Metamath

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Created by Norman Megill at MIT
Metamath is a small language to describe theorems
Existed since 1997
Metamath is mainly used for mathematics and quantum logic.
The biggest formalisations done in Metamath have been:
- Real and natural numbers from ZFC set theory.
- Hilbert space
- Quantum logic
The system

- Metamath does not have any specific logic.
- Core algorithm consist only of substituting of expressions for variables.
- This is combined with axioms for:
  - Propositional calculus
  - Predicate calculus
  - ZFC set theory
- Or any other axioms that you might want, for example for quantum logic.
Language

- Syntax
  - $c \ldots \ $. Constant declaration
  - $c \ldots \ $. Variable declaration
  - $a \ldots \ $. Axiom, a definition or a syntax construction
  - $p \ldots \ $= \ldots \ $. Theorem and its proof
- The proof is represented by a list of labels of the theorems and/or axioms used
- This list is written in Reverse Polish Notation (RPN)
- Each theorem on the list takes its hypothesis from the stack and puts the resulting expression back on the stack.
Main tools

- Website with all the proofs
- The Metamath program
- Metamath Solitaire
Other tools

- Hmm written in 400 lines of Haskell by Marnix Klooster
- mmverify written in 300 lines of Python by Raph Levien
- mmj2 written in Java by Mel O’Cat
Demo

sqr2irr and pm2.21i