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# Algorithms and Data Structures – Conditional Course

## Winter Term 2026/27

### Exercise Sheet 1

**Due:** Wednesday, 28 October 2026, 12:00

#### Exercise 1: Registration

*(5 Points)*

Register for [Zulip](#) using the invitation link on the course website once it is available. We use Zulip as a forum for questions about the lectures, exercises, and course organization. Prefer asking questions in the public course channel so that others can benefit from the answers. Follow the current course website for submission instructions.

#### Exercise 2: Sorting and Measuring Running Times

*(5 Points)*

You have already encountered several sorting algorithms in the lectures. In this exercise, you will implement such algorithms and measure and compare their running times. Implement both *Selection Sort* and *Merge Sort*. Use the template `Sort.py`.

- Measure the running time of both implementations. Use the supplied code to generate random arrays of size  $n$ . Plot running time against  $n$ , using lengths from 100 to 10000, for example in increments of 100.<sup>1</sup> Briefly discuss the results in `experience.txt`; see Exercise 4.

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<sup>1</sup>The comparison is clearest when both algorithms appear in the same plot, with  $n$  on the horizontal axis and running time on the vertical axis.

### Exercise 3: Puzzle: The Corrupt Police Officers

(5 Points)

Solve the following puzzle and write your solution in a PDF, as you should for all subsequent theoretical exercises. We recommend L<sup>A</sup>T<sub>E</sub>X, but other formats are acceptable if the result is clear and legible.

Imagine that you are investigating a police station with 64 officers. Some are corrupt, but a strict majority (at least 33) are honest. Every officer knows exactly which officers are corrupt.

**Your task:** Determine which of the 64 officers are honest and which are corrupt. You may ask only one *type* of question: “Officer A, is your colleague B corrupt?” You may question any officer as often as you wish, but each question must concern exactly two officers in this manner.

Honest officers always tell the truth. Corrupt officers answer arbitrarily: they may deliberately lie or tell the truth to protect themselves.

Describe a strategy that is guaranteed to identify all corrupt officers. What is the minimum number of questions needed to guarantee that you identify them all?

### Exercise 4: Submission

(5 Points)

Prepare your code from Exercise 2, including plots, together with the PDF containing your solution to Exercise 3. Submit the files according to the instructions on the current course website.

Also include a text file named `experience.txt`. In a few sentences, describe your experience with this sheet and the related lectures. In particular, how much time did you spend? Where did you encounter difficulties, and how much time did they cost you?