
3. P: programs, R: programmers, $\text{write}(r,p)$: r writes p, $\text{short}(p)$: program p is short.

$$\begin{aligned}\forall p \in P, \exists r \in R, \text{write}(r, p) \\ \exists r \in R, \forall p \in P, \neg \text{write}(r, p) \\ \forall r \in R, \exists p \in P, (\text{short}(p) \wedge \text{write}(r, p))\end{aligned}$$

I: integers, $\text{odd}(i)$: i is odd, $\text{even}(i)$: i is even.

$$\begin{aligned}\exists i \in I, \text{even}(i) \wedge \exists i \in I, \text{odd}(i) \\ \forall i \in I, \neg \text{even}(i) \rightarrow \text{odd}(i)\end{aligned}$$

R: roads, $\text{lead}(r,d)$: road r leads to destination d.

$$\forall r \in R, \text{lead}(r, \text{rome})$$

A: grammar, F: formulae, $\text{wf}(f)$: formula f is well-formed, $\text{generate}(a,f)$: grammar a generates formula f.

$$\forall f \in F, \text{generate}(a, f) \leftrightarrow \text{wf}(f)$$

P: a set of people, $\text{love}(a,b)$: a loves b.

$$\begin{aligned}\forall p \in P, \exists q \in P, \text{love}(p, q) \\ \exists p \in P, \forall q \in P, \text{love}(p, q)\end{aligned}$$

P: a set of people, $\text{know}(p)$: p knows, $\text{do}(p)$: p does, $\text{understand}(p)$: p understands, $\text{teach}(p)$: p teaches.

$$\begin{aligned}\forall p \in P, \text{know}(p) \rightarrow \text{do}(p) \\ \forall p \in P, \text{understand}(p) \rightarrow \text{teach}(p)\end{aligned}$$