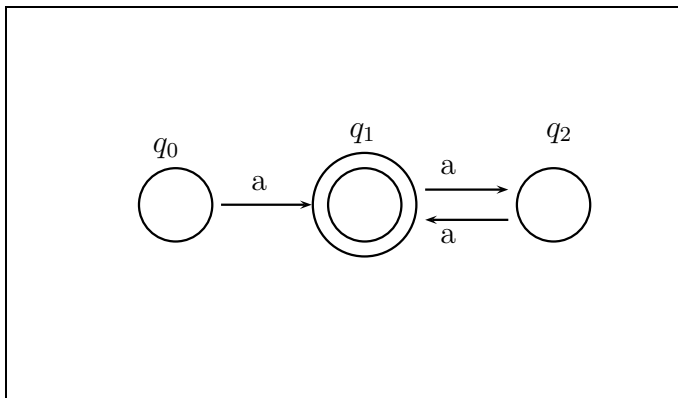


Practice midterm
Phil 303
The test will be “open book”.

1. Find a pattern that is matched by the given positive cases and is also matched by none of the negative cases:
 - a) Positive: $aaaa, bbab, aaaaaa, ababaab, bbbabb, babaaba$
 Negative: $\epsilon, aa, aaa, b, bb, bbb, bbbb, baaa, aaba$
 - b) Positive: $ab, abbb, abaa, abbbbb, abbaba, abaaaa$
 Negative: $\epsilon, aba, aab, aaa, bbb, abb, abbba$
2. a) Give a recursive definition of multiplication by 25 ($x \cdot 25$) in terms of addition ($x+25$).
 b) Consider the simple FSA F_1 with states q_0, q_1, q_2 , transitions $\langle q_0, a, q_1 \rangle, \langle q_1, a, q_2 \rangle, \langle q_2, a, q_1 \rangle$, and final state q_1 .

Graphically, it looks like this:



Prove by induction that F_1 does not accept any string in $\{aa\}^*$.

3. a) Devise an FSA over the alphabet $\{a, b\}$ that accepts only strings that i) are the empty string or ii) contain no b's and an odd number of a's. What modification to this machine would make it not accept the empty string?
 b) Draw the graph of the FSA F_1 , given by $\langle \mathbf{A}, Q, q_0, F, R \rangle$ where $\mathbf{A} = \{a, b\}$, $Q = \{\langle q_0, a, q_1 \rangle, \langle q_1, b, q_2 \rangle, \langle q_2, a, q_1 \rangle, \langle q_0, b, q_3 \rangle\}$ and $F = \{q_2, q_3\}$.
 c) What strings are recognized by the machine F described in b)?