

XSL-FO Conversion Development

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Abstract. A small article exercising the conversion of PreTeXt to XSL Formatting Objects, rendered as an accessible PDF by Apache FOP. It grows in concert with the capabilities of the conversion.

1 Prose

This is the first paragraph of a minimal article, used to exercise the conversion of PreTeXt source to XSL Formatting Objects, and then to a PDF by Apache FOP. A paragraph is the fundamental unit of prose, so it is the first element implemented, and this one is long enough to demonstrate line-breaking and justification.

A second paragraph demonstrates inter-paragraph spacing. It contains some inline markup, such as *emphasized text* and a **defined term**, rendered with italic and bold fonts. A footnote¹ hangs off this sentence.

A Little History. The lightweight <paragraphs> division has just a title, run in to this paragraph. Cross-references work too: see [Theorem 7.4](#), [Definition 7.2](#), and [Section 4](#), all referenced from [A Little History](#). Even the starred equation (**★**) answers to its decoration.

2 Inline Markup

Semantic markup, mostly by font: *emphasis*, a **defined term**, an *alert*, a *lingua aliena*, the book *A First Course in Linear Algebra*, the paper “On Computable Numbers”, and the species *Quercus garryana*.




Edits as **inserted**, ~~deleted~~, and ~~state~~ text. Verbatim text such as `print("Hello, world")`, and markup-language fragments like <section>, <mdash/>, and @xml:id.

Quotations, “double” and ‘single’. Dashes for ranges, 2023–2024, and for asides—like this one. An ellipsis... and a few characters: 98.6°, 3×5, ©, ™, and several logos: PreTeXt, LaTeX, TeX, XeTeX, XeLaTeX, and WeBWorK.

¹ The footnote drops to the bottom of the page, below a separator rule.

Abbreviations render plainly: an acronym like SCUBA, an initialism like XML, and Latin abbreviations, e.g., this very sentence.

Keyboard keys, named like $\boxed{\downarrow}$ and $\boxed{\uparrow}$, or verbatim like $\boxed{\text{q}}$, render visibly boxed.

Interface icons name a glyph from a standard set, such as settings , tools , and save .

External references are active links: the [PreTeXt website](https://pretextbook.org/), the bare URL <https://pretextbook.org/>, and an address for writing, info@example.com. Cross-references, like one to [Theorem 7.4](#) ahead, are internal links.

3 Lists

A plain unordered list gathers a few short, unstructured items.

- a side
- an angle
- a vertex

An ordered list nests several levels deep, with an unordered list at the bottom, which exercises the changing labels and the growing indentation.

1. Measure the three sides.
 - (a) Single out the longest side, the candidate hypotenuse, and square it.
 - record the square
 - set it aside
 - (b) Square each of the two shorter sides, and add the results.
2. Compare the two totals to test for a right angle.

and then the surrounding paragraph resumes.

The items of a list may lead with a title.

- *Acute.*
every angle is smaller than a right angle
- *Right.*
one angle is exactly a right angle
- *Obtuse.*
one angle is larger than a right angle

An author may set the list label, such as lower-case Roman numerals.

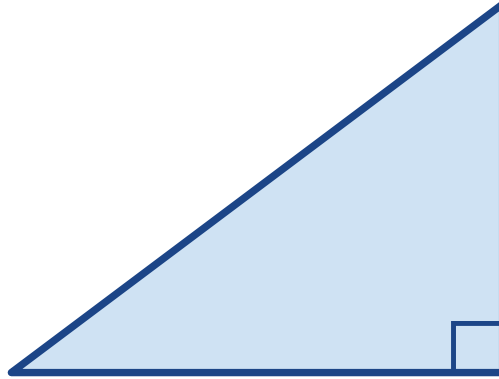
- (i) One item.
- (ii) A second item.

A description list pairs short terms with their explanations; a wide label column sets the terms right-aligned against the descriptions.

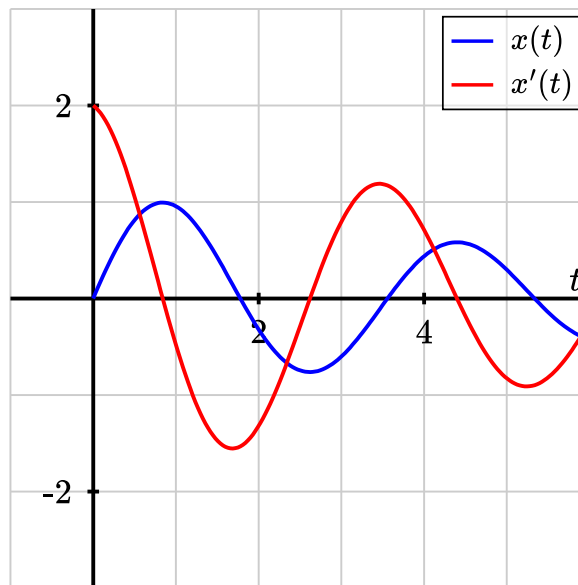
- | | |
|-------------------|--|
| Leg | One of the two sides that meet at the right angle. |
| Hypotenuse | The side opposite the right angle, and the longest of the three. |

4 Images

An externally produced image, a right triangle, follows at half of the available width.



A born-in-source image, authored in PreFigure syntax, follows. It is generated to SVG, which Apache FOP embeds directly; the diagram carries an intrinsic width and height, so it occupies only the vertical space it needs.



5 Tables and Figures

A small table of tree data follows, ruled only horizontally, with a header row and varied column alignment.

Species	Family	Height (m)
Garry oak	Beech	20
Douglas fir	Pine	100

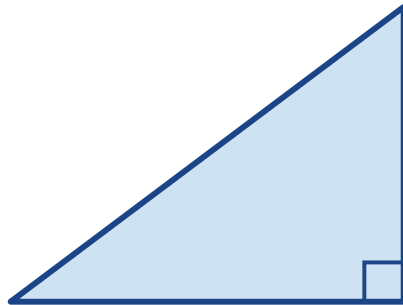
Table 5.1. Some Trees and Their Habits

A second table groups three columns under a spanning header, sets the names off with a single vertical rule, and sizes itself to its content rather than to fixed percentages.

Name	Side Lengths		
	<i>a</i>	<i>b</i>	<i>c</i>
3-4-5	3	4	5
5-12-13	5	12	13
8-15-17	8	15	17

Table 5.2. Some Pythagorean Triples

A side-by-side arranges panels horizontally: an image, beside a list of the sides of the pictured triangle, with the bottoms of the two panels aligned.



- a leg of length 3
- a leg of length 4
- hypotenuse of length 5

Some prose separates the bare side-by-side above from the captioned figure below, so the two layout devices read as distinct.

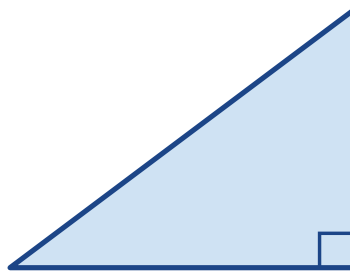


Figure 5.3. A right triangle, now wrapped in a captioned figure.

Definition 7.2. Hypotenuse. The **hypotenuse** of a right triangle is the side opposite the right angle. ◆

Definition 7.3. The **distance** between points $P = (x_1, y_1)$ and $Q = (x_2, y_2)$ in the plane is

$$d(P, Q) = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}.$$

Theorem 7.4 (Pythagoras). Pythagorean Theorem.

If a right triangle has legs a and b , and hypotenuse c , then $a^2 + b^2 = c^2$.

Proof. Dissect a square with side length $a + b$ in two different ways, and account for the areas. ■

Example 7.5. Computing a Hypotenuse. A right triangle has legs 3 and 4, and here each step toward its hypotenuse c is annotated with the fact it relies on.

$$\begin{aligned} c^2 &= a^2 + b^2 && \text{Theorem 7.4} \\ &= 3^2 + 4^2 && \text{(the given legs)} \\ &= 25, \end{aligned}$$

so $c = 5$. ▲

Example 7.6. A Quadratic Equation. Solve the equation

$$x^2 - 5x + 6 = 0. \tag{7.1}$$

Solution. The left side factors as $(x - 2)(x - 3)$, so the solutions are $x = 2$ and $x = 3$. ▲

Theorem 7.7. Characterizing Even Squares. *An integer n is even if and only if n^2 is even, a fact worth a reference number,*

$$2 \mid n \iff 4 \mid n^2 \tag{★}$$

which earns a decorative tag instead.

Proof.

(\Rightarrow) If $n = 2k$, then $n^2 = 4k^2$, so n^2 is even.

(\Leftarrow) If n is odd, say $n = 2k + 1$, then $n^2 = 4k^2 + 4k + 1$ is odd; the contrapositive completes the case. ■

The Central Identity.

Nearly everything in this section turns on a single relationship: in a right triangle, the square on the hypotenuse equals the sum of the squares on the legs, $a^2 + b^2 = c^2$.

7.1 Depth

A subsection exercises a deeper heading, and a two-level number.

7.1.1 More Depth

A subsection is the deepest traditional division, with a three-level number.

7.1.2 Deeper Still

A second subsection confirms that the numbering increments within the subsection.

A subsection may also close with a conclusion, set after its subsections.

8 Projects and Checkpoints

An inline exercise is a “checkpoint”, numbered with the blocks.

Checkpoint 8.1. A Quick Check. A right triangle has legs 5 and 12. How long is the hypotenuse?

Answer. 13.

Project 8.1. A Project in Pieces. Projects often divide into tasks.

(a) Compute the area of the 3-4-5 right triangle.

Solution. One half of $3 \cdot 4$, so 6.

(b) Now find its perimeter, in two steps.

(i) Add the two legs.

(ii) Add in the hypotenuse.

9 Quotations, Verse, Quantities

Fill in the blank: the answer is _____ here. And a quantity with units: the speed limit is 100 km/h.

The grand thing is to be able to reason backwards.

—Sherlock Holmes

“A Study in Scarlet”, 1887

Fog

The fog comes
on little cat feet.

It sits looking
over harbor and city
on silent haunches
and then moves on.

Carl Sandburg

10 A Few Exercises

1. Multiply $13 \cdot 31$.

Hint. A calculator might help.

Square each of the following.

2. 7.

3. $2x - 3$.

11 A Worksheet with Workspace

A worksheet is a printout, so an exercise may request @workspace—blank space below, where a reader works. The space is elastic: it can stretch to fill out the printout's page, or surrender a bit when the page is crowded.

1. Add the first ten positive integers.

2. Now multiply them. This deserves the larger workspace.

3. This exercise begins an authored second page. Formulate a conjecture relating the two preceding answers, with plenty of room to think.

The conclusion of the worksheet follows the final workspace.

12 References

- [1] Judson, Thomas W., *Abstract Algebra: Theory and Applications* (2022), Orthogonal Publishing, Ann Arbor, MI.
- [2] Lay, David C., *Subspaces and Echelon Forms*, The College Mathematics Journal **24** no. 1 (1993) 57-62.
- [3] Conrey, J. B. and D. W. Farmer, *Mean values of L-functions and symmetry*, International Mathematics Research Notices **17** (2000) 883-908.
- [4] Dummit, David S. and Richard M. Foote, *Abstract Algebra*, 3rd edition (2004), John Wiley & Sons, Hoboken, NJ.
- [5] The PreTeXt Project, *The PreTeXt Guide*, accessed 2026-06-01 <https://pretextbook.org/doc/guide/html/>.
- [6] Author, Jane Q., Smith, John (ed.), *Finite Fields and Their Applications*, Topics in Modern Algebra (2010) 45-98, Academic Press, San Diego, CA.
- [7] Lovelace, A.; C. Babbage and G. Boole, *A Fast Algorithm for Matrix Factorization*, Proceedings of the International Congress of Mathematicians (2018) 1123-1140.
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- [9] The Sage Developers, *SageMath, the Sage Mathematics Software System (Version 10.3)* (2024) <https://www.sagemath.org>.
- [10] National Institute of Standards and Technology, *Digital Signature Standard (DSS)* no. FIPS PUB 186-4 (2013), U.S. Department of Commerce.
- [11] Strang, Gilbert, *Introduction to Linear Algebra*, 5th edition (2016), 584 pages, Wellesley-Cambridge Press, Wellesley, MA, ISBN 978-0-9802327-7-6.
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A Answers and Solutions

8 · Projects and Checkpoints

Checkpoint 8.1. A Quick Check.

Answer. 13.

Project 8.1. A Project in Pieces.

(a)

Solution. One half of $3 \cdot 4$, so 6.

Index

distance, 6

even integer, 6

hypotenuse, 6

Pythagorean Theorem, 6

Colophon

This article was authored in, and produced with, PreTeXt, rendered by Apache FOP by way of XSL Formatting Objects.