PHYS 500
HANDOUT 2

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

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

    a) Find the average value of the length of the rod
    b) Fill in the table
    c) Find the absolute error
    d) Quote the experimental result
    e) 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. Somebody made a measurement of a physical quantity A in two sets. In the first set he did 10 measurements and in the second he did 20 as shown in the tables below. The errors in the experiment were random.

5.9	5.6	5.7	5.6	5.6	5.8	6.2	5.7	5.7	5.5

5.6	5.9	5.8	5.9	6.0	5.6	5.7	6.1	6.2	5.6
6.0	5.8	5.5	5.9	5.7	6.2	5.8	6.0	5.9	6.0

For the two cases calculate the average values, the variance s^2 and the absolute error of the average value. Discuss.

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

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

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