WEB TECHNOLOGIES
A COMPUTER SCIENCE PERSPECTIVE

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Chapter 3
Style Sheets: CSS

Motivation

- HTML markup can be used to represent
  - Semantics: `h1` means that an element is a top-level heading
  - Presentation: `h1` elements look a certain way
- It's advisable to separate semantics from presentation because:
  - It's easier to present documents on multiple platforms (browser, cell phone, spoken, …)
  - It's easier to generate documents with consistent look
  - Semantic and presentation changes can be made independently of one another (division of labor)
  - User control of presentation is facilitated

Style Sheet Languages

- Cascading Style Sheets (CSS)
  - Applies to (X)HTML as well as XML documents in general
  - Focus of this chapter
- Extensible Stylesheet Language (XSL)
  - Often used to transform one XML document to another form, but can also add style
  - XSL Transformations covered in later chapter

CSS Introduction

- A styled HTML document

produced by the style sheet `style1.css`:

```
body   { background-color:lime }
p      { font-size:x-large; background-color:yellow }
```

CSS Introduction

```
<!DOCTYPE html
        PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
        "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
  <head>
    <title>
      CSSHelloWorld.html
    </title>
    <link rel="stylesheet" type="text/css" href="style1.css"
          title="Style 1" />
    <link rel="alternate stylesheet" type="text/css" href="style2.css"
          title="Style 2" />
  </head>
  <body>
    <p>
      Hello World!
    </p>
  </body>
</html>
```

link element associates style sheet with doc.

CSS Introduction

```
<!DOCTYPE html
        PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
        "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
  <head>
    <title>
      CSSHelloWorld.html
    </title>
    <link rel="stylesheet" type="text/css" href="style1.css"
          title="Style 1" />
    <link rel="alternate stylesheet" type="text/css" href="style2.css"
          title="Style 2" />
  </head>
  <body>
    <p>
      Hello World!
    </p>
  </body>
</html>
```

type attribute specifies style language used

CSS Introduction

```
<!DOCTYPE html
        PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
        "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
  <head>
    <title>
      CSSHelloWorld.html
    </title>
    <link rel="stylesheet" type="text/css" href="style1.css"
          title="Style 1" />
    <link rel="alternate stylesheet" type="text/css" href="style2.css"
          title="Style 2" />
  </head>
  <body>
    <p>
      Hello World!
    </p>
  </body>
</html>
```

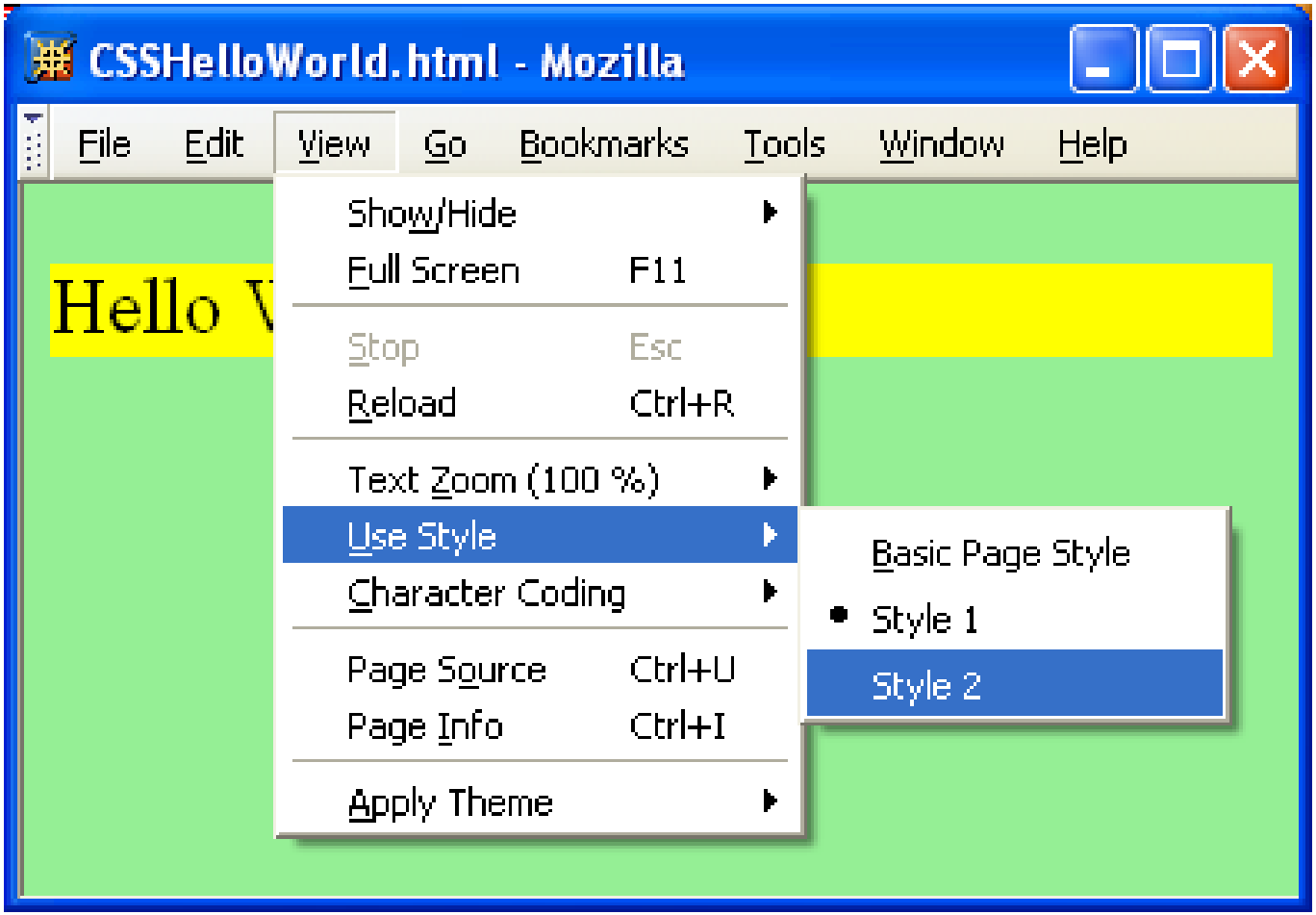
`href` attribute provides style sheet URL

CSS Introduction

```
<!DOCTYPE html
        PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
        "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
  <head>
    <title>
      CSSHelloWorld.html
    </title>
    <link rel="stylesheet" type="text/css" href="style1.css"
          title="Style 1" />
    <link rel="alternate stylesheet" type="text/css" href="style2.css"
          title="Style 2" />
  </head>
  <body>
    <p>
      Hello World!
    </p>
  </body>
</html>
```

`title` attribute provides style sheet name

CSS Introduction



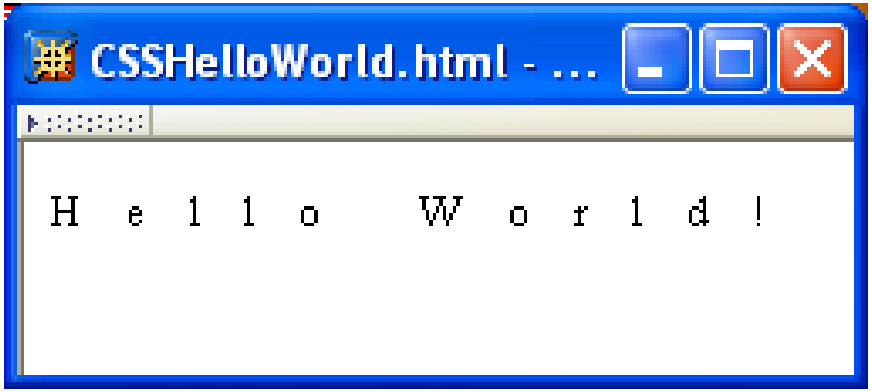
CSS Introduction

```
<!DOCTYPE html
        PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
        "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
  <head>
    <title>
      CSSHelloWorld.html
    </title>
    <link rel="stylesheet" type="text/css" href="style1.css"
          title="Style 1" />
    <link rel="alternate stylesheet" type="text/css" href="style2.css"
          title="Style 2" />
  </head>
  <body>
    <p>
      Hello World!
    </p>
  </body>
</html>
```

Alternative, user selectable style sheets can be specified

CSS Introduction

- A styled HTML document



produced by the style sheet `style2.css`:

```
p     { font-size:smaller; letter-spacing:1em }
```

CSS Introduction

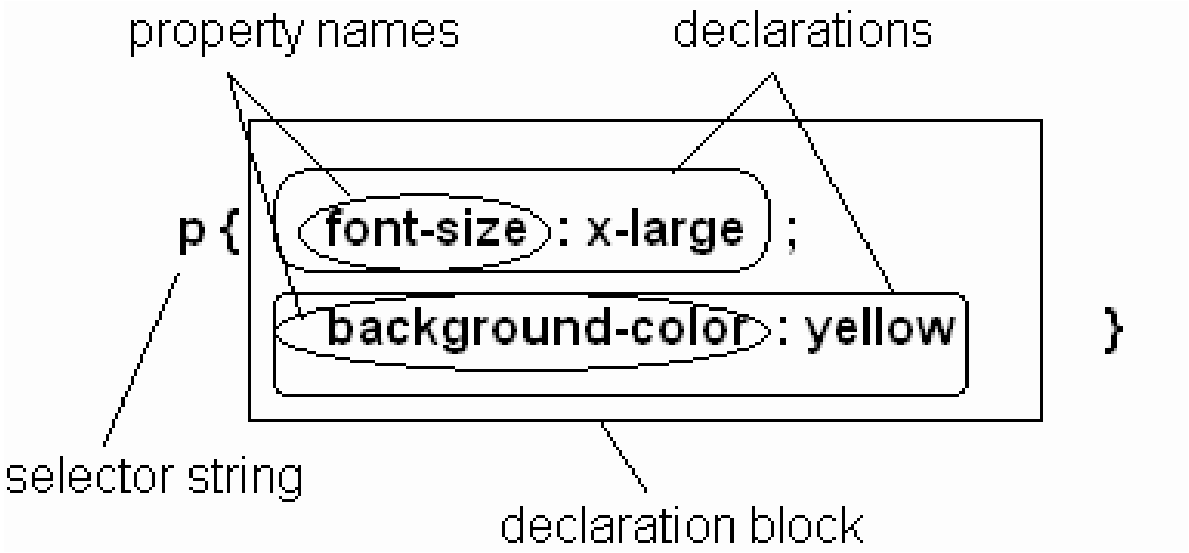
- Single document can be displayed on multiple media platforms by tailoring style sheets:

```
<link rel="stylesheet" type="text/css" href="style1.css"
      media="screen, tv, projection" />
<link rel="stylesheet" type="text/css" href="style2.css"
      media="handheld, print" />
```

This document will be printed differently than it is displayed.

CSS Syntax

- Parts of a style rule (or statement)



CSS Syntax: Selector Strings

- Single element type:

```
p     { font-size:smaller; letter-spacing:1em }
```

- Multiple element types:

```
h1,h2,h3,h4,h5,h6 { background-color:purple }
```

- All element types:

```
* { font-weight:bold }
```

- Specific elements by id:

```
#p1, #p3 { background-color:aqua }
```

CSS Syntax: Selector Strings

- Single element type:

```
p      { font-size:smaller; letter-spacing:1em }
```

type selector

- Multiple element types:

```
h1,h2,h3,h4,h5,h6 { background-color:purple }
```

- All element types:

```
* { font-weight:bold }
```

- Specific elements by id:

```
#p1, #p3 { background-color:aqua }
```

CSS Syntax: Selector Strings

- Single element type:

```
p     { font-size:smaller; letter-spacing:1em }
```

- Multiple element types:

```
h1,h2,h3,h4,h5,h6 { background-color:purple }
```

- All element types:

```
{ font-weight:bold }
```

universal selector

- Specific elements by id:

```
#p1, #p3 { background-color:aqua }
```

CSS Syntax: Selector Strings

- Single element type:

```
p     { font-size:smaller; letter-spacing:1em }
```

- Multiple element types:

```
h1,h2,h3,h4,h5,h6 { background-color:purple }
```

- All element types:

```
* { font-weight:bold }
```

- Specific elements by id:

```
#p1, #p3 { background-color:aqua }
```

ID selector

CSS Syntax: Selector Strings

- Elements belonging to a style class:

```
#p4, .takeNote { font-style:italic }
```

class selector

  - Referencing a style class in HTML:

```
<span class="takeNote special cool">
```

- Elements of a certain type and class:

```
span.special { font-size:x-large }
```

CSS Syntax: Selector Strings

- Elements belonging to a style class:

```
#p4, .takeNote { font-style:italic }
```

  - Referencing a style class in HTML:

```
<span class="takeNote special cool">
```

this span belongs to three style classes

- Elements of a certain type and class:

```
span.special { font-size:x-large }
```

CSS Syntax: Selector Strings

- Elements belonging to a style class:

```
#p4, .takeNote { font-style:italic }
```

  - Referencing a style class in HTML:

```
<span class="takeNote special cool">
```

- Elements of a certain type and class:

```
span.special { font-size:x-large }
```

this rule applies only to `span`'s belonging to class `special`

CSS Syntax: Selector Strings

- Source anchor elements:

```
a:link { color:black }
a:visited { color:yellow }
a:hover { color:green }
a:active { color:red }
```

pseudo-classes

- Element types that are descendents:

```
ul ol li { letter-spacing:1em }
```

CSS Syntax: Selector Strings

- Source anchor elements:

```
a:link { color:black }
a:visited { color:yellow }
a:hover { color:green }
a:active { color:red }
```

- Element types that are descendants:

```
ul ol li { letter-spacing:1em }
```

rule applies to `li` element that is

CSS Syntax: Selector Strings

- Source anchor elements:

```
a:link { color:black }
a:visited { color:yellow }
a:hover { color:green }
a:active { color:red }
```

- Element types that are descendants:

```
ul ol li { letter-spacing:1em }
```

rule applies to `li` element that is part of the content of an `ol` element

CSS Syntax: Selector Strings

- Source anchor elements:

```
a:link { color:black }
a:visited { color:yellow }
a:hover { color:green }
a:active { color:red }
```

- Element types that are descendants:


```
ol li { letter-spacing:1em }
```

rule applies to `li` element that is
part of the content of an `ol` element
that is part of the content of a `ul` element

CSS Syntax

- Style rules covered thus far follow ruleset syntax
- At-rule is a second type of rule

  - Reads style rules from specified URL
  - Must appear at beginning of style sheet

Style Sheets and HTML

- Style sheets referenced by `link` HTML element are called external style sheets
- Style sheets can be embedded directly in HTML document using `style` element

```
<head>
  <title>InternalStyleSheet.html</title>
  <style type="text/css">
    h1, h2 { background-color:aqua }
  </style>
</head>
```

- Most HTML elements have `style` attribute (value is list of style declarations)

Style Sheets and HTML

- Rules of thumb:
  - Use external style sheets to define site-wide style
  - Prefer style sheets (either external or embedded) to `style` attributes
  - XML special characters
    - Must use references in embedded style sheets and `style` attribute
    - Must *not* use references in external style sheets

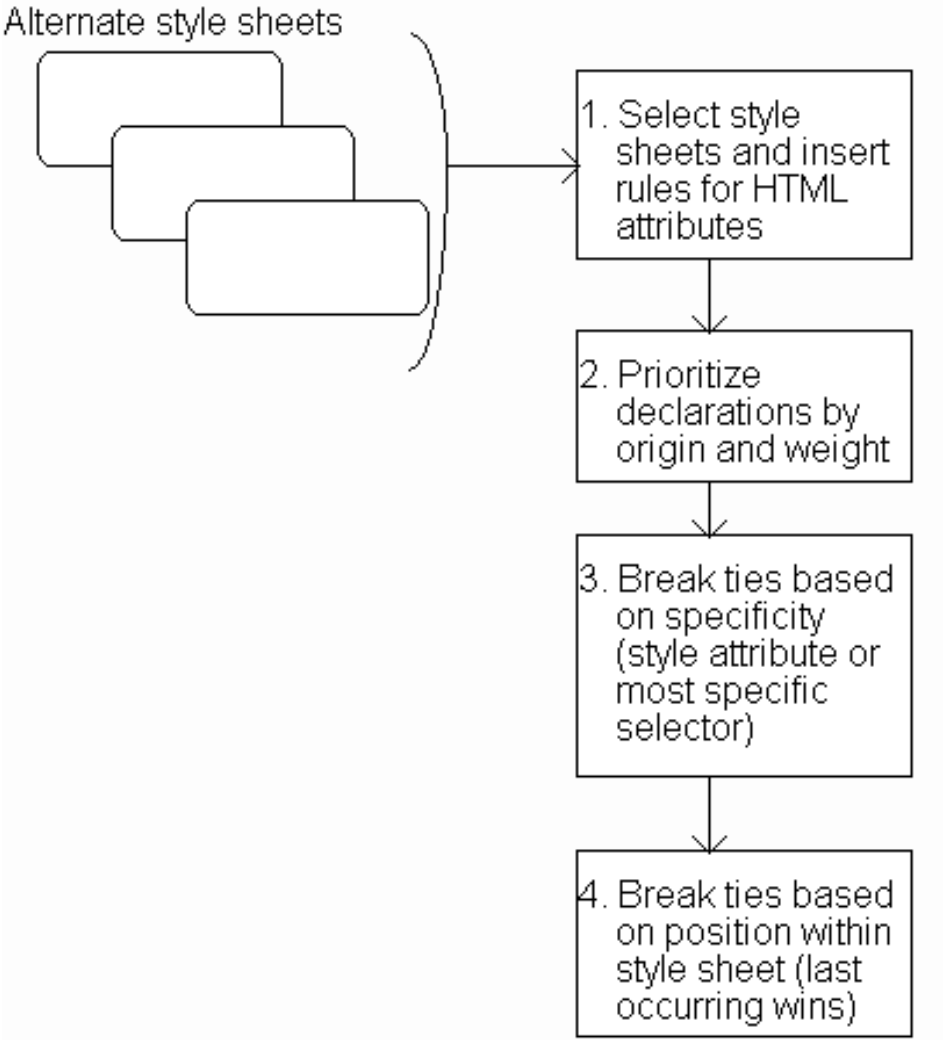
CSS Rule Cascade

- What if more than one style declaration applies to a property of an element?

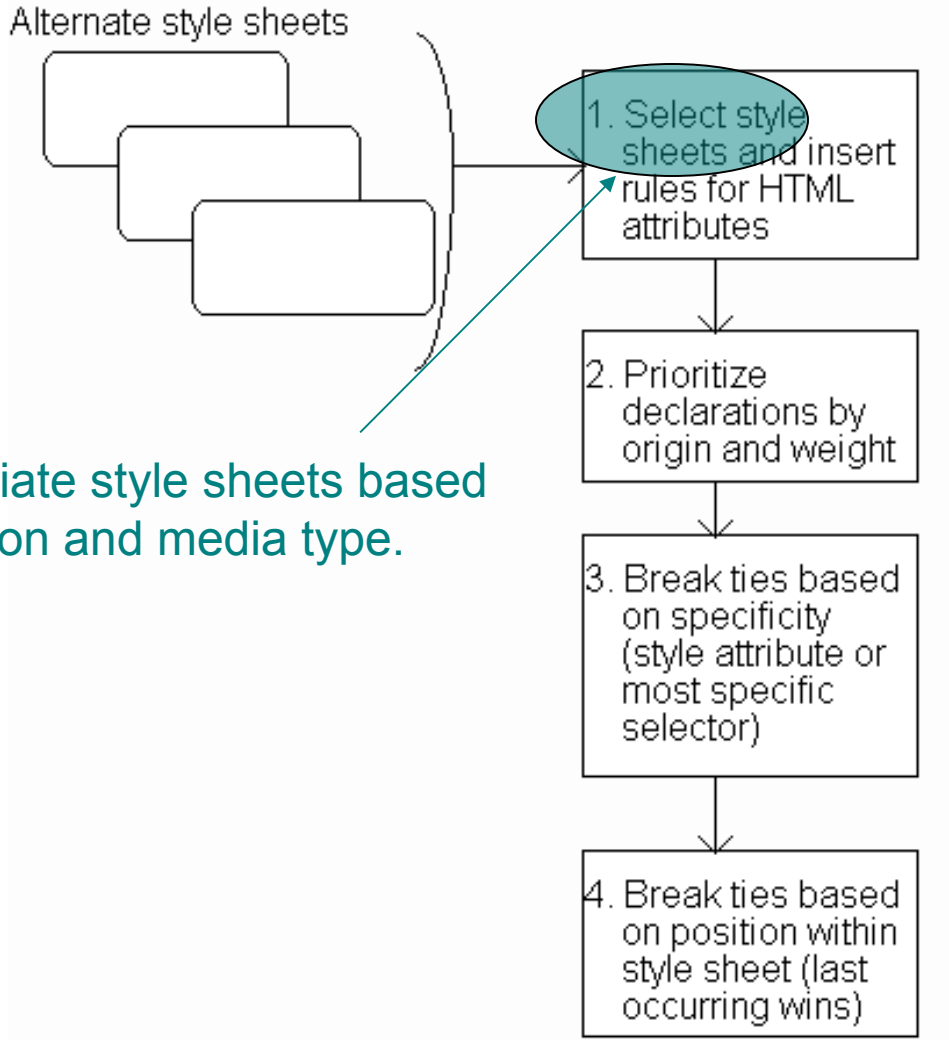
```
* { font-weight:bold }
#p3 { font-weight:normal }
```

- The CSS rule cascade determines which style rule's declaration applies

CSS Rule Cascade

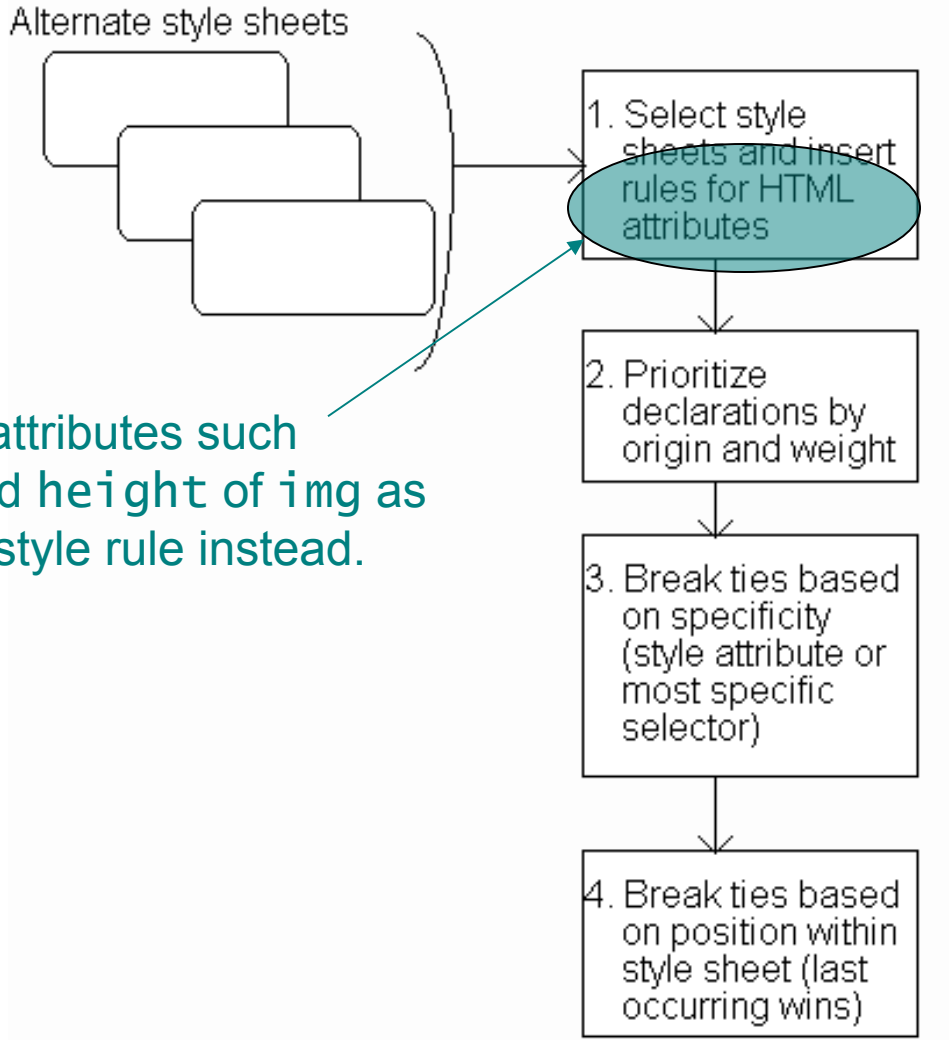


CSS Rule Cascade



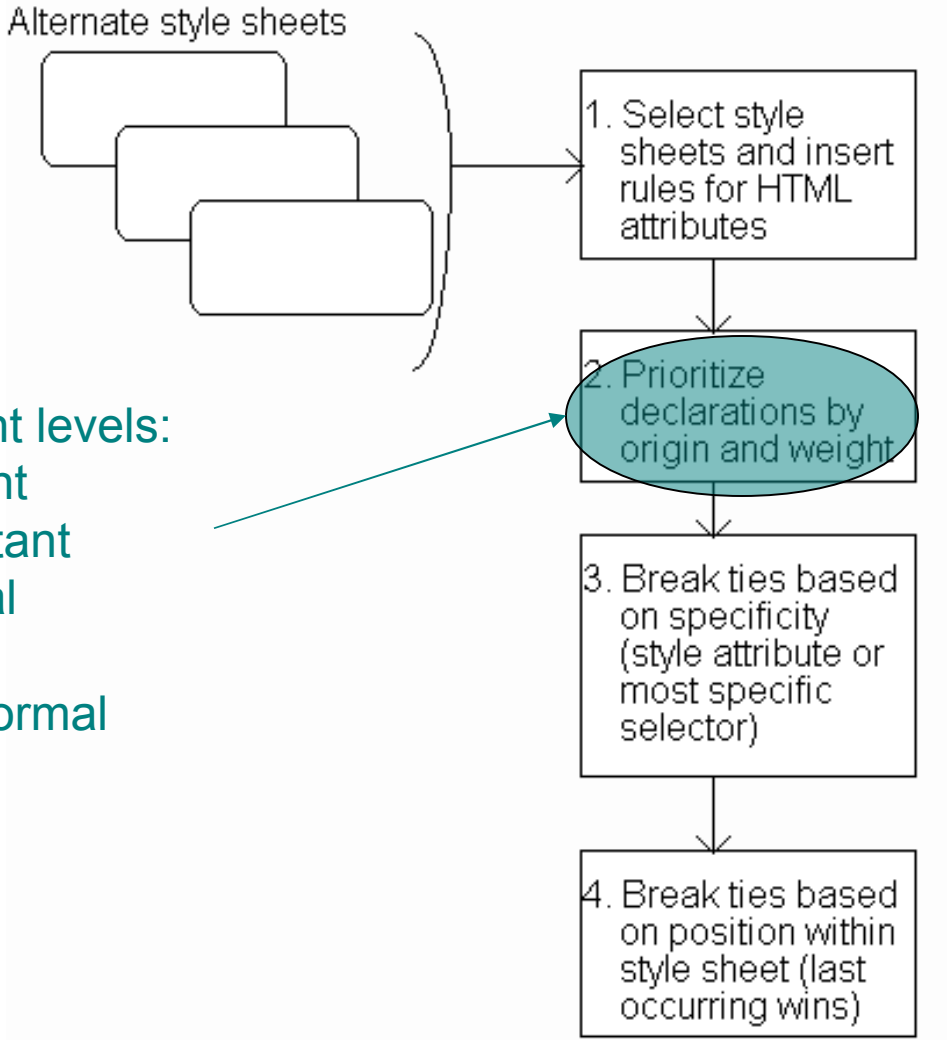
Select appropriate style sheets based on user selection and media type.

CSS Rule Cascade



Treat HTML attributes such as `width` and `height` of `img` as if defined by style rule instead.

CSS Rule Cascade



Five origin/weight levels:

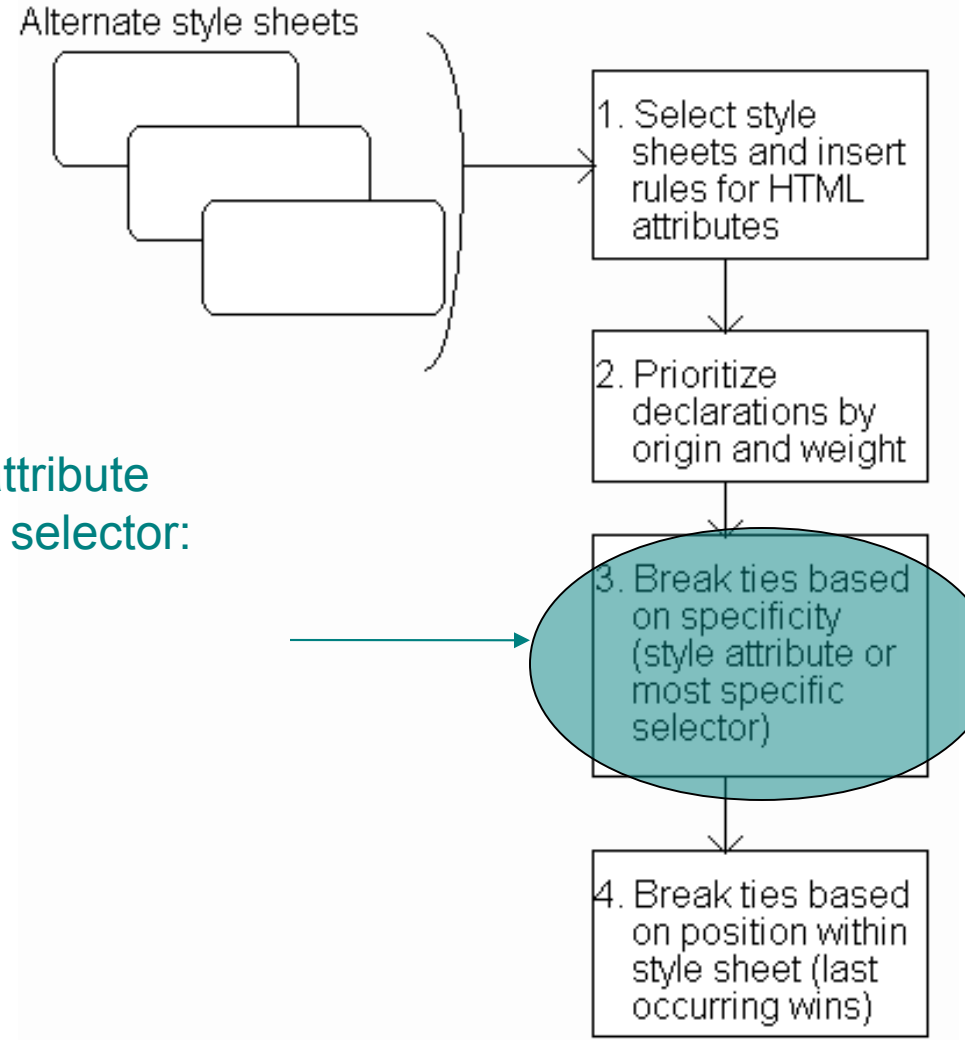
1. user/important
2. author/important
3. author/normal
4. user/normal
5. user agent/normal

CSS Rule Cascade

- User can define a style sheet
  - Explicitly (easy in IE)
  - Implicitly (preferences)
- User/important highest priority in CSS2 to accommodate users with special needs
  - Rules made important by adding “!important”:

```
p { text-indent:3em; font-size:larger !important }
```

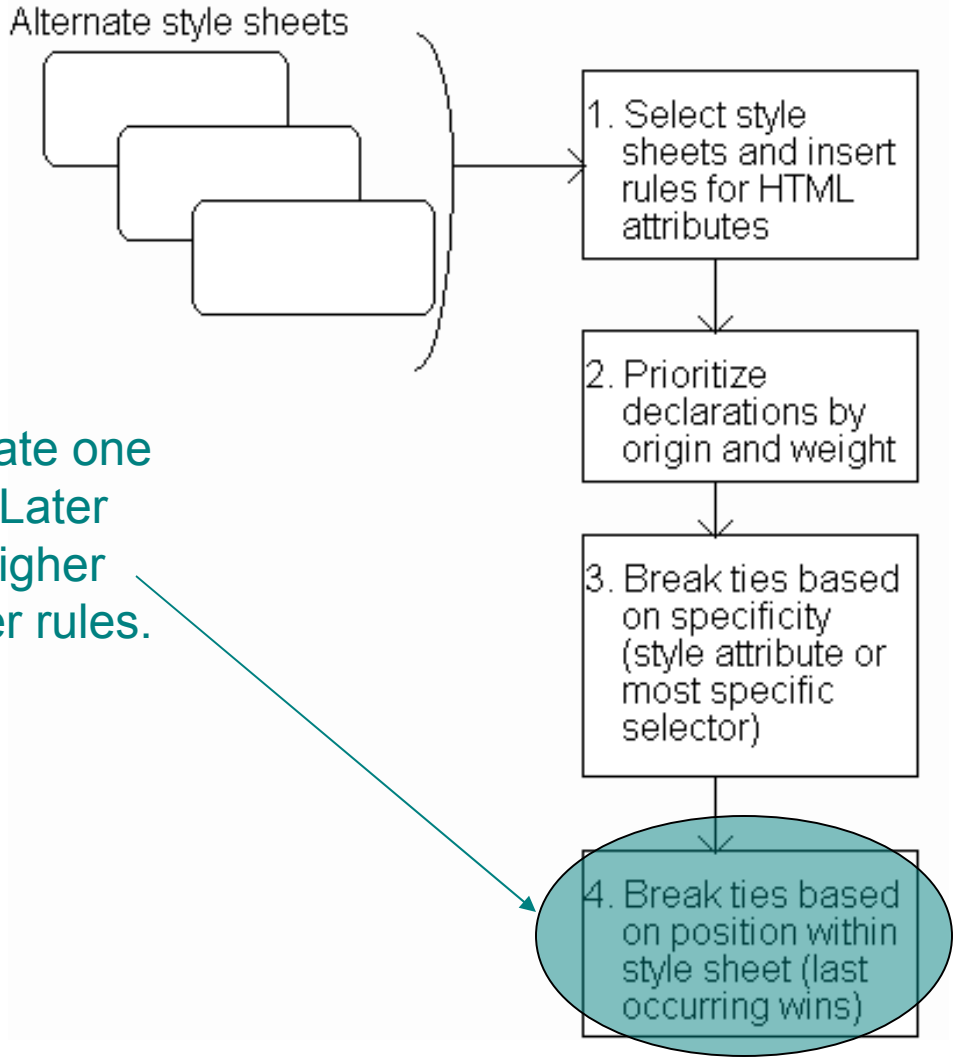
CSS Rule Cascade



Specificity:

1. `style` attribute
1. rule with selector:
    1.

CSS Rule Cascade



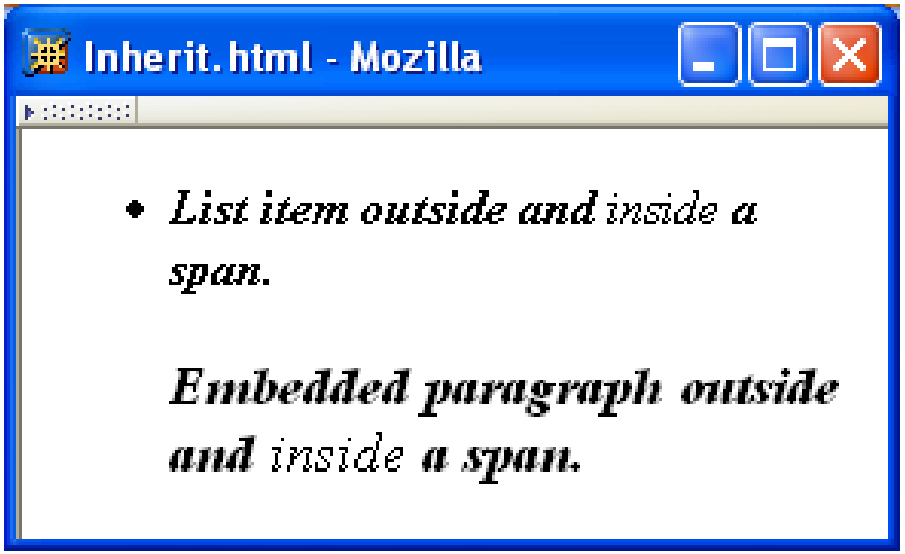
Conceptually, create one long style sheet. Later style rules have higher priority than earlier rules.

CSS Inheritance

- What if no style declaration applies to a property of an element?
- Generally, the property value is inherited from the nearest ancestor element that has a value for the property
- If no ancestor has a value (or the property does not inherit) then CSS defines an initial value that is used

CSS Inheritance

```
body { font-weight:bold }
li { font-style:italic }
p { font-size:larger }
span { font-weight:normal }
```



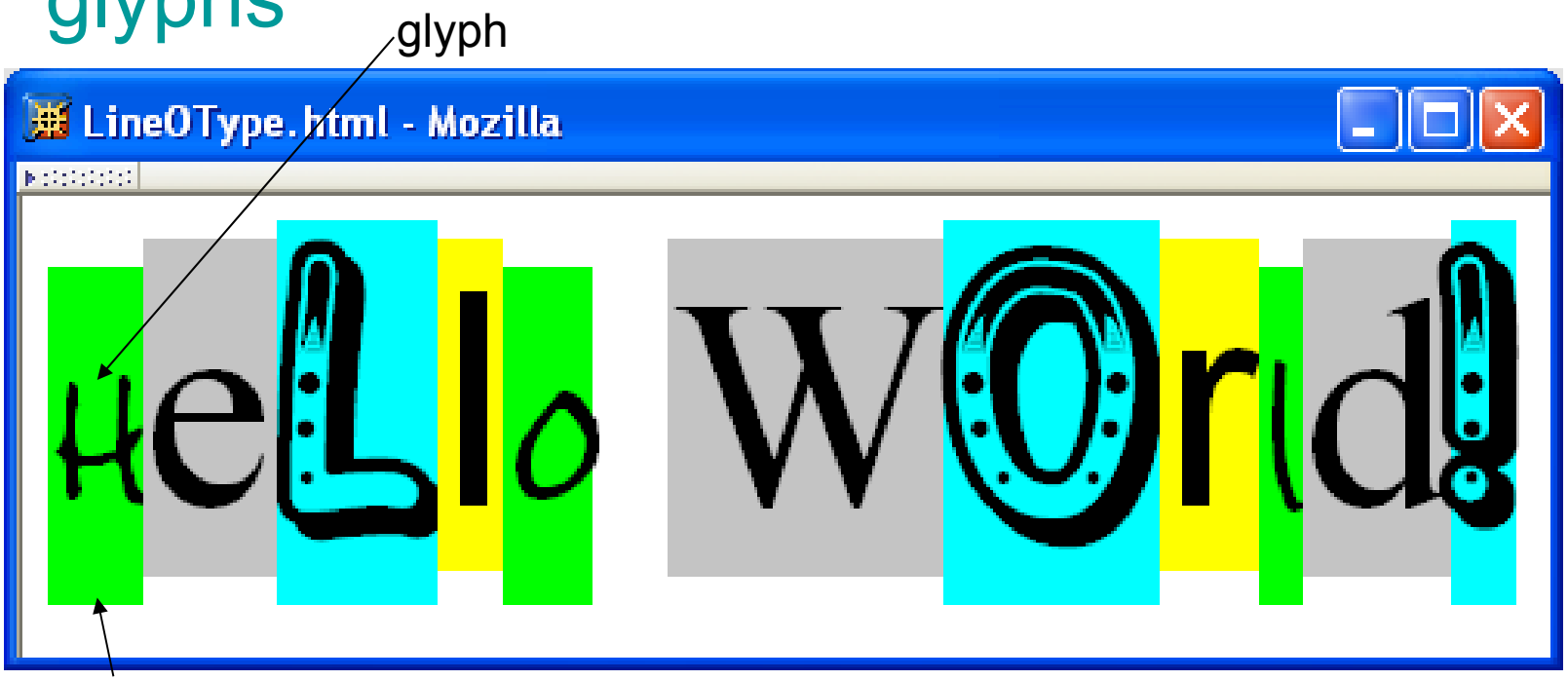

```
<body>
  <ul>
    <li>
      List item outside and <span>inside</span> a span.
      <p>
        Embedded paragraph outside and <span>inside</span> a span.
      </p>
    </li>
  </ul>
</body>
```

CSS Inheritance

- Most properties inherit computed value
  - Exception discussed later: `line-height`
- A little thought can usually tell you whether a property inherits or not
  - Example: `height` does not inherit

CSS Font Properties

- A font is a mapping from code points to glyphs



CSS Font Properties

- A font family is a collection of related fonts (typically differ in size, weight, etc.)

```
<p style="font-family:'Jenkins v2.0'">
```

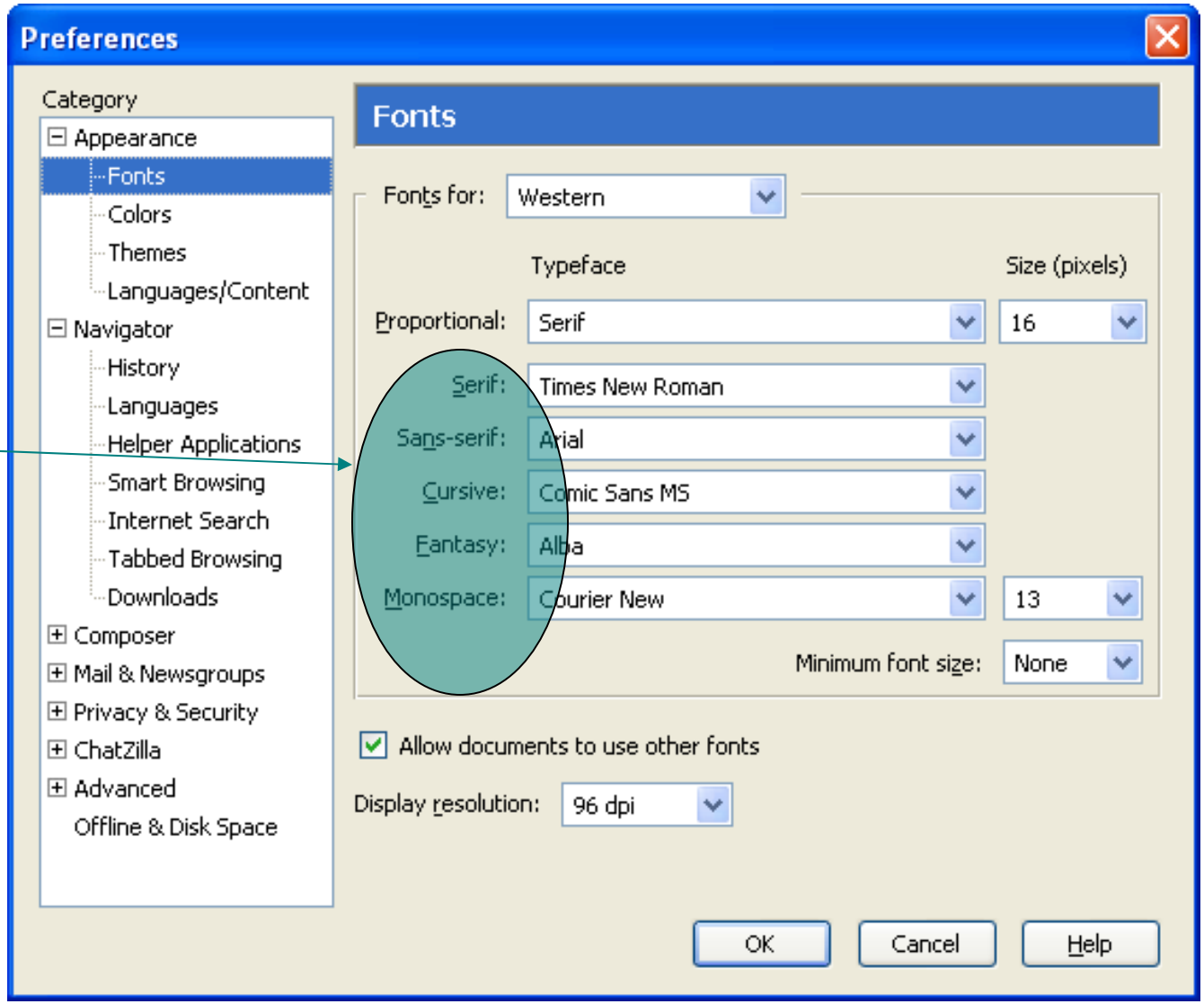
- font-family property can accept a list of families, including generic font families

```
font-family:"Edwardian Script ITC","French Script MT",cursive
```

generic

CSS Font Properties

generic fonts are system-specific



CSS Font Properties

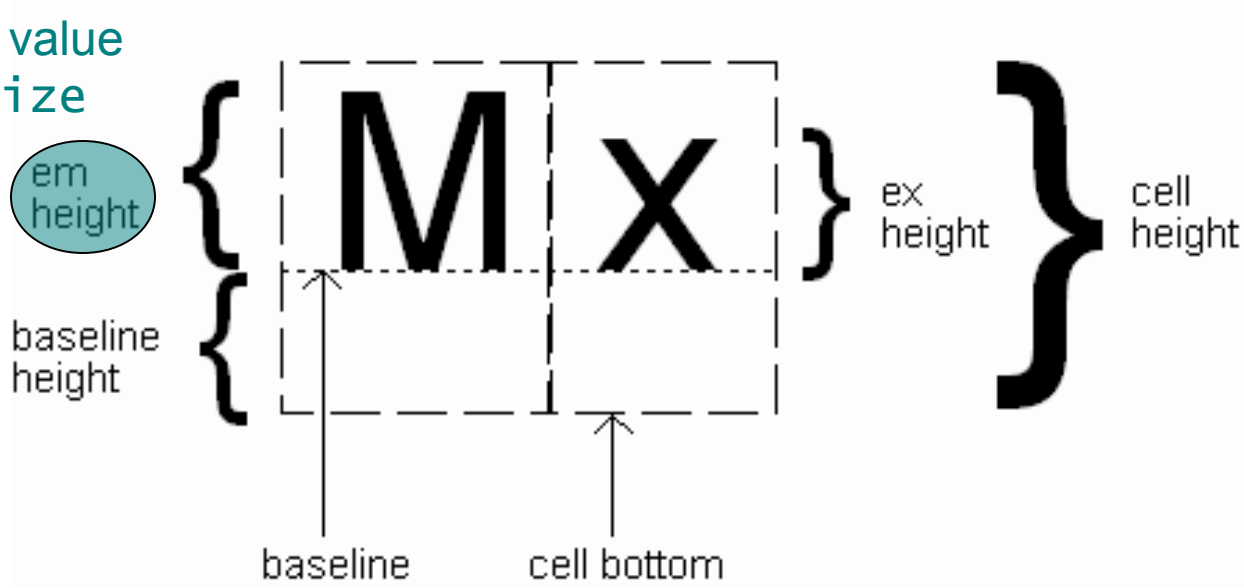
- Many properties, such as `font-size`, have a value that is a CSS length
- All CSS length values except 0 need units

TABLE 3.4: CSS length unit identifiers.

Identifier	Meaning
`in`	inches
`cm`	centimeters
`mm`	millimeters
`pt`	points: 1/72-inch
`pc`	picas: 12 points
`px`	pixel: typically 1/96-inch (see text).
`em`	1em is roughly the height of a capital letter in the reference font (see text).
`ex`	`1ex` is roughly the height of the lowercase 'x' character in the reference font (see text).

CSS Font Properties

Computed value of `font-size` property



CSS Font Properties

- Reference font defines em and ex units
  - Normally, reference font is the font of the element being styled
  - Exception: Using em/ex to specify value for `font-size`

```
<div id="d1" style="font-size:12pt">
  <div id="d2" style="font-size:2em">
```

parent element's font is reference font

CSS Font Properties

- Other ways to specify value for `font-size`:
  - Percentage (of parent `font-size`)

```
font-size:85%
```

  - Absolute size keyword: `xx-small`, `x-small`, `small`, `medium` (initial value), `large`, `x-large`, `xx-large`
    - User agent specific; should differ by ~ 20%
  - Relative size keyword: `smaller`, `larger`
    - Relative to parent element's font

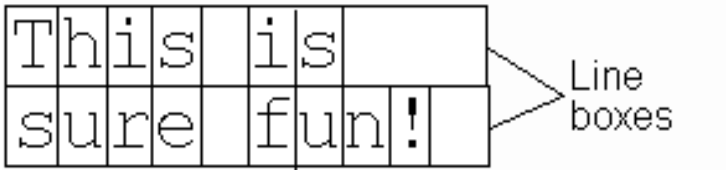
CSS Font Properties

TABLE 3.5: Additional font style properties.

Property	Possible values
`font-style`	`normal` (initial value), `italic` (more cursive than normal), or `oblique` (more slanted than normal).
`font-weight`	`bold` or `normal` (initial value) are standard values, although other values can be used with font families having multiple gradations of boldness (see CSS2 [W3C-CSS-2.0] for details).
`font-variant`	`small-caps`, which displays lowercase characters using uppercase glyphs (small uppercase glyphs if possible), or `normal` (initial value)

CSS Font Properties

- Text is rendered using line boxes



- Height of line box given by `line-height`
  - Initial value: `normal` (*i.e.*, cell height; relationship with em height is font-specific)
  - Other values (following are equivalent):

```
line-height:1.5em
line-height:150%
line-height:1.5
```

CSS Font Properties

- `font` shortcut property:

```
{ font: italic bold 12pt "Helvetica",sans-serif }
```

```
{ font-style: italic;
  font-variant: normal;
  font-weight: bold;
  font-size: 12pt;
  line-height: normal;
  font-family: "Helvetica",sans-serif }
```

Initial values used if no value specified in `font` property list

CSS Text Formatting

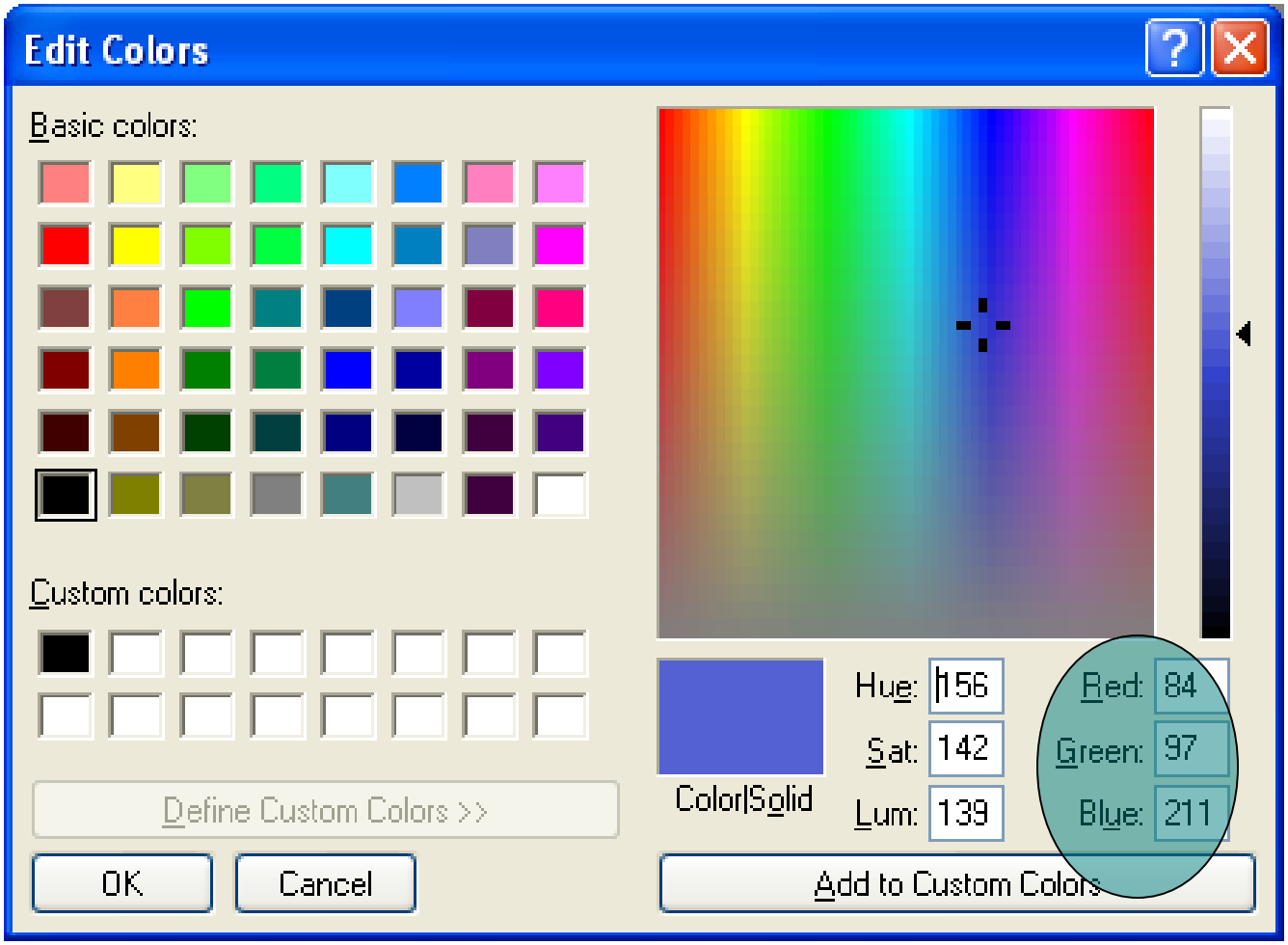
TABLE 3.6: Primary CSS text properties.

Property	Values
`text-decoration`	`none` (initial value), `underline`, `overline`, `line-through`, or space-separated list of values other than `none`.
`letter-spacing`	`normal` (initial value) or a length representing additional space to be included between adjacent letters in words. Negative value indicates space to be removed.
`word-spacing`	`normal` (initial value) or a length representing additional space to be included between adjacent words. Negative value indicates space to be removed.
`text-transform`	`none` (initial value), `capitalize` (capitalizes first letter of each word), `uppercase` (converts all text to uppercase), `lowercase` (converts all text to lowercase).
`text-indent`	length (initial value 0) or percentage of box width, possibly negative. Specify for block elements and table cells to indent text within first line box.
`text-align`	`left` (initial value for left-to-right contexts), `right`, `center`, or `justified`. Specify for block elements and table cells.
`white-space`	`normal` (initial value), `pre`. Use to indicate whether or not white space should be retained.

CSS Text Color

- Font color specified by `color` property
- Two primary ways of specifying colors:
  - Color name: black, gray, silver, white, red, lime, blue, yellow, aqua, fuchsia, maroon, green, navy, olive, teal, purple, full list at http://www.w3.org/TR/SVG11/types.html#Colo
  - red/green/blue (RGB) values

CSS Text Color



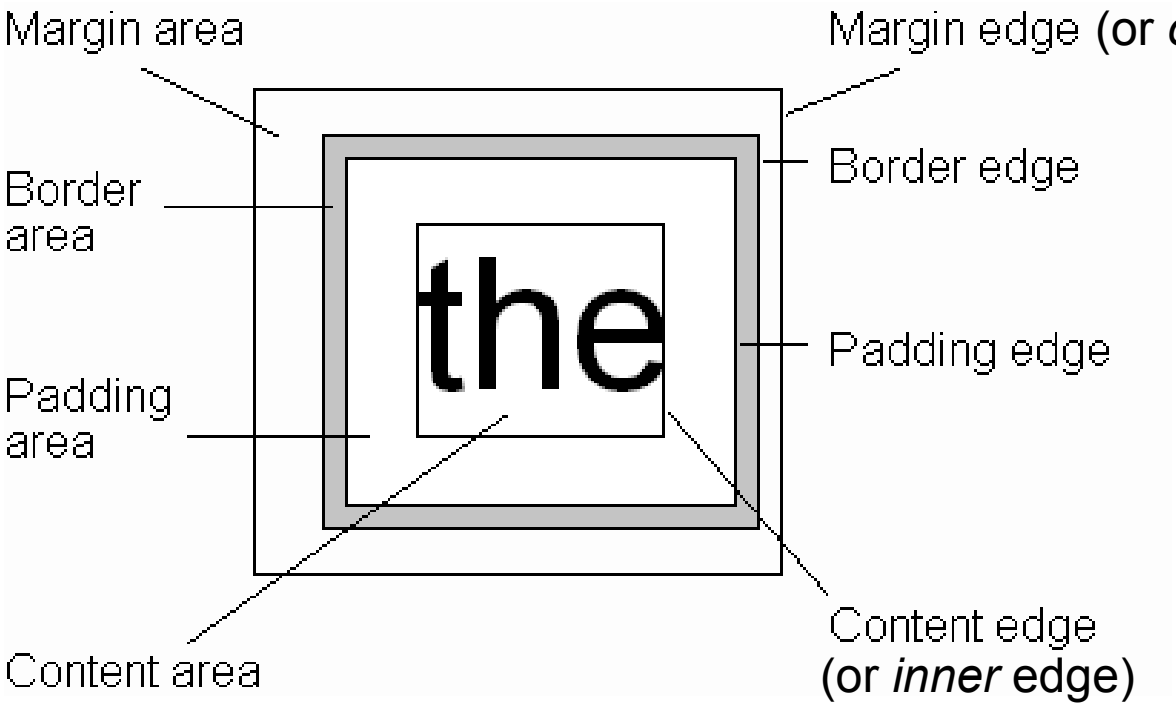
CSS Text Color

TABLE 3.7: Alternative formats for specifying numeric color values.

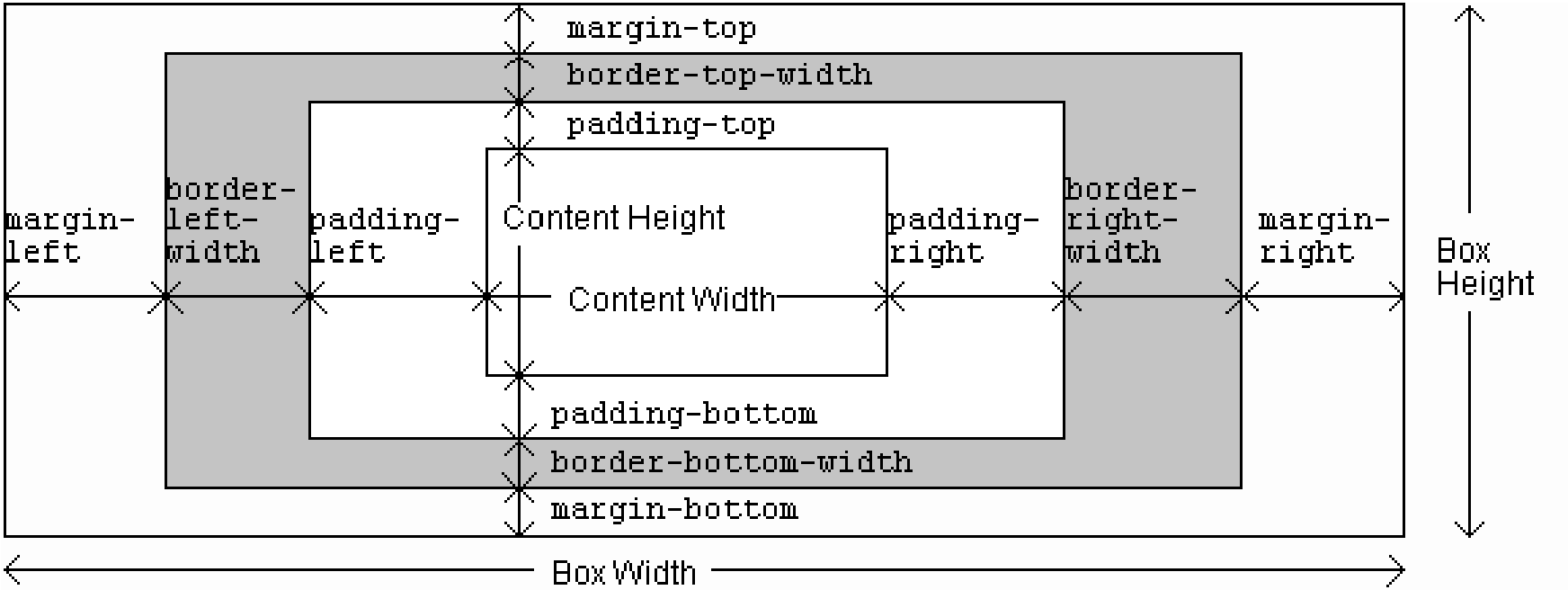
Format	Example	Meaning
Functional, integer arguments	`rgb(255,170,0)`	Use arguments as RGB values.
Functional, percentage arguments	`rgb(100%,66.7%,0%)`	Multiply arguments by 255 and round to obtain RGB values (at most one decimal place allowed in arguments).
Hexadecimal	`#ffaa00`	The first pair of hexadecimal digits represents the red intensity, second and third represent green and blue, respectively.
Abbreviated hexadecimal	`#fa0`	Duplicate the first hexadecimal digit to obtain red intensity, duplicate second and third to obtain green and blue, respectively.

CSS Box Model

- Every rendered element occupies a box:

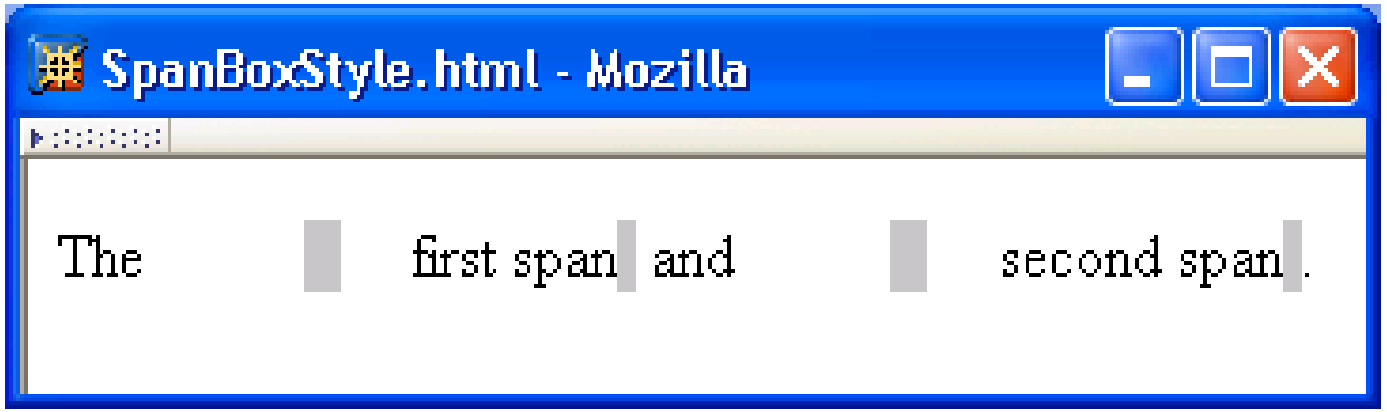


CSS Box Model



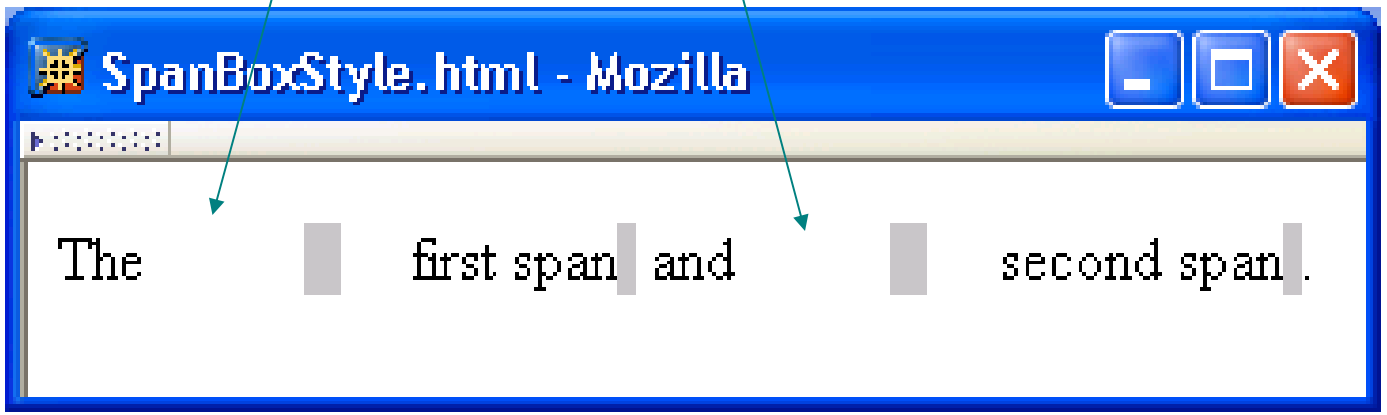
CSS Box Model

```
span { margin-left: 1cm;
       border-left-width: 10px;
       border-left-color: silver;
       border-left-style: solid;
       padding-left: 0.5cm;
       border-right-width: 5px;
       border-right-color: silver;
       border-right-style: solid }
```



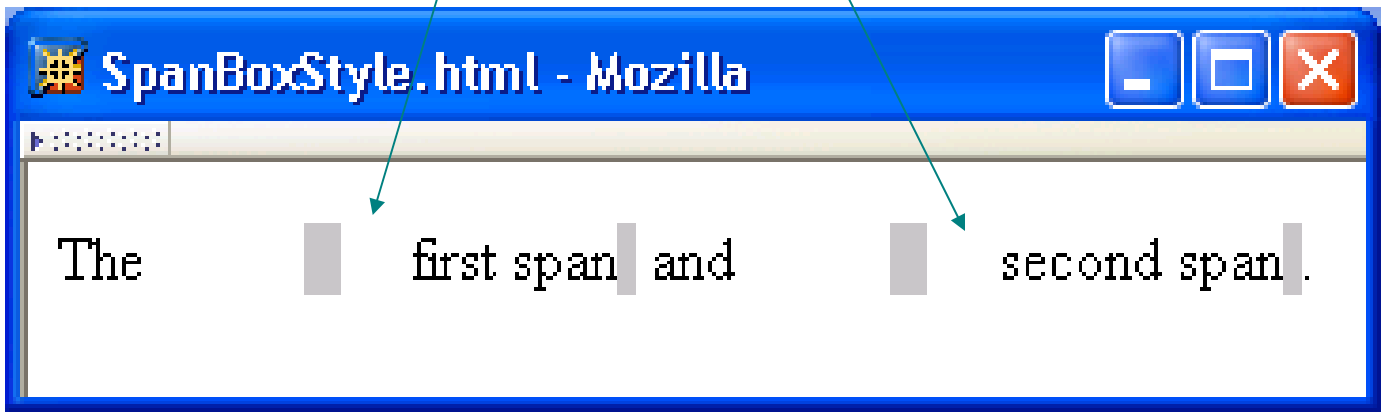
CSS Box Model

```
span { margin-left: 1cm;
       border-left-width: 10px;
       border-left-color: silver;
       border-left-style: solid;
       padding-left: 0.5cm;
       border-right-width: 5px;
       border-right-color: silver;
       border-right-style: solid }
```



CSS Box Model

```
span { margin-left: 1cm;
       border-left-width: 10px;
       border-left-color: silver;
       border-left-style: solid;
       padding-left: 0.5cm;
       border-right-width: 5px;
       border-right-color: silver;
       border-right-style: solid }
```



CSS Box Model

TABLE 3.9: Basic CSS style properties associated with the box model.

Property	Values
`padding-{top,right,bottom,left}`	CSS length (Sec. 3.6.2).
`padding`	One to four length values (see text).

TABLE 3.10: Meaning of values for certain shorthand properties that take one to four values.

Number of values	Meaning
One	Assign this value to all four associated properties (`top`, `right`, `bottom`, and `left`).
Two	Assign first value to associated `top` and `bottom` properties, second value to associated `right` and `left` properties.
Three	Assign first value to associated `top` property, second value to `right` and `left`, and third value to `bottom`.
Four	Assign first value to associated `top` property, second to `right`, third to `bottom`, and fourth to `left`.

CSS Box Model

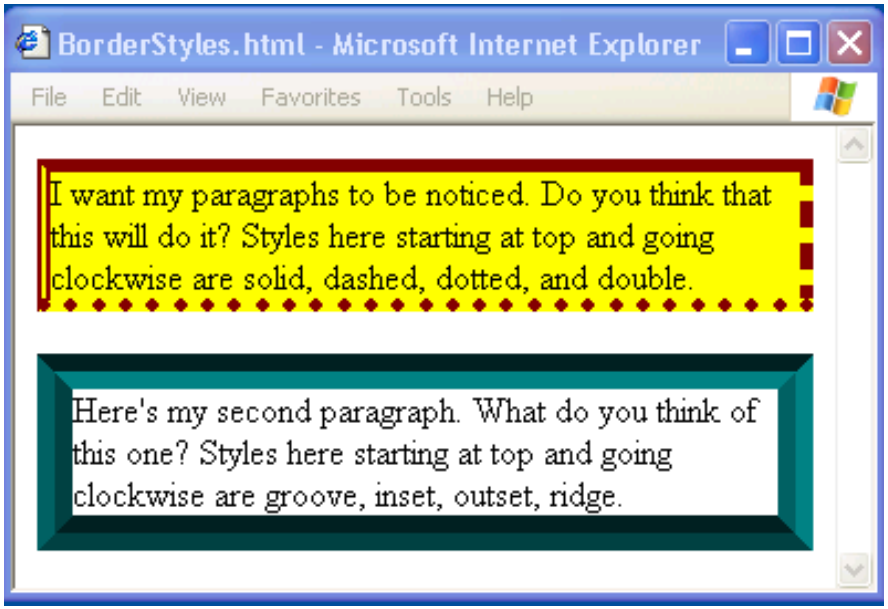
TABLE 3.9: Basic CSS style properties associated with the box model.

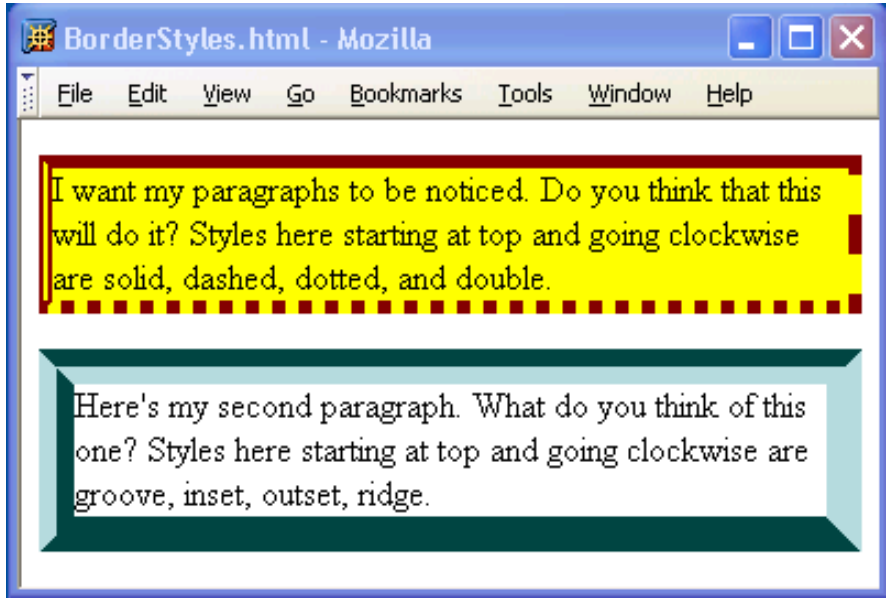
`border-{top,right,bottom,left}-width`	`thin`, `medium` (initial value), `thick`, or a length.
`border-width`	One to four `border-*-width` values.
`border-{top,right,bottom,left}-color`	Color value. Initial value is value of element's `color` property.
`border-color`	`transparent` or one to four `border-*-color` values.

CSS Box Model

TABLE 3.9: Basic CSS style properties associated with the box model.

`border-{top,right,bottom,left}-style`	`none` (initial value), `hidden`, `dotted`, `dashed`, `solid`, `double`, `groove`, `ridge`, `inset`, `outset`.
`border-style`	One to four `border-*-style` values.





CSS Box Model

TABLE 3.9: Basic CSS style properties associated with the box model.

`border-{top,right,bottom,left}`	One to three values (in any order) for `border-*-width`, `border-*-color`, and `border-*-style`. Initial values are used for any unspecified values.
`border`	One to three values; equivalent to specifying given values for each of `border-top`, `border-right`, `border-bottom`, and `border-left`.
`margin-{top,right,bottom,left}`	`auto` (see text) or length.
`margin`	One to four `margin-*` values.

CSS Box Model

- If multiple declarations apply to a property, the last declaration overrides earlier specifications

```
{ border: 15px solid;
  border-left: 30px inset red;
  color: blue }
```

Left border is 30px wide, inset style, and red

Backgrounds

- `background-color`
  - Specifies background color for content, padding, and border areas
  - Margin area is always transparent
  - Not inherited; initial value `transparent`
- `background-image`
  - Specifies (using `url()` function) image that will be tiled over an element

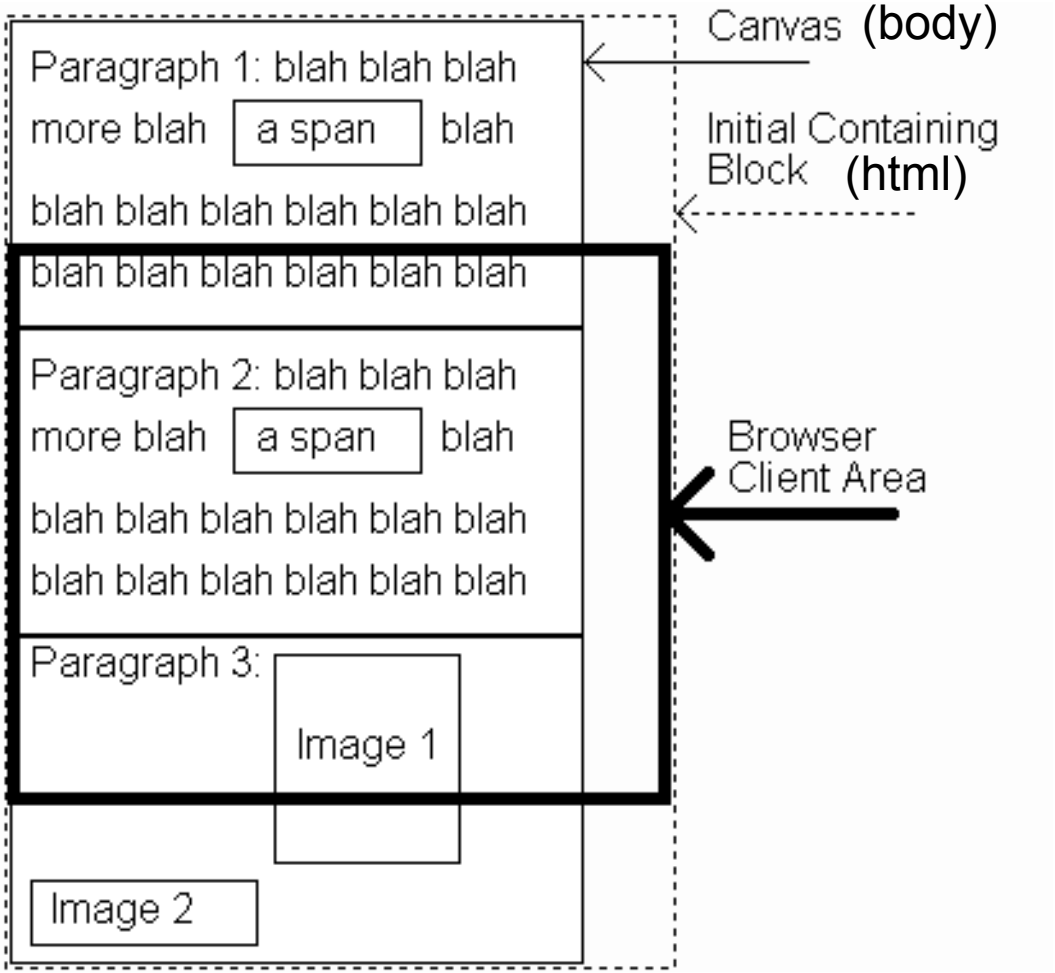
Backgrounds

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

Normal Flow Layout

- In normal flow processing, each displayed element has a corresponding box
  - html element box is called initial containing block and corresponds to entire document
  - Boxes of child elements are contained in boxes of parent
  - Sibling block elements are laid out one on top of the other
  - Sibling inline elements are one after the other

Normal Flow Layout



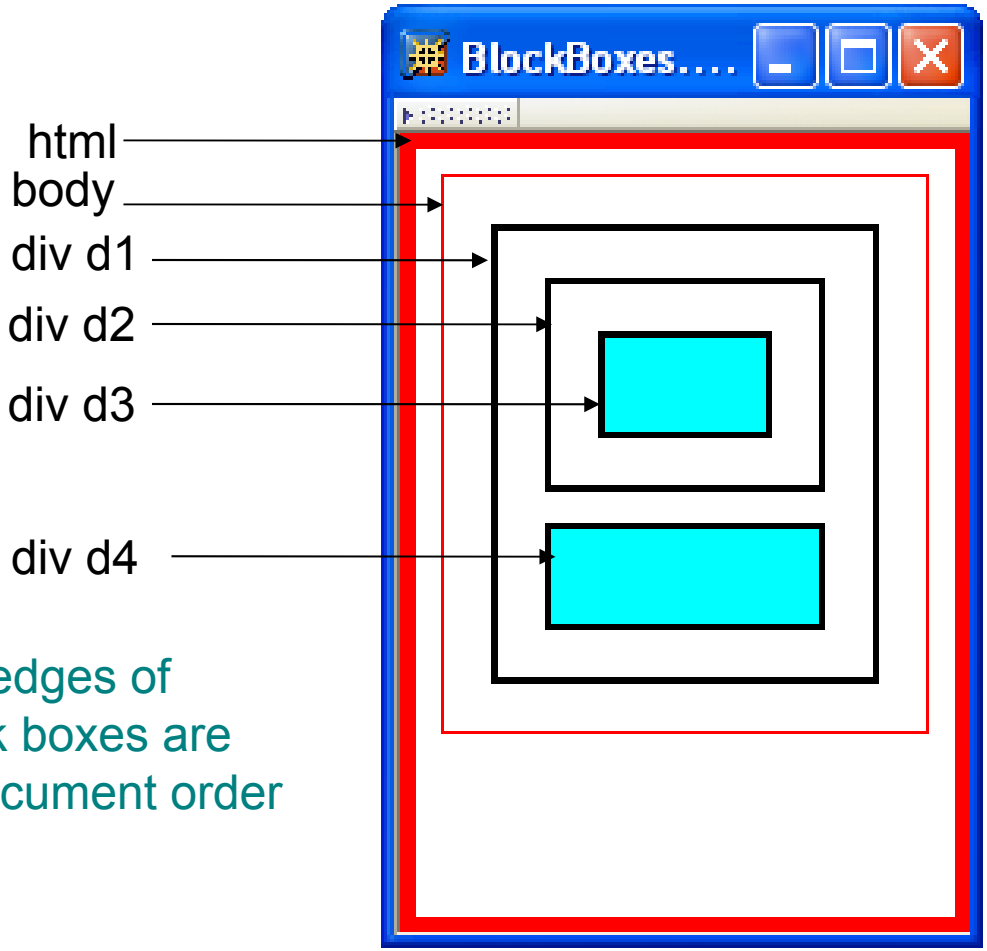
Normal Flow Layout

```
html, body { border:solid red thin }
html { border-width:thick }
body { padding:15px }
div { margin:0px; padding:15px; border:solid black 2px }
.shade { background-color:aqua }
.topMargin { margin-top:10px }
```

```
<body>
  <div id="d1">
    <div id="d2">
      <div id="d3" class="shade"></div>
    </div>
    <div id="d4" class="shade topMargin"></div>
  </div>
</body>
```

Block elements only

Normal Flow Layout



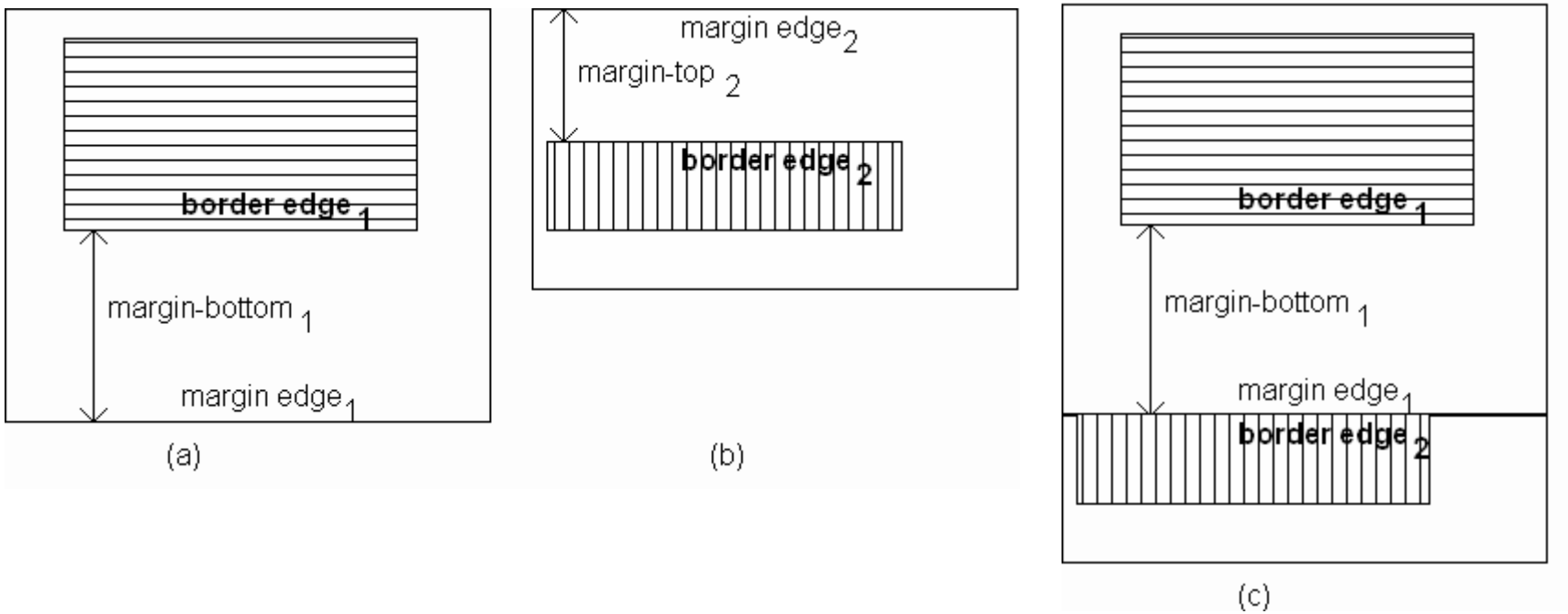
Top edges of block boxes are in document order

Normal Flow Layout

- What is a “block element”?
  - Element with value `block` specified for its `display` property
  - User agent style sheet (not CSS) specifies default values; typical block elements include `html`, `body`, `p`, `pre`, `div`, `form`, `ol`, `ul`, `dl`, `hr`, `h1` through `h6`
  - Most other elements except li and table-related have `inline` specified for `display`

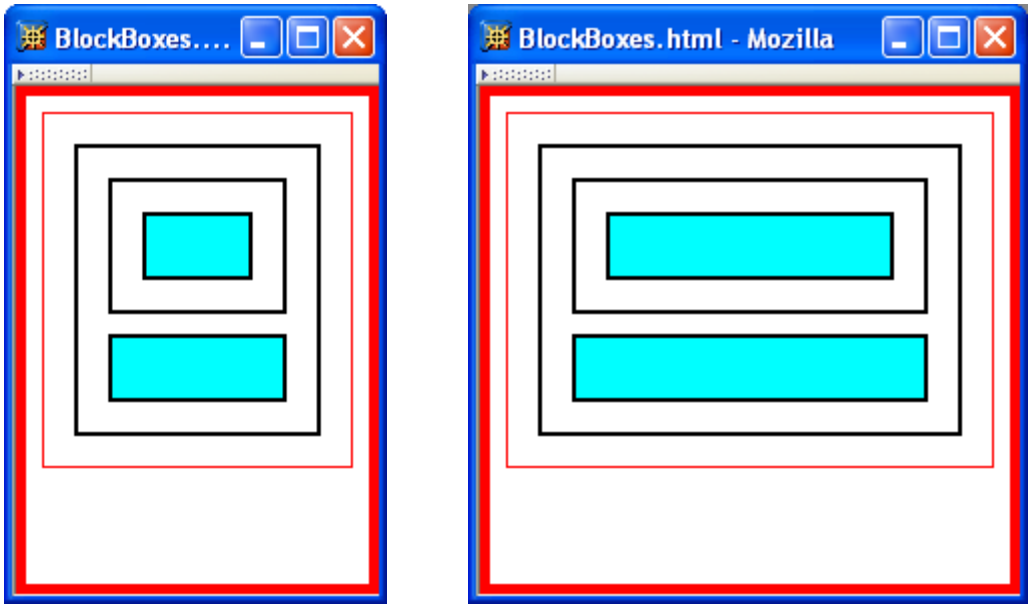
Normal Flow Layout

- When blocks stack, adjacent margins are collapsed to the size of the larger margin



Normal Flow Layout

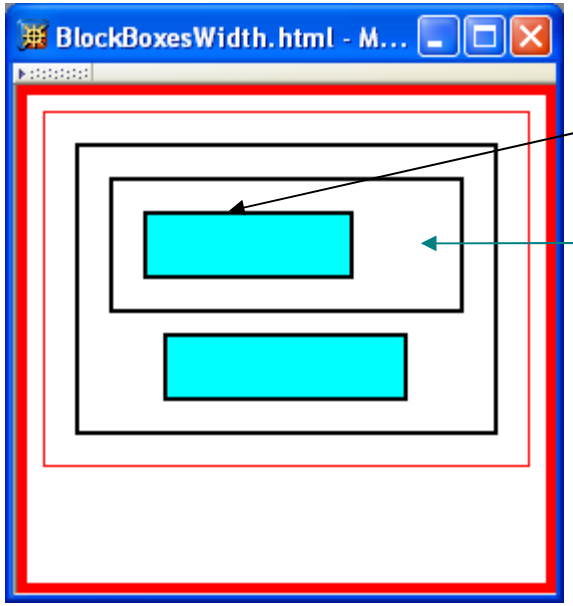
- Initial value of `width` property is `auto`, which for block boxes means to make the content area as wide as possible within margin/padding constraints:



Width of block boxes increases as browser client area is widened

Normal Flow Layout

- Can also specify CSS length or percentage (of parent's content width) for `width` property

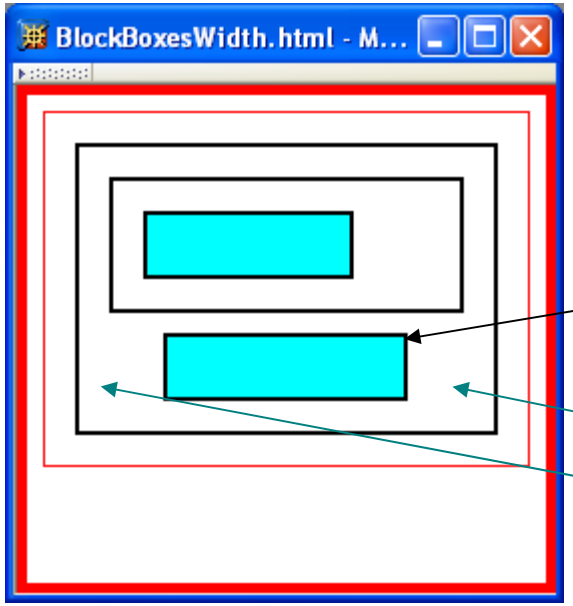



```
#d3 { width:50% }
```

By default, width of right margin is adjusted to accommodate a change to width

Normal Flow Layout

- Can also specify CSS length or percentage (of parent's content width) for `width` property

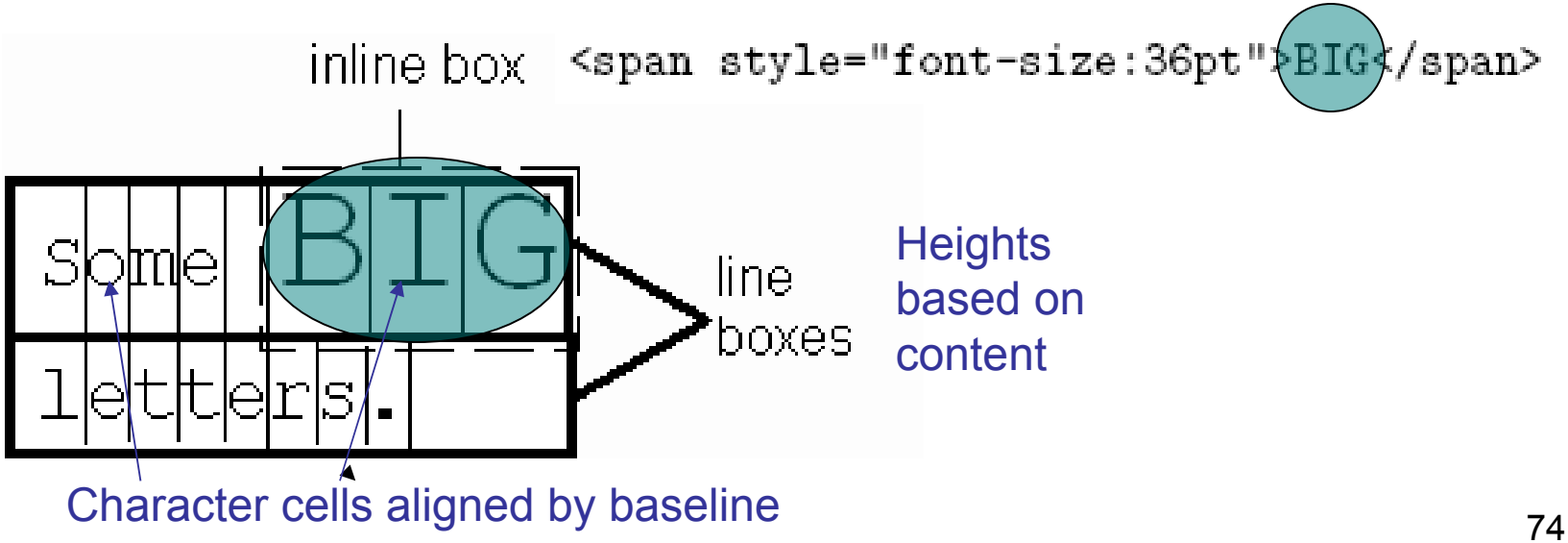



```
#d4 { width:50%; margin-left:auto; margin-right:auto }
```

Centering can be achieved by setting both margins to `auto`

Normal Flow Layout

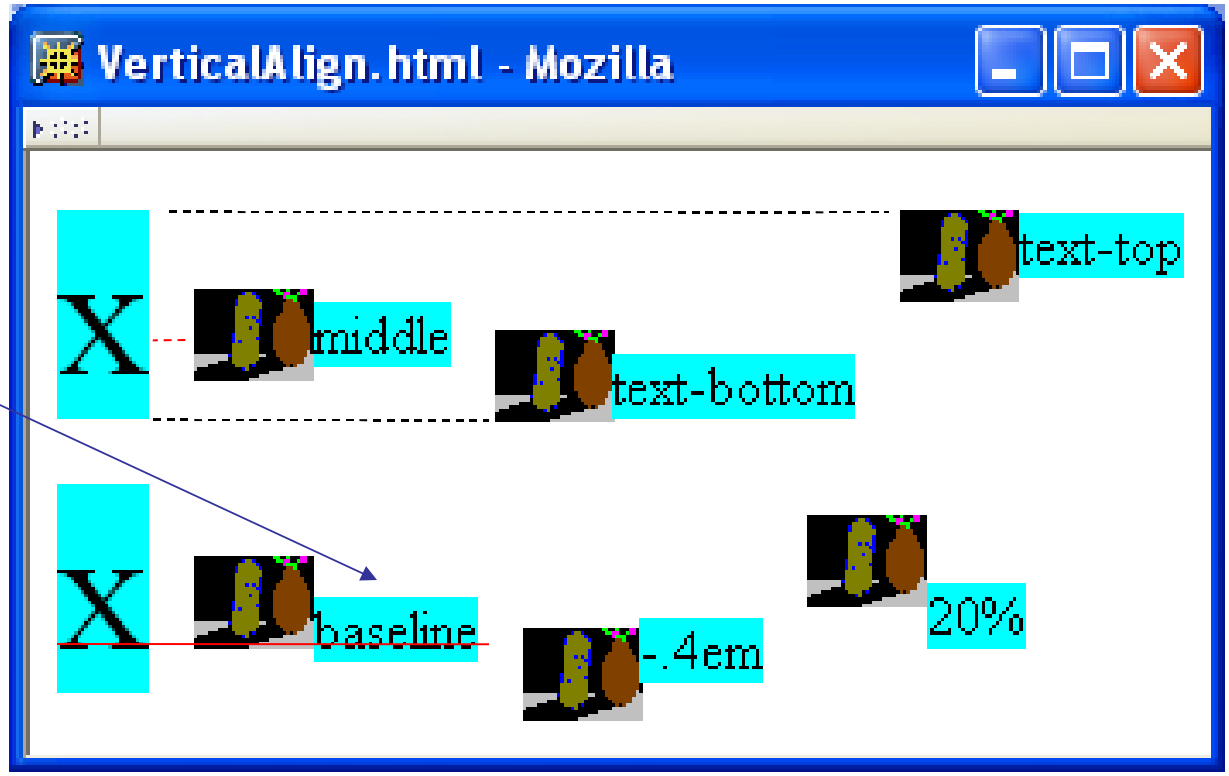
- Boxes corresponding to character cells and inline elements are laid out side by side in line boxes that are stacked one on top of the other



Normal Flow Layout

- Specify value for `vertical-align` to position an inline element within line box:

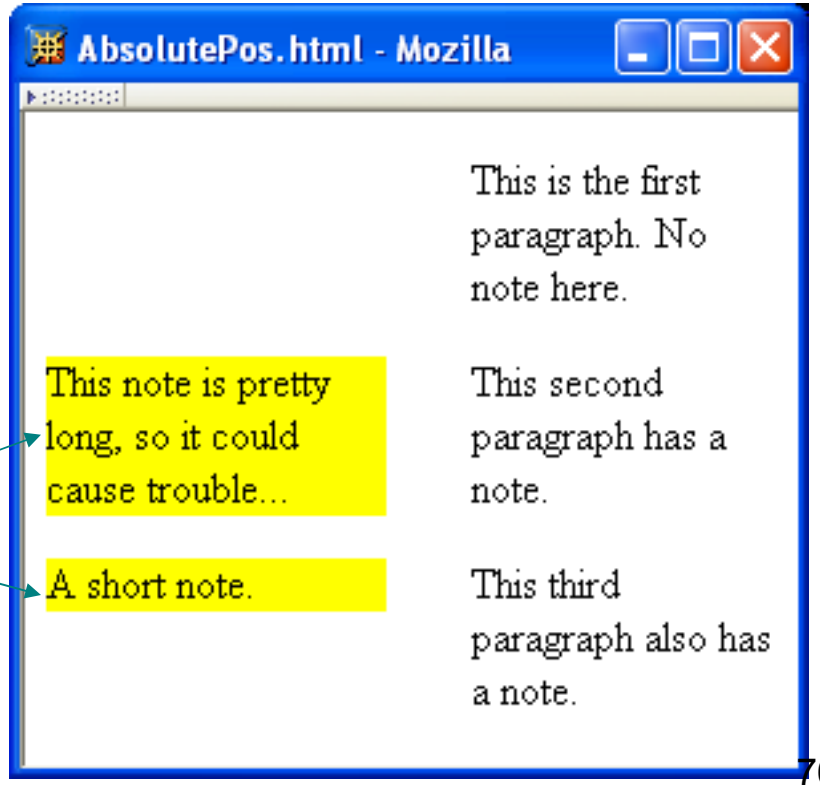
initial value of vertical-align



Beyond Normal Flow

- CSS allows for boxes to be positioned outside the normal flow:
  - Absolute positioning

span's removed from normal flow and positioned relative to another box



Assignment “Style sheets”

- See the assignment description
- Use book and W3C CSS 2.1 Recommendation as background

http://www.w3.org/TR/CSS21/