

Exercise 3: Historical measurements on the speed of light

The following 66 measurements, taken from³ were recorded by Newcomb in 1878 as measurements of the speed of light. The given values $\times 10^{-3} + 24$ give the time in millionths of a second for the light to traverse a known distance. (Note that the two negative numbers are not physically meaningful.)

28	-44	29	30	24	28	37	32	36	27	26	28
29	26	27	22	23	20	25	25	36	23	31	32
24	27	33	16	24	29	36	21	28	26	27	27
32	25	28	24	40	21	31	32	28	26	30	27
26	24	32	29	34	-2	25	19	36	29	30	22
28	33	39	25	16	23						

- Plot the data by a histogram. Also plot the empirical distribution function and make a box plot. What do the different plots tell you? Are there indications of "outliers" in the data?
- Compute the (empirical) mean and median. These are both *measures of location*. What do the two measures of location tell you?
- Compute the (empirical) standard deviation and the interquartile range (i.e. the difference between the third and the first quartile). These are both *measures of spread*. What do the two measures of spread tell you?
- Compute a 95% confidence interval using all data. Also compute a 95% confidence interval without the two "outliers" (cf. question a).
- The true value has subsequently been shown to be 33.02. Comment on the confidence intervals in question d.

³Staudte, R. G. and Sheather, S. J. (1990). Robust testing and estimation. Wiley. See p. 314.