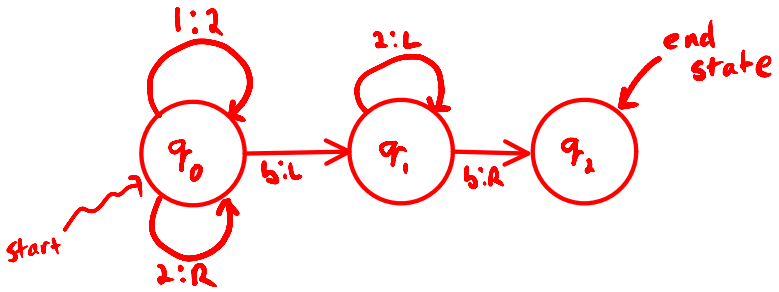
SOME TMs FROM THE NOTES

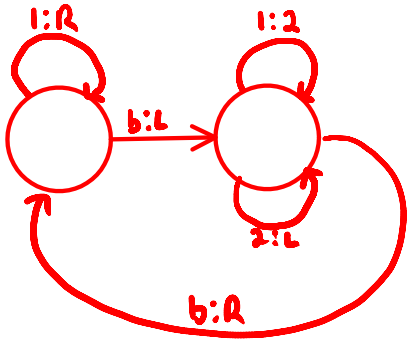
1. Starting at the leftmost 1 on a contiguous block of one or more 1s bracketed by blanks, change them all into 2s:



Or quadruples:

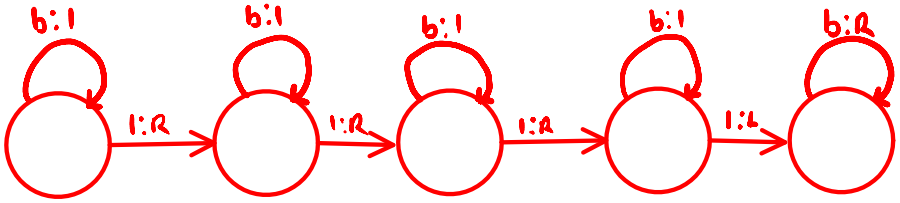
$q_0 1 2 q_0$ $q_0 2 R q_0$ $q_0 b L q_1$ $q_1 2 L q_1$ $q_1 b R q_2$

Here's a shorter one:



(End state = halting state!)

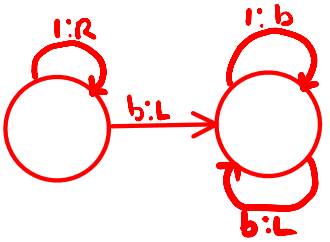
2. Write the number 3 on a blank tape:



One can similarly write n on a blank tape using n+2 states

3. Starting at the leftmost 1 on a contiguous block of one or more 1s bracketed by blanks, erase all but one of them:
(In other words, the constant function 0)

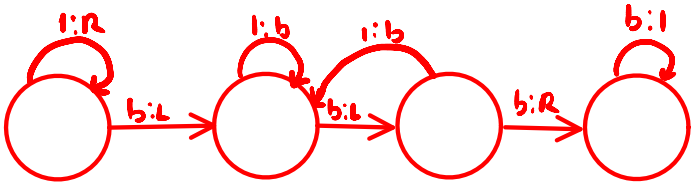
Here is a 2-state attempt:



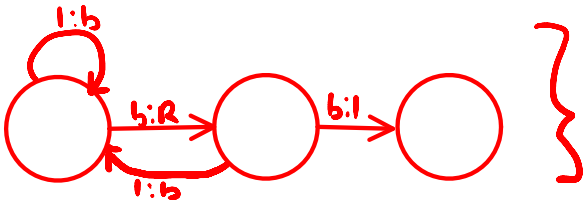
It does erase the 1's

Problem: it doesn't halt!

This modification uses a bb as a marker:



Here's a quicker solution:



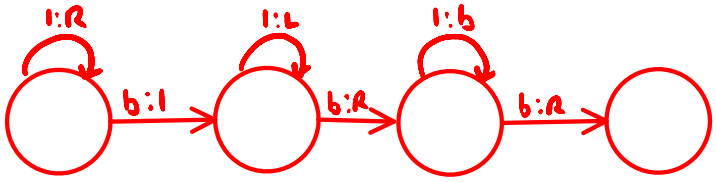
The point here is the tape doesn't recognize absolute positions

4. Add $m + n$

Given: $\cdots$ b 1 1 $\cdots$ 1 b 1 1 $\cdots$ 1 b $\cdots$ ($m+1$, $n+1$)

Output: $\cdots$ b 1 1 $\cdots$ 1 b $\cdots$ ($m+n+1$)

So: erase the blank in the middle, then erase a 1:



Compute $f(n) = \begin{cases} n, & n \text{ odd}; \\ \text{undefined} & \text{otherwise.} \end{cases}$