# Math2 extra exercises week 2-1 - answers

**Matrix multiplications / determinant / inverse**

Exercise 1: (201906)

Given are the following lines:

𝑙: 3𝑦+𝑥−9=0 and 𝑚: 2𝑥+4𝑦=12

The system of equations can be written in matrix form as: MX = B.

a) Give the coefficient-matrix M of this system.

b) Calculate the determinant of this matrix M.

Determine the intersection point in two different ways:

c) With the elimination method.

d) By using the inverse matrix.

Answer 1

a)M = b)|M| = -2

c) intersection point = (0,3)

d) M-1=

EXERCISE 2 *(20120119)*

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#### Given is a system of two linear equations : 3x+by=6 -5y+2x=7 where b is some unknown constant value.

a For which value(s) of b does the system have no solutions? **Explain your answer!**  
Now replace b by the value −1.

b. Determine the inverse of the coefficient-matrix.

c. Calculate the intersection-point of the two lines by using this inverse matrix. **(Show clearly which calculations you perform).**

2. a. The coefficient-matrix is with determinant: -15-2b.  
When this determinant is equal to 0, there are no or more solutions: -15-2b=0 then b=-7.5  
With this value you will get 2 different but parallel lines, without a solution.  
So the answer is -7.5

b. -1 = =

c. = -1  = =

## Regular expressions / regular languages

EXERCISE 3 *(201906)*

Given is the alphabet A = {3,a,5}.

Let L = {a3, 55, a} and K = {33, aa, 3} be two languages over this alphabet.

a. Give the language LK and |LK|.

b. Give the language M = { m ∈ K\* **|** | m | <= 3 }.

Answer 3

a) LK = {a333, a3aa, a33, 5533, 55aa, 553, aaa, a5} or {a3, 55, a} {33, aa, 3} |LK| = 8

b) M = {λ, 33, aa, 3, 333, aa3, 3aa}

EXERCISE 4 *(201906)*

Given is the alphabet A = { *a, b, c*}. Consider the language L that contains the words that satisfy all of the following conditions:

* Having exactly 2 a’s
* Having abc as a subword

Examples of correct words are: abbbcabcbbbcc, ccbbabcbba, abccccabb

a. Give a regular expression for the language L.

b. Give a set representation for the language L .

Answer 4

a) (b v c)\* a (b v c)\* abc (b v c)\* V (b v c)\* abc (b v c)\*a (b v c)\*

b) {b,c}\*{a}{b,c}\*{abc}{b,c}\* U {b,c}\*{abc}{b,c}\*{a}{b,c}\*

EXERCISE 5 *(20120119)*

Given is the alphabet A = { 0, 1 } and the words *u* = 0101 and *w* = 110.

Let L = {uw, ww } be a language over A.

a. Give | *wuw* |

b. Mention all the elements of L2. (You may use the words *u* and *w* in your answer.)

c. Give all the words from A\* which are a subword of both *u* and *w*.

5.a. | *wuw* | =3+4+3=10  
 b. { uwuw,uwww,wwuw,wwww}  
 c. λ, 0, 1, 10

EXERCISE 6 *(20120119)*

Given the alphabet A = {0,X}   
Consider the language K defined on A, where K = { 0Xn | n>0} ∪ {X}

Give a regular expression for K.

0XX\* \/ X