The Greek letters phi (ϕ) and psi (ψ) are used to represent any predicates whatever.

Rules of Inference: Quantification

Universal Instantiation U.I. $(x)(\phi x)$

$\therefore \phi v$

(where v is any individual symbol)

Universal Generalization U.G. ϕy

$\therefore (x)(\phi x)$

(where y denotes 'any arbitrarily selected individual')

Existential Instantiation E.I. $(\exists x)(\phi x)$

$\therefore \phi v$

Existential Generalization E.G. ϕv

$\therefore (\exists x)(\phi x)$

Gottlob Frege (1848 - 1925), one of the founders of modern symbolic logic.

~~1848 - 1925~~ ~~18~~

U.I Any substitution instance of a prop. function can be ~~, one may~~ validly inferred from its ~~the~~ universal quantification.

U.G. From the substitution instance of a prop. function, one may validly infer the Universal quantification of that prop. function

E.I From the existential quantifi of a prop function, we may infer the truth of its substitution instance (other than y) that occurs nowhere ~~in the~~ earlier in the context

E.G. From an true substitution instance of a propositional function, we may validly infer the existential quantification of that propositional function

In the geometer's proof, the only assumption made about ABC is that it is a triangle; hence what is proved true of ~~y~~ ABC is proved true of any triangle. In our proof, the only assumption made about y is that it is an individual; hence what is proved true of 'y' is proved true of any individual. The symbol 'y' is an individual symbol, but it is a very special one. Typically it is introduced into a proof by using U.I., and only the presence of y permits the use of U.G.

Here is a valid argument, the demonstration of whose validity requires the use of U.G. as well as U.I.:

No humans are perfect

All Indians are humans.

∴ No Indians are perfect.

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The formal proof of its validity is :

1. $(x)(Hx \supset \sim Px)$
2. $(x)(Ix \supset Hx)$

$\therefore (x)(Ix \supset \sim Px)$

3. $Hy \supset \sim Py$ 1, U.I.
4. $Iy \supset Hy$ 2, U.I.
5. $Iy \supset \sim Py$ 4, 3, H.S.
6. $(x)(Ix \supset \sim Px)$ 5, U.G.

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1. $(x)(Cx \supset Vx)$
2. $(\exists x)(Hx \cdot Cx)$

$\therefore (\exists x)(Hx \cdot Vx)$

3. $Ha \cdot Ca$ 2, E.I.
4. $Ca \supset Va$ 1, U.I.
5. $Ca \cdot Ha$ 3, Com.
6. Ca 5, Simp.
7. Va 4, 6, M.P.
8. Ha 3, Simp.
9. $Ha \cdot Va$ 8, 7, Conj.
10 $(\exists x)(Hx \cdot Vx)$ 9, E.G.

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If we failed to heed the restriction on E.I. ~~from~~ that a substitution instance of a propositional function inferred by E.I. from the existential quantification of that propositional function can contain only an individual symbol (other than y) that has no previous occurrence in the ~~context~~ context, then we might proceed to construct a "proof" of validity for the following invalid argument. So an erroneous "proof" might proceed as follows:

1. $(\exists x)(Ax \cdot Cx)$
2. $(\exists x)(Bx \cdot Cx)$
$\therefore (\exists x)(Ax \cdot Bx)$
3. $Aa \cdot Ca$ 1, E.I.
4. $Ba \cdot Ca$ 2, E.I. (wrong)
5. Aa 3, Simp.
6. Ba 4, Simp.
7. $Aa \cdot Ba$ 5, 6, Conj.
8. $(\exists x)(Ax \cdot Bx)$ 7, E.G.

The need for the indicated restriction on the use of E.I. can be seen by considering the obviously invalid ~~ab~~ argument.