

Verification-Driven Program Development

Exercise Sheet, Week 2

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Setup (AI help allowed to debug installation issues)

1. Install Dafny (<https://dafny.org/dafny/Installation>).
2. Useful links:
 - Main webpage: <https://dafny.org/>
 - Installation instructions: <https://dafny.org/dafny/Installation>
 - Visual Studio Code Dafny Plug-in:
<https://marketplace.visualstudio.com/items?itemName=dafny-lang.ide-vscode>
 - Cheatsheet 1: <https://dafny.org/latest/DafnyCheatsheet.pdf>
 - Cheatsheet 2: <https://dafny.org/latest/Dafny-cheat-sheet.pdf>
 - Tutorial: <https://dafny.org/latest/OnlineTutorial/guide>
 - Documentation: <https://dafny.org/latest/toc>

Exercises (please solve without using AI)

1. **Computing the absolute value of a number.** Following the same pattern as in the lecture, perform the following tasks:
 - write a **function** `funAbs` that returns the absolute value of a natural number;
 - implement a **method** `computeAbs` that computes the absolute value of a natural number;
 - Have Dafny **prove** that `computeAbs` implements `funAbs`.
 - Write **another specification** for `computeAbs` and prove it.
2. Implement a method `max3` that computes the maximum of three numbers. Specify the method in two distinct ways and have Dafny prove the two specifications.
3. Implement/specify/verify various ways to compute the `nth` Fibonacci number.
4. Implement a method `minArray` that computes the minimum in an array of integers.
5. Update the method to search from the last element towards the first.
6. Work in groups of two: implement, specify, and verify a method to compute the **2nd** maximum value in an array of integers.