

## Project: Unsigned reversal

This assignment aims to compute the unsigned reversal distance. You are required to implement the 4-approximation and 2-approximation algorithm.

The input consists of two lines. The first line consists of two integers  $n$  and  $flag$ .  $n$  (which is at most 100,000) is the length of the permutation and  $flag$  indicates if we want to output the sequence of reversal ( $flag=1$  means print the reversal sequence). The second line consist of  $n$  integers, which represent the permutation of  $1, 2, \dots, n$ . For example,

The input sequences are in FASTA format. For example,

```
8 1
2 4 3 5 8 7 6 1
```

The output consists of one integer  $d$ , which is the reversal distance computed by your program. If ( $flag=1$ ), the next  $d+1$  lines illustrate the sequence of reversals.

For the above example, the output (for both 4-approx and 2-approx) is

```
4
2 (4 3) 5 8 7 6 1
2 3 4 5 (8 7 6) 1
(2 3 4 5 6 7 8) 1
(8 7 6 5 4 3 2 1)
1 2 3 4 5 6 7 8
```

### Detail of the programming task

You are required to write two programs:

- A 4-approximation algorithm for computing unsigned reversal distance**  
`java 4approx_unsigned_reversal input.txt output.txt`
- A 2-approximation algorithm for computing unsigned reversal distance**  
`java 2approx_unsigned_reversal input.txt output.txt`

### Testing data

Ten sets of testing data are provided. Answers are provided for input1.txt, input5.txt and input7.txt