Key concepts

- Basic elements: constants, functions, etc.,
- Atomic sentences (single claim) and complex sentences
- Universal quantification ∀: e.g., $\forall x : f(x) \wedge g(x)$
- Existential quantification ∃: e.g. $\exists x : f(x) \Rightarrow g(x)$
- Quantifiers property:
  - $\forall x \exists y : f(x, y),\ \exists y \forall x : f(x, y),\ \forall y \exists x : f(y, x),\ \forall y, \exists x : f(x, y)$
  - De Morgan rules: $\neg \forall x f(x) = \exists x \neg f(x); \quad \neg \exists x f(x) = \forall x \neg f(x)$

Inference

- Universal Instantiation: $\forall v : f(v) \vDash f(g)$: $\{v/g\}$ (replacement)
- Existential Instantiation: $\exists v : f(v) \vDash f(C)$: $\{v/C\}$
  - introduce new constant or new constant function
    $\forall x \exists y : f(x, y) \vDash f(x, F(x))$
- Unification: $f(x, C) \,|\, f(A, y) = \{x/A, y/C\}$
- Most general unifier