COMP519 Web Programming
Lecture 8: Cascading Style Sheets: Part 4
Handouts

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Contents

Layout Via Divisions: Overview

- For a long time, web page layout was based on the extensive use of `div` elements
- A web page would typically consist of roughly a handful of `div` elements as follows:

```
<div id="header">  ... </div>
<div id="nav">     ... </div>
<div id="main">
  <div id="content"> ... </div>
  <div id="ads">     ... </div>
</div>
<div id="footer">  ... </div>
```

  possibly with additional `div` elements inside each of those
- Layout is then a matter of arranging those `div` elements
- Decisions on layout are a matter of design, not of technical possibility
  $\rightsquigarrow$ there is typically not one right answer
  $\rightsquigarrow$ this is not a topic for this module (web programming vs web design)

Divisions and Properties (1)

- By default, a `div` element takes up the whole width of a browser window and there is a line break before and after it
  - ⇝ Changes almost always need to be made to achieve the desired layout
- CSS properties that we can use to make those changes include

Property	Explanation / Example values
`width`	Width of an element `1000px` `90%` 90% of the width of the containing element
`height`	Height of an element `200px` `10%` 10% of the height of the containing element
`margin`	All four margins of an element `auto` centre horizontally within containing element

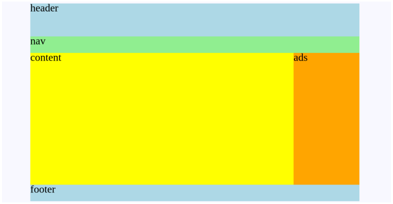
Divisions and Properties (1)

- By default, a `div` element takes up the whole width of a browser window and there is a line break before and after it
  ⇝ Changes almost always need to be made to achieve the desired layout
- CSS properties that we can use to make those changes include

Property	Explanation / Example values	
`float`	Whether and in which direction an element should float	
	`left`	element floats to the left of its container
	`right`	element floats to the right of its container
`clear`	Whether and how an element must be (cleared) below floating elemnts	
	`left`	element moves down to clear past left floats
	`right`	element moves down to clear past right floats
	`both`	element moves down to clear past all floats

Layout Via Divisions: Example (1)

A common layout of the top-level `div` elements is the following

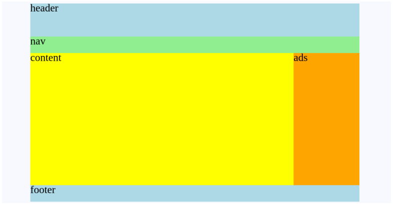


with the width of header, nav, main, footer fixed to a value between 900px and 1000px

```
<body>
  <div id="header">
    header
  </div>
  <div id="nav">
    nav
  </div>
  <div id="main">
    <div id="content">
      content
    </div>
    <div id="ads">
      ads
    </div>
  </div>
  <div id="footer">
    footer
  </div>
</body>
```

Layout Via Divisions: Example (1)

A common layout of the top-level div elements is the following



with the width of header, nav, main, footer fixed to a value between 900px and 1000px

```
#header { width:  1000px;
          height:  100px;
          background-color: blue;
          margin: auto;   }
#nav    { width:  1000px;
          height:   50px;
          background-color: green;
          margin: auto;   }
#main   { width:  1000px;
          margin: auto;   }
#content { width:   800px;
           height:  400px;
           background-color: yellow;
           float:   left;   }
#ads    { width:   200px;
          height:  400px;
          background-color: orange;
          float:   right; }
#footer { width:  1000px;
          height:   50px;
          clear: both; margin: auto;
          background-color: blue;}
```

http://cgi.csc.liv.ac.uk/~ullrich/COMP519/examples/layout1.html

Layout Via HTML5 Elements

- In the example, we assigned unique a id to each `div` element and associated a style directive with each of those ids
- Alternatively, we could have assigned a unique class to each `div` element and associated a style directive with each of those classes
- In HTML5, we would use the appropriate elements like `header`, `nav`, etc instead of `div` elements
- We would then associate a style directive with each of those elements

```
header { width:  1000px;
         height:  100px;
         background-color: blue;
         margin: auto;   }
nav    { width:  1000px;
         height:   50px;
         background-color: green;
         margin: auto;   }
```

```
<body>
  <article>
    <header>
    </header>
    <nav>
    </nav>
    <section>
    </section>
    <aside>
    </aside>
    <footer>
    </footer>
  </article>
</body>
```

Fixed Positioning (1)

- So far, we have positioned elements relative to each other
- This means the arrangements of elements as a whole can move and can move out of view if the user scrolls up or down in a browser window
- CSS properties that we can use to change that include

Property	Explanation / Example values	
`position`	Specifies how an element is positioned in a document	
	`fixed`	The element is removed from the normal document flow; no space is created for the element in the page layout; it is positioned relative to the screen's viewport using properties `top`, `bottom` `left`, `right` and does not move when scrolled

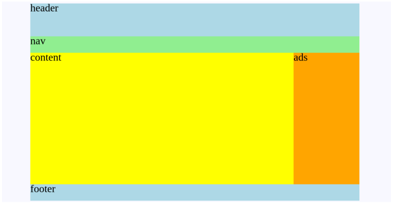
Fixed Positioning (2)

- CSS properties required for `position` include

Property	Explanation / Example values	
`top`	When `position` is set to `absolute` or `fixed`, specifies the distance between the element's top edge and the top edge of its containing block	
	`10px`	10px off top edge
`bottom`	Analogous to `top` for the element's bottom edge and the bottom edge of its containing block	
	`20%`	20% of the width of the containing block
`left`	Analogous to `top` for the element's left edge and the left edge of its containing block	
	`auto`	
`right`	Analogous to `right` for the element's left edge and the left edge of its containing block	
	`inherit`	inherit from parent element

Fixed Positioning: Example

We want to achieve the same layout as before but with header, nav and footer fixed in position



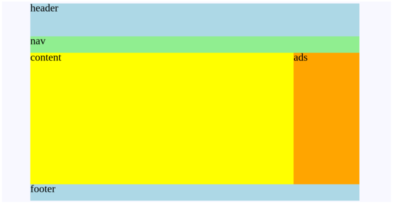
Wo do so with slightly different approaches used in the style directives for each of these three elements

```
header  { width:    1000px;
          height:    100px;
          background-color:  blue;
          position:  fixed;
          top:         0px;
          left:        50%;
          margin-left: -500px;  }
nav     { width:    1000px;
          height:     50px;
          background-color: green;
          position:  fixed;
          top:       100px;
          left:        0px;
          right:       0px;
          margin:     auto;     }
article { width:    1000px;
          padding-top: 142px;
          margin:   0 auto;     }
```

`http://cgi.csc.liv.ac.uk/~ullrich/COMP519/examples/layout2.html`

Fixed Positioning: Example

We want to achieve the same layout as before but with header, nav and footer fixed in position



Wo do so with slightly different approaches used in the style directives for each of these three elements

```
section { width:      800px;
          height:    1000px;
          background-color: yellow;
          float:       left;
        }
aside   { width:      200px;
          height:    1000px;
          background-color: orange;
          float:      right;
        }
footer  { width:     1000px;
          height:      50px;
          background-color:   blue;
          position:  fixed;
          bottom:       0px;
          left:         50%;
      transform: translate(-50%,0%);
         }
```

http://cgi.csc.liv.ac.uk/~ullrich/COMP519/examples/layout2.html

Adaptive Design Revisited

- One fixed, rigid layout is unlikely to be suitable for every medium that a user might use to access an HTML document
- We have seen that the media-attribute of the link element allows us to select which external style sheets to use for which medium, e.g.

```
<link rel="stylesheet" type="text/css" media="screen"
      href="browser.css">
<link rel="stylesheet" type="text/css" media="print"
      href="print.css">
```

- However, if the style directives in the these different style sheets are largely identical, this is not an optimal approach
  $\leadsto$ the same style directives exist in several files,
  changes are error prone
- HTML5 provides three meachanisms to better deal with such a situation
  - Import rules
  - Media rules
  - Support rules

Importing CSS style files

- The `@import` CSS at-rule is used to import style directives from other style sheets

```
@import url;
@import url list-of-media-queries;
```

Examples:

```
@import url("http://cgi.csc.liv.ac.uk/styles/common.css");
@import "screen-specific.css" screen;
@import 'print-specific.css'  print;
```

- These rules must precede all other types of rules and directives except `@charset` rules
- A `@charset` CSS at-rule specifies the character encoding used in a style sheet, for example:

```
@charset "utf-8";
```

  - The default character encoding is UTF-8
  - Useful / used when attributes like `content` are given values involving non-ASCII characters

Media Rules and Media Queries

- Within a style sheet, `@media` at-rules can used to conditionally apply styles to a document depending on the result of media queries

  `@media` *`list-of-media-queries`* `{` *`group-rule-body`* `}`

  where *`group-rule-body`* is either another `@media` at-rule, `@supports` at-rule, or list of style directives

  Examples:

```
@media print {
       body  { font-size: 10pt; }
}
@media screen and (resolution > 150dpi) {
       body  { font-size: 13px; }
}
```

- The language for media queries is an extension of the one we have seen for the `media` attribute

Feature Queries

- Within a style sheet, `@support` at-rules can be used to conditionall apply styles to a document depending on the result of feature queries

  `@supports` *`feature-query`* `{` *`group-rule-body`* `}`

- A feature query is basically a boolean combination (using `and`, `or`, `not`) of *`property`*`:`*`value`* pairs
- For each *`property`*`:`*`value`* it will be evaluated whether the browser used to process the style sheet supports this specific CSS feature and then works out the truth value for the feature query overall

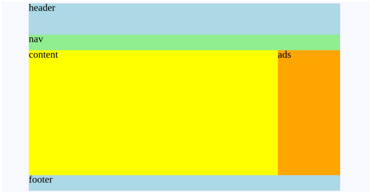
  Examples:

```
@supports (display: flex) {
  div { display: flex; }
}
@supports not(display: flex) {
  div { float: left; }
}
```

CSS Grid Layout

- CSS Grid Layout is a two-dimensional grid-based layout system
- Such layout systems are motivated by the observation that most web layouts can be seen as grids where elements are placed on one or more grid cells
- Height and width of grid columns and grid rows will in general vary

Sample page layout



Underlying grid and allocation of elements to grid cells

	col 1	col 2	col 3	col 4
row 1		header		
row 2		nav		
row 3		content	ads	
row 4		footer		

Defining a Grid Layout

CSS properties of Grid include

- `display: grid`
  defines an element as grid container

-
  ```
  grid-template-columns: track-size |
                         [col-name] track-size ...
  ```
  specifies the size and names of columns

-
  ```
  grid-template-rows:    track-size |
                         [row-name] track-size ...
  ```
  specifies the size and names of rows
- *track-size* can be `auto`, a length, a percentage, or a fraction of the free space

These properties allow to specify a grid, including the size of each column and each row

Placing Elements on a Grid

One way to place an element on the grid is to specify
– in which column/row it starts (top, left corner) and
– in which column/row it ends (bottom, right corner)
using the following properties

- `grid-column-start: cell`
- `grid-column-end:   cell`
- `grid-row-start:    cell`
- `grid-row-end:      cell`
- *cell* can take the following values:

number	column number / row number
name	name of a column / row
`span` *number*	number of tracks covered
`span` *name*	span until *name* is reached
`auto`	automatic

Placing Elements on a Grid

An alternative way to place elements on the grid is to assign grid names to the elements and to use a grid template that references those names:

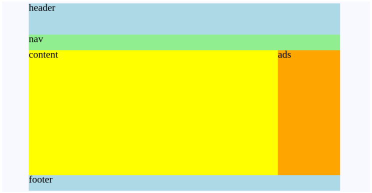
- `grid-area: area-name`
  assign a grid area name to an element

-
  ```
  grid-template-areas:   "area-name  | . | none | ..."
                         "..."
  ```
  associates grid area names with grid cells

This is only a glimpse of the possibilities of the CSS Grid Layout System

CSS Grid Layout: Example

We want to replicate the same layout as before:



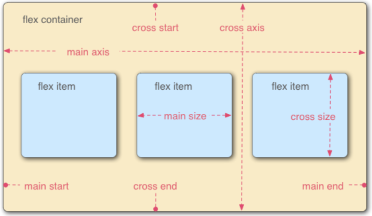
```
<body>
  <article>
    <header>  </header>
    <nav>     </nav>
    <section> </section>
    <aside>   </aside>
    <footer>  </footer>
  </article>
</body>
```

```
article { display: grid;
          grid-template-rows:    100px  50px  auto   50px;
          grid-template-columns:  auto 800px  200px  auto;
          grid-template-areas:   ".     header  header ."
                                 ".     nav     nav    ."
                                 ".     content ads    ."
                                 ".     footer  footer .";
}
header  { grid-area: header;   background-color: blue;   }
nav     { grid-area: nav;      background-color: green;  }
section { grid-area: content;  background-color: yellow; }
aside   { grid-area: ads;      background-color: orange; }
footer  { grid-area: footer;   background-color: blue;   }
```

http://cgi.csc.liv.ac.uk/~ullrich/COMP519/examples/layout3.html

CSS Flexbox Layout

- CSS Flexbox Layout is a simpler layout system, typically used for parts of a web page, not the whole page
- Flexbox distinguishes between flex containers and flex items within those containers
- Unlike Grid, Flexbox distinguishes between a primary main axis and a secondary cross axis



- The main axis is not necessarily horizontal, its direction is determined by `flex-direction`

Defining a Flexbox Layout

CSS properties of Flexbox include

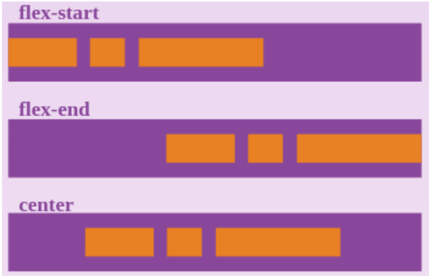
- `display: flex`
  defines an element as a flexbox container

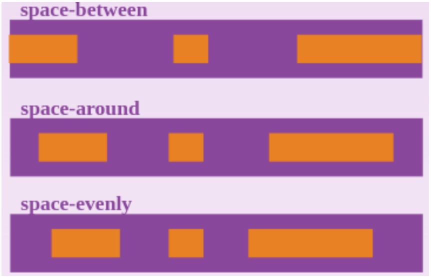
-
  ```
  flex-direction: row    | row-reverse |
                  column | column-reverse
  ```
  defines the direction of the main axis,
  for example, with `row` the direction is left to right (horizontally)
- `flex-wrap: nowrap | wrap | wrap-reverse`
  whether and how flex items wrap when the main axis is 'full',
  for example, with `wrap-reverse`, flex items will wrap onto multiple 'lines' from bottom to top along the cross axis
- `flex-flow:` *`direction-option`* `||` *`wrap-option`*
  combines `flex-direction` and `flex-wrap`

Flexbox Layout Properties

CSS properties of Flexbox include

- `justify-content:` *justify-option*
  defines the alignment along the main axis
  justify-option can take the following values:



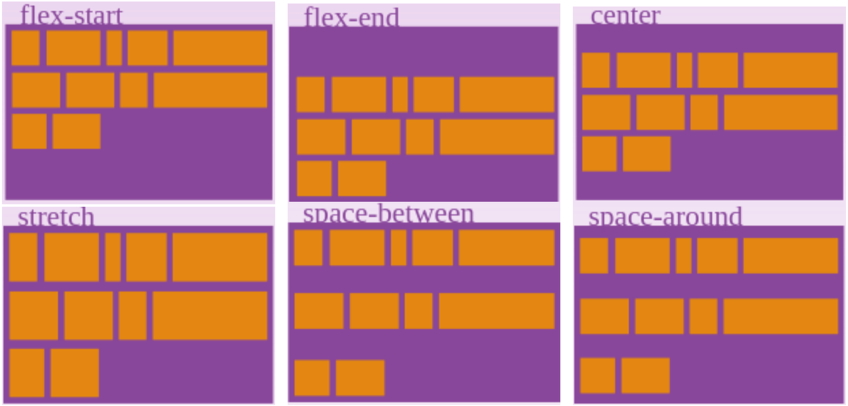


Images courtesy of Chris Coyier: A Complete Guide to Flexbox. *CSS-Tricks.* 4 September 2019.
`https://css-tricks.com/snippets/css/a-guide-to-flexbox/` (accessed 14 September 2019).

Flexbox Layout Properties

CSS properties of Flexbox include

- `align-content:` *`align-option`*
  defines the use of extra space along the cross axis
  `align-option` can take the following values:



Images courtesy of Chris Coyier: A Complete Guide to Flexbox. *CSS-Tricks*. 4 September 2019. `https://css-tricks.com/snippets/css/a-guide-to-flexbox/` (accessed 14 October 2019).

CSS Flexbox Layout: Example

HTML

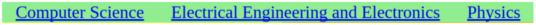
```
<nav>
  <a href="#">Computer Science</a>
  <a href="#">Electrical Engineering and Electronics</a>
  <a href="#">Physics</a>
</nav>
```

CSS

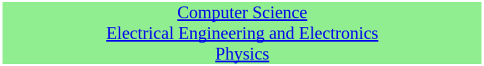
```
a   { text-align: center }
nav {
  background-color: LightGreen;
  display:          flex;
  flex-direction:   row;
  justify-content:  space-around;
}
```

```
/* Narrow screen width */
@media all and (max-width: 900px) {
  nav {
    flex-direction: column;
  }
}
```

Width = 1000px


Computer Science Electrical Engineering and Electronics Physics

Width = 900px


Computer Science
Electrical Engineering and Electronics
Physics

http://cgi.csc.liv.ac.uk/~ullrich/COMP519/examples/layout4.html

Adaptive versus Responsive Design

Adaptive Design

Uses a limited number of different web pages and/or different styles depending on media devices and media attributes

Responsive design

Uses a single web page and style that through the use of

- media queries,
- flexible grids,
- relative units and
- responsive images

tries to adjust to any media device with any media attributes at any time

Adaptive versus Responsive Design

Adaptive Design

Uses a limited number of different web pages and/or different styles depending on media devices and media attributes

Responsive design

Uses a single web page and style that through the use of media queries, flexible grids, relative units and responsive images tries to adjust to any media device with any media attributes at any time

- There are no generally agreed definitions of adaptive design and responsive design
- It is often debatable whether a website uses adaptive design or responsive design (or neither)
- There is even more debate which one is better
- Most/all of the examples we have seen use adaptive design, but this was done for effect

Style Guide

- HTML and CSS provide a lot of features, but these must be used sensibly
  $\leadsto$ just because a feature exists does not mean it be used
- Do not use features that distract from the content of your web page
- Use (non-default) colours and fonts carefully
  $\leadsto$ no purple text on pink background
  $\leadsto$ no "weird" fonts (that includes Comic Sans)
  $\leadsto$ mainly use a dark font on a light background
- Remember that an estimated 8-10% of people have some type of colour-blindness
  $\leadsto$ avoid red/green colour combinations
- Remember that some people use screen readers to read the content of web pages
  $\leadsto$ always include `alt` properties for images

Style Guide

- Use relative units to specify font sizes, not fixed pixel sizes
- Use images appropriately
  - ⇝ avoid bright background images that make foreground text hard to read
  - ⇝ avoid clickable images instead of standard buttons for links as they can slow down the download of your page
- Do not rely on specific window size or specific font size for layout as the user might change those
  - ⇝ use an adaptive or responsive design
- Break a large web page into several smaller ones or provide a menu for navigation
- Utilise style sheets to make changes to style and layout easy and ensure consistency across a set of web pages
- Stick to standard features and test several browsers

Revision and Further Reading

Read

- Chapter 15: Floating and Positioning
- Chapter 16: CSS Layout with Flexbox and Grid

of

J. Niederst Robbins: Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics (5th ed).
O'Reilly, 2018.
E-book `https://library.liv.ac.uk/record=b5647021`

Revision and Further Reading

Read

1. Chris Coyier: A Complete Guide to Flexbox.
   CSS-Tricks. 28 September 2017.
   `https://css-tricks.com/snippets/css/a-guide-to-flexbox/`
   (accessed 18 October 2017).
2. Chris House: A Complete Guide to Grid.
   CSS-Tricks. 13 September 2017.
   `https://css-tricks.com/snippets/css/complete-guide-grid/`
   (accessed 18 October 2017).
3. Mozilla and individual contributors: CSS Grid Layout.
   MDN Web Docs, 5 October 2017.
   `https://developer.mozilla.org/en-US/docs/Web/CSS/CSS_Grid_Layout` (accessed 19 October 2017).