }
```

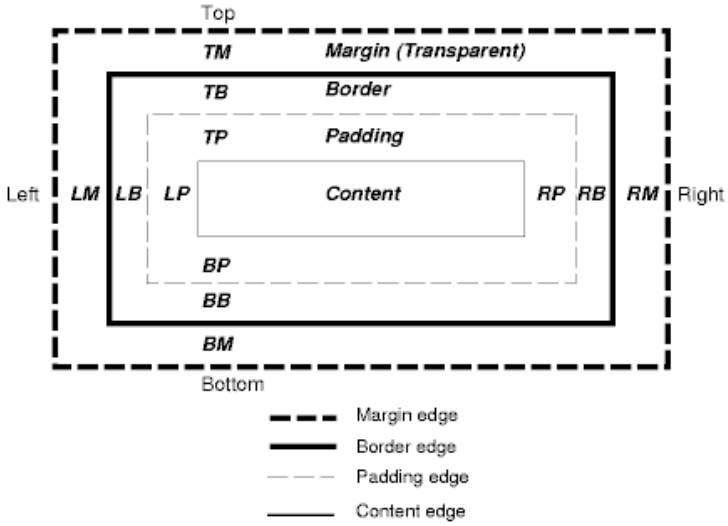
f. colours
    i. color
        1. for changing the text colour
        2. defined using one of:
            a. name, there are 16 names approved by W3C including aqua, black, blue, fuchsia, gray, green, lime, maroon, navy, olive, purple, red, silver, teal, white, and yellow
            b. there are other cross-browser colours like cyan and sienna
            c. RGB as in #00FF00 meaning no red, maximum green and no blue

d. rgb(0%, 100%, 0%) is lime
e. rgb(0, 255, 0) is lime
f. hsl(120, 100%, 100%) is lime

ii. background-color
iii. background-image

g. font
   i. font-family types – serif, sans-serif, monospace, cursive, fantasy
   ii. font-style – default is normal; can be italic or oblique
   iii. font-weight – how thick or thin the characters appear
      1. default is 400, bold is 700
   iv. font-size – how large the font is, default is 100% em
      1. relative (em, ex, px)
      2. absolute (in, cm, mm, pt, pc)

h. box model
   i. width
   ii. height
   iii. "TRouBLe" – order of properties (top, bottom, left, right)



i. positioning
   i. float
      1. sets where an image or text will appear in another element
      2. float:left means the element moves to the left in the parent element
      3. float:right means the element moves to the right in the parent element
   ii. absolute
      1. unit types are fixed regardless of monitor size – used for printing
      2. in, cm, mm, pt (point, 72 points=1 inch), pc (pica, 1 pc=12pts)
   iii. relative
      1. unit types adapt to different monitor display types and sizes

2. em, ex (rarely used), px

iv. clear
1. sets the sides of an element where other floating elements are not allowed
2. clear:both means no elements to appear on either side of me

v. fixed
1. indicates the element is to stay on the screen and not scrolled

5. HCI
   a. Definition
   b. Six goals of HCI – safety, utility, effectiveness, efficiency, usability, appeal
   c. UI difficulties
      i. Some UI are designed poorly.. why? .. what are consequences?
      ii. Challenges facing UI designers

   d. Fitts' Law
   e. Hicks' Law
   f. Schneiderman's eight golden rules
      i. Strive for consistency
      ii. Cater to universal usability
      iii. Offer informative feedback
      iv. Design dialogs to yield closure
      v. Offer error prevention and simple error handling
      vi. Permit easy reversal of actions
      vii. Support internal locus of control
      viii. Reduce short-term memory load

   g. Aspects of good UI design
      i. Affordance
      ii. Forcing function
      iii. Mapping
      iv. Conceptual model

6. Javascript
   a. Origin
      i. Originally called "LiveScript" as a scripting language by Netscape
      ii. A "worm" malware can be written in Javascript – security issues
      iii. Is not the same as Java but shares object-oriented features

   b. Purpose
      i. Javascript provides dynamic response within a web page
      ii. Javascript allows the web page to respond to user actions

   c. Best used when

i. Defining form elements; define an onclick attribute for radio buttons, checkbox buttons, submit and reset input types; define an onselect attribute for select elements
ii. Button actions
iii. Require date and time functionality

d. Key features
i. Source files typically end in .js
ii. The <script> tag defines Javascript content
iii. variables are declared using keyword var
iv. comments use // (single line) or /* … */ structure
v. statements may end with semicolon
vi. DOM – Document Object Model
1. Defines the HTML as a tree with <html> tag as the root and other elements as branches and subbranches
2. Can use Javascript to inspect and change DOM elements dynamically
3. Notation example:
document.getElementById("element_name").property,
document.getElementById("element_name").method or
document.getElementsByName(
"name_attribute_of_elements")

7. jQuery
a. Purpose
i. A multipurpose JavaScript library used to simplify DOM manipulation
b. Key features
i. Notation is $(" id_of_element").property

8. Flash
a. Origin
i. Creates a shockwave file (.swf) containing the published Flash
ii. Uses vector graphics primarily leading to faster download time
iii. Frames define what appears on the stage at any point in the timeline
iv. Layers are separate identifiable graphics or text which have their own timelines
v. Symbols are automatically stored in the Library, available for reuse

b. Purpose
i. Create visual, dynamic content for a web site

c. Features
i. Key frame – (has the black dot) contains specific content which may be different from the previous frame

ii. Stage – the panel that shows what elements are to be displayed
iii. Motion guide – allows you to define a path for the motion tween to follow
iv. Onion-skin mode – superimpose onto the stage a set of frame images to indicate where the image is moving from / to
v. Motion tween – start and end frames within a layer are key frames, object must be a symbol, Flash determines the animation needed to mimic movement
vi. Shape tween – start and end frames within a layer are key frames, Flash determines the animation needed to mimic a shape or colour change
vii. Ease property controls the motion tween's acceleration (ease in) or deceleration (ease out)
viii. Library stores symbols for re-use in the animation
ix. Timeline stores the layers for the animation

9. XML
    a. Used as a data transport mechanism – especially for e-business usage
    b. Open source – non-proprietary
    c. Multiplatform support – multi-application support
    d. Human-readable
    e. Format:
```
<?xml version="1.0"?>
<root element>
  <child1>
  </child1>
    …
  <childN>
  </childN>
</root element>
```
    f. DTD – Document Type Definition
        i. Defines the rules which will the XML file will use to define its content (what elements are needed, the order of elements)
    g. Properties
        i. Well-formed
            1. XML is well-formed if its elements are syntactically correct (no missing tags)
        ii. Valid
            1. XML is valid if its elements do not break any of the DTD rules
    h. XSLT
        i. Used to define formatting for the XML and define any selection of XML data elements in the browser