# Expressões regulares:

As gramáticas $G_1 = (V_1, \Sigma, P_1, S_1)$ e $G_2 = (V_2, \Sigma, P_2, S_2)$, relativas a cada uma das linguagens listadas a seguir, foram obtidas a partir do DFA e do NFA, respectivamente, propostos nos gabaritos das atividades AA-4 e AA-6 ($S \equiv s_0$, $A \equiv s_1$, $B \equiv s_2$, $C \equiv s_3$, $\ldots$).

$\mathcal{L}_1 = \{w \in \Sigma^* = \{0,1\}^* \mid |w| \geqslant 4$ e o segundo e o penúltimo símbolos de $w$ são, ambos, $1\}$.

- $G_1 = (\{A,B,C,D,E,S\},\{0,1\},P,S)$, com

$$P = \left\{ \begin{array}{l\|l} S \to 0A \mid 1A, & C \to 0D \mid 1E, \\ A \to 1B, & D \to 0B \mid 1C \mid \varepsilon, \\ B \to 0B \mid 1C, & E \to 0D \mid 1E \mid \varepsilon \end{array} \right\}.$$

- $G_2 = (\{A,B,C,D,S\},\{0,1\},P,S)$, com

$$P = \left\{ \begin{array}{l\|l} S \to 0A \mid 1A, & C \to 0D \mid 1D, \\ A \to 1B, & D \to \varepsilon \\ B \to 0B \mid 1B \mid 1C, & \end{array} \right\}.$$

$\mathcal{L}_2 = \{w \in \Sigma^* = \{0,1\}^* \mid |w|$ é par e $w$ contém pelo menos um símbolo $0\}$.

- $G_1 = (\{A,B,C,S\},\{0,1\},P,S)$, com

$$P = \left\{ \begin{array}{l\|l} S \to 0B \mid 1A, & B \to 0C \mid 1C, \\ A \to 0C \mid 1S, & C \to 0B \mid 1B \mid \varepsilon \end{array} \right\}.$$

- $G_2 = (\{A,B,C,D,E,S\},\{0,1\},P,S)$, com

$$P = \left\{ \begin{array}{l\|l} S \to 0A \mid 1B \mid 1C, & C \to 0D, \\ A \to 0D \mid 1D, & D \to 0E \mid 1E \mid \varepsilon \\ B \to 1S, & E \to 0D \mid 1D \end{array} \right\}.$$

$\mathcal{L}_3 = \{w \in \Sigma^* = \{0,1\}^* \mid w$ não termina com a subcadeia $0011\}$.

- $G_1 = (\{A,B,C,D,S\},\{0,1\},P,S)$, com

$$P = \left\{ \begin{array}{l\|l} S \to 0A \mid 1S \mid \varepsilon, & C \to 0A \mid 1D \mid \varepsilon, \\ A \to 0B \mid 1S \mid \varepsilon, & D \to 0A \mid 1S \\ B \to 0B \mid 1C \mid \varepsilon, & \end{array} \right\}.$$

- $G_2 = (\{A,B,C,D,E,F,G,H,I,J,K,L,M,S\},\{0,1\},P,S)$, com

$$P = \left\{ \begin{array}{l\|l\|l\|l} S \to 0A \mid 1H \mid H, & D \to 0A, & H \to 0I \mid S \mid \varepsilon, & K \to 0I \mid 1L, \\ A \to 0B \mid 0E \mid 1H, & E \to 0E \mid 1F, & I \to 0J \mid \varepsilon, & L \to 0I \\ B \to 0B \mid 1C, & F \to 1G, & J \to 0J \mid 1K \mid 1M \mid \varepsilon, & M \to \varepsilon \\ C \to 0A \mid 1D, & G \to 1H, & & \end{array} \right\}.$$

$\mathcal{L}_4 = \{w \in \Sigma^* = \{0,1\}^* \mid w$ termina com $101$ e contém $100\}$.

- $G_1 = (\{A,B,C,D,E,F,S\},\{0,1\},P,S)$, com

$$P = \left\{ \begin{array}{l\|l\|l} S \to 0S \mid 1A, & C \to 0C \mid 1D, & E \to 0C \mid 1F, \\ A \to 0B \mid 1A, & D \to 0E \mid 1D, & F \to 0E \mid 1D \mid \varepsilon \\ B \to 0C \mid 1A, & & \end{array} \right\}.$$

- $G_2 = (\{A, B, C, D, E, S\}, \{0, 1\}, P, S)$, com

$$P = \left\{ \begin{array}{l} S \to 0S \mid 1S \mid 1A, \\ A \to 0B, \\ B \to 0C, \end{array} \middle\| \begin{array}{l} C \to 0C \mid 1C \mid 1D, \\ D \to 0E, \\ \phantom{x} \end{array} \middle\| \begin{array}{l} E \to 1F, \\ F \to \varepsilon \\ \phantom{x} \end{array} \right\}.$$

$\mathcal{L}_5 = \{w \in \Sigma^* = \{0, 1\}^* \mid |w| \neq 2\}$.

$\mathcal{L}_6 = \{w \in \Sigma^* = \{0, 1\}^* \mid w$ não começa com 000 e não termina com 111$\}$.

$\mathcal{L}_7 = \{w \in \Sigma^* = \{0, 1\}^* \mid |w| > 0$ e o primeiro e o penúltimo símbolos de w são idênticos$\}$.

$\mathcal{L}_8 = \{w \in \Sigma^* = \{0, 1\}^* \mid |w|$ é ímpar e $w$ começa com 0 e termina com 1$\}$.

- $G_1 = (\{A, B, C, S\}, \{0, 1\}, P, S)$, com

$$P = \left\{ \begin{array}{l} S \to 0A, \\ A \to 0B \mid 1B, \end{array} \middle\| \begin{array}{l} B \to 0A \mid 1C, \\ C \to 0B \mid 1B \mid \varepsilon \end{array} \right\}.$$

- $G_2 = (\{A, B, C, D, S\}, \{0, 1\}, P, S)$, com

$$P = \left\{ \begin{array}{l} S \to 0A, \\ A \to 0B \mid 1B, \\ B \to 0C \mid 1C \mid 1D, \end{array} \middle\| \begin{array}{l} C \to 0B \mid 1B, \\ D \to \varepsilon \\ \phantom{x} \end{array} \right\}.$$

$\mathcal{L}_9 = \{w \in \Sigma^* = \{0, 1\}^* \mid w$ contém no máximo 4 ocorrências do símbolo 0$\}$.

- $G_1 = (\{A, B, C, D, S\}, \{0, 1\}, P, S)$, com

$$P = \left\{ \begin{array}{l} S \to 0A \mid 1S \mid \varepsilon, \\ A \to 0B \mid 1A \mid \varepsilon, \\ B \to 0C \mid 1B \mid \varepsilon, \end{array} \middle\| \begin{array}{l} C \to 0D \mid 1C \mid \varepsilon, \\ D \to 1D \mid \varepsilon \\ \phantom{x} \end{array} \right\}.$$

- $G_2 = (\{A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, S\}, \{0, 1\}, P, S)$, com

$$P = \left\{ \begin{array}{l} S \to A \mid B \mid C \mid D \mid \varepsilon, \\ A \to 0E, \\ B \to 0F, \\ C \to 0G, \end{array} \middle\| \begin{array}{l} D \to 0H, \\ E \to O, \\ F \to 0I \mid 1F, \\ G \to 0J \mid 1G, \end{array} \middle\| \begin{array}{l} H \to 0K \mid 1H, \\ I \to O, \\ J \to 0L \mid 1J, \\ K \to 0M \mid 1K, \end{array} \middle\| \begin{array}{l} L \to O, \\ M \to 0N \mid 1M, \\ N \to O, \\ O \to 1O \mid \varepsilon \end{array} \right\}.$$

$\mathcal{L}_{10} = \{w \in \Sigma^* = \{0, 1\}^* \mid w$ começa com 0 e contém quantidade ímpar de 1's$\}$.

- $G_1 = (\{A, B, S\}, \{0, 1\}, P, S)$, com

$$P = \left\{ \begin{array}{l} S \to 0A, \\ A \to 0A \mid 1B, \\ B \to 0B \mid 1A \mid \varepsilon \end{array} \right\}.$$

- $G_2 = (\{A, B, C, D, S\}, \{0, 1\}, P, S)$, com

$$P = \left\{ \begin{array}{l} S \to 0A, \\ A \to 0A \mid 1B, \\ B \to C, \end{array} \middle\| \begin{array}{l} C \to 0C \mid 1D \mid \varepsilon, \\ D \to 0D \mid 1C \\ \phantom{x} \end{array} \right\}.$$

$\mathcal{L}_{11} = \{w \in \Sigma^* = \{0,1\}^* \mid$ todo símbolo 0 em $w$ é seguido de pelo menos dois 1's consecutivos, exceto a última ocorrência de 0 em $w\}$.

$\mathcal{L}_{12} = \{w \in \Sigma^* = \{0,1\}^* \mid w$ começa com 0, não contém 10 e termina com $1\}$.

- $G_1 = (\{A, B, S\}, \{0,1\}, P, S)$, com

$$P = \left\{ \begin{array}{l} S \to 0A, \\ A \to 0A \mid 1B, \\ B \to 1B \mid \varepsilon \end{array} \right\}.$$

- $G_2 = (\{A, B, S\}, \{0,1\}, P, S)$, com

$$P = \left\{ \begin{array}{l} S \to 0S \mid 0A, \\ A \to 1A \mid 1B, \\ B \to \varepsilon \end{array} \right\}.$$

$\mathcal{L}_{13} = \{w \in \Sigma^* = \{0,1\}^* \mid w = xyz$ e $|x| = 2\}$.

$\mathcal{L}_{14} = \{w \in \Sigma^* = \{0,1\}^* \mid |w|$ é ímpar e $w$ termina com $1\}$.

- $G_1 = (\{A, B, S\}, \{0,1\}, P, S)$, com

$$P = \left\{ \begin{array}{l} S \to 0A \mid 1B, \\ A \to 0S \mid 1S, \\ B \to 0S \mid 1S \mid \varepsilon \end{array} \right\}.$$

- $G_2 = (\{A, B, C, S\}, \{0,1\}, P, S)$, com

$$P = \left\{ \begin{array}{l} S \to 0A \mid 1A \mid B, \\ A \to 0S \mid 1S, \end{array} \right\| \left. \begin{array}{l} B \to 1C, \\ C \to \varepsilon \end{array} \right\}.$$

$\mathcal{L}_{15} = \{w \in \Sigma^* = \{0,1\}^* \mid |w|$ contém quantidade par de 0's ou ímpar de 1's (ou ambos)$\}$.

$\mathcal{L}_{16} = \{w \in \Sigma^* = \{0,1\}^* \mid |w|$ termina com um 0 seguido de uma quantidade ímpar de 1's$\}$.

$\mathcal{L}_{17} = \{w \in \Sigma^* = \{0,1\}^* \mid |w|_0$ é par e todos os 0's antecedem todos os 1's$\}$.

- $G_1 = (\{A, B, S\}, \{0,1\}, P, S)$, com

$$P = \left\{ \begin{array}{l} S \to 0A \mid 1B \mid \varepsilon, \\ A \to 0S, \\ B \to 1B \mid \varepsilon \end{array} \right\}.$$

- $G_2 = (\{A, B, C, S\}, \{0,1\}, P, S)$, com

$$P = \left\{ \begin{array}{l} S \to A \mid C, \\ A \to 0B \mid 1C \mid \varepsilon, \end{array} \right\| \left. \begin{array}{l} B \to 0A, \\ C \to 1C \mid \varepsilon \end{array} \right\}.$$

$\mathcal{L}_{18} = \{w \in \Sigma^* = \{0,1\}^* \mid w$ contém quantidade par de 01's e ímpar de 0's$\}$.

$\mathcal{L}_{19} = \{w \in \Sigma^* = \{0,1\}^* \mid w$ começa com 0 e contém $00\}$.

- $G_1 = (\{A, B, C, S\}, \{0, 1\}, P, S)$, com

$$P = \left\{ \begin{array}{l} S \to 0B, \\ A \to 0B \mid 1A, \end{array} \middle\| \begin{array}{l} B \to 0C \mid 1A, \\ C \to 0C \mid 1C \mid \varepsilon \end{array} \right\}.$$

- $G_2 = (\{A, B, C, D, E, F, G, H, S\}, \{0, 1\}, P, S)$, com

$$P = \left\{ \begin{array}{l} S \to 0A, \\ A \to 1B \mid C, \\ B \to D \mid 1D, \end{array} \middle\| \begin{array}{l} C \to A \mid 0E, \\ D \to B \mid 0C, \\ E \to F \mid G, \end{array} \middle\| \begin{array}{l} F \to 0H \mid 1H, \\ G \to E \mid \varepsilon, \\ H \to G \end{array} \right\}.$$

$\mathcal{L}_{20} = \{w \in \Sigma^* = \{0, 1\}^* \mid w$ não contém 01 como prefixo$\}$.

- $G_1 = (\{A, B, S\}, \{0, 1\}, P, S)$, com

$$P = \left\{ \begin{array}{l} S \to 0A \mid 1B \mid \varepsilon, \\ A \to 0B \mid \varepsilon, \\ B \to 0B \mid 1B \mid \varepsilon \end{array} \right\}.$$

- $G_2 = (\{A, B, C, D, S\}, \{0, 1\}, P, S)$, com

$$P = \left\{ \begin{array}{l} S \to 0A \mid A \mid B, \\ A \to \varepsilon, \\ B \to 0C \mid 1D, \end{array} \middle\| \begin{array}{l} C \to 0D, \\ D \to 0D \mid 1D \mid \varepsilon, \\ \end{array} \right\}.$$

$\mathcal{L}_{21} = \{w \in \Sigma^* = \{0, 1\}^* \mid |w|_1$ é par e $w$ não contém a subcadeia 11$\}$.

$\mathcal{L}_{22} = \{w \in \Sigma^* = \{0, 1\}^* \mid w$ não contém três símbolos idênticos consecutivos$\}$.

- $G_1 = (\{A, B, C, D, E, S\}, \{0, 1\}, P, S)$, com

$$P = \left\{ \begin{array}{l} S \to 0B \mid 1A \mid \varepsilon, \\ A \to 0B \mid 1C \mid \varepsilon, \end{array} \middle\| \begin{array}{l} B \to 0D \mid 1A \mid \varepsilon, \\ C \to 0B \mid 1E \mid \varepsilon, \end{array} \middle\| \begin{array}{l} D \to 0E \mid 1A \mid \varepsilon, \\ E \to 0E \mid 1E \end{array} \right\}.$$

- $G_2 = (\{A, B, C, D, E, F, G, H, I, S\}, \{0, 1\}, P, S)$, com

$$P = \left\{ \begin{array}{l} S \to A \mid 1A \mid \varepsilon, \\ A \to B \mid 1B \mid \varepsilon, \\ B \to 0C \mid \varepsilon, \end{array} \middle\| \begin{array}{l} C \to D \mid 0D \mid G \mid 0G \mid \varepsilon, \\ D \to E \mid 1E, \\ E \to 1F, \end{array} \middle\| \begin{array}{l} F \to 0C, \\ G \to H \mid 1H, \\ \end{array} \middle\| \begin{array}{l} H \to I \mid 1I, \\ I \to \varepsilon \\ \end{array} \right\}.$$

$\mathcal{L}_{23} = \{w \in \Sigma^* = \{0, 1\}^* \mid w$ contém o mesmo símbolo em todas as posições pares$\}$.

- $G_1 = (\{A, B, C, D, S\}, \{0, 1\}, P, S)$, com

$$P = \left\{ \begin{array}{l} S \to 0B \mid 1A \mid \varepsilon, \\ A \to 0C \mid 1C \mid \varepsilon, \\ B \to 0D \mid 1D \mid \varepsilon, \end{array} \middle\| \begin{array}{l} C \to 1A \mid \varepsilon, \\ D \to 0B \mid \varepsilon \\ \end{array} \right\}.$$

- $G_2 = (\{A, B, C, D, S\}, \{0, 1\}, P, S)$, com

$$P = \left\{ \begin{array}{l} S \to A \mid B, \\ A \to 0C \mid \varepsilon, \\ B \to 1D \mid \varepsilon, \end{array} \middle\| \begin{array}{l} C \to 0A \mid 1A \mid \varepsilon, \\ D \to 0B \mid 1B \mid \varepsilon \\ \end{array} \right\}.$$

$\mathcal{L}_{24} = \{w \in \Sigma^* = \{0,1\}^* \mid |w|_{01} = |w|_{10}\}$.

$\mathcal{L}_{25} = \{w \in \Sigma^* = \{0,1\}^* \mid |w|$ é múltiplo de $3\}$.

$\mathcal{L}_{26} = \{w \in \Sigma^* = \{0,1\}^* \mid |w|$ é uma sequência de subcadeias 01 ou $10\}$.

$\mathcal{L}_{27} = \{w \in \Sigma^* = \{0,1\}^* \mid |w|$ é ímpar e $w$ contém pelo menos uma ocorrência do símbolo $1\}$.

$\mathcal{L}_{28} = \{w \in \Sigma^* = \{0,1\}^* \mid w$ contém 00 e não contém $11\}$.

- $G_1 = (\{A, B, C, D, S\}, \{0,1\}, P, S)$, com

$$P = \left\{ \begin{array}{l|l} S \to 0B \mid 1A, & C \to 0D \mid \varepsilon, \\ A \to 0B, & D \to 0D \mid 1C \mid \varepsilon \\ B \to 0D \mid 1A, & \end{array} \right\}.$$

- $G_2 = (\{A, B, C, D, E, F, S\}, \{0,1\}, P, S)$, com

$$P = \left\{ \begin{array}{l|l|l} S \to 0A \mid 1B, & C \to 0A, & E \to D, \\ A \to 0D \mid 1C, & D \to 0E \mid 1F \mid \varepsilon, & F \to 0D \mid 0E \mid \varepsilon \\ B \to 0A, & & \end{array} \right\}.$$

$\mathcal{L}_{29} = \{w \in \Sigma^* = \{0,1\}^* \mid w$ contém pelo menos um 0 e contém quantidade par de 1's$\}$.

- $G_1 = (\{A, B, C, S\}, \{0,1\}, P, S)$, com

$$P = \left\{ \begin{array}{l|l} S \to 1A \mid 0B, & B \to 0B \mid 1C \mid \varepsilon, \\ A \to 1S \mid 0C, & C \to 1B \mid 0C \end{array} \right\}.$$

- $G_2 = (\{A, B, C, D, E, F, G, S\}, \{0,1\}, P, S)$, com

$$P = \left\{ \begin{array}{l|l} S \to B \mid 1A, & D \to 0D \mid 1E, \\ A \to 1S, & E \to F, \\ B \to 0E \mid 1C, & F \to 0F \mid 1G \mid \varepsilon, \\ C \to 0D, & G \to 0G \mid 1F \end{array} \right\}.$$

$\mathcal{L}_{30} = \{w \in \Sigma^* = \{0,1\}^* \mid |w|$ é múltiplo de 3 e $w$ termina com $11\}$.

- $G_1 = (\{A, B, C, D, S\}, \{0,1\}, P, S)$, com

$$P = \left\{ \begin{array}{l|l} S \to 0B \mid 1B, & C \to 0S \mid 1D, \\ A \to 0S \mid 1S, & D \to 0B \mid 1B \mid \varepsilon \\ B \to 0A \mid 1C, & \end{array} \right\}.$$

- $G_2 = (\{A, B, C, D, E, S\}, \{0,1\}, P, S)$, com

$$P = \left\{ \begin{array}{l|l} S \to 0A \mid 1A \mid 0D \mid 1D, & C \to \varepsilon, \\ A \to 1B, & D \to 0E \mid 1E, \\ B \to 1C, & E \to 0S \mid 1S \end{array} \right\}.$$

$\mathcal{L}_{31} = \{w \in \Sigma^* = \{0,1\}^* \mid |w|$ não contém a subcadeia 00 ou a subcadeia $11\}$.

$\mathcal{L}_{32} = \{w \in \Sigma^* = \{0,1\}^* \mid$ todo par de 0's adjacentes ocorre antes de qualquer par de 1's adjacentes$\}$.

$\mathcal{L}_{33} = \{w \in \Sigma^* = \{0,1\}^* \mid w$ não começa com 00 e não termina com 11$\}$.

$\mathcal{L}_{34} = \{w \in \Sigma^* = \{0,1\}^* \mid w$ não contém pares de 1's consecutivos$\}$.

$\mathcal{L}_{35} = \{w \in \Sigma^* = \{0,1\}^* \mid w$ termina com 0 ou com 11$\}$.

- $G_1 = (\{A, B, C, S\}, \{0, 1\}, P, S)$, com

$$P = \left\{ \begin{array}{l} S \to 0A \mid 1B, \\ A \to 0A \mid 1B \mid \varepsilon, \end{array} \middle\| \begin{array}{l} B \to 0A \mid 1C, \\ C \to 0A \mid 1C \mid \varepsilon \end{array} \right\}.$$

- $G_2 = (\{A, B, C, D, E, S\}, \{0, 1\}, P, S)$, com

$$P = \left\{ \begin{array}{l} S \to A \mid 0S \mid 1S \mid C, \\ A \to 0B, \\ B \to \varepsilon, \end{array} \middle\| \begin{array}{l} C \to 1D, \\ D \to 1E, \\ E \to \varepsilon \end{array} \right\}.$$

$\mathcal{L}_{36} = \{w \in \Sigma^* = \{0,1\}^* \mid w$ contém quantidade par de 0's seguida de quantidade ímpar de 1's$\}$.

$\mathcal{L}_{37} = \{w \in \Sigma^* = \{0,1\}^* \mid w$ começa com 0, contém exatamente dois 1's e termina com 00$\}$.

- $G_1 = (\{A, B, C, D, E, S\}, \{0, 1\}, P, S)$, com

$$P = \left\{ \begin{array}{l} S \to 0A, \\ A \to 0A \mid 1B, \\ B \to 0B \mid 1C, \end{array} \middle\| \begin{array}{l} C \to 0D, \\ D \to 0E, \\ E \to 0E \mid \varepsilon \end{array} \right\}.$$

- $G_2 = (\{A, B, C, D, E, S\}, \{0, 1\}, P, S)$, com

$$P = \left\{ \begin{array}{l} S \to 0A \mid 0S, \\ A \to 1B, \\ B \to 0B \mid 1C, \end{array} \middle\| \begin{array}{l} C \to 0D, \\ D \to 0D \mid 0E, \\ E \to \varepsilon \end{array} \right\}.$$

$\mathcal{L}_{38} = \{w \in \Sigma^* = \{0,1\}^* \mid w = 0u1$ ou $w = 1u0$, com $u \in \Sigma^*\}$.

$\mathcal{L}_{39} = \{w \in \Sigma^* = \{0,1\}^* \mid w$ contém um número ímpar de ocorrências de 01$\}$.

- $G_1 = (\{A, B, C, S\}, \{0, 1\}, P, S)$, com

$$P = \left\{ \begin{array}{l} S \to 0A \mid 1S, \\ A \to 0A \mid 1B, \end{array} \middle\| \begin{array}{l} B \to 0C \mid 1B \mid \varepsilon, \\ C \to 0C \mid 1S \mid \varepsilon \end{array} \right\}.$$

- $G_2 = (\{A, B, C, D, E, F, S\}, \{0, 1\}, P, S)$, com

$$P = \left\{ \begin{array}{l} S \to 0B \mid 1A, \\ A \to 0B \mid 1A, \\ B \to 0B \mid 1D, \end{array} \middle\| \begin{array}{l} C \to 0B \mid 1C, \\ D \to 0E \mid 0F \mid 1D \mid \varepsilon, \\ \phantom{x} \end{array} \middle\| \begin{array}{l} E \to 0E \mid 1C, \\ F \to 0F \mid \varepsilon \\ \phantom{x} \end{array} \right\}.$$

$\mathcal{L}_{40} = \{w \in \Sigma^* = \{0,1\}^* \mid 0^n,\ n \in \mathbb{N}$, e $n$ é múltiplo de 2 ou de 3$\}$.

$\mathcal{L}_{41} = \{w \in \Sigma^* = \{0,1\}^* \mid w$ é um número binário maior que zero e múltiplo de 3$\}$.

$\mathcal{L}_{42} = \{w \in \Sigma^* = \{0,1\}^* \mid w$ é número binário, não negativo, divisível por 4 (sem 0's iniciais redundantes)$\}$.

$\mathcal{L}_{43} = \{w \in \Sigma^* = \{0,1\}^* \mid$ toda subcadeia de $w$ de comprimento 4 contém exatamente um 1$\}$.

$\mathcal{L}_{44} = \{w \in \Sigma^* = \{0,1\}^* \mid |w|_0$ é par e $|w|_1$ é par.

$\mathcal{L}_{45} = \{w \in \Sigma^* = \{0,1\}^* \mid |w|_0$ é par e $|w|_1$ é ímpar.

$\mathcal{L}_{46} = \{w \in \Sigma^* = \{0,1\}^* \mid |w|_0$ é par e $|w|_1$ é divisível por $3\}$.

$\mathcal{L}_{47} = \{w \in \Sigma^* = \{0,1\}^* \mid |w|$ é ímpar e $w$ começa com $1\}$.

- $G_1 = (\{A, B, S\}, \{0,1\}, P, S)$, com

$$P = \left\{ \begin{array}{l} S \to 1A, \\ A \to 0B \mid 1B \mid \varepsilon, \\ B \to 0A \mid 1A \end{array} \right\}.$$

- $G_2 = (\{A, B, C, D, E, S\}, \{0,1\}, P, S)$, com

$$P = \left\{ \begin{array}{l\|l} S \to 1A, & C \to 1A, \\ A \to 0B \mid 0C \mid 1D \mid 1E \mid \varepsilon, & D \to 0A, \\ B \to 0A, & E \to 1A \end{array} \right\}.$$

$\mathcal{L}_{48} = \{w \in \Sigma^* = \{0,1\}^* \mid w = 0u$ e $|w|$ é ímpar ou $w = 1u$ e $|w|$ é par, com $u \in \Sigma^*\}$.

$\mathcal{L}_{49} = \{w \in \Sigma^* = \{0,1\}^* \mid w$ termina com 010 e contém $011\}$.

$\mathcal{L}_{50} = \{w \in \Sigma^* = \{0,1\}^* \mid w = 1u1$, com $u \in \Sigma^*$, e $w$ não contém 11 e $000\}$.

$\mathcal{L}_{51} = \{w \in \Sigma^* = \{0,1\}^* \mid w = 0^{3n+5},\ n \geqslant 0\}$.

- $G_1 = (\{A, B, S\}, \{0,1\}, P, S)$, com

$$P = \left\{ \begin{array}{l\|l} S \to 0A, & C \to 0D, \\ A \to 0B, & D \to 0E, \\ B \to 0C, & E \to 0C \mid \varepsilon \end{array} \right\}.$$

- $G_2 = (\{A, B, C, D, E, S\}, \{0,1\}, P, S)$, com

$$P = \left\{ \begin{array}{l\|l} S \to 0A, & C \to 0D, \\ A \to 0B, & D \to 0E, \\ B \to 0C, & E \to B \mid \varepsilon \end{array} \right\}.$$