Computational Physics Homework # 104.

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When you hand in the homework, you should gather all your files into a single tarball file as follows.

- Use an unix command `tar -czf` <file name>.tar.gz <file 1> <file 2> ⋯.

- For undergraduate students, put a copy of a tarball <file name>.tar.gz into a directory:

  `/physics/upload/comp2023/`<user-ID>.

- For graduate students, put a copy of a tarball <file name>.tar.gz into a directory:

  `/physics/upload/acomp2023/`<user-ID>.

- You must use the GNU `make` command and `Makefile` to compile the code starting from the homework `hw101`.

Chapter 7

1. In the class, you learned how to use file I/O in C. Please find a data file "data.104". Make a code according to the following instructions:

   - Make a code which can read in the data file "data.104". Do not assume that you know the total size of the file. Make a general code which can work regardless of the file size.

   - While reading in the data, determine the size of the data: how many data points are there in the data file?
   [HINT] Use the `feof()` function to find the end of a file.

- Obtain the average of the data.

$$\bar{x} = \frac{1}{N} \sum_i x_i$$

- Obtain the standard deviation or variance s^2 of the data.

$$s^2 = \frac{1}{N-1} \sum_i (x_i - \bar{x})^2$$

- Obtain the variance σ^2 of the mean.

$$\sigma^2 = \frac{1}{N(N-1)} \sum_i (x_i - \bar{x})^2$$

- Print the average, variance, variance of the mean into a file named "stat.data" in the following format:

average = ???
variance = ???
variance of the mean = ???