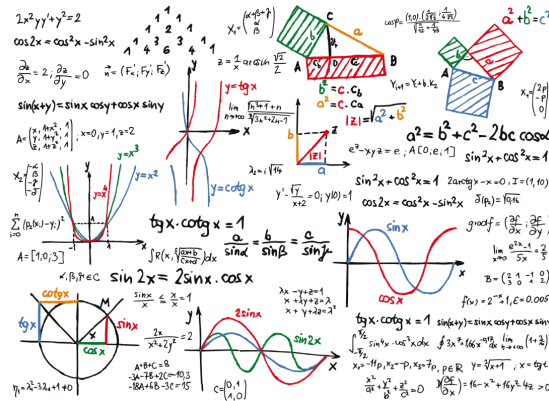# B4 - Mathematics

206neutrinos

No mean task here…

206neutrinos

binary name: 206neutrinos
language: everything working on "the dump"
compilation: when necessary, via Makefile, including re, clean and fclean rules

- The totality of your source files, except all useless files (binary, temp files, obj files,...), must be included in your delivery.

- All the bonus files (including a potential specific Makefile) should be in a directory named *bonus*.

- Error messages have to be written on the error output, and the program should then exit with the 84 error code (0 if there is no error).

A distinguished nuclear physics researcher and their assistant are studying neutrinos, a kind of promising particle, and are trying to prove that these particles can travel faster than light.

Given temperature and pressure conditions, they record the speed of some particles under these conditions, modify one parameter, and start again. Almost 11 months of hard work on several hundreds of millions records...

They are unable to efficiently store all of these values. For each series of records, they only register:

1. its arithmetical mean,
2. its standard deviation,
3. its root mean square (they need an average speed so that if all the particles travel at this speed, they would have the same total kinetic energy, which writes $\frac{1}{2}mv^2$),
4. its harmonic mean (as a precaution, in case they would need another variable, with a non-quadratic dependency on speed).

Considering the size of the series, they need you to develop a software that will allow them to update their data in real-time. This program will take 4 numbers as inputs (the number of recorded values, their arithmetic mean, harmonic mean and standard deviation), and must:

1. wait for the next value to be written on the standard input,
2. print the number of recorded values, their standard deviation, arithmetic mean, root mean square and harmonic mean,
3. return to the first step, except if the keyword END is entered.

A smart program design will produce a compact and elegant code!

Usage

Examples

```
▽                          Terminal                          −  +  x
~/B-MAT-400> ./206neutrinos 12000 297514 297912 4363
Enter next value: 299042
    Number of values:   12001
    Standard deviation: 4362.84
    Arithmetic mean:    297514.13
    Root mean square:   297546.11
    Harmonic mean:      297912.09

Enter next value: 302420
    Number of values:   12002
    Standard deviation: 4362.89
    Arithmetic mean:    297514.54
    Root mean square:   297546.52
    Harmonic mean:      297912.46


Enter next value: END
```