

PHYS 500
HANDOUT 2

1. You are given the following recordings for the length of a rod

ℓ_i <i>mm</i>	$\ell_i - \bar{\ell}$ <i>mm</i>	$(\ell_i - \bar{\ell})^2$ <i>mm</i>
24.25		
24.26		
24.22		
24.28		
24.24		
24.25		
24.22		
24.26		
24.23		
24.24		
$\sum_{i=1}^{10} \ell_i =$	$\sum_{i=1}^{10} (\ell_i - \bar{\ell}) =$	$\sum_{i=1}^{10} (\ell_i - \bar{\ell})^2 =$

- Find the average value of the length of the rod
- Fill in the table
- Find the absolute error
- Quote the experimental result
- Find the relevant error

2. Find the mean, median, the most probable and the standard deviation values of x for the following data:

i	x_i	i	x_i	i	x_i	i	x_i	i	x_i
1	3	6	8	11	12	16	6	21	5
2	7	7	9	12	8	17	7	22	10
3	3	8	7	13	6	18	8	23	8
4	7	9	5	14	6	19	9	24	8
5	12	10	7	15	7	20	8	25	8

3. Fill in the table with the values of the corresponding relative error.

	Average value	Error	Relative Error	Relative Error %
	\bar{x}	δx	$\delta x / \bar{x}$	
1	263.28	0.08		
2	12.20	0.03		
3	127.2	0.9		
4	17.24	0.23		

4. In an ideal gas of molecules the distribution of the molecular speeds is the so called Maxwell-Boltzman distribution and is given by:

$$f(v) = \sqrt{\left(\frac{m}{2\pi kT}\right)^3} 4\pi v^2 e^{-\frac{mv^2}{2kT}}$$

Where m is the molecular mass, T the absolute temperature and k the Boltzman constant. For the above distribution find the mean speed, the mode speed and the variance.

5. The probability distribution of a continuous random variable x is given by:

$$f(x) = \begin{cases} 4x(9-x^2)/81 & 0 \leq x \leq 3 \\ 0 & \text{otherwise} \end{cases}$$

Find (a) the mean value, (b) the mode and (c) the median.

6. Find the average and the variance in a single roll of a fair dice.