

4) Let $L(P, F) = \text{"person } P \text{ likes eating food } F\text{"}$

Let $P \in \text{"all people"}$

Let $F \in \text{"all food"}$

a) $(\exists P \in P)(\exists F \in F)[L(P, F)]$

b) $(\exists P \in P)(\forall F \in F)[L(P, F)]$

c) $(\exists F \in F)(\exists P \in P)[L(P, F)]$

d) $(\neg(\exists F \in F)(\exists P \in P)[L(P, F)])$

e) $(\exists F \in F)(\forall P \in P)[\neg L(P, F)]$

f) $(\forall P \in P)(\forall F \in F)[\neg L(P, F)]$

g) $(\exists P \in P)(\exists F, y \in F)[L(P, F) \wedge L(P, y) \rightarrow F = y]$

h) $(\exists P \in P)(\exists F, y \in F)[L(P, F) \wedge L(P, y) \rightarrow F \neq y]$

5a) $(\forall x)(\forall y)[x=y]$

(I) \mathbb{Z} finite

(II) impossible infinite

b) $(\forall x)(\exists y)[x < y]$

(I) impossible

(II) $\mathbb{Z} = \{\dots, -1, 0, 1, 2, \dots\}$

c) $(\exists y)(\forall x)[x < y]$

(I) impossible

(II) impossible

d) $(\forall x)(\forall y)(\exists z)[(x < y) \rightarrow x < z < y]$

$\sqrt{x} = y$

(I) impossible

(II) \mathbb{Z}

e) $(\forall x)(\exists y)[y^2 = x]$

(I) $\{1, 3\}$

(II) $\mathbb{R}^+ \leftarrow$ positive reals

f) $(\exists x)(\exists y)(\forall z)[(x < y) \wedge (x \leq z \leq y)]$

(I) impossible

(II) impossible

a) (I) Let $P(x, y) = x$ greater than y $x, y \in \mathbb{R}$

(II) let $P(x, y) = x$ even & y 's odd $\in \mathbb{Q}$

b) (I) Let $P(x, y) = x$ is a factor of y $\in \mathbb{R}$

(II) Let $P(x, y) = x$ likes y $\in \{ \text{people} \}$

c) (I) let $P(x, y) = x$ and y are brothers $\in \{ \text{family members} \}$

(II) let $P(x, y) = x$ and y are the same person $\in \{ \text{people} \}$