Quantum Computing Since Democritus

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Chapter 2: Sets

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Why Sets?

- Math = foundation of thought, set = foundation of math

- Bumpy road ahead: learner discretion is advised
- Warning No. 2: I could be very wrong

Why Sets?

- Math = foundation of thought, set = foundation of math
- Real reason will get clearer later
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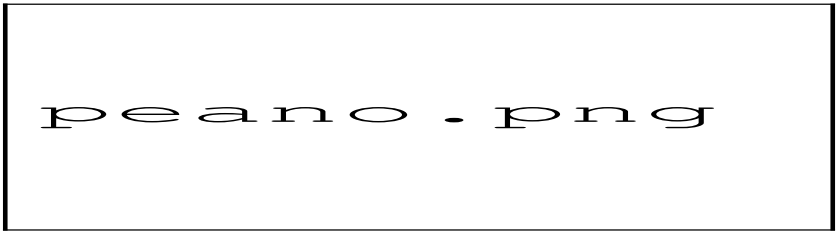
First Order Logic

Used to construct ”valid” (tautologically true) sentences about sets.

Example: Peano Axioms and Models

- Here S(x) = x + 1 (Successor function)
- “model” = any collection of objects whose functions satisfy axioms
- more than one model satisfies a group of axioms



Why write axioms?

- Chicken-egg problem: why write rules for integers when I know what integers are?
- Doesn't provide a foundation to basic arithmetic
- Still useful because:
  - When we talk about infinities and not integers, only writing axioms helps!
  - Formalizing makes reasoning a syntactic procedure, even a computer can do it
  - Meta-mathematics!