Phase 11 b : Function Application

Basic function application (single argument):

$f(x)$
$square(5)$
$parent(john)$

Multiple arguments:

$g(x, y, z)$
$sum(a, b, c, d)$
$max(x, y)$

Nested function application:

$f(g(x))$
$f(g(h(x)))$
$outer(middle(inner(value)))$

Empty argument list:

$f()$
$initialize()$

Function application in expressions:

$f(x) \land g(y)$
$f(x) \Rightarrow g(x)$
$f(x) > 0$
$height(m) < 10$

Function application in quantifiers:

$\forall\, x : N \bullet f(x) > 0$
$\exists\, d : Dog \bullet gentle(d) \land neat(d)$
$\forall\, x, y : N \bullet g(x, y) = g(y, x)$

Special Z notation functions (generic instantiation):

$items : \text{seq}\ Npossibilities : \mathbb{P}\ Itemcollection : \text{bag}\ Xsequence : \text{iseq}\ N$

Function application with set membership:

$x \in f(S)$
$y \in \mathbb{P}\ X$
$z \in \text{seq}\ N$

Complex predicates from Solution 5:

$\exists\, d : Dog \bullet gentle(d) \land neat(d)$
$\forall\, d : Dog \bullet neat(d) \Rightarrow attractive(d)$

Function application in definitions:

$$f : X \to Y \;\vdash\; \forall\, x : X \bullet f(x) \in Y$$

$$\begin{array}{|l} \textit{PersonHeight} \\ \hline height : Person \to N \\ \hline \forall\, p : Person \bullet height(p) > 0 \land height(p) < 300 \\ \hline \end{array}$$

Function application with comparisons:

$f(x, y) > g(x, y)$
$max(x, y) = max(y, x)$
$f(0) = 1$

Expression arguments:

$f(x \land y)$
$g(x \lor y, p \Rightarrow q)$
$h(a > b, c < d)$

Function application with subscripts and superscripts:

$f(x_i)$
$g(x^2)$
$h(a_1, a_2)$