

CSCM985, Lab Dafny-3

To be ticked off:

- on **27.11.2025** or
- a week later, on **4.12.2025** at the beginning of the lab.

Please work in teams of two. There are Computer Instructions at the begin of this Lab Sheet.

- There are is a task with three sub-items.
- There is one challange task.
- All group participants need to be present to be ticked off.
- Check your marks on Lab-Tracker after having been ticked off, marks cannot be changed after.

Learning Outcomes

- ◎ Finding loop onvariants

Where to Look Up Things

- 👁 Dafny Cheat Sheet: <https://dafny.org/latest/DafnyCheatsheet.pdf>

Computer Instructions

- sign in to OneDrive in order to have your files synched to the cloud
- Under Teaching Software Faculty
 - choose VScode [Do not choose Visual Studio!!!]
 - start Visual Studio Code (it might be the case that it still needs to be installed)
 - note: the window is often hidden
- In VScode choose extensions (left sidebar)
 - enter Dafny
 - select Dafny
 - click install
 - create a new file with extension .dfy, say hugo.dfy
 - click into this file
 - if there are migration instruction [likely], accept the update to version 4.6.0.0, and you are ready to go
- In case there is no migration pop-up
 - click on Dafny in the extensions field
 - click uninstall
 - click install
 - (possibly repeat this cycle)
 - until you are offered restart extension
 - click restart extension
 - a pop-up upgrade version appears accept the upgrade to 4.6.0
- click on hugo.dfy
 - check for Dafny 4.6.0.0 in the bottom right corner - then things are correctly installed
- Seeing Dafny in Action:
 - Download the file hello.dfy
 - Open it in VScode
 - Press F5: this executes hello.dfy
 - you should see “hello” and the number “34” on the screen
 - Change the assertion “assert 42 > 0;” to “assert 42 < 0;”
 - you see a right marker on the left of this line

Task 1 - Further Steps on the Way of Becoming a “Dafny Guru”

Introduction to the Task: This Lab Sheet compiles a number of Dafny challenges around loop invariants.

➤ The method `find_max` is supposed to return the maximum value of a non empty sequence. Annotate the code such that Dafny proves it to be correct.

➤ The method `fast_exp` is supposed to compute the value 2^n for the input n . Annotate the code such that Dafny proves it to be correct.

The function `exp_spec` defines (standard, slow) exponentiation. The method `fast_exp` implements a method that is called ‘exponentiation by squaring’.

➤ The method `nodup` is supposed to check if the given list contains no duplicates. Annotate the code such that Dafny proves it to be correct.

Assessment Check List

✓ Three items to be ticked off.