

## **Lab 1 - instruction**

Let A, B, C and D denote your drawn numbers.

Calculate:

- $M = \max(B, 7-B)$
- $N = 18 + C + D$

In the further part of this instruction the following notation will be used:

- (1) - Gauss method
- (2) - Cholesky method
- (3) - LU decomposition method
- (4) - Simple iteration method
- (5) - Gauss-Jordan method
- (6) - Seidel iteration method

### **Task 1. (4p)**

Investigate the computational complexity of the method A (e.g. if A=2, it is Cholesky method).

In order to do this:

- do several tests for your method, to find the maximal dimension of the matrix  $n$  (the calculations shouldn't last too long – for the biggest matrix it should be shorter than 1 sec) – you may use for this section 4 in the file *pracownia1.py* **(1p)**
- extend the method *mierz\_czas* in the file *zadanie.py* in such a way, that it does M iterations of the algorithm – its result should be analogical to the method *mierz\_czas* of the class *Sortowania* (you may write it in a way using a conditional instruction to make it possible to use it for both methods in task 2) **(1p)**
- run the method *badaj\_zlozonosc* for the object of the class *Zadanie* (for this you may use section 5 in the file *pracownia1.py*); then plot the corresponding plot and describe it **(1p)**
- summarize the results and formulate the conclusions from the experiment **(1p)**

### **Task 2. (2p)**

Compare the effectiveness of obtaining the solution of the system by methods A and B.

(if A = B, compare A and (7-B)).

In order to do this:

- modify the method *mierz\_czas* in such a way, that it does M iterations each algorithm, that you investigate
- make the plot using the method *porownaj\_metody* and analyse it (red points should be for the first method, blue ones – the second one) – for this you may use the section 5 in the file *pracownia1.py* **(1p)**
- summarize the results and formulate the conclusions from the experiment **(1p)**

Include in the report the code of the method *mierz\_czas* and indicate the arguments used when creating the object of the class *Zadanie* in both tasks.

**Sign the report by your name and surname! E.g. KleksAmbrozy-Report1.pdf and send it via moodle within 24h since the meeting at lab finishes.**

### Hints:

1. writing the report remember that you work on matrices, not the lists,
2. drawing the system of linear equations use relevant method of drawing (*losuj*, or *losuj\_symetryczny\_dodatnio\_okreslony*),
3. remember to measure the time of executing all methods important in a specified method of solving the system, e.g. in case of simple iteration you need to execute 2 methods – first you need *przygotuj*, then *iteruj\_roznica*, choosing the correct parameters (parameter *eps* can be  $1e-10$ , the norm – 0 or 1). For each algorithm one of the methods returns 0, if the algorithm cannot be applied, you may use it in the experiment.