

HW2
4BL
MHM
07

4.5. A student measures the period of a pendulum and obtains the following values.

Trial	1	2	3	4	5	6	7	8
Period	1.35	1.34	1.32	1.36	1.33	1.34	1.37	1.35

- Find the mean and standard deviation of the measurements and the standard deviation of the mean.
- Estimate the probability that another single measurement will fall within 0.02 s of the mean.

4.7. A counter is set to count gamma rays from a radioactive source. The total number of counts, including background, recorded in each 1-min interval is listed in the accompanying table. An independent measurement of the background in a 5-min interval gave 58 counts. From these data find:

- The mean background in a 1-min interval and its uncertainty.
- The corrected counting rate from the source alone and its uncertainty.

Trial	1	2	3	4	5	6	7	8	9	10
Total counts	125	130	105	126	128	119	137	131	115	116

Find the maximum likelihood estimate of the mean and its uncertainty.

4.10. Assume that you have a box of resistors that have a Gaussian distribution of resistances with mean value $\mu = 100 \Omega$ and standard deviation $\sigma = 20 \Omega$ (i.e., 20% resistors). Suppose that you wish to form a subgroup of resistors with $\mu = 100 \Omega$ and standard deviation of 5Ω (i.e., 5% resistors) by selecting all resistors with resistance between the two limits $r_1 = \mu - a$ and $r_2 = \mu + a$.

- Find the value of a .
- What fraction of the resistors should satisfy the condition?
- Find the standard deviation of the remaining sample.

Problem 2.10 A charge q sits at the back corner of a cube, as shown in Fig. 2.17. What is the flux of \mathbf{E} through the shaded side?

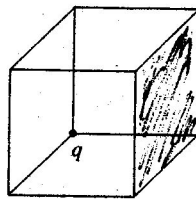


Figure 2.17

Problem 2.36 Two spherical cavities, of radii a and b , are hollowed out from the interior of a (neutral) conducting sphere of radius R (Fig. 2.49). At the center of each cavity a point charge is placed—call these charges q_a and q_b .

- Find the surface charges σ_a , σ_b , and σ_R .
- What is the field outside the conductor?
- What is the field within each cavity?
- What is the force on q_a and q_b ?
- Which of these answers would change if a third charge, q_c , were brought near the conductor?

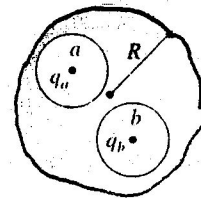


Figure 2.49