

## Eksaminatorier DM573 Uge 43/44

Husk at læse de relevante sider i slides før du/I forsøger at løse en opgave.

### **I: Løses i løbet af øvelsestimerne i uge 43**

Start 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.

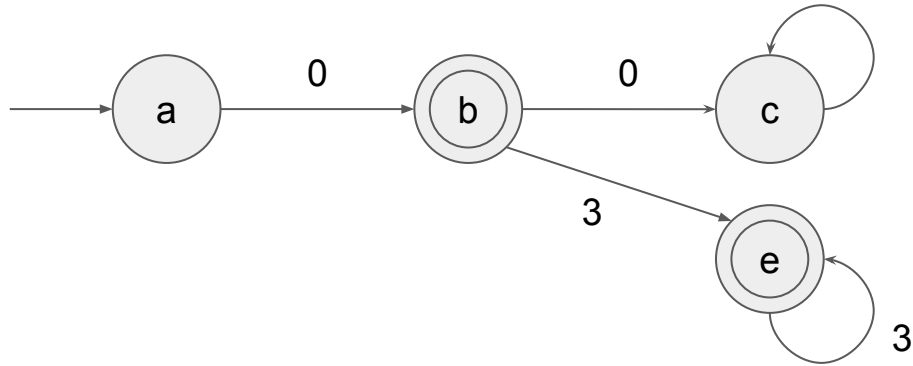
Lav derefter opgave 1–8 på de næste sider.

### **II: Løses hjemme inden øvelsestimerne i uge 44**

Lav opgave 9–11 på de følgende sider.

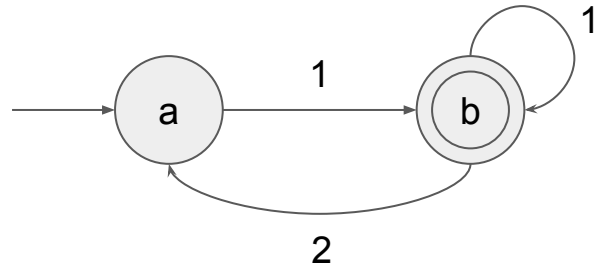
# Exercise 1

- 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.