02393 C++ Programming Exercises

Assignment 5

To be handed in via CodeJudge — `https://dtu.codejudge.net/02393-e21/assignments`

1 Processing datasets

The goal of the following exercises is similar. You have to read some datasets of `int` values from `cin` and process them. Each data value is preceded by the identifier of the dataset it belongs to, and there are only two datasets, identified by `a` and `b`. The datasets can be of different sizes.

You have to keep reading values from `cin` until there is nothing more to read (there is no explicit stop input; see the "hints" below).

Exercise 1: Read the datasets and write them into `cout` in the following order: first by dataset (first `a`, then `b`), and then by value. Example:
input: `a 3 b 2 b 1 a 1 a 4 b 2`
output: `1 3 4 1 2 2`

Exercise 2: Read the datasets and write them into `cout` in the following order: the 1st value stored in dataset `a` (if any); the 1st value stored in dataset `b` (if any); the 2nd value stored in dataset `a` (if any); the 2nd value stored in dataset `b` (if any); etc... Example:
input: `a 3 b 2 b 1 a 1 a 4 b 2`
output: `3 2 1 1 4 2`

Exercise 3: Read the datasets. Interpret each dataset as a vector (in the order provided by the input) and compute their scalar product. If one of the vectors is shorter than the other, consider the missing dimensions as having value 0. Example:
input: `a 3 b 2 b 1 a 1 a 4 b 2`
output: `15` (which is obtained from $(3,1,4) \times (2,1,2) \;=\; 3 \cdot 2 + 1 \cdot 1 + 4 \cdot 2 \;=\; 15$)

Hints. The method `cin.fail()` returns `false` if `cin` can yield more inputs, or `true` otherwise.

You can use one `vector` container to store each dataset. You may load the datasets into the vectors first, and process them later. Use the documentation for `vector`:

`http://en.cppreference.com/w/cpp/container/vector`
`http://www.cplusplus.com/reference/vector/vector/`

To sort the values of a vector, you can use the function `sort()` available by including `<algorithm>`:

`https://en.cppreference.com/w/cpp/algorithm/sort`
`https://www.cplusplus.com/reference/algorithm/sort/`

Challenge. Try to extend the programs to support an arbitrary number of data sets, specified by the user at run-time. To this purpose, you might consider using STL `map`s...