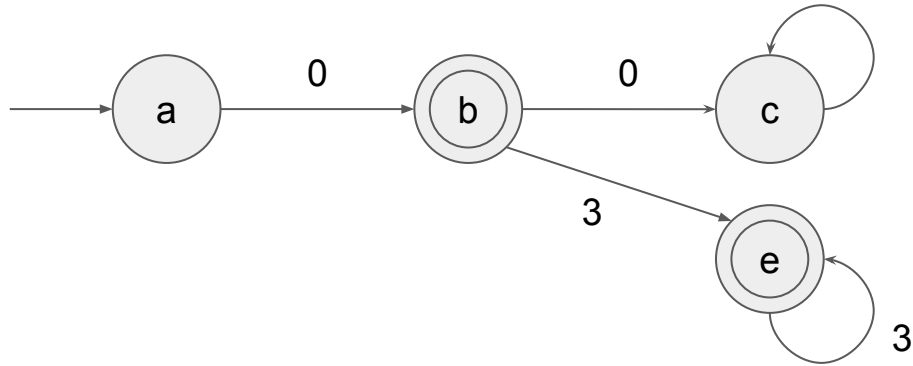# Opgaver DM534 uge 47

Starte med at repetere følgende definitioner fra slides:

- En Deterministic Finite Automaton (DFA)

- At en DFA accepterer en streng.

- Sproget bestemt af en DFA.

- En Context-Free Grammar (CFG).

- At en CFG udleder (derives) en streng.

- Sproget bestemt af en CFG.

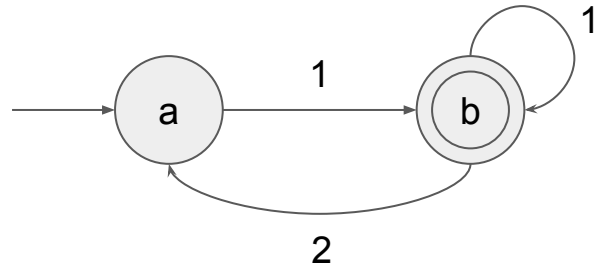Lav derefter opgaverne på de følgende sider.

Exercise 1

● What is the language of the following DFA?

Exercise 2

● What is the language of the following DFA?

Exercise 3

- Define a DFA that recognises the following language:
  - All strings of 0s and 1s that contain an odd number of 1s and any number of 0s.

Exercise 4

- Define a DFA that recognises the following language:
  - All strings of 0s and 1s that contain the string 010.

Exercise 5

- Define a DFA that recognises the following language:
    - All strings of 0s and 1s that contain at least two occurrences of 10 and an even number of 0s.

Exercise 6

- What is the language of the following CFG?

$$S \rightarrow ab$$
$$S \rightarrow SS$$

Exercise 7

- Write two different derivations for the string 0001111 with the following CFG. (Same end result, but some different intermediate steps.)

$$S \rightarrow 0M1$$
$$M \rightarrow M1$$
$$M \rightarrow 0M$$
$$M \rightarrow 0$$
$$M \rightarrow 1$$

Exercise 8

- What is the language of the following CFG?

$$S \rightarrow 0MM1$$
$$M \rightarrow 0M$$
$$M \rightarrow 1M$$
$$M \rightarrow 0$$
$$M \rightarrow 1$$

Exercise 9

- Define a CFG that recognises the following language:
  - All strings of 0s and 1s consisting of n 0s followed by n 1s.
  - Examples: 0011 is OK, 1100 is not OK, 011 is not OK.

Exercise 10

- Define a DFA that recognises the same language of this CFG:

$$S \rightarrow 0M$$
$$S \rightarrow 1$$
$$M \rightarrow 0S$$
$$M \rightarrow 1T$$
$$T \rightarrow 0M$$
$$T \rightarrow 1T$$

Exercise 11

- Define a CFG that recognises the following language:
  - All strings of arithmetic additions that contain numbers, the + sign, and (balanced) parentheses.
  - Examples: (0+1) is OK, (2+(3))+4 is OK, 2+3(2) is not OK.