

## Exercise 3

**General instructions:** Follow these instructions, as they facilitate the revision of the exercises. The review takes into account that you always use the requested file names. Send **only** the files requested. Return your answers to your assistant as an e-mail entitled **TilaI,2017**. If you have not programmed before, choose only one of the programming languages (**octave/python**) and do not change it during the course. If you are sure that you want to try both languages, you can of course do the exercises of both languages. However return the exercises to your assistant in one language only.

- **Exercise 3a (linux, emacs, L<sup>A</sup>T<sub>E</sub>X)**

The goals of this exercise are: learning how to use  
**grep** command of **linux**  
“find” command **[Ctrl]+[s]** of **emacs**  
**Replace** command of **emacs**

Make a new directory

**/home/username/linux/**

in your home directory. Copy files:

**H3aetsi1.txt**

**H3aetsi2.txt**

**H3aetsi3.txt**

**H3aetsi4.txt**

**H3aetsi5.txt**

**H3aetsi6.txt**

in your new directory from the homepage.

**Question 1:** In which files the word **aku** can be found and how many times?

**Question 2:** In which files the word **iines** can be found and how many times?

**Question 3:** Explain briefly, **how** you found the answers to the questions 1 and 2.

Next we will learn how to use the “replace” command of **emacs**, which is **[Alt][%]**. Same command works also by choosing **Replace** from the **Edit** menu of the top bar.

**emacs** asks what characters you want to replace. Write the characters and press **[Return]**. **emacs** asks what are the substitutive characters? Write the characters and press **[Return]**. **emacs** moves forward in the file and asks do you want to make the next replacement. Answer to the question either **y** or **n**.

Move to the directory created before: **/home/username/latex/**

Copy the file: **H3akesken.tex** from the homepage.

Copy this file as a new file named: **H3avalmis.tex**

Edit the text of the **H3avalmis.tex**, in such way that you change all the symbols on the left of this table to the symbol on its right. For example you change all the **\*** symbols to **a**.

<b>*</b> = a	<b>)</b> = o	<b>z</b> = u	<b>q</b> = t	<b>&gt;</b> = e	<b>?</b> = ä	<b>w</b> = i
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Begin the replacements from **L)pzksw** i.e. leave all the first 7 rows in their original state.

Do the command **pdflatex H3avalmis.tex** every now and then and follow what kind of result we want with the command **evince H3avalmis.pdf &**.

**Requirements of the exercise:** Answer briefly to the **questions 1-3**.

File **H3avalmis.pdf** is ready when even the last **w** symbol is replaced with the symbol **i**. The text should be understandable Finnish by now.

- **Exercise 3b (emacs, python, octave)** Do either the **python** or the **octave** part.

### python part

Move to the directory `/home/username/ohjelmat/` created before.

Copy to this directory files `H3bvalmis1.py` and `H3bvalmis2.py` from the course homepage.

“Run” first program with the command

```
python H3bvalmis1.py
```

**Question 1:** Why the program “crashes”?

**Question 2:** What are the texts after the `#` symbols?

**Kysymys 3:** What do the commands `import os` and `os.system('clear')` do?

“Run” the second program with the command

```
python H3bvalmis2.py
```

**Question 4:** Why this program “crashes” too?

Make a program `H3bvalmis3.py`, that counts variables  $a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u$  and  $v$ , print the values of these variables to the screen. Run the program using command `python H3bvalmis3.py`

```
a = pi
b = sin(a)
c = cos(a)
d = tan(a)
e = 1
f = asin(e)
g = acos(e)
h = atan(e)
i = 9
j = sqrt(i)
k = i**2, where i is the imaginary unit i^2 = -1
m = 1 + i, complex number
n = 2 + 3i, complex number
o = m + n
p = |o|
q = e = 2.71828... = Euler's number
r = ln(q) (natural logarithm)
s = log(q) (logarithm to base 10)
t = -3
u = |t|
v = t**4
```

Values printed to the screen could be for example these:

```
3.141592653589793
1.22464679915e-16
-1.0
-1.22464679915e-16
1
1.57079632679
0.0
0.785398163397
9
3.0
(-1+0j)
(-1+0j)
(1+1j)
(2+3j)
(3+4j)
5.0
2.71828182846
1.0
0.434294481903
-3
3
81.0
```

**Note:**  $i^2 = -1 = (-1+0j)$  is calculated with two different ways above so it is printed twice. It is enough to calculate it with only one way.

**Requirements of the exercise:** Answer briefly to the questions 1–4.

File `H3bvalmis3.py` is ready, when the **content** of its output matches the example above and it doesn't crash with the command `python H3bvalmis3.py`.

## octave part

Move the the directory `/home/username/ohjelmat/` created before

Copy to this directory files: `H3bvalmis1.m` and `H3bvalmis2.m` from the homepage of the course  
“Run” the first program with the command

```
octave H3bvalmis1.m
```

Question 1: Why the program “crashes”?

Question 2: What are the texts after the `#` symbols?

Question 3: What do the commands `clear` and `clc` do?

“Run” the second program with the command

```
octave H3bvalmis2.m
```

Question 4: Does this program crash too?

Make a program `H3bvalmis3.m`, that counts variables  $a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u$  and  $v$ , and prints the values to the screen. Run the program with the command `octave H3bvalmis3.m`

```
a = pi
b = sin(a)
c = cos(a)
d = tan(a)
e = 1
f = asin(e)
g = acos(e)
h = atan(e)
i = 9
j = sqrt(i)
k = i^2, where i is the imaginary unit  $i^2 = -1$ 
m = 1 + i, complex number
n = 2 + 3i, complex number
o = m + n
p = |o|
q = e = 2.71828... = Euler's number
r = ln(q) (natural logarithm)
s = log(q) (logarithm to base 10)
t = -3
u = |t|
v = t^4
```

Printed values could be for example these

```
3.1416
1.2246e-16
-1
-1.2246e-16
1
1.5708
0
0.78540
9
3
-1
-1
1 + 1i
2 + 3i
3 + 4i
5
2.7183
1
0.43429
-3
3
81
```

Note:  $i^2 = -1 = -1$  is calculated with two different ways above so it is printed twice. It is enough to calculate it with only one way.

**Requirements of the exercise:** Answer briefly to the questions 1–4.

File `H3bvalmis3.m` is ready, when the content of its output matches the example above and and it doesn't crash with the command `octave H3bvalmis3.m`.

### Turning in the exercises

H3a: Answer briefly to the [questions 1–3](#), and send files `H3avalmis.tex` and `H3avalmis.pdf` to the assistant attached to the e-mail

H3b: Answer briefly to the [questions 1–4](#), and send files `python` file `H3bvalmis3.py` or `octave` file `H3bvalmis3.m` to the assistant attached to the e-mail.