

Lab Assignment 1

CS 361 – Principles of Programming Languages I

Fall 2017

Problem 1

Write a C++ program that

- reads all numbers from a file *data.txt*;
- computes the 25 % percentile, the 50 % percentile, and the 75 % percentile of these numbers; and
- outputs the computed percentiles to the console.

The x % percentile of a set S is the smallest element e in S such that at least x % of the elements in S (including e) are smaller than or equal to e .

Your program should be in a single file *percentile.cpp*. It should contain a function named `percentile` which takes a percentage-value as input and returns the corresponding percentile. Do not use any third party libraries.

The numbers in the file *data.txt* are all integers. Each line of the file contains a single number. The first number of the file states how many numbers follow, it should be ignored when computing the percentiles. You can read the numbers using the code below.

```
#include<iostream>
#include<fstream>
using namespace std;

int main() {
    ifstream dataFile("data.txt");
    while (!dataFile.eof()) {
        int number;
        dataFile >> number;
        /* Process number... */
    }
    return 0;
}
```

Bonus. Write the numbers in ascending order into a file *dataSorted.txt*. The numbers should be in a single line separated by a single space character. The first number in the file states how many numbers follow.

Problem 2

Write a C++ program that, for a given n and k with $1 \leq k \leq n \leq 10$, outputs all the permutations which can be created using k out of n digits. For example, if $n = 4$ and $k = 3$, your program should output: 012 013 021 023 031 032 102 103 ... 321 (24 in total). Output all permutations to the console separated by a single space character.

Your program should be in a single file *permutations.cpp*. The numbers n and k are given as command line parameters when your program is started. You can determine n and k using the following code.

```
int main(int argc, char* argv[]) {
    int n = atoi(argv[1]);
    int k = atoi(argv[2]);
    /* ... */
    return 0;
}
```

Submission

For your submission, upload a single zip-file to canvas. The zip-file should contain

- a file *percentile.cpp*, your submission for problem 1,
- a file *permutation.cpp*, your submission for problem 2, and
- a file *report.pdf*, a short (at most two pages) report describing the structure of your programs, how your programs work, and design choices you made.

This is an individual assignment. Therefore, a submission is required from each student. Your program is expected to run on Visual Studio 2012 (the version on the lab computers).

Deadline: Sunday, October 22, 11:59 pm.