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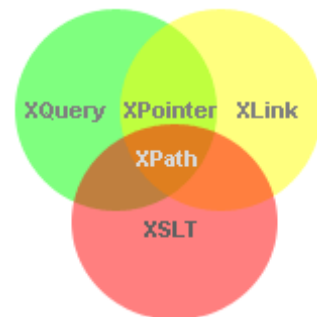
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XPath Tutorial

XPath Tutorial



XPath is a language for finding information in an XML document. XPath is used to navigate through elements and attributes in an XML document.

XPath is a major element in the W3C's XSLT standard - and XQuery and XPointer are both built on XPath expressions.

So an understanding of XPath is fundamental to a lot of advanced XML usage.

[Start learning XPath!](#)

XPath Reference

At W3Schools you will find a complete reference of all the built-in functions in XPath 2.0, XQuery 1.0 and XSLT 2.0.

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This chapter explains what XPath is.

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This chapter explains the XPath axes.

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This chapter lists the operators that can be used in XPath expressions.

[XPath Examples](#)

This chapter uses the "books.xml" document to demonstrate some XPath examples.

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[XPath Summary](#)

This chapter contains a summary on what you have learned in this tutorial and a recommendation on what subject you should study next.

XPath Reference

[XPath Functions](#)

This reference library defines the built-in functions required for XPath 2.0, XQuery 1.0 and XSLT 2.0.

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XPath Introduction

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XPath is a language for finding information in an XML document. XPath is used to navigate through elements and attributes in an XML document.

What You Should Already Know

Before you continue you should have a basic understanding of the following:

- HTML / XHTML
- XML / XML Namespaces

If you want to study these subjects first, find the tutorials on our [Home page](#).

What is XPath?

- XPath is a syntax for defining parts of an XML document
- XPath uses path expressions to navigate in XML documents
- XPath contains a library of standard functions
- XPath is a major element in XSLT
- XPath is a W3C Standard

XPath Path Expressions

XPath uses path expressions to select nodes or node-sets in an XML document. These path expressions look very much like the expressions you see when you work with a traditional computer file system.

XPath Standard Functions

XPath includes over 100 built-in functions. There are functions for string values, numeric values, date and time comparison, node and QName manipulation, sequence manipulation, Boolean values, and more.

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XPath is Used in XSLT

XPath is a major element in the XSLT standard. Without XPath knowledge you will not be able to create XSLT documents.

You can read more about XSLT in our [XSLT tutorial](#).

XQuery and XPointer are both built on XPath expressions. XQuery 1.0 and XPath 2.0 share the same data model and support the same functions and operators.

You can read more about XQuery in our [XQuery tutorial](#).

XPath is a W3C Standard

XPath became a W3C Recommendation 16. November 1999.

XPath was designed to be used by XSLT, XPointer and other XML parsing software.

You can read more about the XPath standard in our [W3C tutorial](#).

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In XPath, there are seven kinds of nodes: element, attribute, text, namespace, processing-instruction, comment, and document (root) nodes.

XPath Terminology

Nodes

In XPath, there are seven kinds of nodes: element, attribute, text, namespace, processing-instruction, comment, and document (root) nodes. XML documents are treated as trees of nodes. The root of the tree is called the document node (or root node).

Look at the following XML document:

```
<?xml version="1.0" encoding="ISO-8859-1"?>

<bookstore>

<book>
  <title lang="en">Harry Potter</title>
  <author>J K. Rowling</author>
  <year>2005</year>
  <price>29.99</price>
</book>

</bookstore>
```

Example of nodes in the XML document above:

```
<bookstore> (document node)

<author>J K. Rowling</author> (element node)

lang="en" (attribute node)
```

Atomic values

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Atomic values are nodes with no children or parent.

Example of atomic values:

```
J K. Rowling
```

```
"en"
```

Items

Items are atomic values or nodes.

Relationship of Nodes

Parent

Each element and attribute has one parent.

In the following example; the book element is the parent of the title, author, year, and price:

```
<book>
  <title>Harry Potter</title>
  <author>J K. Rowling</author>
  <year>2005</year>
  <price>29.99</price>
</book>
```

Children

Element nodes may have zero, one or more children.

In the following example; the title, author, year, and price elements are all children of the book element:

```
<book>
  <title>Harry Potter</title>
  <author>J K. Rowling</author>
  <year>2005</year>
  <price>29.99</price>
</book>
```

Siblings

Nodes that have the same parent.

In the following example; the title, author, year, and price elements are all siblings:

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```
<book>
  <title>Harry Potter</title>
  <author>J K. Rowling</author>
  <year>2005</year>
  <price>29.99</price>
</book>
```

Ancestors

A node's parent, parent's parent, etc.

In the following example; the ancestors of the title element are the book element and the bookstore element:

```
<bookstore>

<book>
  <title>Harry Potter</title>
  <author>J K. Rowling</author>
  <year>2005</year>
  <price>29.99</price>
</book>

</bookstore>
```

Descendants

A node's children, children's children, etc.

In the following example; descendants of the bookstore element are the book, title, author, year, and price elements:

```
<bookstore>

<book>
  <title>Harry Potter</title>
  <author>J K. Rowling</author>
  <year>2005</year>
  <price>29.99</price>
</book>

</bookstore>
```

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XPath uses path expressions to select nodes or node-sets in an XML document. The node is selected by following a path or steps.

The XML Example Document

We will use the following XML document in the examples below.

```
<?xml version="1.0" encoding="ISO-8859-1"?>

<bookstore>

<book>
  <title lang="eng">Harry Potter</title>
  <price>29.99</price>
</book>

<book>
  <title lang="eng">Learning XML</title>
  <price>39.95</price>
</book>

</bookstore>
```

Selecting Nodes

XPath uses path expressions to select nodes in an XML document. The node is selected by following a path or steps. The most useful path expressions are listed below:

Expression	Description
<i>nodename</i>	Selects all child nodes of the node
/	Selects from the root node
//	Selects nodes in the document from the current node that match the selection no matter where they are
.	Selects the current node
..	Selects the parent of the current node

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@	Selects attributes
---	--------------------

Examples

In the table below we have listed some path expressions and the result of the expressions:

Path Expression	Result
bookstore	Selects all the child nodes of the bookstore element
/bookstore	Selects the root element bookstore Note: If the path starts with a slash (/) it always represents an absolute path to an element!
bookstore/book	Selects all book elements that are children of bookstore
//book	Selects all book elements no matter where they are in the document
bookstore//book	Selects all book elements that are descendant of the bookstore element, no matter where they are under the bookstore element
//@lang	Selects all attributes that are named lang

Predicates

Predicates are used to find a specific node or a node that contains a specific value.

Predicates are always embedded in square brackets.

Examples

In the table below we have listed some path expressions with predicates and the result of the expressions:

Path Expression	Result
/bookstore/book[1]	Selects the first book element that is the child of the bookstore element
/bookstore/book[last()]	Selects the last book element that is the child of the bookstore element
/bookstore/book[last()-1]	Selects the last but one book element that is the child of the bookstore element
/bookstore/book[position()<3]	Selects the first two book elements that are children of the bookstore element
//title[@lang]	Selects all the title elements that have an attribute named lang
//title[@lang='eng']	Selects all the title elements that have an attribute named lang with a value of 'eng'
/bookstore/book[price>35.00]	Selects all the book elements of the bookstore element that have a price element with a value greater than 35.00
/bookstore/book[price>35.00]/title	Selects all the title elements of the book elements of the bookstore element that have a price element with a value greater than 35.00

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Selecting Unknown Nodes

XPath wildcards can be used to select unknown XML elements.

Wildcard	Description
*	Matches any element node
@*	Matches any attribute node
node()	Matches any node of any kind

Examples

In the table below we have listed some path expressions and the result of the expressions:

Path Expression	Result
/bookstore/*	Selects all the child nodes of the bookstore element
//*	Selects all elements in the document
//title[@*]	Selects all title elements which have any attribute

Selecting Several Paths

By using the | operator in an XPath expression you can select several paths.

Examples

In the table below we have listed some path expressions and the result of the expressions:

Path Expression	Result
//book/title //book/price	Selects all the title AND price elements of all book elements
//title //price	Selects all the title AND price elements in the document
/bookstore/book/title //price	Selects all the title elements of the book element of the bookstore element AND all the price elements in the document

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The XML Example Document

We will use the following XML document in the examples below.

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<bookstore>
<book>
  <title lang="eng">Harry Potter</title>
  <price>29.99</price>
</book>
<book>
  <title lang="eng">Learning XML</title>
  <price>39.95</price>
</book>
</bookstore>
```

XPath Axes

An axis defines a node-set relative to the current node.

AxisName	Result
ancestor	Selects all ancestors (parent, grandparent, etc.) of the current node
ancestor-or-self	Selects all ancestors (parent, grandparent, etc.) of the current node and the current node itself
attribute	Selects all attributes of the current node
child	Selects all children of the current node
descendant	Selects all descendants (children, grandchildren, etc.) of the current node
descendant-or-self	Selects all descendants (children, grandchildren, etc.) of the current node and the current node itself
following	Selects everything in the document after the closing tag of the current node

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following-sibling	Selects all siblings after the current node
namespace	Selects all namespace nodes of the current node
parent	Selects the parent of the current node
preceding	Selects everything in the document that is before the start tag of the current node
preceding-sibling	Selects all siblings before the current node
self	Selects the current node

Location Path Expression

A location path can be absolute or relative.

An absolute location path starts with a slash (/) and a relative location path does not. In both cases the location path consists of one or more steps, each separated by a slash:

An absolute location path:

```
/step/step/...
```

A relative location path:

```
step/step/...
```

Each step is evaluated against the nodes in the current node-set.

A step consists of:

- an axis (defines the tree-relationship between the selected nodes and the current node)
- a node-test (identifies a node within an axis)
- zero or more predicates (to further refine the selected node-set)

The syntax for a location step is:

```
axisname::nodetest[predicate]
```

Examples

Example	Result
child::book	Selects all book nodes that are children of the current node
attribute::lang	Selects the lang attribute of the current node
child::*	Selects all children of the current node
attribute::*	Selects all attributes of the current node
child::text()	Selects all text child nodes of the current node
child::node()	Selects all child nodes of the current node
descendant::book	Selects all book descendants of the current node

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ancestor::book	Selects all book ancestors of the current node
ancestor-or-self::book	Selects all book ancestors of the current node - and the current as well if it is a book node
child::* / child::price	Selects all price grandchildren of the current node

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An XPath expression returns either a node-set, a string, a Boolean, or a number.

XPath Operators

Below is a list of the operators that can be used in XPath expressions:

Operator	Description	Example	Return value
	Computes two node-sets	//book //cd	Returns a node-set with all book and cd elements
+	Addition	6 + 4	10
-	Subtraction	6 - 4	2
*	Multiplication	6 * 4	24
div	Division	8 div 4	2
=	Equal	price=9.80	true if price is 9.80 false if price is 9.90
!=	Not equal	price!=9.80	true if price is 9.90 false if price is 9.80
<	Less than	price<9.80	true if price is 9.00 false if price is 9.80
<=	Less than or equal to	price<=9.80	true if price is 9.00 false if price is 9.90
>	Greater than	price>9.80	true if price is 9.90 false if price is 9.80
>=	Greater than or equal to	price>=9.80	true if price is 9.90 false if price is 9.70
or	or	price=9.80 or price=9.70	true if price is 9.80 false if price is 9.50
and	and	price>9.00 and price<9.90	true if price is 9.80 false if price is 8.50
mod	Modulus (division remainder)	5 mod 2	1

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XPath Examples

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Let's try to learn some basic XPath syntax by looking at some examples.

The XML Example Document

We will use the following XML document in the examples below.

"books.xml":

```

<?xml version="1.0" encoding="ISO-8859-1"?>

<bookstore>

<book category="COOKING">
  <title lang="en">Everyday Italian</title>
  <author>Giada De Laurentiis</author>
  <year>2005</year>
  <price>30.00</price>
</book>

<book category="CHILDREN">
  <title lang="en">Harry Potter</title>
  <author>J K. Rowling</author>
  <year>2005</year>
  <price>29.99</price>
</book>

<book category="WEB">
  <title lang="en">XQuery Kick Start</title>
  <author>James McGovern</author>
  <author>Per Bothner</author>
  <author>Kurt Cagle</author>
  <author>James Linn</author>
  <author>Vaidyanathan Nagarajan</author>
  <year>2003</year>
  <price>49.99</price>
</book>

<book category="WEB">

```

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```
<title lang="en">Learning XML</title>
<author>Erik T. Ray</author>
<year>2003</year>
<price>39.95</price>
</book>

</bookstore>
```

[View the "books.xml" file in your browser.](#)

Selecting Nodes

We will use the Microsoft XMLDOM object to load the XML document and the selectNodes() function to select nodes from the XML document:

```
set xmlDoc=CreateObject("Microsoft.XMLDOM")
xmlDoc.async="false"
xmlDoc.load("books.xml")

xmlDoc.selectNodes(path expression)
```

Select all book Nodes

The following example selects all the book nodes under the bookstore element:

```
xmlDoc.selectNodes("/bookstore/book")
```

[If you have IE 5 or higher you can try it yourself.](#)

Select the First book Node

The following example selects only the first book node under the bookstore element:

```
xmlDoc.selectNodes("/bookstore/book[0]")
```

[If you have IE 5 or higher you can try it yourself](#)

Note: IE5 and later has implemented that [0] should be the first node, but according to the W3C standard it should have been [1]!!

A Workaround!

To solve the [0] and [1] problem in IE5+, you can set the SelectionLanguage to XPath.

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The following example selects only the first book node under the bookstore element:

```
xmlDoc.setProperty "SelectionLanguage", "XPath"  
xmlDoc.selectNodes("/bookstore/book[1]")
```

[Try it yourself](#)

Select the prices

The following example selects the text from all the price nodes:

```
xmlDoc.selectNodes("/bookstore/book/price/text()")
```

[If you have IE 5 or higher you can try it yourself.](#)

Selecting price Nodes with Price > 35

The following example selects all the price nodes with a price higher than 35:

```
xmlDoc.selectNodes("/bookstore/book[price>35]/price")
```

[If you have IE 5 or higher you can try it yourself.](#)

Selecting title Nodes with Price > 35

The following example selects all the title nodes with a price higher than 35:

```
xmlDoc.selectNodes("/bookstore/book[price>35]/title")
```

[If you have IE 5 or higher you can try it yourself.](#)

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