itself.exe Exercises for Chapter itself

Mathematical reasoning, logic, and set theory

In order to communicate mathematical ideas effectively, formal languages have been developed within which logic, i.e. deductive (mathematical) reasoning, can proceed. Propositions are statements that can be either true ⊤ or false ⊥. Axiomatic systems begin with statements (axioms) assumed true. Theorems are proven by deduction. In many forms of logic, like propositional calculus (Wikipedia. Propositional calculus — Wikipedia, The Free Encyclopedia. http://en.wikipedia.org/w/index.php?title=Propositional%20calculus&oldid=914757384. [Online; accessed 29-October-2019]. 2019), compound propositions are constructed via logical connectives like "and" and "or" of atomic propositions (see Lec. sets.logic). In others, like first-order logic (Wikipedia. First-order logic — Wikipedia, The Free Encyclopedia. http://en.wikipedia.org/w/index.php?title=First-order%20logic&oldid=921437906. [Online; accessed 29-October-2019]. 2019), there are also logical quantifiers like "for every" and "there exists."

formal languages
logic
reasoning
propositions
theorems
proof
propositional calculus
logical connectives
first−order logic
quantifiers

The mathematical objects and operations about which most propositions are made are expressed in terms of set theory, which was introduced in Lec. itself.found and will be expanded upon in Lec. sets.setintro. We can say that mathematical reasoning is comprised of

set theory

mathematical objects and operations expressed in set theory and logic allows us to reason therewith.