Pre-Lab Practice: Measurements and Error Propagation

Review the Textbook:

- PHYS 1401: Serway & Vuille: Appendix A and Chapter 1.
- PHYS 2425: Serway & Jewett: Appendix B and Chapter 1.

Practical Population Standard Deviation: $\sigma = \sqrt{(\overline{X^2} - \overline{X}^2)}$ Practical Sample Standard Deviation: $s = (\sqrt{\frac{n}{n-1}})\sigma$

The instantaneous speed of a car measured from the speedometer reading every second for 10 seconds, in units of miles per hour are: 0, 1, 9, 11, 17, 10, 28, 40, 36, 55.

- 1. The average of the above readings in mph is about (21)
- 2. The sample standard deviation of the above readings is about (18)
- 3. The mass of a ball is measured as $(60.2 \pm 0.5)g$. What is the same measurement, given with a percent uncertainty? ($60.2g \pm 0.83\%$)
- 4. How many significant figures does the measured value of the mass of the ball have? (3)
- 5. A mass of a box is described as 52 ± 0.5 kilograms, what is the range of values, in kilograms in which you expect to find the mass of the box? (51.5, 52.5)
- 6. The volume of milk in a jug is determined by pouring it out into a container, first using a 50.0 ml jar in which a 0.5 ml error in measurement is estimated and then using a smaller 5.0 ml flask in which a 0.25 ml error in measurement is estimated. The milk was poured out 5 times using the 50.0 ml jar and 8 times using the 5.0 ml flask. What is the measured volume of milk in the jug, in ml? State in the standard form (Total volume \pm estimated uncertainty in volume) (290.0 \pm 4.5) (Alternative: 290 \pm 5. It's common to round the uncertainty to one significant figure.)
- 7. The dimensions of a table are measured with a meter stick. The length of the table is measured 3.431 m and width of the table is measured 2.187 m. The uncertainty of each of these measurements is 2 mm. What is the area of the table in m² and its uncertainty? (7.504±0.011)
 (Alternative: 7.50±0.01. It's common to round the uncertainty to one significant figure.)