

2.1 HTML document structure

HTML (HyperText Markup Language) is a textual language for creating web pages. The HTML acronym highlights the three main characteristics of web pages:

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2.1.1: Understanding the HTML acronym.



Markup Language HyperText

Text that contains connections to other documents.

Part of a document that explains how to interpret or structure other parts of the document.

A set of rules describing how to write HTML.

Reset

HTML defines over 130 elements. An **element** is a single HTML structure. Elements are represented with HTML tags. An HTML **tag** is a markup instruction identified by <, a tag name, and a >. An **opening tag** indicates the starting point in the document where the tag takes effect. A **closing tag** indicates the ending point in the document where the tag stops having an effect. Ex: Hello causes Hello to appear in a strong weighted font; is the opening tag, is the closing tag, and everything from the opening tag to the closing tag is the element. While tag names can be uppercase or lowercase, good practice is to use lowercase letters for the tag names, as in Hello rather than Hello

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2.1.2: Valid HTML markup.



1) <p>This is a very short paragraph.</p>

- Valid
-

Invalid



2) <h1>This is a chapter heading

- Valid
- Invalid



3) <p>We changed the font in this paragraph.</p>

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- Valid
- Invalid



4) <p>Sentence one. Sentence two.</p>

- Valid
- Invalid



5) <P>A short paragraph.</P>

- Valid
- Invalid

A user on a desktop/laptop computer can instruct a browser to show a web page's HTML. A web search for "View web page HTML in Chrome" (or another browser) yields instructions, usually finding the browser menu option (like "View" then "Source"), or typing a shortcut like ctrl+u (pressing and holding the control button and then the u button). Most web pages use more advanced techniques than taught above, so the HTML can be hard to read.

Figure 2.1.1: HTML page source.

```

1 <!DOCTYPE HTML>
2 <html>
3 <meta charset='utf-8'>
4 <title>Example with &lt;br&gt;</title>
5 <body>
6 <section>
7 <h1>White House Address</h1>
8 <p>
9 White House<br>
10 1600 Pennsylvania Avenue Northwest<br>
11 Washington, DC 20500
12 </p>
13 </section>
14 </body>
15 </html>
16

```

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2.1.3: View source in action.



- 1) To see how a web page is constructed, a user can view the page source in the browser.

- True
 False

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- 2) To copy the functionality of another web page found on the Internet, just copy the HTML from the view source page.

- True
 False



The **World Wide Web Consortium (W3C)** is the official organization that defines web standards, including HTML and CSS. **HTML5** is the fifth major revision of the HTML standard and is recommended for use by the W3C. HTML5 contains many new and useful features, so most new web page development uses HTML5.

Every HTML5 document uses the following:

1. The **<!DOCTYPE html>** declaration instructs the web browser about what type of document follows.
2. The **<html>** opening and closing tags enclose everything but the **<!DOCTYPE html>** declaration .
3. The **<meta>** tag specifies metadata, which is data that describes the document's data. **<meta charset="UTF-8">** is a required meta tag describing how characters are represented in the HTML document. Additional **<meta>** tags may be used to indicate when the document was saved, who the author is, what language the page is written in, etc.
4. The **<title>** opening and closing tags enclose the name of the document. The title is usually displayed in the titlebar of the browser, is used by search engines, and is used for bookmarking.
5. The **<body>** opening and closing tags enclose all elements and content to be rendered in the browser.

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The **<meta>** tag differs from other tags in two ways:

- The **<meta>** tag uses an attribute to indicate the character set. A tag **attribute** is a value that provides additional information about a particular tag and is included after the tag name but before the **>** in the tag. Each attribute has a name and a value, specified using the form **name="value"**. Ex: **<meta charset="UTF-8">** has an attribute named **charset** with value "UTF-8".

- The `<meta>` element does not use a closing tag because `<meta>` is a void element. A **void element** is an element that only needs an opening tag. Other void elements include `` for displaying an image and `<input>` for obtaining user input.

Notes

Omitting the DOCTYPE from an HTML document or placing any characters before the 3368 *DOCTYPE causes the web browser to render the document in quirks mode. Quirks mode is a browser rendering mode that renders a web page using non-standard layout rules emulating older web browsers. A web page with the DOCTYPE is rendered using standards mode, which uses the HTML5 standard.*

UTF-8 is a common character encoding that describes characters used by most of the world's languages. UTF-8 even includes fictional languages (e.g., Klingon, elvish) and emoji (e.g., 😊, ✈)

The `<head>` tag is traditionally used to contain the document title, document metadata, and various other elements that are typically not displayed. In HTML5, the `<head>` tag is optional.

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2.1.4: Minimum HTML document structure.



Animation captions:

- The document starts with `<!DOCTYPE html>`, which is an instruction to the browser for how to interpret the rest of the document.
- The `<html>` opening and closing tags mark the beginning and ending of the document.
- The `<meta charset="UTF-8">` opening tag indicates that the document will be encoded using UTF-8.
- The `<title>` opening and closing tags enclose the name of the document.
- The `<body>` opening and closing tags enclose the contents of the document. The browser displays the document body.

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2.1.5: Matching basic document tag order.

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`<body>The California quarter features Yosemite valley.</body>` `<meta charset="UTF-8">`

`<!DOCTYPE html>` `<title>California State Quarter</title>` `<html>` `</html>`

Instruction to web browser that specifies the document type.

Tag that marks the beginning of the HTML document.

Tag that specifies the character encoding used in the document.

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Tag that names the document.

HTML content displayed by the browser.

Tag that marks the end of the HTML document.

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Some tags that were used in earlier versions of HTML are deprecated in HTML5. A **deprecated** feature is part of a language that is officially discouraged because newer or better features exist, or because the deprecated feature is no longer considered safe. Ex: The <center> tag is an officially deprecated pre-HTML5 feature. [W3C documentation](#) states that <center> should not be used.

Browsers handle improperly structured HTML and deprecated tags differently and unpredictably. The only way to have predictable browser behavior is to use valid HTML. An **HTML validator** checks that an HTML document conforms to the standard. [Good practice](#) involves using tools like the [W3C Markup Validator](#) to check document conformance.

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2.1.6: HTML standardization and validation.



- 1) What organization defines web standards?

Check

Show answer

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- 2) What is the current recommended version of the HTML standard?

Check

Show answer





- 3) An HTML ____ is a program that indicates whether a document follows the HTML standard.

[Check](#)[Show answer](#)

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- 4) The W3C Markup Validator indicates the HTML below has an error. What attribute is missing from <meta>?

```
<!DOCTYPE html>
<html>
  <meta>
    <title>Learning HTML</title>
    <body>Some HTML tags have
  attributes.</body>
</html>
```

[Check](#)[Show answer](#)

- 5) The W3C Markup Validator indicates the HTML below has an error. What deprecated tag is causing the error?

```
<!DOCTYPE html>
<html>
  <meta charset="UTF-8">
  <title>Learning HTML</title>
  <body>
    <center>This page uses deprecated
  HTML.</center>
  </body>
</html>
```

[Check](#)[Show answer](#)

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Exploring further:

- [HTML tutorial from W3Schools.com](#)
- [W3C Markup Validator](#) - Checks the validity of web documents
- [Quirks Mode and Standards Mode](#) from MDN

How was this section?

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2.2 Basic HTML tags

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A **paragraph** is the basic unit of text in an HTML document. A paragraph is enclosed in HTML by the `<p>` opening and closing tags. Browsers visually separate paragraphs from other text with spacing above and below.

**PARTICIPATION
ACTIVITY**2.2.1: `<p>` tags enclose a paragraph.

Animation captions:

1. Raw text in HTML is displayed as one block of continuous text.
2. A paragraph is surrounded by opening and closing `<p>` tags.
3. Additional paragraph tags may be added to generate new paragraphs.

A common error is forgetting the closing `</p>` tag, or trying to put a paragraph inside of another paragraph. The web browser might render nested `<p>` tags visually correct, but an HTML validator will generate a non-visible error.

**PARTICIPATION
ACTIVITY**2.2.2: Add `<p>` tags to enclose the paragraphs.

The following HTML is an example with two paragraphs. Notice that blank lines do not start a new paragraph in the rendered web page. Try adding `<p>` opening and closing tags around each paragraph so that the preview shows two paragraphs. Try adding extra spaces and blank lines between words to see how the rendered HTML changes.

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```
1 This is the first sentence of the first paragraph. This is the second sentence of the
2
3 This sentence is the first sentence of the second paragraph.
4 Here is the second sentence of the second paragraph.
```

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Render web page

Reset code

Your web page

This is the first sentence of the first paragraph. This is the second sentence of the first paragraph.
This sentence is the first sentence of the second paragraph. Here is the second sentence of the
second paragraph.

A **whitespace** character is an unprinted character such as the spaces between words and lines of text. Browsers treat all sequences of whitespace as a single space between non-whitespace characters. Ex: The three spaces in the HTML "hello there" will be displayed with a single space "hello there". Whitespace characters include spaces, tabs, and newlines. So, a browser treats multiple lines of text as a single line.

The **
** tag creates a **line break** in a paragraph, such that the content after the line break appears on a new line. A good practice is to use **
** when the line break is essential to the content, such as lines in a poem or mailing address, and not just to add spacing for formatting a web page. CSS, discussed elsewhere, should be used for formatting a web page.

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2.2.3: Whitespace in HTML.

Animation captions:

1. Multiple spaces are displayed as one space when rendered.
2. Multiple blank lines are displayed as one space.
3. Adding
 tags splits the displayed sentence into multiple lines.

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2.2.4: Line Break.

The following HTML fragment shows the address of the White House. Try modifying the HTML to include line breaks (
), so that your rendered web page matches the expected web page.

```
1 <p>The White House
2 1600 Pennsylvania Avenue Northwest
3 Washington, DC 20500</p>
```

[Render web page](#)[Reset code](#)

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Your web page

The White House 1600 Pennsylvania Avenue
Northwest Washington, DC 20500

Expected web page

The White House
1600 Pennsylvania Avenue Northwest
Washington, DC 20500

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A **section** is a collection of related paragraphs, images, and other content organized into units such as chapters, subchapters, tabbed content in a tabbed container, and numbered sections of a thesis. Sections are surrounded by the `<body>` and `<section>` tags, or are implicitly created using a heading tag. A subsection is a section nested within another section. The section wrapped in `<body>` tags is the top-level section of the web page. All other sections wrapped in `<section>` tags are considered subsections.

A **heading** provides a title for a section of content. Headings are visually separated from the other text by extra spacing and are displayed with a different appearance. Heading tags exist for the first six levels of nested sections. The first level heading is surrounded by the `<h1>` opening and closing tags, and is appropriate for chapter titles. The second level heading is surrounded `<h2>` tags, and is appropriate for subchapter titles. The third through sixth level headings tags are `<h3>`, `<h4>`, `<h5>`, and `<h6>`. Selecting an appropriate heading is helpful for uses such as assisting visually impaired persons to navigate a web page. The `<h4>` through `<h6>` tags are rarely used except in legal or academic documents that contain sections within sections within sections.

A good practice is to wrap each subsection with `<section>` tags instead of relying on heading tags starting new implicit sections, and to label each section with a heading.

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2.2.5: Section headings.

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Animation captions:

1. A heading provides a title for a section. The `<h1>` heading "Section 1" is visually separated from other text by extra spacing and is displayed with a larger font.
2. Each heading level may have a different appearance. The `<h2>` heading is displayed with less spacing and a smaller font than the `<h1>` heading.

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2.2.6: Match the HTML tag with the tag's meaning.

**<section>** **
** **<h1>** **<p>**

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paragraph**line break****section****first level heading****Reset****PARTICIPATION
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2.2.7: Basic formatting tags.



1) The <p> tag can have another <p> tag inside.



- True
- False

2) The
 tag has a closing tag.



- True
- False

3) If <h1> text appears too big, <h2> or <h3> tags can be used to decrease the text size.



- True
- False

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2.2.8: Headings activity.



The following HTML is missing headings. Try modifying the HTML by adding `<h1>` tags around the "Bill of Rights" section title, and `<h2>` tags around each "Article" section title, so that your web page matches the expected web page.

```

1 <body>
2 Bill of Rights
3 <p>The following are the bill of rights of the USA</p>
4
5 <section>
6 Article 1
7 <p>Body of article 1</p>
8 </section>
9
10 <section>
11 Article 2
12 <p>Body of article 2</p>
13 </section>
14
15 </body>

```

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[Render web page](#)

[Reset code](#)

Your web page

Bill of Rights

The following are the bill of rights of the USA

Article 1

Body of article 1

Article 2

Body of article 2

Expected web page

Bill of Rights

The following are the bill of rights of the USA

Article 1

Body of article 1

Article 2

Body of article 2

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A good practice is to select a heading tag that matches the document hierarchical structure 2019 rather than to control how the browser renders the section title.

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2.2.9: Hierarchical structure of documents.



- 1) Write a heading for a book chapter titled



"Introduction".

[Check](#)

[Show answer](#)

2) What tag is used for subchapter titles?

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[Check](#)

[Show answer](#)

3) Write an HTML fragment that creates a title for the fourth level of a document hierarchy. The title should be "Exquisite details".

[Check](#)

[Show answer](#)

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2.2.10: Valid or invalid HTML.

Determine if the following HTML is valid or invalid.

1) <h2>Highway traffic code
overview</h2>

- Valid
- Invalid

2) This is the first verse.
The second
verse begins on the next line.

- Valid
- Invalid

3) <p>HTML is derived from HyperText
Markup Language. <p>The inspiration
for HTML was SGML, the Standard
Generalized Markup Language</p>
HTML is simpler than SGML and adds
hyperlinks.</p>

- Valid
-

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Invalid

The **** tag indicates **emphasized** text, such as text having an emphasized pronunciation when spoken, and is italicized by default. The **** tag indicates text that has **strong importance**, and is bolded by default.

The **<cite>** tag denotes a title, such a book or song title, and is italicized by default. Ex:

<cite>Spaceballs</cite> is a parody of the **<cite>Star Wars</cite>** trilogy.
yields: Spaceballs is a parody of the Star Wars trilogy.

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The **<mark>** tag denotes content that is important and should be semantically highlighted and is rendered with a yellow background by default. Ex:

Remember to mark your answers in the <mark>box</mark>. yields: Remember to mark your answers in the box.

The **** tags cause enclosed text to render using **bold**. The **<i>** tags indicates text in an alternative voice, such as a word or phrase in a foreign language, and is rendered using **italics**.

Ex: *Dashi* is a stock used in Japanese cooking. The **<u>** tags denotes text that should appear differently from normal text, such as misspelled words, and is underlined by default. Ex:
Misspelled is often misspelled as mispelled.

Note

Historically, in HTML4, the ****, **<i>**, and **<u>** tags were used to render text and did not have meaning, or semantics. A good practice is to avoid formatting tags whenever possible, and instead use tags to indicate meaning. Ex: Italics can be used to emphasize text, but the **** tag should be used to convey this meaning.

Table 2.2.1: HTML5 tags.

HTML tag	HTML example	Rendered	Semantics
em	emphasis	emphasis	Emphasized text
cite	<cite>cite</cite>	cite	Title of a work
strong	strong	strong	Important text
mark	<mark>mark</mark>	mark	Marked or highlighted text
var	<var>variable</var>	variable	Definition of a variable in a computer program

kbd	<kbd>keyboard</kbd>	keyboard	Keyboard input
code	<code>code</code>	code	Computer code
samp	<samp>sample</samp>	sample	Sample output from a computer
b	bold	bold	Bold text
i	<i>italic</i>	<i>italic</i>	Text of an alternate voice or word from another language ©zyBooks 03/01/19 00:02 458368 jingya xun SANDIEGOCOMP494GappySpring2019
u	<u>underline</u>	<u>underline</u>	Text that is rendered differently from normal text

Note

Many CSS libraries, such as Font Awesome and Bootstrap, use the *<i>* tag to insert icons or simple images. See [W3Schools Icons Tutorial](#) for more details.

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2.2.11: Valid or invalid HTML.



Determine if the following HTML is valid or invalid.

- 1) You must read <cite>A Tale of Two Cities</cite>, one of the best selling books of all time.

- Valid
- Invalid



- 2) You must read <cite>A Tale of Two Cities</cite>, one of the best selling books of all time.

- Valid
- Invalid



- 3) You must read <cite>A Tale of Two Cities</cite>, one of the best selling books of all time.

- Valid
- Invalid

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2.2.1: Basic HTML tags.



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Exploring further:

[Headings and Sections](#) from W3 Consortium. HTML5 guidelines on how to use section and heading tags.

[HTML Text Formatting](#) from W3Schools. HTML5 guidelines discourage using a number of these formatting tags in favor of display styling with CSS.

How was this section?

[Provide feedback](#)

2.3 Comments

An HTML **comment** is a portion of the document that is not displayed by the browser. A comment begins with the <!-- character sequence and ends with the --> character sequence. Web developers sometimes use comments to leave notes for themselves or others, or to tell the browser to ignore part of the document. A common error is trying to put a comment inside of another comment.

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2.3.1: Comments.

The following HTML shows two paragraphs. Try modifying the HTML to use a comment so that the second paragraph is not displayed.



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2.3.2: Valid or invalid comments.



Determine if the following HTML is valid or invalid.

- 1) <p>This sentence does <!--not-->
contain a comment</p>

- Valid
 Invalid



- 2) <p>Roses are <!--purple--> red. Violets
are <!--turquoise. <!--green.--> black.--
>blue.</p>

- Valid
 Invalid



- 3) <p>Bananas grow <!--in bushes.</p>-->
on a tree.</p>

- Valid
 Invalid



- 4) <p>Mary had a <!--soft, little</p>-->
lamb. Its fleece was white as snow.

- Valid
 Invalid



How was this section?

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2.4 Lists

An **unordered list** is a collection of items, usually indented and shown using bullets, surrounded by the **** opening and closing tags. Each **list item** is surrounded by **** opening and closing tags.

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2.4.1: Unordered list.

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Animation captions:

1. An unordered list is surrounded by opening and closing tags.
2. A list item is surrounded by opening and closing tags. The browser displays each item indented and with a bullet.
3. Additional list items may be added. Indenting ends after the list.

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2.4.2: Unordered lists and list items.



Arrange the tags to produce the following unordered list.

- Peanutbutter
- Jelly

 Jelly Peanutbutter

(1)

(2)

(3)

(4)

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2.4.3: Unordered list tags.

Indicate whether each line has an error.

- (a)
- (b) Apples
- (c) Oranges
- (d)

1) (a)

- No error
 Error

2) (b)

- No error
 Error

3) (c)

- No error
 Error

4) (d)

- No error
 Error

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A **nested list** is a list within a list item of another list. The entire nested list is indented and uses a different bullet.

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2.4.4: Nested lists.



The following HTML fragment shows a nested list example. Try modifying the HTML to include bananas and corn.



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2.4.5: Nested lists.



Indicate the tags needed in the following HTML to achieve the rendered nested lists shown.

```
<ul>
  <li>Movies with cats
    <ul>
      <li>Garfield</li>
      <li>The Aristocats</li>
    (a)
  (b)
  <li>Movies with dogs
    (c)
      <li>Marley and Me</li>
      <li>101 Dalmatians</li>
    </ul>
  </li>
</ul>
```

- Movies with cats
 - Garfield
 - The Aristocats
- Movies with dogs
 - Marley and Me
 - 101 Dalmatians

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1) (a)

-
-
-
-



2) (b)

-
-
-
-



3) (c)

-
-
-
-



An **ordered list** is a sequenced collection of items, usually indented and shown using numbers or letters, surrounded by the `` opening and closing tags. As with an unordered list, each list item is surrounded by `` opening and closing tags.

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2.4.6: An ordered list: High demand majors.



The following HTML fragment shows an ordered list example. Try modifying the HTML to add Mechanical Engineering as the fourth major, and Business as the fifth.



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An ordered list can be nested within another ordered list. Each nested list is a new list, so the numbering starts at 1.

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2.4.7: Nested ordered lists.



The following HTML fragment shows a nested ordered list example. Try modifying the HTML to include the fourth most populous state, New York, with cities New York and Buffalo.

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2.4.8: Ordered lists.



Indicate what precedes the given list item when rendered by the browser.

Valid answers are the word bullet, or 1., 2., 3.

1)

```
<ol>
  <li>Apples</li>
  <li>Oranges</li>
</ol>
```

Oranges

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**Check****Show answer**

2)



```
<ol>
  <li>Apples</li>
  <li>Oranges
    <ol>
      <li>Valencia</li>
      <li>Mandarin</li>
    </ol>
  </li>
</ol>
```

Valencia

Check**Show answer**

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3)

```
<ol>
  <li>Apples
    <ul>
      <li>Granny Smith</li>
      <li>Red Delicious</li>
    </ul>
  </li>
  <li>Oranges</li>
</ol>
```

Red Delicious

Check**Show answer**

4)

```
<ol>
  <li>Apples
    <ol>
      <li>Red</li>
      <li>Green</li>
    </ol>
  </li>
  <li>Oranges</li>
  <li>Bananas</li>
</ol>
```

Oranges

Check**Show answer**
**CHALLENGE
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2.4.1: Lists.

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Exploring further:

- [HTML lists](#) from W3Schools.

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How was this section?



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2.5 Tables

A **table** is an HTML structure surrounded by the <table> opening and closing tags that allows data to be organized in rows and columns. A **cell** is a location in the table at a specific row and column. A **table row** is surrounded by the <tr> opening and closing tags and contains all the cells within a table row. The <th> opening and closing tags create a new table cell containing **table header** information about the data. Usually, the browser will display the table headers centered with a bold font. The <td> opening and closing tags create a new table cell containing a **table datum**. Every cell in a table is contained within a table row.

Note

The word data is the plural form of datum.

PARTICIPATION ACTIVITY

2.5.1: HTML tables organize data into rows and columns.



Animation captions:

1. The <table> opening and closing tags create a structure to store the table's contents.
2. The <tr> opening and closing tags creates a row inside the table.
3. The <td> opening and closing tags creates a new cell inside a table row.
4. A second <td> opening and closing tag creates another cell in the same table row.
5. Two more rows, each with two columns, are added to the table.
6. Changing the <td> tags in the first row to <th> tags converts the table data into column header

A table **caption** defines a short descriptive text for a table. The caption is surrounded by the <caption> opening and closing tags and must immediately follow the opening table tag. Usually, a web browser renders the table caption centered above the table.

**PARTICIPATION
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2.5.2: Table structure.



Indicate the tags needed in the following HTML on the left to achieve the rendered table shown on the right.

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```
<table>
(a) Transistors then and now</caption>
<tr>
  <th>Attribute</th>
  <th>1975</th>
  <th>2015</th>
</tr>
(b)
  <th>Transistor size</th>
  <td>6 &mu;m</td>
  <td>14 nm</td>
</tr>
<tr>
  (c) Transistor count</th>
  <td>6K</td>
  (d) 1.3G</td>
</tr>
</table>
```

Attribute	1975	2015
Transistor size	6 μ m	14 nm
Transistor count	6K	1.3G

<td> <caption> <th> <tr>

-
- (a)
(b)
(c)
(d)

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2.5.3: Creating tables.



Enter the necessary HTML to create the different parts of a table.

- 1) Create a table cell with datum of "open".



[Show answer](#)

- 2) Create a table cell with header of "hours".

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[Check](#)[Show answer](#)

- 3) Create an empty table row with no content.

[Check](#)[Show answer](#)

- 4) Start a table with the caption "store information".

[Check](#)[Show answer](#)**PARTICIPATION ACTIVITY**

2.5.4: Add table row.



The following HTML is an example of a table with one row of column headers and one row of data. Try adding the necessary HTML and text to create another row, Average Temperature, at the bottom of the table that shows Alaska as having the lowest average temperature and Florida as having the highest average temperature.



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2.5.5: Add table column.



The following HTML is an example of a table with one column of headers and one column of data. Try adding the necessary HTML and text to create another column, Heaviest, on the right side of the table that shows Ostrich as the heaviest bird and Blue Whale as the heaviest mammal.

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Note

Web browsers often have to process *invalid HTML* and attempt to fix those errors. However, the resulting behavior is unpredictable. Because web developers commonly do not write the closing `<tr>`, `<th>`, and `<td>` tags, the HTML5 standard permits not writing those closing tags. Good practice is to always use both the opening and closing tags for the `<tr>`, `<th>`, and `<td>` tags.

PARTICIPATION ACTIVITY

2.5.6: Identify missing table tags.



Identify the missing tags in the following HTML on the left required to achieve the rendered table shown on the right.

```
<table>
  (a)
    <th>Head 1 (b)
    <th>Head 2</th>
    (c) Head 3</th>
  </tr>
  <tr>
    (d) Item 1</td>
    <td>Item 2 (e)
    <td>Item 3</td>
  (f)
</table>
```

Head 1	Head 2	Head 3
Item 1	Item 2	Item 3

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1) (a)



- <tr>
- </tr>
- <th>
- </th>
- <td>
- </td>

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2) (b)

- <tr>
- </tr>
- <th>
- </th>
- <td>
- </td>

3) (c)



- <tr>
- </tr>
- <th>
- </th>
- <td>
- </td>

4) (d)



- <tr>
- </tr>
- <th>
- </th>
- <td>
- </td>

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5) (e)



- <tr>
- </tr>
- <th>
-

- </th>
 - <td>
 - </td>
- 6) (f)

- <tr>
- </tr>
- <th>
- </th>
- <td>
- </td>

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CHALLENGE
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2.5.1: Modifying a table.



Ugly tables

HTML tables are rather plain without CSS. Table columns and rows render just large enough to display the inner content, and usually no table border is displayed. CSS (discussed elsewhere) can be used to increase the table's size, add borders, add background images and color, change the cell text alignment, etc.

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A single table cell occupies a single row and column by default, but a cell may span multiple columns or multiple rows using the **colspan** and **rowspan** attributes. The **colspan** and **rowspan** attributes apply to **<td>** and **<th>** tags.

PARTICIPATION
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2.5.7: Spanning multiple columns and rows.



The following HTML creates a table with a "Warmup" cell that spans 3 columns and a "Scrimmage" cell that spans 2 rows. Add HTML and text to create a "Sat" column and "12:00" row containing cells spanning multiple rows or columns as shown in the expected web page.



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**PARTICIPATION
ACTIVITY****2.5.8: Spanning multiple columns and rows.**

Refer to the table below.

alpha	
beta	
epsilon	gamma

1) What HTML creates the "alpha" table cell?



- `<tr colspan="2">alpha</tr>`
- `<td colspan="2">alpha</td>`
- `<td cols="2">alpha</td>`

2) What HTML creates the second row?



- `<tr><td>beta</td><td rowspan="2">gamma</td></tr>`
- `<tr><td>beta</td></tr>`
-

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```
<tr>
  <td>beta</td>
  <td>gamma</td>
</tr>
```

3) What HTML creates the third row?

- `<tr>
 <td>epsilon</td>
 <td
 rowspan="2">gamma</td>
 </tr>`
- `<tr>
 <td>epsilon</td>
 <td></td>
 </tr>`
- `<tr>
 <td>epsilon</td>
 </tr>`

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Three optional table tags specify each part of a table:

- The **<thead>** tag specifies the table header.
- The **<tbody>** tag specifies the table body.
- The **<tfoot>** tag specifies the table footer.

The **<thead>**, **<tbody>**, and **<tfoot>** tags do not affect the layout of the table, but browsers may use the tags to enable the table body to scroll independently of the header and footer or to print the header and footer on each page of a multi-page table printout.

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2.5.9: Head, body, footer.

Indicate the tags needed in the following HTML to properly specify the table header, body, and footer.

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```

<table>
(a)
  <tr>
    <th>Movie</th>
    <th>Rate</th>
    <th>Price</th>
  </tr>
</thead>
(b)
  <tr>
    <td>Finding Dory</td>
    <td>Adult</td>
    <td>$10</td>
  </tr>
  <tr>
    <td>Finding Dory</td>
    <td>Child</td>
    <td>$6</td>
  </tr>
</tbody>
(c)
  <tr>
    <th colspan="2">Total</th>
    <th>$16</th>
  </tr>
</tfoot>
</table>

```

Movie	Rate	Price
Finding Dory	Adult	\$10
Finding Dory	Child	\$6
Total		\$16

<thead> <tbody> <tfoot>

(a)

(b)

(c)

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Exploring further:

- [HTML tables](#) from W3Schools.com

How was this section?

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2.6 Images

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img tag for images

The **** tag displays an image in a web page. The **** tag does not enclose any content and consequently does not have a closing tag. The image tag contains two attributes:

- The **src attribute** specifies the URL location of the image file to display.
- The **alt attribute** provides a text description to use as an alternative to displaying the image.

Ex:

```

```

displays the image family.jpg, but the text "Smith family reunion" displays if the image cannot be displayed. The **src** and **alt** attributes are required for all images.

PARTICIPATION
ACTIVITY

2.6.1: Loading images in HTML.



Animation captions:

1. The image tag adds an image to the web page. The browser retrieves the image using the **src** attribute.
2. The browser will display the text from the **alt** attribute when the image cannot be loaded.
3. The browser displays content following the images.

PARTICIPATION
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2.6.2: Images.



1) What tag includes a picture in a web page?

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- <image>
-
- <pict>

2) Which image tag attribute specifies the



image's URL?

- url
- src
- alt

3) Which is **NOT** a required attribute for images?

- src
- alt
- title

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2.6.3: Reasons for using alt attribute for images.



Below are reasons for using the alt attribute. Match the reason with the appropriate scenario.

Handle broken image URLs

Pass HTML validation

Allow browser to turn off image display

Support assistive technology

Software, such as page readers, help users with vision or cognitive impairments.

A user may want to reduce data cost or load a page faster.

The image cannot be loaded from the specified location.

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The alt attribute is required.
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Image size and aspect ratio

The **width** and **height** attributes are optional attributes supported by tags that tell the browser how many pixels the image should occupy. The actual image size may be different from the specified **width** and **height**, in which case the browser will resize the image for display.

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2.6.4: Image sizing.



The following HTML fragment shows an image of a cat 640 by 424 pixels. Try modifying the HTML to adjust the size of the image to:

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1. Make the image 250 pixels wide. Specify only the width.
2. Make the image 250 pixels high. Specify only the height.
3. Resize the image to have a width of 250 pixels and a height of 250 pixels.

Try experimenting with other combinations of sizes to see how the width and height affect the display of the image.



An image **aspect ratio** is the ratio of the image width to the image height. The aspect ratio is written as width:height. Ex: An image 500 pixels wide and 250 pixels high has an aspect ratio of 500:250, which simplifies to 2:1. If an image has a different aspect ratio than the image tag's width and height attributes, the browser will distort the image to match the specified attribute values .

PARTICIPATION
ACTIVITY

2.6.5: Image width and height attributes.



For the following questions, assume the image is 1000 pixels wide and 800 pixels high.

Indicate the values needed in the following HTML to produce an image with an aspect ratio of 2:1 while maintaining the image's width of 1000 pixels.

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```

```

- 1) (a)

1000



- 500
- 800
- 400

2) (b)

- 1000
- 500
- 800
- 400

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**PARTICIPATION**
ACTIVITY

2.6.6: Valid HTML code.

Indicate which of the following `img` tags are valid.1) ``

- Valid
- Invalid

2) ``

- Valid
- Invalid

3) ``

- Valid
- Invalid

4) ``

- Valid
- Invalid



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Image formats

Web browsers support three popular image formats:

1. The **JPEG (Joint Photographic Experts Group)** image format is commonly used for digital photographs.

2. The **PNG (Portable Network Graphics)** image format is commonly used for line art and screenshots or images requiring transparency.
3. The **GIF (Graphics Interchange Format)** image format is commonly used for simple animated images.

All three formats use data compression to decrease the image file size, which allows the file to be transferred over the internet quicker. JPEG images use **lossy compression**, meaning that some of the original picture information is lost. A photograph is best saved as a JPEG image because humans cannot easily perceive the quality loss in a photograph. PNG and GIF images use **lossless compression**, meaning no image quality is lost. Lossless compression works best when a large number of adjacent pixels are the same color.

JPEG and PNG images can display **true color** (24-bit color), which is approximately 16 million different colors. GIF images are limited to only 256 colors (8-bit color), but GIF images can display animations, which are popular on social media.

Table 2.6.1: Three popular image formats.

Name	File extension	Use	Compression	Colors	Transparency	Animation
JPEG	.jpg	Photographs	Lossy	24-bit	No	No
PNG	.png	Line art and screenshots	Lossless	24-bit	Yes	No
GIF	.gif	Animated images	Lossless	8-bit	Yes	Yes

PARTICIPATION ACTIVITY

2.6.7: Image formats.



Match each image to the image format most appropriate for that image.

(a)



Source: [Stork image](#)

(b)



(c)



(c) (a) (b)

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PNG

JPEG

GIF

[Reset](#)

WebP

Google created the **WebP** image format that supports true color, transparency, and animation. WebP can compress image information more efficiently than other formats in some situations. WebP may become more popular in the future as more browsers add WebP support.

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ACTIVITY

2.6.1: Images.



Exploring further:

- [HTML images](#) from W3Schools.com
- [WebP](#) from Wikipedia

How was this section?



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2.7 Links

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The **anchor tag <a>** defines a hyperlink in a web page. A **hyperlink**, or link, specifies where other information is located and what action the web browser should perform when a user clicks the hyperlink. A hyperlink action may tell the web browser to go to another web page, to go to a location in the same web page, to download a file, or to send an email.

A hyperlink has three parts: the opening <a> tag with the href attribute, the content displayed for the link , and the closing tag. The **href** attribute specifies the hyperlink's URL. Ex: Wikipedia displays the hyperlink Wikipedia and causes the browser to request the URL https://wikipedia.org/ when the hyperlink is clicked. Other URL schemes may cause the browser to take different actions. Ex: The URL mailto:mary@gmail.com uses the **mailto** scheme that directs the browser to start an email program and address an email to mary@gmail.com.

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2.7.1: URL schemes.

[file](#) [http](#) [ftp](#) [mailto](#) [https](#)

Hyperlink used to send requests and responses that are readable only by the client and server.

Hyperlink used to send requests and responses over the Internet without encryption.

Hyperlink used to send email.

Hyperlink used to refer to a document on the same computer as the web browser.

Hyperlink used to transfer data files.

[Reset](#)
PARTICIPATION ACTIVITY

2.7.2: Hyperlink actions.

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What does each of the following hyperlinks do?

- 1) See example

- Loads a web page over an unencrypted connection



- Encrypts the web page load request and response
- Sends an email
- Opens a file

2) Get in touch



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- Loads a page over an unencrypted connection
- Encrypts the page load request and response
- Sends an email
- Opens a file

3) See example



- Loads a page over an unencrypted connection
- Encrypts the page load request and response
- Sends an email
- Opens a file

4) Raw data



- Loads a page over an unencrypted connection
- Encrypts the page load request and response
- Sends an email
- Opens a file

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2.7.3: Hyperlinks: Create a hyperlink to a web page.



The following HTML shows a paragraph with a URL. Try turning the URL into an HTTPS hyperlink to example.com.



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A URL can point to a section, or **fragment**, of a document by adding a hash tag and a fragment identifier at the end of the URL. Ex:

https://en.wikipedia.org/wiki/Computer_science#History refers to the "History" section of the "Computer_science" page on Wikipedia.

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2.7.4: Hyperlinks: Create a hyperlink to a web page fragment.



The following HTML contains a hyperlink to the Wikipedia page about George Washington. Try adding a document fragment identifier to the hyperlink to point to the papers George Washington wrote, which are in the section named "Papers". Each Wikipedia section has a unique fragment identifier to which a hyperlink can link. Note that the only way to discern whether the hyperlink is correct requires clicking the hyperlink to examine where the hyperlink leads.



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Adding the **id attribute** to any HTML tag creates a **fragment identifier**, thus permitting URLs to link directly to that location in the document. Ex: The following HTML has a heading with the fragment identifier "Ch1" and two paragraphs with the fragment identifiers "Ch1p1" and "Ch1p2".

Figure 2.7.1: Fragment identifiers: The id attribute creates a fragment

identifier for an HTML tag.

```
<title>Pride and Prejudice</title>
<h1 id="Ch1">Chapter One</h1>

<p id="Ch1p1">It is a truth universally acknowledged, that a single man in possession of a good fortune, must be in want of a wife.</p>

<p id="Ch1p2">However little known the feelings or views of such a man may be on his first entering a neighbourhood, this truth is so well fixed in the minds of the surrounding families, that he is considered the rightful property of some one or other of their daughters.</p>
```

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The content in a hyperlink may be any valid HTML or text. A **graphical hyperlink** uses an image inside a hyperlink instead of text. Ex: The following HTML uses an image of a dog that links to the American Kennel Club .

Figure 2.7.2: Graphical hyperlink: An image used within a hyperlink.

```
<a href="http://www.akc.org/"></a>
```

An anchor tag's **target** attribute indicates how the browser should display the link when clicked. _self, which is the default value for the target attribute, indicates the browser will open the link in the same tab or window. If the target attribute is _blank, the web browser will open the link in a new tab or window.

Figure 2.7.3: Target attribute: browser will open the link in a new tab.

This link to the [Wikipedia main page](https://en.wikipedia.org/wiki/Main_Page) will open in a new tab or window.

PARTICIPATION ACTIVITY

2.7.5: Fragment identifiers, graphical hyperlinks, and the target attribute.

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- 1) Hyperlinks may only contain text.

- True
- False

- 2) The fragment identifier for the `<p id="location">` opening tag is location.

-

True False

- 3) Two tags within the same HTML document may have the same id.

 True False

- 4) The default value for the target attribute is _self.

 True False

- 5) The web browser will always create a new window for hyperlinks whose target attribute is _blank.

 True False

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When a web page links to other web resources in the same website, a relative URL may be specified in the `href` attribute instead of an absolute URL. An **absolute URL** is a complete URL. Ex: `test` is a hyperlink using the absolute URL `http://example.com/test.html`. A **relative URL** specifies the relative path to the web resource with no scheme or hostname. Ex: `test` uses the relative URL `test.html` to refer to an HTML document on the same website and with the same path as the current HTML document.

PARTICIPATION ACTIVITY

2.7.6: Using relative URLs to link to files on the same website.



Animation content:

`undefined`

Animation captions:

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1. A website is organized into 4 HTML files. `football.html` and `geocaching.html` are located in the `hobbies` directory.
2. `index.html` contains a hyperlink with a relative URL to `family.html` since `family.html` is on the same website as `index.html`.
3. Hyperlinks to `football.html` and `geocaching.html` use relative URLs that start with "`hobbies/`" because both files are in the `hobbies` directory.

4. football.html uses a relative URL to link to geocaching.html, which is in the same directory as football.html.
5. football.html uses ".." in the relative URL to link to index.html, because ".." refers to the directory that is one level up from football.html, which is the mywebsite directory.

PARTICIPATION ACTIVITY**2.7.7: Relative URLs.**

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Refer to the animation above.

- 1) In which file would you expect to find the hyperlink below?

```
<a href="index.html">Home page</a>
```

- family.html
- football.html
- geocaching.html

- 2) In which file would you expect to find the hyperlink below?

```
<a href="../family.html">Family</a>
```

- index.html
- family.html
- geocaching.html

- 3) Assume a directory called "junk" is located in the hobbies directory. What relative URL would index.html use to link to a file called stuff.html in the junk directory?

- stuff.html
- junk/stuff.html
- hobbies/junk/stuff.html

- 4) Assume a directory called "junk" is located in the hobbies directory, and the junk directory contains the file stuff.html. What relative URL would stuff.html use to link to index.html?

- index.html

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-/index.html
- ../../index.html

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2.7.8: Hyperlink structure.



Determine if the following are valid or invalid hyperlinks.

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1) See example

- Valid
- Invalid

2) History

- Valid
- Invalid

3) History

- Valid
- Invalid

4) Notes

- Valid
- Invalid

5)

- Valid
- Invalid

6) Another example

- Valid
- Invalid

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Exploring further:

- [HTML Links](#) from W3schools

How was this section?

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2.8 Special characters

An **entity** is a mechanism for writing special characters or symbols in HTML, such as mathematical symbols, characters in most languages, and many other symbols. Entities can be specified using the three formats shown in the accompanying table:

Table 2.8.1: HTML5 entity formats.

Format type	Format example	Symbol	Description
Entity name	©	©	HTML5 defines names for common well-known entities. The entity names are typically abbreviations of the English name for the symbol.
Decimal number	©	©	Each HTML entity has a unique number, which can be specified as decimal value.
Hexadecimal	&x000A9;	©	Each HTML entity has a unique hexadecimal number,

number

which is the hexadecimal equivalent to the entity's decimal number.

Many, but not all, HTML5 entities have entity names and can be specified by entity name. However, all HTML5 entities can be specified using either the decimal number or hexadecimal number formats.

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PARTICIPATION ACTIVITY

2.8.1: HTML entities for special symbols.

- 1) The mathematical forall symbol, \forall , can be written as ∀

- True
- False

- 2) The Euro symbol, € , can be written as &euro

- True
- False

- 3) An umbrella symbol, ⊤ , which is assigned the decimal number 9730, can be written as ☂

- True
- False

The < and & characters can only be displayed using entities. The < character normally marks the beginning of a tag, so <; is used to display the < character when < is not part of a tag. The & character marks the beginning of an entity name, so &; is used to display the & character when & does not start an entity name.

PARTICIPATION ACTIVITY

2.8.2: HTML entities.

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< & ñ ½ π

&amp;;

&lt;

&#189; or &#000BD;

&ntilde;

&pi;

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Reset

A web browser sometimes wraps a line – called wrapping or breaking the line – at an inconvenient location. For instance, when specifying a measurement range such 2-2.5", all the characters should be kept together when displayed. However, the browser may split the character sequence if the characters occur at the end of a line, with 2- appearing at the end of one line and 2.5" appearing at the beginning of the next line.

A **non-breaking character** is an inter-word character that permits treating the words on both sides to be one word. A **non-breaking hyphen**, ‑, looks like a regular hyphen, but acts like a normal character in the middle of a word. A **non-breaking space**, s;, looks like a single space, but acts like a normal character in the middle of a word.

**PARTICIPATION
ACTIVITY**

2.8.3: HTML entities for spaces and hyphens.



Match the entity to the entity description.

— † s; ‑

Non-breaking space

-

†

—

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Reset

Exploring further:

- [Table of all known HTML entities](#) from W3 Consortium.

How was this section?



[Provide feedback](#)

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