PUTTING IT ALL TOGETHER

USING PRETEXT FOR FULL DOCUMENTS

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RAISED MATHEMATICS PROJECT PRESENTATIONS
NEXTSENSE
ROUND TABLE ON INFORMATION ACCESS FOR PEOPLE WITH PRINT DISABILITIES
THE INTERNATIONAL COUNCIL FOR EDUCATION OF PEOPLE WITH VISUAL IMPAIRMENT (ICEVI)

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1. WHAT IS PRETEXT?

- An authoring and publishing system:
  - Extensive support for mathematics (and STEM)
  - Designed to create openly licensed materials
- An abstract specification of a scholarly document
- Markup for scholarly documents
- (markup—“the process or result of correcting text in preparation for printing”)
- Implementations of conversions to various formats
- A modern replacement for LaTeX
- A commitment to creating accessible materials
- A community of instructors, authors, and publishers
- Guided by 11 principles, e.g. …
- Principle #10: PreTeXt recognizes that scholarly documents involve the interaction of authors, publishers, scholars, instructors, students, and readers, with each group having its own needs and goals.

2. KEY IDEA: WRITE ONCE

The PreTeXt authoring language captures an author's intent and document structure, AS THE AUTHOR WRITES.

An author concentrates on CONTENT and is not able to influence PRESENTATION.

Principle #1: PreTeXt captures the structure of textbooks and research papers

3. PAYOFF: READ ANYWHERE

- PDF: print and electronic versions
- HTML: highly interactive, amazingly accessible
- EPUB/Kindle: an improvement on PDF
- Jupyter notebooks: popular for data science, Python programming
- Runestone: open-source hosting of open textbooks, with LMS, more interactivity
- Braille: embossable and electronic, 100% automated, no transcriber
- Slideshows: you are viewing one now
- Principle #3: PreTeXt documents serve as a single source which can be easily converted to multiple other formats, current and future.

4. PDF, FOR PRINT AND SCREEN

- Via LaTeX, two slightly different PDFs are possible.
- Electronic is different than hardcopy print.
  - Active links, colored?
  - Color versus B/W
  - One-sided v. two-sided
  - Page size, margins
- Example: Judson's Abstract Algebra

5. EPUB

- A superior offline format
- On desktops or laptops
- Or on tablets or dedicated devices
- Example: Foliate reader on Linux

5.2 Dihedral Groups

Another special type of permutation group is the dihedral group. Recall the symmetry group of an equilateral triangle in Chapter 3. Such groups consist of the rigid motions of a regular n-sided polygon or n-gon. For $n = 3, 4, \ldots$ we define the ***nth dihedral group*** to be the group of rigid motions of a regular n-gon. We will denote this group by D_n We can number the vertices of a regular n-gon by $1, 2, \ldots, n$ (Figure 5.2.1). Notice that there are exactly n choices to replace the first vertex. If we replace the first vertex by k then the second vertex must be replaced either by vertex $k + 1$ or by vertex $k - 1$ hence, there are $2n$ possible rigid motions of the n-gon. We summarize these results in the following theorem.

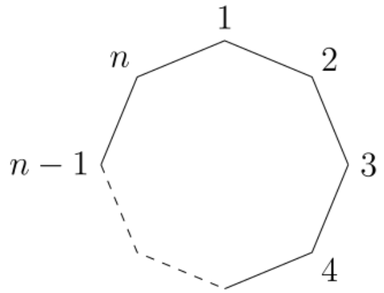


Figure 5.2.1. A regular n-gon

Theorem 5.2.2. *The dihedral group, D_n is a subgroup of S_n of order $2n$*

Theorem 5.2.3. *The group D_n $n \geq 3$ consists of all products of the two elements r and s satisfying the relations*

$$r^n = 1$$
$$s^2 = 1$$
$$srs = r^{-1}.$$

Proof. The possible motions of a regular n-gon are either reflections or rotations (Figure 5.2.4). There are exactly n possible rotations:

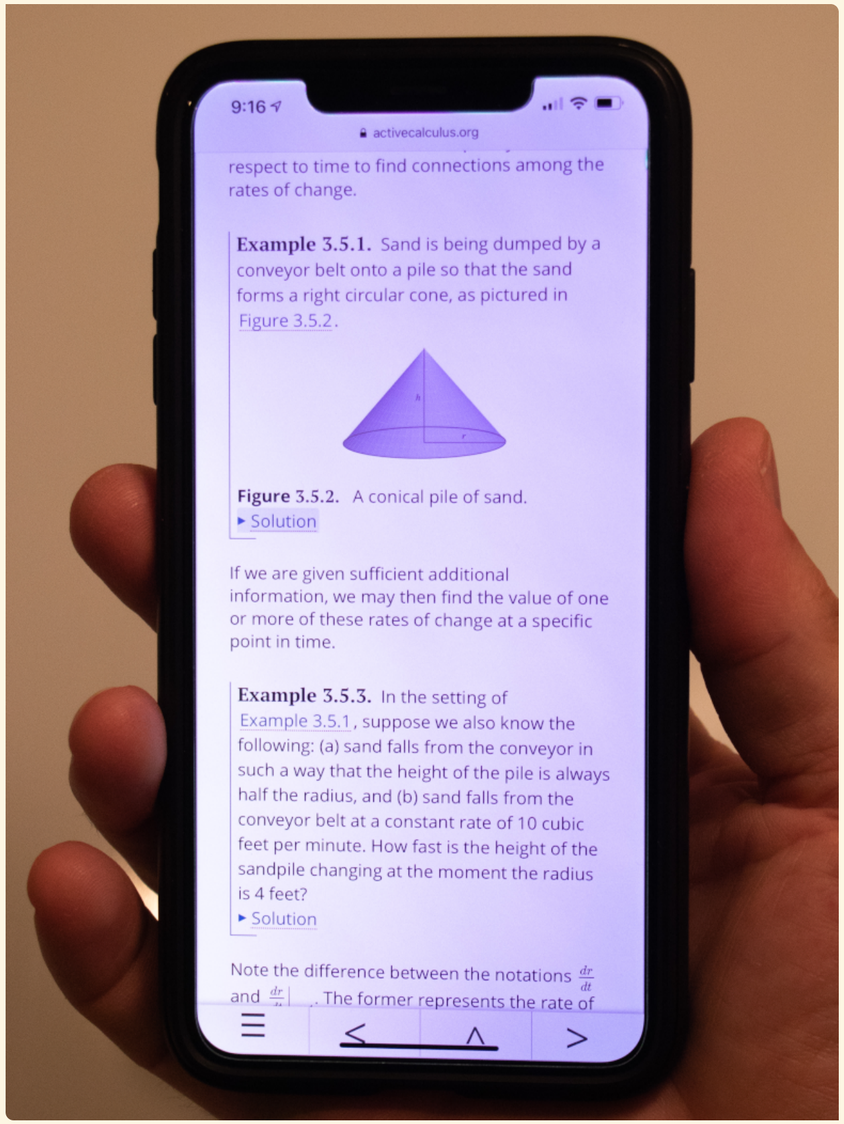
$$\text{id}, \frac{360^\circ}{n}, 2 \cdot \frac{360^\circ}{n}, \ldots, (n-1) \cdot \frac{360^\circ}{n}.$$

We will denote the rotation $360^\circ/n$ by r The rotation r generates all of the other rotations. That is,

$$r^k = k \cdot \frac{360^\circ}{n}.$$

6. HTML

- Everybody's favorite
- Takes advantage of HTML, CSS, Javascript
- Works well on small screens
- Accessible: works well with screen readers
- Math is powered by MathJax
- Many interactive features
- Principle #6: PreTeXt makes use of the full capabilities of the Web.



7. DEMONSTRATION

Judson's Abstract Algebra: Theory and Applications

http://abstract.ups.edu/aata/aata.html

8. BRAILLE EXAMPLE

AATA's theorem on a presentation of a dihedral group:

```
77777777777777777777777777777777777777
,!orem  #e4ba 4
  ,! gr|p _% ,d;n _:1 _% n .1: #3 _:1
3si/s ( all products ( ! two ele;ts .2;r
& .2;s1 satisfy+ ! rela;ns
_%
r~n" .k #1
s~2" .k #1
srs  .k r~-1
_:
4
77777777777777777777777777777777777777
```

Theorem 5.2.3. *The group D_n $n \geq 3$ consists of all products of the two elements r and s satisfying the relations*

$$r^n = 1$$
$$s^2 = 1$$
$$srs = r^{-1}.$$

9. BRAILLE

Judson's Abstract Algebra: Theory and Applications, as 24 BRF files

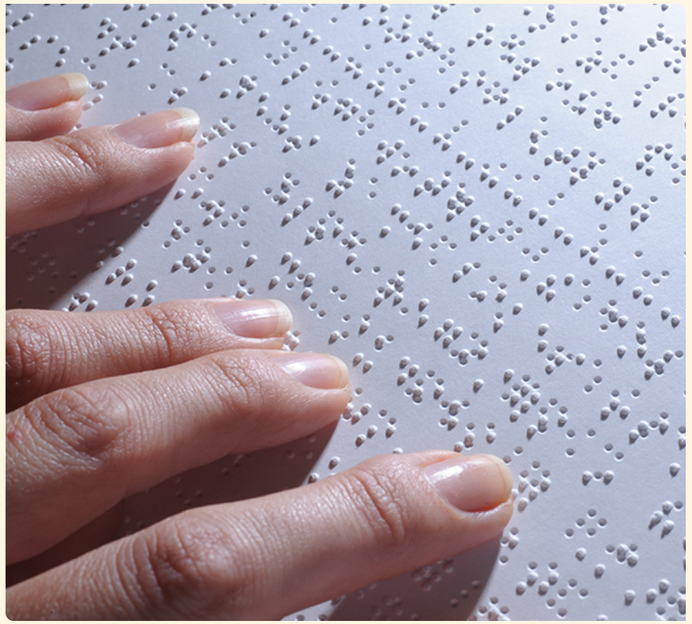
https://raised-mathematics.github.io/dissemination/aata/

10. BRAILLE

Principle #11: PreTeXt recognizes the inherent value in producing material that is accessible to everyone.

Key open-source tools:

- Speech Rule Engine (MathJax) makes Nemeth braille
- `liblouis` makes braille for literary text
- `liblouis` formats an embossed page
- This talk could be converted to braille! (It was!)



11. PROCESS/PIPELINE

- Isolate inline and multi-line mathematics in LaTeX syntax—the author does this for us.
- Example: variable names are not indicated by an italic font!
- Use Speech Rule Engine to convert math to Nemeth. Make replacements in source.
- Convert to HTML, with directives for `liblouis`.
- Apply `liblouis` without harming Nemeth bits.
- Result: UEB + Nemeth formatted for an embossed page.

12. TACTILE GRAPHICS

Design (and implement) markup for:

- Label placement (move braille labels away from graphic elements)
- Sub-components with descriptions (walkable versions)

13. CONCLUSION

Principle #8: PreTeXt is free: the software is available at no cost, with an open license. The use of PreTeXt does not impose any constraints on documents prepared with the system.

Links

- pretextbook.org
- buzzard.ups.edu/talks.html
- Twitter: #PreTeXTBook, #PreTeXtGang

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