Summation: See <https://en.wikipedia.org/wiki/Kahan_summation_algorithm>

In particular, simply summing *n* numbers in sequence has a worst-case error that grows proportional to *n*, and a [root mean square](https://en.wikipedia.org/wiki/Root_mean_square) error that grows as sqrt(n) {\displaystyle {\sqrt {n}}} for random inputs (the roundoff errors form a [random walk](https://en.wikipedia.org/wiki/Random_walk)).[[2]](https://en.wikipedia.org/wiki/Kahan_summation_algorithm#cite_note-Higham93-2) With compensated summation, the worst-case [error bound](https://en.wikipedia.org/w/index.php?title=Error_bound&action=edit&redlink=1) is independent of *n*, so a large number of values can be summed with an error that only depends on the floating-point [precision](https://en.wikipedia.org/wiki/Precision_(arithmetic)).[[2]](https://en.wikipedia.org/wiki/Kahan_summation_algorithm#cite_note-Higham93-2)

Academic analysis: <https://people.eecs.berkeley.edu/~demmel/AccurateSummation.pdf>

Discussions see: <http://ipl.physics.harvard.edu/wp-uploads/2013/03/PS3_Error_Propagation_sp13.pdf>

<http://lectureonline.cl.msu.edu/~mmp/labs/error/e2.htm>

<http://www.utm.edu/staff/cerkal/Lect4.html>

Above using relative error of addition, also use error propagation