Exercises
Sequences

Exercise 1.
Simplify the following expressions:

1. $\langle 1, 2, 3 \rangle ^\frown \langle\,\rangle$

2. $\mathrm{dom}\langle a, b, c \rangle$

3. $\mathrm{ran}\langle 1, 1, 2 \rangle$

4. $\{a \mapsto 2, b \mapsto 3, c \mapsto 1\}^\sim$

5. $\mathrm{dom}(\langle 1, 2 \rangle ^\frown \langle 3, 4 \rangle)$

6. $\{1\} \vartriangleleft (tail(\langle a, b, c \rangle))$

7. $\mathrm{dom}(front(\langle 1, 3, 5, 7 \rangle))^\sim$

8. $head(\ tail\ (\ tail\ (\langle 1, 7, 9, 2, 2 \rangle ^\frown \langle 2, 4, 5 \rangle)\ )\ )$

9. $last\ (tail\ (\langle\ \langle\,\rangle, \langle 1 \rangle, \langle 1, 2 \rangle, \langle 1, 2, 3 \rangle, \langle 1, 2, 3, 4 \rangle\ \rangle\ )\ )\ ^\frown \langle 1, 2 \rangle$

10. $squash\ (\ 3..5 \vartriangleleft \langle a, b, c, d, e, f \rangle\ )$

11. $squash\ (\ \mathrm{dom}(\langle a, b, c \rangle) \vartriangleleft (rev\ (\langle 2, 3, 4, 6, 8 \rangle\ )\ )\ )$

Exercise 2.
Given a sequence of natural numbers :

$$s : \mathrm{seq}\,\mathbb{N}$$

Write down a predicate that is true the numbers in the sequence are in ascending order (i.e. increasing from left to right).

Exercise 3.
Write a Z expression for the number of occurences of a natural number n in a sequence of natural numbers s.

Exercise 4.

Write a Z predicate which states that a given sequence of characters s is a palindrome, i.e. it spells the same backwards as forwards.

Exercise 5.

Given the following

$$[CHAR] \qquad the \, set \, of \, all \, characters$$
$$s : \text{seq } CHAR$$

Write an expression for s' where s' has the following value: (s' should be a sequence)

1. s with elements at positions 2 to 4 (inclusive) deleted.

2. s with all occurrences of the character f deleted.

3. s with the sequence $\langle a, b, c \rangle$ inserted after position 3. (You may assume that $\# s$ is at least 3).