

Assignment 1

Do the following problems and exercises from the book. Note that the ordering reflects the order in which the relevant material is being covered by the course. Always *justify* your answers.

1. Do exercise 1.3.45

Recommended exercises: 1.3.46, 1.3.48

Hints:

1.3.45 *By linear-time algorithm, think of an algorithm that “touches”/“looks into” a stack element at most a constant number of times, say 2 or 3 times. This statement will become rigorous in Section 1.4.*

1.3.46 *The exercise hint proves one direction (\Rightarrow). To prove the other (\Leftarrow), think that you can always create a sequence of push/pop operations to output $a < b$ in any order you like ($[push(a), push(b), pop, pop]$ will output b first, a second, while $[push(a), pop, push(b), pop]$ will output a first, b second). Can you see why you need to have c now?*

1.3.48 *See problem 1.3.33.*

2. Do exercises 1.4.5, 1.4.6, 1.4.12, 1.4.17

Recommended exercises: 1.4.9, 1.4.15

Hints:

1.4.15 *Assume that the arrays are sorted; even if they are not, we’ll see that sorting an N -element array takes $O(N \lg N)$ time, so sorting the three arrays will take $3 \cdot O(N \lg N)$ which is still linearithmic.*

3. Do exercises 1.4.34 (for the last part, note that you can ask for numbers outside interval $[1, N]$, even *negative* ones), 1.5.14, 1.5.15

Recommended exercises: 1.4.20, 1.4.25