

# Notes on Mathematical Notation: You are doing it wrong

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# Outline

- Pretty and Practical
- CTU in Prague Guide
- ISO Norm
- Software Independent Recommendations
- Case Study with  $\text{\LaTeX}$  Examples
- Frequent Mistakes

Voice your disagreement anytime!

# Consistency

Publisher's Guide

Field Customs

General Rules

Creativity

# Consistency

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Field Customs

General Rules

## Consistency

We consider a two-dimensional lattice representing a room with an entrance and exit, consisting of  $N \times N$  sites. Each site can contain only one pedestrian at most. Every time step pedestrians choose one destination site out of five neighboring sites:  $(i, j)$ ,  $(i+1, j)$ ,  $(i-1, j)$ ,  $(i, j+1)$ , and  $(i, j-1)$  (see Fig. [1](#)), according to two types of FFs. One of the FFs is the static FF  $S_{ij}$  describing the shortest distance to the exit site, and the other is the dynamic FF  $D_{ij}$  expressing the total number of pedestrians who has visited the site. The dynamic FF has the dynamics of diffusion and decay, unlike the static FF. The transition probability  $p_{ij}$  for a jump to the neighboring site  $(i, j)$  is determined by the following expression:

$$p_{ij} = N \xi_{ij} \exp(-k_s S_{ij} + k_d D_{ij}), \quad (1)$$

where  $k_s$  and  $k_d$  are non-negative sensitivity parameters, and  $N$  stands for the normalization factor.  $\xi$  returns 0 for forbidden transitions such as to a wall, an

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# Consistency

- Exact and consistent expression of complex ideas
- Repeated breaking of formal rules is not a mistake but an alternative formalism
- Consistency of names
- Consistency of symbols
- Consistency of graphics
- Consistency of rules

# Formal Rules

- Publisher's Guide
  - CTU in Prague Guide: [https://knihovna.cvut.cz/files/VSKP/VSKP\\_02.pdf](https://knihovna.cvut.cz/files/VSKP/VSKP_02.pdf)
  - Journal Guide
- General Rules
  - Language Rules
  - ISO Norm



## II. Formální úprava

Každá vysokoškolská závěrečná práce je vizitkou autora, proto by měla být úhledná, bez věcných a jazykových chyb. Práce musí být dobře čitelná, bez překlepů. Chyby objevené po vytištění práce se opravují tzv. [erraty](#) (oprava na samostatném vloženém listu).

## Písmo

- v celém textu je nutné zachovat jednotnou grafickou úpravu, titulky a podtitulky
- nejčastěji používaná písma: patkové (např. Times Roman, Courier), bezpatkové (např. Arial, Calibri, Verdana)
- není dobré používat více druhů písma - lepší je kombinovat velikost, kurzívu, tloušťku jednoho typu písma

## Tabulky

- tabulku tvoří název, popř. číslo tabulky, hlavička, legenda, sloupce a řádky
- každá tabulka musí mít popis (např. název, číslo, legenda)
- popisný text tabulky musí být nad tabulkou za arabskou číslicí tabulky (podle ISO 7144, ostatní normy neuvádějí)
- tabulky se uvádějí v příloze, pokud ovšem nejsou přímo součástí textu
- seznam tabulek může být uveden v obsahu
- tabulky se číslují a popisují průběžně
- číslo tabulky se píše arabskými číslicemi
- záhlaví a legenda se výrazně oddělí od ostatních částí tabulky
- písmo tabulky má být stejné jako je použito v textu, ale zmenšeno o 1-2 body

## Obrázky

- patří sem všechny grafy, schémata, kresby, fotografie apod., které většinou označujeme jako obrázek (obr. 1)
- číslujeme je a označujeme názvem
- název začíná velkým písmenem a nepíše se za ním tečka
- číslo a název obrázku se uvádí pod obrázek (jinak než je to u tabulek)
- používané symboly a zkratky musí být stejné jako v textu

## Matematické, fyzikální a chemické vzorce

- číslice se musí psát v souladu s normou ISO 31
- při psaní matematické proměnné se používá kurzíva
- čárky a tečky se používají pouze pro desetinnou čárku
- číslice větší než 999 se rozdělují malou mezerou po každých třech číslicích
- desetinná čísla s více než 3 číslicemi se po desetinné čárce rozdělují malou mezerou po každých třech číslicích
- je-li číslo menší než 1, před desetinou čárku dáme 0
- závorky kulaté  $()$ , lomené  $[\ ]$  a složené  $\{ \}$  by měly respektovat dohodnuté pořadí v matematice

# ISO 80000

ISO 80000-1	2009	General
ISO 80000-2	2019	Mathematics
ISO 80000-3	2019	Space and time
ISO 80000-4	2019	Mechanics
ISO 80000-5	2019	Thermodynamics
IEC 80000-6	2022	Electromagnetism
ISO 80000-7	2019	Light and radiation
ISO 80000-8	2020	Acoustics
ISO 80000-9	2019	Physical chemistry and molecular physics
ISO 80000-10	2019	Atomic and nuclear physics
ISO 80000-11	2019	Characteristic numbers
ISO 80000-12	2019	Condensed matter physics
IEC 80000-13	2008	Information science and technology
IEC 80000-14	2008	Telebiometrics related to human physiology



← ICS ← 01 ← 01.060

## ISO 80000-1:2022

### Quantities and units — Part 1: General

#### Abstract

[Preview](#)

This document gives general information and definitions concerning quantities, systems of quantities, units, quantity and unit symbols, and coherent unit systems, especially the International System of Quantities (ISQ).

The principles laid down in this document are intended for general use within the various fields of science and technology, and as an introduction to other parts of this International Standard.

The ISO/IEC 80000 series does not, as yet, cover ordinal quantities and nominal properties.

#### General information

Status :  Published

Publication date : 2022-12

Edition : 2

Number of pages : 22

Technical Committee : [ISO/TC 12](#) Quantities and units

ICS : [01.060](#) Quantities and units

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ISO 80000-2: Mathematics  
4 000 CZK

# Field Customs

- Mathematics, Physics, Chemistry, . . .
- Different branches, different symbols

*f*, *F*

# General Rules

- Regular text is written with upright/Roman font
- Mathematics is written with sloping/italic font
- ... usually

Greek letter alpha has assigned symbol  $\alpha$ .

Let us set value  $\alpha = 1$ .

# General Rules

- Different entities, different symbol types
- Variables, constants, functions, vectors, sets, operators, ...
- Always add clarification if anything unusual is used

# General Rules

- Mathematics expressions are part of a sentence.

Let us set  $a = 1$ ,  $b = 2$ , and  $c = 3$ .

Let us set

$$a = 1,$$

$$b = 2,$$

$$c = 3.$$

# Examples

- Follow examples in  $\text{\LaTeX}$ .
- These slides are created in beamer and ordinary serif font is not used.
- Differences between "normal" font and math font are more visible.
- Beauty is temporary, consistency is consistent.

# Sets

A	<b>A</b>
<code>\$A\$</code>	<b>A</b>
<code>\$\$\mathbb{A}\$\$</code>	<b>A</b>
<code>\$\$\mathcal{A}\$\$</code>	<b>A</b>
<code>\$\$\mathcal{F}\$\$</code>	<b>F</b>
<code>\$\$\mathcal{L}\$\$</code>	<b>L</b>

# Vectors

$v$

$\$v\$$

$\$\mathrm{v}\$$

$\$\mathbf{v}\$$

$\backslash\mathbf{b}\mathbf{m}\{v\}$

$\$\overrightarrow{v}\$$

$\$\vv{v}\$$

$v$

$v$

$v$

$\mathbf{v}$

$\mathbf{v}$

$\overrightarrow{v}$

$\vv{v}$



# Functions

`exp (x)`

`$exp (x) $`

`$\exp (x) $`

`$\exp\left (x\right) $`

`$f (x) $`

`$\mathrm{f} (x) $`

`$\text{f} (x) $`

`$\bm{f} (x) $`

`exp(x)`

`exp(x)`

`exp(x)`

`exp (x)`

`f(x)`

`f(x)`

`f(x)`

`f(x)`

# Constants

e

`$e$`

`$\text{e}$`

`$\mathrm{e}$`

`\textpi`

`$\pi$`

`$\mathrm{\pi}$`

`$\uppi$`

e

*e*

e

e

$\pi$

$\pi$

$\pi$

$\pi$

## Text in Mathematics Mode

$$R_{ratio} = \frac{\textit{numberofthefirtsomething}}{\textit{numberofthesecondsomething}}$$

$$R_{ratio} = \frac{\text{number of the first something}}{\text{number of the second something}}$$

$$R_{ratio} = \frac{N_{\text{first thing}}}{N_{\text{second thing}}}$$

$$r = \frac{N_1}{N_2}$$

# Multiplication

<code>\$a\$ x \$b\$</code>	$a \times b$
<code>\$axb\$</code>	$axb$
<code>\$a\times b\$</code>	$a \times b$
<code>\$a\cdot b\$</code>	$a \cdot b$
<code>\$a,b\$</code>	$ab$
<code>\$ab\$</code>	$ab$
<code>\$a\odot b\$</code>	$a \odot b$
<code>\$a\otimes b\$</code>	$a \otimes b$

# Derivatives

`\frac{df}{dx}`

$\frac{df}{dx}$

`\frac{\text{d}f}{\text{d}x}`

$\frac{df}{dx}$

`\frac{\partial f}{\partial x}`

$\frac{\partial f}{\partial x}$

# Decimal Separator

1 . 2	1.2
\$1 . 2 \$	1.2
1 , 2	1,2
\$1 , 2 \$	1,2
\$1 { , } 2 \$	1,2

# Dots

<code>a . . .</code>	<code>a...</code>
<code>\$a . . . \$</code>	<code><i>a</i>...</code>
<code>\$a \ldots \$</code>	<code><i>a</i>...</code>
<code>\$a \cdot \$</code>	<code><i>a</i>·</code>
<code>\$a \cdots \$</code>	<code><i>a</i>...</code>
<code>\$a \dots \$</code>	<code><i>a</i>...</code>
<code>\$a \bullet \$</code>	<code><i>a</i>●</code>

# Transposition

`\bm{M}^T`

`\bm{M}^{\mathrm{T}}`

`\bm{M}^{\text{T}}`

`\bm{M}^{\intercal}`

**$M^T$**

**$M^{\mathrm{T}}$**

**$M^{\text{T}}$**

**$M^{\intercal}$**



# Brackets

$\$(a)\$$

$\$[(a)]\$$

$\$\{[(a)]\}\$$

$\$\left((a)\right)\$$

$\$\big((a)\big)\$$

$\$\Big(\big((a)\big)\Big)\$$

$(a)$

$[(a)]$

$\{[(a)]\}$

$((a))$

$\big((a)\big)$

$\Big(\big((a)\big)\Big)$

$$\int_0^1 (x + 1)^n dx$$

$$\int_0^1 (x + 1)^n dx$$

10000000 CZK

10 000 000 CZK

```
\DeclareMathOperator{\Var}{\text{Var}}
```

$\$P(X)\$$	$P(X)$
$\$\mathrm{P}(X)\$$	$\mathbf{P}(X)$
$\$\mathbb{P}(X)\$$	$\mathbb{P}(X)$
$\$\Pr(X)\$$	$\Pr(X)$
$\$\mathrm{Var}(X)\$$	$\mathbf{Var}(X)$

# Macros

```
\def\example{f_{\text{example}}}  
\DeclareMathOperator{\argmin}{\text{arg},min}}
```

`$\$ \backslash \text{example} \$$`

`$\$ \backslash \text{argmin}_{\{t \in T\}} \$$`

$f_{\text{example}}$

$\arg \min_{t \in T}$

# Frequent Mistakes

- Consistency of language
  - Text and figures
  - Text and cables
  - Text and citations
  - Text and text

# Frequent Mistakes

- Consistency of notation
  - Math and text
  - Math and figures
  - Math and tables
  - Math and math

# Frequent Mistakes

- Consistency of graphics
  - Figure font
  - Figure font size
  - Decimal separator

- Consistency
- Publisher's guide
- Font of mathematics and text
- Rules of symbol usage
- Macros
- Consistency

Thank You For Your Attention