

Addenda to handout “Lab0-DataAna”

re: significant figures

Students must take care to write the appropriate number of significant figures, both in their original data sheets, and especially in their final reports, as detailed further in the section describing how to write reports. Results of calculations should always be stated to the appropriate precision. Here, we need to borrow methods for “propagation of errors” which is elaborated in the next section. Basic rules can be summarized as follows:

The precision of the result is:

- 1. For products or division, the same fraction (number of significant figures) as the least precise factor.*
- 2. For addition or subtraction, the same absolute value(decimal place) as the least precise term.*

Errors are conventionally stated to only 1 significant figure. Experimental values should be stated with the same decimal place as the errors. This will usually require making several readings of a value to establish the random errors (see below). For example, a result might be stated as $12.3 \pm 0.2 \times 10^2$ cm/sec². Intermediate calculations should always be carried out with at least one more significant figure than the final answer.

re: error propagation

Case III: pure addition

$$f(x,y) = Ax + B y \quad \text{eq.1.6.13}$$

where A and B are constants. Note that A or B may be negative, corresponding to subtraction. Now the ratio trick is no longer useful and we have

$$\Delta f^2 = (A\delta x)^2 + (B\delta y)^2. \quad \text{eq.1.6.14}$$

“For sum/difference functions, absolute errors (not fractions) add quadratically”