This document specifies a tally system for first-past-the-post (FPTP) elections in Z.

Votes are tallied anonymously, using a token system. Issuing tokens is beyond the scope of this specification. We assume a finite set of tokens available as a basic type:

$$[TOKEN]$$

In an FPTP election, citizens are registered as voters and candidates. Every candidate is a voter, but not every voter is a candidate. The process of voter registration is beyond the scope of this specification. We assume a set of voters and a set candidates available as global variables:

$$\begin{array}{|l} voters : \mathbb{P}\ TOKEN \\ candidates : \mathbb{P}\ TOKEN \\ \hline candidates \subseteq voters \end{array}$$

Not all tokens are necessarily dealt to voters. This is to allow token generation to happen separately from voter registration. We should take care not to allow arbitrary tokens to register ballots, but only those that have been dealt to a voter.

We assume a set of ballots available as a global variable:

$$\begin{array}{|l} ballots : voters \to candidates \end{array}$$

We represent ballots as a function as multiple voters may vote for the same candidate, but every voter must vote for exactly one candidate. A "none of the above" option may be implemented as a candidate[1].

This is a relative majority FPTP teller. For every candidate we provide a tally, and specify the winner of an election:

Teller

$$\begin{array}{|l} tally : candidates \to \mathbb{N} \\ winner : candidates \\ \hline \forall\, c : candidates \bullet tally(c) = \#(ballots \rhd \{c\}) \\ \forall\, c : candidates \bullet tally(winner) \geq tally(c) \end{array}$$

[1] The "none of the above" candiate would then also be a voter.