Answers

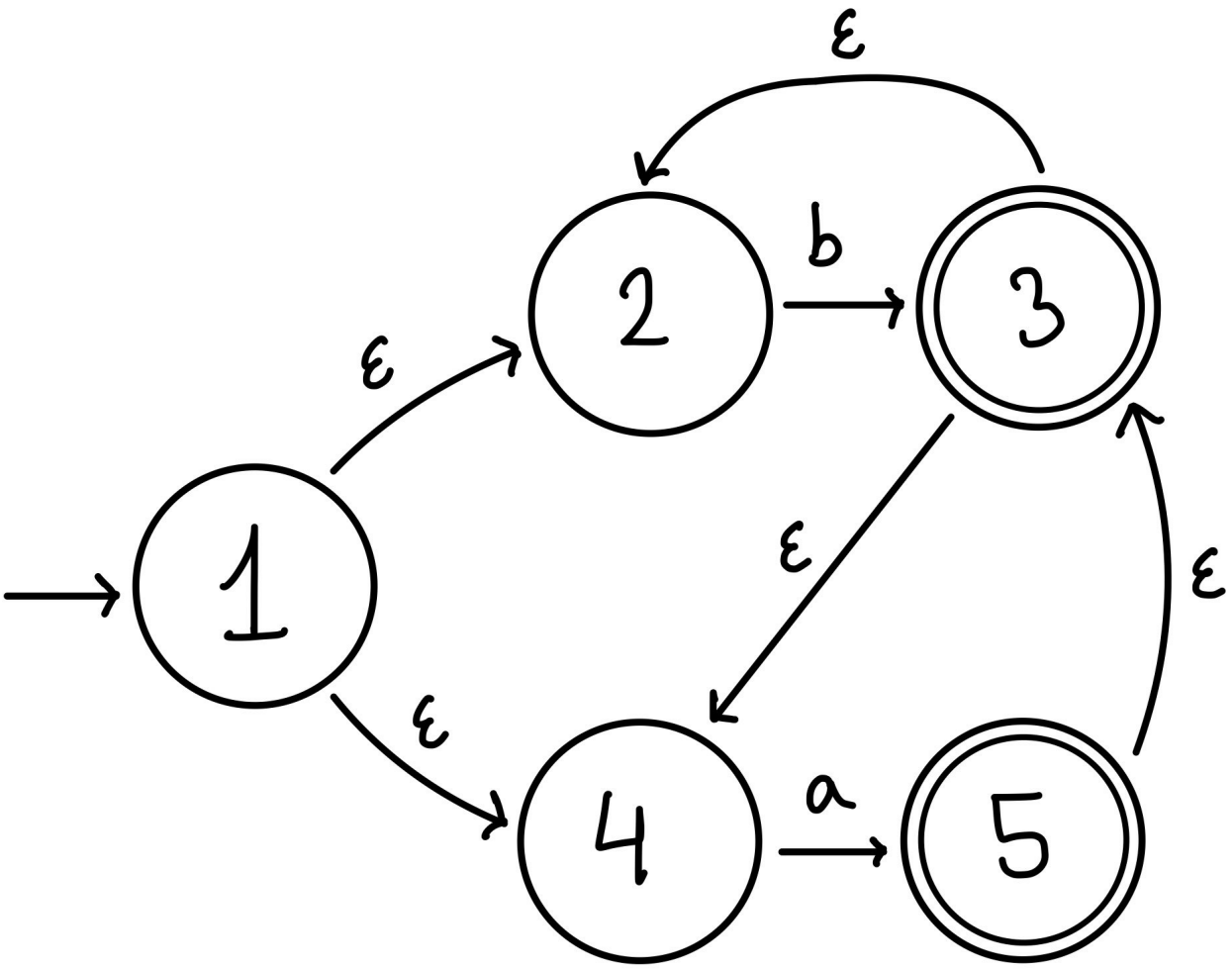
PLC 2.4 & 2.5

Our answers to these exercises can be viewed here: https://github.com/REXKrash/PRDAT2022/blob/main/Lectures/Lec02/ex2_4Handout.fs (See ex2_4Handout.fs)

PLC 3.2

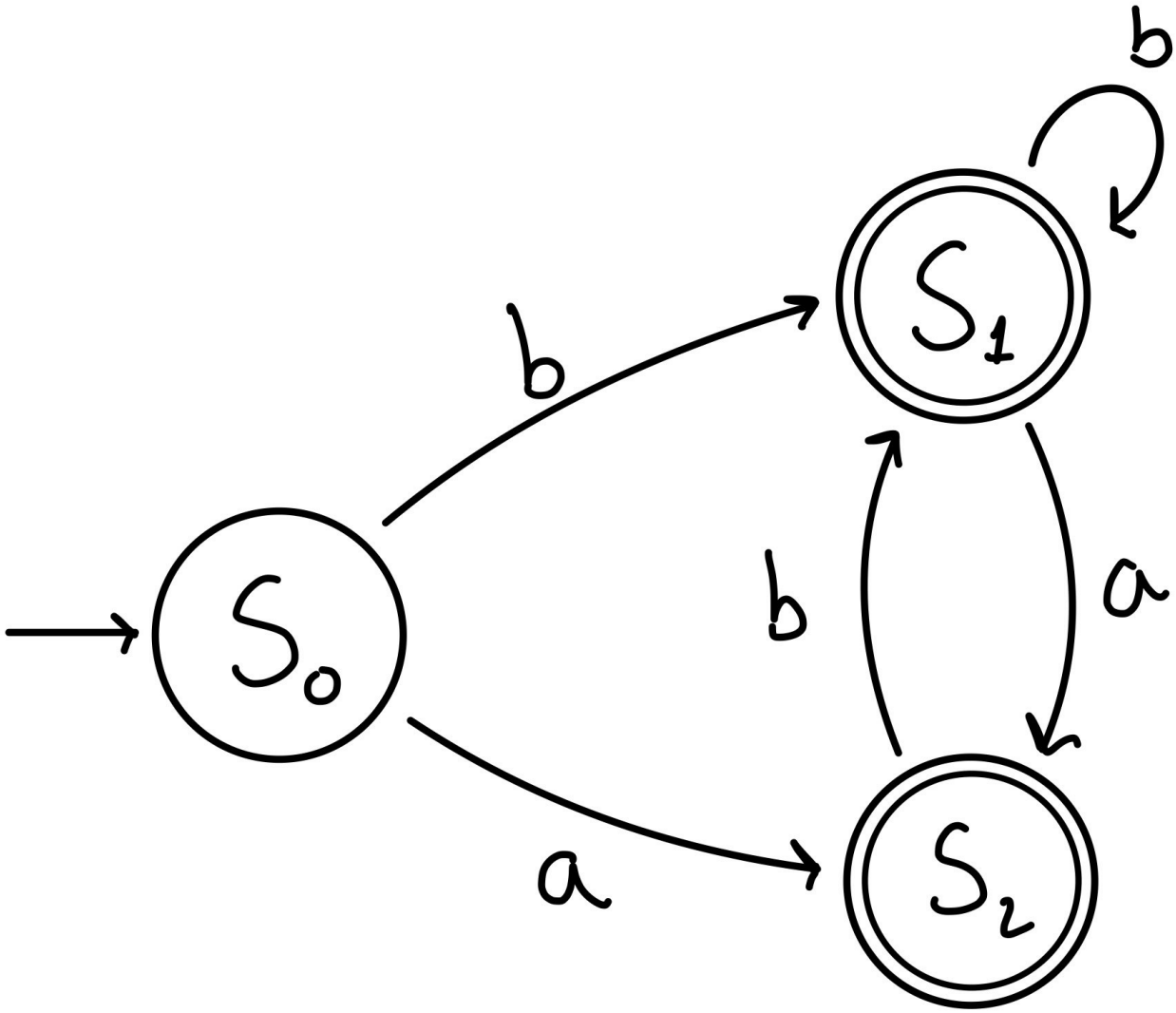
Our regular expression solution for a regular expression which recognizes all sequences consisting of *a* and *b* where two *a*'s are always separated by at least one *b*, is "^(b | ab | a$)+$".

NFA



DFA

DFA	At A	At B	NFA-states
S0	S2	S1	{1,2,4}
S1	S2	S1	{3}
S2	X	S1	{5}



BCD 2.1

Note: We were confused about the phrasing of the question, and asked a TA. For example, we were confused whether "All number-strings that have the value 42." meant any number that had "42" in it, such as 1230420123, or if it is any number that equals 42, such as 0000042. We were told the former was the correct understandig, and have done the exercises in such a manner.

a)

([0-9]*42[0-9]*)+

b)

^(?!.*42.*)[0-9]+

c)

0*([1-9][0-9]{2,}|4[3-9]|[5-9][0-9])

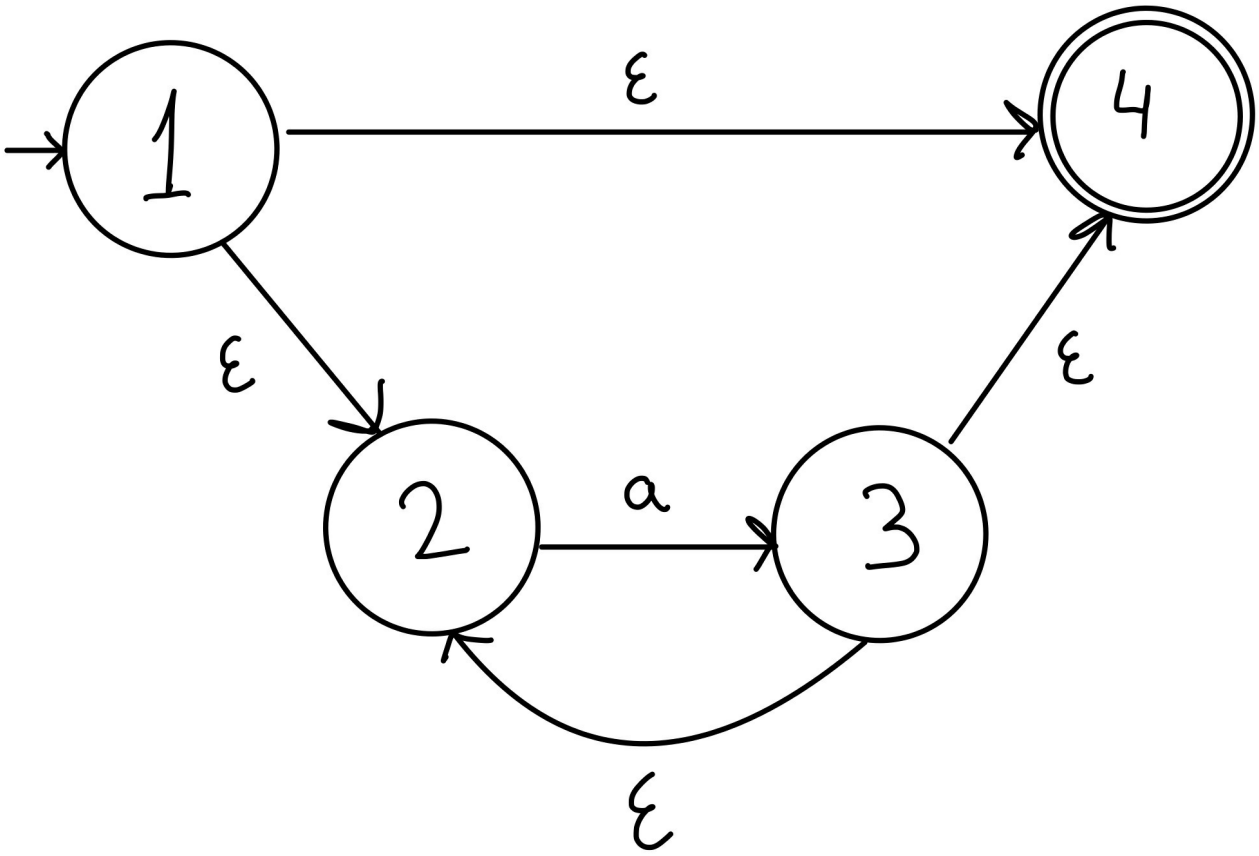
BCD 2.2

a)

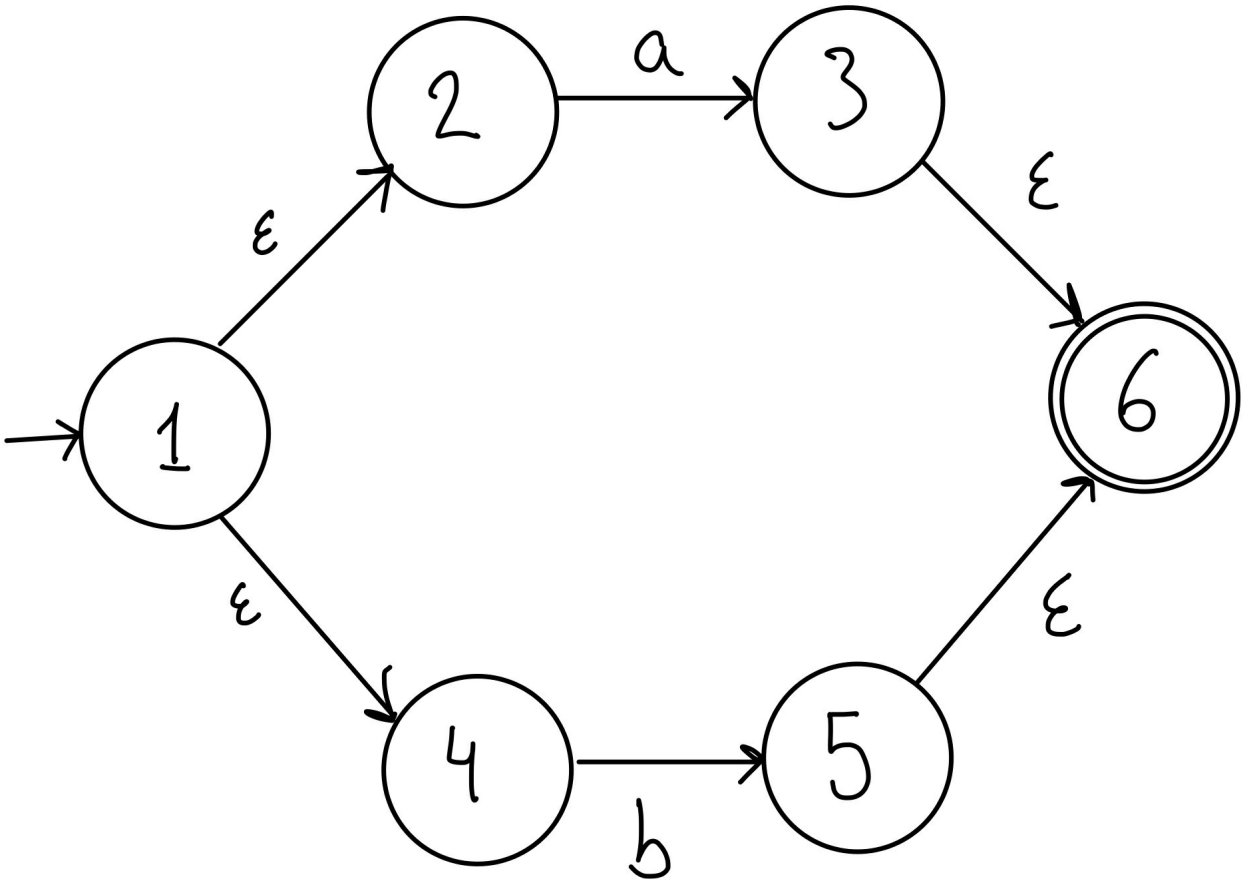
To make a NFA, we have divided the regular expression into 3 parts (a*, alb and aa):

We then make separate NFAs for each part:

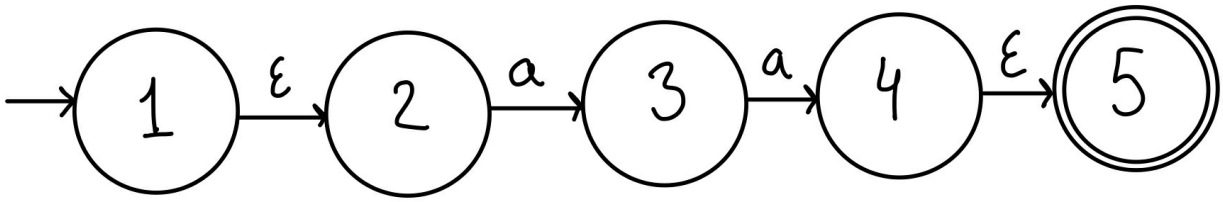
NFA for *a



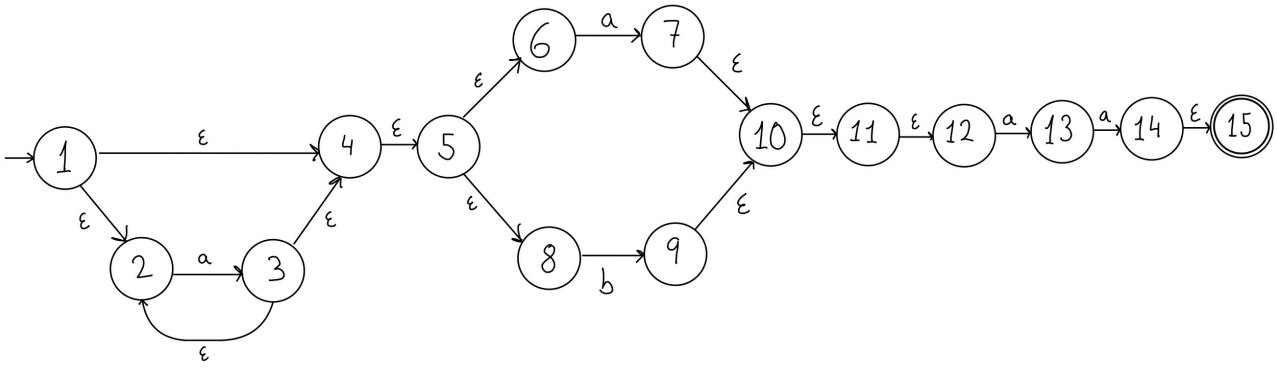
NFA for *alb*



NFA for *aa*



Lastly, we will unify each separate NFA into 1 final NFA:



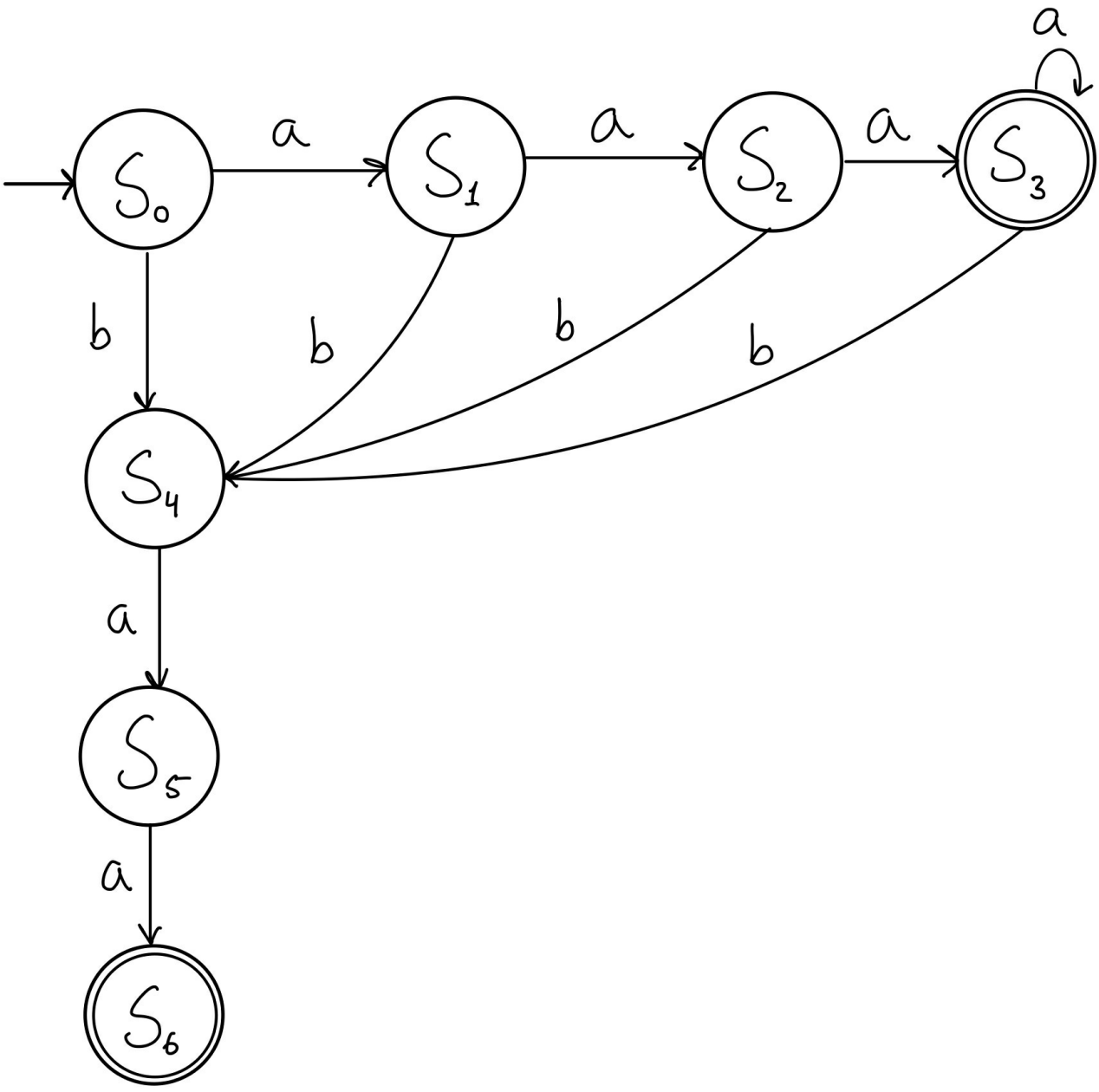
b)

Through building this DFA, we have made the following matrix:

DFA At A	At B	NFA-states

S0	S1	S4	{1,2,4,5,6,8}
S1	S2	S4	{2,3,4,5,6,7,8,10,11,12}
S2	S3	S4	{2,3,4,5,6,7,8,10,11,12,13}
S3	S3	S4	{2,3,4,5,6,7,8,10,11,12,13,14,15}
S4	S5	X	{9,10,11,12}
S5	S6	X	{13}
S6	X	X	{14,15}

This translates into the following DFA:



HelloLex exercises:

Question 1:

What are the regular expressions involved, and which semantic values are they associated with?

[0-9]

This is a single digit which is one of the natural numbers

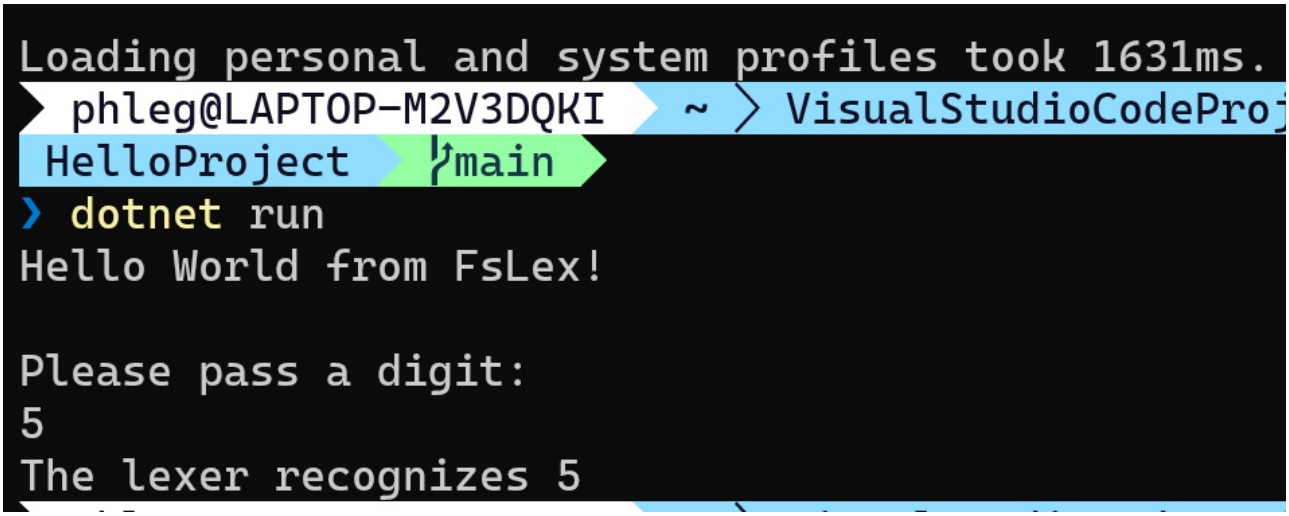
Question 2:

Which additional file is generated during the process?
hello.fs

How many states are there by the automaton of the lexer?
3 states

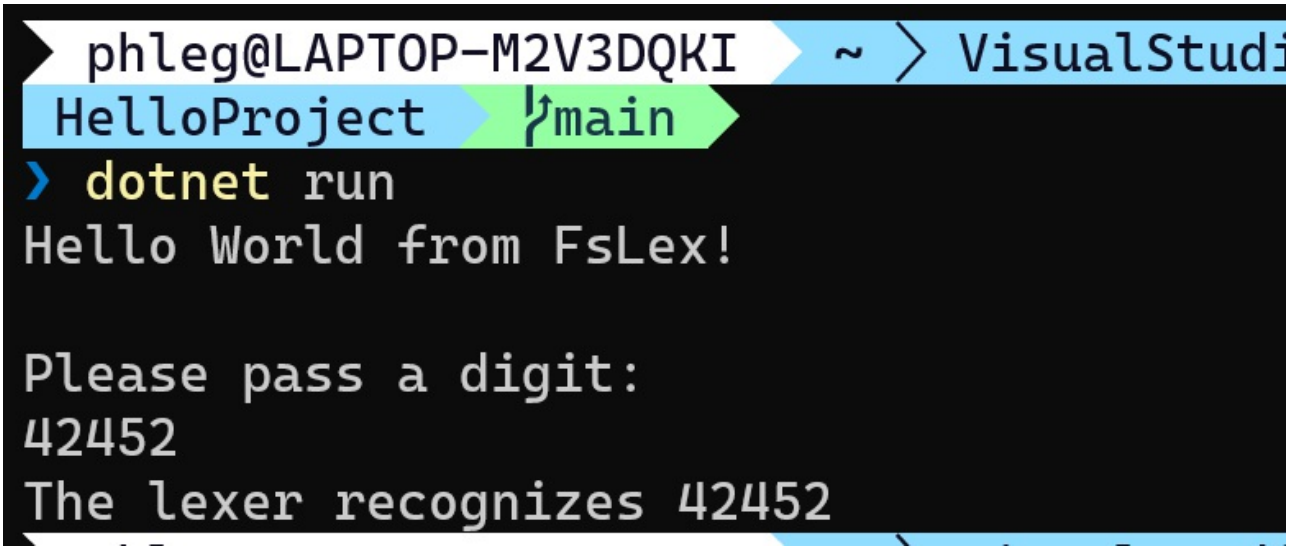
Question 3:

Compile and run the generated program



Question 4:

Extend the lexer specification hello.fsl to recognize numbers of more than one digit. New lexer specification is hello2.fsl. Generate hello2.fs, compile and run the generated program.



Question 5:

Extend the lexer specification hello2.fsl to recognize floating numbers. New lexer specification is hello3.fsl. Generate hello3.fs, compile and run the generated program.