Exercises for Chapter 9

# Sequences

**Exercise 9.1** (Supermarket) In a supermarket, there are $m$ checkouts open.

(a) At any instant, the supermarket checkouts may be modelled as a number of queues. Using an axiomatic definition, and assuming the set $P$ of people, define the set of all possible configurations of the supermarket checkouts. [Hint: don't forget to include reality which prevents someone being in two places at once.]

(b) Define a function that models the arrival of someone at the supermarket checkouts. The function should take a person as argument and put them into the shortest queue. [Hint: don't forget to make the function partial.]

(c) Define another function which models a person changing queues. The function should take three arguments: the person, the queue being left, and the queue being joined.

(d) Define a relation which models the opening of an $(m + 1)$th queue. Customers may join the new queue, but they do not otherwise change places. Modelling the opening using a relation allows us to capture the variation arising from the decisions of individual customers.

□

**Exercise 9.2** (Esrever) Prove, using the induction principle for sequences, that

$$reverse\,(reverse\,s) \;=\; s$$

for any sequence $s$. □