

## Turing machine programming exercises

- 1) With the same editing conventions as for the multiplier on page 9 of the notes, design a T.m. to calculate  $m^n$ , for natural numbers  $m$  and  $n$ .

What does your machine have to say about  $0^0$  ?

- 2) Calculate the following function:

$$f(n) = \min \{ k \in \mathbb{N} \mid k > \log_2 n \} .$$

You should make sure that your machine accepts a clean argument specification on the tape, and leaves the same argument representation for the result. In particular you must adopt the same number representation for argument and result.

This function was set as the T.m. programming prize competition for a large number of years, and there are too many old friends out there waiting to be recycled!