



NEW PERSPECTIVES

HTML5, CSS3, and JavaScript

6th Edition

Tutorial 6

Working with Tables and Columns

Objectives – 1/2

- Explore the structure of a web table
- Create table heading and data cells
- Apply CSS styles to a table
- Create cells that span multiple rows and columns
- Add a caption to a table

Objectives – 2/2

- Create row and column groups
- Apply styles to row and column groups
- Display page elements in table form
- Create a multi-column layout

Structure of a Web Table

The first table row is made up of all header cells.

The browser renders the web table with bold headers and spanning cells.

The two data cells span seven columns.

Time	Mon	Tue	Wed	Thu	Fri	Sat	Sun
6:00 PM	National News						
6:30 PM	World News						
7:00 PM	Opera Fest	Radio U	Science Week	The Living World	Word Play	Agri-Week	Folk Fest
7:30 PM					Brain Stew	Bismarck Forum	

These four data cells span two rows each.

The table caption is placed at the bottom-right corner of the table.

All Times Central

The `border-collapse` property determines which table borders are separated or collapsed into each other.

```
table.schedule {  
  background: white;  
  border: 10px outset rgb(153, 0, 153);  
  border-collapse: collapse;  
  font-size: 0.75em;  
  width: 100%;  
}
```

The `caption-side` property places the table caption at either the top or bottom of the web table.

```
table.schedule th, table.schedule td {  
  border: 1px solid gray;  
}  
  
table.schedule caption {  
  caption-side: bottom;  
  text-align: right;  
}
```

Introducing Web Tables

Web table

- HTML structure that consists of multiple table rows
- Each table row contains one or more table cells
- Effective tool for organizing and classifying web page content
- Consists of a ***table*** element

Marking Tables and Table Rows – 1/3

- A *table* element contains a collection of table rows marked using the *tr* (table row) element
- A table contains cells within each row
- Size of a table is defined by
 - number of table rows
 - number of cells within rows

Marking Tables and Table Rows – 2/3

- General structure of a web table:

```
<table>
  <tr>
    table cells
  </tr>
  <tr>
    table cells
  </tr>
  ...
</table>
```

Marking Tables and Table Rows – 3/3

Figure 6-2

Marking a table and table rows

```
<section id="main">
  
  <h2>DLR Nightly Schedule</h2>
  <p>DLR airs listener-supported public radio in Bismarck,
    North Dakota from 5:00 a.m. to 10:30 p.m.
    You can <a href="#">Listen Live</a> to streaming audio
    of our broadcast. Please refer below for our current
    nightly schedule.</p>
```

table element marks
the web table

```
<table class="schedule">
```

tr element marks
each table row

```
  <tr>
  </tr>
  <tr>
  </tr>
  <tr>
  </tr>
</table>
```

class attribute with a
value of "schedule"
sets this table in its
own class

```
</section>
```


Marking Table Headings and Table Data – 1/4

- Web tables support two types of table cells

- Header cells

- Contains content placed at the top of a column or beginning of a row
 - By default, displays text in bold and centers text horizontally
 - Marked using the ***th*** element

Marking Table Headings and Table Data – 2/4

- Data cells

- Contains content within columns or rows
- By default, displays text as unformatted text and is aligned to the left within the cell
- Marked using the ***td*** element

Marking Table Headings and Table Data – 3/4

Figure 6-3

Marking table header cells

the th element marks header cells placed in the first row to identify the content of each column

header cells at the start of each row identifies the row content

```
<table class="schedule">
  <tr>
    <th>Time</th>
    <th>Mon</th>
    <th>Tue</th>
    <th>Wed</th>
    <th>Thu</th>
    <th>Fri</th>
    <th>Sat</th>
    <th>Sun</th>
  </tr>
  <tr>
    <th>6:00 PM</th>
  </tr>
  <tr>
    <th>6:30 PM</th>
  </tr>
</table>
```

Marking Table Headings and Table Data – 4/4

Figure 6-4

Marking table data cells

the td element marks table cell content that is not considered the head of a row or column

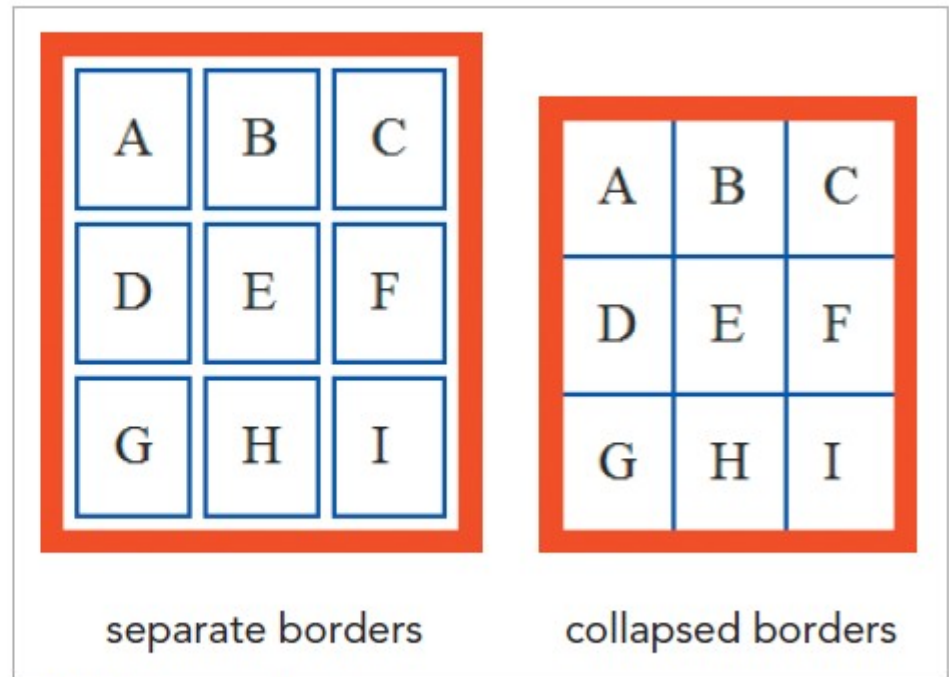
```
<tr>
  <th>6:00 PM</th>
  <td>National News</td>
  <td>National News</td>
  <td>National News</td>
  <td>National News</td>
  <td>National News</td>
  <td>National News</td>
  <td>National News</td>
</tr>
<tr>
  <th>6:30 PM</th>
  <td>World News</td>
  <td>World News</td>
  <td>World News</td>
  <td>World News</td>
  <td>World News</td>
  <td>World News</td>
  <td>World News</td>
</tr>
</table>
```

Adding Table Borders with CSS – 1/7

- The CSS *border* property is used to add borders to any part of a web table
- Borders need not be of the same style
- Two style choices for borders
 - Separate borders
 - Collapsed borders

Adding Table Borders with CSS – 2/7

Figure 6-8 Separate and collapsed borders



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Adding Table Borders with CSS – 3/7

- To choose between separate or collapsed borders model apply the following property to the `table` element:

border-collapse: type;

where *type* is either ***separate*** or ***collapse***

- The separate borders model sets the spacing between borders using

border-spacing: value

where *value* is in CSS units of measure

Adding Table Borders with CSS – 4/7

- The collapsed borders model

- Borders from adjacent elements are merged together to form a single border
- Borders are joined to combine their features
- Combining adjacent borders with different widths, styles, or colors is complicated

Adding Table Borders with CSS – 5/7

- Five rules to reconcile the differences between adjacent borders

- If either border has a style of `hidden`, the collapsed border is hidden
- Border style of `none` is overridden by another border style
- The style of wider border takes priority over the narrower border if neither border is hidden

Adding Table Borders with CSS – 6/7

- Double borders have higher precedence followed by solid, dashed, ridge, outset, groove and inset
- If borders differ only in color, precedence is given to borders
- Precedence to borders in decreasing order
 - Borders around individual table cells
 - Borders for table rows
 - Borders for row groups
 - Borders for columns
 - Borders for column groups
 - Borders around the entire table

Adding Table Borders with CSS – 7/7

Figure 6-9 Reconciling hidden borders

in the separate borders model, the border around the table is hidden and the border around each cell is shown in blue

separate borders

A	B	C
D	E	F
G	H	I

```
table {border-style: hidden;
       border-collapse: separate;}
td    {border: 1px solid blue;}
```

collapsed borders

A	B	C
D	E	F
G	H	I

```
table {border-style: hidden;
       border-collapse: collapse;}
td    {border: 1px solid blue;}
```

in the collapsed borders model, the hidden border around the table takes precedence over the blue borders for individual cells

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Adding Table Borders with CSS – 8/8

Figure 6-6

Adding styles to the table and table cells

```
/* Table Styles */
table.schedule {
  background: white;
  border: 10px outset rgb(153, 0, 153);
  font-size: 0.75em;
  width: 100%;
}

/* Table Cell Styles */
table.schedule th, table.schedule td {
  border: 1px solid gray;
}
```

sets the table background to white

adds a 10-pixel purple outset border around the entire table

sets the table width to 100% of its parent element

sets the table font size to 0.75em

adds a 1-pixel solid gray border to every table cell

Figure 6-7

Program schedule with borders

DLR Nightly Schedule

DLR airs listener-supported public radio in Bismarck, North Dakota from 5:00 a.m. to 10:30 p.m. You can [Listen Live](#) to streaming audio of our broadcast. Please refer below for our current nightly schedule.

Time	Mon	Tue	Wed	Thu	Fri	Sat	Sun
6:00 PM	National News	National News	National News	National News	National News	National News	National News
6:30 PM	World News	World News	World News	World News	World News	World News	World News

border around the entire table

borders around table cells

Adding Table Borders with CSS – 9/9

Figure 6-11 Setting the border collapse style

sets the borders within the table to collapse into one another

```
table.schedule {  
    background: white;  
    border: 10px outset rgb(153, 0, 153);  
    border-collapse: collapse;  
    font-size: 0.75em;  
    width: 100%;  
}
```

Figure 6-12 Program schedule with collapsed borders

spacing between the borders has been removed

DLR Nightly Schedule

DLR airs listener-supported public radio in Bismarck, North Dakota from 5:00 a.m. to 10:30 p.m. You can [Listen Live](#) to streaming audio of our broadcast. Please refer below for our current nightly schedule.

Time	Mon	Tue	Wed	Thu	Fri	Sat	Sun
6:00 PM	National News	National News	National News	National News	National News	National News	National News
6:30 PM	World News	World News	World News	World News	World News	World News	World News

Spanning Rows and Columns - 1/4

- Spanning cells

- Single cell that occupies more than one cell row and/or column
- Created by adding `rowspan` and/or `colspan` attributes to `td` or `th` elements
- Spanning starts in the cell with `rowspan` or `colspan` attributes and covers the cells in the right and below the initial cell

Spanning Rows and Columns - 2/4

- `rowspan="rows"`

where *rows* is the number of rows that the cell occupies

- `colspan="cols"`

where *cols* is the number of columns that the cell occupies

Spanning Rows and Columns - 3/4

Figure 6-13 Spanning several columns with a single cell

```
<table class="schedule">
  <tr>
    <th>Time</th>
    <th>Mon</th>
    <th>Tue</th>
    <th>Wed</th>
    <th>Thu</th>
    <th>Fri</th>
    <th>Sat</th>
    <th>Sun</th>
  </tr>
  <tr>
    <th>6:00 PM</th>
    <td colspan="7">National News</td>
  </tr>
  <tr>
    <th>6:30 PM</th>
    <td colspan="7">World News</td>
  </tr>
</table>
```

remaining six td elements removed from the second and third rows to keep the size at 8 total columns

sets each cell to span 7 columns within its row

Figure 6-14 Column-spanning cells

the second cell in both rows 2 and 3 spans seven columns

DLR Nightly Schedule							
DLR airs listener-supported public radio in Bismarck, North Dakota from 5:00 a.m. to 10:30 p.m. You can Listen Live to streaming audio of our broadcast. Please refer below for our current nightly schedule.							
Time	Mon	Tue	Wed	Thu	Fri	Sat	Sun
6:00 PM	National News						
6:30 PM	World News						

Spanning Rows and Columns - 4/4

Figure 6-15 Row-spanning cells

four table cells
in the first row

only three
table cells
are required
for the second
and third rows

```
<table>
  <tr>
    <td rowspan="3">1: This cell spans three rows</td>
    <td>2</td>
    <td>3</td>
    <td>4</td>
  </tr>
  <tr>
    <td>5</td>
    <td>6</td>
    <td>7</td>
  </tr>
  <tr>
    <td>8</td>
    <td>9</td>
    <td>10</td>
  </tr>
</table>
```

HTML code

1: This cell spans three rows	2	3	4
	5	6	7
	8	9	10

resulting table

Creating a Table Caption - 1/3

- Marked using the `caption` element

`<caption>content</caption>`

where *content* is the content contained within the caption

- Listed immediately after the `<table>` tag

- Only one caption is allowed per web table

- Inherits the text styles associated with the table

Creating a Table Caption - 2/3

- By default, captions are placed above the tables
- To specify the location, use the `caption-side` property

caption-side: position;

where *position* is either *top* or *bottom*

Creating a Table Caption - 3/3

Figure 6-20 Adding a caption to a web table

```
<table class="schedule">
  <caption>All Times Central</caption>
  <tr>
    <th>Time</th>
    <th>Mon</th>
    <th>Tue</th>
    <th>Wed</th>
    <th>Thu</th>
    <th>Fri</th>
    <th>Sat</th>
    <th>Sun</th>
  </tr>
```

Figure 6-21 Adding a caption to a web table

```
/* Table Caption Styles */
table.schedule caption {
  caption-side: bottom;
  text-align: right;
}
```

places the caption
at the bottom of
the table

right-aligns the
caption text

Rows and Column Groups

The `colgroup` element identifies groups of columns in the web table.

The `thead` element identifies the row(s) in the table header.

The `tfoot` element identifies the row(s) in the table footer.

The `tbody` element identifies the row(s) in the table body.

```
<table class="schedule">
  <caption>All Times Central</caption>
  <colgroup>
    <col id="firstCol" />
    <col class="dayCols" span="5" />
  </colgroup>
  <thead>
    <tr>
      <th>Time</th>
      <th>Mon</th>
      <th>Tue</th>
      <th>Wed</th>
      <th>Thu</th>
      <th>Fri</th>
    </tr>
  </thead>
  <tfoot>
    <tr>
      <td colspan="6">DLR ends its broadcast day at 10:30 p.m.</td>
    </tr>
  </tfoot>
  <tbody>
    <tr>
      <th>6:00 PM</th>
      <td colspan="5">National News</td>
    </tr>
    <tr>
      <th>6:30 PM</th>
      <td colspan="5">World News</td>
    </tr>
    <tr>
      <th>7:00 PM</th>
      <td rowspan="2">Opera Fest</td>
      <td rowspan="2">Radio U</td>
      <td rowspan="2">Science Week</td>
      <td rowspan="2">The Living World</td>
      <td>Word Play</td>
    </tr>
    <tr>
      <th>7:30 PM</th>
      <td>Brain Stew</td>
    </tr>
  </tbody>
</table>
```

Individual columns are identified with the `col` element.

Rows and Column Groups

The firstCol column lists the times.

The dayCols columns list the days of the week.

The table header consists of six columns.

Time	Mon	Tue	Wed	Thu	Fri
6:00 PM	National News				
6:30 PM	World News				
7:00 PM	Opera Fest	Radio U	Science Week	The Living World	Word Play
7:30 PM					Brain Stew
DLR ends its broadcast day at 10:30 p.m.					

The table footer text is left-aligned.

The table body includes rows and columns, some of which span multiple columns or multiple rows.

All Times Central

Rows and Column Groups

```
table.schedule thead {  
    background: rgb(153, 0, 153); color: white;  
}  
  
table.schedule tfoot {  
    background: black; color: white;  
}  
  
table.schedule thead tr {height: 30px;}  
table.schedule tbody tr {height: 40px;}  
  
col#firstCol {  
    background: rgb(218, 210, 218); width: 20%;  
}  
  
col.dayCols {  
    background: rgb(255, 220, 255); width: 16%;  
}
```

This style rule sets the background and text color of the table header.

This style rule sets the background and text color of the table footer.

This style rule sets the height of rows in the table header.

This style rule sets the height of rows in the table body.

This style rule defines the background color and width of the first table column.

This style rule defines the background color and width of the remaining table columns.

Creating Row Groups – 1/3

- Row groups contain specific table information
- Allows to create different styles for groups of rows
- HTML supports three row groups
 - Rows that belong to the table head
 - Marked using ***thead*** element
 - Rows that belong to the table footer
 - Marked using ***tfoot*** element
 - Rows that belong to the table body
 - Marked using ***tbody*** element

Creating Row Groups – 2/3

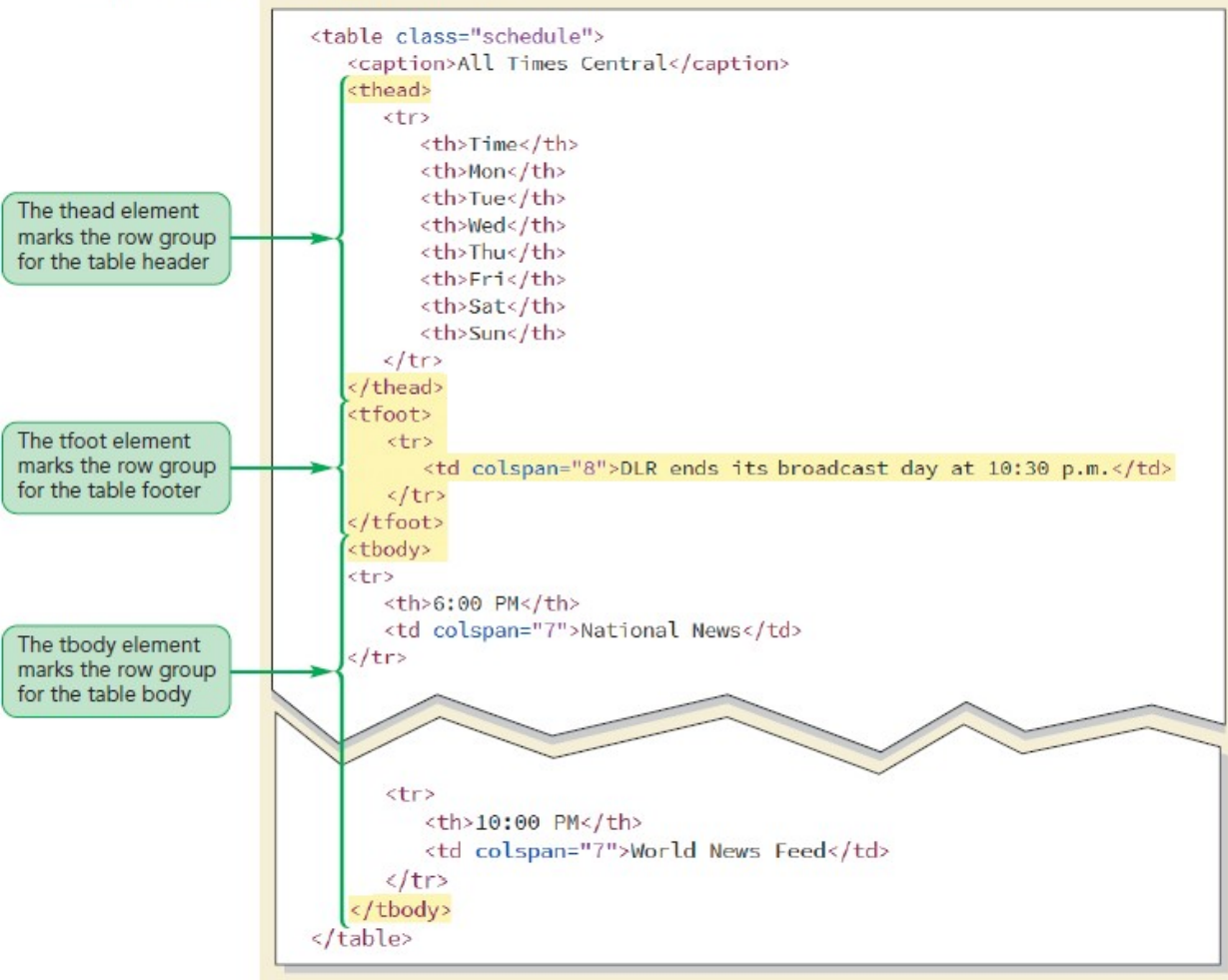
- The general structure of a web table divided into row groups

```
<table>  
  <thead>table rows</thead>  
  <tfoot>table rows</tfoot>  
  <tbody>table rows</tbody>  
</table>
```

- Only one `thead` and `tfoot` element is allowed per table

Creating Row Groups – 3/3

Figure 6-23 Marking row groups



Creating Column Groups – 1/4

- Columns are determined implicitly based on the number of cells within the table rows
- Columns are identified by the `col` element
- To identify individual columns, use the `id` and/or `class` attributes

Creating Column Groups – 2/4

- Columns can be referred using the following `colgroup` element:

```
<table>  
  <colgroup>  
    columns  
  </colgroup>  
  table rows  
</table>
```

where *columns* are the individual columns defined within the group

Creating Column Groups – 3/4

- Columns and column groups accept only CSS style properties to modify

- column borders
- background
- width
- visibility

Creating Column Groups – 4/4

Figure 6-26

Defining a column group

col element
references the
first column

col element
references the
next seven
columns

```
<table class="schedule">
  <caption>All Times Central</caption>
  <colgroup>
    <col id="firstCol" />
    <col class="dayCols" span="7" />
  </colgroup>
  <thead>
```

Figure 6-27

Formatting the table columns

displays the first
column with a
gray background

displays the day
columns with a
pink background

```
/* Column Group Styles */
```

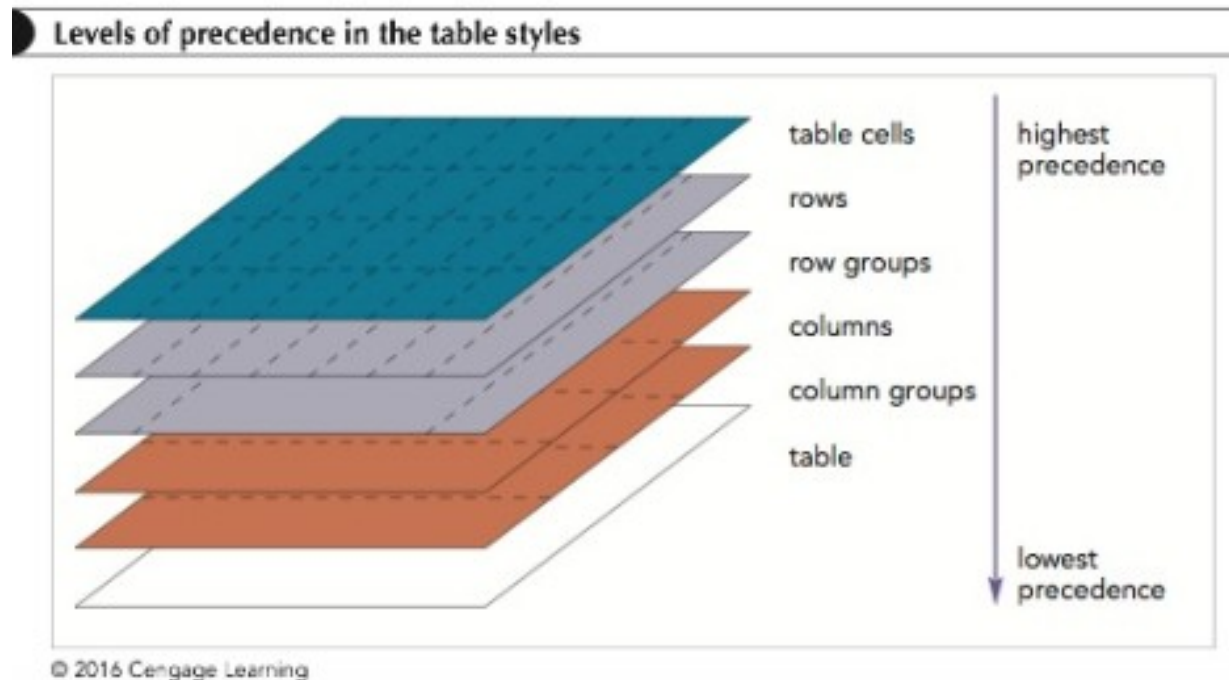
```
{col#firstCol {
  background: rgb(218, 210, 218);
}}
```

```
{col.dayCols {
  background: rgb(255, 220, 255);
}}
```

Exploring CSS Styles and Web Tables

Levels of precedence in the table styles in decreasing order

- Table cells
- Rows
- Row groups
- Columns
- Column groups
- Table



Working with Width and Height - 1/3

- By default, browsers attempt to fit more content in each column before wrapping the cell text
- Extra space is divided equally among columns if the width of a table is larger than its individual columns
- Column widths are set using the `width` property

Working with Width and Height - 2/3

- The height of each row is based on the height of the tallest cell
- A uniform row height is defined by applying the height style to table rows within each row group
- The `vertical-align` property is used to move the cell text

Working with Width and Height - 3/3

Figure 6-30 Setting the column width

sets the width of the first column to 16% of the width of the table

sets the width of the day columns to 12%

```
col#firstCol {  
    background: rgb(218, 210, 218);  
    width: 16%;  
}  
  
col.dayCols {  
    background: rgb(255, 220, 255);  
    width: 12%;  
}
```

Figure 6-31 Setting the row height

sets the height of the row in the table header to 30 pixels

sets the height of the rows in the table body to 40 pixels

```
table.schedule tfoot {  
    background: black;  
    color: white;  
}  
  
table.schedule thead tr {  
    height: 30px;  
}  
  
table.schedule tbody tr {  
    height: 40px;  
}
```

Applying Table Styles to Other Page Elements – 1/2

Apply a table layout to other HTML elements using the CSS `display` property

Figure 6-35 Table display styles

Display Style	Equivalent HTML Element
<code>display: table;</code>	table (treated as a block-level element)
<code>display: table-inline;</code>	table (treated as an inline element)
<code>display: table-row;</code>	tr
<code>display: table-row-group;</code>	tbody
<code>display: table-header-group;</code>	thead
<code>display: table-footer-group;</code>	tfoot
<code>display: table-column;</code>	col
<code>display: table-column-group;</code>	colgroup
<code>display: table-cell;</code>	td or th
<code>display: table-caption;</code>	caption

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Applying Table Styles to Other Page Elements – 2/2

Figure 6-36 Applying table styles to a definition list

```
<dl>
  <div>
    <dt>bandwidth</dt>
    <dd>A measure of data transfer speed over
      a network</dd>
  </div>
  <div>
    <dt>HTTP</dt>
    <dd>The protocol used to communicate with
      web servers</dd>
  </div>
</dl>
```

definition list code

bandwidth	A measure of data transfer speed over a network
HTTP	The protocol used to communicate with Web servers

definition list displayed as table

```
dl {
  display: table;
  border-collapse: collapse;
  width: 300px;
}
dl div {
  display: table-row;
}
dt, dd {
  display: table-cell;
  border: 1px solid black;
  vertical-align: top;
  padding: 5px;
}
```

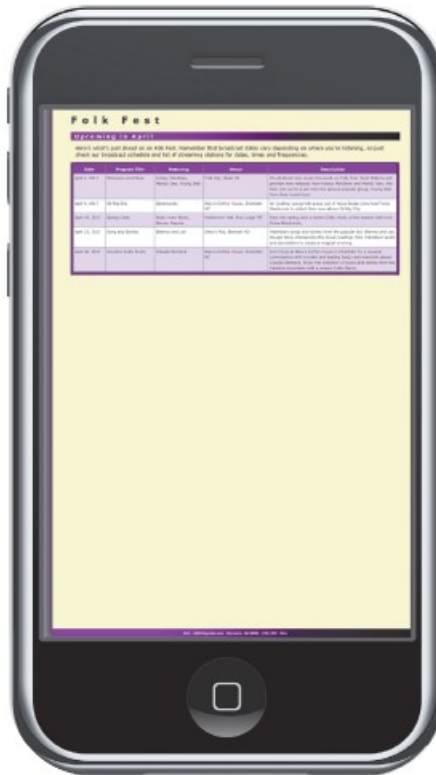
table styles

Tables and Responsive Design – 1/7

- Tables do not scale well to mobile devices
- Problems faced by users to view a table in a mobile device
 - Table is too small to read
 - Table does not fit the visual viewport
 - Table columns are too narrow to read the cell content

Tables and Responsive Design – 2/7

Figure 6-37 Web tables on mobile devices



complete table
is too small to
read

BenBois/openclipart



table is easier to read but
does not fit within the
viewport



table fits within the viewport
but columns are too narrow
to read comfortably

Tables and Responsive Design – 3/7

- A new layout of table data for mobile screens is required
- Several table columns are reduced to two:
 - One column containing all data labels
 - Second column containing data associated with each label

Tables and Responsive Design – 4/7

- To create a responsive web table, add the text of data labels as attributes of all `td` elements in the table body
- Store data labels using a **data attribute**
- General format of a data attribute is
`data-text="value"`
where *text* is the name of the data attribute
and *value* is its value

Tables and Responsive Design – 5/7

- Data attributes use names specific to the function it is used for
- For example, the following code uses a data attribute named `data-label` to store the text of the labels associated with the data cell:

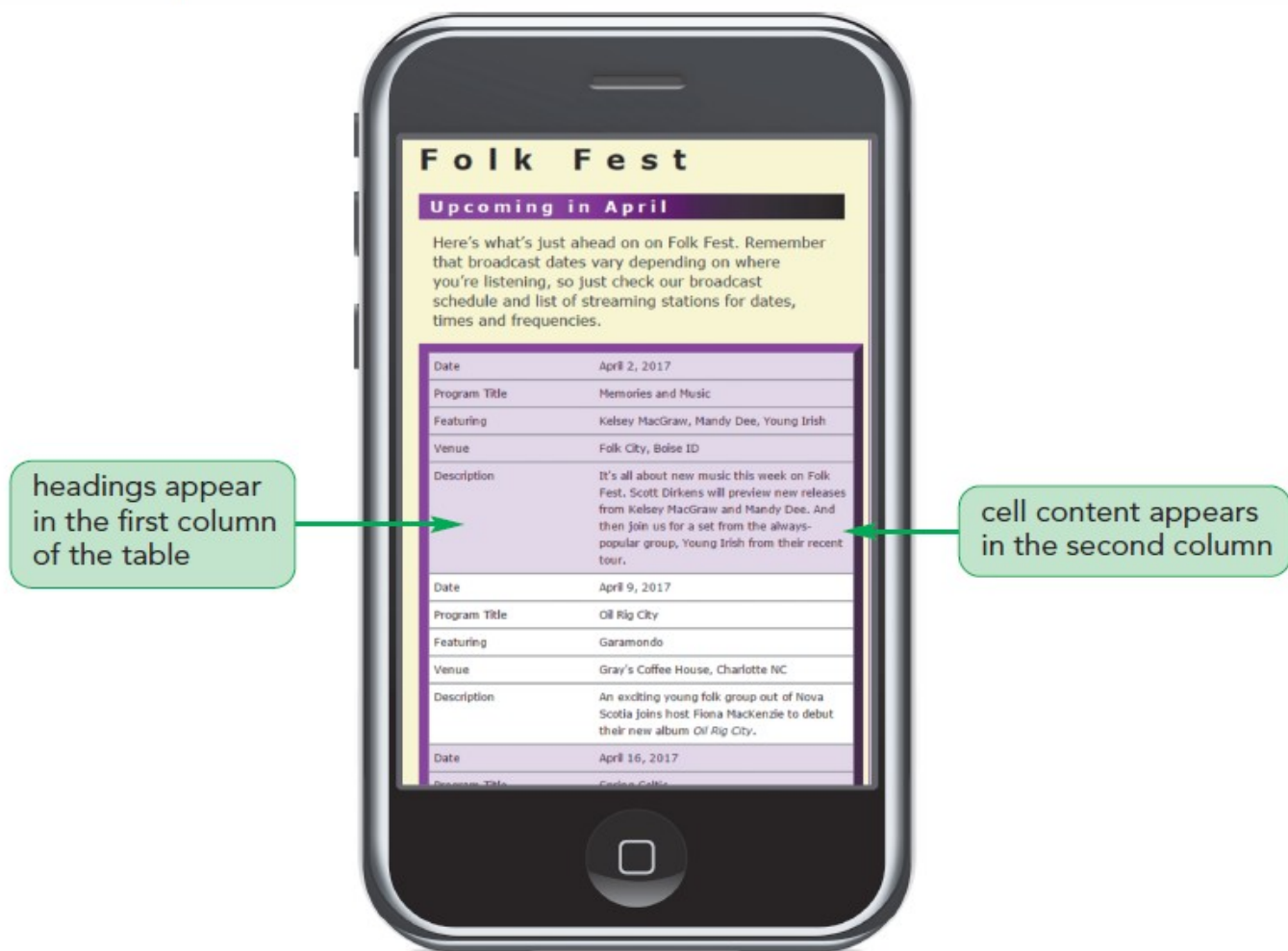
```
<td data-label="Date">April 2,  
2017</td>
```

Tables and Responsive Design – 6/7

- The result is a list of data cells that are aligned as block elements
- Within each block element, the data label is followed by the data cell content
- The goal is to transform table with multiple columns into two-column layout

Tables and Responsive Design – 7/7

Figure 6-38 Two-column layout for a mobile device



Designing a Column Layout

- Column layout enables display of content side-by-side in a page
- Layouts that use float elements or flexboxes differ from column layout
 - Single element can flow from one column to the next
 - Flow of content adjusts to match the page width

Setting the Number of Columns – 1/2

- Size of a column is set using the `column-count` property

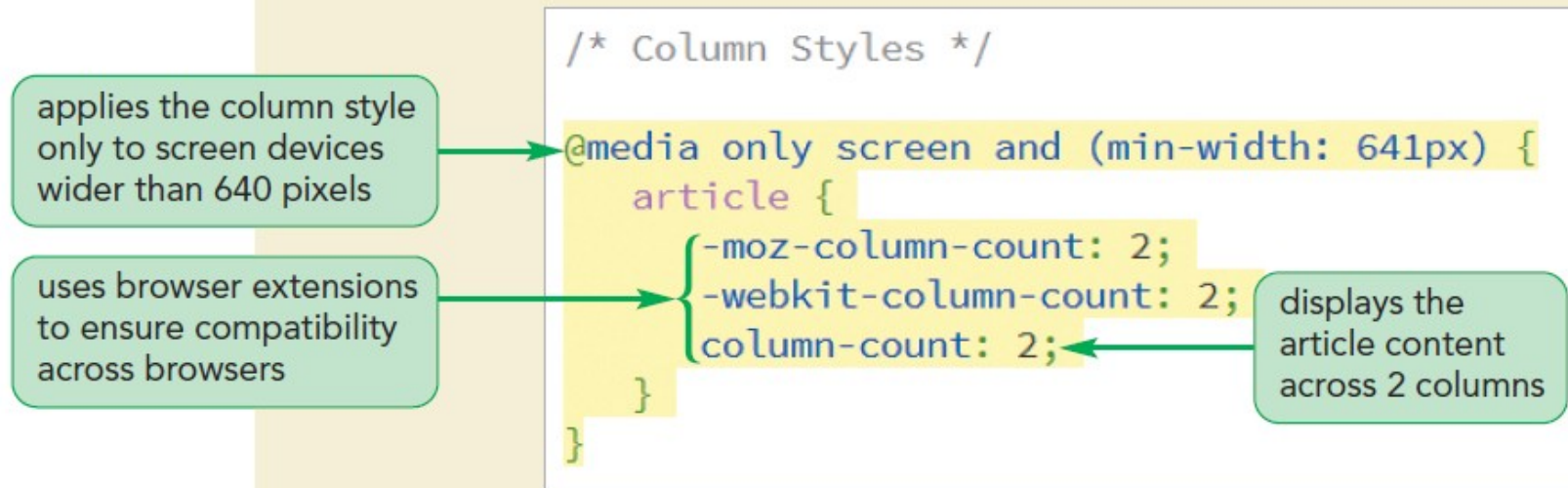
```
column-count: value;
```

where *value* is the number of columns in the layout

- Browser extensions are included to ensure cross-browser compatibility

Setting the Number of Columns – 2/2

Figure 6-40 Applying a 2-column layout to the article element



Setting the Number of Columns – 2/2

Article displayed across two columns



The Living World

April 14

Join host Tim Unger for this week's edition of *The Living World* where we discuss the future and economic impact of autonomous vehicles, otherwise known as driverless cars.

Rise of the Driverless Car and How It Will Impact You

Your world is about to change with widespread adoption of driverless cars. Driverless cars are autonomous vehicles that interact with their surroundings with radar, GPS, proximity sensors, and computer image enhancement. This information is fed into a control system that uses it to plot navigation paths and to respond to obstacles and road directions. A driverless car is capable of updating its status based on changing conditions. Driverless cars should be autonomous even when entering unfamiliar regions.

In the United States, the National Highway Traffic Safety Administration (NHTSA) has proposed the following levels of autonomy for motorized vehicles:

Level 0: The driver completely controls the vehicle at all times.

Level 1: Individual vehicle controls are automated, such as electronic stability control or automatic braking.

Level 2: At least two controls can be automated in unison, such as adaptive cruise control in combination with lane keeping.

Level 3: The driver can fully cede control of all safety-critical functions in certain conditions. The car senses when conditions require the driver to retake control and provides a "sufficiently comfortable transition time" for the driver to do so.

even

Experts predict that autonomous vehicles will gradually be introduced into the market with the following anticipated benchmarks:

2007: U.S. Department of Transportation hopes to publish a rule mandating vehicle-to-vehicle (V2V) communication by an unspecified future date.

2008: Tesla Motors expects to produce a version of fully self-driving cars, where the driver can fall asleep, though the actuality of marketing such a vehicle will depend on the economic and legal climate.

2010: GM, Mercedes-Benz, Audi, Nissan, BMW, Renault, Tesla, and Google all expect to sell vehicles that can drive themselves at least part of the time.

2014: Jaguar expects to release an autonomous car.

2015: Daimler and Ford expect to release autonomous vehicles on the market.

2015: IHS Automotive report says will be the year more self-driving vehicles will be operated completely independently from a human occupant's control.

2020: Experts at the Institute of Electrical and Electronics Engineers (IEEE) estimate that up to 75% of all vehicles will be autonomous.

Clearly, the introduction and widespread adoption of autonomous vehicles will have enormous repercussions.

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2-column layout

Defining Column Widths and Gaps – 1/4

- Columns are laid out evenly across the width of the parent element by default
- To set the column width, use the `column-width` property

```
column-width: size;
```

where *size* is the minimum width of the column

- Column width acts like the basis value for items in a flexbox

Defining Column Widths and Gaps – 2/4

- The `column-width` and `column-count` properties are combined to form shorthand `columns` property

```
columns: width count;
```

- The default gap between columns is 1em

- To set a different gap size, use the `column-gap` property

```
column-gap: size;
```

where *size* is the width of the gap

Defining Column Widths and Gaps – 3/4

- Another way to separate columns is with a graphic dividing line created using the `column-rule` property

```
column-rule: border;
```

where *border* defines the style of dividing line

- The `column-rule` property can be broken into individual properties like `column-rule-width`, `column-rule-style`, and `column-rule-color`

Defining Column Widths and Gaps – 4/4

Figure 6-43 Add a dividing line to the columns

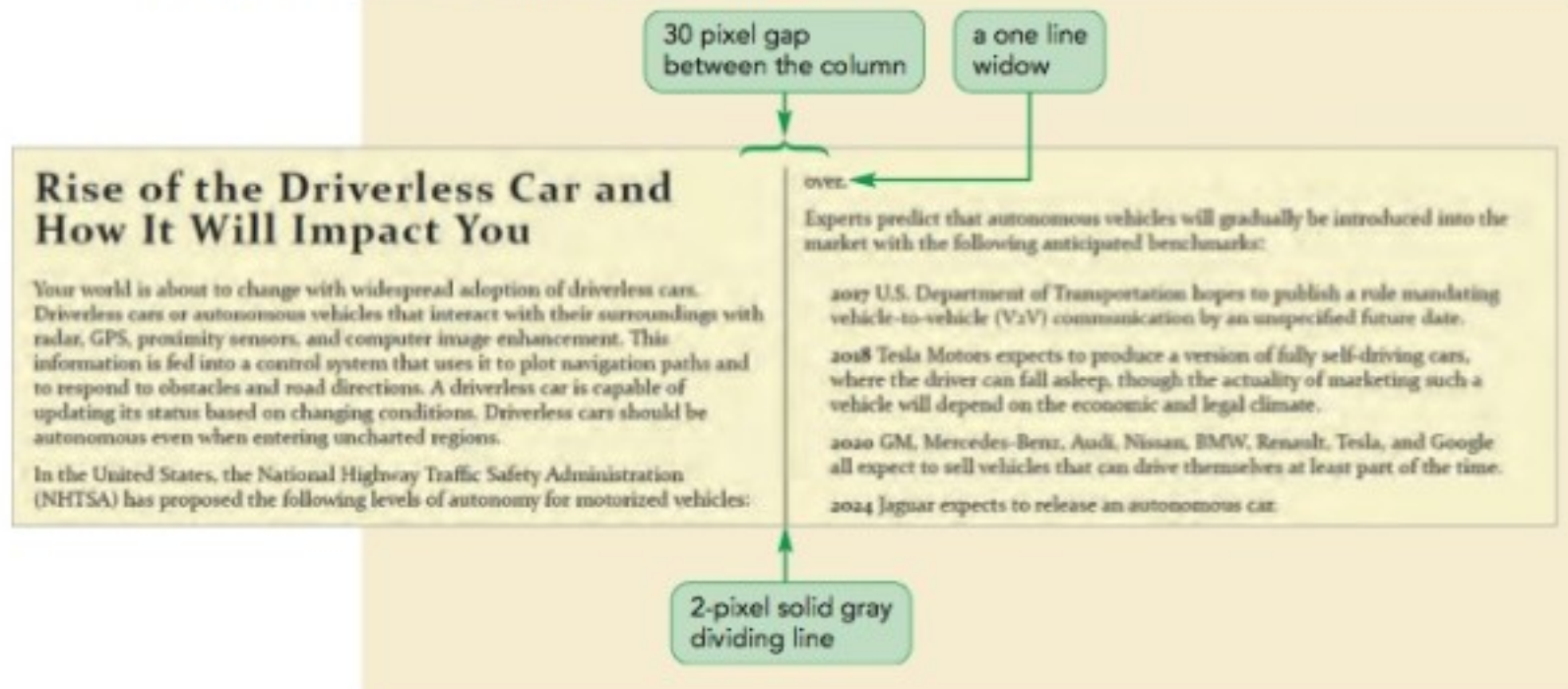
```
@media only screen and (min-width: 641px) {  
  article {  
    -moz-column-count: 2;  
    -webkit-column-count: 2;  
    column-count: 2;  
  
    -moz-column-gap: 30px;  
    -webkit-column-gap: 30px;  
    column-gap: 30px;  
  
    -moz-column-rule: 2px solid gray;  
    -webkit-column-rule: 2px solid gray;  
    column-rule: 2px solid gray;  
  }  
}
```

adds a 2 pixel solid
gray dividing line
between the columns

Defining Column Widths and Gaps – 4/4

Figure 6-44

Dividing line in the column layout



Managing Column Breaks – 1/4

- The size of column orphans is controlled using the `orphans` property

`orphans: value;`

where *value* is the minimum number of lines stranded before a column break

- The size of column widows is controlled using the `widows` property

`widows: value;`

where *value* is the minimum number of lines placed after a column break

Managing Column Breaks – 2/4

- Other properties to define column breaks

`break-before: type;`

`break-after: type;`

where *type* is one of the following:

- `auto` (browser automatically sets column break)
- `always` (to always place a column break)
- `avoid` (to avoid placing a column break)

Managing Column Breaks – 3/4

- To control placement of column breaks within an element, use the property

`break-inside: type;`

where *type* is either `auto` or `avoid`

Managing Column Breaks – 4/4

Figure 6-45 Defining widows and orphans around column breaks

keeps at least three lines together after the column break

keeps at least three lines together before the column break

```
-moz-column-rule: 2px solid gray;  
-webkit-column-rule: 2px solid gray;  
column-rule: 2px solid gray;
```

```
widows: 3;  
orphans: 3;  
}
```


Spanning Cell Columns – 1/2

- To span cell columns, use the `column-span` property

`column-span: span;`


where *span* is either `none` to prevent spanning or `all` to enable the content to span across all the columns

Spanning Cell Columns – 2/2

Figure 6-46

Creating a column-spanning heading

sets the heading so
that it extends across
all columns




```
widows: 3;  
orphans: 3;  
}  
  
article h1 {  
  -moz-column-span: all;  
  -webkit-column-span: all;  
  column-span: all;  
}  
}
```

Spanning Cell Columns – 2/2

Figure 6-47

Final column layout of the article

heading spans
the two columns
in the layout



The Living World

April 14

Join host Tim Unger for this week's edition of *The Living World* where we discuss the future and economic impact of autonomous vehicles, otherwise known as driverless cars.

Rise of the Driverless Car and How It Will Impact You

Your world is about to change with widespread adoption of driverless cars. Driverless cars or autonomous vehicles that interact with their surroundings with radar, GPS, proximity sensors, and computer image enhancements. This information is fed into a control system that uses it to plot navigation paths and to respond to obstacles and road directions. A driverless car is capable of updating its status based on changing conditions. Driverless cars should be autonomous even when entering uncharted regions.

In the United States, the National Highway Traffic Safety Administration (NHTSA) has proposed the following levels of autonomy for motorized vehicles:

- Level 0 The driver completely controls the vehicle at all times.
- Level 1 Individual vehicle controls are automated, such as electronic stability control or automatic braking.
- Level 2 At least two controls can be automated in unison, such as adaptive cruise control in combination with lane keeping.
- Level 3 The driver can fully cede control of all safety-critical functions in certain conditions. The car senses when conditions require the driver to retake control and provides a "sufficiently comfortable transition time" for the driver to do so.

Experts predict that autonomous vehicles will gradually be introduced into the market with the following anticipated benchmarks:

- 2017 U.S. Department of Transportation hopes to publish a rule mandating vehicle-to-vehicle (V2V) communication by an unspecified future date.
- 2018 Tesla Motors expects to produce a version of fully self-driving cars, where the driver can fall asleep, though the actuality of marketing such a vehicle will depend on the economic and legal climate.
- 2020 GM, Mercedes-Benz, Audi, Nissan, BMW, Renault, Tesla, and Google all expect to sell vehicles that can drive themselves at least part of the time.
- 2024 Jaguar expects to release an autonomous car.
- 2025 Daimler and Ford expect to release autonomous vehicles on the market.
- 2026 IEEE Automotive report says will be the year most self-driving vehicles will be operated completely independently from a human occupant's control.
- 2028 Experts at the Institute of Electrical and Electronics Engineers (IEEE) estimate that up to 75% of all vehicles will be autonomous.

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Trouble? At the time of this writing, the column-span property is not supported by the Firefox browser.