1. Let $X = \{\alpha, \beta\}$, $Y = \{\gamma, \delta\}$. Thus:
   a. $X^2 = \{\alpha\alpha, \beta\beta, \alpha\beta, \beta\alpha\}$
   b. $Y^3 = \{\alpha\alpha\alpha, \alpha\alpha\beta, \alpha\beta\alpha, \alpha\beta\beta, \beta\alpha\alpha, \beta\alpha\beta, \beta\beta\alpha, \beta\beta\beta\}$
   c. $YX = \{\gamma\alpha, \gamma\beta, \delta\alpha, \delta\beta\}$

2. If $a(ab)^*a^*$ is a regular expression, then it generates the language of words that start with an $a$, then any number of repetitions of “ab”, followed by any number of $a$s. The finite state machine that would recognize this language would look like this:

   ![Finite State Machine](image)

3. Let $L = \{x \mid x \text{ begins and ends with 01}\}$ be a language over $\sum = \{0, 1\}$. The finite state automata that would recognize this language looks like:

   ![Finite State Automata](image)