4. (30 points) The alphabet is $\{0, \ldots, 8\}$. We interpret the input as a base 9 natural number, read *right to left*. So the number 28138 will be read 8-3-1-8-2.

(a) (15 points) Give the diagram for a finite automata classifier that determines, given w, what w is congruent to mod 3. How many states does it have?

All digits past the first are multiples of 9, and therefore equivalent to 0 (mod 3), so can be ignored.

4 states:
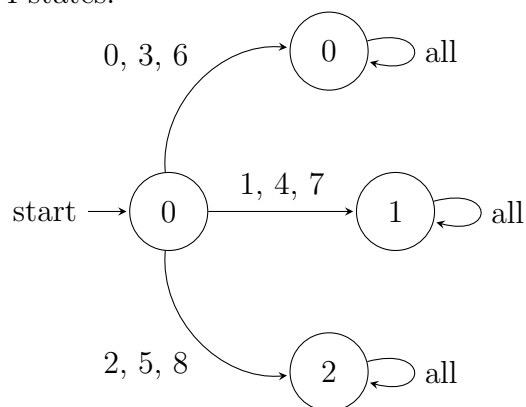
(b) (15 points) Give the diagram for a finite automata classifier that determines, given w, what w is congruent to mod 4. How many states does it have?

4 states: