

# Problem 1.38

kristora

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We show that  $C$  is regular by creating a DFA  $D$  that recognises  $C^{\mathcal{R}}$  knowing from problem 1.36 that if  $C^{\mathcal{R}}$  is regular then so is  $C$ .

The idea is that multiplying by three is the same as multiplying by two and adding one, ie  $n + 2n = 3n$ . We need two bits of information to do this, the previous read top value ( $p$ ) and any remainders ( $r$ ). A valid transition happens if the top value together with the previous read top value and the remainder yields the bottom value in the first position. We accept if there is no remainder and the previous top value is 0.

We describe  $D$  with the following state diagram:

