

PreTeXt Documents

For an article

```
<?xml version="1.0" encoding="UTF-8"?>
<pretext>
  <article>
    <title>Hello World!</title>
    <p>This is a PreTeXt document.</p>
  </article>
</pretext>
```

or a book

```
<?xml version="1.0" encoding="UTF-8"?>
<pretext>
  <book>
    <title>Hello World!</title>

    <chapter>
      <title>My Great Chapter</title>
      <p>This is a PreTeXt document.</p>
    </chapter>

  </book>
</pretext>
```

Structure of a PreTeXt Document

PreTeXt documents are structured and may contain divisions such as <chapter> (for books), <section>, <subsection>, and <p> (paragraphs).

```
<section>
  <title>Mandatory</title>
  <p>First paragraph. </p>

  <p>Second paragraph.</p>
</section>
```

Divisions may contain other divisions. Divisions require a <title>.

```
<section>
  <title>Mandatory</title>
  <introduction>
    <p>Introductory text. (Optional.)</p>
  </introduction>

  <subsection>
    <title>Mandatory</title>
    <p>Subsection content.</p>
```

```
</subsection>

<conclusion>
  <p>Concluding text. (Optional.)</p>
</conclusion>
</section>
```

Blocks

Besides paragraphs (<p>) the most common object to include in a division, <remark>, <example>, <figure> and <table>.

Cross-References

Any element that you place a @xml:id on can become the target of a cross-reference. For example, suppose your source had <subsection xml:id="subsection-flowers"> and someplace else you wrote <xref ref="subsection-flowers" />.

Mathematics in PreTeXt

Since PreTeXt has robust support for mathematical formulas. Inside the tags that delimit math environments, your code is basically L^AT_EX with the caveat that you must be careful with <, >, and & since they are special symbols for XML. When typing math in your PreTeXt code, use \lt for <, \gt for >, and \amp for &.

For inline math, wrap things in the <m> tag: $a^2 + b^2 = c^2$ is produced by <m>a² + b² = c²</m>.

We get displayed equations via the <m< and <men>. (to produce a numbered equation) tags. The code

```
<m>
  \frac{d}{dx} \int_1^x \frac{1}{t} dt
</m>
<men xml:id="eqn-ftc">
  \int_a^b f(x) dx = F(b) - F(a)
</men>
```

produces

$$\frac{d}{dx} \int_1^x \frac{1}{t} dt$$
$$\int_a^b f(x) dx = F(b) - F(a) \tag{1}$$

For a collection of equations all aligned at a designated point, use <md> and <mrow> (<mdn> for numbered equations.). The code

```
<md>
  <mrow>x \amp = r\cos\theta</mrow>
  <mrow>y \amp = r\sin\theta</mrow>
</md>
```

produces

$$x = r \cos \theta$$
$$y = r \sin \theta.$$

Images, Figures, sidebyside

Images can be included using the <image> tag with the @source. The @width attribute can be used to control the size of the image. Images can be wrapped inside a <figure>. A <figure> must have a <caption>, and the figure will be numbered. The <sidebyside> tag provides flexible options for placing several images together or combining figures with subcaptions. PreTeXt provides support for authoring with graphics languages such as Asymptote, TikZ, PGF, PSTricks, and xy-pic in addition to using Sage code to describe a plot or image. In most cases output can be obtained as smoothly-scalable SVG images, in addition to other formats like PDF or PNG. For accessibility, every <image> should either have a <description> child.

```
<figure xml:id="figure-spring-mass">
  <image width="60%" xml:id="spring-mass">
    <description>a mass on a table that is
      attached to a wall with a spring</description>
    <latex-image>
      <xi:include href="tikz/spring-mass.tex"
        parse="text"/>
    </latex-image>
  </image>
  <caption>A spring-mass system</caption>
</figure>
```

Lists

The structure of ordered lists (numbered), unordered lists (bullets) and description lists (defined terms) is given by the , , <dl> tags (respectively). List items are delimited with the tag.

Theorem-Like Elements

The tags <theorem>, <algorithm>, <claim>, <corollary>, <fact>, <identity>, <lemma>, and <proposition> have the same structure in PreTeXt.

```
<theorem>
  <title>Optional</title>
  <statement>
    <p>Here's the statement of the theorem.</p>
  </statement>

  <proof>
    <p>You don't actually need a proof.</p>
  </proof>
</theorem>
```

Example-Like Elements

The tags <example>, <problem>, and <question> have the same structure in PreTeXt.

```
<example>
  <title>Differentiating a polynomial</title>
  <p>The derivative of the function
    <m>f(x) = 3x5-7x+5</m> is <m>f'(x) = 15x4-7</m>.</p>
</example>
```

Axiom-Like Elements

The tags `<assumption>`, `<axiom>`, `<conjecture>`, `<heuristic>`, `<hypothesis>`, and `<principle>` have the same structure in PreTeXt.

```
<axiom>
  <title>Optional</title>
  <creator>Peano</creator>
  <statement>
    <p>Here's the statement of the axiom.</p>
  </statement>
</axiom>
```

Remark-Like Elements

The tags `<convention>`, `<insight>`, `<note>`, `<observation>`, `<remark>`, and `<warning>` have the same structure in PreTeXt.

```
<remark>
  <title>A little remark</title>
  <p>This is a remark.</p>
</remark>
```

Project-Like Elements

The tags `<activity>`, `<exploration>`, `<investigation>`, and `<project>` have the same structure in PreTeXt.

```
<project>
  <title>A structured project</title>
  <introduction>
    <p>Here is the introduction.</p>
  </introduction>

  <task>
    <statement>
      <p>The first step to do.</p>
    </statement>
  </task>

  <task>
    <statement>
      <p>The second step to do.</p>
    </statement>
  </task>

  <conclusion>
    <p>A little wrap up.</p>
  </conclusion>
</project>
```

Exercises

An `<exercise>` in the middle of a division, intermixed between theorems and paragraphs and figures. In this case, it is labeled as a “Checkpoint.” You can put several `<exercise>`s as part of an `<exercises>` element within a division, which is the typical way for creating a collection of exercises together at the end of a division such as a chapter or section. An `<exercisegroup>` can group together a collection of exercises that have a set of common instructions.

A specialized division, `<reading-questions>`, can be used to house `<exercise>`s designed to test or guide a reader’s comprehension of the material in that division. It is possible to embed WeBWork exercises into a PreTeXt document

An `<exercise>` has the following structure.

```
<exercise>
  <statement>
    <p>The <c>statement</c> is mandatory.</p>
  </statement>
  <optional-signal/>
  <hint>
    <p>Optional.</p>
  </hint>
  <answer>
    <p>Optional.</p>
  </answer>
  <solution>
    <p>Optional.</p>
  </solution>
</exercise>
```

An element we generically call a “signal” is an important component of an exercise if you want to add something that will be interactive in HTML and Runestone. Signals include `<choices>` for multiple choice questions, `<blocks>` for Parsons (mixed up blocks) problems, `<match>` for matching, `<areas>` for clickable area, `<response>` for short answer, and `<setup>` for fill-in-the-blank. A True/False question simply uses a `correct` attribute on `<statement>` as a signal. The signal element usually has further structure, see pretextbook.org for examples and source.

Worksheets

A `<worksheet>` is a specialized division that can be a child of most divisions and can contain most PreTeXt tags.

Tables

Similar to \LaTeX PreTeXt provides a `<table>` tag and a `<tabular>` tag. The `<tabular>` tag is used for producing the array of data, while the `<table>` tag provides the number and title.

SageMath Content

A SageMath cell can be included in a PreTeXt document.

```
<sage>
<input>
2+2
</input>
<output>
4
</output>
</sage>
```

SageMath can be used to created an image in a PreTeXt document.

```
<figure xml:id="fig-sage-cubic">
  <caption>A cubic plotted by SageMath on
  <m>[-3,2]</m></caption>
```

```
<image xml:id="sageplot-cubic" width="50%">
  <description>A cubic function on the interval
  [-3,2]</description>

  <sageplot>
    f(x) = (x-1)*(x+1)*(x-2)
    plot(f, (x, -3, 2), color='blue', thickness=3)
  </sageplot>
</image>
</figure>
```