**Indian National Olympiad in Informatics, 2003**

**Solution to Question 2, Nearest fraction**

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* **The naive solution**

For each input fraction *a/b*, we keep track of the largest fraction below *a/b* and the smallest fraction above *a/b* that we have seen so far. Initially, these values are *1/99* and *98/99*.

In a loop, we generate all possible fractions *i/j*. If the fraction is proper, we check whether it lies above or below the current input *a/b*. If it beats the current nearest fraction in that direction, we update the value of the nearest fraction.

Notice that solution cycles through the entire set of fractions for each input.

* **A smarter solution**

We generate the entire set of proper fractions in the range given and sort them in ascending order.

For each input fraction, we use binary search on the sorted list to find the pair of fractions that are nearest to it.

* **Some general tips**

The fractions should always be stored and compared in terms of their integer numerators and denominators, rather than being compared as floating point numbers, to avoid errors due to loss of precsion.

* [A C program for the exhaustive solution to the problem](https://www.iarcs.org.in/inoi/2003/inoi2003/qpaper/fraction-exhaustive.c)
* [A C program for the solution using sorting and searching](https://www.iarcs.org.in/inoi/2003/inoi2003/qpaper/fraction-sort-search.c)
* Some test inputs ...
  + [Input 1](https://www.iarcs.org.in/inoi/2003/inoi2003/qpaper/fraction-input.1)
  + [Input 2](https://www.iarcs.org.in/inoi/2003/inoi2003/qpaper/fraction-input.2)
  + [Input 3](https://www.iarcs.org.in/inoi/2003/inoi2003/qpaper/fraction-input.3)
  + [Input 4](https://www.iarcs.org.in/inoi/2003/inoi2003/qpaper/fraction-input.4)
  + [Input 5](https://www.iarcs.org.in/inoi/2003/inoi2003/qpaper/fraction-input.5)
  + [Input 6](https://www.iarcs.org.in/inoi/2003/inoi2003/qpaper/fraction-input.6)
  + [Input 7](https://www.iarcs.org.in/inoi/2003/inoi2003/qpaper/fraction-input.7)
  + [Input 8](https://www.iarcs.org.in/inoi/2003/inoi2003/qpaper/fraction-input.8)
  + [Input 9](https://www.iarcs.org.in/inoi/2003/inoi2003/qpaper/fraction-input.9)
  + [Input 10](https://www.iarcs.org.in/inoi/2003/inoi2003/qpaper/fraction-input.10)
* ... and corresponding outputs
  + [Output 1](https://www.iarcs.org.in/inoi/2003/inoi2003/qpaper/fraction-output.1)
  + [Output 2](https://www.iarcs.org.in/inoi/2003/inoi2003/qpaper/fraction-output.2)
  + [Output 3](https://www.iarcs.org.in/inoi/2003/inoi2003/qpaper/fraction-output.3)
  + [Output 4](https://www.iarcs.org.in/inoi/2003/inoi2003/qpaper/fraction-output.4)
  + [Output 5](https://www.iarcs.org.in/inoi/2003/inoi2003/qpaper/fraction-output.5)
  + [Output 6](https://www.iarcs.org.in/inoi/2003/inoi2003/qpaper/fraction-output.6)
  + [Output 7](https://www.iarcs.org.in/inoi/2003/inoi2003/qpaper/fraction-output.7)
  + [Output 8](https://www.iarcs.org.in/inoi/2003/inoi2003/qpaper/fraction-output.8)
  + [Output 9](https://www.iarcs.org.in/inoi/2003/inoi2003/qpaper/fraction-output.9)
  + [Output 10](https://www.iarcs.org.in/inoi/2003/inoi2003/qpaper/fraction-output.10)