Function Application Examples

[*Item*, *Dog*, *PersonRes*, *XRes*]

This file demonstrates function application in Z notation definitions.

Example 1 : Basic function definitions

$$squareRes : \mathbb{N} \longrightarrow \mathbb{N}$$
$$double : \mathbb{N} \longrightarrow \mathbb{N}$$

$$\forall\, n : \mathbb{N} \bullet squareRes(n) = n * n$$
$$\forall\, n : \mathbb{N} \bullet double(n) = 2 * n$$

Example 2 : Functions with multiple arguments

$$add : \mathbb{N} \times \mathbb{N} \longrightarrow \mathbb{N}$$
$$maximum : \mathbb{N} \times \mathbb{N} \longrightarrow \mathbb{N}$$

$$\forall\, a, b : \mathbb{N} \bullet add(a, b) = a + b$$
$$\forall\, a, b : \mathbb{N} \bullet (maximum(a, b) = a \vee maximum(a, b) = b) \wedge maximum(a, b) \geq a \wedge maximum(a, b) \geq b$$

Example 3 : Generic functions

$$=[XRes]=$$
$$collection : \mathrm{seq}\ XRes$$

Example 4 : Function application elem quantifiers

$$posFunc : \mathbb{N} \longrightarrow \mathbb{N}$$

$$\forall\, x : \mathbb{N} \bullet posFunc(x) > 0 \Rightarrow posFunc(x) > 0$$

Example 5 : Schema with function type

$$\_\_Heights\_\_$$
$$height : PersonRes \longrightarrow \mathbb{N}$$

$$\forall\, p : PersonRes \bullet height(p) > 0 \wedge height(p) < 300$$

Example 6 : Nested function application

$$func1 : \mathbb{N} \longrightarrow \mathbb{N}$$
$$func2 : \mathbb{N} \longrightarrow \mathbb{N}$$
$$func3 : \mathbb{N} \longrightarrow \mathbb{N}$$

$$\forall\, x : \mathbb{N} \bullet func1(func2(func3(x))) \geq 0$$