*v ∀x(Gxy ↔ ∃yHy)
*vi ∃x(Ax → ∀xFxx)
*vii ∀x∀y(Fxy → ∀z(Hxyz & Jz))
*viii ∀xFxx ↔ ∀x∀yFxy
*ix ∼∀x∼∃z(Hz ∨ Jx)
*x P → Gab
*xi Ga → ∀x∼(Ha ∨ Fxx)
*xii ∼(P & ∼∃xFx)
*xiii ∀x(Fx) & P
*xiv ∃y(Fyyy & P)
*xv ∀xyz(Fzx ↔ Hxyz)

quantifier convention

Comment. When a wff contains an uninterrupted sequence of quantifiers of the same type, existential or universal, it is often convenient to omit repetitions of ∃ or ∀.

Examples.

The expression

∀xyz(Fxy & Gyz ↔ Hzx)

will be read as shorthand for

∀x∀y∀z(Fxy & Gyz ↔ Hzx)

The expression

∃xy∀zw(Fxyz & Gwx → ∼Hzx)

is to be read as

∃x∃y∀z∀w(Fxyz & Gwx → ∼Hzx)

open formula

Definition. An **OPEN FORMULA** is the result of replacing at least one occurrence of a name in a wff with a new variable (one not already occurring in the wff). They may also be obtained by removing the prefixed quantifier from a universal or existential wff.