

# Template Week 4 – Software

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## Assignment 4.1: ARM assembly

Screenshot of working assembly code of factorial calculation:

## Assignment 4.2: Programming languages

Take screenshots that the following commands work:

`javac --version`

`java --version`

`gcc --version`

`python3 --version`

`bash --version`

### **Assignment 4.3: Compile**

Which of the above files need to be compiled before you can run them?

Which source code files are compiled into machine code and then directly executable by a processor?

Which source code files are compiled to byte code?

Which source code files are interpreted by an interpreter?

These source code files will perform the same calculation after compilation/interpretation. Which one is expected to do the calculation the fastest?

How do I run a Java program?

How do I run a Python program?

How do I run a C program?

How do I run a Bash script?

If I compile the above source code, will a new file be created? If so, which file?

Take relevant screenshots of the following commands:

- Compile the source files where necessary
- Make them executable
- Run them
- Which (compiled) source code file performs the calculation the fastest?

#### Assignment 4.4: Optimize

Take relevant screenshots of the following commands:

- a) Figure out which parameters you need to pass to **the gcc** compiler so that the compiler performs a number of optimizations that will ensure that the compiled source code will run faster. **Tip!** The parameters are usually a letter followed by a number. Also read **page 191** of your book, but find a better optimization in the man pages. Please note that Linux is case sensitive.
- b) Compile **fib.c** again with the optimization parameters
- c) Run the newly compiled program. Is it true that it now performs the calculation faster?
- d) Edit the file **runall.sh**, so you can perform all four calculations in a row using this Bash script. So the (compiled/interpreted) C, Java, Python and Bash versions of Fibonacci one after the other.

#### Bonus point assignment – week 4

Like the factorial example, you can also implement the calculation of a power of 2 in assembly. For example you want to calculate  $2^4 = 16$ . Use iteration to calculate the result. Store the result in r0.

Main:

```
mov r1, #2
```

```
mov r2, #4
```

Loop:

End:

Complete the code. See the PowerPoint slides of week 4.

Screenshot of the completed code [here](#).

Open

Run

250

Step

Reset

```

1 Main:
2   mov r0, #1
3   mov r1, #2
4   mov r2, #4
5
6 Loop:
7   mul r0, r0, r1
8   sub r2, r2, #1
9   cmp r2, #0
10  bne Loop
11
12 End:
13   b End

```

Register	Value
R0	10
R1	2
R2	0
R3	0
R4	0
R5	0
R6	0
R7	0
R8	0
R9	0
R10	0

  

0x00010000:	01	00
0x00010010:	01	20
0x00010020:	00	00
0x00010030:	00	00

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