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[waiting peer review]

The membership relation

Open Mathematics Collaboration*†

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Abstract

The MEMBERSHIP RELATION and its underlying definitions are presented in this white paper (knowledge base).

keywords: membership relation, abstract algebra, pure mathematics, knowledge base

The most updated version of this white paper is available at

https://osf.io/r9p2m/download

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*All *authors* with their *affiliations* appear at the end of this white paper.

†Corresponding author: mplobo@uft.edu.br | **Open Mathematics Collaboration**

Definition

1. MEMBERSHIP RELATION

$$\in = \{(a,b) \in A \times A \mid a \in b\}$$

$\in, A, b :=$ sets
$\in :=$ binary relation
$(a,b) :=$ ordered pair
$A \times A :=$ Cartesian product
$(a, b \in A, \; a \in b) \rightarrow ((a,b) \in \in)$
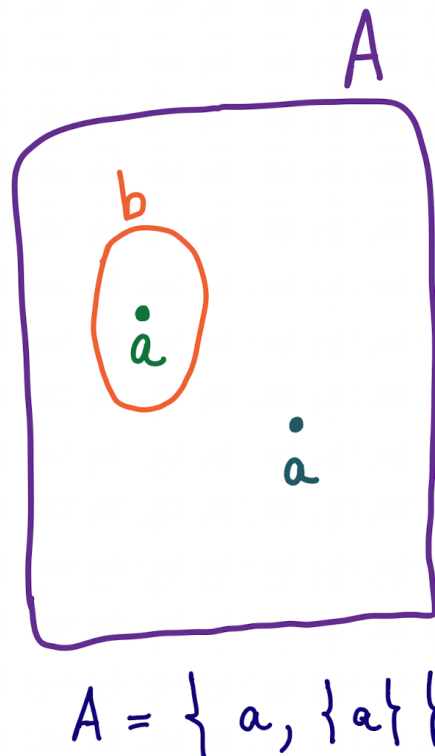$((a,b) \in \in) \equiv (a \in b)$

$[1,2]$

Figure 1: A diagram that illustrates the definition (1).

Example

2. [1]

3. $A = \{\varnothing, \{\varnothing\}\}$

4. $A \times A = \{(\varnothing, \varnothing), (\varnothing, \{\varnothing\}), (\{\varnothing\}, \varnothing), (\{\varnothing\}, \{\varnothing\})\}$

5. $\in \subset A \times A$

6. $\in = \{(\varnothing, \{\varnothing\})\}$

7. $((\varnothing, \{\varnothing\}) \in \in) \equiv (\varnothing \in \{\varnothing\})$

Prerequisites

8. <u>Notation</u>
    `⊆ :=` subset relation
    `⊂ :=` proper subset relation

    [3]

9. **Ordered pair**
    $$(a, b) = \{\{a\}, \{a, b\}\}$$

    $a :=$ `first coordinate`
    $b :=$ `second coordinate`

    $[1, 3]$

10. **Cartesian product**
    $$A \times B = \{(a, b) \mid a \in A,\ b \in B\}$$

    $A, B :=$ `sets`
    $A \times B :=$ `Cartesian product`
    $(a, b) :=$ `ordered pair`

[3]

11. **Binary relation** on A

$$R \subseteq A \times A$$

$R, A \coloneqq$ `sets`
`relation on` $A \coloneqq$ `binary relation on` A
$(a, b) \in R \equiv aRb$

$[1, 3]$

Open Invitation

Review, add content, and **co-author** this white *white paper* $[4, 5]$.
Join the **Open Mathematics Collaboration**.
Send your contribution to `mplobo@uft.edu.br`.

Open Science

The **latex file** for this *white paper* together with other *supplementary files* are available in $[6]$.

Acknowledgements

References

[1] Warner, Steve. *Abstract Algebra for Beginners*. GET 800, 2018.
    https://books.google.com/books?id=UFleyAEACAAJ

[2] Warner, Steve. *Pure Mathematics for Beginners*. GET 800, 2018.
    https://books.google.com/books?vid=dcWrvAEACAAJ

[3] Velleman, Daniel J. *How to prove it: A structured approach*. Cambridge University Press, 2019.
    https://books.google.com/books?vid=ISBN0521861241

[4] Lobo, Matheus P. "Microarticles." *OSF Preprints*, 28 Oct. 2019.
    https://doi.org/10.31219/osf.io/ejrct

[5] Lobo, Matheus P. "Simple Guidelines for Authors: Open Journal of Mathematics and Physics." *OSF Preprints*, 15 Nov. 2019.
    https://doi.org/10.31219/osf.io/fk836

[6] Lobo, Matheus P. "Open Journal of Mathematics and Physics (OJMP)." *OSF*, 21 Apr. 2020.
    https://doi.org/10.17605/osf.io/6hzyp
    https://osf.io/6hzyp/files

[7] Lobo, Matheus P. "The Membership Relation." *OSF Preprints*, 17 Mar. 2021. https://doi.org/10.31219/osf.io/r9p2m

The Open Mathematics Collaboration

Matheus Pereira Lobo (lead author, mplobo@uft.edu.br)[1,2]
https://orcid.org/0000-0003-4554-1372

[1]Federal University of Tocantins (Brazil)
[2]Universidade Aberta (UAb, Portugal)