Homework I

Description

You need to make a research to compare the working time of the **median finding algorithms**:

1. Trivial solution using sorting
2. Toni Hoar algorithm
3. Blum, Floyd, Pratt, Rivest and Tarjan algorithm

Write a report based on the results you get. You are not given input or output format, or any template, so you can choose any you want to.
You need to implement the algorithms mentioned above, write a tester, measure the time of working, and write a report.

Your work should consist of two parts:

1) A .cpp file contains algorithms and code that measures working time.
2) A report where you analyse and prove time complexity for the each algorithm and explain the results you get. A .cpp file must be runnable and reproduces the results you describe in the report.

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What you have to do step by step for the code part:

1) **Implement algorithms**: Trivial solution using sorting, Toni Hoar algorithm, and Blum, Floyd, Pratt, Rivest and Tarjan algorithm
2) **Write a tester** that validates your implementation works correct. You can compare the output of the algorithms if they are all the same, or compare the output of the algorithms with STL implementation of median finding. Run the tester on random generated arrays.
3) Write a **benchmarker** that runs your algorithms on different size inputs and measure the computation time.

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What you have to do step by step for the report part:

4) Analyse and **prove** the time complexity for each of the algorithms, **compare** the working time of algorithms you implemented and explain it

In your report you **have to answer** the following questions:
4.1) What is the time complexity of **each** version of the algorithm? **Why?**
4.2) What is the working time of each version of the algorithms on **different inputs**? Try arrays of different sizes from very small to very large. Build charts with your measurements
4.3) What **input size** you can see the **difference** in working time for each of the algorithms?

5) **Write down** your thoughts and answers in your report. Use **Google Colab notebook** to draw charts and write the proofs.

6) **Create a folder** with the code files, **archive** it as **.zip** and **send** as an email with a link to your Google Colab Notebook to algo.hw@gmail.com . Remember to write your name!

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The evaluation rules

The deadline for the problem is **28 February 23:59**. The deadline counted by the time of your **last email sending**.

Your work will be evaluated based on your **code style**, **code structure**, **correctness**, and **completeness** of the report.

The variant you sent to my email is the final version, you can’t change it later.