`bmath` Example

Using `ctext` & `amath` — 06.06.2017

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1 Introduction

bMath defines some new environments for usage in scripts or subtasks. Environments may be chosen from the following list. Starred versions let you specify a name for the given type of environment.

- `definition` (available in starred version) lets you define formulas
- `beispiel` (available in starred version) lets you state an example
- `bemerkung` adds a remark
- `konvention` defines a convention
- `proposition` (available in starred version) proposes content
- `notation` adds a notational convention
- `satz` (available in starred version) defines a theorem
- `korollar` defines a corollary
- `lemma` (available in starred version) defines a lemma
- `algorithmus` (available in starred version) marks an algorithm
- `induktion` starts an inductional proof and puts appends a proof end mark at the end.[1]

bMath requires the `amsthm` package, which by default adds some environments, like `\begin{proof}\end{proof}` which MIGHT be useful in combination with bMath . A minimal working example SHALL be given by:

[1] `\QED` is a command defined by bMath putting a right-flushed square in the line

2 Examples

(2.1) Notation. bMath SHALL be displayed in small capitals.

(2.2) Satz (Homomorphiesatz für Mengen)**.** Es sei eine Abbildung $f : X \to Y$ gegeben. Dann haben wir eine induzierte Abbildung $\bar{f} : X/{=_f} \to Y, [x] \mapsto f(x)$, welche $f = \bar{f} \circ \mathrm{quo}$ erfüllt. Es ist $\bar{f}$ injektiv und $\mathrm{Im}\ \bar{f} = \mathrm{Im}\ f$. Insbesondere ist

$$\bar{f}\big|^{\mathrm{Im}\ f} : X/{=_f} \to \mathrm{Im}\ f$$

eine Bijektion.

(2.3) Corollary. bMath is quite nice.

Proof. This is left for exercise purpose to the reader. □

(2.4) Notation.

(a) Es sei ein Monoid M gegeben. Für jedes $n \in \mathbb{N}_0$ und alle $x \in M^n$ mit $x_i x_j = x_j x_i$ für $i, j \in [1, n]$ notieren wir rekursiv

$$\prod_{i\in[1,n]} x_i := \begin{cases} 1, & \text{falls } n = 0, \\ (\prod_{i\in[1,n-1]} x_i)x_n, & \text{falls } n > 0 \end{cases}$$

(b) Es sei ein abelsches Monoid A gegeben. Für jedes $n \in \mathbb{N}_0$ und alle $x \in A^n$ notieren wir rekursiv

$$\sum_{i\in[1,n]} x_i := \begin{cases} 0, & \text{falls } n = 0, \\ \sum_{i\in[1,n-1]} x_i + x_n, & \text{falls } n > 0 \end{cases}$$

Special case: `induktion` environment

Proof by complete induction:

(Basis): $n = 1 : \ldots$

(Inductive Hypothesis): $\ldots$

(Inductive Step): $n \mapsto n + 1 : \ldots$

Therefore, the hypothesis was shown by complete induction. □

3 Markers

bMath adds some (pseudo-)subsectioning commands, which are not displayed in any glossary (Basically, they are just fancy-styled text). As seen in table 3.1, they look like this:

Marker	Command	Comment
(Basis):	`\anfang`	Marks the basis of a proof by induction
(Inductive Hypothesis):	`\voraussetzung`	Marks the inductive hypothesis
(Inductive Step):	`\schritt`	Marks the inductive step
Hypothesis:	`\behauptung`	Marks a hypothesis
Proof:	`\beweis`	Marks a proof
Assumption:	`\ueberlegung`	Marks an assumption
Consider the following counterexample:	`\gegenbeispiel`	Marks a counterexample

Table 3.1: Marker commands