

## CS 361 – Homework #4 – Find Four – Due November 7, 2018

Write a computer program in Java or Python that determines if the same number exists in four different lists. Specifically, here is your task: The user will supply the name of an input text file at the command line. If the user happens to forget this, print a friendly error message and quit.

The input file contains 4 columns of numbers. Assume they are 32-bit integers, each able to be represented by Java's `int` data type. Each column has the same number of values. In other words, each line of the text file will have exactly 4 numbers on it. Within a line, the numbers are separated by one or more space characters. Each of the 4 columns of data represents a list of numbers. Assume that within each list, the integers are unique.

Determine if there exists a number that resides in all 4 columns. If so, print that integer out (using standard output). See the output format below. If no value appears in all 4 lists, then print the sentence: `No value appears in all 4 columns.` To be a successful search, it is not sufficient for a number to appear in only 3 out of the 4 columns: it must appear in all 4. If more than one value happens to appear in all 4 lists, then it is sufficient to identify any of these duplicated values. For example, if the numbers 11, 13, and 15 all appear in all 4 lists, then your answer may be either the 11, the 13 or the 15.

Most importantly, your algorithm must be computationally efficient. It must run in  $O(n \log n)$  time. Your program will be tested with large input files. Your documentation should explain the approach taken by your algorithm and why it should be expected to compute at this level of efficiency.

Example I/O:

Let's assume that the file `input.txt` looks like this.

```
17 18 6 20
51 13 53 52
21 22 25 26
18 27 28 29
54 57 56 55
67 62 79 18
106 92 18 42
```

We invoke the program from the command line as follows:

```
java Driver input.txt
```

Then the program should say...

```
The number 18 appears in all 4 columns.
```