1. We use the alphabet $\Sigma = \{a, b\}$ and consider the following DFAs $A, B$:

   $A = (Q_A = \{0, 1, 2, 3\}, \Sigma, \delta_A, q_0^A = 0, F_A = \{1, 2\})$

   $\delta_A = \{((0, a), 1), ((0, b), 2), ((1, a), 0), ((1, b), 3), ((2, a), 3), ((2, b), 0), ((3, a), 2), ((3, b), 1)\}$

   $B = (Q_B = \{0, 1, 2, 3\}, \Sigma, \delta_B, q_0^B = 0, F_B = \{2, 3\})$

   $\delta_B = \{((0, a), 1), ((0, b), 0), ((1, a), 2), ((1, b), 3), ((2, a), 2), ((2, b), 3), ((3, a), 1), ((3, b), 0)\}$

For both DFAs do the following:

(a) Draw their transition diagrams.

(b) Determine which of the following words belong to $L(A), L(B)$:

   i. $\epsilon$
   ii. $aabb$
   iii. $aaab$
   iv. $bbb$

(c) Explicitely calculate $\delta_A(0, bab)$ and $\delta_B(0, bab)$.

(d) Try to describe the languages these two automata recognize with your own words.

2. This time we use $\Sigma = \{0, 1, 2\}$. Construct a DFA $C$ which precisely recognizes those words which only contain decreasing sequences of digits, i.e. the 01,02 or 12 should not occur. Hence $210 \in L(C)$, $\epsilon \in L(C)$, $222 \in L(C)$ but $001 \notin L(C)$, 012 $\notin L(C)$, etc.