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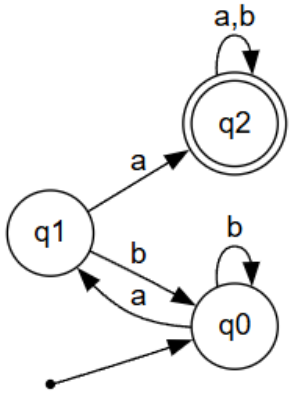
Section 1: Problem 1

Consider DFA $M = (Q = \{q_0, q_1, q_2\}, \Sigma = \{a, b\}, \delta, q_0 = q_0, F = \{q_2\})$ with transitions:

- $\delta(q_0, a) = q_1, \delta(q_0, b) = q_0$
- $\delta(q_1, a) = q_2, \delta(q_1, b) = q_0$
- $\delta(q_2, a) = q_2, \delta(q_2, b) = q_2$

Trace the computation on input w = abba.
List the sequence of states visited (including start state) and state whether the input w is accepted.



w = abba
Sequence: q0, q1, q0, q0, q1 → we end at state q1, which is not an accept state so we reject w.

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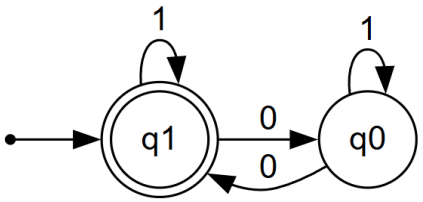
Section 2: Problem 5

Draw a DFA over the alphabet {0,1} that accepts all strings containing an even number of 0's.



M = ({q0, q1}, {0, 1}, δ, q1, {q1})

Input in Q x E	Output in Q
(q1,1)	q1
(q1,0)	q0
(q0,0)	q1
(q0,1)	q0

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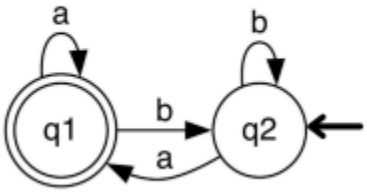
Section 3: Problem 11

Consider the DFA over $\{a,b\}$ below. Explain what type of strings this DFA accepts?



Hint: List down 5 strings this DFA accepts. Do you notice a pattern?

- 5 example strings: a / a,a,a,a,a,a / b,a / b,b,b,b,a / a,b,b,b,a
- The DFA only accepts strings that end in an ‘a’ because the accept state is q1. All the incoming transition arrows to q1 (the accepted state) are labeled ‘a’, meaning the last element in the sequence of any w must be ‘a’.
- {w | w ends with a}

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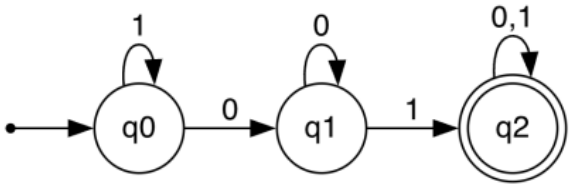
Section 4: Problem 14

Given the DFA below, write its 5-tuple $(Q, \Sigma, \delta, q_0, F)$ explicitly. Use a table to define δ.



M = ({q0,q1,q2}, {0,1}, δ, q0, {q2})

Input in Q x E	Output in Q
(q0,0)	q1
(q0,1)	q0
(q1,0)	q1
(q1,1)	q2
(q2,0)	q2
(q2,1)	q2