A sample article for Algebra Universalis

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This article is dedicated to AU authors, present and future

Abstract. In this note we give instructions for preparing the LaTeX file of an AU paper.

1. Introduction

This sample article gives instructions for preparing a LaTeX file in the AU format. It also serves as a template: you should model your own LaTeX file on this.

The following sections discuss the various parts of the LaTeX file, in turn; except for Section 5, which gives examples of some constructions that you may need throughout your paper. If you are unfamiliar with LaTeX, you may also need to refer to one of the several available texts [8, 10], or start with George Grätzer's freely downloadable *Short Course* [9] (the pdf file, the sample LaTeX files, and the video presentations).

2. Preamble

You will need the class file `au.cls`, which can be downloaded from the AU homepage (Section D of *Instructions for Authors*):

http://www.math.umanitoba.ca/homepages/au

You do not have to learn anything new about `au.cls` to use it. It is a modification of the standard AMS article class `amsart.cls`; the same rules apply.

Place the file `au.cls` in your article's folder (or in the input directory of your TeX implementation), and start your article with `\documentclass{au}`.

Please base your LaTeX file's preamble on that for this sample article. In particular, note the following AU conventions.

Presented by ...
Received ...; accepted in final form ...
2010 *Mathematics Subject Classification*: Primary: 00A99; Secondary: 08A40, 06E30.
Key words and phrases: partial examples, distributed instructions.
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- We use `\theoremstyle{plain}` for statements that are usually proved (Theorem, Lemma, etc.); we use `\theoremstyle{definition}` for statements that are usually not proven (Definition, Remark, etc.). We do not use `\theoremstyle{remark}`.
- Unless a paper is very short, theorems, definitions, etc. and numbered equations should be numbered by section. Theorems, definitions, etc. should be numbered consecutively, not independently. So Theorem 3.6 is followed by Lemma 3.7, for example.
- To define your own commands, use the LaTeX commands `\newcommand` and `\renewcommand`; do not use `\def`.

3. Front matter

Please base your LaTeX file's front matter on that used for this article. The front matter consists of the following parts.

Title: Only the first letter of the first word and the first letters of proper names are capitalized.

Authors: Each author is listed separately, along with e-mail and address. (Note: The order of the items is important!)

Thanks: At most one per author, listed together so that if two authors give thanks, it reads: "The first author thanks blah, blah, blah. The second author thanks blah, blah, blah."

Dedication: Optional.

Subject class and Keywords: Normally present. Use only one primary subject class. There may be several secondary subject classes.

Abstract: The abstract should be self-contained; in particular, it should not include citations or references to the paper itself, such as "in [3]" or "in Theorem 5.2".

4. Main matter

4.1. Structure. Unless a paper is very short, it should be divided into sections; the first section (Section 1 not Section 0) immediately follows the abstract. Capitalization for section titles follows the same rule as for paper titles; see Section 3.

4.2. Formatting. Use the standard LaTeX environments to create your article's formatting:

- Lists should be created using the `itemize`, `enumerate`, or `description` environments. (You may use the `list` environment and the `enumerate` package for customized lists.)
- Declarations (theorem-type statements) and proofs should be formatted using the standard environments, as illustrated in Section 5.

4.3. Spacing. As a rule, there should be **no vertical spacing commands** in your LaTeX file; appropriate vertical spacings are encoded in the `au` class file. Any final vertical adjustments, including page breaks, are done by the editorial office.

The TeX system is designed to typeset mathematics with the correct spacing. So, in general, you should not need to insert tiny amounts of horizontal space into your mathematical expressions. If the spacing in a mathematical expression does not look right, it could be one of the following problems.

- If you use a binary relation symbol in a non-standard way, then you may need to put braces around it to obtain the correct spacing. (For example, use $(0,1) \in \leqslant$ rather than $(0,1) \in\leqslant$.)
- If you use a non-standard binary relation or operation symbol, then use `\mathrel` or `\mathbin` to correct the spacing. (For example, use $x \mathrel{\theta} y$ and $a \mathbin{\hat{+}} b = c$ rather than $x\theta y$ and $a\hat{+}b = c$).

4.4. References. Do not hardwire citations and internal references. Use `\cite` for citations and use `\label` and `\ref` for internal references, except that internal references to equations should be done using `\eqref`.

When referring by number to your figures, equations, theorems, etc., capitalize and do not abbreviate. For example, use `Subsection~\ref{style}` to refer to Subsection 4.5. Refer to external results as in [2, Theorem 1] or [11, p. 42].

4.5. Style. Definitions, formal or informal, should be set off in *emphatic mode* (not in **boldface**).

Pay attention to displaying mathematical formulas. While long formulas (more than half a line long) should usually be *displayed*, as in

$$(a+b)^4 = a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4,$$

short formulas should usually be presented *inline*, as in $a + b = b + a$.

(Note that, in the LaTeX file, the displayed formula has its concluding punctuation mark *inside* the delimiters, but the inline formula has it *outside* the delimiters.)

An article, even a mathematical one, should be written in paragraphs. Please avoid line-breaking commands like `\\` in the text of your article.[1]

4.6. Line breaks. Please ensure that your article does not have any lines that stick out into the right margin. (These lines will be marked in the right margin by a black 'slug'.) You should be able to fix these lines by

- rephrasing a sentence,
- displaying a long formula, or
- adding optional hyphens (as in `what\-cha\-ma\-call\-it`).

[1]Please *do not* use footnotes.

You may also take the opportunity to fix other unattractive line breaks: for instance, if an inline formula is being broken at an inappropriate place. (For bad line breaks in text, the 'unbreakable space' `~` may be useful.)

4.7. A few finer points.

(1) For a function f from A to B, write `$f \colon A \to B$`. This is typeset as $f\colon A \to B$; note the nice spacing.
(2) If you use the command `\dots`, then LaTeX will generally choose the correct position and spacing for your dots, as in

$$1, 2, \dots, n \quad \text{and} \quad 1 + 2 + \cdots + n.$$

(3) Mathematical operators should be declared in the preamble of the article. For example, `\DeclareMathOperator{\dom}{dom}`. *Then* $\operatorname{dom} f$ *will be typeset correctly, even in an italicized theorem statement.*
(4) Do not use the `eqnarray` environment. Please use `align` or `alignat` instead; see the proof of Theorem 5.2 for an example.
(5) Avoid using the default math font for words or abbreviations of words in formulas. For example, use A_{fix} rather than A_{fix}.

5. Examples

To illustrate some of the standard LaTeX constructions, we give a proof that the two-element Boolean algebra is primal.

Definition 5.1. We use $\mathbf{B} = \langle \{0,1\}; \vee, \wedge, ', 0, 1\rangle$ to denote the *two-element Boolean algebra*; see Figure 1.

$\vee$	0	1
0	0	1
1	1	1

$\wedge$	0	1
0	0	0
1	0	1

	$'$
0	1
1	0

FIGURE 1. The operations of $\mathbf{B}$

Theorem 5.2. *For all $n \in \mathbb{N}$, every function $f\colon \{0,1\}^n \to \{0,1\}$ is an n-ary term function of $\mathbf{B}$.*

Proof. Let $f\colon \{0,1\}^n \to \{0,1\}$, for some $n \in \mathbb{N}$. We start by introducing the notation

$$x^i = \begin{cases} x', & \text{for } i = 0; \\ x, & \text{for } i = 1. \end{cases}$$

Now define the term function $t\colon \{0,1\}^n \to \{0,1\}$ of $\mathbf{B}$ by

$$t(\vec{x}) = \bigvee \{\, x_1^{a_1} \wedge \cdots \wedge x_n^{a_n} \mid \vec{a} \in f^{-1}(1) \,\}. \tag{5.1}$$

For all $\vec{b} \in \{0,1\}^n$, it follows that

$$\begin{aligned} t(\vec{b}) = 1 &\iff b_1^{a_1} \wedge \cdots \wedge b_n^{a_n} = 1, \text{ for some } \vec{a} \in f^{-1}(1) \\ &\iff b_i^{a_i} = 1, \text{ for some } \vec{a} \in f^{-1}(1) \text{ and all } i \in \{1, \ldots, n\} \\ &\iff \vec{b} = \vec{a}, \text{ for some } \vec{a} \in f^{-1}(1) \\ &\iff f(\vec{b}) = 1. \end{aligned}$$

Hence f agrees with the term function t, as required. □

Remark 5.3. In the proof of Theorem 5.2, we showed how to write a Boolean function in *disjunctive normal form*; see Equation (5.1).

6. Bibliography

Algebra Universalis now uses the Springer 'Math and Physical Sciences' reference style. Articles in journals should be as in [1, 2, 3]; please follow carefully the format and punctuation. Book chapters are as in [4, 5, 6], theses as in [7], and books as in [10, 11, 12, 13]. For publications on the internet, conference papers and manuscripts, see [9, 14, 15].

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